THE TOY FISH

A History of the Aquarium Hobby in America - The First One-Hundred Years

by Albert J. Klee



Fourth Edition

Dedicated to
Braz Walker and Ross Socolof,
Dear Friends and Distinguished Colleagues
who shall long be remembered for
what they gave, each in their own way,
to the aquarium hobby.

AJK Productions

Milford, Ohio

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Qui lacerat, violatve, rapit, presens epitoma
Hunc laceretque voret, *Cerberus* absque mora.

JOHN SKELTON 1460-1529

That man who tears or harms this book,
or carries it away,
Him let the hellhound
***Cerberus* devour without delay.**



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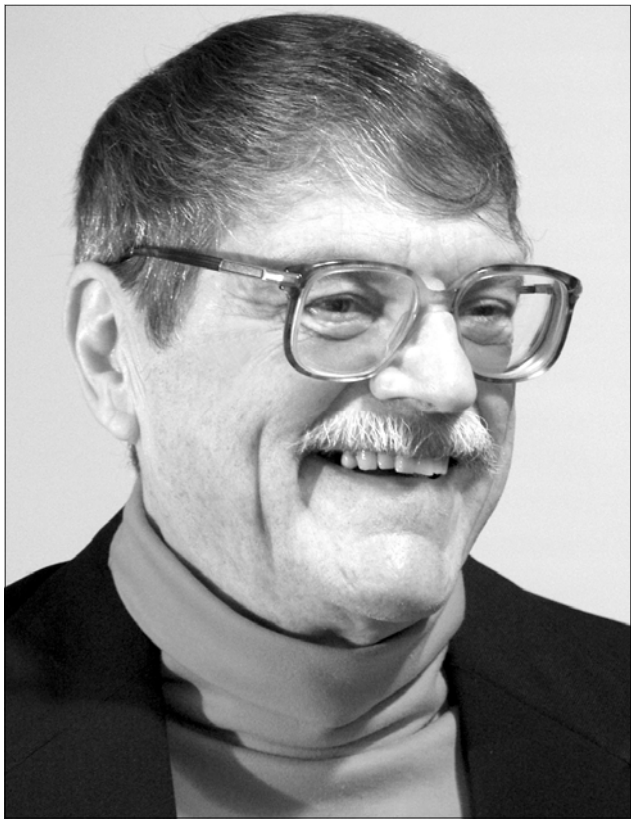
FOURTH EDITION

ABOUT THE AUTHOR

Dr. Albert J. Klee has a diverse educational background, holding five American university degrees including Engineering, Business, Mathematics, Modern Languages and Computer Sciences, as well as a diploma from the Universidad Complutense de Madrid, where he studied Hispanic art and culture.

A1 has traveled to 37 foreign countries and reads and translates nine languages. He has collected reptiles, fishes, birds, insects and mammals from South and Central America for the Cincinnati and Detroit Zoos, and has discovered several new species of fishes and a new genus of cichlids (*Apistogrammoides*). He has also served as a consultant to the Fleischman Aquarium at the Cincinnati Zoo.

In 1950 he devised a saltwater formula for the Fleischmann aquarium and it was used in the new saltwater exhibits that were installed in 1953. The production was contracted to a commercial chemist and to defray the costs, the Zoo marketed the material under the name of "Marine Mix," the first such formulation on the market in the United States.



He is an Honorary Member of many aquarium associations and societies and has written almost 600 articles on fishes, both popular and scientific. He has been an Associate Editor of the AQUARIUM JOURNAL, Contributing Editor of TROPICALS MAGAZINE, Contributing Editor of the Swedish aquarium magazine, AKVARIET, Editor of THE AQUARIST'S NOTEBOOK, Editor and Publisher of AQUARIUM ILLUSTRATED and Editor of THE AQUARIUM magazine. His articles, some of which are indexed in the ZOOLOGICAL RECORD, have been translated into many foreign languages and published in journals all over the world. Al's writings have not been all serious, however. In 1961 the San Francisco Aquarium Society published a book of his humorous aquarium columns and cartoons called *The Finny Bone!*

Although he has authored a number of small booklets on various aquatic subjects, he is widely recognized as the leading author on aquarium history matters, his best known work being *The Toy Fish – A History of the Aquarium Hobby in America, The First One Hundred Years*. He is also the author of *The Guppy, 1859-1967, The History of Ichthyology, A History of Aquarium Inventions, The First One Hundred Years, Aquarists of the New York Aquarium 1896-1941,* and *The First Lady of the Aquarium Hobby, Ida May Mellen.* His two-volume 700-page *Anthologica Aquatica,* consisting of over 300 of his aquarium articles published between 1951 and 1971 was recently published on CD for the Aquarium Hobby History Society.

Al is, along with Robert Criger, a founder of the American Killifish Association, and is responsible for the term, "killifish," being widely used throughout the aquarium world today. He was the first Chairman of the AKA's Board of Trustees and its first Fellow. He was author of the original AKA By-Laws, the first Editor of THE JOURNAL OF THE AMERICAN KILLIFISH ASSOCIATION (JAKA) and the first Editor of its KILLIFISH INDEX. His interest in fishes is diverse, and Dick Stratton credits him with the idea of first establishing a national cichlid association, although he had to leave it to others as he was just starting up the AQUARIUM ILLUSTRATED magazine.

Braz Walker, one of the aquarium hobby's "greats" once commented:

> "There is a rare breed of individual who can hardly maintain an interest without an intense drive toward mastery of the subject at hand. One such individual is at the same time a warm and sharing human being with linguistic capability in a number of tongues useful in the scientific pursuit of his chosen laity, plus a tremendous storehouse of related technical and practical knowledge with a spring-trap mental key for withdrawing the knowledge for scriptic or oral presentation. Because of a facility for presenting ordinarily indigestible material in a completely palatable way, it was perhaps inevitable that Albert J. Klee would one day be willingly drafted into the professional service of his non-professional ichthyological and aquaristic peers.
>
> "He is university teacher, explorer, discoverer, researcher, scientist, author, adventurer, husband and father, but most of all he is a naturalist who loves nature equally as well as the knowledge of it. His affinity with nature is evident in his written word and in his chosen epitaph, "Knowing that Nature never did betray the heart that loved her."
>
> "There are perhaps few persons, certainly within our aquatic field, who more thoroughly research and analyze material before signing their names to it than Albert J. Klee. Truth and accuracy are of prime importance to him, and he is quick to see issues developing and to comment on them editorially. His literary resources, many of which are retained in his head, are of such that few aquatic inquiries cannot be answered no matter how obscure. His is the education of conviction and assurance, for he is one of the rare experts who finds no difficulty in saying that he does not know if indeed this does occur. It seldom does, but if it should he can probably find the answer in short order.
>
> "Many to whom near perfection in their field comes easily lack patience and tolerance with those for whom the plodding is a bit more soggy. To be a "stickler for minutiae," to quote his own words in a personal letter of a few years back, Al has at the same time helped plenty of little old ladies across the street with their attempts at literalizing, and at least one medium sized, not-too-old man."

Diane Schofield, noted aquarist and writer, provided this observation:

> "If you have never met Al Klee, you indeed have an experience in store for you. Frankly, he's one of my favorite people in the hobby - he's like meeting an IBM machine with a sense of humor. He is also the only person that I could sit through the same speech within a two week period of time and not try desperately to find any old opportunity to go out and powder my nose, hide under the tablecloth, or seek an opportunity for a short beer on the second go around. In short, this boy is a fabulous personality."

Finally, one of our most distinguished aquarists, noted fish farm entrepreneur and discoverer of new fish species in the jungles of Central America, Ross B. Socolof, wrote:

> "When the history of the aquarium hobby in America is brought up to date, his name and accomplishments will probably shine brightest. He is one of the most accomplished aquarists of all time."



INTRODUCTION

The roots of the aquarium hobby in Great Britain were laid down during the period 1841-1852 and, like a whirlwind, the aquarium quickly became a fashionable household item in Victorian England. Although goldfish, native freshwater fishes and all sorts of other freshwater life were kept, marine aquaria were far more popular and so the early aquarium books dealt largely with coldwater marine species. Saltwater life was the more bizarre, interesting and spectacular, and since the seashore is not far away in the British Isles, aquarists could easily obtain both saltwater and living organisms. Amateurs, unfortunately, had a hard time keeping marine fish alive, and within ten years the hobby was fading faster than a soufflé on a polar expedition. By 1870, the fad had quite worn itself out in England.

In the United States, however, things were different. American aquarists were not as easily discouraged and, since freshwater fishes were acknowledged easier to keep than their marine counterparts and tanks were available commercially, the fledging hobby continued to grow. Although developments from the mid-to-end of the nineteenth century were not particularly significant, by the end of the Victorian era the first American aquarium societies were formed and, along with native American fishes and the goldfish, a limited number of tropical species were available and kept by aquarists.

The aquarium hobby had begun in Germany in 1856 with the publication of Emil Rossmässler's, "Der See im Glase," followed a year later by "Das Süsswasseraquarium." The British had preceded the Germans by about fifteen years, however, so it was from Great Britain that we obtained the first aquarium literature in which the basic principles of the so-called "balanced aquarium" were enunciated. From 1875 to the beginning of World War II, however, German enthusiasts from diverse trades and professions led the aquarium world and exerted a great influence on the American hobby. German sailors collected fish from all over the world; German businesses established collection stations in Asia, Africa and South America, and German ichthyologists organized expeditions to acquire new aquarium fishes and provided most of their scientific descriptions. Until World War I, the aquarium hobby in America had a decided Teutonic flavor.

The Edwardian era - the interval between 1900 and the start of World War I - marked the real beginning of the aquarium hobby in America. The first aquarium societies had been established, the importation of exotic tropical fishes accelerated, and books that included information on these new, more exotic arrivals were published domestically. New aquarium magazines also started to appear, as well as rudimentary heating schemes, airlifts and filters. Also notable in this period was the birth of aquarium photography. The following era, that between World War I and the beginning of the Great Depression towards the end of the Twenties, was the heyday of the American aquarium hobby prior to World War II.

Since there was little money for amusements and entertainments, one might have thought that the depression years of the Thirties that followed would have administered the coup de grâce to the aquarium hobby in America. However, although the commercial side certainly was adversely affected, in the absence of television and because it cost very little to maintain and breed aquarium fishes, the hobby did survive this calamitous period.

Since this history concerns the aquarium hobby it should be underscored that an aquarium is not simply a container and that it takes an aquarist to transform a tank into an aquarium. Over 130 years ago John Collier wrote: "It is not generally understood what constitutes an aquarium. Many people are in the habit of calling every vessel or tank wherein fish are placed, an aquarium. This is not so, as an aquarium is a tank or vessel, no matter of what material it may be com-

posed, that contains animal and vegetable life self sustaining."

Therefore, although this history gives the container as such its appropriate due, its aim is to encompass the principles, equipment, techniques and people responsible that justified the activity over time as a hobby, and not merely as a device used as a conversation piece or to brighten up an otherwise unremarkable corner of a room.

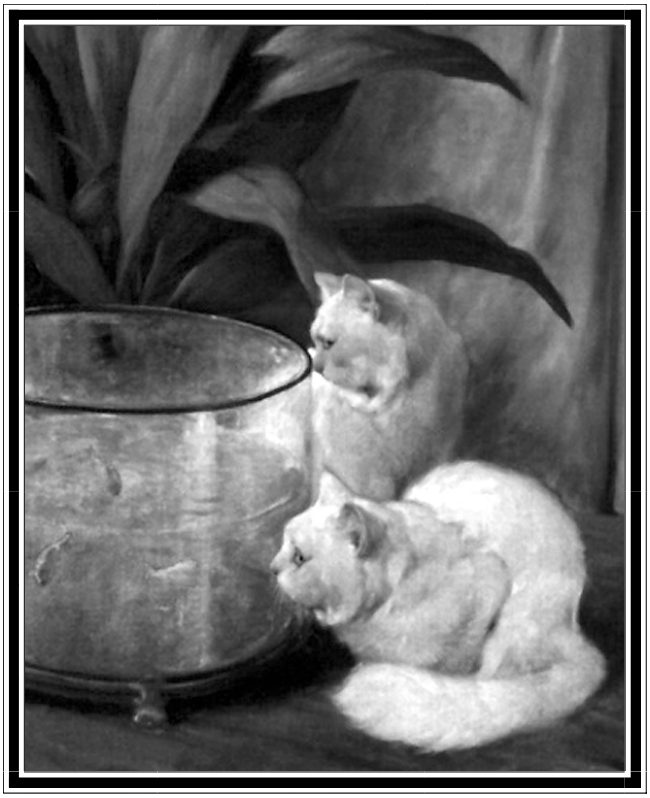
My preliminary notes for this account date back to over 50 years ago when I began wondering how this wonderful hobby of ours came about and evolved through the years. Learning was not always easy since, as one sage put it, "The men who make history have not time to write it." There is also the unfortunate truth that we are not always interested in our common heritage. Even William T. Innes, the last of those I have named as the greatest American aquarists of the period, knew little about Hugo Mulertt, the man whom I have described as the "Grandfather of the Aquarium Hobby in America."

The process of writing a history such as this one involves a detailed examination of the available literature, mostly out-of-print and difficult-to-obtain references that are scattered over countless libraries, both public and private, domestic and foreign. Fortunately, many of the references I needed were available on microfilm. Since many German-Americans adopted the hobby with unparalleled enthusiasm, some of the literature that had to be studied was in German.

One weakness of the written word, however, is that it often fails to provide insights into the personalities involved, so that interviewing those who are still with us is an important part of the process. Fortunately, I was able to do this with many of those who led the way, such as Richard Büttner, Dr. Myron Gordon, William T. Innes, Dr. George S. Myers, August Roth, Ida May Mellen and Hugo Schnelle, to mention a few.

I have spent a good deal of my life in both New York City and Cincinnati. The Cincinnati area is of historic aquarium interest for two reasons: it was, early on, one of the three places in the United States ideally situated for the raising of goldfish (St. Louis, Missouri and Silver Springs, Maryland are the other two), and it was also where Hugo Mulertt settled after immigrating to America. I was therefore able to stroll past the old location of his store on Race Street, long since demolished, and through Burnet woods where his goldfish farms were once situated but now is mostly occupied by the University of Cincinnati and surrounding private residences. In the basement of the old Cincinnati Historical Society building I got my hands covered with the dust of almost three-quarters of a century of old issues of the *Cincinnati Gazette* and the *Deutscher Pioneer*, looking into Mulertt's life and activities. My thanks to Dr. John Patten of the Historical Society of Cincinnati for permission to reproduce several of the illustrations in this history.

I also had access to the Lloyd Library and Museum in Cincinnati, a world-class research institution provid-



ing archival materials in the botanical, medical, pharmaceutical and sciences, but also remarkable for its collection of rare aquarium books. Thanks goes to Kathleen D. Connick, Director of the Lloyd Library for permission to reproduce extracts from this material here, and to her staff, Carol Maxwell, Cataloger, Betsy Kruthoffer, Cataloger, Janet Keith, Library Assistant and Shauna Hannibal, Library Assistant for their valuable and friendly assistance with material acquisition and reproduction. My appreciation is also extended to the librarians at the Library of Congress who helped me locate patents for early aquarium equipment, and to the staff of Photo Antiquities, the Museum of Photographic History in Pittsburgh.

Since the most significant activity in the early years of the aquarium hobby in America occurred mainly in the New York City area, I was also fortunate to be able to draw on my years in that city. I was able to visit historically important businesses now long-since gone, such as Empire Aquarium and Paramount, and to obtain access to the resources of the American Museum of Natural History, the New York Public Library and the New York Zoological Society, to name a few.



My trip through time to uncover the roots and to explore the development of the aquarium hobby has indeed been a fascinating journey. Along the way it prompted feelings of nostalgia as if I had actually lived during those early times. For various reasons I could, for example, empathize with Eugene Smith, another of the hobby "Greats," a man who established the first aquarium society in this country and who enunciated most of the principles of fish keeping that are still valid today.

On the other hand, reading those antiquated references on occasion brought a smile to my face, as it did when I came across the following advice from the "Grand Old Man" of the aquarium hobby, William T. Innes, in his 1928 book, The Modern Aquarium:

> "If tropical fishes become chilled, the effects can often be counteracted by keeping them extra warm for a time. One way to do this is to immerse about two thirds of the glass of a lighted electric bulb in the water. This is also a way of avoiding chill on cold nights."

Yeah, Bill, and a sure-fire way to get yourself electrocuted at the same time, not to mention the trouble you have to go through to make those tiny little sunglasses to protect the fishes' eyes from that overpowering bright light!

One might justifiably ask why the average aquarist should be interested in the history of the hobby. After all, it doesn't help one bit in obtaining new species or in increasing our proficiency with the ones we already have. However, the aquarium hobby is much more than just fishes and tanks. The aquarium hobby has enriched my own life, and it has done so largely through the many friends I have made over the years. The community of aquarists is an extended family and, in learning about its history, we establish roots and a heritage that brings us closer to each other. In gaining knowledge of the past, we attain a sense of belonging, and this is the value of its history.

The first ten chapters originally appeared in the January/February 1966 to the July/August 1967 issues of AQUARIUM ILLUSTRATED, but after THE AQUARIUM absorbed publication of that magazine in 1967, the project was re-started, completed and published in that magazine from December 1967 to September 1969. My thanks to all who have accessed this material and credited the source.

In 1987 permission was given to the American Cichlid Association to reprint the material from THE AQUARIUM as "Special Publication Number 1" to benefit the "Guy D. Jordan Endowment Fund." As a result of the Herculean efforts of Ross Socolof, and Aline and Lee Finley, three hundred signed and numbered copies were produced and it is now out of print. When in 1972 the Mattel Toy Company bought out Metaframe and discontinued publication of THE AQUARIUM, my job as editor was over and I decided after thirty active and diversified years to retire from the hobby, save for the occasional article or lecture. It was time to make way for younger aquarists with new ideas. I continued, however, to maintain my interest in aquarium history and recently, because of the many requests I have had from aquarists throughout the country to make this material once more available, I decided to write this revised and considerably expanded edition.

Two new chapters on early history have been added, as well as an addendum of related historic interest and an index. Among other things, the index eases the burden of locating those pages that contain information about specific persons who were important in one way or another in the history of the hobby. Along with minor spelling and grammatical corrections, additional information has been added to many of the captions for the illustrations, significant improvements have been made in layout and design, quite a few new illustrations have been added, and an extensive bibliography has been appended.

Some years before I started writing this history of the aquarium hobby in America, Dr. James W. Atz, a friend and distinguished former Curator and Dean Bibliographer in the Department of Ichthyology at the American Museum of Natural History, planned to write such an account. However, "The best laid schemes o' mice and men…" and Jim never did get around to it. As a title he had intended to use "The Toy Fish," a term introduced into the hobby by Ida May Mellen over 70 years ago. Because it evokes a certain charm and enchantment that reflects the period covered by this history, I have added it to the title in this edition.

While on the subject of professional ichthyologists, I would like to express my appreciation to three outstanding men in this field who unhesitatingly shared their technical knowledge with me, provided invaluable assistance without hesitation, and inspired me in my own aquarium research. In addition to Dr. George S. Myers and Dr. James W. Atz already mentioned, I add another old (we go back a long time!) friend, Dr. Stanley H. Weitzman, Curator & Research Scientist, Division of Fishes, Smithsonian Institution.

An author must recognize his debts for assistance rendered, and I happily acknowledge mine to Lee and Aline Finley and to my wife, Harriet Joy, for their diligent proofreading and editing of the manuscript. My wife patiently polished numerous awkward expres-



sions that rivaled the repertoire of a teenager on his first date. I, of course, accept responsibility for any errors of either omission or commission that may remain, and hope that they not prove to be overly important. An accomplished aquarium historian in his own right, I owe particular thanks to Lee Finley for his help in providing certain difficult-to-obtain references and for his generosity in sharing his considerable knowledge of the subject.

Finally, the "Knowing that Nature never did betray the heart that loved her" quote that appears in the "About the Author" and at the end of this book is taken from a poem written by William Wordsworth composed a few miles above Tintern Abbey on July 13, 1798. The complete stanza is as follows:

"Knowing that Nature never did betray
The heart that loved her; 'tis her privilege,
Through all the years of this our life, to lead
From joy to joy: for she can so inform
The mind that is within us, so impress
With quietness and beauty, and so feed
With lofty thoughts, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Nor greetings where no kindness is, nor all
The dreary intercourse of daily life,
Shall e'er prevail against us, or disturb
Our cheerful faith, that all which we behold
Is full of blessings."

Albert J. Klee
January 14, 2003

INTRODUCTION TO THE THIRD EDITION

This edition represents a significant extension to the prior one as the accompanying table indicates. In order to avoid confusion, it should be noted that I consider the 21-month series that was published in THE AQUARIUM from December 1967 to September 1969 to be the First Edition, and the volume published in 2003 as the "Revised & Expanded Edition" to be the Second Edition.

Most aquarium hobby histories, like previous editions of this book, have been based primarily on the material contained in aquarium books and in post-1900 aquarium magazines. I undertook, however, a detailed examination of the general American periodical literature prior to 1900 and found a wealth of new information that has been incorporated into this edition. I also examined those United States patents dating back

	SECOND EDITION	THIRD EDITION
WORDS	75,062	163,248
ILLUSTRATIONS	242	514
BIBLIOGRAPHIC ENTRIES	119	319
PAGES	204	391
CHAPTERS	24	27
ADDENDA ENTRIES	5	9
INDEX ENTRIES	463	618

to the mid-1800's relevant to the aquarium hobby; an arduous task, but fascinating in the material uncovered.

This excursion into the periodical literature of old showed that the earliest writings on the home aquarium in this country date back to 1853 when the first substantial piece on the goldfish was published, followed in 1854 when one of the first allusions to the aquarium kept in the home appeared in an American magazine. In 1857 the aquarium and "toy" were mentioned together for the first time in print, leading the way for aquarium fishes to be popularly termed "toy fishes."

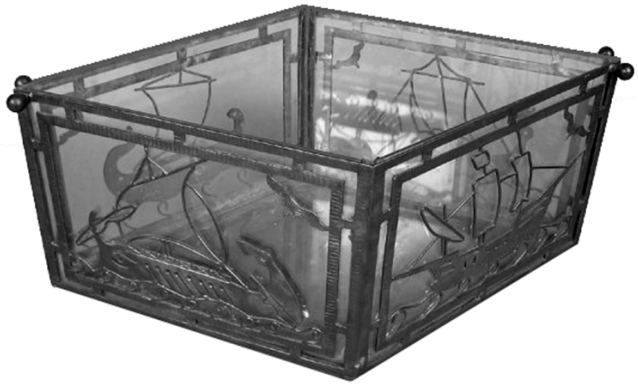
New personages are described in this edition, e.g., a remarkable woman, Jeanne Villepreux-Power who, with some justification, has frequently been termed the "Mother of the Aquarium"; Annie Rebecca Coggeshall, who wrote the first significant American article on the aquarium even predating both the Edwards and Butler books; Charles E. Hammett, who was an important purveyor of aquarium supplies in the 1850's in this country; Eliza Brightwen, an exceptional British aquarist of the mid 1800's, related to Philip and Edmund Gosse; and William Stimpson, the first aquarist of record in the United States. Important biographical information has been added about Henry Dennison Butler, Arthur Mead Edwards, William Emerson Damon, Hugo Mulertt, Shirley Hibberd, Ida Mellen and many others. For the first time, pictures of William Emerson Damon, Henry Dennison Butler, Joseph Winn Fiske and Shirley Hibberd have been included, as well as many others.

One result of this research has been to show that William Emerson Damon was probably the most accomplished aquarist of his time, overshadowing even Cutting and Butler. Along the way, important snippets of information have been dislodged, such as the so-called "German shipping can" that was, in reality, the invention of Frank Buckland of Great Britain. There is an addendum in this edition concerning William Alfred Lloyd that will be new to readers on both sides of the Atlantic.

During the writing of the previous edition of this book I ran into a stumbling block that I was unable to overcome at the time. I was not alone, however, as others had previously encountered the same problem, i.e., that of defining important terms, such as "hobby" or even "aquarium" for that matter. Philip F. Rehbock, in his "The Victorian Aquarium in Ecological and Social Perspective," in *Oceanography, the Past* (1980) and Stephen Jay Gould in his *Leonardo's Mountain of Clams and the Diet of Worms* (1998) both attempted to define "aquarium," but in my opinion not with any palpable success.

The problem is of concern since a part of any historical investigation is frequently an attempt to find "firsts," such as the first person to discover something or the first time an event occurred. If one cannot define "aquarium," however, then one cannot identify the first person to keep an aquarium, and if one cannot define "hobby," then one cannot identify the first aquarium hobbyist. After some reflection, I realized that the history of the aquarium hobby consists of four separate and fairly distinct stages – and this solved the problem. After all, an aquarium is nothing more than a vessel that holds water and a hobby is nothing more than a pastime pursued for pleasure. Accepting these terms in their broadest interpretations, therefore, allows us to proceed in the most meaningful and useful way, i.e., by looking at the stages of the hobby as they occurred and developed over time, and this edition is re-structured around this concept.

One result of looking at the aquarium hobby in these four stages was that this edition discusses ancient aquarists, such as the Assyrians, Sumerians, Egyptians, Romans and Chinese, in appreciable detail. Consider-



FRENCH AQUARIUM, CIRCA 1920.



VICTORIAN OCTAGONAL MOLDED TIN AQUARIUM.

able information has been added about the early history of goldfish, as well.

One of the failings I have noticed over the year with articles that pertain to aquarium hobby history matters is their lack of critical analysis. On a number of topics, therefore, I have not hesitated in taking issue with commonly accepted beliefs. I am reminded of the following quote from Shirley Hibberd. Although he was talking about gardening, it is relevant to the thought here:

> "Perhaps there will be less said about taste than practice in the following pages; but it is a difficult matter to write on a subject which has occupied one's attention, both as a business and a hobby, for a quarter of a century, and on many matters connected with which distinct opinions have been formed, without being occasionally betrayed into expression of those opinions, or, at the least, of indicating the direction in which intentionally-concealed opinions tend. On matters of practice, the practical man has within certain limits which propriety will point out, the right to dictate. On matters of taste, dictation is equally unjust and absurd. When we encounter subjects that divide opinions amongst those who study them, we must be careful to avoid dogmatism, and that spirit of self-satisfaction which would make 'I say' a law binding on all the world. But when the range of opinion is limited, and its limits are appreciable only by the aid of technical knowledge, it is another matter, and the man who knows may proceed to lay down directions for those who reed them, provided he will always keep in mind to be correct, and explicit, and as brief and modest as possible. On these principles I propose to labour in the preparation of this and other works intended to follow it; and I make the declaration at starting that, as regards principles, there shall never, through any carelessness on my part, arise the shadow of a misunderstanding between me and my readers. I shall have to deal chiefly with matters of fact, and hope always to have the discernment to keep them distinct from matters of fancy."

A case in point is the belief that the so-called "balanced aquarium" principle was responsible for the success of British aquarists in the mid 1800's and, by implication, that of American aquarists as well. My argument is not that the principle was a "myth," but that it was not the determining factor. In an addendum titled "Was the Balanced Aquarium Principle Responsible for the Success of the Victorians?" I endeavor to show that, among other factors, the design of aquaria as expounded by both Lloyd and Gosse was at least as important and perhaps even more so. I am in good company here as my position is identical with that of William Alford Lloyd, an important figure in the early history of the hobby in Britain and in the history of public aquaria as well. To this end, equations for the prediction of dissolved oxygen concentrations in aquaria are presented that hitherto have not been discussed in any aquarium publication. (Those who are comfortable plugging numbers into equations will no doubt find it useful for present-day purposes as well.)

Being both an engineer and a scientist, I am interested both in why things work and in how they work. To my great embarrassment, I realized one day that one technological achievement had been overlooked by all aquarium historians, including myself. The result is an addendum that tells the story of glass as it relates to the aquarium, from the Romans to the present day. Readers will be astonished, perhaps, to learn that the so-called "all glass" tank – one with no vertical fram-

ing and with the glass glued together by an adhesive, dates as far back as 1899!

Finally, the bibliography, being both extensive and unequaled heretofore in its size, is presented in two forms – alphabetically by author and by date – making it easier to follow up references in the text and at the same time providing some sense as to how these historical matters progressed in time.

Albert J. Klee
January 4, 2009

INTRODUCTION TO THE FOURTH EDITION

Except for the section on the Romans, in the main only minor additions have been made in this edition. In Chapter 6, for example, the material on Collier and Hooper has been updated; in Chapter 10 the publication history of Mulertt's *The Aquarium* has been expanded; in Chapter 12 new biographical material has been added regarding Eugene Smith; in Chapter 13 a family portrait of William T. Innes (with his mother, grandmother and daughter) has been added; and in Chapter 16 additional information about *The Fish Fancier* has been added as well as an image of the first issue of the magazine. A number of additions have also been made to the bibliography and corrections have been made to the Index.

Material that concerns the Romans and the aquarium hobby has been moved from "The History of Glass" (Addendum A6) and placed in a separate and new section (Addendum A10). Because the Romans were really the first aquarists, an additional twelve pages of text and illustrations have been added to this section.

Albert J. Klee
August 21, 2014

THE VALUE OF A DOLLAR

Prices for aquarium fishes, tanks and equipment are given in this book for the times stated. Such prices are meaningless, however, unless they can be converted in such a manner that the reader obtains an appreciation for the true economic significance of these purchases.

Determining the relative value of an amount of money in one year compared to another is more complicated than it seems at first. There is no single "correct" measure, and economic historians use one or more different indicators depending on the context of the question.

The following are descriptions of the three indicators that are most relevant to the price of aquarium fishes and equipment:

1. The CPI (Consumer Price Index) is most often used to make comparisons partly because it is the series with which people are most familiar. This series tries to compare the cost of things the average household buys such as food, housing, transportation, medical services, etc. It can be interpreted as how much money you would need today to buy an item in the year in question if its price had changed the same percentage as the average price change.

2. The Consumer Bundle is the average dollar value of the annual expenditures of a "consumer unit" (the consumer unit could be a family, for example). The main point here is that spending is a joint decision of the members of the unit and the bundle increases over time as household income increases. Unlike the CPI, not only the cost but also the amount of goods and services typically increases over time.

3. The Unskilled Wage Rate is good way to determine the relative cost of something in terms of the amount of work it would take to produce or the relative time it would take to earn its cost. (The unskilled wage is a more consistent measure than the average wage for making comparisons over time.)

To put these indicators in perspective, consider the price for a pair of guppies, which in 1927 was 50 cents:

1. Using the Consumer Price Index this is the equivalent of $5.80 today in consumer purchasing power.

2. Using the Consumer Bundle this is the equivalent of $12.35 today in what the average household buys.

3. Using the Unskilled Wage Rate this is the equivalent of $19.11 to what a bagger in a supermarket would earn.

For those interested in converting prices mentioned in the text to the year 2007, Table I can be used (the sequence of numbers may look strange but they take into account the effect of recessions and depressions as well as inflation):

For example, to convert $5 in 1877 to 2007, multiply 5 by 19.7, i.e., (5)(19.7) = $98.50.

Thus $5 in 1877 is worth $98.50 in 2007.

To obtain a better appreciation of what the prices in this book mean in context, Table II shows how consumers spent their income from 1910 to 1940. Recreation and Tobacco are the most logical contenders for the income that might have been spent on aquariums, fishes, and aquarium supplies. The expenditures are per capita figures, however, so bear in mind when using the table that the average family size was about 3.4 in 1910, declining steadily to about 2.2 in 1938.

TABLE I: CONSUMER PRICE INDICES

DATE	FACTOR	DATE	FACTOR
1875-1879	19.2	1910-1914	20.5
1880-1884	19.5	1915-1919	15.5
1885-1889	20.9	1920-1924	11.9
1890-1894	22.1	1925-1929	11.8
1895-1899	23.4	1930-1934	14.2
1900-1904	22.8	1935-1939	14.8
1905-1909	21.8		

TABLE II: CONSUMER EXPENDITURES, PER CAPITA PER YEAR

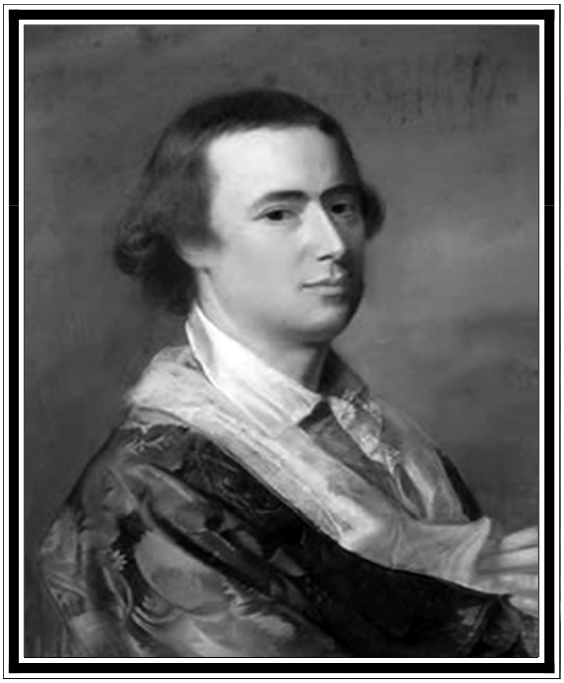
YEAR	AVG. YEARLY INCOME	CLOTHING	FURNITURE	HOUSING	PHYSICIANS	RECREATION	TOBACCO
1910	$630	$30.00	$3.25	$61.48	$3.24	$9.49	$6.33
1915	$687	$29.52	$3.47	$62.78	$2.99	$10.06	$7.39
1920	$1489	$55.52	$6.97	$76.98	$6.87	$19.09	$13.67
1925	$1434	$62.04	$9.49	$98.99	$7.68	$24.52	$13.13
1930	$1494	$54.39	$7.30	$90.92	$7.30	$32.41	$12.18
1935	$1195	$39.26	$5.49	$62.03	$5.49	$20.41	$10.99
1938	$1303	$42.32	$6.97	$70.79	$6.92	$24.62	$13.08
1940	$1392	$46.93	$8.33	$73.42	$6.81	$28.76	$14.38

FOREWORD

A Perspective on the Early Aquarium Hobby in America

No one knows who the first person in America was to keep fishes as a hobby, but the earliest recorded instance dates back to 1791 from the diary entry of the Reverend William Bentley of Boston, Massachusetts in which he mentioned having seen a bird cage aquarium in the house of Boston Merchant Joseph Barrell. Barrell was an original thinker, and a good speaker and writer. He is said to have "early espoused and firmly maintained the cause of his country," and for a time represented the town of Boston in the State Legislature. He lived well, and it was in his splendid home that General Washington was entertained during his visit to Boston. He was also the head of the group of five Boston merchants who fitted out the ship *Columbia* and sent her into the Pacific where, in 1792, her crew discovered the Columbia River. Later they purchased the territory about this stream from the Indians, and in this way began the colonization of what has now grown to be the Northern Pacific States. Bentley wrote:

> "Was politely received at dinner by Mr. Barrell, & family, who shewed me his large & elegant arrangements for amusement, & philosophical experiments. His birds played in a globe surrounded with a globe of water in which the fish play. He was an adventurer in the first voyage to the back parts of America, and has several great curiosities."



Joseph Barrell (1740-1804), the first on record to keep fish in America. Painting circa 1767.

The aforementioned globe was an illusion device that can be traced back to 1572 when Leonhard Thurneysser constructed a double-walled glass globe in the center of which sat a bird and within the walls swam fish. It was most likely brought over from England and similar to the one described by Gilbert White in 1792. Although the fish were not identified, the only two possible candidates are native fishes or goldfish. Jerome Smith in his 1833 *Natural History of the Fishes of Massachusetts*, stated: "The gold fish was introduced into this country, many years since, from England, especially for ornamentation." Since the goldfish become popular in England between 1775 and 1784, it is not unreasonable to suggest that the fish seen by the Reverend Bentley in 1791 were indeed goldfish.

However, goldfish were certainly known in this country even much earlier. The following is an account of goldfish kept in the ponds of Col. Godfrey Malbone, a wealthy Newport merchant:

> "Noble mansions, spacious and elaborate gardens, arose and adorned the island and the town. The country-house of Col. Godfrey Malbone, which was commenced in 1744, was famous as the finest residence in the colonies. It was built of stone, two stories high, with a circular stair-ease leading to the cupalo [*sic*], the cost of which was reputed to be equal to that of an ordinary dwelling-house. The house was within a mile of Newport, and the farm of six hundred acres sloped gently toward the bay. According to tradition, this garden was elaborately laid out; ranges of banks and terraces alternated with plots of flowers, and hedges of shrubbery, and groups of rare trees; silver and gold-fish swam in artificial ponds;

while over this mingled beauty the eye swept across the bay to the blue line of the opposite shore, or saw the sea flashing over the rocks and cliffs at the entrance of the harbor."

The house was completed no later than 1747 (Charles Pym Burt wrote to Malbone from London in 1747: "It gives me the deepest Concern, to find that your new Habitation proves so very disagreeable to you, but I hope you will soon be reconciled to it."), and since it seems unlikely that Malbone would not have completed his landscaping within three years after occupancy, I would not hesitate to date this early reference to goldfish in America to somewhere between 1747 and 1750.



Combination Bird Cage and Fish Bowl, English, circa 1810-1820 (walnut and other woods and glass).

It was common in the early 1830's for florists to sell goldfish along with cage birds, these being marketed along with the plants and flowers as both gifts and as middle-class parlor ornaments. Frances Anne (Fanny) Kemble, an English actress who loved the natural world, set out in 1832 on a two-year theater tour in America where she was received with great enthusiasm, and in the journal she kept during the trip recorded a visit to a florist whose greenhouse held a tank of goldfish. Later on, it was the bird store that took over this function.

The very first aquarist of record in the United States was William Stimpson, the collector and curator of the aquaria in the Smithsonian Institution at Washington who had, as early as 1849, constructed seven or eight small aquaria in which he successfully kept native fishes. The publication of articles about aquaria in LIVING AGE and GODEY'S LADY BOOK between 1852 and 1857, however, was the recognizable start in this country of fish keeping, further reinforced in 1858 by magazine articles in THE ATLANTIC MONTHLY and the two books by Arthur Mead Edwards and Henry Dennison Butler, both published in that same year. From this point on until about 1900, the aquarium hobby - if it can be called that - was confined mostly to goldfish and native fishes, the latter both freshwater and marine, kept by children and/or women, or as ornaments to the home.

Since it is my intention to show in this Foreword how the costs of fish and equipment have varied over the years, I have converted all of the prices herein to current equivalents. Take note, however, that in the remainder of this book the prices are those quoted in the period cited.

Starting in the last quarter of the Nineteenth Century, goldfish farms proliferated. By the mid-1870's goldfish farms in Cincinnati and Long Island shipped goldfish all over the country. In

1883 Hugo Mulertt estimated that the annual sales of goldfish were 2 million fish worth $4,840,000. This is a wholesale value of $2.42 per fish, certainly not cheap for a common goldfish. By 1929 this cost had dropped to 27 cents, starting a commodity market in them. They became the standard dime-store pet, were loss-leaders in all sorts of stores, and became commonplace carnival prizes.

The first aquarium society in this country was formed in 1896 and was called simply, "the Aquarium Society." At the time, the only tropicals available to the hobbyist were the Paradise fish and the Chanchito. This all changed when a number of pioneering aquarists, such as Richard Dorn, John J. Halterbeck, and Hermann Rabenau, imported freshwater tropical fishes never before seen in this country. By 1890 the Industrial Revolution in this country had provided the middle class with hitherto unheard of leisure time. Whereas women took up arts and crafts with a vengeance, men on the other hand were pretty much barred from these pursuits since they were viewed as being "unmanly." However, like breeding canaries or fancy pigeons, the keeping and breeding of tropical fish was an acceptable male pastime, and the trend carries over to this day where men still play the dominate role in the hobby.

In 1910, in an historic first, the Aquarium Society held its first exhibition. The following, under the title of "First Exhibition by Aquarium Society Opens To-day in Old Castle Garden," is an account from the NEW YORK TIMES of November 19, 1910:

> "An interesting exhibition, the first of its kind ever held, opens to-day in Castle Garden in Battery Park by the Aquarium Society, which has placed on view more than one hundred balanced aquaria and terraria, containing small fish and reptiles from many lands. The exhibition is free. It will remain open daily between 9 A. M. and 4 P. M. all next week. On Friday evening the society will hold a meeting in the building, and on Nov. 30 its annual dinner will be held at the Cafe Boulevard.
>
> "Although the society is fifteen years old, this is its first exhibition. More than forty members are represented in it by many rare fish. One of the more interesting exhibits is by Richard Dorn, the President of the society. His rarest fish is Hyphopherus [*sic*] helleri, a native of Mexico, this specimen, however, being born and bred in Germany. This fish, which is about two inches long, has brilliant stripes lining its sides as far as the lower notch of the tail, which is three times as long as the upper part. The fish is one of the few which do not spawn, the young being born after the mammalian manner. Mr. Dorn has a wonderful display of Japanese fantails, the tails of some of which are four times the size of their bodies. The barbus is another rare fish shown by Mr. Dorn.
>
> "Other live bearing fish, as the Helleri are known, are the Gambusi of India, shown by William Mack. These are three months old and were brought here from Germany. They are half an inch long. Mr. Mack also is showing weather frogs - known as tree toads to country boys - in terraria, containing little ladders on which they climb or descend, according to the weather, wet or dry. Mr. Mack's smallest terrarium is in a tiny phial. In this are growing plants and living insects.
>
> "Other interesting terraria contain chameleons, turtles, and frogs.

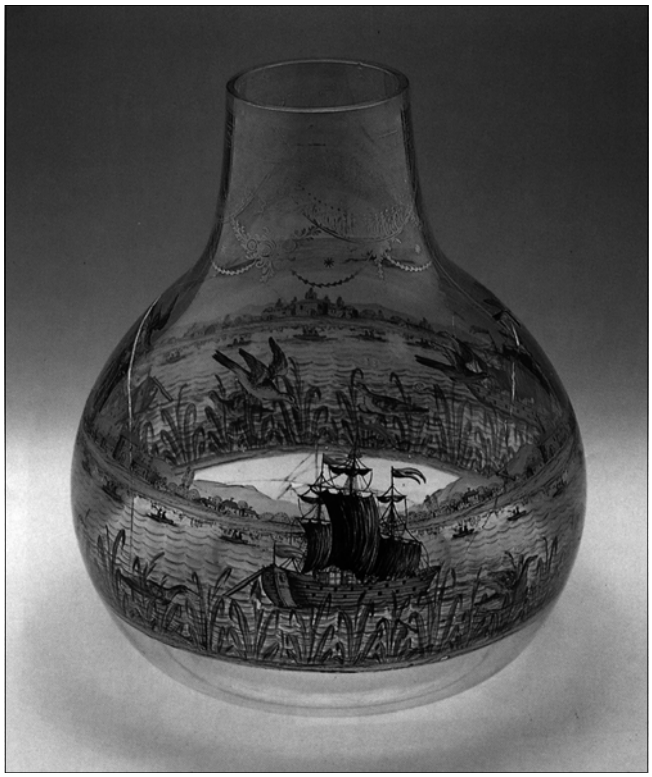


Frances Anne (Fanny) Kemble (1809-1893)

"Paradise fish from India are shown by J. Arthur Osborne. They are beautifully brilliant in coloring. R. C. Rathborne has an interesting series of Japanese gold fish parents and young, showing the variations which may be looked for by the breeder. Comet fish, so called from their shape, golden red in color, attract the eye in a large aquarium shown by W. F. Devoe.

"Small silver colored fish, about two inches long, exhibited by Frederick Rodiek are known as Mouth Breeders. After the spawn is deposited the mother swallows it and it lodges in a sac behind the gills. In three weeks the fish hatch and swim out, able to take care of themselves.

"Supplementing the exhibits of the members, a fine collection of terraria and fresh and salt water aquaria has been loaned by the New York Aquarium. They contain among other things sea anemones, living coral, &c. The object of the exhibition is to interest and instruct the public in balanced aquaria and how to keep them. In some of the aquaria shown by the New York Aquarium the water has not been changed for nearly twenty years. A special invitation is extended to school children to attend."



Fishbowl circa 1790-1820; probably English. Blown glass with enamel and gilded decoration

It is clear that the reporter had difficulties with names (both fish and people) and locations, but it was a significant start. The venue for the Second Annual Exhibition held in 1911 was moved to the American Museum of Natural History but did not rate much more than a short notice in the TIMES outlining the date, place, and hours. The Third Annual Exhibition was quite another matter, however, and the following is a report that appeared in the NEW YORK TIMES of October 6, 1912 under the title of "Aquarium Society Shows Rare Fish":

"Fish of exquisite colors, fish of graceful lines, fish that build nests, fish that climb trees, and fish that can live for months out of water are some of the wonders to be seen at the American Museum of Natural History, when the third annual exhibition of the Aquarium Society opened yesterday. The exhibition yesterday was at private view, though the judges have already begun the work of awarding the prizes in the different classes.

"The exhibits are all in small glass tanks placed on wooden stands that run the length of the room. They are divided into eight classes, and awards will be made for the best specimen in every class. By late afternoon several of the small groups were in proud possession of their blue, red, and yellow ribbons. The right to these decorations was shown by colored labels tacked above the tanks announcing the prizes won. The entries to the show have come from other cities as well as this, for there are exhibits by members of Philadelphia and other allied aquarium societies.

"Those unacquainted with aquarium culture and the breeding of aquarium fish will find much to interest them in the exhibition, for there is shown exotic fish originating from all corners of the world. The keeping of aquaria is much more popular in European countries, notably in

Germany, than here, it is one of the aims of the Aquarium Society to spread and popularize the pastime in this country, as a form of nature study offering especial advantages for furnishing intimate glimpses of animal and plant aquatic life.

“An interesting exhibit are the betta splendens, or nest building fish. These little fish build their nests by giving out a secretion from the mouth, which rises to the surface of the water. They will continue their nest building until a space about three inches square has been covered with the bubbles. Under the shelter of their own ‘roof” the fish take up their residence, and there care for their large families.

“Mr. Betta Splendens spent most of yesterday making a nest, and late in the afternoon he gathered his family into their new home, and there they will be “at home” during the exhibition, which will last until next Monday.

“There are also to be seen representatives of the viviparous class of fishes, which do not spawn, but give birth to perfectly developed young. Some of them, like the Xiphophorus helleri, are gorgeously colored. Mrs. Xip was a centre of attraction yesterday. She added seventy-five fish to the show, and all afternoon she spent proudly watching and keeping order among her numerous and exceedingly healthy family, which could be seen scampering all over the bottom of the aquarium.

“Within two days the youngsters will be strong enough to accompany their parents all about their home. The male of this species is black in color, while the female is larger and of a silver reddish color. They look like an ill-assorted, for the female is the family boss.

“One can stand in front of the glass holding the Indian perch and speculate on their tree climbing ability. Some remarkable stories have been told of the ability of this rather uninteresting fish. The attendant who accompanies you around is careful to explain that Indian perch do not climb trees. But under cross-examination he will admit that they can climb trees and other things, and one comes away with the impression if the perch do not climb trees it is simply because they are not so inclined.

“In another glass home the visitor can see a very lively group of Egyptian mouth-breeding fish. The female takes the spawn into her mouth and keeps it there until it hatches. At the end of two weeks she lets the young out. At night or at the first sign of danger, real or fancied, she will open her mouth, and in a second her young are safe from possible harm. During all the time she is carrying the spawn the female does not eat or open her mouth.

“With many specimens like the paradise fish and the Indian fighting fish it is the male that takes charge of and rears the young. In other cases, like the chanchito family from South America, both male and female share in bringing up the family. It is a very pretty sight to watch both parents lead a flock of young ones from one end of the aquarium to the other, herding them like a sheep dog does the flock. At night the father will dig out a depression in



Up to 1900, the aquarium hobby was confined mostly to goldfish and native fishes (the latter both freshwater and marine) kept by children and/or women, or as ornaments to the home.

the sandy bottom and there he and the mother will put the little fishes to bed, while they mount guard for the night.

"Stepping down to the end of the room one can see the lung fish from Africa. This fish is fitted out with a combination of lungs and water-breathing apparatus. In time of drought it buries itself in the mud and is able to withstand long periods of dry weather. Other fishes to be seen include the armored catfish, the brilliant butterfly fish, the pumpkin-head sunfish, many beautiful varieties of gold fish. Very retiring is the cichlasoma from Yucatan. This fish likes to hide under some projecting rock or plant and has a positive aversion to being seen. The exhibitor got the best of his cichlasoma by putting a flower pot in the tank and turning it on the side of the aquarium and within a few inches of the glass side. Under this the pair promptly took shelter and there they remained in plain view of the audience.

"Among the exhibitors are Isaac Buchanan of Elizabeth, R. Dorn of Montclair, H. S. Coffin of New York, F. Rodick of Tenafly, N. J., W. Kiernan of East Orange, August Obermuller of Jersey City, F. Beller of New York, William Bimer of West Hoboken, William E. Heisterberg of Jersey City, Nature Shop, Inc., W. L. Brind of New York, O. H. Smith of New York, Sinclair Smith of Brooklyn, H. A. Richtberg of East Orange, G. L. Lamprecht of Brooklyn, William Mack of New York, and Herman Rabenau of Brooklyn."

Because of the expense in obtaining and keeping tropical species, however, the hobby then was only for the affluent, and up to 1920 it was strictly the province of men (exceptions were married women whose husbands also were aquarists). Although the Edwardian era saw a loosening of Victorian rigidity, society nevertheless was still underpinned by rigid moral and social values with ideal forms of masculine and feminine behavior. Moral respectability and domesticity were important ideologies of feminine behavior. The "woman's mission" was that of supportive wife, dutiful daughter, and caring mother, and the woman's domestic role was seen as an important and pivotal part of society. It would have been as unthinkable for a single woman or a married woman unaccompanied by her husband to attend an aquarium society meeting during this period as it would have been for them to enter a saloon.



Early on in the aquarium hobby, bird stores were the primary sources of fish and supplies. This 1916 bird store sold aquariums, aquarium ornaments and fish food.

The breeding of many of these new importations was a slow learning experience. The Giant Danio, for example, arrived in New York City in 1914 but no one had any great success in breeding them, so by 1918 they were practically extinct in the hobby. It was only in the mid-1920s that they became one of the more easily-bred aquarium fishes.

The equipment of the time for heating, filtration, and aeration was rudimentary and awkward at best. It might be supposed, therefore, that one of the stumbling blocks for the entry of the less well-off into the aquarium hobby was the requirement for tropical fishes, as opposed to keeping native fishes and goldfish, to keep them warm.

However, around 1900 warm air heating systems began to take the place of fireplaces. In the past, small rooms that were not used were easily closed off for heating, but now central heating made this infeasible and houses were less drafty and cold. Furthermore, the advent of gas heating made it possible to heat individual spaces economically. Thus the aquarists of the period 1900-1920 had no problem in heating a multiplicity of tanks.

A problem only arose when it was desired to heat a single, usually decorative, tank in a room where it would have been uncomfortable and uneconomical to raise the room temperature. It was these isolated tanks that were responsible for the array of Rube Goldberg devices used for heating, such as applying a Bunsen burner to its bottom or burning oil in a cylinder placed within. Furthermore, early aquarists frequently kept their fish at much lower temperatures than is typical today. William L. Paullin, writing in 1915 about his success in breeding angelfish, declared that he had kept them as low as 65 degrees, and Frank Dungan, writing about his experiences in breeding *Corydoras paleatus* in 1927, mentioned that at one time the temperature in his tank of "youngsters" had registered as low as 58 degrees but that they seemed as lively as when kept much warmer.

The real stumbling block was the prices of tropical fish and equipment, which were considerably higher when compared to those of today. In the following discussion the prices include guaranteed shipping, and for fish they are for pairs as that is how they were usually sold prior to World War II.

In 1915, typical prices for aquariums were as follows: all-glass round aquaria from one to ten gallons, $12 to $100; all-glass rectangular aquaria of greenish glass - the lowest quality - from one to nine gallons, $10 to $75; and steel or aluminum frame aquaria with slate bottoms, from three to fifteen gallons, $40 to $110. It is not generally realized that glass aquaria – as opposed to metal-framed aquaria – were extremely expensive, especially as their size increased. It might also come as a surprise to some to learn that aluminum was commonly used in aquaria, either as framing material or as a one-piece cast.

In 1924, typical fish prices were as follows: Platies, $6.85; Zebra Danios, $7.80; Paradise Fish and swordtails, $9.80; Snakeheads, $11.62; Rosy Barbs, $14.70; and Black Mollies, $58.80. The prices for the last were very high because they were brand-new introductions. Furthermore, their price remained high; in 1932 they still commanded $44 a pair. Pairs of Angelfish were offered at from $176 to $235 dollars, according to their size. An all-glass, 16-gallon aquarium cost $100 and this was F.O.B. from St. Louis! However, it should be mentioned that their bottoms were one-half inch thick, strong enough to stand on.

In 1927, some commonly-quoted fish prices included: guppies and Mosquito fish, $5.80; Zebra Danios, $8.70; Paradise Fish and Pearl Danios, $11.60; Mouthbreeders, Platies, and Swordtails, $14.70; Bloodfins and Rosy Barbs, $17.40; and Blue and Dwarf Gouramies, Bettas, and Giant Danios, $23.25. A shipping can was $4.05 extra. In 1928, breeding pairs of Angelfish were offered for about $410! Even the books were expensive, e.g., Inneses *Modern Aquarium* booklet cost almost $12 and his *Goldfish Varieties and Tropical Aquarium Fishes* cost about $47! The only relatively inexpensive aquarium items were dry fish foods, $1.75 a box; aquarium cement, $4.12/pound; nets, $1.75 to $5.90 depending on the



This ad from 1928 shows that native fishes were still popular at the time and much cheaper than tropicals. The price for a pair of the dace is about $5.90 in today's currency.

size; and thermometers, $5.30. Even so, in 1929 a simple 25 watt "chill breaker," i.e., a heater sans thermostat, cost $29.

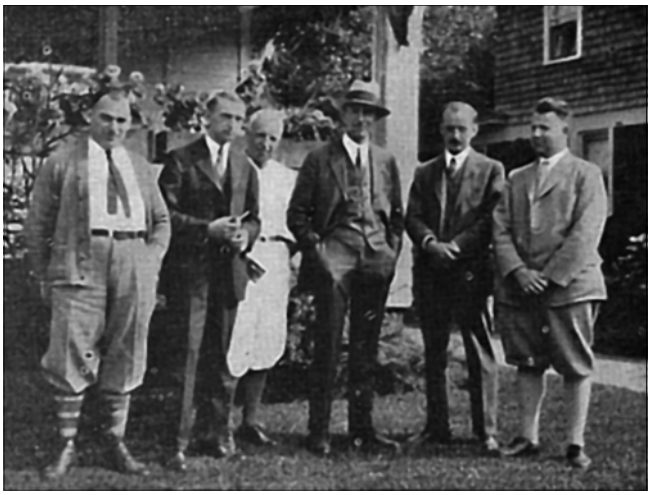
The aquarium hobby prior to World War II clearly was much more expensive than it is today. That the tropical fish hobby included some very well-off personages is attested to by the following headline that appeared in the NEW YORK TIMES on April 15, 1932: "ASTOR YACHT BRINGS RARE TROPICAL FISH." The story went on to report that Vincent Astor's yacht, the *Nourmahal*, returned from a cruise to the Galapagos and islands in the far South Seas, bringing specimens for the New York Aquarium and "private collections."

The expansion of the hobby in the latter part of the 1920's was not due to any drop in cost but rather the publicity it drew when aquarium societies held exhibitions open to the public, some of which drew thousands of visitors, and the development of marketing techniques by the large fish farms and hatcheries that included aggressive advertising, color catalogues, and free instructional pamphlets. The tropical fish hobby was not alone in this increase; the marketing of pets in general made meteoric gains and industry magazines such as the PET DEALER, introduced in February 1927, attest to this change.

This was also the time when women began to make their presence known in the hobby. The following are some quotes from the newspapers during this period reporting on the exhibitions given by The (New York) Aquarium Society:

> 1924 - "All the plants used in the show this year were sent by Mrs. J. H. Cummings of Wilmington, N.C. The pair of mouth breeders is shown by Miss Agnes Kuhn, who was awarded a silver medal for the best collection of egg-laying fish; 1926 - "The pair, (i.e., referring to *Badis badis*) won a prize for Mrs. H. Christman of New Rochelle, a teacher who exhibited them;" 1927, Mrs. Christman again - "The only tank in the show with wild native fish is that shown by a woman, Mrs. H. Christman of New Rochelle. Another tank of Mrs. Christman's, containing various tropical fish, brought her a first prize;" and 1932: "Some of them (i.e., referring to *Betta splendens*) belonged to Mrs. S. S. Van Dyne (Mrs. W. H. Wright), who won the cup in the novice class for the best young fish raised by an exhibitor."

The last is interesting in that the lady in question was the wife of Willard H. Wright, popularly known then as S.S. Van Dine (or Van Dyne), the author of the Philo Vance mysteries that included *The Dragon Murder Case*, which dealt in some detail with tropical fish. Wright himself maintained about 60 aquaria populated with such rarities of the time, and therefore extremely expensive, as *Carnegiella strigata, Scatophagus argus* and *rubifrons, Symphysodon discus, Barbus sumatranus,* and *Pantodon buchholzi.*



Members of the Hudson County Aquarium Society, 1927. Note the absence of women in the photograph.

The economy descended from full employment in 1929 when the unemployment rate was 3.2 percent, into massive unemployment in 1933 when the unemployment rate reached 25 percent. While the Great Depression was a catastrophe, it is well to keep in mind that at its worst 75 percent of the labor force was employed and that it was not a sudden total collapse. The stock market turned upward in early 1930, returning to early 1929 levels by April, though still almost 30 percent below of peak in September 1929. Together government and business actually spent more in the first half of 1930 than in the corresponding period of the previous year. By late in 1930, a steady decline set in which reached bottom by

March 1933. However, in 1932 the hobby had made a remarkable recovery from the economic downturn, the aquarium fish industry being better off than most with the volume of its business increasing by leaps and bounds. From 1930 to 1934, for example, the number of fish clubs almost doubled.

Even so, aquariums continued to be expensive compared to today. Typically, a four-gallon tank in 1932 was almost $34 and a 10-gallon tank was $68. A thermostatically-controlled electric heater was offered for $113. However, in order to lower costs, it was not unusual in this period to use a single thermostat to control one or more heaters. Thermostats that could accommodate three heaters varied in price between $50 and $83, while the heaters themselves varied between $26 and $36 for the smallest wattages, which were around 17 watts. Air pumps during the early 1930's retailed for between $180 and $200, the latter being the well-known Marco induction pump, and even something as simple as an air stone cost $17.

One of the most important events in hobby history occurred in May of 1932, for on this date the first issue of THE AQUARIUM magazine appeared, one outstanding feature of which was its use of color plates of fishes on its covers, a feature that took the aquarium world by virtual storm. This was followed three years later, in 1935, with what many consider to be the piece de resistance of all aquarium books, William T. Inneses *Exotic Aquarium Fishes*.

As the country was in the throes of a serious depression, a number of suggestions were made to raise revenues by placing an excise tax and an import duty on aquarium fishes. A flat tariff was proposed, ranging from $1.50 to $3.80 per fish. This would have made the cheaper fishes (platies, swordtails, danios, etc.) comparatively high-priced, but the price of the rarer species imported from overseas would not have increased sufficiently to make their cost prohibitive since they already were high priced. As a result the plan was never implemented.

One reason for the recovery of the tropical fish industry between 1932 and 1936 was that the price of tropical fishes had decreased significantly. The NEW YORK TIMES reported in December of 1935 that:

> "Siamese fighting fish brought $440 a pair when they were first introduced seven or eight years ago. Now specimens can be had for as little as $15. Mollies were $220 a pair at one time. Now every dealer has dozens for $15 and $22. But the best example of tropical fish economics is supplied by the angel fish. Recently one dealer advertised them for 75 cents each and another immediately cut his price to $515 a thousand. Three years ago a fancier couldn't consider buying them unless he had at least $440 to spend for a pair."

In 1937, the American economy took an unexpected nosedive (the Recession of 1937), lasting through most of 1938. Production declined sharply, as did profits and employment. Unemployment jumped from 14.3% in 1937 to 19.0% in 1938. It was at this time that the hobby lost many of its followers, and many hatcheries and fish stores went out of business. Unlike the depression of 1929, when the hobby actually experienced a rebirth, this depression had disastrous results, and the hobby did not revive until after World War II. Many of the fish departments in pet shops closed as did most of the pet stores and at least half of the fish breeders and hatcheries. In the old days there was a certain cachet in paying $15 to $20 for a fish; this feeling evaporated, however, when the price dropped to below $2. There was more money to be had in breeding other animals and in 1937, piling ignominy upon ignominies, Henry Kissel, one of the earliest breeders in this country, converted the aquaria in his fish conservatory to mouse cages and bred mice instead of fish.



The story of the development of the aquarium in America is a fascinating one, and will be fully developed in the following pages.

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A HISTORY OF THE AQUARIUM HOBBY IN AMERICA

The First One Hundred Years

By Albert J. Klee, PhD



CHAPTER 1: THE PROTO-AQUARISTS

Over the course of the many years in which I have been interested in the aquarium hobby, the past has always asserted itself, dimly at times, tantalizingly so at others. Consequently, a desire built up to learn how the hobby started and to whom we owe this debt. Did it just occur like a sort of parthenogenesis? Did it grow like "Topsy?" What were things really like in the old days? In the process of research to this end, several things became clear. It is unfortunate but true that the little history that has been published in the aquarium literature falls far short of providing answers that truly satisfy. More regrettable is that what is available is often misleading, saddling aquarists with conclusions reminiscent of Ambrose Bierce's definition of history, i.e., "…an account mostly false, of events mostly unimportant…" Perhaps it is high time then that several long-time aquarium myths are vanquished and their bones set at rest with those of the since forgotten but nevertheless epoch-making fishes that graced the tanks of aquarists over a century ago.

When did the aquarium hobby start? Who "invented" the aquarium? What do we mean when we say the "aquarium hobby" or, for that matter, the "aquarium"? These questions have presented difficulties for hobby historians precisely because there are no universally agreed-upon definitions. Trying to pin down a concise explanation of the meaning of a word or a term sometimes is - to paraphrase a remark of my grandmother's - akin to attempting to estimate the number of angels that can dance on the head of a pin. Even if we were to agree on these definitions, and bear in mind the line from Lewis Carroll's *Through the Looking-Glass and What Alice Found There*: "When I use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean—neither more nor less," there is no guarantee that this will take us any "forwarder" on our quest to elucidate the hobby. It also should be recognized that, in defining an object, the definition then limits the object, and this may have unforeseen consequences.

One way out of this dilemma is to avoid definitions and instead describe the major stages in the development of the aquarium hobby. The first stage clearly started when people began to keep fish for their ornamental and entertainment value in ponds and in indoor containers, e.g., goldfish by the Chinese a thousand years ago, and the piscina (from *piscis*, a fish, fish-pond, pool or basin – the term later took on different meanings) of the Romans. One can argue that these ponds and indoor containers were not aquariums in the technical sense since, although the owner of any respectable Roman villa could look down upon the animals in his fishpond, they could only be viewed from above through the opacity of rippled water. The same held for the indoor containers of the time since they, too, were opaque-sided. STAGE I of the aquarium hobby, therefore, is what I term "The Top-Down Aquarium," exemplified by these ancient, opaque-sided, outdoor and indoor aquariums that were viewed from above, although obviously STAGE I aquaria are still common today (Figure 1-1). I use the term "aquarium" accurately here, as originally it was nothing more than a reservoir or large vessel holding water without any specification as to the uses to which that water was applied.

People have kept fish in opaque-sided containers such as ponds and pools for a variety of reasons but primarily for food or ornamentation, although they have also been kept for educational, scientific and even religious purposes. The Sumarians kept the oldest known fishponds about 4,000 years ago and they were generally associated with temples. Whether they were for food, ornamentation, or religious purposes is unknown, as is the case with the fishponds

THE FOUR STAGES OF THE AQUARIUM HOBBY

STAGE I:
THE TOP-DOWN AQUARIUM
(circa 4000 BC)
Opaque-sided containers.
STAGE II:
THROUGH A GLASS CLEARLY
(late 1530's)
Glass jars: fish kept for ornamental or scientific study purposes.
STAGE III:
OCEAN AND LAKE IN GLASS
(mid 1800's)
Tanks frequently with flat glass sides; aquarium books; commercial aquarium fish and equipment suppliers; object to emulate a small portion of a natural habitat.
STAGE IV:
ASSOCIATION (circa 1900)
Aquarium societies; exhibitions; competitions; aquarium magazines.

Figure 1-1. THE FOUR STAGES OF THE AQUARIUM HOBBY.

constructed by the Assyrians (Figure 1-3). The Sumerian pantheon included the fish-god Oannes, who had the head and feet of a human and a body of a fish (Figure 1-3), and later in their history, the Assyrians also worshiped a fish-god, Dagon, whose lower body was that of a fish.

China has a long history of fish culturing. As long ago as the 12th Century B.C. there were fish rearing records in the Chinese Classics of early Chou Dynasty (1112–221 B.C.). Charles F. Hickling - the English aquaculture author, citing S. Y. Lin, a noted Chinese aquaculturist and the author of the well-known aquarium species, the white cloud mountain fish, *Tanichthys albonubes* - considered the earliest beginnings of aquaculture as during the period 2000–1000 B.C. This indicated that aquaculture has a long history dating as far back as 4000 years ago. However, during the period and especially before the advent of printing, no records were available except the narratives handed down from one generation to another, especially those found in the seat of power during those periods. Admittedly, China was the cradle of the beginning of aquaculture, utilizing mainly the common carp (*Cyprinus carpio*). It is said that aquaculture as a husbandry developed in China resulting from the fact that population started to have a settled condition and has been kept as an unbroken tradition. No detailed description of aquaculture practices was however available during that early period.

The year around 500 B.C. (473 B.C. or 475 B.C.) is considered of very great significance in the annals of the history of aquaculture. Many authors round the year as 500 B.C. although most agree that the exact year is 475 B.C. and some even use 473 B.C. as the period when Fan Lai (his name is also spelled Li or Lee by some authors), a politician turned fish culturist , wrote his book, *The Classic of Fish Culture*. This is the oldest known publication in Chinese literature on fish culture methods. Due to the antiquity of the article, some of the points mentioned in the text do not seem to make any sense so they are therefore not to be taken literally. Although the narrative also dealt on fantasies and metaphysical aspects, it is the first to record and describe the structure of ponds, the method of propagation of the common carp and the growth of fry. The following are extracts from the book:



Figure 1-2.
STAGE I. EXAMPLE OF THE TOP DOWN AQUARIUM, i.e., a goldfish pond.





Figure 1-3.
ABOVE: Sumerian Fish-God, Oannes.
RIGHT: Assyrian Fish-God, Dagon.

"King Wei of Chi[1], upon learning that Chu Kung was visiting in neighboring Lau, invited him over and asked: 'I hear that you have been calling yourself a different name every time you visit a different country, and in Yuch you are called Fan Lee. Is it true?' 'True,' answered Chu Kung. The King continued, 'You live in a very expensive house, and you have accumulated millions. What is the secret?' Whereupon Chu Kung responded: 'Here are five ways of making a living, the foremost of which is in aquatic husbandry, by which I mean fish culture. You construct a pond out of six mou[2] of land. In the pond you build nine islands. Place into the pond plenty of aquatic plants that are folded over several times. Then collect twenty gravid carp that are three chih[3] in length and four male carp that are also three chih in length. Introduce these carp into the pond during the early part of the second moon[4] of the year. Leave the water undisturbed, and the fish will spawn.'

"'During the fourth moon, introduce into the pond one turtle, during the sixth moon, two turtles: during the eighth moon, three turtles. The turtles are heavenly guards, guarding against the invasion of flying predators. When the fish swim round and round the nine islands without finding the end, they would feel as if they are in natural rivers and lakes. By the second moon of the next year, you can harvest 15,000 carp of one chih in length, 45,000 carp of two chih and 10,000 carp of three chihs. The total harvest can render a cash value of 1,250,000 coins. The following year, you can get 100,000 carp of one chich, 50,000 carp of two chih, 50,000 carp of three chich, and 40,000 carp of four chih. Save 2,000 carp that are two chih in length as parent stock and market the remainder. The take will amount to 5,150,000 coins. In one more year, the increase in income is countless.'

"Following the advice of Chu Kung, King Wei started a fish pond in his garden. In his first year, the King made more than 300,000 coins. In his pond, there were built nine islands, In addition, eight depressions were excavated. Each depression had two chih of water at the rim and six chih of water in the center. The carp would segregate themselves according to size in these depressions. The reason to raise carp rather than other species of fish is that the carp is not cannibalistic, that it is fast growing, and that it is inexpensive to raise.



Figure 1-4. THE JACKAL-HEADED GOD ANUBIS is shown embalming the sacred fish of Latopolis, instead of the usual human mummy, on a funerary bed beneath a canopy.



Figure 1-5. A PAGE FROM FAN LAI'S *The Classic of Fish Culture*, 473 B.C.

> "Carp as large as three chih long are obtained only in the vicinity of large rivers and lakes. If you start with small fish, they would take too long to mature. If you start with the spawn, the method to collect spawn is to go to shore areas of rivers and lakes where large carp gather, Collect the mud at the water's edge, take a dozen loads or so and spread the mud on the bottom of the culture pond. Within two years large carp will be grown. This is because the mud contains eggs of large carp, which hatch readily in pond water."

[1] Chi, a kingdom ruled by King Wei, 378–344 B.C.

[2] Mou is a Chinese land measure of area. In today's standard, 6.6 mou is equal to one acre.

[3] Chih is a Chinese measure of length. In today's standard, 1 chih is equal to 0.3581 meters, or 1.175 feet.

[4] The Chinese calendar goes by moon phases. Each moon of the year is 29 or 30 days. Generally it is approximately 1 to 1.5 months later than the Western calendar. The second moon is roughly equivalent to March, the fourth moon to May, etc.

In addition to keeping fish for food, in Egypt fish were held in even higher regard. Some of their temple complexes even contain marble-lined ponds for tilapias and the Nile Perch (*Lates niloticus*) was worshiped as a deity. The town of Esueh was renamed Latopolis by the Greeks because of the thousands of Nile perch embalmed there (Figure 1-4). Speaking of Greeks, Aristotle (384-322 B.C.) reported that the marine electric ray (*Torpedo marmorata*) was kept in ponds since it was thought that its discharge could cure migraine headaches. This is the first documentation of electric shock treatment!

As long ago as 2000 B.C. in China, carp eggs were artificially incubated and silkworms were used to rear the young. This detailed in a book by Fan Lai dating from 475 B.C., Lai wrote that silkworm culture began in 2698 B.C. and that right from the start the feces and pupae of the silkworms were an important fish food. For this reason, the fishponds were located below the silkworm colonies. However, a current popular Cantonese Recipe for "Steamed Mud Carp" notes that, "Mud Carp is a Guangdong specialty. Mud carps from ShunDe District are plentiful but do not taste good because they feed on silkworm droppings." So much for haut cuisine four thousand years ago!

The earliest institution which received the name of "museum" (from the Greek "mouseiou") was that founded by Ptolemy Philadelphus about 280 B.C., i.e., the Alexandrian Museum. It formed part of the royal palace and originally contained cloisters, porticos, a public theatre or lecture-room for the more elaborate discussion of appointed subjects and a large hall where the professors supped together and enjoyed their symposiums unmolested by the presence, and



Figure 1.6. A PAINTING OF CHINESE CARP.



Figure 1-7. IN EGYPT FROM THE LATE PERIOD ON, it became common to dedicate appropriate bronze images in the temples and shrines of deities. Many such statues take the form of deities themselves, while others represent animals sacred to different deities. This is the oxyrhynchus fish, an African freshwater elephant fish (*Sternarchorhynchus mormyrus*), sacred to the goddess Hathor. It is usually shown wearing her crown of cow's horns and sun disk on its head. Sometimes, as shown here, a kneeling figure of the donor was included.

perhaps the criticisms, of the vulgar. The museum was supported by a common fund supplied from the public treasury, and the whole was under the direction of an archpriest, who was appointed by the king, and when Egypt became a province of the Roman Empire, by the Caesar. Not only were botanical and zoological gardens attached to this splendid establishment, but an aquarium was incorporated, also. This was the first recorded instance of an aquarium used for educational and/or scientific purposes.

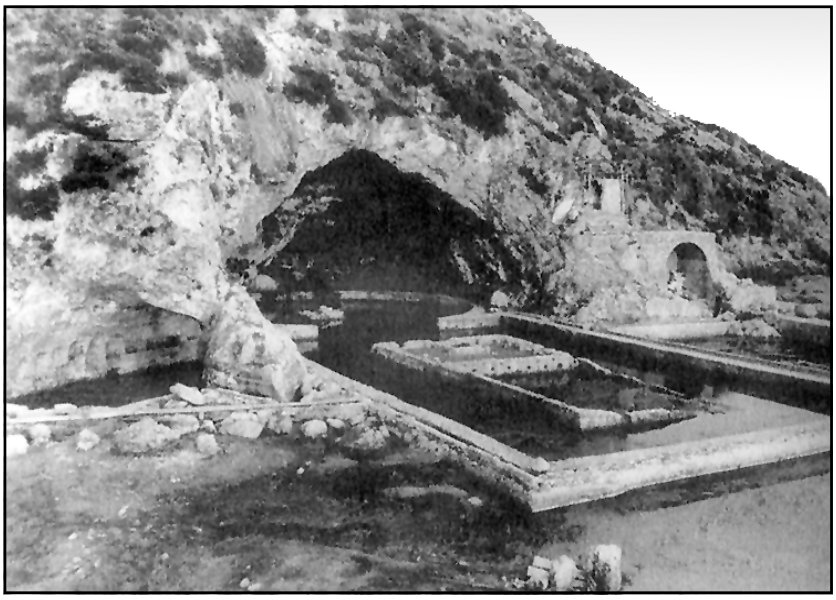
It is not until we come to the Romans, however, that we find the really dedicated STAGE I aquarists. Pliny the Elder (23-79 A.D.) was the first author to mention a fishpond (*Historia Naturalis of Gaius Plinius Secundus*). Lucinus Muraena, whom is said by Pliny to have invented fishponds, had a fishpond containing Moray eels, and Marcus Terentius Varro (116-27 B.C.) had two long piscinae in his aviary at Casinum. In Varro's book, *De Re Rustica,* he distinguished two types of fishponds: *dulces*, which were freshwater ponds maintained by ordinary people for food, and *salsae* or *maritima*, which were saltwater ponds maintained by the rich and noble and used solely as an entertainment or ornamentation, although some saltwater ponds were also used for raising food. To quote Varro:

> "There are two kinds of fish-ponds, the fresh and the salt. The one is open to common folk, and not unprofitable, where the Nymphs furnish the water for our domestic fish; the ponds of the nobility, however, filled with sea-water, for which only Neptune can furnish the fish as well as the water, appeal more to the eye than to the purse, and exhaust the pouch of the owner rather than fill it."

The status symbol for a Roman was the Moray eel, common in the Mediterranean. Since the times of the ancients, eels have been prized very highly on account of their savory flesh. The Romans were great experts at feeding these fish, Vidius Pollio being the master of them all, as he made a practice of feeding his eels with the flesh of slaves sentenced to death. Pliny states that at Cæsar's triumphal entry, Gaius Hirrius furnished six thousand Murænæ. Slaves were frequently driven into the ponds, and were immediately attacked by the voracious fishes, and killed in a very short time. Hirrius used the rent of his houses, amounting to 12,000,000 sesterces, to buy food for his lampreys, and sold one farm which was well stocked with them for 400,000 sesterces. Due to the greatly different nature of today's economics, any effort to equate sesterces to modern currency is probably wasted.



Figure 1-8. A SMALL SARCOPHAGUS OF THE SACRED FISH (the Nile perch, *Lates nilotocus*), Late Kingdom, 1000 BC. The sarcophagus is made of Wood.



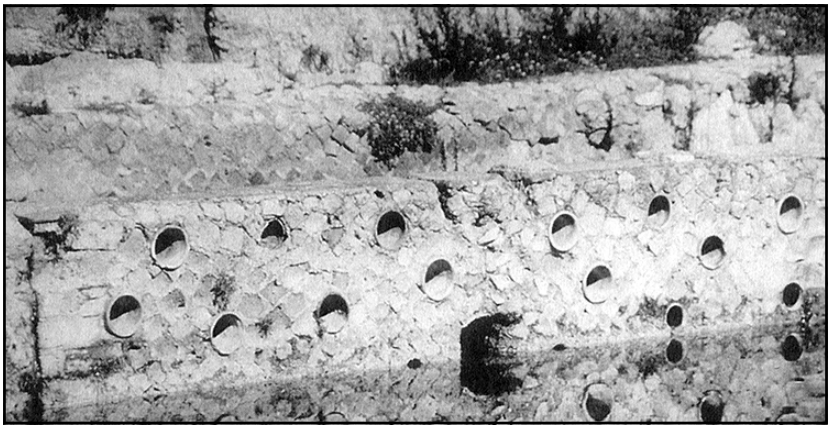


Figure 1-9. TOP: THE SALTWATER PISCINA (*salsae* or *maritima*) at the Grotto of Tiberius.
BELOW: THE CIRCULAR RECESSES (amphorae) in the sides provided shade and refuge.

coop to a modern farmer or rural gentleman. Wherever there was a well-appointed Roman villa, it contained a 'piscina'; while many gardens near the sea could boast also a 'vivarium', which, in this connection, means an oyster-bed.

"Fish-ponds, of course, varied with the wealth, the ingenuity, and the taste of their owners. Many were of vast size and of heterogeneous contents. The costly 'Murcena' (***Author's Note:*** **This is the name of an eel common in the Mediterranean, and obviously highly esteemed by the ancient Romans.**), the carp, the turbot, and many other varieties, sported at will in the great inclosures prepared for them. The greater part of the Roman emperors were very fond of sea-eels. The greedy Vitellius, growing tired of this dish, would at last, as Suetonius assures us, eat only the soft roe; and numerous vessels ploughed the seas in order to obtain it for him. The family of Licinius took their surname of Murcena from these fish, in order thus to perpetuate their silly affection for them. The love of fish became a real mania, and the 'Murcena Helena' was worshipped.

However, consider that a man in the times of Augustus was considered to be part of the rich class if he possessed 400,000 sesterces worth of property.

An interesting commentary on Roman fishkeeping appeared in the September 1861 issue of THE ATLANTIC MONTHLY authored by D. W. Cheever and titled "The Aquarium." This was an extremely extensive article of 9,825 words and started out with a history of Roman fishponds.

> "The fish-pond, to raise and breed the finest varieties of fish, was as necessary an adjunct to a complete establishment as a barn-yard or hen-

"Hortensius, who possessed three splendid country-seats, constructed in the grounds of his villa at Bauli a fish-tank so massive that it has endured to the present day, and so vast as to gain for it even then the name of 'Piscina Mircihilis'. It is a subterraneous edifice, vaulted, and divided by four rows of arcades and numerous columns, - some ten feet deep, and of very great extent. Here the largest fishes could be fattened at will; and even the mighty sturgeon, prince of good-cheer, might find ample accommodations."



Figure 1-10. A ROMAN FRESHWATER PISCINA or *dulce* in the House of Meleager, Pompeii. The niches were used to shade the fish from the sun.

The earliest enclosures built in Italy for the raising of fish were fed by fresh water. Later, the Romans began to build fishponds that made use of the sea as their principal water source. These seaside enclosures were more elaborate and costly than their inland forebears. Varro asserts that "… in the first place they were constructed at great cost, second they were stocked at great cost, and third they were maintained at great cost." In consequence, seaside piscinae were generally held to be the province of the rich, while ponds fed by fresh water became associated with poorer individuals. Another consideration was that freshwater fish were considered suitable for the table of the poor, while saltwater catch was more prized and often part of the cuisine of the elite.

Saltwater fishponds were always located at coastal sites in order to take advantage of the natural forces of the sea to circulate seawater within the enclosures (Figure 1-9, top). The seawater was moved by the force of tides and waves and thus was not circulated far from its source. Circulation aerated the water, maintained cool temperatures and helped regulate the salinity of the water inside the fishpond.

Freshwater fishponds were another matter (Figure 1-10). Not only were freshwater fishponds easier to construct, but fresh water was an easier supply to control and could be piped to locations far removed from natural sources by means of aqueducts and conduits. Simple gravity flow could maintain a freshwater hydraulic system many miles in length. The magnitude of the drop in altitude from the freshwater source to the fishpond would be in direct proportion to the pressure and rate of flow of the water entering the enclosure and thus would provide a vigorous flow adequate for the needs of circulation. This hydraulic technology would have permitted greater latitude in selecting a site for constructing a fishpond. Thus, by the first century A.D. the freshwater piscina became a popular and less expensive alternative to the more ornate seaside types.

Certain architectural details were incorporated into the fishpond plan to help confine and maintain the fish. For example, many fishponds were divided into smaller tanks, permitting the owner to segregate his fish by species or age. Most piscinae were open to the air, and shade where needed had to be incorporated into the plan. These included structures attached to the sides of fishponds so that they projected out into and covered part of the enclosure, submerged tunnels created by vaults to provide shade for the fish, and ceramic vessels of various shapes (amphorae) and size into which the fish could seek relief from the sun and from aggressive fish, predating the current practice of cichlid fanciers using flower pots and other artificial niches for this purpose (Figure 1-9, bottom). These piscinae were often built close to or even within the home. Both Pliny the Younger and Martial describe the leisure practice of fishing from one's bed just by dropping a line out the bedroom window!

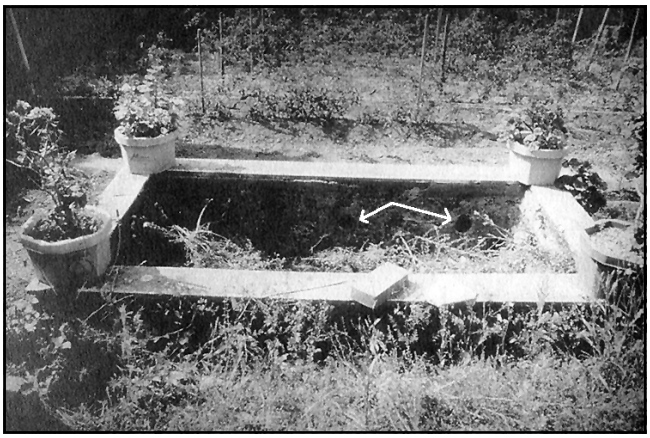


Figure 1-11. THE SMALL FISHPOND AT THE CASA DI GAVIUS RUFUS IN POMPEII. The arrows show two of the amphorae that provided shade for the fish and refuge from aggressive tank mates.

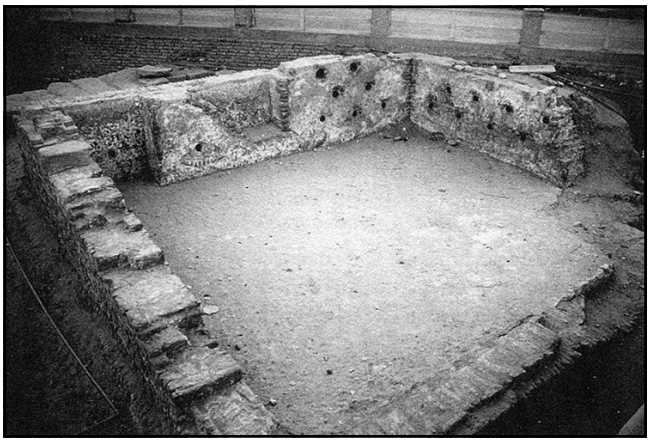


Figure 1-12, THE FISHPOND AT THE END OF THE AVENUE OF RAM-HEADED SPHINXES, Luxor, Temple of Amon. The photo shows the opening of the ceramic vessels incorporated into the sides of the pond that provided shade and refuge for the fish .

The majority of the fishponds were constructed of concrete with masonry facings; only a few were made of fired clay bricks or tiles. However, many of the ponds at Pompeii were decorated with blue fresco interiors to enhance the semblance of deep ocean. Not all were particularly large, however. The one at the Casa di Gavius Rufus in Pompeii and illustrated here measures 7 feet x 3.4 feet with a depth of 20 inches. The inside of the pond was lined with *opus signium*, a waterproof mortar of lime with crushed terracotta as aggregate and finished with a coat of blue-painted plaster. Another one found in Pompeii, topped in a marble facing and painted blue, measured 22 inches square with a water depth of about 23 inches, i.e., about 48 gallons.

The question now arises, since the Romans had access to clear glass, was glass used in the piscinae? Giuseppe Lugli, who completed the excavation of the Villa of Horace in Licenza in the 1930's, suggested that the fishpond there could have contained glass windows through which the fish could be viewed. However, the expense of the glass and the engineering difficulties that would have been encountered would make this seem unlikely. In short, there is no evidence that the Romans used flat glass in any of their fish tanks. A more complete discussion can be found in the Addendum, "A History of Glass in the Aquarium."

Although it might seem that the Romans should be given credit for being the first STAGE I aquarists to construct vertical-walled tanks, Figure 1-12 shows an ornamental fish pond at the Temple of Amon in Luxor, constructed about 1350 B.C. Since the amphorae embedded in the walls show that the Egyptians not only knew how to build fishponds but also were knowledgeable about the requirements for keeping fish, the credit, therefore clearly goes to the Egyptians.

STAGE II is what I term "Through a Glass Clearly," i.e., any container of glass or other transparent medium that affords the viewing of a fish in the more direct, edge-on, eye-to-eye orientation. Since the Romans produced glass bottles and other glass containers, it might be supposed that they were used to house some of their fishes and thus were the first STAGE II aquarists. Although there is some evidence of this of a sort (see Seneca's remark in the addendum, "A History of Glass in the Aquarium") it is in a strict sense highly unlikely since their fishes were rather large for such containers. The Romans, however, did maintain fish hatcheries and may have used glass jars to temporarily house the fertilized eggs of fishes destined to be introduced into waters where they were expected to reproduce and provide a source of food. Again, however, there is no evidence that they did so.

Guillaume Rondelet (1507-1566) was a French physician and natural researcher from Montpellier (Figure 1-13). He was a friend of Rabelais and, although active in several branches of biology, secured his reputation with his massive compendium on aquatic life, *Libri de Piscibus Marinis* (1554-5). This book, which covered far more species than any earlier work in the field, laid the foundation for later ichthyological research and was a standard reference work for over a century. In one of a series of Historical Lectures and Essays given at Cambridge in 1869, Charles Kingsley comments on Rondelet's life in Montpellier, France in 1551:

> "He had a villa outside the city, whose tower, near the modern railway station, still bears the name of the 'Mas de Rondelet.' There, too, may be seen the remnants of the great tanks, fed with water brought through earthen pipes from the Fountain of Albe, wherein he kept the fish

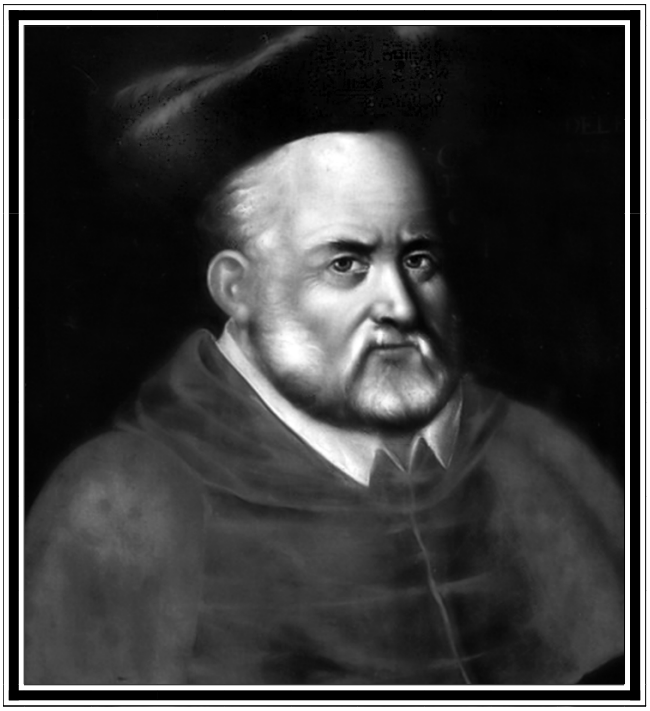


Figure 1-13. GUILLAUME RONDELET (1507-1566)

Although Rondelet kept both freshwater and saltwater fishes in large ponds, his wife, Jeanne, must be given credit for being the first to keep a fish in a glass container.

> whose habits he observed. Professor Planchon thinks that he had salt-water tanks likewise; and thus he may have been the father of all 'Aquariums.'"

However, the "great tanks" referred to could not have been made of glass since plate glass did not come to the Western World until 1688. The French word for "tank" in Planchon's time, from the Old French, "estanc," meant "pond" or "pool," so it is in this sense that Planchon employed the word. The honor, therefore, must go to Jeanne Rondelet, his wife, whom Rondelet claimed had kept a fish alive in a glass of water for three years. The dates of these three years are unknown but we do know that they were married in 1538. Although the fish in question is not known, it certainly was a European species, not an exotic or tropical species. In any event, Guillaume Rondelet was not the "father of all Aquariums" since the Sumarians, Egyptians and the Romans had beaten him to it.

Leonhard Thurneysser (1531-1596) was born in Basel, Switzerland, traveled all over Europe, and worked for many years in Berlin (Figure 1-15). He was a physician, alchemist, and mining and metallurgical technologist who, though steeped in the occult philosophical sympathies of nature as evidenced by his alchemical pursuits, was also a practical scientist who made contributions to mining, metallurgy and hydrology. His importance stems from the physicochemical methods he introduced into uroscopy. He, for example, proposed that urine distillates and their residues should be burnt in order to define their composition from the color of the flame.

Thurneysser led an interesting life, to say the least. He was forced to flee Basel after having been discovered selling gold-covered lead as pure gold. He spent some time in Holland, northern Germany, France and England, working as a goldsmith, armorer and soldier. 1552, he returned to Germany and joined the army of Albert, Margrave of Brandenburg. 1553, he was captured by the Saxon army and put to work in the mines at Tarenz in the

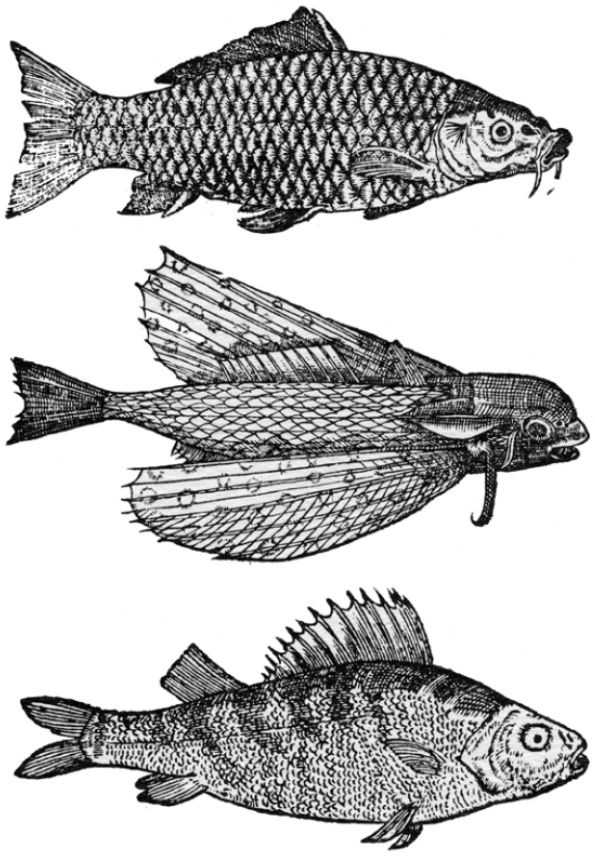


Figure 1-14. ILLUSTRATIONS FROM *L'Histoire Entiere des Poisons* by Guillaume Rondelet, 1558.



Figure 1-15. LEONHARD THURNEYSSER (1531-1596).

Inn Valley. Following his release, he worked as a goldsmith and smelter in Nuremberg.

Thurneysser was made court physician in Berlin at the high salary of 1352 Taler. He also conducted a medical practice in Berlin. In addition, he acted as adviser on metallurgy and mining, and established a huge laboratory, employing up to 300 people, at the Greyfriars monastery in Berlin for the production of saltpeter, mineral acids, alums, colored glass, drugs, essences and amulets. He also founded a printing house which published calendars, prognostications, alchemical and medicinal tracts, and other polemics. Since his books often contained words in languages he did not know, he was accused of harboring in his ink pot a devil who dictated to him!

Over time Thurneysser became rich and owned a large library, art collection and a kind of natural history museum. Around 1572 he constructed a double-walled glass globe in the center of which sat a bird and within the walls swam fish, although neither the fish nor the bird were identified (see Figure 1-16). To the casual observer this bird seemed like a magic bird (see Wassermann, 1915) because it apparently lived in the middle in the water with fishes swimming joyfully about as if they were in the air! This makes Thurneysser the second aquarist, after Jeanne Rondelet, of record in this history. The combination of aquarium and bird cage surfaced again when Gilbert White described a variation in 1782, Hibberd pictured another in 1856, and various American patents for such combinations were awarded in 1875, 1877, 1884 and 1919.

In the years that followed, his second wife died, his business suffered terribly, and he became the object of increasing criticism from his colleagues. More or less broke, he returned to Brandenburg where he spent some years trying to make gold. After failing to transmute a large amount of silver, he finally left and traveled to Italy but returned to Germany shortly before his death in 1596.

Leonhard Baldner (Figure 1-17) was born in 1612 at Strassburg, Germany, of a family in which the fisherman's trade had been hereditary for generations, and he too became a fisherman. Though Baldner was

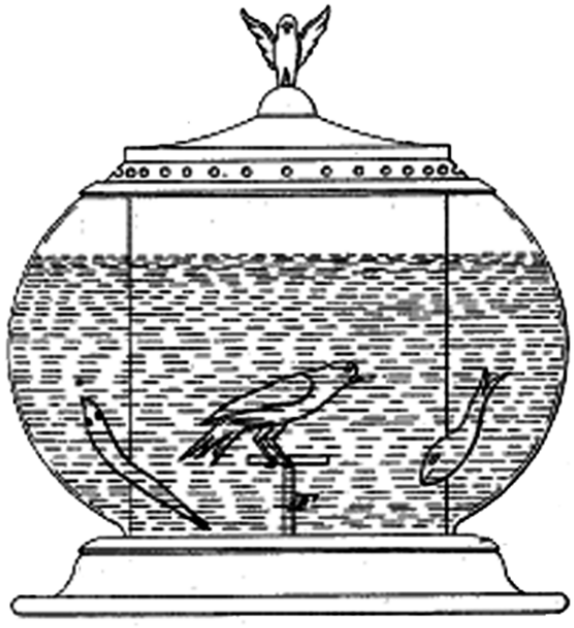


Figure 1-16. THE BIRD CAGE AQUARIUM, similar to the one devised by Leonhard Thurneysser circa 1572.



Figure 1-17. LEONHARD BALDNER (1612-1694).

not a learned man, his occupation and his inherent love of wild life combined to make him a remarkably keen observer of the animal kingdom, which was a closed book to most of the scholars of his time. He has been called "the father of the zoology of the Rhineland."

From his youth on, most of his days were spent in hunting and fishing. He was devoted to these pursuits and in time rose to the position of Warden of Fisheries and Forests in his own district. In addition, he was intensely curious to know the ways of the wild life with which he was so much in contact. No trouble or exertion was too great for him, day or night, if it would serve to put into his possession some rare animal specimen.

While hunting one day, Baldner brought down what he subsequently described as "a beautiful waterfowl, of a species unknown" to him. So pleased was he with this find that he caused the bird to be painted by a Strassburg artist. Pictures of others of his captures soon followed, and the collection gradually grew. Finally, it occurred to him to investigate thoroughly "the nature, kinds, and attributes" of all the animals that he could find and to compile the results. He went about his self-imposed task with characteristic carefulness and energy but it was not until 1666, twenty years after he had begun it, that his *Vogel-, Fisch- und Thierbuch* (*Bird-, Fish- and Animal Book*) was completed (the preface is dated 1653 and although the 1666 date is most commonly cited, there were earlier copies). After the completion of the book, Baldner continued his investigations until 1687, when advancing age compelled him to lay them aside.

One of the interesting things in connection with Baldner was that his work attracted little attention among professional zoologists of the time, although he made many original observations. It was not published, and then the text only, until 1901 when a German professor in the University of Heidelberg did full justice to this remarkable man. But various zoologists have made use of Baldner's manuscript, notably Francis Willughby, who purchased a copy when, with John Ray and Philip Skippon, he passed through Strassburg in 1663. Valenciennes in his and Cuvier's *Histoire Naturelle des Poissons* and von Siebold in his *Fresh-water Fishes of Middle Europe* also made use of Baldner's observations.

He kept and tamed otters too, and made experiments with salamanders and fish. Fish were apparently his favorite group and he made many painstaking observations upon their habits, migrations, rate of growth and the number of eggs in the ovaries. He tells of a wels (*Silurus glanis*) that was kept in a fish pond

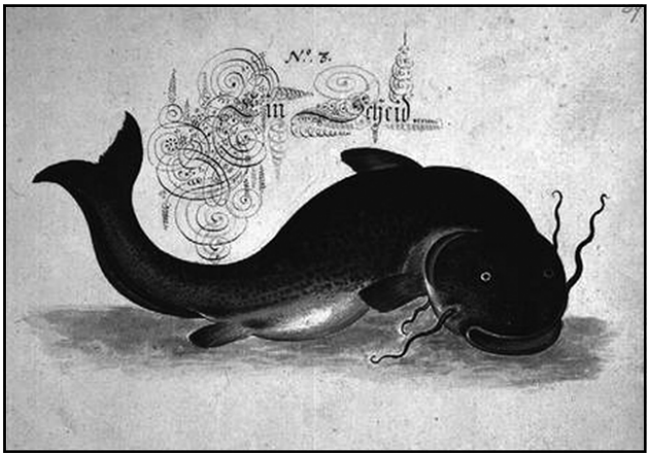


Figure 1-18. FROM VOGEL-, FISCH- UND THIERBUCH, 1666, by Leonhard Baldner.

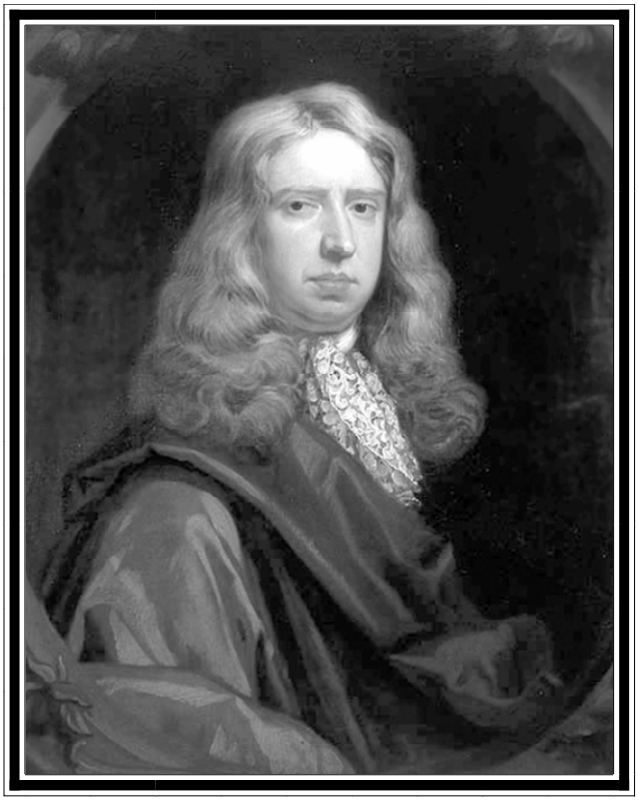


Figure 1-19. SAMUEL PEPYS (1632-1703)

for fifty-one years until it had grown to a length of five feet. In order to observe weather loaches over a longer period of time, he put them in large tanks filled with water and sand. The exact date he kept his loaches is not known but I will give the nod here to Baldner as being the second aquarist of record.

There was very little about the life history of the salmon which Baldner did not know and it took about two hundred years to rediscover what he had previously made perfectly plain. Cuvier, Valenciennes and many others after them ignored the truths that, in simple and homely language, we find in Baldner's book. He even took the trouble to count 148,800 eggs in the body cavity of one pike. He even made a remark about trout which some of our present-day naturalists can well afford to contemplate for he noticed that they changed color according to their surroundings: "…if put alive in a new tub they grow quite white and in a black one they turn dark, taking thus the color of whatever place they are in."

Samuel Pepys (Figure 1-19) made the following entry in his diary on May 28, 1665:

> "Thence home and to see my Lady Pen, where my wife and I were shown a fine rarity: of fishes kept in a glass of water, that will live so for ever; and finely marked they are, being foreign."

The "Lady Pen," it should be noted, was Margaret (nee Van der Schure) Penn (1622-1682), the mother of the Quaker, William Penn of Pennsylvania.

It was originally suggested in 1876 by William Alford Lloyd that the fish in question were goldfish but this lost favor over the years when no evidence was unearthed to show that the goldfish was introduced into England before Pepys' visit. This, and on the basis that the fish was "finely marked" and that its supplementary breathing organ would permit it to live for a very long time in a small container, prompted Christopher Coates of the New York Aquarium to suggest that the fish was the Paradise Fish (*Macropodus operculatum*).

This view prevailed until it was discovered that in 1643 the Jesuit, Martinus Martini, arrived in Hangzhou and became interested in a local farm where goldfish were being bred. From these ponds he brought 10 goldfish to Holland in 1653 (reported in his 1655 book, *Description Géographique de l'Empire de la Chine traduite d'un autheur Chinois par le père Martini*) and thus this date is the first documented introduction of goldfish into Europe.

Both Lady Penn, her father and her first husband were Dutch and it is known that she spoke Dutch as well. Through relatives in Holland, she could easily have received some goldfish, either from this importation, its offspring or some other importation into Holland. It should be noted that her husband, William Penn, had important naval and military connections with Holland.

Male Paradise fish are fairly combative, harassing and attacking each other and so cannot be kept together, especially in tight quarters. Thus if Pepys saw Paradise fish then he saw only females, otherwise he would have commented on the male's impressive finnage and coloration. However, although their markings are less impressive than that of the males they do have pointed fins, at least faint vertical bars

and some color. Pepys, however, comments on none of these. He uses the adverb "finely" to describe the markings of the fish but among the many meanings of this word are included "beautifully," "elegantly" and "extremely well." In other words, since it can be used to say that something is very good or impressive, the markings of goldfish can also be described in this manner. Note that in red goldfish the red scales are edged in yellow, forming fine lines that can be vertical, horizontal or even diagonal, depending upon the light. This effect can also be observed in goldfish of lesser or different pigmentation.

Finally, Whether a fish survives in small containers or not depends upon the care its owner gives it. The water must be changed in all small containers that are without filtration or aeration regardless of whether the fish kept are air-breathers or not, since a buildup of rotting food, algae or feces are health risks to the fish and the resultant cloudiness of the water detracts from seeing them, destroying the usefulness of the aquarium as an ornamentation.

In matters like these I tend towards the use of Ockham's razor, which states that among competing hypotheses, the one with the fewest assumptions should be selected. Thus I favor the view of William Alford Lloyd that the fish most likely were goldfish.

Although it is reputed that goldfish were being bred in China as early as the 4th century B.C., documented reports place this much later. It is known for certain that Huan Ch'ung (328-384 A.D.), who lived at the time of the Eastern Zhou Dynasty, saw wild fishes with red scales (*Carassius auratus*, the ancestral form of the goldfish) in a lake on Mount Lu. We know that at the time of the Tang Dynasty (618-907 A.D.) every high official wore a goldfish badge but, as Hervey and Hems point out, badges of office are not the same as living fish kept in captivity. The first undisputed evidence of maintenance, and therefore breeding, of goldfish in captivity occurred during the Song Dynasty (960-1279 A.D.). In his *Wu Lei Hsiang Chi* (*Account of the Mutual Influence of Things*), the T'ien-t'ai monk Tsan-ning (919-1001?) who was a devotee of natural history wrote: "If goldfish eat the refuse of olives or soapy water then they die; if they have poplar bark they do not breed lice." As Hervey and Hems note (1948), this passage suggests that during this time goldfish were being kept domestically as pets.

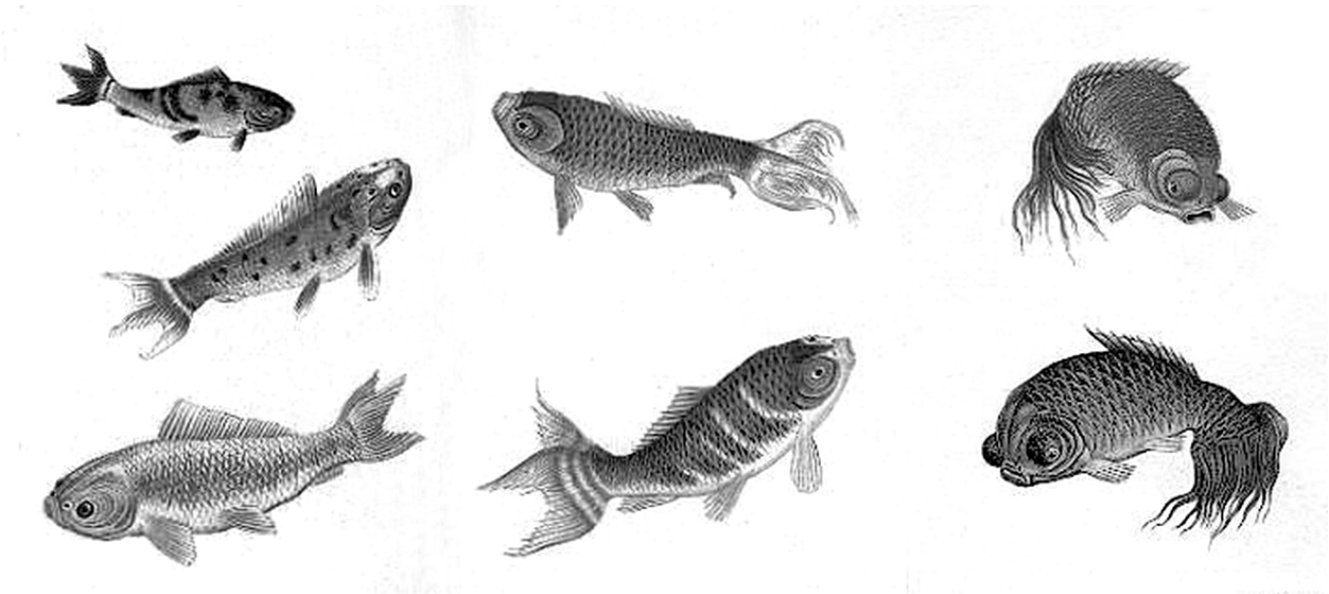


Figure 1-20. THESE GOLDFISH PLATES ARE TAKEN FROM EDME-LOUIS BILLARDON-SAUVIGNY'S *Histoire Naturelle des Dorades de la Chine* (*Natural History of the Dorados of China*), published in 1780. Sauvigny (1736-1812) was best known as a dramatist (included in his *Recueil d'Apologues* were a number of poems on American themes) but also was a naturalist. The plates, however, were drawn by François Nicolas Martinet (1731-1790?) whose engraved illustrations of birds for books by some of the most influential ornithologists in 18th-century France. Born in 1731, Martinet was trained as an engineer and draftsman. Engraving illustrations for books probably began as a secondary profession, but as his popularity and output grew it must have consumed the majority of his time.



FIGURE 1-21. MARIE ANTOINETTE, MARCHIONESS DE POMPADOUR (1721-1764). The goldfish was introduced into France during the last days of the monarchy. According to Sauvigny, the first specimens to reach France arrived at the port of Lorient about 1750. It is purported that Madame Pompadour was given some of these fish and valued them highly. Whether this story is true of not, it is interesting to note that she was born "Jeanne Antoinette Poisson" and that "poisson" is French for "fish."

In the Poem on the Pagoda of the Six Harmonies, written around 1030 A.D., the poet - Su Dongpo - recalls standing on a pine bridge and waiting for the golden Chi (i.e., goldfish). At this time golden Chi were held in high regard in China, but keeping and cultivating these divine creatures was reserved for the priests. Not until 1163 A.D. were private citizens allowed to keep these revered fishes.

By 1547 goldfish were a permanent fixture among the high-ranking populace. Nobles and mandarins kept these pieces of gold in splendid - sometimes fabulous - bowls of precious jade. The man-in-the-street kept them in earthenware tubs, vats and bowls. These containers were very popular, as goldfish would even breed in them. Perhaps the first author to write extensively on these jewels and their breeding was Chang Ch'ien (1577-1643 A.D.), and his work (*Chu sha yü p'u*, published in 1596 A.D.) was undoubtedly the first ever book on ornamental fish.

Towards the end of the Ming Dynasty (1644 A.D.) every Chinese household had a small (or large) goldfish basin. This was the centerpiece of the dwelling and brought people much pleasure, acting as a source of interest and entertainment, and already the first cultivated forms were appearing, such as the bubble-eye, the celestial and the twin-tailed lionhead. In 1643 the Jesuits arrived in Hangzhou where they proceeded to construct their churches. Some of the priests, however, became interested in a local farm where goldfish were being bred. As I have pointed out previously, from these ponds the Jesuit, Martinus Martini, brought 10 goldfish to Holland in 1643 and thus this date is the first documented introduction of goldfish into Europe. It should be noted that the reported introduction of goldfish in 1611 into England is in error. The exact date is uncertain, but it most likely was somewhere between 1692 and 1705 (for the introduction of goldfish into the United States, see Chapter 5).

Dr. James W. Atz summarized his own research on goldfish in the following paragraphs some twelve years before I put my own first words on the subject down on paper, a few minor alterations having been made for simplification:

> "But the keeping of fishes as pets did not become a popular pastime until after the goldfish was widely introduced into England during the first half of the eighteenth century. At first they were maintained in ponds on the lands of the well to do. Sir John Hawkins, noted editor of Izaak Walton and Charles Cotton, wrote in 1760: 'There has also been lately brought hither from China those beautiful creatures, Gold and Silver Fish. These fish are usually kept in ponds, basins and small reservoirs of water, to which they are a delightful ornament; and I have known a few of them kept for years in a large glass vessel like a punch-bowl.'
>
> "In the second and third editions of *The Complete Angler* which Hawkins edited, dated 1766 and 1775 respectively, the above footnote

was repeated, but in the fourth edition, printed in 1784, he saw fit to alter it, stating that 'it is now a very common practice to keep them in a large glass vessel like a punch-bowl.' The Reverend Gilbert White corroborates Hawkins in Letter LIV of *The Natural History of Selborne*, based on an entry from his journal dated October 27, 1782: 'When I happen to visit a family where gold and silver fishes are kept in a glass bowl, I am always pleased with the occurrence, because it offers me an opportunity of observing the activities and propensities of those beings with whom we can be little acquainted in their natural state.'"

Frank Buckland, in his *Curiosities of Natural History (*1858) states: "They [goldfish] were first brought to Europe in the seventeenth century, and continued very rare in England till the year 1728, when a fresh accession was received." In any event, goldfish importations into the Western world prior to the early 1700's were modest, consisting of only a limited number of specimens and thus precluding any widespread increase in the destination countries during those times.

The most memorable of the early goldfish keepers in England was surely Horace Walpole (Figure 1-25, left), Fourth Earl of Oxford, who cultured them at Strawberry Hill, his pseudo-Gothic villa, and presented them magnanimously to the rich and famous of his day. Probably no one before or since has obtained so much social mileage out of goldfish! Upon the death of Walpole's cat Selima in his goldfish bowl, Walpole asked his friend, the poet Thomas Gray (Figure 1-25, right), for an epitaph, but Gray responded more enthusiastically. "I am about to immortalize [her]" wrote Gray to Walpole on March 1, 1747. The delighted Walpole had the first stanza of Gray's poem engraved on the fatal Chinese vase that housed the fish in question and that is still on display in the Grand Salon at Strawberry Hill. The following is the poem in its entirety:

ODE ON THE DEATH OF A FAVORITE CAT DROWNED IN A TUB OF GOLDFISHES

'Twas on a lofty vase's side,
Where China's gayest art had dyed
The azure flowers that blow;
Demurest of the tabby kind,
The pensive Selima, reclined,
Gazed on the lake below.

Her conscious tail her joy declared;
The fair round face, the snowy beard,
The velvet of her paws,
Her coat, that with the tortoise vies,
Her ears of jet, and emerald eyes,
She saw: and purred applause.

Still had she gazed; but 'midst the tide
Two angel forms were seen to glide,
The Genii of the stream;
Their scaly armour's Tyrian hue
Thro' richest purple to the view
Betrayed a golden gleam.

The hapless nymph with wonder saw:
A whisker first and then a claw,
With many an ardent wish,
She stretched in vain to reach the prize.
What female heart can gold despise?
What cat's averse to fish?
Presumptuous maid! with looks intent
Again she stretched, again she bent,
Nor knew the gulf between.



Figure 1-22.
EXAMPLES OF A HOLLOW GLASS FISH BOWL placed over a bird cage. The one at the right was sold by the O. Lindemann and Company, New York City, circa 1912.



Figure 1-23. IN THE MIDDLE 1700'S, JAPANESE COURTESANS used to stroll outdoors with small glass globes, carrying their goldfish with them.

(Malignant Fate sat by, and smiled)
The slippery verge her feet beguiled,
She tumbled headlong in.
Eight times emerging from the flood
She mewed to every watery god,
Some speedy aid to send.
No Dolphin came, no Nereid stirred;
Nor cruel Tom, nor Susan heard.
A favorite has no friend!
From hence, ye beauties, undeceived,
Know, one false step is ne'er retrieved,
And be with caution bold.
Not all that tempts your wandering eyes
And heedless hearts is lawful prize,
Nor all, that glisters, gold.

Goldfish are also mentioned in Gilbert White's *The Natural History of Selborne*, a sort of diary and collections of letters. In it he writes in letter dated October 27, 1782:

> "When I happen to visit a family where gold and silver fishes are kept in a glass bowl, I am always pleased with the occurrence, because it



Figure 1-24. LEFT: HORACE WALPOLE (1717-1797). Walpole was well-known for giving goldfish away to his friends. RIGHT: THOMAS GRAY (1716-1771), composer of "Ode on the Death of a Favorite Cat Drowned in a Tub of Goldfishes."

offers me an opportunity of observing the actions and propensities of those beings with whom we can be little acquainted in their natural state.

"Some that delight in gold and silver fishes have adopted a notion that they need no aliment. True it is that they will subsist for a long time without any apparent food but what they can collect from pure water frequently changed; yet they must draw some support from animalcula, and other nourishment supplied by the water; because, though they seem to eat nothing, yet the consequences of eating often drop from them. That they are best pleased with such jejune diet may easily be confuted, since if you toss them crumbs, they will seize them with great readiness, not to say greediness: however, bread should be given sparingly, lest, turning sour, it corrupt the water. They will also feed on the water- plant called lemma (duck's meat), and also on small fry.

"Nothing can be more amusing than a glass bowl containing such fishes: the double refractions of the glass and water represent them, when moving, in a shifting and changeable variety of dimensions, shades, and colours; while the two mediums, assisted by the concavo-convex shape of the vessel, magnify and distort them vastly; not to mention that the introduction of another element and its inhabitants into our parlours engages the fancy in a very agreeable manner.

"Gold and silver fishes, though originally natives of China and Japan, yet are become so well reconciled to our climate as to thrive and multiply very fast in our ponds and stews. (***Author's Note:*** **a stew was a pond or tank in which fish were kept, usually for the purpose of holding them before needed for the table.**) Linnaeus ranks this species of fish under the genus of cyprinus, or carp, and calls it cyprinus auratus.

"Some people exhibit this sort of fish in a very fanciful way; for they cause a glass bowl to be blown with a large hollow space within, that does not communicate with it. In this cavity they put a bird occasionally; so that you may see a goldfinch or a linnet hopping as it were in the midst of the water, and the fishes swimming in a circle round it. The simple exhibition of the fishes is agreeable and pleasant; but in so complicated a way becomes whimsical and unnatural."

Although the idea of placing a bird in a hollow in the middle of a fish globe sounds somewhat Victorian, White is actually describing a fish bowl made 55 years before the Victorian age began!

I have previously mentioned Frank Buckland's reference to the goldfish in his *Curiosities of Natural History*. Since this is of some historical interest, the following is what Buckland (Figure 1-26) had to say about the fish:

"I was informed by a man, who wanted to sell me five gold-fish, and the bowl in which they were, for ten shillings, that the fish he buys are bred by a gentleman near Amsterdam, and sent



Figure 1-25. TRADITIONAL JAPANESE GOLDFISH TANK.

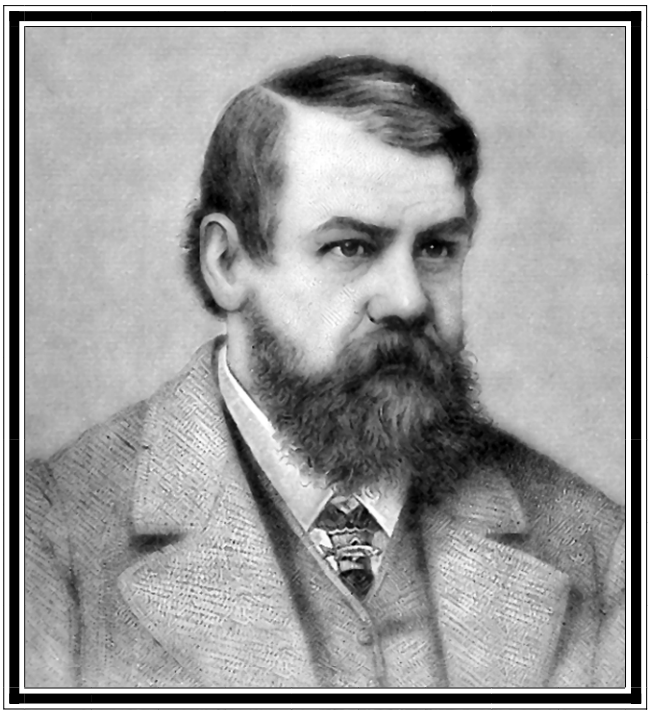


Figure 1-26. FRANCIS TREVELYAN BUCKLAND, 1826-1880.

over by hundreds, in zinc tanks, on board the Dutch eel-boats. From another source, I learn that there is a breeding-pond near or at Bradford, in Yorkshire, and the fish are sent up thence by rail to London."

"When they were cleaning out the basins of the fountains at Charing-cross, I asked the foreman if he ever found any fish at the bottom, when the water had been drawn off. He told me that sometimes gold-fish were found, and that he imagined they got there out of the glass globes of the men who go about the streets selling gold fish, and who come to the Charing-cross fountains-to change the water. During this operation, a gold-fish or two might easily escape; or, if the glass bowl got broken (they are not made of very thick glass) against the side of the basin the pool would at once become well stocked.

"Fish, in general, are very difficult to transport, but I can readily imagine that a gold-fish would bear a long journey, as they are of the carp tribe, and will exist, and thrive too, in very foul and dirty water: when even taken completely out of water they will live a very long time. The conformation of their gills explains this. The gill filaments do not readily adhere together, and so they continue to breathe if there is any moisture at all left in their gills, whereas most other fish soon get suffocated out of water, as previously explained.

"I once had a curious confirmation of this fact. I was invited to the clearing out of a pond in the neighborhood of London, which was full of gold-fish. I arrived late in the day; the work had been all done, and in an out-house I was shown a common water-cart, such as is used to water the roads, quite full of goldfish, nearly all of them alive, all quite small, none weighing above three ounces. The owner kindly gave me a dozen, which I placed in wet grass, and then in a cloth in a carpet-bag. There the fish remained all night.

On my arrival in London, the afternoon of the following day, I placed them in water, and found, to my surprise, that half of them were still alive having passed a night and half a day in a carpet-bag. Those that were dead, I cooked: they were like carp, and I cannot say good eating. Those that were alive, I transferred to a glass bowl. In a few hours they were well and swimming about, though at first they rolled about in the water as if intoxicated. I was informed that the pond having been cleaned out, the water-cart was wheeled to its margin, and the gold-fish turned in again. Two thirds of them recovered, and are living in the pond to this day. These fish were taken out of the water on Monday morning early, and remained in the water-cart till Tuesday afternoon! Who, after this, will doubt the vitality of the gold-fish? I understand that no young gold-fish are ever seen in this pond: they do not seem to breed. I believe they do breed, but the spawn never comes to anything; because the ducks get at it, whilst it adheres to the weed in the pond, and eat it all up. Another cause why these fish do not increase, is that they devour each other. The spawn is eaten, and the young fish also, by their comrades.

"Well aware that gold-fish will live in very high temperatures, I was anxious to obtain further particulars on this point, and I applied to my friend Dr. Warden, of Manchester, who kindly obtained from Mr. Hall, of the marble works, Derby, the following particulars, which he has obligingly allowed me to print.

"'You have been correctly informed as to the breeding of gold-fish in reservoirs used for cooling down the water from the condensers of steam-engines. I have myself a small tank or reservoir in a yard where I have- kept gold-fish for the last thirty years. It was at first stocked from a pond in the neighborhood with half-a-dozen fish, which were about twelve years old then; the longest survivor of them only died about ten months ago, June 1857, and I have many now from twenty to twenty-eight years old. As my place was constructed to keep them for amusement only, and not for breeding them rapidly, it was not made of a proper form for the latter purpose, having walls square up from the bottom; but for breeding it should have been run out into shallows.

"These fish (and I presume others also) eat up all the spawn they can find, and should any spawn escape they eat the young fry; and even the young ones three months old will devour their younger brethren only just born: so that, in a tank with upright sides, there is little chance of any escaping; but if the receptacle run out into shallows, the smaller fish can easily keep in a small depth of water out of harm's way. The propensity of these fish to devour their own young is no doubt a provision of nature to prevent their over increase; however, to enable some to escape, they are born nearly the color of the moss which grows on the sides of the pond, and begin to change to red in the course of a year, when they are about an inch in length. The old ones seem to take very little notice of them. To keep up the stock I have been obliged to take out the spawn and keep the young fish during the first few months of their lives in separate vessels.

"'These fish live in extremes of heat and cold. The water in my place flows in at the top, and consequently all the hot water keeps uppermost. The temperature of this has occasionally been as high as 90° and at the bottom not more than 30°, yet all the fish keep close to the top in the hottest part. Then, again, in winter, when the conducting pipes have been frozen up, the pond also has been frozen, and all we do is to break the ice every day to give a supply of air.'"

That Frank Buckland ate his goldfish should come as no surprise since Buckland ate everything: crocodiles, squirrels, hedgehogs, frogs, mice, elephant trunk (which he made into a soup), rhinoceros, porpoise, giraffe, toucan, monkey, armadillo, horse's tongue and ostrich, to name a few. In fact, Lynn Barber's chapter on Buckland in her *The Heyday of Natural History* is titled, "The Pioneer of Zoophagy"!

Finally, mention should be made of the Prince of Wales (and Prince Regent from 1811-1820), later George IV. George was an unpopular spendthrift and held his banquets on the longest table in London, some 200-feet long, in fact. A gurgling stream stocked with goldfish ran down the center of the table, adorned with moss and flowers!



Figure 1-27. THE STAGE II AQUARIUM. Cats and goldfish bowls are almost a cliché in the aquarium hobby.

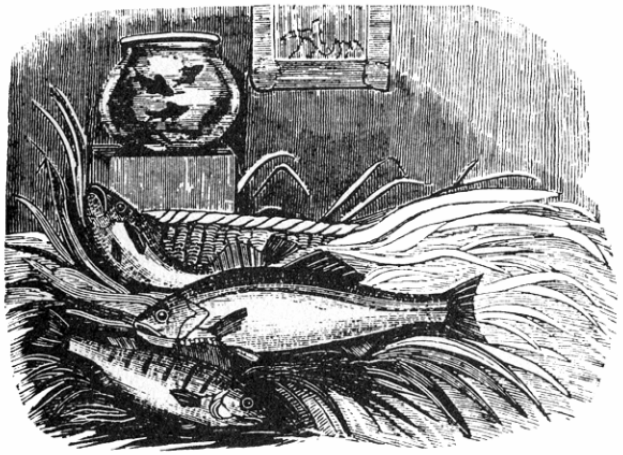


Figure 1-28. ONE OF THE EARLIEST ILLUSTRATIONS OF A HOME SHOWING A GLASS BOWL WITH FISHES (from *The Book of Fishes*, 1837, published by The Society for Promoting Christian Knowledge). The Society for Promoting Christian Knowledge is the greatest and most important society within the Church of England. It was founded in 1698 by Thomas Bray, an Anglican priest, and a small group of friends in order to encourage Christian education and the production and distribution of Christian literature. The Society also published some of Philip Gosse's books, including Natural History, Mammalia (1848).

Returning now to other early STAGE II aquarists, William Arderon (1703-1767) was a local eighteenth century diarist, letter-writer, philosopher and scientist from Norwich. In 1748 Arderon first figured what was undoubtedly a saprolegniasis (winter fungus) of Roach but, more relevant for our purposes, in 1746 he wrote a letter to a friend describing the keeping of sticklebacks in glass jars ("A letter from Mr. Wm. Arderon, F.R.S. to Mr. Baker, F.R.S. on keeping of small fish in glass jars: and on an easy method of catching fish").

Sir John Graham Dalyell (1775-1851), an Edinburgh barrister (one who nevertheless devoted much of his time to detailed studies of marine invertebrates) maintained marine animals in cylindrical glass vessels of various sizes, possibly as early as 1790. Generally each vessel held a single animal; plants were not included, nor was the water aerated by any other means. Dalyell therefore found it necessary to change the water once or twice a day. A porter brought several gallons of sea water in an earthenware jar two or three times per week, enabling Dalyell to keep many of his specimens alive for eight to ten years or more. One particular anemone, nicknamed "Granny," survived from the time of its collection in 1828 until 1887, out-living Sir John and several others to whom it was passed on.

In the 1830's at the University of Edinburgh, saltwater vessels also were kept in the rooms of Edward Forbes (1815-1854) and his fellow medical students, John (1814-1867) Goodsir, Harry (1816?-1847) Goodsir and George E. Day (1815-1872) in which marine invertebrates were maintained for study and later dissection to the amazement of numerous visitors, including the Swiss naturalist Louis Agassiz. Forbes wrote much on mollusks and other marine animals; one of his books, published in 1841, was *A history of British starfishes and other animals of the class Echinodermata*. Harry Goodsir wrote a good deal about crustacea and copepods, including a paper in 1842 titled "Description of some new crustaceous animals found in the Firth of Forth."

Forbes' associate, Dr. George Johnston (1797-1855), the author of important works on British zoophytes, sponges and other groups, set up a glass jar containing corallines, sea lettuce, mollusks, annelids and a starfish in his Berwickshire home about 1842. The aquarium was self-sustaining for two months, and thus Johnston must be given credit for the first marine aquarium. However, at the time it was considered an exceptional case, not reproducible or worthy of wide publicity.

As we have seen, sometime between 1775 and 1784 it became a very common practice in England to keep goldfish in glass bowls. Although this may fall somewhat short of being a "hobby," a stronger case may be made for one of the earliest fishes kept in the aquarium, the three-spined stickleback. Indeed, by 1820 children had distorted the word to "tittlebat," and the keeping of this little fish was so prevalent that this pre-Victorian aquatic fad was lampooned by Charles Dickens in his *Posthumous Papers of The Pickwick Club (1836)* as evidenced by the very first entry in the *Papers*:

> "May 12, 1827. Joseph Smiggers, Esq., P.V.P.M.P.C.,[1] presiding. The following resolutions unanimously agreed to:

"That this Association has heard read, with feelings of unmingled satisfaction, and unqualified approval, the paper communicated by Samuel Pickwick, Esq., G.C.M.P.C.,[2] entitled `Speculations on the Source of the Hampstead Ponds, with some Observations on the Theory of Tittlebats;' and that this Association does hereby return its warmest thanks to the said Samuel Pickwick, Esq., G.C.M.P.C., for the same.

[1]Perpetual Vice-President - Member Pickwick Club.
[2]General Chairman - Member Pickwick Club.

Dickens, of course, by fabricating this very scientific-sounding but nonsensical, non-existent paper was poking fun in a manner reminiscent of PUNCH twenty-one years later making fun of the Mid-Victorian ladies, hoopskirts and all, collecting tide pool specimens for their aquaria.

Our last prototype-aquarist to be described is a remarkable woman, Jeanne Villepreux-Power who, with some justification, has frequently been termed the "Mother of The Aquarium."

Jeanne Villepreux, the daughter of a shoemaker, was born in a small French village (Juillac) in 1794. As a young girl her job was to take care of the family's sheep but, thanks to her mother, the small Jeanne learned to read and to write, a rarity for a simple shepherdess at the beginning of the 19th Century. At the age of 18 she traveled to Paris (a distance of roughly 200 miles, walking a good part of the way!) and became a dressmaker of some renown. In this fairy story her "magic wand" was a needle - the one with which she embroidered the dress of the bride-to-be, Caroline Bourbon of Sicily, the future spouse of the Duke of Berry, son of Charles X. Having made the dress, she was invited to attend the rather spectacular marriage and during the course of the ceremony met a young English Count, James Power, a rich industrialist from Messina, a port city Sicily. They were married in 1818 in Messina where they lived for 20 years.

Thus begins a true histoire d'amour. Jeanne Villepreux, the petite dressmaker, becomes Lady Jeanne Power, living in a luxurious English colony of the rich and the cultivated. Lively and intelligent, Jeanne studied languages and the natural sciences. The wealth of Sicily - its minerals, fossils, butterflies, plants and marine life - excited her curiosity. Life and its mysteries thrust this self-taught naturalist into a life of multifaceted research.

While conducting scientifically controlled and reproducible experiments, she invented, according to the physiologist Claude Bernard, the principles of the experimental method. Moreover, she was the first (1832) to create and use aquariums for experimentation in aquatic environments. She was also the first to suggest that raising fish in aquariums until they were big enough to be reintroduced could repopulate rivers. As early as 1858 she was recognized by Richard Owen, one of the most renowned British zoologists of the time, as the "mother" of "aquariophily." From 1832 to 1842, she was the only woman in the Catania Accademia di Scienze and a corresponding member of the London Zoological Society plus 16 other academies. She wrote several books and the Historical Society of Messina has just republished her *Guida per la Sicilia,* a brilliant and erudite inventory of that Island's environment. Villepreux is mentioned in a French book published in 1899 about women in Science, *Les femmes dans la science*.

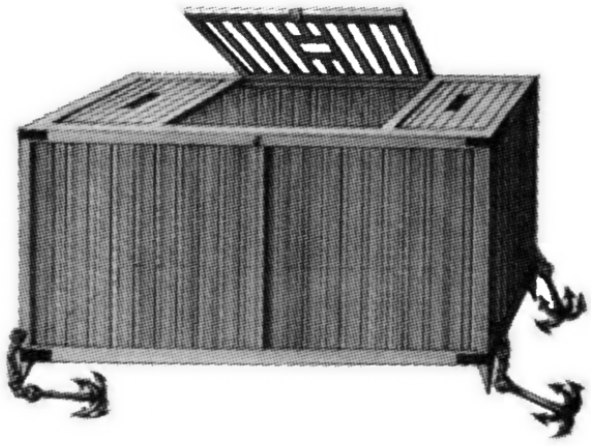


Figure 1-29.
POWER HAD SPECIAL WOODEN BOXES MADE, known as Cages à la Power, that were lowered into the water and anchored to keep the animals fishermen brought to her or which she had caught herself.

Villepreux was famous all throughout Europe for her works on the shell of the Paper Nautilus (*Argonauta argo*). The following is an article titled, "Introduction to Mollusca," published in *Mollusca* in 1858 by Richard Owen (for those readers not familiar with marine mollusks I have provided definitions in the parentheses):

> "The knowledge of the varying forms of the living Mollusks, of their habits and powers, has been increased, and is likely to be materially advanced, by the rapidly extending practice of preserving them in confined spaces of sea or fresh water. Poli, Montagu, and before them probably other lovers of nature, resident near the sea, availed themselves of large vessels to keep alive, in frequently renewed sea-water, the marine animals in the study of which they were interested. But to Madame Jeannette Power (née de Villepreux), according to the testimony of Professor Carmelo Maravigna, in the *Journal du Cabinet Littéraire de l'Academia Gioenia, of Catania*, for December 1834, ought to be attributed, if to any one individual, the invention and systematic application of the receptacles now called Aquaria, to the study of marine, and principally of molluscous animals.
>
> "Madame Power invented three kinds: one of glass, for preserving and studying living Mollusca in a room; another, also of glass, for small Mollusks, protected by an external cage of bars, in which they could be kept submerged in the sea, and withdrawn at will for inspection; and a third kind of cage for larger Mollusks, which could be sunk and anchored at a given depth in the sea, and raised, when required, for the purpose of observation and experiment (Figure 1-29). With these different kinds of molluscous menageries, of which the first answers to our present improved and enlarged aquaria, Madame Power carried on her observations and experiments from the year 1832 to 1842 at Messina in Sicily.
>
> "She determined the question of the true relation of the Argonauta, or Paper Nautilus, to the delicate boat-like shell that it inhabits. She first showed that the so-called "sails" were normally applied over the exterior of the shell, and proved experimentally that they were the organs that formed and repaired the shell. She proved that the *Bulla lignaria* (i.e., a marine shell) preyed upon, and by its strong gizzard ground down and digested, the Dentalium entale (i.e., a Tusk shell). She described the curious maneuvers by which the *Astropecten aurantiacus* (i.e., a Sand Star) seized and conveyed to its mouth and stomach small Naticae (i.e., marine gastropods). And many other interesting facts were brought to light by this persevering and ingenious observer, through the application of the "Gabioline alla Power," as her aquaria were termed by the Gioenia Academy, some years before the practice of so studying aquatic animals was introduced and diffused in this country."

The first two aquaria invented by Madame Power and mentioned by Owen in his article clearly were flat-sided. Fish had been kept in round containers for hundreds of years prior to 1832 when Maravigna stated Powers had first devised her three types of aquaria, so Owen would not have attributed Power's aquaria as being the first if they were not flat-sided. Also, the second type of glass aquarium mentioned by Owen that were protected by an external cage of bars could not have been anything but flat-sided and clearly followed Power's third design which we know were of rectangular design and flat-sided.



Figure 1-30. EARLY FRENCH CARD BY PONSOT
The Child on the stool is holding a pair of fish tongs
Above the Goldfish bowl.

Isabella James, writing in 1858, suggested that "The cages made by Mrs. Power, a learned French lady residing in Messina, in 1832, although she gave to some of them the name of Aquaria, were merely receptacles suspended in the waters of the bay to enable her to watch the habits of marine animals. The plan of maintaining the balance of nature by means of plants was unknown to her." James, however, was unaware of the other aquaria invented by Power as described by Owen. Power did not, of course, maintain her aquaria according to the balanced aquarium principle; what is being claimed here is that she was the first on record to keep aquatic animals in flat-sided aquaria.

With regard to the Paper Nautilus, for years it was the subject of a great argument between Owen and the French naturalist Ducrotay de Blainville (and others). Blainville maintained that it was fixed in its shell, Owen having the opposite opinion. Jeannette Power solved the problem years later when, breaking shells, she proved that the cephalopod was able to repair it. In 1856 she published "Observations physiques sur le poulpe de l'*Argonauta Argo*," followed by other marine studies in 1860.

Unfortunately, after 20 years the couple was obliged to leave Sicily. During the voyage to France she lost all her equipment (including her aquaria) and, even worse, most of her collection during a shipwreck. Jeanne Villepreux-Power passed away in her natal town of Juillac at the age of 77. Her husband, who remained in Paris in 1871 to defend the city during the Prussian siege of that year, rejoined her a few months later in their shared sepulture. In 1883, Matilda Joslyn Gage wrote:

> "While passing by woman's discovery in science…, mention must still be made of the aquarium, the invention of Madam Jeanette Power, one of the most eminent naturalists of the century. It was used by her in making curious scientific discoveries. The value of the aquarium to marine zoology is incalculable. Not only can rare species from the Indian, Arctic, and Pacific oceans be brought into close comparison, but the subject of embryology can be studied, and the great Darwinian problems of evolution and permanence of type are likely to be solved by its instrumentality."

Forgotten for more than 120 years, she and her works are now coming back to light, and her name, "Villepreux-Power," was given to a very important crater on Venus during the Magellan Project.

As with STAGE I aquaria, STAGE II aquaria are (unfortunately) also still common today. However, some well-known writers (e.g., Philip F. Rehbock and Stephen Jay Gould) do not view these as aquariums in a strict sense. Rehbock, for example, quotes Edwards (1858):

> "The great difference between a fish-globe and an Aquarium is, that in the one, we keep fish only, whilst, in the other we cultivate many beautiful and wonderful plants and animals which would not flourish if we changed the water often. It should be remembered, when it is found necessary to aerate the water, that we do not possess an Aquarium: which is a collection of plants and animals that is self-supporting, self-renovating-that requires only the feeding of the inhabitants and the watching for accidents."

To Rehbock, therefore, the true aquarium is one that remains in a healthy state without requiring any renewal of the water, fresh or salt. Such a statement



Figure 1-31. CHINESE CARP PAINTINGS.



Figure 1-32. EXAMPLE OF A STAGE II AQUARIUM. Jeanne Villepreux-Power holds the honor for being the outstanding practitioner in this Stage.

might come as a surprise to present-day aquarists who commonly follow the practice of providing frequent changes of water. To follow this to its logical conclusion, if a true aquarium is one where the water is not changed, then a "true aquarist" is one who never changes the water!

Similarly, Gould argues that the fish bowl is not an aquarium because it lacks the following defining feature: a *stable community* of aquatic organisms. To Gould, a fishbowl presents a temporary display, not a stable community:

> "The water quickly goes foul and must be changed frequently. The concept of an aquarium, on the other hand, rests upon the principle of sustained balance among chemical and ecological components-with plants supplying oxygen to animals, fish eating the growing plants, and snails (or other detritus feeders) scavenging the wastes and gobbling up any algal film that might grow on the glass walls."

To the extent that fishbowls in actual practice are small and quite inadequate to house even a single fish without frequent water changes, Gould is right in maintaining that a fishbowl is a temporary display and not a stable community. This does not mean, however, that a suitably large fishbowl could not sustain one or more fishes without changing its water. After all, there is no difference between a very large fishbowl and an outdoor pond, save the opacity of the sides of the latter.

Both Rehbock and Gould rely greatly upon the so-called "principle of the balanced aquarium" for their definition of the word "aquarium" and the major portion of their articles cited are taken up with the history and development of this concept. However, as I will later point out this principle played a much smaller role than these authors presume. However, there is no doubt that the concept of the balanced aquarium, an elucidation of its physical and chemical nature that was begun in the 1700's and that continued into the 1840's, was a crucial element of the intellectual climate that spawned the sudden interest in the home aquarium. As Dumas (1841) comments, "If the 'circle of organic life at the surface of the globe' depends upon the vegetable kingdom - 'that great laboratory of organic life' and if such 'laboratories' could be successfully established in the isolation of closely glazed cases, then could not the same 'circle of organic life' be achieved in an aquatic medium?"

As we shall see, however, the aquarium craze in Britain in the mid-1850s was a sociological phenomenon based upon the notion that the study of nature led to spiritual enlightenment. During the 1850's and 60's a flood of books - in addition to serving as practical manuals on how to collect specimens, how to construct an aquarium, and how to conduct observations - extolled both the aesthetic pleasure and the scientific and religious knowledge to be gained from the home aquarium. This was the driving force behind the keeping of aquaria during this time, and the "balanced aquarium principle" was not necessary for its success.

CHAPTER 2:
THE BIRTH OF THE AQUARIUM HOBBY IN ENGLAND

Since this history is concerned with the care of aquarium fishes as a more earnest pastime, we'll move to the next Century and examine the events that took place in Great Britain. What the aquarium craze of the mid 1850's in Britain did was to bring on STAGE III of the aquarium hobby, i.e., what I term "The Ocean and Lake in Glass." This stage is characterized by the following: (1) first, and most important, the interpretation of the aquarium as a mini-representation of a small portion of some natural aquatic environment - the marine aquaria of the day, for example, were frequently referred to as "parlour oceans," (2) an availability of books on the subject, and (3) the existence of commercial establishments supplying fish and equipment.

Edwin Lankester (1814-1874, Figure 2-1) was a physician, botanist and professor of Natural History in London. He became such a good friend of Richard Owen - a famous naturalist of the time - that his youngest son was given the name Alfred Owen Lankester. In 1856 he wrote an excellent treatise on the aquarium, *The Aquavivarium, fresh and marine; being an account of the principles and objects involved in the domestic culture of water plants and animals.* The following is his account of the early history of the hobby.

> "If there has been no open controversy, there has been a good deal of latent feeling on the subject of the invention of collections of plants and animals in water. The subject has not appeared to me to be one of so great interest as to demand original research, and I shall therefore speak of the history as far as my own memory serves me. To whomsoever credit may be given for perfecting these arrangements, I cannot for a moment doubt that the original idea was taken from the success attending the cultivation of plants in closed glass cases, on the plan recommended by Mr. Ward. It was his genius that saw, in the accidental sprouting of a fern in a glass bottle, the means of maintaining fresh vegetation in the midst of the smoke and dirt of London. When he had succeeded in fitting up his first fernery in Wellclose Square, he was not long in discovering, that in the little pools which he so ingeniously constructed there, gold fishes and other creatures would live in the water, provided plants were present, as animals lived in the air of his fernery. The culture of ferns in cases, by Mr. Ward's friends, led naturally to the culture of waterplants in the same cases, and airbreathing and waterbreathing animals were introduced, to increase the interest of the scene. As early as June, 1849, Mr. Ward stated, at a meeting of the British Association at Oxford, that he had succeeded, not only in growing seaweeds in seawater, but in seawater artificially made. This must certainly be regarded as the first step towards realizing the marine A qua vivarium. From this time experiments of various kinds were tried, for the purpose of ena-



Figure 2-1. EDWIN LANKESTER, 1814-1874

bling persons away from the sea side to keep marine animals. A lady in London frequently surprised the scientific societies by exhibiting beautiful living specimens of rare marine animals; and these she succeeded in keeping for many months by aerating the sea water by pouring it from one vessel to another.

"Previous to the year 1850, many experiments had been made in London of keeping sticklebacks, gold fish, and other animals, in jars containing *Valisneria.* I find, from some of my own notes, that I had sticklebacks in a jar containing Valisneria and Water Starwort, in 1849. In March, 1850, Mr. Robert Warington read a paper before the Chemical Society, which was afterwards published in the journal of that Society, in which he described the general conditions necessary to the growth of plants and animals in jars of water, and gave an account of his own arrangements for that purpose.

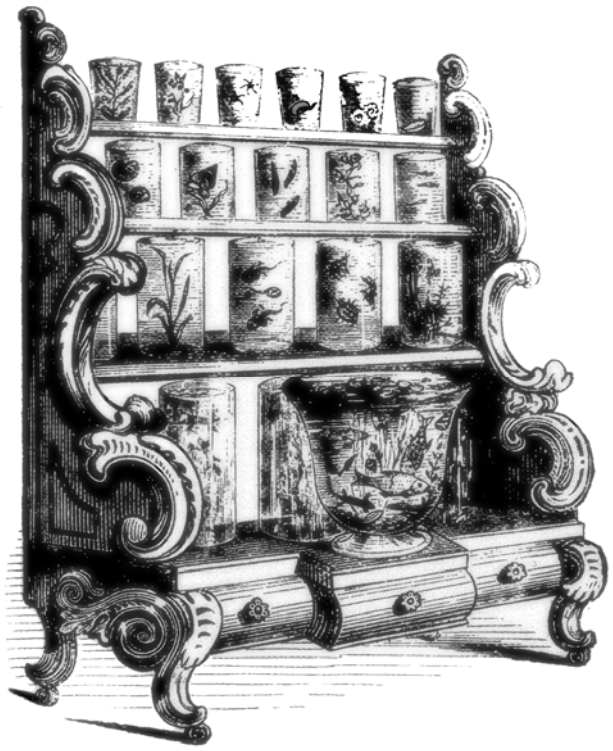


FIGURE 2-2. A CABINET AQUARIUM OF THE 1850's. The glass jars permitted a variety of animals to be exhibited without the danger, common to framed aquaria, of metals leaching and poisoning the marine life.

"The practicability of establishing arrangements of this kind had been often discussed in the council of the Zoological Society, and in 1852 they deter mined to erect, under the skilful guidance of Mr. Mitchell, a house in their gardens in Regent's Park, large enough to hold several watertanks for marine and freshwater animals. In the spring of 1853 this house was opened, and at once gave an immense impetus to the establishment of water vivaries. Most of the marine creatures contained in it were obtained by Mr. Gosse, who had previously cultivated marine animals with plants in seawater. An account of his experiments is given in his very interesting "Rambles of a Naturalist on the Devonshire Coast." In 1854 Mr. Gosse published a beautiful volume, entitled "The Aquarium," in which he describes minutely the structure and habits of a large number of marine animals adapted for domestication in vessels of seawater.

"After the success of his experiments with fresh water plants and animals, Mr. Warington commenced operating upon marine plants and animals with seawater. In this he has been more successful than any other operator, probably arising from the care with which he constructed his tanks. An account of his experiments is given in the "Annals of Natural History" for November, 1853. Many important hints and suggestions will be found in Mr. Warington's other papers in the "Annals of Natural History."

"Since the opening of the house in the Zoological Gardens, numerous papers and books on the subject of the Aquavivarium have appeared. Mr. Gosse has written a little book, containing directions for managing the marine aquarium. Mr. Shirley Hibberd has devoted considerable space, in his work on "Rustic Adornments for Homes of Taste," to the management of the Water vivaries. Dr. Badham also, who has made Felixstow a classical spot for the marine naturalist, has contributed his experience on the subject. We ought also to mention Mr. William Thompson, of Weymouth, who has been a collector of specimens for domestication from the

first, and Mr. W. Alford Lloyd, of London, who, by his enterprise in securing specimens for his beautiful collections, has done much to extend our knowledge of how to manage the Aquavivarium, as well as to create a taste for its adoption."

One of the best writers of the time was James Shirley Hibberd (Figure 2-4). Many people have had trouble with Hibberd's androgynous first name, assuming him to be a "she" but as his first name was James his gender was definitely male. In 1856 Hibberd wrote three books dealing with the aquarium: *The Book of the Aquarium and Water Cabinet*, *The Book of the Fresh-Water Aquarium* and *The Book of the Marine Aquarium*, all three of which were combined into one volume, *The Book of the Aquarium*. As was noted by Lankester, he also wrote *Rustic Adornments for Homes of Taste* in this same year, a book overlooked by some aquarium hobby historians but in some ways perhaps his most important (Figure 2-3). It provided much insight into how the aquarium was actually used in the home, an aspect not discussed by any other writer in as much detail.

The following account by Shirley Hibberd appeared in his *The Book of The Aquarium*, and although Hibberd was not always entirely accurate, he can be trusted here. Although a more detailed account, although Hibberd does overlook several names noted by Lankester:

"Lavoisier was the first who, upon philosophical grounds, established the fact of this balance of influences. De Saussure (***Author's Note:*** **Horace**



Figure 2-4. JAMES SHIRLEY HIBBERD, 1825-1890

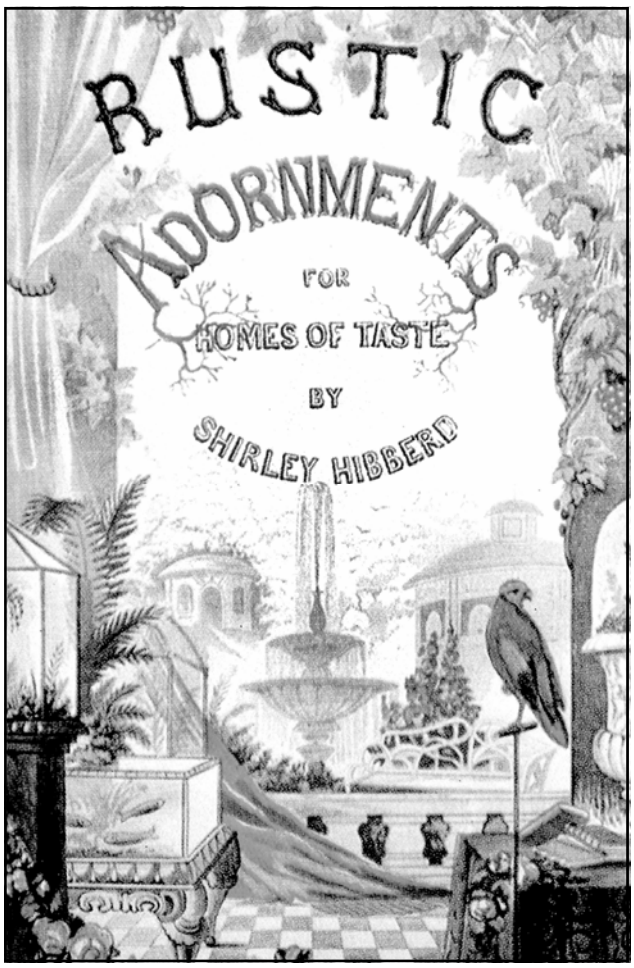


Figure 2-3. TITLE PAGE OF RUSTIC ADORNMENTS FOR HOMES OF TASTE by Shirley Hibberd, 1856.

Although Gosse wrote the first book on the maintenance of marine aquaria, the first book to deal with the fresh water aquarium was this one. In the middle of the century there was hardly a middle class drawing room that did not contain an aquarium, a fern collection, birds, or some other evidence of a zest for natural history.

The 1895 edition is one of the most beautiful aquarium books ever published. Among other things, each page has a floral border in full color.





Figure 2-5

RIGHT: CHARLES ROBERT ALEXANDRE DESMOULINS, (1798-1875), French botanist and malacologist.

FAR RIGHT: CHARLES GILES BRIDLE DAUBENY, (1795-1867), English chemist, botanist and geologist.

-Bénédict de Saussure, 1740-1799, was a Swiss physicist and geologist), in 1780, proved that plants had a tendency to improve the atmosphere, by robbing it of the gases most baneful to animal life; and Priestly, by means of well-devised experiments, ascertained that when atmospheric air had become vitiated by combustion and animal respiration, plants had the power of restoring it to a normal condition, so as to be again capable of supporting flame, and the breathing of animals. Inglehouse and Ellis contributed to this inquiry, and modern chemistry establishes the fact, that though vegetables absorb oxygen, they do, by the decomposition of carbonic acid into its elements - oxygen and carbon - yield a large quantity of the first element to the atmosphere, while retaining the second for the construction of their tissues.

"In the philosophical examination of this subject, the report of Professor Daubeny (*Figure 2-5*) to the British Association, in 1833, is perhaps the most conclusive and elaborate of any of the contributions of modern chemists. He regarded light as operating upon the green parts of plants in such a way as to enable them to assimilate carbon and evolve oxygen; and concluded that as a very small portion of a tree or shrub generates a considerable quantity of oxygen, there were no reasons to doubt that the influence of the vegetable might serve as a complete compensation for that of the animal kingdom. **(Author's Note: Three years previously, in 1830, the Frenchman Charles Robert Alexandre Desmoulins - also spelled "des Moulins" (Figure 2-5) - was able to establish that fishes were healthier and did better in water containing plants and mollusks than without them. Moulins was a botanist, the author of the chrysanthemum genus *Dendranthema* and malacologist. Towards the end of his life he opposed the ideas of Darwin.)**

"The formation of a marine Aquarium was first accomplished by Dr. Johnstone (*Figure 2-9*), one of our most successful students of marine life. In his "History of British Sponges," published in 1842, he describes the formation of a little marine Aquarium in a glass jar, containing only six ounces of sea water, stocked with living corallines, minute confervae, ulva, several little mussels, annelides, rissae, and a star-fish. The jar was placed upon a table, seldom disturbed, and after eight weeks, the water still unchanged, had lost little of its capability for the support of animal life; some of the animals were still active, and the coralline was still growing.

"Dr. Lancaster, in his interesting and attractive work on the "Aquavivarium," expresses an opinion that the original idea was taken from

the success attending the cultivation of plants in glass cases, on the plan recommended by Mr. Ward. With this opinion I quite concur, and it is agreeable to have to associate Mr. Ward's name with the subject before us, for he was one of the early pioneers, and at a meeting of the British Association at Oxford, 1849, communicated an account of his success in growing marine algae in artificial sea water. In 1841 Mr. Ward established the first Aquarium for fishes and plants



Figure 2-6. THREE PLATES FROM HUMPHREYS' 1857 BOOK, *Ocean and River Gardens*, showing the freshwater fishes typically kept in the aquaria of that time. LEFT: MINNOWS, PERCH, TENCH, ROACH AND PIKE. MIDDLE: STICKLEBACKS WITH CADDIS WORM, MARSH SNAIL AND WATER SCORPION. RIGHT: VARIETIES OF GOLDFISH ACCOMPANIED BY VALISNERIA SPIRALIS AND VARIOUS WATER SNAILS. In those days goldfish that had patches of silver were called "Gold and Silver Fish." Humphreys' book was excellent and rivaled those of Gosse in quality.

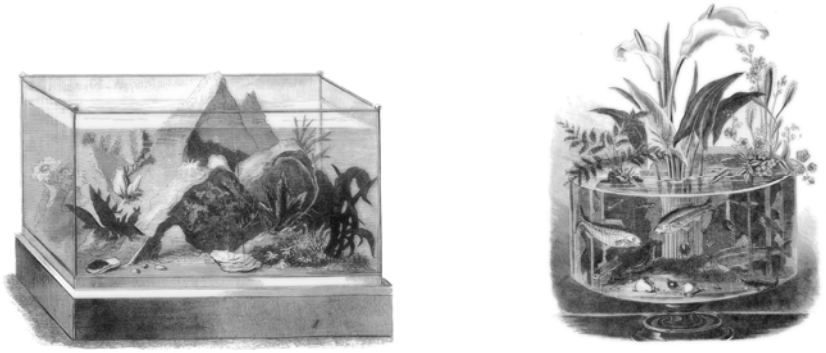


Figure 2-7. TWO AQUARIUMS ILLUSTRATED IN HUMPHREYS' 1857 BOOK, *Ocean and River Gardens*. LEFT: A saltwater tank. RIGHT: A CIRCULAR FRESHWATER AQUARIUM planted with *Arum*, sundew, forget-me-nots, etc. The object was to combine the aquarium with a terrarium.



FIGURE 2-8. COMMON MADREPORES, members of the family that produces coral and similar structures. Although allied to the anemones they are distinct from them. FROM LEFT TO RIGHT: CARYOPHYLLIA SMITHII, BALANOPHYLLA REGIA and a group of CARYOPHYLLIA SMITHII.

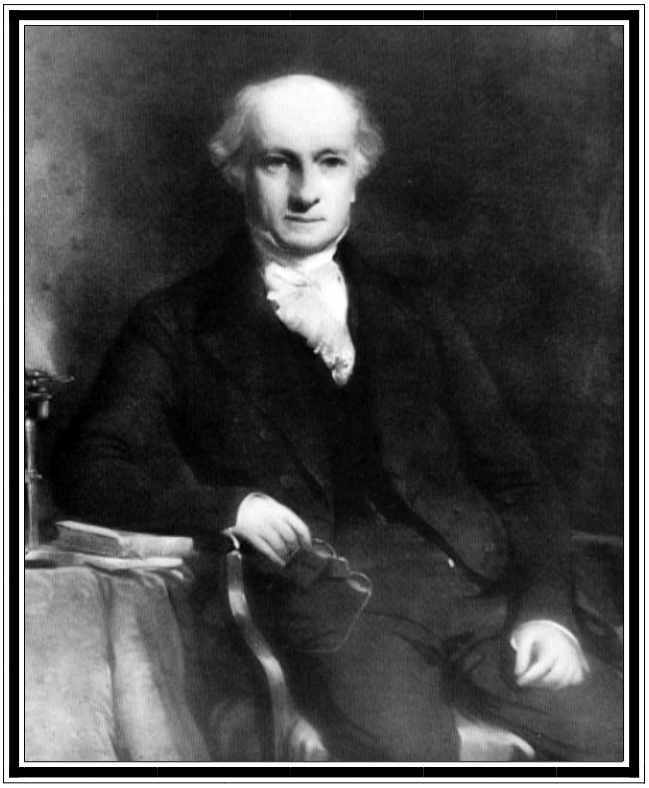


Figure 2-9. DR. GEORGE JOHNSTON, 1797-1855

in his fern-house in Wellclose Square, his object being not to determine the counterbalancing influence of plants and animal in water - that having been ascertained long before by Priestly - but to determine whether the limited quantity of air in the fern house would be sufficient for the well being of the fishes. Dr. Lancaster had sticklebacks in jars containing *Vallisneria* and *Callitriche* in 1849, and from that date there commenced a little stir upon the subject among the scientific public, about which date I made my own first experiments with a collection of marine objects, gathered on the shore at Sunderland, where Peter Allan's Cave and Rock gave a local and romantic interest to those splendid cliffs of magnesium limestone.

"Further experiments were made by Mr. Robert Warington (*Figure 2-10*), who reported upon them to the Chemical Society, in March, 1850. Two small gold fish were placed in a glass receiver of about twelve gallons capacity, covered with muslin to exclude the dust. The vessel was half filled with spring water, with a bottom of sand and mud, and some loose fragments of limestone and sandstone, so arranged as to form shelter and shade. A small specimen of *Vallisneria spiralis* was, at the same time, planted in the mud and kept in place by a stone. Everything went on well for a time, till it was found that the natural decay of the older leaves of the plant began to produce turbidity in the water, and a confervoid growth accumulated on the sides of the vessel, and on the surface of the water; to meet this emergency, Mr. Warington introduced a few pond snails, which greedily fed on the decaying vegetable matter and slimy mucus growth, so as quickly to restore the whole to a healthy state.

"Here was a complete circle of compensating processes. The plants grew and increased by offsets, and at the same time exhaled sufficient oxygen to preserve the health and beauty of the fishes. The snails ate up the mucus, and bred rapidly: their eggs and young supplied the fishes with food. Thus the three tenants of the globe maintained each other as in any well -ordered human community; and the water preserved its purity unchanged, and the compensating powers of animals and vegetables were established.

"The first marine vivarium established in London, was constructed by Mrs. Thynne, who made the experiment of bringing some living madrepores from Torquay to London, for the purpose of study and the entertainment of friends; this was in the autumn of 1846. A stone jar was filled with seawater; the madrepores were fixed on a large sponge by means of a needle and thread. They arrived in London safely, and were placed in two glass bowls, and the water changed every other day. But the six gallons of water brought by Mrs. Thynne was now exhausted, and must be used again. She then devised means to freshen it for second use. "I thought of having it aerated by pouring it backwards and forwards before an open window, for half or three-quarters of an hour between each time of using it. This was doubtless a fatiguing operation; but I had



Figure 2-10 ROBERT WARINGTON, 1807-1867.

a little handmaiden, who, besides being rather anxious to oblige me, thought it rather an amusement."

"Thus the madrepores were supplied with air by means of the agitation of the water, into which they were to be placed, and at the expiration of three months a fresh supply of sea water was obtained, and all went on well. This success led Mrs. Thynne to further experiments, her narrative of which is so instructive that it seems advisable to quote her own words. She says:

"'In the spring of 1847, I wished to try whether I could adjust the balance between animal and vegetable life, and sent for shells and small pieces of rock, to which living seaweed was attached. On these shells, etc., were sure to be many zoöphytes and other animals, so that I obtained a very various and curious collection of marine creatures. I had a quantity of microscopic corallines, which multiplied very fast; ferulae, that readily elongated their stony cases; some nerves, ophiurae and a great many beautiful little things for which I could find no name. On one piece of rock was the first germ of a living sponge. It was very fine, and grew to the size of a hazel nut, coming to maturity in about six weeks. In the course of the next winter, from want of motion in the water, it had become so covered with dust that I did not know whether it were alive or dead; but in the following June a bright spot appeared on one side, and it threw forth a sporule which attaches itself to the rock, and in about six weeks a full grown young sponge stood beside its parent. I placed this sponge in a darkened room, and found the spicula grew most on whichever side was turned to the light. From this time I regularly placed seaweed in my glass bowls; but as I was afraid that I might not keep the exact balance required, I still had the water refreshed by aeration. I do not know from which, or whether it was from both causes, that my little flock continued to thrive so much, but I seldom had a death."



Figure 2-11 JAMES SCOTT BOWERBANK, 1797-1877

"Mr. Warington and Mr. Gosse commenced experiments with seawater, almost simultaneously in the spring of 1852, and with such success as to establish the possibility of adjusting the balance of animal and vegetable life, so that the most delicate productions of the deep sea may be reared in small tanks, with scarcely any detriment to their health and vigor. Mr. Bowerbank (*Figure 2-11*), following in the steps of Mr. Ward, in the culture of freshwater plants and fishes, gave to Mr. Mitchell, Secretary of the Zoological Society, the hint which resulted in the establishment of the interesting vivaria at the Regent's Park Gardens, unquestionably the most curious and novel scene which those charming gardens contain. The botanist and zoologist have here presented to them, sufficiently close for microscopic examination, those productions of nature that hitherto have been most hidden, and hence least studied of all the tribes that come within their circles of research.

"New species have been distinguished, the forms of those already known are now displayed in all the freshness of life and health, the habits of the creatures in all their moods manifested even more plainly than we could expect to see them, were it possible to watch them in their native deeps; besides this we can watch the growth and reproduction of animals and plants which heretofore we have been wont to make acquaintance with as isolated, mutilated, shriveled, and dead specimens, happy if we could detect a few of their structural peculiarities after death had contracted, distorted, or destroyed the most delicate and most interesting. But in the Aquarium,

'…The minutest fish
Will pass the very hardest gazer's wish,
And show his little eyes' anatomy.' Keats.

"The Aquarium-house at the Regent's Park Zoological Gardens was first opened to public inspection in 1853, and at once attracted popular attention for the novelty and rare beauty of the exhibition. From that day we may fairly date the establishment of the aquarium as a popular adornment, either of a public exhibition or a private household. The knowledge of the principles involved in its construction and maintenance spread rapidly among students and *dilletanti;* exhibitions of a similar kind, though of less perfect character, were subsequently opened at various public institutions, and among others at the Crystal Palace; at the Surrey Gardens; the Royal Polytechnic Institutions; by the Zoological Society of Ireland, in Dublin; and by other public institutions at Edinburgh, Galway, and Scarborough; while on the continent, where studies of this kind are far less popular than here, several scientific societies kept pace with the times, and added Aquaria to the number of popular recreations and means of scientific study.

"The Aquarium involves so many matters of minute detail, that its present perfection is to be attributed, not to its popularity, but to the persevering ardour of the many scientific men who have given their close attention to it, and who, through patient investigation and repeated trials and disappointments, have achieved success, and through the medium of their several published experiences have secured for this choic-



Figure 2-12. WILLIAM THOMAS BRANDE 1788 - 1866. Brande was the first (1821) to describe the principle of the "Balanced Aquarium."



Figure 2-13. PHILIP HENRY GOSSE (1810-1888)

Gosse was one of the first popular natural history writers to include color illustrations in a book priced for the mass market. He made his own lithographs for his book, The Aquarium (1854) and supervised every stage in the color printing process. Unfortunately, his writings were characterized by pious interjections and, as a religious fundamentalist, became embroiled in disputes with noted naturalists of the time. He spent the remainder of his days rather obsessed with religious extremism and crime and murder stories.

(Courtesy Lloyd Library and Museum)

> est of indoor recreations, the appreciation of men of taste and scientific study everywhere. To the writing of Mr. Gosse, a naturalist who has traversed the globe, and who never wrote a line but what betrayed a Christian spirit united to a profound philosophical sagacity, we owe much of our extended knowledge of marine life, and of the rationale of Aquarium management; and to the student of the Aquarium I most heartily commend that gentleman's elegant and able works on the subject, and here cheerfully acknowledge that I am deeply indebted to them for information which I could scarcely have acquired by other means. Mr. Warington, an old disciple of this school; Mr. Bowerbank, Mr. Sowerby, Dr. Badham, and recently Dr. Lancaster, have severally thrown light upon the subject, and to these works of high character, I humbly add my own work on "Rustic Adornments for Homes of Taste," in which was offered to the public the first treatise on the management of the River Tank, just as Mr. Gosse's "Aquarium" was the first treatise on the Marine Tank."

To Warington, then, belongs the honor of reintroducing, to a much wider audience, the principle of the balanced aquarium. I say "reintroducing" since the honor for the first elucidation of the principle rightly should go to another Englishman, William Thomas Brande (Figure 2-12) who, in his 1819 *Manual of Chemistry* declared: "Fishes breathe the air which is dissolved in water; they therefore soon deprive it of its oxygen, the place of which is supplied by carbonic acid; this is in many instances decomposed by aquatic vegetables, which restore oxygen and absorb the carbon; hence the advantage of cultivating growing vegetables in artificial fish-ponds." Warington, a chemist himself, later said that it was Brande's statement that had incited him to set up his experimental tank with goldfish and *Vallisneria.* Brande was a man of many talents and, in addition to several books on chemistry, wrote about medicine, pharmacy and geology. He also edited a dictionary of science, literature, and art, and even wrote a book about a famous relative, John Stewart, nicknamed "Walking Stewart," a man who traveled extensively in the East Indies, Turkey, Germany and the United States in the early part of the 17th Century.

However, the history of books on aquarium keeping really starts in 1854 with the publication of Philip Henry Gosse's *The Aquarium: An Unveiling of the Wonders of the Deep.* This was the most successful of all his books and earned for him today's equivalent of about $40,000. In 1855 Gosse followed up his own success with *A Handbook to the Marine Aquarium*, also an extremely popular book, two thousand copies being sold in a matter of weeks.

Philip Henry Gosse (Figure 2-13) was educated at local schools but he especially valued the classical training he received from 1823 to 1824 at a nearby boarding school in Blandford. "From infancy my tastes were bookish," he recalled, and so when he left school at 15 his academic interests did not end. He developed

a delight for the study of natural history long before his formal education ceased and throughout his life he was an adherent of the natural theology tradition. He was influenced by his father's strong belief in evangelical Christianity and inherited from him a keen interest in painting and drawing. After quitting school Gosse held a number of odd jobs until 1827 when a clerkship was obtained for him in the counting house of Slade, Elson and Company in Carbonear, Newfoundland.

In November 1832 Gosse began systematically to collect the local insects and to enter scientific observations in journals. He was often seen in the field collecting insects, and people spoke of him as "that crazy Englishman who goes about collecting bugs." In June 1835 Gosse left Newfoundland. One of Gosse's close friends and his wife had heard some "very flaming accounts" about Canada and were intent on moving there. Gosse decided to join them and together they purchased 110 partially cleared acres just north of Compton, Canada. For the next three years Gosse worked his 60 acres of the land in the face of constant hardship. In the winter months Gosse taught school to supplement his income. In spite of an initial wave of optimism it soon became apparent that the experiment was a failure, and Gosse left the colony in March 1838 for the United States, landing in Mobile, Alabama, then on to King's Landing, south of Selma.

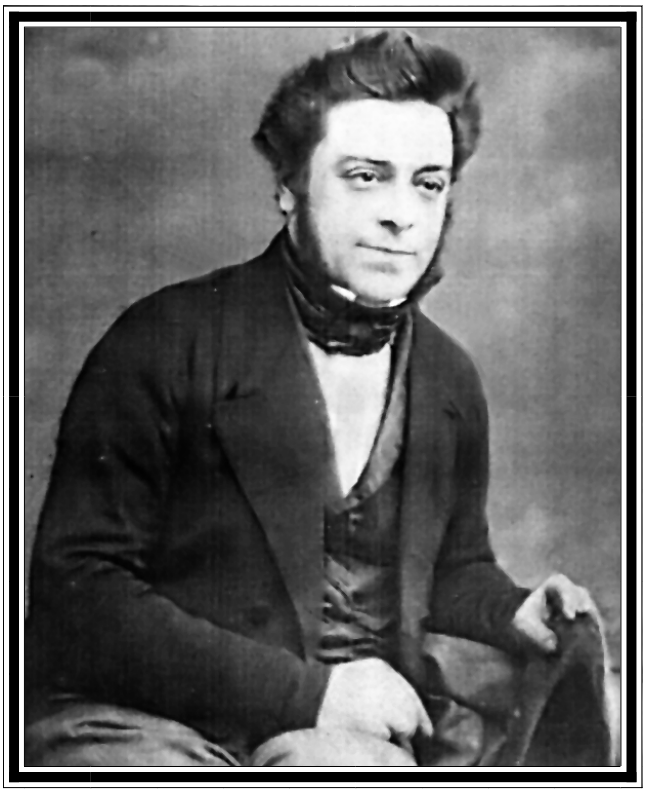


Figure 2-14. PHILIP HENRY GOSSE (1810-1888). This is the earliest known picture of Gosse, taken circa 1850.

There he worked as a teacher of the children of several elite families, living closely with these early settlers of Alabama and "document(ing) regional distinctiveness in its early stages of development." He detailed the food they enjoyed, their topics of conversation, their humor and social mores. In 1859 he published *Letters from Alabama (U.S.) chiefly relating to natural history*, a book still sold by the Alabama Tourist Association. While in Alabama, he compiled a manuscript that included 233 drawings and colored sketches of insects, birds and plants. Known as *Entomologia Alabamensis*, 48 of the drawings were of Alabama insects, all "accurate in size, color, and form." Never published, this manuscript eventually found its way to the British Museum.

Although the subject of both of the 1854 and 1855 aquarium Gosse books was the marine aquarium, it should be mentioned that the differences between the keeping of marine and freshwater aquaria in those days was not as great as they are today. The marine aquarium of the 1850's dealt with cold-water fishes and animals whose requirements were undemanding compared to those of today's tropical saltwater aquarium. Although Gosse, who was not a chemist, miscalculated his widely-used formula for artificial seawater, marine organisms thrived in his artificial mix because the major factor in artificial salts for the coldwater marine aquarium is total salinity and Gosse's flawed formulation was nonetheless effective.

The popularity of Gosse's books spurred holiday travel to Devonshire, fueled an aquarium craze that in turn created a network of related businesses, and made marine biology a "rational recreation" for middle-class visitors to the shore. In the first half of the nineteenth century seaside resorts had become associated with idleness and frivolous pleasure seeking. As the development of the railroads made the Devon resorts more accessible to middle-class visitors, the demand for

intelligent recreation in this culturally underdeveloped region increased. Indeed, Gosse's works must be seen within this social context of seaside life in particular, for it is this specific context in which his scientific and his religious views merge. Gosse's books were an effort to "testify," to provide those idle hands with something to do that was both intellectually and morally uplifting.

"Few, very few," wrote Gosse in *A Naturalist's Rambles* (1883), "are at all aware of the many stirring, beautiful, or wondrous objects that are to be found by searching on those shores that every season are crowded by idle pleasure-seekers. Yet such searching will lead us to God, for the careful study of the habits and anatomy of even the lowest forms of animal being brings us to say with the Psalmist, 'I will praise Thee; for all is fearfully and wonderfully made.'" And, as Gosse contended in *The Aquarium*, such careful study, whether in the field, in the aquarium, or through a microscope, "will not fail to reward us with increased knowledge of His works and ways." Also in *The Aquarium* Gosse argues that corals, as "a City, a commonwealth of myriad individuals" nonetheless sharing "a common life, a bond of identity," reflect that heavenly City that is both composed of "happy spirits in resurrection bodies" and collectively forms an individual being, "the Church of the living God, the Bride of Christ."

This then was the problem with Gosse's books; for every useful fact he supplied about the keeping of fishes in the aquarium, the reader was subjected to a great deal of religious preaching. It is no wonder then that the year 1856 ushered in a spate of new authors – specifically Shirley Hibberd, Edwin Ray Lankester, F. S. Leach and Francis S. Merton – where piety took a back seat to aquatic husbandry. Leach, for example, wrote a 46 page booklet titled *Plain instructions for the management of the Aquarium, or tank for gold, and other fish, water plants, etc.* The demand was so great that this was followed up in the same year by *Handbook of Plain Instructions for the Construction and Management of Fresh Water Aquaria*, an expansion to 72 pages of his work by James Bishop and A. H. Lloyd. Lankester, who spent eight years at the Natural History Museum, provided a more scholarly book, *The Aquavivarium, fresh and marine; being an account of the principles and objects involved in the domestic culture of water plants and animals.*

Although Philip Henry Gosse must be credited with the popularization of the aquarium - Stephen Jay Gould has described him as the "David Attenborough of his day, Britain's finest popular narrator of nature's fascination" - it must be remembered that it was not until Hibberd's *Rustic Adornments for Homes of Taste* was published in 1856 that much was written on the freshwater aquarium for popular consumption. The marine aquarium was a short-lived fad in Great Britain and was of little significance in America until after World War II, when improved artificial saltwater formulations and more advanced equipment became available.



Figure 2-15.
A FRENCH APRIL FOOL'S DAY PICTURE POSTCARD from the Edwardian era.

Nonetheless, Gosse was one of the best-selling writers of the day and his books were read with great eagerness. As a result, aquaria became parlor or library ornaments and the directors of the zoological gardens in both London and Dublin eagerly adopted the innovation as a source of new entertainment and instruction for their visitors.

Although it has been customary to equate the start of the aquarium hobby with the introduction of the so-called principle of the "balanced aquarium, it is neither indispensable nor even of any real importance in keeping aquarium fishes. From ancient times to the present day, thousands upon thousands of aquarists have kept fish successfully using no plants whatsoever. This is not to say that plants are of no benefit in the aquarium. They do absorb nutrients, such as nitrates, and Warington did get this part right when he stated that the material excreted by the fish is "a rich food to the plant and well fitted for its luxuriant growth." Nitrates, however, are not harmful to fishes, at least in the concentrations ordinarily found in the aquarium so this cannot be considered a substantive benefit in fishkeeping. In short, the so-called "balanced aquarium" principle is primarily a model of gas exchange that is of little significance in the uncrowded aquarium. (***Author's Note:*** **For a more complete discussion, see "Was the Balanced Aquarium Principle Responsible for the Success of the Victorians?" in the Addendum.)**



Figure 2-16. PORTRAIT OF ANNA THYNNE, 1806-1866.

Returning now to Anna Thynne (Figure 2-16), she was born Anna Constantia Beresford in 1806 in a small village in Northern Ireland where her father was the rector of a large parish. When her mother was expecting her fourth child, her Aunt proposed adopting Anna. It should be mentioned that the adoption of children within larger families was not an unusual occurrence in the late eighteenth and early nineteenth centuries. This was an offer not easily turned down since her Aunt was married to one of the wealthiest men in the south of England. The offer was accepted and, somewhere between the age of two and seven, Anna sailed with her Aunt to a new life in England.

At the age of sixteen Anna was already admired as one of the beauties of the royal court and a year later, married John Thynne who, although destined for the clergy, was also extremely wealthy. Anna had ten children by John but only seven - five boys and two girls - survived to adulthood. Being well off, the Thynne family was able to spend part of the year in the country at one of John Thynne's many estates. As collecting fossils and minerals was a popular pastime of the day, Anna obtained most of her supplies in the home of Mary Anning, one of the most famous fossil collectors of the day. Anning, for example, discovered the first nearly complete example of *Pleiosaurus* and the first British *Pterodactylus macronyx*, among others.

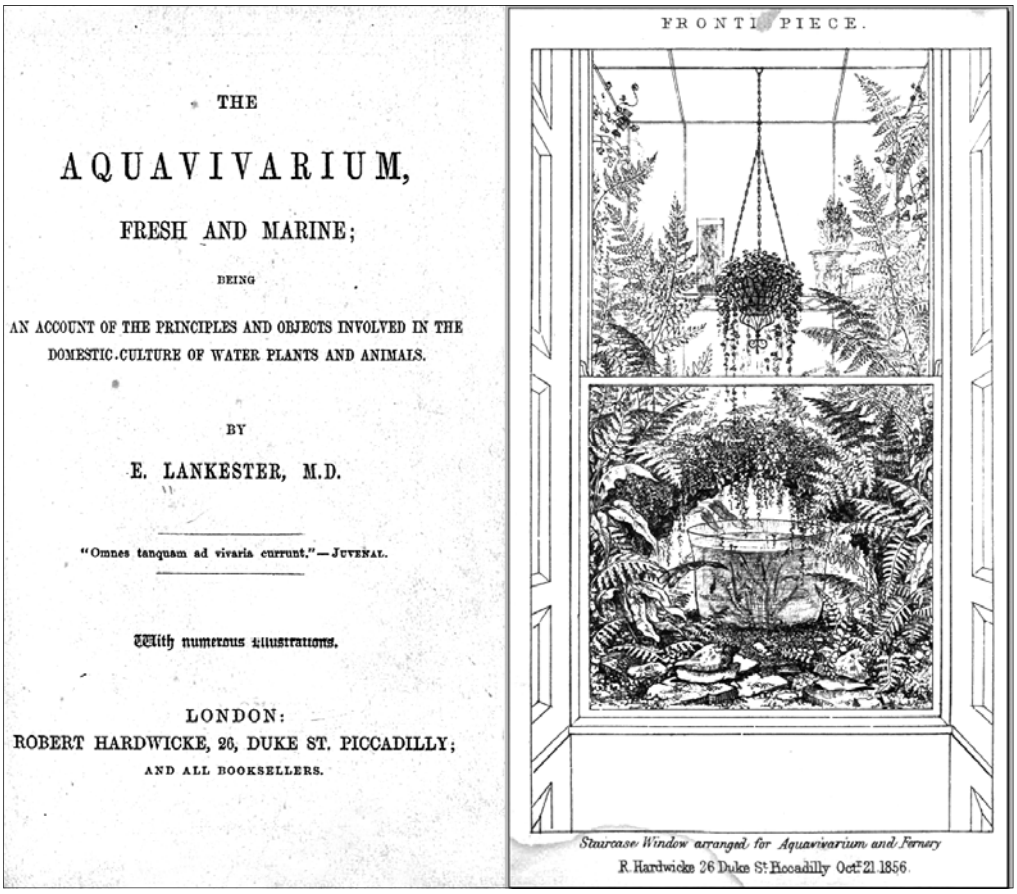
Anna arranged her fossil collection in expensive glass cabinets in her house in Westminster Abbey where her husband was sub-Dean and began to attend meetings of the British Association for the Advancement of Science (the only scientific forum then open to women). The new Dean of the Abby, William Buckland, as well as his wife, Mary, were avid naturalists and soon eminent zoologists regularly visited the Deanery. In 1846 Anna traveled to Torquay where she found madrepores in the rock-pools

at the beach. The madrepores survived the journey from Torquay to London and for the next several years she experimented in breeding them, being the first one to do so and to describe the process. By the spring of 1849 Anna was receiving visitors from all over England who flocked to see her glass tanks arranged on carved mahogany sideboards in her living room.

Over the years, one of the friends she made was Philip Henry Gosse. In 1856, having finished with her madrepore observations, Thynne sent Gosse the key extracts from her zoological journals having decided to let him make use of her experiments for his own research. Gosse immediately rejected the idea of assimilating Anna's work into his new book on sea anemones, judging that "the following Notes, so uninterrupted, so fortunate in their results, and so intelligently watched" were of such "scientific value... that they ought to be published in extensio." He thereupon wrote a short introduction and posted it and her observations, entitled "On the Increase of Madrepores," to the editors of the ANNALS AND MAGAZINE OF NATURAL HISTORY. The article was published in the magazine in June 1859, the same year that Darwin published *On the Origin of Species*. Anna Constancia Thynne died in 1866, at the age of sixty.

(*Author's Note:* Hibberd's spelling of "Johnstone" is in error. Dr. George Johnston was one of the leading naturalists of 19th Century Britain. From his medical practice in Woolmarket, Berwick he traveled throughout the Borough treating patients, but also studying the local botany. His Flora of Berwick upon Tweed (1829-31) was the beginning of a distinguished scientific career. Developing an interest in marine biology he became Britain's leading expert on sponges and was commissioned to catalogue the British Museum's collection of worms. Another misspelling is "Lancaster." The Bowerbank to whom Hibberd refers is James Scott Bowerbank, a wealthy distiller and noted microscopist. Bowerbank wrote many monographs on natural history, including one on British sponges. Charles David Badham (1805-1857) was a medical doctor (Member of the Royal College of Physicians) who, like many medical men of the time, was interested in nature. In 1847 he wrote an important work on fungi, A Treatise on the Esculent Funguses of England.

Regarding Bowerbank, Hibberd's crediting Thynne for the first marine aquarium, and the "Wardian case," see the next chapter. As to the meaning of the term, "madrepore," it is related to the sea anemones and, specifically, is any of the various stony corals of the order Madreporaria.)



THE

AQUAVIVARIUM,

FRESH AND MARINE;

BEING

AN ACCOUNT OF THE PRINCIPLES AND OBJECTS INVOLVED IN THE DOMESTIC CULTURE OF WATER PLANTS AND ANIMALS.

BY

E. LANKESTER, M.D.

"Omnes tanquam ad vivaria currunt."—JUVENAL.

With numerous Illustrations.

LONDON:
ROBERT HARDWICKE, 26, DUKE ST. PICCADILLY;
AND ALL BOOKSELLERS.

FRONTISPIECE.

Staircase Window arranged for Aquavivarium and Fernery

R. Hardwicke 26 Duke St. Piccadilly Oct.r 21. 1856.

Figure 2-17. LANKESTER'S *The Aquavivarium, Fresh and Marine*, 1856.

CHAPTER 3:
THE EARLY AQUARIUM - PRIVATE & PUBLIC

For years people had been trying to uncover the secret of keeping animals alive in jars of water, whether fresh or salt. Some conjectured that the reason why such creatures always perished in the end was that the water was allowed to become too stagnant and motionless. Others supposed that keeping the water fresh was the one essential requirement. The traditional but extremely tedious method was to change the whole contents of the jar daily, and this was the normal practice in keeping goldfish throughout the first half of the 1800's. However, it was hardly realistic for the marine aquarium since there was the problem of obtaining saltwater. As previously mentioned, Sir John Dalyell managed to keep a sea anemone alive for twenty-eight years and numerous other marine animals for lesser periods, but only because he was wealthy enough to be able to arrange for a fresh supply of saltwater to be brought round to his house every morning. This was an expensive proposition until about 1850 when the development of the railroad system facilitated access to the coasts.



Figure 3-1. FERNS GROWING IN A WARDIAN CASE. Fern growing was one of the passions of the mid-Victorian period in England and even acquired a title - PTERIDOMANIA (from the Latin pteridos = fern).

Over time, various people made the observation that the animals survived and the water remained much cleaner if some plant life was added as well. Unfortunately, they kept this information to themselves. The real honor as the discoverer of any principle is reserved for the person who not only first fully appreciated its importance but also took the trouble to give the world the benefit of his or her knowledge. It is much like the awarding of a patent. To get your patent you must first disclose all its particulars. In a similar manner, to get credit for being "first," you must tell others.

In the autumn of 1829, an English surgeon and amateur entomologist named Nathaniel Bagshaw Ward (Figure 3-4) found a moth chrysalis and decided to try to hatch it at home. The following is his recounting of the experience:

> "I had buried the chrysalis of a sphinx (moth) in some moist mould contained in a wide-mouthed glass bottle, covered with a lid. In watching the bottle from day to day, I observed that the moisture which, during the heat of the day arose from the mould, condensed on the surface of the glass, and returned whence it came; thus keeping the earth always in some degree of humidity. About a week prior to the final change of the insect, a seedling fern and a grass made their appearance on the surface of the mould.
>
> "I could not but be struck with the circumstance of one of that very tribe of plants which I had for years fruitlessly attempted to cultivate, coming up of its own accord in such a situation, and

asked myself seriously what were the conditions necessary for its well-being? To this the reply was -- a moist atmosphere free from soot or other extraneous particles; light; heat; moisture; periods of rest; and change of air. All these my plant had; the circulation of air being obtained by the diffusion law already described.

"Thus, then, all the conditions requisite for the growth of my fern were apparently fulfilled, and it remained only to test the fact by experiment. I placed the bottle outside the window of my study, a room with a northern aspect, and to my great delight the plants continued to thrive. They turned out to be *L. Filix mas* and the *Poa annua*. They required no attention of any kind, and there they remained for nearly four years, the grass once flowering, and the fern producing three or four fronds annually. At the end of this time they accidentally perished, during my absence from home, in consequence of the rusting of the lid, and the consequent too free admission of rain water."



Figure 3-2. THIS IS A WARDIAN CASE USED TO TRANSPORT PLANTS ON BOARD SHIP. It is made of sturdy hard wood and tightly glazed. The glass is protected by an iron grid work on both sides, the other side is a mirror image of the side shown. Being rather heavy, it was provided with robust handles on either end.

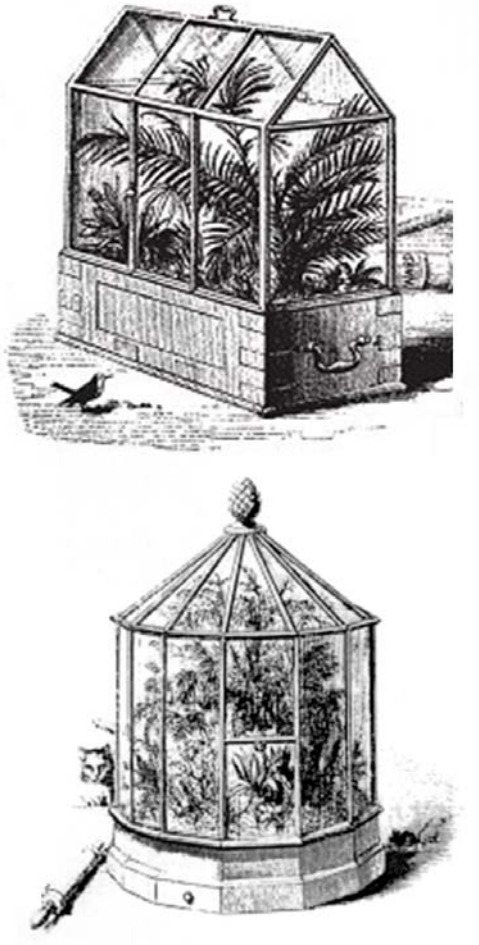


Figure 3-3. ABOVE, TWO EARLY WARDIAN CASES (the lower one was pictured in Ward's book

Ward had, in actuality, accidentally discovered the principle that plants enclosed in an almost airtight glass case could be sustained with little intervention on the part of a human. The glass enclosure consequently became known as a "Wardian case."

The mould referred to was leaf mold, partially decomposed leaves that are often used in gardening. Ward's *Poa annua* (annual bluegrass) is a common, introduced lawn weed in the United States, and his fern is the male fern, now called *Drypoteris filix-mas*. Ward mistakenly referred to the young fern as a seedling. However ferns grow from spores, not seeds.



Figure 3-4. NATHANIEL BAGSHAW WARD: 1791-1868, Inventor of the "Wardian case," the forerunner of the aquarium.

After his initial observations Ward quickly began other experiments and soon constructed larger glass plant cases that filled his house and yard and were even placed on his roof. His largest, named the "Tintern Abbey case" because it contained a model of the West window of Tintern Abbey, was almost eight feet square and overgrown with 50 species of plants. He continually expanded the number of species successfully cultivated.

There has been some controversy in the literature over who was the first recorded to establish a home aquarium. By "aquarium" here is meant the Warrington Case, based upon the "balanced aquarium" principle as described by Warington and Gosse and not just a jar of water containing fish. Lynn Barber, for example, in the first chapter of *The Heyday of Natural History* (1980) mistakenly states: "…the aquarium was not invented until 1850…" and, further adding to the error, "We see him (Gosse) at his happiest on the seashore… gathering up a few select specimens to add to his marvelous new invention - the aquarium."

Gosse himself, in the second edition (1856) of his *The Aquarium: an Unveiling of the Wonders of the Deep Sea,* has this to say on the matter:

> "Since the publication of the first edition of this Work, other competitors for the honour of having first invented the Aquarium have appeared. In a lecture delivered before the Royal Institution, by Dr. Stephen H. Ward, the following statements occur **(Author's Note: The S. H. Ward mentioned is Nathaniel Ward's son.)**:
>
> "Mr. Ward, in 1841, established, in a capacious earthenware vessel, an Aquarium for fish and plants. In this vessel, which contained twenty gallons of water, and which he surrounded with rock-work raised several feet above its margin, he placed gold and silver fish, in company with several aquatic plants, viz., *Vallisneria spiralis*, *Pontederia crassipes*, *Pistia stratiotes*, and *Papyrus elegans*. In this miniature lake, the water of which was never changed, but kept in a constantly pure state by the action of the associated plants, the animals lived in a healthy condition for many years. The individual to whom is due the merit of having introduced marine vivaria into London is Mrs. Thynne. Having procured some living madrepores when at Torquay; in the autumn of 1846, she placed them in some



Figure 3-5. The Tintern Abbey Wardian Case.

sea-water in a bottle covered with a bladder, and brought them safely to town. They were then transferred to two glass bowls, the sea-water being kept aerated by being daily poured backwards and forwards, and being, moreover, periodically renewed by a fresh supply from the coast. In the spring of 1847, Mrs. Thynne sent for some pieces of rock, shell, etc., to which living sea-weeds were attached, and subsequently depended upon the action of these for the purification of the water.'

'Mrs. Thynne has kindly favoured me with a perusal of her observations, which not only prove her to have succeeded in maintaining a self-supporting Aquarium, but are of the highest interest in a physiological view."

Stott (2003) states,

"By the spring of 1849, Anna Thynne had established the first balanced marine aquarium in London." However, this "balance" was not a balance at all since, in later experiments, Thynne never abandoned her practice (or her housemaid's effort) of aeration by hand, and thus never built a truly self-sustaining aquarium: "I regularly placed seaweed in my glass bowls; but as I was afraid that I might not keep the exact balance required, I still had the water refreshed by aeration. I do not know from which, or whether it was from both causes, that my little flock continued to thrive so much, but I seldom had a death."

In an article published in 1854 in the PROCEEDINGS OF THE ROYAL INSTITUTION, Ward's son further made the case for his father's development of a fresh water aquarium in 1841, and Mrs. Anna Thynne's for a salt-water aquarium in 1846. Although the record is clear regarding Ward's priority, the case for Mrs. Thynne is not as persuasive since George Johnston had established a marine aquarium as early as 1842. To be strictly accurate, however, Ward actually was the rediscoverer of the principle with which his name has become inseparably associated since, quite unknown to him, a Scottish botanist named A. A. Maconochie had followed a similar line of reasoning. About 1825, inspired on the one hand according to his account by some experiments in 1780 of the Swiss scientist, Nicolas-Théodore de Saussure, that showed that plants improve the atmosphere by absorbing carbon dioxide, and on the other by the discovery by Baron von Humboldt, the great German explorer, of seaweeds at an immense depth in the ocean, growing in almost complete darkness and yet preserving their natural color, Maconochie decided that plants accustomed in their natural habitats to fairly dense shade might well thrive in a confined atmosphere and "in a light more or less decomposed by the refraction of two surfaces of window glass."

He proceeded to experiment with several exotic ferns and club-mosses, obtained from the Glasgow Botanic

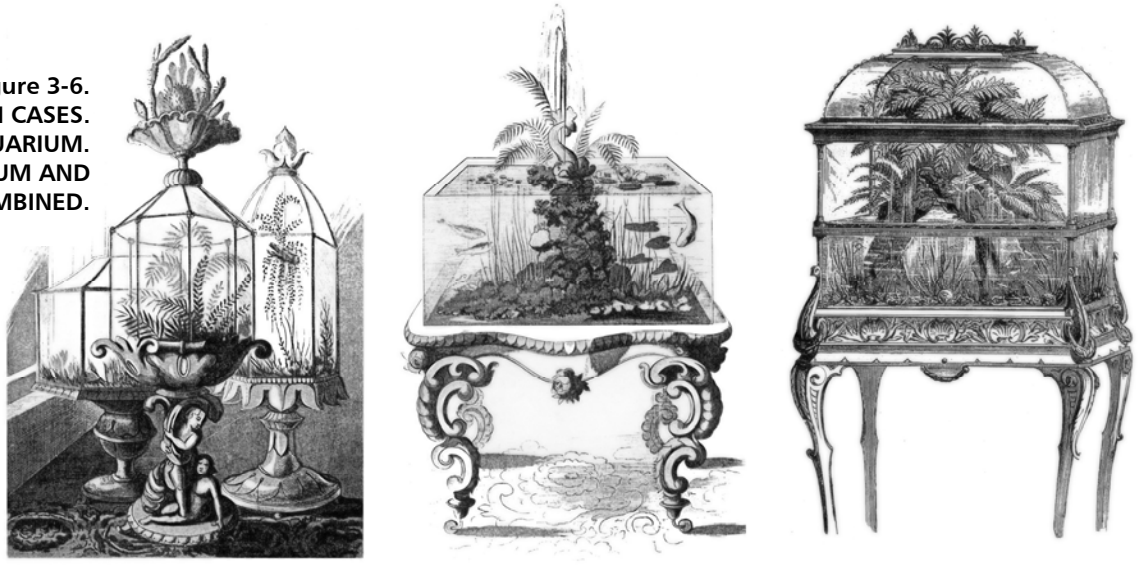


Figure 3-6. LEFT: WARDIAN CASES. MIDDLE: AQUARIUM. RIGHT: AQUARIUM AND FERNERY COMBINED.

Garden, which were planted in peaty soil inside a large glass vessel previously used for goldfish. This was so successful that he had a glazed case or "miniature greenhouse" made to his requirements by a country carpenter, and in this he grew in his window for many years not only ferns but also orchids and cacti. In general, scientific credit is determined by priority of publication. The publish-or-perish principle is operative. Although his friends were familiar with it, he never troubled to make his discovery public until 1839, by which time Ward's cases had become known in Scotland. Ward had published his first article in 1834 in GARDENER'S MAGAZINE, "On growing ferns and other plants in glass cases, in the midst of the smoke of London; and on transplanting plants from one country to another by similar means." With praiseworthy generosity, unusual in such matters, he conceded to Ward all the credit for concept.

The first publication of his work occurred in 1834, when John Loudon, leading horticulturist and publisher of the popular GARDENER'S MAGAZINE, visited Ward's house. Loudon wrote enthusiastically of the house filled with fern cases and persuaded Ward to contribute an article.

In December 1834, the influential Society of Arts requested further details on Ward's work resulting in another article, but not until 1836, when a letter from Ward describing his cases was also published in the COMPANION TO THE BOTANICAL MAGAZINE. This letter finally alerted the scientific community to Ward's invention, because also in 1836, the British Association for the Advancement of Science gave a grant for studying Wardian cases to a committee headed by James Yates.

In 1837 Ward reported on his studies to the British Association for the Advancement of Science in a brief pamphlet describing his methods, "The growth of Plants without open exposure to the Air." Michael Faraday, the famous physical scientist and President of the Royal Society, gave a lecture on Wardian cases before the Royal Institution in April of 1838. Ward followed it with his 1842 book titled, *On the Growth of Plants in Closely Glazed Cases*. At the Great Exhibition at the Crystal Palace in 1851, Ward actually displayed a bottle containing a fern and mosses that had not been watered for 18 years. The resulting version of his case, specially designed for housing animals, came to be known as a "vivarium," while its counterpart for water creatures was termed an "aquavivarium," soon abbreviated to the simpler "aquarium." Both terms had actually long been in use already, but only for collections of plants or fish in a much generalized sense.

The abolition of the glass tax in 1845 in England led to an unprecedented reduction in the price of this commodity. After the Napoleonic Wars, glass had been subjected to a heavy excise tax, along with the practice of law, newspaper advertisements, glass, candles, beer, malt, carriages, menservants, coats of arms, newspapers, paper, bricks, stone, coal, windows, corn, horses, dogs, salt, sugar, raisins, tea, coffee, tobacco, playing cards, timber and, of course, land and income. The abolition of the tax was partially due to the agitation of Ward and several others. By the middle of the 1850's no fashionable Victorian drawing room was

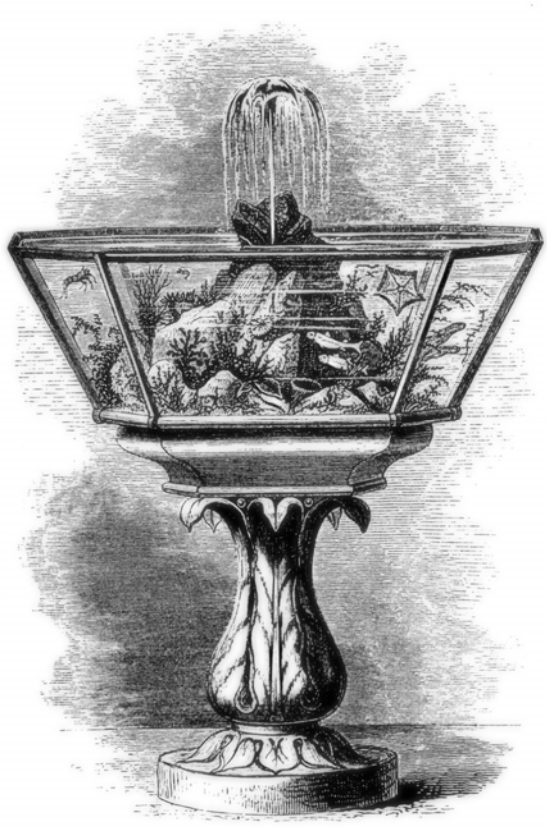


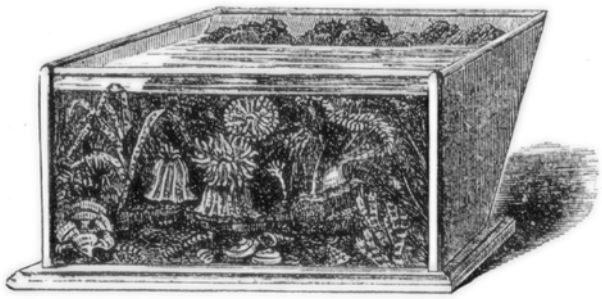
Figure 3-8. THIS WAS ANOTHER SORT OF AQUARIUM THAT DID NOT MEET WITH GOSSE'S APPROVAL. Three sides of the tank were made of slate, thus decreasing the illumination of its contents.

considered complete without its Wardian case full of "vegetable jewellery" prominently displayed (*The Fern Garden*, Hibberd, 1869). It was a fad that was diminished only with the arrival of the home aquarium, the latter facilitated by the fact that the aquarium itself was merely an adaptation of the Wardian case. Our present day aquaria, then, owe their existence to the English Victorian drawing room fashion of collecting and maintaining ferns in these glass cases.

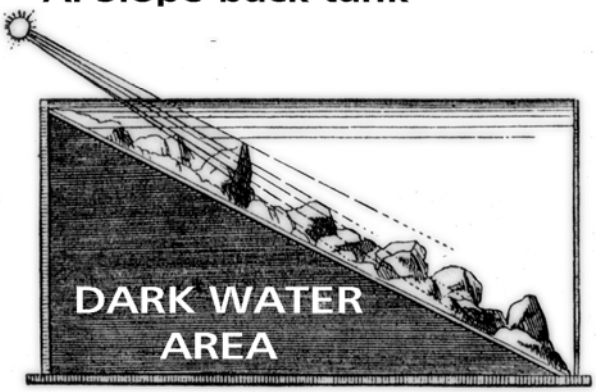
One of the early designs for the marine aquarium was the slope-back and its variation, the dark water chamber slope-back tank (Figure 3-7). Quite early in the course of his experiments, Warington devised the form of tank which he named the "slope-back tank," from its resembling a box with its back receding upwards and backwards ; this slope being placed towards a window, the light entered the tank from above, as in nature, and without undue shadow, and the creatures had also choice of various depths of water upon the shelving bank. This design was afterwards much improved upon by Mr. Edward Edwards who converted the triangular space below the slope into a receptacle for water in a state of darkness. It contained no animals, but was in contact with the water in the part of the tank where the animals lived. Termed the "dark water chamber slope-back tank," it is perhaps the best existing form of tank without a current of water. It had two advantages: (1) It doubled the amount of water in the tank, diluting contaminants and increasing the oxygen supply, and (2) The dark area decreased algal growth since, without a strong source of light, the algae dies. Lloyd was an avid proponent of the dark water chambered slope-back tank.

Edward Edwards (1803–1879) was a marine zoologist, born in Wales. He started in life as a draper, which business he carried on until 1839, when he retired from it. In the following year he established a foundry and ironworks, which he appears to have carried on for several years with much success.

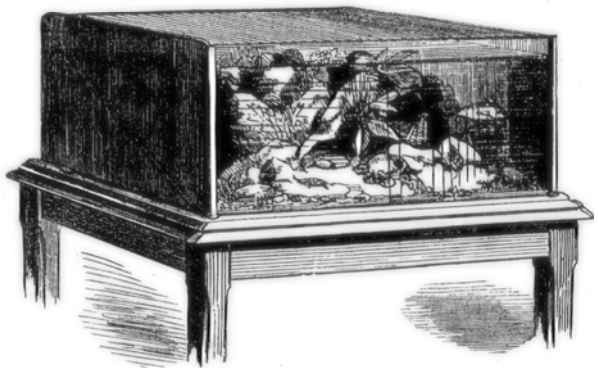
In 1864, being interested in observing the forms of marine life in the beautiful waters of the Menai Straits, a narrow stretch of shallow tidal water that separates the island of Anglesey from the mainland of Wales, he began to study the habits and characters of the fish in their native element. He was induced to



A. Slope-back tank



B. Side view of a dark water chamber slope-back tank



C. Front view of dark water chamber slope-back tank

Figure 3-7. INVENTED BY WARINGTON, THE PURPOSE OF THE SLOPE WAS, AMONG OTHER THINGS, TO IMITATE THE SLOPE OF A ROCK POOL.

The triangular space under the chamber slope-back tank (invented by Mr. Edward Edwards, a marine Biologist, 1803-1879) communicated with the space in front. Animals, however, were barred From entry to the chamber.

The main purpose of the chamber was to allow the water to rejuvenate by reducing the light that caused algal growth, increasing the volume of water to make more oxygen available to the animals, and providing a larger buffer against changes in the chemistry of the water.



Figure 3-9. VICTORIAN LADIES COLLECTING SPECIMENS AT THE SEASHORE.
From ILLUSTRATED LONDON NEWS, August 1859.

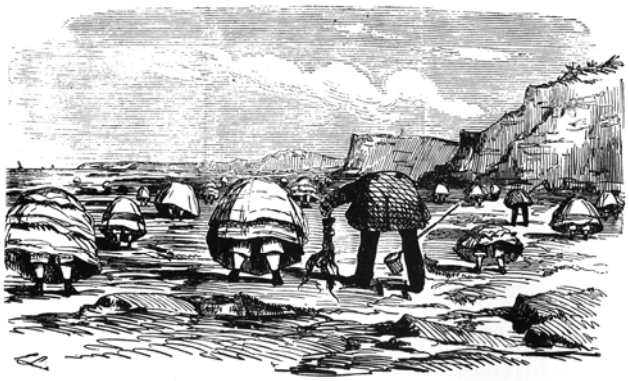


Figure 3-10. THE COLLECTION RAGE, HOWEVER, CAME IN FOR A GREAT DEAL OF RIDICULE. "Common Objects at the Seaside." From PUNCH, 1857.

attempt an artificial arrangement for preserving the fish in health in confinement, so as to be enabled to study their habits more closely. By an imitation of the natural conditions under which the fishes flourished, he succeeded in introducing such improvements in the construction of aquaria as enabled him to preserve the fish for an almost unlimited period without change of water.

Although the slope-back tank was invented by Robert Warington, Edwards developed the design in his 1858 patent for a "dark water chamber slope-back tank," the result of a close study of the rock pools, with their fissures and chasms, in the rocks on the shores of the Menai Straits. This improvement retarded for a long time the falling off in the taste for domestic aquaria, and the principle of Edwards's tank was most successfully adopted in all the large establishments of Great Britain, and in many of the continental and American zoological schools.

Hibberd (1856) provides the following description and rationale for the slope-back tank concept:

> "The back and ends are of an opaque material, and light is admitted from above only, so that the tank is in itself the closest possible imitation of a rock-pool, with the advantage of affording an uninterrupted, view of the contents. The form in which these tanks were originally made has been improved upon, as shown in the annexed cut. After the shallow square tanks and the glass pans, these are certainly the next best in efficiency; and, so far from being inelegant, nothing can surpass or even equal the beauty of the scene they present when well stocked, the subdued light being in favour of the view rather than against it. Were it otherwise, the health of the inmates would be a sufficient compensation, for in a matter of this sort it would be absurd to advocate any form of vessel, however elegant, which did not fulfill the conditions essential to the preservation of the creatures. Let us consider for a moment what are the advantages of this form.
>
> "Owing to the slope of the back it can be fitted and unfitted more quickly than any other kind of vessel, except the little shallow ones already described. In fitting rockwork, not a particle of cement is needed; hence, instead of losing the whole stock two or three times over, as is the case sometimes when cement has been used, and has been supposed to be properly seasoned, the risk from that danger is reduced to nil. Any rough non-metallic mineral may be piled upon the slope in a few minutes, tufts of Algae inserted if desirable, and removed again when they decay, without the smallest disturbance of the general furniture. Better still, the most beautiful and appropriate background may be made up of old serpula, oyster, and other shells; blocks of coral, and such, light rough debris as will be sure to accumulate in the hands of an aquarian.
>
> "Oyster shells, incrusted with serpulae, balanae, and other small marine masons, add nothing to the weight of the vessel, yet serve all the purpose of heavy rockwork; and if the spontaneous

vegetation so necessary to the success of the tank does not appear on them with sufficient profusion, a few pieces of mica-schist may be mixed with them and left alone, and there will soon be plenty.

"Another advantage of these tanks is their strength. When properly made, they will last a lifetime without becoming leaky, which cannot be said of any vessel having four sides of glass. Perhaps four-fifths of the glass tanks made and sold at the first start of the aquarium are now in lumber-rooms inhabited by spiders, and the majority of their owners have given up aquarium pursuits, under an impression that the construction of water-tight tanks is an impossibility; whereas the Warrington tank, having three sides of slate, can be made sufficiently strong to endure a lifetime. The amateur who constructs his own vessel must be on his guard against the folly of attempting to make it light; the heavier the better, consistent with neatness and soundness of the joints.

"A still more important advantage of the slope-back tank is the equable temperature of the water within it. Even if the sun's rays be allowed to play on the back of the vessel -which they should not - there is so large a bulk of slate for them to heat before the water can be affected, that there are no sudden changes of temperature to destroy the lives of the inmates. Vessels of this sort are therefore essentially cool, and during the trying months of July and August marine animals will endure the heat with patience, when, in any vessel having glass sides, they would perish rapidly.

"The improvements since effected have rendered this form of vessel still more acceptable than it was originally. On the principle that the larger the bulk of water the greater the variety of creatures that may be preserved in it, a form was adopted by which the triangular space under the sloping back is converted into a water chamber, communicating with the space in front: Into this chamber none of the animals can find access…"

However, Gosse was a severe critic of the slope-back design:

"I have also another tank with a sloping back, made on Mr. Warington's plan. It is of zinc, with the back and two sides of slate, the front and two front-sides alone being of glass. Its form is six-sided, the front resembling a bow window; it is three feet long by one foot ten inches in greatest width, and the same in depth; the peculiarity is that the back slopes inward, so

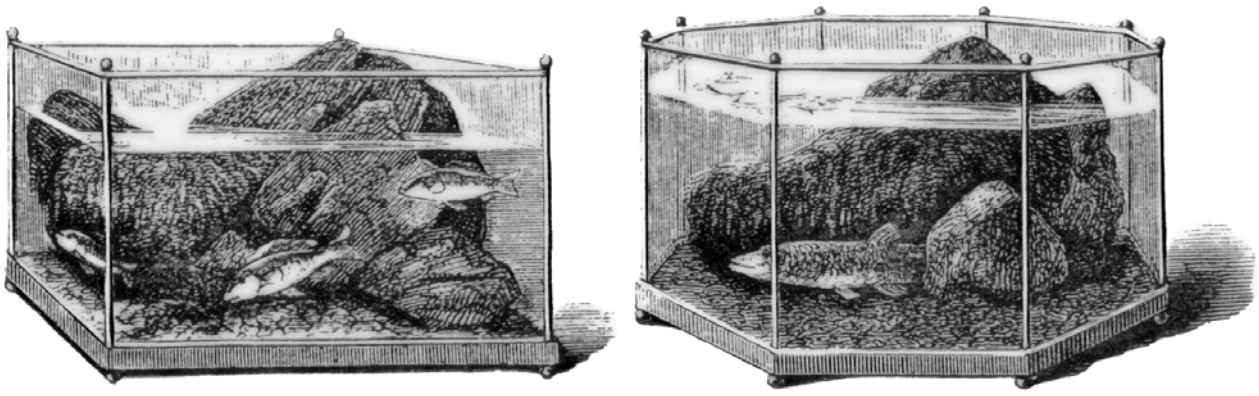


Figure 3-11. THESE ARE TWO EXAMPLES OF THE KIND OF AQUARIA, APPROVED BY GOSSE, THAT WERE MADE FOR THE LONDON ZOO IN 1853. LEFT: RECTANGULAR TANK. RIGHT: OCTAGONAL TANK. Aquarists might wonder at the rather shallow depths of early aquaria. Shallow tanks provide a greater air surface to water volume ratio and therefore increase the oxygen content, an important consideration in the days when aeration in the home was not an option.

that the bottom is but eight inches wide. I cannot commend this form; its appearance is lumbering and inelegant; the opacity of the back and sides throws the interior into a degree of darkness, (even though placed in a south window), which greatly impedes observation; and I cannot see, by comparison with my others, which are of glass all round, that the advantage anticipated, of admitting the light only from above, is real, or at least of sufficient importance to compensate the uninviting gloominess alluded to. Its depth also is too great; a foot of water is as much as is needful for a parlour Aquarium."

He was, on the other hand, much impressed with those made by the firm that constructed the tanks for the London Zoo in 1853:

"The tanks at the Zoological Society's Gardens are constructed by Messrs. Sanders and Woolcott, of Guilford Street. They make Aquaria from eight feet in length to sixteen inches, and either with all the sides of glass, or with slate ends. The bottom is of slate, and the framework of iron. Their tanks are excellently made, and their prices reasonable."

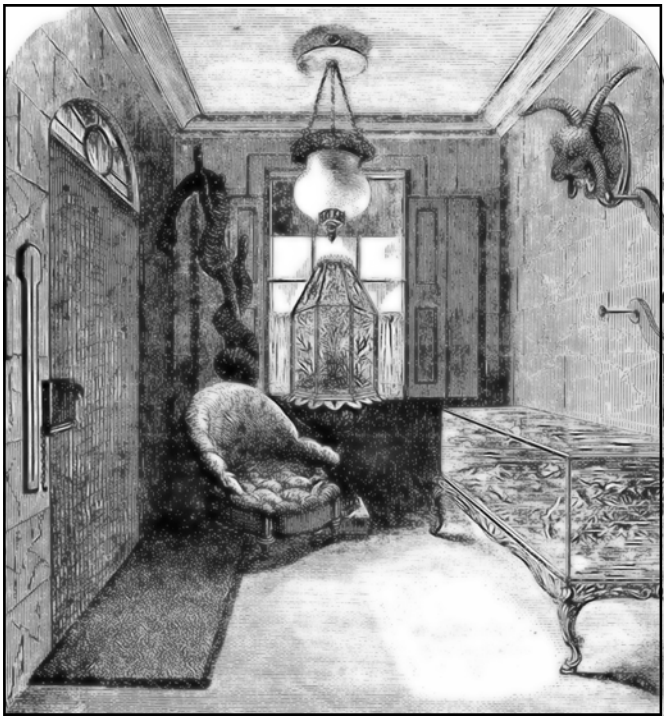


Figure 3-12.
ONE OF THE ILLUSTRATIONS FROM HIBBERD'S RUSTIC ADORNMENTS for HOMES of TASTE, 1856. The objective of this book was quite different from the books of the day. As Hibberd tells us in his preface: "Its purport is to enlarge the circle of domestic pleasures and home pursuits; to quicken observation of natural phenomena, so that the meanest of familiar things shall become eloquent in praise of beneficence and beauty; to strengthen family ties and affections by multiplying the sources of mutual sympathy; and to cheer the loneliest with amusements that tend to cheerfulness, and afford solace and society, where, but for such reliefs, life might become unbearably monotonous and wearisome."

By 1858, however, Gosse was persuaded by William Alford Lloyd to change his mind with regard to the dark-chambered slope-back tank.

Gosse was already well known for his immensely successful book, *The Ocean*, published in 1843. Ten years later he repeated his success with his *Naturalist's Rambles on the Devonshire Coast* in which he described the marine aquarium and forecast that it would soon be in mass production for the parlour. In it he reported that a "...marine aquarium for the parlour or conservatory..." was already in the manufacturer's hands, presumably Messrs. Sanders and Woolcott, and "...though there are some minor difficulties attendant on the mechanical part of the execution, they are not such as to throw any material doubt on my confident expectation, that in a short time an elegant vase stocked with algae and sea-anemones, and comprising within itself the elements of its constant self-purification, will be before the world."

Within a year of the book's publication, the aquarium was popping up in every drawing room in England and aquarium suppliers were setting up shop in every large town. By 1857 Sowerby reported that, vases for Aquaria; and another, to collect and supply plants and animals for stocking them." The Reverend Kingsley noted in his 1855 book, *Glaucus; or The Wonders of the Shore* (a rather tiny book; the title *Glaucus* was chosen from a character in Greek mythology and it means the "color of the sea"):

"One more hint before we part. If, after all, you are not going down to the sea-side this year, and have no opportunities of testing 'the won-

ders of the shore,' you may still study Natural History in your own drawing-room, by looking a little into 'the wonders of the pond.' I am not jesting; a fresh-water aquarium, though by no means as beautiful as a salt-water one, is even more easily established. A glass jar, floored with two or three inches of pond-mud (which should be covered with fine gravel to prevent the mud washing up); a specimen of each of two water-plants which you may buy now at any good shop in Covent Garden…"

Interestingly enough, the craze for the aquarium was almost entirely sustained by women as they expanded their interest in natural history, previously confined to botany, to include almost every other branch of science. A similar fervor was evinced among American women when the aquarium was popularized in the 1850's in America.

One of the most enthusiastic female marine aquarists was the dauntless Margaret Gatty, a Yorkshire parson's wife. In 1848, shortly after the birth of her seventh child, she suffered a serious breakdown in health and her physician, casting around for something to hold an invalid's attention, introduced her to the subject that was to become her overriding passion. Two years later an entry in her diary reads: "Set off for Filey, Alfred, self, seven children, two nurses and the cook. Arrived safely. D. G. Went down to the sands and found sea-weeds."

Subsequently she visited the great Dr. George Johnston at Berwick and accompanied him on several of his expeditions. Johnston, no less gallantly, named a new marine worm in her honor: *Gattia spectabilis*. In 1863 she published the book, *British Seaweeds*, including a special section of handy hints on dress for fellow members of her sex:

"Any one really intending to work in the matter, must lay aside for a time all thought of conventional appearances," she opened ominously. For the feet, she advised a pair of boy's shooting-boots, rendered waterproof with a thin coat of neat's-foot oil. Petticoats should never reach

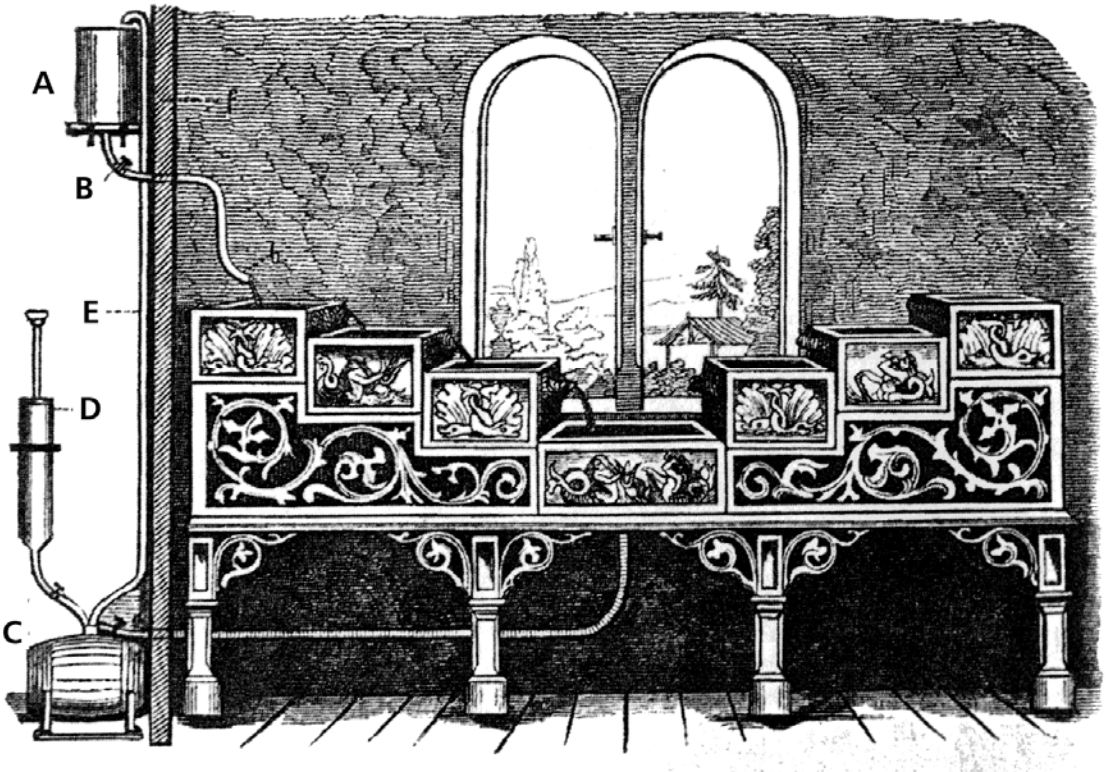


Figure 3-13. THIS FOUNTAIN SYSTEM OF 1858 WAS THE FIRST SUCCESSFUL ATTEMPT AT RECIRCULATING WATER THROUGH A SERIES OF TANKS. Water overflowed from cistern A (via line B) into the tanks, then into cistern C. When Cistern C was full, the water was pumped out (pump D) into cistern A (via line E).

below the ankle, and cloaks and shawls were, if possible, to be avoided.

"A ladies' yachting costume," she went on, "has come into fashion of late, which is, perhaps, as near perfection for shore-work as anything that could be devised." A hat was to be preferred to a bonnet, stockings of merino wool to ones of cotton, while a strong pair of gloves was, of course, indispensable. Finally, all fancy millinery-work "must, and will, be laid aside by every rational being who attempts to shore-hunt." Thus clad, the novice could decently set forth - always remembering, in the author's parting words, that "a low-water-mark expedition is more comfortably taken under the protection of a gentleman."

The rush to publish aquarium books continued in 1857 with new authors arriving on the scene, including George B. Sowerby II, Henry Noel Humphries, Emil Adolf Rossmässler, Robert M. Stark and the Rev. John George Wood. The arrival of Rossmässler's *Das Süsswasser-Aquarium. Eine Anleitung zur Herstellung und Pflege desselben* (i.e., *The Freshwater Aquarium, instructions for their construction and care*) marked the first appearance of a German book on the subject. Robert Mackenzie Stark, a fellow of the Botanical and Royal Physical Societies, wrote *The Marine Aquarium: directions for its preparation and management*. Stark was primarily a botanist (in 1854 he had written *A Popular History of British Mosses*) and achieved some fame as the one who arranged the illustrations for Charlotte Mary Yonge's, *The Instructive Picture-Book; or, Lessons from the Vegetable World* (1857). For those not familiar with the name, Yonge was a best-selling author in her time and her output was prodigious - over 250 works. Most were reprinted many times, and many were published all over the world both in the original English and in translation.

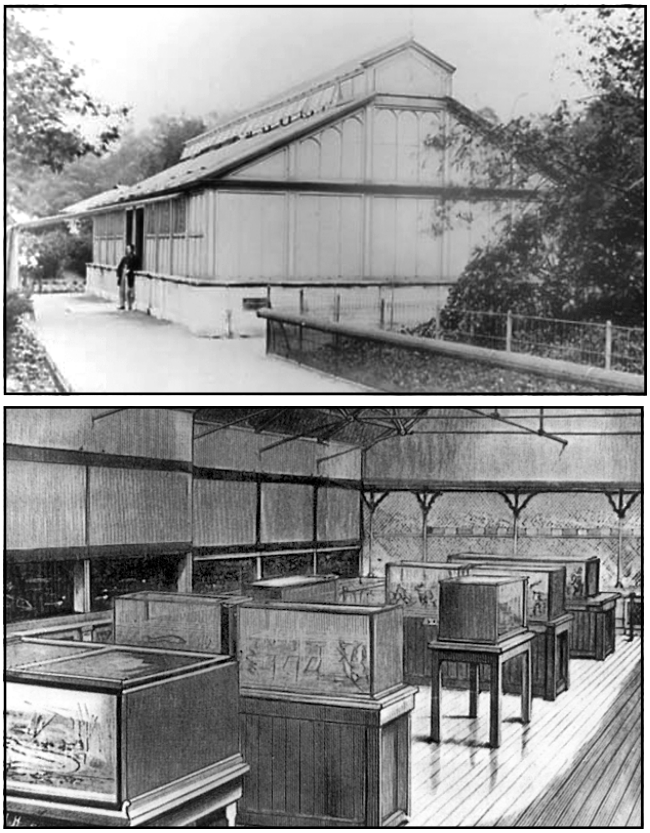


Figure 3-14. THE EARLIEST PUBLIC AQUARIUM, THE AQUA VIVARIA ESTABLISHED IN LONDON'S REGENT'S PARK ZOO IN 1853, consisted simply of a number of standing freshwater and saltwater aquaria that were housed in a conservatory-like building, 20' x 60'.

It is interesting to note that when aquarium information was generated in England, it was not long afterwards in arriving in the United States. Warington's 1851 seminal article on his experiments with a freshwater aquarium was reviewed in LIVING AGE on August 9, 1851; Gosse's *The Aquarium*, which was published in 1854, was reviewed in the American literature the very same year. British aquarium books were exported and sold and often pirated in the United States so it is useful, therefore, to explore the lives of some of the authors whose names are so well-known to students of aquarium history.

The English family of Sowerby included 10 artists and naturalists during four consecutive generations. George Brettingham Sowerby, I (1788-1854) devoted himself to natural history and art. His son, George Brettingham Sowerby, II (1812-84) was an important marine biologist of his day (Figure 3-15), and his grandson George Brettingham Sowerby, III (1843-1921), was a noted conchologist. However, it was George Brettingham Sowerby, II, known in England as "Sowerby the Younger," who wrote the *Popular History of the Aquarium* in 1857, a best-selling book that described the construction and maintenance of the marine aquarium and the type of creatures to collect. He established his marine aquaria using various live

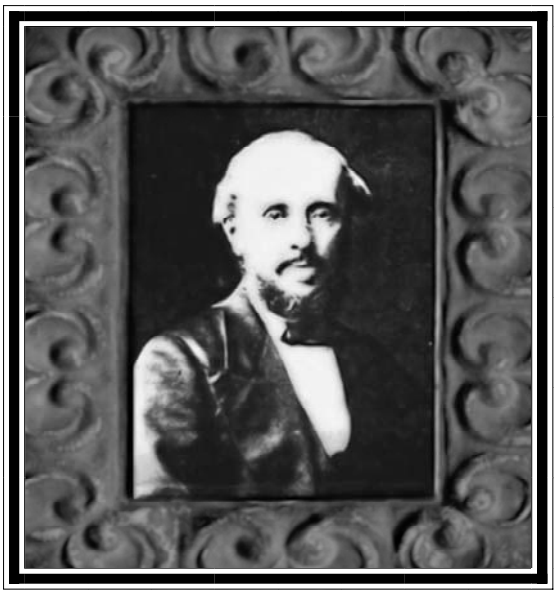


Figure 3-15.
GEORGE BRETTINGHAM SOWERBY II (1812-84).

marine plants and animals, usually collected personally at the seashore. He also included, as was the fashion of the day, information on collecting natural history objects with the object of displaying them in the home.

By 1862, however, the aquarium craze in Britain was over and Lloyd's Aquarium Warehouse was bankrupt. By 1868 the Rev. John G. Wood was recording the complete demise of the home aquarium in England:

> "Some years ago, a complete aquarium mania ran through the country. Every one must needs have an aquarium, either of sea or fresh water, the former being preferred. The fashionable lady had magnificent plate-glass aquaria in her drawing room, and the schoolboy managed to keep an aquarium of lesser pretensions in his study. The odd corners of newspapers were filled with notes on aquaria, and a multitude of shops were opened for the simple purpose of supplying aquaria and their contents. The feeling, however, was like a hothouse plant, very luxuriant under artificial conditions, but failing when deprived of external assistance. So, in due course of time, nine out of every ten aquaria were abandoned; many of the shops were given up, because there was no longer any custom; and to all appearance the aquarium fever had run its course, never again to appear, like hundreds of similar epidemics."

It is also interesting to note that in the first edition (1856) of Hibberd's book, *Rustic Adornments for Homes of Taste*, which dealt with all sorts of animals and plants for the home,, e.g., birds, plants, fishes, etc., the marine and freshwater aquarium sections were at the front of the book while in the 1895 edition these sections were moved to the back.

Speaking of the Reverend John George Wood (Figure 3-16), the special attraction of natural history for the clergy, and this includes the Reverend Bateman whose books will be appraised later, was explained by John C. Loudon, writing in the 1830's in the MAGAZINE of NATURAL HISTORY:

> "Compared even with a taste for classical studies, for drawing, painting, or any other branch of the Fine Arts; or for amateur turning, or any other kind of a mechanical employment; a taste for Natural History in a clergyman has great





Figure 3-16. THE REVEREND JOHN GEORGE WOOD (1827-1889).

advantages, both as respects himself and others. It is superior, in a social point of view, even to a taste for gardening. The sportsman often follows his amusements to the great annoyance of his parishioners; the horticulturist exercises his gentler pursuit within his garden; and the classical or indoor student of any kind secludes himself in his closet or his laboratory; but the naturalist is abroad in the fields, investigating the habits and searching out the habitats of birds, insects, or plants, not only invigorating his health, but affording ample opportunity for frequent intercourse with his parishioners. In this way their reciprocal acquaintance is cultivated, and the clergyman at last becomes an adviser and friend, as well as a spiritual teacher."

Wood (1827-1889) was born in London and, being a weakly child, was educated at home. He did, however, lead an outdoor life that provided scope for the development of his innate love of all natural history pursuits. Wood graduated from Oxford with a B.A. in 1848, and then an M.A. in 1851. For a time he worked under Henry Acland in the anatomical museum there. Sir Henry Acland was a Professor of Medicine at Oxford and accompanied the Prince of Wales to America in 1860. He was the author of several works on medicine and educational subjects, and was one of John Ruskin's old and tried friends. In 1852 he became curate of the parish of St. Thomas the Martyr, Oxford and in 1854 was ordained a priest.

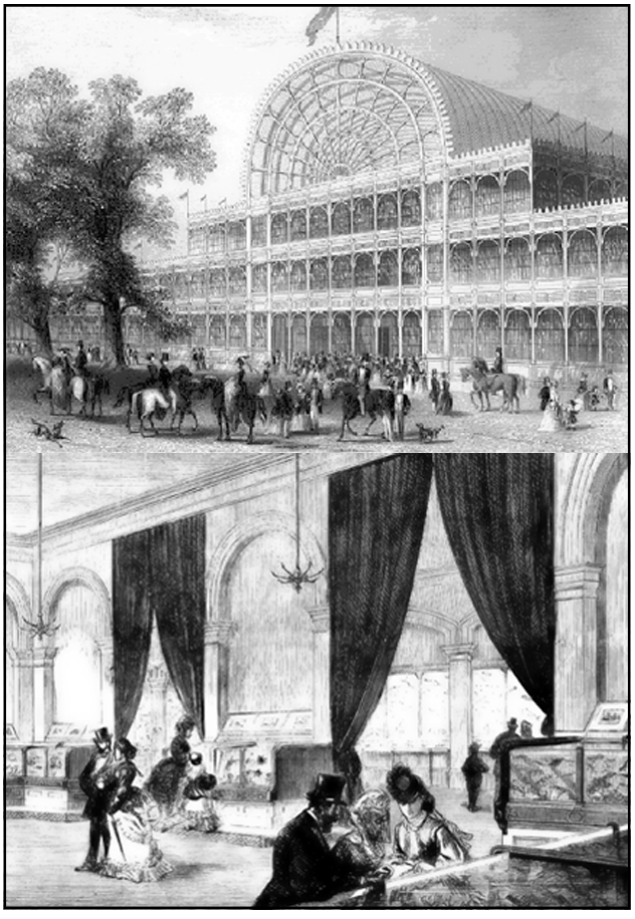


Figure 3-17. TOP: THE CRYSTAL PALACE, 1851. BOTTOM: INTERIOR OF THE CRYSTAL PALACE.

Prior to this, however, his first book had already been published, viz., *The Illustrated Natural History*, in 1851. From as early as 1856 Wood delivered occasional lectures on natural history subjects, but in 1879, having given a series of lectures in Brixton he resolved to take up lecturing as a second profession. During 1879-88 these lectures took him to all parts of the country and to America, where in 1883-4 he delivered the Lowell lectures in Boston. The conspicuous feature of these 'sketch lectures' as they were called were his illustrations, drawn on blackboards in colored pastilles, or on large sheets of white paper with colored crayons, all of which was the outcome of very careful study and practice.

Wood's writings were in no sense scientific; conscious of his shortcomings in this regard - he was least successful in those books in which a systematic treatment of the subject was required - his single objective was to popularize the study of natural history by rendering it interesting and intelligible to non-scientific minds. Timely as his books were, he was thoroughly successful at this, turning public attention to the subject of natural history. Indeed, not a few naturalists of the day owed their first inspiration to his writings.

The popular enthusiasm for natural history that Wood created was quite unprecedented. His rather undistinguished natural history book, *Common Objects of The Country*, sold 100,000 copies in one week. Subsequent natural history bestsellers of the 1860s were also written by Wood, who was then at peak of his always-prolific output. Unlike Gosse, the new generation of writers led by Wood merely passed over subjects such as Darwinism and natural theology in silence, and concentrated on assuring their readers that natural his-

tory "is far better than a play, and one gets fresh air besides."

As well as being editor of *The Boys Own Magazine*, Wood's numerous publications include the book most familiar to aquarists: *The Fresh and Salt-water Aquarium* (1868), and also *Bees*, *The Boy's Own Book Of Natural History*, *Animal Traits And Characteristics*, *The Natural History Of Man*, *Half hours with a Naturalist*, *Common British Beetles*, *Illustrated Natural History For Young People* and *Natural history*, his most important work. He was most renowned for the series of books that began with *Common Objects of the Seashore: Including Hints for an Aquarium*, published in 1857.

Although interest in the private aquarium faded during the 1860s, a new craze for public aquaria arose. One of Ward's great friends, the microscopist James Scott Bowerbank, had created what appears to have been the first ordinary-sized aquarium, complete with a piece of glass on top to make it closely glazed, and designed in accordance with a proper comprehension of the underlying balanced aquarium principles. It was this jar of Bowerbank's that attracted the attention of the Secretary of the Zoological Society, David Mitchell, and gave him the idea for the public aquarium that was opened in 1853 in the Zoological Gardens in Regent's Park (the "Aqua Vivaria" – Figure 3-14). Gosse was called on as a consultant, and his collection of annelids and zoöphytes formed the nucleus from which the collection in Regent's Park grew.

Writing about the public aquarium in Dublin that was opened the same year, Humphreys (1857) provides an entertaining account of the interesting way its tanks were aerated:

> "The water in the tank may be occasionally aerated, also, by means of a common pair of bellows with a piece of gutta-percha tubing attached to the end of the pipe. A contrivance of this sort is adapted for all the tanks at the Dublin Zoological Gardens, with branch pipes leading to each separate tank, so that one pair of bellows aerates the whole series. The action of the air, as it enters the vessels from these tubes, is said to produce a very pleasing effect, insomuch that Dr. Ball, when he described the apparatus at the Cheltenham meeting of the British Association, stated that 'visitors were so fond of blowing the bellows, that the curator found it quite unnecessary to employ attendants to inject fresh air into the tanks;' an amusing remark which has been repeated by Dr. Lankester."

The Regent's Park aquarium, however, was no match for the huge, spectacular public aquaria that surfaced in the 1870's. One of the first was London's Crystal Palace Aquarium (Figure 3-17). Conceived by Prince Albert, the Great Exhibition of 1851 was held in Hyde Park in London in the specially constructed Crystal Palace. After the Great Exhibition closed, the Crystal Palace was moved to Sydenham Hill in South London and reconstructed in what was, in effect, a 200-acre Victorian theme park opened by Queen Victoria in



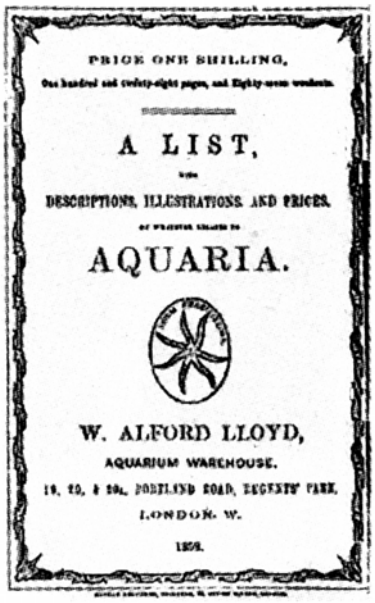


Figure 3-18. TOP: WILLIAM ALFRED LLOYD'S "The Aquarium Warehouse," London, 1856. RIGHT: FRONT COVER OF LLOYD'S *Aquarium Warehouse*, London 1858.

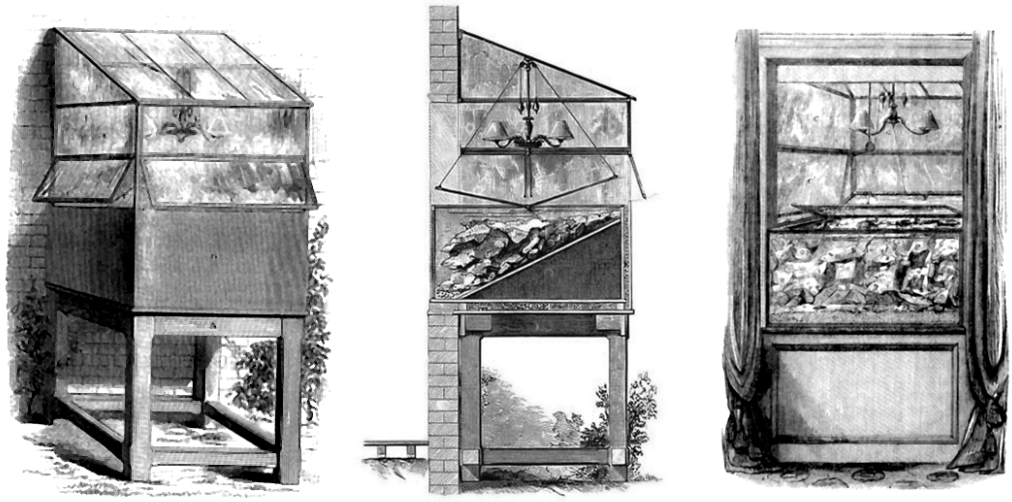
1854. In 1870 a plan was put before the directors to construct a marine aquarium. The directors saw its potential and the derelict basement site was opened as a salt-water aquarium in 1871. Trains from Brighton brought the seawater for the tanks. The following are quotes from the newspapers of the day:

> "A sea aquarium is in the course of being erected by a separate company, and its size may be gathered from the fact that 700 tons of sea water will be used in different classes, and steam engines will be constantly employed in keeping the water in motion. This ambitious and interesting project is expected to be soon finished and is under the superintendence of Mr. Lloyd.
>
> "The visitor may now enter the Marine Aquarium, situated at this end of the building. It is constructed on the best principles, and contains a large, perhaps the largest, collection of fishes, crustacea, and other curiosities of the deep; all to be seen in their habits as they live. Some most remarkable curiosities will attract attention - the octopus, the crabs and lobsters, numerous specimens of the marine anemone, strange-looking but minute sea-horses, various examples of living coral and sponges, and some very rare specimens of fishes from distant seas, together with salmon in their several stages of growth. In addition to the above, this Aquarium contains specimens of what may be called the domestic fishes - those which are brought to market, and whose appearances are better known to us on the table than in their living state."

The Marine Aquarium had 38 tanks and, in addition, a handbook was produced for the public. The aquarium was a considerable success until the 1890's when the popularity of marine life gave way to a menagerie of monkeys who occupied the now empty fish tanks.

The Lloyd mentioned was William Alford Lloyd, superintendent of the Aquarium. Lloyd also was a part of the commercial element of STAGE III of the aquarium hobby in England. By 1855 at least two dealers in aquarium supplies and equipment had set up shop in London: Thomas Hall, "dealer in Marine and Freshwater Stock, of Fountain Place, City Road"; and Lloyd himself in St. John's Street, Clerkenwell. By 1858 Lloyd's "Aquarium Warehouse" (Figure 3-18) occupied two adjacent shops on Portland Road, and his illustrated catalogue "of whatever relates to Aquaria" ran to 128 pages. According to West (1865), Lloyd maintained:

> "…in fifty large tanks and innumerable smaller vessels, at least fifteen thousand specimens of salt water animals alone. Over his counter sea-water is sold by the pint, quart, or gallon as commonly as milk or London porter at other places. He has a large steam factory for the manufacture of tanks, and employs uninterruptedly fourteen persons in collecting marine objects, besides purchasing largely from amateur collectors."



SEEN FROM THE OUTSIDE SIDE VIEW SEEN FROM THE INSIDE

Figure 3-19. WILLIAM ALFORD LLOYD'S MEDAL WINNING AQUARIUM AT THE INTERNATIONAL EXHIBITION OF 1862. Aquariums of the period were usually placed in front of a window but this backlit them, making it difficult to see the contents. The dark-chamber slope-back tank was set outside the room and illuminated by its own gas lights.

Lloyd, although a bookbinder, had an overwhelming enthusiasm for marine biology that suddenly took a quantum leap in 1853 when, at the age of 38, he made his first visit to the Regent's Park Aqua Vivaria. The following year he opened a small shop, without quitting his day job, selling fish and equipment, and in 1855 he opened his famous "Aquarium Warehouse" in Portland Road in Regent's Park. One of his good customers and a friend in the bargain was Philip Gosse who named *Cerianthus lloydii* - a tube anemone - for him in 1859. By this time Lloyd had acquired a remarkable reputation as an aquarium consultant by designing and installing in his premises a system of closed continuous circulation that made it possible to keep animals alive in tanks without changing the water (see the Addendum A9, "The Early History of Aquarium Water Changes"). Lloyd's principle, obvious today but revolutionary at the time, consisted in sending a continuous flow of sea-water, by means of steam-operated pumps, from a cistern to the tanks and from there back to the cistern. The current generated by the circular motion carried tiny air bubbles to all corners of the tanks, allowing the breathing of the animals and the oxygenation of their wastes. Lloyd subsequently designed and/or supervised many of the great public aquaria of the day, including those in Paris (1860), Hamburg (1868), the Crystal Palace in London (1871) and the famous Stazione Zoologica at Naples (1874) that still exists.

Returning now to the flood of public aquaria opened in the 1870s, the Brighton Aquarium (Figure 3-20) opened a few months after the Crystal Palace Aquarium and is still the largest such building in Europe. An early advertisement touted it as:

> "The Largest and most Beautiful Building devoted to Piscatorial Science in the World. Thousands of Fishes and Marine Animals - many of great rarity. The Tanks and Ferneries nightly Illuminated. Promenade Concerts every Saturday at Three o'clock. Band plays thrice daily."

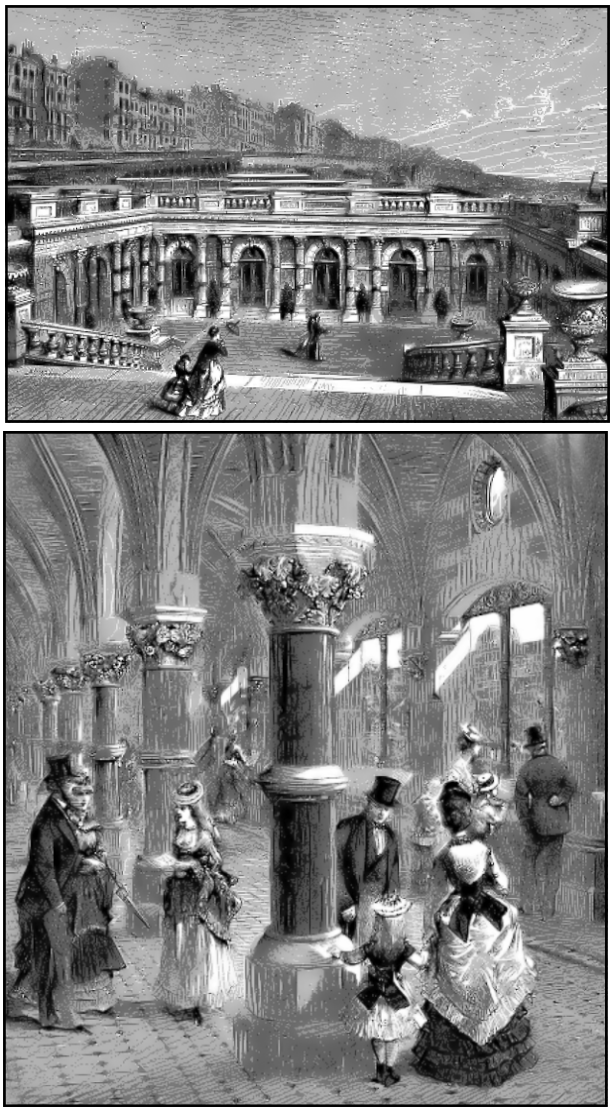


Figure 3-20. ABOVE, TOP TO BOTTOM: ENTRANCE TO THE BRIGHTON AQUARIUM, 1872. INTERIOR OF THE BRIGHTON AQUARIUM. BELOW: MAIN CORRIDOR OF THE BRIGHTON AQUARIUM.



Other Public aquaria quickly followed, and at huge costs for the day. They competed in offering ever larger or rarer attractions, such as white whales, manatees and otters. Southport's star attraction was its baby alligators that, according to Buckland (1890), started an alarming fashion:

> "Several of the ladies in Southport have purchased pets from among them, and it may be that no Southport lady will consider her establishment perfect without a baby alligator to bask on the hearth-rug, and go out for a walk on the promenade with her. When the pet defuncts, he can be stuffed, gilt, and put in the hat for an ornament, don't you know?"

Not to be outdone, the attractions advertised at the Brighton Aquarium consisted of giants, midgets, Zulu chieftains and Javanese temple dancers, while the Westminster Aquarium featured human cannonballs and sword swallowers. Edmund Gosse, writing in 1890 about his father's role in the development of the aquarium, commented bitterly that,

> "When he [Philip Henry Gosse] was eagerly proposing the preservation of marine animals alive in mimic seas, he certainly did not anticipate that within forty years an aquarium would come to mean a place devoted to parachute monkeys, performing bears and aerial queens of the tightrope."

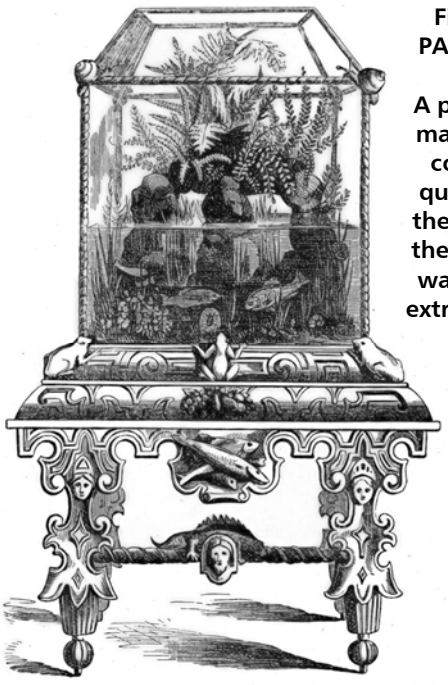


Figure 3-21. A PALUDARIUM OF THE I850's. A paludarium is a marsh-aquarium, combining the qualities of both the terrarium and the aquarium and was, at the time, extremely popular.

At the height of the craze the President of the Birmingham Natural History and Microscopical Society reported that the arrival of an octopus attracted almost as much attention as the visit of a foreign emperor, and the death of a porpoise was mourned as a national calamity. But the day of the public aquarium in England, like that of its private counterpart, was short-lived.

Lloyd, the superintendent of the Crystal Palace Aquarium, worried 120 years ago that the public's enthusiasm for aquatic overkill reflected "inartistically educated lives." On the other hand, his more religiously minded contemporaries, like Gosse and Hibberd, begged to differ. Hibberd saw the ornate little oceans as "beads in our Rosary of homage to the Spirit of Beauty;" others called Lloyd's understated approach "as plain and unattractive as a barn."

In such a way the public aquarium in England had evolved into a mere common amusement, and the Wardian cases that had promised so much thirty or so years before were abandoned and forgotten. It was to happen to American public aquaria as well, including Cutting and Butler's Boston Aquarial & Zoological Gardens (1859-1862) and Barnum's Aquarial Gardens, also in Boston (1862-1863). It is ironic that the balance between education and entertainment is a dilemma that public aquaria must face even today. Ryan, in his *The Forgotten Aquariums of Boston,* reviews this issue in greater depth, and readers are referred to his book for his thoughtful analysis.

However, it also should not be forgotten that these public aquaria prompted a new interest in the home aquarium, resulting in John Ellor Taylor's publication of *The Aquarium: its inhabitants, structure, and management* in 1876, Reginald Arthur Renau Bennett's *Marine aquaria: their construction, arrangement, and management* in 1889 and Gregory Climenson Bateman's *Fresh-water aquaria: their construction, arrangement, and management* in 1890. In 1890 the Bennett and Bateman books were also combined and sold as one volume, ultimately going into seven editions, the last of which was published in 1937!

CHAPTER 4:
BARNUM'S AMERICAN MUSEUM AND THE BOSTON AQUARIAL AND ZOOLOGICAL GARDENS

It was not long before the new fad also appeared in America. In 1854, James Ambrose Cutting, an inventor and photographic pioneer, established two small but perfect aquaria in his home. William Emerson Damon (Figure 4-11) gives the following account of early American aquarium activity in his *Ocean Wonders* (1879):

> "In this country I believe the writer was one of the very first to be inoculated with the aquarial passion - a passion that has grown with time, and has a deeper hold today than even in the first period of magnificent visions.
>
> "So far as I have been able to ascertain, the pioneer inductor of the private aquarium in this country was Miss Elizabeth Emerson Damon, of Windsor, Vermont; and her first essays were made with the simple apparatus of a two-quart glass jar, with a few fish, some tadpoles and snails, and some *Potamogeton* (common pond weed); but so perfectly balanced was this young aquarium with animal and vegetable life, that I fell in love with it at first sight; and never since, among all the aquarial curiosities which I have possessed, and the thousands I have seen, has there been a collection nearer perfection than that contained in the poor old two quart jar - an opinion confirmed by nearly a quarter of a century's experience that Nature's laws are unchangeable, and that it is not the quantity but the quality which makes perfect."

However, the very first aquarist of record in the United States was William Stimpson (Figure 4-1). In 1858 Isabella James wrote: "In our own country William Stimson, the collector and curator of the aquaria in the Smithsonian Institution at Washington, without any previous knowledge of Dr. Johnson's experiments in England, had, as early as the year 1849, made seven or eight small aquaria, which were perfectly successful; inasmuch as he kept some of them in a healthy condition for several months without change of water. He published no account of his success, not knowing that it was a subject which was just beginning to awaken attention in England, and fated eventually to excite such universal interest. To him may safely be assigned the credit of having made the first systematic attempt at constructing an aquavivarium, although in all the works before us that honor is given to Mr. Robert Warrington (sic), who in 1850 communicated to the Chemical Society of London a paper 'On the Adjustments of the Relation between the Animal and Vegetable Kingdoms.'" Note: this was confirmed by Robert Carter, who knew Stimson well (See: "A Cruise along the Coast of New-England," Boston, 1864).

William Stimpson (1832-1872) was a native of Boston, Massachusetts, where he studied under Louis Agassiz. He was primarily interested in marine invertebrates, but his collections in the field included many fishes that found their way into the Smithsonian collection. At the age of 21, Stimpson was appointed as naturalist on the North Pacific Exploring Expedition (1853-1856), which returned one of the largest and

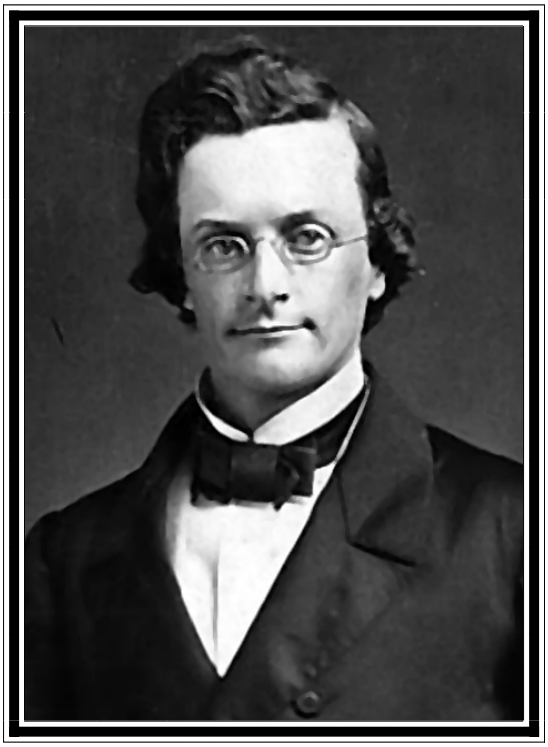


Figure 4-1. WILLIAM STIMPSON (1832-1872)

most important collections of marine organisms that had yet been made. Stimpson's efforts were largely responsible for this success and, after the completion of the expedition, he followed the collections to the Smithsonian where he began to work up the results.

In Washington, Stimpson became head of the Smithsonian's Department of Invertebrates and was the leader of a group of young naturalists, the Megatherium Club, who had gathered around the ichthyologist, Spencer Baird. Robert Kennicott, who would die while exploring Alaska in 1866, was "always bubbling over with fun," said one club member. Portrait artist Henry Ulke studied beetles, Henry Bryant was an ornithologist, and their leader, William Stimpson, was a zoologist. All were protégés of Assistant Secretary Spencer Fullerton Baird, who occasionally admonished them for overindulging.

By day, these young men were serious scholars at the Institution. At night, however, they joined fellow members of the Megatherium Club, some of whom rented lodgings in the Museum, and the hijinks began. Using the imaginary call - "How! How! - of their namesake, an extinct ground sloth, they gathered over ale, oysters, eggnog and any other delicacies their meager incomes afforded. They ran sack races in the Museum's Great Hall and serenaded Secretary Joseph Henry's daughters. The party ended in 1863 when Secretary Henry kicked out most of the lodgers, and the club had dissolved by 1866.



Figure 4-3. P.T. BARNUM (1810-1891) Barnum's American Museum was the first to popularize aquarium fishes in America.

Stimpson traveled to Europe, visiting the great museums and collecting in European seas. He was granted an honorary M.D. degree from Columbian University (now George Washington) in 1860, became director of the Chicago Academy of Sciences in 1867 and was elected to the National Academy of Sciences in 1868.

In 1865, Stimpson was called to direct the Chicago Academy of Sciences by his friend, Robert Kennicott. By 1871, perhaps only the Smithsonian contained more valuable scientific material than Stimpson had accumulated at Chicago. The Academy building was designed to be fireproof, but nothing could have withstood the firestorm that swept Chicago on October 8, 1871. Glass melted, iron turned to wax, and everything combustible burned. In one night, Stimpson lost his entire life's work. He valiantly tried to start over, joining a Coast Survey cruise in the Gulf of Mexico the following winter. But his health was broken and he died in May 1872. The goby, *Sicydium stimpsoni* Gill, 1860 and the eel, *Bathycongrus stimpsoni* Fowler, 1934 are named after him.

Before leaving this discussion of William Stimpson, it must be noted that since Elizabeth Emerson Damon was five years older than Stimpson, it is entirely reasonable to argue that William Damon might have been right and that she kept aquaria before he did. Lacking further documentation, however, the nod must go to Stimpson.

However, the first to introduce the wonders of the aquarium world to the general American public was none other than P. T. Barnum (Figure 4-2). In 1841 Barnum purchased the old Scudder Museum in New York City and renamed it, "Barnum's American Museum (Figure 4-5)." In the summer of 1855, as a result of some unwise investments, Barnum was bankrupt and tried to safeguard at least some of his wealth by transferring real estate holdings to his wife and his

brother, Philo, as well as selling the contents of his museum to his assistants, Messrs. John Greenwood, Jr., and Henry Dennison Butler (Figure 4-7), for the sum of one dollar.

Barnum then departed for England with Tom Thumb and lectured with success in London and other English cities. The subject chosen was "The Art of Money Getting," although Barnum told his friends that in the light of recent events he felt more competent to speak on the art of "money losing." During his trip Barnum functioned quasi-officially as agent and consultant to the American Museum and secured many novelties for it, e.g., the Albino Family, Thiodon's Mechanical Theatre and others. Barnum's creditors must have bristled at the fact that he was, in reality, still running the Museum. One is reminded here of the scene from Gilbert & Sullivan's *The Mikado* where Pooh-Bah tells Ko-Ko, "Choose your fiction and I'll endorse it!"

Barnum became acquainted with the aquarium display at the London Zoological Gardens and persuaded the directors to lend him two of their curators. In 1856 he purchased a number of tanks and, together with some sea anemones and other marine animals, they were shipped to New York and established at the American Museum. It was here that Butler acquired his aquatic expertise, leading him two years later to write one of the first books published in America on the subject. Although we know much about his working life, there is little known about his vital statistics except that he was born Henry Dennison Butler in Connecticut in 1818, where he most likely made his first acquaintance with P. T. Barnum. Barnum, it should be noted, was born in 1810 in Bethel, Connecticut. In 1890 Butler was still listed as one of Barnum's superintendents in Bridgeport, but Barnum died the following year. Butler was associated with P. T. Barnum for almost half a century, although one of his Great Granddaughters was quoted as saying that Butler never liked his business dealings with Barnum. Butler's wife, Betsey, died in 1874 and is buried in Bridgeport.

The following is from the SCIENTIFIC AMERICAN, Nov 14, 1857, and is the earliest aquarium writing on record by Henry Butler:

"THE AQUARIUM

Mssrs. Editors: There is one feature which no writer on the aquarium has yet noticed: when a tank is properly stocked, the water soon gets crowed with animalculae, which swarm among the plants, and occupy the sides of the glass in countless numbers, made visible only by the aid of this microscope. These facts are in accordance with certain laws of nature, and the presence of vegetable and animal life always develops them. But observe the utility of these animalculae; they contribute to this sustenance of the other living creatures by supplying them with food. The researches of chemistry have proved that these minute organizations respire in much the same way as plants, while animals generally absorb oxygen, and perish if the introduction of that gas is suspended. These minute organisms absorb carbonic acid gas, and give out oxygen in abundance. My experience convinces me that a tank which has been fitted up for some months, will sustain a much greater



Figure 4-2. JAMES A. CUTTING (1814-1867). Taken at his studios (in partnership with A.A. Turner, advertising "ambrotype pictures") at 10 Tremont Row, Boston. Cutting holds the dubious record to be the first aquarist of note to be committed to a mental institution. (See the Addendum for more details.)

amount of animal life than one of the same dissensions but recently stocked. Beginners should distinctly remember the leading principles of the aquarium, and then success in maintaining one may, without much difficulty, be achieved. If the tank have not a distinctly self-supporting character, such as will preserve its strength without alteration of any kind, it may be concluded that there has been unskillful management in its stock.

H. D. BUTLER."

In 1859 Butler and James A. Cutting (Figure 4-3) opened a public aquarium in Boston called the "Aquarial Gardens (Figure 4-6)." Here they displayed some 41 tanks of local and exotic fishes, plus a variety of other animals. It was, therefore, the first genuine public aquarium in this country. Cutting had collected some $20,000 in fees for his photographic patents before going into partnership with Butler and, with some of the proceeds, he built a boat called "The Ambrotype," using it to collect specimens for the Aquarial Gardens.

Butler was still involved with the American Museum at the time so the day-to-day burden of running the Aquarial Gardens fell upon the shoulders of Cutting. To alleviate this problem Butler had William E. Damon, then an employee of the American Museum and a pioneering aquarist in his own right, transferred to the Aquarial Gardens.

His lecture tour having proved both attractive and profitable, Barnum returned to the United States where his earnings and his wife's assistance enabled him to emerge from his financial misfortunes. The American Museum had not done particularly well over the prior four years under Greenwood and Butler and it had always been agreed that, whenever he wished, Barnum could resume ownership. Accordingly, early in 1860 Barnum bought back the American Museum and Greenwood thereafter acted as manager. Butler, on the other hand, opted to take care of his other business interests, namely his partnership in Boston with Cutting.

Later in the same year the Aquarial Gardens moved to new quarters and was renamed the "Boston Aquarial and Zoological Gardens," with Butler listed as manager. The style of the operation now became much more flamboyant. Not surprisingly, sideshow-like performances prevailed since Butler had learned his craft at the foot of the master himself, P. T. Barnum.

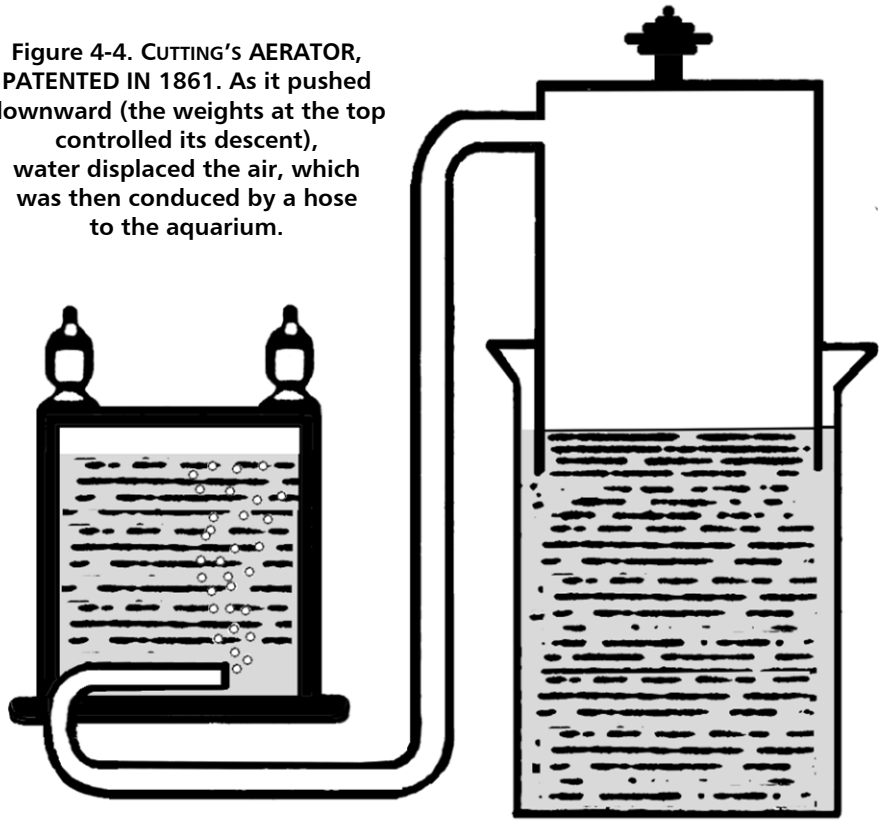


Figure 4-4. CUTTING'S AERATOR, PATENTED IN 1861. As it pushed downward (the weights at the top controlled its descent), water displaced the air, which was then conduced by a hose to the aquarium.

In 1861 the Boston Aquarial and Zoological Gardens was exhibiting a bottlenose dolphin, a gray shark and a harbor seal. Later in the year Butler secured a white beluga whale and brought it to Boston. It was kept alive for about one year and although Barnum also displayed several white whales, contrary to what has been written, the Boston whale was on exhibit before those in the American Museum.

Because of what we nowadays usually term "artistic differences," Butler dropped out of his partnership with Cutting shortly afterwards and returned to New York once again to manage Barnum's American Museum, the whale subsequently being placed under Damon's care.

Earlier in 1861, while he was still associated with the Boston Aquarial Gardens and Cutting, Butler wrote of a trip he made to Key West with Cutting. The following is his report verbatim without any corrections to the scientific names he uses. In his account he characterizes himself as a "naturalist," although in the 1860 census he lists himself as a "merchant."

> "We were not long in finding an efficient boat's crew, composed of fishermen, who obtain a somewhat scanty living by supplying the Key West market. These are a curious class of men. They are natives of the Bahama Islands, brought up as fishermen, and adhering through life to that occupation. They are by no means lacking in natural abilities, and to the extent of their wants and their ambition, are as wide awake to the main chance as any Yankee from the farthest Down-East. But to use a common phrase, 'their education has been sadly neglected.' In this respect, and with regard to accomplishments, they are very decidedly below par, and this without an exception. One day, as they were rowing the boat near the shore, I asked one of them where the people of Key West buried their dead. His reply was: 'The sailors who dies, we buries all along here in the sand; but us folks what dies, we buries all of them up here in the seminary.' I looked for the 'seminary,' but did not find it.
>
> "Our first day's operations were confined to the neighborhood of the shore, and the fish we caught were, therefore, of the smaller kind. But our net must have been cast on 'the right side of the ship,' as we drew in large quantities of the finny tribes. As a naturalist, I was disappointed

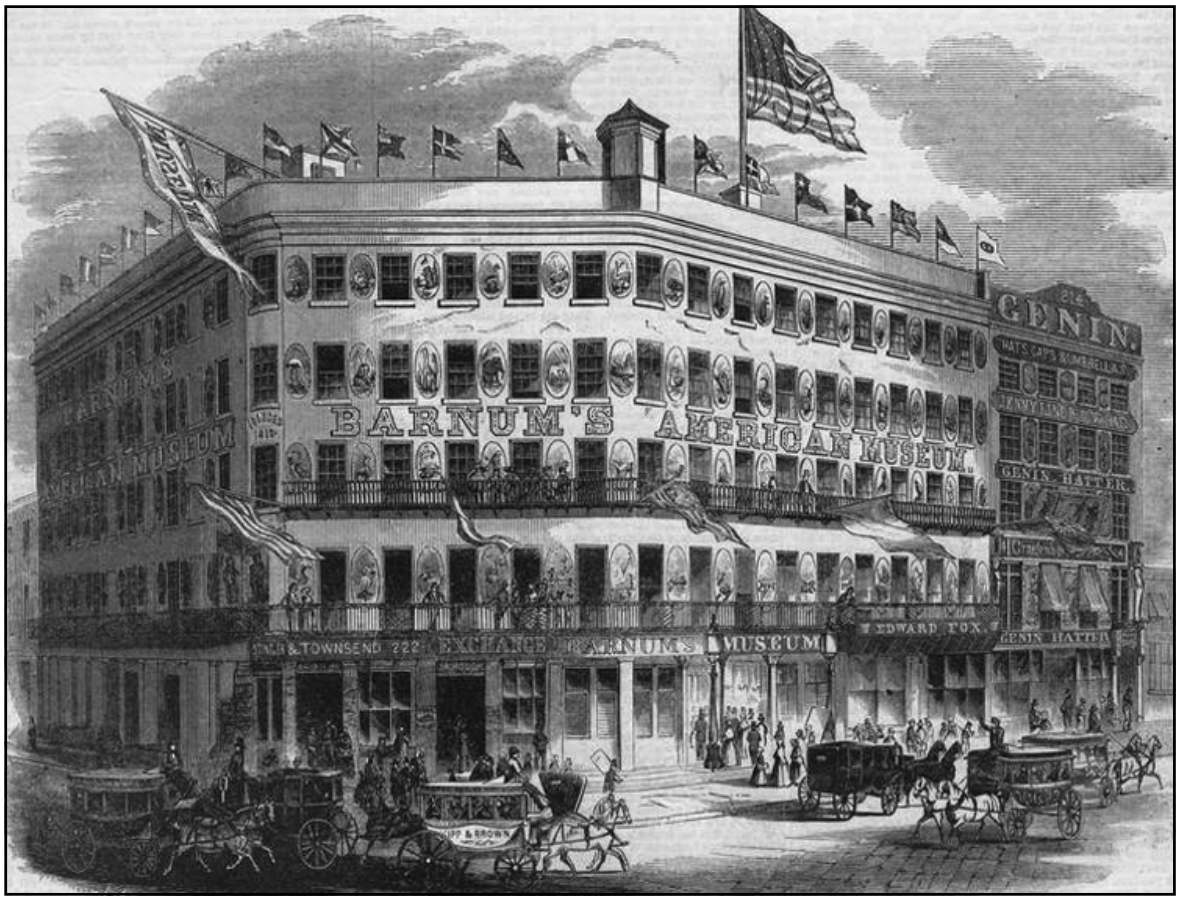


Figure 4-5. BARNUM'S AMERICAN MUSEUM.

at not finding greater varieties. A large proportion of them were cowfish (*Astracion Sexeornutus*). This fish has six horns, two of which are between the eyes. It is triangular in shape, and resembles the trunkfish of our waters (*Lactophrys Yalei*). It is finely marked: and those we caught, ranged from three to eight inches long. In the Gulf of Mexico they are very large, and are highly esteemed for the table. Having obtained specimens of all the fishes in this locality, we rowed to the northeast shore. Only those who have prosecuted such an expedition, can conceive how purely local are the haunts of the ichthyological tribes, Comparatively short as was the distance we had passed over, we here found quite a different class of fishes. We caught large numbers of sardines (Engralius meletta), and three varieties of the *Hamulon*, viz.: the red mouth (*Hamulon chrysopteron*), the grunt-fish (*Hamulon arcuatum*), and the black-tailed grunt-fish, species undescribed. The last two derive their common name from the peculiar sound they emit when taken in the hand, resembling much the guttural voice of swine. In shape they are a good deal like our salt-water perch, and their colors are very beautiful.

"It is, in fact, impossible to find any fish in tropical waters that are not much more brilliant in colors than those found in Northern latitudes. The varieties of the *Hamulon* above described, were from five to ten inches in length. We caught, also, a very curious fish called *Hemirumphus*. It resembles the garfish in its general character, but has the upper jaw short, and the lower one elongated into a beak, without teeth. The body is slim, from ten to fourteen inches long. This fish swims very near the surface of the water. It is impossible to keep one any length of time. If merely lifted out of the water and returned immediately, it turns over on its back and dies.



Figure 4-6. CUTTING AND BUTLER'S AQUARIAL GARDENS, 1859
The main floor of the Aquarial Gardens consisted of a circular arrangement of exhibit tanks, varying in capacity from 20 to 30 gallons, with a central tank of 700 gallons. A small band played background music from the balcony.

"Next we visited Fort Taylor, accessible from the shore by a bridge, probably more than half a mile long. Underneath, and in the neighborhood of this bridge, the most beautiful anemones were plentiful. One species (*Rhodactinia apicalis*) resembles the *R.A. divisii* found on our Northern coast, but is much more plentiful in color. Of this species we procured eight varieties; some with red tentacula, white body, and variegated disk; others with tentacula tipped with yellow, white body, with pink spots and red disk. Just as we were about to leave this spot, so prolific of zoophytes, my friend Cutting, found a specimen of the *Heteractas chloroluca*, the most beautiful of all anemones. It has a green disk, its tentacula are white and buff, and its body is buff, spotted with pink. The colors are truly gorgeous, more so than those of any other of the zoophyte family. We searched diligently for a long time, but found only this solitary specimen.

"We caught several specimens of the salt water crayfish (*Palynurus Americanus*), weighing seven and eight pounds each. They are very handsomely colored, varied with red, green, and yellow. Their lateral antennae are large, cetaceous, and set with sharp points. They are among the largest animals of this class. Their flesh is highly esteemed.

"We also found in abundance the hermit crab, which has, since the introduction of the aquarium, been justly esteemed as one of its most curious and interesting inhabitants. It is the Petrocairus granulatus of the naturalist. These animals are much larger than the hermit crab of Northern latitudes, *Eupurgus longicarpus*, or *E. Bemhardus*. They grow to a large size, and their claws are dark crimson. They are mostly found in those large strombus shells which are abundant in these parts."

Cutting also was busy in 1861, inventing and patenting an aerator made of glass and rubber tubing. The principle was similar to the gasometer or old-fashioned gas storage tanks of some years ago. The principle of Cutting's aerator can be explained as follows. Suppose, for example, that you invert a tumbler over a pot of water. The air inside is, of course, trapped, but if a hole were drilled in the end of the tumbler and a piece of tubing inserted to lead the air off into an aquarium, gravity would force the air out of the tumbler through the hose to the aquarium. This method for aeration was also adopted for use at the American Museum by Butler.

Henry D. Butler was probably one of the most underappreciated characters in the history of the aquarium. As Barnum's biographers, the Kennards, point out, "Barnum himself was so famous and charismatic, and his leading performers were so well known and admired, that little attention was ever given to the scores of individuals behind the scenes at his museum who made it all work." John Greenwood, for example, had been Barnum's right-hand man for over twenty years. Of English birth but raised in Barnum's hometown of Bethel, Connecticut, Greenwood joined the Museum staff in 1846 and served variously as Barnum's business manager, interim owner, assistant manager, confidential agent and finally manager of the American Museum. Another of his employees, Emile Guillaudeu, was his house naturalist for even longer. Like



FIGURE 4-7. HENRY DENNISON BUTLER, 1890.

the self-effacing Butler, no one remembers Greenwood or Guillaudeu now.

According to Joel Benton, another of Barnum's biographers, in June of 1861 Barnum heard that some fishermen at the mouth of the St. Lawrence river had captured alive a fine white whale and was told that, "… such an animal, if packed in a box filled with seaweed and salt water, could be transported over land a considerable distance without danger to its life or health." The man who told him this was the very one who had accomplished the feat two months earlier, i.e., Henry D. Butler.

Shortly after the whale had been established at the Aquarial Gardens in Boston, Barnum hired Butler to help him acquire his own whales. Barnum was not satisfied with just a single whale – he had to have two. Unfortunately for Barnum, the American Museum was not ready to accommodate these animals. The Aquarial Gardens already had in place a suitable tank and, even more important, it had a ready supply of saltwater piped in from the surrounding bay.

Nonetheless, in June of 1861, a month after Butler had left the Aquarial Gardens, he once again went to work for Barnum and accompanied the latter to Canada to bring back the first of Barnum's white beluga whales. From a newspaper account we have Barnum's own words: "I made a journey there in June last, accompanied by my agent. I remained there a fortnight, and made every arrangement for capturing and keeping alive two of these monsters." The "agent," of course, was Henry Dennison Butler. Barnum's whale tank was not yet completed nor had he finished bribing the local New York City aldermen for the right to lay an iron pipe under the streets of the city from the Museum out into New York harbor to secure the large volumes of saltwater that would be needed for the whales. His first two whales, therefore, did not survive. In fact, of the six white beluga whales Barnum ultimately brought back to the American Museum, only one survived. It died in the fire that destroyed the Museum in 1865.

In 1862 the Boston Aquarial and Zoological Gardens was not doing well financially and Barnum bought it out, later renaming it "Barnum's Aquarial Gardens." Although Cutting was engaged to supervise the aquatic end of things, he once again became dissatisfied with Barnum's theatrical approach to the business and, towards the end of the year, he started the "New Boston Aquarial and Zoological Gardens" with a brand-new partner. The business lasted only two weeks and shortly afterwards Cutting entered a mental institution in Worcester, Massachusetts. The following year Barnum moved his collection to the American Museum in New York. The Museum burned down in 1865 and was rebuilt and reopened the following year as the "New American Museum," this time with Butler as a co-owner. In 1868, like the old one, this also burned down. Butler was to re-surface again in 1876 as Superintendent of the New York Aquarium.

The following is taken from *Bermuda, Past And Present* (1911) by Walter Brownell Hayward:

> "No less a personage that Phineas T. Barnum was the first to introduce Bermuda fishes to the New York Aquarium public. Barnum, on the alert for new thrills, conceived the idea of bringing live specimens from tropical waters, and sent out two expeditions, one to Honduras, the other to Bermuda. Both returned without their fish, all having died in transit. Barnum was disappointed but was prevailed on by one of his assistants, Mr. W. E. Damon, to fit out the well-smack 'Pacific' which sailed to Ber-

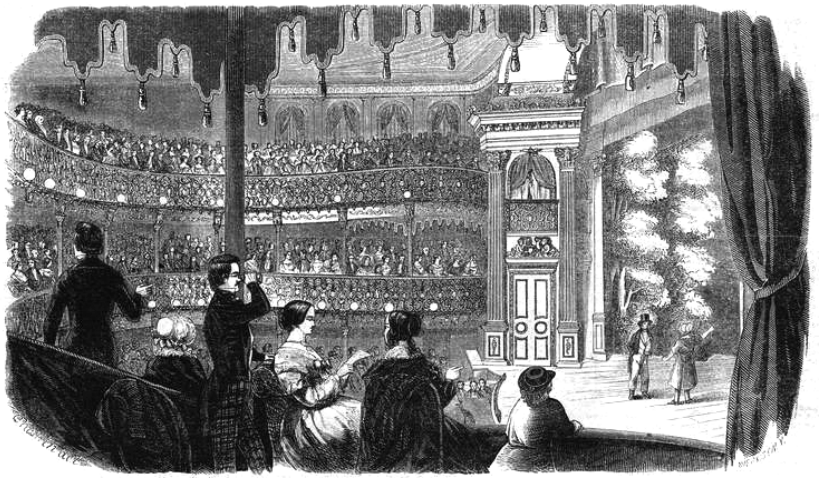


Figure 4-8. INTERIOR VIEW OF THE LECTURE ROOM, American Museum.

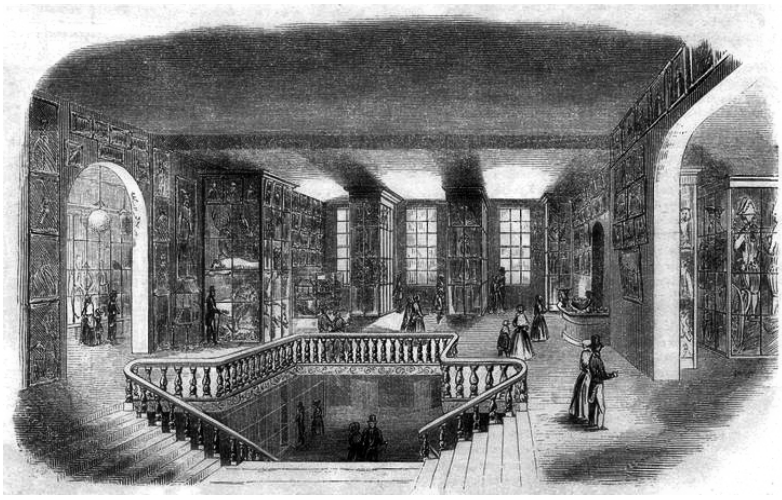


Figure 4-9. INTERIOR VIEW OF THE FIRST GRAND HALL OF THE AMERICAN MUSEUM.

muda in the summer of 1862. These being the days of blockade runners, all Northerners were regarded with suspicion and soon it was rumored that Mr. Damon in his frequent trips across the bays was taking soundings, not fish. Finally a peremptory order from the authorities halted his work and it was not until the American Consul had intervened in his behalf was Mr. Damon allowed to resume his harmless occupation. His party caught 600 fish, all of which were successfully transported to the greater glory and profit of Barnum, and the pleasure of his patrons of the Ann Street Museum."

Barnum, who had just acquired the "Aquarial Gardens" in Boston, wrote to Professor Agassiz at Harvard that if the latter had an assistant whom he would like to send along to collect specimens for the Museum of Comparative Zoology in Cambridge, all facilities would be accorded to him. This offer was accepted by Agassiz, who selected Albert S. Bickmore as his representative. Bickmore later was to become the principal founder of the American Museum of Natural History (Figure 4-10) and the organizer and first curator of the Department of Public Education; he was also curator of archaeology and curator of ethnology. After receiving his B.A. and M.A. from Dartmouth and working at Harvard's Museum of Comparative Zoology as just noted, Bickmore traveled for three years between 1864 and 1867, through Indonesia, East Asia, Siberia and Europe, collecting specimens and studying ethnology, visiting the Ainu, Gilyaks and other peoples. On his return to the U.S., Bickmore worked with a group of prominent New Yorkers to draw up a petition and plan for a natural history museum. When the American Museum of Natural History opened in 1871, Bickmore was appointed superintendent.

Damon's and Bickmore's trips were during our Civil War and one can imagine the risks in sailing along the Atlantic coast, subject to interdiction by naval forces of the Confederacy. The following details of this trip were provided by Bickmore himself.

The little fishing-smack charted for the trip was given the high-sounding name *Pacific*. Its equipment, however, was of the simplest, not even a chronometer being on board so that when, after coasting along until Cape Hatteras was reached, the course was laid due east and the ship passed out of sight of land, there was no means of determining its exact position. Fortunately, half-way toward Bermuda, an East-Indiaman was met, and the adventurous seamen were able to learn their precise latitude and longitude. On the arrival of the little craft in Bermuda, Professor Bickmore writes:

> "As we came near Port Hamilton, the principal harbor, a number of native boats put off to board us, for what purpose we were at a loss to imagine, until one more skillfully managed than the others came alongside, and its black crew offered to aid us as agents. 'What for?' we asked; to which came the rejoinder: 'Why, when we saw how you could sail in a strong breeze, we felt sure you were a blockade-runner loaded with tobacco.'"

When the entirely peaceful intentions of the newcomers were made plain, the authorities facilitated their operations and as was previously mentioned, some 600 live tropical marine fishes were secured, and safely brought to New York. They were the first to transport successfully ocean fishes from the tropics to the temperate zone. The Bermuda Islands were then but little known to New Yorkers and the enthusiastic account of their charms given by both. Damon and

Bickmore undoubtedly helped much to make that region popular with New Yorkers and Bostonians. These exhibits at the American Museum also kindled an interest in aquaria in the United States, especially in those residing in the northeastern portion of the country.

Damon was probably the most accomplished and enthusiastic aquarist in the United States in the early 1860's and was the first American on record ever to maintain a saltwater aquarium in his home. He had more years of experience in fish keeping than did any other American aquarist of his time. In a review of Damon's *Ocean Wonders*, the reviewer stated: "The author has long been known as an enthusiastic student of marine zoology… and as the possessor of one of the most extensive and valuable private aquaria in the country." In a six-gallon marine tank, Damon kept anemones, some of which he himself had brought from Bermuda in 1861, serpulid worms, tubularia, barnacles, hydractinia, shrimp, a sand crab, nereid worms, buccinid whelks and 12 varieties of marine algae. The water in his tank maintained its integrity and was not changed for 23 months! Many present day marine aquarists would be happy to equal Damon's achievement. Damon was also very successful in keeping seahorses alive in the aquarium. William E. Damon was a confidant of Robert West, the editorialist of the COMMERCIAL ADVERTISER who at the time perhaps exerted more influence than any other individual in advancing the hobby in the public appreciation. (Robert West's role in the aquarium hobby will be explored shortly.) Damon knew the leading amateurs and professionals of the day, including even Louis Agassiz, and he was, of course, a polished author on aquarium matters. The following is taken from the NEW YORK SUN of May 9, 1899:

> "W. E. Damon read on Friday evening before the New York Microscopical society a paper on the seahorse, the wonderful little marine animal with a head and neck bearing a strong resemblance to those of a horse, while its tail is prehensile like that of a monkey. Mr. Damon exhibited a photograph of a seahorse which he had kept alive in his own aquarium for over a year. This seahorse was very tame, and would readily take food from its owner's hand."

Damon's father, Luther Damon, took young William on a trip to Boston where they visited the Boston Aquarial Gardens but whether his sister Elizabeth went along is apparently not known. Damon was seized with additional fervor for the hobby after viewing Barnum's "Aquarial Hall" in the American Museum, as we note from his own account:

> "From fish to fish I traveled, and from those fishes I never stirred for the whole day; and, when finally dragged away from the place by my companion, my first thought was, "I must have an aquarium!" At first I wanted one as big as the Central Park, where could be kept every kind of fish I had ever heard of; then, successively, I felt obliged to reduce the size to that of Union Square and of the Everett House; and thought I was very moderate when I had compressed my imagination to the limits of two city lots, and mentally flooded them for the purpose of fish culture! But, finally, on reflection, it became apparent to my sobered thought that in so large an aquarium as I had been imagining I should not be able to see my fish, any more than if I should drop them into the ocean. So away went my dreams, and, in sad sobriety, I at last concluded to content myself with a tank of the largest size!"

Damon was born in Windsor, Vermont in 1838



Figure 4-10. THE OPENING OF THE AMERICAN MUSEUM OF NATURAL HISTORY.
Albert S. Bickmore, William Damon's friend, enlisted 19 of New York's richest men and got permission from City Park Commissioners to site the building.

and educated in local schools and the Kimball Union Academy in New Hampshire. Since his sister was older - she was born in 1827 and therefore the age difference was 11 years - she most likely was the one who started William Damon on his interest in fishes and aquariums. He was educated in the public schools and at Kimball Union Academy across the river in New Hampshire. The Academy – the 15th oldest private boarding school in the country - was opened in 1814 and its goal was to prepare young men for the ministry but at the time of Damon's attendance this emphasis had changed and it was widely known for its high standard of scholarship. He remained in Windsor for several years, obtaining a valuable training in commercial life, and afterwards conducted a retail business in Galena, Illinois for one year. In 1860 his interest in the natural sciences won over and he became associated with Barnum in New York in 1860.

After working for Barnum, Cutting and Butler during the period 1860-1863, Damon became associated with Tiffany's in New York City, and for over forty years he was part owner of the business and also superintendent of its credit department.

In 1865 he married Alma C. Otis of Windsor, Vermont. Alma Damon was, like her husband, also a great lover of nature, and during her life in New York she and her husband were identified with several societies offering opportunity for the study of trees, plants, flowers and especially of marine life. After her husband's death, Mrs. Damon spent a part of every summer at her farm where she could enjoy to better advantage, the natural beauties which the country afforded.

The Damon's retained ownership of the family homestead in Hartland, Vermont, a farm of 160 acres. He retired to his family farm where he died in 1911. Damon Hall (Figure 4-13) in Hartland, Vermont, a building is on the National Register, is named after him. A few months after Damon's death, the following appeared in a brief note published by George F. Kunz that appeared in the February 2, 1912 issue of SCIENCE:



Figure 4-11. WILLIAM EMERSON DAMON, 1838-1911.

"The death of William Emerson Damon on December 1, in Windsor, Vermont, at the age of seventy-three, recalls to his friends memories of his early days, when his enthusiastic devotion to natural history studies in general, and more especially to ichthyology and pisciculture, caused him to become the leading spirit in the establishment of New York's first aquarium. This first venture was a department of Barnum's old Ann Street museum. It was due to Mr. Damon's persuasion that the irrepressible showman was induced to undertake this enterprise; however, unexpected difficulties were encountered in securing specimens from the South Atlantic, but few of the fish being alive when they reached New York. Finally a special craft was chartered and placed under Mr. Damon's immediate control.

"To this first aquarium venture succeeded another, which was housed for some years in a building on the site now occupied by the Herald Square Theatre. A most appropriate banquet celebrated the opening of this aquarium, the menu of fifty-three courses consisting exclusively of fish. With this foundation Mr. Damon was largely interested and when, finally, the

present well-equipped aquarium in Battery Park was established his advice and council were eagerly sought and he was given a deciding voice in the choice of the director.

"There can be no doubt that if Mr. Damon could have found an opening enabling him to devote all his time and energies to natural history he would have earned a world-wide reputation in this field, but a leading jewelry house would have lacked his valuable services as part owner and credit-man, services extending for forty years. Nevertheless, his interest in these studies was always great and he found time to make many contributions to the progress of this branch of science. His book entitled *Ocean Wonders* records a number of very interesting experiences gained during his early researches. During his business career he was exceedingly fond of making pedestrian excursions in the environs of New York City, and thus acquired an exceptionally thorough knowledge of the formation of the land in this territory.

"His lively interest in scientific pursuits and the recognition accorded him in the scientific world is shown by his membership in the New York Microscopical Society, the Royal Microscopical Society of London, the New York Mycological Club, the Scientific Alliance of New York, the New York Naturalists' Club and the New York Zoological Society. He was also a member of the New England Society."



Figure 4-13. DAMON HALL, HARTLAND, VERMONT.

The reference to the Herald Square Theatre was to Coup's New York Aquarium which had formerly occupied the site. Damon was one of the influential New Yorkers who, with others such as Eugene Blackford and Spenser Baird, provided support for Coup's proposal to build an aquarium in Central Park.

William Emerson Damon was remarkable in that he not only was an influential figure in Cutting and Butler's Boston Aquarial Gardens, Barnum's American Museum and Coup's New York Aquarium, it was largely through his efforts that the New York Aquarium at the Old Castle Gardens (Battery Park) was established (see Chapter 10), subsequently becoming one of its original directors. He, along with Bickmore, was the first to introduce truly tropical fishes, albeit marine, into this country and it was through his urging of Barnum that made the venture possible. Furthermore, he was an accomplished author and a respected amateur naturalist and scientist. It is clear that, like Butler, Damon's importance in the early history of the aquarium hobby in America cannot be overstated.

It is interesting at this point to consider aquatic nomenclature. For a while there was some question as to the term to be employed to describe these "river gardens," as they were sometimes known. The word "aquarium" was championed by Gosse, "aquavivarium" by Lankester. This was the case stated by Lankester:

> "Having said thus much with regard to its history, I must say a word or two on the name. 'What's in a name?' is a question often asked to defend the use of inappropriate, absurd, and even wrong names. If you are going to give a thing a new name, then, indeed, it does not much signify what name you give it. A high authority, Sir John Herschell, says, that under these circumstances, a 'nonsense name' is best. Perhaps it is. But it is one of the glories of our English language that we can make use of words from other languages without corrupting our own; and we have a habit of naming new things significantly - let Panopticon, Perambulator, and Polytechnic, stand as examples.

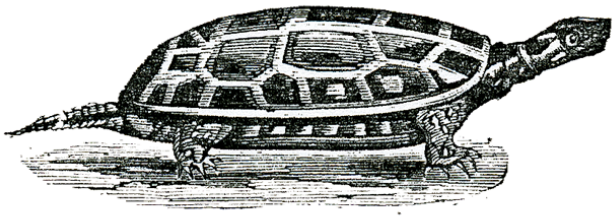


Figure 4-12. PAINTED TURTLE, *Chrysemys picta*, Collier & Hooper, 1866.

"All parties are agreed that to use old names in a new sense is bad. The collections of water-plants and animals that we have been speaking of have been called a 'Vivarium' and an 'Aquarium.' They are both Latin words, used by Roman folks in times of old. By a 'Vivarium' they meant a collection of any living animals: a wild-beast show, a hutch of rabbits, or a pond with fish, was equally a Vivarium. To call our water collections vivaria, then, is correct enough, but not distinctive. We might as well call it a show; and if we must Saxonize the word we want, it would be a water-beast-plant-show. It is clear, however, that we cannot use so uncouth a word as this, although our German friends might.

"The objections to Vivarium have led to the use of Aquarium; but here we have another Latin word with already a definite meaning. A Roman Aquarium was a reservoir for water, whether used for drinking, bathing, or other purposes. It may be applied to a jug or a pond: it expresses but one-half of our show. We have not only water but living creatures. When it became necessary to write the article Aquarium in the 'English Cyclopaedia,' these objections occurred to the word, and in a conversation with Mr. Charles Knight, he suggested, what appeared to me to be a very happy word - Aquavivarium - as expressing both the characters of our show. It was accordingly adopted, and published in that work in June, 1853. Mr. Gosse says, 'The objection to this is its awkward length and uncouthness, which render it unsuitable for a popular exhibition or domestic amenity.' I cannot think that the word is either awkward from its length, or uncouth. That it is unsuited for a popular exhibition can hardly be urged, when such words as Polytechnic, Zoological, Pantechnicon, Amphitheatre, and others, are popularly used. With regard to its interference with domestic amenity, I must leave to the decision of those who use it in their family circles. Several of my friends employ the word, and I have not heard of any 'domestic amenity' having been destroyed. For those who prefer the analogies of our own language, there is the Saxon-Latin word, Water-vivary, or the more purely Saxon, Water-show."

Hibberd stated the case as follows:

"Whether we should call the contrivance in which living aquatic objects are presented by the Vivary, Aquavivarium, Water Show, Aquarium, or aught else, has been settled by a power that is not always obedient to the perceptions of the learned. Public opinion is in favor of Aquarium, and I take it that the term has become popular because it is the most easy of ut-

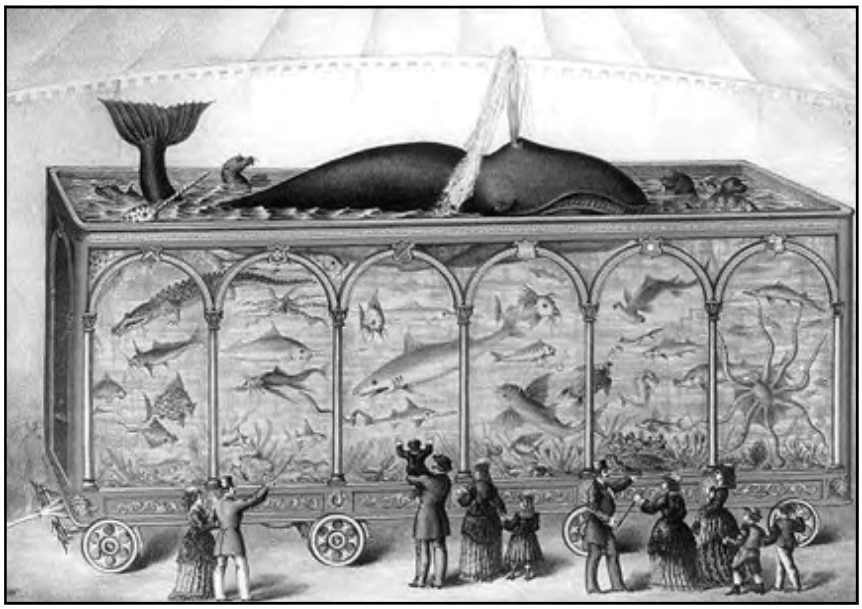
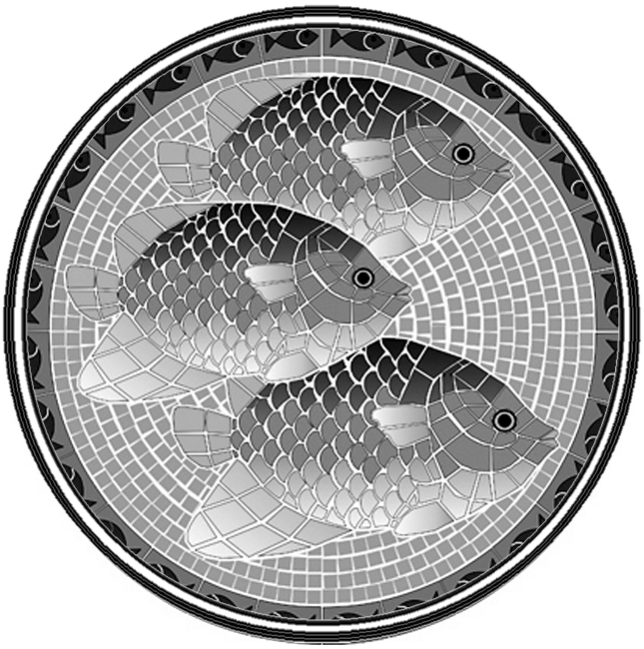


FIGURE 4-14. AN ADVERTISING POSTER FOR BARNUM'S AQUARIUM.

terance of any that have been devised. Dr. Lancaster's (sic) favorite designation is too long for general and familiar use, though it is, perhaps, philosophically the most correct.

"The term Vivarium, which takes the next place as suited for popular use, applies to any collection of animals - to a park of deer, a rabbit warren, a menagerie, or a wild beast show. Hence such a term could never convey the very special idea that we have before us in this instance. It is the water that gives the collection its special character; and water always reminds us of old Aquarius, who treats us to an annual drenching from his celestial watering pot. Aquarius triumphed, and the pretty prison in which his cool companions of the sign Pisces were doomed to be confined acquired his name; and, since it is better to follow than to oppose usage, we leave the philological part of the question to the learned, and adopt Aquarium as the name of our collection."

In 1857 an article appeared in FRANK LESLIE'S ILLUSTRATED NEWSPAPER, "A new pleasure - the Aquarium or Aquavivarium," thus effectively sidestepping the issue. Butler, whose book, *The Family Aquarium, or Aqua Vivarium* (1858) has been alluded to previously, also dodged the bullet. A book written a bit earlier in the same year by Arthur Mead Edwards, *Life Beneath the Waters, or the Aquarium in America*, did not hedge. However, since Butler referred to the collection at the American Museum as "The Grand Aquaria," and mostly used the term "aquarium" in his book, he along with Edwards must share the credit for the popularization of this term in the United States. Some backsliding occurred in 1866 with the publication of Collier and Hooper's, *The American Parlor Aquarium or Fluvial Aqua Vivarium*, and also with William P. Seal's 1883 monograph, *The Aqua-vivarium As An Aid To Biological Research*.



Collier and Hooper, however, although they acceded to popular usage and adopted the term "aquarium," make a reasoned argument why Aqua-Vivarium is correct and why Aquarium is not:

"First, we must define our title. In this country it is known as the Aquaria when in the plural number, and Aquarium in the singular. Throughout Great Britain and the continent of Europe it is called the Aqua-Vivarium: this name is correct for the following reasons. Amongst the ancient Romans an Aquarium was simply a reservoir or large vessel for holding water, without regard to the uses to which that water was applied. A collection of living animals or reptiles was called a Vivarium; in the earlier period of the discovery of our science, a name was required for it, and it was deemed essential to leave one that would convey and embrace within itself a truthful meaning of the subject; and the term Aqua-Vivarium was adopted, the first, *Aqua*, signifying water, and the latter, *Vivarium*, animal life. Now as our name Aquarium means simply a vessel for holding water, regardless of the uses to which that water may be applied, it is conclusively proven that the English name is the best and only correct one. But as the term Aquarium has been so generally adopted in this country, it will be used in this work."

CHAPTER 5:
THE BIRTH OF THE AQUARIUM HOBBY IN AMERICA

As was discussed In Chapter 1, the goldfish was firmly established in Great Britain by the middle of the Eighteenth Century and it is reasonable to surmise that it arrived in North America shortly afterwards (see page 13). DeKay (*Zoology of New York*, 1842) recorded the first releases in this country as having been in the late 1600s but I believe he was in error, referring to purported introduction dates into England instead. Jerome Smith, in his 1833 *Natural history of the fishes of Massachusetts*, stated: "The gold fish was introduced into this country, many years since, from England, especially for ornamentation." Smith's recommendations concerning the goldfish are interesting: "As it is customary in towns to keep gold-fish in glass vessels, as parlor ornaments, it may be useful to remark, that the water should be changed daily, without failure," and "The best kind of food, extensively prepared in Canton, and sold in the shops, is a mixture of flour paste, mixed with the yolks of hard boiled eggs."



Figure 5-1. GODEY'S LADY'S BOOK

The earliest substantive American magazine reference to the goldfish in the aquarium was the following poem that appeared in the March, 1853 issue of GODEY'S LADY'S BOOK. The magazine was founded by Louis Godey in 1830. Under his direction it was relatively insignificant, and employed the common practice of the times of reprinting articles from English periodicals. Not until Godey persuaded Sarah Hale to become the editor in 1836 did the magazine begin to gain widespread success, culminating in an extensive circulation of 150,000. The popularity of GODEY'S was so great that many women who would not otherwise be able to afford the subscription rate would join together to form clubs which would subscribe to the magazine, thus reducing the cost to each member. The widespread appeal of the magazine, due to its colored fashion plates and its articles on health, architecture, beauty, gardening and cookery, had a considerable influence on the women of the day.

"HOURS OF IDLENESS, by Richard Coe

Now within a crystal palace,
Crystal waters all around,
Little gold fish," spake sweet Alice,
"I have placed ye safe and sound:
Oft to gaze upon you, smiling,
I will come from day to day,
And, my fancy thus beguiling,
Pass mine idle hours away.

"Pure, sweet water from the mountain
Unto you will I supply,
Bubbling upward from the fountain
In my garden plot near by:
And while you, ye pretty creatures,
Are disporting gayly there,
I'll display your golden features
To my friends with fondest care.



Figure 5-2. THE PLATE THAT ACCOMPANIED RICHARD COE'S "Hours of Idleness."

"Maiden, I've a soul for beauty,
Wheresoe'er 'tis to be found;
Yet my first and fondest duty
Were to place them where abound
Many more such golden fishes,
In some streamlet running wide,
That they might enjoy their wishes
In the sweetly flowing tide.

"Liberty's a thing, sweet maiden,
Dearly prized by all on earth,
And the streamlet is their Aidenn,*
There their Maker gave them birth;

There they sported, oh! how gayly,
Life to them one happy dream,
Till they caught from heaven, daily,
Part of its own sunny gleam!

"Many an hour of idle leisure
Couldst thou, maiden, then employ,
Unto others giving pleasure,
Filling thine own soul with joy:
Some poor widow sitting lonely,
Care-enwrinkled, blind with age,
Oh! what would she give for only'
One short chapter from the page
"Of the book her aged pastor
Gave her ere he passed away,
Saying, 'For thy Lord and Master,
Ever, sister, "watch and pray:"
Soon I hope to meet thee, sister,
In the laud of light and love,
Gazing through the heavenly vista
Of the paradise above!"

Thus engaged in works of duty,
Would thy life glide sweetly by,
Till an angel of rare beauty
Whisper to thee thou must die
"One more cherub, now, sweet maiden,"
Thus the angel one would say,
"Want we in our distant Aidenn;
'Sister spirit, come away!'"

*** Aidenn, used by Poe, in his "Raven," for paradise.**

In GODEY'S LADY'S BOOK of November, 1854 one of the first allusions to the aquarium kept in the home appeared - a response to a query from one of its readers:

> "LIZZIE N. — An aquarium is a tank or basin filled with sea water, in which are kept fish, sea—weeds, etc., for amusement, as we would cultivate any other pets. If she desires it, we

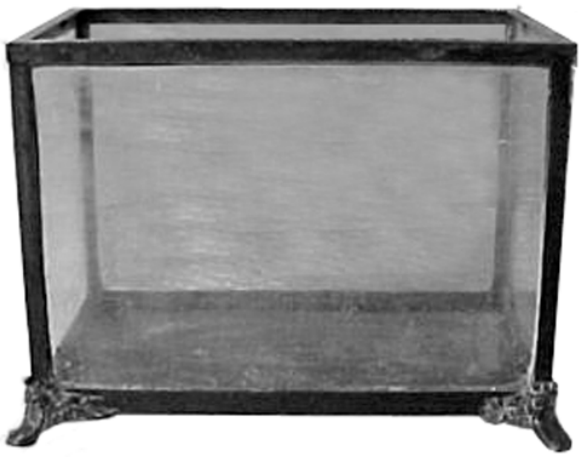


Figure 5-3. AS THE 19TH CENTURY PROGRESSED, AQUARIUM DESIGN BECAME SIMPLER. However, this one Is made of brass with a slate bottom and has very ornate feet. It measures approx 14" long by 11" high by 8 " wide.

will give a more extended description in our January number."

This "extended description" did appear but in the February, 1855 issue and, like most of the magazine's references to aquarium fish, was anonymous:

"GOLD FISH

Few objects can be more ornamental or amusing than a glass globe containing gold fish. The double refractions of the glass and water represent them, when in motion, in a most beautiful variety of sizes, shades, and colors, while the two mediums, glass and water, assisted by the concave-convex form of the vessel, magnify and distort them; besides, we have the gratification of introducing another element and its beautiful inhabitants into our very parlors and drawing-rooms.

"Some persons, however, exhibit their gold fish in, to say the least, a very extraordinary manner. They have a hollow globe in the interior of the one containing the fish, and in this hollow globe they put a canary, or other small cage bird, which appears to be hopping in the midst of the water, while the fish are swimming in a circle round it. This conceit, as our ancestors would have termed it, is tasteless and unnatural, and, in an esthetic point of view, richly deserves the severest reprobation.

"Though gold fish are seen to the greatest advantage when kept in glass globes, yet we regret to be compelled to say that they are very unsuitable dwellings for them. Just let us consider, for a moment, the conditions which are absolutely necessary for the health and even the existence of fish, and we will find that a glass globe, however beautiful they may appear in it, is one of the most inappropriate of vessels for keeping them in. In the first place, they require abundance of air. Now, scarcely any other shape than a globular one contains so much water with so little exposure to the air. Fish, too, require shade, not when we choose to give it to them, but when they feel the want of it; and it need scarcely be observed that all day long a glass globe is in a blaze of light. Still more, the water in a globe must be daily changed, consequently the fish must be lifted out either by the hand or a small net; and it is utterly impossible, however careful we may be, to handle or net these delicate, little, struggling creatures without injuring them, at one time or another. Indeed, we find— and we have had no little experience in the management of gold fish— that when we take a few from our store pond and put them in globes, they very soon begin to lose their brilliant colors, become diseased, and die. The large dealers in these fish are well aware of this fact, and keep constantly shifting from the pond to the globe, and vice versa.

"Where there can be a contrivance made for letting a flow of water, be it ever so small, say a drop a minute, in and out of the vessel containing the fish, the water will not require to be changed; and a small water-plant would afford the required shade.

"But, as the globe will ever be the most popular domicile for these fish, we shall give a few directions respecting how they should be treated in it. When purchasing a globe, procure



Figure 5-4. AN EIGHT-SIDED, VICTORIAN IRON FRAME AQUARIUM WITH EIGHT PERCHED EAGLES ON AN ORNATE DECORATED BASE.

as wide-mouthed a one as possible, and subsequently never let it be more than three parts full of water. By these means you will secure as much air for the fish as is possible under the circumstances. Keep the globe also in the most airy part of the room, never letting it be in the sun, nor near the fire. Change the water daily, and handle the fish tenderly when doing so. Some persons, when changing, use a small net, some the hand; we cannot say which is the better, but would advise our readers to use that which they may find the handier. Never give the fish any food; all they require, when in a globe, is plenty of fresh air and fresh water. They will derive sufficient nutriment from the animalculae contained in the water. Numbers of people kill their gold fish by giving them bread. Now, we do not deny that bread is good for gold fish, and that they will eat it, but the uneaten crumbs immediately get sour and deteriorate the water, to the great injury of the fish.

"One hint more: If, on getting up in the morning, you find a fish missing, and can discover no traces of it, you must not conclude that it has taken wings to itself and flown away, but that the cat has hooked it out with her claws and eaten it. Not that pussy hated wet feet less, but that she loved fresh fish more.

"Two diseases, being the most frequent, may he pointed out as the principal ills which it is the lot of gold fish to be heirs to. Sometimes a fish seems less lively than usual, and, on a close inspection, will have a sort of mealy look, and, in a day or two, this mealiness will turn out to be a parasitical fungus. We have heard of several remedies for this very mysterious disease, but never found any of them of the slightest use. There is absolutely nothing for it but to take the fish, at the first appearance of the disease, and throw it away, for it will not recover, and it will infect the others, and thus destroy the whole stock. We would, however, advise the inexperienced gold fish keeper, whenever a fish seems unhealthy, to place it by itself for a few days; he will then see whether



Figure 5-5. VICTORIAN, SHORT-PEDESTAL CAST IRON GARDEN AQUARIUM, CIRCA 1885.

the fungus makes its appearance; if not, the fish may recover, and be returned to the globe.

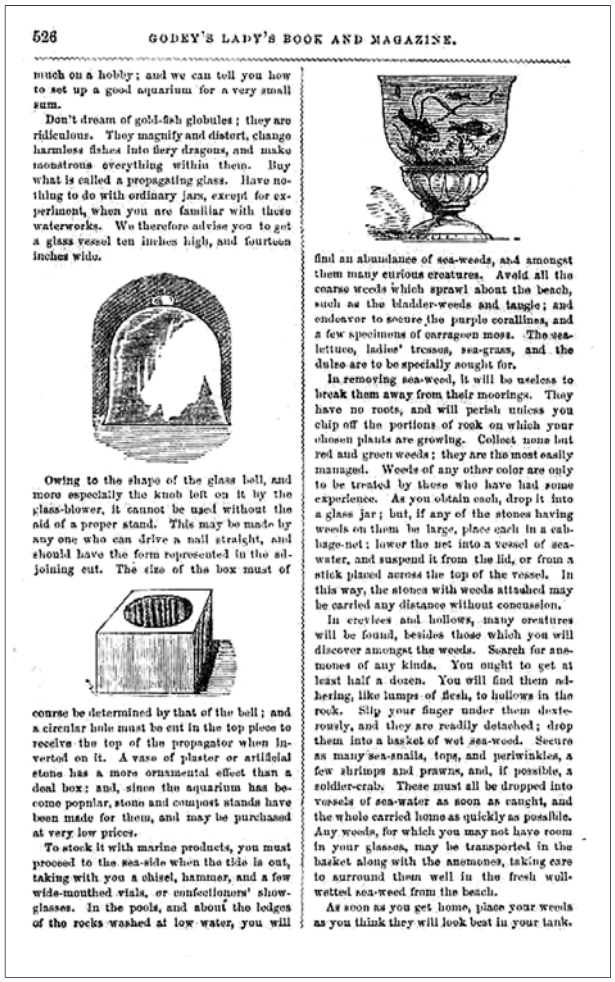
"The other disease is apparently an affection of the air-bladder, arising from being supplied with too little air. We have found fish recover from it when removed from the globe and placed in a pond. When under the influence of this disease, the fish swims sideways, with its body bent as if its back were broken, and in a short time dies. Whenever these symptoms are observed, the fish should be placed in a large tub of water, and a small stream of water allowed to drop into it; the water, through dropping becomes more aerated, and the fish, thus receiving an abundant supply of air, will frequently recover.

"The variety of colors among gold fish are, in all probability, principally caused by their being a sort of semi-domesticated animals. The rabbit, pigeon, duck, and many other animals, when domesticated, lose the distinctive markings of their race, and assume a variety of other colors. The young gold fish, also, are at first dark-colored, indeed nearly black, changing more or less rapidly according to their constitutional power. Besides, we have reason to believe that the silver-colored fish are most generally old

ones. The reader must recollect that size in fish, as in men, does not always betoken advanced age. Sauvigny, a French naturalist of the last century, published a most elaborate work on gold fish, with colored representations of eighty -nine specimens, exhibiting almost every possible shade or combination of brilliant orange, silver, and purple.

"Not only do these curious and interesting fish vary in color, but, what is more remarkable still, they vary in the number and size of their fins and tails, some having double anal fins, others triple tails; but when such anomalies occur, the other organs are deficient. Thus, the specimens with triple tails are sometimes without a vestige of dorsal fin. Out of twenty-four that we took out of our pond at random, and accurately examined, a few years ago, we found that no two were exactly alike. Some had dorsal fins extending more than half the length of the back; others, on the other hand, had dorsal fins consisting of five or six rays only; and one, to our amazement, had no dorsal fin whatever, and yet preserved its perpendicular position in the water with apparently the same ease as any of the others. As it was generally supposed, at that time, that a fish could no more preserve its equilibrium without a dorsal fin than a man could dance on the tight-rope without a head, the reader may fancy our surprise, and readily believe that we immediately communicated the fact to a scientific friend, when we were informed that a celebrated ichthyologist had, from observing a gold fish without a dorsal fin, been induced to make some experiments, the result of which proved that the fin was not of the extreme consequence previously attached to it.

"When gold fish are bred in ponds, under favorable circumstances, the young will attain the length of four or five inches in the first year; but their subsequent growth is much less rapid. The largest we have ever heard of, from an authentic source, did not exceed ten inches in length; the largest we have seen only measured nine."



526 GODEY'S LADY'S BOOK AND MAGAZINE.

much on a hobby; and we can tell you how to set up a good aquarium for a very small sum.

Don't dream of gold-fish globules; they are ridiculous. They magnify and distort, change harmless fishes into fiery dragons, and make monstrous everything within them. Buy what is called a propagating glass. Have nothing to do with ordinary jars, except for experiment, when you are familiar with these waterworks. We therefore advise you to get a glass vessel ten inches high, and fourteen inches wide.

Owing to the shape of the glass bell, and more especially the knob left on it by the glass-blower, it cannot be used without the aid of a proper stand. This may be made by any one who can drive a nail straight, and should have the form represented in the adjoining cut. The size of the box must of course be determined by that of the bell; and a circular hole must be cut in the top piece to receive the top of the propagator when inverted on it. A vase of plaster or artificial stone has a more ornamental effect than a deal box; and, since the aquarium has become popular, stone and compost stands have been made for them, and may be purchased at very low prices.

To stock it with marine products, you must proceed to the sea-side when the tide is out, taking with you a chisel, hammer, and a few wide-mouthed vials, or confectioners' show-glasses. In the pools, and about the ledges of the rocks washed at low water, you will find an abundance of sea-weeds, and amongst them many curious creatures. Avoid all the coarse weeds which sprawl about the beach, such as the bladder-weeds and tangle; and endeavor to secure the purple corallines, and a few specimens of carrageen moss. The sea-lettuce, ladies' tresses, sea-grass, and the dulse are to be specially sought for.

In removing sea-weed, it will be useless to break them away from their moorings. They have no roots, and will perish unless you chip off the portions of rock on which your chosen plants are growing. Collect none but red and green weeds; they are the most easily managed. Weeds of any other color are only to be treated by those who have had some experience. As you obtain each, drop it into a glass jar; but, if any of the stones having weeds on them be large, place each in a cabbage-net; lower the net into a vessel of sea-water, and suspend it from the lid, or from a stick placed across the top of the vessel. In this way, the stones with weeds attached may be carried any distance without concussion.

In crevices and hollows, many creatures will be found, besides those which you will discover amongst the weeds. Search for anemones of any kinds. You ought to get at least half a dozen. You will find them adhering, like lumps of flesh, to hollows in the rock. Slip your finger under them dexterously, and they are readily detached; drop them into a basket of wet sea-weed. Secure as many sea-snails, tops, and periwinkles, a few shrimps and prawns, and, if possible, a soldier-crab. These must all be dropped into vessels of sea-water as soon as caught, and the whole carried home as quickly as possible. Any weeds, for which you may not have room in your glasses, may be transported in the basket along with the anemones, taking care to surround them well in the fresh well-wetted sea-weed from the beach.

As soon as you get home, place your weeds as you think they will look best in your tank.

Figure 5-6. FROM GODEY'S LADY'S BOOK, June 1857.

In June, 1857, followed in July of the same year, GODEY'S published a lengthy two-part article on the aquarium. The introduction is of particular interest since it was the first time in print that the aquarium and "toy" were mentioned together, and lead the way for aquarium fishes to be popularly termed "toy fishes." Since this is also the very first significant article on the aquarium to appear in an American magazine, I also include the discussion of the freshwater aquarium

> "Fashionable as this new parlor toy has already become in England and on the Continent, so much so that the tanks and stock for them are a regular and large branch of the fancy agricultural houses, there are many of our readers who will doubtless hear of them for the first time. We have endeavored to quote from the most reliable and direct authorities; and to

make our directions more readily understood, they are accompanied by drawings to which we refer the young student in salt water and natural history.

"The aquarium is the toy of the day, and will eventually take its place as a toy of high order for the delight of the naturalist, the instruction of the young, the amusement of everybody.

"An aquarium consists of a tank made of plates of slate and glass cemented together at the edges, and bound with zinc. Rockwork is built up in them for both ornament and use. The rocks serve for the growth of seaweeds, which have no roots, but which cling by a sort of foot to the surface of the stone. They serve also as lurking-places for creatures which love darkness. The tank is filled with sea-water; the plants are carefully inserted where they are to remain; and, when they begin to grow and flourish, the animals are added, and the aquarium is complete.

"Just as, in a Wardian case, or common fernshade, there is no necessity for the admission of fresh air, so, in a well-arranged tank, there is no need of a change of water. By a system of compensation, the plants continually refresh the fluids which surround them, and the fishes get all the atmospheric air they require without needing to come to the surface for it. If, in observing tanks, you look closely at the stones which are just covered with a green slime, you will perceive that the whole of the surface is headed with bright globules. Now, the green coating is a mass of vegetation; and the globules are pure oxygen which the young plants are rapidly elaborating out of the water in which they grow. These globules ascend and charge the water with oxygen gas, which fishes require for breathing purposes, just as we ourselves do.

"Did you ever keep gold-fish in a glass globe? If you have, you will be pretty sure to remember that you kept them but for a short time, for they died off rapidly; and you got tired of continually purchasing them only to see them

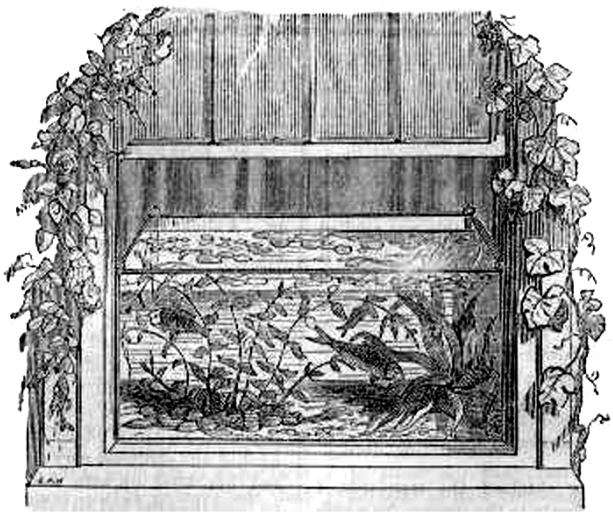


Figure 5-7. FROM GODEY'S LADY'S BOOK, June 1857.

perish. They died, as most other creatures do, for want of breath. They soon exhausted the oxygen in the water; there were no growing plants in it to supply fresh; and asphyxia, that is, suffocation, killed them. Resume the experiment; give your fishes a more natural lake to live in; let the globe be stocked with water-plants, as the rivers are in which fishes prosper before we catch them, and you will lose none, or at least very few, compared with your past experiences.

"But this is not all. The water-plants will create a mucous scum that will soon defile the water; and your fishes may die of poison, or, at least, languish in the midst of "muddy impurity." If your tank be filled with salt water, the remedy for this state of things is to add a few live periwinkles, or the conical shells called tops. These will eat up all decaying matter as fast as it collects, and amuse you while doing so; whereas, if a fresh-water basin be concerned, the fresh-water snails will do the same good service of preserving the purity of the element. We have mentioned the foregoing particulars for the purpose of explaining the philosophy of the aquarium, for herein is the chief interest of this choicest of toys. It illustrates the scheme of nature, which is a network of compensations.

"It is not every one who can afford to spend much on a hobby; and we can tell you how to set up a good aquarium for a very small sum.

"Don't dream of gold-fish globules; they are ridiculous. They magnify and distort, change harmless fishes into fiery dragons, and make monstrous everything within them. Buy what is called a propagating glass. Have nothing to do with ordinary jars, except for experiment, when you are familiar with these waterworks. We therefore advise you to get a glass vessel ten inches high, and fourteen inches wide.

"Owing to the shape of the glass bell, and more especially the knob left on it by the glass-blower, it cannot be used without the aid of a proper stand. This may be made by any one who can drive a nail straight, and should have the form represented in the adjoining cut. The size of the box must of course be determined by that of the bell; and a circular hole must be cut in the top piece to receive the top of the propagator when inverted on it. A vase of plaster or artificial stone has a more ornamental effect than a deal box; and, since the aquarium has become popular, stone and compost stands have been made for them, and may be purchased at very low prices.

"But a fresh-water tank is much more easily stocked, quite as interesting, and presents a very pretty spectacle. Get your weeds from ponds and rivers; plant them in a bed of sand and pebbles. Common duck-weed (*Valisnaria*), and the New River weed (*Anacharis*) are essential. By dipping your hand down into the mud at a river side, you will draw forth all sorts of curious vegetation, the smallest kinds being, of course, most suitable. A hand-net and a tin can are all the tools required to capture newts, tench, carp, water-beetles, pond-snails, and other fresh-water specimens. These are much more easily preserved in health than marine animals; and the stock is at any time readily replenished by a visit to the nearest brook or pool.

"The wealthy are availing themselves of the aquarium to add to the graces of their homes. Why should not the poor man have the enjoyment too? We look forward to the day when every village school shall be furnished with it for the instruction of youth in natural history, and when it will be a common ornament to the parlor window of the mechanic in town, and the farmer in the country. The family geraniums may have to clear away to make room for it. It may even compete with the flower-stand and the bird-cage; but it will compete honorably, and pay for the little space



FIGURE 1

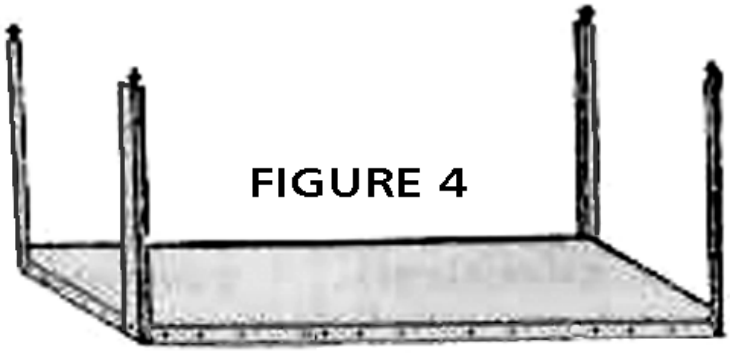


FIGURE 4



FIGURE 2



FIGURE 3

Figure 5-8. FROM GODEY'S LADY'S BOOK, June 1957.

it occupies in an exhibition at once novel, pleasing, and wonderful. We have done our best, in thus introducing the subject to our readers, to smooth down the difficulties of the undertaking, and especially to reduce its expense. Our second article will present the aquarium in quite another form, as simply and practically explained."

Part 2 of this article was much more detailed and described the construction of a flat-sided aquarium in detail:

"My first considerations were of what kind and shape I should make it, and where should it stand? I speedily fixed all the points, and decided upon a glass tank of such size and form as would fit in a window, which, having an aspect towards the west, appeared suitable for the purpose.

"The sill of the window was 2 feet 8 inches; its breadth 61 inches; the height of the first row of panes 11-1/2 inches. I procured from a glazier two sides, two ends, and a bottom, of the proper dimensions, cut from thick glass. The sides were each 2 feet 7 inches by 10-1/2 inches; the ends each 10-1/2 inches by 5-1/2 inches, and the bottom 2 feet 7 inches by 5-1/4 inches. I also obtained from a carpenter a well-dried inch-board, 2 feet 7-1/4 inches long, and 5-3/4 inches broad. This was for the bottom, and you will perceive that when the glass intended for the bottom was fastened down to it, there would be a space of one-eighth of an inch all round (equal to the thickness of the glass.)

"I next fastened to each edge of this board a straight plaited lath, an inch and a half broad, which, therefore, stood half an inch above the surface of would be a space of one-eighth of an inch above the surface of the board. The laths did not come quite to the corners of the board, for I left a space of an inch on each side of every angle. This board, with the lath at its edges, is represented in fig. 1.



Figure 5-9. FROM GODEY'S LADY'S BOOK, January 1958.

"I now cut out from the same lath (which was a quarter of an inch thick), two pieces, in the form of fig. 2. Both were 11 1/2 inches long; and the first was five-eighths of an inch broad at the top, and one inch at the bottom; the other was seven-eighths of an inch broad at the top, and an inch and a quarter at the bottom. These, by means of a little glue and sprigs, I fastened together at right angles at the edges, and stuck a little brass ornament on the top, when it presented the appearance of fig. 3. The greater width at the bottom extends upwards for an

inch and a half; and you will perceive that when this was applied to one of the corners of the board, fig. 1, it would just fit in the opening. As I wanted four of these, viz., one for each corner, and as they must be very strong, I took this model to an iron foundry, and obtained four castings from it. Two screw holes were now drilled through each, not opposite to each other, for then the screws would meet in the wood, but in the positions shown by the small circles in fig. 3.

"Having now obtained the standards, I screwed them firmly to the corners for which they were intended, which completed the vessel as far as is represented in fig. 4.

"It now remained to fit in the glass. For this purpose I procured some putty from the glazier. I first spread some putty all around the edge of the board forming the bottom, and put a few portions in the middle. It is not necessary to cover all the board. If the edges are carefully done all round, and a little in the middle, the glass will be held quite firmly, and, as I said before, there would be a space or margin of an eighth of an inch all round.

"The inside of the standards, which I first painted with white paint, now had some putty applied to them, and the sides and ends filled in. A slight frame-work round the top completes the vessel. No white lead should be allowed to get inside, as it will prove injurious to the fish."

The "plaited lath" referred to by the author is an easily bendable metal with holes at intervals of an inch or so used to support wall plaster. The lath that surrounds the board, except at the corners, was meant to provide support for the bottom of the tank. However, the lath was too soft to serve as vertical frames so they were taken to a foundry to serve as a pattern from which the foundry made four angle-iron supports. These were screwed into the wood bottom. The glass panes were then inserted into their proper positions, glazed with putty. The author shows the final aquarium with a thin framing all around the tank at the top. The glass used was crown glass between 1/8 and 1/16 of an inch in thickness, the author commenting that plate glass was too expensive for any but "rich amateurs."

Although the tank held 6-1/2 gallons of water, he limited the quantity to about 5 gallons. The aquaria of the day were very seldom filled to the top. Each day about two-thirds of a pint of water was removed and then a like quantity added as gently as possible. The tank had been in operation for about two months and during this time the only inmates lost were some very young dace, not an inch long.

As the author pointed out, the tank was not heated:

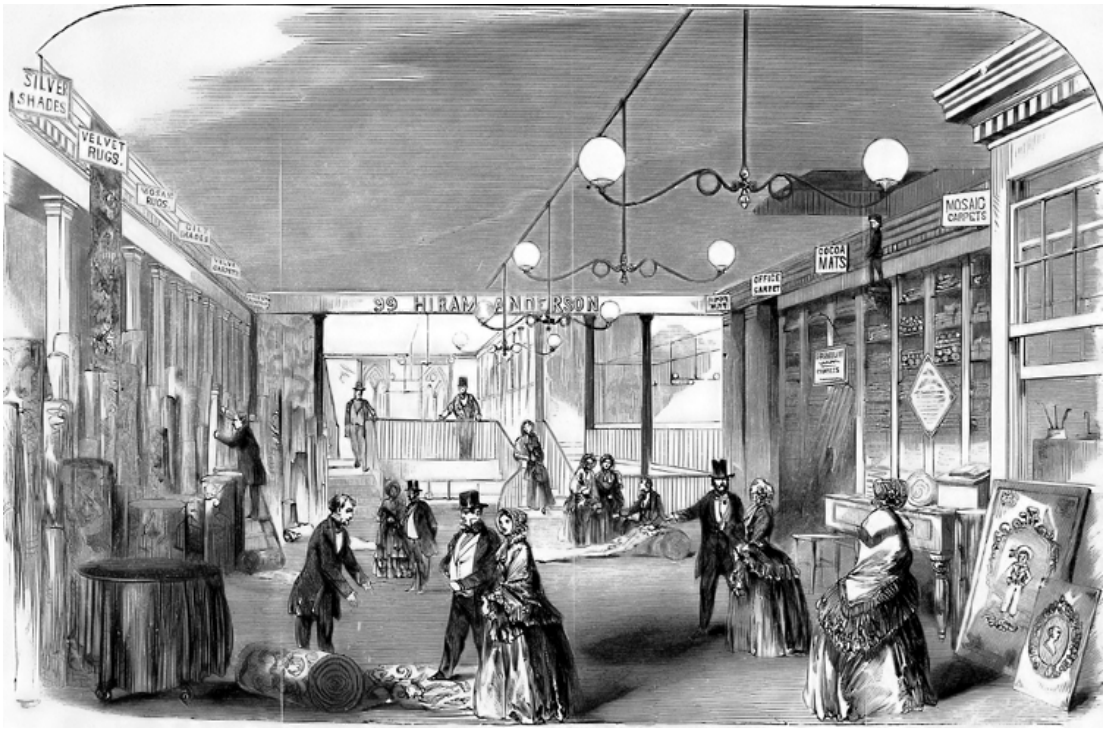
"My aquarium is inside the window. I have no doubt that, in the case of a very frosty night, the water might be frozen; but, at the same time, I expect injury neither to the glass nor the fish. The power of freezing water, in the act of congelation, is most prodigious, when anything tends to confine it in more than one direction; but the thickness to which the ice could attain, by one night's cold, would not, I feel certain, have any prejudicial effect on the glass. But if it should be allowed to go on freezing, day after day, without being broken in the intervals, the glass would most certainly be broken, because the superincumbent ice would be stronger than the glass, and as ice occupies more space than the water from which it is frozen, and the ice will not give way, the glass would inevitably be broken."

I might note that GODEY'S LADY'S BOOK was the first American magazine to introduce, "to ordinary usage," the subject of the home aquarium, the claim appearing in an article entitled, Marine and Fresh Water Aquariums that appeared in the January 1858 issue:

"The pretty fashion which we were the first to introduce to ordinary usage, on this side of the water, is already a rage, so much so as to demand the latest improvements in constructing and stocking them. It is the simplicity of the Aquarium that insures its success, and most excites the admiration of the scientific observer; for, like the Wardian case, it is an adoption of the means employed by nature to secure to



Figure 5-10. COGGESHALL, EDWARDS and BUTLER WROTE ABOUT THE HOME AQUARIUM IN THE LATE 1850's. To provide readers with an idea both of the clothing and store environments of this period, the above right shows the typical women's attire at the time (it was the reign of the hoop skirt – 1856 to 1866) and the above left shows a man in typical everyday attire. Below is the interior of the salesroom of Hiram Anderson in the Bowery, New York City, where he sold both American and imported carpets. Note the characteristic dress of the male and female customers. Thus was what the aquarists of the time were wearing!



certain kinds of life the conditions essential to continuance and prosperity."

The first aquarium book published in America was *Life Below the Waters or the Aquarium in America* (1858), written by Arthur Mead Edwards. There has been some question as to which was published first - *Life Below the Waters* or Butler's *The Family Aquarium, or Aqua Vivarium*, (the latter sold for 50¢) but as I have established previously (Klee, 2004) it is clear that the Edwards book came first. The Edwards book was first reviewed in June 14, 1958 and the Butler book was published on July 9, 1858, giving Mead priority by at least one and perhaps even two months.

Edwards was a microscopist and diatomist who published a number of short papers on both subjects, viz., *Note on the reproduction of individuals of the genus Actinia*, 1858; *On collecting, preparing, and mounting diatomaceae for the microscope*, 1859; *On some sub-peat deposits of Diatomaceæ*, 1860; and *The microscope in gynaecology*, 1875. Edwards corresponded in the 1880's with William Healey Dall (1845-1927), one of the great, late 19th century American naturalists. The collection of the Boston Society of Natural History's Section on Microscopy developed between 1857 and 1876 contains about 2,000 slides and 50 dried samples of diatoms and a variety of other microscopic objects, and the slides of material worked on by Edwards are strongly represented.

Edwards also collaborated with Christopher B. Johnston and Hamilton L. Smith on a paper describing methods for collecting, preserving and mounting diatoms. In this paper all three are given the title of "Professor" but it is not known what college Edwards was affiliated with. Hamilton Lanphere Smith (1818-1903) was rather well-known in his time (he was the editor/publisher of the *Annals of Science* for 1853 and 1854) and we do know that he attended Yale and went on to a career of teaching at Hobart College in Geneva, N.Y. Whether Edwards also taught at Hobart College is not, however, known.

Although Edwards' book was reviewed in the September 1858 issue of *THE ATLANTIC MONTHLY*, it did not fare well:

"Like so many books by which our literature is discredited, it is a work got up hastily to meet a public demand, and is deficient in method, thoroughness, and accuracy. There is much repetition in it, and the observations of its author seem to have been limited to the waters around New York, and to extend over but a short period. In spite of these and other minor defects, it may be recommended as containing much useful information for those just beginning an aquarium and forming an acquaintance with the sea."

Some of the criticism is justified since much of the material seems to have been taken from the British texts of the period. The book contains, for example, an illustration of one of the slope-back tanks so disliked by Gosse.

Nonetheless, Edwards did know what he was talking about when it came to the local fishes. In the March 1860 issue of *HARPER'S NEW MONTHLY MAGAZINE* in an article of 2,450 words titled, "A Fish Story," Edwards relates the (fanciful) relationship between Mr. Jones and Mr. Smith, the former an authority all matters of natural history.

Edwards starts his story with,

"My friend Jones is a naturalist; that is to say, he has made the fish, the birds, the trees, and, in fact, all of Nature's handiwork his especial study, and can tell you tell you tales of the forest and the field that would not only surprise my fellow-townsmen, as they have often surprised me, but more especially the dwellers among these unheeded wonders themselves."

In this article Edwards provides detailed information on sunfishes, sticklebacks, dace, eels, pipefishes, seahorses, electric eel (he specifically mentions *Gymnotus*), lungfish, and killifishes. He also takes to task those keeping goldfish in small glass globes, going into much detail describing the principle of the balanced aquarium. The following is Edwards' comments on dace and killifishes:

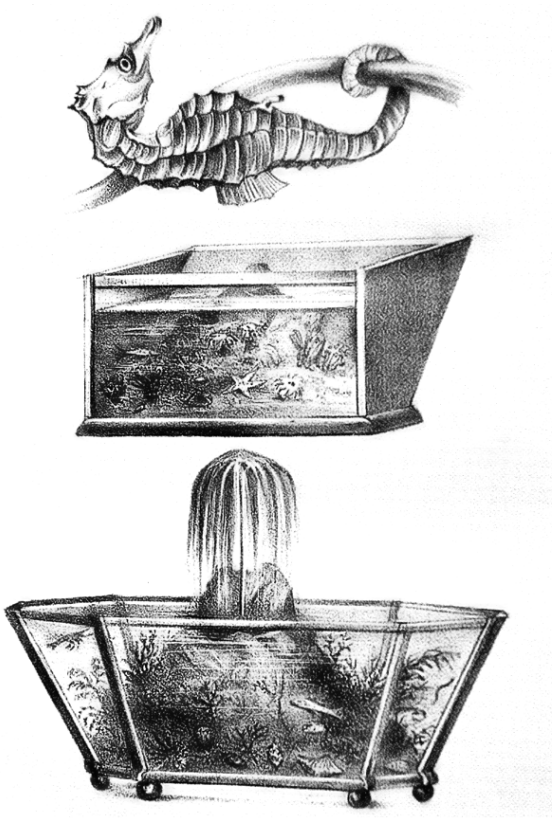


Figure 5-11. SOME OF THE ILLUSTRATIONS FROM EDWARD'S *Life Below the Waters or the Aquarium in America,* 1858, including the slope-back tank so despised by Gosse.

"As the antipodes of the stickleback, both in appearance and demeanor, look at those little pigmy dace that are so plentiful in many of our streams and brooks. The dace is a sleek, smooth little creature, having the back light olive-green and the belly white, with a stripe of dark brown running down the side and over the nose, which gives it a comical appearance. These fish are extremely docile and easily tamed. I once had four of them that would come to the side of the tank when I tapped on the glass, and when I fed them from my hand seemed rather to like being gently stroked. They died, poor fellows, all except one, of the slime - a disease which often attacks gold-fish, and for which I know of no cure.

"I have made pets of many kinds of fish, and have generally found them very docile. The fierce sun-fish is the only one of our small species that I have not succeeded in taming. I had a minnow once who had been christened by some friend 'Minny,' and an intelligent animal 'Minny' was. He would come to the surface of the water at my call, and always received his food of worms or meat from my hand; but he went the way of all fish at last, and I mourned over him in silence.

"By-the-way, our minnow - or, as it is called around New York, killie-fish - is not the same as the English fish which goes by that name, but belongs to an entirely different family. They are both small, and used as bait for larger fish. I have noticed a curious fact connected with our common killie-fish, and that is, that when it is frightened it loses a considerable part of its dark - gray color, and becomes of a silvery tint, but again acquiring the darker color if allowed to remain at rest for some time. I know of no other fish that 'pales' with fright."

Despite the fact that Edward's book was the first published in America, the first significant article (3,700 words) on the aquarium appeared prior to this in the February 1858 issue of *THE ATLANTIC MONTHLY* titled "My Aquarium." It was written by Annie Rebecca Coggeshall (although her name did not appear in the article), another instance where a woman came in first for a hobby record. On 10 May 1857 we learn that she

"…became the glad possessor of a tank capable of holding thirteen or fourteen gallons of water. Its substantial frame of well-seasoned oak, its stout plank bottom, lavishly covered with cement, promised to resist alike the heat and dryness from without and the wet within. The sides and ends, of double flint-glass, seemed to invite the eye across their clearness."

Coggeshall placed sand upon the bottom to the depth of two inches and ten gallons of seawater brought from a nearby wharf at high tide twenty-four hours previously were then added. It was not, however, perfectly clear and at the end of a week was still cloudy. On the fifth day after the tank was filled, marine plants (*Enteromorpha* and *Corallina*) were added, as well as ten small marine snails (*Buccina*) "in the hope that they would perform the part of gardeners

to the young plants." On the sixth day seven sea anemones (*Actinia*) were introduced and on the seventh day a horsefoot crab (*Limulus polyphemus*) was allowed to make his burrow in the sand. On the eighth day four hermit and soldier crabs and two sand crabs were placed into the tank; on the ninth day three fine sticklebacks and three saltwater minnows (not precisely identified; note that certain sticklebacks, such as the Two-spined stickleback, are found in saltwater marshes) joined the inhabitants; and on the tenth day, an eel and two prawns completed the collection.

Unfortunately, by the twelfth day the tank clouded up and the water began to smell. The inhabitants were removed to shallow pans containing fresh seawater while the author pondered what had gone wrong. One possibility was that, in order to guard against the possibility of a leak, the posts of the tank and its bottom had been covered with many coats of an alcoholic varnish and it was thought that not enough time had elapsed between the several applications for the alcohol to evaporate completely. It should be noted that by the 1860's this problem had been solved by the use of slate for the bottom, and sometimes even the ends, of the tank. The whole contents of the tank were removed and the tank was thoroughly washed on the inside, exposed for several days to the sun and air, and then soaked for twelve hours in clean seawater. The tank was then refilled and re-stocked.



Figure 5-12. A RARE PHOTOGRAPH BY MATHEW BRADY: Barnum's American Museum in 1850. Brady had a studio right across the street from the Museum.

Unfortunately, once again there were problems. At the end of about two weeks the plants suddenly became covered with a dull, bluish mould and at the same time a greenish tinge pervaded the water, rapidly decreasing its clarity. In five days no object could be recognized six inches from the glass. It was thought that the problem was an excess of light, so a double curtain of glazed muslin was stretched across the window behind the tank and the tank, both top and sides, were wrapped in folds of paper. A week of darkness changed the deep green to a dingy olive but the inhabitants, however, were not happy. Light therefore was again admitted freely to all but one side of the tank. This was an improvement, but not entirely satisfying, so the tank once again was emptied and reestablished for a third time. This time everything went well and after a few months the author had fifty living creatures in his tanks, all doing quite nicely.

As previously mentioned, there was a tendency for the English writers of the day to throw into their writings pious interjections and Coggeshall was no exception, ending with the following:

> "New evidences are here disclosed to me of God's care for his creation, deepening my faith in the fact that he is not merely the great First Cause, but still the watchful Father. New revelations teach me of his sympathy in our joys, as well as of his care for our necessities. The Maker's love of the beautiful fills me with gladness, and I catch new glimpses of those boundless regions where the perfection of his conceptions has never been marred by sin; and where each of us who may attain thereto shall find a fitting sphere for every energy, an answering joy for every pure aspiration."

Annie Rebecca Coggeshall is the first female American aquarist of record. She was born in 1819 in Newport, R.I. and knew Charles Hammett well (we'll meet him shortly). Her father was a banker who was a trustee of the Long Wharf Public School and a benefactor of the Redwood Library, both of Newport. Annie was a school teacher and never married. She died in 1897 at the age of 79.

The two seminal books published in 1858 just mentioned were, like Gosse's books, primarily concerned with marine aquaria. Butler's book, based on his experiences at the American Museum, was the more authoritative of the two. For his qualifications as a competent authority, Edwards offered the fact that he had kept an aquarium for two years! His recommended cure for body fungus or "slime" was to place the fish in a bucket of water and throw sand over it. According to Edwards, the fish would then rub itself and eradicate the slime! Although Butler's book was heavy with the literary style of the day, e.g., speaking of plants he states: "A plant is philosophically called an organized body without voluntary motion," his advice was generally sound. Due to their fouling the water he warned against feeding bread or biscuits and instead recommended chopped earthworms, pieces of dried beef, brewer's ale grains, the spawn of mollusks and well-cleaned millet seeds.



Figure 5-13. THE AMERICAN MUSEUM (flags flying) AS SEEN BY "UNCLE HIRAM" STROLLING THROUGH THE PARK.

It is from Edwards, however, we learn that "objects for the purpose of stocking the Aquarium can be now purchased in New York City, and may soon be for sale in other of our large cities." Indeed, in 1859 Burgess Greenwood was in business in his Broadway pet store in New York City and by 1864 the business was dealing exclusively with freshwater stock and was thriving. A chemist by the name of Elijah D. Davis, also of New York City, manufactured an aquarium cement sold by Greenwood. Interestingly, both tanks and stock were shipped via rail express to the Midwest. Edwards also points out that, for the price of a six-cent car ride, New Yorkers could find their own specimens if they would take the trouble to comb the East River shoreline at low tide.

Another aquarist of historical interest during this early period was introduced when, writing in THE ATLANTIC MONTHLY for July 1858, Annie Coggeshall commented as follows:

> "The best tanks, so far as we know, that are made in this country, are those of Mr. C. E. Hammett, of Newport, Rhode Island. But the tank is of little importance, if one cannot get the water, the seaweed, and the stock; and therefore Mr. Hammett undertakes to supply these also. He will send, not the water itself, but the salts obtained by evaporation from the quantity of water necessary for each aquarium. These are to be dissolved in clear spring-water, (previously boiled, to insure its containing no injurious living matter,) and then the aquarium, having first had a bed of cleanly-washed sand put upon its bottom for about an inch or an inch and a half in depth, and this in turn covered with a thin layer of small pebbles, - though these last are not essential, - is to be filled with it."

The following is part of an article Charles E. Hammett (1823-1902) wrote, titled "The Aquarium or Aqua Vivarium," that appeared in SCIENTIFIC AMERICAN in 1857:

> "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 lamplight, 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 than 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 rockwork 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 study (for study it is) of Aquaria is 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.



Figure 5-14. ANOTHER VICTORIAN CAST IRON OCTAGONAL AQUARIUM. This one had a tapered column adorned with scroll, bird and leaf decorations, and was topped off with a ceramic fountain. Its origin was Pennsylvania, circa 1865-1875.

"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 seawater.

"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."

Appended to the article was the following editorial comment:

"Mr. Hammett's modesty forbids his intimidating in the above article that he is prepared to furnish Aquaria tanks of superior construction (an improvement of his own) to

such persons as may desire to try their skill in raising the pisces, molluscs, and articulates of the mighty ocean, and to derive instruction from serving the life and habits of those curious creatures."

The marine side of the hobby, however, gave way by the mid 1860's to the freshwater side. In 1864 Burgess Greenwood's aquarium business in New York was dealing exclusively with freshwater stock and was thriving, and two years later John Collier was bemoaning the fact that "at the present time there is not an establishment in New York, or even in the United States, where any of the marine objects suited to a salt water Aquarium can be procured." However, the freshwater side of the hobby was not without its problems as Collier also observed that, although the popularity of the home aquarium had steadily increased, "Undoubtedly they would become much more popular if experienced men in the science were engaged in their manufacture and sale, for few of them know anything at all of the subject, or are acquainted in the least manner with the habits of our fish, or the peculiarity of our Aquatic plants, their knowledge being confined to buying of Gold-fish by the hundred, and retailing them their customers." In any event, American aquarists in the 1850's, as did their British counterparts, of course, met all three of the criteria for STAGE III.

The next significant article on the aquarium appeared in a book written by Levina Buoncuore Urbino (?-1888) in 1860 with the lengthy title of *Art recreations: being a complete guide to pencil drawing, oil painting ... moss work, paper mache ... wax work, shell work ... enamel painting, etc., by Madame L.B. Urbino, Prof. Henry Day and others. With valuable receipts for preparing material*. The following are selections from the section on "Aquaria":

"The first requisite is a tank, which can be of any shape to suit the maker's fancy and his facilities for construction. The square or oblong forms are generally preferred, being easier of manufacture, although octagons, or other angular forms, are readily made. Great care must be taken that the tank is perfectly water-tight; and this is one of the chief difficulties to



Figure 5–15. ROSS COMPOUND AQUARIUM MICROSCOPE, 1875. The large flat tripod foot is designed so the microscope can be placed adjacent to the flat surface of the aquarium for observation.

be encountered. Of course, simple tanks can be made of glass tumblers, china bowls, etc., but we are speaking of those on a more extensive scale. The tank is, in few words, a water-tight box with glass sides and a slate or marble bottom. A cabinet maker, or any ingenious person, can easily make one by constructing the skeleton of a box, or the frame of a box, and fitting glass sides into solid grooves in the frame. Also have a glass slab for a cover, raising it a little from the top of the tank by placing bits of cork upon the edges, in order that air may pass over the water. The dimensions can be decided according to taste or convenience. The following are found to be very available sizes:

18 inches long, 13 inches wide, and 13 inches high.
30 inches long, 18 inches wide, and 18 inches high.
48 inches long, 24 inches wide, and 24 inches high.

"Having completed the tank, the next, and perhaps more difficult step, is to fit it up, or "stock it"; and here is a field for the display of

taste and beauty. Of course, this process depends upon whether the tank is for a salt or fresh water aquarium - the tank itself being the same for both. In a small aquarium it is not best to fill up the tank with rock-work, as all the space thus occupied diminishes to that extent the room for the animal and vegetable life. Before fitting up the tank, it should be well soaked for two or three days, to remove any loose particles and all scent and foul matter from the cement used in fastening the glass sides, as any such impurities will destroy all the animal life contained in the tank. Cover the bottom of the tank evenly to the depth of one or two inches (the depth is not essential) with coarse sand, pebbles, small shells, etc., washed clean. In this layer the aquatic animals will delight to amuse themselves. Next, place stones and rocks of different sizes in the tank, piling or adjusting them so that open spaces will be left between the stones, corresponding to the caverns and hiding places in the beds of brooks and on the bottom of the ocean. Allow one piece of rock to project above the surface of the water, so that such of the animals as desire can crawl up and breathe atmospheric air. The tank should be filled perhaps two thirds full of water, and the height marked on the side of the tank.

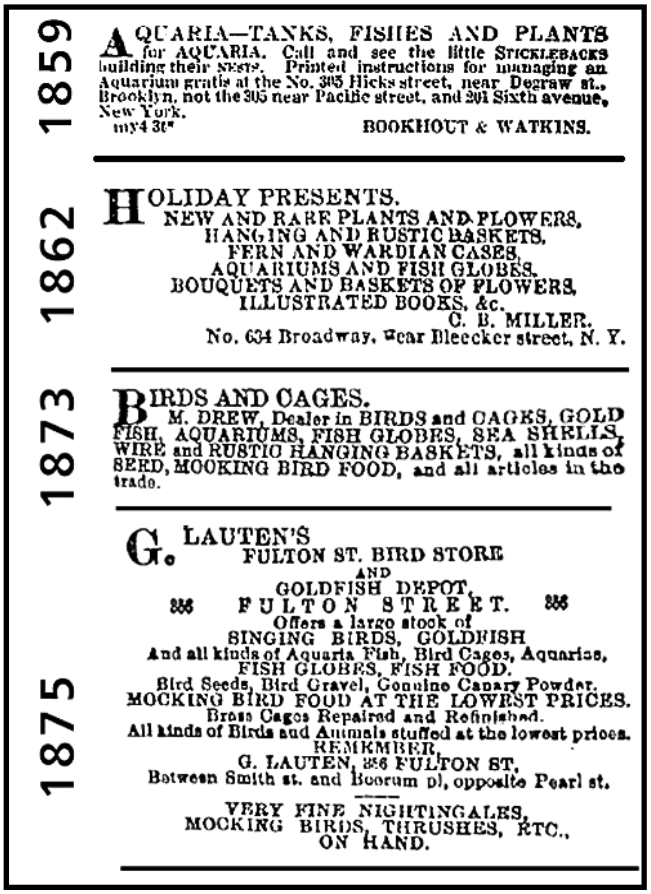


Figure 5-16. EARLY ADVERTISEMENTS FOR AQUARIUMS, FISH, AQUATIC PLANTS, AND OTHER SUPPLIES. Apparently Mr. Lauten would not only sell you a fish but he would stuff it also!

"As the water evaporates, fill up with fresh water to this mark. If the aquarium is for salt water, the filling up to compensate for evaporation should be done with fresh water, (not sea water,) as the salt remains in the tank after the evaporation. The water should be occasionally supplied with fresh air, by means of a syringe, and changed from time to time during the first week, or until the plants and animals seem to thrive naturally.

"The aquarium should be stocked with the vegetable life first, and the plants should be suffered to remain a week or more before any animals are introduced, as some plants may die, and dead leaves and sticks may accumulate. These should be removed as soon as seen.

"Care must be exercised to have neither too strong nor too feeble a light. The fresh water muscle, and all the genera and species which abound in ponds and creeks, are suitable for the aquarium, and the same may be said of the fishes. The spawn of the mollusca furnishes some food for the fish; but they should be fed daily, not with bread, but with red worms cut up small, and occasionally with millet seeds. Pieces of dried beef, in minute fragments, will answer as a substitute for worms. All impurities should be removed from the tank, to prevent an unpleasant odor, and to preserve the life of the animals."

The article commenting on Roman fishkeeping cited in Chapter 1 (*THE ATLANTIC MONTHLY*, September 1861) was written by David Williams Cheever, a prominent surgeon at the Boston City Hospital. He wrote, for example, a historic article in the August

1860 THE ATLANTIC MONTHLY about the ubiquitous use of tobacco throughout history, including observations regarding its effects on the health of its users. After introducing the subject of present-day fish keeping (i.e., 1861) Cheever went on to examine the custom of overcrowding goldfish in glass globes. The discussion is reminiscent and similar to that presented in Arthur M. Edwards' March 1860 HARPER'S NEW MONTHLY MAGAZINE article. Cheever then went on to describe the requirements for an aquarium:

> "Any vessel that will hold water can, of course, be readily converted into an aquarium. But as we desire a clear view of the contents at all times, glass is the best material. And since glass globes refract the light irregularly and magnify and distort whatever is within them, we shall find an advantage in having the sides of the aquarium parallel and the form rectangular. As the weight of the aquarium, when filled with water, is enormous - far more than we should at first imagine - it follows that it must be capable of resisting pressure both from above and from within. The floor and stand, the frame and joints must be strong and compact, and the walls of plate or thick crown glass.
>
> "The bottom should be of slate; and if it is designed to attach arches of rock-work inside to the ends, they, too, must be of slate, as cement will not stick to glass. The frame should be iron, zinc, or well-turned wood; the joints closed with white-lead putty; the front and back of glass. There is one objection to having the side which faces the light of transparent glass, and that is that it transmits too much glare of sunlight for the health of the animals. In Nature's aquarium the light enters only from above; and the fish and delicate creatures have always, even then, the shady fronds of aquatic plants or the shelter of the rocks - as well as the power of seeking greater depths of water, where the light is less - to protect themselves from too intense a sunshine. It is, therefore, sometimes advisable to have the window side of the aquarium made of glass stained of a green color. It is desirable that all aquarial tanks should have a movable glass cover to protect them from dust, impure gases, and smoke."



Figure 5-17. A SCENE FROM THE VICTORIAN AGE.

Another interesting part of this article is a long quote from a certain "C. Percival":

> "The emanations from paint and putty are often fatal in new tanks. Several weeks' exposure to water, air, and sunlight is necessary to season the new-made aquarium. Of equal consequence is it that the water be absolutely pure; and if brought from the sea, care must be exercised about the vessel containing it. Salt acts upon the glazing of earthen ware of some kinds. Stone or glass jars are safest. New oak casks are fatal from the tannin which soaks out; fir casks are safe and good. So delicate and sensitive are the minute creatures which people the sea, that they have been found dead on opening a cask in which a new oak bung was the only source of poison. And no wonder; for a very slight proportion of tannic acid in the water corrugates and stiffens the thin, smooth skin of the

anemone, like the tanning of leather.

"A certain natural density of the sea-water must also be preserved, ranging between no wider limits than 1.026 and 1.028. And in the open tank evaporation is constantly deranging this, and must be met by a supply from without. As the pure water alone evaporates, and the salts and earthy or mineral constituents are left behind, two things result: the water remaining becomes constantly more dense; and this can be remedied only by pure fresh water poured in to restore the equilibrium. Hence the marine aquarium must be replenished with 'fresh water', until the proper specific gravity, as indicated by the hydrometer, is restored.

"The aquarium may be found some morning with a deep and permanent green stain discoloring the water. This unsightly appearance is owing to the simultaneous development of the spores of multitudes of minute Algae and Confervae, and can be obviated by passing the water through a charcoal filter. When any of the fishes give signs of sickness or suffocation, by coming to the surface and gulping air, they may be revived by having the water aerated by pouring it out repeatedly from a little elevation, or by a syringe. The fishes are sometimes distressed, also, when the room gets too warm for them. A temperature of 60° is about what they require. (***Author's Note:*** **Percival is talking about coldwater marine fishes here.)** And they will stand cold, many of them, even to being frozen with the water into ice, and afterwards revive.

"A novice is apt to overstock his aquarium. Not more than two moderate-sized fishes to a gallon of water is a safe rule. Care, too, must be taken to group together those kinds of creatures which are not natural enemies, or natural food for each other, or a sad scene of devastation and murder will ensue."

Another female aquarist who made mention of the aquarium appeared on the scene in 1863. The following appeared in Virginia Penny's (1826-?) book, *The Employments of Women: a Cyclopædia of Woman's Work*:

"One of the most innocent and pleasing amusements that has attracted attention for some time is the making of aquaria. The cases are formed of plate glass, square, oblong, circular, or any shape to please the fancy of the owner. The glass is tightly sealed when joined. The aquaria are of two kinds: one is formed of salt water, and contains marine plants and animals; the other contains fresh water, and such plants and animals as are found in rivers and smaller streams. They form a beautiful addition to a garden, conservatory, or drawing room. Rocks form the foundation, and the soil on them furnishes subsistence to the plants. Zoophytes, mollusca, and fish form the inhabitants of the aquarium. Insects also find a place in this miniature "ocean or river garden." The size for parlors is from one foot to three in length. The largest aquaria in this country are now on exhibition at Barnum's Museum, New York. "They comprise over one thousand specimens of living animals and vegetation. In

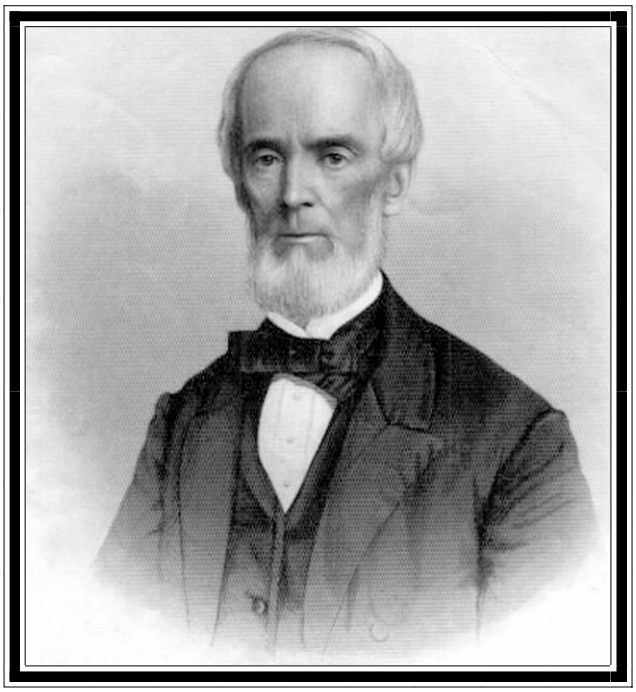


Figure 5-18. WILLIAM C. CUTTER WRITING AS "HIRAM HATCHET," EXTOLLED THE VIRTUES OF THE AQUARIUM AT BARNUM'S AMERICAN MUSEUM IN THE 1850's.

these tanks the water is seldom changed, the natural operations of the plants and animals keeping it always pure." They are made to order in New York, and we think might afford a pleasant pastime to some, and pecuniary profit to others. A work giving directions for making them has been published in New York. The author is a Mr. Butler, who has got up the mammoth aquaria in Barnum's Museum. There are two establishments in New York where they may be ordered, and specimens seen."

Regarding the impetus public aquaria in England provided to the aquarium in the home, something along the same lines apparently happened in the United States when Barnum established his Aquarium at the American Museum in 1856. ROBERT MERRY'S MUSEUM (1841-1872) - this was not a museum but one of the premiere U.S. children's magazines of its day - published the work of the most important authors for children. One of these stories was "Uncle Hiram's Pilgrimage" by William C. Cutter writing as "Hiram Hatchet." In this story "Uncle Hiram" narrates his journey down Broadway where humorous encounters with "the natives" punctuate heavily illustrated descriptions of New York City landmarks, including Barnum's American Museum. The following is a short section taken from the January 1858 issue (the series went from 1857 to 1860):

"**Elsie**. Oh, Uncle! How long we have been waiting for you to tell us more of the Museum, and of all the wonderful things that are there!

Uncle Hiram. I fear you will not find any other part as interesting and curious, as that which contained the Aquaria.

Elsie. Perhaps not, Uncle. I never heard anything more curious or beautiful, and I mean to have an aquarium of my own, by-and -by.

Fanny, Harry, and all the rest. And so do I, and so do I, and so do I.

Frank. And soon we can go fishing in our own parlors, without any danger of wetting our feet, or freezing our fingers.

Uncle Hiram. Well, Frank, I will join you, some stormy day, and try the fun of fishing in a glass vase, while seated in a rocking-chair, with Hannah playing on the piano, or reading some luxurious book. But, we will now to the Museum, for we have much to see there yet, before I can proceed with my Pilgrimage."

In the July 1858 issue of THE ATLANTIC MONTHLY, Annie Coggeshall, wrote: "Let no one who has been to Barnum's Museum, to look at what the naming advertisement elegantly and grammatically terms 'an aquaria,' fancy that he has seen the beauty of the real aquarium." Barnum's American Museum clearly had an effect on the aquarium hobby in America.

Finally, we present in its entirety an article entitled, "How to Keep Gold Fish in Health," that appeared in GODEY'S LADY'S BOOK for November, 1870:

"1. Cover the bottom of the aquarium with clean coarse sand (obtainable at the aquarium dealers) to the depth of about an inch and a half. Avoid fine sand and soil.

2. Insert the weeds with a stone over each bunch, to prevent their disturbance by the fish.

3. In a few days, when the plants show that they are thriving, by the production of oxygen bubbles, put in the fish— not before.

4. Beware of the common fault of putting in too many fish, and be careful as to the admission of sticklebacks, injurious insects, &c. Some sorts of beetles are very destructive to fish.

5. Never give the fish bread. In good condition they require no feeding; but a pinch of dry vermicelli, broken into minute pieces with the finger and thumb, is good for them. They are very fond of it, and will soon take it from the fingers when called. If forgotten, no harm will follow.

6. Do not let the aquarium remain in a strong sunshine or glare of light; a position between two windows is the best. If in a window, the light should be regulated with the blind or frosted glass.

7. In addition to the rooted plants, it is well to have a few at the round-leaved water-plants floating upon the top. The water in my

aquarium has not been changed for twelve months; I simply add a little from time to time to make up for diminution by evaporation. If the fish remain near the surface, gasping for air, it is a proof either that the aquarium is overstocked with fish, or that the weeds are not growing healthily, through some of the foregoing rules being broken. It is well to have a few water snails in the aquarium. A sponge fastened to a stick will suffice to cleanse the interior sides, leaving the side next the light uncleansed, whereby the light is qualified. Once fairly started, there is no further trouble whatever."

What is remarkable is the statement that goldfish "require no feeding." Actually these kinds of statements were not uncommon in the literature of the Nineteenth Century. In the January 1858 issue of GODEY'S LADY'S BOOK the author remarked, "We seldom feed our marine stock." What these fish lived on is a mystery but they may have subsisted on the algae that typically grew in the tanks of the day.



Figure 5-19. "The Aquarium," from the WEEKLY WELCOME, 1879.

In leaving this look at the stirrings of the aquarium hobby in the United States, one should be skeptical to claims that the aquarium craze in Great Britain was responsible for the establishment of the hobby in America. Social conditions differed substantially between the two countries and as a consequence the dawn of the American hobby in no way resembled that of Great Britain. It was the Industrial Revolution in England that afforded the increased income and leisure time that permitted women to participate to the degree that PUNCH felt compelled to satirize. American women had neither the inclination nor the resources to descend en masse, hoop skirts hiked up, to frolic in the tide pools of Boston and New York. It was only in the ten years after the Civil War ended in 1865 that the Industrial Revolution in America caught up.

In point of fact, unlike in Great Britain, American women were a somewhat less significant factor during the nineteenth century in a hobby where, to paraphrase Edwards, the "gentleman part of the community" predominated. Edwards, at one point in his book, spoke to "the lady part of the community, whom I hope soon to see taking as much delight in the fitting up and management of these beautiful parlor ornaments as their sisters on the other side of the Atlantic."

Perhaps the most important contribution by Great Britain to the aquarium hobby in America was its books. The demand for British aquarium books prompted their reissue, many being sold in the United States as "new" editions. Taylor's *The Aquarium; Its Inhabitants, Structure, and Management*, for example, first appeared in 1876 but was reissued in numerous "warmed up" versions as late as 1910.

However the aquarium hobby originated in this country, the activities of this handful of early American aquarists deserve acknowledgment, and their names certainly must forever be etched on the figurative tablet commemorating the pioneers. William Emerson Damon, James Ambrose Cutting and Henry D. Butler share an honored niche as the first of the master aquarists who were to follow them.

CHAPTER 6:
AMERICAN PROGRESS

One of the most accomplished aquarium writers in the early days in the hobby was Robert A. West of New York City, later of Georgetown. Damon himself said of West that he was: "...the most devoted lover of aquarial science that I have ever met. On his practical wisdom and counsel I could always rely." West was probably the first one to describe correctly the spawning of sticklebacks in the aquarium. Furthermore, he was the first aquarist, English or American, to write much in detail concerning freshwater aquaria. His *Fresh And Salt Aquaria* appeared in a *Governmental Report of The Commissioner of Agriculture for the Year 1864*, published in 1865.

A number of indifferent aquarium books that were published in England about this time made their way to this country, e.g., John G. Wood's *The Fresh and Salt-Water Aquarium*, editions of which appeared between 1859 and 1869, and George B. Sowerby's popular *History of the Aquarium* in 1865. Although a clergyman, Wood had no parish or parishioners to distract him from the production without end of rather second-rate books on natural history.

The first American aquarium book to appear on the scene after those by Edwards and Butler was Collier and Hooper's *The American Parlor Aquarium or Fluvial Aqua Vivarium* in 1866. Since this is not only the rarest of all the American aquarium books and was the first one to deal exclusively with freshwater fishes, it is worthwhile to single it out for special attention. This marked the first time that an American aquarium book concerned itself solely with freshwater fishes. John Henry Collier (1837-1879), also the publisher of the book, was born in Alexandria, Egypt of English parents and emigrated from Great Britain in 1859. From 1865 to 1872 he conducted business in Brooklyn as a dealer in birds. Bird shops were popular in New York at the time and many of them sold fish, mostly goldfish and natives, as a sideline. It seems Collier's shop followed the same model.

It is evident that Collier had a connection with Barnum's American Museum. In his discussion of the golden dace on page 65 he writes: "I placed some fine specimens of this fish in the Aquaria of the American Museum, where they remained for a long time." I doubt Collier could have done this were he not either working there at the time or providing specimens for the exhibits on a regular basis. It might be that Collier relieved Henry Butler of part of his load when the latter was dividing his time between the American Museum in New York and the Boston Aquarial and Zoological Gardens between 1859 and 1861. Collier also traveled to England where, with his friend, Capt. J. H. Mortimer (of Savannah), they introduced the common sunfish, *Pomotis vulgaris* (= *Lepomis gibbosus*), into private ponds.

It is clear from reading the text that the book was written over a relatively extended period of time. On page



Figure 6-1. A SIX-SIDED VICTORIAN AQUARIUM. This one had no top frame and was provided with six large and solid bronze Dolphins as vertical supports. It sits on a green piece of granite placed on a wrought iron base with a glass vase in the center.

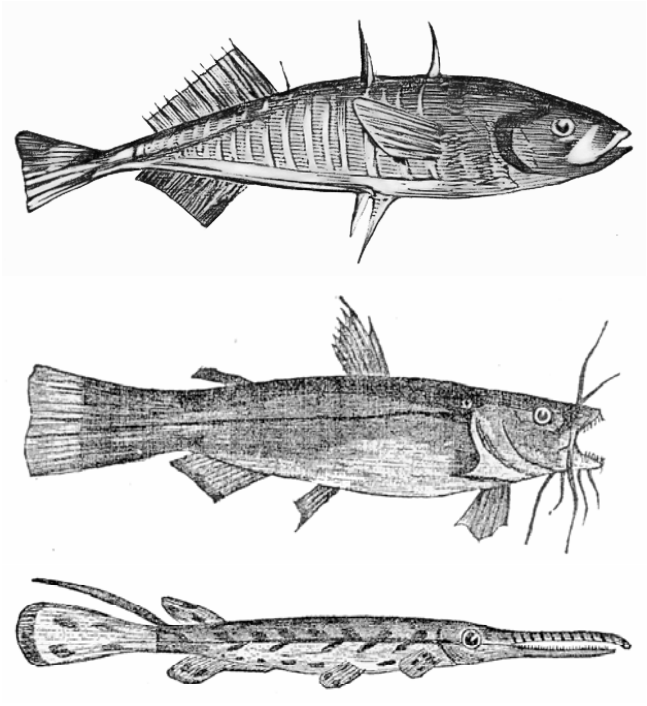


Figure 6-2. SOME ILLUSTRATIONS FROM COLLIER AND HOOPER

TOP: THE TWO-SPINED STICKLEBACK, *Gasterosteus biaculeatus*.

MIDDL E: THE BROWN BULLHEAD, *Ameiurus nebulosus*.

BOTTOM: THE ALLIGATOR GAR, *Lepisosteus spatula*.

The various stickleback species and the bullhead were the only fish bred in the aquarium in 1866,

22, for example, the author writes: "In the Aquaria of the American Museum in New York, which at the present time is the only public exhibition of the kind in the United States…" but on page 132 he writes: "Before the late American Museum building was destroyed by fire, we had a tank completely filled with this plant alone…" The American Museum burned down in 1865 so it appears that the writing of the book occurred over a span of two or more years.

Julian Hooper (1833-1895) was born in Oxford, England and immigrated with his father in 1839 to Brooklyn, Kings County, New York. His father, John Hooper (1802-1869), was a botanist, also born in Oxford, England, and devoted himself to natural science. In conjunction with Professor Jacob W. Bailey of West Point, and Professor William H. Harvey of Trinity college, Dublin, he made many researches in the study of marine algae, of which he accumulated a valuable collection. This he bequeathed to the Long Island Historical Society, of which he was a charter member and which formed the basis for the Brooklyn Botanic Garden algal collection. In 1850 he wrote *Introduction to Algology; with a catalogue of American Algae, or seaweeds, according to the latest classification of Prof. Harvey*. He was a Director of the Brooklyn Institute, the forerunner of the Brooklyn Institute of Arts and Sciences, and in 1852 was one of those responsible for the introduction of the English House sparrow into this country.

Julian Hooper followed in his father's footsteps and also devoted himself to natural science. Like his father, he was a member of the Brooklyn Institute, the Lyceum of Natural History (later known as the New York Academy of Sciences) of which he was Secretary, the American Institute of the City of New York for the Encouragement of Science and Invention (it also was later merged with the New York Academy of Sciences) and the Long Island Historical Society.

Hooper made many presentations on natural history, in particular on birds and insects. His presentation "The Aquarium" was so popular that on March 2, 1866 the Long Island Historical Society voted to have it read again later in the month. His paper, "Methods of Study in Natural History," was quite provocative and was re-delivered before many audiences. One reporter titled his story, "Naturalists Listen to an Erudite Discourse from Julian Hooper" and one of the subtitles was "Smithsonian Scholars Scored." The following quote is taken from Hooper's talk:

> "Many very able authors succeeded in rapid succession, but none have excelled his [Hooper is referring here to Linnaeus] grasp of intellectual clearness and conciseness of description, and of establishing the objects comprised in the vast field of nature into a natural system of order. Yet we have men in our institutions who wantonly throw aside the names given to objects of natural history by such men as Linnaeus and Cuvier, and substitute names of their own. Read the papers published by the Smithsonian Institute, and you can see with what sacrilegious hands they remove old and long-established species, ignoring the names originally

given to them. The trouble with some of these learned gentlemen is that they are closet naturalists, perfect in their declension of Latin verbs and masters of Greek, yet still closet naturalists."

The reporter commented at the end, "The discourse contained numerous poetical extracts which elicited warm applause."

Julian Hooper definitely was not a closet naturalist. Many of his talks were illustrated with animals he had collected in the field and from 1885 to 1887 (when he was in his early fifties) directories listed him as a "collector." Like his father, Hooper competed in competitions in the preparation of natural history exhibits and won awards for Best Prepared Insects and Best Stuffed Birds.

In the preface to *The American Parlor Aquarium*, Collier writes: "The author has endeavored to simplify his style as much as possible…," indicating that he was the sole author. What then, was Julian Hooper's contribution? Clearly, he was its illustrator. Hooper not only was a lithographer, he was known to do paintings. In 1868 he presented to the Long Island Historical Society a large painting of the moths of Long Island of the genus *Attacus* (the genus containing the Atlas moth) and in 1872 he did the same with water colors of the butterflies and moths of Long Island that were "exquisitely painted."

Directories from 1862 to 1866 list Hooper as either a lithographer or a printer, but from 1867 to 1868 his trade was "aquarist" and "aquariums," respectively, implying perhaps that he was proprietor of an aquarium store although only his home address was given. Lastly, it seems that Hooper and Collier must have had a falling out since between 1871 and 1873 Hooper had a bird store at 44 Montague Street in direct competition with Collier's on 78 Fulton Street located less than 7 blocks away.

In addition to fishes, the book contains amphibian, mollusk and insect sections. Regarding the fish species, the book describes in great detail 44 species found within a 25 or 30-mile radius of New York City. As might be expected, the species included minnows, pike, bass, shiners, sunfish, dace, darters and the like. When I say "great detail," it is not an exaggeration as the coloration and markings are described meticulously and the fin counts for each species are given. As a consequence, the book falls somewhere between an introduction to the freshwater aquarium and an identification manual for fishes of the region. A very technical glossary is appended at the rear of the book.

Appended to the book was a synopsis (with some annotations) of about 100 fishes native to the United States east of the Mississippi River. One of the species listed in the synopsis was *Mollienesia latipinna,* spelled "*Molinesia latipennis*" in the book. The goldfish and its history are discussed in some detail and certain myths regarding that fish are debunked, e.g.,

"Many foolish notions are entertained relative to the sexes of the Gold Fishes, one of these most prevalent is, that those varieties only that have a short or abbreviated dorsal are males; this is quite erroneous. Some, too, think that the abbreviated dorsal is indicative of a distinct species, and have asserted that this peculiarity exists only when the



Figure 6-3. AQUARIUM SCENES WERE FREQUENTLY USED ON ADVERTISING CARDS. The firm of G.D. Longshore & Co. was started in business in 1867 and this card is

dorsal line of the fish is highly convex, causing the fish to appear deformed; this also I am satisfied is incorrect."

Collier remarks that the catfish, *Pimelodus atrarius*, "… will breed in confinement, in the Aquarium." Thus it appears that the only fishes bred in the aquarium at the time were the sticklebacks and this catfish. In those days American catfish were placed in the genus *Pimelodus*, which is now recognized as a South American catfish genus. The "*Pimelodus atrarius*" referred to by Collier is the Brown Bullhead, currently known as *Ameiurus nebulosus.*

A minor quibble is that Collier incorrectly attributes the first freshwater aquarium to Lankester (and mistakenly spells it "Lankaster") in 1841 when it should be Ward, but correctly attributes the first marine aquarium to Johnson.

Collier lays down the following extremely sound observations and principles:

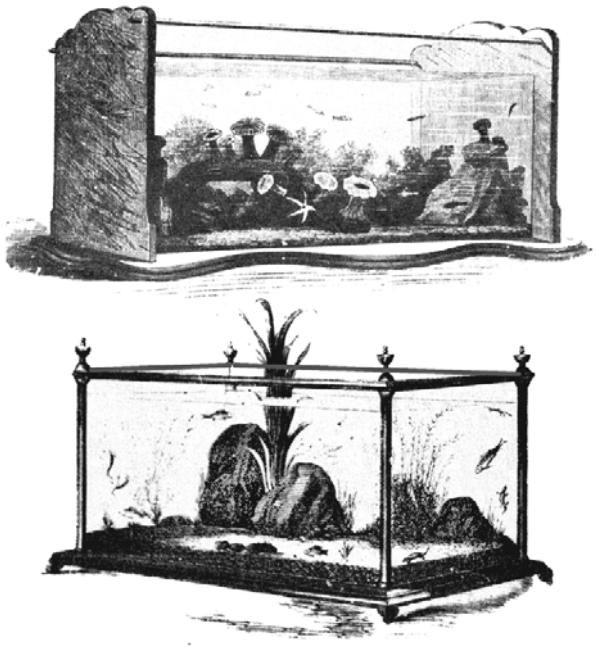


Figure 6-4. TOP: A MARINE TANK OF THE 1860's. Marine tanks of the day mostly housed colorful invertebrates since they were of greater interest than the drab, coldwater marine fish then accessible to the hobbyist.

BOTTOM: A FRESHWATER TANK OF THE 1860's. Native plants were often allowed to grow above the water's surface. Note the ornate treatment of the tank corners and the built-in legs.

"1. Many persons think that a mere tank designed for the use of fish, etc., is an Aquarium; this is a popular error in this country. A tank manufactured for such a purpose… is not an Aquarium, but an Aquarium tank. The true and perfect Aquarium should be self sustaining. The plants contained therein sufficiently numerous to liberate or throw off enough oxygen to furnish the living animals with life sustaining power, the fish and other animal life sufficient to consume that oxygen and repay the plants with enough carbon to sustain them."

2. "A good self supporting fluvial tank never requires a change of water; I have kept one eighteen months with the same water, the only water added during the time, being a sufficiency to make good the evaporation continually going on…"

3. "In regard to the general proportions of a tank, as a rule the breadth and height should be relatively half the length, these proportions should necessarily be graduated according to the size of the tank. It is usually the fault that tanks for Aquarium purposes are manufactured with too great a depth."

4. "One of the most important things to be considered in the proper arrangement of the Aquarium, is its situation in respect to light and heat. In the first place it should be placed in as cool a location as possible, as far removed from artificial heat as convenience will admit. And even more important is the subject of light… In view of its importance we should endeavor to have the light act as naturally as circumstances will admit of upon our miniature aqua world. With this object in view as our guide, we easily discern that in their native waters animal and vegetable life receive their light from above, therefore we can immediately conclude that such is the only natural position they should be placed in…"

5. "A few natural rocks, readily procured in the environs of the city, are requisite for picturesque effect; these should be grouped so as to have a careless or accidental appearance, avoiding too much formality, as in this way they represent a much more natural appearance."

6. "Of all things avoid over crowding; this is almost a

Universal error, people generally are never satisfied to have a few healthy fish in their Aquariums, but they place in it so many that the carbon thrown off by the same cannot be neutralized by a sufficient amount of vegetation. Avoid also too much rockwork, remembering this, the more rock you have the less water."

7. "Fish, like all animal life, are subject to diseases, but unlike the higher orders of animals, but little can be done for them."

8. "Fish intended for the Aquarium should be handled with great care, the less the better, as they are easily injured, much easier than is usually imagined. If a fish be allowed to fall to the ground, no perceptible injury may be apparent at the time, but in the space of four or five days, the wounds make their appearance in the form of bruises that soon assume a wooly appearance; these when examined under a powerful lens, are found to be vegetation; a parasitical fungi that spreads over the fish, and in a majority of cases, proves fatal."

9. "It is the constant meddling with the tank, changing the water, the position of rocks and plants, the heaping in of bread, crackers, cake, etc., to the fish, why so many, yes! nearly all, fail in keeping their tanks healthy and clean."

The early 1860's were the days when an aquarist was not an aquarist but an "aquarianist." A number of fabricators of iron went into the aquarium business and a typical commercial tank was 24 inches long, 18 inches wide and 14 inches deep. The base was of slate, as often were the ends. Such a tank was held together by torsion bars pressing the glass against the slate in a matrix of aquarium cement. However, all sorts of glass containers were used for aquaria including bell-glasses, confectioner's jars, tumblers, and goblets. The aquarium equipment of the day was simple and there wasn't much of it; a length of rubber tubing for siphoning, a length of glass tubing used as a rudimentary dip tube, a pair of wooden forceps, a sponge stick for cleaning, a syringe for aerating the water by hand, and a few nets made from mosquito netting. If the water in a tank went bad, a frequently used remedy was to put the water, including its fishes, into shallow pans for two or three days, thus allowing the water to purify itself via natural oxygenation.

Regarding the fishes kept in the aquarium of 1864, West tells us:

"In stocking a 'river garden' with fishes, two things must be borne in mind - they must not be too large, and they must not be too numerous. The losing sight of these two facts, or either of them is fatal to the success of the aquarium, especially with regard to size. Large fishes consume more oxygen than this artificial pond can supply. Three inches should be the extreme length of any admitted into a moderately sized aquarium. Small goldfish, from their capacity to bear a high temperature, and no less for their beauty and the variety of their markings, will be the first choice of an aquarianist. But they grow rapidly, if healthy and properly fed, and must, therefore, sooner or later be parted with - a grievous trial when one has loved and petted them.

"The minnow (*Fundulus heteroclitus*), lively and full of frolic, yet easily tamed; the common shiner (*Notemigonus crysoleucas*), a very handsome fish; the yellow perch (*Perca flavescens*) when, and only when, quite small; the sun fish (*Lepomis gibbosus*), also only when quite small for when well grown he will worry and torment to death the smaller fish; the pigmy dace (*Umbra pygmaea*), a beautiful little fish, not more than an inch and a half long; the black-nosed dace (*Rhinichthys atratulus*), a beautiful little fish common to all our



FIGURE 6-5. WILLIAM CAMERON COUP (1837-1895) established the New York Aquarium in 1876.

brooks, and distinguished by a black band running from the nose down each side and dividing very definitely the silvery abdomen from the olive brown back, as happy in the aquarium as a fish can be anywhere; the common sucker (*Catostomus commersonii)*, when quite small; and the tessellated darter (*Percina copelandi)*, may all, or some of them, according to the size of the tank, be brought together in peace and harmony, and will afford a sufficient variety of animated nature."

In the spring of 1860 West procured some sticklebacks (*Gasterosteus*) and placed a pair into an aquarium. The male constructed a nest using bits of hair algae and stems of *Nitella.* As West relates: "The madam now acted with proverbial female coquetry and waywardness, and led her imperious spouse a chase, a dozen or twenty times around the aquarium, avoiding the nest as obstinately as she had before eagerly sought it."

The fish consequently bred and West obtained about 200 fry. Prior to this, references to the breeding of sticklebacks alluded to the care of the fry by the "female" fish. Even the noted English aquarist, Dr. Lankester, fell into this error, publishing with his endorsement a communication from a correspondent who described "the mother fish" as "continuing her attendance at the nest as long as any of the young fry were left."

With perhaps tongue in cheek West remarked, "As the correspondent was a woman, the mistake was a natural one." Again, this was America. In England, women figured very prominently in the early days of the hobby for it was they who took the painstaking care and who had the patience necessary for the keeping of fish. On more than one occasion, male "experts" referred for practical details to the experiences of women aquarists.

Because of the ready availability of strange and curious marine invertebrates along our eastern shores, the marine aquarium was, as I have already indicated, far more popular than the freshwater aquarium. Oddly enough, artificial saltwater was frequently used, as it was free of undesirable materials. The following formula, devised by Gosse, was widely used:

Common table salt,	81 parts
Epsom salts,	7 parts
Chloride of magnesium,	10 parts
Chloride of potassium,	2 parts

When enough water was added to bring the specific gravity between 1.026 and 1.028, one pound of this formula made almost 3 gallons of saltwater.

Sea lettuce (*Ulva*) was a staple in such tanks. As for animals, these included anemones of all sorts (up to ten or so species of *Actina* alone), *Serpula,* hermit crabs (three species), fiddler and other crabs and mollusks of all sorts. As for fishes, I hesitate to alienate marine aquarists, but here is what West had to say:

"It is unnecessary to enumerate the fishes suitable for a marine aquarium, since they are quite secondary to the many other curious and interesting objects which the sea supplies. If these are desired, however, and the tank be large enough to admit of their being added to the stock of zoöphytes, crustacea, etc., nothing can well be more ornamental than the stickleback, which lives and breeds full as well in salt water as in fresh; but they, or indeed, any fish, will drive the shrimps into hiding places, annoy to some extent the anemones, and make havoc with the mollusks. A harmless and exceedingly beautiful fish for the marine aquarium is the sand smelt *Menidia menidia,* having burnished silver scales, and a longitudinal bar of silver on each side of its semi-transparent body. It is exceedingly delicate, however, and he who would even safely transport it from its safe place of capture must

'Take it up tenderly,
Lift it with care'"

West remarks that the seahorse was a worthwhile curiosity but although Damon managed to keep them with some success, West could not. With his characteristic humor he remarks: "After repeated trials and failures, I have succeeded in keeping one for a year and half by transferring it from the tank to a phial of alcohol!"

In 1872 William Cameron Coup, a New York businessman with a bent for natural history, traveled to

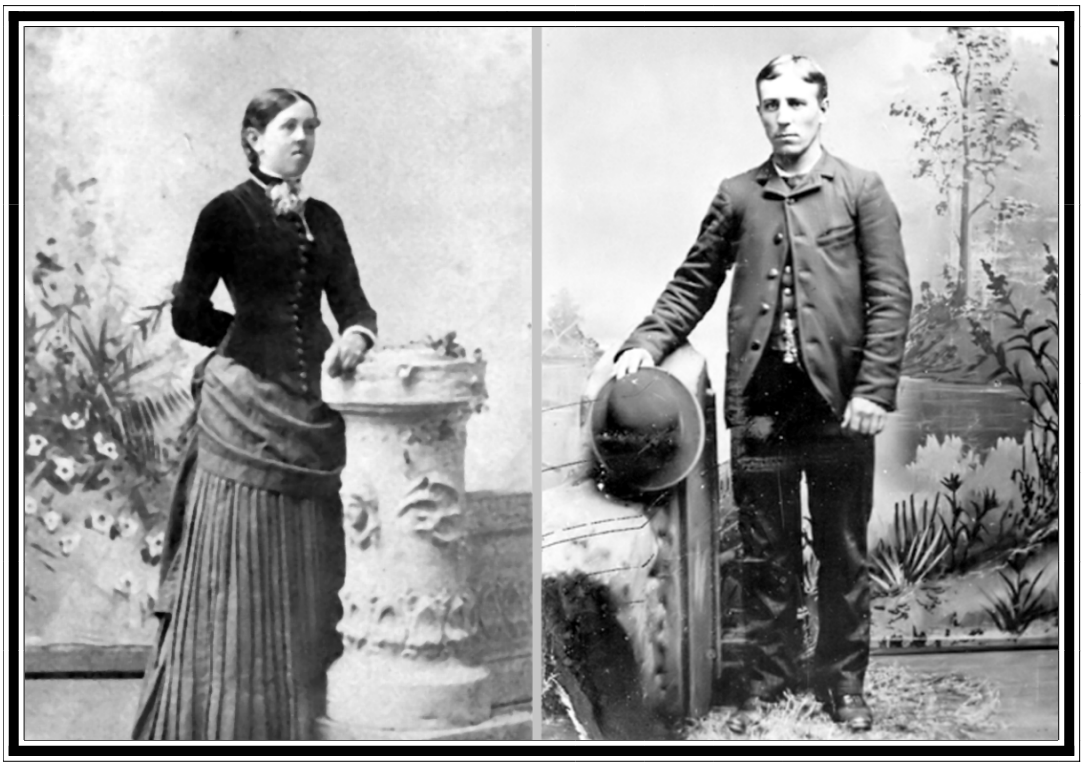


Figure 6-6. ABOVE: TO PROVIDE READERS WITH AN IDEA BOTH OF THE CLOTHING AND THE INDOOR ENVIRONMENTS IN THE PERIOD OF THE NEW YORK AQUARIUM, the image shows the typical women's attire at the time (it was the reign of the natural form & cuirass body – 1875 to 1882) and the above left shows a man in typical everyday attire. BELOW RIGHT: A SCENE FROM THE SECOND ANNUAL WESTMINSTER KENNEL CLUB DOG SHOW, held at Madison Square Garden (then known as Gilmore's Garden) in 1878. Harper's reported that almost 1,000 dogs (including this mastiff) were exhibited at this event.

Europe where his interest was aroused by the number of great public aquaria he saw there. Coup, a supreme showman, had previously been a business partner in Barnum's circus. Though Barnum's freaks had big drawing power, it was Coup's advance publicity, advertising and transportation arrangements that made the show a success. It is a matter of some controversy over whether it was Barnum or Coup who first had the idea to design a special circus train. Coup, however, became deeply dissatisfied with his business arrangement with Barnum and the partnership was dissolved.



Resolving to establish a public aquarium in New York City, Coup examined these foreign aquaria in some detail and consulted with those charged with their maintenance. Returning to New York,

Coup proposed to the City that he construct an aquarium in Central Park, defraying all expenses but claiming the privilege of retaining for a given period, such profit as might be obtained from a small fee for admission. After being compensated for this outlay, Coup proposed to give the aquarium to the City as a gift. However, there was a question of certain legal restraints forbidding the use of public lands under these conditions, so the Park Commission was forced to decline the offer.

During 1873, there was a great deal of interest in Coup's proposal to establish the aquarium in New York City and a number of letters appeared in Appleton's Journal supporting the plan, including some written by W. Saville Kent, recently the Naturalist to the Brighton Aquarium. It was thought at the time that when the New York Aquarium was built, the post of Superintendent would go to Kent, but it ultimately went to Henry D. Butler. The following appeared in the March 13, 1875 issue of APPLETON'S JOURNAL:

> "After an interval of several months' duration, the attention of the readers of the JOURNAL is again directed to the question regarding the establishment of a grand marine and freshwater aquarium at the Central Park. The active efforts of the JOURNAL in this cause have been already recognized, and we are now pleased to announce that our initial labors are being followed up by that of others directly interested in the success of the scheme. To Mr. Eugene G. Blackford, of this city, credit is due for a direct effort to secure to our people this valuable and interesting institution. At the late annual meeting of the American Fish Culturists' Association, convened in this city, Mr. Blackford offered the following resolutions: 'That the Fish Culturists' Association believes that an aquarium in New York would be of the greatest benefit to science generally, and to ichthyology particularly. That the Fish Culturists' Association fully indorse any private or public measures which would tend toward the establishment of an aquarium in New York.'
>
> "Mr. Blackford prefaced his proposal with a brief address, in which the claims of the aquarium as a means of popular enlightenment and scientific education were ably set forth. At the close of his remarks, the speaker called upon the science-editor of the JOURNAL for information regarding the present state of the movement. In the reply a brief summary of the efforts of the JOURNAL was given, including references to the eminent services rendered by Mr. Saville Kent, and the favorable correspondence of Professors Henry, Baird, Jeffries, Newton, and others, several of which letters have already appeared in our columns. Those of our readers who have followed us in these efforts toward the establishment of this aquarium will recall the fact that the original plan as suggested and forwarded by us purposed to secure, through the liberality of some one or more private citizens, a free aquarium which would be amply endowed by private contributions, and so made a free public institution. With this end in view, we were content to lay before the public the claims and merits of the scheme, trusting that there might come forward in due season some generous citizen who, for the love of science and popular education, would lend his purse, and receive from the people he thus served their appreciative thanks as his only but just reward. While we are not ready to acknowledge any other plan as preferable to this, we are by no means unwilling to indorse the present movement, since it is originated, as we are convinced, through a worthy desire to serve the public, though this service may result in a direct pecuniary gain to the projectors. As, however, the original plan as proposed by us has, through this means, been modified, and the enterprise, from being a strictly public one, is to take the form of a private investment, we shall look upon our labors as finished, save where we may be permitted in the cause of science to refer to the results of the work. Before, however, turning over our interest to the worthy gentlemen who have taken the matter in hand, we again call the attention of the public to the plans of the movement, and believe that we can render it no more efficient service than by indorsing the remarks of Professor Baird, who, on being called upon by the president to express his

views on the subject referred to in the resolutions, spoke as follows:

"'I would only add my expression of desire that such an establishment could be initiated in this city. There is no place in this country more adapted, end no place where so large a population is ready to support such a display. It is one of that class of enterprises that would never fail to meet with the popular approbation. If started as a joint-stock company, I think it would be successful, but it would be better to have it a public institution, open freely at all times to all who wish to attend. It is now well known that there is no need of being within one thousand miles of the sea; so long as you can get a few thousand gallons of seawater to start with, the further progress is very simple. At Southport, Brighton, and Manchester, in England, and at Hamburg and Berlin, the aquariums are in successful operation. In all places where they have been carried on in a business-like way, they have been successes. Central Park is by far the best-arranged place for such an institution in our city. A year will be ample margin of time to get the whole thing in successful operation and working order. It has generally been combined with some class of open-air concerts. This, I think, is not entirely necessary, but there seems to be nothing objectionable in it. So far as I could help the project, I should be happy to do so. I could furnish in a week enough interesting matter to fill the largest aquarium that would probably be built. The dredging and coast examinations being made in connection with the office of the United States Fish Commission give ample opportunity to obtain specimens of all kinds. It is a comparatively easy thing to get objects to fill it.'"

The two men quoted were Eugene Gilbert Blackford (1839-1904) and Spenser Fullerton Baird. A prolific editor and writer, Baird was head of the science department of HARPER'S MAGAZINE and was editor of THE ANNUAL RECORD OF SCIENCE AND INDUSTRY. In 1850 he became permanent secretary of the American



FIGURE 6-7. AN ARTIST'S SKETCH OF THE NEW YORK AQUARIUM, LOCATED AT THE CORNER OF 35TH STREET AND BROADWAY, AS IT LOOKED IN 1876.

Association for the Advancement of Science and in 1863 he helped organize the National Academy of Sciences. When the new United States Commission of Fish and Fisheries was created in 1871, Baird was appointed by President Ulysses S. Grant its first commissioner, to serve without additional salary, which he did until his death. Upon the death of Joseph Henry in 1878, Baird succeeded him as Secretary of the Smithsonian Institution. Along with Blackford, in 1888 Baird established the first marine laboratory in the United States, the Marine Biological Laboratory at Woods Hole, Massachusetts and started a federal fisheries program to rehabilitate the nation's fisheries resources.

Eugene Gilbert Blackford, 1839-1904, who, as Fish Commissioner of the State of New York, was a pioneer in the solution of important problems in the commercial culture and propagation of food fishes. Blackford was also a merchant and banker whose active interest in behalf of the institution of the New York Aquarium entitles him to be remembered as a founder of that beneficent educational establishment. Blackford was also a merchant and banker. The census of 1870 listed his occupation as "fish business," alluding to his connections to the famous Fulton fish market of the time. The Blackford Co., obtaining their oysters from the Market, supplied all the leading hotels of New York City and Westchester. Blackford introduced the Red Snapper to the fish market, which was named for him (*Neomaenis blackfordi*). The medusa genus, *Blackfordia* Mayer, 1910 also is named in his honor.

Coup purchased a plot of ground at the corner of 35th Street and Broadway and the erection of a building was started. At this time, Charles Reiche and Brothers, well known importers of rare animals at the time, joined with Coup in partnership and under their joint direction the New York Aquarium was completed in 1876.

An interesting article on the New York Aquarium, written by William S. Ward (1836-1912), appeared in the March 1877 issue of SCRIBNER'S MONTHLY and the following are some excerpts:

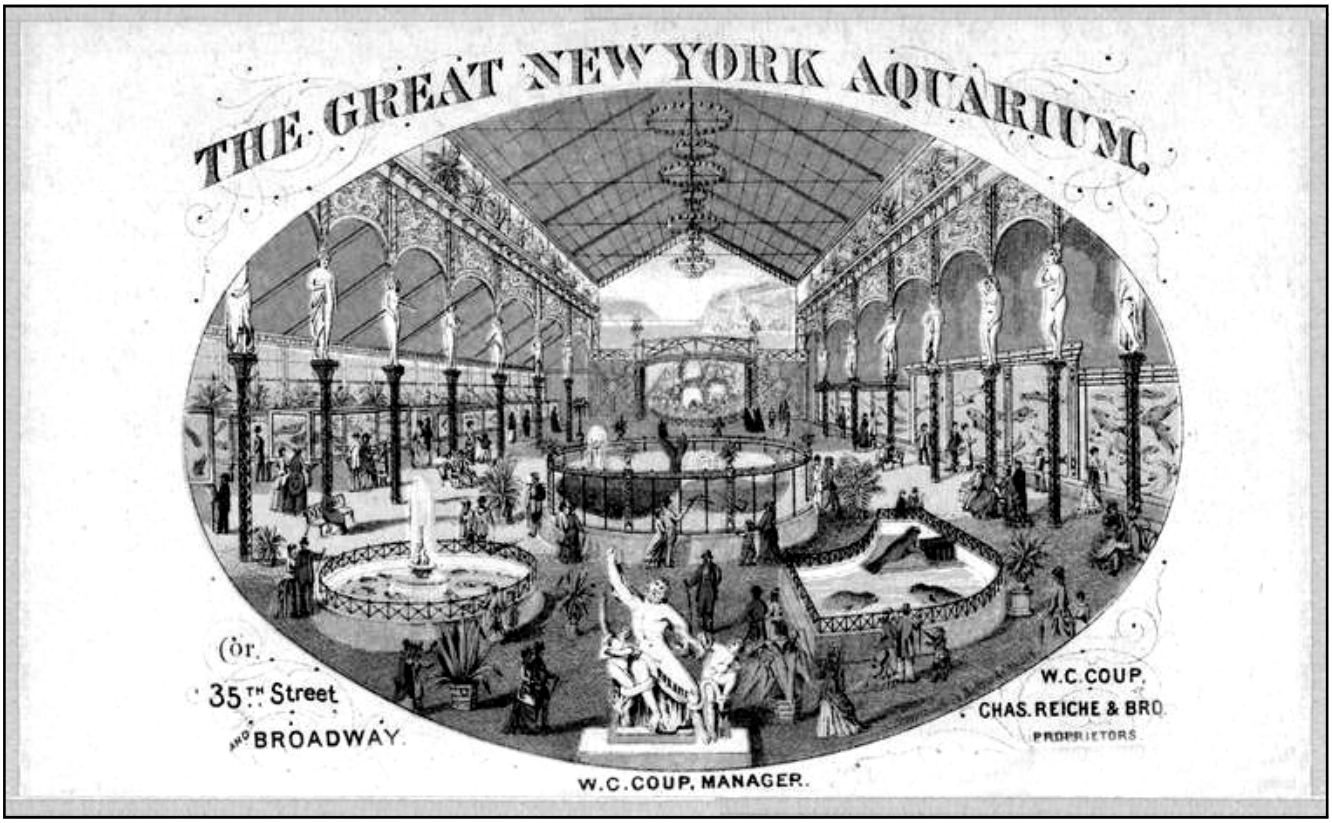


Figure 6-8. THE INTERIOR OF THE NEW YORK AQUARIUM.

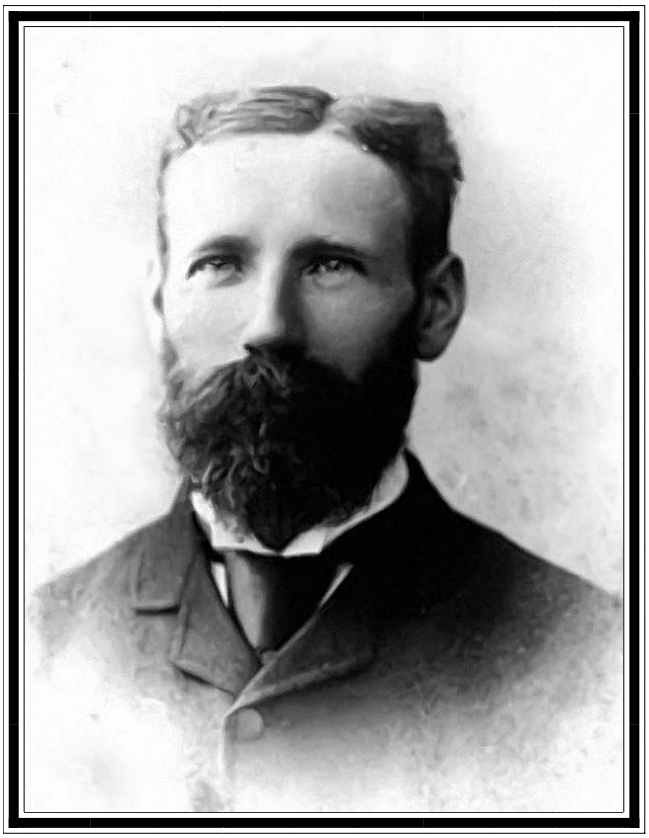


Figure 6-9. WILLIAM SAVILLE-KENT, 1845-1908, marine biologist, author and fishery scientist.

"Entering the lobby, one receives from the ticket-agent a check whose obverse is engraved with a grotesque image of one of the members of the finny tribe. This check is surrendered at the entrance of the main pavilion. Advancing between counters on which are displayed for sale every form of parlor and experimental aquaria, we approach the point which the artist who has been in advance of us chose as the proper site from which to secure his sketch of the interior. The building occupies an area of over twenty thousand square feet, and the skillful arrangement of tanks, screens, rustic work and statuary, gives to the whole the effect of a cool and refreshing summer-garden, the inclosing walls of which are lined with crystal cages, containing the fish and other objects of interest.

"Referring to the ground-plan, we notice along the right a series of dividing lines which indicate the position and relative size of the main fresh and salt water reservoirs known as wall tanks these consist of a series of receptacles resting on foundations of solid rock, the three interior walls of which are composed of heavy brickwork laid in cement and lined with rock, the latter being so arranged as to give to the interior, when viewed from without, the appearance of a rock-walled grotto. The fourth side, which faces the main pavilion, is composed of plate glass, an inch thick, over eight feet high, and three to four feet wide.

"The construction of these tanks, which includes the securing of solid foundations, the designing and adjustment of the iron framework or sashes, and the final procuring and firm adjustment of the heavy glass plates, was a work calling for the exercise of great caution, wisdom and taste. One of these great wall tanks has a capacity of fifty thousand gallons, and the front wall of glass is nearly sixty feet in length. This tank occupies the whole of the eastern side of the pavilion to the right of the entrance platform, and is the home of the shark, porpoise, sturgeon, etc. At the farther end of this shark

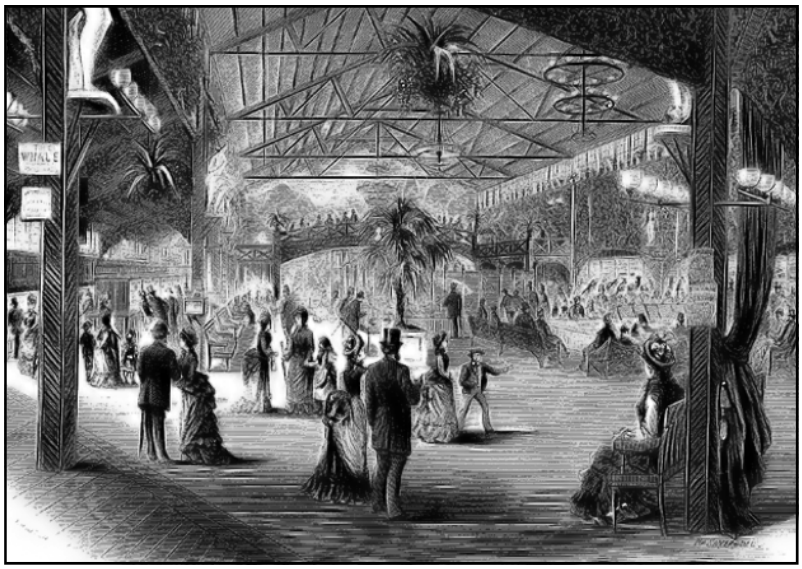


Figure 6-10. ANOTHER INTERIOR VIEW OF THE NEW YORK AQUARIUM.

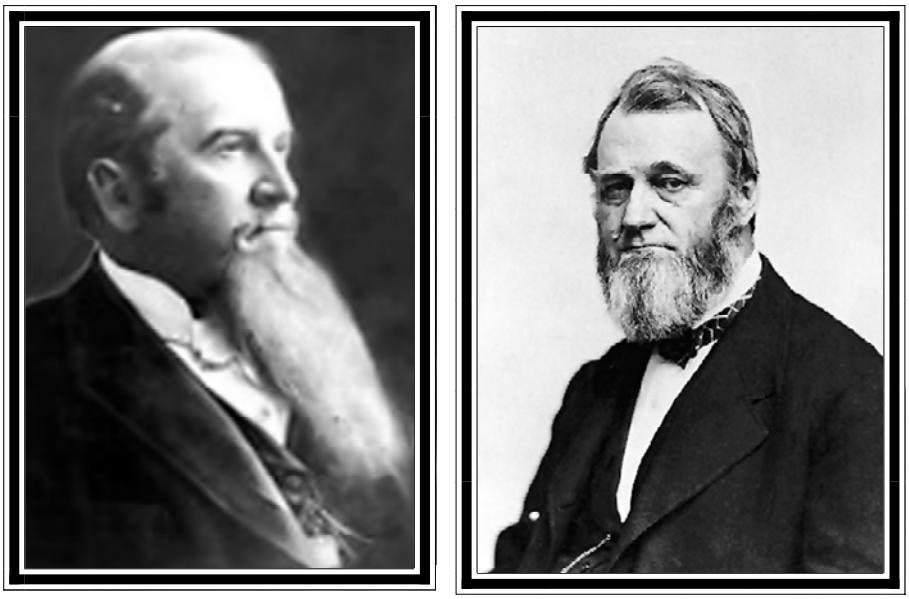


Figure 6-11. LEFT: EUGENE GILBERT BLACKFORD, 1839-1904. RIGHT: SPENSER FULLERTON BAIRD, 1823-1887.

tank is a concealed reservoir in which are located the filters through which the overflow is made to pass before returning to the grand storage reservoir beneath; still farther on and at right angles with the shark tank, extend in uninterrupted series the remaining great marine and fresh water wall tanks, in which are contained and displayed all the larger forms of marine life. The tanks composing this series are sixteen in number; the four central ones are each ten feet in width, with a proportionate height and depth, flanked by six of six feet width, followed by a third series having fronts of four feet. The depth from top to bottom of the four central tanks is eight feet, which decreases in the smaller ones in such a proportion as to secure an active flow of the water from the center toward either end."

Ward noted that the water supply for the freshwater fishes was supplied from the city mains and filtered. To obtain the saltwater, a special steamer, fitted out with reservoirs and pumps, was sent out to sea beyond Sandy Hook, as far from shore to ensure that the water was clear and pure. On its return from these trips the steamer sometimes stopped at fishing stations along the route to take on board any new or rare varieties of marine forms that the fishermen, acting under previous instructions, had been able to capture and secure. Arriving at its pier a mile or more distant from the Aquarium, the steamer proceeded to discharge its freight. Often the larger varieties of fish were removed by the aid of slings and blankets to large portable tanks. He also describes in some detail the water distribution and aeration systems of the Aquarium:

"In order to trace the course of the water in its circuit, it is only needed to begin at the storage reservoir and follow the current in the direction of the arrows. First drawn over the wall through the great siphon suction-pipe, the water enters the pump cylinders, and here receives the impulse which is to project it into arid through the whole length of distributing mains, which, passing first over the grand tank, extend beyond it to the most distant of the grand wall series, - this single main being nearly two hundred feet in length. How the water is projected from this main into the tanks below is clearly indicated in the sketch. Depending from this, the grand artery of the Aquarium system, are short lengths of tubing which have first been drawn over conical mandrels, so that the original pressure may be increased. These injectors, as they are named, terminate in small orifices at a distance of from two to three feet above the proposed level of the water in the tank beneath. Following the water after the first impulse given it by the pump we find it projected in fine jets into the tank below.

"The uninitiated would at this point naturally propound the following query: Why not dispense with this complicated system of injectors, and furnish to each tank its requisite supply of water through single channels - one for each tank? And it is in reply to this reasonable inquiry that the secret of what is called the circulating system of aeration is disclosed. Let it be remembered that it is not water alone that fish



Figure 6-12. ADOLPHUS BUSCH, 1839-1913

need, but water charged with air. They live in one medium - water; their vitality depends upon another medium - air. The one must be charged with the other; and so often as in the natural course of respiration the oxygen of the air is exhausted, the deficiency must be made good by a fresh supply of this life-sustaining element. The injectors are designed to meet this want, and in what manner they accomplish it may be readily perceived if we take up our position in front of one of the glass-walled tanks over which the injectors are at work."

A very large marine tank some 65 feet in length housed sharks, skates, large surf bass and the like. A series of moderately large tanks housed fresh and saltwater species. For example, one such tank contained anemones, sponges, porgies, hermit crabs and flounders; another contained California salmon, lake trout and brook trout. A series of tanks set on tables were also exhibited and these contained smaller exhibits, both fresh and saltwater. Again, as examples, one such tank contained pickerel and another contained skate eggs. Finally, a rockery and pool designed to hold sea lions completed the Aquarium.

In 1876 the New York Aquarium was officially opened, the very year the Paradise Fish was introduced into the United States by Adolphus Busch, of St. Louis, Missouri. Busch not only brought success to

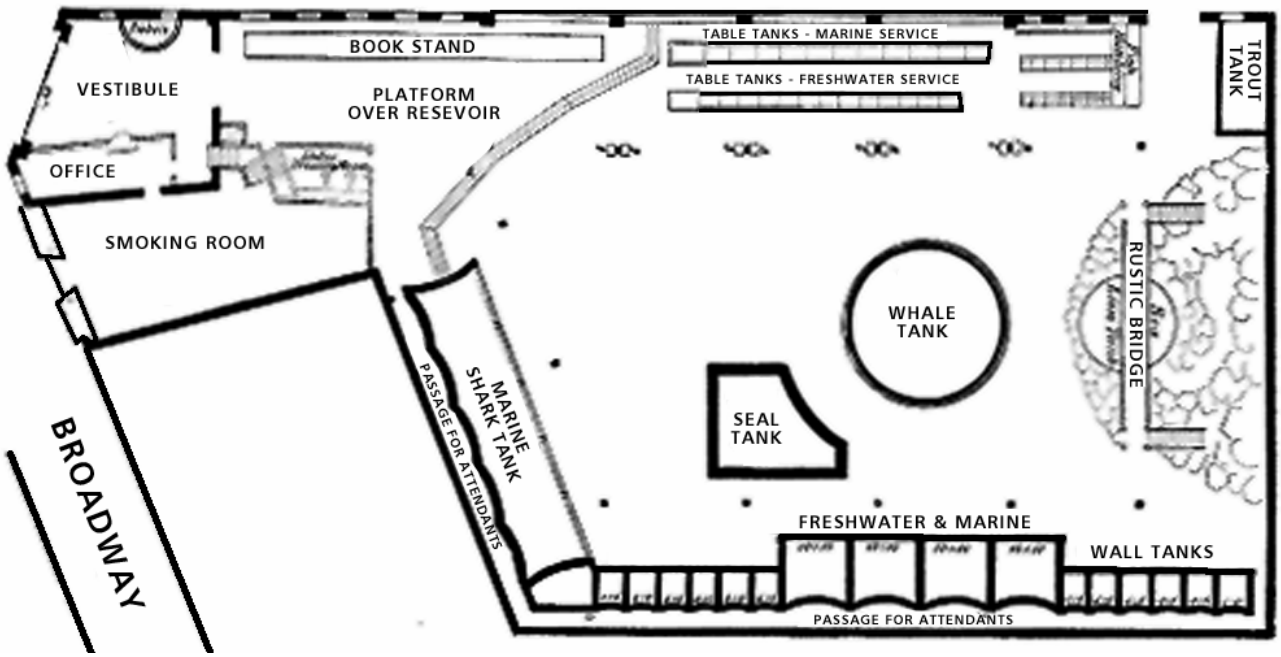
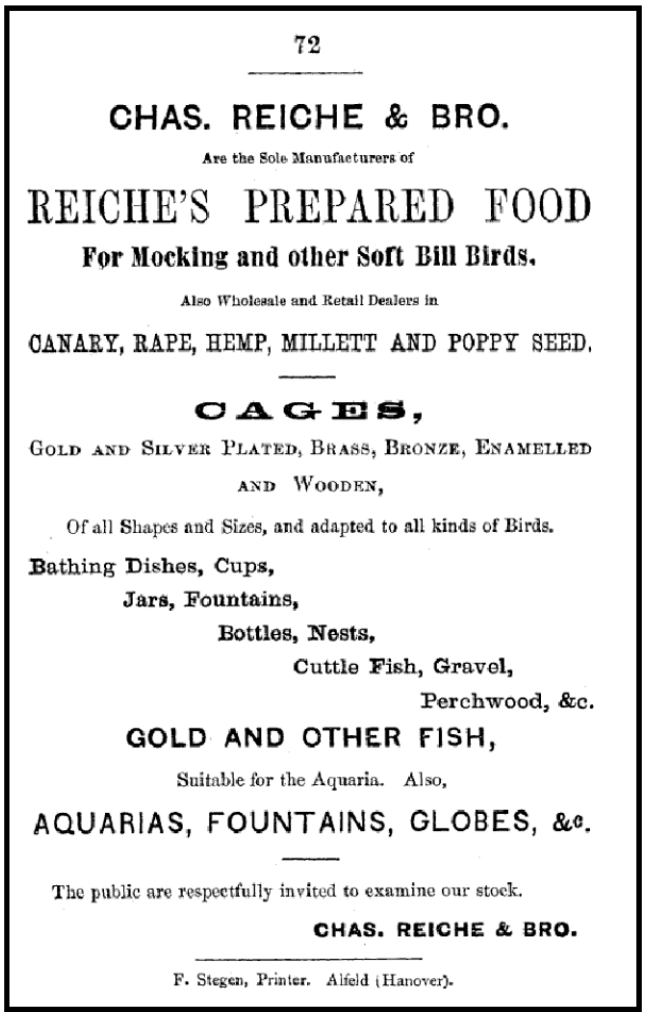


Figure 6-13. GROUND PLAN OF THE NEW YORK AQUARIUM, LOOKING SOUTH.

the Anheuser-Busch brewery, but to other diverse business enterprises as well. Often referred to as "The First Citizen of St. Louis," he was a leader also in philanthropy. Because of his business interests he made frequent visits to Europe. During one of these visits to Germany in 1876, Busch, who loved animals of all sorts, was fascinated by the Paradise Fish. In 1869, a French consul in Ningbo, China had sent one hundred Paradise fish to the Parisian breeder Paul Carbonnier; the fish arrived in Berlin the same year as Busch's visit, so he was able to bring several back to the United States.

Returning now to the New York Aquarium, as Superintendent the services of Henry D. Butler of Barnum's American Museum fame were secured. Other personnel included: William S. Ward, naturalist; Fred Mather, Superintendent of Fish Culture; and A. W. Roberts, in Charge of Fisheries.

Fred Mather, born in Albany, New York, in August, 1833, was a man with impressive credentials in fish culture. In 1854 he became interested in the lead-mines of Potosi, Wisconsin and afterward hunted and trapped in the Bad Axe country in that state. Here he learned enough of the Chippewa language to become interpreter to the government survey in northern Minnesota. During the political troubles in Kansas he served under General James Lane and was one of Jennison's "Jay-hawkers." He enlisted in the 113th New York regiment in 1862 and became 1st lieutenant two



72

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Figure 6-15. THE REICHE BROTHERS WERE DEALERS IN BIRDS AND FISH. This page was taken from Charles Reiche's book, *The bird fancier's companion; or, Natural history of cage birds; their food*, published in 1871.

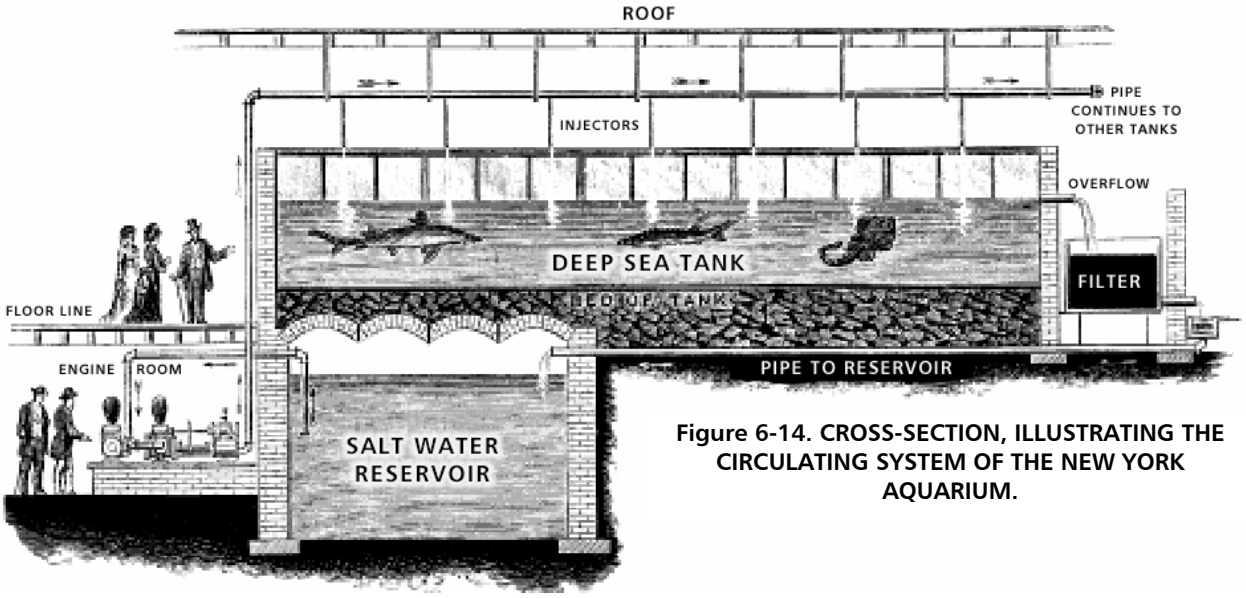


Figure 6-14. CROSS-SECTION, ILLUSTRATING THE CIRCULATING SYSTEM OF THE NEW YORK AQUARIUM.

years later. At the close of the civil war he took a clerkship in the live-stock yards near Albany and in 1868 he bought a farm at Honeoye Falls, New York and began to hatch fish of various kinds.

When the United States fish commission was formed in 1872 Mather was sent for by Professor Spencer F. Baird to hatch shad for the Potomac River. In 1875 he established hatcheries at Lexington and Blacksburg for the state of Virginia; a year earlier he had hatched the first sea-bass and graylings. After several vain attempts to transport salmon-eggs to Europe, he devised a refrigerator-box and in 1875 succeeded in carrying the eggs to Germany. At the same time he invented a conical hatching apparatus by which, through the admission of water at the bottom, shad and other eggs were hatched in bulk instead of in layers upon trays or floating boxes. In 1884 he hatched the adhesive eggs of the smelt, although all previous attempts had been failures.

Mather was sent abroad several times by the United States government in connection with fish culture and received medals and testimonials from many scientific societies of Europe. From 1876 to 1879 he was associated with The New York Aquarium and during this time he became in 1877 fishery editor of THE FIELD in Chicago. In 1880 he obtained a like position with FOREST AND STREAM in New York City. In 1882 he was sent by Professor Baird to Roslyn, Long Island, to hatch salmon for the Hudson River and in the following year he was appointed superintendent of the New York Fish Commission Station at Cold Spring Harbor, Long Island. Here the hatching of lobsters, codfish and other marine forms was begun. In 1885 he published his *Ichthyology of the Adirondacks* in which several fishes heretofore unknown were described, in 1897 an interesting book titled *Men I have Fished With*, and in 1900 *Modern Fish Culture in Fresh and Salt Water*. The following was taken from the last-named:

> "The indiscriminate introduction of this fish (*Note: Mather is talking about carp here*) in America was a mistake. It was boomed as a great producer of good food where no good food grew. It was a vegetarian, 'a sheep among fishes,' quick growing and prolific. All of this is true. The fact is that in Germany fish are a luxury and poor people do not eat fresh fish. Before the day of railroads fish that reached Berlin came by stage coach, and to-day the people are prejudiced against all salt-water fish, which they say has 'a sea taste.' This is hereditary prejudice and prevents good sea fish from going to Berlin in large quantities. They want their fish alive, and the fishmongers have most of their fish in aquaria. Fancy this for the thousands of tons that come to New York daily! In the streets of Hamburg can be seen tubs with pike 'hecht' (*esox*), perch (*barsch*) and carp, all kept alive by women aerating the water.
>
> "We must remember this in order to understand why the Germans consider the carp a good fish; they know no better. They have 'improved' breeds of them as they have of cattle, from the fully scaled fish to those partly naked but with big scales accidentally placed, *mirrorkarpfen*, to those without a scale, *lederkarpfen*.



FIGURE 6-16. FRED MATHER (1833-1900). RIGHT: Taken in 1864, First Lieutenant, Battery L, Seventh New York Heavy Artillery. RIGHT: Taken in 1897.

"The late Herr von Behr, President of the German Fishery Association, induced Prof. Baird to import the carp and eulogized it. Prof. Baird did so, and today no fish is so heartily cursed by Americans as the carp. It roots up the water plants, muddies the ponds and renders them unfit for other fish, and the carp are worthless for the table. They are in the class of the soft buffalo fish of the Mississippi, and the suckers.

"Great carp of fifteen to twenty pounds come to Fulton Market, New York, and some Germans, with old country memories, buy them; a lot are sold by push cart men among the tenements on the East Side, but there is little sale for them outside of this. I have eaten the carp in Germany, cooked in beer and served with a brown beer sauce, but never when I could help it.

"The carp spawn in early summer, the eggs adhering to water plants. The fish grow fast, under favorable circumstances reaching a weight of ten pounds in three years. The Government carp ponds at Washington, D. C, overflowed some years ago and let a lot of these fish into the Potomac, and the shad fishers and anglers are cursing them today for a nuisance that can never be abated, like our European sparrow.

"It is a significant fact that the United States Fish Commission published 'A Manual of Fish Culture' in 1897 and did not mention the carp."

The following was also taken from the book:

"In the first stages of this trouble the fungus can be killed by keeping the fish in salt water for a week or two, but when the roots penetrate below the skin and attack the muscle there is no remedy known at present. In the old New York Aquarium, Broadway and Thirty Fifth Street, New York, 1876-79, I tried salicylic acid, borax, boracic acid and alum, separately and combined, with no effect on … fishes injured in transit. The last three things named are deadly to fish if not carefully used, and I went so far as to bandage the fish and put it in a trough where it could not turn, and then apply the remedies behind its mouth and gills, saturating the bandage, but found nothing as good as salt…"

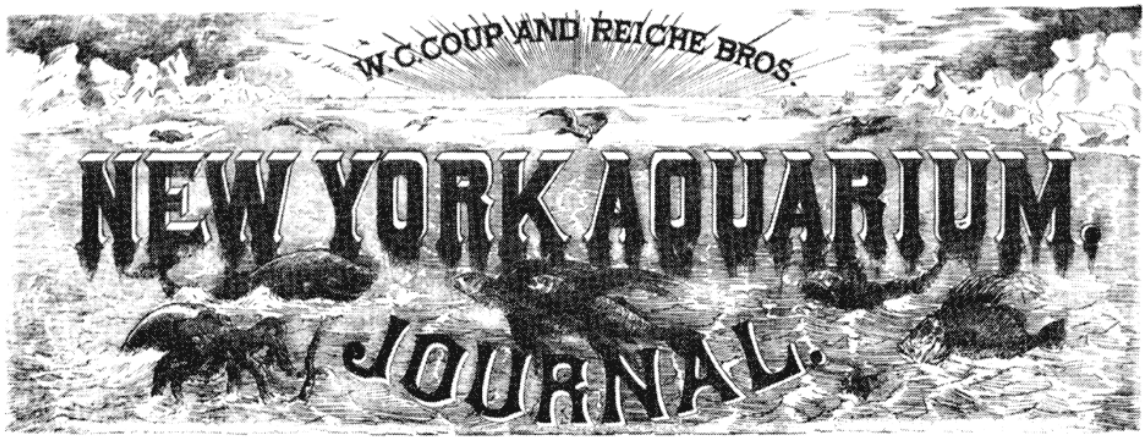
In addition to his knowledge of aquarium fishes, William S. Ward also wrote about gemstones, notably the Kohinoor Diamond. He also wrote an article on the Brighton Aquarium in 1874, and is the author of a book titled, *Facts and Fancies about Fish*, published in 1877. William S. Ward and Fred Mather clearly are under appreciated figures in the history of the aquarium hobby.

Little is known about A.W. Roberts, although he did write about fish for the AMERICAN ANGLER and SCIENTIFIC AMERICAN. The following was taken from an issue of the former:

"When I was curator of the New York Aquarium, several small specimens of the so-called "Banded Drum" were brought to the establishment by the regular collectors. At first they were placed in the medium-sized tanks, where they increased in size so rapidly that in course of time it was found necessary to remove them to more roomy quarters, where they remained



Figure 6-17. Henry Dennison Butler on the RIGHT and Fred Mather on the LEFT, at the New York Aquarium in 1876. The object in the pot is a Century Plant in bloom.



Published Monthly at the New York Aquarium, cor. 35th Street and Broadway.

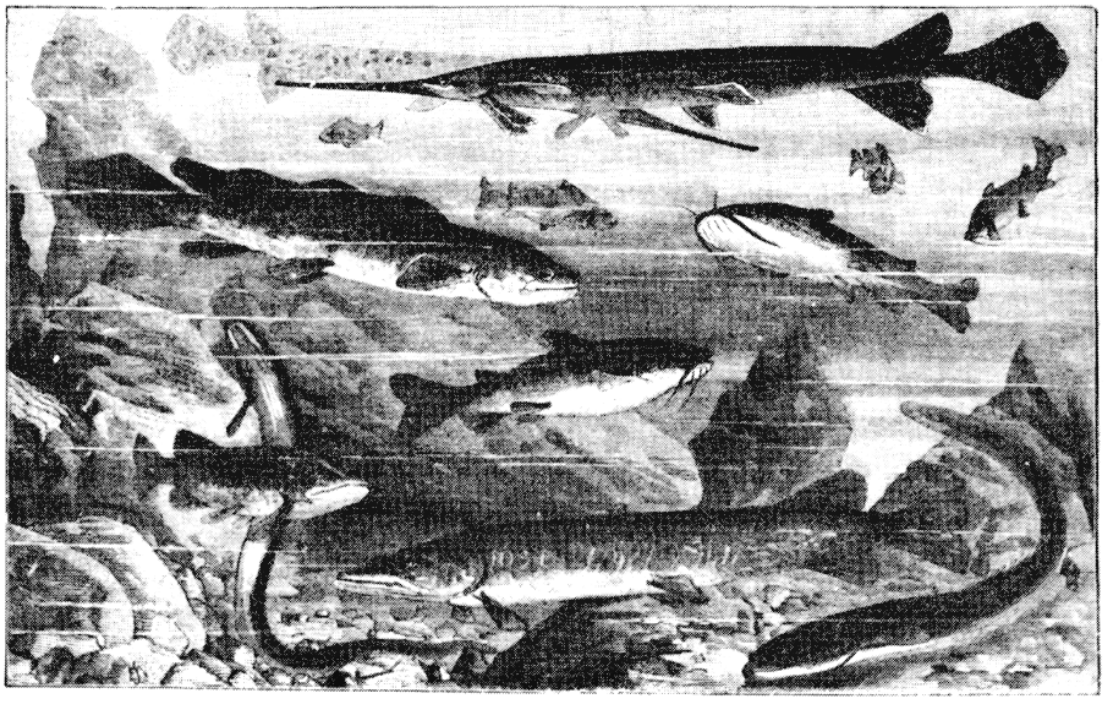
VOL. 1. NEW YORK, MAY, 1877. NO. 10.

A FEW FRESH WATER FISH.

So faithfully has the artist, whose work is before us, performed his duties, that it will not be needed to add to his truthful portrayal of these fresh water fish any extended description of their forms and external peculiarities of structure. In directing attention, therefore, to several of the more interesting species of the fresh water fish now to be seen at the Aquarium, a brief reference will only be made to certain characteristic points relating to their internal structure or their special habits. In the great fresh water tank 43 we find an interesting company of these native fish, many of which will be recognized as those with which every American is familiar, while a few may be, and doubtless are, new and strange to the eastern visitor.

To this latter class belong the gar pikes, two of which are represented in our first illustration, occupying the upper space, and readily to be recognized by their slim bodies and their long pointed jaws. Prof. Burt G. Wilder, to whom we have already acknowledged our indebtedness for services rendered, has in the May number of the *Popular Science Monthly* given an exhaustive review of the habits and structure of this interesting and peculiar fish, and as the specimens in the Aquarium are very fine ones the reader can supplement the information given by Prof. Wilder by a personal examination of the fish itself.

True gar pikes, we are here told, are not found in Europe, Asia, Africa, Australia or South America, while in North America they seem to be nearly confined to the Mississippi river and its tributaries. The body is described



THE GAR-PIKE, CAT-FISH, EEL-POUT, FRESH-WATER DOG-FISH.

Figure 6-18. THE FIRST AQUARIUM MAGAZINE PUBLISHED IN THE WORLD: THE NEW YORK AQUARIUM JOURNAL.

up to the time of the closing up of the establishment, having been in confinement over three years, and by which time they had become the blackest of black drum; all the bands that were so conspicuous in their younger stage having disappeared entirely, although, for the last two years, the shark tank, (some seventy feet in length), in which they had been kept, was always flooded with strong sunlight in the morning and strong daylight during the afternoon, not to mention a flood of gaslight during the evening. The bottom of this tank consisted of clean and white shingle, so that a great deal of reflected light was the result, and yet these "banded drum" seemed to become blacker and blacker black drum every month. Mussels and scallops, in the shell, were their particular delight, and they always had plenty as long as I was their keeper. The bull-nosed clam was too much for their pharyngeal teeth; consequently I had them partially opened before feeding them out.

"During the spring months the males constantly pursued the females, and, on such occasions, both the males and females gave out a series of very musical and liquid drum-like sounds, which could be distinctly heard in any part of the aquarium. Often, when dredging at nighttime at Princess Bay, Staten Island, I have heard the constant drumming of the drum at different points about my boat; they were evidently having a big oyster supper."

From the start, although run as a business, the admission charge was 50 cents for adults and 25 cents for children, it was Coup's sincere desire to develop a truly scientific institution. Dr. Baird, the distinguished ichthyologist of the United States Fish Commission, supplied valuable advice and counsel. Further, Dr. Baird assisted in the stocking and proper maintenance of the tanks. Coup wanted to promote and encourage original scientific research and to aid in the study of natural history, so to this end a "Free Scientific Library and Reading Room" was provided as an adjunct to the Aquarium, as well as a "Naturalist's Workshop," outfitted with microscopes, dissecting tables, experimental tanks, etc., where it was proposed to admit students and teachers for study, all under the immediate charge of Ward at whose suggestion it was established.

This was an ambitious undertaken and it is unfortunate that the New York Aquarium lasted only until 1879. A most interesting feature of the Aquarium was its fish-hatching department. On one such occasion 60,000 eggs of the California salmon were received and the following delightful account is reported verbatim by Mather:

"Of these eggs, 8,200 died, or were killed before hatching; and I will here say we had a difficulty to contend with that is not met with in an ordinary hatching house, viz., handling eggs by visitors. In the State and other establishments there are no more people than the attendants can watch; but in the crowds at the Aquarium, it has been a common thing to find that while talking to one party another by your side has a handful of eggs going off to the window to examine them, and which were invariably killed."

Thus were the liberties permitted visitors to the New York Aquarium!

At the opening of the Aquarium, the principal address was given by the Honorable Robert B. Roosevelt, Chairman of the New York State Fish Commission. From this point on, the Aquarium was a curious mixture of science and business. Even the Secretary of the Smithsonian Institution, Joseph Henry, took an interest in its activities. Yet, as noted previously admission was charged; as was the custom of the day, even a concert was included in the admission price.

Of prime interest was another of the Aquarium's activities - that of the first aquarium magazine published in this country. Indeed, this was the very first aquarium magazine published in the world, predating even the earliest of the German periodicals. The name of this publication was the NEW YORK AQUARIUM JOURNAL, perhaps surprising those who might have thought that the name was original with the San Francisco Aquarium Society.

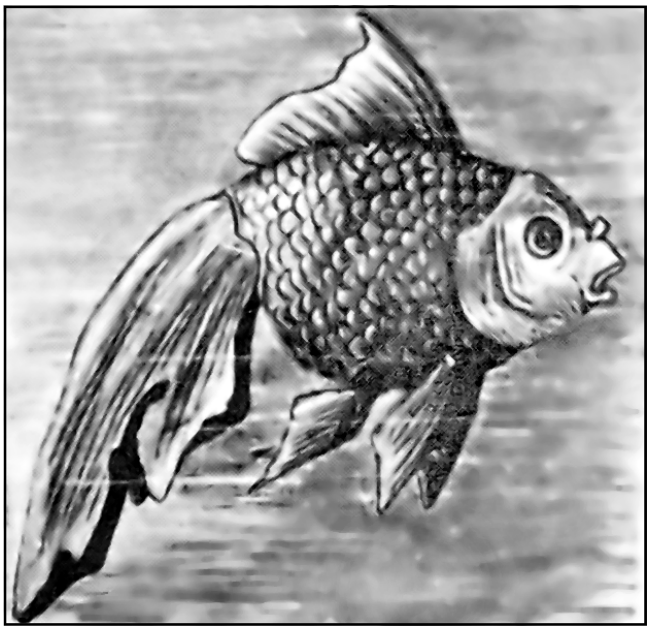


Figure 6-19. A WOODCUT OF THE KINGIYO GOLDFISH DISPLAYED AT THE NEW YORK AQUARIUM IN 1876. This fish was in the very first shipment of fancy goldfish imported into the United States (in 1875).

The NEW YORK AQUARIUM JOURNAL originally started life as a semi-monthly with a subscription rate of 50 cents per year. This was changed shortly afterwards to a monthly at $1.00 per year. The first issue appeared in October 1876, the last (issue number 10) in May of 1877. Each issue contained from eight to ten pages, featured illustrations in the form of woodcuts and also ran advertisements. In form it was a three-column, newspaper tabloid type of publication, ably edited by the erudite Mr. Ward.

The JOURNAL was an excellent magazine for its day; indeed, a good portion of it was far superior to some of the drivel appearing in aquarium magazines published today. There were feature articles, news notes, columns and editorials. One column especially, "For Our Young Folks - told by Uncle Octopus," was a delight. Among other things, "Uncle Octopus" conducted contests for children, offering prizes for the best essays on aquatic subjects. Both salt and freshwater subjects were included among the feature articles in the JOURNAL. Of interest to freshwater aquarists is the fact that the subject of the first article concerning a tropical fish ever to appear in an aquarium magazine (November 1876) was the Climbing Perch, *Anabas testudineus.* It was titled, appropriately, "Fish Out of Water," and to illustrate the quality of the writing, the opening sentence was: "The conceit of a 'fish out of water' is sufficiently incongruous to have given to this phrase a proverbial significance; arid yet what is inconsistent with our ideas of the fitness of things is, it appears, not wholly out of nature's power or plan to accomplish."

Another item of interest to aquarists was the very first goldfish article to appear in an aquarium magazine (NEW YORK AQUARIUM JOURNAL, November 22, 1876). It was titled, "Japanese Kingiyo," and because of its historic significance to the hobby, its major portion is reproduced here:

> "The presence in the Aquarium of this wonderfully beautiful, and strangely grotesque fish, should be a cause for special congratulation. The specimen exhibited in table tank p, of the fresh water series, was brought from Japan by a gentleman who has furnished the following interesting facts regarding it: Starting from Japan with eighty-eight, he arrived in Baltimore with but seven, all of which are now alive and in good health. The captain of the steamer taking great interest in his efforts to introduce the fish to America, built a tank on the steamer to accommodate them, and took in a supply of river water; but it was soon found that the motion of the ship dashed the fish against the sides of the tank and many were lost. To obviate this a smaller tank was built and suspended like a compass, which counteracted the motion of the ship; but notwithstanding all the care bestowed on them only fifteen arrived in San Francisco, all in a very weak condition. Of these eight subsequently died.
>
> "The Japanese claim that the brilliant colors displayed in this fish, and the wonderful development of its triple tail, is the result of many years careful breeding. This one is an unusually fine specimen. In Baltimore great care was taken of the seven survivors, and during the summer they spawned, the result being about fifty young fry, which exhibit all the peculiarities of the originals. It is the intention of the owner

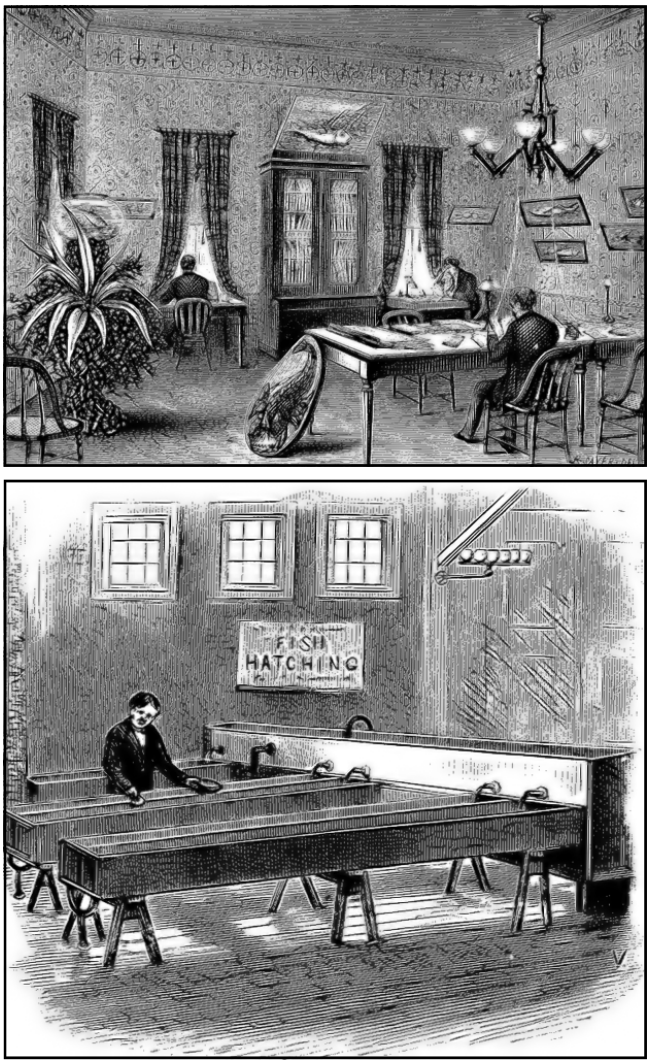


Figure 6-20. TOP: NEW YORK AQUARIUM READING ROOM. BOTTOM: A VIEW OF THE FISH HATCHING FACILITIES AT THE NEW YORK AQUARIUM. The eggs were hatched in long troughs, fed by running water.

when he has a sufficient stock, to donate them among persons who will take an interest in them and carefully raise them.

"For the benefit of any of our readers who have not as yet been able to visit the Aquarium, we would state that in outline and general appearance the above illustration, drawn from life by Mr. Vance, is exact and truthful in every particular. The body is red in color, similar to that of a brilliantly hued goldfish; the tail, however, is a pearly white, and as it rests in the water presents the appearance of a fine, silken fabric, terminating in a delicate fringe. In addition to the peculiar attraction which the form of the fish is to the general observer, the naturalist will find in its very existence and the tradition regarding its origin theme for thoughtful study."

The gentleman referred to as the importer of the "Kingiyo" (the accepted spelling is Kingyo) was Mr. M. Gillet Gill of the tea-importing house of Martin Gillet and Co. of Baltimore. Since he was the first to import fancy goldfish to the United States, I'll return to his story in more detail in a later chapter.

Although the NEW YORK AQUARIUM JOURNAL was discontinued in 1877, the Aquarium itself survived for several years afterwards. Two of the staff later joined Coup in his New United Monster Shows, formed in 1879, which included an "OCEANIC AND INLAND Aquarium of Marine and Freshwater Fishes and RARE AND CURIOUS MONSTERS OF THE DEEP, under the immediate supervision of Prof Roberts."

During this 1879 season Henry D. Butler was listed as being in charge of the aquarium.

As with the aquaria at the American Museum, the New York Aquarium served to further interest in the hobby. Many visitors were so converted, including one Eugene Smith who first saw the inside of the Aquarium during his teen years. Smith was later to become one of the great American aquarists of the period covered by this history.

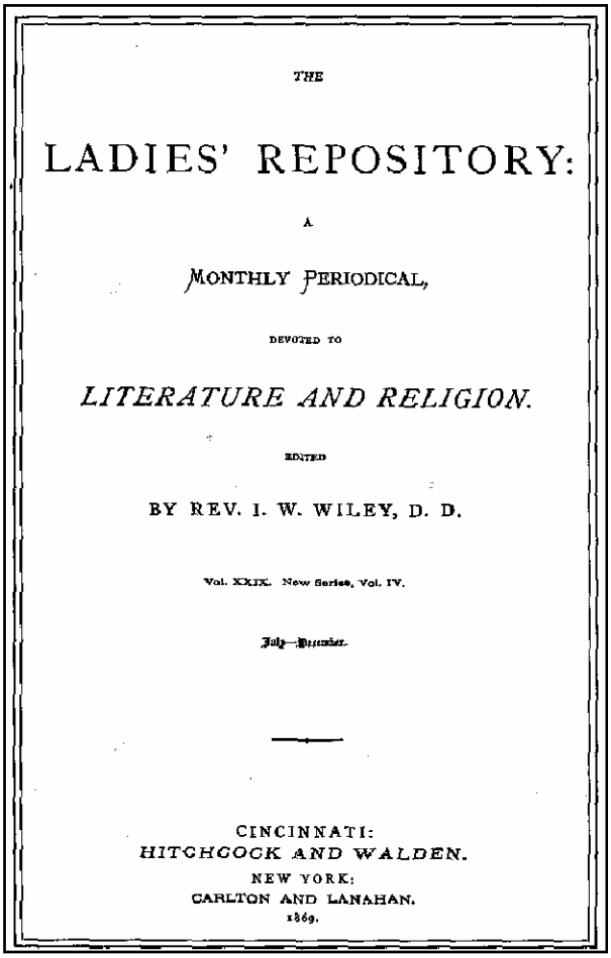


CHAPTER 7:
THE LAST QUARTER OF THE CENTURY

I have previously noted that aquarium literature in America in the 1850's had, as it did in England, religious overtones. Fifteen years later, however, all this had changed. An article in the July 1869 issue of the LADIES' REPOSITORY (see Figure 7-1) dispensed with the sermons and concentrated on supplying practical information. By way of introduction, LADIES' REPOSITORY was a Methodist publication for women that ran for thirty-five years beginning in 1841. It was formulated to be an alternative to GODEY'S LADY'S BOOK and served as a "bridge for women who wanted to venture safely beyond her domestic boundaries."

The following is the text of the article, with the sections on marine aquaria omitted as the author states, "We need not add much in the special treatment of the salt-water aquarium. The general principles already given apply equally in the treatment of marine plants and animals":

> "Here is no household toy, if so we choose to denominate it, more ornamental and instructive than the aquarium, and though requiring some intelligence and considerable care and skill in its management, none is more remunerative in the entertainment and instruction which it affords. 'The aquarium,' says Sidney Hibbard, 'introduces us to new scenes hitherto hidden from our view, makes us acquainted with the ceremony of creatures of whose very existence many of us were previously ignorant. Their habits of feeding, of moving and burrowing; their battles, their changes of form, the display of even a strange intelligence, working its ways by wonderful means to wonderful ends, impress the observer with an idea of the boundlessness, the variety, the adaptations and resources of a world brimming with life, in all manner of strange forms and developments.'
>
> "With respect to the tank, there is scarcely any limit to the kind of vessels that may be converted into aquaria. An earthen bowl of any size, a common bell-glass inserted and fixed in a wooden stand, the ordinary globes used for gold fishes, a confectioner's glass-jar, a tumbler or goblet, or even a wine-glass or small phial, have been made available, especially for marine aquaria, which afford a large range of almost stationary animals, such as sea-anemones, serpule, etc., to which capacious dwellings are matters of no moment. We give two well-accepted forms, one a glass globe that may be purchased of the dealers in glassware in a large variety of shapes, the other rectangular, which is of easy construction, and may be made by the aquarianist himself. A neat size for the rectangular aquarium is two feet long, eighteen inches wide, and fourteen inches deep. It may be made


THE

LADIES' REPOSITORY:

A

MONTHLY PERIODICAL,

DEVOTED TO

LITERATURE AND RELIGION.

EDITED

BY REV. I. W. WILEY, D. D.

Vol. XXIX. New Series, Vol. IV.

July—[illegible]

CINCINNATI:
HITCHCOCK AND WALDEN.
NEW YORK:
CARLTON AND LANAHAN.
1869.

Figure 7-1. THE LADIES' REPOSITORY in 1869.

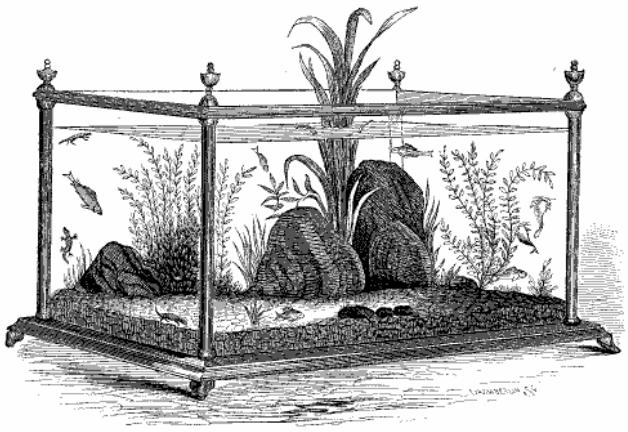


Figure 7-2. A FRESHWATER AQUARIUM. From THE LADIES' REPOSITORY, July 1869

of a metallic or wooden frame-work, into which glass of the proper size is cemented by water-proof cement. The four sides are now generally made of glass. Some prefer opaque ends, slate answering a very good purpose, the emerald, velvet-like appearance which the growth of confervae (***Author's Note:*** **Conferva is a genus of alga)** soon causes them to assume, adding greatly to the beauty of the aquarium. When made wholly of glass, and it is seen that too much light causes too rapid a growth of conferva, the evil can be remedied by covering the back, and the ends too if necessary, with dark-colored paper or muslin, and the amount of light may be regulated by the depth of such covering.

"In addition to the tank, the aquarianist should provide himself with a few feet of India-rubber tubing, to serve as a syphon to draw off the water when necessary, and to remove any sediment; a glass tube for dipping out any semi-liquid, or any small, offensive object, and which is thus used: Place the finger or thumb on the top of the tube before inserting it in the water; place the tube directly over the object to be removed; lift the finger for a moment and the object will rise into the tube with the rush of water, and can then be easily withdrawn. A pair of wooden forceps to remove any larger body or solid substance, and which any one can make for himself out of a piece of hickory wood; a sponge stick, to wipe from the glass any confervoid growth, and a small hand-net, with fine meshes, for taking out any of the animals it may be desirable to remove-mosquito netting will answer the purpose. Nothing more is necessary, though experience will suggest the utility of other simple instruments. When the aquarium is out of order-when the water becomes milky or yellow, and the fishes come to the surface to breathe oxygen, the best remedy is not to agitate the water or throw it away, but to syphon it off into shallow vessels -placing the animals into the shallowest of them - to expose the water for two or three days to the action of the atmosphere, and it will purify itself, the oxygen of the atmosphere decomposing the carbonic acid gas, which is the cause of the mischief. The best exposure for an aquarium is a northern or eastern, the worst is a southern one.

"When the tank is at length ready for fitting up, the bottom should be covered with small pebbles or gravel to the depth of from two to three inches. Earth is unnecessary, as water plants, with a few exceptions, derive their nourishment from the element in which they grow. The mud is but an anchorage-ground for them. Many of the aquatic plants require no anchorage, but grow floating. Pebbles are preferable to sand, as the sand becomes compact under the pressure of the water, and the small particles of decayed vegetation, etc., remain on its surface, whereas they disappear in the interstices of the pebbles. The pebbles also soon become coated with confervae, and are then both ornamental and useful. Rocks are next to be added and arranged according to the taste of the owner, advantage arising from one or two of them projecting above the water. For a freshwater aquarium there should not be too much rock-work, remembering that "the more rock, the less water," and in the fresh-water aquarium groupings of sea-shells, branches of coral, etc., are manifestly incongruous and should never be allowed.

"In the introduction and grouping of the plants there is room for the display of much taste, though utility-the capacity of the plants for evolving oxygen-should be the first consideration. It must be kept in mind that the purpose of

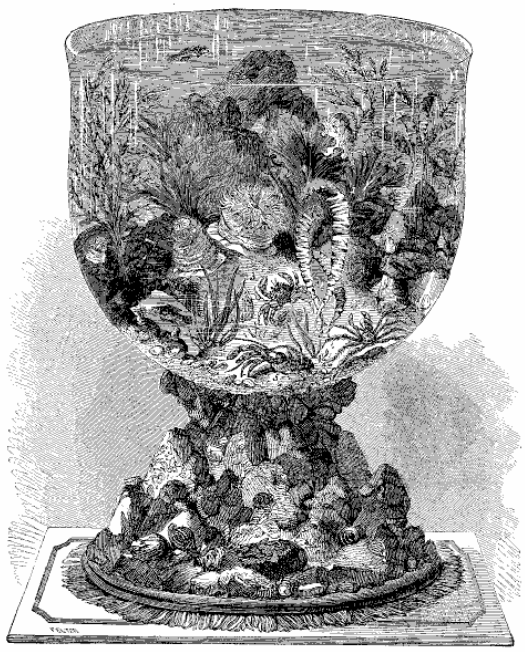


Figure 7-3. A MARINE AQUARIUM. From THE LADIES' REPOSITORY, July 1869

vegetation is to decompose the poisonous carbonic acid gas thrown off by animals, the carbon being absorbed into the substance of the plants and the oxygen being set free for the use of the animals. Modern experience has shown that the confervae and minute vegetation indigenous to the aquarium, are themselves sufficient for the production of oxygen, and the introduction of other plants is for taste and ornament, and the skill of the aquarianist must be exercised in this. For this purpose the following are the best for fresh-water aquaria: *Calla Ethiopica*, African calla; it will thrive well and flower freely, even in a small tank. It requires considerable depth of anchorage, or its buoyancy will lift it out of its place. It may be procured at any green-house. *Lobelia Cardinalis*, with its brilliant, intensely scarlet flowers, works well in the aquarium. *Acarus Calamus*, the common sweet-flag, grows rapidly, sending up its erect blades to a great height. *Alisma Plantago*, great water-plantain, makes a handsome center plant. *Sagittaria Sagittifolia*, arrowhead, is an elegant plant, and is common in all ponds and streams. The best plant for the aquarium is *Valisneria Spiralis*, being vigorous and healthy in growth, and especially valuable in its oxygenating quality; fortunately it is quite common. *Hippuris Vulgaris*, common mare's tail, and *Anacharis Alsinastrumn*, sometimes called water-thyme, are very common and grow readily and improve greatly in the aquarium.

"A tank is generally fit for the reception of its animal inmates in from three days to a week after the introduction of the plants, but pond snails may be introduced simultaneously with the vegetation. In stocking an aquarium two things must be borne in mind-the fishes must not be too large, and they must not be too numerous. Large fish consume more oxygen than this artificial tank can supply. A tank holding six gallons of water will not safely support more than three fish, averaging three and a half inches in length, in addition to the mussles and snails required as scavengers. A newt and a very small eel or two might be added without danger. After some weeks, especially in warm weather, and when the stones begin to show considerable confervoid growth, fifty or even a hundred snails may be put in with good results, as they will clean out all decaying vegetation and keep the water pure and bright.

"Small gold-fish will of course be the first choice of the aquarianist; but the minnow, the common shiner, the yellow perch, the sunfish, the dace, the common sucker, may all, or some of them, be brought together in peace and harmony, and will afford a sufficient variety of animated nature. But these selections must be left to the taste and judgment of the aquarianist. No small part of the value and interest of an aquarium lies in learning how to take care of one, to preserve the plants and animals, and to gain knowledge of their nature and habits, as well from failure as from success. No number of failures should deter from further experiments, as in this way only will the operator learn the great extent and variety of interesting objects of observation and study that may be brought to his hand by means of the aquarium."

The advice given in this article is both practical and useful, although I am amused by the term

"aquarianist." Apparently it would be another five or six years, with the arrival of Hugo Mulertt and the other turn-of-the Century pioneers, before aquarium terminology became those of today's standards.

The state of the art in aquariums and in fish keeping in the late 1860's and early 1870's in the United States was still rudimentary. An article in SCRIBNER'S MONTHLY for September 1871 provides a good example of the ingenuity used to construct a simple, inexpensive aquarium:

> "To those who have not looked into the subject, an aquarium seems both expensive and troublesome. Short experience, however, will prove that it need not be either. A simply constructed and intelligently managed aquarium is less trouble than a hanging basket or choice pot-plant, and by its mature possesses greater and more varied interest.
>
> "Let us suppose ourselves among a group of young people at the seaside, dabbling in the surf, fishing for weeds at their daily bath, and rather wishing to possess some means of preserving the beautiful and curious things they daily see. Only they 'know their fish will die,' and 'the whole thing prove a failure,' and 'Papa says it's nonsense to spend much on it,' etc. 'Now,' they ask,' how shall we go to work?'
>
> "You can do one of two things. First and simplest, you can buy a large glass cake cover, of the kind used in confectioners shops, and which costs from three to five dollars, according to size. 'Somebody' will whittle you a thick square block of wood and make a hole in the middle, of right dimensions to hold the glass knob of the cover firmly. Well, now you have your aquarium! If you choose to glue shells and pebbles on the wool, or stain it some pretty color, or paint it with sealing-wax paint, and stick over it bits of white coral, it will he all the prettier. But that is your own affair."

In the September 1872 issue of MANUFACTURER AND BUILDER - a kind of a POPULAR MECHANICS, POPULAR SCIENCE and SCIENTIFIC AMERICAN, all rolled into one - an anonymous correspondent offers a formula for aquarium cement:

> "I send you a recipe which I have used eight years in my own aquarium with perfect success. The cement has never been removed, and the tank has never leaked a drop during the time: One part, by measure, say a gill, of litharge; one gill of Plaster of Paris; one gill of dry, white sand; one third of finely-powdered rosin. Sift and keep corked tight till required for use, when it is to be made into a putty by mixing with boiled linseed oil, with a little patent dryer added. Never use it after it has been mixed with the oil over fifteen hours. This cement can be used in marine as well as fresh water aquaria, as it resists the action of salt water. But the tank must have either an iron or stone framework - a wooden one will warp, and cannot be made tight with any kind of cement. Be sure your plaster of Paris is pure. Dentists always keep that which is good. It is best to let the tank stand a day or two before the water is put in."

Another popular aquarium cement of the period was made by mixing two parts of tar with one part of gutta percha, a rubber like material from various Malayan trees.

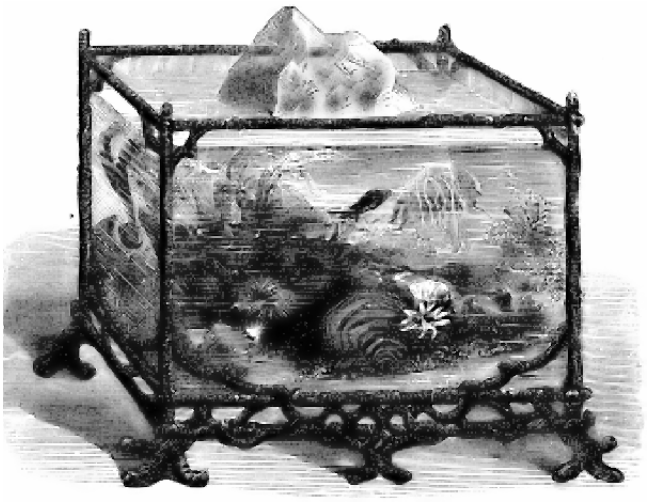


Figure 7-4. AN AQUARIUM ILLUSTRATED in "Life Under the Ocean Glass," HARPER'S NEW MONTHLY MAGAZINE, May 1873.

In HARPER'S NEW MONTHLY MAGAZINE for May 1873, Lyman Abbott, in article titled, "Life Under the Ocean Glass," talks of the construction of the tank (see Figure 7-4):

> "That of the parlor (aquarium) is of very simple construction. A flat vessel of slate or zinc constitutes the bottom. Four columns of metal, bronze or iron, hold four sheets of glass in a vertical position, surmounted by a metal frame. To adjust the vegetation of this little world to its animal life, so that the plants will exhale just as much oxygen as the fishes need for life, and will decompose just as much carbonic acid gas as the fishes exhale - this is the scientific problem which a perfect aquarium must solve, and which is by no means easy of solution. On these cabinet aquaria science and art have made, however, great improvements."

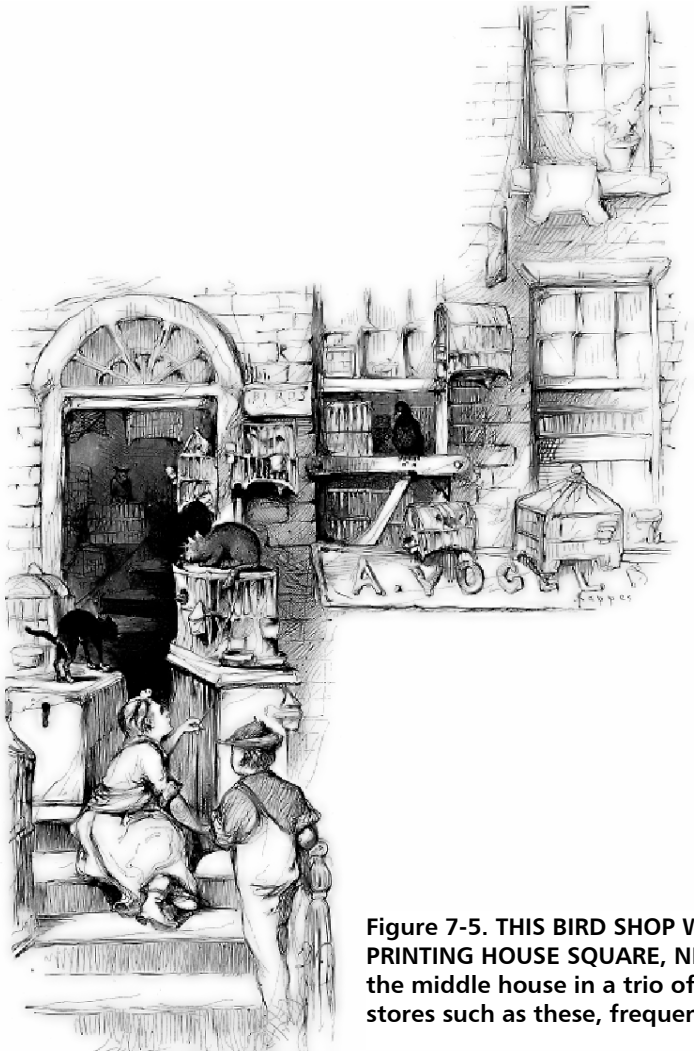


Figure 7-5. THIS BIRD SHOP WAS LOCATED IN THE CHATHAM STREET CORNER OF PRINTING HOUSE SQUARE, NEW YORK, 1872. It occupied half the ground floor of the middle house in a trio of small and ancient two-storied brick structures. Bird stores such as these, frequently sold fish and other animals as well as birds.

5) in New York City in 1872. In all my years exploring the history of the aquarium hobby I have never encountered such writing as elaborately or excessively ornamented as his:

> "A searching glance behind the four large panes, set in a stout unpainted sash, shows that the room usually devoted to a broad sill is mainly usurped by a rude wooden aquarium, a yard square and twenty inches deep. A narrow space along the front of the sill is garrisoned with a troop of rusty-gray, rose-lipped conch-shells, while two wire baskets, conchologically filled with rainbow specimens, are pendent in the background. The broad front edge of the tank does duty as a shelf, whereon appears a battalion of gold-fish globes of glass, three of them, goblet-shaped and taller than the two small, round intermediate ones, and all of then freshly plenished with sparkling Croton and with handfuls of green and feathery water-plants. In the first of the taller globes half a dozen little fishes with gossamer fins and tails are swimming restlessly around, thrusting their cold noses against the incomprehensible glass, while a bigger, flame-colored brother, with a black face and a jet stripe along his back, poises himself among the fern-like leafage and tranquilly disregards the impertinent nibblings of two or three scaly and comical little fellows, with brown backs, flat white bellies, beady black eyes, and half a dozen slender ebony feelers, waving about their mouths like so many fierce mustachios.
>
> "In the second large globe a score of little olive-green eels, beautifully lithe, glide to and fro with sinuous smoothness, or, startled by a passing shadow, slip out of sight with proverbial celerity among the feathery foliage. In the third a community of small brown snails is securely housed, their fine indifference to alarming circumstances, and their philosophic deliberation

of movement, affording an edifying contrast to the superfluous squirminess of their finny brethren. In one of the smaller globes are six or eight docile minnows, while the other is full of a wrestling crowd of youthful tortoises, an inch or two in length, who look demurely vicious as they claw their way persistently along the smooth glass, displaying the vivid scarlet and yellow stripes on the under sides of their shells, slowly wagging their acute little tails, and thrusting forth their long necks at intervals with an air of preternatural penetration."

Sterns also wrote an article for SCRIBNER'S MONTHLY titled, "The Street Vendors of New York," and I am overcome with amazement to report that the article was no less florid than this one.

The 1870's was a time when soap was 8 cents a cake, coffee 18 cents a pound and Hennessy brandy $4 a gallon. It was a Victorian period of great ostentation and ornamentation that was also reflected in the home aquaria of the day. Victorian style means lushness and lavishness and, after a century of modern art and architecture, represents a feast for eyes long starved for detail. After a steady diet of beige and right angles, there are those among us who cannot get enough crimson and floral carving. And although most of the surviving artifacts of the Victorian age were machine-produced, which is why there are so many of them, they were made to a much better standard than we are used to now. Even if the aesthetics of a six-sided aquarium with flower urns at each corner and a fountain in the middle suggest "enough is enough," at the very least one has to admire the workmanship.

By this time many iron and zinc works had gone into the manufacture of tanks, notably rectangular tanks from 14 inches to 4 feet long, although the ornate bases and corner spires might make them unrecognizable as such today. Especially popular were octagonal aquaria; these were available in sizes of from 2 feet to 5-1/2 feet in diameter, and on either short bases or tall pedestals. However, smaller octagonal tanks were available without pedestals or bases. It was customary to bronze such tanks and it was also usual to furnish fountain sprays that sat in the middle of such aquaria. Even the rectangular tanks could be supplied with such fountains. The following is from the MANUFACTURER AND BUILDER for July 1878:

"At the request of one of our subscribers, we give two designs for aquariums. Fig. 1 is an ornamental, and Fig. 2 a plain aquarium (***Author's Note:*** **see Figures 7-6 and 7-7**). We earnestly advise all who thus far have never indulged in the luxury of practically studying aquatic life, to procure such an apparatus and observe the mutual reaction and sustenance of its vegetable and animal domain.

"A close observation of what takes place in a well-arranged contrivance of this kind, offers far better lessons in this delightful branch of natural history than a much more protracted and sometimes fatiguing study of books on the subject. We could fill whole numbers of our journal with the recital of our experiences and observations in this line, but will confine ourselves now to a single instance.

"The reader should know, in the first place, that the common black water snail is a useful scavenger for keeping the glass of an aquarium clean, which otherwise soon becomes covered with a greenish slimy deposit, which however, by the aid of a magnifying glass, will be seen to

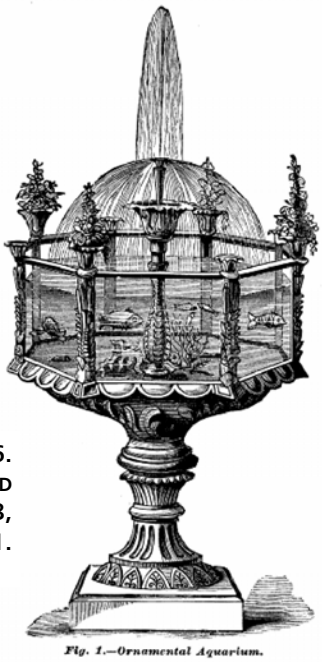

Fig. 1.—Ornamental Aquarium.

Figure 7-6. MANUFACTURER AND BUILDER, July 1878, Figure 1.

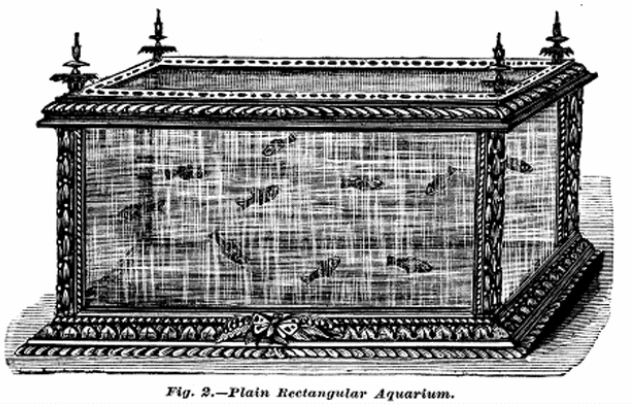


Fig. 2.—Plain Rectangular Aquarium.

Figure 7-7. MANUFACTURER AND BUILDER, July 1878, Figure 2.

consist of a luxuriant vegetation, consisting of fibers finer than the finest velvet. The snails eat this and graze over the glass sides, like cattle in a pasture. They also deposit eggs against the glass, which eggs, being perfectly transparent, afford a fine opportunity to observe with the microscope the development of the young, which remain perfectly transparent for a while, even after they begin to move about.

"Noticing that the fish in the aquarium soon ate those eggs, we arranged one of our aquariums without any fish; plenty aquatic vegetation was provided, and about fifty snails. This was also done for the purpose of studying infusorial life, which soon becomes very vigorous when fish are absent; and if the aquarium contains no decaying matter, but only prosperously-growing plants, this life will be of at higher order than that developed from decaying objects. Very soon the interior was teeming with living beings of various forms, which moved by thousands among the aquatic foliage like birds among the trees of a forest, and it was delightful to adjust lenses of different focal distances against the glass sides of the aquarium and watch the numbers of animalculae which crossed the focus of each lens. Among the familiar forms of rotifera, and others described by naturalists, less familiar forms were often noticed, and it gave the most enticing inducement to a deeper study of this branch of natural history, of which the greatest fascination consists in the utmost fantastical variety of forms, which often are such as to be impossible of existence and impracticable among large animals.

"After this arrangement had served the purpose of practical study of a great many genera, it was finished up by placing in it one of the smallest fishes from another aquarium, less than 1-1/2 inches long; this little being, small as it was, had in a very few days cleaned the aquarium of all the living animalculae; it was as if an eagle had been put in an aviary full of canaries and other small birds and eaten them all.

"The two aquariums here represented are from the establishment of J.W. Fiske, 26 and 28 Park Place, and 21 and 23 Barclay St., New York. We recommend Fig. l to those whose principal aim is to have an ornamental object; but for the study of aquatic life we recommend Fig. 2 as being the most convenient and best adapted for observation."

The firm of J. W. Fiske and Company mentioned in this article was one of the preeminent makers and retailers of ornamental iron and zinc objects in New York City in the second half of the nineteenth century, producing a wide range of garden fountains, statues, urns and furniture. Although known as a manufacturer, Fiske did not have his own zinc factory or iron foundry, thereby bypassing one of the most time-consuming and capital-intensive aspects of the business. Nevertheless, the resourceful business practices of Joseph Winn Fiske (1832-1903) elevated him above other manufacturers, and as a result his products were admired as some of the finest of the period. Imitation, it is said, is the sincerest form of flattery and in the latter part of the twentieth century misattributions of unmarked pieces to the Fiske Company became extremely common.

Fiske was born in Chelmsford, outside Boston, the son of Benjamin M. Fiske, a house builder, and his wife, Elizabeth. Fiske ancestors had immigrated to America from England in the seventeenth century. Joseph graduated from Westford Academy, a local school, but little else is known about his early years. In 1853 he traveled to Melbourne, Australia, intending to manufacture and sell "hardware, mining tools and general

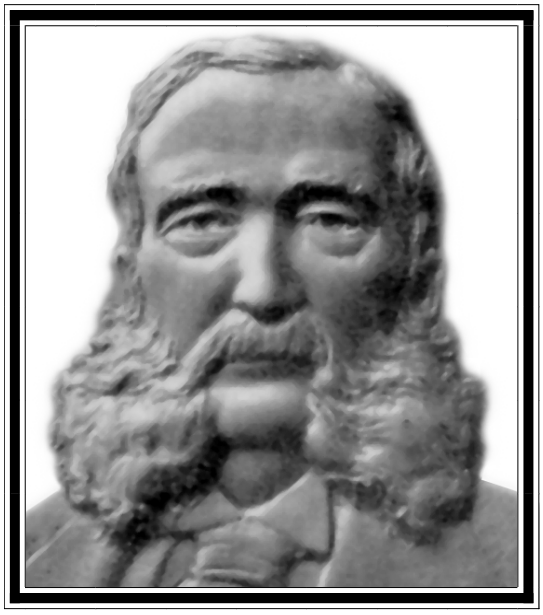


Figure 7-8. JOSEPH WINN FISKE (1832-1903)

merchandise." An amusing aside is that in 1854 he was served a summons for causing "an obstruction in a public street, to wit in Swanston Street (where he lived) within the City of Melbourne by leaving out cases and chests on the foot path."

Fiske returned to the United States in 1857 and the first listing of the Company in New York City dates from 1864. However, the early years of Fiske's Company is concealed in the labyrinthine relationships among himself, John Winn, a relative, and Thomas W. Brown. The last-named filed a lawsuit in 1864 against Fiske and John Winn, claiming that the three men entered into a partnership in December 1863, but that the other two had not given him his share. Fiske and Winn held that the partnership never existed because Brown had failed to pay his outstanding debts as required before the partnership went into effect. In August 1864 the judge ordered, among other things, that the partnership be dissolved.

Whatever its beginnings, the J. W. Fiske and Company in the business of iron had emerged in New York City by 1865. In December 1867 Fiske professed that he had "no partner" even though "and Company" was part of the firm's name. When questioned, he said he planned to change the Company name to Joseph W. Fiske, which he did in 1868. Fiske proceeded to employ family members who eventually spawned a sort of dynasty. John M. Fiske, a nephew, came from Boston to work for him in 1871, and Joseph Winn Fiske II joined the firm in 1881. Both men remained with the Company for life. Another relative was John Warren Fiske, who designed most of the famous hexagonal and octagonal aquaria produced by the firm.

After 1830 new techniques and improved smelting methods allowed manufacturers to exploit the versatility of cast iron to satisfy the eclectic taste of Victorian consumers. The market for ornamental cast iron expanded and by 1860 there were a number of large manufacturers competing fiercely in the Northeast. In 1879, for example, there were at least forty-one iron foundries in New York City. Many began by making such household objects as cast-iron stoves and later diversified into architectural and garden ornaments. As early as 1867 and in later years as well, Fiske was reported to have had a good business and been a responsible credit risk. The 1869 New York City Register listed Fiske as a manufacturer of ornamental ironwork, fountains, vases [urns], statuary, settees and chairs, cast iron and wire railings, iron stable fixtures and copper weathervanes.

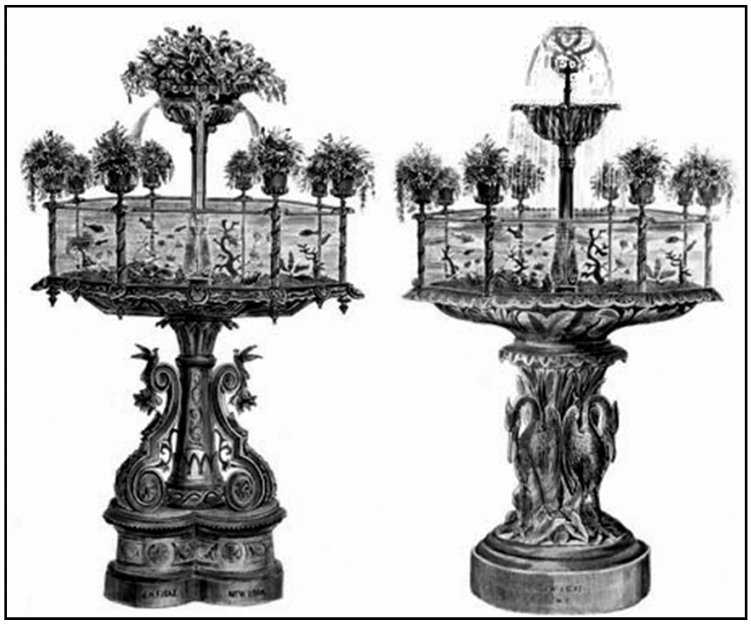


Figure 7-9. FOUNTAIN AQUARIA from the 1893 J. W. Fiske catalog.



Figure 7-10. THIS CAST IRON AQUARIUM BY THE J.W. FISKE & CO. WAS OCTAGONAL AND WAS DECORATED WITH A SHELL AND FOLIATE DESIGN. The central fountain was raised on a pedestal with cast iron figural herons on a molded round base, complete with four candle stands and four plant stands. The tank is 47" high by 30" wide. The base holds the pump whose electrical cord is shown extending from one side at the bottom.

The rivalry between the Fiske Company and the J. L. (for Jordan Lawrence) Mott Iron Works of New York City (see Figure 7-11) is illustrated by their competition for providing and installing a large municipal fountain in Chambersburg, Pennsylvania. These two New York firms and Robert Wood of Philadelphia submitted designs for the fountain. When none of them were adopted, Fiske offered another design, which was immediately accepted but the price, $3,000, "prevented purchase." Early in 1878 Mott proposed that the town buy the fountain he had displayed at the Centennial Exhibition in Philadelphia in 1876. Just as this offer was about to be accepted, the town reopened negotiations with Fiske; ever the persuasive salesman, he sent them a new design at the much-reduced price of $1,700 delivered. He won the contract!

Although Fiske's line was more extensive than most of similar companies in the United States (see Figures 7-8, 7-9, 7-10 and 7-13), many of its individual products were not unique to the firm. Despite design patents, companies appropriated patterns without compunction. In his 1868 "Illustrated Catalogue and Price List of Ornamental Iron Goods," for example, Fiske offered two lines of seating furniture whose patents were registered to other makers. In many cases molds were taken directly from existing objects, such as statues of a French bloodhound and a wild boar that Fiske brought back from Germany about 1860. A fountain composed of a boy and girl under an open umbrella was copied from an Italian terra-cotta group that had been shown at the Centennial Exhibition of 1876 in Philadelphia. This is not to say that the Company did not register a number of its own seven-year patents, for such included ornamental vases, fountains, a settee, and statues of a dog and a lion, and a boy and stork fountain was modeled by one of the Company's own unnamed sculptors in 1881 in the Fiske workshop.

Designs were often derived from classical sculpture and urns. Fiske's 1874 "Illustrated Catalogue of Zinc Statuary," pictured many mythological and allegorical statues. Works by such well-known sculptors as Antonio Canova (1757-1822) and Bertel Thorvaldsen (1768 or 1770-1844) were replicated as statues or on urns. Designs for seating furniture were copied after popular, often registered, designs in Great Britain. French urns of 1870 may have served as design sources for at least eight of the vases in Fiske's catalogue of about 1893 and some of Fiske's fountain designs and many others of the period were inspired by sixteenth-century Italian Renaissance fountains.

The Fiske Company responded to prevailing Victorian tastes with a broad range of garden decorations. Naturalistic and botanical themes for statues, fountains, aquariums and furniture attracted the attention of the proponents of the English landscape garden school. Fiske's catalogues pictured deer, lions, and eagles and classical statues of the four seasons that were shown alongside costumed Arcadian figures in the pastoral tradition. Many of these ornaments could have been used to decorate the park-like cemeteries of the day as well as private gardens. Fiske's offerings in the 1870s

included copper weather vanes, for which he was later renowned.

Fiske's order books offer compelling proof of the volume and character of the Company's production of outdoor decorations. Between May and August of 1872, for example, the Company took orders for 178 urns, 62 garden seats, 34 fountains and 23 figures. An inventory of outdoor sculpture in the United States taken in 1995 credits Fiske's factory with sixty-five sculptures, monuments, or fountains still extant in eight states, while Mott is listed with sixty-four and Wood with thirty-four. The objects were shipped either with a bronzed finish, or painted white, green, red, granite, or blue. Among the identifiable buyers were cemeteries, hotels, a nursery, a steamship company and even a sheriff in Warren, Ohio. Deliveries were made to relatively nearby places, such as New Haven, Boston, Martha's Vineyard in Massachusetts, Baltimore and Washington, D.C., and as far away as Atlanta, Chicago and Detroit.

Late in the twentieth century, the prestige of the Fiske Company led to frequent misattributions of unmarked products to the company. Fiske decided early on to mark many of his pieces with the company's name, the showroom address and sometimes even the patent date. Because the company frequently changed names and addresses, these marks are useful in dating the objects. However, since designs and patterns were almost universally duplicated among makers, it is impossible to differentiate the designs of one or another without a solid provenance or the presence of a mark.

In certain situations competing companies chose to work together. This was necessary for Fiske who, having no foundry, relied on others to do his casting. On May 3, 1869 Fiske signed a contract with E. G. Smyser of York, Pennsylvania, by which Smyser's firm, Variety Iron Works, would supply Fiske with various iron objects "at Five cents per pound delivered free at the Depot in New York City." Established in 1840, Smyser's York foundry was one of the oldest and largest in the state and was reported to be "one of the great Iron Establishments of the Country....which supplies one of the largest Iron and Architectural Houses in New York [Fiske]."

In 1982, the Fiske Iron Works, a.k.a. J. W. Fiske Architectural Metals, donated its weathervane dies, molds and miscellaneous equipment to the American Folk Art Museum in New York City and finally closed its doors. Although J. W. Fiske produced a fantastic variety of statuary and other iron artifacts, among aquarists the name will forever be associated with Victorian, hexagonal aquaria where understatement was never in either the manufacturer's or the buyer's mind. Sadly, the aquariums of this vibrant Victorian age are no longer available to us today, except as antiquities not easily affordable to the average hobbyist.

In addition to the effect mentioned in Chapter 4 that public aquaria had on the American public, the influence of expositions such as the World's Columbian Exhibition of 1893 in Chicago also must not be discounted. The building (see Figure 7-15) devoted to the



Figure 7-11. THIS FISKE AQUARIUM, IN AN OCTAGONAL AND GLASS ENCLOSED DESIGN, WAS DESIGNED BY JOSEPH WARREN FISKE AND BUILT IN 1875. It holds 50 gallons of water.



Figure 7-12. THE MAIN COMPETITOR TO THE FISKE COMPANY WAS THE J. L. MOTT IRON WORKS OF NEW YORK CITY. This Mott aquarium was offered in its 1873 catalog.

aquaria of the Fisheries exhibit in this Exhibition, for example, was one hundred and thirty-five feet in diameter. In the center was a rotunda sixty feet in diameter, in the middle of which was a great basin or pool, twenty-six feet across, from which towered a moss and fern covered rookery.

Streams of water poured from the crevices in the rocks and fell to a mass of reeds and ornamental aquatic plants in the pool below containing many brilliant varieties of fish. A series of large tanks, ten in number having a water capacity of 7,000 to 27,000 gallons each, were arranged along one side of a corridor or arcade, fifteen feet wide, and on the opposite side a line of smaller tanks with a capacity ranging from 750 to 1,500 gallons each. The glass fronts of the aquaria contained 3,000 square feet of surface and were in length 575 feet.

The total water capacity of the tanks was 140,000 gallons. Forty thousand gallons of this was devoted to the marine exhibit and required a salt-water reservoir and circulation of 80,000 gallons. The supply was received from the Wood's Hole (Massachusetts) station of the United States Fish Commission, where the seawater was evaporated to one-fifth its original bulk and which was restored to its original density by mixing it with water from Lake Michigan. All this had an effect on the public and at least one well-known figure in the aquarium hobby, Fred Kaempfer of Chicago, was motivated here to expand his interest in aquarium fishes. The influence of public aquaria and the great expositions of the 1800's on the aquarium hobby is an interesting topic that begs to be explored by aquarium hobby historians.

The period 1856 - 1866 saw the rise and fall of the hoop skirt. In 1860 there were but sixteen American cities with populations over 50,000; in 1900 there were seventy-eight and New York City had passed Paris in numbers. Although the Civil War dominated this early period, it also saw the rise of the Industrial Revolution in America. After the Civil War American communities were changing in both size and nature. The changing community, against a background of



Figure 7-13. J.W. FISKE MANUFACTURED THE CAST IRON HEXAGONAL AQUARIUM ABOVE. The top of the aquarium has decorative plant holders and sits on a cast iron pedestal base (which is not original, but it is very old and works well with the actual aquarium). The pedestal base is 28" high and the aquarium measures 34" corner to corner and is 18" high.



Figure 7-14. J.W. FISKE WASN'T THE ONLY ONE PRODUCING ELABORATE, CUSTOM AQUARIUMS. During the last half of the 19th Century, iron works produced anything that could be made of that metal. This ad appeared in THE CENTURY magazine for April 1895.



Figure 7-15. VICTORIAN AQUARIA (this one is circa 1890) FREQUENTLY DISPLAYED FINIALS ON THE TOP OF THE VERTICAL SUPPORTS.

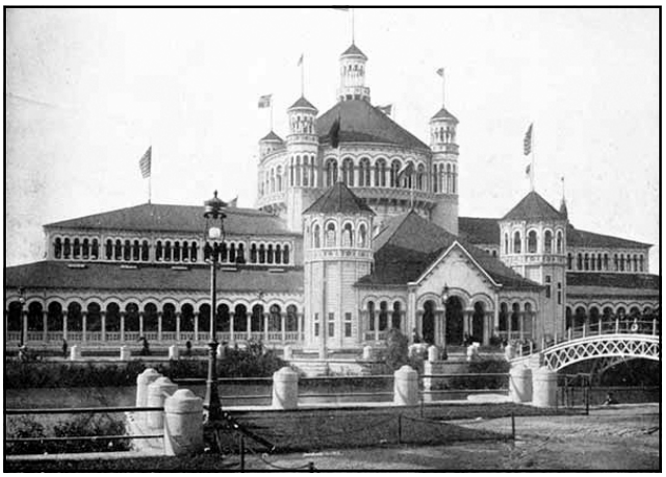


Figure 7-16. THE FISHERIES BUILDING AT THE WORLD'S COLUMBIAN EXHIBITION OF 1893 IN CHICAGO.

changing technology, produced an inevitable change in patterns of leisure-time activity. Urbanization brought people together in dense centers of population and improvements in local transportation made it possible for them to assemble conveniently at a given place and time.

Improved printing, cheaper mails and telephone service put people in quick touch with what was going on. It was the age of the periodical and, as we shall see, in the aquarium hobby it started with the publication of Mulertt's THE AQUARIUM in the late 1870's and into the 1890's. Tropical fishes were being imported for the first time, starting with the Paradise Fish in 1876 and the others that followed shortly after the introduction of the Chanchito in 1895. In the 1890's, aquarium societies appeared on the scene as well as new authors such as Ernst Bade, Gregory Bateman, Charles Page and Mark Samuel, ushering in the last stage of the aquarium hobby as we know it today, i.e., STAGE IV, "Association," the notion of aquarium societies, exhibitions and competitions, all strengthened by improved communication through the appearance for the first time of aquarium magazines, improvements in travel and the changing nature of cities. First, however, we shall take a look at one of the earliest and most important aquarists of the last quarter of the Nineteenth Century.

CHAPTER 8:
THE GRANDFATHER OF THE AQUARIUM HOBBY IN AMERICA

In the course of preparing this history I set as one objective the identification of the greatest American aquarists of the period. Chronologically, Cutting, Damon and Butler were the first to enter on the scene, but they were a product of the times. Without denigrating their remarkable achievements or denying their rightful place in this exalted group, it is clear that when no one has preceded it is easier to set records. Indeed, under such circumstances every accomplishment is a record. I have no hesitation in naming the next man, however, one who is most likely the greatest of them all. Using adjectives such as "real" and "true" to skirt technicalities on which purists may carp, it may be said that he was our first real aquarium writer, our first aquarium plant expert, our first cultivator of the fancy goldfish, the publisher and editor of our first true aquarium magazine, the one who introduced *Sagittaria subulata* (= *Sagittaria natans*) to the hobby, a popularizer of aquarium fishes after Barnum, a confidant of ichthyologists, and an expert breeder of fishes and propagator of plants alike. This man was Hugo Mulertt (see Figure 8-1).

Mulertt rightfully can be named the "Grandfather of the Aquarium Hobby in America." I can forgive those chroniclers of aquarium history before this who have overlooked Cutting, Butler and Damon, but I cannot absolve those who have denied Mulertt his just due. Admittedly writing history is not easy, as uncovering the facts involves much hard, tedious work. In addition, Mulertt's activities spanned the period from the 1870's to shortly after the first decade of the turn of the century and these 45 or so years preceded the mainstream of the organized hobby in America. In a sense, the hobby took up where Mulertt left off. The significance of Mulertt's contributions was therefore not manifest to those active after his retirement from the scene.

Before World War I there were three waves of German immigration to the United States. The first, which peaked between 1850 and 1856, occurred before the birth of the aquarium hobby in Germany, which started about 1856-1857, and so had no influence on the American hobby. The second wave occurred between 1865 and 1875, bringing a number of German immigrants, many of whom settled in the Midwest and were to become significant figures in the hobby. The most important of them all was Hugo Mulertt.

Hugo Mulertt was born in 1848 in the town of Delitzsch, near Leipzig, Germany and his boyhood was passed in an old castle in the moat of which he was wont to amuse himself catching all sorts of swimming and creeping things, and thus he conceived a strong love for the study of natural history. He came from a very old family in Germany, his father being a merchant in Halle, a city located about 20 miles from Leipzig. The foundation for his future was laid at the



FIGURE 8-1. HUGO MULERTT (1848-1927), Grandfather of the Aquarium Hobby In America.

Realschule of the famous Franke Foundations (Franckesche Stiftungen) of that city. In 1695 in the then outskirts of Halle, August Hermann Francke (1663-1727), a theologian and university professor in Halle established a school for deprived and orphan children. Within only 30 years, the Franckesche Stiftungen, favored and protected by the Elector of Brandenburg and King of Prussia, the school was able to establish a publishing house, a book store, a printing office, a pharmacy and an impressive collection of natural history specimens.

After spending a year in England he immigrated to the United States in 1864 and found employment in a commercial nursery in New Jersey. At this time, the civil war was at its height, and on January 10, 1865 at the age of 17, under the name of Charles H. Mulerst (sic), he enlisted as a private in the Union Army, Company C of the 10th Calvary Regiment of New York and fought to the end of the war. Re his enlistment name, the supposition is that he was christened Karl Hugo Mulertt but Anglicized his first name after he came to this country. He preferred Hugo to Charles, however, and that is how he was known here.

His most stirring experiences were during the closing days when Sheridan and Grant were closing in upon the confederate forces. During the operations at Sailors' Creek and Farmville he was wounded on August 7 when his regiment swam their horses across a river filled with floating ice and came under the fire of the enemy. Two days later, at the very last charge before the surrender at Appomattox, he was taken prisoner while attempting to capture a confederate battle flag. He was confined in Lynchburg and with two companions raised the first Union flag over the city after the surrender, the rope for this purpose running into the room where the boys in blue had been confined.

After the war Mulertt found work on Southern plantations where he had ample opportunity to study the flora and fauna of that part of the country, and he supplied many fine specimens to the institutions of learning in Europe. Leaving his position as horticulturist in 1872 at the Bellevue High School in Virginia**,** he spent nearly two years in foreign traveling, visiting nearly every point of interest in Europe. Returning to the United States he settled in Cincinnati, Ohio, and by 1874, the year the first zoo opened in America (Philadelphia, July 1, 1874), he had established himself as a florist in downtown Cincinnati, sometime later advertising himself as "Aquarist and Florist" specializing in "Native and foreign ornamental fish, amphibians for ornamental and scientific purposes, aquatic plants of every description, native and foreign." (***Author's Note***: **Native fishes were in the beginning called "wild fishes" by aquarists.**)

His store handled tanks of all sizes and shapes made of cast iron, sheet metal, terra cotta and Cincinnati faience, the last-named a sort of ornamental, glazed earthenware. Along with the aquarium accessories of the time, e.g., tuft stone ornaments - Mulertt introduced tuft stone into the hobby in this country - seasand, aquarium cement, plant tongs, prepared fish foods, etc., he also dealt in tulip bulbs, gladioli, lilies, iris and tuberoses.

From the start, Mulertt was fascinated by the lore of natural history and although primarily a horticulturist, he became deeply interested in fishes. Sometime during the 1870's, he was appointed Assistant Commissioner of Fishes for the District of Southern Ohio and the surrounding area. It turned out that the area around Cincinnati was ideal for the cultivation of fishes and in a short while became the leading producer of German carp. In those days the U.S. Fish Commissioner was interested in establishing German carp culture in this country.

Accordingly the Government offered, free of charge, ten to twenty fingerlings to anyone willing to attempt their cultivation. In the year 1876 only three people had applied, but by 1879 this number had risen to 324 and a good many of these fish were sent to Cincinnati. In 1879, 37 individuals in the Cincinnati area received varying numbers of carp, not counting Mulertt, who received 21 for his own use.

Mulertt apparently took his duties as Assistant Fish Commissioner seriously. In these early days myths about fish culture abounded and Mulertt, at his own expense, printed a brochure that answered 22 questions on the subject, such as optimum water temperature, stream flow, depth of water, etc. One of his outstanding contributions in the area of aquarium fishes,

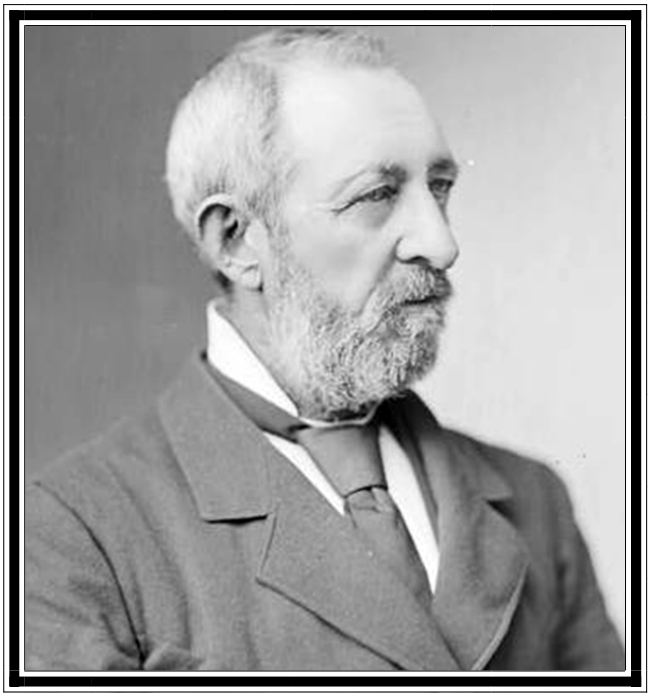


Figure 8-3. REAR ADMIRAL DANIEL AMMEN, 1820-1898, was a U.S. naval officer during the American Civil War and the postbellum period, as well as a prolific author.

however, was the establishment of the first true aquarium magazine in this country and the world. This magazine, a monthly called THE AQUARIUM, first appeared in Cincinnati in the year 1878. Mulertt published two volumes of this magazine, which was in English, suspending publication sometime in 1881 or 1882 - the exact year is not known.

He resumed publication in Brooklyn, New York, in the 1890's and its contents will be examined in some detail in a later chapter. Many of the articles that appeared in THE AQUARIUM were reprinted in both the English and German language American press of the time. They enjoyed a wide readership and helped immeasurably to spread the word of the aquarium hobby.

By the end of the 1870's Mulertt had also built a nursery in a then suburban part of Cincinnati where he raised fish, mostly goldfish and aquatic plants. This nursery was quite an extensive affair for the time, consisting of numerous concrete pools arranged in a semicircle. This destroys, once again, another myth. In Joseph Kane's book, *Famous First Facts* (3rd edition, 1964), the author credits Eugene C. Shireman with starting the first successful goldfish hatchery in America, at Martinsville, Indiana in 1899, and later known as Grassyforks, Inc. This is, of course, not true, as Mulertt had preceded him by many years. Indeed, there were many successful goldfish hatcheries in the Cincinnati area, all started before Shireman's. The area was as ideal for goldfish cultivation as it was for German carp.

Kane also erroneously credits Rear Admiral Daniel Ammen, U.S.N. (see Figure 8-4), with the introduction of the goldfish to America in 1878 when the Admiral presented a number of these fish, which had been brought over from Japan, to the United States Fish Commission, now the Bureau of Fisheries. Ordinary goldfish, of course, had been imported many years before the Admiral's trip. However, as I have shown in the previous chapter in this book, a fancy goldfish was exhibited at the New York Aquarium as early as 1876. The Ammen fish were bred, by the way, and Mulertt was one of the few who received fish from the very first spawning, four young fish that later luckily proved to be two pair. Thus Mulertt was one of the very first to be in a position to breed veiltail goldfish. As for the ordinary goldfish, no one really knows for sure who brought in the first. Certainly they were in this country at least as early as the 1820's and probably even earlier.

Mulertt imported two varieties of the Paradise Fish from Germany in 1880. Although he was not the first to introduce this fish (this honor is reserved for Adolphus Busch), Mulertt was responsible for its widespread distribution and subsequent popularity. On the other hand, there are no disputants to the fact that he was the first to import *Sagittaria subulata.* This story is told best in Mulertt's own words:

> "During the winter of 1878-79, while in business in Cincinnati, Ohio, we ordered from a correspondent, then traveling in the Amazon river region, an assorted lot of wild aquatic plants. In due time we received a little box full of various roots and rhizomes, some big, others small, and planted them in various tanks in our greenhouse. It is one of our peculiarities to throw nothing away as useless until it has had a fair trial. In this case we placed the moss that

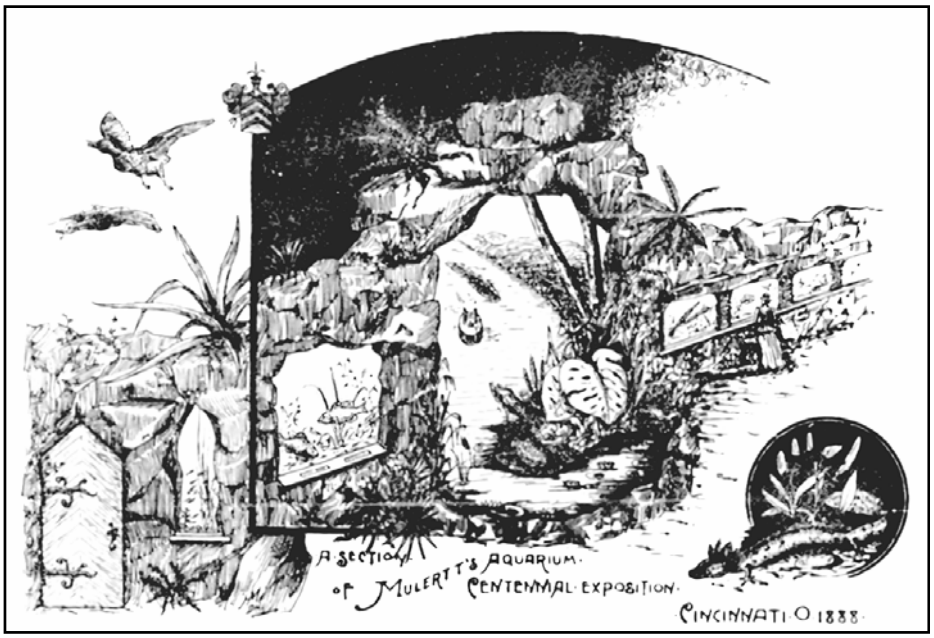


Figure 8-4. MULERTT'S DISPLAY AT THE CINCINNATI CENTENNIAL EXPOSITION OF 1888. It was probably one of the most (if not the most) fabulous displays devised by one man in the history of the aquarium hobby .

had been used as packing and also the trimmings of the roots in a tank of water, and the mud that had dropped from the roots we placed in another vessel, thinking that some stray seeds might possibly be among this refuse that might develop into something useful.

"In due time we discovered several little sprigs of vegetable growth in the vessel that held the refuse. These were carefully removed to a separate tank where they would be under better control. Among these sprigs thus removed were two grass like blades, not quite as wide as a straw; their starting points were two little corms, each not larger than an apple seed. To all appearances these were Vallisneria spiralis, and we expressed our surprise regarding the wide distribution of this famous water plant, which we were in the habit to obtain from the Northern lakes.

"It was about the middle of March, these two little plants had completed their third leaf, when a lady, a faithful customer of ours, called at our store for a small *Vallisneria* for her aquarium. The two above mentioned plants being the only ones we had in foliage at the time (our native *Vallisneria* starts much later), we sold her the biggest of them for ten cents, making apologies at the same time regarding its inferiority to what we used to supply. About the end of April a carriage drove up in front of our store from which the same lady alighted. She came to ask the name of that little plant which we had sold her some time ago. We informed her that it was a *Vallisneria spiralis*. 'No, no', said she, 'I know *Vallisneria* well enough, the plant which you gave me the last time I called here is not a *Vallisneria;* it is much more beautiful and is now in bloom, proving by its flowers that it belongs to an entirely different order.' We were unable to give its name from a verbal description of the flower, and were invited to ride down to her residence, in her company, and see it, she being anxious to know the correct names of her plants.

"When we saw the little white flowers floating on the surface of the water in her aquarium, and the graceful shape to which the plant had developed, we were agreeably surprised, for this little plant certainly was a prize for the aquarium. We explained its origin. The lady then voluntarily offered to give it back to us in order to propagate it. It was very fortunate indeed that this little plant had come in such careful hands, where its characteristics had been noticed. We were as happy as if we had discovered a gold mine. We felt like 'running' home. The streetcar seemed too slow for us so anxious were we to find out whether the other plant, its mate, was still in our possession. What then... if it had been sold to some careless, strange person for ten cents? Every person we met, as we neared our store, we observed closely, for he might have just carried off our prize."

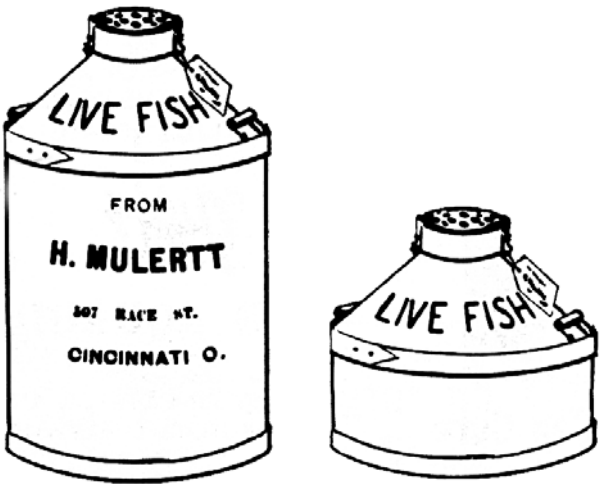


Figure 8-6. LEFT: THIS CAN WAS THE ORIGINAL SHIPPING CONTAINER USED BY MULERTT IN THE LATE 1870'S AND EARLY 1880's. Twenty years later, Mulertt was using the cut-down version shown to the right. This is identical to the so-called "German shipping can" used extensively throughout the aquarium hobby until the introduction of plastic shipping bags.

BELOW: MULERTT'S AD FOR HIS AQUARIUM FISH FOOD.



Mulertt subsequently propagated the plant and disposed of several thousands of dollar's worth in a very short time. At the Cincinnati Industrial Exposition in 1879, he was awarded a complimentary medal for it. Mulertt supplied the plant to aquarists across the world, even as late as the 1890's. Without doubt, he was an aquatic plant expert par excellence. Besides developing several very popular strains of *Sagittaria subulata*, Mulertt also developed a special strain of *Ludwigia natans* that later came to be known as "*Ludwigia mulertti.*" As early as the 1890's he successfully propagated and sold Madagascar lace leaf plants.

As his fame spread with the popularity of his magazine, Mulertt was asked to participate in sundry Cincinnati Industrial Exposition displays (see Figure 8-3). This he did and because these displays further popularized the aquarium hobby in the United States, they must be counted as additional outstanding contributions by Mulertt to the hobby. Children as well as adults became aware for the first time of what the aquarium hobby had to offer.

In 1879 and again in 1882 he won medals for his In 1879 and again in 1882 he won medals for his work. However, this was the extent of the credit given him until 1883, when Mulertt published the first English language edition of his book, *The Goldfish and Its Culture*. Until the arrival of Herman T. Wolf's book *Goldfish Breeds and Other Aquarium Fishes*, this text was the standard for the hobby and it ranks in the top three aquarium books ever published in America. With this book his reputation was made and Mulertt became a recognized authority not only in the United States, but in Europe as well. There were five editions: four in English (1883, 1896, 1902 and 1910) and one in German (1892). The German edition was published in Stettin (Germany's largest Baltic port), the first two English editions were self-published in Cincinnati, Ohio and the last two English editions were published in Brooklyn, New York.

The German edition of 1892 was titled, "Der Goldfisch: Und Seine Systematische, Gewinnbringende Zucht" ("The Goldfish: And Its Systematic, Profitable Breeding"). The 1883 and 1896 editions were titled,

"The goldfish and its systematic culture with a view to profit: a practical treatise on the fish, its propagation, enemies, diseases, and care of the fish in captivity." To the 1902 and 1910 English editions, however, about fifty pages were added and the book was re-titled, "The Goldfish And Its Systematic Culture; a Thorough Guide for Goldfish Keeping And Goldfish Breeding in the House And Out-of-doors, the Construction And Care of the Parlor Aquarium And Ponds for Breeding."

The honors kept coming and in 1885 the *Imperial Russian Society for the Acclimatization of Animals and Plants* elected him corresponding member, and a year later the same Society awarded him their great silver medal, a distinction which had, in their days, been bestowed upon Alex von Humboldt and Prof. von Siebold. The following is an excerpt from Mulertt's goldfish book:

"When fish are kept in tanks as merchandise by dealers, the location of such receptacle should be well lighted, airy, and not permitted to freeze. As was stated in another chapter, it is the oxygen contained in the water that the fish breathes, and it is therefore necessary to consider what means can be employed to keep up a continuous supply of it. One way, the most in use, although the worst for the retail customers, is to keep a stream of water constantly flowing through the tank. Now, this is wrong. Goldfish are intended to live in standing water, and should not be made accustomed to the contrary, as the reversing again of the character of the water often proves fatal to them."

In his 1883 book, the preface being written by Mulertt in July, 1883, there is an announcement of a book in preparation: "In Preparation! Mulertt's Aquarium: Practical Natural History of Fresh Water Fishes, Amphibians, Insects, etc. and Aquatic Plants, with a view to their culture, and hints for the successful construction, and management of an aquarium by Hugo Mulertt. Profusely illustrated with plates and wood cuts, drawn from life." The book, however, apparently was never published. Interestingly enough, my copy has the following stamp on the last page: "Hugo Mulertt, Aids for Teaching Natural History, Brooklyn, N.Y." In 1909 did publish "The Aquarium: Devoted to Aquarium Culture and Window-gardening. Information for the Care of the Parlor Aquarium," but it only had eight pages.

In 1883 Mulertt reported that the yearly volume of goldfish sold in the United States was 2,000,000, with an estimated value of $300,000. According to Mulertt, Europe raised and sold more but the quality of the American fishes was much better. Returning now to his book, two advertisements in the 1883 edition are of interest. The first was from J. W. Fiske, whom I



Figure 8-7.
THE SWAMP AQUARIUM, STILL POPULAR AT THE TURN OF THE CENTURY.

have already mentioned with regard to the 1870's. The second was from Jacob C. Cassel (1849-1919) of Philadelphia. Cassel claimed that his variety of aquarium goods was the largest in the country. In any event, his firm remained in business for many years.

Mulertt shipped fish all over the country, even as far away as San Francisco. For this purpose he used soldered cans that were generic to the coal oil trade at the time (see Figure 8-6). The cans were 15" to 18" in diameter with a 5" opening at the top. The tops being perforated were open to the air and water occupied 4/5^{ths} of the total can volume. The containers were, as one might expect, shipped via rail. In later years the cans were shortened, thus giving rise to what ultimately became known as the "German shipping can." Ironically, despite their name, these shortened shipping containers were developed in the United States independent of such development in Germany. The original concept, however, was developed by Frank Buckland (see the illustration in Chapter 13). The following is an account by Mulertt of shipping fishes in 1883:

> "The proper way to keep fish is in pure standing water, to which the necessary oxygen is supplied by the action of aquatic plants; these every dealer in fancy fish is compelled to keep on hand, if he understands the principles upon which the aquarium is managed, and if he wants to make the handling of fish a financial success."
>
> "The vessel best adapted for the shipment of live fish, to any reasonable distance in this country, is a tin can, clad with wood.
>
> "The shipping can should be perfectly smooth upon the inside, so that the fish will be subjected to the least percentage of injury while en route. At the upper end the can should taper off, forming a kind of neck or shoulder, similar to that seen upon the common coal-oil can. This makes it easy for the contents to slide out when the vessel is to be emptied. The opening at the top is five (5) inches in diameter, and closed with a perforated lid that is fitted in like the top to a milk can. The perforations consist of half a dozen one-half (1/2) inch holes, punched through from the under side of the lid, thus leaving the sharp rim of the holes on the outside where they can do no injury to the fish within the vessel.
>
> "Those cans very extensively used in the coal oil trade, and usually designated "wooden jacket cans," are about the very best thing that could be invented for our purpose. As the Express Companies demand that tin vessels be protected in some manner or other with wood, we find in these vessels the fulfillment of all requirements of that nature, and at a slight increase in weight. Besides, these cans are readily obtained in the large cities, (and smaller ones, too, in all probability), the only necessity being the enlargement of the opening to make it a complete shipping can for fish.
>
> "When it is desirable to make a shipment of live fish, it is necessary to take into consideration their size, the length of time they will be upon the road, and the season of the year in which they are transported, all with reference to the all-important supply of oxygen, without which, of course, the fish cannot live.



Figure 8-8. THE FRONTISPIECE OF MULERTT'S, *The Goldfish and Its Culture,* 1883.

The shipping can is filled with pure water, to four-fifths (4-5) of its capacity only, thus providing ample space for the water to splash about during the journey, as it is by this constant motion of the water in the vessel that it is aerated and made capable of supplying the fish with oxygen.

"The hour of shipping ought, if possible, to be so arranged that the journey on the road may be made at night, as it is cooler in the summer, does not expose the fish to the great heat of sunlight and the arrival is made usually sometime in the morning or forenoon when those at the destination are on hand to receive them. The cans must be plainly labeled, stating the nature of their contents, so that they may receive more care in the handling from the express agents, consequently running less risk of damage. It is also advisable to notify the party to whom the fish are sent that the shipment has been made, in order that he may take them from the agent as soon as possible, otherwise, if they are left to remain quiet at the express office or freight depot, the fish will be in great danger of their lives from want of proper care.

"If the shipping can is an ordinary small tin bucket, such as are on sale at the tinsmith's, the ventilating holes would better be punched in the center of the lid, the remainder being left unmolested, forming a shoulder against which the water can splash without being spilled. In all cases the lid must be securely fastened with strong twine or wire, so that a jar will not displace it.

"The above directions apply more especially to shipments that do not occupy any great length of time in the transit.

"If the fish are to be sent great distances over our own country or exported to foreign parts, the safest plan is to put them in a vessel fitted up like a regular aquarium. Japanese goldfish have been sent to Europe with perfect success in the following manner: A one-gallon candy-jar, (such as are used for hatching spawn) is fitted up in proper style, with sand, water-plants, snails and tadpoles, and filled nearly to the top with pure water. In this may be placed four two inch fish, the top then covered with a perforated tin lid, and the whole set aside for observation for about a week. During this time a tin bucket is obtained of such a size that the entire candy-jar aquarium will nicely fit into it, the top of the jar being neither higher nor lower than the upper, edge of the bucket This tin bucket, or sheath, if you will, serves as a perfect guard against breakage, and should any accident occur to the jar^ the bucket is on hand to act as a substitute. Furthermore the tin is provided with a convenient handle to carry it by, and for greater security the jar can be retained in its place with a heavy wire bar across the top, so adjusted that it can be removed at will.

"On board the ocean steamer, the buckets are suspended by the handles, the water is not changed, and neither are the fish fed anything.

"As will be seen, the uncovered shoulder of the jar will admit plenty of light, so that the plants can act on the water and keep it fresh, neither can the water in the jar be lost by splashing out, as when this does happen, it merely falls into the bucket, from whence it can be returned; the perforated lid admits the air, but at the same time prevents the accidental escape of the fish.

"This description of a trans-Atlantic shipping can is not at all expensive, and is further recommended by its reliability. Make it a rule, however, to ship only such fish as are in perfect health and fully domesticated.

"While on the road the water in the can should be changed only in exceptional cases, and then with great care. If the fish become weak it is a sign that they are not in good condition, and that a mistake has been made in preparing them for travel, and the simple changing of the water then will not prevent their dying. The rule is, do not crowd' the shipping cans.

"When, upon the arrival of a lot of fish, there happen to be any dead ones in the vessel, and the balance weak or in a dying condition, or look slimy and pale, with bloody streaks on the fins or around the scales, it is a sure sign that suffocation has been the cause of the death of some, and will speedily cause that of the others. The living ones should at once be placed in a large vessel in the open air, filled with fresh water, to which a good handful of common table-salt is added. A clean wash-tub answers the purpose nicely, and besides, has the merit of usually being close at hand.

"This treatment, if resorted to immediately, will, in most cases, restore the fish to good health."

One of the great aquarists appearing later in the period covered by this history, William T. Innes, apparently knew nothing of Mulertt and his contributions until Mulertt wrote to Innes in 1932, protesting the use of THE AQUARIUM for the title of Inneses new magazine. Innes, of course, was within his right to do so since Mulertt's magazine had long ceased publication. The matter was evidently settled amicably between them and Innes published an article by Mulertt on salamanders shortly afterwards.

In 1845, the City of Brooklyn, incorporated in 1833, had a population of about 40,000. Although it had churches, shops, banks, etc., it had no high schools or colleges. A small group of Brooklyn landowners and merchants formed a committee "of all the citizens interested in the cause of Female Education." A board of trustees was selected, funds were raised and the new school, named The Brooklyn Female Academy (BFA) was built. It was a financial and educational success, its enrollment increasing steadily as the years went on. On January 1, 1853, however, the building caught fire and burned to the ground.

A few days later, Harriet Putnam Packer, the widow of William S. Packer, one of the late trustees of the BFA, offered the sum of $65,000 to rebuild the Academy with just one small caveat: that the new institution be named in honor of her deceased husband. At the time this was the largest gift ever for the higher education of women. The new building opened in November 1854. The Packer Collegiate Institute was the preeminent school for girls for much of the latter 19th century (in 1972, Packer became fully coed).

In 1889 Mulertt obtained the position of Curator at the Packer Institute - as it was now called - where he was responsible for maintaining its freshwater and marine aquaria, other animals, preserved specimens and its greenhouse where ornamentals and vegetables were raised. In Mulertt's time, the five buildings of the school surrounded a one-half acre garden, which was unique in an urban environment and it was of this garden that he was given charge. He remained with the Institute until his retirement and subsequent return to Germany where he died in 1927.

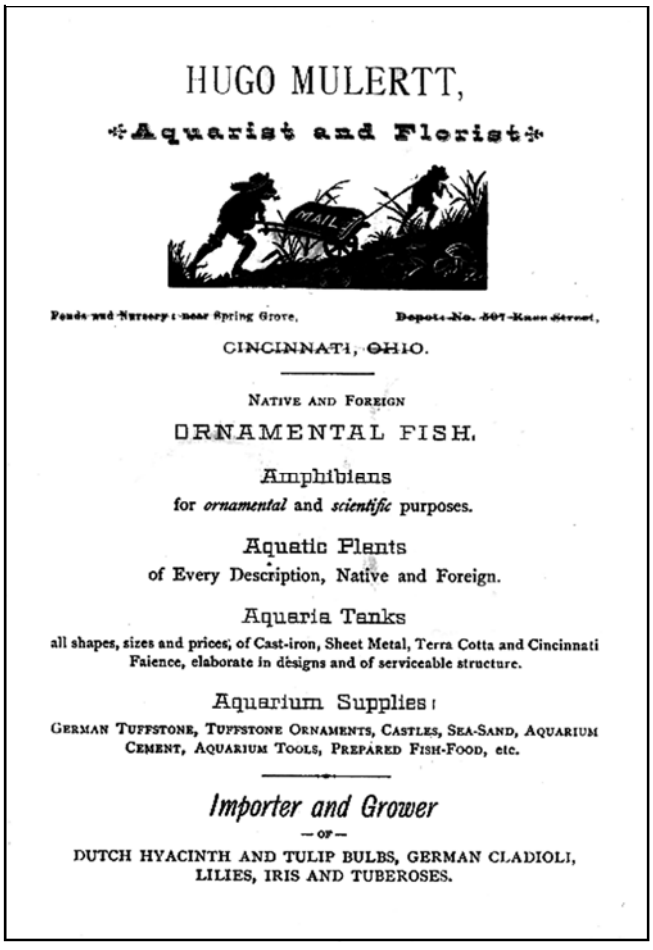


Figure 8-9. AN 1883 ADVERTISEMENT FOR MULERTT'S STORE IN CINCINNATI, OHIO.

CHAPTER 9:
THE GOLDFISH MEN

The 1880's were active times for Hugo Mulertt. In 1886, he wrote a book entitled, *How to Cook Fish*, a collection of translations of recipes by the "Verein Deutscher Fisch Händler" ("Society of German Fish Dealers") and in 1887 he published *House Plants and their Care; Also, Hints for the Care of Goldfish and Canary Birds*. In addition, he continued exhibiting at the Cincinnati industrial fairs. By no means were these trivial things. For example, from the period July 4 through November 10, Mulertt displayed live fish and aquatic plants at the Cincinnati Centennial Exposition of 1888. His design, as the engraving shows, consisted of two rustic rock walls connected by an arch. The building material used was plaster, paint and old stumps from ravines. The left of the display contained six large and one smaller tank, three of which received aeration. The right side of the display contained eight smaller and one large tank. Below the arch was a pond for marsh plants and amphibious animals. Fabulous displays such as this one gave tremendous impetus to the aquarium hobby and fixed Mulertt's reputation into the bargain.

Just before the Christmas of 1888 when Mulertt arrived in New York City to start his life anew there, he was already a famous man. Reports of his display at the Cincinnati Exposition preceded him and he was welcomed into the small group of amateur and professional aquarists of the time. Within a few years he was to embark on the last but perhaps the greatest of his contributions to the aquarium hobby in America.

But first, a brief side excursion to the City of Philadelphia serves as an introduction to another important aquarium pioneer, William P. Seal. Seal, born in 1845, was engaged in attempting to breed some newly imported goldfish. At the time, he happened to live at the very edge of acres of Daphnia ponds and it was he who first determined the value of this crustacean in fish culture. Sometime around 1870, Dr. Wahl, then Secretary of the Franklin Institute and a man interested in goldfish himself, heard of Seal's efforts and visited him. This contact with a leading scientist of the day started Seal into the business of collecting biological material for colleges and students, and in writing monographs dealing with sundry aquatic subjects. Other aquarists in Philadelphia followed Seal's lead and started to use Daphnia as a fish food.

Because of his growing reputation, Seal was engaged by the Bureau of Fisheries in Washington, D.C. and was soon placed in charge of constructing and maintaining the exhibit of the U.S. Fish Commission at the 1893 World's Fair in Chicago. His writings include: 1883, *The Aqua-vivarium As An Aid To Biological Research*; 1887, *The Aquarium, A Brief Exposition Of Its Principles And Management*; 1889, *Aquaria Notes*; 1890, *Observations on the Aquaria of the United States Fish Commission;* 1892, *Transportation of Live Fishes*; and 1911, *Breeding Habits of the Viviparous Fishes Gambusia Holbrookii* and *Heterandria formosa*.

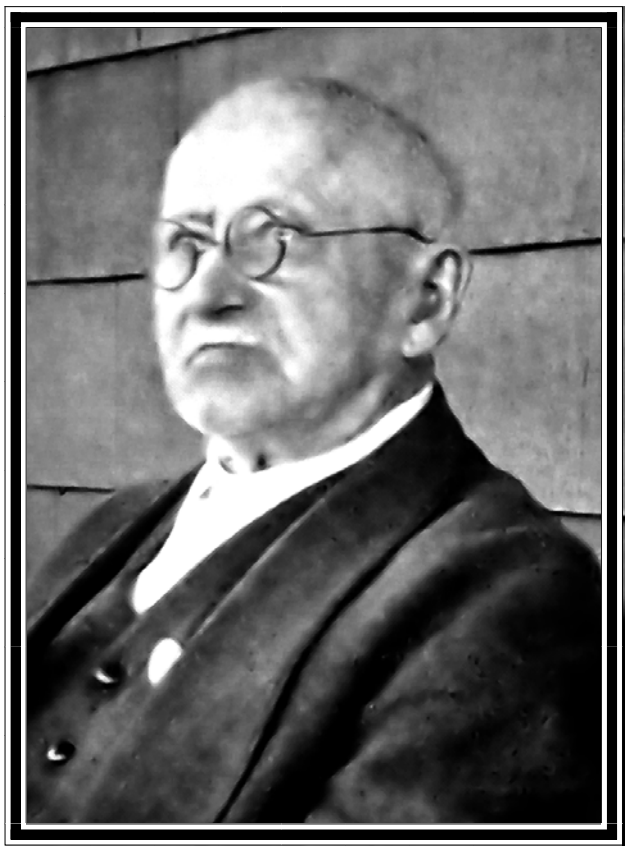


FIGURE 9-1. WILLIAM P. SEAL, a pioneering American aquarist and the man who gave us Daphnia.

A great deal has been written about Seal and the part he played in the story of the famous "World's Fair Fish." This fish was sold to the pioneer Philadelphia goldfish breeder, Franklin Barrett, subsequently developing into a truly magnificent specimen and becoming the standard of excellence for generations to come. Fantastic appraisals of its worth were made but the true story is best told in Seal's own words:

> "It may seem heartless to destroy the illusions concerning the so-called 'World's Fair Goldfish', especially as it appears to have become a historical piscatorial celebrity, a sort of exalted standard of its kind. It was once heralded as 'The five thousand dollar goldfish' in a full-page article illustrated in color in a Philadelphia Sunday newspaper. I have also heard its cost estimated at hundreds of dollars, as well as many other exaggerations concerning it.
>
> "Insomuch as the history of the fish was of sufficient importance to inspire misrepresentations, the real facts concerning it should be at least of equal interest.
>
> "The facts are briefly as follows. The Wisconsin Fish Commission brought two hundred imported Japanese fantail goldfish for their exhibit at the Columbian Exposition. Unfortunately, these were infected by the disease commonly known as 'tail rot', 'fin rot', etc. and died off very rapidly. When all were dead but seven they were given to me by James Nevin, Superintendent of the Wisconsin Commission. This was before the opening of the Exposition. I succeeded in saving three or four of them, which I brought to Philadelphia. Two of them, a male and a female, one the pure pearl fish subsequently exploited as the 'World's Fair Fish', and pictured as red in color, were sold to a Philadelphia fancier for fifteen dollars; but this fish at that time had not attained anything like the later development of his fins. In fact, at that time it was not better than thousands of others that are imported every year and sold at low prices. It was not exhibited at the World's Fair, and would only have attracted attention as one of a tank full if they had lived.
>
> "At that period of its development the apex or dorsal ridge of its tail started upward at an angle of about 45 degrees, and, altogether it was a particularly symmetrical and promising type of fish.
>
> "At that time these fish cost thirteen dollars per hundred at San Francisco, so that this particular fish began its career in the United States with a value of thirteen cents, finally attaining a mythical newspaper value of five thousand dollars. It might as well have been ten or twenty five thousand. I have photographs of fish of the long bodied type, with fins even longer than those of the 'World's Fair Fish', that were bred from the stock brought from Japan for Admiral Ammen about 1878.
>
> "The Japanese exhibit contained no specimens except for a few large and inferior type specimens in alcohol. Some live ones, intended as a present to the United States Fish Commission, died on the ocean.
>
> "It is all a matter of small importance, but is interesting as an example of the unscientific attitude that promotes and fosters the birth and growth of myths and traditions."

Thus is put to rest the final story of the "World's Fair Fish," and I remark only that William P. Seal's concluding sentence is true even today.

The following excerpt from an article written by Seal not only shows the breadth and depth of his achievements, but it is extremely important historically in the subject matter it treats:

> "Inasmuch as the origin and history of the type of goldfish known to us as the 'Comet' is inextricably interwoven with that of all the other varieties, the straight tail being the form from which they were all derived - it was inevitable that this article should be a sort of reminiscent hodge-podge, so to speak, concerning the genesis and development of both the amateur and commercial breeding of fine goldfish.

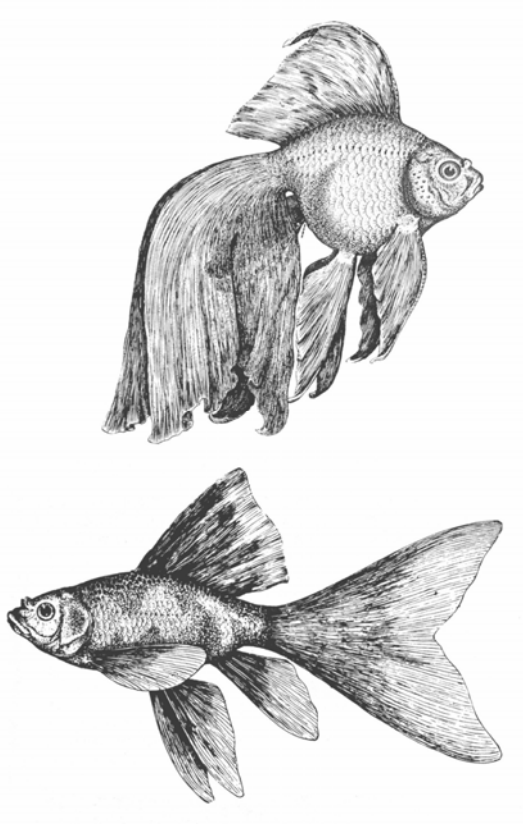


Figure 9-2. Top: The World's Fair Fish (after Wolf), one of the most famous goldfish in history. The true story of this fish is told in this chapter of the history.

Bottom: The Comet goldfish (after Wolf), developed by Hugo Mulertt in 1881 and named after a long tailed comet seen in u.s. skies that year.

"In the summer of 1880, I noticed some goldfish spawning in a ditch in the 'Neck'. I succeeded in catching a male that had very prominent horny protuberances on the opercles and pectoral fins. I at once recognized the significance of these characters, as I was familiar with them on the chubs and suckers, but had not noticed them on the goldfish, as I took no interest in the common form. Up to that time in Philadelphia there was probably no one who could tell a male from a female goldfish, except by seeing them spawn in ponds or ditches. One dealer in goldfish insisted that the male was distinguished by having a shorter dorsal fin, which deformity was quite common among them. I immediately began to experiment with small specimens in tubs and found that they would spawn readily. I also tried stripping them, but found that the eggs would adhere together in masses and were soon killed by fungus, and also that it was liable to injure the fish.

"In a letter dated June 6th, 1881, from the late Prof. John A. Ryder, the embryologist of the U.S. Fish Commission, I find the following in relation thereto: 'I am much interested in your account of the breeding of the gold and pearl fishes. Why don't you write it up and send an account of your experience to the fish cultural department of Forest and Stream, edited by Fred Mather?' As the names are no longer used, it might be well to explain that the all-white variety was termed 'Pearl fish' and the white and red, 'Pearl and Gold.'

"And on August 16th, 1882, he says: 'The goldfish eggs (shipped to Washington, D.C.) were alive and have afforded me some new points for investigation.' Apropos of this I will say here that I have successfully sent fine goldfish eggs by mail as far as Dahlonega, Georgia.

"There is hardly the remotest possibility that any goldfish of the type called 'Comet' by us, was ever introduced into the United States from China or Japan, or even from Europe. If so it never became a matter of public knowledge.

"The first fine goldfish introduced were seven fantails called 'Kin-gi-yo's'. These were brought from Japan by Mr. M. Gillet Gill of the tea-importing house of Martin Gillet and Co. of Baltimore. One of these was presented to the New York Aquarium established by W. C. Coup and Reiche and Bro. The 'Guide to the Aquarium' which is profusely illustrated, contains a cut of this fish that appeared later in Mulertt's book and THE AQUARIUM, a small monthly paper published by him, as the 'The Fringe-Tail.' This cut I have also used to describe the 'Schleirschwanze' or 'Veil-Tail,' the German name for that type of fish. The 'Guide' is not dated but some letterheads illustrated with a picture of the interior of the Aquarium, which was located at 5th St. and Broadway, are dated 1876 and 1877.

"Mr. M. Gillett had many years before told me his experiences in bringing these fish over but the details had escaped my memory, so in 1909 I asked his nephew, Mr. Ernest A. Gill, what he knew concerning the matter and I insert his answer: 'It is rather hard for me to give you any positive dates or description of the bringing of the Japanese fish to this city as it was a little before my time, but my older cousin, who has a good memory, tells me that my uncle, Mr. M. Gillet Gill, brought the fish I think you have reference to, in himself on his last trip from Japan about 1875.'

"'They came to San Francisco and he used to tell some very interesting stories about the numerous troubles he had in bringing the fish across the continent. At one place in Nebraska my cousin tells me that the train was stalled in the snow for several days and my uncle had the fish packed in snow to keep them to show the people at home, but to his surprise they survived this hard treatment and lived to breed in ponds he had in his yard in the city. He afterward stocked the fountain that was at the Centennial Exhibition and was bought by the City of Baltimore, through him. This is all I can find out about them except that Henry Bishop got what fish were left in the fountain. The others died for want of proper care and interest.'

"In THE AQUARIUM for January 1880, Mulertt says: 'In one of the tanks at the Cincinnati Aquarium the visitor will observe some odd

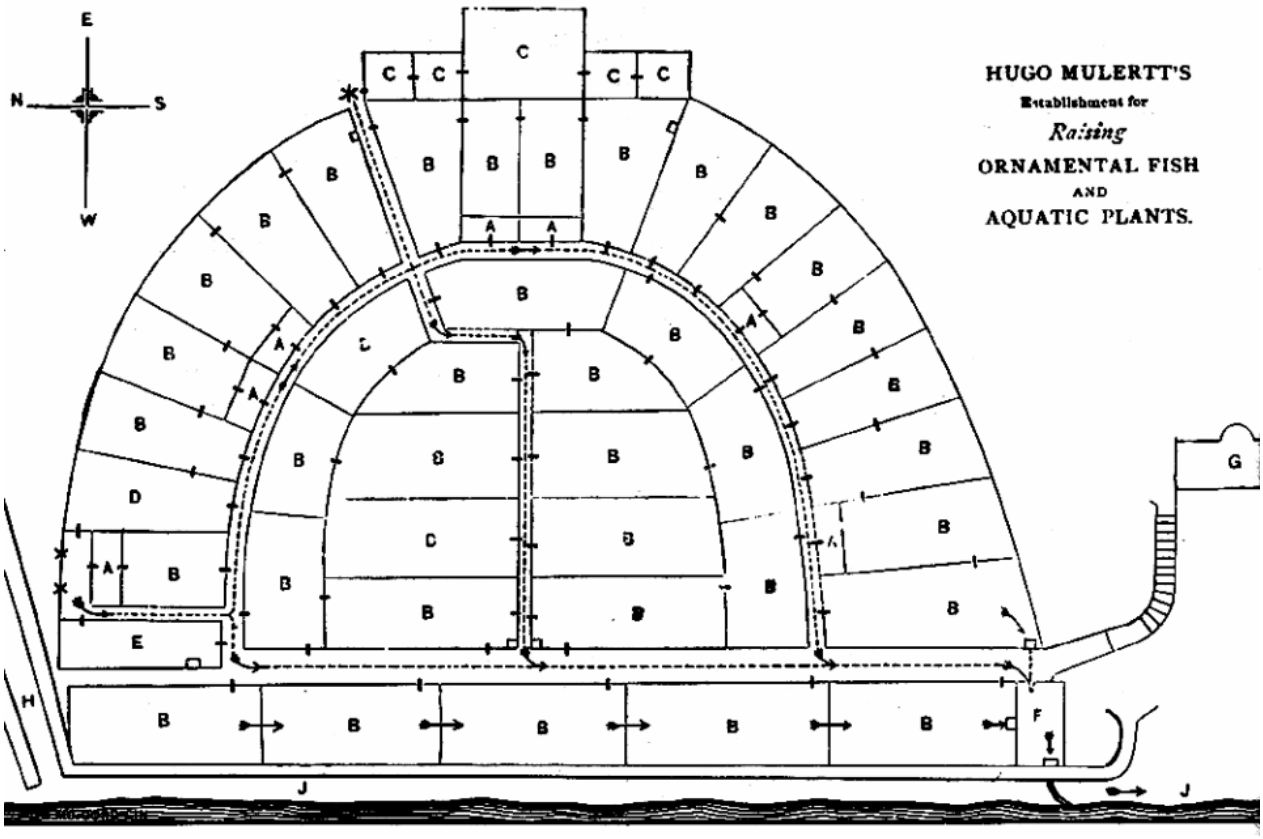


Figure 9-3. Mulertt's goldfish hatchery at Cincinnati, Ohio. The description of the plan is as follows:

A. Spawning or propagating beds. B. Rearing ponds. C. Storage ponds and nursery.
D. Winter pond. E. Isolated pond for special purposes. F. Catch basin for stray fish.
G. Lodge, egg hatchery. H. Wind-brake & guard against freshets. I. Creek, passing the hatchery.

Star = Location of springs. Arrow = Direction of water flow.
Dotted Lines = Supply drain. Bracket = Outlets.

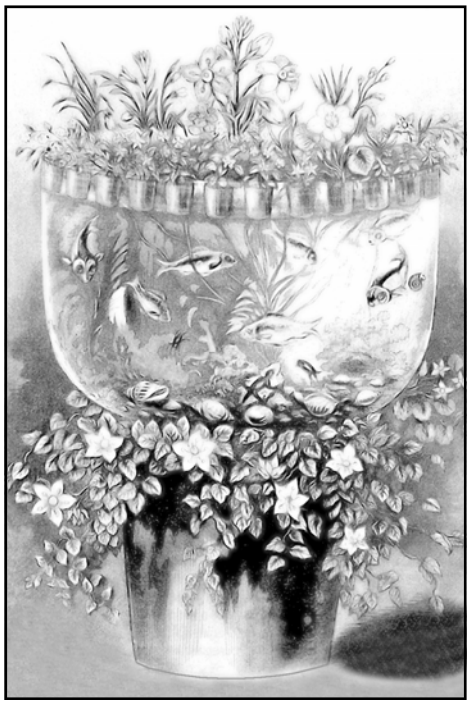


Figure 9-4. Although glass bowls such as this one used in Victorian drawing rooms were still used, by Mulertt's time serious aquarists understood the value of the rectangular tank and were phasing them out.

shaped and beautifully marked goldfish. They are Japanese goldfish and belong to the 'Kin-gi-yo' tribe. Their parents were brought to this country two years ago by a gentlemen of high rank who now keeps them for this pleasure.' This refers to Rear Admiral Daniel Ammen, U.S.N., who made the second importation of these fish. I have somewhere among my papers a written description of them and an account of their transportation from Japan made for me by the late Captain Z. L. Tanner, who commanded the Pacific Mail Line Steamer that brought them over, I think 'The City of Pekin' or 'The City of Tokio,' and who afterwards for many years commanded the U.S. Fish Commission steamer 'Albatross.'

"From the stock of Admiral Ammen, which was bred on his estate at Ammendale, Md., came that of the U.S. Fish Commission which was bred and distributed in large numbers by them for a number of years until discontinued several years ago. A few of the Ammen stock were brought to Philadelphia from Ammendale and were bred in pools for several years, the output being sold in that city for fine prices.

"The first of the long straight-tails to appear in the market were bred from Fish Commission stock in the early eighties by William McCarty, of Loudoun Co., Va., who graded them as well as the fantails, giving them distinctive names which I have forgotten but which distinguished the various grades which were based on the sizes of the fins. I remember that those with the biggest fins were called 'Gorgeous-Tails.' They were in fact very superior to those of the scale variety imported today. McCarty had begun to make sale exhibits in northern cities, when unfortunately having made the mistake so common in undertaking fish culture, of locating his ponds wrongly, a freshet of unusual dimensions swept away all the results of his enterprise.

"The next to appear on the market were from Mt. Airy, near Cincinnati. Hugo Mulertt undoubtedly started fine goldfish breeding there but his experience was very short as his partner, the man who owned the ponds, soon found means to dispossess him after getting an insight into his methods and control of the stock. So far as I could ever see or find out this brief experience of Mulertt's in pond breeding, and his book, were his sole contributions to fine goldfish culture. In that, however, he deserves credit, and the sympathy that should go to all such as are balked in their endeavors to advance any form of human endeavor.

"At all events the first long straight-tails to be sold in considerable number came from Mulertt's ex-partner and another man who took up the industry in the same vicinity."

Seal's account clearly provides much information regarding the early days of the goldfish hobby in America. Apparently he did not have access to copies of the NEW YORK AQUARIUM JOURNAL, for he refers only to that establishment's "Guide To The Aquarium." By combining Seal's narrative with the NEW YORK AQUARIUM JOURNAL article published in Chapter 4, the reader will have a rather complete story of this



Figure 9-5. HENRY BISHOP.

first importation of the fancy goldfish to the United States. We now know it was M. Gillett Gill, not Admiral Ammen, who deserves the honor of priority in this matter.

According to Seal then, it was Ammen's fish that formed the basis for the fancy goldfish hobby in this country. Although this is substantially true, the fact must not be overlooked that Henry Bishop obtained the last of Gill's fish and that Bishop remained in business for many years. Also, one must recognize the fact that Seal unfairly represented Mulertt's accomplishments, maintaining that as far as he could see, Mulertt's "brief experience" in pond breeding and his book were his sole contributions to fine goldfish culture. Seal even cites the supposed priority of William McCarty in the distribution of stock bred from Admiral Ammen's fish. It is known, however, that Mulertt had offspring from Ammen's fish in 1879 and although his fish may not have reached Eastern markets before those of McCarty, Mulertt produced his Comet as early as 1881.

In any event it was Mulertt's name "Comet" that stuck, not McCarty's "gorgeous tails." It is true, however, that Mulertt was not the founder of fancy goldfish culture in this country. This was strictly the province of Philadelphia aquarists just before the turn of the century. As a goldfish breeder, however, Mulertt need not have deferred to anyone, and that Seal should downgrade a man of Mulertt's accomplishments is strange indeed. The fact that Mulertt had produced an aquarium magazine in 1878 was brushed aside without any comment whatsoever!

One explanation might be that Mulertt looked with a critical eye on the practice of the U.S. Fish Commission in giving, on the request of Congressmen, a globe of goldfish to selected persons as a gift. It was remarked by Mulertt that nearly a third of the homes in the District of Columbia had been supplied with goldfish at the Government's expense. Seal, who was associated with the U. S. Fish Commission, may have taken offense at Mulertt's criticism. Or, the truth may simply be that both Seal and Mulertt were highly individualistic, there being evidence to suggest that both were a bit "crusty," thus producing a natural competition between them. In any event, William P. Seal must be reserved a significant niche in the history of the aquarium hobby in America, not only "as the man who gave us Daphnia," but also as a remarkable aquarist in addition.



Figure 9-6. Bishop's book discussed birds and other animals, and had a large section on the origin, housing and general care of goldfish.

CHAPTER 10:
MULERTT IN NEW YORK

After his arrival in New York City at the end of 1888, Mulertt set up a business that he ran from his home in Brooklyn where he sold fish, plants, equipment and supplies. A great many of the plants sold were cultivated by Mulertt himself and he developed a strain of *Ludwigia natans* that came to be known as "*Ludwigia mulertii.*" Further, he manufactured his own brand of fish foods and aquarium cement. His activity in the publishing field was not overlooked either, for he wrote new editions of his older books and published one or two pamphlets regarding natural history as well. But without doubt his most important achievement was resumption of publication of America's first real aquarium hobby magazine. We say "real" for although the NEW YORK AQUARIUM JOURNAL technically had priority in time, the publication was primarily a house organ and not a fancier's magazine as such. Mulertt's effort, however, was truly a publication for the hobbyist.

Although it is known that THE AQUARIUM was first published in 1878 and continued throughout 1879 to 1881 (and most likely 1882), no copies are extant, so it is not known what the magazine looked like or what its volume and numbering system was. The magazine resumed publication in Brooklyn in October 1892 as a quarterly, the issue being designated as volume 3, number 25. Subsequently, the first issue of each year appeared in January and the last of each year in October. All of the Brooklyn issues were numbered sequentially from 25 to 43, the last issue appearing in April 1897.

This, of course, suggests that its publishing history in Cincinnati consisted of volumes I and II, and issues 1 through 24. However, if it was a quarterly and we assume that four issues were published in the years 1878 to 1881 and three issues in 1882, this only accounts for 19 issues, so the magazine had to be something other than a quarterly during this time if Mulertt's issue numbers are correct. Mulertt's volume numbering system makes no sense, either, since he starts volume 4 with issue 37 in October of 1895 where one would expect it to be labeled volume 3. In any event, each issue of THE AQUARIUM (Figure 10-1) published in



Figure 10-1. THE COVER OF THE APRIL 1895 ISSUE OF THE AQUARIUM. This was the first real aquarium hobby magazine in America.

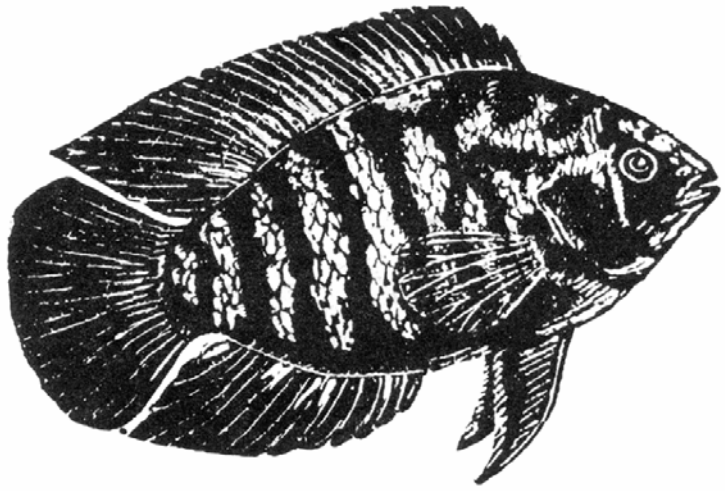


Figure 10-2. THE CUT OF *Cichlasoma facetum* THAT APPEARED WITH THE ARTICLE ON THE "BRAZILIAN ZEBRAFISH" IN THE APRIL ISSUE OF THE AQUARIUM. Although this was our first aquarium cichlid, it is rarely seen in the hobby today (the Zebra, Convict, or "Congo" cichlid is another species).

Brooklyn usually numbered about 24 to 26 pages per issue. At first the price was 15 cents per copy or 50 cents per year, but this was later increased to 25 cents and $1.00 respectively.

A typical issue was that of April 1897 (Vol. IV, No. 43). The lead article, "The Care of the Parlour Aquarium," (Figure 10-3) was a comprehensive history and guide to the principles of the aquarium, its setting-up, stocking and maintenance, and was illustrated with woodcuts. Although it was unsigned, Mulertt himself wrote it. This was followed by a column written by H. B. Small, called "Fish Gossip," that dealt with some odds and ends about fish behavior and biology.

An illustrated (woodcuts again) article entitled "Outlook of the Water Lily," written by George B. Moulder was next. After this came an announcement by the Chief Clerk of the College of Agriculture, Ithaca, N.Y., of an offer of assistance by the College to all parents and teachers interested in introducing nature study into school curricula. The issue included a column called "Driftwood" that dealt with technical items about aquarium fishes, and there were announcements of the activities of groups concerned with the hobby, both here and abroad. Mulertt also wrote this although again, it was unsigned. A column, "Answers and Queries," filled out the editorial material in this issue, followed by seven pages of advertising, three of which were house ads for Mulertt's own business.

Under Mulertt's editorship THE AQUARIUM was well balanced, authoritative and all in all, a very excellent magazine. It, for example, published an address by the eminent American ichthyologist, Samuel F. Garman and one by Fred Mather of New York Aquarium fame. Another "graduate" of that institution, A. W. Roberts, as late as 1896 contributed an article on fish parasites. On occasion there were even articles on the saltwater side of the hobby, although it primarily was a freshwater magazine. On one occasion Mulertt was invited to a dredging expedition off the New York coast and his detailed experiences, with illustrations, were written up in the magazine.

Aside from its importance as a repository of historic facts of interest to the hobby of today, Mulertt's magazine was the rallying point of the aquarium hobby in the 1890's. It popularized the hobby, disseminated information and laid the groundwork for the foundations of the organized hobby as we know it today. Due to space limitations, all the many articles of interest to present-day aquarists that appeared in THE AQUARIUM cannot be reproduced here but the following somewhat brief selection, written by Mulertt, should give the reader a fair idea of the material offered. The article, which appeared in the April 1895 issue, is, in its own right, a historic document for the hobby.

"The Brazilian Zebra Fish

"This new aquarium fish was first brought to Germany by an enthusiast a year ago, and was successfully propagated last summer. We saw the original imported fish with their fry. Our picture is a good representation; we reproduced it from 'Natur and Haus.'

"The fish attains a size of about five inches in length by two inches in width (Figure 10-2). The general appearance of the fish is that of a sunfish; the ground color of the body, which is entirely covered with small scales similar in size to those of the Paradise fish, is a brassy

yellow marked with a number of irregular vertical bars or stripes of black; the dorsal and anal fins are large and long, being composed of a great many rays, of which about two-thirds are spinous; they are black in color; at times, however, when the fish is excited, the yellow of the body becomes brighter and runs in streaks into the black dorsal fin, making this appear as if it was a continuation of the body; the ventral fin is colorless and transparent; the caudal fin is rounded. The eyes are yellow, flashing like fire on some occasions, resembling those of the moss bass.

"The fish is very attractive, especially when excited; it reminds one of a herald of the middle ages, whose dress used to display the colors of their masters in stripes. At other times the fish will assume a very plain grayish color, with only one irregular black spot on each side of the body, midways and near the ends of the dorsal and anal fins. Young specimens show these peculiar markings even more distinct than the adults.

"The habits of the Zebra fish are very much like those of our Moss bass; they are very pugnacious and display the same motions when attacking one another as the Moss bass does, but their point of attack is the mouth, which if they succeed in grasping they hold firmly, much like fighting male Paradise fish do, until the weaker one gives up. But although they fight a great deal, we have not yet seen one that was seriously hurt; they seem to be on friendly terms again soon after.

"Their breeding habits, too, are much like those of the sunfish family. They "pair off" during the summer and prepare a nest on the bottom of the tank, where the female deposits her eggs, which both guard. Four days after spawning the young hatch. These are as carefully guarded as the eggs were, and later on they are instructed for their future career by both parents, who swim about with them, as a hen walks around with her chicks. We find that the Zebra fish stand captivity well, enjoying their meals, which consist of scraped raw beef or I.X.L. fish food, immensely. **(*Author's Note:* a dry food prepared and sold by Mulertt.)**

"Their native home is the La Plata valley; the South Americans call them 'Chanchitos', which means 'pig', either because their shape is somewhat like that animal or because they fight in a similar manner to that of young pigs. In Germany the name 'chameleon fish' is proposed, owing to the ability of the fish to change its colors. This, however, we consider no denominative feature, as nearly all of our sunfish and also the Chinese Paradise fish possess this ability, in some cases even to a greater extent than the Zebra fish does. We selected the latter name for them, because we find that through their color and stripes this fish resembles a zebra more than anything else, especially when the fish are most brilliant in colors and the yellow appears in the dorsal fin; even the markings of the mane of the zebra are then represented."

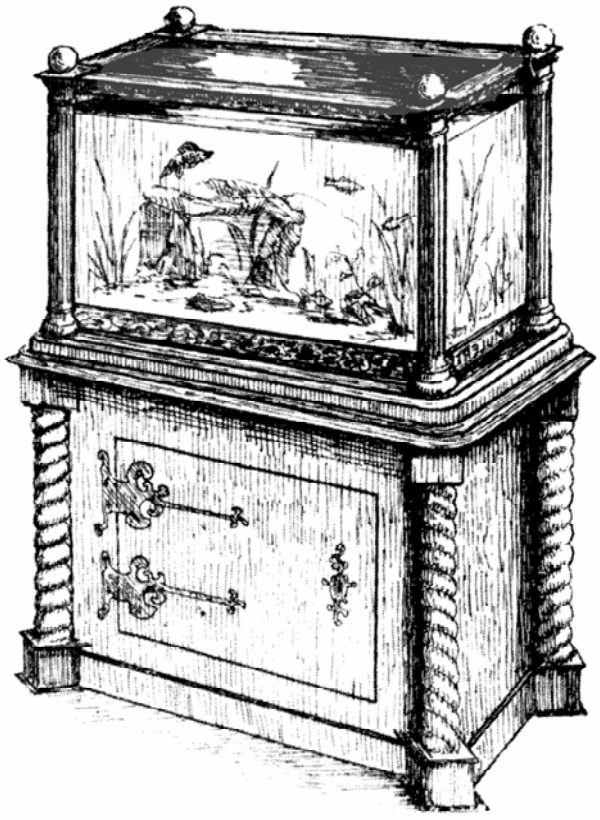


Figure 10-3. THE "PARLOR AQUARIUM" DESCRIBED BY MULERTT. The frame is decorated by a wood molding in a Greek motif.

Another article written by Mulertt is of interest as it provides an insight into the types of aquaria available to the hobbyist of the 1890's. Indeed, much of the material discussed would be of interest even today to the "do-it-yourselfers" or to those who like to dress up their tanks. The article was titled, "Shapes of Aquariums."

> "Any kind of a vessel that holds water and the material of which does not affect the water may be used to harbor a collection of aquatic plants and animals. For the cultivation of water lilies, or other water plants, whose beautiful flowers or leaves are the principle points of attraction, or for the keeping of turtles, wooden tubs meet all requirements. But when one wishes to keep fish in order to enjoy their graceful motions or study their shapes and habits, a vessel that admits a view from the side, a transparent glass vessel is necessary. Fishes must be seen as they see one another, not from the top, as such a view gives an incorrect idea of the fish. Think how different a person looks when seen from a fourth or fifth story window on the sidewalk, and when one meets the same person on the same level, or meets him in his own house where he is perfectly as ease. We find just as much difference in fish when kept in lakes and fountain basins as in glass-sided aquariums.
>
> "The old-fashioned fish globe has seen its day; they are still manufactured to be sure, but the manufacturers have greatly improved on them. The shape of the new globe, the so-called 'new pattern globe,' is not quite so round as the former ones, being more in the shape of a Japanese jardinière, the widest part being near the top. They are a decided improvement on the old shape, and fill the bill, as a cheap round aquarium intended for decoration, very well.
>
> "For observation and study the sides must be straight. Our pictures illustrate some very attractive patterns for window decoration, or for a small table. Next to these come the plain rectangular tanks. These may be made all of one piece of glass, shaped in a form while in a soft state, or they may consist of a metal frame, into which the bottom and side and end glasses are cemented.

OFFICE OF

HUGO MULERTT, AQUARIST,

(*Oldest Aquarium Establishment in America.*)

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PRICE LIST AND CATALOGUE



CHOICE AQUARIUM PLANTS

Grown under cultivation especially for the purpose.

Sagittaria "New Era." An improvement on the old favorite *S. natans.* A free bloomer in the parlor aquarium. Plants, well rooted, each 25 cts

Sagittaria "Frances M." A hybrid of great beauty, of same habit as preceding, but larger, some of the blades attaining a length of 18 inches and a width of over one inch. Prolific bloomer. Pot-grown plants, each $2.

Sagittaria "Windermere." A seedling of the former, smaller in habit, but equally as graceful, new. Each $2.

Sagittaria sinensis. *Chinese arrowhead.* A charming novelty of easy culture. It may be grown, similar to the Chinese lily, in water, moss, or soil, in vases, bowls, tubs or pots, in or out-doors. Started corms, each 25 cts.

Ludwigia Mulertii. Beautiful hybrid aquarium plant. Foliage deep green above and beautiful crimson underneath, producing a very fine effect. Small plants, well rooted, each 50 cts.

Myriophyl proserpiuncoides. *Parrot's feather.* A very interesting novelty, its light green feathery foliage, growing partly below, partly in tufts above the surface of the water, finally gracefully overhanging the top of the tank. Cuttings, each 10 cts.

Cabomba carolinensis, the very popular green fanwort. Each 25 cts.

Cabomba rosæfolia, the pink fanwort, very beautiful. Each 50 cts.

Salvinia amazonica. Very interesting little floating plant for the parlor aquarium. Plants, a dozen 25 cts.

Riccia fluitans, another interesting, little floating plant resembling stag horns. A dozen 25 cts.

Chara vulgaris, for microscopical work. 25 cts.

Eichhornia crassipes. *Water Hyacinth.* A very curious and handsome floating plant, bearing conspicuous blue flowers, for aquariums or out of door culture. Each 25 cts.

Limnocharis Humboldtii. *Water Poppy.* The oval leaves of this plant float on the surface of the water, while the lemon-yellow flowers reach about six inches above it, for the parlor or out door aquarium. Each 25 cts.

SENT PREPAID BY MAIL ON RECEIPT OF PRICE.

Choice Ornamental Fish.

25 to 50 cents should be added when remitting, for cost of shipping can. When ordering please to direct by what Express Co. you prefer the goods shipped.

Chinese Paradisefish.
German "Goldorfe."
German "Golden Tench."
German "Green Tench."
Brazilian Zebrafish, new.
Newts, Frog-tadpoles.
Pond Snails.
Nestbuilding Sticklebacks in season.

Above fish are fully domesticated, and of suitable size for the parlor aquarium. Prices range according to shape and brilliancy of colors.

Mulertt's I. X. L. Fishfood, a new and excellent compound, improving shapes and colors of the fish, per box 25 cts., 5 boxes for one dollar.

Mulertt's Prepared Fishfood, (wafers) per box 10 cts., 12 boxes for one dollar.

—PREPAID BY MAIL.—

Mulertt's Waterproof Cement, dry (with printed directions how to mix it). In ¼ lbs. tin boxes, per box 50 cts. by express only.

Aquarium Dipnet, with turned walnut handle. Each 25 cts.

SPECIAL OFFER.

Plain aquarium tanks. See p. 167.

Pattern 95, A. 11½ inches high, 7¾ inches wide by 14¾ inches long (inside), plate-glass bottom. Price $5.

Pattern 95, A. with wooden base and cornice. Price $7 50.

Pattern 95, B. 11½ inches high, 7¾ inches wide by 21 inches long (inside) plate-glass bottom. Price $6.

Do. with wooden base and cornice. Price $9.

Fitted frames, without glass, packed flat for shipment, of above tanks, A, $2; B, $3.50.

Terms: Cash with Order.

Figure 10-4. HUGO MULERTT'S PRICE LIST FOR 1895. Among plants the list included *Sagittaria* (several species), *Myriophyllum, Cabomba* (two species), *Salvinia, Riccia, Eichhornia, Chara* and *Limnocharis*. The fish offered included the Paradise Fish, the Brazilian Zebra Fish (*Cichlasoma facetum*) and sticklebacks. Equipment included fish food, aquarium cement, dip nets and tanks.

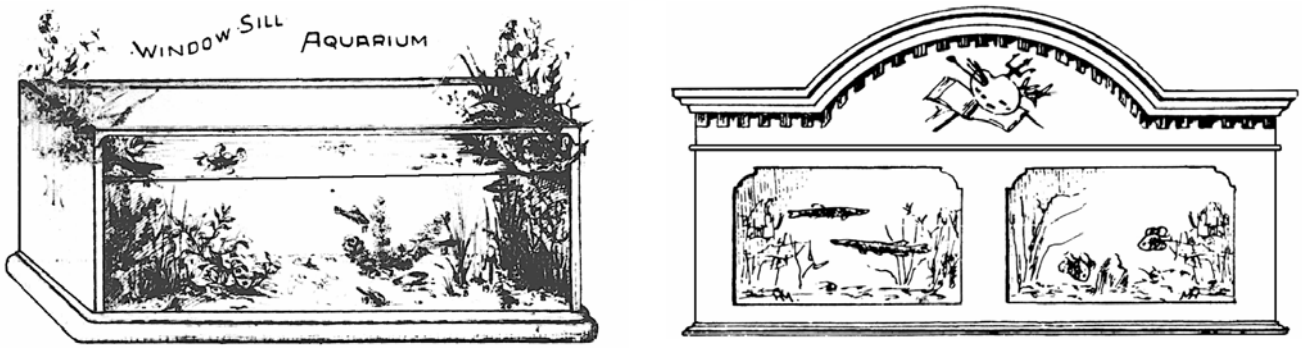


FIGURE 10-5. LEFT: THE WINDOW SILL AQUARIUM WITH END PLATES OF CAST IRON. The interesting innovation here is the presence of two internal platforms, one at each end, permitting bog plants to grow up and out of the aquarium. RIGHT: THE TWIN AQUARIUM RECOMMENDED BY MULERTT ESPECIALLY FOR SCHOOL USE. The facade is of wood; it and the two tanks behind were placed in front of a window for light.

The latter ones have the advantage that when a glass breaks, it can be replaced by a new one, which cannot be done when the tank is made of one piece only. The exterior of such a tank can easily be ornamented with wooden molding to suite one's fancy (Figures 10-5 and 10-7). One of our illustrations shows one, of a large pattern in this case, that is decorated with fluted pillars and otherwise trimmed to form a design somewhat Greek in appearance. The wood is stained a dull black, to represent antique iron, and the smaller borders are kept in a shiny, creamy white, to represent old ivory. The effect of the whole is very pleasing. The stand on which it rests forms an antique oaken cabinet.



Figure 10-6. HUGO MULERTT WAS A CURATOR AT THE PACKER INSTITUTE. The original Packer building was constructed of brick with brownstone dressings and a slate roof. It included a tower, 112 feet in height, that was fitted with a revolving dome used as an observatory. The dome was removed in the early part of the 20th century when the I.R.T. subway was constructed under Joralemon Street. One of the great amenities of the original building is its Chapel shown here. With a seating capacity of 700, it has always been the center of community life at Packer.

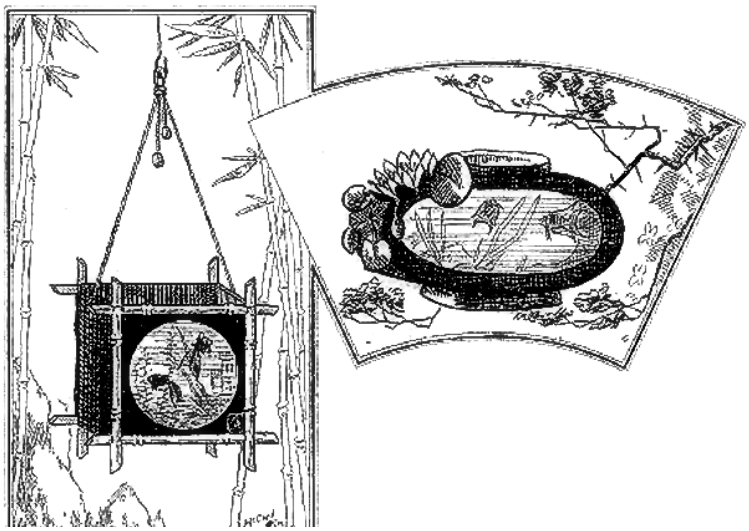


Figure 10-7. TWO EXAMPLES OF SMALL AQUARIA ENCASED IN DECORATIVE CABINETS. Note that the one on the left is designed to hang from a ceiling.?

"Two of the above mentioned smaller sized tanks might be used on one window sill (Figure 10-5); they would then form a twin aquarium. The advantages of such a screened twin aquarium are very important, especially in kindergartens. Each tank can be stocked with different objects, each one can be changed and rearranged without molesting the other; both are protected by an ornamental front, which hangs on hinges below, and is fastened to the window with hooks. Over the tops of both is a wire cloth screen, to prevent books or lunch remnants from coming in contact with the water.

"The 21-inch size is a good shape for a breeding tank. (***Author's Note:*** **Mulertt is referring to a tank 21 inches long by 14 inches wide and 16 inches high.)** When one wishes to raise some young Paradise or goldfish, or for breeding sticklebacks, its length permits dividing it in two or more apartments by simply placing one or more pieces of glass between the sides.

"The window sill aquarium, represented in another illustration, it will be observed is rather long compared with its width and height; it is designed for an ordinary window sill. The dimensions, 30 inches in length, 12 inches in height, and 10 inches in width, experience has taught us to be the correct one for the welfare of the collection and convenience of study, as well as for ornament.

"In the tank represented, each end is formed of one solid plate of cast iron; against the upper and lower bars that form the front and rear of the tank they are fastened. These ends are lined with ordinary glass. The bottom consists of rough (rolled) plate glass 1/4-inch thick, and the front and rear of the best double thick French or English glass. It is not necessary, however, that the ends should be of one solid piece of cast iron; the tank may be made of angle iron. All that would be necessary in such a case would be to give the outside of the end glass two or more coats of paint.

"The two brackets, seen on the right and left of the tank, are to imitate the banks or borders of a brook. To form such a bank, a strong galvanized wire is bent into shape of a capital letter U; each end is then bent to form a little hook, and after the whole is bent in the middle to form a right-angled bracket. When the support has been shaped to fit snugly (the hooks nicely over the edges of the ends and the wires running alongside the corners of the tank), a piece of ordinary glass about four inches wide and as long as the tank is wide, is placed upon it, and the brackets are ready to receive the plants intended for the decoration of the embankment."

Mulertt despised bureaucracies and the pettiness so often accompanying their operations. In October 1892, he reprinted a story from the San Francisco Examiner regarding a question of the California Fish Commission, viz., whether or not the German carp could be established in certain waters. They debated the matter through several meetings, grew red in their faces over it, and to save heat and a possible disruption of the Board, submitted the question to a prominent fish culturist of the day, a certain Doctor Hochstadter. Numerous water samples were delivered to the good doctor and, within a short while, he rendered a report and bill for $100. The report concluded that the carp would indeed live in those waters; the Fish Commission un-

fortunately proceeded to turn loose that undesirable fish and subsequently upset the balance of nature. Some years later, when asked how he had come to his very correct conclusion so quickly, Dr. Hochstadter replied: "Why, I bought a carp for ten cents, and put it into the water. It lived"! Mulertt loved printing that story!

Soon after he arrived in New York City, Mulertt paid a visit to one of the members of the New York State Fish Commission. The conversation drifted away from the usual aquarium topics to Mulertt's exhibit at the Cincinnati Centennial Exposition of 1888. Much interest was being generated in New York at that time in the great Columbian Exposition scheduled to be held in 1893, and it was thought likely that it would be held in New York City. Mulertt's friend hoped to have the fish commissions of the various States and the Federal government display live fishes in an elaborate aquarium to be built in Central Park. The aquarium, according to the plan, was to remain as a permanent exhibit after the Fair was over and operated either by the City or the State.

The Fair, however, went to Chicago, but nevertheless a bill was introduced in the New York legislature and passed, appropriating the sum of $160,000 to get the project underway. Unfortunately, however, the legislature placed the proposed aquarium under the charge of the Board of Public Parks, rather than the Fish Commission. The Board decided to locate the aquarium in the Old Castle Gardens, an ancient fort in Battery Park, under the control of the Board. One consequence of all this was that the Fish Commission was "frozen out" of the planning and consulting stages of the aquarium.

Renovation of this ancient structure started in 1893 and continued to 1895. On February 16, 1895 Mulertt was one of several experts and scientists invited to inspect the aquarium before its official opening. Mulertt was furious. He announced to a reporter, "The plant will not work." Not only did the distinguished group of visitors find the tank shapes to be all wrong, for marine tanks the water was pumped directly from the Bay to the aquarium and in February, the month of the inspection, the tanks were near freezing. For freshwater, water was piped directly from the city mains. Nowhere was there provision for storage or temperature conditioning of the water before its use. The outcry from Mulertt and his colleagues led to the resignation of Harvey T. Woodman, the man who had designed the aquarium and under whose direction it was built. He was replaced in July of 1895 by the very able and eminent ichthyologist, Dr. Tarleton H. Bean. Bean initiated major changes and on December 10, 1896, the New York Aquarium at Battery Park opened to the public. It was a great success.

In 1917 the New York Aquarium was the largest in the world, both as regards size of building and number and variety of specimens exhibited. It was situated in Battery Park at the foot of Broadway and was reached by all elevated, surface and subway lines running to South Ferry. The nearest elevated station was Battery Park; the nearest subway station, Bowling Green.

Erected as a fortress by the United States Government in 1807, the outer walls of the building were nine feet thick and contained thirty gun embrasures; the walls of the old ammunition rooms were fifteen feet thick. The fort occupied a mole 200 yards from the mainland, but the intervening space was later filled in. In

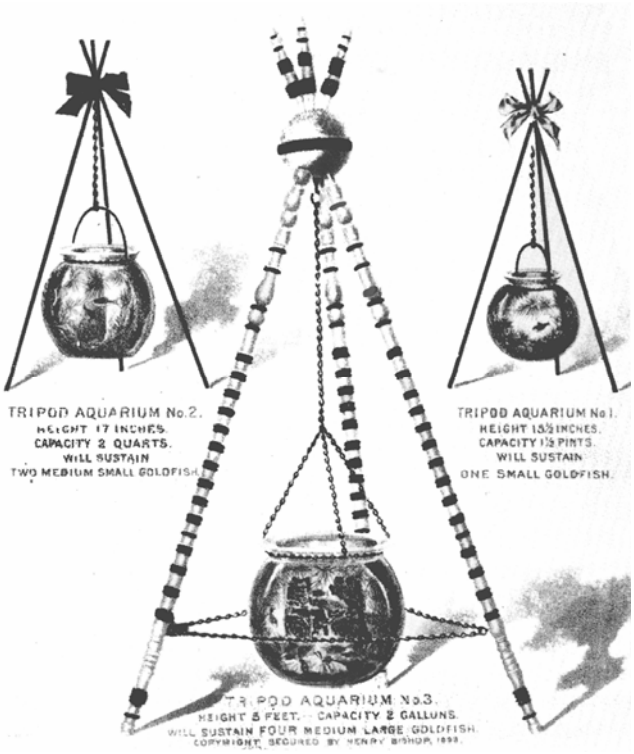


Figure 10-8. HENRY BISHOP'S TRIPOD AQUARIUM, DEVISED BY HIM IN 1893.

1823 it was ceded by Congress to the City of New York and became an amusement hall known as Castle Garden, and later an opera house where, in 1850, Jenny Lind made her first appearance in America. From 1855 to 1891 the building was used as an immigration station, and in 1896 it was opened as an aquarium by the Department of Public Parks of New York City. In 1902 its management was transferred to the New York Zoological Society, a private scientific association which had complete control of the institution and was responsible for its status as a museum. The annual maintenance fund of the Aquarium was provided by the City of New York. The exhibits were provided by the New York Zoological Society.

The building was circular in form with a diameter of 205 feet. Seven large pools, containing turtles, crocodiles, large fishes and marine mammals occupied the main floor and a series of large, well-lighted wall tanks thirty to forty around the main floor and fifty to sixty on the gallery above presented to the visitor a comprehensive view of American fishes, including marine, fresh-water, tropical and northern species.

The equipment included facilities for heating sea water in winter for the tropical fishes; for cooling fresh water in summer for the natives of mountain lakes and rivers; for pumping and filtering brackish water from New York Bay for the large floor pools; and for maintaining a reservoir of pure sea water for the salt-water wall tanks. There was also an air compressor for supplying extra aeration to all tanks when necessary.

The following are excerpts from an interview with Hugo Mulertt that appeared in THE BROOKLYN DAILY EAGLE (Figure 10-10) on December 16, 1894 titled, “Making Pets Of Fish - What You Can Keep In A Home Aquarium.” The images shown are taken from the original article.

> “At the intersection of the two main corridors on the main floor of the Packer institute (Figure 10-6) stands a large aquarium. The attention of every one coming into the building by the main entrance on Joralemon street is sure to be attracted by this collection of gold fish and aquatic specimens, because of its size and the excellent condition in which it is kept. The aquarium is decidedly ornamental, but this was not the main object of its being established. It is part of the plan adopted by the institute for teaching the young women who attend this famous school biology. Not only is there an aquarium at this principal portion of the building, but additional ones will be met with in other corridors and class rooms, and they are all in charge of Hugo Mulertt, an expert In fish culture, and especially in the management of aquariums and in the growing of aquatic plants.
>
> “The first thing that the writer asked Mr. Mulertt, when the clearness of the water of the aquariums was observed and the healthy appearance of the fish, as well as the luxuriant growth of the aquatic plants, were noted, was: "How often do you change the water to keep it so clear?" Mr. Mulertt said in reply to this question that he only changed the water when school opened in September, and after that the occupants of the tanks were their own scavengers and purified the water themselves. This will undoubtedly surprise the novice, because the idea prevailing in the minds of many persons is that keeping an aquarium necessitates the dipping in and out of fresh water frequently, and many doubtless hesitate to introduce an aquarium into the house on this account.



Figure 10-9. THE NEW YORK AQUARIUM AT BATTERY PARK IN 1917.

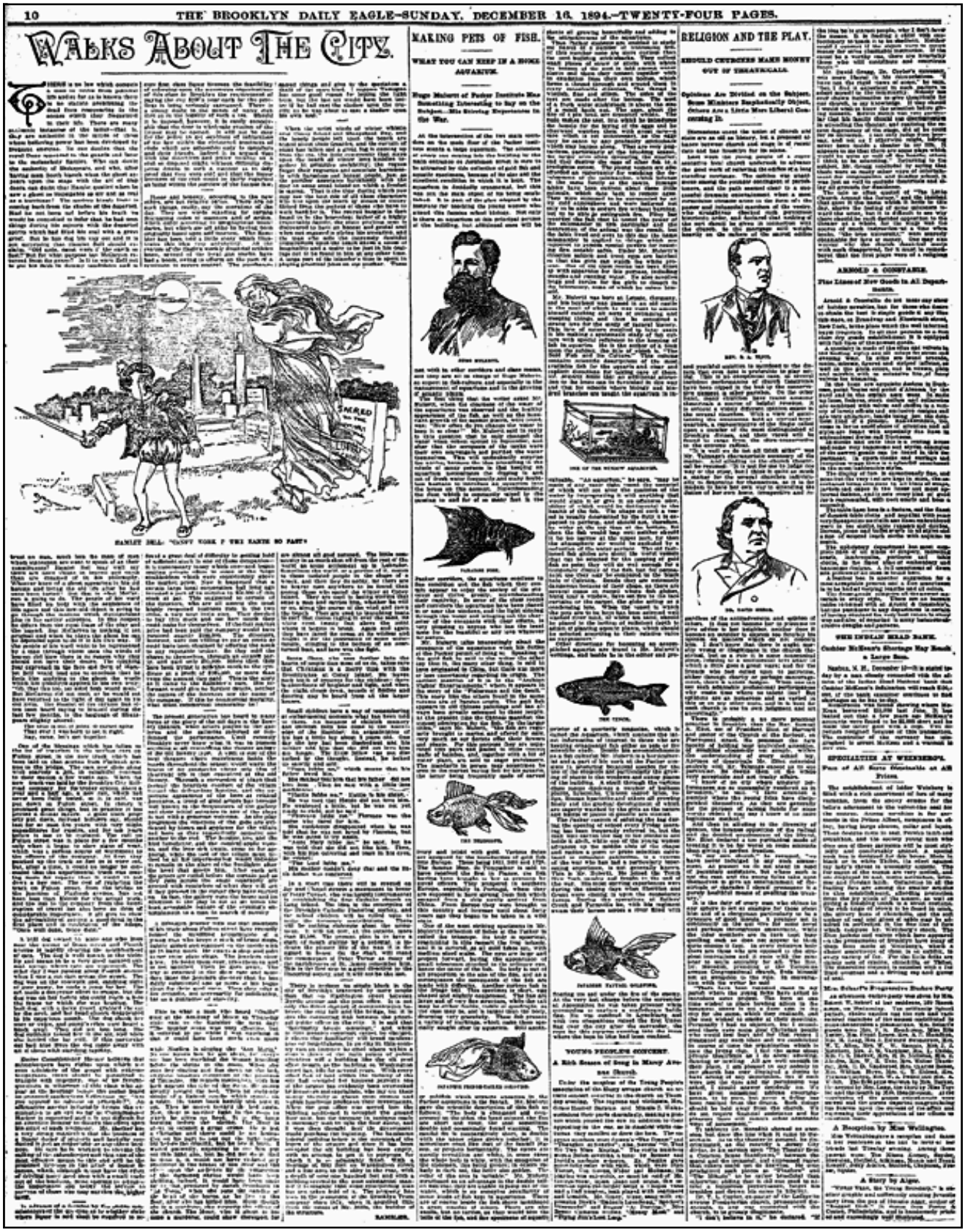
"Notwithstanding the dust which is constantly raised by the passing to and fro of so many feet in the Packer corridors, the aquariums continue in fine condition and the fish which they contain appear to enjoy the society of the students and thrive greatly, notwithstanding their captivity. In some of the class rooms and corridors the aquariums have been placed in or near the windows, and the light shining through the water and bringing out the character of the occupants With clear effects, is very pleasing to anyone who has the least taste for the beautiful or any love whatever for nature.

"Mr. Mulertt talks interestingly about the occupants of the aquariums when his duties at the Packer permit of doing so. Speaking of the gold fish he said to the writer the other day that it, like many other things, is said to have originated in China. but there was more or less uncertainty regarding its origin. The earliest mention of it is in the 'Arabian Nights Entertainments,' where it appears in the story of the 'Fisherman and the Genii.' This story like the others found in the same volume are of Persian origin. The gold fish appears in old Chinese paintings and has always been greatly esteemed by those people. At the present time the Chinese manifest the utmost admiration for the fish. 'In the larger cities,' says Mr. Mulertt, "the fish are regularly brought to market and offered for sale, very much as our florists offer their flowers and plants. For this purpose they are separated into pairs and placed in little vessels made of bamboo, and, together with a bit or water plant, are sold to eager purchasers. The mandarin in person may sometimes be seen in the market buying fish for his aquaria, the latter being frequently made of carved ivory and inlaid with gold. Various dates are assigned for the Introduction of gold fish into Europe. These being 1611, 1601 and 1728. The famous Mme. de Pompadour is said to have received the first in France, the fish having been brought to her as presents by naval officers. They prospered in southern Europe. especially in Portugal, where they are supposed to have sprung from fish which escaped from a ship newly arrived from China. From Europe they were brought to this country and increased until about forty years ago they began to be taken in a wild state.

"One of the most striking specimens in Mr. Mulertt's collection of fishes at the Packer is called the telescope. Its body is spherical, resembling in this respect the frog tadpole, and it is covered, as all gold fishes are, with medium sized scales. The eyes are large and project forward, having the appearance of small telescopes attached to the ordinary eye, hence the name of the fish. Its body is out of all proportion to the size of the fins, and as a consequence the movements of the fish are made with difficulty. Another curious fish is the fringe tail. This specimen is short, egg shaped and slightly compressed. The fins are large and of very fine structure, while the tail may be either double, treble or quadruple, as the



Figure 10-10. BATTERY PARK AQUARIUM, NEW YORK. Originally built in 1807 as a fort, it was converted to a public aquarium in 1896.



10 THE BROOKLYN DAILY EAGLE—SUNDAY, DECEMBER 16, 1894.—TWENTY-FOUR PAGES.

WALKS ABOUT THE CITY.

There is no law which compels a man to wear three pairs of suspenders at once, but there is no statute governing the number of buttons to be sewed upon each pair. Suspenders are of two kinds—that is, they are suitable for the needs of those who have never been developed by Dickens' genius. No one denies that the royal Duke married to the gracile and here to the melancholy Danish. Who can dispute the modernity of Shakespeare, and who, after having seen Booth legends when the ghost appears upon the stage with the air of that dusty old dickey that Hamlet quarrel when he sees a ghost so incongruous as any and as real as a nightmare? The modern knack that is coming back from the shades of the departed. Had he not been out before the fourth he would be consigned to limbo that he had seen things during the morning which made the departed spirits wish had died his real was a great grief. But he has dug his own and in it he has buried his sorrow. Shall anybody ever smile, "Old mole, canst work i' the earth so fast?" But for other purposes he has been resurrected from the grave? In it is very well not to put his head in dreamy meditation and to

HAMLET (tell): "DON'T YOUR F THE EARTH SO FAST?

bread an man, much has he made of such which opinions are used to express of all their consistency! Indeed but they will say that they are not to be taken as they are thought of in the philosophy. Whatever knave of a glove a man may wear in his hands and betray the old city after he has been known a part of its existence. The Hall is going to do. The people of the ward have liked by long that they will not be able again and take not object in going to the through the same street where he was in the Democratic ranks. Like in the matter attention. In the respect he differs from the rest of the city and the ward. But differences is nothing if not surprised and wonder about his way in the Democratic ranks. Like in the matter attention. In the respect he differs from the rest of the city and the ward. But differences is nothing if not surprised and wonder about his way in the Democratic ranks. Like in the matter attention. In the respect he differs from the rest of the city and the ward. But differences is nothing if not surprised and wonder about his way in the Democratic ranks.

The present generation has learned to exist upon the glory of the old days in the law-making body of the city. Many of the old leaders and the salaries enjoyed at that time are still remembered. Even the Democrats never knew when it was to succeed in all respects during the reign of the Democratic city. A man, or one of the leaders, was a member of the Board of Aldermen,

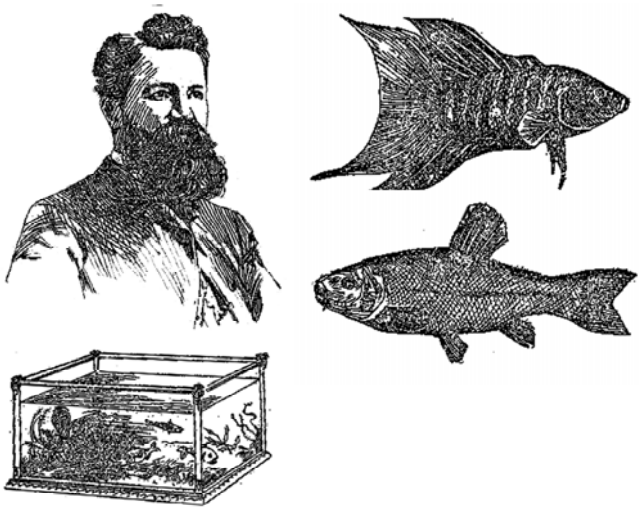


Figure 10-12.
WOODCUTS FROM THE BROOKLYN DAILY EAGLE ARTICLE.
LEFT TOP TO BOTTOM:
HUGO MULERTT AND AQUARIUM OF THE DAY.
RIGHT, TOP TO BOTTOM: PARADISE FISH AND TENCH.

case may be, and is larger than the body, drooping very gracefully. These fish present a variety of markings, which make them specially sought after by aquarists. Still another goldfish which attracts attention in the Packer aquariums is the fantail. Mr. Mulertt gave the scientific description of this fish as follows: 'The body is elongated and compressed on the sides, the head pointed, the fins are short and stout, the anal sometimes double and occasionally found wanting. The caudal fin is comparatively short, is double with the upper edges grown together; it is sometimes erect like that of the fantail pigeon. or projects horizontally. The colors are mostly vermilion and white, in some cases the whole body is white. with the exception of the abdomen, this being golden; in others the body is dark red, the belly also golden. The color of the eyes is variable.' Mr. Mulertt mentioned as an advantage in the double tailed fish that they are unable to jump out of the water, which is an annoying peculiarity of some kinds of fish kept in aquariums. There are of course beside the fish above mentioned a great number of others. There are also snails, but no turtles, as they would bite the tails of the fish, and fine specimens of aquatic plants all growing beautifully and adding to the attractiveness of the aquariums.

"Thus Packer students are enabled to study the habits of a number of interesting fish. Of this number none are more curious than the nest building sticklebacks. They collect small pieces of straw or sticks with which the bottom of the nest is laid among water plants and these they cement together with an exudation from their own booties, which forms a thread through and around them in every conceivable direction. The thread is whitish, fine and silken. The sides of the nest are made after the bottom. The nest of a fresh water stickleback is about the size of a small hazel nut. The eggs, about the size of a pin head, are deposited within. The male makes the nest, into which he introduces the female for the laying of the eggs and he afterward watches them with great care - a care which is not unnecessary, as the eggs may be eaten by any predatory stickleback which may happen along. They are very pugnacious, particularly at the breeding season, the larger ones often devouring the smaller, and they destroy the eggs of other fish to a prodigious extent. The young women are also afforded an opportunity for watching the development of the salamander, which belongs to the same family as the newts. Strange fables have been current about these little animals, which date back to remote ages. They were supposed to be surrounded by an icy cold atmosphere and were believed not only to be able to endure fire without burning, but to be able to extinguish fire. Pliny has recorded the fact that he tested the power of the salamander in this particular and the destruction of the animal was the result, but the fable lived and even to this day the name salamander is applied to things which are supposed to possess special powers for resisting fire, notably safes. Under Mr. Mulertt's direction salmon and trout eggs are hatched so that the girls can watch the whole process. One of the class rooms has been fitted up with apparatus for this purpose, including troughs and running water. He also supplies frogs and turtles for the girls to dissect in the laboratory, some of which he raises himself.

"Mr. Mulertt was born at Leipzig, Germany, and his boyhood was passed in an old castle in the moat of which he was wont to amuse himself catching all sorts of swimming and creeping things, and thus he conceived a strong love for the study of natural history. This love of nature resulted in later years in his making a systematic study of fish culture with special reference to the keeping of fish in aquaries. He is the author of a book upon the subject, the title of which is, 'The Gold Fish and Its Culture.' This volume contains scientific descriptions of the most available fish for the aquaria and clear and explicit directions for taking care of them. Mr. Mulertt holds that an additional attraction to the home can be furnished in this way and that for schools where biology, and kindred branches are taught the aquarium is invaluable. 'An aquarium,' he says, 'may be made of any water tight vessel the material of which will not alter the qualities of the water by impregnating it with anything that would stain it or give it an offensive odor, either of which would be detrimental to the health of the fish. The shape of such a vessel is usually determined by the duty it is expected to perform, and should not, therefore, be wider at the top than at the bottom, for then the fish would leap out; neither should it be too narrow at the upper part, for then the atmospheric air would be excluded by a reduction of the water surface.'

"'The old fashioned fish globes are about the worst vessels that can be selected for the keeping of gold fish as pets; they will do well enough for a temporary display of the fish, but for permanent use they may be compared to the black hole of Calcutta. Beside they are extremely dangerous, because of their shape, as there are several cases on record where fish globes, hung near a window, have set fire to the lace curtains or the carpet, the globe acting as a condensing lens. When the vessel in which the pets are to be kept has been selected well washed river sand, or white sea sand, should be placed in the bottom of sufficient depth to admit of planting aquatic plants, which should be selected according to their relative value as oxygenators.'

"Other directions for becoming an accomplished aquarist are found in Mr. Mulertt's writings, and besides he is the editor and proprietor of a quarterly magazine, which is called the Aquarium, which contains the latest information of interest to those who are keeping ornamental fish either as pets or for scientific study. Beside his accomplishments as a fish culturist Mr. Mulertt is a horticulturist and a part of his work at the Packer consists in procuring botanical species for the use of the students and particularly the growing of plants in the windows and sunny places of the building. A stroll through the various class rooms discloses a number of bulbous plants, hyacinths, Chinese sacred lilies, tulips, Roman hyacinths and others all growing finely and the gradual development of which are eagerly watched by the girls as the nature and habits of plants In general are studied."

Although Hugo Mulertt will be mentioned briefly once or twice more, limitations of space now force a close to this biography of the "Grandfather of the Aquarium Hobby in America." He was one of the most important of our great aquarists and, sadly enough, the one most unjustly denied his place in aquarium history.

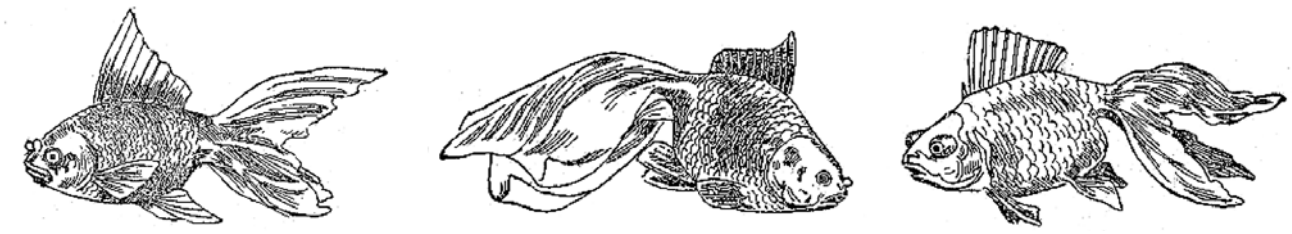


Figure 10-13. GOLDFISH WOODCUTS FROM THE ARTICLE.
From LEFT to RIGHT: FANTAIL, FRINGETAIL, AND TELESCOPE.

CHAPTER 11:
EARLY AQUARIUM SOCIETIES & EQUIPMENT

The 1880's were truly significant years for the aquarium hobby in America. Although there was considerable activity in both the Philadelphia and the New York-New Jersey areas, it is necessary for the time being to treat developments in these two regions somewhat separately as the faint stirrings of organized aquarium society activity in the United States is traced to its beginnings.

As was mentioned in Chapter 8, before World War I there were three waves of German immigration to the United States, the first having no effect on the American aquarium hobby and the second bringing men like Hugo Mulertt to the Midwest. The last wave, occurring between 1880 and 1897 and tapering off to 1910, brought many German-speaking aquarists, along with their influence on the hobby, to the New York-New Jersey area by the turn of the century.

On March 12, 1893 the first aquarium society in this country made its appearance. It was formed in New York City by five persons who had become acquainted by chance. The name of this small group was *Triton* and its president was Baron von Schlichting, a German immigrant. In April of 1893 the second aquarium society in this country was organized and it also originated in New York City. Its name was *Salamander*, with Dr. A. von Duerung as President and Mr. H. V. Letkemann as Secretary. If the names of these societies seem peculiar to readers it is because they followed the custom then prevalent in Germany of naming aquarium societies after fish and other aquatic animals. Triton, it may be noted, is type of aquatic salamander, an amphibian commonly kept in aquaria in the early years of the hobby. *Triton* and *Salamander* were at that time already famous as German aquarium societies. The German immigrants who formed these American counterparts understandably named their societies after them. It is interesting to note that about this time Mulertt started a quarterly aquarium-terrarium magazine written entirely in German. Its name was NAIADE. It was published in Brooklyn along with THE AQUARIUM, but it was short lived. The aquarium hobby in the United States clearly was in Stage IV in full stride.

Although *Triton* and *Salamander* were the first two aquarium societies in the United States, they had no real effect on the hobby as such. They were clannish and only German was spoken at their meetings. As a consequence, these organizations were little known outside New York City. It is not really known exactly what these groups did, although *Salamander* had an exploring excursion to the Bronx River Park on May 21, 1893 that was "well attended." It must be remembered that, as far as tropical fish were concerned, there were few species available in this country at that time. The Paradise Fish was pretty much it. It is helpful,

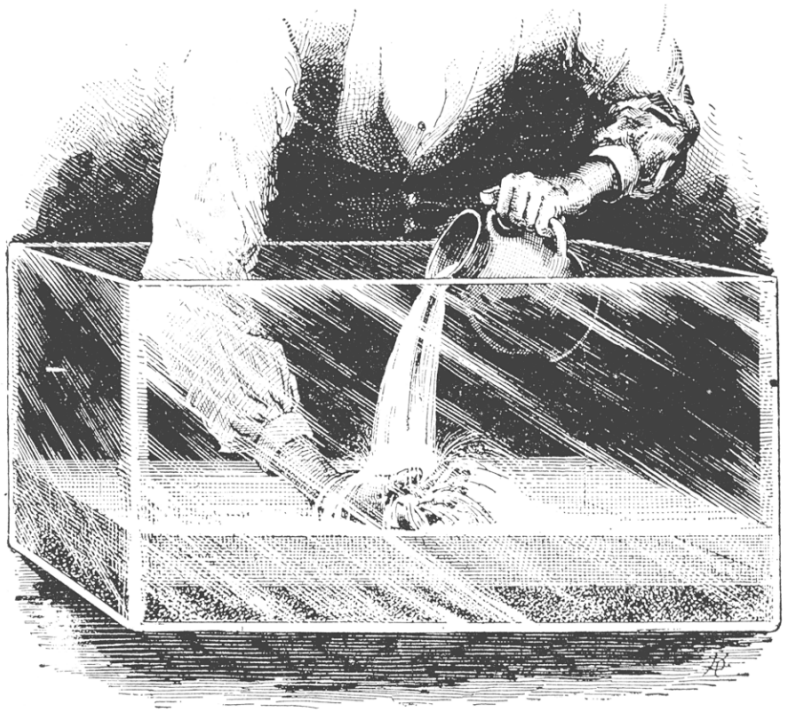


Figure 11-1. AN ILLUSTRATION TAKEN FROM MARK SAMUEL'S BOOK, *The Amateur Aquarist*, published in 1894, showing that the principle of using an object - here a hand - to break the fall of water added to the newly set-up tank was well known even at this early date. The technique, of course, insured that the gravel would remain undisturbed.

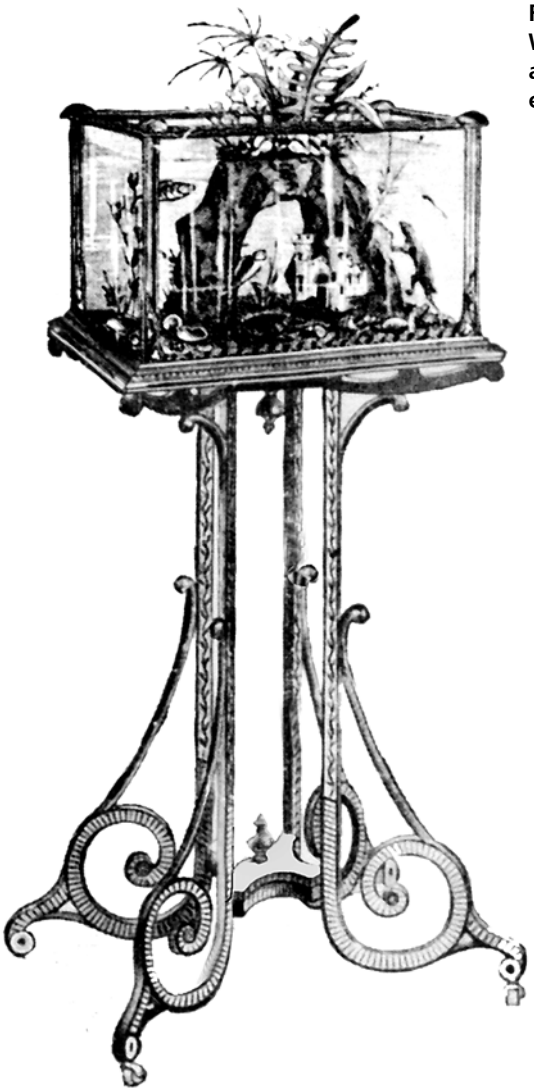


Figure 11-2. IN THE 1890'S, ELABORATE PEDESTALS WERE QUITE COMMON. Also typical were the stone arches in the tank that permitted bog plants to emerge above the water's surface.

therefore, to review briefly the state of the hobby circa 1893.

In 1893 almost every major city in the East had at least one prime dealer in aquarium supplies. A very impressive establishment in Pittsburgh, for example, was "The Aquarium," located at 908 Penn Avenue. Not only did they deal in aquarium supplies but they handled fancy goldfish as well and their catalogue and price list could be obtained for the princely sum of two cents.

One could buy plants such as *Ludwigia,* water hyacinth and several species of *Sagittaria.* These sold for 25 cents to 50 cents each. Special center plants, on the other hand, sold for as much as $2 each. Plain and fancy goldfish were offered, as well as sticklebacks, Paradise Fish, tench and the Chanchito. Fish prices varied according to species, size and color, from a few cents to several dollars for the rarest of the goldfish. Also available were snails, newts and tadpoles. Fish food sold for 25 cents a box, aquarium cement for 50 cents a pound and nets with turned walnut handles for 25 cents.

In medium sizes, tanks sold for about $1 per gallon. A tank 11-1/2" high x 7-1/2" wide and 14-1/2" long with a plate glass bottom sold for $5; the same tank with wooden base and cornice sold for $7.50. Slate bottomed tanks were available in 9- and 13-gallon sizes, also selling for about $1 per gallon. The following prices of the larger sizes were typical: 19 gallon, $15; 33 gallon, $22.50; 47 gallon, $25. Note the odd sizes to tanks then; there was no standardization either in dimension or capacity.

It is important to note, however, that tanks manufactured before 1890 often had metal bottoms, inside ribs, or exposed cement. This made it almost impossible to keep fish in such tanks without circulating the water, as was commonly done with goldfish, or making frequent water changes. Aquarium cements of the day were imperfect and after long immersion in water they discolored, usually killing fish and/or plants. The development of tanks in the 1890's in which the glass was arranged so as just to meet inside the frame and thus minimizing contact of water with the aquarium cement, plus the abandonment of the use of metal inside the tank, permitted the aquarist to set up an unaerated tank for periods of up to one year.

As to precisely how one went about constructing a tank prior to the turn of the Century, Mulertt himself tells it best, circa 1894:

> "Of the different shapes used for an aquarium tank we find the rectangular shape the best for all around purposes. Its advantages over the round, the triangular and the hexagonal shape are so apparent that any of the latter should only be constructed for special purposes.

"The first thing to be considered when about to construct a tank is the space or location which it is to occupy. As a rule amateurs make their tanks too large. A large tank, when proportionally stocked, makes a grand effect; this we admit, but its size and weight make it inconvenient at certain seasons of the year, and the cleaning and refilling involves a great deal of labor and time which everybody has not at his disposal at the required time. We always advise building one medium sized or two small tanks; in the latter you are enabled to keep different species that are not on friendly terms with one another.

"The medium sized tank, which we find best suited for a parlor, sitting or dining room, has a capacity of about eighteen gallons. The inside dimensions, from glass to glass (the proper way to measure an aquarium tank), is twenty-four by twelve inches, by fifteen inches in height. This tank sets on a stand, the top of which is on a level with the windowsill.

"To make such a tank, get an ironworker to make you a simple iron frame out of one inch angle iron to correspond with above dimensions, and at perfect right angles at the corners. The frame is painted with one coat of red lead. After this is perfectly dry, a straight piece of one quarter inch thick rough plate glass, such as is used for large skylights, is cut to fit loosely, leaving about one eighth of an inch play all around in the lower part of the frame. This glass is to be the bottom of the tank. It forms, so to speak, the foundations, and great care is therefore to be exercised in placing it properly. To this effect all of the entire lower angles are covered liberally with rather stiff aquarium cement, being especially particular that the corners are well supplied with it. Now take a dry rag and wipe the corners of the plate perfectly clean and lay it gently and evenly on the cement bed. If the frame stands where it should, on a perfect level, the weight of the glass will tend to sink it into position; if, however, the cement is not very pliable, it will be necessary to assist by pressing it down with the hands; in this case the pressure should be gentle, uniform, and only in the middle of the plate.

"The surplus cement is now removed, both below and above, with a putty knife, followed by a dry rag. If examination shows that the cement has taken hold of the glass at every point, it is left to stand quiet for at least twenty-four hours. The two lights, twenty-four by fifteen, which are to form the front and rear, are now prepared. These may be cut out of second hand polished plate glass (pieces of broken show windows), or where this cannot be had, they should be extra heavy double thick French, or so called English twenty-six ounce glass. In every case the lights should fit loosely into the frame, and if one of the long edges should be rough or ragged, this should go up in order to have the lower edge fit snugly against the bottom. The lights are now cleaned with water and wiped perfectly dry. The angles on the bottom and those at the uprights, but not the upper horizontal ones, are next filled with cement, as was done when the bottom glass was placed, and the lights are then set in place, using gentle force to make a uniform fit. Two wooden sticks (braces) are then placed across from one to the other to hold them in position, then the surplus cement is removed and the glass again wiped clean.

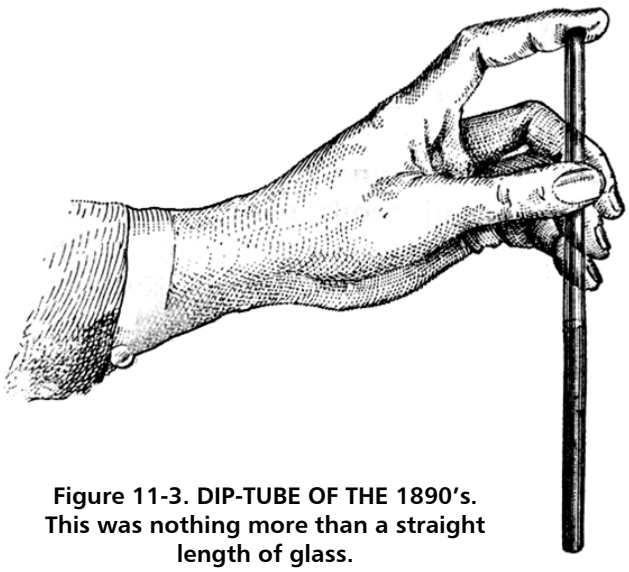


Figure 11-3. DIP-TUBE OF THE 1890's. This was nothing more than a straight length of glass.

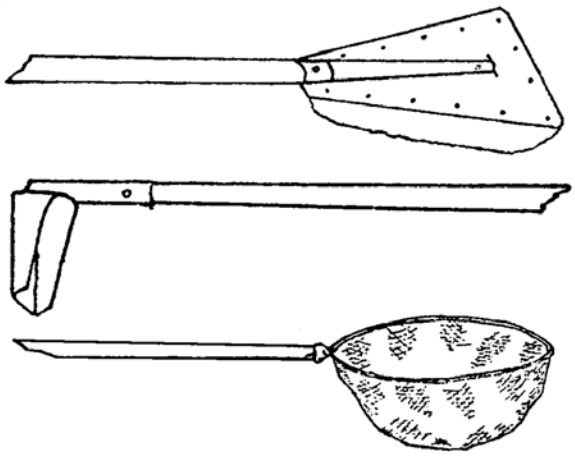


Figure 11-4. FROM TOP TO BOTTOM:

AN AQUARIUM "WIPER." It consisted of a piece of sponge fastened to a stick.

A "DREDGE," CIRCA 1894. This instrument was used for scooping debris from the bottom of a tank.

A WOODEN HANDLE NET OF THE 1890's. Early nets were shallower and more inefficient than those of today.

"Our next move is to measure the distance between the two lights just now set, as the two end lights should fit snugly, but without any strain, against them. Double thick French glass is best suited for these, and the edges that will meet the other glass should be clean cut. We then proceed to set them as described above for the others. After two or more days, according to the season or weather, the cement has sufficiently hardened and the tank may be filled with water.

"For the small tanks above mentioned we find fifteen by seven and one half inches, by eleven inches height (all inside measure), the most desirable size. The frame is in this case made by a tinner, out of galvanized sheet iron, bent into right angles and soldered at the corners. The bottom in this size is made of double thick Pittsburgh glass, and the sides should be double thick French, on the same principle as in the larger tank described above.

"Do not attempt to make an aquarium out of wood; in nine cases out of ten they are a failure. Neither take outside advice regarding the size of the tank. Someone will tell you that 'If you make if such and such size the glass will cut to better advantage, etc.,' but an inch or two out of the way one way or the other makes a very big difference in the appearance and also in the welfare of your collection.

"These are the details to be observed in the construction of the inner hull, or the tank proper; the outside hull, or ornamental part, is easily put on afterwards. This can be a simple coat of paint and varnish, or it may consist of a rustic decoration of tree bark or tuff stone, or a stylish mantle of wood work; no rules are set for this part, and one may exercise his individual taste. Regarding the stand for the aquarium, however, we find that a closed pedestal, for instance, a little cabinet, tends to set the collection off to its best advantage."

The use of the term "light" for a pane of glass seems odd to today's aquarist, but Mulertt's suggestion that the frame of the tank be covered with tree bark or other decorative material is intriguing. In short, Mulertt's instructions 109 years ago for tank construction still reflect sound principles and some interesting ideas as well.

Paradise fish, Climbing Perch, Chanchitos and sundry South American catfish species formed the sum total of tropical fishes available at the time. A common method for heating their tanks in the early 1890's was as follows: A sheet iron pan, several inches deep and about 1/2 inch larger all around than the bottom of the tank to be heated, was filled with two inches of sand. The tank was placed on top of the sand; then the pan/tank combination was set on a framework or on a table with a hole cut into it so that there was direct access to the bottom of the pan.

Two kerosene lamps were placed under the pan; during the day when the room was usually heated by an open stove fire, one lamp was used to keep the water temperature between 70 and 80 degrees F. At night, both lamps were used. Of course a great deal of attention had to be paid to such setups, e.g., checking the water temperature, guarding against fires and other accidents, etc., but a typical 18 gallon aquarium could

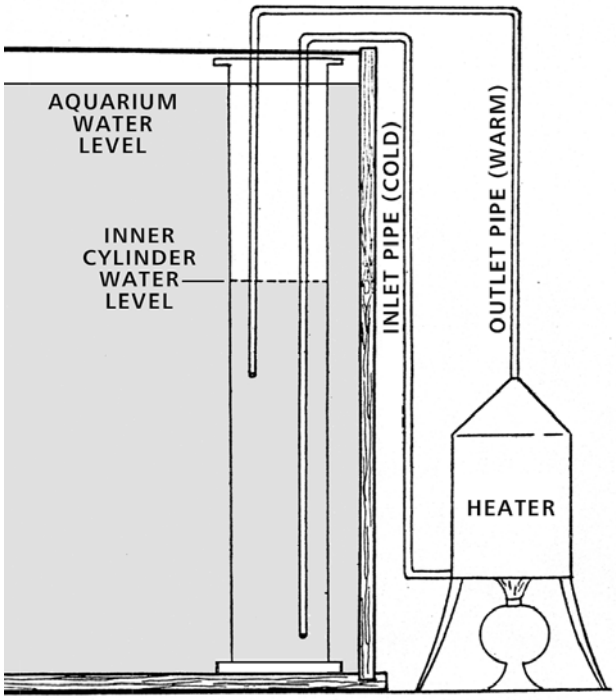
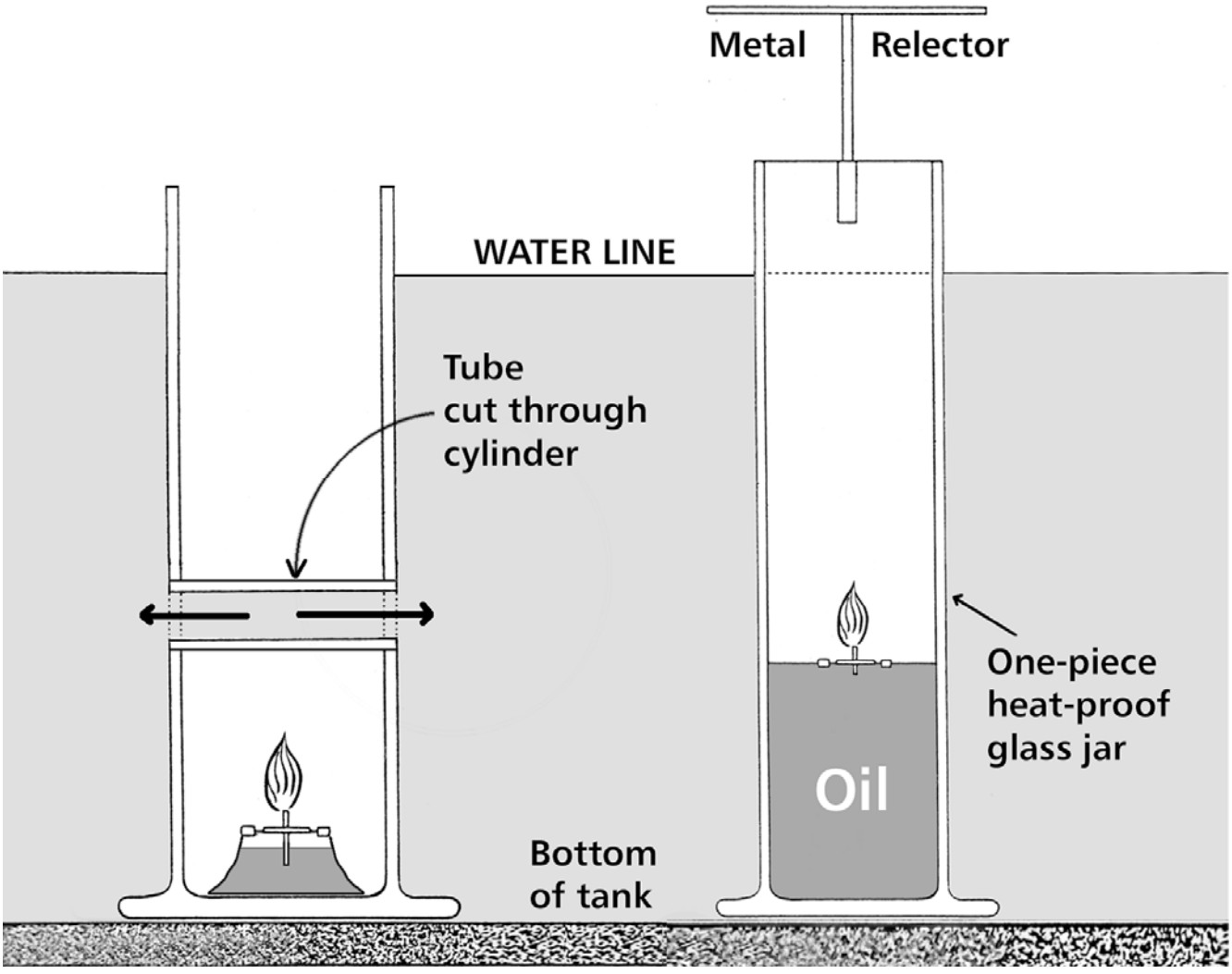


Figure 11-5. EARLY AQUARIUM HEATING DEVICES

RIGHT: Water was heated in the small copper kettle. As the water became warm it was delivered by the outlet pipe to the inner cylinder placed in the aquarium and, via convection, the colder water was drawn from the bottom and returned to the kettle.

BELOW LEFT: The lamp not only heated the sides of the container and therefore the aquarium water with which it was in contact, it heated the aquarium water that moved through the tube as well.

BELOW RIGHT: This system was similar to the one on the left but without the horizontal tube. A metal reflector directed some of the heat that would otherwise be lost back into the aquarium .



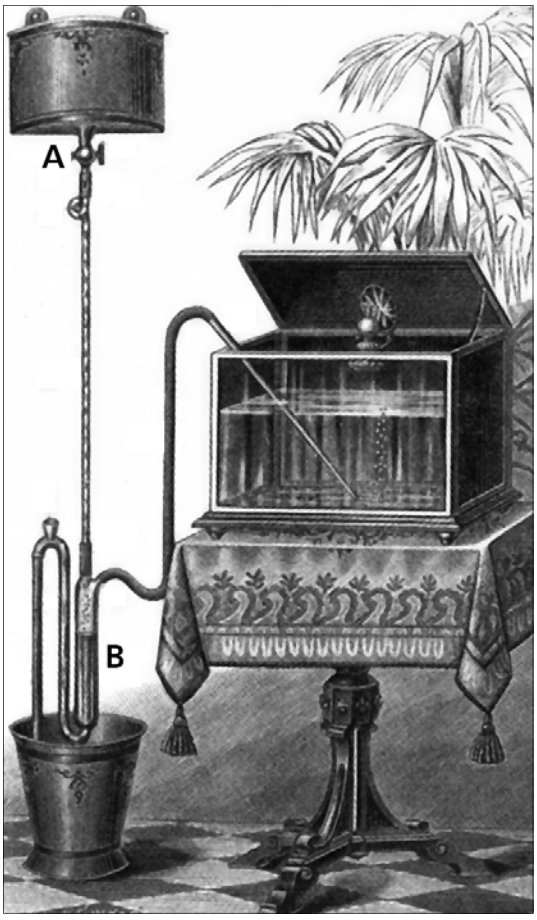


Figure 11-6. WATER FROM THE RESERVOIR FALLS INTO THE BUCKET, dragging air that enters via a needle valve at point A with it. The air is separated from the water in the large U-tube; the pressure of the falling water/air mixture forces the air into to the aquarium.

be kept suitably warm at a surrounding air temperature of 60 degrees F for about 5 cents per week.

Other clever devices were occasionally employed. One consisted of a sheet metal box 10" high and 3" x 4" in cross-section. The top was left open and all the joints were tightly soldered to be leak-proof. A tube was soldered crosswise in the middle of the box so that water could pass through. Below the tube a small kerosene lamp, or an alcohol lamp if a higher temperature was desired, provided the heat; the whole device was suspended in the tank. The edges of the box were located above the level of the water but the tube openings were below the water level so that the water could pass through. The fumes passed up and out of the box and the water passing through the tube was heated (Figure 11-5).

The heating of aquaria with oil lamps was not without adverse incidents. The following account was written by Walter H. Chute, reporting on an incident that took place at the third annual exhibition of the Boston Aquarium Society held in the Mechanics Building during January of 1918 in conjunction with the Boston Poultry and Pet Stock Show:

> "More than a hundred goldfish were entered in the sixteen classes. In the tropical section twenty-nine species were shown, together with two hundred native fishes, representing fourteen species. The tropical were shown in electrically heated cases, the heat being supplied to the air and not to the water direct. One member showed a beautiful community tank, heated by an oil lamp. This worked admirably, maintaining a temperature of 75 degrees, while the hall temperature dropped as low as 50, until some curious individual in the absence of the attendant, turned up the flame to see how it worked – and forgot to turn it down again! After that the aquarium was maintained at 120 degrees, presenting its unfortunate owner with an entirely unexpected fish chowder the next morning. If exhibition must be heated, heat the air, not the water, and by all means have an attendant present at all times, even if you have to hire one."

It is interesting to note that roughly one-third of all the species entered in this show were native fishes; if one considers the sixteen goldfish classes equivalent to species, the ratio of goldfish to tropicals to natives was roughly ¼ to ½ to ¼.

At this period in the aquarium hobby filtration was unheard of and aeration was decidedly primitive See (Figure 11-7).

A leading aquarist of the day was Mark Samuel. Samuel had a store located at 10 East 16th Street between Broadway and Fifth Avenue from which he sold fish, aquaria and supplies. Besides manufacturing his own tanks and certain other hard goods, he was retained as a consultant to Columbia College, as Columbia University was then known. One of Samuel's real contributions to the hobby was his book *The Amateur Aq-*

uarist, published in New York in 1894. This was a very fine publication, smallish, of some 114 pages. It was authoritative (Figure 11-1) and featured some interesting innovations. For example, he warned of the danger of using gravel or stone ornaments that were high in lime content. Samuel's book also provided tables of "wise and unwise combinations" of fishes to be kept with goldfish and a summary chart of 20 aquarium disorders together with both cause and cure. His table of 18 things to avoid, e.g., "Avoid using soap or chemicals to clean the aquarium" and "Avoid introducing a doubtful specimen without quarantining," is still excellent advice.

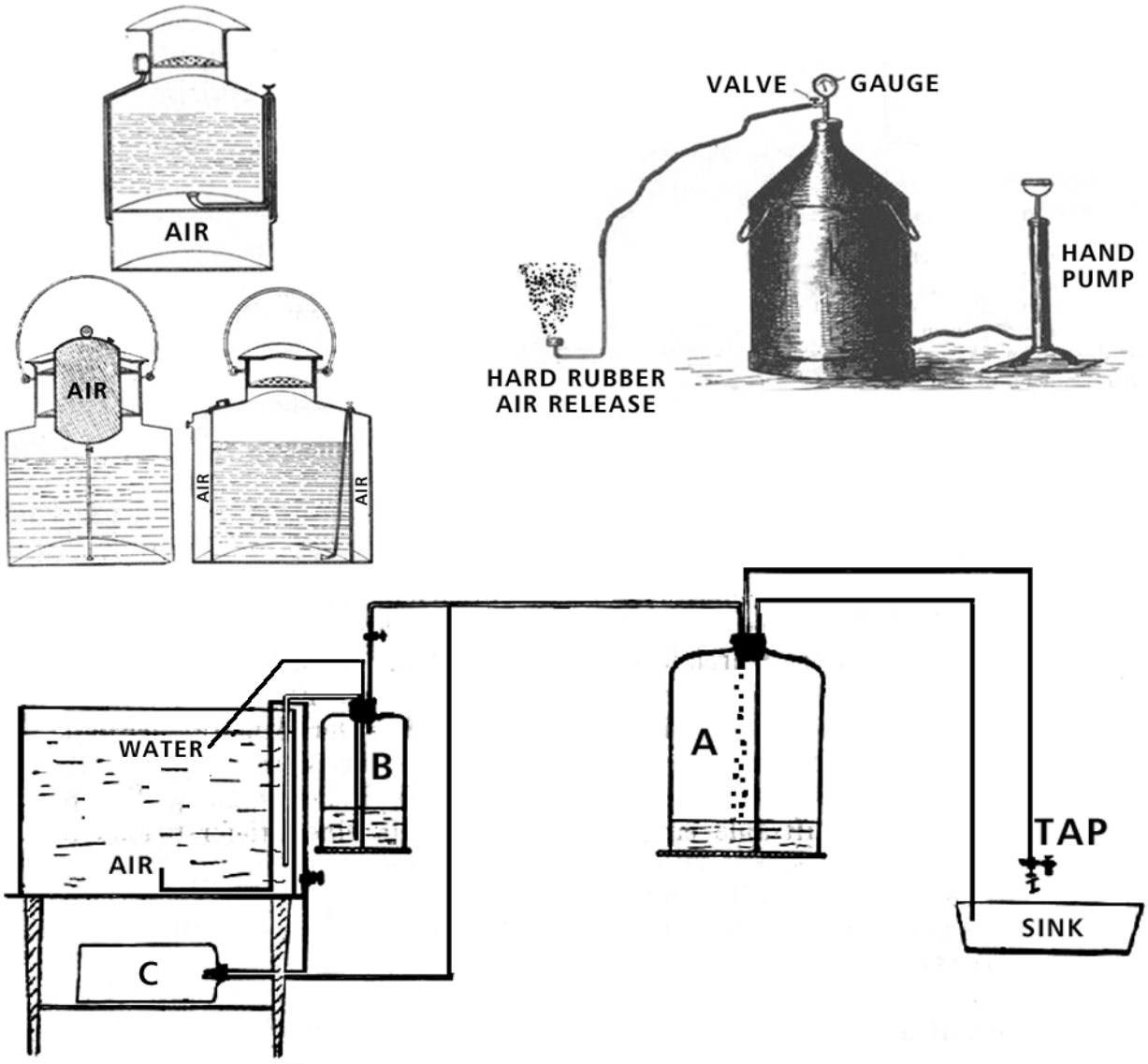


Figure 11-7. EARLY AERATION DEVICES, CLOCKWISE from UPPER LEFT:

TOP LEFT: SHIPPING CONTAINERS. The water was aerated by compressed air stored in separate compartments within the cans.

TOP RIGHT: HAND PUMP. A hand pump was used to fill the tank. A single tank could be aerated for hours using such a scheme.

BELOW: AIR WAS COMPRESSED BY FORCING WATER FROM THE TAP INTO CONTAINER A. The aquarist then had the option (via various valves) either of recirculating the aquarium water using the air forced into container B, or aerating the tank directly with the air forced into container C. After container A was half-filled with water, it was emptied into the sink.

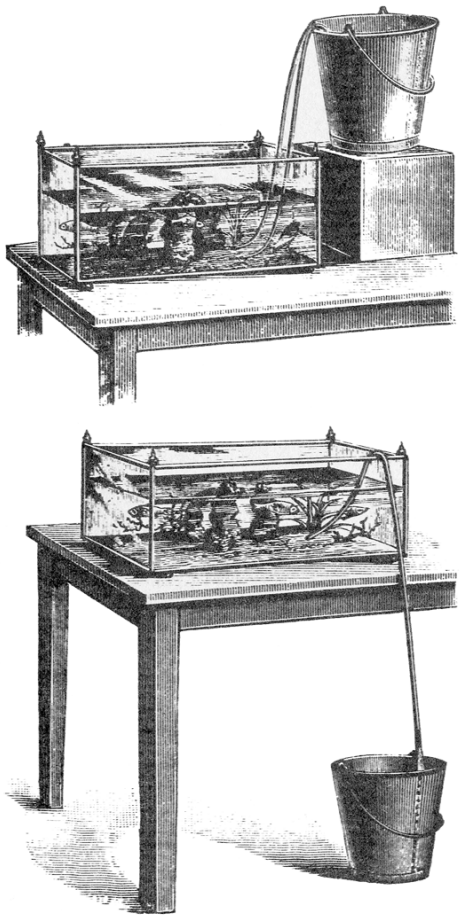


Figure 11-8. METHODS OF FILLING AND EMPTYING AN AQUARIUM, FROM *Fresh-Water Aquaria*, 1890, by GREGORY C. BATEMAN.

On May 5, 1891 Samuel sent to the Stevens Institute of Technology a gallon of water from one of his tanks that had been set up, undisturbed, for eight months. Dr. Albert Leeds of that institution made a detailed examination of this water including nitrate, chloride, hardness, oxygen and eleven other chemical constituents and found the water to be in excellent condition: "... and return to you a copy of my analysis of the water, from which you will see how much the satisfactory character of the water must have depended on the nice balance you struck in its inhabitants". Samuel's book, although popularly written, was of high quality and retained the mark of a scholar throughout. Mark Samuel was a very fine, pioneering aquarist and his name should not be overlooked.

In December 1896 a milestone occurred in the aquarium hobby. This was the formation of a society that was to have a tremendous effect on the aquarium hobby in the United States for years to come. It rightly marks the beginning of truly organized aquarium activity in this country. In a sense, it was mothered by the *Triton* society that, by 1896, had gone out of existence. Because the new organization was the only aquarium society at that time, *Salamander* also having passed from the scene, it was called simply, "The Aquarium Society." Only many years later, when other societies had formed throughout the country, was its name changed to "The New York Aquarium Society."

In point of fact, however, The Aquarium Society was organized in Jersey City, New Jersey and not in New York City as one might have thought. At first it held its monthly meetings at the German-American School Building in Jersey City. Later it also used facilities at the American Museum of Natural History in New York City, meeting twice a month - once in Jersey City and once in New York City. Twenty years later it ceased meeting in New Jersey and met then only in New York, at which time it changed its name to "The New York Aquarium Society." The first officers were: Eugene Smith, President; F. C. French, Vice President; George Baehr, Secretary; W. Spicer, M.D., Treasurer; R. Breetz, Financial Secretary; P. C. A. Graupner, Librarian.

The initial membership of The Aquarium Society even included one woman. An oddity was that only those residing within a radius of 15 miles from New York City Hall, the maximum reasonable traveling distance for the day, were eligible for active membership. The initiation fee was $1 with dues of $1.25 annually but payable monthly. A fascinating provision in their Constitution was Section 5 of Article IV: "Dealers shall not be debarred from membership; it must be, however, definitely understood that they are not to use the fact of their membership as an advertising medium, and that they consider the members privileged parties and grant them reasonable concessions." What a donnybrook the latter part of this clause would cause among today's societies! It is interesting, however, to note that the question of dealer members arose as early as 1896, for the problem still plagues many present-day clubs.

The founder and first President of The Aquarium Society was Eugene Smith. Smith, however, is entitled to his niche in the history of the aquarium hobby in America over a much broader basis. He is the next, chronologically after Damon, Butler and Mulertt, in our series of the greatest American aquarists of the period. Where Mulertt only briefly influenced the 20th Century, Smith brought the hobby successfully from the 19th Century to the next. A closer look at his activities will be taken in the next chapter. In any event, December 1896, primarily through the efforts of Eugene Smith, saw the beginnings of organized aquarium work in America.

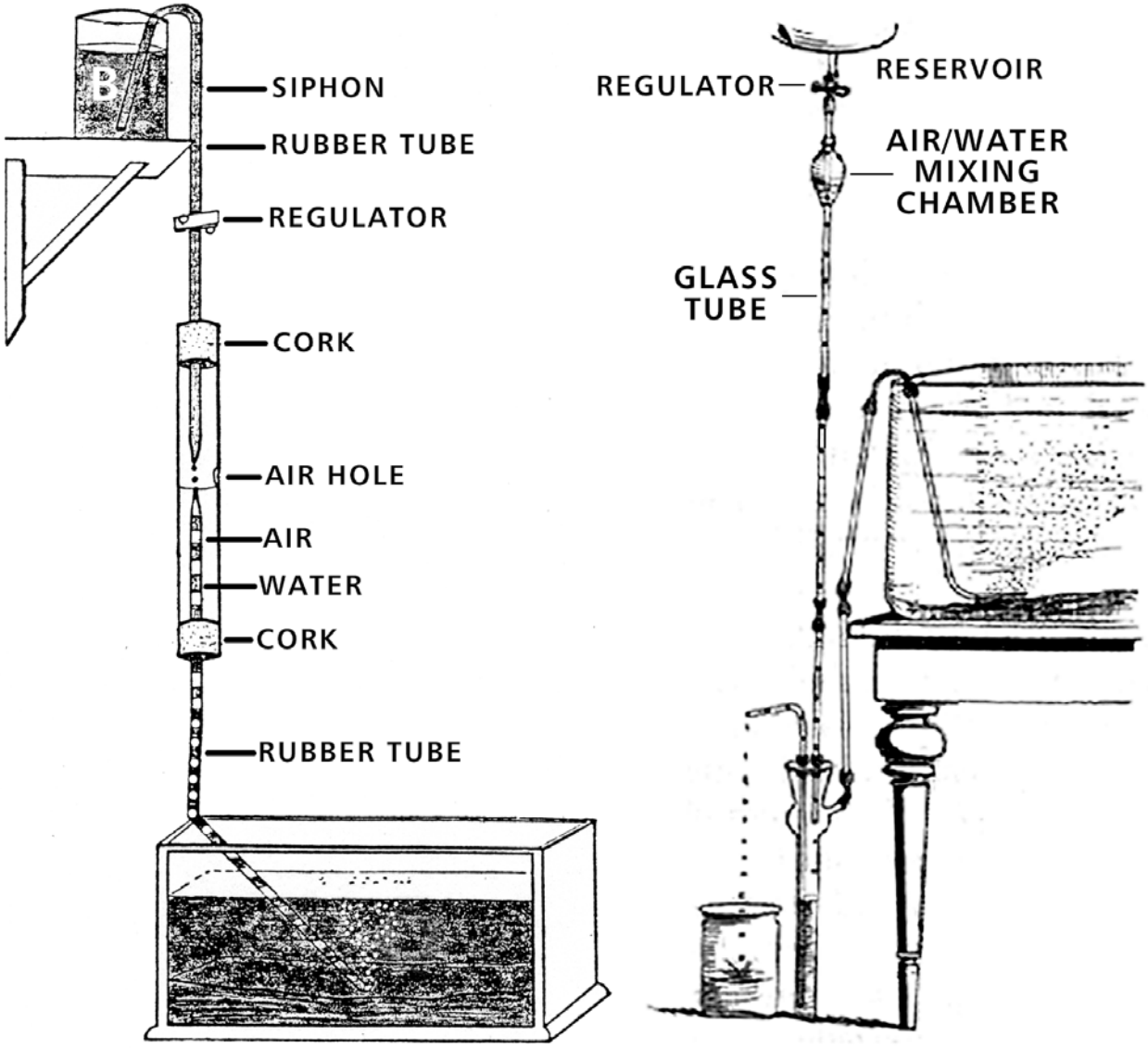


Figure 11-9. AERATION VIA DRIP METHODS.
LEFT: BETWEEN THE RUBBER TUBING THAT CONNECTS RESERVOIR B WITH THE TANK IS A GLASS CYLINDER, 4 inches long and ½ inch in diameter. Two pieces of small glass tubing, blown to a sharp point, are set within the tube about ½ inch apart and connected to the upper and lower tubing. There is an air hole in the middle of the glass cylinder and, as the water drips from above, it mixes with the air and falls into the aquarium as a mixture of air and water, a variation on the well-known venturi effect. A clamp regulates the water flow to ensure that it is not supplied faster than the lower pointed tube can convey it down to the aquarium By careful adjustment, a jar of water lasted for about twelve hours, after which the reservoir is once again filled with water from the tank.
RIGHT: IN THIS SYSTEM, DROPS OF WATER MIX WITH AIR IN A GLASS CHAMBER. The air/water mixture then falls into a larger chamber where the air separates from the water. The water buildup then forces the air into the aquarium. In 10 hours only 2 quarts of water is needed in the reservoir. No tank water is used in this system.

CHAPTER 12
SHUFELDT, SMITH & THE PHILADELPHIANS

In 1893 the Philadelphian, William P. Seal, was in charge of the aquaria of the U.S. Fish Commission at the Columbian Exposition in Chicago and in that very same year J. Hope originated the fancy goldfish hobby in Philadelphia. Philadelphians pursued the cult of the goldfish with a vengeance and polished that creature to a gleaming perfection seen nowhere else in the world. One after the other the Philadelphia pioneers appeared; Franklin Barrett, Z. K. Dannenhower and others led the way.

In a small pet shop on Ninth Street operated by John Cugley, who was the first to import calico telescope goldfish from Japan, a few hobbyists started to assemble on a regular basis to discuss the problems of this new hobby. One of these regulars, H. G. Burrows, suggested that the group organize and conduct meetings in a regular way and so, with the aim of setting up a permanent organization, the very first meeting was held at the Colonnade Hotel on May 5, 1898. Burrows, who was elected President, proposed the name by which the society was henceforth known, i.e., The Aquarium Society of Philadelphia. Other officers elected were: Harry Folwell, Vice President; George Cugley, Secretary; and E. Thalag, Treasurer. The object of the society was simply, "The scientific management of the aquarium and the amateur breeding of aquarium fish." In that the breeding of goldfish was stressed, the Philadelphia group set goals quite different from those of The Aquarium Society (New Jersey).

Active membership in the Society cost $6.00 per year and Associate membership cost $3.00. For the first three meetings the average attendance was ten and by the end of the year the total membership stood at eighteen. On June 14, 1898 the practice of meeting at members' homes was started. In August of 1898 the Society was visited by Mr. M. Hammerschlag of The Aquarium Society (New Jersey) and thus, intersociety contacts were started. One interesting observation was that, independent of the New Jersey group, the Philadelphia society also wrestled with the problem of commercialism. Their By-laws, however, stated explicitly: "It must be definitely understood that no member shall use the Society as an advertising medium."

By the end of 1899 the Philadelphia group, perhaps influenced by the New Jersey club, realized that its dues were too high. In order that the charter members not lose their initial investment, the Society disbanded on January 10, 1900, dividing the $20.40 cash on hand among fifteen members. All but two members immediately reorganized as a new association, adopting the old Constitution as a whole but reducing the dues to $1.20 per year. In March of 1900, the Philadelphia club held the first competitive aquarium exhibition in America. It was held in the home of one of its members, Mr. E. Hoffman of 1813 South Third Street. The fish, goldfish only, were divided into three classes: under one year, one to three years and over three years. Ribbons were awarded by popular vote, not by judges selected for that purpose. By January of 1908 it had 128 active members, a number of whom resided in neighboring cities. Meetings were held monthly, except June, July and August. As stated by the Secre-

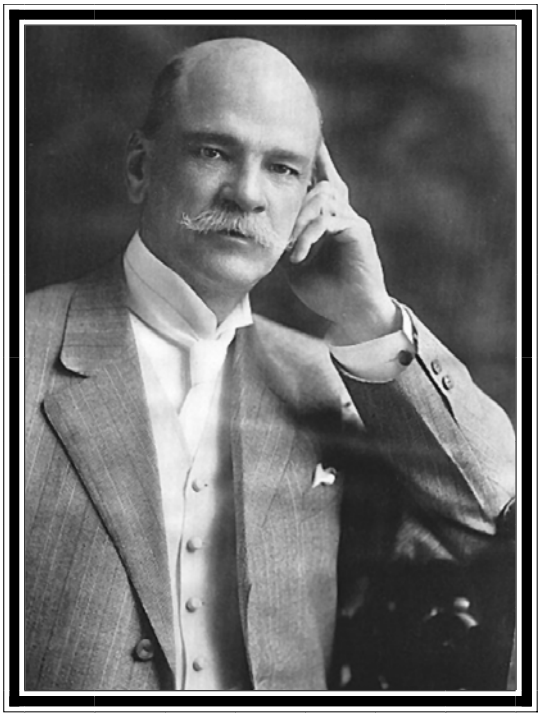


Figure 12-1. THE "FATHER OF AQUARIUM PHOTOGRAPHY," DR. R. W. SHUFELDT (1850-1934).

tary of the Society, Mr. Herman T. Wolf, "Set topics of interest are discussed, exhibitions take place, prizes are awarded and inquiries from any source are invited and answered."

A historic point of considerable importance occurred at the May 1901 meeting when Wolf proposed a series of subjects to be taken up for discussion at the meetings. This afterwards formed the basis for his famous book, *Goldfish Breeds and Other Aquarium Fishes*, which will be discussed in a later chapter.

In this brief history of the founding of the Aquarium Society of Philadelphia, I must make it clear that this is about goldfish fanciers starting a goldfish society. In no way was there a comparability between The Aquarium Society (New Jersey) and the Aquarium Society of Philadelphia. The former was an organization whose interest encompassed all aquarium fishes; the latter focused mainly on goldfish.

A significant personality of the day was Dr. Robert Wilson Shufeldt (Figure 12-1). Shufeldt, an Army surgeon who pioneered in photographing live fishes. An impressive report by this brilliant man of his early efforts in fish photography appeared in Volume XIX of the Bulletin of the United States Fish Commission for 1899 entitled, *Photography of Live Fishes*. Over the years he contributed many articles on photography, natural science and aquarium fishes to various foreign and domestic magazines. Robert Wilson Shufeldt was born in New York City in 1850 and attended several schools in the United States and in Havana, Cuba. During the Civil War he saw service as a captain's clerk and signal officer with the rank of midshipman aboard the U.S. Gunboat Proteus, commanded by his father. In 1872 he entered the medical school of Cornell University and in 1876 received his degree in Washington, D.C., from Columbian, now George Washington, University. In the same year he received an appointment as Lieutenant in the Medical Department of the Army and was ordered to Fort McHenry, Baltimore, Md., as assistant surgeon. He later served as a surgeon on the frontier in the campaign against the Sioux Indians.

In 1882 Shufeldt was made a curator in the Army Medical Museum and afterward served as an honorary curator in the Smithsonian Institution. He was retired for disability from the army in 1891 with the rank of Captain and promoted to Major in 1904. At the time of his retirement he was serving as post surgeon at Fort Wingate, New Mexico. During World War I he was restored to the active list, placed on duty at the Army Medical Museum and finally retired in 1919.

Shufeldt began his literary activity when he was still a practicing surgeon. He had a rich zoological and botanical collection, the former forming the basis of his first publications on the osteology and systematics of the different species and families of birds. Prior to 1913 Shufeldt published more than 1,100 articles, books, short notes and papers, many of his studies appearing in popular reviews of natural history.

Shufeldt is one of the pioneers of North American Paleornithology. He described 43 new forms and,

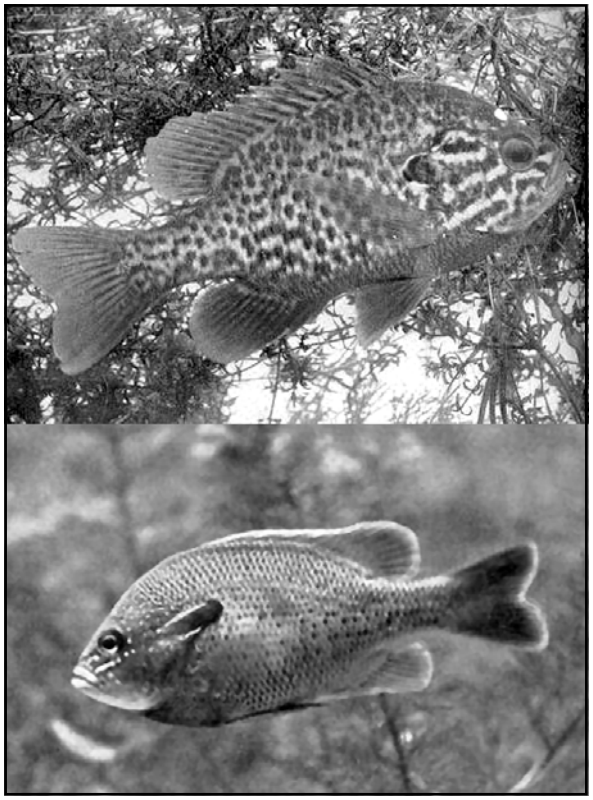


Figure 12-2. TOP: AMERICAN SUNFISH, *Eupomotis gibbosus.* BOTTOM: A PICTURE OF THE LONG-EARED SUNFISH. Both pictures by R.W. Shufeldt.

because of the pioneer character of his work, he did make a few mistakes. Nevertheless, most of the forms which he described and named are valid.

His popular works on oölogy, the branch of zoology that deals with the study of eggs, especially birds' eggs, museology, the study of how to organize and manage museums and museum collections, and medicine are very numerous; he also contributed to mammalogical and herpetological literature by anatomical descriptions of *Heloderma suspecturn* (the Gila Monster), *Amia calva* and a monograph of the Procniatidae, i.e., Swallow Tanagers. Shufeldt was a collaborator of Newton's wonderful *Dictionary of Birds*. He was one of the Founders of the American Ornithologists' Union and was transferred to the list of Retired Fellows in 1927.

Unfortunately, Shufeldt's reputation is marred by his racial intolerance. Despite his disdain for "inspirational archaeology" and his self-declared practice of sticking to the data, he also ventured out into the sea of meaning on the little raft of his intuition with disastrous results on the issue of racial characteristics, as in his *The Negro a Menace to American Civilization* (1907), *America's Greatest Problem: The Negro* (1915) and his *Indian Types of Beauty* (1891). Shufeldt's views may have been influenced by his father, a Union naval officer and diplomat. When the Civil War broke out, the elder Shufeldt was appointed consul general at Havana and reported on Confederate shipping and on European actions in Mexico, but was recalled after holding unauthorized discussions with Mexico about the establishment of a colony there for freed American slaves.

After World War I little more was heard from Shufeldt, and the many friends and colleagues with whom he had maintained an animated correspondence waited in vain for the usual interesting letters from him. His last years were passed in a sanitarium and, after a prolonged and serious illness, he died at Washington, D.C., January 21, 1934.

The following is a quote from Herman Wolf's book, *Goldfish Breeds and other Aquarium Fishes*, published in 1908:

"The photographing of the ichthyfauna in the natural element and surroundings is a recent achievement of the instantaneous processes but the difficulties are so many that good results are extremely rare. Probably the best work in this line was done R. W. Shufeldt, of the Medical Corps, U. S. Army. The usual conditions are unfavorable to proper light, the incessant movements of the fishes makes focusing difficult, the refraction of the glass front of the aquarium is troublesome and the reflection produces a mirror as likely to show the camera and operator as the contents of the aquarium. By the use of a glass plate behind the fish, to restrict its movement, one element of difficulty may be partially obviated; but a specially constructed very narrow miniature aquarium, fitted to a tripod and backed by a screen will lead more satisfactory results, as it may be set in the open air and in favorable light. The apparent plant life, to form a natural background, may consist of a sepia drawing secured to the back of the aquarium; the front being constructed of the thinnest portrait glass; but even this interposes a slight screen to the contents and sometimes interferes with a perfectly clear picture."



Figure 12-3. OTHER EXAMPLES OF SHUFELDT'S ART. TOP: CATFISH (*Ameiurus nebulosus*). BOTTOM: LARGE-MOUTH BLACK BASS (*Micropterus salmoides*). Considering that these photos by Shufeldt were taken about 80 years ago (and from copies of very old magazines at that), we can easily see why he merits the sobriquet, "Father of Aquarium Photography."

Shufeldt's techniques are still of considerable interest to us today. He used a specially constructed aquarium 14" high x 16" long x 5" wide. The bottom was covered with 1-3/4 inches of sand and small pebbles into which aquatic plants were anchored, as well as a small stone or two. The background was either natural sky or, lacking this, a large sheet of white blotting paper. The camera used was an 8" x 10" view camera with ground glass focusing. In general, the camera was focused on some object in the middle of the aquarium, although Dr. Shufeldt also would readjust focus on the fish itself as it swam into view.

The shutter speed selected was dependent on the degree of activity of the fish. However, Shufeldt was never in a hurry. He waited patiently until the subject calmed down and swam of its own accord to the desired position. In those days, of course, only black and white film was available but his photos were masterpieces (Figures 12-2 and 12-3). Shufeldt was more than a fish photographer; he was a philosopher of photography as well. He once said: "The camera is more than a tool; it is a thing for which to have the deepest sympathy. It is worth more than promiscuous snapping just to use up the rest of the films; it is worth making it an end in itself."

The following article by Shufeldt, titled, "Photographing Fishes," appeared in the OVERLAND MONTHLY AND OUT WEST MAGAZINE in June 1899.

> "Naturalists nowadays use the photographic camera in their work quite as frequently, and fully as effectively, as do the members of any one of the other learned professions. In obtaining the pictures of living animals wherewith to illustrate zoological treatises of various kinds, this instrument is now rapidly superseding the old methods of obtaining such subjects by the use of brush and pencil. Beautiful half-tone pictures of living wild animals of every description, taken in captivity, as well as in their natural haunts, are now frequently met with, both in scientific works, and popular articles devoted to their history. Formerly, for a zoological artist to produce a small uncolored picture of a bird, for example, it frequently took a day or two, and then after this it had to be engraved if intended to figure in a book. Such productions, always attended with considerable expense, were at the best more or less inaccurate, unsatisfactory, and worse than all, often unnatural. Photography, as has just been stated, is rapidly revolutionizing all this, and although it may never entirely supplant the graphic art, it will surely far outstrip it in the race, as a means to meet pictorial ends.
>
> "During the last few years naturalists who have become skilled in the use of the camera have, among vertebrate forms, succeeded best with mammals, then with reptiles, while birds are far more difficult; and it is the rarest thing of all to meet with any good photographs of living fish. It is of this last-named class of subjects that I desire to say a few words.
>
> "My first experiences in the photography of living fish occurred at the aquaria of the United States Fish Commission at Washington, the facilities for doing so having been extended to mo by the United states Commissioner of Fish and Fisheries, Captain J. J. Bryce. It had been tried by others there upon numerous other occasions, but nothing worthy of the name of success had ever been accomplished. This was principally due to the great difficulty in handling the light; of overcoming the reflections in the various aquaria in the 'Marine Grotto' where they are upon exhibition; to the fact that the front side of any one of the tanks is alone composed of glass, through which the fish must be taken; and finally, to the great restlessness of many of the fishes themselves.
>
> "It at once became apparent to me, that the only hope of obtaining good results lay in using a tripod camera, with the very quickest plate obtainable, and by instantaneous exposures.
>
> "Then came the matter of focusing sharp on the moving subjects. After the tripod and camera had been set in front of the aquarium, and the light most carefully studied, this was met by focusing on the inner surface of the glass, then cautiously carrying the focal distance to a point in the water beyond it. So that, when a fish in the aquarium swam close by the inner surface of the glass oppo-

site the center of my lens, it might be photographed by an instantaneous exposure. This was tried many times with varying success, the best pictures secured being those wherein the subjects were moving, or swimming, with the least rapidity. Some fishes poise themselves in the water, in such a manner as to be almost immovable in the element, - as, for example, in the case of the common pike (*Esox lucius*), - and with but little trouble I secured a fine picture in the case of one of this species. Then some of the sunfish (*Lepomis*) offered fairly good subjects, and in one trial a good result was attained, in which twenty fish appeared upon the same negative, all sharp and clear, and exhibiting no movement whatever. These were the common form (*L. gibbosus*), so well known to the young fishermen of our ponds and streams.

"On another day, when I had the 'Grotto' all to myself, and the light as good as it could be in such a place, I was engaged for over two hours in my attempts to secure a 'snap' upon a small male long-eared sunfish (*L. aturitus*) that kept constantly swimming round and round his large aquarium. It seemed he never would come opposite my lens, and close to the glass; but at last, when my patience was almost exhausted, I got him there, and quickly took advantage of the circumstance. A half-tone of the photograph, the result of my attempt in this instance is given here as the illustration to the present article. None of my other pictures of fish are as good as this one; and it is only through rare chance, that another equally successful can be secured.

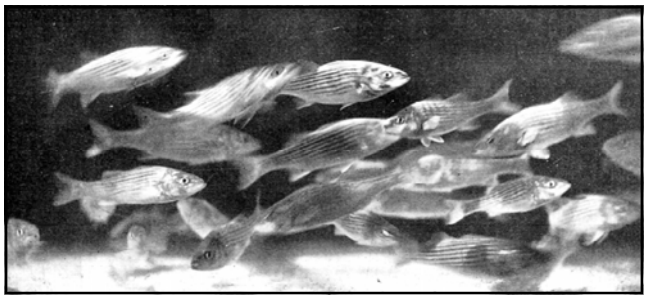


Figure 12-4. STRIPED BASS, photographed by ROBERT WILSON SHUFELDT.

"Especially is this true if the attempt is made under the same circumstances, where three or four factors are forever operative to defeat your aims. A cloud may obscure the sun just at the wrong moment; or the latter may flash out, and thereby produce all sorts of shadows and reflections, at the very instant perhaps, when you desire to make an exposure. Then the fish itself in some lights shines like silver, and in others, appears almost to be (to a degree) semi-transparent, with brilliant points and lines on various parts of its body, the very features to be most dreaded.

I am confident that better success, and more certain results, can be obtained by putting the fish in small aquaria, and these latter so placed that the rays of the sun can pass horizontally through from side to side, while they are shut off from above. The object of a small aquarium is to limit the movements of the fish, and consequently increase the number of instances in any given time, when it comes in focus opposite the center of the lens. By placing the aquarium as suggested, we ought to be able to see the blue sky and no more through the two longer and opposite sides. This insures abundant light, and an excellent background, giving the very best chances for fine outline and detail. Experiments of this kind were tried at Woods's Hole, Massachusetts, several years ago, at the station of the United States Fish Commission there, and I am informed, with very "encouraging results, but of these I know only by report.

"The prettiest photographic pictures of fishes are those wherein the subjects exhibit strong dark markings set off by a light, but not too silvery, body. A large gar pike, commonly known as the needle gar, for example, is a beautiful fish for the purpose, and possesses the advantage of remaining long at rest in one position in its tank, thus giving the zoological photographer abundant opportunity both to focus and make his exposure."

In addition to his photographic skills, Shufeldt was also an excellent aquarium writer and, during the 1900's, contributed to various aquarium publications. Dr. R. W. Shufeldt well earns the sobriquet, the "Father of Aquarium Fish Photography."

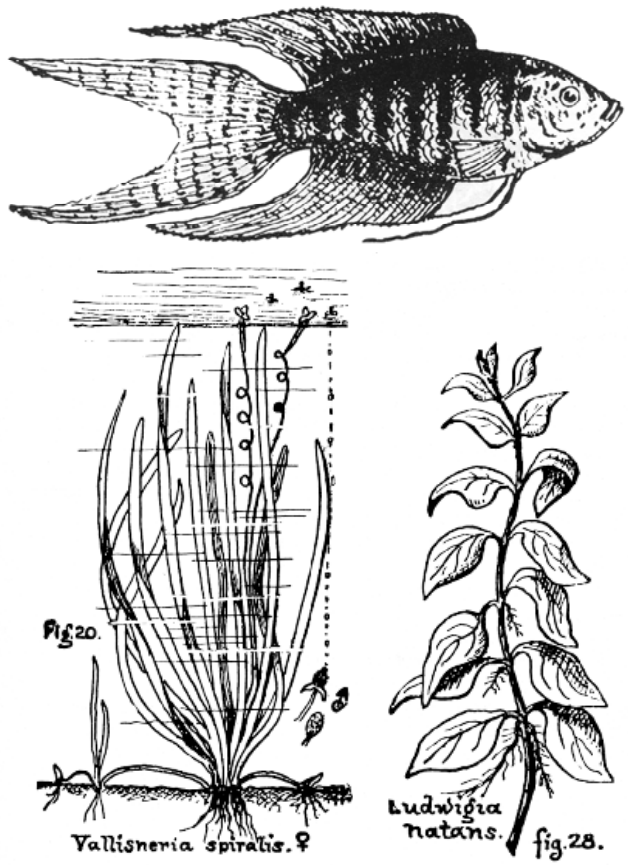


Figure 12-5. TOP: AN ILLUSTRATION FROM EUGENE SMITH'S BOOK, *The Home Aquarium*, 1902. At the time, the Paradise Fish was the staple tropical fish of the hobby.
BOTTOM LEFT: At the turn of the Century, *Vallisneria spiralis* was a staple aquarium plant.
BOTTOM RIGHT: *Ludwigia natans*. (Both drawings from Smith).

The previous chapter introduced Eugene Smith, the founder of organized aquarium activity in America and one of the great American aquarists of the period.

Smith was born in New York City in 1860, both of his parents having been born in Germany. Since German was most likely spoken at home, it was easy for Smith to converse with the German-speaking aquarium societies of the 1890s such as *Triton* and *Salamander*. He was educated in the public and high schools of Jersey City and by tutors. He became city engineer and surveyor in 1888. Besides being an engineer of high standing, he was also much interested in sociological questions. However, science being his greatest interest, he was a member of the American Association for the Advancement of Science, the Linnaean Society, the National Geographical Society and the Scientific Alliance.

Although a founder and first President of the New York Aquarium Society, Smith was more than just an aquarist. In 1897 he wrote a small booklet for the Linnaean Society titled, "The Fishes of the Fresh and Brackish Waters in the Vicinity of New York City." His observations on certain of the fishes described were cited by many authors of the day.

In 1902 Smith wrote *The Home Aquarium... How to Care For It*. It was truly a milestone for it marked the beginning of modern aquarium literature, introducing concepts and techniques absent in earlier publications. The book consisted of 213 pages, illustrated with line drawings prepared by Smith himself (Figure 12-4). Here was a manual for freshwater aquarists that was truly authoritative, based on the personal observations of a keen student of aquatic natural history.

Even its introductory paragraphs were a startling departure from previous practice. Except at the very end of his book, Samuel merely sought to expound its principles, whereas Smith made a vigorous attempt to "sell" the aquarium pastime and to place it in its proper relationship to other popular hobbies of the day. The following are several examples from the beginning of *The Home Aquarium*:

> "An aquarium in a living room or parlour is more easily maintained than house plants or birds. It requires less attention, bears changes of temperature more readily, and if neglected for a time need not suffer. A bird must have constant care, houseplants need regular watering, security from cold drafts in winter from without, and from the dry heat within doors, and must be guarded against destructive insects.
>
> "Were it not for the feeding of the animals, provided the aquarium is rightly placed for light, you could leave it undisturbed for months and then find it had not deteriorated in the least during your absence, but had become perhaps even more attractive than before.

> "There is no danger to health, no damp soil to produce exhalation; on the contrary, it is well known that all clean water absorbs gases and acts as a purifier of the air. The evaporation of the water, especially during the winter season, will also give much needed moisture to the air of our usually overheated rooms. In these ways the aquarium becomes of sanitary value in our homes."

When Smith wrote his book he had before him an aquarium that he had set up in 1893. Nine years later, without ever being taken down, it was still going strong! To accomplish this feat he observed what he considered to be the one great principle of the aquarium, i.e., "to bring about a balance of life, plant and animal, amid natural surroundings." One must appreciate this principle to understand Smith. He was not primarily a breeder of aquarium fishes, for few were bred in aquaria in those days; he was, however, a true student of aquatic life.

Smith, although not alone responsible for its introduction, first popularized the name "tank" for the aquarium and used the term throughout his book. He recommended against the use of the six or eight sided aquaria so popular in the 1800's and against goldfish globes, which he called "torture cells." Smith was the first to discuss the manufacture of wooden tanks and his advice on setting up aquaria is still followed today, e.g., the practice of sloping gravel from rear to front Samuel, in the manner of the day, had merely suggested placing the gravel evenly over the bottom of the aquarium. One bit of counsel I vigorously second was, "Do not use such whimsicalities as submerged castles, lone fishermen, nymphs, and the like!"

Another of Smith's innovations was a discussion in some detail of the external anatomy of fishes, including an explanation of the fin and scale count formulas used in identification. In fact, it was Smith who was the first aquarium book author to explain scientific nomenclature and the naming of fishes. For every fish described in his book Smith provided dorsal, anal and lateral line counts. Subtleties such as placing the name of the original describer in parenthesis when the species was no longer considered in the original genus were not neglected either.

As might be expected, native fishes made up the greater part of the discussion. Of tropical fishes, he referred to the following: Paradise Fish, Chanchito (*Cichlasoma facetum*), Climbing Perch, Betta, and the Mudskipper. Passing mention was made of labyrinth fishes of the genera *Osphronemus* and *Trichogaster* and to certain South American and Indian catfishes. He advised keeping covers over tanks containing tropical fishes.

Smith's recommendations on aquarium care and maintenance were very sound. He was the first to write about the floating feeding ring and his cardinal rule of feeding was, "Never give more than is eaten." In those days little was known about fish diseases, the standard remedies being salt and potassium permanganate, and so Smith emphasized prevention such as a careful inspection of all new fishes for the presence of disease and a quarantining period. He also included chapters on field collecting and aquatic insects in his book, something present day authors could emulate to advantage.

It was Smith who introduced the term "exotic" into the hobby. He pooh-poohed the myth of the necessity of having snails in the aquarium and pointed out the damage they can cause to aquarium plants. At the end of his book Smith provided tables showing those combinations of animals and plants, where Samuel only specified animals, that harmonized and those that might be troublemakers.

In short, Eugene Smith, an aquarist in the broadest sense of the word, enunciated most of the principles of fish keeping on which modern day aquarists "cut their teeth."

Sadly, Eugene Smith died on Christmas Day, December 25, 1912 at the age of 52. At the time of his death, his daughter, Lenia, was 22 and his son, Victor, was 19. His wife, Mary, donated to the American Museum of Natural History 350 live fishes, his collection of amphibians and reptiles, and his collection of insects and crustaceans from various localities in the New York-New Jersey area. In his honor for his accomplishments I name him "Father of the Aquarium Societies in America."

CHAPTER 13: ENTER BRIND, DORN, INNES, & BADE

The previous chapter addressed events up to 1902, the date of publication of Eugene Smith's book, *The Home Aquarium and How to Care for it*. The next period, 1900-1910, was an important one for the embryonic aquarium hobby in at least two respects: the appearance upon the scene of four titans of the hobby – chronologically, Walter Lannoy Brind, Richard Dorn, William T. Innes and Ernst Bade - and the fact that the commercial importation of fishes from Germany began for the first time on a regular basis.

Walter Lannoy (or DeLannoy) Brind (Figure 13-1) was born in the year 1873 of British parents at Mussooree, North West Province, India. He usually accompanied his father, a civil engineer, on his trips of inspection for the British Government. These inspections commonly included irrigation works used for rice fields and bridges over rivers. While on these trips, Brind's father customarily shot Mahseer, a sort of carp, as game as any salmon, as they leaped out of the water in their efforts to evade the nets spread to catch them. This was considered great sport and called for crack marksmanship.

Later as a small boy in England, Brind made a hobby of catching trout and other native fishes and keeping them alive in aquaria he had made himself. Because of experiments he had conducted with trout, he was made manager in 1896 of the Weston Fishery located near Norwich, England. This later led to appointment as manager of the Solway Fisheries near Dumfries, Scotland, after which he took charge of the experimental work in the Fish House at the London Zoological Gardens. In London he met Dr. Albert Guenther, then head of the Department of Ichthyology at the British Museum. Brind also met two assistants to Dr. Guenther, Dr. C. Tate Regan and Mr. E. G. Boulenger. Guenther and Regan proved to be among Britain's most distinguished ichthyologists of all time, and Boulenger as one of her most distinguished professional aquarists.

When Brind immigrated to the United States in 1899 therefore, he possessed impressive credentials despite his tender years. He soon became affiliated with Fred Kaempfer, who at the time operated the leading Chicago pet shop, then located opposite Marshall Fields on State Street. Floyd Young, who was later to head Chicago's Lincoln Park Zoo and Aquarium, married one of Brind's sisters-in-law. Brind, therefore, figured early among the commercial figures of our hobby.

Although Brind's contributions were important ones, I am not persuaded to include his name in the roster of the great aquarists of the first one hundred years of the hobby in America. In my opinion he missed out by a







FROM LEFT TO RIGHT: Figure 13-1. WALTER LANNOY BRIND (1873-1964), one of the important aquarium pioneers in America; Figure 13-3. RICHARD DORN, one of our great pioneering aquarists and a member of the group of greatest American aquarists in the history of the hobby; FIGURE 13-4. WILLIAM THORNTON INNES, JR. (1874-1969), the last member of the group of greatest American aquarists.

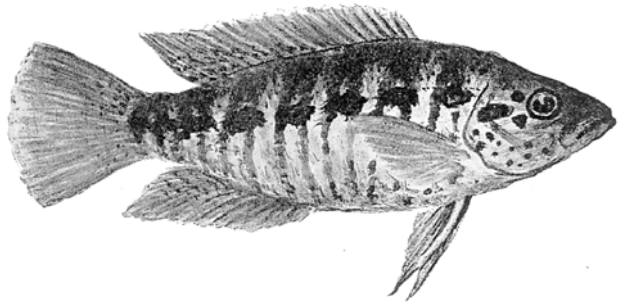


Figure 13-2. *Cichlasoma steindachneri*, from an original painting by Walter Brind. Brind was not only an excellent artist, he was an accomplished photographer of fish as well.

perceptible margin. It could be said of him that he was a "glory hound"; most assuredly he was one of the major controversial figures in the hobby. Some considered him arrogant; this, we feel, was unjust and most likely inspired by some measure of envy. Brind was an extremely well educated man for the times and a linguist of some repute. His somewhat reserved (no one ever called him "Walt") aristocratic bearing, coupled with an outspoken self-confidence, somewhat dimmed his popularity. Nonetheless, he had a capability for creativity and innovation, as his production in 1918 of a motion picture about the aquarium hobby called, "The Freshwater Aquarium" will attest. I'll have a great deal more to say about Walter Lannoy Brind; readers will find him a fascinating personality.

Previously I have called the attention of readers to the fact that certain pioneers have received rather short shift in the hobby, a case in point being Mulertt himself where, in the few instances where he has been mentioned at all, even his name was spelled incorrectly. Consider now the following genera of fishes and the principal species of aquarium inhabitants found among them: *Aphyosemion, Aplocheilus, Barbus, Betta, Brachydanio, Cichlasoma, Colisa, Corydoras, Electrophorous, Epiplatys, Gasteropelecus, Geophagus, Haplochromis, Hemigrammus, Hyphessobrycon, Osphronemus, Pantodon, Polyacantrus, Pterophyllum, Rasbora, Rivulus, Scatophagus* and *Xiphophorous*. In short, we are talking about our barbs, danios, a good number of our catfishes, most of our tetras, the backbone species of our livebearers, many of our cichlids and rasboras, most of our gouramis, a hatchet fish or two and our killifishes plus the Butterfly Fish and the Scat. If I were to mention further that one man was the primary force behind the introduction of these fishes into America, you might find it hard to believe that his name is all but unknown to present day aquarists. This man was Richard Dorn.

Richard Dorn (Figure 13-3), born in Ludwigsburg, Germany in 1867, immigrated to the United States just after the turn of the century. His effect on the fledgling hobby was incalculable. Although not commercially involved - he served until his retirement as a New York Customs House Officer - he sacrificed much of his own personal savings to bring about the introduction of the fishes mentioned. Often he met with failure, but his perseverance won out and ultimately he established many of the tropical fishes we rely so much on even today.

Originally a resident of New Jersey, Dorn naturally joined The Aquarium Society, presided over at the time by Eugene Smith. From 1903 until 1930 when he was made President Emeritus, he held some sort of office in that organization. Although Dorn could and did write for the hobby, it was not his greatest contribution. By importing these fishes, breeding some and circulating others to those who were expert breeders, he established The Aquarium Society as the greatest of its kind in the country and the New York-New Jersey area as the center of the hobby in America.

After his retirement Richard Dorn settled in San Diego, California where he took an active interest in that city's zoo. In January 1943, he died, ranking with the other great aquarists of the period of this history. One can hardly escape the fact that when you look at the "bread and butter" fishes of our hobby today, you are looking for the most part, at the products of Dorn's prodigious efforts.

Next on the scene and the last in our small coterie of "greats" was William T. Innes, Jr. (Figure 13-4). Innes, a Philadelphian born in 1874 and a printer by trade, as a child had shown an interest in native fishes and goldfish. However, at the turn of the Century he was primarily interested in the then new pastime, photography, so at that time he was not a "hobbyist" in the strict sense of the word.

While attending a meeting of the Columbus Photographic Society circa 1904, he chanced to mention common goldfish to another member. This man, Joseph Powell, was a member of the Aquarium Society of Philadelphia and so invited Innes to the next meeting. When Innes saw truly fancy goldfish for the first time, he was instantly converted to the hobby.

In the previous chapter it was mentioned that, in 1901, Herman T. Wolf, an officer of the Philadelphia Society and a brother of Rudolf Wolf who by his extensive importations was largely responsible for establishing Philadelphia as the center of the fancy goldfish hobby in America, had suggested a series of topics on goldfish and allied subjects that the Society might entertain in discussions. As Secretary of the club, Herman Wolf took detailed notes and these led to the writing of a manuscript. Wolf tried to get the work published but to no avail and was at the point of burning the whole thing when he mentioned the fact to Innes. After reading the manuscript, Innes offered to publish it.

What followed has become part of the history of our hobby. Inneses father typeset the entire 385-page book by hand and Innes himself printed it on a small job press. The work took almost two years, appearing finally in 1908 as *Goldfish Breeds And Other Aquarium Fishes*. It was well written and beautifully illustrated. Wolf was an excellent artist and, for many years, several of his large drawings of goldfish types hung on the walls of the meeting room of the Philadelphia Society until 1909 when they were stolen. To the author's credit, the book was a masterpiece and it would not be an overstatement to say that Wolf's book was one of the great aquarium works of all time. But apart from this, it must be said that Inneses contribution was also a masterpiece. It was set in type and printed as was no aquarium book before it. It, of course, established Innesess reputation in the aquarium hobby as a publisher of aquarium literature and started his ascendancy to prominence within his own Society and in the hobby in general.

Before discussing Wolf's book, however, Inneses position at that time must be reviewed, if only to set the record straight. Innes was by no means, Father of the Aquarium Hobby," as is so commonly believed. The goldfish fancy preceded him by some twelve years in Philadelphia alone. Up to 1910 or 1911 neither he nor, for that matter Philadelphia hobbyists in general, knew of the giant strides being made by Dorn and his friends in importing tropicals from far-off lands. In short, they knew little or nothing of aquarium fishes other than the goldfish and our own natives. Neither was Innes at that time the "giant" of Philadelphia aquarists. Indeed, when Brind wrote to Philadelphia in 1910, inquiring about that city's knowledge of certain tropical fishes, it was to Wolf that his letter was addressed, not Innes, although Brind did correspond with Innes as early as 1908 because of the latter's position as Secretary of the Philadelphia Society.



Standing: William T. Innes, left, his mother at the right; seated is his grandmother and his daughter, Evelyn B. Innes, circa 1900.



Figure 13-5. A JAPANESE FRINGETAIL GOLDFISH, The frontispiece of Wolf's book, *Goldfish Breeds and Other Aquarium Fishes*, 1908.

It might be well also to point out that Philadelphia was by no means the "Birthplace of the Aquarium Society in America" either. That signal honor, as was previously made clear, belongs to the New York-New Jersey area. New York had a twelve-year head start on Philadelphia and, although Philadelphia ultimately produced many a fine aquarist to rank with the best that New York could offer, it never did catch up with their neighbors to the North. On the other hand, in fancy goldfish Philadelphia had no peers in America. Its goldfish fanciers were among the finest, perhaps the best, in the world. But as this is a history of the aquarium hobby and not just of goldfish, there is unfortunately not enough space to develop this interesting aspect in its own right.

Returning now to Wolf's book, it consisted of a very scholarly introduction, followed by fifteen chapters describing goldfish varieties, native fishes, goldfish propagation, feeding, diseases and aquarium construction (Figure 13-5 and 13-6). Included also were detailed chapters on aquatic insects, aquatic plants, marine aquaria and terrariums. Except for problems in nomenclature, Wolf's plant chapter is still probably the best ever written by an American aquarist. His principles of fish keeping were sound, his advice was detailed and the text was supplemented with 280 illustrations of real value. Several of them are reproduced in this history. Wolf's book later was to form the basis for Inneses *Goldfish Varieties and Tropical Aquarium Fishes*, a book that prior to World War II appeared in more editions than any other aquarium book in the world. A goodly number of the author's friends who

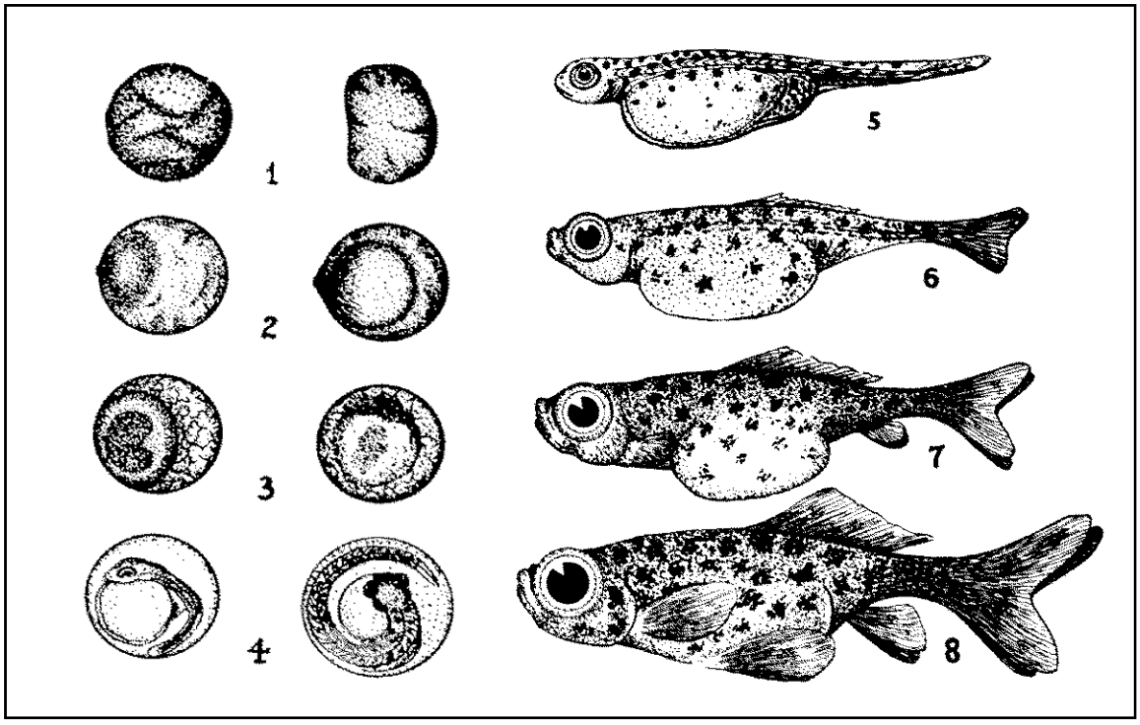


Figure 13-6. THE EMBRYOLOGY OF THE GOLDFISH AS PRESENTED IN WOLF'S BOOK.

specialize in fancy goldfish and who have also studied Wolf's book, are amazed and annoyed that Wolf is another aquarist who has never received suitable recognition in the hobby. Since Wolf's book formed the basis for much of Inneses later material, perhaps it is to Wolf that we owe the debt to for the enunciation of the principles of fish keeping that today's aquarist relies on.

Our last titan, Dr. Ernst Bade, immigrated to the United States about the same time as the appearance of Wolf's book, settling first in New York. On his arrival in America Bade already was one of Germany's leading authorities on the hobby and therefore one of the world's leading authorities. In 1896 the first edition of his comprehensive book, *Süsswasser Aquarium* (Freshwater Aquarium), appeared. In 1897 he wrote *Die Kunstliche Fischzucht nach dem neuesten Stande* (Artificial Fish breeding According to the Latest Views); in 1898 he wrote *Der Chanchito als Zierfisch* (The Chanchito as an Ornamental Fish); in 1899 followed *Praxis der Aquarienkunde* (The Practice of Aquarium Art); and in 1900, two books - *Die Schleierschwantz and Telescopschleierschwanz* (The Veil tail and Telescope-veil tail Goldfish) and *Die Mitteleuropaischen Süsswasserfische* (Middle European Freshwater Fishes).

Bade is not included among the greatest aquarists in this history because his major contributions to the hobby were made in Germany, not here, and his influence on the American hobby was not as great as the others I have mentioned. In a sense his attitude was that, since he had already achieved the pinnacle of prominence, why should he do more? Bade did write, but somewhat infrequently, for several American aquarium magazines, collaborating with Eugene Smith on one occasion. He was also a pioneer photographer of fishes and from time to time supplied photographs to various magazines. In 1913 he wrote, *Das Seewasser Aquarium* (The Saltwater Aquarium) and in 1923 he revised his book, *Praxis der Aquarienkunde*. Up to 1931 he continued to bring out new editions in German of his major work, *Süsswasser Aquarium*. In 1911, when a German-speaking only section of the New York Aquarium Society was formed, Dr. Bade was its President. Possessing considerable stature in the hobby, Dr. Bade was frequently consulted by the leaders of the American hobby when important decisions were about to be made. He was often asked to judge shows, arbitrate technical discussions and speak before sundry aquarium groups.

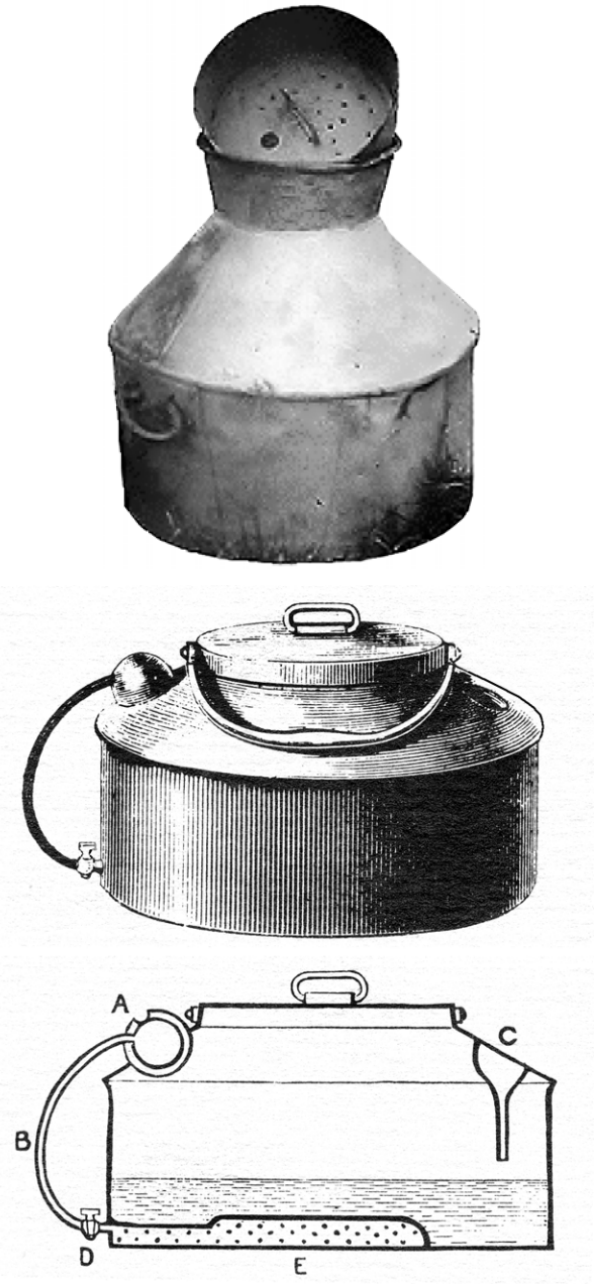


Figure 13-7. ALTHOUGH THESE TYPES OF SHIPPING CANS ARE GENERALLY KNOWN AS "GERMAN SHIPPING CANS," it was the British aquarists who first used them. This self-aerating can was invented by Frank Buckland and is described in Reginald Bennett's 1889, *Marine Aquaria; Their Construction, Arrangement and Management*, with full information as to the best animals and seaweeds to be kept, how and where to obtain them and how to keep them in health.

CHAPTER 14:
THE HOBBY STARTS IN EARNEST

Although the importation of aquarium fishes did not really hit its stride until about 1912, the period of 1900-1910 was not without some significant activity in this regard. Among the fishes imported - mostly by Richard Dorn - were: the Dwarf, Thicklipped, Blue and Striped Gouramies, *Corydoras paleatus*, the Betta, the Swordtail at $2.00 a pair, the Archer Fish, the Egyptian Mouthbreeder, the Zebra Danio, *Cichlasoma severum*, *Cichlasoma insignis*, the Guppy, the Butterfly Fish (*Pantodon*), several killies of the genus *Rivulus*, many barbs including *Barbus semifasciolatus, B. ticto, B. vittatus* and *B. conchonius and* a few tetras such as *Hyphessobrycon heterorhabdus*, *Geophagus brasiliensis* and *G. gymnogenys*. It was a fair start, indeed!

The Detroit Aquarium opened in 1904, the first such institution after the Battery Park Aquarium in New York City and the second after the Grotto in the original U. S. Commission Building at 6th and B Streets, SW, at Washington, D.C., which was established in 1888. Very little aquarium literature appeared during this period and, except for Wolf's book and Taylor's *The Aquarium*, the latter a later edition of a work previous published in 1881, most of what was published was uniformly poor. Four examples were: 1902, Bateman and Bennett's *The Book of Aquaria* (based partly on Bateman's 1890 book); 1908, Reed's *Goldfish Aquaria and Ferneries*; 1908, Eggeling and Ehrenberg's *The Freshwater Aquarium and Its Inhabitants*; and 1910, more a booklet than a book, Osburn's *The Care of Home Aquaria*, 1914, originally published two years previously as a New York Zoological Society Bulletin under the title, *The Balanced Aquarium*.

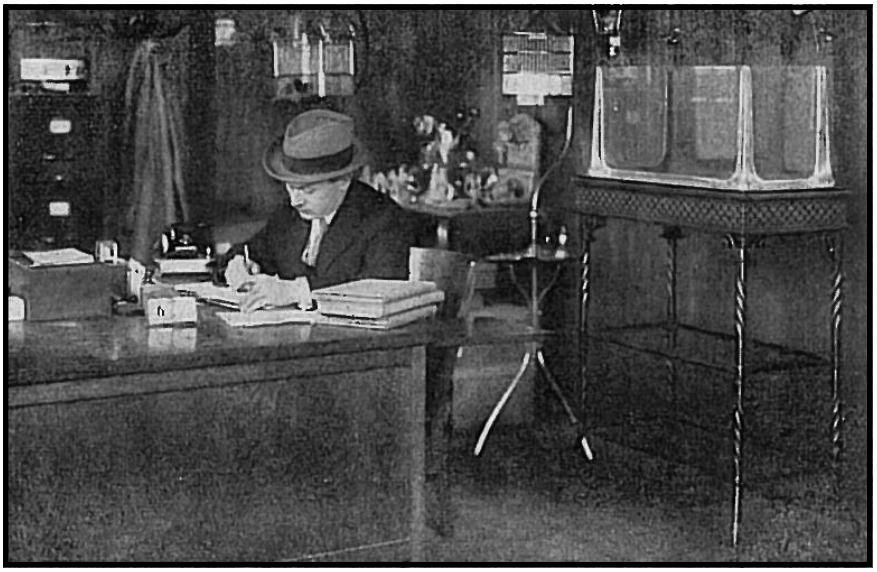


Figure 14-1.
J. J. HALTERBECK AT WORK.

The year 1907 marked the arrival on the New York scene of two commercial figures in the hobby who were to have considerable influence on its future, i.e., John J. Halterbeck (Figure 14-1) and Hermann Rabenau (Figure 14-2). The latter earns a prominent niche in this history of the hobby as the first to import tropicals for commercial purposes, with the former a close second. Although over the years Rabenau's business (Figure 14-3) - he was located in Brooklyn - tended to emphasize aquarium fish breeding, he continued to import fishes on a fairly extensive scale. Halterbeck, on the other hand, was primarily a manufacturer, taking out a patent for his famous "Peerless" aquarium in 1912 (Figure 14-4). He was the first, circa 1915, to put a one-piece aluminum tank on the market, although like Rabenau he did continue importing. In 1913 he sent collectors to the Amazon basin to bring back the first wild angelfish America had ever seen; others, tank-bred, had been previously imported from Germany. The following is a short biographical sketch that appeared in the November 1929 issue of AQUATIC LIFE:

"Enthusiast As Well As Manufacturer

Seldom this day do we find a manufacturer whose whole heart and soul is full of the desire to help the amateur.

"A few days ago, one such person was met. It

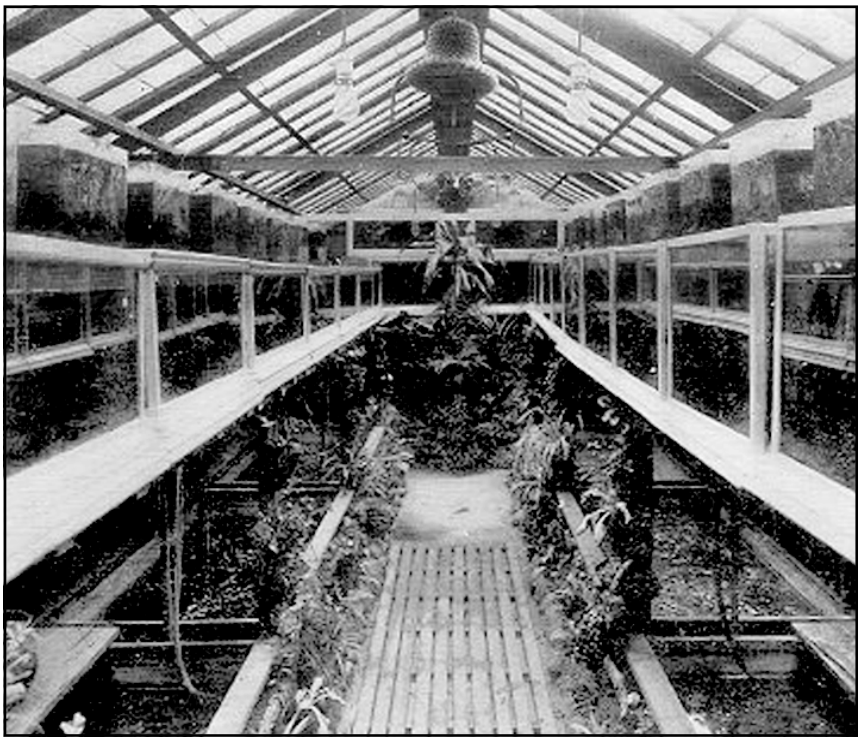


Figure 14-3. RABENAU'S CONSERVATORY IN BROOKLYN, NEW YORK. The fish house was heated by a hot water system; the aquaria on the right-hand side of the picture were devoted to tropicals.

was none other than J. J. Halterbeck of J. J. Halterbeck Co., Inc., manufacturers of the Peerless Aquarium and importers of bird cages, New York.



Figure 14-2. HERMANN RABENAU, our first commercial aquarium fish importer.

"Mr. Halterbeck's experiences as a fancier have fitted him to pass on the advisability of aquaria for certain types of fish. He has been a fancier and breeder for twenty-five years and was one of the pioneer tropical fish men way back in 1907. In 1912 he brought the first German Scalare to the United States, and in 1913 sent a collector to the Amazon River who brought to America the first wild Scalare, direct from Rio Nigro. He and Mr. Pauline of Philadelphia, (now deceased) had worked incessantly to breed the Scalare and a short time later Mr. Pauline's attempts were crowned with Success. So great has been the response from fanciers to his efforts that it now requires a two story factory with an area of 5000 square feet of floor space covering one-half block in New York to get out the 13,000 tanks per year and the countless number of bird cages which are shipped from this establishment.

"The Peerless Aquarium, for which a patent was issued in 1915, was quite an accomplishment in itself. Since that time great improvements have been made in the machinery of the establishment and now aluminum is worked as well as the other easier to work metals.

"Mr. Halterbeck's whole efforts are now spent in manufacturing and importing, yet he still finds time to breed the new fishes, and some of the *Betta cambodia* he showed the writer would make the average fancier feel small.

"You can count on him for help when you need it, for he has been more than willing to do his share to help a fancier or dealer when requested."

Three other aquarists, all from the New York-New Jersey area, deserve mention at this point; Isaac Bu-

chanan, Dr. Frederick Schneider (Figure 14-11) and August Obermueller. Buchanan succeeded Eugene Smith as President of The Aquarium Society; Schneider, a prominent member of that organization, was an influential figure in the hobby for many years afterwards. A bit later, Buchanan became a President of The Aquarium Society also and, like Dorn, actively engaged in importing aquarium fishes on a non-commercial scale. August Obermueller deserves special mention because he was our first significant commercial breeder of tropicals.

One of Halterbeck's importations in the year 1908 provides the basis for an amusing story regarding the difficulties these early pioneers experienced. This particular consignment consisted of two large cans of danios. When Halterbeck arrived at the port to receive his fishes, the customs inspectors held up the shipment, assuring him that an import duty had to be paid. The officials, however, were stumped. What classification were they to give this importation? After giving the matter much earnest deliberation they concluded that live fish were in the same category as "Dried Food Fishes" and accordingly proposed to tax the fish at the rate of fifteen cents for each pound.

During the examination of government documents and records, Halterbeck, sensing the humor in the situation, called two of his old friends to the scene, Dr. Frederick Schneider and Hermann Rabenau who, of course, were prepared to offer Uncle Sam every assistance! Having decided that the fish were to be taxed by weight, the next act in the comedy was to weigh them. Uncle Sam's first proposal was to weigh the cans and charge for the gross weight, to which our three aquarists voiced an objection. Why should they pay an import duty on German water? America was not dry at that period. There was no urgent need for importing water. Therefore they flatly refused to pay on that basis.

Then Dr. Schneider offered a solution. He proposed weighing a bit of board and then heaping the fish thereon to be weighed. This caused dissension in the ranks of other fish fanciers. Halterbeck, who owned the fish, objected to the idea on the grounds that his fish would suffer in this procedure. Finally, the idea was abandoned and the group went into another huddle to decide on more satisfactory ways and means.

Rabenau then suggested that the fish first be removed from the can and then the can with its water be weighed. Thereafter the fish were to be returned to the can and the can re-weighed with the fish. Determining the net weight of the fish would then resolve itself into a simple exercise in subtraction.

But lo, here another hitch was encountered. There was no fish net available to catch the fish, so another idea was rejected! By this time the trio and their problem had aroused much curiosity, gathering together all the best minds connected with the customs house and the fish hobby.

After a long, drawn out conference, it was mutually agreed and decided to allow the fish to enter the port, duty free, as "honored visitors" with permission for an indefinite sojourn in the country. The officials and our triumvirate of fish fans formed a reception committee for this shipment of danios that possibly may be the forefathers of the very fish now in your tanks. Your

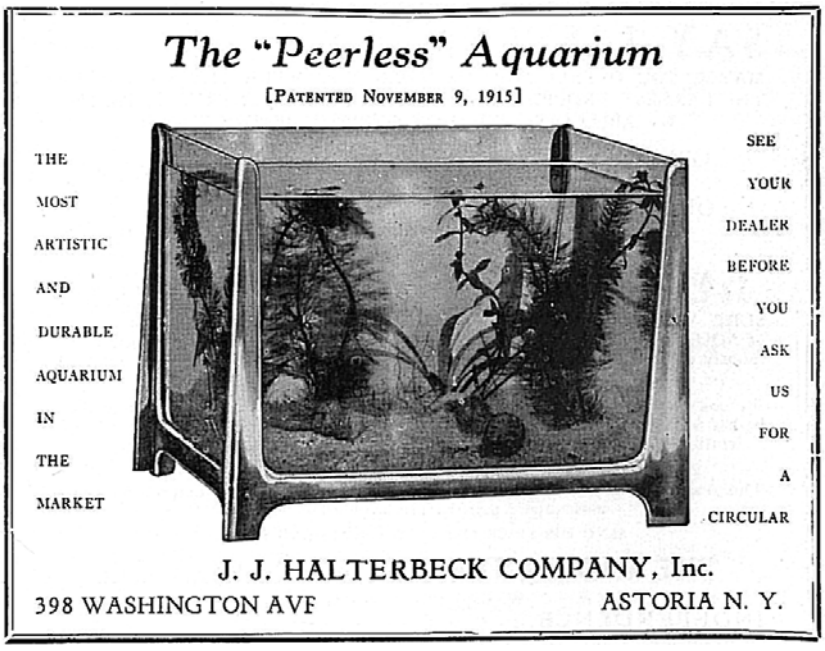


Figure 14-4. THE HALTERBECK "PEERLESS AQUARIUM,"

fish may even boast, among themselves, of that historic occasion when their great, great, great, great, great grand daddies (and mothers) outwitted Uncle Sam and landed, not at Plymouth Rock, but in the port of New York!

The first aquarium exhibition in America not solely devoted to goldfish was held in November 1910 at the Battery Park Aquarium under the sponsorship of The Aquarium Society. It was in this year that Walter Brind traveled to Germany, consulting with breeders and scouring that country for aquarium fishes to bring back with him to the United States. He returned with over 30 different species and this importation, coupled with those of Richard Dorn and Isaac Buchanan, were the first really large fish importations in the hobby.

On this return to Chicago, Brind wrote a letter to Herman Wolf:

"Dec. 5, 1910 Herman T. Wolf, Esq., Bourse Bldg., Phila, Pa.

"Dear Sir:
I am indebted to Henry A. Dreer for your name and address. I wrote him asking for the names and addresses of persons in Philadelphia who had imported tropical aquarium fishes during the past summer and he said that you know these people and can furnish me the requisite information.

"I got back from Europe about the middle of October and brought about thirty species with me and now I want to get in touch with people

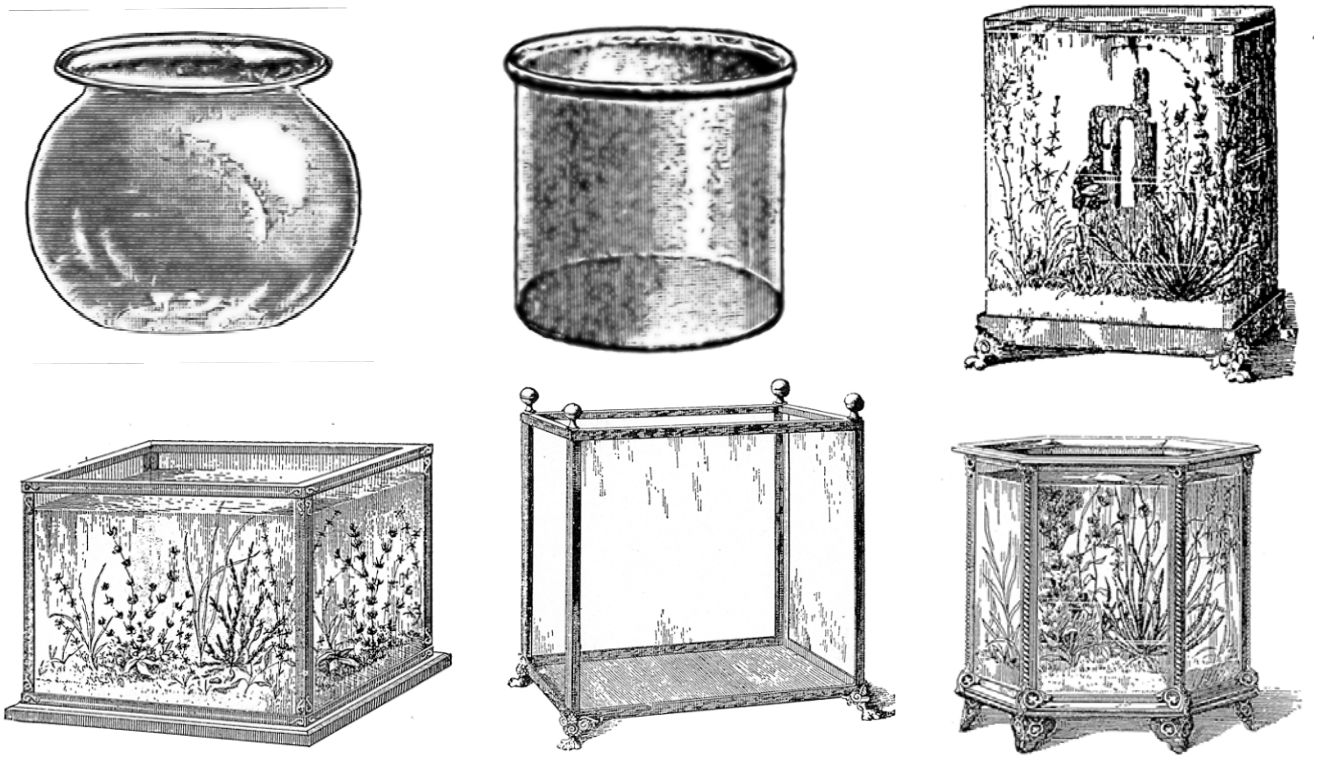


Figure 14-5. AQUARIUMS OF 1908.
(From Eggeling and Ehrenberg's *The Freshwater Aquarium and Its Inhabitants*).

TOP, LEFT TO RIGHT: ROUND FISH GLOBE, CYLINDRICAL FISH JAR AND OBLONG GLASS AQUARIUM.

BOTTOM, LEFT TO RIGHT: OBLONG AQUARIUM WITH GLASS BOTTOM, METAL & GLASS AQUARIUM WITH MARBLE BOTTOM AND HEXAGONAL AQUARIUM.

The authors rightly had little use for the round fish globe and cylindrical fish jar, and favored those with iron frames. They did point out, however, that rusting of the frames was a problem and recommended that the frame be tinned. When an aquarium was to be used for ornamentation, they recommended the hexagonal type. However, on the whole, their tank designs were much too deep.

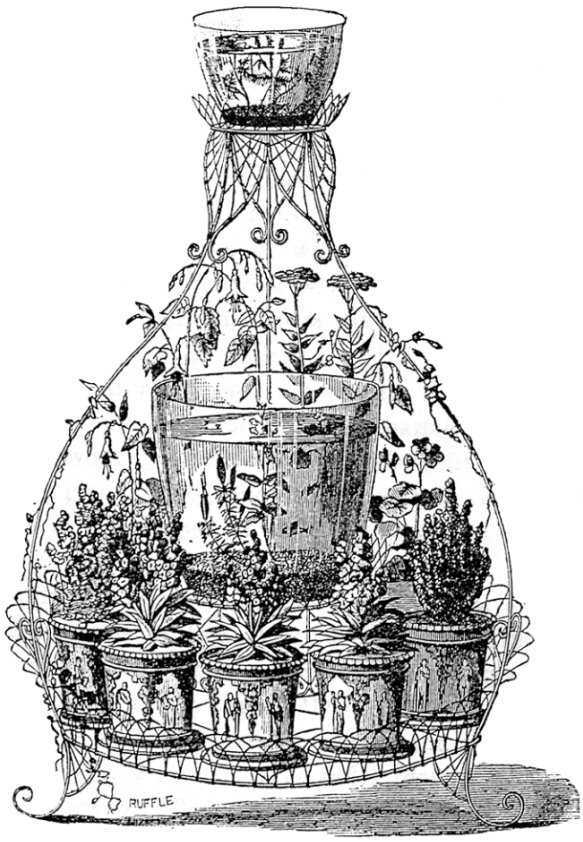


Figure 14-6. A FLOWER STAND WITH BELL-GLASS AQUARIA. THE VICTORIAN TASTE AT WORK!

From Taylor, 1910, *The Aquarium; Its Inhabitants, Structure, And Management*. Dr. John Ellor Taylor (1837-1895) was a botanist and geologist. He was also curator of the Ipswich Museum, editor of the national popular science journal HARDWICKE'S SCIENCE GOSSIP MAGAZINE and leading light of the Ipswich Science-Gossip Society. He advocated the possibilities of coal-mining in Suffolk and gave lectures (free to the working classes) to audiences of up to 500, giving 20 lectures each season from 1872-1893. He also made a lecture-tour of Australia in 1885 and wrote the celebrated book, *The Sagacity and Morality of Plants*, among others.

who also have such fish in Philadelphia, in order to have them as corresponding members of the Chicago Aquarium Club, of which I am president, and also to arrange for the exchanging of young fish when we have any later on, so as to avoid breeding "in-and-in". I know dealers in Europe who told me that they had shipped fish to Philadelphia during the past season and they are the parties I want to correspond with.

Thanking you in advance for the favor of a reply, I am,

Yours very truly,
WALTER L. BRIND"

William T. Innes, however, answered the letter:

"Mr. Walter L. Brind
Dear Sir:
Mr. Wolf is unable to answer your question regarding tropical aquarium fishes and turned over your letter to me.

"The only recently imported tropical fish I know about are dwarf gouramies. I had an article on this fish in "Guide To Nature" earlier this year. I am acquainted with a great many fish fanciers here, but aside from myself none of them take any interest in fish other than Goldfish. What did you import and do you find any of them especially beautiful or interesting? Can you get Rainbow Darters in Chicago? They belong to the Mississippi Valley. I have been most anxious to secure some of these.

"I spent some time last summer gathering small wild fish, but have concluded that it is not satisfactory to keep in one aquarium fishes of entirely different habits. I have had the most pleasure out of an aquarium stocked with Silverfins. These are scarce. They are most active, seeming to keep at play constantly, chasing one another about and enjoying a perpetual revel. They take food from the surface of the water like a trout, making a dash for it. They live well in the aquarium, but are liable to jump out.

"Would also like to know about your Club. Yours very truly, WM. T. INNES"

Several things are interesting about this correspondence. First, it shows the limited knowledge that Philadelphia aquarists, including Innes himself, had concerning tropical fishes at the time. Second, Brind refers to himself as president of the "Chicago Aquarium Club," a somewhat premature action as Brind, being the controversial character that he was, did not get along too well with his fellow hobbyists and conse-

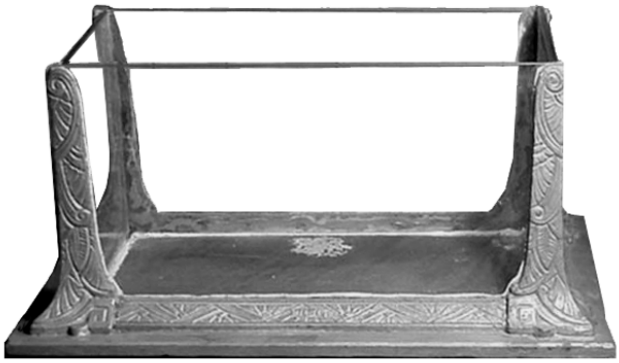




Figure 14-7.: A CAST IRON JEWEL AQUARIUM MADE BY THE HANS JENSEN MFG. CO. OF CHICAGO. It has a slate bottom and measures 20 inches wide by 11 1/2 inches deep by 10 inches tall. BELOW: A detail of one of the bottom corners of the tank.

quently the club never did get off the ground. Therefore in early 1911 a new Chicago club was formed called the "Chicago Fish Fancier's Club," with F. S. Young as President and F. G. Orsinger as Secretary. Young later became head of the Jackson Park Aquarium in Chicago and then superintendent of the entire Park; Orsinger (Figure 14-13) rose to become Director of the National Aquarium in Washington, D.C. Although Chicago technically produced the third aquarium society in the United States, not counting *Triton* and *Salamander*, we can hardly count Brind's abortive attempt as a genuine group. Even so, the Chicago Fish Fancier's Club really wound up fourth since the Brooklyn Aquarium Society was formed just a few weeks before it.

Third, the correspondence led Innes to visit Chicago where he established lasting friendships with both Orsinger and Young. This visit really awakened Innes to the fact that tropical fishes were in the United States to stay. Since this inspired him to expand his activities in the aquarium field beyond just that of goldfish, Chicago aquarists beyond any doubt played an important part in the future development of the hobby.

Innes and Brind also met, of course, but from then on it was more or less a rival relationship, especially on Brind's part. Years later, when Innes referred to Brind whimsically as "Old Reprobate Brind," Innes received the following letter:

"Dear Innes:

"May I refer to your probably jocular reference to myself as "Old Reprobate Brind"? You later on honor me as "Friend Brind," which at least places us on something of a common level. I question whether all of your readers know of your prankishness, and that the term is likely intended as one of endearment. At any rate, Mrs. Brind and I so take it, and had a hearty laugh after the first shock wore off.

"Sincerely yours, WALTER L. BRIND"

Beyond question, it is the second decade of the 1900's that marked the beginning of the modern phase of the aquarium hobby in America. One event of significance occurred on February 14, 1911 when the Brooklyn Aquarium Society was formed, chiefly from the



Figure 14-7. OUR FIRST AQUARIUM "WRITER," CHRISTIAN J. HEEDE.

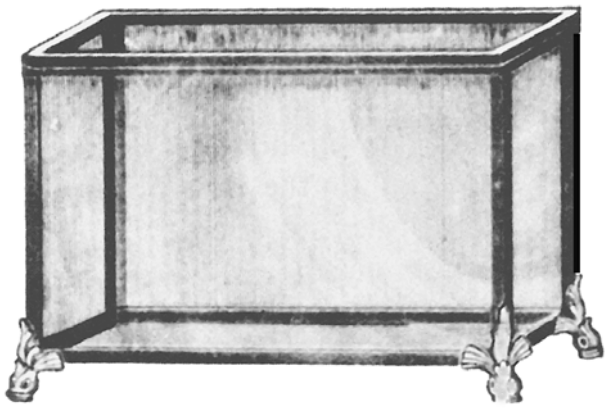


FIGURE 14-9. A TANK OF THE TYPE SOLD IN 1911 BY THE AQUARIUM SPECIALTY COMPANY, BROOKLYN, NEW YORK. Note the charming "fish legs."

membership of The Aquarium Society, which was then operating from Long Island. It had been realized for some time that The Aquarium Society covered far too wide a geographical area for members to cope with the challenges posed by travel in those days. There were, in addition, certain differences of opinion that contributed to the formation of this new group. The Brooklyn Aquarium Society was, for example, much more scientifically inclined and paid more attention to the subtleties of organization than did the parent society, which from now on we will refer to as the New York Aquarium Society, although it still catered to New Jersey aquarists residing in the Greater New York area. As its first President, the Brooklyn Aquarium Society elected William F. De Voe.

As it turned out the Brooklyn society was to play an important role in these crucial days of the hobby. Among other accomplishments, it published the third aquarium magazine to appear in America, the BROOKLYN AQUARIUM SOCIETY BULLETIN (Figure 14-10). The first issue appeared in May 1911 and although originally planned as a monthly periodical, the second issue appeared in September of that year. From that time until the Spring of 1912, it did appear monthly.

The BULLETIN was rather large as aquarium club newsletters of the day went, some nine by twelve inches and consisting most frequently of four pages. Although primarily intended for its own society's membership, initiation dues for which were $1.00 with annual dues of $2.00, subscriptions were available at 60 cents per year with individual copies selling for 5 cents. De Voe was its first Editor, this post passing to Dr. Rudolph Lienau in September of 1911. The remainder of its editorial staff included some very prominent aquarists including Hermann Rabenau, whose first name was, at times, also spelled as "Herman," and Christian J. Heede.

A typical issue was that of September 1911. Examples of its articles include: "Live Bearing Fishes" by C. J. Heede, "How to Start and Manage a Terrarium" by Hermann Rabenau, and "Shipping Live Fish." In addition, there were editorials, a "Wants and Exchanges" column and 1-1/2 pages of advertisements. Other issues posted meeting notices, book reviews and answers to queries. Although it may be difficult to believe, the article on shipping live fish mentioned above described the use of oxygen in shipping! The oxygen was bubbled through the water contained in a one-gallon pickle jar, the jar top then being sealed with Kraft paper. In this experiment several jars, with their piscine charges, were cushioned with paper and sent off in a wooden crate.

An article by C. J. Heede in the November 1911 issue is of special interest because it is the first article in an American aquarium magazine on the Guppy. We reprint it here verbatim:

"Poecilia guppyi

This is another livebearing fish which, with *Girardinus reticulata* (our next article) and *Poecilia poeciloides*, belongs to the species *Acanthophacelus*. (***Author's Note:*** **Heede is somewhat confused here. All these names are synonyms for the guppy, *Acanthophacelus* being a genus erected by Eigenmann a few years before and a synonym for *Lebistes*. The fish that Heede was calling "*Girardinus reticula*" was really *Phalloceros caudomaculatus*, our first aquarium livebearer. The proper name for the guppy now is, of course, *Poecilia reticulata*.**)

"*Poecilia guppyi* are found in Venezuela, Trinidad and Barbados, in the latter place they are called the 'millionfish' on account of their great abundance. They are also found in the Dutch colony of Surinam and in its capital Paramaribo. The fishes are raised, then liberated in

"MYOSOTIS"

Brooklyn Aquarium Society

BULLETIN

Issued monthly to stimulate interest in the study of water life and organisms.

Headquarters and Society Rooms: Fairchild Building, 702 Fulton St., Brooklyn, N.Y.

Vol. I. DECEMBER, 1911. No. 5

Our next meeting will be Tuesday, Jan. 9, 1912

GIRARDINUS RETICULATA PETERS

C. J. Heede.

Fish fanciers who have kept Gambusia affinis, var. Holbrooki, were delighted to find that another live-bearing species was in the market in which both males and females are marked *alike*, and not like the gambusia of which only the male is blackspotted and the female of a plain color. This new fish was first called Poecilia, but later rightly changed to Girardinus, to which species they actually belong. They were first imported from Brazil, later from the West Indies and Venezuela. The color of their body is yellowish, toward the fins and tail silvery, and deep jet black spots cover the body and fins, as is shown in our picture. Girardinus is a fine looking fish in the aquarium; breeds easily and rapidly, the time between each brood being about four to six weeks, and a bit



Girardinus Reticulata

longer in the wintertime. The temperature in the tank should be from 56° to 68° Fahrenheit, being the minimum and maximum limits. The young grow rapidly, and if born in early spring, will breed in later part of summer same year.

Both the parent fishes and young are easy to feed; they take artificial food as well as scraped raw meat, daphnia and cyclops, and while they eat algae and dead plants in the tank, they do not destroy the living growth. The young newly born must, of course, be fed with the finest food.

In nature Girardinus live in streams where the water is fresh and cool. Thus it occasionally is advisable to partly renew the water in the tank where they are kept so the fishes will keep strong and healthy. The added water must be of the same temperature as the balance of the aquarium or the fishes may acquire fungi.

Several gentlemen of the aquarium societies keep Girardinus, and all speak with pleasure of the beauty and alertness of these fishes, how easy it is to breed them, and that they fishes may be kept with Hyphophorus guppyi in the same aquarium. These latter have about the same friendly disposition, contrary to the gambusii, who are very cannibalistic, and always ought to be kept for themselves. In a later article we will describe Gambusia affinis and Holbrooki.

INFUSORIA WATER

There are various ways of producing infusoria in water, as food for young fishes, of which I state a few below:

1. A fair quantity of cow manure dilute in two gallons of fresh water. From this original mixture put four or five tablespoonfuls in half a gallon of fresh water and leave it in a light and sunny place; it will be full of infusoria in a short time. A liberal dose fed daily to the young fishes will be enough to help them to grow until they can eat dry or small live food, as daphnia, etc.

2. Put a handful of hay, best from low marshy land, in a glass with a pint of fresh water (preferably rain water), and leave it in a sunny place. It will soon get brownish and is then ready for use. When the water supply gives off an odor, discard it and make up a new solution.

3. Old faded leaves of water plants when collected and saved in a separate water tank make excellent material from which to raise infusoria.

4. Sun or oven dried pulverized lettuce strewn on the surface of the water in the aquarium will also produce infusoria in five to six days.

5. Artificial infusoria creating material, special for newborn fishes, can also be had at Mr. Johannes Thumms, in Klotzhe by Dresden, Germany; he manufactures his product by pulverizing water plants.

Old undisturbed aquaria, full of algae and plants, will always be full of infusoria, but seldom enough for many young fishes, as they consume great quantities until they are able to be fed with daphnia or other food.

It is wise not to keep daphnia in tanks where infusoria are needed, as these crustacea live and feed on infusoria.

C. J. Heede.

TO CATCH FISH BY NOISE

CAMBRIDGE, Mass., Oct. 22.—George Howard Parker, Professor of Zoology at Harvard, offers a novel method for catching fish. Prof. Parker, who has made the study of hearing in fishes the subject of a life work, says that the fisherman of the future may make his catch by the employment of some noise producer instead of the time-honored net or hook and line.

"The idea is not fully worked out as yet," says the professor, "and it would be premature for me to go into the matter at the present time. It is not, however, too much to say that certain fish possess organs for communication by sound with their fellows, and indeed to call each other so that it might be perfectly possible to attract fish in this manner by artificial means. Certain kinds of noises do not produce a negative reaction on fish, but instead serve to attract them. This characteristic might well be made the means of luring them to a desired province."

Prof. Parker was recently requested to prepare a report on this subject for the Bureau of Fisheries, a division of the Department of Commerce and Labor

Figure 14-10. THE FRONT COVER OF THE DECEMBER 1911 ISSUE OF THE BROOKLYN AQUARIUM SOCIETY BULLETIN. The magazine, in addition to line drawings, made use of photographs as well.



Figure 14-11. LEFT: DR. FREDERICK SCHNEIDER; RIGHT: JOHN J. HALTERBECK. These two aquarists were extremely influential in the aquarium hobby in the early decades of the Nineteenth Century. Halterbeck later became a manufacturer of innovative aquaria.

ponds to catch and eat the larvae of the mosquitoes, thereby stamping out malaria. In several English colonies the local governments have distributed this species of fish, amongst ponds and other still waters with the intention to extinguish the larvae of the malaria-giving mosquitoes. These fishes were first imported to Europe in 1908 and account of their beauty have won many friends among fish fanciers. Others were imported to New York last spring, but are only held by a few collectors.

"These fishes breed every four to six weeks, bearing at first 7 to 15 young and later, as with all livebearing fishes, a greater number of young. The parent fishes are not very cannibalistic toward their young, still the aquarium must be well stocked with plants, both below and on the surface as a protection for the brood, *Myriophyllum* and floating plants being especially adapted to this purpose. The safest way would be to remove the newly born to another aquarium; a teaspoon is a handy article for this purpose.

"The coloring of the male fish is very beautiful, red, yellow and dark spots, and lines cover his yellowish colored body. Two dark spots are found on each side of the fish, one near the gill cover and one near the tail, the latter resembling an eye somewhat similar to that seen on the peacock-eyed sunfish.

"The coloring varies according to the temperature and condition of the fish. Hardly two males are alike and they change their marking and coloring continuously. Even while watching the fish for a short time one can easily observe the rapid changes. Poecilias are about one inch long and are one of the smallest aquarium fishes in existence. The females are plain; of a yellowish pearly color, and larger than the males."

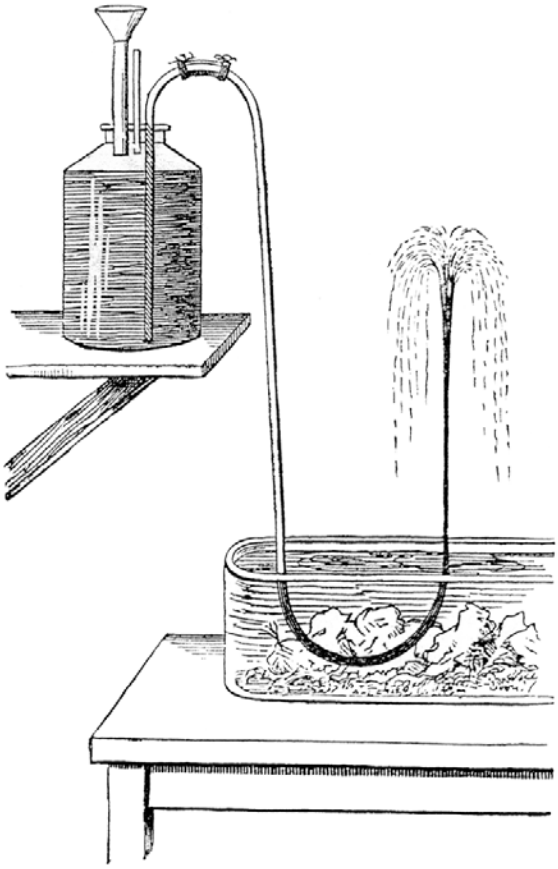


Figure 14-12. AN EARLY GRAVITY FOUNTAIN AERATION SYSTEM. Clamps at the top controlled the flow of the water, which would flow as long as the water level in the jar was above the fountain outlet. Excess water was removed by an overflow, not shown.

Guppy fanciers will no doubt find the above account helpful in explaining the origin of that fish in the United States. Heede's account puts the importation of the guppy into America at about April-May 1911, most likely an importation by Ernst Bade.

Christian Heede was our first "aquarium writer" and, from 1911 to his death in 1920, wrote many informative articles about tropical fishes. In this manner, he aroused popular interest in the aquarium hobby.

In addition to being a charter member of the Brooklyn Aquarium Society he introduced the red ramshorn snail into the United States. The red ramshorn had been introduced to German aquarists about 1900 and was later imported into Denmark. During a trip to Copenhagen, Heede discovered the snail there and carried several back with him to Brooklyn. A Philadelphia hobbyist obtained a few snails from him to bring back to Philadelphia. As he was leaving he asked Heede for the name of the snail and Heede, for a moment unable to think of the scientific name (*Planorbis corneus*) said, "I imported them from Copenhagen." Thereafter they became known as the "Copenhagen snail," although that name is now no longer used.

Heede's interest in biology began about 1870 in Denmark, the land of his birth. In his obituary of Heede, William Poyser, about whom more will be said later, wrote: "He combined the characteristics of the naturalist with those of the fancier, and his original research work coupled with an extensive first hand knowledge of the literature of the subject in several languages, placed him in the front rank among aquarists. He will be remembered as a lovable and generous man, ever ready to share his great store of knowledge and fishes and plants with his friends." Although not included among the greatest aquarists in this history, Christian Heede at least ranks with Walter Brind in our aquarium heritage.

Another item of interest in the early days of the BROOKLYN AQUARIUM SOCIETY BULLETIN was a controversy, albeit friendly, between the Society and William T. Innes. Innes took issue primarily with two statements in the November 1911 issue of the BULLETIN, viz., that the Orientals extracted the dorsal fins from some goldfish and that it was advisable to place earth under the sand in planting. Innes disagreed with both ideas; certainly he was correct in the dorsal fin question and the BULLETIN concurred, by its silence, on this point. On the matter of earth below the gravel, none other than Hermann Rabenau himself replied. Rabenau argued that Innes was considering the question from the point of view of goldfish or, as Rabenau put it, "fish of rude habits," and that in nature it is the soil bottom which supports luxuriant vegetation, not sand or gravel. However, Innes was right; placing soil

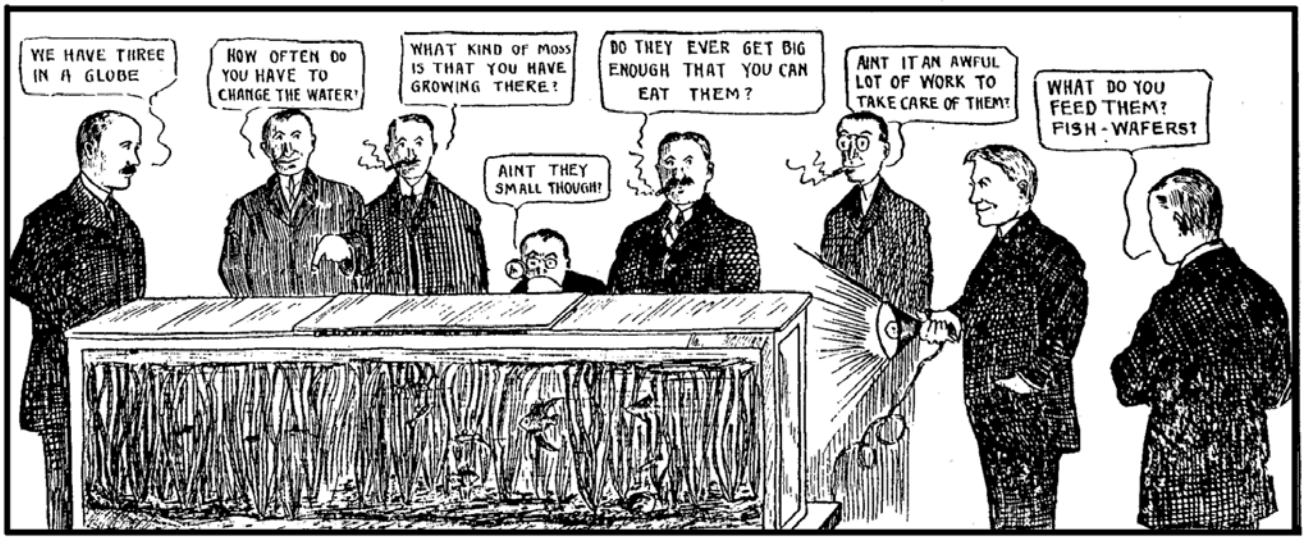


Figure 14-13. THE CAPTION ON THIS CARTOON READ: "Thankless Occupations: Fred Orsinger Showing the Daw'g-gone Big Tank to a Bunch of Boobs (non-aquarists had little understanding of the aquarium in those days!)." Orsinger was a well-known Chicago aquarist and was much in demand for judging and lecturing. He later became Director of the National Aquarium in Washington, D.C.

in an aquarium is not the best of ideas.

It is difficult to determine just who first thought of the idea of joint society publication. During the year 1911 an attempt had been made by the Brooklyn Aquarium Society to bring about a closer relationship between it and the New York club but to no avail. Dr. Lienau stated: "Somehow or other it is next to impossible to solicit a reply to most any question or letter addressed to the New York Society. This may be due to their small meetings, again due to the inclement weather at present, or to a general inertia usual in aquaria during this season!" This statement was somewhat charitable as there was much obstructionism and bickering within the New York club at that moment. Richard Dorn, Vice President at the time, was furious but could do little about the situation.

Through the efforts of William T. Innes, however, progress was made and Innes finally received a commitment from New York and proceeded with their proxy. At the same time, he communicated with the Chicago club who received his ideas with enthusiasm. Thus the practicable implementation of the concept of a joint society venture, the first in the history of the hobby in America, mainly fell to Innes and the leaders of the Brooklyn Aquarium Society.

On January 21, 1912, Innes and a fellow member of the Philadelphia Society journeyed to Brooklyn where they met with De Voe, Heede, Lienau and others of the Brooklyn group and arrived at the following proposals for the four aquarium clubs then in existence:

1. To publish jointly, a magazine to be called THE AQUARIUM. The magazine was to be eight pages, 6- 1/2 x 9-1/2 inches in overall dimension. The Innes printing firm was to do the printing.
2. Each society was to elect a local editor and a local business manager.
3. The societies would elect an Editor-in-chief.

The clubs at the time were: the Brooklyn Aquarium Society, W. F. De Voe, President; the Chicago Fish Fancier's Club, F. S. Young, President; the New York Aquarium Society, Isaac Buchanan, President; and the Philadelphia Aquarium Society, William T. Innes, President. Each of these groups met and subsequently approved the proposals. The venture also had the approval of the then great names in the hobby - Bade, Smith and Mulertt. The members of the Brooklyn club graciously agreed to merge their BULLETIN with THE AQUARIUM and the societies elected as their Editor-in-chief, none other than Eugene Smith himself.

Thus in April of 1912 the first issue of THE AQUARIUM appeared, backed by four aquarium societies, two of which were old, i.e., New York and Philadelphia, and two of which were relatively new, i.e., Brooklyn and Chicago. Three of these clubs, New York, Brooklyn and Chicago, were involved in the more general fields of the hobby and one, Philadelphia, specialized in goldfish. It was another milestone in the hobby, more about which will be said in the next chapter. Further, it established William T. Innes as a major influence in the hobby, an influence that was to reach its peak some twenty years later.



Figure 14-14.
PHILADELPHIA AQUARISTS COLLECTING DAPHNIA IN 1920.

CHAPTER 15:
PRE WORLD WAR I LITERATURE

THE AQUARIUM (Figures 15-1 and 15-2), published monthly in Philadelphia except for July and August, was priced at 10 cents per copy and $1 for a one-year subscription. Its Editor was Eugene Smith and its Business Manager, W. F. DeVoe of Long Island, New York. This very first issue, some sixteen pages long, contained articles on the Chanchito (*Cichlasoma facetum* but referred to as "*Heros facetus*"), darters, the household aquarium and the feeding of aquarium plants. Those advertising included the old firm of Jacob C. Cassel in Philadelphia (Figure 15-3), William L. Paullin, Harry P. Peters, Charles Paullin, Franklin Barrett, William Mack, Innes & Sons, Hermann Rabenau and numerous others.

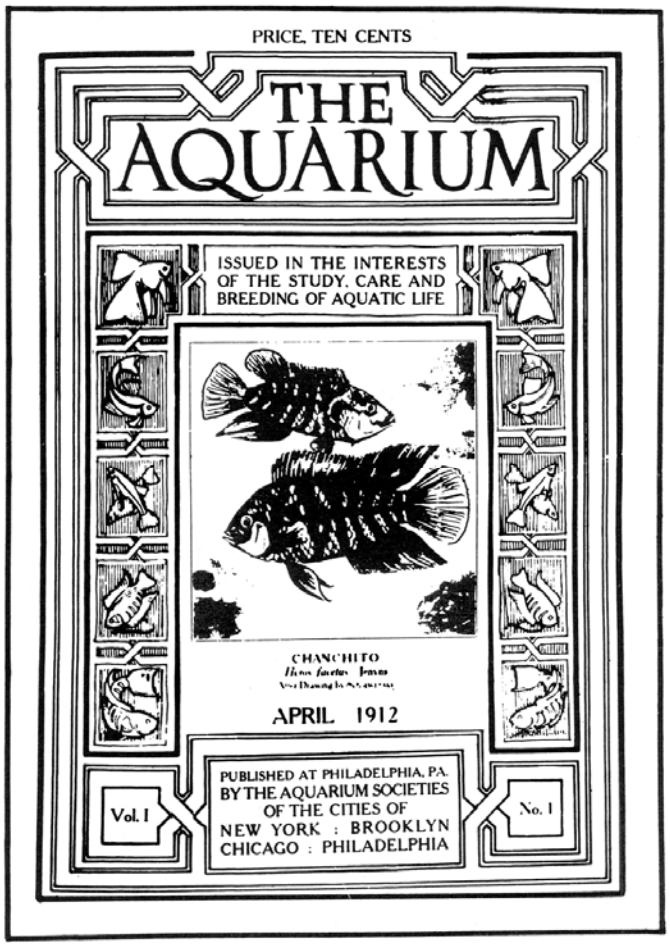


Figure 15-1. THE FRONT COVER OF ONE OF THE EARLY ISSUES OF THE AQUARIUM, PUBLISHED BY THE AQUARIUM SOCIETIES OF NEW YORK, PHILADELPHIA, BROOKLYN, AND CHICAGO.

Society lecture announcements included: Brooklyn Aquarium Society - "Persuading highly developed male goldfish to breed," by S. Chichester Lloyd; Chicago Fish Fancier's Club - "The Aquarium," by William Kopp; and "Aerating devices," by F. S. Young and Carl Fossetta; New York Aquarium Society - "The freshwater mollusks of the vicinity of New York City," by Silas C. Wheat; and the Philadelphia Aquarium Society - "Varieties of tropical aquarium fish," by Isaac Buchanan. The last lecture was significant as it marked the beginning of the tropical fish hobby in Philadelphia and the relative decline of the goldfish. William T. Innes, then President of the Philadelphia Society, invited Buchanan, who was President of the New York club, to present a stereopticon lecture. It was a tremendous success and Philadelphia was never the same again!

THE AQUARIUM boasted a number of firsts. It was, for example, the first such publication to have an "exchange" column; it exchanged with publications such as the "NATURE-STUDY REVIEW". One first which lasted but one issue, however, was the matter of the "new spelling." There was an attempt at the time by some to simplify the spelling of the English language in America; Teddy Roosevelt was one of its proponents. Smith was a member of this group and the April issue contained the following spellings: "publisht" for published, "workt" for worked and "obtaind" for obtained. Smith came under heavy criticism for this and was forced to return to regular school spelling in the next issue.

Smith did a very fine job of editing THE AQUARIUM and contributed articles from time to time, mostly on native fish topics. William Innes also contributed, primarily on goldfish topics, and Heede, Brind, and others provided tropical fish input. It is difficult to select one article as typical but the following is of some historic interest as it marked the beginning of the use of formaldehyde in the aquarium hobby. The article ap-

peared in the October 1912 (Vol. 1, No. 5) issue.

"FORMALDEHYDE - A REMEDY FOR FISH INFECTED WITH PARASITES

By H. A. Rogers,
Pagosa Junction, Colorado

"About two months ago we received 25 goldfish from a reliable breeder who is also a personal friend. On arrival they seemed a little weak, but we attributed this to the long journey. Later indications showed an improper assimilation of food, which we thought no more than natural, considering the change of diet from the natural food of a pond to the concentrated, prepared dry food. In time we thought they would become accustomed to the change.

"After giving them frequent salt baths and keeping them isolated for ten days, we added a choice one to a colony of Japanese goldfish, every member of which had been in perfect condition for three years. Their aquarium was provided with an aerator that even at low speed had always kept the water thoroughly aerated even in the warmer weather.

"In a week's time a beautiful, white, tripod nymph showed unfavorable symptoms, and, in spite of salt baths and special care, soon died. The symptoms, which were as new to us as they were alarming, spread to the entire colony, one after another dying until only two remained. The respiration of the fish went far above normal and they hung at the surface, gasping as if suffering for air. Speeding up the aerator brought no relief. The fish became listless, carrying their fins close to their body, occasionally violently twitching the fins, or darting recklessly about among the rocks as if in great agony. Later, they would lie around the bottom in a comparatively exhausted condition for a day or two, when death would ensue. No discoloration or dissolution of scales, fins or tails had taken place; in other words, no outward signs of disease was visible, excepting a marked thinness of body just before death. In the meantime, the same condition had developed among the new fish, one at a time dying until only ten remained.

"After testing and finding untenable every pos-

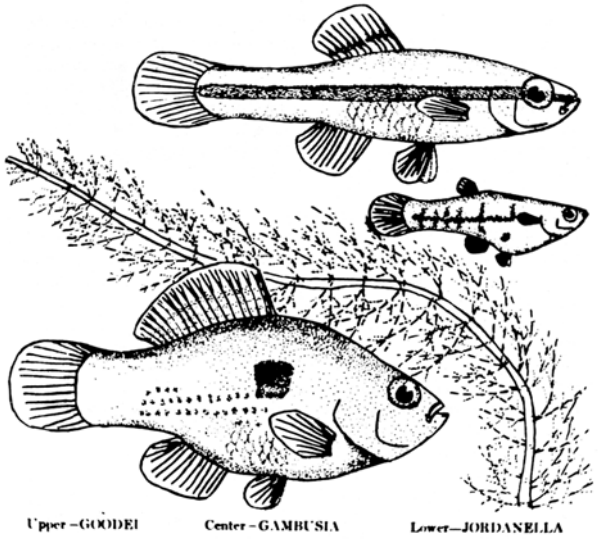


Figure 15-2. AN ILLUSTRATION FROM THE AQUARIUM CIRCA 1913. In addition to line drawings, the magazine also featured photographs as well. One issue even had a color plate tip-in (but of snails, not fish).

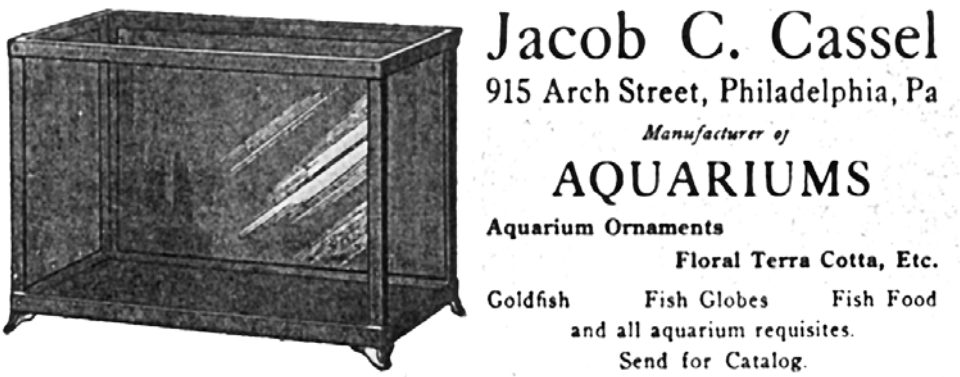


Figure 15-3. AN AD FOR CASSEL'S STORE THAT APPEARED IN THE JANUARY/JUNE 1922 ISSUE OF AQUATIC LIFE.



Figure 15-4. IN MANY CASES AQUARIUM SUPPLIES WERE SOLD BY STORES SPECIALIZING IN BIRDS. Note the use of the term "Aquaria," rather than "Aquarium."

sible cause of the trouble which suggested itself to us, we came to the conclusion that the disease must have been imported with the new fish, and that, inasmuch as changing the water always gave temporary relief, it must be in the shape of a parasite whose numbers were greatly reduced for a time by a change of water.

"A microscope of 250 diameters was next brought into service in the hope of discovering the cause and, lo!, there it was, an active, vicious looking, leech-like worm, which, by sudden violent contraction and expansion of the body, struck out in all directions. The villain was quickly identified in a scientific volume on aquarium fishes as the *Gyrodactylus elegans*. (***Author's Note:*** **The "scientific volume" was undoubtedly Herman T. Wolf's book.**) It belongs to the group of flukes, having prehensile hooks at one end and a sucker at the other. They burrow under the scales and infest the gills, feeding upon the juices of their host.

"We were made heartsick by learning that among the uncertain remedies mentioned the most promising was to destroy the fish, disinfect everything, and start over again. By careful experiments my wife demonstrated that when the flukes were put into a solution of four drops of formaldehyde to a quart of water, death ensued in a few minutes. Here then, was a hint of a remedy, worse, possible, than the disease. I suggested that, as a desperate experiment, she place a patient in the solution. She received the suggestion as a joke, having one prominent characteristic of the true scientist; she was always just as ready to explode a theory of her own as that of another. She said, therefore, 'Well, here goes. You arrange for the funeral and I will provide the corpse.'

"She began, however, with a much weaker solution than that mentioned above. Much to our surprise, the fish swam around in it as though nothing unusual had happened. Even after half an hour there was not the least sign of any ill effects. The strength of the solution was gradually increased until 10 drops of formaldehyde to a quart of water produced an unnatural quietness in another fish after 15 minutes. When it was removed to fresh water we thought it was all up with the little fellow, no respiration, no movements of the fins; but, presently, a gasp, a wriggle, and he was a live fish once more. The same result occurred with another fish in 20 drops to a quart for one minute. Our hint of a remedy had thus become a hope.

"We subjected all of our remaining fish, eight in number, to a bath in a solution of 5 drops of formaldehyde to a quart of water for 15 minutes on two consecutive days, disinfecting the aquarium and everything about it each time with a solution of a teaspoonful of formaldehyde in a quart of water. Microscopic examination revealed live flukes still. We increased the strength to 10 drops the third day. No more flukes could be found. To make sure that any adults lurking under the scales might be destroyed and to kill a possible new crop, we repeated this bath twice more, three days apart, disinfecting everything each time. Since then frequent and thorough searches have failed to show the parasite. It was of interest to observe that the weaker fish were affected more seriously by the formaldehyde than the stronger ones and that, as they recovered, they were affected less and less by the drug.

"Three of the eight fish to receive the first treat-

ment died before the treatment was completed, but the five survivors are now all bright and happy, with fins wide spread, respiration normal, and appetites and digestion of the best; and it has been three weeks since they had their last treatment. One of the old ones, which we have had four years, has lost patches of scales, but this is the only remaining sign of the dreadful ordeal through which they have passed. We firmly believe had we used the formaldehyde solution at the beginning of the trouble, the majority, if not all, of our pets would have been saved.

"Having no more patients for further experiments, we are unable to determine the proper strength of the solution and length of time for the bath to obtain the best results, and would suggest that the aquarist meeting with this, or any other parasitic horror, try a weaker solution and greater length of time for the bath. It may be that such treatment would be as effective in destroying the parasites and less injurious to the fish. The individual could never know what the rest of the world is, or has been doing. Others may have used the same remedy, which has been original with us, but, as we have not found this treatment or any other practical one mentioned in any of our literature on the subject, we are prompted to give the readers of this magazine the benefit of our experience in the hope that, if the facts given are not generally known, others with better facilities for experimenting

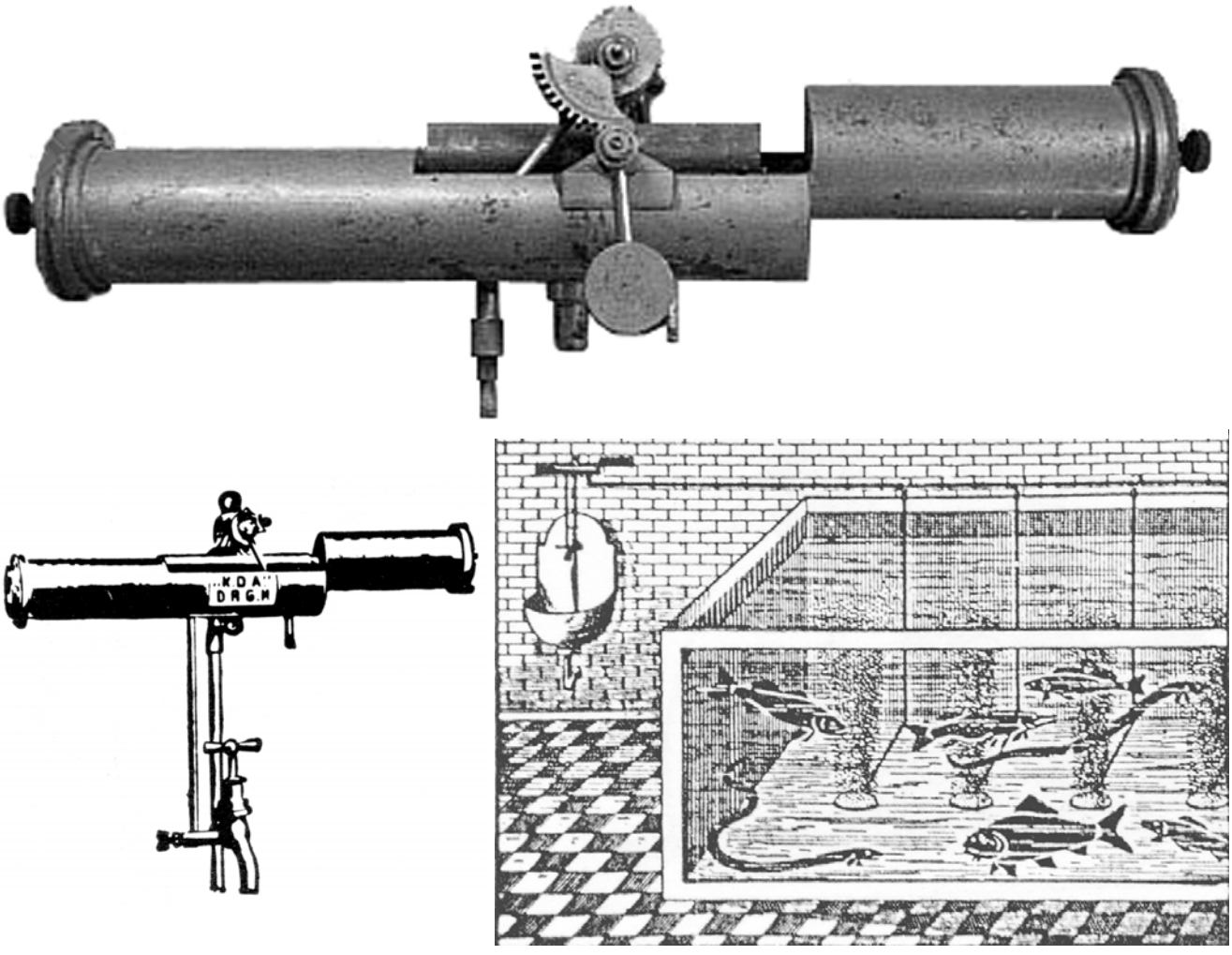


Figure 15-5. THE K.D.A. AERATING PUMP,1912. Attached to an ordinary faucet fixture, it resembled a steam piston engine except that it used moving water rather than steam.

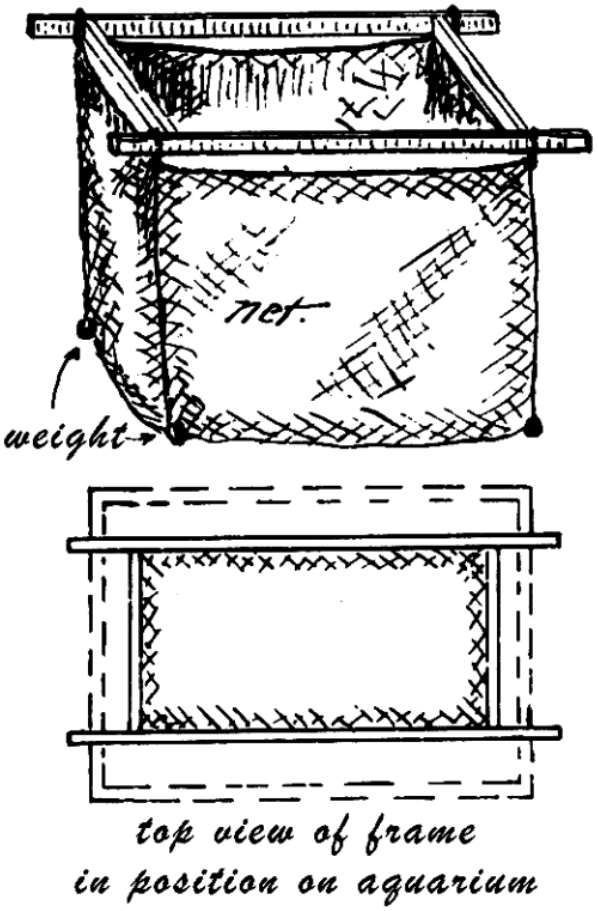


Figure 15-6. SOME AQUARISTS MAY THINK that the idea of suspending a net In the tank for spawning egglayers is relatively new. Hobbyists, however, were using this arrangement at the turn of the century.

than we have at hand may carry the test to a more definite end and give the results to others of aquatic life.

"While formaldehyde is extremely fatal to lower orders of life, it is not excessively poisonous to the higher forms. It is, however, an irritant to the mucous membranes and should, therefore, be used with great caution. The aquarist will find that little instrument, the microscope (without which surgery would still be butchery and the Panama Canal merely a hope of the nations), a valuable addition to his paraphernalia. It need not be an expensive one; even 100 or 150 diameters will reveal the existence of dangerous parasites, and afford many pleasant hours studying the many forms of harmless animaculae which inhabit all aquariums."

The aquarium hobby in 1912 was somewhat Spartan in nature. In hard goods the fish stores of the day sold mainly tanks and foods, supplemented by ornaments, gravel and nets. Filters were not commercially available, heaters were rudimentary and air pumps were not commonly employed. One pump that was for sale at most large stores, however, was a German import, the K.D.A. Aquarium Aerating Pump (Figure 15-5). This was a double-piston reciprocating water pump, made to fit onto an ordinary sink faucet. Water pressure forced the pistons back and forth, providing a more or less steady stream of air. The idea was not new however. In 1859, Mr. George Hurwood, of Ipswich, England invented a device that used the pressure of a stream of tap water compress air.

An interesting aside about this pump concerns a then famous court case in Germany. Typically, the K.D.A. pump would use about a bathtub full of water a day and a landlord objected to the water consumption by one of these pumps used by a tenant who happened to be an aquarist. The judge, however, ruled that every person had a right to one bath a day; if an aquarist elected to use his bath tubful of water on his fish rather than himself, then the aquarist was perfectly within his rights. Case dismissed!

The importations of Dorn, Rabenau, Bade, Brind and others began to produce results and a partial list of the fishes available to the hobbyist of 1912 included: the Climbing Perch, Rosy Barb, Half-Banded Barb, *Badis badis*, betta, *Callichthys callichthys*, *Cichlasoma octofasciatum*, Zebra Danio, Spotted Danio, Giant Danio, *Gambusia affinis*, *Gambusia nicaraguensis*, *Geophagus gymnogenys*, Guppy, *Epiplatys dageti*, *Aplocheilus panchax*, *Epiplatys sexfasciatus*, Chanchito, Paradise Fish, *Channa striata* (Snakehead), *Mollienisia latipinna*, Egyptian Mouthbreeder, *Pantodon buchholzi* (Butterfly Fish), *Xiphophorous maculatus*, Leaf Fish, *Rasbora heteromorpha*, *Macropodus cupanus dayi*, African Lungfish, *Pseudoxiphophorus bimaculatus*, *Rivulus tenuis*, Dwarf Gourami, Striped Gourami, Swordtail, *Moenkhausia oligolepis*, *Hemibrycon guppyi*, *Mystus tengara* and *Hemigrammus ulreyi*.

In October 1912 a spectacular exhibit of aquarium fishes was put on display at the annual show of the New York Aquarium Society. It seems strange to read

of the enthusiasm caused by fishes that scarcely merit passing mention at the shows of today - danios, gouramis and barbs - but in 1912 these were stellar attractions indeed. However, the hits of the show were the betta and the Butterfly Fish (*Pantodon*). Most of the killies were shy and did not show well, and the Guppy of that time was only one species among a host of other brilliantly colored livebearers.

In 1912 Hugo Mulertt ended his active participation in the hobby - some forty-three years of service - by retiring to Wiesbaden, Germany. On June 3, 1912 the Milwaukee Aquarium Society was founded with 19 members, C. G. B. Schenk being named as its President. By the end of 1912 aquarium societies had been formed in Boston (President: Tennant Lee), Minneapolis (President: Frank L. Tappan) and San Francisco (President: F. S. Curtis). Counting the New York Club as number one, the last three represented the sixth, seventh and eighth societies in America, respectively. Dues typically were $1 a year with an initiation fee of $1. New York, however, had dues of $2. Most clubs met monthly except for the summer months, New York being the exception once again as it convened twice a month.

Just before Christmas of 1912, tragedy struck with the unexpected death of Eugene Smith. Thus passed away one of the pioneer aquarists in America and its first organizer. As a temporary gap William T. Innes was appointed Acting Editor and a general reorganization followed with the burden of publication falling on new shoulders in the Midwest. The new Editor was William A. Poyser of Hammond, Indiana, librarian of the Chicago Club, a former active member of the Philadelphia society, an expert on goldfish and frequent contributor to THE AQUARIUM. The task of business manager went to C. G. B. Schenk, President of the Milwaukee Aquarium Society, since it was thought that the business manager should be one in closer contact with the Editor. William T. Innes, who had put much effort, time and skill into the publishing of the magazine for its first seven issues, now had a welcome "breather" as the printing was now done in the Chicago area. Milwaukee, however, proved too far away and I. J. Ackerman of Chicago replaced Schenk as business manager soon afterwards.

In September of 1913 Poyser resigned because of the press of personal business and Willis S. Hilpert of Chicago was prevailed upon to edit the September issue. In October 1913 J. W. Gage became Editor-in-chief. At this point the entire burden of the operation of THE AQUARIUM fell upon Chicago aquarists. Even before this, however, the magazine was in financial difficulty. Advertisements and subscriptions were not sufficient to pay its publication costs and the business of gathering material from societies in widely separated parts of the country proved formidable. Consequently, in February 1914 THE AQUARIUM published its last issue and passed from the scene. During its short life it was a magazine of superb quality, ably edited and creatively illustrated. It was an ambitious undertaking that was not to be repeated until after World War II. It was never, however, to be equaled.

The use of pure oxygen in the aquarium is not a new idea, by any means. In 1918 Ernest Leitholf wrote an article for AQUATIC LIFE entitled, "On the Use of Oxygen in Aquarium Aeration." Leitholf's idea was to take a cylinder of oxygen, as employed in welding, and to conduct the oxygen via a rubber tube into the

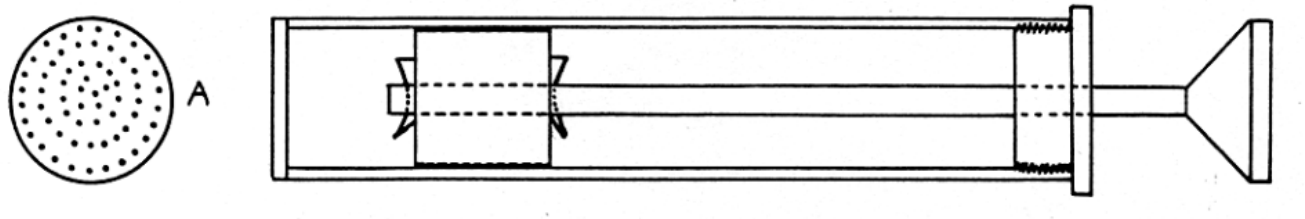


Figure 15-7. THE AERATION SYRINGE.
This syringe was used for either aerating the water in an aquarium or in a shipping can. It consisted of a brass tube about seven or eight inches long with a diameter of ½ to 1 inch. At one end was soldered a finely perforated brass disc (A). The piston was made of brass and wrapped with cotton to make a snug fit. One simply sucked the syringe full of water and then squirted it back from a height of a few inches.

aquarium water. The releasers that were inserted into the end of the hose in the aquarium, were of two types: One was a cross section of basswood and the other was made from a piece of hard carbon such as were used in the lights and dry batteries of the time. A refillable oxygen cylinder costing $2.00 furnished sufficient oxygen for eight aquaria for ten weeks, making the cost two and one-half cents per aquarium per week. Leitholf reported the following:

> "We have convinced ourselves beyond all doubt of the practicability and efficiency of the scheme, not to mention the advantages of the low cost of operation. Its effect was particularly noticeable in the case of two aquaria stocked with *Cichlasoma facetum* and *Tetragonopterus rutilus*. All efforts towards cleanliness, notwithstanding, these were always murky, with a scum on the surface of the water. A few days of oxygen transformed them into healthy, crystal-clear tanks."

A more extreme example of oxygenation was that discussed in AQUATIC LIFE of the same year by John P. Putnam, of the Massachusetts Institute of Technology. Putnam actually conducted in-aquarium electrolysis with a DC electric device consisting of a glass tube about one centimeter in diameter (Figure 15-8)), the oxygen and hydrogen each being generated at a ring of coiled platinum wire. The hydrogen, being of no use in the aquarium was simply vented, while the oxygen was bubbled through the aquarium water. Putnam reported: "On one occasion I kept thirty-two fishes, averaging two inches in length - goldfish, dace and shiners - in a three gallon tank for three weeks without changing the water. At the end of this time a chemical analysis of the water was made for oxygen. The result, 8.95 parts per million (by weight) of dissolved oxygen, showed the water to be in a state of 3 percentage super-saturation."

In Leitholf's case the oxygen probably helped break down the decomposing plant material aerobically but in either case, pumping ordinary air into the tanks would most likely have achieved the same results since, because of the rapidity of the transfer at the air-water interface, aquarium water is always saturated with oxygen.

It would take another seven years before the suggestion was made to use oxygen to aerate shipping containers (Paul Kuliga, "The Use of Pure Oxygen and of Heat Isolating Containers in Transporting Aquatic Animals," AQUATIC LIFE, November 1925). The shipping containers in those days were, of course, metal, not the plastic bags used today. Philip Gosse himself, being the religious man he was, would have appreciated the relevance to the aquarium hobby in this instance of the Biblical observation (Ecclesiastes 1:4-9), "There is nothing new under the sun!"

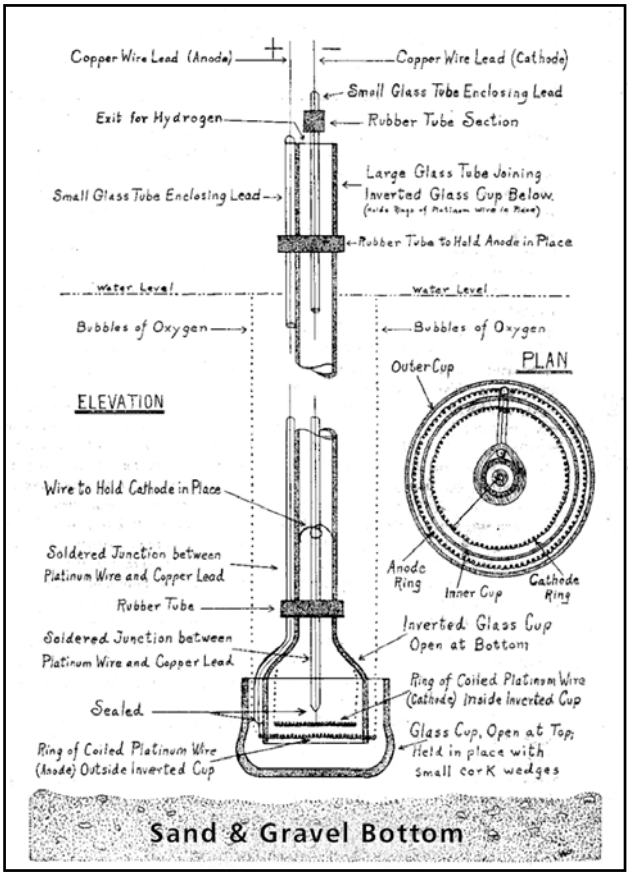


Figure 15-8. JOHN PUTNAM'S ELECTROLYSIS DEVICE. The details will be skipped here. Suffice it to say that it is something only an M.I.T. engineer could come up with!

CHAPTER 16:
PRE-WORLD WAR I EQUIPMENT

Although America had eight aquarium societies in 1912, Europe was deeply committed to them. The tiny country of Switzerland had seven, only one fewer than the United States. Holland had five, Russia three, and Belgium, Denmark, Hungary and Sweden had one apiece. However, Austria had 22 and Germany 127! It is no wonder then that most of our pre-World War I aquarium fishes came to us from Germany.

By 1912 several miscellaneous items of aquarium equipment had been added to the aquarist's bag of gear, including a breeding trap for livebearer fry and the razor blade type of aquarium glass scraper. The K.D.A. water-driven air pump, costing $17.50 and described in the previous chapter, was available but due to its expense it was not widely used. Electric motor-driven air pumps were too large and expensive for use in other than professional hatcheries or in the very largest of amateur fish houses. One simple expedient was to solder an air valve to a five-gallon oilcan and fill it with air from a bicycle pump. This would provide air for half of a day for one aquarium.

Some aquarists used fancier hydraulic pumps, such as were found in saloons for the aeration of beer, but the "bottle system" was most popular of all. In brief, the system employed two glass bottles (usually five-gallon water bottles), one set on a high shelf - the higher the better - and other on the floor. A Rube Goldberg airtight network of glass or lead tubing connected the bottles. By running the water from the upper bottle into the lower one the air would be driven from the latter into the aquarium, a variant on the Cutting aeration system. When the upper bottle was empty the bottles would be exchanged. Thin discs of boxwood were sometimes used as airstrips, i.e., where the air entered the water, but these soon would rot or fill up. Pumice or sandstone was the preferred material, not unlike the air stones of today.

Although filtration in 1912 was practically unheard of, the Treasurer of the Chicago Fish Fanciers' Club, Carl Fossetta, devised the first airlift outside filter (Figure 16-2). His equipment is shown in the accompanying sketch. Water was drawn through a perforated glass tube, down a rubber hose to a triple-necked Wolff bottle. The Wolff bottle, used by chemists, contained the gravel used as the filtering medium. The filtered water passed through an airlift, up through a rubber hose and then back to the tank. The third neck of the Wolff bottle was used for back-washing the gravel. In principle this is identical to the outside airlift filter systems used much later.

Aquarium heating was an even more challenging task, falling into two categories: direct heating and water circulating systems. In the former, heat was applied to an inverted pan in the center of the aquarium or to a tin or lead block (Figure 16-3). These devices were sealed with aquarium cement, the heat source generally being a small Bunsen burner or oil lamp. Metal-bottomed tanks, of course, could have the heat applied directly to their bottoms. Since many of the tanks in existence at the time had drain pipes, e.g., the running water tanks used mostly for goldfish, the drains could be replaced with nickel-plated brass tubes and heat

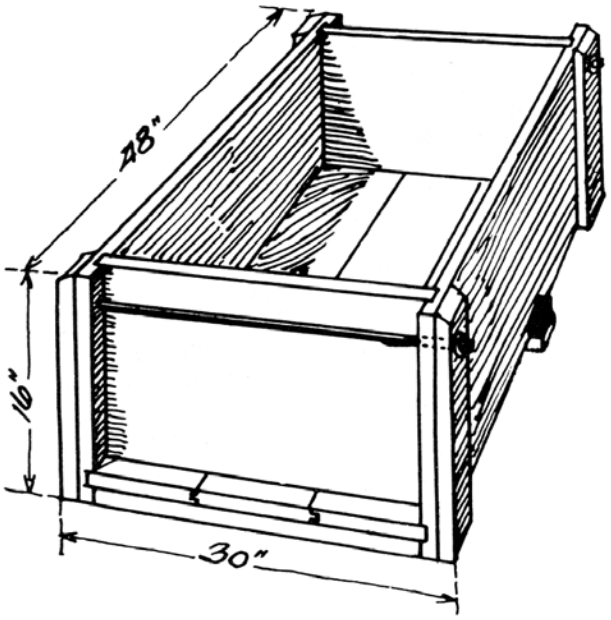


Figure 16-1. A WOODEN TANK CIRCA 1913. Not having access to epoxy cements and paints, the aquarist of 1913 was forced to build these very bulky, massive structures, held together by tie rods.

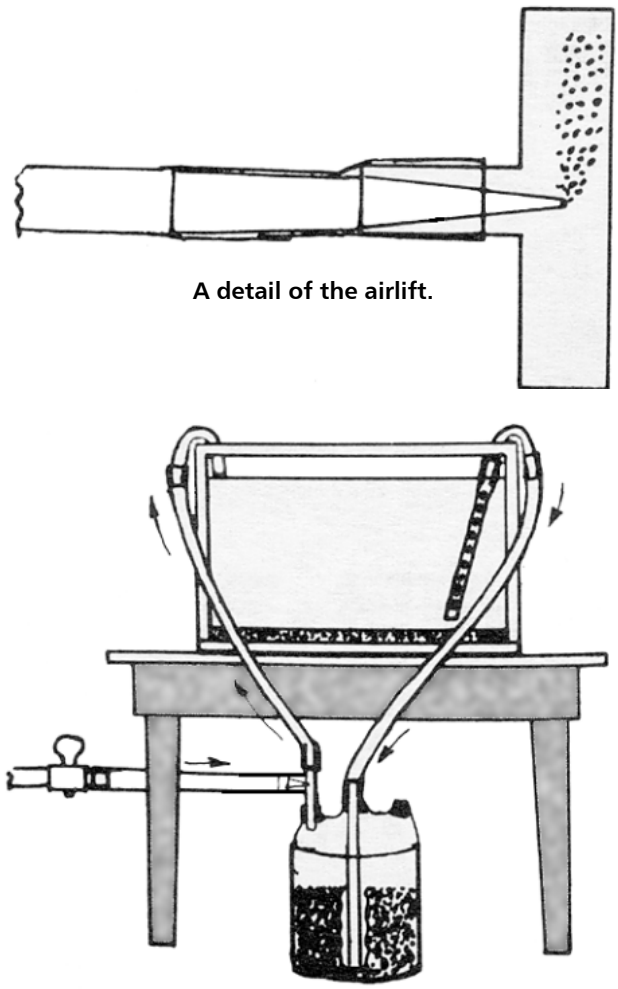


Figure 16-2. THE OUTSIDE FILTER, WITH AIRLIFT, DEVISED BY ?CARL FOSSETTA IN 1912. This was the forerunner of the outside filter as we know it today.

applied from the bottom opening. The water circulating schemes were based on the same principle as household hot water systems (Figures 16-4, 16-5 and 16-6). Nickel-plated brass was used to form the conductor; a spiral was formed in this at a point outside the tank to which the heat was to be applied directly via a Bunsen burner or oil lamp.

A far easier way for aquarists to heat their tanks was to partly immerse an electric bulb in the aquarium. Although a dangerous procedure, the method worked, but only for those aquarists whose homes had that new -fangled invention, electricity!

Because heating was so difficult, the temperatures recommended for keeping aquarium fishes were lower than what aquarists are accustomed to today. The standard temperature was 68 degrees F, with special cases as follows: Dwarf Gourami - 61 degrees F; *Gambusia* and the Guppy - 59 degrees F, African killifishes - 71 degrees F; barbs and danios - 65 degrees F; Chanchito - 61 degrees F; *Geophagus*, *Tilapia* and *Cichlasoma* - 65 degrees F; *Callichthys* - 61 degrees F; *Pimelodus* and *Otocinclus* - 71 degrees F. Most aquarists today, of course, would have second thoughts about these recommended temperatures.

In 1903 Mr. Henry S. Hale of Philadelphia thought well enough of the idea of mechanically "supplying food for fish or land animals" to work out and patent an apparatus for the purpose (Figure 16-8). The idea centered on a revolving drum that contained the food. Each revolution liberated an amount controlled by a valve adjustment. Evidently Hale was not satisfied with this principle for, in 1907, he was granted another patent in which conveyor buckets lifted the food. The accompanying illustrations (Figure 16-9) show that the Hale machines were partly in water.

Harry F. Peters of Philadelphia, one of the early goldfish breeders in America, introduced the use of copper as a treatment for fish diseases in 1912. He used a



Figure 16-3. HEATING AN AQUARIUM. This is one of the earliest heating methods. The aquarium was fitted with a metal mantel cemented in from the bottom (in some cases, the tank was all glass and the mantel was molded into the tank). A heating lamp fueled by alcohol or oil was placed underneath the mantel.

bath duration anywhere from 15 minutes to several hours, a solution made by adding a tablespoonful of stock solution, i.e., 120 grams of copper sulfate to a pint of water, to a quart of water. This rid the goldfish of certain gill parasites and marked the beginning of the use of copper in the hobby.

This also is an appropriate time to mention two prominent firms of the period. The oldest was the Auburndale Goldfish Co. of Chicago, Illinois, having advertised in THE AQUARIUM of 1912; the second oldest was the Nippon Goldfish Co. of San Francisco, California. A third firm, the Aquarium Stock Co. of New York City, a wholesaler, was in existence before the establishment of these two firms; however, the conversion of the Aquarium Stock Co. into a retail operation did not take place until 1917.

Since the "old timers" were uncomfortable seeing the almost complete takeover of the Philadelphia society by the "tropicals" enthusiasts, in May of 1913 a group of goldfish fanciers split from the Philadelphia Aquarium Society to form the Philadelphia Goldfish Fanciers Society, the ninth aquarium society to be formed in the United States. George B. Smith was its President, Harry P. Peters (not Harry F.) its Vice President and Joseph E. Bausman its Treasurer. Still, the break was amicable as most of the goldfish people retained membership in the parent society as well.

Among other things, 1914 marked the publication of the first work in America devoted solely to tropical fishes - Walter Brind's booklet, *Domesticated Fish*. Booklets by other authors soon followed, e.g., Fred Kaempfer's, *The Aquarium; Care and Treatment of the Gold Fish and Tropical Fishes,* 1923. Kaempfer,

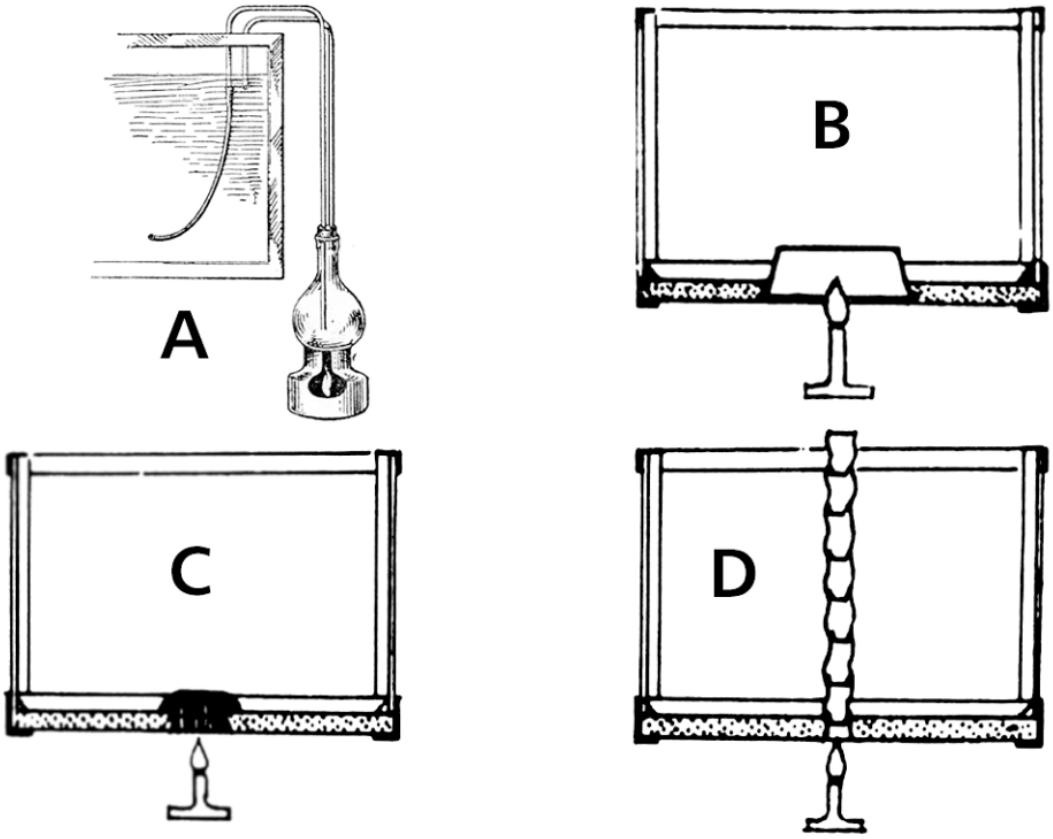


Figure 16-4. HEATING WITH GAS BURNERS.
In A the aquarium water was directly heated in a small outside reservoir and circulated back. This was undesirable since, if the water intake clogged, the water would boil. B utilized an inverted pan set into the bottom of the tank. In C, a lead plug was used. In D the commonly-used drain pipe (overflow) was replaced with a nickel-plated brass pipe (constructed in sections to improve heat transfer). Heat was then applied at the opening in the bottom of the tank.

as was mentioned in Chapter 7, operated a leading pet shop in Chicago. As was pointed out in the previous chapter, THE AQUARIUM ceased publication with its February 1914 issue. However, another magazine had been launched one month before the demise. Because the difficulties being experienced by THE AQUARIUM were well known, the Philadelphia group decided to go on its own and, in January 1914, the Aquarium Society of Philadelphia embarked on the AQUARIUM NOTES AND NEWS (Figure 16-7). As previously mentioned, along with the increasing recognition of its superiority in matters concerning goldfish, the club was rapidly expanding its interests and activities in the tropicals end of the hobby as well. The following is taken from the very first issue:

> "Philadelphia has become the Mecca of goldfish lovers. Visitors from Canada and many parts of the United States have honored us in the past year. In the last two years we have found our place in the goldfish world and others have found US. Why is this? It is due directly and indirectly to the establishing of the magazine, "The Aquarium." Before its advent we knew practically nothing of the fish in other cities, and our own reputation was limited to the idea that we are a slow town with a fast baseball club. The magazine has gotten us acquainted with members of the other societies. One of our members has called on all other societies, including the group in San Francisco. The calls have been returned, and with interest. We know in what point others lead and others know where we lead - goldfish.
>
> "This fall we had two large delegations from Brooklyn and New York over, and a dandy lot of folks they were. Will Innes had fifteen to table at his home and then they took in as many of the representative fanciers as time allowed, visits being made to the homes of Messrs. Peters, Dorsey, Haldeman, Peck, McMichael, Barrett, Coles, Wm. Paullin, and the office of Messrs. Innes and Sons, where there is a tropical aquaterrarium.
>
> "Philadelphia, too, has learned about tropical fish almost entirely through the work of "The Aquarium" and while we are now at this end of the game and not so favorably located as New York as regards the source of supply, we, nevertheless, hope to show them something about breeding, and in the near future it is likely we will do considerable direct importing on our own account."

Clearly modesty was not one of the virtues of the Philadelphia fraternity! True to their prediction, however, Philadelphia turned out some of the finest breeders of

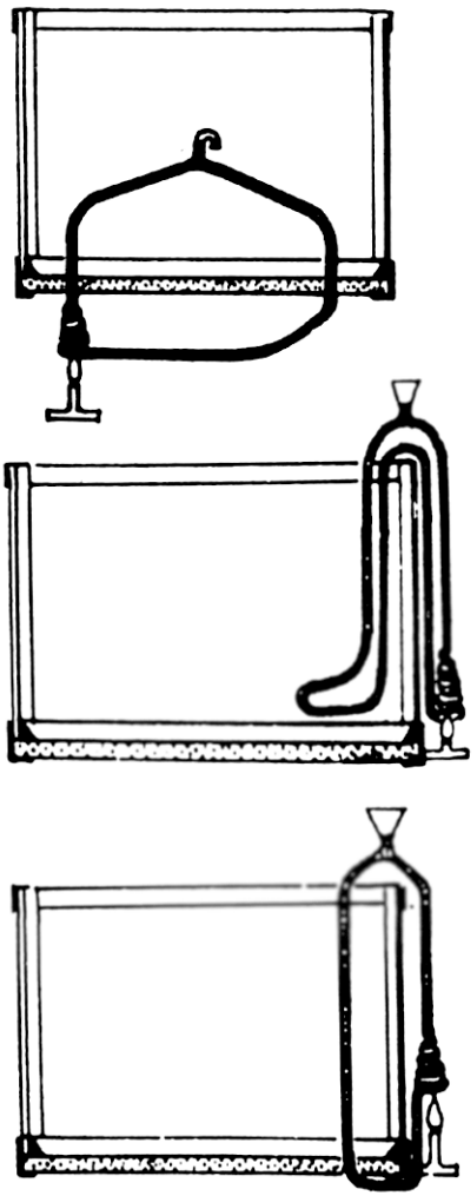


Figure 16-5. GAS HEATED RECIRCULATING SYSTEMS
The funnels shown were incorporated to reduce the pressure formed by the expansion of the water.

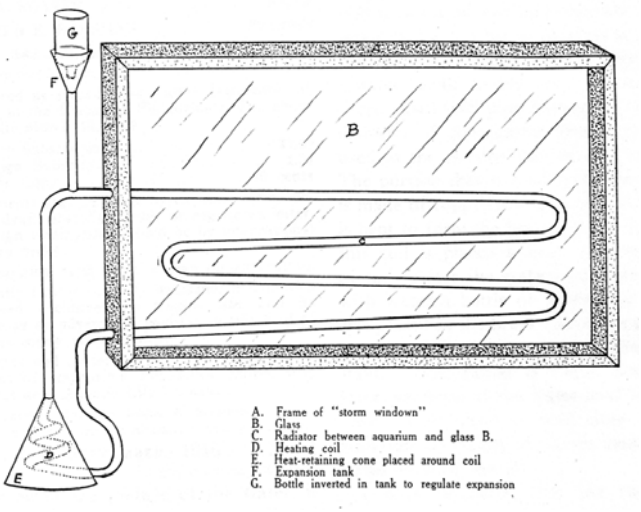


Figure 16-6. A "STORM WINDOW" HEATER OF 1916
The backside of the frame (about 1-1/2 inch thick) had glass so light could shine through to the aquarium. The heated water rises through the coils and heats the tank set in front of it. The bottle, G, is inverted in the funnel, F, to regulate expansion of the heated water. Nothing comes in contact with the aquarium.

tropical fish the country has ever seen. Modesty, however, was justifiable with regard to AQUARIUM NOTES AND NEWS for it nowhere matched the quality of layout, scope, and interest of THE AQUARIUM nor, for that matter the old BROOKLYN AQUARIUM SOCIETY BULLETIN. Walter Lee Rothberger was its Editor and although its primary emphasis was on goldfish, there were a respectable number of articles concerning other fishes as well, although mainly of the native variety. The magazine understandably devoted a good amount of space to society affairs and although no advertisements were allowed nor were issues or subscriptions sold, the magazine was printed via letterpress and featured a limited amount of line drawings and photographs; hence, it had the appearance of a commercial operation. Accordingly, it is the fifth on the scene in the history of aquarium magazines in America.

Although the publication was essentially of a serious tone, an occasional bit of humor appeared, as witnessed by the following:

"Success With Fish

I know a man who managed once a fine aquarium,
And asked for hints on his success, and so he gave me some.
I keep my shad in shadow, and my sun-fish in the sun.
My trigger-fish most carefully I fix upon a gun.
The bass in baskets you will find, the carp in carpets rolled.
And jellyfish preserved in jars will never, never mold.
I keep the skate on ice, of course, my perch on perches perch.

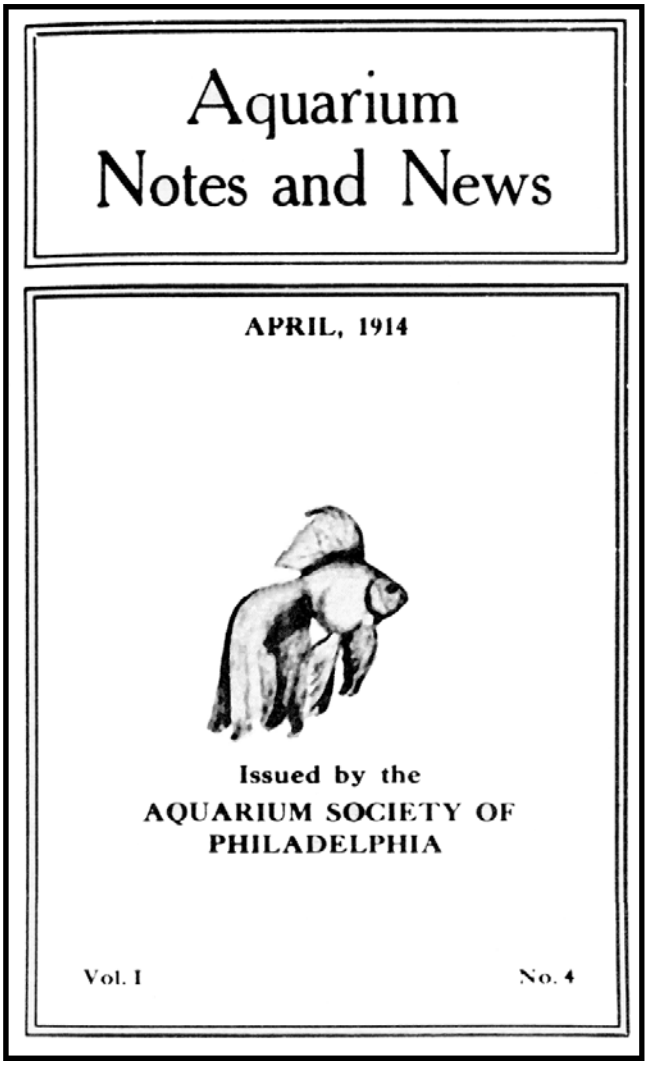


Figure 16-7. AQUARIUM NOTES AND NEWS, PUBLISHED BY THE AQUARIUM SOCIETY OF PHILADELPHIA FROM 1914 TO 1918.

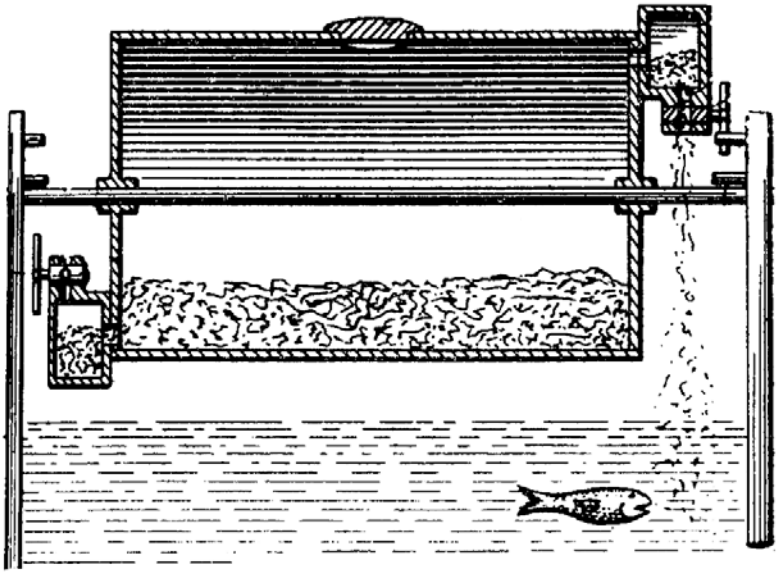


FIGURE 16-8. HALE'S FIRST FEEDER. The revolving drum alternately fills the side chambers. These are emptied as they pass a cam at the top, which opens a valve.

And when the day is fine, I send my
angel-fish to church.
I file away my file-fish so I know
just where
they are;
My swordfish in a scabbard lies, and
thus
escapes a mar.
My sea-horse and my barnacle are
always in the stable.
And signs like these I keep in sight
as well as I am able.
Please do not stir the sturgeon up,
and do not poke the pike;
And kindly do not maim the limpet
by a careless strike.
Pray, do not whale the gentle whale,
nor rock the rockfish small,
And do not fly the flying fish,
it would not do at all.
Please do not muss the mussels up,
nor saw the sawfish slim;
And do not smoke the pipe-fish -
it would make an end of him.
Please do not light my lamprey.
These are just the hints you wish.
Because I follow them myself, I
have success with fish."

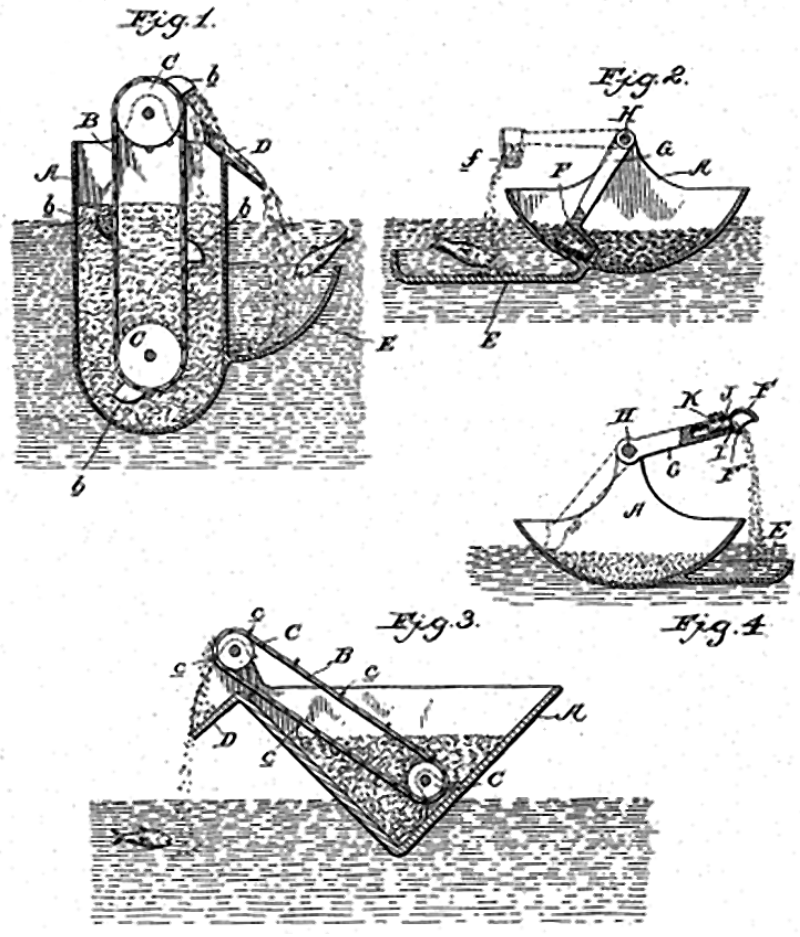


Figure 16-9. HALE'S LATER FEEDERS. These employed a bucket system on an endless chain. However, metal in constant contact with water always invites trouble!

CHAPTER 17:
THE APPROACH OF WORLD WAR I

With the demise of the cooperative publishing effort of the New York, Brooklyn, Philadelphia, and Chicago aquarium societies in February 1914 (THE AQUARIUM), an attempt was made to formulate a national association of aquarium clubs. This effort was led by William T. Innes of Philadelphia and later in that year representatives of the committees on amalgamation from the societies met in that city. All the representatives attending were favorably disposed to the idea and Dr. Frederick Schneider was elected Chairman. A committee was formed to draft a set of rules to govern the proposed organization and to select a name, with its members as follows: New York Aquarium Society President Edward Kiernan, Brooklyn Aquarium Society President Dr. Frederick Schneider, Chicago Fish Fanciers' Club Representative I. J. Ackerman, Goldfish Fanciers' Society of Philadelphia President George B. Smith, and Aquarium Society of Philadelphia President C. A. Provost. Another meeting was scheduled to be held in Brooklyn at the end of 1914 but the effort faltered and ultimately died. It was, however, the first serious attempt to form a truly national association.

Turning now to the Western scene, one of the earliest and most important aquarists of the San Francisco area was Frank S. Locke. Locke, who was a mechanic by trade, ultimately turned his talents to the tropical fish business and in time introduced several fishes that became household names in the hobby. Outstanding among these was the Cambodian Betta, at which a closer look will be taken later. Locke was persuaded to set down in print some of his reminiscences about the origin of the aquarium hobby in San Francisco, a portion of which follows:

> "My first recollection of anything aquatic was when I visited the home of a friend who had several Medakas and a pair of Mexican swordtails. As nearly as I can remember, it was about 1913 and the sight of this aquarium was very entrancing. Inquiry brought to light the fact that he had purchased these fishes and the plants from an aquarist on O'Farrell Street. Being quite interested in the set-up, I hastened to the location mentioned on O'Farrell St. and found a Mr. Richards ensconced there in all the glory surrounding his work-a-day life. Undoubtedly

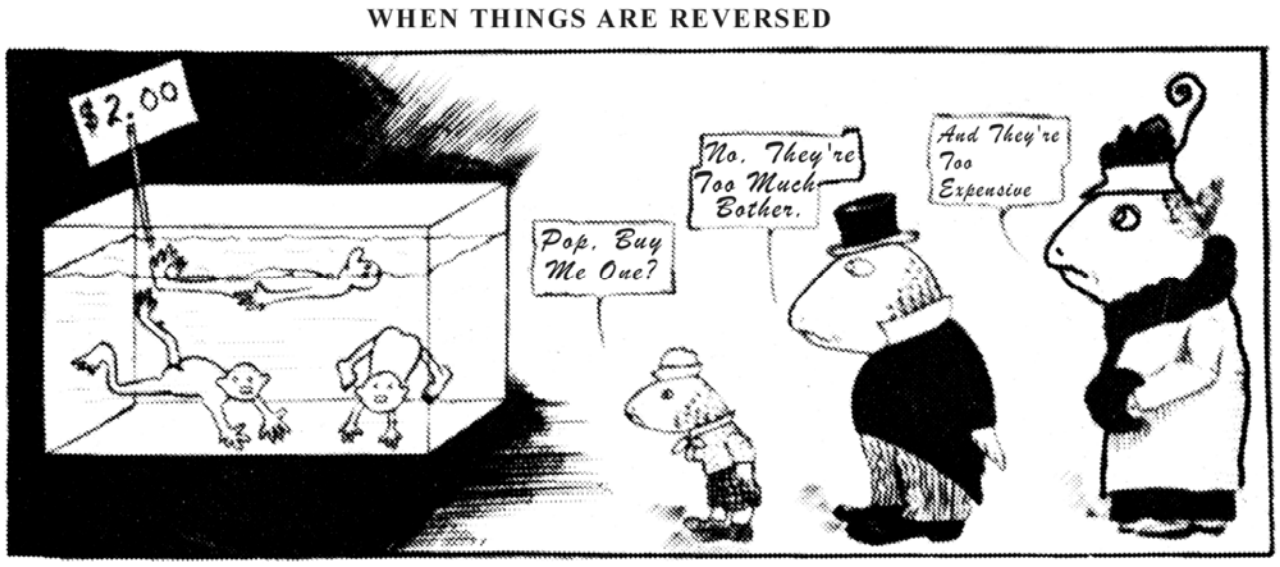


Figure 17-1. ONE OF THE EARLIEST AQUARIUM CARTOONS PRINTED IN THIS COUNTRY (1916). Viewing the humans in the tank for $2.00 apiece, the youngster fish is saying, "Pop, buy me one?" The father fish replies, "No, they're too much bother," and the mother adds, "And they're too expensive."



Figure 17-2. THE ORNATE LEGS OF THIS AQUARIUM STAND WERE SO FRAGILE THAT THEY HAD TO BE SUPPORTED BY GUY WIRES AT ITS BASE.

Mr. Richards was the first professional aquarist to blossom forth in San Francisco and it seems a pity that he did not progress any further than to realize that it was an uphill climb to educate the people interested and to get enough customers to make a real living.

"The prices obtained for the material at that time were really exceedingly high, although they did not appear so, for the simple reason that it was practically impossible to obtain any of the raw material in the way of plants or aquariums locally. And those few tanks that were for sale in some of the pet shops were mostly of the all glass imported type, or a very inferior grade of metal aquarium.

"Mr. Richards did make a pretty fine aquarium, and for a twenty gallon job would get about $75.00. One sprig of Vallisneria (if you could wheedle him out of it) would probably go at 50 cents. Cabomba usually brought about 50 cents a bunch. And I recall paying $2 for a giant Sagittaria. At the time, Mr. Richards' stock was composed of a few goldfish and about 25 or 30 large Mexican swordtails, probably 50 or 75 young, and half grown. I paid him $2.50 for a half grown pair which was transported to my home in a tin can. Having no way to heat them at the time, I placed them over an electric light globe for the night, forgot to cover them, and found them both on the floor in the morning, dried beyond repair.

"If my recollection serves me, there were also in this establishment a few pairs of Paradise and about 6 or 8 *Gambusia holbrooki*. This little fellow was really quite good looking, a livebearer, but seldom seen any more. The female resembles very closely a guppy. The male, about the same size a guppy male, was made up of a series of black and white blotches, not unlike a poor grade black Mollienisia. The eyes were a milky white and he was not an unattractive chap. Now and then in a litter, a much darker male would develop and usually brought good prices.

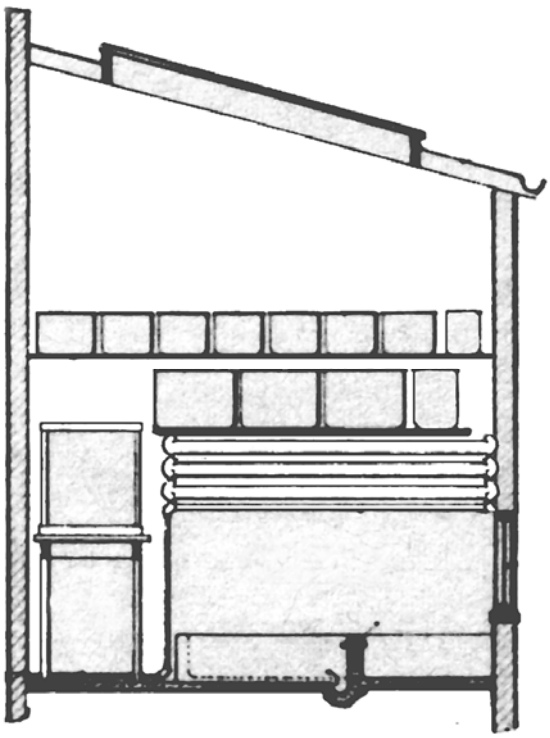


Figure 17-3. A LEAN-TO FISH HOUSE BUILT IN 1916. The heating unit below the tanks were steam coils.

"At the time of which I speak, it was impossible to get Mr. Richards to relinquish any of his breeders at any price, but babies, a couple weeks old, sold for $1.50 a pair. A small cabinet, probably of ten cubic feet contents, comprised the entire tropical fish department, and the foregoing fishes, both tropical and semi tropical, comprised all the stock, so that one must use his imagination to figure out how any one could really get very far under these conditions unless he obtained pretty good prices for his products.

"The aquarium situation was really a little amusing. Being a mechanic myself and not able to afford a $50.00 or $75.00 aquarium, I felt that I could build it quite reasonable. I did so, but went aground in the fog when Mr. Richards refused to sell me any aquarium cement for the purpose of setting the glass. No amount of coercion could tempt him and I was informed the aquarium cement was a deep secret and his own particular formula. I am frank to confess that no one in San Francisco had ever heard of aquarium cement when I tried to buy some elsewhere and I was forced, on my own initiative, to compile my own secret formula that, at first blush, materialized into an awful fizzle.

"While my tank frame was gradually rusting, I was in the throes of a new inspiration, namely mixing various dry ingredients and combining them into a perfected aquarium cement. I even had visions of making a fortune out of it if I did solve the problem. The house was littered with small pieces of broken glass, stuck together with various formulas, labeled, numbered, and tagged. We finally completed the aquarium (much to the chagrin of our fellow tenants) on the drain board of an apartment house sink. We had no other place in which to work.

"A few plants were obtained at fabulous cost and we were well on our way toward the realization of a wonderful dream, which, before many moons, took on all the aspects of a brainstorm.

"A new aquarist appeared on the horizon, and I discovered him quite by accident one day on Sutter Street at the corner of Buchanan. He had some beautiful Medakas on display in a few bowls in the window. These were surrounded with various Japanese groceries and other paraphernalia. No other equipment was offered for sale except a few large goldfish which were in the back, along with two or three tubs of newly arrived Medakas. This enterprising "Isaac Walton" was none other than an old friend, Mr. T. Murata, who was dying to get out of the grocery business and into the fish business.

"Suiting the action to the work, Mr. Murata did go into the fish business and on no very small scale. At the time this step was taken by him,



Figure 17-4. A WROUGHT-IRON TANK STAND, CIRCA 1915, BUILT TO HOLD THREE AQUARIUMS.

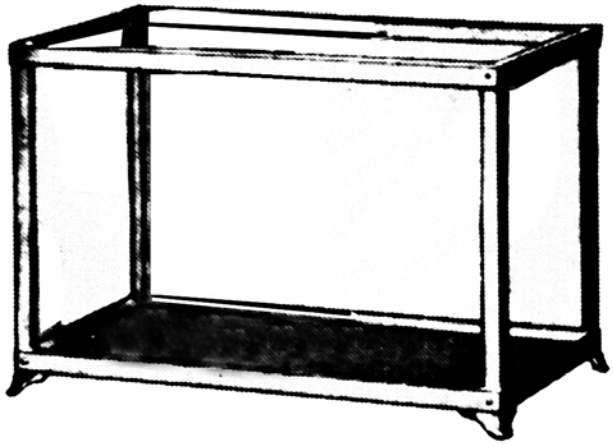


Figure 17-5. A STANDARD METAL, PAINTED-FRAME AQUARIUM OF 1915.



Figure 17-6. A COVER OF THE BROOKLYN AQUARIUM SOCIETY BULLETIN AFTER RESUMPTION OF PUBLICATION FOLLOWING THE DEMISE OF THE OLD AQUARIUM MAGAZINE.

there was no one in the West who had either the inspiration or the imagination to branch out in a big way along these lines. A new aquatic importing organization was born in San Francisco when he opened his present establishment at 1919 Bush Street and known since as the Nippon Goldfish Company.

"Mr. Murata and his organization have done a great deal to advance the possibilities of aquaria in the home and they also have had a hand in the distribution of probably more goldfish than any one else on the Pacific Coat to date. It was he who originally brought to this country, some of our very finest fancy goldfish so highly valued throughout the Eastern States and which usually sold for considerable sums. Though San Francisco is apparently the gateway to the Orient where some of this stock originated, it has never, in the true sense of the word, developed the craving for the ultra in goldfish. It does seem funny that this should be so. Nevertheless, it has always contented itself with a mediocre assortment in its outdoor pools and gardens. Yet, some of the finest goldfish which have ever been brought into the United States have passed through the channels of the Nippon Goldfish Company, and found happy landings at the hands of many buyers in the Eastern portion of the United States. This organization became one of the interesting highlights in San Francisco because it was, at the time, a unique business venture, and from the start it has thrived and more than fulfilled the wants of both local fanciers and others scattered throughout the country."

Locke's reminiscences will be revisited a little later. The "Mr. Richards" mentioned was W. J. Richards, the Vice President of the first aquarium society in San Francisco. The Nippon Goldfish Company was mentioned in the previous chapter but two other dealers are also worthy of mention. The first is the Long Island Bird Store, although it was located in Brooklyn. At the time the firm was started in 1878 it was primarily a seed, feed, and farm supply store although, oddly enough, it also sold mixed breed dogs. It is not known in what year

the firm started to sell fish, but it advertised in THE AQUARIUM magazine in 1912. This certainly antedates the entry of the Nippon Goldfish Company, and most likely even the Auburndale Goldfish Co. of Chicago.

It is also important to mention that, from 1915 to 1920, a New York pet dealer, Richard Donker, was engaged in supplying marine fishes and salt water to marine hobbyists. Donker shipped fishes and salt water inland as well. For a short while he and his successor, Arthur Catchpole, were the only dealers in the country in saltwater fishes. Donker was in love with the wonder of the sea and particularly with the grace and beauty of the coelenterates. As Ida Mellen once wrote: "He would sigh with delight for an hour at a time while watching a white anemone slowly wave its drooping tentacles like a weeping willow swaying gently in the breeze." In 1911 his wife, Ruth Donker, was featured in the New York City newspapers when she performed a successful tracheotomy on a goldfish, the first so recorded.

In August 1915 the Brooklyn Aquarium Society, with Dr. Frederick Schneider as its President, resumed publication of the BROOKLYN AQUARIUM SOCIETY BULLETIN (Figure 17-6). The club's Corresponding Secretary, E. J. Wilcox, was named Editor of the magazine. At first the resumed publication, a monthly, was quite modest, only consisting of four pages, and selling for 5 cents a copy or 50 cents for a year's subscription. In time, however, it expanded to 28 pages. It had a much wider appeal than AQUARIUM NEWS AND NOTES as it catered primarily to the tropical fish hobbyist rather than to the goldfish fancier. It boasted an able array of writers and aquarists such as Christian Heede, August Obermueller, Walter L. Brind, and John Treadwell Nichols.

The pages of the BULLETIN provide numerous items of historic interest (Figures 17-8 and 17-9), including the following short article that was the first ever published in the American aquarium periodical literature about *Betta splendens*. At the time (1916), the fish was known as "Betta Rubra."

"BETTA RUBRA

"There is a very beautiful and attractive variety of aquarium fish called Betta Rubra which comes from distant Siam. They are also of the labyrinth family and as such are very pugnacious, the males fighting not only with other males of their own species, but sometimes with the females as well.

"The female Rubra is a rather light brown, with dark brown markings which come and go according to her moods. She also shows red and blue coloration, though these are not as prominent as in the males.

"When quiet and in repose the male fish somewhat resembles the female, but he is easily excited and irritated, and at such times shows really remarkable coloring. The body becomes dark reddish brown, the fins and tail rays a vivid electric blue, while the lower portion of the

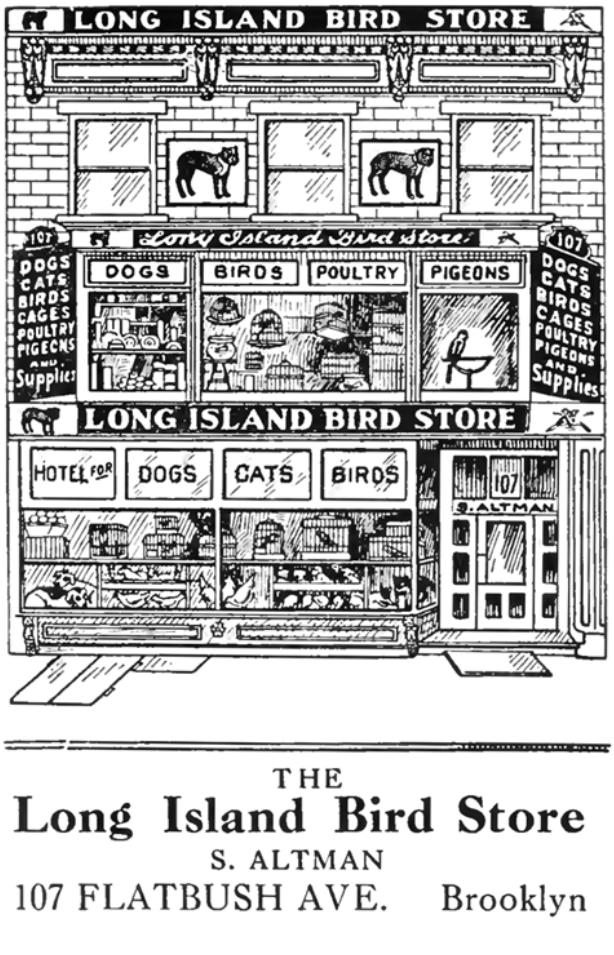


Figure 17-7. A VIEW OF THE LONG ISLAND BIRD STORE, ONE OF THE EARLIEST FISH STORES IN AMERICA.

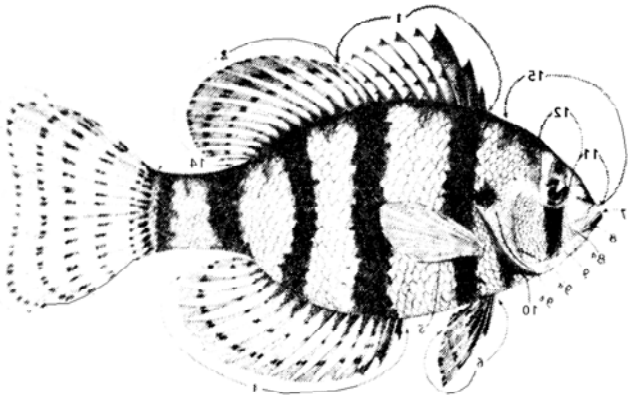


Figure 17-8. THIS SKETCH OF A BANDED SUNFISH APPEARED IN THE BROOKLYN AQUARIUM SOCIETY BULLETIN. It indicated parts of the fish which, in turn, were described scientifically.

back and upper portion of the ventral fins are brilliant red.

"The natives of Siam greatly enjoy the breeding of these fish and frequently hold contests, much the same as cock fighting, betting heavily on the results. The termination of such fights always comes with the death of one of the combatants, and sometimes both.

"At the breeding season the pairs are usually placed in an aquarium, the water in which has been withdrawn until it is shallow - not exceeding five inches, and the tank then placed in a secluded spot. The male will build a nest of air bubbles that float upon the surface of the water. For this purpose the mouth of the male is slightly stronger than that of the female and thicker. The eggs are carefully placed in the nest and allowed to hatch, and like the paradise fish, the female must then be removed. As soon as the young fish arrive the nest is destroyed and the male cares for the fry until they learn to swim freely and eat well. These fighting fish thrive best in a temperature ranging from 72 to 80 degrees F."

The BULLETIN of the Brooklyn Aquarium Society published its last issue in August 1919. During its lifetime it was a publication of remarkable quality, as was the organization that sponsored it. It did not, however, leave the hobby devoid of a magazine for in September 1915 an aquarium magazine appeared on the scene that was to influence the hobby significantly for some 35 years. This publication was AQUATIC LIFE.

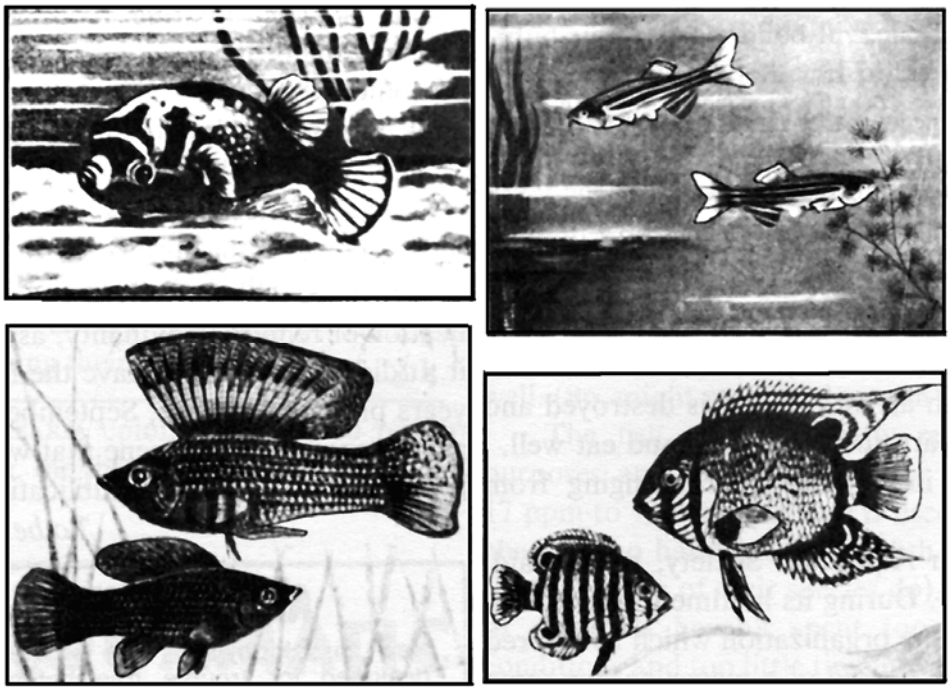


Figure 17-9. SEVERAL OF THE ILLUSTRATIONS OF FISHES THAT APPEARED IN THE BULLETIN from 1915 to 1919. CLOCKWISE FROM UPPER LEFT: *Tetraodon cutcutia, Brachydanio rerio, Mollienisia velifera*, and *Cichlasoma severum*.

CHAPTER 18:
WORLD WAR I AND POST WAR PERSONALITIES

AQUATIC LIFE appeared on the American aquarium scene in September 1915, the first of our really important national magazines. It was edited by William A. Poyser, the former Editor of THE AQUARIUM (1913), published by Joseph E. Bausman, a well-known Philadelphia aquarist, and owned jointly by them. Poyser at the time was also a resident of Philadelphia so the magazine was published monthly from that city. A single copy cost 10 cents and a yearly subscription went for $1.00. Consisting of 16 pages at the start, additional pages were added in due time. Being an independent publication with no ties to any particular aquarium society, AQUATIC LIFE was closer to what we think of today as a commercial aquarium magazine than were its predecessors. It boasted the finest authors and the highest quality articles. Because of its cosmopolitan interests and wide circulation it was extremely influential in the development of the aquarium hobby and it will be analyzed in more detail in future chapters. Its editor was a most unassuming man and a gentleman in the truest meaning of the word. Because of his modesty his name seldom appeared in the pages of the magazine, and it is a real pity that he is hardly remembered today.

The following was the introductory article appearing in the very first issue in September 1915:

"FOREWORD
C. G. B. Schenk, Ex-President of Milwaukee Aquarium Society

Interest in the aquarium and all that pertains thereto is constantly growing. We now have eleven organized aquarium societies in the United States, and no doubt will hear of more from time to time. The combined membership of all the societies, however, is but a small fraction of the number of people who have aquaria of some sort and a love for fishes. The majority of people who are interested are generally novices, and know very little of what can be clone with the household tank. The experience of most is limited to the ordinary round fish globe, and such goldfishes as can be purchased in almost any bird store.

"Bearing in mind the increasing interest and the general lack of knowledge, what more worthy incentive can the aquarium societies of America have than to help these amateurs to greater experience and success, and to point out in one way or another what can be accomplished with an aquarium as a household ornament, both with regard to beauty and instructive interest? In my opinion there is nothing in the way of general furnishings which will attract so much attention as an aquarium properly made and set



Figure 18-1. THE "PEERLESS" AQUARIUM, MANUFACTURED BY THE J. J. HALTERBECK COMPANY, MOUNTED ON A PEDESTAL, CIRCA 1915.



Figure 18-2. One Of The First Aquariums In America To Be Heated With Electricity. The tank belonged in 1916 to Mr. Robert W. Chanter, of New York City. Although the tank was designed solely to employ the Simplex water heater attached directly below the tank, this was not sufficient. Accordingly, light bulbs were mounted below the aquarium cover.

up with a selected variety of growing plants. The fishes are secondary, for any kind will be of interest and an ever ready source of study.

"With these thoughts in mind, I am sure I am expressing the sentiments of the majority of the members of all the societies when I state that with the publication of this magazine we have the realization of an ambition which we have all felt. This is not the first attempt to have an American journal devoted to the interests of the aquarium, and though the previous attempts have been failures, there is no reason why this effort should not be success-



Figure 18-3. WALTER HARRIS CHUTE (1891-1981) EXAMINING TANKS AT THE SHEDD AQUARIUM. As a young man, Chute was Secretary of the Boston Aquarium Society. He later became Director of the world famous Shedd Aquarium in Chicago.

ful. The failures of the past will in themselves help to make this magazine a success. Without subscribers no publication can exist, so every individual member of every society should help toward the general good by contributing his "bit" and becoming a subscriber. On account of the benefit each one of us will derive, it is to our interest to induce others to become subscribers. We should also be willing to contribute to its columns anything that may be new, or which may in any way help the beginner. Personally I believe the editor should consider the amateur to the extent of seventy-five per cent.-the other twenty-five can be devoted to the advanced worker and the professional. If the advanced worker feels that he is beyond the limits of this publication in experience and knowledge, let him subscribe anyway and so contribute to its upkeep. Many amateurs will be benefited, and that should in itself be sufficient compensation. Let us all be willing to share the pleasures of our hobby with others who want to learn, so that he or she may get as much enjoyment from the wonders of the aquarium as we do. I know that I am expressing the opinion of many others when I state that we need a monthly magazine in English whereby, we will know what is going on among the different societies, and the new discoveries that are being made from time to time."

By the end of 1915 three additional aquarium societies had been added to the list: the American Federation of Goldfish Fanciers, headquartered in Brooklyn, with S. Chichester Lloyd as its president); the Reading Aquarium Society, Pennsylvania, with J. R. Melcher as President); and the Lancaster Aquarium Society, Pennsylvania, with Hiram Peoples as its President. Indeed, the hobby in 1915 had broadened to almost all parts of the country. In 1916 the following societies were added to the roster: National Aquarium Society, St. Louis, with S. Chichester Lloyd as President (the American Federation of Goldfish Fanciers had merged with the Brooklyn Aquarium Society, and Lloyd had moved to St. Louis); Pittsburgh Aquarium Society, with Dr. O. T. Cruickshank as President; Washington Aquarium Society, Washington, D.C., with Dr. R. W. Shufeldt as President and Dr. Hugh M. Smith as Honorary President; and the Essex County Aquarium Society, Newark, New Jersey, with Lothair Smith as President and Max G. Hammerschlag, one of the earliest aquarium pioneers in this country, as Secretary.

City after city, new societies were added after this date with consistent regularity. For the record, however, both the San Francisco and Boston groups had undergone reorganizations before 1917 and therefore were by that date, different societies. Also, the Chicago Fish Fanciers Club had incorporated as the Chicago Aquarium Society. It is of interest to note that the new Boston Aquarium Society had as its Secretary a young man who, in future years, was to be the first Director of the world famous Shedd Aquarium in Chi-

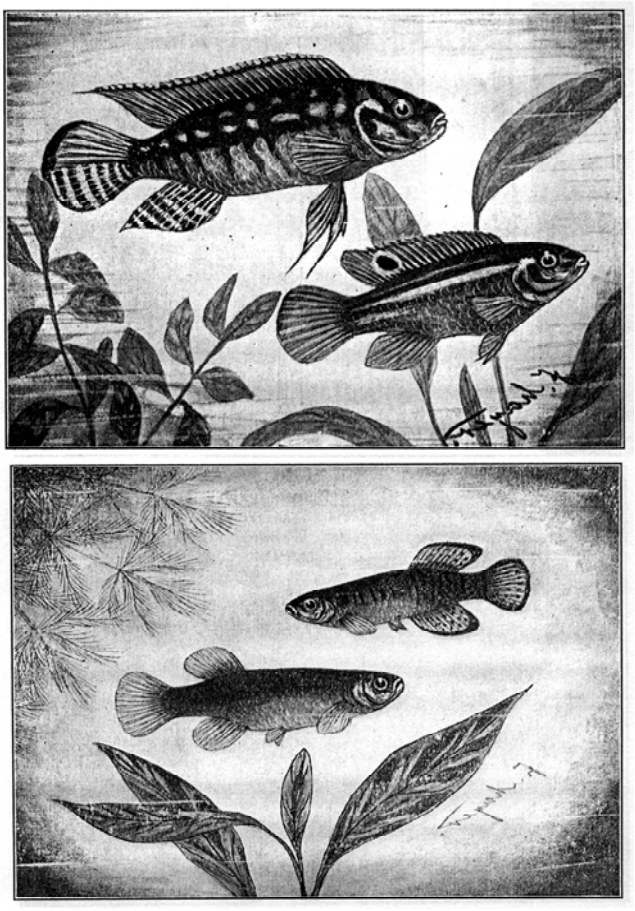


Figure 18-4. AQUATIC LIFE FEATURED DRAWINGS BY FRITZ MAYER, A WELL-KNOWN GERMAN AQUARIST. The drawings were of excellent quality. They served to illustrate fishes when the photography of fishes was still in its infancy. TOP: *Pelmatochromis subocellatus*; BOTTOM: *Valencia hispanica*. Both were drawn in 1932.

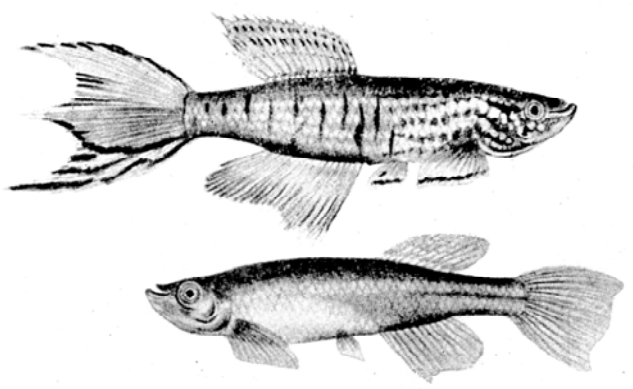


Figure 18-5. THE BLUE GULARIS WAS ONE OF THE EARLY AFRICAN KILLIFISHES INTRODUCED INTO THE HOBBY.

cago, i.e., Walter Harris Chute (Figure 18-3). Leaving this chronicle of aquarium societies, it should be noted that the St. Louis group, the so-called "National Aquarium Society," came under heavy criticism for its choice of name. As Poyser put the case:

> "It is a mistake to organize a society and adopt a name that creates the impression that it is national in scope. No one society can hope to be national in influence. It has been tried and found a failure. Most anywhere the field, locally, is sufficiently large to make work in a restricted area attractive. There can be no doubt of the desirability of a national body, but this organization must be composed of existing societies as bodies, and not of individuals. Only through such a body can subjects of national interest, such as a uniform standard goldfish, be decided with general satisfaction."

An event of considerable historic significance to the hobby occurred in October 1915 in the pages of AQUATIC LIFE when William L. Paullin published the account of the first breeding of the angelfish in America. It is reproduced here in its entirety:

> "After losing several lots of spawn, I have at last succeeded in rearing the scalare - the first time it has been bred in America. I obtained my pair when quite young, and have since kept them in large aquaria, holding 100 gallons or so. Contrary to other writers, I have found them very docile, and at times, though I do not recommend the practice, have kept goldfish in the same tank. While generally slow and stately, they are graceful swimmers, and can dash across the tank about as fast as any fish I have seen. In color the scalare is warm brown, the body and fins transversed by dark stripes. The long, slender rays of the pectoral fins are clear yellow. These extensions and those of the tail are easily broken, but soon grow again. Pterophyllum comes to us from the Amazon River, Brazil.
>
> "Scalare seems to be able to stand quite a variation in temperature. I have had it as low as 65 degrees Fahrenheit, and as high as 95 degrees, 82 degrees seems best, and is the temperature at which it is bred. While it will eat Daphnia and the dry prepared foods, it seems to prefer mosquito larvae, dragonfly larvae, water tigers, water boatman, and all the larvae that we fish breeders consider pests when found among Daphnia. It will take earthworms, but demands that the pieces wriggle, and be not more than half an inch in length.
>
> "On the day previous to spawning a leaf of *Sagittaria* is selected and both fish make every effort, but without success, to make it stand upright. The next day the female protrudes an ovipositor half an inch long, just in front of the sweeping anal fin. The organ of the male measures about an eighth of an inch. Both are retracted when spawning has been completed. Turning upon her side, the female deposits the first egg at the base of the leaf. The male with a similar movement fertilizes it. Egg after egg follows, until the leaf is well covered with a single layer. In the operation, the female after each egg descends to the base of the leaf, then arises and deposits the next egg immediately above the last, the male following in like manner. Thus a trip was made by each fish up and down the leaf for each egg deposited. Why the female thus proceeded is not clear, but this action by the male would have been to make doubly sure the fertilization of each egg. If, while the eggs were being deposited, one dropped to the bottom of the tank, it was greedily eaten by the first parent to reach it.

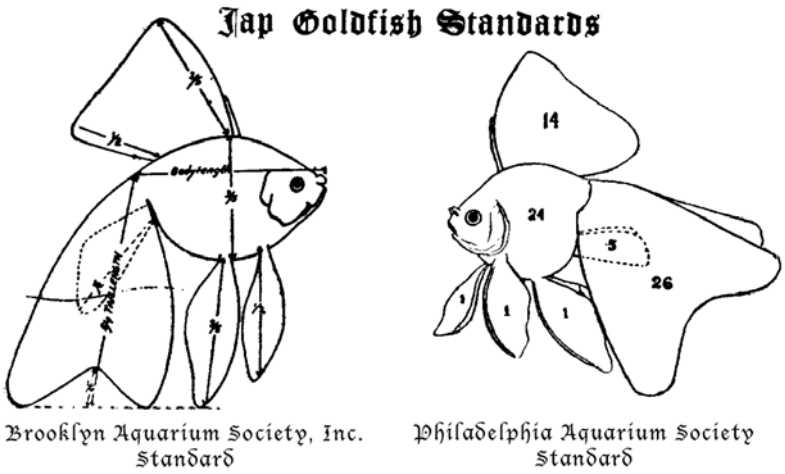


Figure 18-6. THE CONFLICT IN GOLDFISH STANDARDS, 1915. Note the difference between the "Philadelphia School" (RIGHT), and the Brooklyn proponents (LEFT).

"The eggs hatch in about two and a half days. The fry seem to merely protrude head and tail, and to retain connection with the egg. The young are now removed by the parents from the leaf and attached to another by means, apparently, of a tiny filament - a growth from the head. This operation is repeated daily. The young, while attached, keep up a constant wriggling. Should one fall it is replaced at once. While during this period the fry are carefully tended during the day, I found that at night the parents had a tendency to make an occasional meal of them. I prevented this by burning a 40-watt electric light just above the tank. After seven days the young having reached the free-swimming stage, I removed them to a smaller tank that had been standing for two months without fishes. This aquarium was teeming with infusoria. As they grew I fed Daphnia and mosquito larvae. At the present time the surviving young are about the size of a silver dollar, not including the fins."

When Paullin spawned his angelfish, brine shrimp were unknown and though this account dates from 1915, even today his electric light technique may be of help to some breeders.

In 1915 Charles E. Visel (Figure 18-8) was winning prizes in Eastern shows for his goldfish. It was to be another 19 years before his fame as the developer of the first fancy Guppy would set him apart as the "Father of the Fancy Guppy." In February 1916 AQUATIC LIFE published the first color photograph of an aquarium fish ever to appear in a U.S. magazine, a calico telescope goldfish. The aquarists of the hour included George A. Schenk (Figure 18-10), Christian Heede, George Smith (Figure 18-10), Dr. R. W. Shufeldt, Walter Brind (Figure 18-10), John Treadwell Nichols, William L. Paullin (Figure 18-10), George Price (Figure 18-10), Harry P. Peters, Frank J. Myers, Frank L. Tappan, W. H. Heimbach, Jacob Merget, Charles H. Rohrbach, Rev. Paul W. Roth, Perry Bruce Clark, Ernest Leitholf (Figure 18-10), and William E. Meehan, besides the others previously mentioned. Few, if any, are remembered today.

In 1916 killifish was sometimes spelled with a hyphen, i.e., "Killi-fish," and referred mainly to *Fundulus*, particularly *Fundulus heteroclitus*; aquarist was sometimes spelled "aquarian" and Poyser frequently

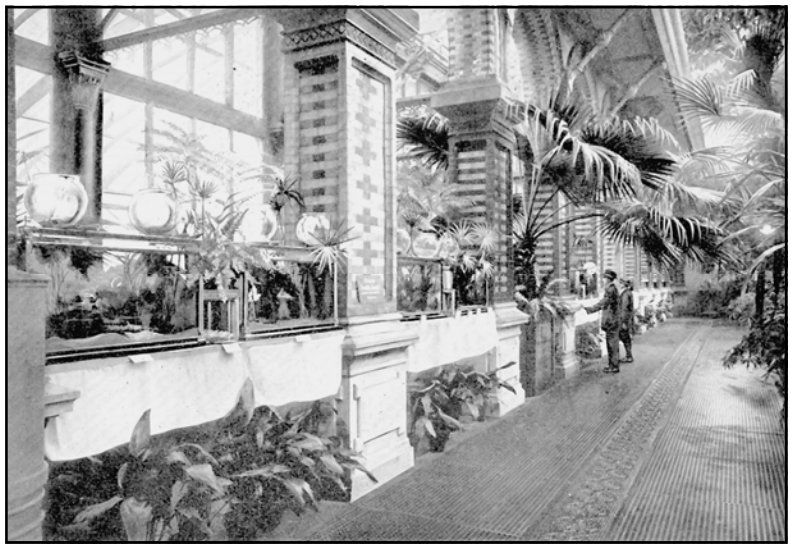


Figure 18-7. AQUARIUM EXHIBITION, HORTICULTURE HALL, PHILADELPHIA. This annual, five-day event attracted visitors from all over, often exceeding 20,000.

used this spelling; the Zebra Fish was *Leporinus fasciatus* not *Brachydanio rerio*; and aeration and heating were still rudimentary. Although goldfish standards were actively being developed (Figure 18-6), tropicals began to steal their thunder. At the New York Aquarium Society show held August 28-30, 1916 and featuring over 100 tanks, the following fishes were exhibited: Jewel Fish, Egyptian Mouthbreeder, Butterfly Fish, Dwarf Paradise Fish, Climbing Perch, Dwarf Gourami, Thick-Lipped Gourami, Blue Gourami, Zebra Danio, Spotted Danio, Pearl Danio, Giant Danio, Rosy Barb, Half-Banded Barb, Medaka, *Aplocheilus lineatus, Aplocheilus panchax, Epiplatys sexfasciatus, Aphyosemion australe, Rivulus tenuis, Rivulus ocelatus, Rivulus cylindraceous, Fundulus chrysotus,* swordtail, platy, *Gambusia holbrooki*, Guppy, *Heterandria formosa*, and species of native fishes of the sunfish and dace groups. Also in this year a section of the New York Aquarium Society conversing entirely in German was formed, with Dr. E. Bade as its presiding officer.

Of greater significance, however, was the first American spawning of a *Corydoras* species. The breeder was Frank Dungan, and the species in question was *Corydoras paleatus*. His account of the accomplishment follows:

> "When I first saw a Brazilian catfish, the panzerwel, as our German friends call it, I was rather fascinated, and this regardless of its somewhat somber color scheme of browns. Interest in a species, especially among aquarists, usually promotes a desire to breed it, more so if its habits be known, and in this respect I am not an exception. My friends could tell me little of the panzerwel, other than that it was an inoffensive and rather shy little fellow, and that it might be kept with goldfish. I was obliged, therefore, to proceed along lines that in my estimation were favorable to the desired end - propagation.
>
> "Specimens gradually were added at intervals to my collection, and I now have three males and two females. The species seems to be *Corydoras paleatus*. The coloration can be briefly described as yellowish brown, with dark or blackish markings, the fins speckled or spotted. The sexes may be distinguished by the relative shapes of the fore dorsal. The first ray of that of the female is noticeably shorter than the next, whereas, in the male the first ray is nearly as long as the next. The males are more slender than the females.
>
> "The panzerwel is a bottom fish, prowling timidly on the sand among the plants, and seldom rising. The tank in which mine find a congenial home contains a considerable accumulation of humus or sediment, the value of which will be-



Figure 18-8. PROMINENT AQUARISTS OF THE PERIOD. FROM LEFT TO RIGHT: A. A. PHILLIPS, JR., leading goldfish fancier of the Brooklyn area; CHARLES E. VISEL (1882-1962), a goldfish breeder in Brooklyn who was later to become the "Father Of The Fancy Guppy"; JOSEPH FROEHLICH, Vice President of the Brooklyn society; and W. H. HEIMBACH, of Allentown, Pa., another leading goldfish breeder.

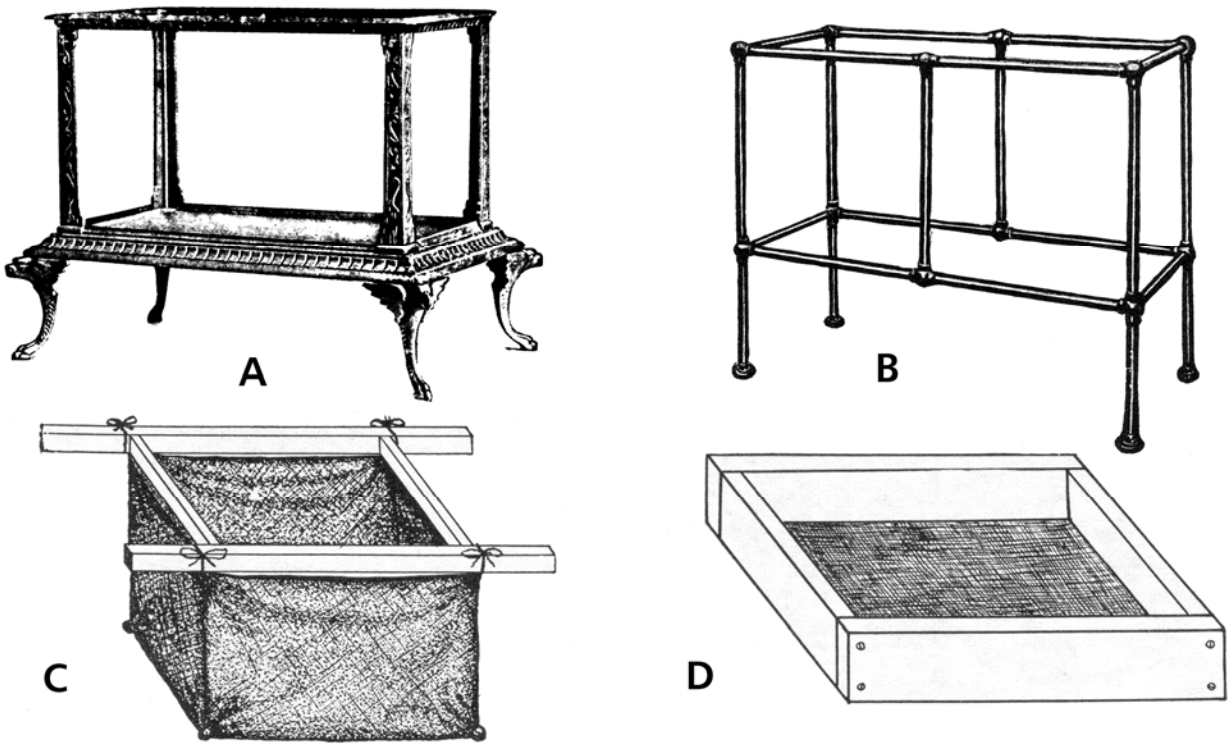


Figure 18-9. EQUIPMENT CIRCA 1915 –1916

A. Deluxe aquarium.
B. Pipe-iron aquarium stand
C. Spawning net (used suspended in an ordinary aquarium).
D. Daphnia screen.

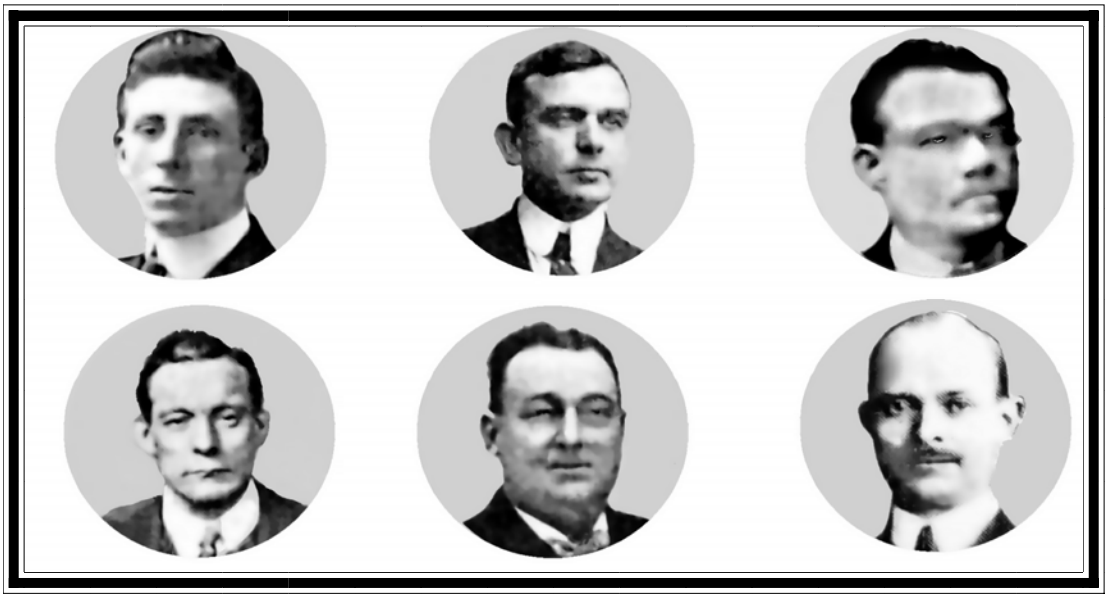


Figure 18-10. OTHER FAMOUS AQUARISTS OF THE PERIOD 1910-1920:
TOP FROM LEFT TO RIGHT: GEORGE A. SCHENK, President of the Milwaukee Aquarium Society;
WALTER LANNOY BRIND, Importer and Author; GEORGE B. SMITH,
President of the Philadelphia Goldfish Fanciers Society;
BOTTOM FROM LEFT TO RIGHT:
WILLIAM L. PAULLIN, first American to breed the angelfish; GEORGE W. PRICE, prominent goldfish breeder;
ERNEST LEITHOLF, frequent contributor to AQUATIC LIFE.

come evident later, and is sparsely planted with Sagittaria. It is in a rather sunny part of my conservatory, which promotes the development of algae upon the glass and plants - to the detriment of the latter.

"Spawning occurred on November 8, the day following the Presidential election, at 5 a.m., and continued for about three hours. (***Author's Note:*** **This was Woodrow Wilson, elected to his second term.**) The pair proceeded like goldfish, but the male "drove" the female much more rapidly, the spawn being scattered about promiscuously in a like manner. The eggs were pearly white, remarkably adhesive, and stuck tenaciously to the glass; none seemed to become attached to the plants. I counted 112 on the front glass alone. The aquarium was maintained at an average temperature of 70 degrees Fahrenheit, and in five days the eggs hatched; the fry dropped to the bottom and were lost to view in the feathery humus. Where each egg was attached to the glass a tiny white circle remained, and now, after two months, some may still be seen.

"The value of the deposit of sediment upon the bottom of the tank will now become evident, because, after the yolk sac was absorbed, the youngsters found amongst it the much needed infusoria. At this time they may be said to resemble tadpoles. I made no microscopically examinations, but as soon as they were large enough to be easily seen, they resembled closely the parents in shape and markings. Other than the minute animal and vegetable life naturally present in the aquarium, I have fed nothing but daphnia and the Cyclops that were collected with it. I have not been able to observe them eat the live water fleas, and it may be that the dead ones falling to the bottom are more acceptable. In any event they spend most of the time wiggling and wriggling about. Sometimes standing on their heads with tails aloft, rooting vigorously in the humus. At intervals one may wriggle up the side of the tank and nibble algae, but mostly they are upon the bottom.

"The youngsters seem to be quite adaptable to changes in temperature, as at the time the thermometer in their tank had registered as low as 58 degrees, yet they seemed as lively as when much warmer.

"I do not know just how many eggs were expelled, but surely more than the 112 counted. After the spawning the parents remained in the tanks for two days, and during this time they possibly ate such as had fallen to the bottom, but they did not molest those attached to the glass. The heaviest mortality occurred during the third and fourth weeks. How many are still alive is problematical; possibly twenty-five, or even fifty."

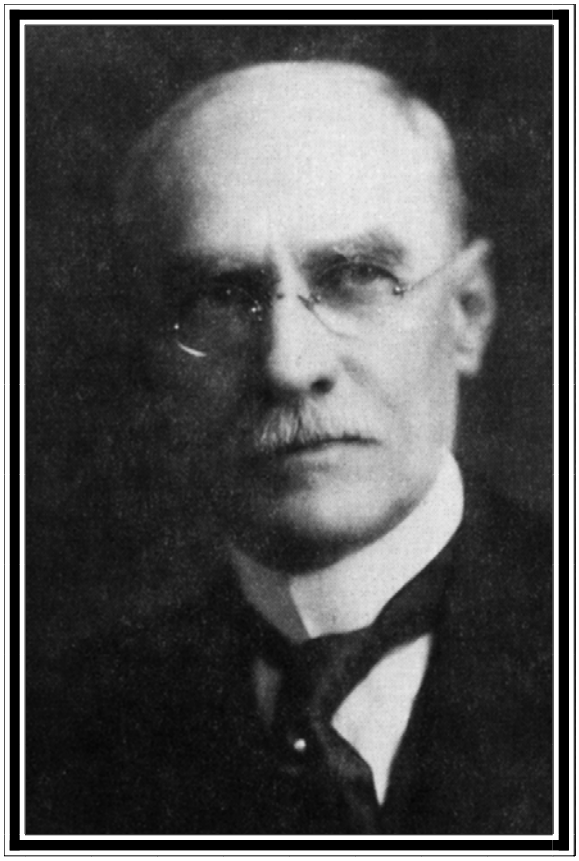


Figure 18-11. DR. HUGH SMITH (1865-1941)

CHAPTER 19: WORLD WAR I FISH IMPORTATIONS

Typical prices for fishes in 1917 were: platies 75 cents to $1.50 a pair; Zebra Danios and swordtails $1.00 a pair; guppies 25 cents a pair, *Aplocheilus lineatus* $1.50 a pair. A 2 ½ gallon tinned frame tank could be purchased for $1.75, an 8 gallon tank for $2, and a 10 gallon tank for $7.50. In terms of today's currency, these prices were quite high, especially for the 10-gallon tank. Interestingly enough, the sale of fish eggs was also known at the time, and Medaka eggs could be bought for $1.00 a dozen.

The following is taken from Frank Locke's (Figure 19-2) reminiscences in which he discusses the prices paid for angelfish, the tremendous problems encountered in transporting fishes from the East to the West coast, and his "infernal machine" designed to resolve the latter problem. It offers a penetrating insight into the hobby of 1917.

> "About 1916 or 1917, there were in the neighborhood of a dozen varieties of tropicals to be obtained from Eastern sources, but very few, if any, were imported through the Pacific Coast. The prices on everything of this nature were so very high it was looked upon as a hobby in which only people of exceptional means could indulge. (As an example, we will take the rosy barbus. The first pair of these fishes, bred in San Francisco I believe, were two that I procured at the bargain price of $4.00.) In 1917, I had saved enough money through sales of surplus tropical fishes, to send to Philadelphia for a pair of scalare. These were obtainable through one source - namely, William Paullin, who was the first tropical fish breeder to propagate this variety (he bred them in 1915). The cost of this pair of Pterophyllum was $75.00, with positively no guarantee whatsoever of their condition on arrival. Sad to relate, mine arrived dead and I was very much chagrined.
>
> "A second attempt was made a year later to obtain some of these scalare during a trip I had taken to Eastern points in an endeavor to obtain new varieties for the Pacific Coast. Such poor success attended all shipments of tropicals at that time that it became almost necessary for one to personally transport them if they desired a minimum of losses. Of the many places visited during this trip, it was practically impossible to persuade anyone possessing Pterophyllum scalare to part with them. By this time, almost all those originally bred by Mr. Paullin had reached maturity and the various fanciers and breeders who possessed them were loathe to part with them, all feeling that they were on the brink of the unexpected, namely, duplicating William Paullin's original breeding technique.
>
> "Despite anything which might be said to the contra-

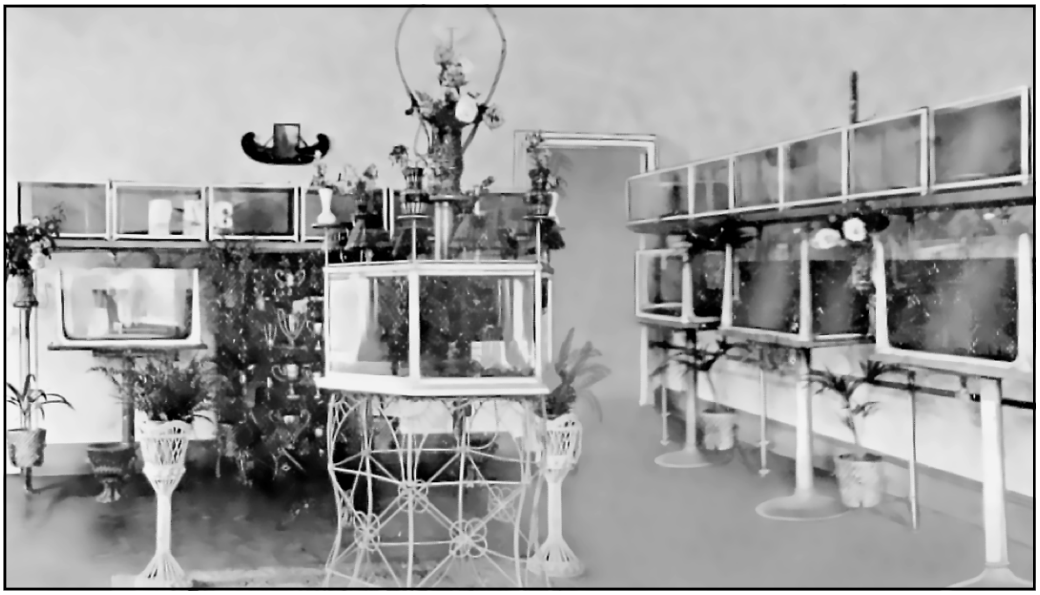


Figure 19-1. AQUATIC LIFE practiced what it preached! The offices of AQUATIC LIFE, 1922.

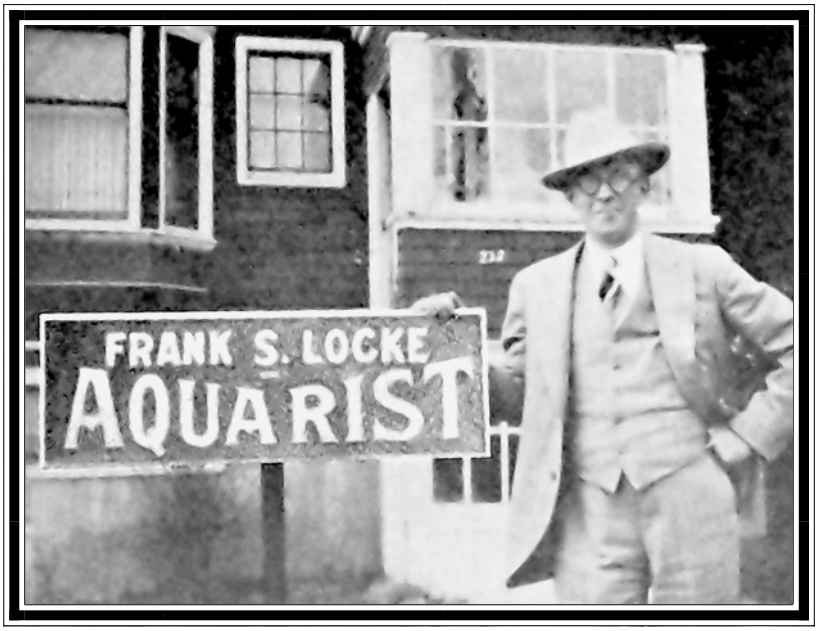


Figure 19-2. ONE OF THE PIONEERING AQUARISTS OF THE WEST COAST, FRANK S. LOCKE.

ry, it was several seasons before anyone in the East was successful in propagating this fish and shipments of young were being regularly received at New York from Germany. (***Author's Note:*** **The next to breed them was Franklin Barrett in 1921. By 1927, only Paullin, Barrett and Julius Riewe of Chicago, had bred scalare in America.)** These found a ready market at from $175.00 to $200.00 a hundred. This was considered a fair bargain inasmuch as they were selling at anywhere from $7.50 to $10.00 a pair in the Eastern States and from $10.00 to $15.00 a pair on the West Coast.

"The mortality in the shipments of angelfishes trans shipped from New York to San Francisco was terrific. It was not unusual to have an entire shipment of one hundred, divided twenty to a can, arrive a complete loss. The express charges would usually be from $35.00 to $40.00 on the shipment. The arguments and strife surrounding these angelfish shipments between the eastern shippers and various dealers throughout the United States would fill a book, I imagine. There seemed to be no possible way at the time to ascertain just why one hundred scalare would arrive in such fine condition two weeks ago and upon the encouragement of this fact, a second order, routed along the same lines, would arrive dead.

"At the time of my trip, of which I spoke above, I had positively determined to bring back a large breeding pair of these fishes. The one man willing to part with two of them wanted $75.00, the original selling price. I had my hands full as it was with many other varieties gathered in several different towns and was loathe to spend so much money for two fishes whose sex then appeared an unknown quantity. It would have been necessary to transport them in a separate container, and inasmuch as all my paraphernalia was kept on or about my person, another huge container just seemed out of the question. These aristocrats of the tropical fish world were unceremoniously turned down and the $75.00 was allowed to repose in the wallet for future use. I had gathered many interesting varieties which heretofore had never been seen on the Pacific Coast, and the manner in which I transported them was really quite unique. These were brought through from the Eastern Coast and during a stopover on the way home, were subjected to a terrific ordeal of heat. I do not think I have ever experienced a temperature, the like of which I encountered on my arrival in Chicago,

"Many types of containers for transporting tropical fishes have made their appearance from time to time - some of them of real value, others really not possessing much merit. When I took the long trek to eastern points for the purpose of enlarging my stock of tropical fishes, the so-called 'thermos' container was practically an unknown quantify as far as shipments of livestock were concerned. At that time, tropical fish shippers were so few and far between that each individual seemed to develop a pet shipping container of his own, most of them adhering to a packed or insulated type shipping can.

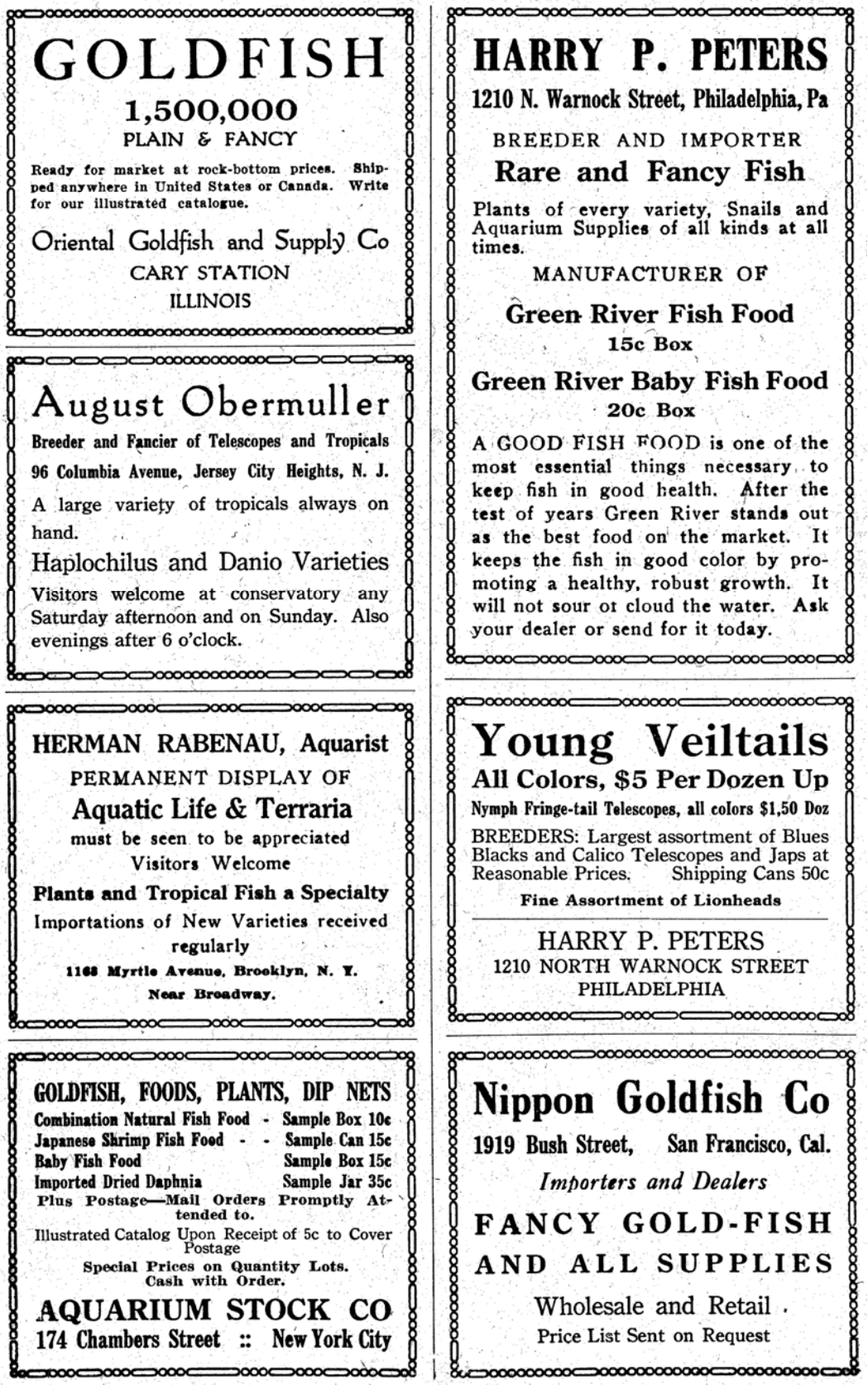
"All of these containers of which I speak were used to transport fishes by way of express company facilities, with no thought in mind of using them for personal transport purposes. The cans were of the one compartment replacement type and usually very bulky. Sometimes that would be a terrible burden to carry at the end of either arm for any great distance. This difficulty had to be overcome if I expected to scurry from spot to spot in different towns, picking up the many varieties that I had mentally resolved to bring back. With the idea of conserving space and weight, and at the same time allowing me to carry a great number of fishes, I designed a carrying case 30 inches long by 12 inches wide by 20 inches high, no small receptacle when we consider its dimensions; yet, the purpose accomplished was considerable when I look back and recall its small size.

"On one end of this case, a separate compartment was constructed, six inches by 12 inches by 20 inches in height. In this was installed a specially built air tank capable of holding 200 pounds air pressure. It was tested to 350 pounds before it was installed. All the lines were hooked up to a single opening by means of tees and crosses of one-eighth inch pipe. Just sticking out the end of the case, we had a valve, similar to the valve on any automobile tube, which was used to fill this tank. A high grade foot pump, double barrel, 20 inches high was our means of air supply for this tank when we were unable to walk up to an easier source, i.e., a bicycle shop or automobile gas station. A gauge, whose face was plainly visible outside, told us the maximum pressure in the tank. We seldom had more than 150 pounds pressure. This would last overnight, with considerable pressure to spare. A pressure regulator was installed on the line which aerated 10 small receptacles carried in separate compartments inside the case.

"These small receptacles held a quart of water each, and were constructed from brick ice cream tins. They were chosen at the time because of their durable strength and reinforced sides, and also because five of them just fit nicely in the space I had allotted for their set up. A narrow splash rim, one-fourth inch, entirely around the top of the tins, one-half inch from the edge, kept water from splashing out and acted as a fine type of agitator whenever the going was rough. A glass cover set down on this rim was always in place, inasmuch as it could not get away. Each glass cover had a small hole, 3/16 inch, drilled in one end. Through this, a piece of 1/8 inch block tin tubing was used to hold a small aerator in the water. A pair of rubber gaskets, top and bottom of the glass, held this block tin aerator in place. Small pieces of porous wood were used as aerator releases. The pump had a compartment inside at the top. We also had another little extra space where spare rubber tubing, tubing fittings, extra air releases, and spare vales for our line were kept.

"Each individual tank had its own spare valve to control the amount of air passing through the releaser. This was found necessary, inasmuch as no two pieces of wood would seem to release the same quantity of air as its neighbor, one robbing the other. These valves were brought from the east at the time through Mr. William T. Innes, who was kind enough to chase them down for me, and were to be obtained only through Germany for many years. The price was very high then, but no other valve of this type was obtainable; so a dozen of them were bought and after our trip were used for many years in the hatchery where they gave fine service. I am not mistaken when I say that a few of them are still doing duty at the present writing. (***Author's Note:*** **This was in 1937.)**

"Above each row of tanks, consisting of five cans in a row, we had two hooks, ordinary brass hooks such as are used to hang up pots. These hooks were about 12 inches apart. Two hot water bottles (rubber) with a metal hanger on each



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Figure 19-3. POST WORLD WAR I ADVERTISERS. Other noted advertisers of the time included Henry Kissel, Jr., Hugo C. Nelles, O.C. Beldt, Henry L. Wagner, and F.L. Tappan.

end were filled with hot water and stretched out between these two hooks if the night on the train bid fair to be chilly.

"One entire side of this carrying case, with the exception of a two inch frame for its foundation, consisted of a piece of quarter inch plate glass through which a thermometer, screwed to the back wall of both decks, was always visible. A glance would tell one exactly just what the temperature was inside the can. During our traveling, the outfit was kept in the gentlemen's dressing room, and on many occasions, we were able to place it so that the sun shone on the glass face and kept the fishes in a state of calm, which does not seem to be the case where they are in a darkened can for five or six days



Figure 19-4. AFTER WORLD WAR I THE GERMAN EXPORTERS RESUMED THEIR INTRODUCTION OF NEW AQUARIUM FISHES INTO THE UNITED STATES. Wilhelm Eimeke (an angelfish – *Pterophyllum eimekei*– was named in his honor) was one of the most important exporters of the time.

across the continent. This, I think, is really a very important feature in the transportation of tropicals. I am confident that the morale of the fishes is of a much higher nature than when they were kept in complete darkness for such a great length of time.

"A large and comfortable handgrip was obtained from a local trunk factory and this was installed on the outer top by means of small brass machine screws that went entirely through the case. An auxiliary ring was placed exactly in the middle and over our shoulder, a comfortable two inch strap with a snap hook at one end, added quite materially in sustaining this 'infernal machine' in its flight through the air from place to place. As I look back upon the miles it was actually carried, I feel like shuddering a bit at the thought of having to go through it again; yet, twenty years ago, my enthusiasm and my muscle were about evenly balanced; one never getting entirely the better of the other.

"That was one receptacle, but strange as it may seem, we had another. Eighteen inches square by 10 inches high, it had at one time been the carrying case of an accordion. This was found down on McAllister Street in one of those places that carry such cast off paraphernalia and seemed to be just what I was looking for when I bought it. The side opened down and the top opened up, giving full access to the interior. This was a very well built case and was lined with plush. Of course, the plush was not necessary, but inasmuch as it was there, it was allowed to remain there. A metal receptacle, exact dimensions of the inside, was made and when it was completed another one, one inch smaller all round (which was to be our container proper) was built into the former and the space between these two metal receptacles was packed with ground cork.

"The inside receptacle in which the fishes were to be carried and which held the water was divided into three compartments with a splash rim around the entire surface of the can, under

which small pieces of silk sponge were wired in place. Between each compartment, six inches from the bottom, several small 16th inch holes were drilled so that the water could pour back and forth to agitate it. The sponges were remarkably efficient aerators, inasmuch as any water that splashed into them and ran back naturally became surcharged with air that was present in the receptacles. I took this along for the purpose of carrying any larger fishes that I might bring back with me and frankly, found it to be more cumbersome than the "infernal machine" case of which I spoke before.

"Coupled with these two monstrosities, I naturally had a bag in which I carried my personal belongings and such other things as were absolutely necessary to keep me going. I had one suit when I started. When I got to New York, I bought another, shipped the one I was wearing from New York to Philadelphia (after it was cleaned). There I picked it up at Mr. Inneses home and just before I was ready to leave to start home, I changed suits again and shipped one home. So, I managed to travel as light as possible as far as clothes were concerned.

"Yet, If anyone imagines he would like to take a pleasure jaunt with an "infernal machine" in one hand (which was the name attached to it by members of the train crew), a heavy carrying case in the other, and a bag slung over his back, he would probably feel he should have his brains examined as mine should have been at the time I undertook this trip. Anyway, it was not in vain, for I did bring back a lot of fishes to the West Coast; and despite the fact of terrific temperatures in Chicago, where my charges were given a swell swim in the bathtub to cool them off, we lost but two or three on the entire journey, which seems to me to a pretty good record. They were fed only once; and that was during our stop at Chicago through a friendly connection, a brother fish fancier, Dr. Preusker, from whom we obtained a feeding of white worms (enchytrae) which had to suffice for the rest of the journey."

As a passing comment, a New Jersey Aquarist - Otto Gneiding - owned a jet-black moor goldfish that during the War turned from black to red, white and blue. This fish became known as "Miss Liberty" and was used to help sell Liberty Bonds. The fish was valued at $5,000 and lived for more than 20 years!



Figure 19-5. OTTO GNEIDING.



Figure 19-6. INNESES *Goldfish Varieties and Tropical Aquarium Fishes* WAS FIRST PUBLISHED IN 1917. This is an ad for the book that appeared in 1927, touted as the "Best Book on the Aquarium and Allied Subjects."

CHAPTER 20:
ROTH & MELLEN

In October 1917 a new aquarium magazine appeared on the scene. Named THE AQUATIC WORLD (Figure 20-1), it was published by August M. Roth who, at that time, owned a printing and publishing firm in Baltimore, Maryland. For some years prior to this date Roth published PET SHOP NEWS and THE PET STOCK WORLD. In the latter magazine which, by the way, was the first pet trade magazine in this country to publish fish news, a regular column appeared under the name, "The Aquarium World." Roth decided to expand the column into a complete magazine and, to this purpose, secured the services of S. Chichester Lloyd, of St. Louis as Editor. Lloyd, readers will recall, was the founder and president of the so-called "National Aquarium Society of America" that had been taken to task previously by the Editor of AQUATIC LIFE for its misleading name. This was evidently characteristic of Lloyd as his earlier organization, The American Federation of Goldfish Fanciers, was in reality merely another Brooklyn society. THE AQUATIC WORLD was a monthly, consisting of 18 pages and selling for 5 cents a copy or 75 cents for a year's subscription. In addition to what was written by Lloyd, J. Henri Wagner, a Washington, D.C. dealer, supplied material, and articles from the notables such as Heede and Brind also appeared. The magazine devoted a good deal of space to society affairs and questions and answers, its theme quickly being set in the first issue by the following editorial entitled:

"A Little Difference In Magazines

Magazines devoted to the study or interest of aquatic life seem to be in two classes. The Advanced or the Useful. There does not seem to be any alternative.

"A magazine which devotes its columns to descriptions of new fishes of tropical varieties or other sorts not needed or known in this country, has its purpose in arousing interest in the different exotic forms, but the real need these days with a population of a hundred million people (only about a thousandth percent of which knows anything about the care of fish), is a magazine devoted to the newcomer in the fish fancy. It is our endeavor to make this magazine a "melting place" for all these newcomers who will derive from any of its issues at least one or two grains of knowledge which will be of value to them in the actual keeping and care of the fish. After they have obtained a working knowledge of the fish keeping pleasure it is time enough to become involved in the more expensive and rarer forms, the care of which is a thing not to be lightly undertaken.

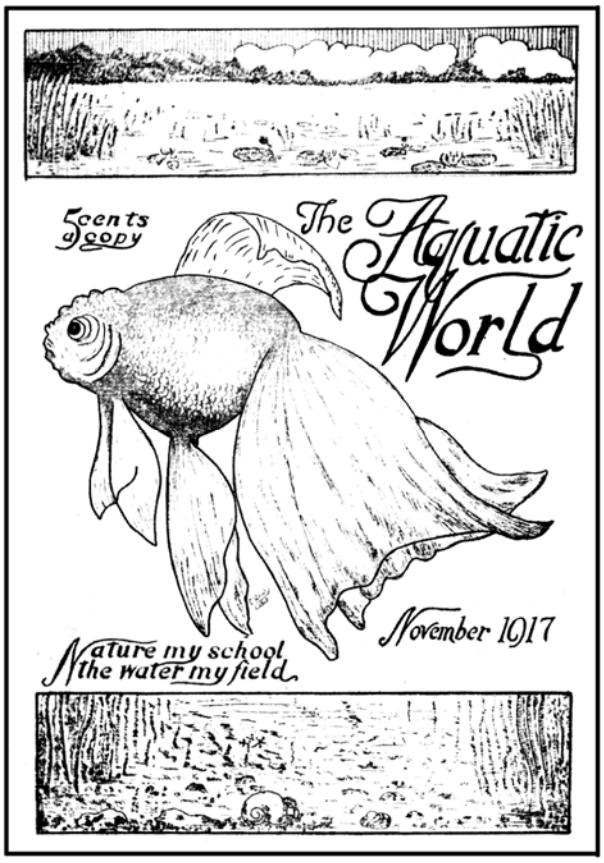


Figure 20-1. THE FRONT COVER OF THE AQUATIC WORLD, NOVEMBER 1917 EDITION. This magazine marked the first serious appearance of August M. Roth in the aquarium publishing field. Unfortunately, the magazine failed after only three issues. Note the motto on the cover: "Nature my school, the water my field." This motto was to be used by Roth in a subsequent publishing attempt, one that met with considerable success.



Figure 20-2. THE "WATER QUEEN" AQUARIUM, manufactured by the Pioneer Aquarium Company. It came in four sizes: four, eight, eleven, and twenty gallons. Although aquaria could be safely shipped anywhere by freight in 1915, the company was willing to ship these tanks without glass and with or without the feet or floor stand.

"Out of the thousands of letters I have received from fish fanciers all over the United States asking for information regarding the care of their fish there are two points which stand out from all the rest. These are: The changing of water and the feeding. These two are the most important of all the points to be studied and yet they are the simplest of all.

"While we shall devote these pages to hints and the answering of questions on fish and aquarium topics, we shall not lose sight of the interest-arousing features of tropical and other rare forms of fishes; therefore, we suggest that any of our subscribers or readers who have forms of fish they have succeeded in keeping with pleasure and interest, write us a brief description of the fish, and telling us of their experiences. These will receive due space and it is not necessary to be an experienced writer in order to tell your story. The editorial end of it will be taken care of and your story presented in readable form. An exchange of ideas of this kind will do more to benefit the fish fancy than any technical article that we could print here.

"Remember that this magazine is written by you and for you, and the other fish fanciers of this country. It is just your magazine as my magazine, or the publisher's. Therefore, we ask you to contribute anything in the way of a story that you have in mind."

The magazine, which Lloyd asserted "... devotes its columns to descriptions of new fishes of tropical varieties or other sorts not needed or known in the country..." was, of course, AQUATIC LIFE. Clearly Lloyd never forgave Poyser for his criticism of the naming of the "National Aquarium Society." True to his word, however, THE AQUATIC WORLD devoted much space to what would be considered beginner's material today. The editing, unfortunately, was clumsy and inept, and the concept of a magazine devoted to beginners did not meet with success. Ironically, in the first issue there appeared an advertisement for a "New Aquarium Book," i.e., the first of the numerous editions of *Goldfish Varieties and Tropical Aquarium Fishes* by William T. Innes. As this book summarized the principles of fish keeping as understood in 1917 quite adequately for the beginner, in a sense it reflected the inevitable failure of THE AQUATIC WORLD as a viable concept. Magazines are periodicals and, as such, must focus on what is timely and what is news. THE AQUATIC

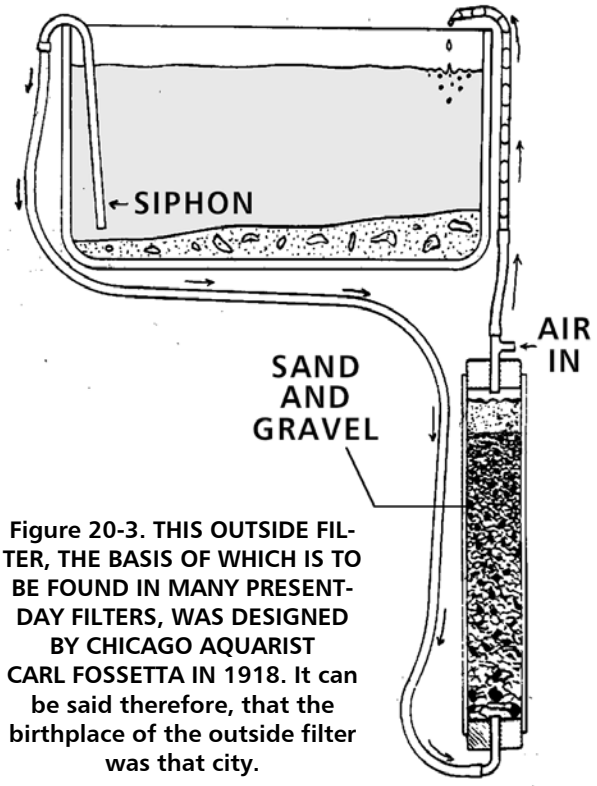


Figure 20-3. THIS OUTSIDE FILTER, THE BASIS OF WHICH IS TO BE FOUND IN MANY PRESENT-DAY FILTERS, WAS DESIGNED BY CHICAGO AQUARIST CARL FOSSETTA IN 1918. It can be said therefore, that the birthplace of the outside filter was that city.

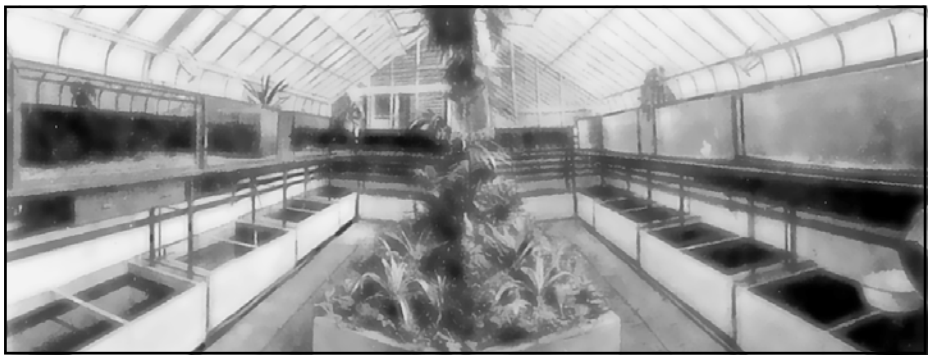
WORLD learned this lesson in December 1917 when it ceased publication after but three issues of life.

Since the publication of *Goldfish Varieties and Tropical Aquarium Fishes* has been mentioned, a brief discussion of its history is in order. As time went on, Innes clearly saw the need for a revision of Wolf's 1908 book *Goldfish Breeds and Other Aquarium Fishes*. What it needed now was added material about tropical fishes but Wolf, the old goldfish man that he was, would not agree to co-authorship of a revised edition of his book. Therefore Innes bought the copyrights from Wolf and agreed to pay a royalty. He then rewrote and re-illustrated portions of the book, and contracted with Walter Brind to write the tropical fish section, the last fact little known in the hobby. Brind, however, did not contribute to subsequent editions of the book that, in 1932, was to reach its 15th edition. It was an outstanding reference work, reflecting the genius of both Wolf and Innes, and was a cornerstone publication of the hobby for many years.

The hobby was, however, still in its infancy and the matter of correct spelling of even basic terms was still in doubt. The following account, written by Ida May Mellen (Figure 20-5) in 1918, discussed the merits of "Aquarist" versus "Aquarian":

"What is the correct title for a person who understands the management of aquaria? For some years this has been a vexed question. Aquarian, aquarium-keeper, aquarist, and other names have been given. A similar difficulty accompanied the selection of the word to describe a receptacle or building containing live aquatic plants and animals, aquavivarium and other names having been used before aquarium was finally settled upon.

"The euphonious and unique name of 'Aquarial Garden' was bestowed upon an aquarium opened in Boston in 1860. Prof. E. S. Morse, President of the Boston Society of Natural History, thinks it may have been suggested by Agassiz, who was greatly interested in the institution. The *Leisure House* of 1864 states Agassiz 'may frequently be seen walking towards the Boston Aquarial Gardens'. The histories and guidebooks of Boston cov-





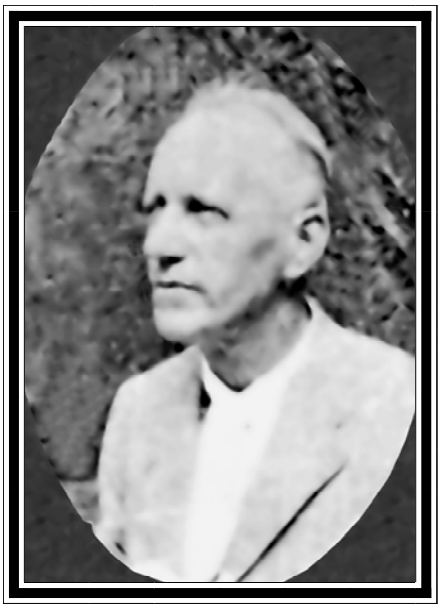


Figure 20-4. TOP: THE CONSERVATORY OF A.A. PHILLIPS, JR., LEADING GOLDFISH FANCIER OF THE BROOKLYN AREA, 1916.

BOTTOM LEFT: IN 1916, WILLIAM H. HEIMBACK TRAVELED BETWEEN HIS HOME in Allentown, Pa., to Philadelphia, Brooklyn, and New York to lecture on goldfish. He devised these unique carrying cases for his fish.

BOTTOM RIGHT: WILLIAM SCHAUMBERG, of Crescent Fish Farms, American fish farm pioneer.

ering that period tell very little about the opening of the Aquarial Gardens. It is interesting to learn from Prof. Morse that the exhibition consisted of individual aquariums around the hall, and in the center a high tank, in which seals, a shark and other animals were displayed. Afterwards a group of Africans, Zulus, Hottentots, and other Negroes danced and sang on the stage.

"Such awkward words as aquavivarium and aquarium-keeper are not likely to become popular. A new book in our Aquarium library, published 60 years ago in London, is entitled *The Aquarian Naturalist*. This is typically English. From old American dictionaries we learn that aquarians were members of a heretical Christian sect that flourished about the middle of the eighteenth century and were so called because they used only water at the Lord's Supper. *Murray's English Dictionary*, at present the standard dictionary in England, gives this definition and also defines aquarian as 'One who keeps an aquarium'. It also states that the word has been used, though rarely, as an adjective, an article in the ILLUSTRATED OBSERVER for 1865 being entitled 'Aquarian Principles.'

"The word aquarist was adopted some years ago by the New York Aquarium. In perfectly correct form, probably, it should be aquariist; but the contraction is preferable. The publishers of the *Century Encyclopedia*, conferring with the offices of the Aquarium on the subject several years ago, stated that in view of our adoption of the word, its usage would be regarded as established, and they proposed inserting it in the next issue of their encyclopedia. This has not yet been printed.

"Mr. W. A. Poyser, Editor of AQUATIC LIFE, revived the word aquarian 1916, and has since used it in his magazine, though he also uses aquarist. Mr. Poyser advised the writer this summer that he had received intelligence of the formation of an astrological society in Boston for the purpose of studying mental, moral and physical effects of planets on human beings. As the world was passing through the portion of the universe determined by the sign Aquarius, the society was named The Boston Aquarian Society, its members being known as aquarians. Mr. Poyser's informant expressed a humorous fear lest a confusion of the titles aquarian and aquarist lead to the latter being accused of star-gazing. But however that might be, aquarium lovers may take assurance from the moral in the old story about the little boy who, being a star-gazer, finally fell into a pond while looking skyward which only shows that he was obliged to direct his attention to aquatic life sooner or later.

"It is true that the word aquarian has proved versatile, having found a place successfully in the realms of religion, pisciculture and astrology; but aquarist, being capable of a single construction, seems to hold the advantage."

Ida May Mellen made her mark early on with articles such as, "The Fresh-Water Shrimp," which appeared



Figure 20-5. IDA MAY MELLEN (1877-1970).

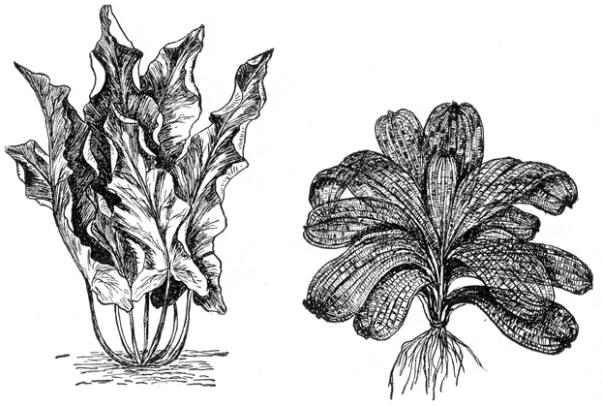


Figure 20-6. TWO CENTER PLANTS commonly used in the late 1920's. Left: Southern Spatterdock; Right: Madagascar Lace Plant.

in the N.Y. ZOOLOGICAL SOCIETY BULLETIN in 1919; "Effects of Captivity on a Sex Character," which appeared in "SCIENCE" in 1922; and "Goldfish Mortality," which appeared in the PET DEALER in 1928. She also wrote books on fish diseases, cats, pigs, and gardening, wrote poems, lectured, and gave radio talks. In 1931 she introduced the term "toy fish" into the hobby and, last but not least, she has also with some justification been described as "one of America's foremost zoologists."

Mellen wrote one of the early Post World War I books on fish keeping in America, *Fishes in the Home*, published in 1927; in that same year she also wrote the *Young Folk' Book of Fishes*. As just indicated, Mellen was also interested in the origin of words and their usage. In 1927 she wrote two articles for AMERICAN SPEECH, "Fish or Fishes" and "The Goldfish Puzzle." This was followed in 1928 with another AMERICAN SPEECH article, "Aquarium English."

Mellen also wrote the first article that described the tropical fish hobby in detail, i.e., "Tropical Toy Fishes," which appeared in the March 1931 issue of NATIONAL GEOGRAPHIC, the subtitle to the article being "More Than 600 Varieties of Aquarium Pygmies Afford a Fascinating Field for Zoölogical Study in the Home". The breadth of this article can be appreciated by its subheadings: "Fish 'Fans" Succumb to Beauty and For," "Where the Dwarf Fishes Come From," Biological Curiosities Make Titbits for Filipinos," "Substitutes for Live Food," "Father Frequently Cares for Fry," "Popular Plants for the Aquarium," "Biological Sports Are Not Sought"," Pygmies at Birth Resemble Two Large Eyes," "Devices for Conveying and Caring for Toy Fishes," "Public and Private Collections of Fishes," and "A Fish 'Fan's' Dream of Paradise. In addition there were detailed descriptions of 26 selected species of the most popular aquarium fishes including representatives from cichlids, characins, catfishes, killifishes, anabantids, barbs, and livebearers. It was nothing short of a tour de force of aquarium hobby writing. The article was accompanied by eight plates from paintings by Hashime Murayama illustrating 31 aquarium fishes in color. Murayama had done the color portraits in the "The Book of Fishes," an extensive work of 243 pages on marine fishes newly published by NATIONAL GEOGRAPHIC.

Her real masterpiece, however, was the monumental *1001 Questions Answered About Your Aquarium*, coauthored (she was the senior author) with Robert J. Lanier in 1935.

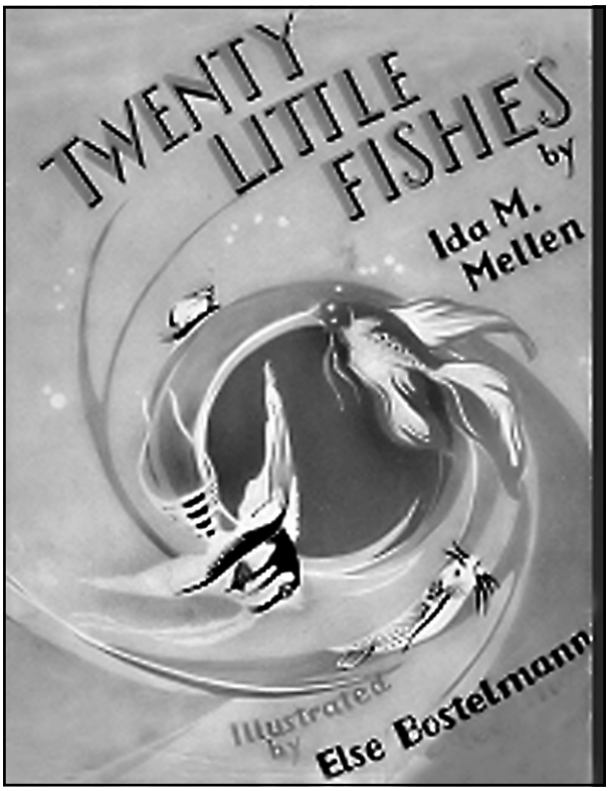


Figure 20-7. *Twenty Little Fishes* BY Ida M. Mellen. This small booklet was written just before World War II started and was published shortly afterwards in 1942, making it one of the last aquarium publications written in the period covered by this history (AQUATIC LIFE suspended publication in 1942).



Figure 20-8. THE FOURTH ANNUAL EXHIBITION OF THE BROOKLYN AQUARIUM SOCIETY, 1915. Fourteen thousand people attended and there were 355 separate exhibits. Winners included Charles E. Visel (largest and best display), Manufacturer A.A. Phillips, Jr. (largest balanced tank), William H. Heimbach (Calico Telescopes), Herman Rabenau (native fishes), and Franklin Barrett (Lion-heads, Celestial Telescopes and Orandas).

In 1927 the LaMotte Chemical Products Co. brought out a pH kit based upon William O'Brian's investigations discussed in Chapter 22. The kit was termed "The O'Brien Aquarium Tester" and contained chemicals used to adjust the pH of aquarium water. To reduce alkalinity the O'Brian kit used hydrochloric acid, but this disappeared from the aquarium overnight. It was suggested to Mellen by a chemist friend, Edward R. Hewitt, that phosphoric acid would remain in solution and would not attack the glass as hydrochloric acid does. Experiments at the New York Aquarium proved this chemical excellent for the purpose and the results were published by Mellen in AQUATIC LIFE the following year, and the LaMotte Company substituted phosphoric acid for hydrochloric acid in the O'Brien set.

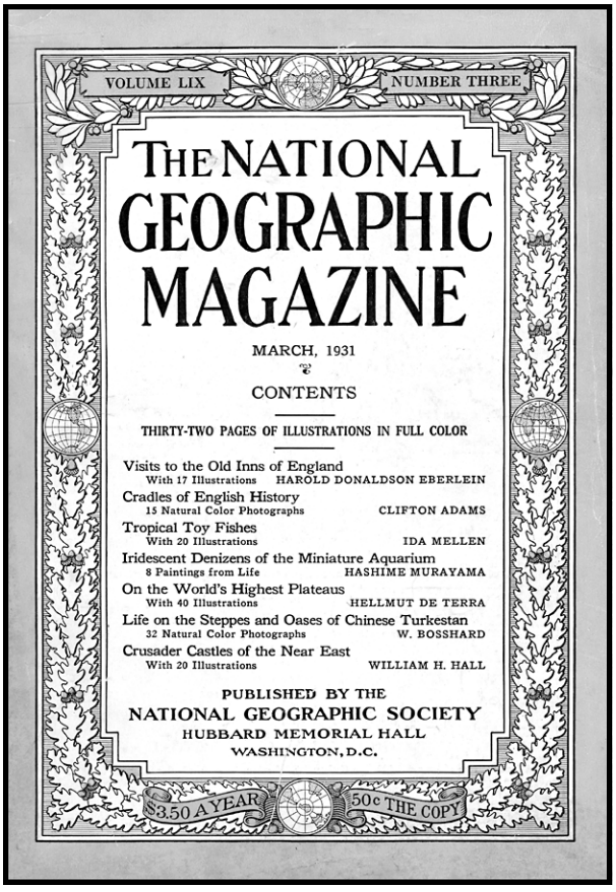
In Stage III of the aquarium hobby in America, which started in the mid 1800's, it was the salt water side of the hobby that predominated at its start. As time passed, interest in the marine side waned and then when the hobby entered Stage IV at the beginning of the 1900's, it disappeared almost altogether. Ida Mellen, however, revived the concept in with the following article that appeared in the January 1918 issue of AQUATIC LIFE:

"Salt Water Aquaria at Home
Ida M. Mellen, Secretary,
The New York Aquarium

"The peculiar beauty and charm of animal and plant life in the sea arouses in our minds a natural craving to enjoy it close at hand. This is a comparatively easy feat for residents of the coast, who may collect plants and animals for themselves and procure plenty of sea water; but for the inland aquarist it is a matter requiring more delicate care and closer concentration.

"Salt water can be shipped inland from the coast with the animals and plants. Formulas for the preparation of artificial sea water have been devised, but we do not know of any one who has succeeded with them.

"That salts in water are not subject to great evaporation, is illustrated by the eternal salinity


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Figure 20-9. The NATIONAL GEOGRAPHIC ISSUE THAT CONTAINED IDA MELLEN'S COMPREHENSIVE ARTICLE ON THE AQUARIUM FISH HOBBY, "Tropical Toy Fishes."

of the seas, whose evaporation is replenished by water from the rivers that constantly flow into them; and though they acquire some additional salt from the rivers, their loss of that substance is so small that the new salt acquired really adds to their salinity. It is therefore quite practicable to replace loss through evaporation in the salt water aquarium with fresh water from the faucet once a week; and a watering can is very good for the purpose.

"It is 75 years since the first salt water balanced aquarium was established in England, and many experimenters have been at work in the field since that time; but for the effecting of a perfect balance of marine animals and plants it is still difficult to advance any unfailing recipe. As with freshwater forms, the animals depend largely upon the oxygen thrown off by the plants, while the plants take up the carbonic acid gas exhaled by the animals; and, as with fresh water, the aquaria whose capacities are measured by the gallon are more satisfactory than those holding only quarts. There is small danger from an excess of plants, but too much animal life is certain to prove fatal. All-glass aquaria are the best for salt water, and are the only kind used at the New York Aquarium for small marine balanced aquaria.

"Marine collections of the "happy family" order are successfully maintained at the New York Aquarium in eight-gallon jars, with two kinds of plants, and as many as eleven forms of animal life. The plants are the red alga *Soleria chordalis*, sometimes attaching itself to rocks, and again living free at the bottom, and the green sea-lettuce (*Ulva latissima*) buoyed with bits of cork to cover two-thirds of the surface and allowed to hang down ten inches from the top on the side of the jar nearest the light. The animals are:

Northern white coral (colonies ranging
In size from 2 to 6 inches in diameter).
Brown anemones (3 or 4).
White anemones (3 or 4).
Tunicates (*Molgula*) (3 or 4).
Killifishes, 2 inches long (2 or 3).
Variegated minnows, 2 inches long (2 or 3).
Prawns, 1-1/4 inches long (2 or 3).
Young eels, 3 or 4 inches long (1 or 2).
Mud snails (*Nassa obsoleta*) (1 to 12).
Oyster (1).
Little-neck clam (*Venus mercenaria*) (1).

"Warning has been given the beginner by some aquarists to limit his animals one to the gallon of water. It can be seen from the list just given that a gallon will accommodate more than one animal - even more than four - but in experiments with marine aquaria too much moderation cannot be urged at the start.

"Sea-lettuce is absolutely essential for the balanced aquarium. Other plants may be used with it, as the red alga called 'Flame weed' (*Grinella americana*); and dead, sun-dried hydroids such as *Sertularia argentea* and *S. pinnata*, make good ornamental effects.

"Other animals which can be successfully confined in balanced aquaria are small mussels - say a quarter of an inch in length, rock barnacles, annelids (especially the tube dwellers), and very small crabs. Large crabs tear the plants and catch the fishes, but small specimens of the mud and spider crabs one-half inch or so in diameter, are interesting (crabs being truly comical animals) and desirable, for they pick up



Figure 20-10. YOUNG TAUTOG OR BLACKFISH, A hardy and interesting fish for the marine aquarium. From Ida M. Mellen's, "Salt Water Aquaria at Home," AQUATIC LIFE, January 1918.



Figure 20-11.
A SELF-SUSTAINING
SALT WATER AQUARIUM.
From Ida M. Mellen's, "Salt Water Aquaria at Home,"
AQUATIC LIFE, January 1918.

scraps from the bottom; and the small hermit crabs are especially good scavengers.

"It is well to place an inch or two of fine pebbles, white sand, or bird gravel on the bottom of the jar, and a few stones must be added for the attachment of anemones, and for the crabs to hide under. Care must be taken to wash the sand thoroughly. Bird gravel is very dirty, and will ruin the aquarium if put in before cleansing.

"Hermit crabs should be provided with empty shells of a suitable size, so that when they outgrow the home they are living in and go house hunting for a large one, the new dwelling will be at hand. They are pugnacious, and two will fight hard for the possession of a desired shell.

"Little-neck clams and oysters, whose siphons are always busy, are valuable as clarifiers.

"Snails which consume vegetation are to be guarded against. The periwinkles do not thrive so well in standing water, but no balanced aquarium is complete without a few mud snails (*Nassa obselata*). These do not harm the vegetation appreciably, preferring animal food, and besides being excellent scavengers, are always interesting to watch, with their long inquisitive siphons traveling on before like an elephant's trunk, and specimens are often seen carrying around a little roof garden of minute green plants, an occasional snail being so thickly covered with the fine marine alga known as *Enteromorpha* that it might be mistaken at first glance for a sea mouse. The mud snail, found all the way from Massachusetts to Florida, is the commonest of small Atlantic Coast mollusks.

"Young specimens of starfishes may be kept. They live on mollusks, however, and a supply of the mud snails is necessary for them. With a starfish it would not be possible to keep alive an oyster, clam, or any other mollusk in the jar, and at best the starfishes are not long-lived in captivity.

"Probably the most attractive of all small fishes is the sea horse; and the general desire to own one is so great that people even inquire if they could not keep one in the same jar with their goldfishes! The little creature is difficult to provide for except with running sea water and salt water *Gammarus* - the minute shrimp that infests the sea-lettuce. Some have succeeded in maintaining sea horses for a number of months in balanced aquaria by feeding them with fresh chop-bed prawn on the end of a stick, which the little fish soon grows tame enough to take. A New York dealer in aquaria and aquarium supplies, sells sea horses, tells us that he feeds them on Daphnia - the common water flea of the ponds-by taking the sea horses out of the salt water and the daphnia out of the fresh water, and putting them all into brackish water one -third salt and two-thirds fresh. Within an hour the sea horses are replaced in salt water, and this process he repeats each day. Fresh-water shrimps may be used in the same way. During a shortage of *Gammarus* last winter we succeeded in enticing some of the sea horses to eat the

fresh-water worm *Tubifex*, which will live for half an hour in salt water.

"Other fishes, also crabs and prawns, annoy the sea horse, but it is possible to keep anemones, barnacles, oysters and clams in the same jar with them.

"The salt water aquarium requires strong light, but should have very little direct sunlight-none in the summer, and not aver an hour or two a day in winter.

"The most useful cover is one made of glass, of the same diameter as the jar with bits of cork glued to its edges at several places in such wise as to allow it when set on the jar, to reef on the cork a quarter of an inch above the top of the aquarium. The cover prevents the escape of crabs, snails, etc., retards evaporation and keeps out dust.

"At the New York Aquarium animals in all balanced aquaria are fed three times a week with macerated clam, care being taken to drop small pieces on the end of a stick or with long wooden forceps, upon the tentacles of the corals and anemones, which may then be seen to carry the food to their mouths. All food not eaten within it few hours is carefully siphoned off with a glass tube.

"For the inland aquarium dried shrimp, desiccated codfish after the salt has been soaked out of it, fresh-water mussels, or fresh fish, finely chopped, would serve. Fresh fish, however, is oily, and even an expert aquarist must take unusual care in using it.

"A bit of wood stuck on the end of a stick, and covered with felt or cheese cloth, is useful to clean the inside of the glass. In the matter of impurities in the water, an ounce of prevention is worth many a pound of cure, particularly in the inland marine aquarium. Watchfulness for dying plants and dead animals, and their speedy removal, is highly requisite. For this a long wooden forceps is a convenient tool. Some aquarists advocate a bit of charcoal placed under the rocks as a clarifier. During a succession of gray days, the water may be aerated by lifting out a dipper full at a time, and letting it fall back from a height of several inches. When the sand appears dirty, it is well to siphon off the bottom with a rubber tube until about four inches of the water have been drawn. This can be used again by filtering through four or five thicknesses of cheesecloth, or letting it seep through a sponge placed in the bottom hole of a watering can. The same method may be employed if the water appears a trifle cloudy.

"What is only difficult may appear to the novice impossible. He must not be discouraged if

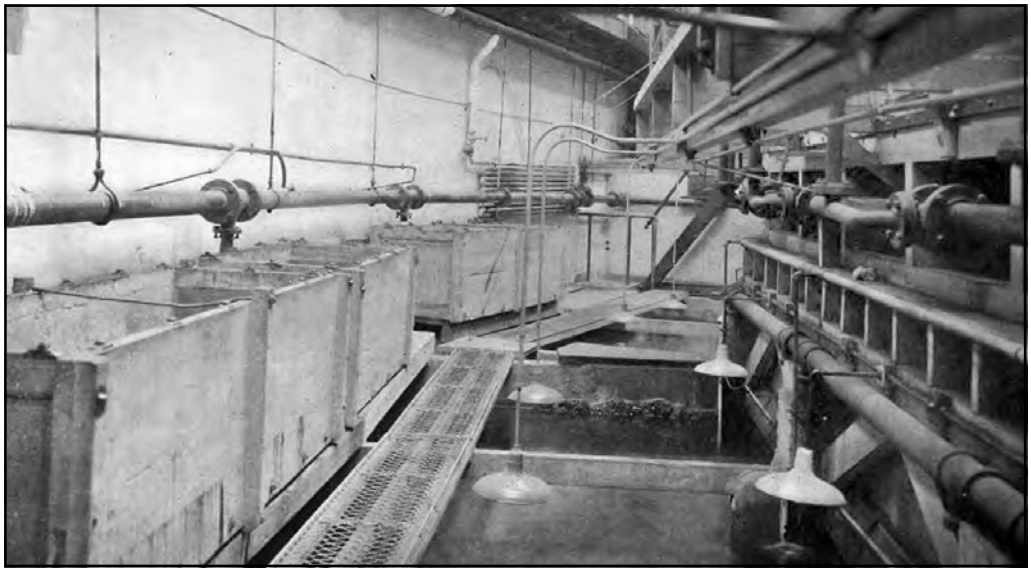


Figure 20-12. View of the service gallery of the New York Aquarium showing the recently enlarged exhibition tanks with wooden reserve tanks mounted at the left. Ida Mellen Retired from the Aquarium in 1929 as Chief Aquarist.



Figure 20-13.
HALF MOON (*Pterophyllum scalare*).
From *Guide to the New York Aquarium*, 1919.

his first efforts fail, however, but remember that "Patience and perseverance overcome all obstacles," and, as a wise woman once remarked, the only difference between the difficult and the impossible is that the impossible takes a little longer time."

Her advice was eminently practical, and her remarks concerning artificial salt water are interesting for the times. Since she was the first aquarist to write a substantial article on the salt water aquarium in Stage IV of the hobby, we can chalk up another first for Ida M. Mellen!

Mellen was highly interested in the English language and wrote a number of small commentaries involving grammar and usage. The following appeared in AMERICAN SPEECH in 1927 under the title of "Fish" or Fishes"?:

" 'I'll take three of those little butter-fishes.'

"No sooner was the sentence spoken than I realized that it was not correct English, but the fish dealer knew not the difference; and if one were to say to the proprietor of a pet shop, 'I'll take three of those goldfish,' he, in all likelihood, would not know the difference, either.

"Even those of us who are devoting our lives to the study of fishes, find it difficult to remember how to designate them correctly in the plural.

"For the table we have 'fish,' but when living specimens or specimens used for scientific study are meant, 'fishes' is the right word. And so, while we may say correctly, 'one smelt, two smelts,' a dozen smelts in the pan are 'fish,' while a dozen smelts swimming in the Pacific are 'fishes.'

"As anglers, we journey homeward (if luck has been with us) with a bag of 'fish;' but as collectors, we return with 'fishes.' There is another nice distinction: we say, 'This is a tank of brown trout' (or black bass, or yellow mackerel); but 'We have two or more species of trouts' (or basses, or mackerels).

"Then there is the problem of the compound words ending in –fish - goldfish, toadfish, angel -fish, buffalo-fish, etc. Dictionaries avoid indicating plurals, but the proper plural is 'fishes' when live specimens arc indicated.

In referring to more than one alewife or pudding-wife, we say 'alewives,' or 'pudding-wives.' "

Another example in 1927 that appeared in AMERICAN SPEECH under the title of "Words from Sea Animals" was:

" 'He's a whale of a man,' wrote a reporter of Sergeant York; but most of our words derived from the sea folk allude to mental and moral, rather than to physical traits, the expression 'clammy hands' being only another exception.

"One may, like Pistol in the Merry Wives of Windsor, boast that 'the world is his oyster.' Generally the sea words arc derisive. A man is 'slippery as an eel,' or a 'downright shark.' He may be 'crab' by nature, or a 'sponge' by habit. If he lacks backbone, he will certainly be called a 'jellyfish' - which is just as complimentary as to say he is a 'lobster.' Years ago an expression

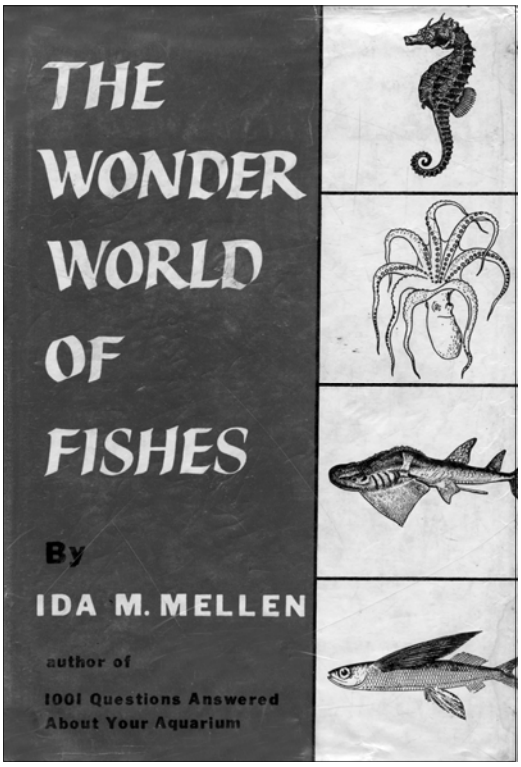


Figure 20-14. The year 1927 was a productive year for Ida M. Mellen. In It described the unusual and also had a section on maintaining fishes in captivity.

was common, 'Don't be a clam.' but now we hear instead, 'You poor fish.' "

Mellen was also a careful observer. In an article titled "Can Catfish Count?," which appeared in SCIENCE magazine in 1930 she wrote:

> "A bullhead catfish (*Ameiurus nebulosus*) which had been maintained since babyhood in a twenty-three gallon all-glass tank of still water with several others of its kind was between three and four years old when it evolved a method of entertaining itself that may be called unique considering the general absence of a spirit of play in this group of fishes.
>
> "A single spray of Canadian water-weed (*Anacharis*) trailed about a foot from the main plant, touching the glass at the rear of the tank (i.e., the side away from the 1ight). The catfish, which was called 'White Whiskers' because the four 'chin' barbels were white, was seen every day circling this spray. It always moved over the spray, than under, always proceeded from the left to the right of the tank, and showed a preference for making the swing an even number of times before coming to rest.
>
> "Often it was observed at play when there was not time to count its motions, but on five different days its circuits in this peculiar game of solitaire were counted. On one day it played forty games, during which it recorded in all 115 swims around the spry.
>
> On the five days it played forty games and traced the circle 263 times!
>
> "In these forty games the fish cane to rest thirteen times after completing the circle an odd number of times (from one to nineteen), but on twenty-seven occasions it recorded an even number of swings (two to sixteen).
>
> "Was it merely a matter of chance, or did the catfish derive some conscious physical satisfaction from encircling the spray an even number of times?"

Although Ida Mellen is not remembered much today, she was one of our great aquarists and as important as either Heede or Brind. Born in 1877, she personally knew such historic personalities in the hobby as William Damon's sister, who might have had the first freshwater aquarium in this country. In a century of a male-dominated hobby where few women ever achieved any level of prominence, Ida May Mellen was the outstanding exception. Although she was a professional aquarist, i.e., Aquarist at the New York Aquarium from 1916 to 1929, rising to the position of Chief Aquarist, she always had her finger on the pulse of the hobby and could evaluate it with an objectivity shared by few of the prominent aquarists of her time. Even towards the end of her long life - well into her nineties - this very small, white-haired lady continued to visit the rooms of the New York Public Library, at work on new books and articles. A truly distinguished aquarist and lady in the finest sense of the word was Ida May Mellen.

CHAPTER 21: PRE-DEPRESSION PERSONALITIES & LITERATURE

Among the aquarists of note active during the 1910's was Jacob Merget of Milwaukee, Wisconsin. Merget was an accomplished writer on the subject of tropical fishes, and his byline appeared frequently during the decade. He described the breeding of many species of fishes that were not bred with much commercial success until the 1930's. In later life he became a famous fish show judge and indeed, his death in 1935 occurred of a heart attack shortly after completing the judging of the Third Annual Show of the Milwaukee Aquarium Society.



FIGURE 21-1. J. LOUIS TROEMNER, founder of the Pennsylvania Fish Culturists' Society and pioneer aquarist of Philadelphia.

In 1916 J. Louis Troemner (Figure 21-2) joined the Aquarium Society of Philadelphia where William T. Innes at the time was President. As was mentioned previously, tropical fishes were then competing actively for attention with goldfish in that city and several feuds sprang up, even to the point where a separate goldfish society split off from the parent club. Efforts to iron out their differences and to recombine the two groups failed, so Troemner started a middle-of-the-road club hoping that all would join and forget past differences. Unfortunately, the goal was not achieved and the other two clubs ultimately disbanded, leaving as the sole survivor the group he founded, i.e., the Pennsylvania Fish Culturists' Society.

Troemner started a monthly club leaflet in 1920 called THE PENNSYLVANIA FISH CULTURIST. For years this remained a very high-quality publication for its size. Troemner specialized in characins, especially the rare ones, and for years the greenhouse attached to his home was a Mecca on weekends for visiting aquarists.

Among those prominent in the business end of the hobby was Bernhard Berkitz (Figure 21-4), the founder of the Aquarium Stock Co. of New York. Berkitz was proprietor of a business specializing in medicinal leaches and drug sundries, but in time he carried a stock of goldfish and aquarium supplies as a sideline. His real entry into the tropical fish business occurred in 1917 when the firm moved to a new location to deal exclusively in aquarium fishes and their supplies. The Aquarium Stock Co. was a landmark in New York City for many years. Berkitz had two assistants who in their own light later became very important commercial figures in the aquarium hobby; Marius Kramer, later with Paramount Aquarium, and Richard Büttner who, with Carl Mertens, established the Empire Tropical Fish Co. in 1929. Both Paramount and Empire were to become two of the most influential importing firms in the aquarium hobby.

Another commercial figure of importance was Otto C. Beldt (Figure 23-5), who had immigrated to the United States from Hamburg, Germany in 1913. Beldt struck out for St. Louis where he learned the baking

trade. As a child, Beldt was introduced to the hobby as a by-product of his father's food fish stand where aquarium supplies were sold as a sideline. After school, young Otto collected Daphnia for a tinsmith who made aquariums and who paid the lad off in kind. Within a short time he was the owner of an impressive collection of fishes and an accomplished breeder.

The hobby carried over into his life in St. Louis when he married in 1918 and made an aquarist of his wife. The couple soon filled a three-room apartment with tanks. This required the purchase of a house, from which a conservatory full of aquariums soon sprouted. With time it turned into a full time business that became famous throughout the country. Beldt was one of those rare creatures - a commercial figure in the hobby who never once lost his boyhood love of breeding unusual fishes.

A new but fairly short-lived fish magazine appeared on the scene in January 1919. Its name was THE DAPHNIAN (Figure 21-6), published by the Boston Aquarium Society. Although technically a periodical, it was not so much a magazine as an annual. Only three issues were published: 1919, 1920 and 1921, but the publication was a letterpress effort with photographs, taking it out of the common club publication category.

The President of the Boston society at the time was C. L. Hauthaway but THE DAPHNIAN was the work of its Secretary, Walter H. Chute. Chute was later to become the Director of the famous Shedd Aquarium in Chicago. Apparently the publication was not sold but was included in the yearly membership dues of $2.00. It carried the advertisements of the firms and aquarists of the day, such as the Aquarium Specialty Co., Hermann Rabenau, Charles E. Visel, William Tricker, Ernest Leitholf, Harry P. Peters, August Obermueller, and others. Of interest was the fact that Chute himself advertised as a "breeder of tropical fish," and offered white worms and ground shrimp for sale, and also an aquarium set-up and maintenance service.

Many of the articles were written by Chute himself and dealt with general aquarium topics. THE DAPHNIAN represents a historic curiosity in the development of our hobby.

William Tricker was the originator of commercial water lily culture in the United States. He came from England in 1885 and first saw tropical water lilies growing in a pool at Newport. While engaged as a private gardener on an estate on Staten Island he experimented for 7 or 8 years growing lilies in pools and tubs, and later started a small business at Clifton, New Jersey. This business was sold to Henry Dreer in 1897 and William Tricker developed water lilies for that firm during the next few years. After another period of gardening he built greenhouses at Arlington, New Jersey, in 1907 and started the business so long known by his name, dying in 1916 among the flowers he loved.

At the death of his father, Charles L. Tricker, the only one of six children interested in flowers, took active

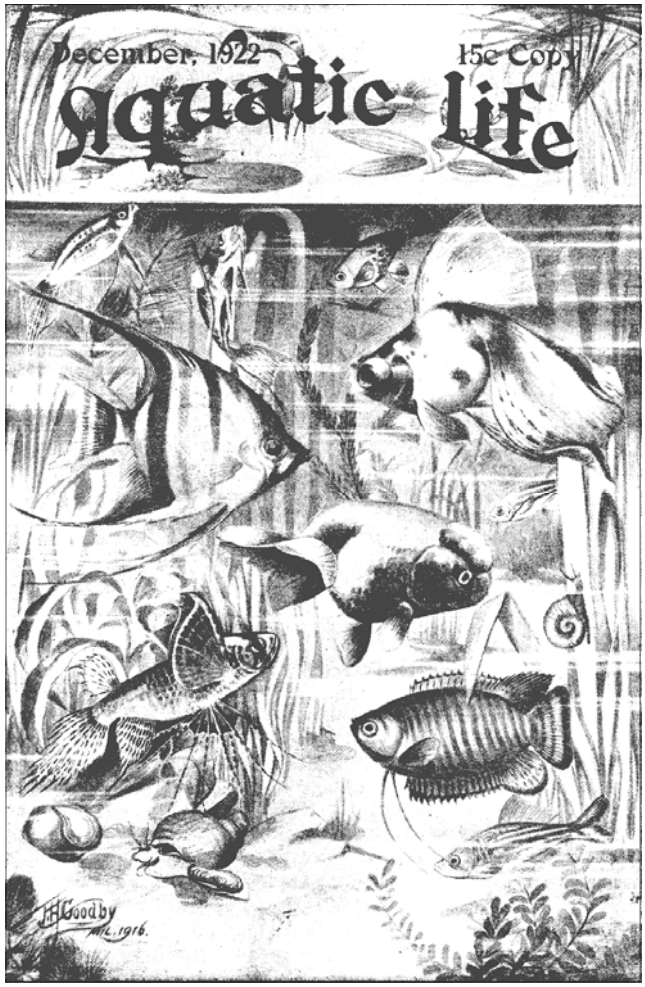


FIGURE 21-2. AQUATIC LIFE, AS IT APPEARED IN 1922, SHORTLY AFTER AUGUST M. ROTH ASSUMED ITS REPUBLICATION.

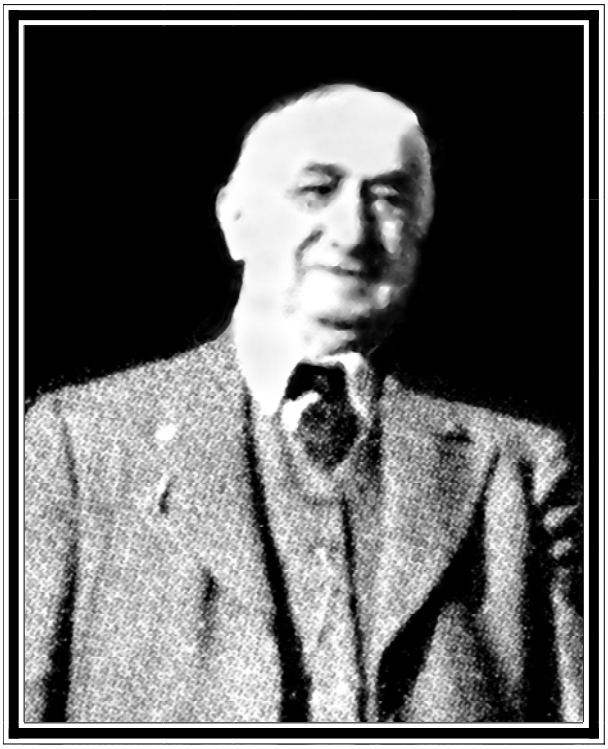


Figure 21-3. BERNHARD BERKITZ, founder of the Aquarium Stock Company.

management of the business, which was then increasing rapidly. Too busy with the added responsibility to continue the hybridizing experiments, he found time to introduce varieties developed in France, England, Garfield Park in Chicago and the Missouri Botanical Gardens. The first American catalogue of water lilies was published at Clifton in 1895, the next at Arlington in 1912 and a new one each year since, until the annual issue in 1927 was some 60,000 copies finely illustrated in color and listing all standard and new varieties.

In keeping with the growing interest in water lilies, the Independence Nurseries at Independence, Ohio, built ponds and pools about 1919 and started aquatics as a sideline. Goldfish were bred in the ponds and tropical fishes used to destroy insects in the warm tanks in the greenhouses. In 1924 this department of the Nurseries was taken over by William O'Brien. Until that time tropical fishes had not been raised in quantity in this country but were imported largely from Germany. Finding that fish and water lilies not only thrive under the same conditions but are both popular with nature lovers, O'Brien soon brought Independence to the front rank in the production of these items and in 1927 the Independence Water Gardens were taken over by him.

One of the ads in THE DAPHNIAN from the Crescent Fish Farm of New Orleans offered velifera mollies for $4.00 a dozen. The man behind Crescent was William Schaumberg, a pioneer in the development of the Black Sailfin Molly and one of the most famous fish farmers in the business. Starting as a hobbyist, Schaumberg found conditions in New Orleans to be favorable to fish farming and soon had acres of water under cultivation. A very modest man to whom the hobby owes much for his work in livebearer development, Bill Schaumberg retired because of ill health in 1941 after over 25 years of commercial activity in the aquarium hobby.

Sadly, in August of 1920 the pioneer aquarium writer in the country, Christian J. Heede, passed away. As



Figure 23-4. OTTO C. BELDT (1895-1980) of St. Louis, founder of Beldt's Aquarium and Hatchery.

William Poyser said of him in his obituary:

> "He combined the characteristics of the naturalist with those of the fancier, and his original research work coupled with an extensive first hand knowledge of the literature of the subject in several languages, placed him in the front rank among aquarists."

Due to the difficulties in the publishing world in general, AQUATIC LIFE (Figure 21-3) began to experience difficulties of its own in 1919 and the issues for October, November, and December were eliminated. In 1921, the magazine was once again in trouble and the issues for February through July were eliminated. By then down to a very thin 12 pages, the magazine suspended publication in 1922 and for four months did not publish. The publication was sold to August M. Roth and reappeared in October 1922 as a combined, July to October issue. The magazine was now published from Baltimore, Maryland.

Roth, as mentioned previously, was a printer and publisher. He began publishing information regarding the aquarium hobby in PET STOCK WORLD in 1914, and I have already mentioned the short-lived THE AQUATIC WORLD. For many years Roth also published the AMERICAN BANTAM JOURNAL, SMALL ANIMAL WORLD, CAGE BIRD WORLD, CATDOM, and PET SHOP NEWS, as well as many books on these subjects. His first act on obtaining ownership of AQUATIC LIFE was to reduce subscription rates (from $1.25 to $1.00) and advertising rates. The rehabilitation of the magazine was painfully slow; in 1923 it reached 16 pages; in 1926, 20 pages; and in 1929, 28 pages. In the second issue put out under Roth's editorship, a subtitle appeared, "AND THE AQUATIC WORLD," which it carried from there on.

One letter to Aquatic Life in May 1925 deserves special mention:

> "Dear Mr. Roth:
>
> "I have just received the February number and it is very good indeed.
>
> "While you have a fair number of advertisements in your magazine, it seems to me that fanciers and breeders in general do not realize what a valuable medium you have to offer them.
>
> "From the results of my magazine articles, radio broadcasts, and from readers of my book, I am in constant communication with people all over the country who want to know where to get fish and general aquarium supplies. Within the last several weeks I presume I have answered as many as 100 letters per week and in many cases I simply refer them to the advertisers in AQUATIC LIFE. I am sure this must be making good business for some of your advertisers.
>
> "Frequently there is no advertiser anywhere

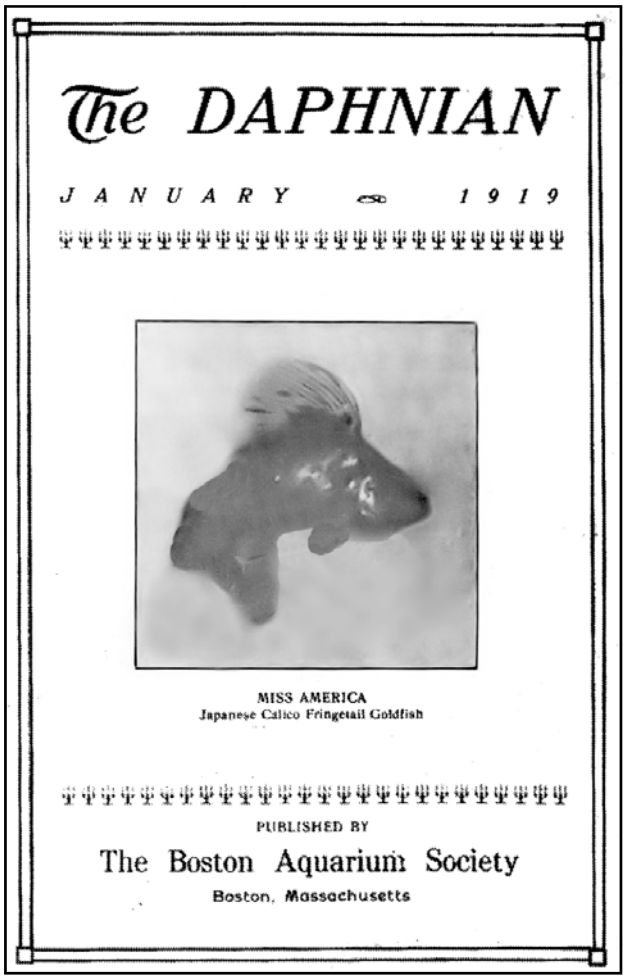


Figure 21-5. THE DAPHNIAN, PUBLISHED BY THE BOSTON AQUARIUM SOCIETY. It first appeared in January 1919 and was edited by Walter H. Chute who was later to become Director of the Shedd Aquarium.

near the point of inquiry, and I am sure it would pay anybody with any aquatic supplies to offer to put an advertisement in your magazine.

"You have the only American periodical of this character with a national circulation and it is to the interest of the entire fancy to help you make the magazine better and larger and to contain as many advertisements as possible. In my opinion the advertising pages in such a magazine represent fully one-half of the value to the subscribers. People interested in a hobby of this kind carefully read every advertisement from cover to cover.

"If you think a publication of this letter would do any good, you are perfectly welcome to use it at any time.

"Very truly yours,
Wm. T. Innes, Philadelphia, Pa."

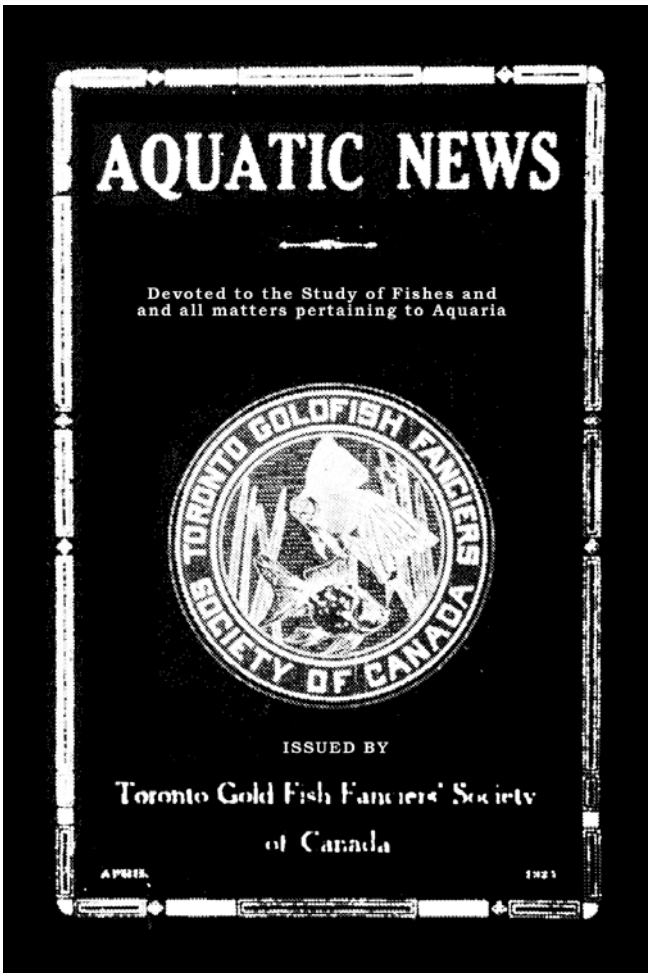


Figure 21-6. AQUATIC NEWS, CANADA'S FIRST AQUARIUM MAGAZINE. It was published by the Toronto Gold Fish Fanciers' Society of Canada and first appeared in 1925.

This was a very nice gesture on the part of Innes, and on the First Year Anniversary of Inneses THE AQUARIUM, Roth congratulated him and wished the magazine well despite the fact that the magazines were competitors. It showed the gentlemanly characters of both men.

Under August Roth's editorship the magazine changed considerably. An extensive use of pseudonyms was made, e.g., articles were written under the names of "You're Welcome," "Fishdom's Lecturer," "Em-En," "Mar-Nur-Si," etc., but the magazine published the material of many famous writers of the day such as Shufeldt, Beldt, and E. Calver Bayliss. Although Walter Brind had been the major contributor to AQUATIC LIFE when Poyser was its editor, this was no longer the case as Brind now was occupied with producing his own aquarium tracts.

The magazine improved, over what it had been during the dark days of the early 1920's. Indeed, Roth's practice of scattering informal paragraphs on miscellaneous matters throughout the magazine made the publication more "human" than it had been under Poyser's editorship. Unlike Poyser, Roth used editorials freely.

The Heyday of AQUATIC LIFE definitely was during the remainder of the 1920's when American authors predominated. The depression years of the 1930's, however, took its toll, as did the competition from THE AQUARIUM. Roth took to the inclusion of many foreign articles (translated), mostly of German origin. Some issues, in fact, were almost entirely written by foreigners. As an adjunct to his periodicals, Roth also published several booklets during the 1920's, two examples of which include: In 1925, *The Aquarium and its Denizens. Being a brief exposition of the proper arrangement and maintenance of home aquaria, with a catalogue of some of the fishes suitable for aquarium culture*, by George S. Myers, a reprint of a pamphlet published by the Hudson County Aquarium Society three years earlier; and in 1927, *Our Aquarium*

Fishes. An encyclopedia of cold and tropical fish - both popular and rare varieties for fresh and salt water. Containing the identification, habits, care and culture…," a translation from the German by Hans Geiwitz.

For many years throughout the 1920's and the early 1930's, there were many large shows held by aquarium clubs, mostly in the eastern states. August Roth faithfully attended these and published many photographs of aquarists, awards, and exhibitions. During the 1920's AQUATIC LIFE was practically the only publication available to aquarists, although I'll cover some minor ventures later in this book. In a sense, AQUATIC LIFE held the aquarium hobby together during these critical times.

Roth ventured into the commercial fish business as a wholesaler but this was a failure. In the early 1930's his brother, who worked in another print shop but who came at night to help put out the magazine, died. Roth was devoted to his brother and the latter's death affected him deeply. Afterwards, he became somewhat of a recluse but continued to publish the magazine even into the 1960's, setting every line of type by hand as he did almost forty years previously. The hobby owes a great debt to this kindly, deeply religious man. His accomplishments were remarkable and both August Roth and AQUATIC LIFE will be revisited shortly.

In 1921, as AQUATIC LIFE underwent some of its most severe difficulties, the Ridgewood Aquarium Society

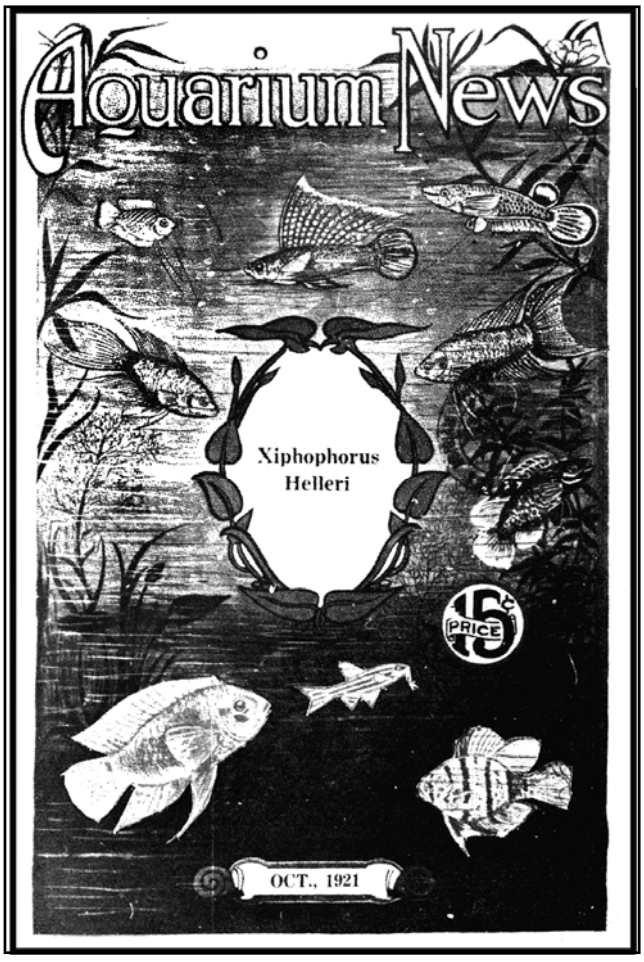


Figure 21-7. AQUARIUM NEWS, PUBLISHED BY THE RIDGEWOOD AQUARIUM SOCIETY OF RIDGEWOOD, LONG ISLAND, N. Y. Its first issue appeared In September 1921.

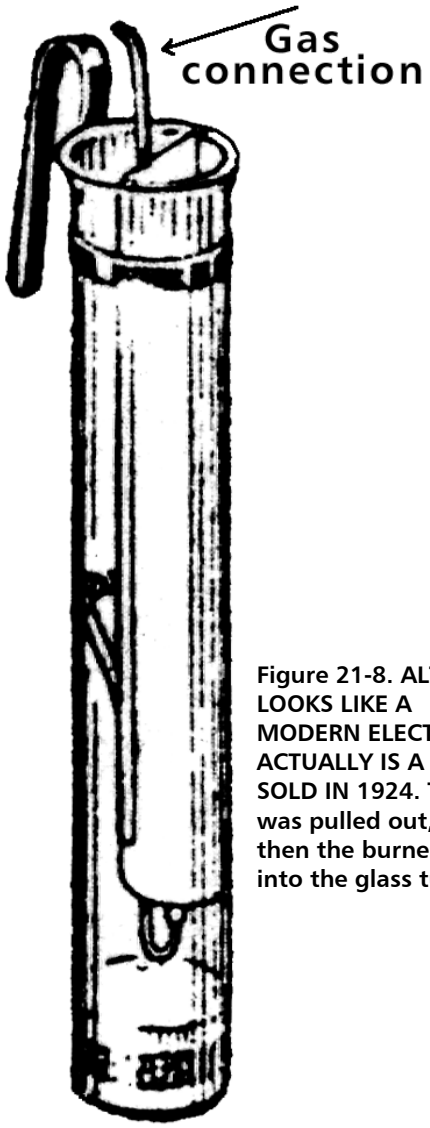
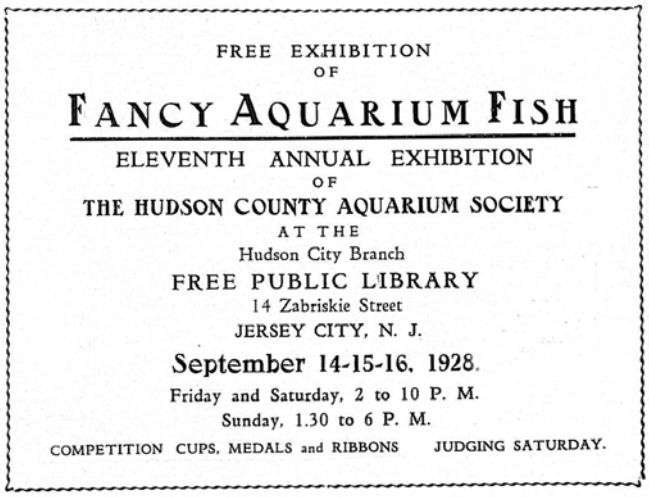


Figure 21-8. ALTHOUGH THIS LOOKS LIKE A MODERN ELECTRIC HEATER, IT ACTUALLY IS A GAS HEATER SOLD IN 1924. The inner burner was pulled out, the gas lit, and then the burner was reinserted into the glass tube.



FREE EXHIBITION
OF
FANCY AQUARIUM FISH
ELEVENTH ANNUAL EXHIBITION
OF
THE HUDSON COUNTY AQUARIUM SOCIETY
AT THE
Hudson City Branch
FREE PUBLIC LIBRARY
14 Zabriskie Street
JERSEY CITY, N. J.
September 14-15-16, 1928.
Friday and Saturday, 2 to 10 P. M.
Sunday, 1.30 to 6 P. M.
COMPETITION CUPS, MEDALS and RIBBONS JUDGING SATURDAY.

Figure 21-9. AQUARIUM SHOW ANNOUNCEMENT OF THE 1900's.

of Ridgewood, Long Island, N.Y. found the available publications inadequate for the hobby and started a publishing venture of their own. Their magazine was called AQUARIUM NEWS (Figure 21-7), the first issue appearing in September 1921. Its Editor was Christof H. Berneburg, the Chairman of the editorial board (and also society President) being Hugo C. Nelles, a well-known fish breeder and author of the period.

The magazine consisted of 12 pages and sold for 15 cents a copy or $1.50 for a one-year subscription. Most of the well-known firms of the day in the New York - New Jersey area were advertisers as well as many from out of town, such as Crescent Fish Farm. A good many of the articles were written by Nelles himself, but other authors contributed as well. Although an excellent little magazine in the style of the BROOKLYN AQUARIUM SOCIETY BULLETIN, like that publication the burden to the publishing society proved too great and AQUARIUM NEWS soon passed from the scene.

It is appropriate to mention here the appearance of AQUATIC NEWS (Figure 21-7), published by the Toronto Gold Fish Society of Canada. This eight-page magazine appeared regularly between 1925 and 1926. A yearly subscription went for $1.00, although copies were free to members of the society. Its articles covered all subjects, not just goldfish. William T. Innes was one of its contributors, as was E. Calver Bayliss. The magazine was supported reasonably well by advertisers, and the quality of the publication was excellent also. Unfortunately, like other society publications it proved too much of a burden for its sponsors and passed from the hobby into history.



A New and Better Aquarium
Designed and Built for Strength . Beauty . Durability

FOR some time the average tropical fish hobbyist has wanted a better moderate price aquarium. He has not been satisfied with the light, hand-made tanks generally available in the low-cost field, particularly because the irregular and unfinished appearance of most of these tanks made it almost impossible to use them in a row.

, . FEATURES . .

FRAME. 20-gauge rust-resisting auto-body steel die cut and stamped, insuring perfect uniformity and accuracy. Reinforced top and bottom rails. Electrically welded joints, finished smooth. Duco enameled in green, brushed with silver unless otherwise ordered.
GLASS. Lustra A—double strength. Slate bottom.
CEMENT. Special formula—plastic—non-poisonous—non-exudant.

Sold With the Following Guarantee:

The EXCEL Aquarium is guaranteed for one year against leaking or cracking due to faulty material or Construction. It is also guaranteed to withstand the strain of moving when filled.

NOW AVAILABLE IN THE FOLLOWING SIZES:

4 gallons	7½ x 11¼ x 16¼	$2.50	10 gallons	9½ x 13¼ x 22¼	5.00
6 gallons	8½ x 11¼ x 18¼	3.50	14 gallons	10½ x 15¼ x 24¼	6.00
8 gallons	8½ x 13¼ x 22¼	4.00	Special Spawning	10½ x 11¼ x 24	5.00

Here is a tank the commercial breeder, dealer or hobbyist can standardize on with full assurance that his shelves or stands will present a uniform, finished appearance... Each tank exactly like the others, and all permanently watertight and capable of being moved when necessary without danger of leaking.

MACHINE-MADE ACCURACY and UNIFORMITY . . . A superior aquarium in the moderate price class. Illustration on the right shows the extra strength frame construction.

EXCEL TROPICAL AQUARIUM
316 Wetmore St., HOWELL, MICH.

Figure 21-10. MOST OF THE AQUARIUMS SOLD IN THE 1920'S WERE TYPICALLY SMALL.

CHAPTER 22:
THE ROARING TWENTIES

By the 1920's the aquarium hobby was well established in this country and names such as Dorn, Holbein, Brind, Berkitz, Bade, Roth, Innes, Troemner, Schaefer, Bausman, Armbruster, Neidig, Kissel, and Schaumberg, among others, were the leaders of the decade. After World War I, the world lapsed into "normalcy" and the influence of German immigrants to the United States and German exporting firms became even greater than before.

During this time the new fad of keeping goldfish in a bowl was fueled by the establishment of pet departments in many of the major chain stores such as S. S. Kresge and Woolworths. The Armbruster mentioned above was Gustav G. Armbruster of Philadelphia who, in 1935, would become the first breeder of the Discus (*Symphysodon discus*), although the fish was referred to as the "Disc-shaped Cichlid" at the time.

In January 1921 an article entitled, "The Labyrinth Fishes," appeared in AQUATIC LIFE, written by George S. Myers (Figure 22-2) of the Hudson County Aquarium Society. He was later to become one of this country's most distinguished ichthyologists and a collaborator with William T. Innes in the latter's publishing efforts. A native of New Jersey, Myers studied under the great ichthyologists, Carl Eigenmann of Indiana University and David Starr Jordan of Stanford University. After completing his formal studies he was appointed Assistant Curator in Charge of Fishes at the United States National Museum. Ultimately, Dr. Myers settled at Stanford University where he became noted as an outstanding teacher of those aspiring to become professional ichthyologists.

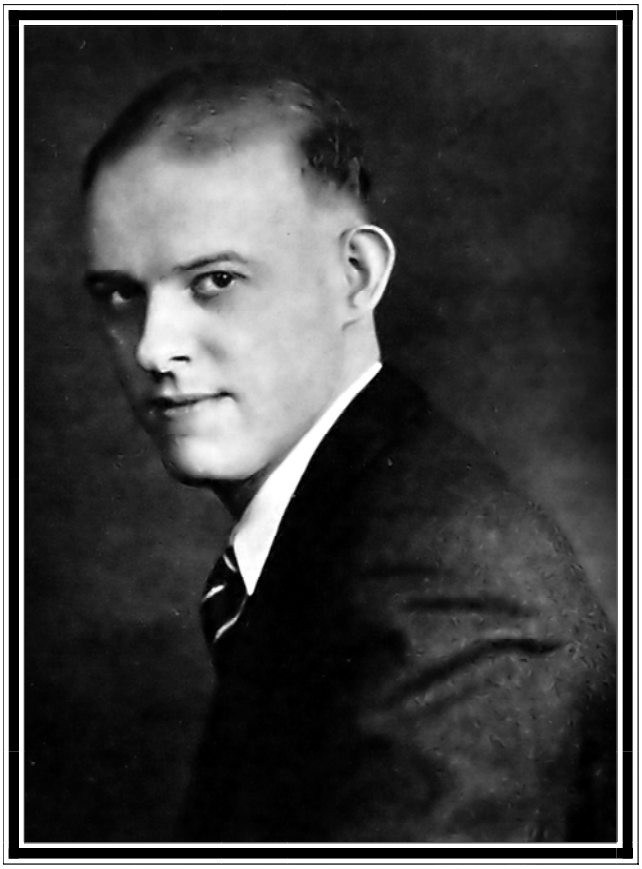


Figure 22-2. DR. GEORGE SPRAGUE MYERS (1905-1985). Myers was one of the first ichthyologists to become closely associated with the aquarium hobby.

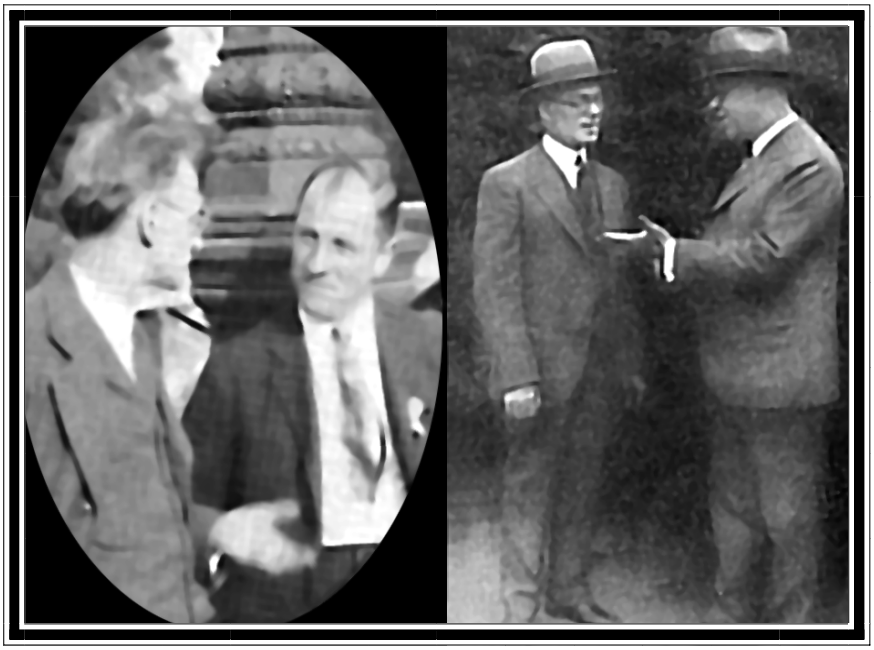


Figure 22-1. LEFT to RIGHT: AUGUST ROTH, GUSTAV ARMBRUSTER, JOSEPH E. BAUSMAN, and WILLIAM T. INNES.



Figure 22-3. WILLIAM G. O'BRIAN. He applied his knowledge as a chemist to the aquarium hobby.

The aquarium hobby achieved another milestone in April 1927 as the concepts of pH, its significance to fish keeping, and its measurement, were introduced to American aquarists. The man responsible was William G. O'Brian (Figure 22-3), whose biographical details will be explored shortly. O'Brian's investigations showed that: "...in a tank of mixed fish, danios and characins will be the first to show symptoms of distress in alkaline solutions, Helleri (i.e., swordtails) next, and barbs last. Conversely, the barbs come to the surface soonest in the presence of acids." Thus, for better or worse, pH had come to the hobby. O'Brian used LaMotte Chemical Co. pH test kits for his own work but it was not too long before the manufacturers of aquarium supplies came out with simplified versions of their own, e.g., with two indicator solutions rather than the six provided by the LaMotte kit.

William G. O'Brian was a chemist with the Goodyear Rubber Co. who, after 12 years at that profession, decided to turn his interest in tropical fishes to a full time job, joining the Independence Nurseries of Independence, Ohio in 1924. The firm, formed in 1916, dealt in water lilies but was starting to expand into the area of tropical aquarium fishes. Although tropicals were extensively imported from Germany at the time, they were not raised in any quantity in this country. O'Brian soon brought the firm to the forefront in the domestic breeding of tropical fishes.

O'Brian bought the company in 1927 and promptly consolidated it with the William Tricker, Inc. firm. The firm was named after an English immigrant who originated water lily culture in the United States, had started the latter in 1885. Tricker had died in 1916 but the business had been carried on in Saddle River, New Jersey by one of his sons.

O'Brian brought a professional approach to the art of breeding fishes and a rare sense of humor. He was a

Figure 22-4. AN EXAMPLE OF WILLIAM O'BRIAN'S SENSE OF HUMOR!

SCALARE EGGS 50c. A DOZEN

OF course you know the parents have to go along to fan the eggs until they hatch, and a real pair will cost about $35.00. Another thing to remember is that the eggs hatch in a little over two days and moving them wouldn't be so good.

If you ask us, the best way is to let the old pair of Scalares spawn right in your own home. We shall be glad to sell you the aquarium, the plants, the Scalares and some live Enchytræ to feed them.

The idea is that we have a real pair of Scalares that do spawn, and we can sell the eggs if we want to. They hatch all right but we haven't raised any yet. Give us time. Meanwhile we still import the best Scalares and let them grow up in our western hatchery.



P. S. The Scalare illustrated above raised by Bill Innes.

Plants for a Ten Gallon Aquarium—7 Kinds—$1.10

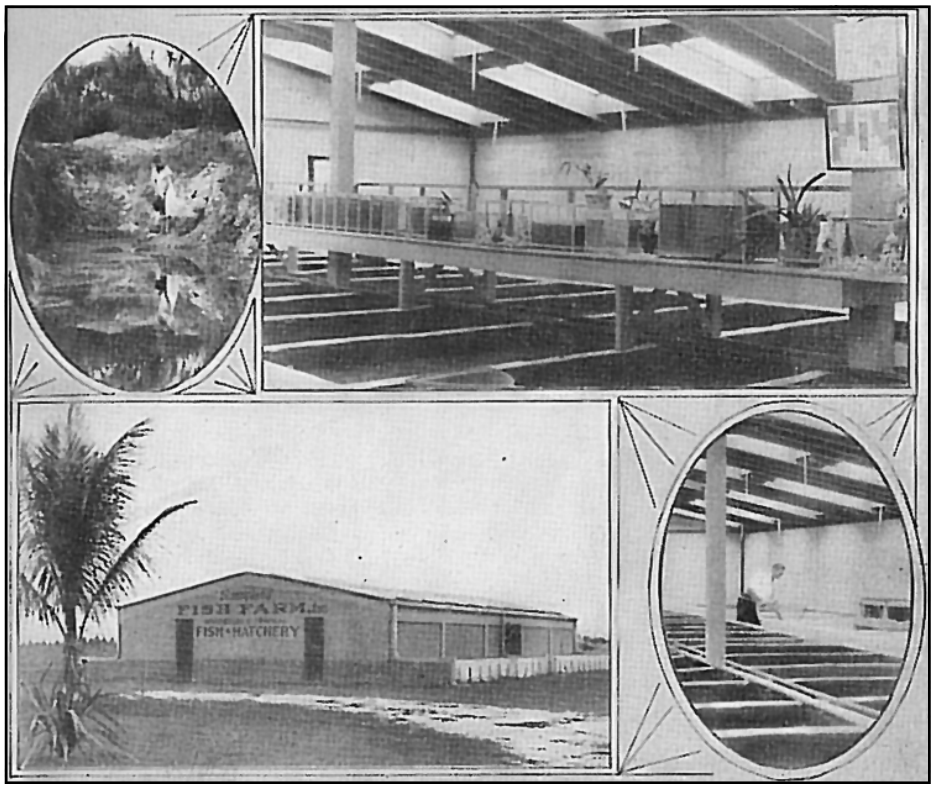
WILLIAM TRICKER, Inc.

W. G. O'BRIEN, Aquarist

Independence, Ohio, - Saddle River, New Jersey.

Get our 1928 Catalogue of Water Lilies and Ornamental Fishes.

Figure 22-5.
STERNKE'S FISH FARMS AT OPA-LOCKA, FLORIDA, 1931.



frequent and witty contributor to AQUATIC LIFE. In one advertisement he wrote for the Independence Nurseries he offered "Sewerdines" at $50 a box! The ad continued as follows:

> "Wrong again! We are not trying to put over any second hand or worn out goldfish for picnic lunches, nor yet for linotype pi. We just found a nifty handle for the *Scatophagus argus*, which is a mighty nice little fish but too hard to remember. We had to do something because it made our greenhouse cat nervous when customers started to read the label and stalled on the first syllable. Bill Innes says the scatophagi (note the Greek plural 'n everything) hunt up a good sewer when they want to stage a dinner party, which may have started the idea of wearing soup and fish. Anyway you get the idea - Sewer Dine. That's the way Adam had to think up names before Latin was invented. We have now reached the dotted line, and if you don't need a whole box, we sell 'em at $20.00 a pair. Maybe you haven't a little sewer in your home, but green water, with a diet of algae and white worms will do almost as well." **(*Note the price of scats in the twenties - $20.00 a pair!*)**

William O'Brian died in 1928 at the age of thirty-nine, a victim of a freak automobile accident, while returning from a visit to Bill Sternke and his family in Daytona, Florida. He was a much-liked man and all who knew him agreed that he died too young. But, as August Roth noted, "Man proposes, God disposes." Aquarists, however, should not forget the man who introduced pH to the aquarium hobby.

Speaking of Bill Sternke, it should be noted that he was a noted breeder of aquarium fishes and his hatchery developed many of our first livebearer strains, including fancy guppies. The following is a short report of a visit to Sternke's fish farm in Opa-Locka, Florida in 1931 (Figures 22-5 and 22-6):

"My Visit to Sunnyland Fish Farm by R. R. Woolf

Recently while in Florida I called on my old friend William A. (Bill) Sternke of the "Sunnyland Fish Farm. As usual I found he was busy but, he suggested come to blank Hotel tonight at 10 P. M., while your time away till called and you will see something different.

"I did as I was told and was treated to a fight between a pair of Betta Cambodias which fairly kept the crowd on edge. No battle of heavy weights ever caused more excitement.

"Next day I called on friend Sternke and found quite a different sight than that which greeted me on my visit to him in Cleveland, fifteen years ago. At that time he had a hotel room lined with tanks of tropical fish. Two years ago

I saw his place at Daytona Beach, Fla., that was an impressive establishment but it does not compare with what he now has at Opa-Locka, Florida.

"'Bill' was born in Berlin and received his first instructions in the care of fish on the other side of the pond. Twenty years ago he came to America and has been developing the fish hobby on this side of the water from the point where he left off in Germany.

"His hatchery at Opa-Locka reflects his early training for it is of a different type construction than that usually seen in this country. Mr. Sternke advised that after a careful study of the houses in London, Hamburg, Berlin and Antwerp, he decided on the present type as containing the best points of them all. A portion of the hatchery is devoted to salt water specimens, but, I understand he is not ready to make his plans known on that score yet.

"Sunnyland Fish Farm is by no means complete, the original plans called for a much larger plant, however, the best laid plans of mice and men often miscarry and when the bank failures tied up his capital it was decided best to postpone matters temporarily.

"According to Mr. Sternke, the climate at Opa-Locka brings fish to maturity in a much shorter period than at any other place in the country."

The year 1926 saw yet another attempt at publishing by an aquarium society. In that year the AQUARIUM BULLETIN of the Aquarium Society of St. Louis appeared, edited by D. Miller. A year's subscription cost $1.00 and a single issue went for 10 cents. It did not last very long, however. One with a far different success story on the other hand was THE AQUARIUM, (Figure 22-7, Left) which appeared in September 1928. A printed four page pamphlet published by the San Francisco Aquarium Society, it was renamed THE AQUARIUM JOURNAL (Figure 22-6, Right) in September 1929.

The San Francisco Aquarium Society had maintained a close relationship with the California Academy of Sciences and with the Steinhart Aquarium. From the start therefore, the club attracted many professionals to its ranks. George S. Myers, for example, was its President in 1929. A typical program was given by Prof. Doanne of Stanford University, speaking on "The Relations of Aquatic Insects to Fishes."

THE AQUARIUM JOURNAL issues of the first few years, however, were not particularly impressive. The text mainly consisted of club news and news of the Steinhart Aquarium, with some space allotted to selected Questions & Answers. The $2.00 yearly membership fee to the society also included a subscription to the magazine. Because of its long history and hobby significance, THE AQUARIUM JOURNAL will be mentioned again in a discussion of the hobby in the thirties.

Although the importation of British aquarium books had noticeably diminished by this time, one notable exception was Edward George Boulenger's *The Aquarium Book,* first published in 1925. Boulenger was the scion of the famous George Albert Boulenger, Head of the Department of Ichthyology at the British Museum and author of many famous works in ichthy-

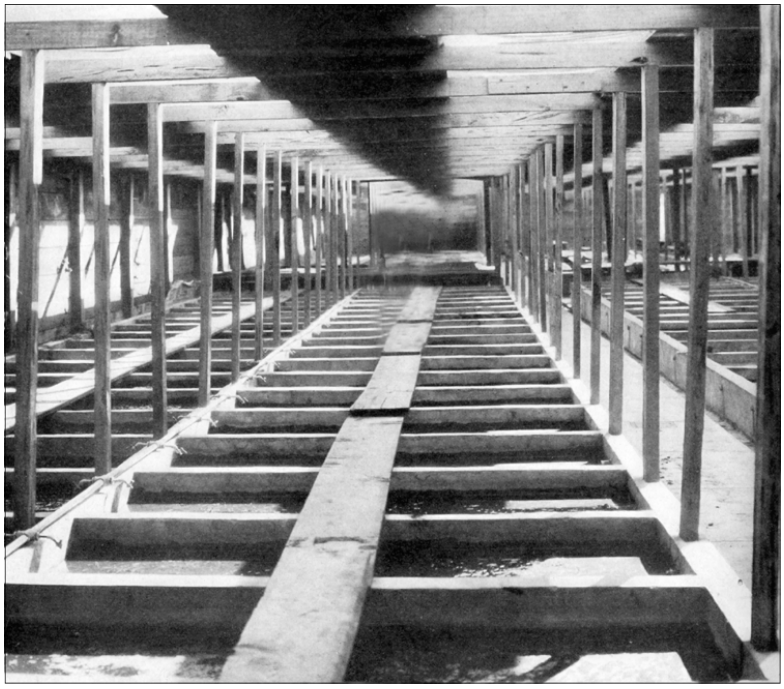
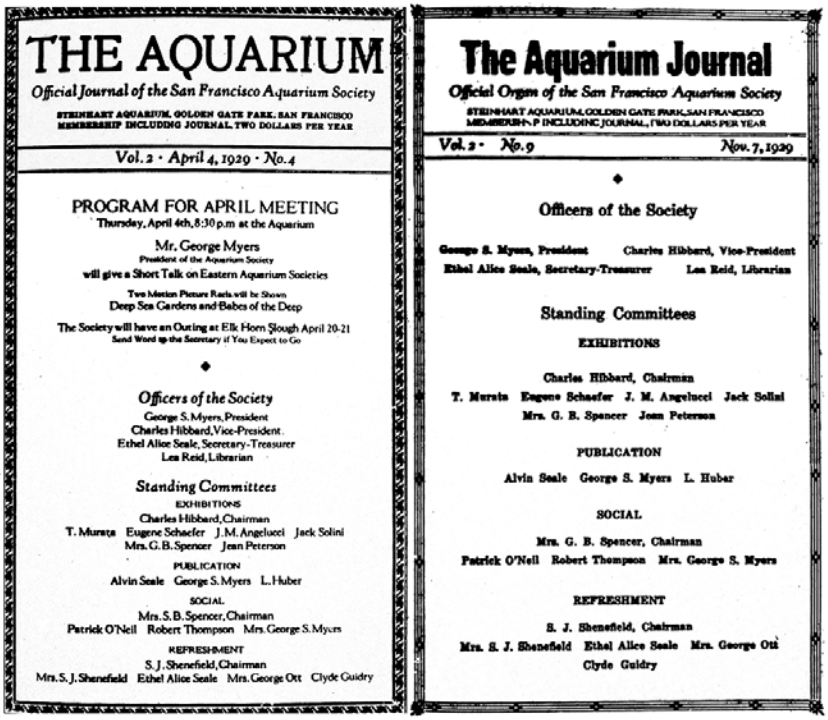


Figure 22-6. ONE OF THE OUTDOOR HOLDING TANKS AT WILLIAM SCHAUMBERG'S CRESCENT FISH FARM.



THE AQUARIUM

Official Journal of the San Francisco Aquarium Society

STEINHART AQUARIUM, GOLDEN GATE PARK, SAN FRANCISCO
MEMBERSHIP INCLUDING JOURNAL, TWO DOLLARS PER YEAR

Vol. 2 · April 4, 1929 · No. 4

PROGRAM FOR APRIL MEETING

Thursday, April 4th, 8:30 p.m. at the Aquarium

Mr. George Myers
President of the Aquarium Society
will give a Short Talk on Eastern Aquarium Societies

Two Motion Picture Reels will be Shown
Deep Sea Gardens and Babes of the Deep

The Society will have an Outing at Elk Horn Slough April 20-21
Send Word to the Secretary if You Expect to Go

◆

Officers of the Society

George S. Myers, President
Charles Hibbard, Vice-President
Ethel Alice Seale, Secretary-Treasurer
Lea Reid, Librarian

Standing Committees

EXHIBITIONS

Charles Hibbard, Chairman
T. Murata Eugene Schaefer J. M. Angelucci Jack Solini
Mrs. G. B. Spencer Jean Peterson

PUBLICATION

Alvin Seale George S. Myers L. Huber

SOCIAL

Mrs. S. B. Spencer, Chairman
Patrick O'Neil Robert Thompson Mrs. George S. Myers

REFRESHMENT

S. J. Shenefield, Chairman
Mrs. S. J. Shenefield Ethel Alice Seale Mrs. George Ott Clyde Guidry

The Aquarium Journal

Official Organ of the San Francisco Aquarium Society

STEINHART AQUARIUM, GOLDEN GATE PARK, SAN FRANCISCO
MEMBERSHIP INCLUDING JOURNAL, TWO DOLLARS PER YEAR

Vol. 2 · No. 9 *Nov. 7, 1929*

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Clyde Guidry

Figure 22-7. LEFT: THE PUBLICATION OF THE SAN FRANCISCO AQUARIUM SOCIETY. At first, it was called THE AQUARIUM, but one year later its name was changed to THE AQUARIUM JOURNAL. RIGHT: THE PUBLICATION OF THE SAN FRANCISCO AQUARIUM SOCIETY AFTER IT WAS RE-NAMED LATER IN 1929 AS THE AQUARIUM JOURNAL.

ology. Edward Boulenger, on the other hand, was a natural history writer who covered a wide variety of subjects somewhat reminiscent of Gosse and the Rev. John George Wood. The book was in two parts, saltwater and freshwater, and included many sections that would be of little interest to present-day aquarists, e.g., reptiles, freshwater invertebrates, batrachians, and mammals. An interesting idea advanced by Boulenger was that of applying to the home aquarium the system used by the large public aquaria of the day for circulating and filtering their marine tanks. Boulenger's *The Aquarium Book* secured a wide circulation in the United States, and editions were even issued after his death in 1946.

In 1928 there occurred one of the most famous "flaps" in American aquarium history. About this time there appeared on the American scene a type of betta known later in the hobby as the "Cambodian Betta." Before this time hobbyists kept what they thought were two different species, i.e., "*Betta rubra*" and "*Betta splendens*." The latter term described a fish with a somewhat bluish body, while the former was applied to reddish strains. In the fall of 1928 Walter Brind attended the annual exhibition of the New York Aquarium Society and came across several fish exhibited by William Schaumberg (of Crescent Fish Farm in New Orleans) that were labeled "*Betta cambodia.*" In an article in AQUATIC LIFE in October 1928, somewhat pretentiously entitled "A Dissertation on the Genus Betta", Brind concluded that the Cambodian strain was merely a southern form of "*Betta rubra* or "*Betta splendens.*" His argument, however, was a very reasonable one in light of the information available to him at the time. Simultaneously, another article was published, this one by C. G. Langley titled, "My Favorite Fish - *Betta cambodia,*" in which the author gave credit for the introduction to Frank S. Locke of San Francisco.

In December 1928 an article written by W. Beckley took exception with certain of Brind's statements, e.g., whether the Cambodian Betta was a natural form or was developed as a result of a long series of aquarium breeding; Brind opted for Mother Nature. More at issue was the matter of priority of naming. Brind responded like a wounded tiger, taking Beckley to task and lecturing him on fish identification. In the issue containing Brind's reply, however, were two Letters to the Editor contending that the Cambodian betta was not a product of New Orleans but San Francisco, giving credit for both the introduction and the name to Frank Locke. Since one of these letters was from none other than William Schaumberg himself, one would think that the matter would have ended there.

However, a letter from Joseph Taubles, a prominent New York dealer and owner of the Aquarium Specialty Co., stated that he had on July 19, 1927 imported 76 of the Cambodian bettas. Taubles did not claim that he had applied that name to the fish; he merely sold them as a new betta strain. Since Locke came into possession of his fish during October 1927, Taubles therefore was the first to import them. The record is also clear that it was William Schaumberg who bred

some of the fish he obtained from Locke and subsequently was responsible for its major distribution throughout the United States.

In any event, the next to jump into the controversy was George S. Myers, then a student at Stanford University and a good friend of Mr. Locke. Myers gave Brind "both barrels," and even reserved a good blast for Mr. Beckley! Recriminations aside, the Myers article is of some historic significance and we reproduce the more important parts of it here:

> "When I arrived (at Locke's hatchery), he ushered me toward a row of battery jars atop his tanks. There in the jars swam a row of the most remarkable fighting fishes I had ever seen. Both the dark (Siamese) and the light (Cambodian) varieties were represented, though neither Locke nor I then knew what they were. They had come off the ship three days before, and the man who brought them from Singapore said that they came from Bangkok, Siam. I shall not attempt a description of these fishes, others have done that, notably Mr. Locke. Suffice it to say that they were long finned bettas, much larger and more gorgeous than any of the common kind that we have seen. Both Locke and I were greatly puzzled by the fishes. On general appearances, however, I hazarded the guess to Frank that they were varieties of the common *Betta splendens.*
>
> "The very week that Mr. Locke's fishes arrived, I received word Dr. Smith (Dr. Hugh Smith, the leading authority on Siamese fishes) was returning from Siam and that his ship would dock in San Francisco in a few days. I went to meet the boat, but found it had arrived before schedule and had docked the day before. Dr. Smith had already left for the east, but there was welcome news. He had brought two pairs of high-grade fishes with him all the way from Bangkok, and had left them in the care of Mr. Alvin Seale of the Steinhart Aquarium and California Academy of Sciences. I went immediately to the Aquarium and Mr. Seale showed me the fighters. There they were, two pairs of them, identically the same type of fish that Mr. Locke had received. One pair of the light type, the other of the dark. Mr. Seale said that Dr. Smith left word that the dark fishes were the true Siamese fishes, carefully bred for fighting, and that the light ones were the type raised in Cambodia. Of course, I immediately went over to Locke's and told him what Dr. Smith had said and later Locke published an article christening the light fish *Betta cambodia.*"

Myers ended his article by pointing out the error in giving the new variety species status. In addition, he destroyed the myth that "*Betta rubra*" was a distinct species as it had been assumed for many years in the hobby. Thus ended the first aquarium controversy of note in this country.

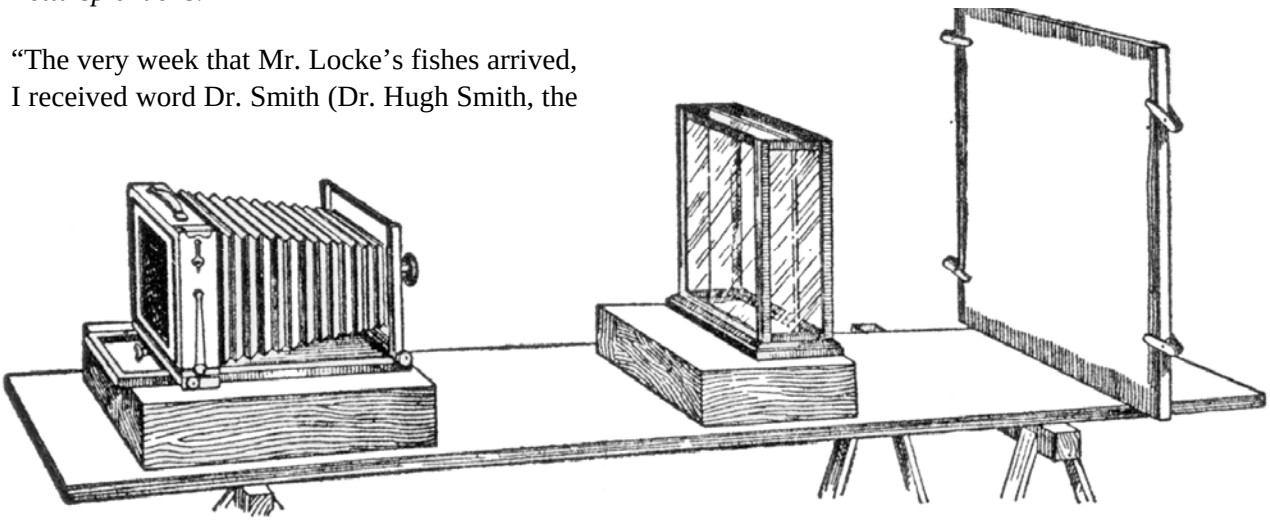


Figure 22-8. INNESES FISH PHOTOGRAPHY SETUP. A sliding inner glass panel in the aquarium controlled fish movement, and it was raised so that the board everything rested on would not appear in the picture. The tank was about 7 inches square and 2-1/2 inches wide.

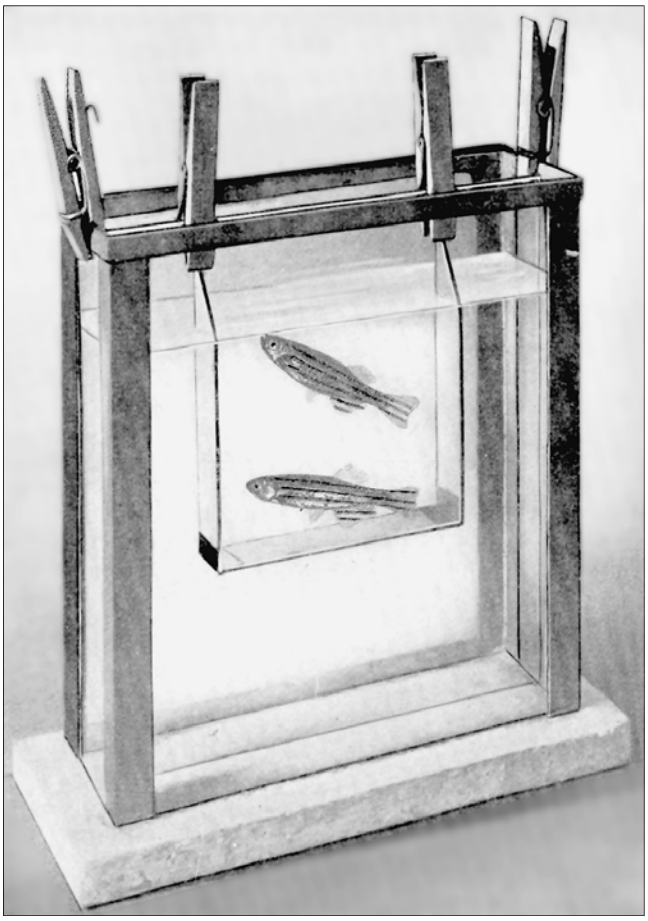


Figure 22.9 THE THREE PIECES OF GLASS FOR THE INNER CONTAINER OF INNESES PHOTOGRAPHING SETUP WERE CUT TO ABOUT TWICE THE WIDTH OF THE THICKNESS OF THE FISH, and to a length from three to five inches, depending upon the size of the fish to be photographed.

ADHESIVE TAPE WAS USED TO HOLD THE BOTTOM GLASS TO THE SIDES, and clothespins were used to hold both the inner container and the glass plate that served as its back (the front glass of the aquarium served as the front).

Several books and booklets were popular among aquarists at the time. As previously mentioned, the old Wolf book had been brought up to date in 1917 by Innes and published as *Goldfish Varieties and Tropical Aquarium Fishes*. A significant change occurred in 1926 when George Myers collaborated in the tropical fish part of that edition. The last edition to appear under that name was published in 1932; in 1936 the book was re-titled as *The Complete Aquarium Book*.

Recognizing the need for a first class, cheaper guide to aquarium keeping, Innes in 1926 also published *The Modern Aquarium*, a 72-page booklet. This sold for $1.00 in a soft cover version. Frank L. Tappan's booklet, *Aquaria Fish*, published in Minnesota, at the time was its only competition. Upon the arrival of the superior Inneses booklet, Tappan's publication became obsolete and its sales declined.

During this time Innes set about learning to photograph fishes, taking up where Shufeldt had left off. He used a view camera, a small aquarium with moveable internal glass dividers, several smaller glass containers to contain the movement of the fish, and a background board to which various cards of different colors could be affixed (Figures 22-8, 22-9, and 22-10). Natural light was used and Innes favored direct sun, preferably from April to September, although he got his best shot of a goldfish photographing it outdoors in February with the sun glaring off recently fallen snow. The results were spectacular for the period and astonished everyone.



Figure 22-10. LEFT: THIS PHOTOGRAPH OF AN AQUARIUM FISH—A BLUE GULARIS - WAS TAKEN BY INNES IN 1920 Using Natural Light And An Exposure Time Of At Least Three Seconds. Since this was before the days of Kodachrome and 35 mm cameras, Innes used a view camera and made the photo via the Autochrome process, a French additive color system that made its appearance in this country in 1907. Although slow and lacking in contrast, the film could produce photographs of a fine and delicate quality. RIGHT: AN EGYPTIAN MOUTHBREEDER (*Haplochromis strigigena*) PHOTOGRAPHED BY CHARLES M. BREDER JR.

However, Innes was not the only one photographing fishes. A young man by the name of Charles M. Breder Jr. (Figure 22-13), who was later to become a famous ichthyologist, was also an accomplished fish photographer. He and George S. Myers were contemporaries; Myers was born in 1905, Breder in 1897. Breder used a setup similar to the one used by Innes, consisting of a 4" x 5" plate camera mounted on a board, a photographing tank, and a removable background (Figure 22-11). The camera was purchased second-hand for eight dollars. Although speeds of up to a hundredth of a second were possible, Breder never used shutter speeds any faster than one-fiftieth of a second. The bellows on the camera could be extended so that objects could be photographed three-fourths size without any extra attachments. However, he also used a 30-cent closeup attachment on his lens for photographing fishes life-size and larger.

Breder's photographing aquarium measured two by five by six inches and had a frame made of 20 gauge galvanized iron strips, one inch wide. Like Innes, he also used a movable partition to keep the subject in focus. He preferred photographing between 10 am and 2 pm, with the light coming from the right side of the photographing tank.

Breder was a columnist for AQUATIC LIFE when Poyser was its editor and a frequent contributor under Roth's editorship. In addition to being a pioneering fish photographer, he was also a very competent draftsman. The following appeared in the September 1917 issue of AQUATIC LIFE:

"An Emergency Heater
Charles M. Breder, Jr.

When the aquarium heater fails, and the tropical fishes are in danger, float a shell-glass tumbler in the tank with a sweet oil night-light in it. Place a number of lead shot, or other weight, in the bottom of the glass; just enough to prevent it from capsizing. Pour in sweet oil until the glass settles to a point where the water is about one-half inch from the brim. After the correct quantity of oil has been ascertained a rubber band may be passed around the glass as a marker for future fillings. I found that the average glass floated in this way holds enough oil to last for twelve hours or more.

"Fifty wicks for these night-lights, together with a float for them, can be bought at almost any drug store for ten cents. They are designed to furnish a dull light for the sick room. Addi-

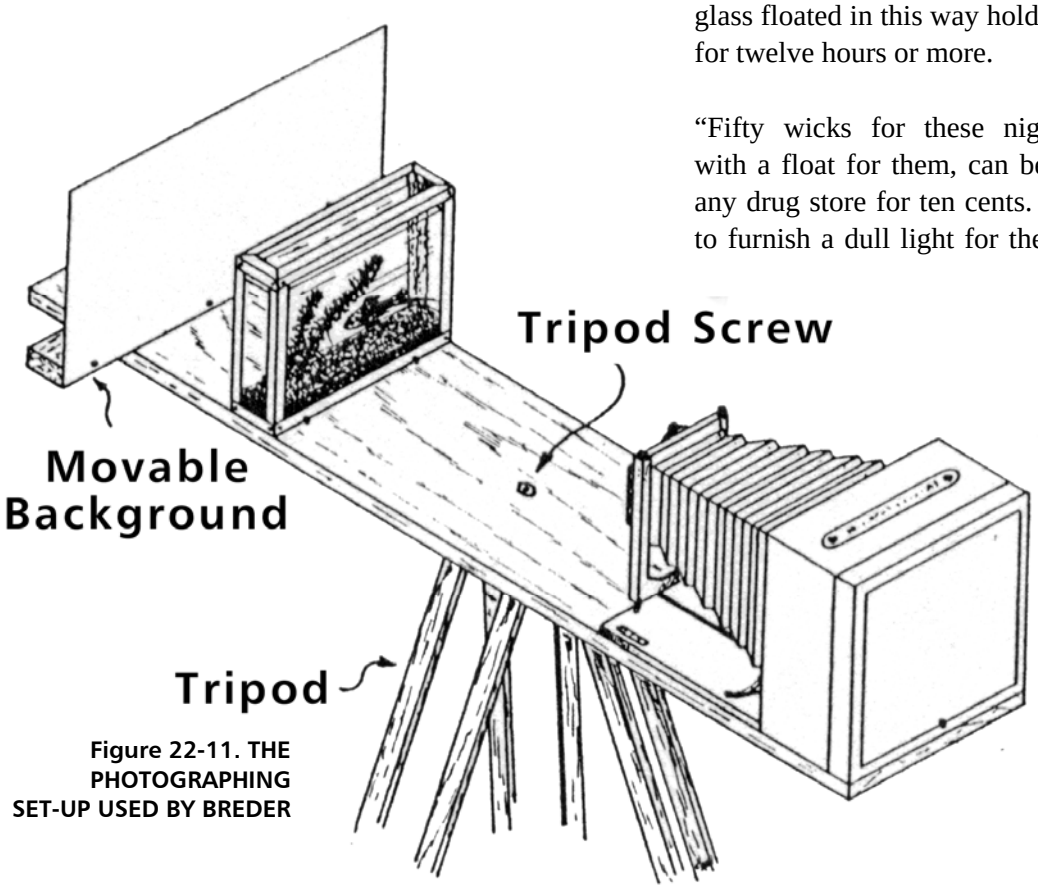


Figure 22-11. THE PHOTOGRAPHING SET-UP USED BY BREDER

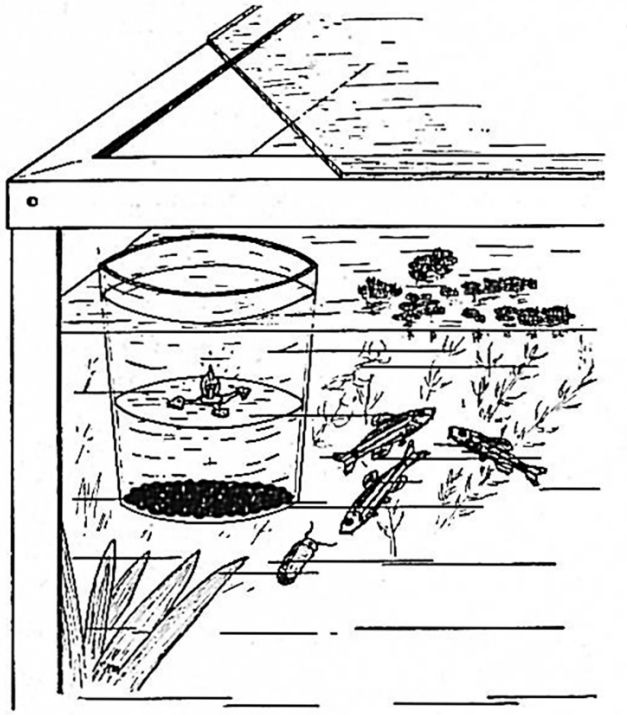


Figure 22-12. THE HEATER IN USE.
Drawing by the author.

tional floats may be made of a piece of tin and a few bits of cork, patterned after the one supplied with the wicks, if more than one heater is to be used. The cover-glass directly over the light should be removed, as the heat arising from the lamp would cause it to crack. A corner may be cut from the cover if the heater is intended to be semi-permanent. It is not safe to use this device with large or very active fishes as they might upset it, but it is just the thing to save *Danio rerio*, or other small species, when things go wrong with the regular heating apparatus. The fishes always congregate about one of these heaters, being attracted by both the heat and the light."



Figure 22-13. CHARLES M. BREDER, JR. (1897-1983), an ichthyologist active in the aquarium hobby during the twenties and thirties.



Figure 22-14. THE EARLY AIR PUMP DESIGNS WERE LEATHER BELT-DRIVEN AND POWERED EITHER ONE OR TWO PISTONS. The frames were made of cast iron and the pistons were of brass. Models utilizing this basic design were available even after World War II although leather belts were replaced by rubber ones.

CHAPTER 23:
THE TWENTIES COME TO A CLOSE

In October of 1928 August Roth announced that he would actively attempt the formation of a national organization of aquarists, the first such serious effort since the previous decade when the aquarium societies of New York, Brooklyn, Philadelphia and Chicago formed a loose alliance and published THE AQUARIUM during the period 1912-1914. For a while, Roth referred to the organization as that "Parent Association." He received considerable support for his plan from some celebrated aquarists. Fritz Gagelman of the Automatic Unit Heater Co. of New York City, for instance, pointed out that in Germany every fancier was a member of an aquarium club and every aquarium club was a member of the "Central Organization." In 1928, the Central Organization even issued insurance policies to its members, insuring against damage caused by leaking tanks! The initial concept of the Parent Association was that it would stage annual shows and arrange for traveling exhibits to arouse interest in tropical fishes. It would also have an Advisory Council of scientists that would provide information to aquarists about new or rare species of fishes.

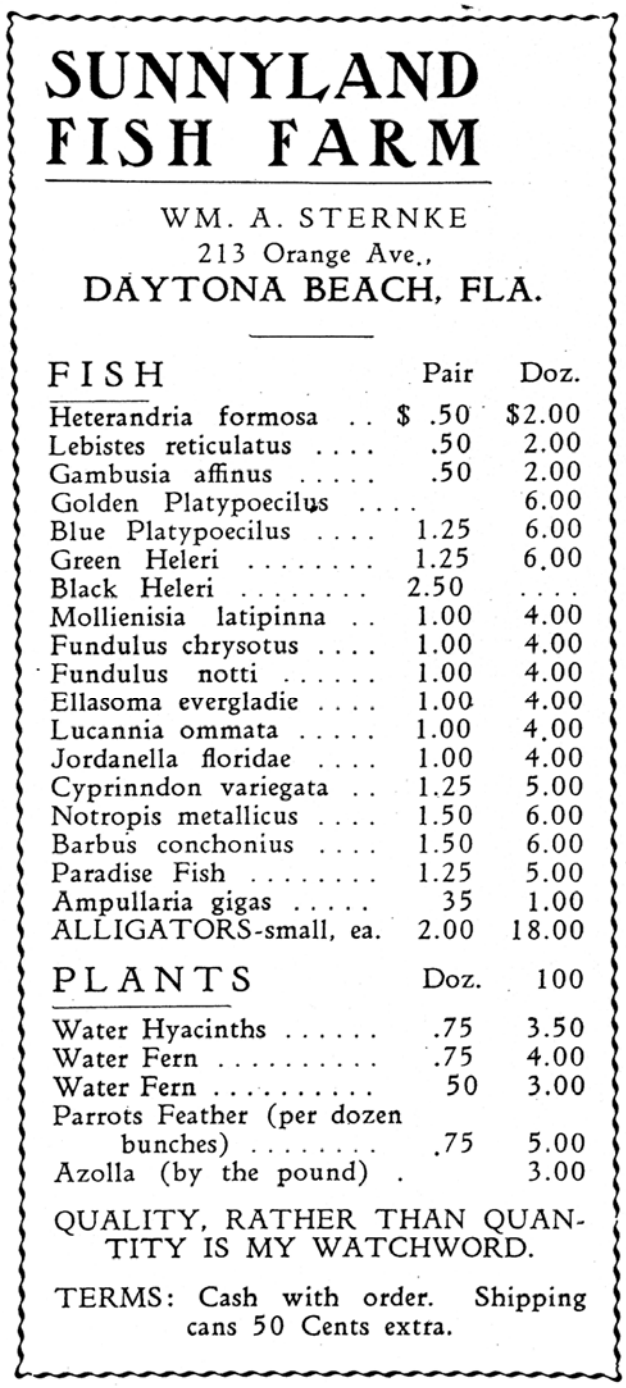


Figure 23-1. AN INDOOR HATCHERY AT SUNNYLAND FISH FARMS.

Tentatively, individual memberships were scheduled at $2.50 per year, the price to include a subscription to AQUATIC LIFE, which was the only genuine commercial aquarium magazine published in the country at the time. For clubs a per capita charge of 50 cents was proposed, plus $1.00 per member for a subscription to AQUATIC LIFE. The idea of a national organization received support from Richard Dorn who was quite bitter at the failure of continual attempts to improve cooperation among New York area aquarium clubs. Support also came from George S. Myers who, when he was a member of the Hudson County Aquarium Society in New Jersey, attempted to establish a federation of aquarium clubs. However, the idea was, as he put it, "squashed."

In any event, on March 22, 1929 a small group of interested hobbyists formed the Affiliated American Aquarists Association (AAAA), meeting in the editorial offices of AQUATIC LIFE in Baltimore for this purpose. Temporary officers elected were: President, Richard Dorn; Vice President, Fritz Gagelman; Treasurer, August Roth; and Secretary, Edwin H. Perkins. The group immediately pledged $62 to the Association and it was agreed that any attempt on the part of a member to commercialize his position as a member of AAAA, would be sufficient cause for expulsion.

Shortly after the formation of the AAAA, however, the Great Depression of 1929 hit the country. Even in the best of times, the concept of the association was a difficult one to sell to the hobby, so the depression was the final straw. With the wind out of its sails, so to speak, the Association existed mostly as a technicality. In 1932, when the hobby had made a remarkable recovery from the economic downturn, an attempt was made to reactivate the AAAA, but by this time two new commercial aquarium magazines appeared on the scene to challenge the leadership of AQUATIC LIFE. Somewhat overwhelmed by the newcomers, AQUATIC LIFE fell from its position of prominence in the hobby and with it went the Affiliated American Aquarists Association. To this day, no attempt at a national aquarist's organization has ever met with any real success, although specialist organizations have fared very well.



SUNNYLAND FISH FARM

WM. A. STERNKE
213 Orange Ave.,
DAYTONA BEACH, FLA.

FISH	Pair	Doz.
Heterandria formosa	$ .50	$2.00
Lebistes reticulatus	.50	2.00
Gambusia affinus	.50	2.00
Golden Platypoecilus		6.00
Blue Platypoecilus	1.25	6.00
Green Heleri	1.25	6.00
Black Heleri	2.50	....
Mollienisia latipinna	1.00	4.00
Fundulus chrysotus	1.00	4.00
Fundulus notti	1.00	4.00
Ellasoma evergladie	1.00	4.00
Lucannia ommata	1.00	4.00
Jordanella floridae	1.00	4.00
Cyprinndon variegata	1.25	5.00
Notropis metallicus	1.50	6.00
Barbus conchonius	1.50	6.00
Paradise Fish	1.25	5.00
Ampullaria gigas	35	1.00
ALLIGATORS-small, ea.	2.00	18.00

PLANTS	Doz.	100
Water Hyacinths	.75	3.50
Water Fern	.75	4.00
Water Fern	50	3.00
Parrots Feather (per dozen bunches)	.75	5.00
Azolla (by the pound)		3.00

QUALITY, RATHER THAN QUANTITY IS MY WATCHWORD.

TERMS: Cash with order. Shipping cans 50 Cents extra.

Figure 23-2. WILLIAM A. STERNKE, A PROMINENT FISH BREEDER OF THE TWENTIES, OWNED THE SUNNYLAND FISH FARM. This is a Sunnyland price list for June 1927. Note that many of the aquarium fishes offered for sale at the time were natives.

Before leaving the decade of the 1920's, a review of the state of the art of the aquarium hobby in America is in order. It was certainly a period that witnessed an increase in the use of aeration and electric heating in the hobby. Although the famous K.D.A water operated air pump was still widely used, towards the end of the decade larger and more expensive, costing about $40, electrically driven piston compressors made their appearance. Filtration, however, was virtually unknown during this period and the popularization of filtration would have to wait until 1932 when the first inexpensive inside box filter was placed on the market.

A good gas heater cost about $5 and non-controllable electric heaters about 50% more. Towards the end of the 1920's the Automatic Unit Heater Co. of New York City placed a fully automatic heater-thermostat unit on the market at a price competitive with gas heaters, thus spelling the end of the use of the latter in the aquarium hobby.

The largest fish farm in the country during this period was Schaumberg's Sunnyland Fish Farm in New Orleans (Figure 23-1). Bettas sold for $7.50 a pair, swordtails $3.00; Rosy Barbs, Blue Acaras, Jack Dempseys, *Aplocheilus chaperi*, Paradise Fish and platies sold for $1.50 a pair. In 1929, however, one-year-old angelfish were still $12 a pair, and young angelfish cost $2.50 each! The large tank manufacturers of the day were Halterbeck with his "Peerless" brand and Hans Jensen with his "Jewel" brand (Figures 23-3 and 23-4). However, towards the end of the 1920's, an aquarist named M. Raymond Potts (figure 23-5), of Caldwell, New Jersey, started making tanks under the firm name of the Potts Aquarium Co., Inc.

Potts, who was an aquarist, obtained several backers and started producing a new kind of aquarium. Before this time most were made either of cast iron or sheet metal. The former was heavy and the latter rusted easily. Potts, who was treasurer of the firm he founded, came up with a brand new idea - sheet metal that did not rust. Thus the first stainless steel tanks were made available to the American aquarium hobby. This was definitely an American innovation, not popularized in Europe until after World War II. In 1931 the name of the firm was changed to the Metal Frame Aquarium Corporation, although "Potts Aquariums" were still featured. Later the firm was internationally known as Metaframe, Incorporated. The following is a short report that appeared in the April 1930 issue Aquatic Life:

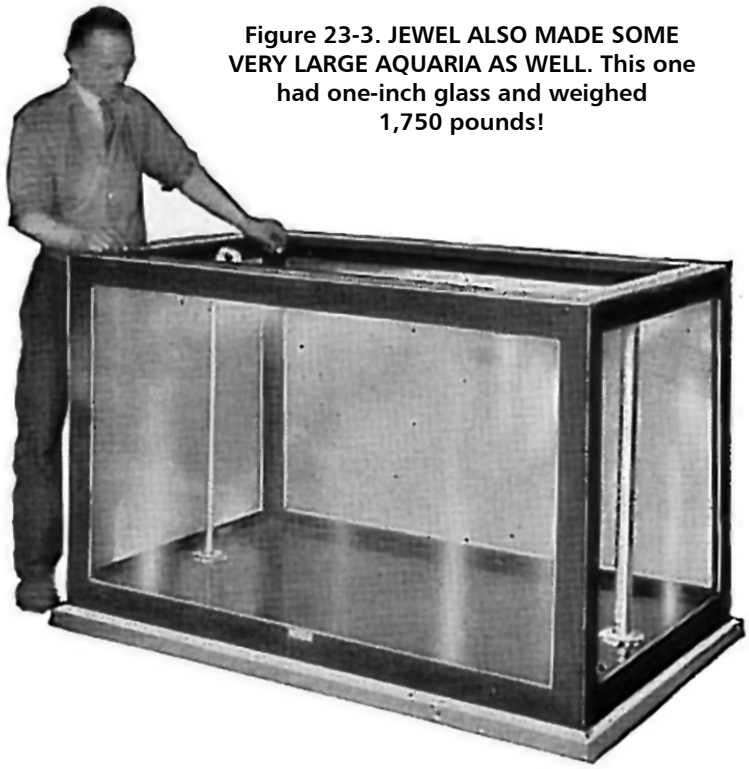


Figure 23-3. JEWEL ALSO MADE SOME VERY LARGE AQUARIA AS WELL. This one had one-inch glass and weighed 1,750 pounds!

"They're Tough

We were sitting in the office quietly resting our fingers after a rather protracted hammering at the typewriter. We closed our eyes and thought of the "Great Gabon" and his rough way of treating his sweetheart. Before this thought left us, who should walk into our office but Mr. M. Raymond Potts, the Treasurer of the Potts Aquarium Co., Inc., of Caldwell, N. J.

"Mr. Potts finished his business in our section then dropped off at the Baltimore Exposition rooms to see the one man exhibit. He showed us something, and friends let me tell you, the way he abuses aquariums (of Potts Manufacture) makes old friend Erich a back number. He hammered on the bottoms, pushed on the sides and then to show the strength of the Potts Aquarium, deliberately threw one on the floor. (Note: Our office is not carpeted



Figure 23-4. JEWEL AQUARIUMS WERE VERY POPULAR DURING THE 1920'S. This ad appeared in 1928.

with Persians druggets). He then dared us to make it leak by ordinary treatment even after his abuse of it. It didn't.

"He then invited us out to see the new sample car this concern uses. It certainly is snappy, so interesting that we called in a picture man to make the photo seen above. This car carries a line of tanks in the well arranged, especially constructed body and we found it hard to call for a size tank that our genial friend could not produce from that car. It is equipped to satisfy the curiosity of any one who doubts the claim of Mr. Potts that his tank will do everything their advertising claims for them.

"We were very much interested in the metal this concern uses, it is steel specially treated and is absolutely non-rustable. No wonder so many people now swear by the Potts Aquarium."

The end of the 1920's saw the beginnings of attempts to impose a tax on the importation of aquarium fishes. The following appeared in the March 1929 issue of AQUATIC LIFE:

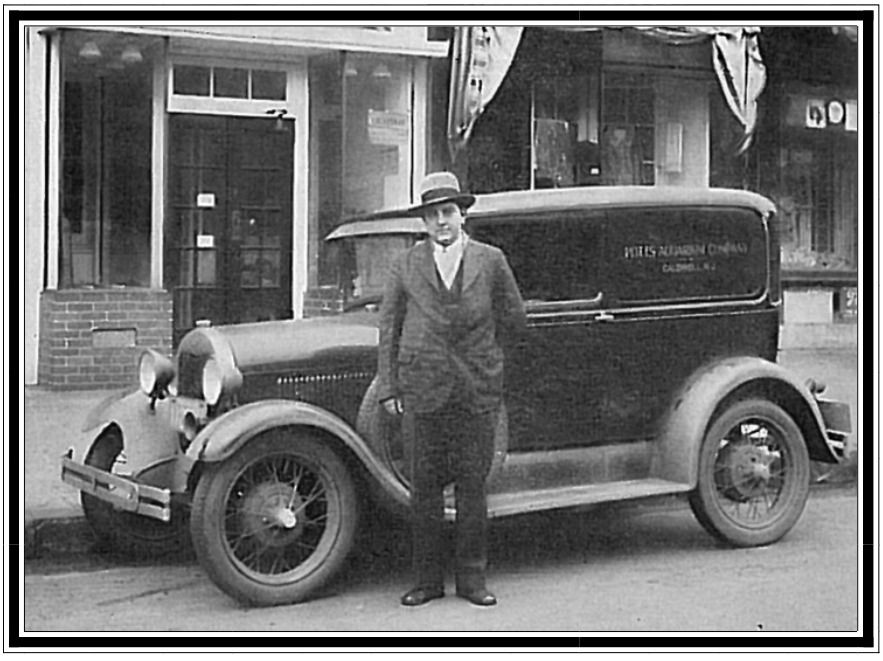


Figure 23-5. MR. M. RAYMOND POTTS AND THE POTTS SAMPLE CAR.

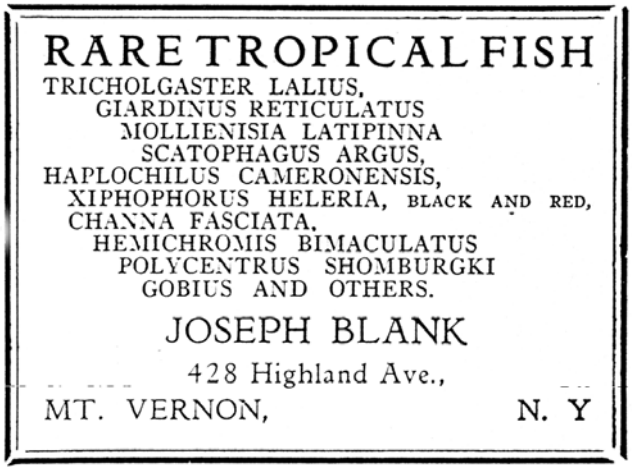


Figure 23-6. WHAT WAS CONSIDERED RARE IN 1925. SCATS, YES, BUT MOLLIES?

"Proposed Tax on Imported Tropicals Unjust
By F. F. Gagelman

"Germany is the acknowledged tropical fish center of the world today, and I think we are willing to admit it is the leading center of exportation in this line.

"The reasons for this are many, but the principal one can be laid at the seaman's door. It is well known that their ships cover every navigable water, and it is further known that their seaman are a very thrifty lot, different from the other seaman who are at best classed as shiftless.

"The method of importation to Germany by the seamen is very simple. German seamen are paid one half their salaries for a trip before they leave their home port. Some with dependents send this money to their homes before sailing, some even spend it in saloons before leaving port - they believing in preparedness while the third group - these constitute the majority - take the money with them to invest in

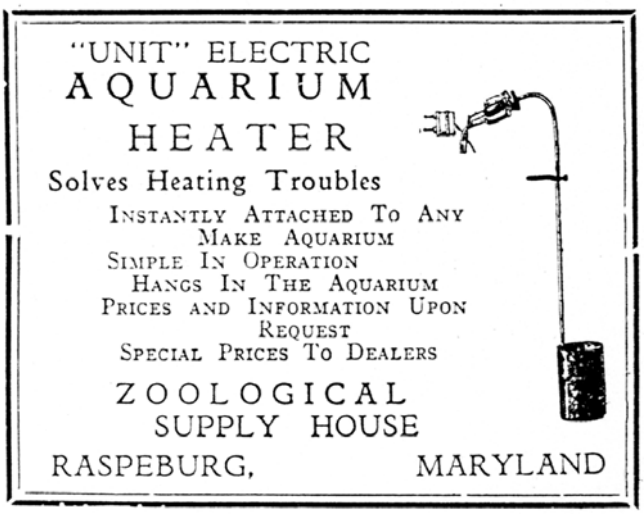


Figure 23-7. THE ELECTRIC HEATERS OF 1925 WERE FAIRLY RUDIMENTARY AT THIS TIME.

articles found in foreign countries for which they expect to find a ready sale at home and in this manner they are able to about double the money they make on a trip.

"When their ship lands, be it Naples, Genoa or any other foreign port, these men make trips to the interior in search of rare fish or birds, knowing full well that as soon as they get back to Germany the dealers will be down to the docks to buy. Natives have learned of these trips and also know some of the men, who in turn advise them when they will be in the native's port. Upon arrival they are whisked away in the native style to a place where the offerings are held and the bartering begins. You can imagine how much chance an ignorant native has with a schooled German sailor.

"After due time the ship returns home, and at the dock are many breeders and exporters, who have been advised by mail of the trophies which are being brought back, and again the merchandise changes hands. So great has the clamoring for this material been that I have known dealers to go out in airplanes to meet the boat and make their offers in this way.

"Seldom is the imported article sold without sufficient remuneration for it, except in the case of a few sailors who are single, and without

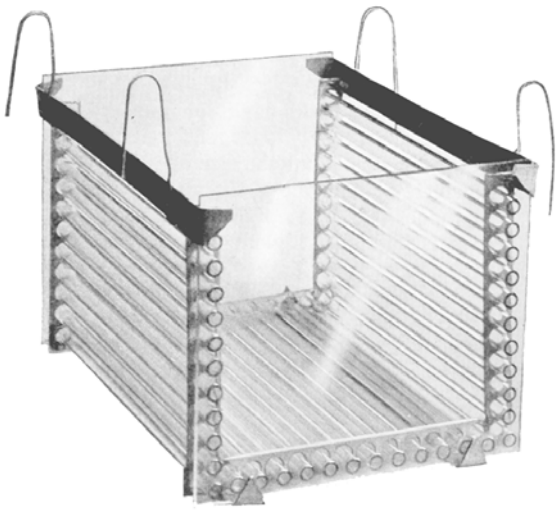


Figure 23-8. THIS WAS A COMMERCIALLY AVAILABLE GLASS BREEDING CAGE CIRCA 1928 FOR BREEDING LIVE-BEARERS. The gravid female fish was placed within the cage, and the young, as they were born, slipped through the bar separations and out of danger of being eaten.

dependents. These men live at an inn to which a saloon is attached. Sailors become indebted to the proprietor and are under obligation to sell their wares to him, but never at a sacrifice. These men - those who buy from the sailors have a ready market for any commodity, and many rare fish are named after them, some of



Figure 23-9. FRITZ GAGELMAN

them know absolutely nothing about fish - their motive being entirely mercenary.

"To this we must add the position of the German breeder today. He has at his finger tips ideal conditions - an especially constructed house- an abundance of lave food and every park or Zoological garden has its own experiment station, the results of which are regularly published. Again the dealer is always a professional breeder and he manages to keep up a stock of rare fishes without having to depend on the little breeder as we do in this country. Even the fish fancier in Germany goes about his work in a methodical way, using the experience of wiser men, and none of them lack a knowledge of aeration.

"In Germany the government very wisely keeps from imposing a duty on anything scientific or related to a hobby, but does impose a tax on anything necessary to a livelihood. Fanciers have thus had an opportunity to establish themselves on a paying basis, without having to go to tremendous initial expense.

"Why then does this country desire to impose a tax on importations for a scientific hobby? And how is this tax to be imposed? Suppose a dealer does not get what he ordered, and suppose the tax is to he assessed on the purchase price, will the customs inspector be able to tell the difference between Guppyi and Veiltail Splendens; or if half a shipment arrives dead will he be able to tell the difference between a dead Paradise and a dried up Cichlid? Dealers have been known to take our money and never send us any fish. How much tax should be paid here?

"There is only one way known to protect the importer of tropical fish. If in any case a dealer has a just complaint against a German exporter, such as keeping money and not sending fish, or sending inferior ones - not like those advertised, the injured party should swear to the facts and send a copy of his statement to AQUATIC LIFE so it may publish the history of the deal and you can rest assured there will be no reoccurrence particularly if they send the statement to the two German papers. Ninety per cent of a German exporter's business is with this country and he certainly would not like to have himself blacklisted.

"Losses to importers are heavy enough now without a tax, and they would be considerably higher if there was one. If the high cost of tropicals is considered a handicap to the hobbyist what would the cost be with a tax of 50%?

"Dealers in the importing business would gradually disappear and then where would the individual fancier get his new varieties?

"When this time arrives the fancier will be in the hands of dealers and importers with large space at their disposal offering facilities for breeding on an extensive scale.

"When this time comes will the fancier he able to get all the varieties he gets today, and will he be able to get them at the same price he has to pay now? I say no, because I believe if the tax is imposed our hobby will dwindle in two years to a mere shadow of its former self, and finally to the wall.

"Then what will become of the dealer or breeder behind the hill? Whom will he sell?

Why do some persons or firms want to protect the fancy or the importer and how can they pose as benefactors?

"Protest against this bill for the sake of our hobby is my advice."

In August of 1928, two species were reported in AQUATIC LIFE to have been bred in the United States, a first for both"

"Breeds *Ambassis Lala*

"Since the publication of the A*mbassis lala* article by Mr. Brind in the June issue, we learn from Mr. O'Brien that the Wm. Tricker Co. has been successful in breeding this fish and at the time of his writing us, which was about the

Figure 23-10. THE BURNSIDE PET SHOP
(NEW YORK CITY) AD OF THE LATE 1920'S.

Burnside PET SHOP

2061 Jerome Avenue
BRONX - NEW YORK

Largest Selection of TROPICAL FISH and AQUARIUM SUPPLIES in the BRONX

o——— VISITORS WELCOME ———o

Weekdays 9 *A. M. to* 10 *P.M.* *Sundays* 9 *A. M. to* 3 *P. M.*

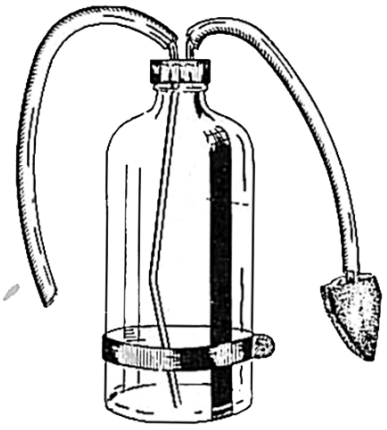


FISH FOOD COLLECTION No. 1
Geha. Wawil, Bartman's, Krone, Havelin, Unisona, Welkes,
....An assorted dozen for Prepaid **$1.25**

FISH FOOD COLLECTION No. 2
Geha, Welkes, Piscidin, Bartman's Krone, Havelin, Unisona, Hy-grade, Long Life, Micrograin, Reliance Wawil. An assorted dozen Prepaid **$2.00**

SPECIALS FOR JUNE ONLY

No electricity, no fussing with any water—just a simple air—
COMPRESSOR
COMPLETE.
1 OUTLET **$2.75**
2 OUTLETS **$3.25**
Air Valves 35c Tees 15c
Air Stones 15c
Hose, per foot 3c



White Worms—Generous quart portion, prepaid **$1.00**

All Live Food Available
the Year Round - - -

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Send self-addressed envelope for our new Price List

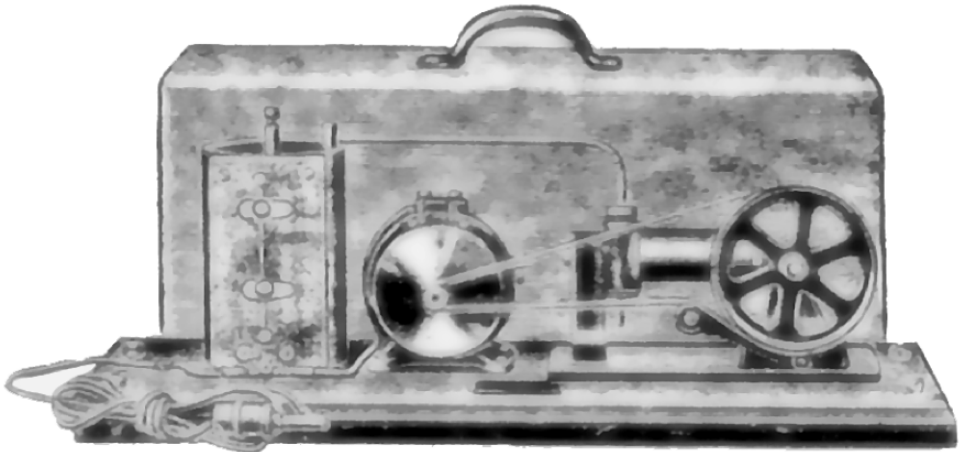


Figure 23.11. THE ELECTROZAN AIR PUMP OF 1924. This pump required a space of only 8 x 15 inches and could supply air for up to 25 tanks. It cost $40. The carrying case is shown behind the pump.

middle of July, they were three-eighths of an inch long and appeared to be well and happy."

"Breeds *Rasbora Heteromorpha*

"Mr. Paul S. Mary, a member of the Fish Culturists' Assn. has succeeded in breeding Rasbora heteromorpha. This is the first recorded instance of this fish having been bred in captivity in America, if not also in Germany.

"Mr. Mory had a pair of these fish in a small battery jar and had covered the bottom of the jar with *fontinallis* or Willow moss, and after watching the fish go through the motions of spawning, removed them and within a few days was delighted to see six young fish swimming in the jar.

"As the event was so very unusual, Mr. Mory called his friend, Mr. J. Louis Troemner on the phone that day. Mr. Troemner lost no time in calling upon Mr. Mory to see the new arrivals. Therefore Mr. Troemner can vouch for this story which to the aquarist may sound like a fish story. It is, but a true one."

Aquarium keeping and the tropical fish hobby grew vigorously during the 1920's, especially from 1927 onward. To support the growing use of aquaria in education, the Lincoln School of Teachers College, Columbia University, New York, published "Schoolroom Aquaria" in 1925. In the Great Crash that materialized four years later, the hobby was affected in a very strange way. As economic indicators dropped, tropical fish keeping rose to heights that seemed dizzy to the old timers. Dr. George Myers proposed the following reasonable explanation: "I suspect it was due primarily to two things - a desire to become absorbed in a hobby and forget monetary troubles, and the hope of making a few dollars by breeding fishes." Whatever the cause, the hobby took a number of giant steps as it entered the 1930's. This decade was to produce many new stars and events.



Figure 23.12.
From LEFT to RIGHT: MSSRS. HOLBEIN, SCHAUMBERG, and BERKITZ.

CHAPTER 24:
THE EARLY DEPRESSION YEARS

Although the United States was in the throes of a depression in the early 1930's, the aquarium fish industry was better off than most, the volume of fish business increasing by leaps and bounds. As will be discovered later, the depression did not catch up with the hobby until 1937. Meanwhile, however, the period was marked by the appearance of a host of new aquarium magazines, some of them of outstanding quality.

Before examining these publications each in their own turn, a few remarks are in order about progress in the hobby. The decade of the 1920's saw the introduction of electric heating, lighting, and aeration on a wide scale. In the following decade, use of these devices became the norm for the hobbyist.

Prior to the introduction of the thermostatically controlled aquarium heater, heating was still rudimentary. One interesting scheme for heating an aquarium involved the steam radiator commonly found in apartment units (Figure 24.1). A glass tube was set into the open space behind the radiator, the water circulation being forced by use of a standard aquarium pump. The circulation was forced since, if the water spent too much time behind the radiator, it would get too hot. Since glass was hard to bend, the system was constructed of sections of glass tubing joined by pieces of rubber hose. The return water could also be made to pass through a shallow suspended filter just above the surface of the water, thus providing triple service: heating, aerating, and clearing the water of coarser particles.

Another approach was even simpler and consisted merely of placing small, 30-watt, electric bulbs between the aquaria (Figure 24-2). The open space was enclosed with boards about three inches wide. Since very little escaped through the boards, most of the heat went through the ends of the tanks. The bulbs were not in the way and did not interfere with the cover glasses.

In the 1920's and even into the thirties there was a great deal of controversy over whether aeration was harmful to fish or not. The argument against aeration was that it destroyed the microscopic life important to the development of young fish and that plays a major part in the balance of an aquarium. AQUATIC LIFE argued for the use of aeration but there were still those who fought the idea. In the January 1935 issue of AQUATIC LIFE August Roth laments,

"AERATION ISN'T NEW

"Every once in a while some who dislike the use of air in the aquarium will voice the fact that they are not in sympathy with the new fangled ideas being fostered by AQUATIC LIFE. The other day the writer read such a letter; he also had on his desk a copy of AQUATIC LIFE, Volume 1. In January 1916 he found an article on page 59 headed 'A Simple Aeration Apparatus.' The author of that article was none other

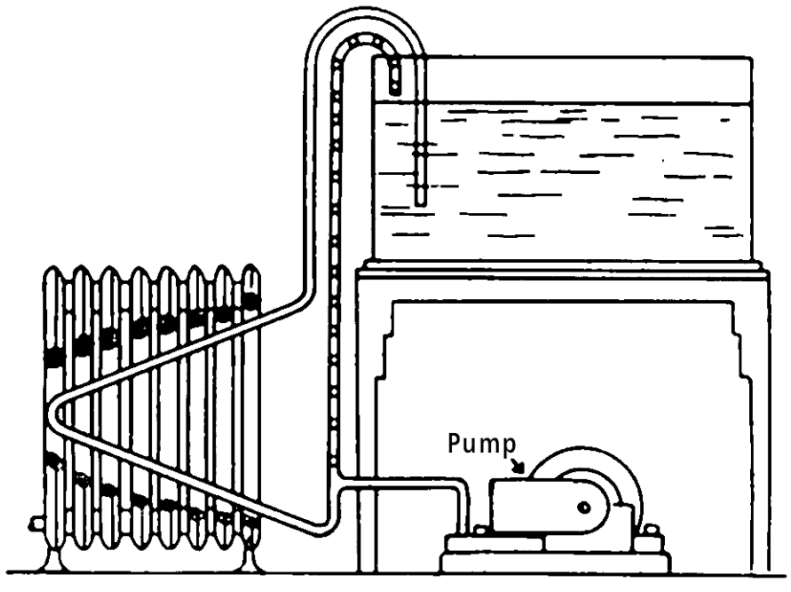


Figure 24-1. HEATING AN AQUARIUM USING A RADIATOR. Circulation was forced by using an aquarium pump to inject bubbles of air into the nearer vertical hose. The air/water mixture, being lighter than air, caused the mixture to rise and empty into the tank.

than Fred G. Orsinger, genial director of the United States Aquarium at Washington, D.C. At the time the article was written Fred was a fancier in Chicago with ideas ahead of his day. That's why he holds such a responsible position in this day.

"The use of aeration is, to quote the article, "essential in many instances" and he then proceeds to tell how to make one from a five gallon oil can and bicycle pump. No need to repeat the directions, we have improved on pumps but we haven't improved on the fact that 'it is essential in many instances today,' just as it was back in 1916.

"Next time you are anxious to knock some new fangled gadget be certain it is really new - not just revamped."

In any event, air pumps became available in smaller sizes, the piston type predominating. The "Boy Wonder," an inexpensive piston pump, could be purchased in 1932 for $10.50 (Figure 24-7). The "Sa-Ja" piston pump, operated on an induction principle, was also popular but considerably more expensive (Figure 24-7).

Depending on one's point of view the arrival of the first real aquarium novelty in 1930 can be considered either "progress" or a pox. In this year the Chase Novelty Mfg. Co. of Chicago, Illinois, placed on the market a metal diver bending over a treasure chest. The diver was piped for air, the bubbles of which were released from the diver's helmet (Figure 24-3). In short, the device was not unlike what is available today. Its price, $2.50, was rather steep for the times but it did signal the beginning of the novelty market in the aquarium field.

The design of the tank itself became neater and less rococo, and some heaters and thermostats resembled for the first time those we see in the hobby today. Reflectors also made their appearance at this time. The one thing, however, that had not yet been developed commercially was the airlift operated filter. Although the principles of filtration were known and many aquarists built their own such devices, filtration was not widely employed throughout the aquarium hobby. In 1932, however, the Empire Tropical Fish Import Co. of New York City placed several imported, inside box type filters of German manufacture on the market.

One of them proved to be the forerunner of the inside type commonly used today. In this design (Figure 24-14), water was pumped via an airlift to the top of a clear plastic box suspended in a corner of the tank. The water then fell by gravity through a layer of cotton, then through a deeper layer of charcoal, known at the time as "active coal," and returned to the main body of water through holes in the bottom of the box. Although the device was cheap, the idea of filtration did not catch on immediately. In 1934 the Wm. Tricker Inc. firm, of Independence, Ohio, introduced the

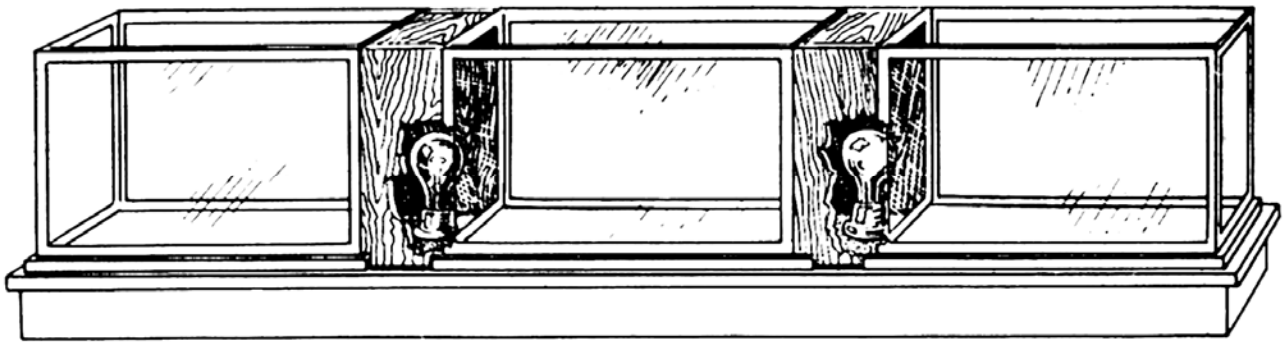


Figure 24-2. ANOTHER HEATING SCHEME. 30-watt electric bulbs were placed between the aquariums. The open space on the sides and the top was enclosed with boards about three inches wide. In this way the heat went through the ends of the tanks and not out into the room. The bulbs were not in the way and did not interfere with the cover glasses.

first outside airlift filter in this country. The acceptance of filtration was slow, and although by 1938 it was not uncommon, the universal use of filtration devices in the aquarium hobby in America did not take place until after World War II.

In 1935 a patent was awarded to Leonard C. Tingley of Providence, R. I. for an aquarium feeder (Figure 24-6). It was made to be clipped to the side of the aquarium and had a slide valve operated by a special clock mechanism. The slide was, in reality, the bottom

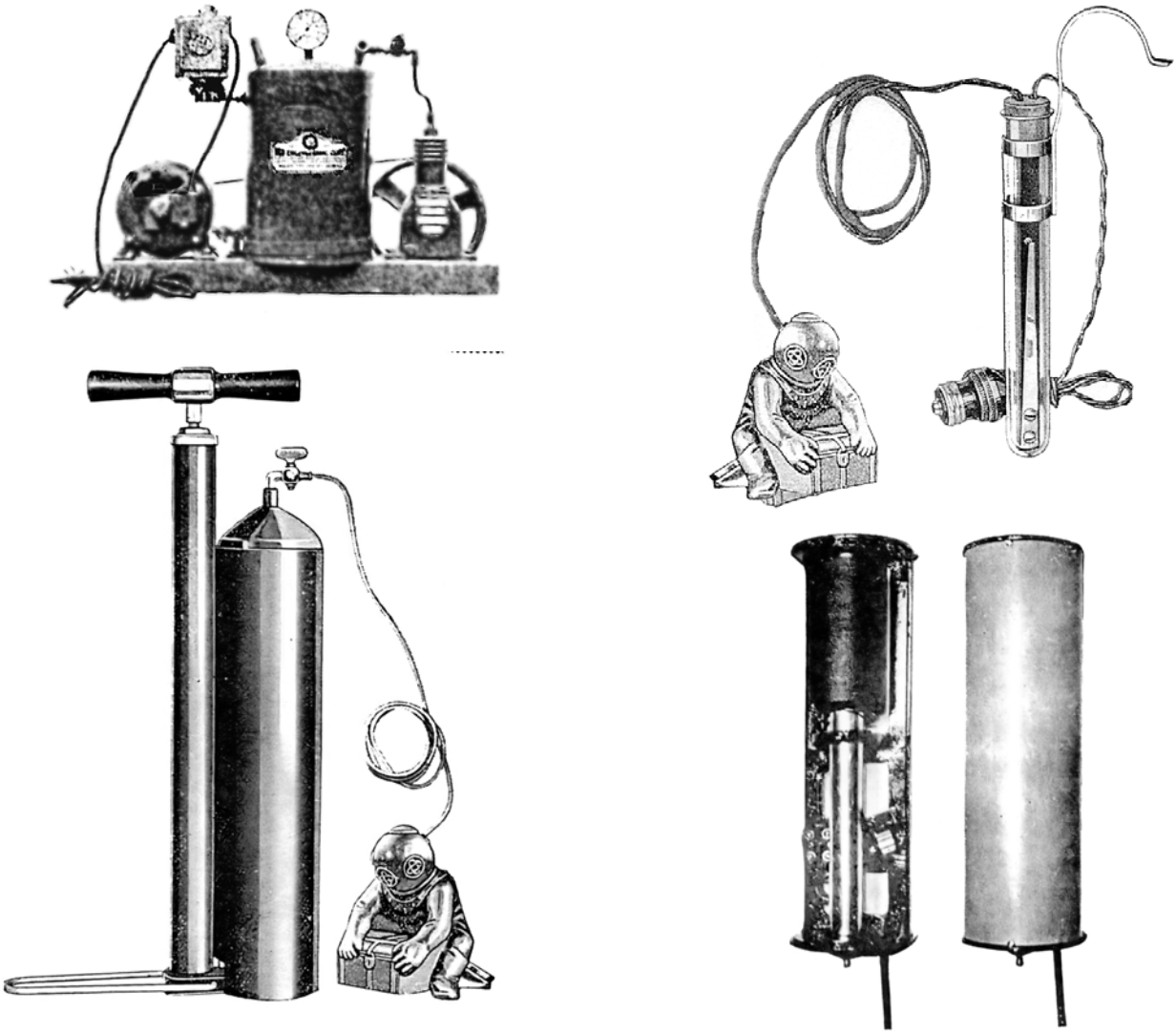


Figure 24-3. THE EARLIEST AERATION DEVICES were very large and expensive, consisting of an electric motor, a belt-driven air compressor, an air reservoir tank, a pressure gauge, and an air pressure regulator (UPPER LEFT). This one was sold by Henry Kissel for $59.50 and could aerate up to fifty aquariums. Some cheaper devices were as follows:

UPPER RIGHT: THE CHASE AUTOMATIC SELF-CONTAINED AQUARIUM UNIT that combined both heating and aeration without any moving parts. It was connected to a simulated diver from whence the air bubbles emerged. The heater expanded the air and forced it out (albeit slowly) through the ornamental diver.

BOTTOM LEFT: THE CHASE AERATING HAND PUMP AND TANK ($9.50), whose advertisements stated: "The tank is tested to 150 lbs. pressure and fifty strokes will give continuous aeration for upward of an hour."

BOTTOM RIGHT (shown with cover both opened and closed): THE COSMOS MOTORLESS PUMP, one of the earliest vibrator pumps on the market ($18.50). The manufacturer stated that it was "noiseless, no moving parts to wear out, no oiling, aerates at least 15 – 20 tanks, can easily be changed from AC to DC, and lasts indefinitely."



Figure 24-4. EARLY HUMOR IN THE AQUARIUM HOBBY. The caption reads:

THE SHOPPER: "Are these genuine goldfish?"
THE SALES PERSON: "No Ma'am, not at that price. These are only rolled plate."

of a series of pockets containing the food. As the slide was withdrawn the pockets were emptied one at a time. The speed at which this occurred was adjustable; if desired, a variety of foods could be placed in the pockets in a single loading.

The discus was first shipped to Germany in 1928 but unfortunately the fish died on the way and were delivered as preserved specimens. The discus finally caught up with this country in 1932, just before the depression really hit the aquarium hobby here hard. The first article about this fish that appeared in the American aquarium literature was the following in the December 1932 issue of AQUATIC LIFE:

"The New King
by Henry Bucknitz

"The Amazon River, that great body of water which covers so much Brazilian territory, together with its tributaries have been proverbial horns of plenty for the aquarist. From it we have received cichlids galore, large ones, small ones, thin ones and those of bizarre shape. The river is the habitat of our *Pterophyllum scalare* or angel fish, which has now been dubbed the Queen of Aquarium Fishes to differentiate her from the new King.

"Few realize the extent of this river. Here are a few measurements, roughly stated, which give a better idea of the river's size than one may have previously had. From shore to shore at the mouth there is a stretch of over three miles of water which at the average sounding is 170 feet deep. There are 20 branch rivers with arms reaching far inland; so far in fact that human endeavor has not been able up to this writing, to describe even a small percentage of their finny inhabitants.

"In so extensive a valley one naturally finds heavy precipitation from rain fall, and, since the rain fall here in what is termed the rainy season is excessive in comparison with other similarly situated sections, the inhabitants do not wonder at a rise in the stream, near its mouth of 33 feet. Naturally all surrounding country becomes flooded but not without good results for, it is well known this flooding in the rainy season has resulted in the lands thus treated to be known as harboring the richest aquatic ponds on earth. To the collector these seem inexhaustible sources of supply. It is these off collections of water and not the river itself which are usually fished.

"To those of us who stay at home the procedure seems simple. Those who have fished these waters tell a different tale. Many and unforeseen difficulties endanger one's plans; then too there is the Brazilian government to be considered. Brazil is now in a period of intense construction the laws are stringent and forbid the careless destruction of native water and other life. These laws fix the size and number of fish to be taken. As an easy commercial proposition the plan is completely upset for most inexperienced men.

"A German firm has however, despite this handicap, succeeded in bringing another new fish, one which bids fair to hold interest for a

while, to its shores. The fish has been named *Symphysodon discus*, but will probably be corrected scientifically later on. The fanciers who saw it hailed it as a new king, and, now it is commonly known as "the new king of the Amazon."

"The illustration reproduced elsewhere in this issue was made from the first specimen imported into Germany to remain alive. Three were imported, two succumbed from weakness after their arrival and the balance departed en route from starvation due to lack of food. Dry food was religiously rejected. It is thought more can be brought in alive by feeding them enchytrae enroute. This too becomes a perilous under taking when it is understood these specimens were brought from far up the river at Tapajaz and not down stream from where the shipment could be handled with more dispatch.

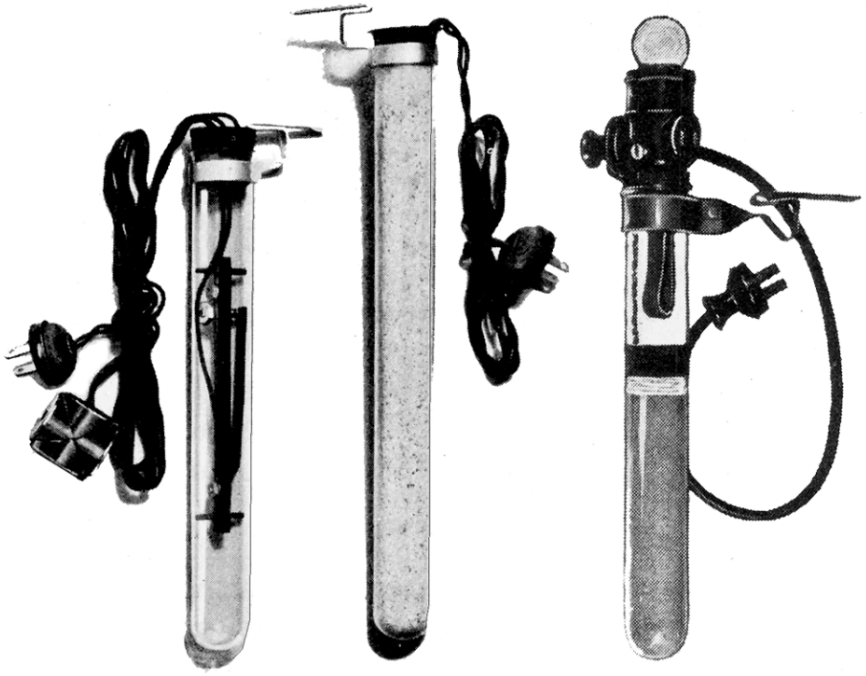


**Figure 24-5. LEFT: A TYPICAL AQUARIUM THERMOSTAT of the 1930's.
MIDDLE: A TYPICAL HEATER (sand filled).
RIGHT: IN 1933 THIS WAS QUITE AN INNOVATION in that it combined into a single unit of convenient shape and size, both a thermostat and a heater.**

"After a glance at the illustration no mention need be made of the shape. The ground color is olive yellow with some bluish sheen. This gave rise to another name "the blue Pterophyllum." The oblique lines which as in its counterpart seem changeable, at will, vary from steel blue to an intense color almost black.

"The ground color of the anal fin is wine red. Over this a number of bluish mother of pearl dots are scattered, waves of the same color appear on the neck. The extended ventrals are also wine red clotted like the anal; sexing at present is done by considering specimens with long highly colored ventrals, males.

"From present indications it will be a long time before this fish replaces the *Pterophyllum scalare* in the hearts of fanciers, even though the Germans have hailed it as the new king.

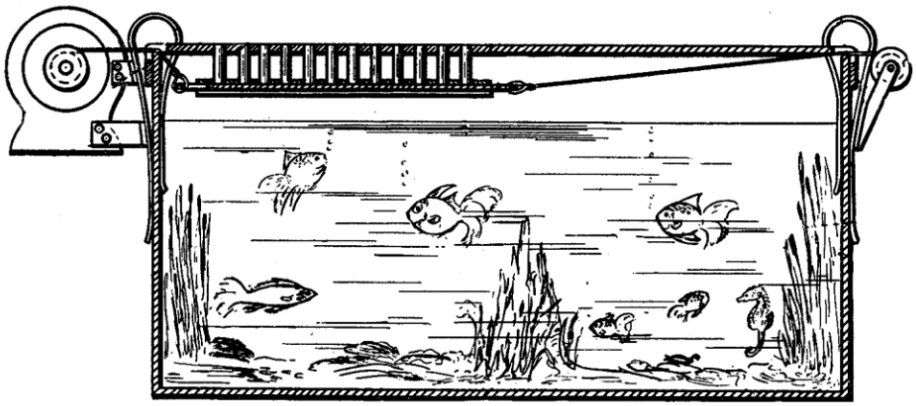


Figure 24-6. THE TINGLEY FEEDER. Food was placed in the 11 little pockets. It dropped from each as the bottom slide moved.

"This variety differs from the near relations by having teeth only in the front edge of its jaw while the near relatives have completely toothed jaws.

"*Symphysodon*, with a toothed symplis, (a skin covering the lower jaw), *discus*, round or disk shaped."

It is interesting to note that, in some other respects, the basic flavor of the aquarium hobby in this country hasn't changed much since the early 1930's as evidenced by the following dialogue written almost 40 years ago.

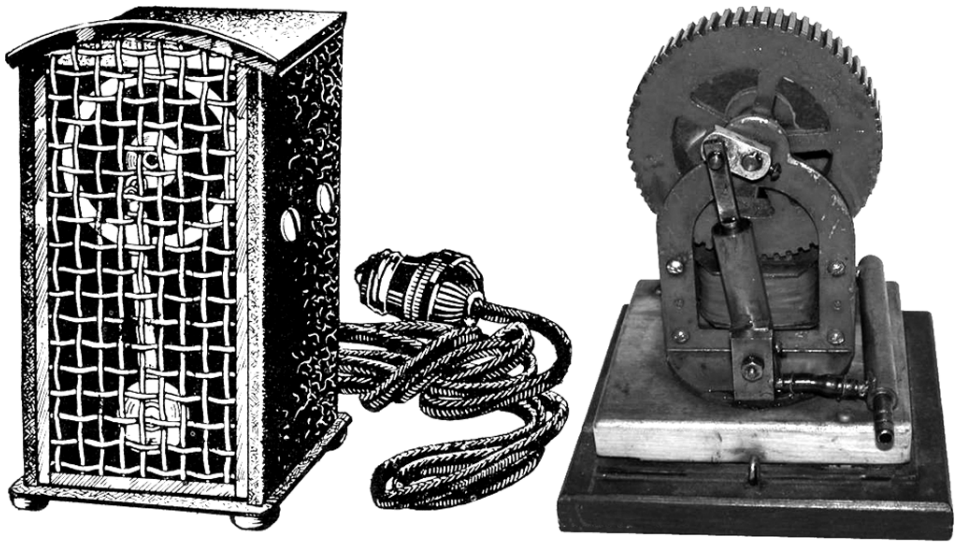


FIGURE 24-7. TWO PISTON TYPE AIR PUMPS OF THE EARLY 1930's. LEFT: The SA-JA air pump was of the induction type and as such ran very slowly. Although the moving parts wore out with time, the motor itself would last forever. Like the Boy Wonder induction pump, the SA-JA was supplied with a sheet metal cover for safety.RIGHT: The "similar Boy-Wonder" pump, less expensive than the Sa-Ja. Both required a push on their wheels to get them going!

"PART OF THE GAME

BILL: Hello, Jack. I haven't seen you for a long time. How are the Guppyi?

JACK: Hello, Bill. Come in and look 'em over.

BILL: Nice young Bettas. How old are they?

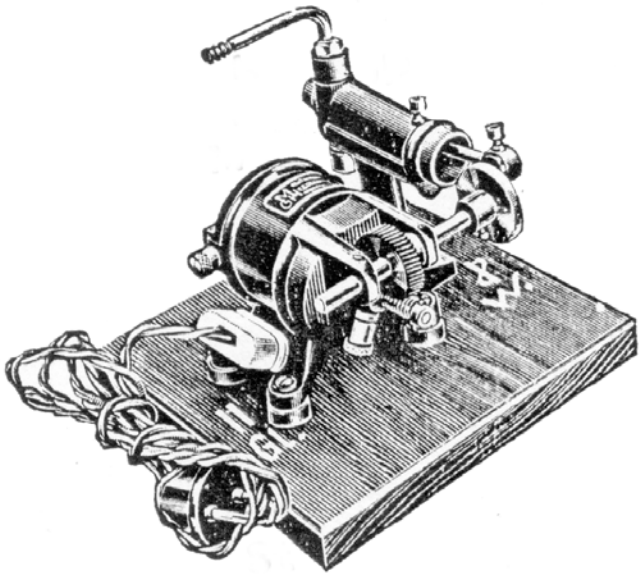


Figure 24-8. THE TYPE "K" ELEKTROZON AIR PUMP OF 1933. This was a compact, induction motor that drove a piston pump. It was expensive but well built and quiet.

JACK: Six weeks old tomorrow.

BILL: I have a bunch five weeks old and they are twice that size. How old is this bunch of swordtails?

JACK: Those will be three months old in a day or so.

BILL: Mine are twice that size and they are only two months old. I get growth on my babies. How old are these young fish?

JACK: Those are about five months old - don't Tell me they are not well developed for that size?

BILL: Oh, Heck! When my baby reds are five months old they have had several batches of babies.

JACK: Say, let's take a look at these beautiful young tets. They will not be born until the middle of next month. How's thatf or development?

Moral: Even in aquatics the worm will turn."

In 1930 a member of the Newark Aquarium Society (New Jersey), George C. Hindenlang, started a club publication. Hindenlang obtained the copy, typed it, and ran it off on a mimeograph machine. It should be

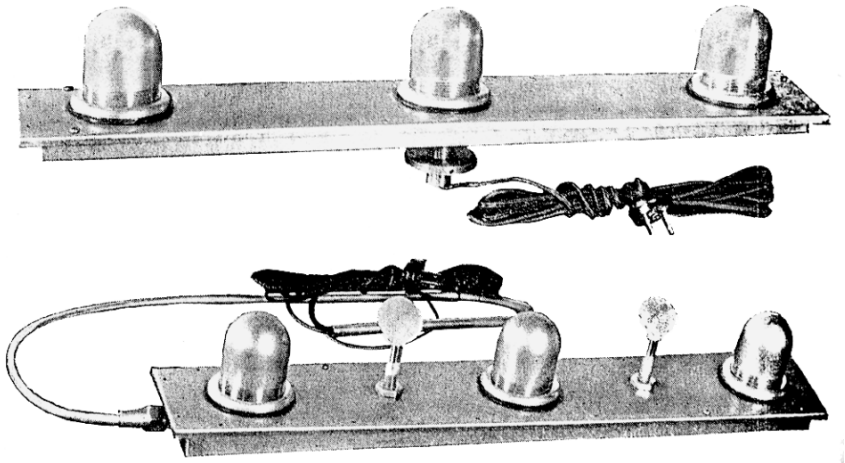


Figure 24-9. THESE PECULIAR DEVICES ARE AQUARIUM HEATERS manufactured by the Welshausen Aquarium Company. They were meant to be submersed in the tank. The domes on the upper device house two heaters and a thermostat and was made to heat tanks of from 25 to 30 gallons. The bottom device also has two aeration outlets and was designed for tanks up to 50 gallons.

noted that this club was a very active and influential group at the time. On its Board of Directors was none other than Max G. Hammerschlag, the pioneer aquarist who, in 1898, had visited the Philadelphia Aquarium Society one month after its inception to become the first aquarist to start a liaison between the New York-New Jersey and Philadelphia groups. It is perhaps difficult to believe, but the Newark Aquarium Society had a membership of over 500 in 1931! The publication was received with much enthusiasm and after twelve issues it was decided to turn it into a private, commercially printed magazine run as a profit-making venture. Hindenlang, together with Louis and Elliot Kautzmann, owned the magazine. Hindenlang, who held the post of Managing Editor, also handled the day-to-day business of the magazine. The Editor of the publication was Charles H. Peters who was President of the club at the time.

Appearing in March 1931 under the name of THE HOME AQUARIUM BULLETIN, the magazine consisted at the beginning of some 22 to 24 pages. A monthly, yearly subscriptions were $1 and individual copies were 10 cents; these prices were later changed to $1.50 and 15 cents respectively. From its inception the magazine was outstanding. There are many today who believe that it was one of the finest aquarium magazines ever published, and for good reason. The editors seemed to have a close rapport with the hobby and admittedly they edited the magazine primarily for fun. Where August Roth was a sort of lone wolf somewhat isolated in Baltimore, Peters and Hindenlang were right in the midst of the action. Without trying to minimize the achievements or influence of either Roth or AQUATIC LIFE, THE HOME AQUARIUM BULLETIN consequently was clearly the better magazine. It, in reality, brought aquarium publishing into its modern phase. THE HOME AQUARIUM BULLETIN was more readable and more intimate than AQUATIC LIFE. Its Question & Answer department was pragmatic and to the point. Old timers in the aquarium hobby might recall that William T. Innes started a monthly feature in THE AQUARIUM called "The Aquarist's Calendar," which reminded hobbyists of topical chores each month. THE HOME AQUARIUM BULLETIN, however, was the first to employ this device calling it, "Do It Now!" The magazine had a "Laboratory & Research" department to which any reader could send an unknown fish for identification. Peters and Hindenlang campaigned for show standards for tropical fish-

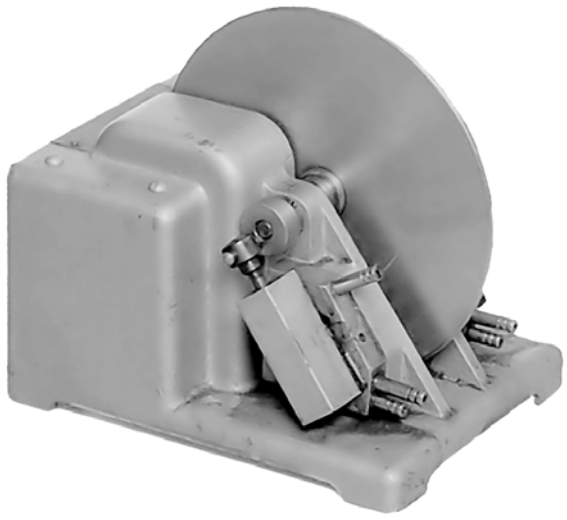


Figure 24-10. AN INDUCTION MOTOR AIR PUMP OF THE NINETEEN THIRTIES. It was expensive and didn't put out much air, but it was quiet!

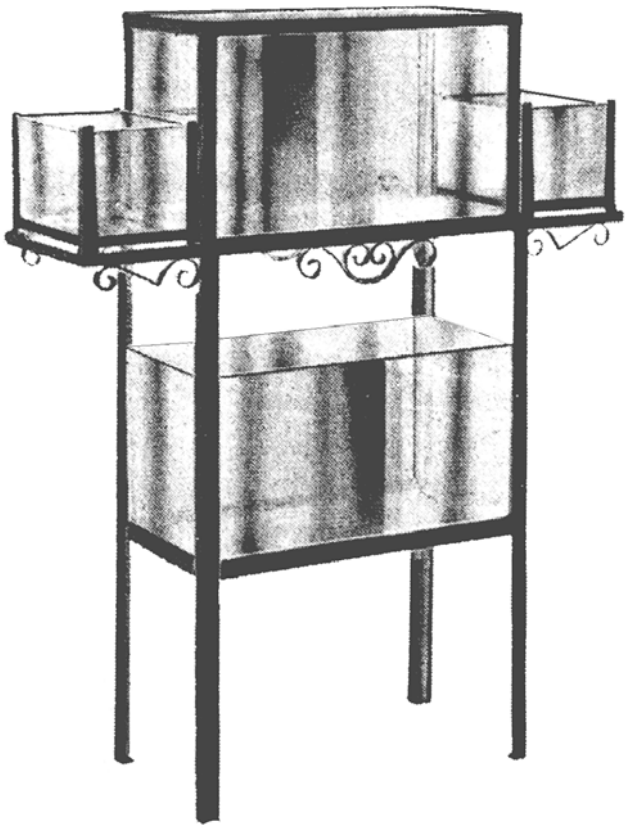


Figure 24-11. A STAND AND TANK ARRANGEMENT CIRCA 1931. By this time, tank design had become less "gingerbready".

es, and attempted to obtain uniform common names for all aquarium fishes.

The following rather amusing account appeared in THE HOME AQUARIUM BULLETIN in 1931 and is typical of the way the magazine would strike a responsive chord with its readers. It is obvious from the article that it was written by one hobbyist talking to another from experience:

"THE MRS. AND THE HOBBY
By Most of Us

"It seems just bad that the Mrs. does not see the hobby in the same light as we do. She simply cannot understand that it is necessary to have a tank on the library table, another in the living room window, two small tanks in the east bedroom window, a tank and a half dozen of various sized jars in the kitchen window, and infusoria jars and white worm boxes in the pantry. She cannot understand why the parlour windows must be used for our pet community tank. She will not listen to rational reasoning when we explain that the shades in the living room must be up - up all the way, instead of being all the more conventional half-mast. She cannot realize that shrimp must be cooked, even if the process does smell a LITTLE. There's no reason why she cannot see the need of having cans of fish food on the mantel in the living room - the brightly colored boxes are surely as decorative as the chipped old antique urns that are perched there.

"She simply cannot understand the need of our driving ten miles to visit Bill's home simply because his swordtail gave birth to a family of one hundred and thirty (babies). She cannot realize the importance of things aquatic at all. She cannot figure out why we must purchase a male Sclahokum at a time when we cannot afford new shoes for the youngest heir. She doesn't realize that the youngest will need the shoes next payday more than he does today. I can't understand how the Mrs. can be so unreasonable.

"Last season we raised four black swordtails and sold them for three dollars - and I gave her the three bucks, too. The black swordtail parents were a beautiful pair - I got them cheap at eight dollars.

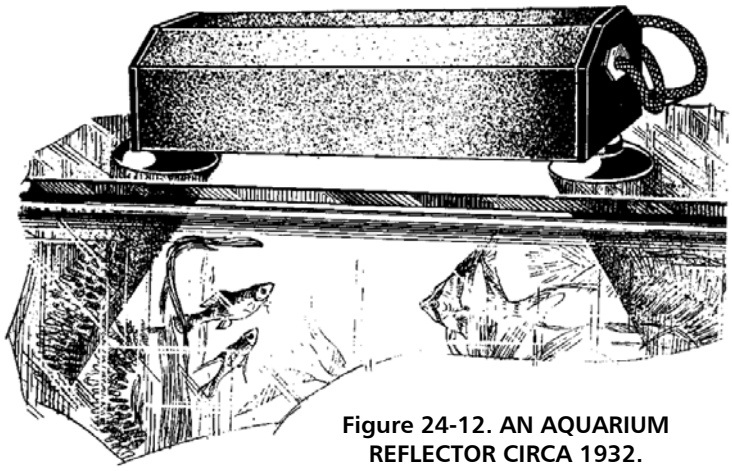


Figure 24-12. AN AQUARIUM REFLECTOR CIRCA 1932.

"Last year I planned to make a lot of extra dough by breeding *Ambassis lala* but she spoiled a perfectly good idea just because the tank that I had on the radio - where it had to be to breed good lalas - broke and damaged the radio. Just because of that little incident she crabbed about putting a second tank up there to such an extent that I decided not to make any money on the lalas.

"She can't realize I am doing something in a big way for humanity when I speak to a visitor for three or four hours when she has her hat on ready to go to the movies. We saved 30 cents many times that way but she doesn't appreciate this. Then there's the case of the last tank I bought. It cost me ten bucks but I lied like a gentleman and told her it cost only three - well, I had to buy her a dress that set me back fifteen bucks to square that.

"Then the scalare case - I bought three beautiful scalares dirt cheap - only twenty dollars. Of course I told the Mrs. a friend of mine who I had told how to breed them gave me the fish to show his appreciation. Then Jim Nutt pays me a visit and says in the presence of friend wife that I got those scalare cheap at fifty dollars - I had lied to him and said they cost me fifty. The Mrs. said - let it go at that, its too painful to recall besides, although the incident occurred two months ago she has not yet had her final words on the matter.

"If I sat down and figured it out, I have paid three times as much in bribes to the Mrs. to keep peace in the family as I have paid for the fish I have bought. Think of the wonderful collection of fish I might now possess if I hadn't paid that hush money. It's an unjust tax!

"I am not permitted to use the family dishes to sterilize plants - in fact I can use nothing I absolutely need around the house. Last summer, while the Mrs. was away, I commandeered a cut glass bowl in which to breed a beautiful pair





Figure 24-13. TWO VERY PROMINENT ICHTHYOLOGISTS who were interested in the aquarium hobby and who rendered it assistance of great value. LEFT: DR. CARL L. HUBBS (1894-1969); RIGHT: DR. MYRON GORDON (1879-1959). Circa1930.

of tetras, and you should have heard the rumpus when she returned home. I only knocked one little curlicue out of it - you couldn't notice it if it was set with the broken part away from observation.

"I would tell you what the Mrs. said the time the ceiling came down on the living room because the water that was supposed to be in the tank upstairs spread itself all over the floor, but the Editor says to be very careful of the language and the grammatical construction in the BULLETIN, and the grammatical construction and the language of what she said were not correct.

"Then there was the time the bird down south sent that pair of mudpuppies to be exhibited at our big show. I had to keep them in the bathtub two months because he thought the show was to be in July instead of September. I wrote to the fellow and asked him if folks went bathing in where he caught the mudpuppies. He answered in the affirmative and I called the Mrs.' attention to it but she would go bathing with no slippery mudpuppies. They weren't too awfully slippery - I held one in my hand for a quarter of a minute once. And although it bit my finger it didn't do much damage - I could use the hand a week later.

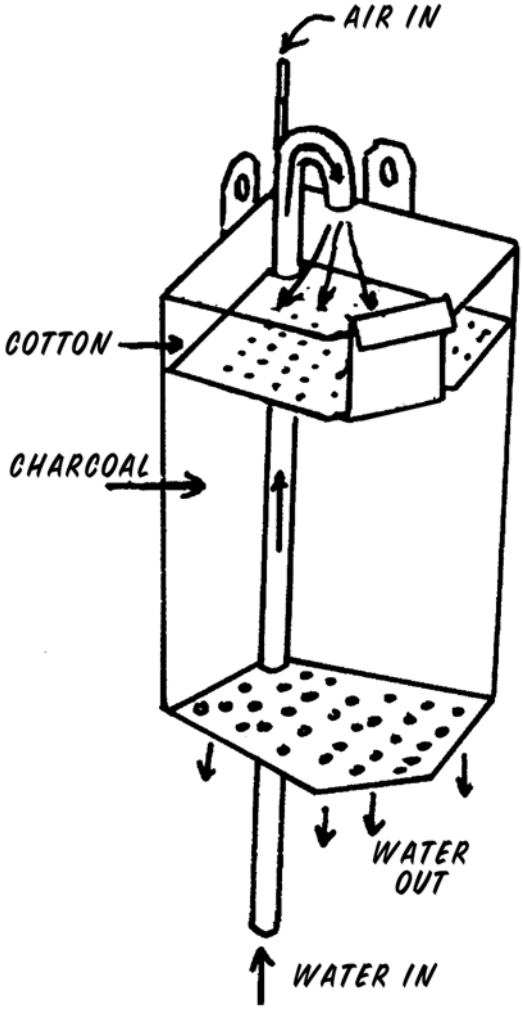


Figure 24-14. THE FIRST INSIDE FILTER AVAILABLE TO AMERICAN AQUARISTS. It was introduced in 1932, but it was not until after World War II that filtration became generally accepted throughout the hobby.

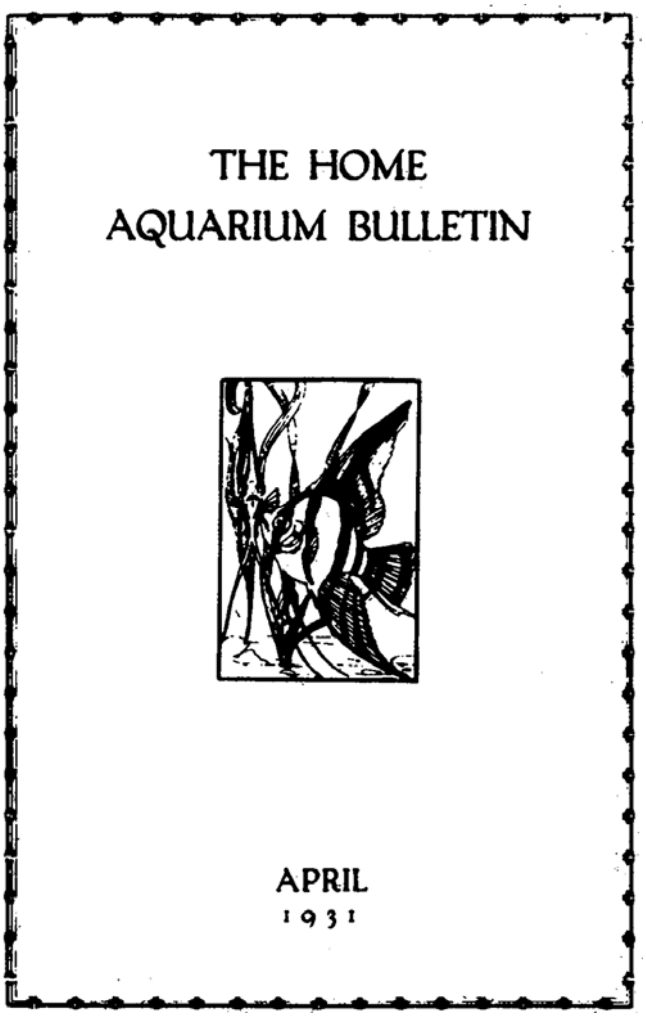


Figure 24-15. THE COVER OF THE HOME AQUARUM BULLETIN IN ITS FIRST YEAR. This magazine was one of the finest ever to be published in the United States.

"Then the time four swordtails jumped out of 'the tank during the meeting of the "Kill Time Ladies Society" is still clear in my mind. Mrs. Smook scraped her nose climbing a chair. Mrs. Fourtz attempted to get up with her legs wrapped around a table leg and Mrs. Muffeling swallowed her cigarette. The Mrs. was very much put out about the breaking up of that party (because Mrs. Yodel had just gotten to the scandalous part of the gossip), and she told me so in no uncertain terms.

"Everything considered, and knowing not only that my personal efforts in the worthwhile en-

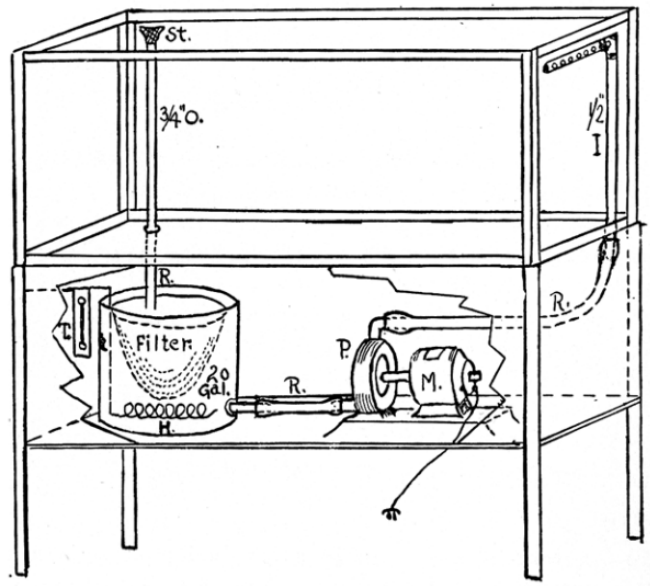
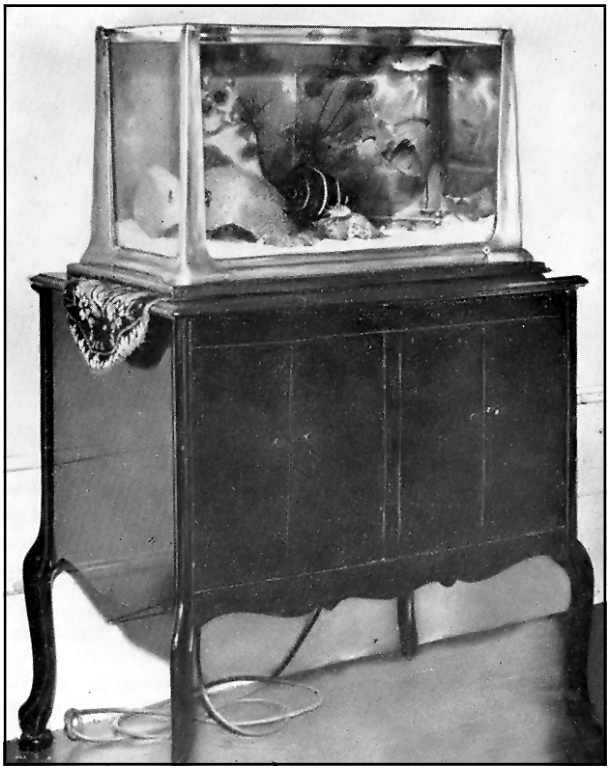


Figure 24-16. Some closed circulating systems of the 1930's were heated. This diagram shows the tank with a 20-gallon reservoir beneath equipped with a filter.
Key:
H - electric heating coil
M - motor
T - thermostat
I – ½: return pipe
R - flexible rubber tubing
O – ¾" outlet pipe
P - pump
St - standpipe (with strainer to prevent fish from being sucked to the reservoir beneath).



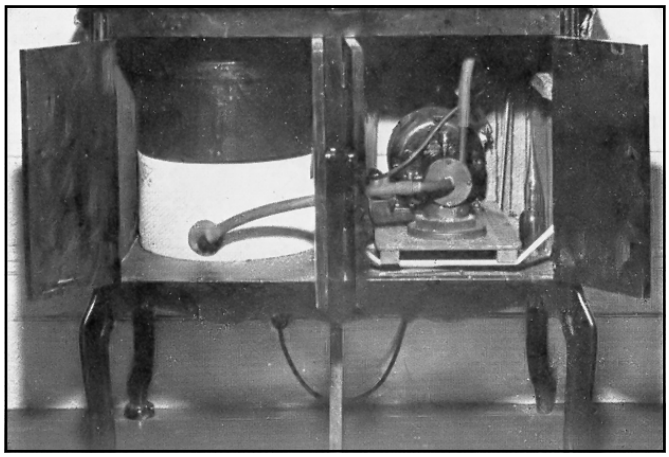


FIGURE 24-17. MARINE AQUARIUMS OF THE 1930'S WERE DESIGNED FOR MORE EXTENSIVE FILTRATION THAN THEIR FRESHWATER COUNTERPARTS. In this example, unheated water was circulated through the tank by a non-metallic pump and pipe system and returned to a filter reservoir in the cabinet beneath. The tanks contains one each of the following: young French Angel, Sergeant Major, Parrotfish, Squirrelfish, Blue Angel and Butterfly, all Florida species which survived at living-room temperature in the latitude of New York.

To the right is a detail of the cabinet. In the left compartment the large crock serves as a reservoir with filtering material agent placed in the bottom. From there the water flows through a rubber pipe to the next compartment to a centrifugal pump made of hare rubber. This forces the water into the tank above. From there it is returned by gravity to the crock below.

deavors of culturing tropical fish are hampered but that there are many aquarists hampered as I am, I am in favor of doing something about it. I think that an organization of aquarists should be formed. The organization should have a highly dignified titled that would make the desired impact on the Mrs. or other Mrs. Something like the "Amalgamated Associates of Antagonized Aquarists of America". This is as far as I have progressed with the idea up to the time of

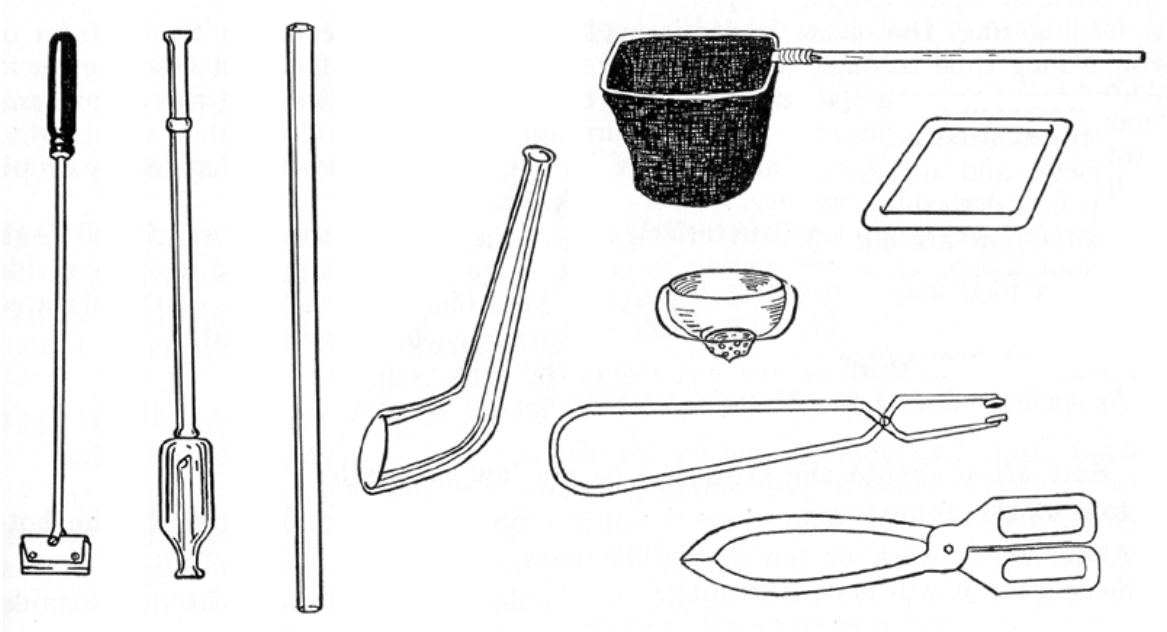


Figure 24-18. AQUARIUM IMPLEMENTS OF THE EARLY 1930's.

LEFT TO RIGHT: GLASS CLEANER, DIP TUBE WITH BOWL, DIP TUBE OF 3/8-INCH GLASS, GLASS NET FOR CATCHING BABY FISHES.
TOP CENTER and BELOW: FISH NET, GLASS FEEDING RING, WHITE WORM FEEDER, PLANTING TONGS, AND PLANTING TONGS OF WOOD USED IN SALT WATER. Note that many of these implements were made of glass.

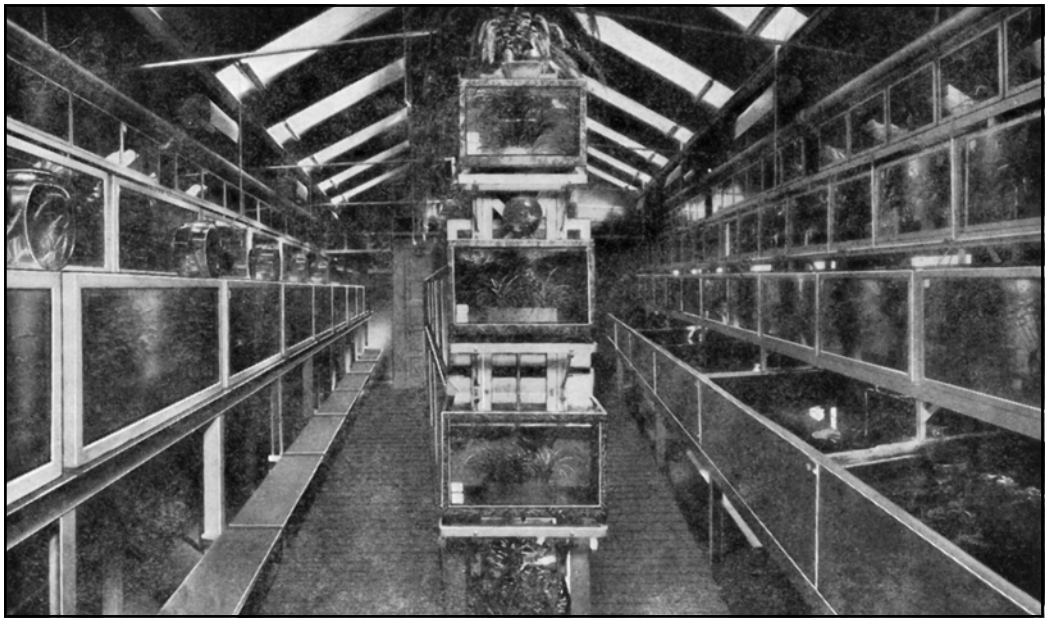


Figure 24-19. A TROPICAL FISH HATCHERY CIRCA 1934. It covers a floor space of 12' x 35', has a hot water system that provides general heat to the tanks and other containers. The tanks are constructed of angle iron.

going to press but I might enlarge on the idea if I am allowed space in a subsequent issue.

"In the meantime I wish other husbands who are in need of an organization to protect them from their Mrs. and possibly their mother-in-law, would write suggestions on the course to pursue."

It is interesting to note that in the heyday of the early 1930's, the hobby was still dominated by men to a somewhat greater extent than we find today.

One thing that concerned the editors of THE HOME AQUARIUM BULLETIN was that "The opinions of novices would put to shame the fairy tales of Grimm and Anderson." The statement is as true today as it was almost 70 years ago when it was written. The articles in THE HOME AQUARIUM BULLETIN were extremely useful and examples include: classifying the various betta varieties, sex differences in Angelfish, and birth rate data on livebearers. The magazine once circulated a questionnaire asking what fish the aquarist would put into a community tank if one were restricted to ten pairs of fishes. Such material was most utilitarian, especially in the 1930's.

THE HOME AQUARIUM BULLETIN (Figure 24-15) had a distinguished stable of writers. Included among them were Dr. Carl L. Hubbs (Figure 24-13), one of the country's foremost ichthyologists, and Dr. Myron Gordon (Figure 24-13), the eminent ichthyologist and geneticist who studied under Hubbs. Incidentally, although many biographical sketches of Dr. Gordon have been written, all overlook how he became interested in fishes. An account in THE HOME AQUARIUM BULLETIN for March 1935 provides the following information:

"Myron Gordon bought his first pair of guppies for seventy-five cents in a pet shop on 125th Street and Park Avenue, New York City, in 1916. Soon he was pumping the old timers for information about tropicals. He went to Brooklyn and talked with Hermann Rabenau. He roamed the Bronx and found Taubles at Tremont Avenue. He went to upper Manhattan and saw the Best-Yet outfit of Walter Lannoy Brind. He traveled to East Eleventh Street and interviewed Silver, the red swordtail Burbank. (***Author's Note:*** **The reference is to Luther Burbank, the eminent American Horticulturist.)** Hugo C. Nelles was recommended. He went to see Nelles on Third Avenue.

"He remembers buying a guaranteed breeding pair of Daphnia from Brind, a box of white worms from Jenny at Singac, and several pairs of Platies from Rabenau. He still has the direct descendants of Rabenau's platies. He has seen over ten generations from them.

"Myron Gordon was a bird fancier too. He did kitchen police duty in the birdhouse of Bronx Park in the summer of 1921. The next three summers were spent in rearing Chinese ring neck pheasants for Maryland at Gwynbrook and for New York at Middle Island, Long Island. During the rest of these years he was studying biology at Cornell University. He was graduated in 1925 and took his doctorate degree in 1929.

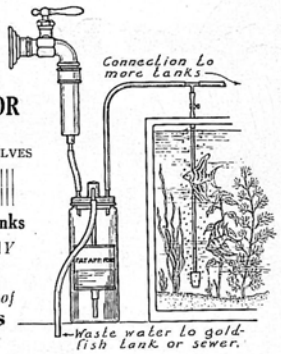
"The University of Michigan, through the interest of Dr. C. L. Hubbs, sent him to Mexico to collect fresh water fishes. In 1930 he collected over a hundred species, ten of which were new to science. Myron Gordon went back to Mexico in 1932 to get all the living species of platies and swordtails. This was accomplished in two months. The expedition was partly financed by the aquarium societies and dealers of tropical fishes."

The last sentence will no doubt come as a surprise to many aquarists. It is likely that many of the livebearers that aquarists have in their tanks today came from descendants of fishes Dr. Gordon caught in Mexico in 1932!

Mention should be made here of Albert Greenberg, the first person in Florida to raise aquatic plants and tropical fish in earthen ponds and concrete pools. Indeed, the aquarium plant industry in this country claims him as their "Father" since he pioneered the tropical plant and fish market in that State. Greenberg founded the Everglades Aquatic Nurseries in 1931,

from which he sold his fish and plants. He also traveled widely around the world in search of the new and different aquarium fishes and plants. Greenberg, a Russian immigrant and onetime salesman who came to Tampa by way of Chicago, was an amateur horticulturist and world traveler, Greenberg bought the land for the Eureka Springs Park and botanical garden in Florida in the late 1930s and filled it with plants he acquired on his journeys. He eventually built a house on adjoining property and in 1967 donated his botanical garden to Hillsborough County. It was a true act of public altruism on the part of Greenberg, who died in 1993. When Greenberg donated the land he stipulated that the park remain a botanical garden and a free attraction to the public. Greenberg had a hybrid water lily named after him and assisted a number of botanists in their research by providing cuttings and other services.

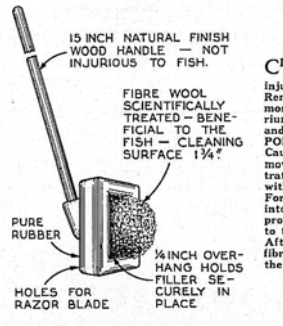
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Figure 24-20. ADVERTISEMENTS FROM THE EARLY 1930's.

CHAPTER 25:
MAGAZINES OF THE THIRTIES

Before reviewing the other commercial aquarium magazines that made their appearance in the decade of the 1930's, a few words are in order about two important staff members of THE HOME AQUARIUM BULLETIN, viz., Henry Uhlig and Milton Schoenfeld. Uhlig was a professional illustrator (Figures 25-1 and 25-2) and, among other things, designed the magazine's covers. In addition, he did a Ripley-like "Strange But True" column. Unlike Uhlig's, however, Ripley's was strictly authentic. Schoenfeld (Figure 25-4) was an instructor in biology at a New York University and an ardent devotee of aquarium fishes, doing much experimental work with them. Joining the staff early in the magazine's history, he was soon its most important and most prolific contributor. Aside from his activities on the magazine, Schoenfeld manufactured a line of fish foods in his spare time under the trademark "Longlife." Other trademarks used in his Longlife line included "Micrograin," a powdered food intended as a substitute for infusoria. A closer look at Milton Schoenfeld will be taken a little later on.

One of the most important events in hobby history occurred in May of 1932, for on this date appeared the first issue of THE AQUARIUM magazine (Figure 25-3). One outstanding feature of the new publication was its use of color plates of fishes on its covers, a feature that took the aquarium world by virtual storm. Somewhat petulantly Walter L. Brind, tried a weak counter-attack in his advertisements for his own publications to the use of color in hobby publications: "Color plates exaggerate so that you think live fish sold to you are poor or sick specimens. I prefer to let you be pleasantly surprised when you buy your fish and check them up with my own photos and illustrations. Black and white is all right!" This ploy, however, definitely did not work, although there certainly was some truth in Brind's statement. Even without color plates, however, THE AQUARIUM was a masterpiece. The printing was impeccable and the line illustrations and black & white photographs were superb. Added to this, the layout was dramatic and imaginative, and the balance and selection of material without peer. It may well be true that no aquarium magazine has ever surpassed these early issues of THE AQUARIUM or ever will.

It was, of course, edited by William T. Innes, and published jointly with his brother, Edward K. Innes under the name "Innes Publishing Co." The brother has never really been given the credit due him in the aquarium hobby. Edward Innes was the "silent partner" who helped launch the venture and who contributed greatly

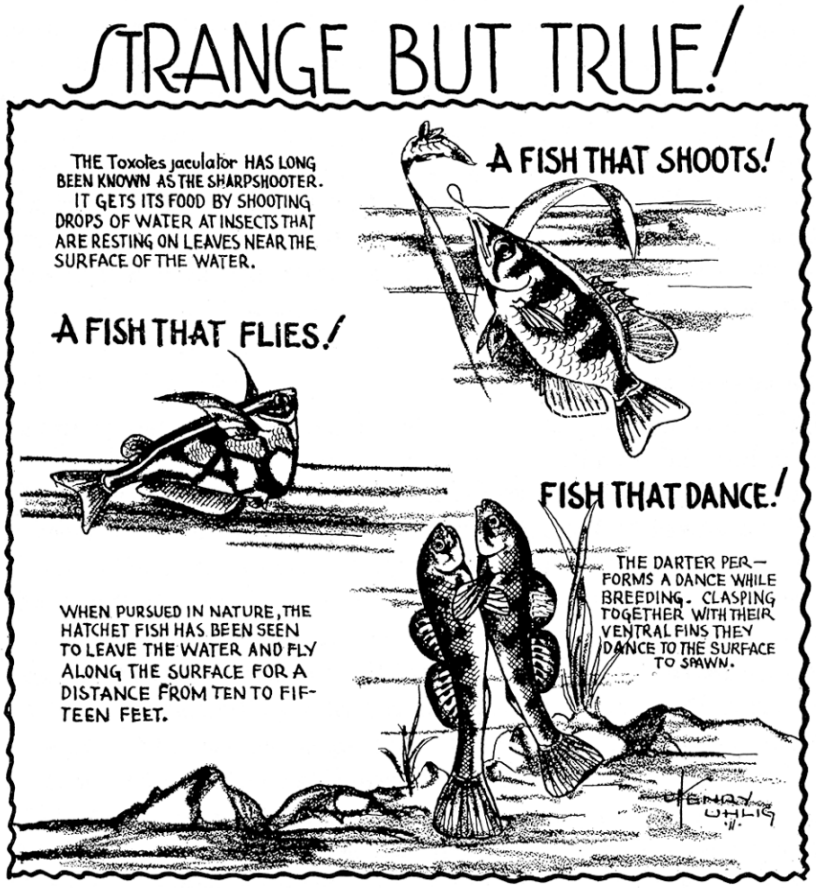


Figure 25-1. ONE OF THE "STRANGE BUT TRUE" COLUMNS BY HENRY UHLIG, ILLUSTRATOR FOR THE HOME AQUARUM BULLETIN .

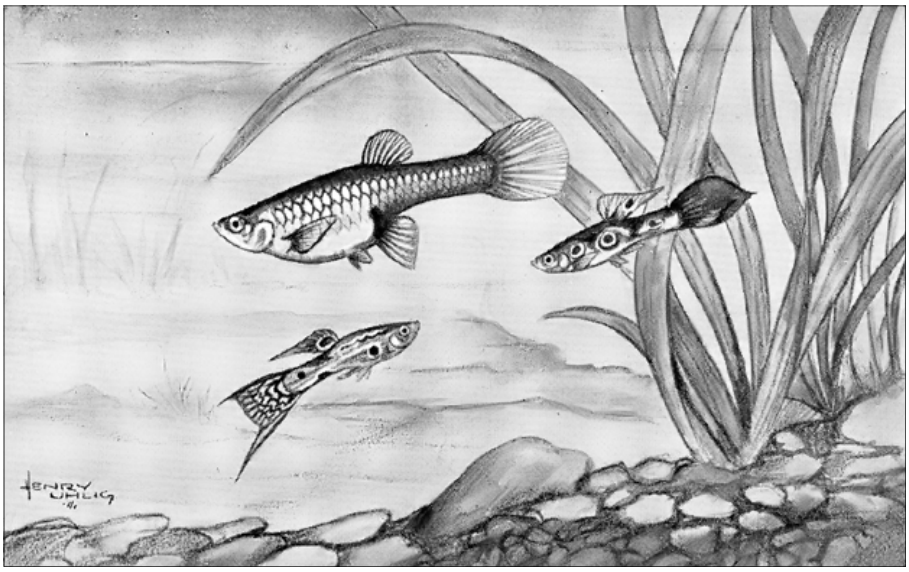


Figure 25-2. HENRY UHLIG ALSO DID MOST OF THE FISH AND PLANT ILLUSTRATIONS IN THE HOME AQUARIUM BULLETIN. This drawing of guppies, female (above) with Lyretail male (LEFT), and Blacktail male (RIGHT) appeared in a paper he did in 1934 titled "75 Ideal Tropical Fish for the Community Aquarium."

to its publishing success. Regardless of the content superiority of an aquarium magazine, its financial future depends primarily on its circulation. It was Edward K. Innes who, in June 1932, negotiated the distribution of THE AQUARIUM on the counters of the American News Company and its many subsidiaries. This was the first aquarium periodical ever handled in this manner; in the process, THE AQUARIUM exposed the hobby to thousands of people who otherwise might not have known anything about it. The second issue of the magazine sold 5,500 copies, an almost unheard of figure for the times and the subject matter. One year after its appearance on the hobby scene THE AQUARIUM printed 15,000 copies a month! With increasing circulation, of course, came an increase in vital advertising accounts as well. The success of the magazine owed much, therefore, to Edward K. Innes.

In addition to William T. Innes, the editorial staff of THE AQUARIUM included George S. Myers, Allen S. Moody, and Professor John A. Timm. Myers, an outstanding ichthyologist and teacher of ichthyologists, brought scientific authority and accuracy to the magazine. He provided valuable assistance in correctly identifying new (and old) aquarium fishes, an essential activity in this somewhat scientifically oriented hobby of ours. Timm, a distinguished educator and aquarist, although nowhere nearly as important as the others, provided an additional scientific touch to the magazine. I don't wish to give the impression that THE AQUARIUM was a heavy, scientific publication - far from it - but it was authoritative.

Allen S. Moody is another of those individuals whose contributions have been overlooked by the aquarium hobby. Moody in effect was Innes' "leg man." It was Moody's job to check reports, material, etc., and to travel in search of new information. He could write well and contributed

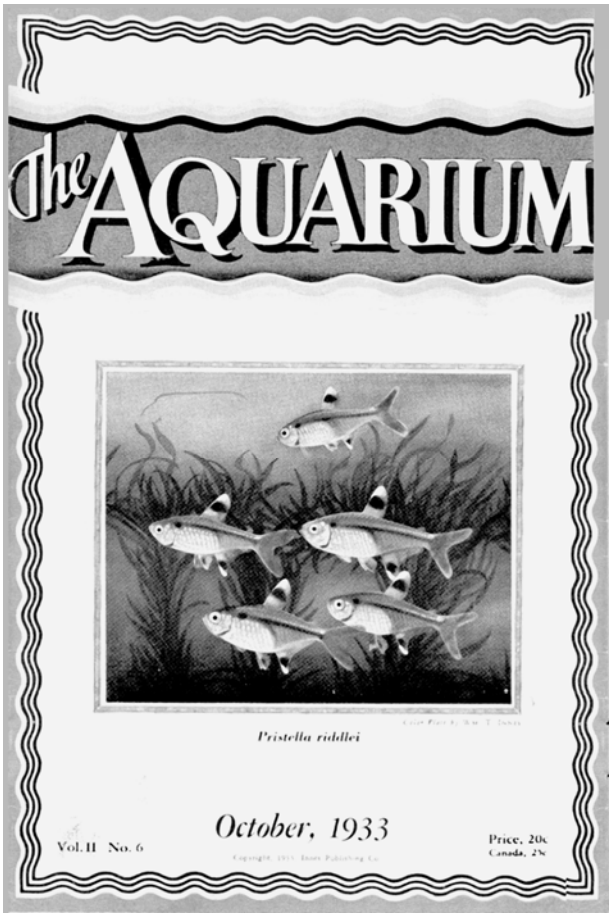


Figure 25-3. A COVER FROM ONE OF THE EARLY ISSUES OF THE AQUARIUM magazine.



Figure 2-4. MILTON SCHOENFELD, ONE OF THE BEST-KNOWN AQUARIUM WRITERS OF THE DECADE OF THE 1930'S. He was the most important contributor to THE HOME AQUARUM BULLETIN , and the originator of the Longlife brand of fish foods.

much material to THE AQUARIUM. Because Moody often was closest to the source material and because Innes had the demanding task of managing the printing and the photography as well as writing editorials and some feature articles, this young man influenced much of the flavor of THE AQUARIUM, a fact not widely appreciated. It may shock some when I say that William Innes, despite misleading and hazy portraits of him as a "kindly old man," was as strong willed as the next and not particularly conciliatory when it came to topics in the aquarium hobby. There was, in other words, no "second-in-command" at THE AQUARIUM. Moody, in his own way, however, contributed a good deal of the "nitty-gritty" detail work that was necessary to the success of the magazine.

THE AQUARIUM was a bargain at 20 cents per copy or $2.00 for a year's subscription. It did not, however, signal the end of the appearance on the market of new aquarium magazines. In July of 1932 AQUARIANA made its debut (Figure 25-5), a periodical edited by Elbert A. Dulfer. What made this unique was the fact that it was the first such commercial venture on the west coast, the magazine being published in San Francisco. Individual copies were 15 cents and yearly subscriptions were $1.50. Printed by the family printing firm, the Dulfer Publishing Co., it too featured color plates on its covers. Its layout was typical of the printing of the 1930's and more "modern" in appearance (sort of Art Deco) than THE AQUARIUM. One gets the overall impression while reading it that one is watching an old Fred Astaire movie of that decade. AQUARIANA fell midway between THE AQUARIUM and THE HOME AQUARIUM BULLETIN. Its appearance was more business-like than the latter, but it fell far short of the critical and authoritative quality of the former. In September 1933 AQUARIANA changed hands, its new Editor being Stuart B. Tinsley. This, however, was its last issue The magazine was expensive to

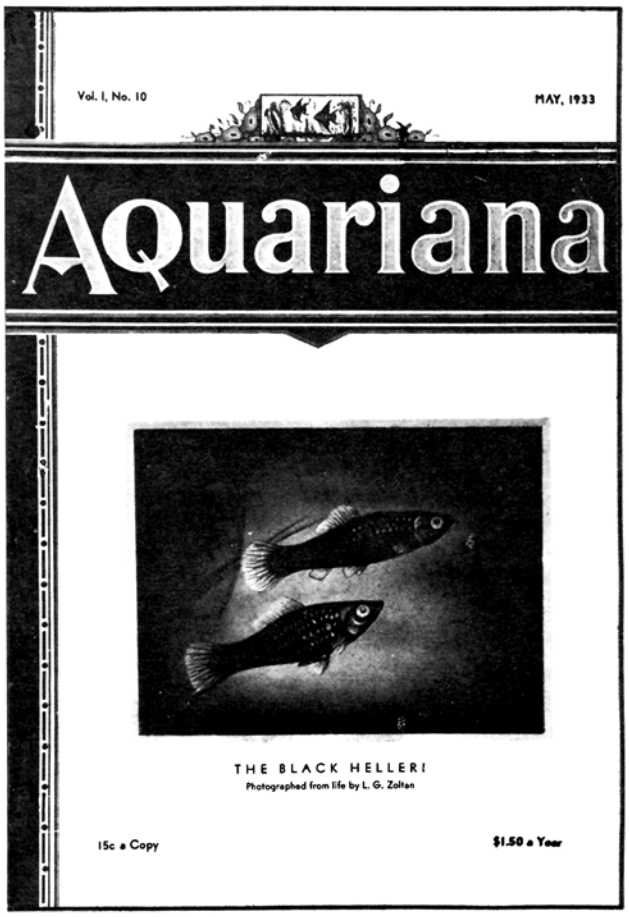


Figure 25-5. THE FIRST WEST COAST AQUARIUM MAGAZINE VENTURE, AQUARIANA. It lasted but a few years. The magazine had color plates on its covers.



THE Fish Fancier

"He profits most who serves best"

No. 1 — Published by The Hollywood Aquarium, 5515 Santa Monica Blvd., Hollywood, Calif. — Nov. - 1934

ABOUT BRINE SHRIMP

In the AQUARIUM MAGAZINE for July, 1933, Mr. Alvin Scale, Superintendent of the Steinhart Aquarium at San Francisco, California, writes as follows, under the heading "An Excellent Live Food."

"At the Steinhart Aquarium of the California Academy of Science, in San Francisco, where we have to constantly provide food for more than 12,000 live fish of 475 different species, the study of live food has received very definite attention, and has been the subject of research by the writer for a considerable period of time.

"It is, therefore, a pleasure to present the following information for the benefit of others who are interested in keeping fish alive and in good condition.

"All of our tropical fishes and, in fact, all our fishes, except the large ones, are fed at least once each week on the small brine shrimp, (Artemia salina). These contain all the food elements to keep fish in good health, and, being their natural food, are greedily taken by all the fish.

"This brine shrimp may be secured in countless numbers in the brine ponds or evaporating pools of any salt works, probably anywhere in the world, as it is a widely distributed crustacean. They are in California so abundant as to give the water a decided pink or red color, due to their number.

"The adult brine shrimp are less than half an inch in length. These may be dipped up with a fine mesh net and fed directly to your fish. Those not eaten at once will usually live six hours in fresh water.

"In the winter time, however, the live shrimp become scarce.

"Little brine shrimp pass through at least three stages. In the first stage they resemble somewhat the young leaf hopper familiar to all. When first hatched they are quite small, usually about one-half millimeter. In the second stage the body is considerably elongate, the legs and appendages much more distinct. In this stage they resemble diminutive length. The adult stage is reached in about six to eight weeks, depending on the temperature and food. The fish take them eagerly at any of these stages.

"When adult, the brine shrimp is well supplied with swimmerets and appendages and is constantly in motion, usually swimming with the ventral side up.

"The sexes are separate, the males slightly smaller than the females. Each female is provided with a large brood pouch in which the round eggs may be clearly seen. I have counted as many as 75 eggs in a single brood pouch, but the number varies greatly with age and size. In copulation the male attaches just above this brood pouch by means of large hooked appendages from the head. Attachment may last for two or three days. During this time the eggs are fertilized.

"It is quite common to see eggs with one side pitted. As a matter of fact most of the dried eggs develop this pit, but it seems not to impair their fertility.

"In the above little animal we have a clean, easily grown source of live food that is available within a few hours, summer or winter —a natural live food eagerly taken by all tropicals. Nothing further need be said to the experienced aquarist."

Shortly after this article appeared, Mr. Scale visited the Hollywood Aquarium and expressed much surprise at seeing a large aquarium full of the adult shrimp on sale for fish food. Over a period of three years live brine shrimp have been fed to all the fish; tropical and gold-fish and salt-water fish, with the delightful result of keeping them fat, strong and healthy. Naturally, the question of the best method of retaining a constant supply for those fanciers living a

Figure 25-7.
THE FISH FANCIER, PUBLISHED BY S. CHICHESTER LLOYD AND HIS WIFE.

print, lacked a distinguished editorial staff, and suffered from being published on the West coast away from the center of aquarium hobby activity in America. Another West coast commercial venture was the FISH FANCIER (Figure 25-6), first published in Hollywood, California in 1934 by S. Chichester Lloyd and his wife, Rose, who had moved to California from St. Louis. Sylvester Chichester Lloyd (no wonder he preferred using his initial for his first name!) was born on June 26, 1885 in New York City and died in California in December 1963 at the age of 78. He would have been 65 when the last known issue (Issue 21, December 1950) was published.

There was also activity in club sponsored "slicks." In January 1934, the Rochester (New York) Aquarium Society published AQUARIUM NEWS (Figure 25-7), a periodical not unlike AQUARIANA. A monthly, except for July and August when it was not published, AQUARIUM NEWS was edited by George H. Sly, Jr. Its price was 10 cents a copy or $1.00 a year. An interesting aside to this periodical was that its Advertising Manager and frequent contributor was Howard C. Damon, a nephew several times removed of William Emerson Damon, one of the pioneer aquarists of America and one of great aquarists of the period covered by this history.

AQUARIUM NEWS did not use illustrations to any great extent and this was especially true for photographs. It was, however, an excellent publication and boasted writers of such note as Myron Gordon and Gilbert P. Whitley of Australia. Even Charles H. Peters contributed to it. It was almost as good a magazine as THE Home AQUARIUM BULLETIN and it lasted a good time longer, passing from the scene in 1936. Like the San Francisco Aquarium Society's THE AQUARIUM JOURNAL, its pages were interesting and absorbing - pure nostalgia to the old-time aquarist. To the average hobbyist, however, it was a more useful publication than THE AQUARIUM JOURNAL since professionals who did not have as great a commitment to the home aquarium



Figure 25-7. A VERY FINE AQUARIUM PUBLICATION WAS AQUARIUM NEWS, PUBLISHED BY THE ROCHESTER (NEW YORK) AQUARIUM SOCIETY.

dominated the latter. Editors Sly, Damon, and contributing Editor Paul B. Tolle carried the burden of publication for four years. A labor of love, it was a credit both to them and to the Rochester Aquarium Society, but it had to end.

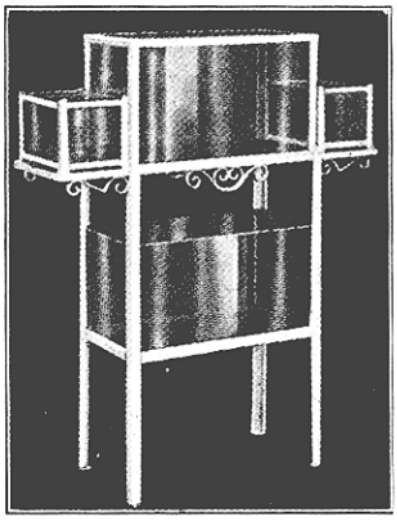
Although THE HOME AQUARIUM BULLETIN maintained a loyal readership, the depression of the mid-1930's made severe financial demands on the magazine. Furthermore, its Editor, Charles H. Peters, developed personal problems that ultimately resulted in his suicide. Faced with publishing the magazine alone, G. C. Hindenlang decided to solve his problem in a manner previously elected by five other pet hobby magazines. In 1936, THE Home AQUARIUM BULLETIN was absorbed into ALL-PETS MAGAZINE. ALL-PETS, published by O. C. Lightner and edited by Stephen Tedor, was a consolidation of DOGS AND KENNEL SCIENCE, FUR FARMING AND TRAPPING, WATERFOWL JOURNAL, THE PET TRADE JOURNAL, and THE PET FANCY magazines. Hindenlang joined the staff and assumed the position of "Aquaria Editor," and the name of the magazine was changed to ALL-PETS MAGAZINE AND HOME AQUARIUM BULLETIN. Hindenlang edited an excellent aquarium department in THE HOME AQUARIUM BULLETIN tradition. The fish section ran to about 21 pages, and that in a publication with a page size almost twice that of any aquarium magazine published. When Hindenlang retired some years later the aquarium section lost its identity, finally ending a historic venture in commercial aquarium magazines. In its heyday THE HOME AQUARIUM BULLETIN was a fine, readable magazine, in rapport with the grass roots of the aquarium hobby. Many were sad to see it go.



Figure 25-8. ANOTHER CLUB PUBLICATION THAT "WENT COMMERCIAL" WAS HOME AQUARIUM NEWS, PUBLISHED BY THE AQUATIC LIFE SOCIETY OF CLEVELAND, OHIO. While not quite as good as either THE HOME AQUARIUM BULLETIN or AQUARIUM NEWS, it was a fine periodical.

In 1936, the Aquatic Life Society of Cleveland began to issue a one-page bulletin with an initial circulation of 20. By early 1937 this had, under the editorship of William J. Connelly, expanded into a 20-page publication prepared via the spirit duplication (Ditto) process. Copies were sold for 10 cents each and subscriptions were available for $1.00 a year. The demand for this publication was considerable and some important advertisers were drawn to it. Accordingly, in April 1937 the magazine, called the HOME AQUARIUM NEWS (Figure 25-8), went commercial and was professionally printed. The Home AQUARIUM NEWS resembled AQUARIUM NEWS in appearance and in its sparse use of illustrations as the artwork was all line. It was a creditable project, not quite as effective perhaps as either AQUARIUM NEWS or THE HOME AQUARIUM BULLETIN, but as good as or better than AQUARIANA. Like the others, it did not survive. As was the usual story, the load on the volunteer staff was too great.

The survivors at the end of the 1930's were THE AQUARIUM, in an unimpregnable position, a somewhat ineffectual AQUATIC LIFE, a limited interest club publication, i.e., THE AQUARIUM JOURNAL, and THE HOME AQUARIUM BULLETIN, the last having lost its identity altogether. It had been a decade of aquarium magazine publishing that has never been equaled.



Fanciers Special Combination

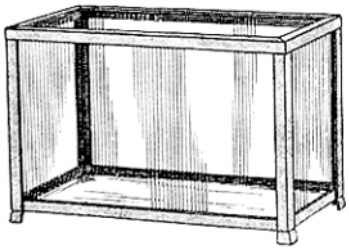
Price Complete $15.00

Three removable tanks. Lower tank bulb edge glass build in. This gives you two tanks for baby fish, one for egglayer and one for live bearer. Overall height 42". Floor space 24 x 9 polychrome finished. Price complete $15.00. Total capacity 13 gallon.

No. 1 Aquariums—Deluxe Radio Finished

These Deluxe finished aquariums are the same as our No. 1 aquarium illustration. They differ in that they are finished more beautifully and they can be obtained in the same size at following prices:

No. 1-A	$1.00 ea.
No. 1-B	1.75 ea.
No. 1-C	3.00 ea.
No. 1-D	3.40 ea.
No. 1-E	6.00 ea.



No. 1

No. 1 Aquariums

These Aquariums are made from welded steel frames finished in deep green duco. The legs are not included in measures.

	Length	Width	Height	Capacity	Price
No. 1-A	9¼	5½	6⅜	1¼ gal.	$0.80
No. 1-B	13	7	8	3¼ gal.	1.50
No. 1-C	14	9	10	5½ gal.	2.75
No. 1-D	18¼	8½	10½	6¾ gal.	3.20
No. 1-E	20	12	12	13 gal.	5.40

DRUM SHAPED BOWLS

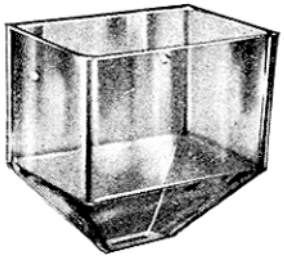
(Like Illustration)

One quart each	$0.15
Two quart each	0.20
One gal. each	0.50
Two gal. each	1.00



Clear Glass Oval Fish Bowl

2 gal. each.....$1.00



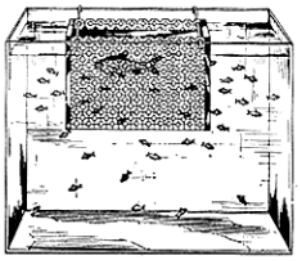
No. 6202 Breeder Trap

No.	Lgth.	Width	Depth	Price
6202	5 7-8	3 7-8	5 5-8	$1.00

Crystal Glass Only



Oval Fish Bowl



Metal Breeding Cages

Square Shape

	Length	Width	Depth	Price
Small	6	4	5	$1.00
Large	10	4	5	1.50

V-shape

	Length	Width	Depth	Price
Small	6	4½	5	$0.75
Large	10	4½	5	1.25



Aquarium Reflector

If turned on during the evening hours the light stimulates plant growth.

Single bulb	9½ inches long	Price $1.00
Two bulb	16 inches long	Price $1.50

These reflectors have universal hangers fitting any aquarium. They differ slightly from illustration. They are furnished complete with bulbs, hangers, and extension cords.

Figure 25-8. A PAGE FROM THE 1933 BELDT'S CATALOGUE. Note the prices! A reflector could be bought for $1.00.

CHAPTER 26: AUTHORS & BOOKS OF THE THIRTIES

Another attempt to form a cooperative national organization of aquarium societies was made, this time in 1933 by William T. Innes, but the response was nil and the effort was abandoned. As the country was in the throes of a serious depression, a number of suggestions were made to place an excise tax and an import duty on aquarium fishes. A flat tariff was proposed, ranging from 10 to 25 cents per fish. This would have made the cheaper fishes, such as platies, swordtails, and Danios, comparatively high-priced since they were raised in this country, but the price of the rarer species imported from overseas would not have increased sufficiently to make their cost prohibitive since they already were high priced. As a result the plan was never implemented. In 1933, however, under the National Recovery Act the tropical fish industry was organized with the formation of the Eastern Tropical Fish Association under the leadership of such well-known names as John Doscher, Charles Visel, Richard Büttner, Joseph Lingg, and Newton Capron. The immediate purpose of the organization was to secure the general acceptance of a code of fair competition to be drawn and sent to Washington. The ultimate aim was to form a permanent trade association, but the effort failed when the Supreme Court declared the NRA unconstitutional.

In 1928 a small quantity of a tiny crustacean was brought to the Steinhart Aquarium in San Francisco, California where the director, Alvin Seale, took particular interest in the creatures. Seale experimented with the shrimp that, after some literature research, he found to be *Artemia salina,* and later collected its eggs in nature. Not only did Seale find them to be an excellent fish food, but he also discovered that the eggs could be dried and stored for some years, later to be hatched at will when the shrimp were desired.

It was that great aquarist, Richard Dorn, however, who suggested that Seale's club, the San Francisco Aquarium Society, market the brine shrimp eggs commercially. As Seale himself tells it, modestly referring to himself as "one of our members":

> "One of our members who for some three years had been making an investigation of various fish foods, succeeded in some of his experiments even beyond his own expectations and it is all due to the vitality of the eggs of the insignificant brine shrimp. It was found these eggs would hatch in from one to two days after being dry and in a jar for at least three years. This made it appear as if the preparation and sale of these eggs might be developed into a small profitable business - in fact this was suggested by our good friend Richard Dorn who reported that in Germany it is not unusual for Aquarium Societies to lease and exploit Daphnia ponds.
>
> "Our President, Mr. Lanier, therefore appointed our Board of Governors as a committee on



Figure 26-1. FREDERICK H. STOYE (1887-1977), Associate editor of THE AQUARIUM and prominent author of the 1930's.

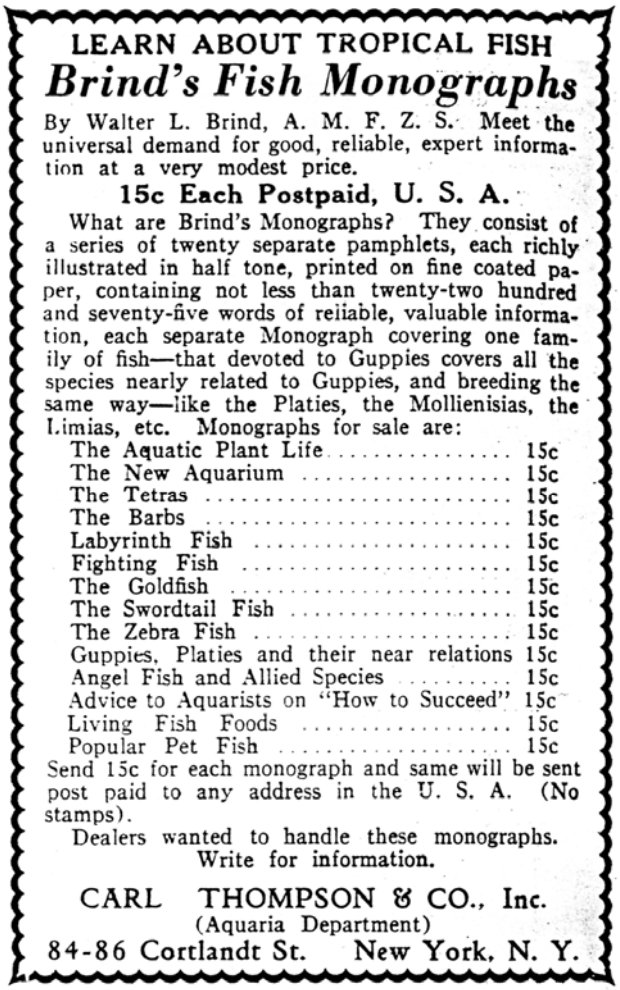


Figure 26-2. WALTER BRIND'S MONOGRAPHS FIRST APPEARED IN THE PREVIOUS DECADE, BUT THEY CONTINUED TO SELL DURING THE EARLY THIRTIES EVEN THOUGH SOMEWHAT DATED. Based on a one-year subscription, however, an issue of the aquarium sold for a little less than 16 cents, so the time clearly was past for these 15-cent pamphlets.

Business with instructions to take such steps and make such arrangements as were necessary to carry on the work. A friend of the Aquarium Society, having agreed to advance the necessary funds for immediate needs, the committee at once went to work. All the salt companies owning salt ponds in California and also some in Utah were approached to secure, upon proper payment, the exclusive rights to gather brine shrimp eggs from their property. Then the services of an experienced collector were secured and a large quantity of eggs were collected, washed, and prepared under the direction of the committee. Labels were printed and boxes and cartons ordered. Many members of the society kindly volunteered their services and packed and labeled 1000 cartons. These are now ready for market and orders have already begun to arrive. Each member of the Society upon application to the President will be presented free with one carton of eggs.

"It is hoped that all members will join in securing markets for these *Artemia* and in this way advertise our Society and add to our revenues so that we may enlarge the Aquarium Journal, build up our library and do such other good things for the good of the Society as is right and proper."

Thus in September 1933 the aquarium hobby was introduced to brine shrimp and its eggs. It revolutionized the hobby and made the San Francisco Aquarium Society the most prosperous aquarium society in history.

American aquarium fish publications were all characterized by the fact that none really listed very many species. A real need existed for a book that would identify, at least in an approximate fashion, the many new fishes that were being sent to this country by German exporters. To fill this requirement the German book, *Ichthyologische Bilderatlas,* published in 1932, was imported in quantity. It was low priced and, fortunately for most American aquarists, contained no text. On the other hand it had a tremendous number of pictures, both good and bad, and dealers used the book to supply names to new importations. It filled the need of the hour and made its author's name, Christian Brüning, a household word among American aquarists. Brüning at the time edited the famous German weekly magazine for aquarists, WOCHENSCHRIFT. The concept of a weekly magazine for aquarists is a difficult one for Americans to comprehend, but this was typical of the extent of the German interest in tropical fishes at the time. It should be noted that this was not the first time a German species reference or "digest" book was made available to an American audience. In order to provide identifications for the tropical fishes available at the time, Arthur Rachow's *Tropical Aquariafish Catalogue* had been translated into English and sold



Figure 26-3. CHARLES H. PETERS, PRESIDENT OF THE NEWARK AQUARIUM SOCIETY, EDITOR OF THE HOME AQUARIUM BULLETIN AND AUTHOR OF *Life And Love In The Aquarium*. He later developed personal problems that ultimately resulted in his suicide.

here in 1927, but the information it provided on the fishes catalogued was minimal.

During the aquarium publishing boom period of 1933-1935, numerous aquarium books appeared on the market. An early comer was *Tropical Fishes for a Private Aquarium*, written by Christopher W. Coates of the New York Aquarium in 1933. This was an excellent book, written in a highly absorbing narrative style, so much so that even today I enjoy sitting down and re-reading it. It was arranged via chapters that discussed the specific groups or families of fishes. Although a limited number of very good photographs were appended to the end of the book, it was not a catalog of aquarium fishes nor was it designed to be a reference identification work.

Charles M. Breder Jr., who joined the New York Aquarium in 1921 and subsequently held many positions that led to his appointment as its director in 1937, first described the presence of bacteriophages in aquarium water but did not pursue the subject. In 1933, however, the following article involving Coates and bacteriophages appeared in TIME MAGAZINE:

> "C. W. Coates found an interesting clinical possibility regarding certain types of dermatitis. Thus far a number of volunteers obtained an unexpected amount of relief, but the study has not progressed sufficiently far to state more than the fact that these volunteers were enthusiastic about the results.
>
> "In working on this problem Ichthyologist Breder had the help of another young man who had never outgrown his childhood interest in polliwogs. He, Christopher William Coates, had also gone into the Army instead of to college, but had kept up his study of fish during the after years in which he was earning a living in the radio business. The discovery set Fishman Coates to thinking. If the phage destroyed bacteria in aquarium water, why shouldn't it destroy them in human infections?
>
> "From the intestinal contents of fish he prepared a concentrated solution of the bacteriophage. Then he deliberately set about getting his own hands infected. He dipped them repeatedly in his phage solution, soon saw them healing up. Word of his success brought other skin sufferers to the Aquarium. One man said his affliction had resisted treatment for 20 years. His hands were so sore and scaly that he could not close them. After plunging them in the phage solution several times a week for three months he could grip a golf club. Last week Researcher Coates had 18 other favorable treatments to report.
>
> "Of the significance of their work honest Messrs. Breder and Coates would only say last week: 'We know we've got something. It's up to the bacteriologists and dermatologists to carry on and find out what it is.' Chief fear of Researcher Coates last week was that news of his work might set skin sufferers everywhere to dipping themselves in convenient goldfish or guppy bowls. Bacteriophage may or may not be

present in the water of an aquarium. But even if present it is too weak to be of any therapeutic value."

In 1930, Coates became the successor to Ida Mellen at the New York Aquarium. Along the way he became an authority on electric eels and another TIME MAGAZINE article, titled "500-Volt Eel," appeared in May 9, 1938:

"Christopher W. Coates, head curator of Manhattan's Aquarium. Curator Coates last week told scientists in Washington that the eels may furnish a clue for electric anesthesia that might be better than the chemical anesthesia now in use. Ingenious Ichthyologist Coates has already found a practical use for these fantastic fish. For years the Manhattan Aquarium was chivied by large river rats that invaded it during the winter. The rats would climb to the top of tanks, snatch fish out, and eat them. Dr. Coates bought a few cats, but they preferred fishing too. Thereupon Coates opened the electric eel tank, turned the fish loose on the floor to play with the cats. The latter promptly pawed the eels, were thoroughly shocked. The Aquarium cats, now firmly convinced that all fish are electrified, pay strict attention to the rats."

One book designed to be an identification reference was Charles H. Peters' *Life and Love in the Aquarium* published in 1934. Although basically a good book, it suffered from various deficiencies. The illustrations were by Henry Uhlig and, as excellent as they were, they could not replace photographs in a book that was designed to be a catalog of fishes. Peters, who was Editor of THE HOME AQUARIUM BULLETIN at the time, developed the book hurriedly, presumably to arrive at publication before the Innes work whose appearance had been delayed for two years but which was known to be in preparation.

The illustrations in *Life and Love in the Aquarium* were located some distance from the text and many species were copied from old German aquarium works. Since many of the latter had not been available or seen for years, they were of limited value to the hobbyist. Further, short shrift was paid to correct nomenclature and identification. General aquarium management and diseases were briefly mentioned, the book being, as I have noted, mainly a catalog of species. On the other hand, Peters was an excellent writer with an easy, readable style. The book, however, was overshadowed by others that followed closely upon its heels.

Another very good book was *Tropical Fishes for the Home, Their Care and Propagation*, published in 1935 and written by Frederick H. Stoye. Stoye was born in Saxony, Germany, immigrating to the United States in 1911. By profession an expert telegraph operator, an early love of nature prompted him as a child to collect frogs, lizards, and birds. His interest later turned mainly to aquarium fishes and he made frequent contributions to magazines and newspapers on aquatic subjects. In time, he was added to the staff of THE AQUARIUM as an Associate Editor where he contributed many major articles, edited a monthly column, and translated material for the magazine.

Stoye's book was actually first printed in Germany but a second edition was published in this country. The book was a more careful, more painstaking effort than was Peters'. It described over 400 species of fishes, 345 of which were illustrated via wash sketches. Included among these were 40 color plates. The book

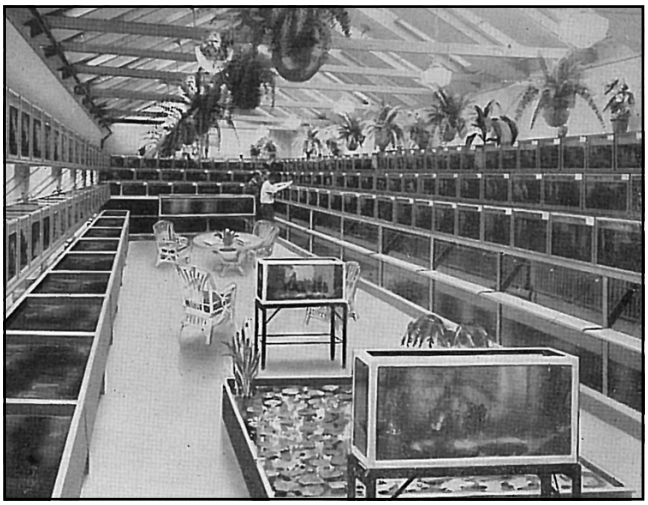


Figure 26-4. IN 1932 THE AQUARIUM HOBBY HAD MADE A REMARKABLE RECOVERY FROM THE ECONOMIC DOWNTURN AND NOT ONLY WERE BOOKS AND MAGAZINES IN GREAT DEMAND, FISH STORES WERE FLOURISHING AS WELL. This is a view of Weber's Tropical Fish Hatchery in Rochelle Park, New Jersey. The number of tanks for the time was impressive.

established Stoye's reputation as an authority and he remained a mainstay of THE AQUARIUM staff for many years afterwards. He also contributed to practically every other American aquarium magazine on a frequent basis. His output was prodigious.

Less noteworthy was Alfred P. Morgan's *Tropical fishes and Home Aquaria; a Practical Guide to a Fascinating Hobby*, published in 1935. It did not come up to the standards set by Coates, Peters, or Stoye. Other books of a somewhat pedestrian nature published during this time included: Norbert B. Lederer's *Tropical Fish & Their Care* (1934), Lucile Quarry Mann's *Tropical Fish* (1934), and Edwin H. Perkins' *Tropical Fish; Their Breeding and Care* (1936). The year 1934 also saw the appearance on the American market translations of several of Werner Ladiges' books, such as *Tropical Fishes for the Aquarium* and *Tropical Fishes/Tropische Fische*. Like the earlier Brüning and Rachow books, these were more or less catalogs with minimal information on the fishes they described. As did Brind, Ladiges wrote many monographs on tropical fishes and many of these, including these books, were reprinted after World War II.

Among the pamphlets and booklets typical of the period are LeRoy Sauer's *Tropical Fish Handbook, a Book of Practical Information for the Beginner* (1933), A. Laurence Wells' *Aquariums and Fishponds* (1936), and The Chicago Park District's *Aquariums and Fishes for the Home* (1939), none of which are particularly noteworthy.

The piece de resistance of all the books published during this period, however, was William T. Innes' *Exotic Aquarium Fishes*, which appeared in May 1935. I can do no better than present the review of the book made by Charles E. Tracewell, which appeared in *The Evening Star*, Washington, D.C. on May 25, 1935:

> "Exotic Aquarium Fishes," by William T. Innes of Philadelphia, is the answer to the fish fancier's dream. Mr. Innes has written it, illustrated it and published it. The result is a beautiful volume, whose excellent, sensible text is supplemented by some of the most beautiful color photographs ever taken of live fishes. Each one of these plates cost several hundred dollars. Each one of them is the personal work of the author, who has spent many years developing his skill as an amateur photographer of note. The keeping of small aquarium fishes and the photographing of them in color have been this man's hobbies. Print is his business.
>
> "Mr. Innes worked for three years upon this book, biding his time while other works were rushed into print to catch the crest of the wave of public interest in the so-called 'tropicals,' those interesting small denizens of the warmer waters of the entire world.
>
> "The result is a work of which the entire 'fancy' may be proud, a book which will take its place as the standard work in the English language on these small 'exotic' creatures.
>
> "Although Mr. Innes has devoted his life to love and care of fishes, beginning many years ago with goldfish when Philadelphia was the center of the hobby, he makes no claim to be an ichthyologist, but his book is as accurate as if he were, for he has had the assistance of Dr. George S. Myers of the New National Museum, internationally known authority, and of the National Geographic Society.

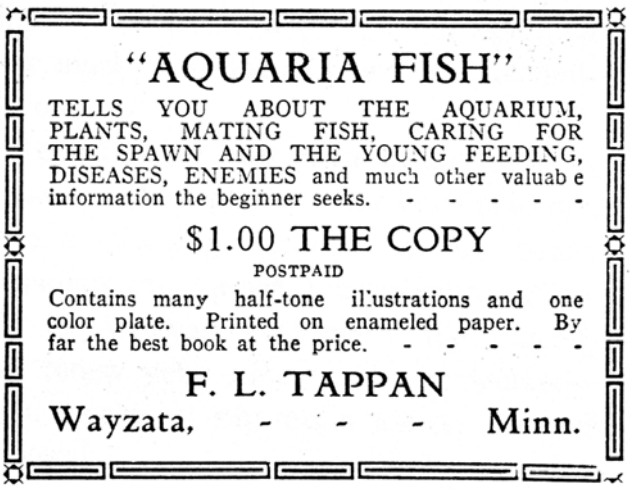


Figure 26-5. FIRST PUBLISHED IN 1912, FRANK TAPPAN STILL ADVERTISED HIS 96-PAGE *Aquaria Fish* DURING THE EARLY THIRTIES but Innes' *The Modern Aquarium* was far superior and the sales of Tappan's publication declined.

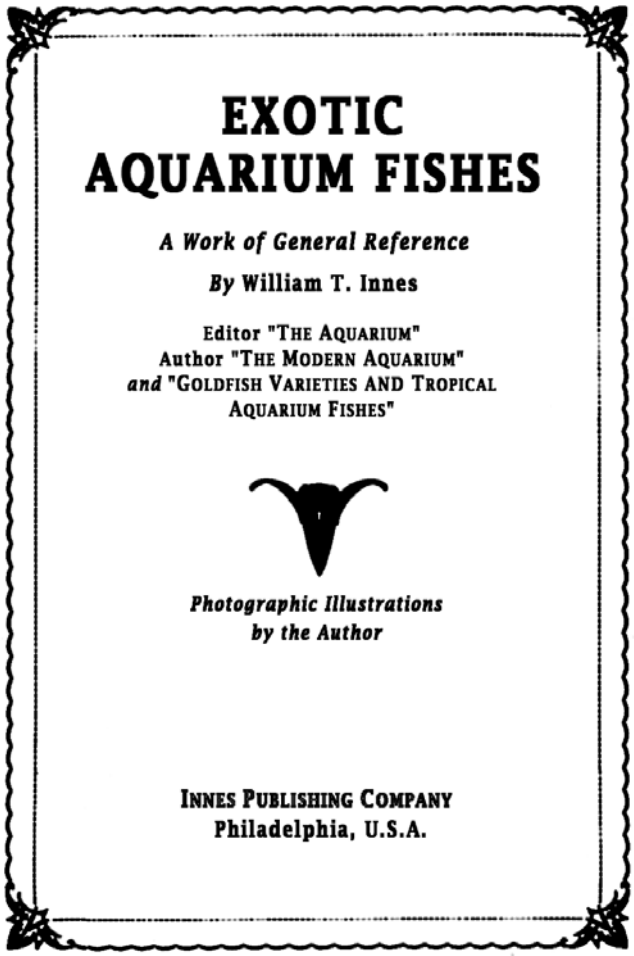


Figure 26-6. THE TITLE PAGE OF THE FIRST EDITION OF *Exotic Aquarium Fishes*, 1935.

"This is Mr. Innes' book from first to last, however. Over it he has spent three years of his life, based upon many prior years as amateur fish culturist and student. Only a man with this experience could put into such a work the love of it that shines through every page, every photograph, many of them in exquisite color, every detail of physical construction. This is the first time in any book that the reader, by aid of the larger maps, may accurately place the natural habitat of any of the scores of fishes treated.

"Also there are small maps for every family of fishes, showing accurately where the small creatures which swim in home aquaria really live in nature. A feature of this book that answers the 'fish fan's' prayer, as well as makes his dream come true, is the pronunciation of every scientific name. These Latin names, so essential, yet so hard to pronounce, are here both pronounced and their meanings made plain.

"The order in which the several hundred varieties, including the so-called 'live bearers' and eggs layers, are considered in the book is unique among books for the layman. Fish families are placed in the book according to the scheme of their relative places as developed creatures, from lowest to highest. Thus, for the first time, the average keeper of aquarium fishes will be introduced to ichthyology, whether he realizes it or not; he will come in time, as he studies this text and accompanying photographs, to have a far better comprehension of the real worth of these small creatures.

"In addition, 'Exotic Aquarium Fishes' will show the beginner the fishes he really can acquire, without cluttering his head with rarities which only a few persons have ever seen. It will tell him how best to care for the fishes he secures, how to manage a tank, feed its inmates in health, and treat their diseases when these occur, as they will from time to time.

"The reader will remember that this book is the outgrowth of Mr. Innes' work as Editor of THE AQUARIUM magazine. He has had the benefit of thousands upon thousands of questions from readers, and knows the point of view of the home fish culturist as few persons do or can. Hence his book is peculiarly for the amateur. At the same time it carries such a stock of true lore that the experienced fancier alone can recognize it.

"In nothing more than the illustrations is this shown, for the newcomer may accept these as a matter of course, whereas the experienced fish fancier will recognize them as true works of art, incorporating a loving care and interest along with the finest precision of the master photographer, working with the latest development of the art.



Figure 26-7. AN ADVERTISEMENT FOR THE NEWLY INTRODUCED THE AQUARIUM, a magazine that featured a full color photograph of an aquarium fish in each issue.

"Here, for the first time, he will find a genuine color photograph of a father and mother angel fish surrounded by their scores of babies.

"Here he will see, for the first time, a photograph of a blowfish held in the hand, blown up into a perfect ball. Here are shown the spawnings of the Betta and the Rasbora, and many another interesting phase in the lives of many unusual creatures.

"While the illustrations are unique, they are by no means all. The text itself is completely free from that confusion that seems to beset even the most learned when attempting to tell others about fishes. Especially is this true in detailing tank management.

"In dealing with the hundred and one points of aquarium management, as well as in discussing the different fishes themselves, Mr. Innes writes with divine common sense, so casually that the uninitiated, picking up this book, might not realize the vast experience behind each sentence.

"Exotic Aquarium Fishes" is that rare thing, a specialist's book that is good reading for anybody and everybody. In physical make-up, contents, and illustrations it leaves nothing to be desired by the hobbyist. When the writer here took up his hobby, three years ago this month, there was nothing to be found except a few pamphlets. Since that date several books on the hobby have appeared, but none so rich and informative as this one. The lore of seas and nations is in the book. It is safe, to say that even Germany, which pioneered in the keeping and culture of these curious animals popularly called "tropical fish," possesses no popular work on the subject as worthy as "Exotic Aquarium Fishes."

Although this is a glowing accolade indeed, the book did suffer from one glaring defect, i.e., the lack of a bibliography. This was typical of all Innes books – bibliographies were as scarce as daphnia in a tank full of goldfish fry. This is surprising since Wolf's *Goldfish Breeds and other Aquarium Fishes*, published by Innes, had one of the best bibliographies ever seen in an American aquarium book.

Tracewell's review lauds the provision of a section on the pronunciation of scientific names, a first for any aquarium hobby book and a boon for aquarists who had been stumbling over the pronunciation of such names for decades. The pronunciation of "guppy," for example, in 1917 varied all over the country as shown by the preferences of the following four cities (and note that the scientific name of the guppy at one time ended in "guppyi"):

Milwaukee:	"GOOP"
Chicago:	like PUPPY
Philadelphia:	GOO'-PAY
Nashville:	GOO'-PIE-EE

However, Innes was not the first to bring help to the aquarist in the matter of the pronunciation of fish names. This honor belongs to Judson Cole who wrote the following article that appeared in the September 1934 issue of AQUATIC LIFE:

"Pronouncing Fish Names
by Judson Cole

"The shark sucker, which uses the shark for a free taxi, is an impediment to the "taxis" comfort, so I'm told. From conversations with fish fanciers I find the proper pronunciation of the

scientific names used for fish quite an impediment also, one as hard to shake off as is the hitch hiker on the shark. Eventually, when the method is determined the shark rids himself of the offender and it is possible for one to overcome the handicaps found in scientific nomenclature of fish once they are defined.

"Fish names seem formidable for two reasons: first, they seem to have no reason to exist unless one is versed in at least the rudiments of foreign languages - alive and dead. Most of them, in defense, do have a meaning, changeable seemingly but more or less appropriate to the occasion. The second handicap - usually the stumbling block, is the uncertainty of proper pronunciation.

"Scientific names, for the most part, are in Latin. If derived from some other language they are expressed in Latinized form. These then, for their proper pronunciation, depend greatly on their derivation, but the proper pronunciation of Latin, if at hand, will minimize the element of error which always creeps in at this point. The rules which apply in the matter are far more exhaustive in nature than a complete issue of AQUATIC LIFE. This being true we must seek some method, less complicated, to complete our purpose.

"Some simple rules, of help, in pronouncing scientific names will suffice in the absence of a reliable information source on the subject. These are not offered to make one a complete specialist on the subject for, it is found that even they (the specialists), in a mixed audience, find themselves completely on edge because of the way in which their pronunciation is received by many of the company assembled. Fish culturists differ more on matters of nomenclature than on any other point.

"Teachers claim there are three distinct methods of pronunciation applicable - all alternative. The Roman method, said to agree with that used by the ancient Romans, finds but little following among the English-speaking peoples because, it is said, we know not how they pronounced their words. In spite of this it has found some following in the schools and, to those who have studied this method, it presents a stumbling block when they attempt fish nomenclature.

"The English method conforms strictly to the rules of Latin in word structure, length of vowels and accent but uses the English sound values of the letters. When, by this method, a good Latin scholar has determined the proper pronunciation of a word, we have something concrete to our purpose. Few of us have the privilege of such an authority to check our pronunciation.

"The last method depends on the fact that many English words are from Latin derivatives, it



Figure 26-8. FRONTISPIECE OF THE FIRST EDITION of *Exotic Aquarium Fishes*, 1935. The illustration was a tip-in in full color of *Rasbora heteromorpha*.

regards the words as English and completely forgets the derivation and Latin rules. This is really the vernacular method, characteristic of a locality, and has its followers - who swear by a local pronunciation, regardless of how far wrong it may be. As an example take the word cichlid which in and around New York City is almost invariably, by dealer or fancier, pronounced as chichlid.



Figure 26-9. ADS FROM THE MARCH 1932 ISSUE OF AQUATIC LIFE. The upper ad announced that Richard Büttner made the move from The Aquarium Stock Company to The Empire Tropical Fish Import Company. (For more about Richard Büttner see Chapter 27).

"The English method, the one preferred by the majority, has each vowel or diphthong determine a syllable with all vowels pronounced which also includes the final one, a, i, or e. The final syllable is generally an inflective ending and needs distinct pronunciation to show grammatical construction, the vowel generally has an intermediate or even long value.

"Long a is pronounced as in fate, short a as in fat. At times when preceded by r or h it takes the broad sound as in car. Final a has an intermediate sound while long e is pronounced as he while the short e is pronounced as get; long i as in mite; short i as in mit; long o as in note; short o as in not; long u as in dude; short u as in dun; long y as in type; short y as in lynch. The diphthongs, æ and œ are pronounced like the vowel e.

"Consonants generally are, sounded soft; r and g like in lice and girl before e, i and y and the diphthongs. Elsewhere their sound is hard like in can and gun. J an involvement of i used as a consonant is always troublesome . Sometimes it is used as alternate of y; at others the correct English pronunciation should be followed as in cognate words.

"Ch, ph, th, ps are Greek derivations and cannot be separated in dividing a word into syllables. Ch is pronounced like k, ph like f, ps like s, while th is used the same as in English. Sch is pronounced scholar.

"The position of accent is complicated. The syllables of most importance are the penult or one preceding the last and antepenult or third from last. If the vowel in the penult is long the accent is taken by it, otherwise, it goes back to the antepenult.

"More than two accents, in succession, are hard to pronounce. There-

fore, a syllable near the beginning, in very long words, receives a secondary accent. A short vowel is indicated by an acute accent, a downward stroke from right to left, while a downward stroke from left to right, opposite from the above, is used to indicate a long vowel. These marks appear over the vowel.

"In words from two derivations or roots, the connection is usually made by an o for sake of euphony. This connects the two by smooth transition when o is accented like in *Hyphessobrycon*.

"Sometimes Latin gives undue importance to unimportant letters. This is found in personal names in which certain letters are silent. Less-objectionable is the case when the commemoratives are derived from personal names ending with a silent e.

"While the above rules, not intended or proposed as complete, will not make one perfect in all pronunciation of fish names, they may well serve as a guide for a start which will make the names have a sonorous rhythm, both euphonious and attractive.

"Much satisfaction will be derived from mastery thus far which will give impetus to still further study."

The pronunciation of scientific names mostly involves the sound of the vowels and the position of the accents. Although Innes addressed both, for some reason he never actually discussed the rules for placing the accents when vowels were long or short. This is important since the major problem most aquarists have with pronunciation is not with the sounds of the vowels (after all, Americans pronounce vowels differently according to where they live), but where to place the stress. Cole, however, did provide the rules and thus his explanation of pronunciation was superior to that given by Innes.

An interesting sidelight to *Exotic Aquarium Fishes* is the fact that, with the exception of the images of *Aphyosemion coeruleum* and *Nothobranchius rachovii*, all the rest were manipulated by Innes. Whether the final image was intended to be printed in black and white, or in color, he first photographed the fish in black and white. If the final image showed a pair, then the sexes were photographed separately. The next step was to make a very large print of the black and white image, or images if a pair was to be shown, and carefully cut out the image from the background. These were pasted onto a background previously photographed - they usually showed plants - and the montage was then photographed. If the image was to be printed in black and white, then this was the final product. If not, once again a very large print was made and the image was hand-colored, with Innes supervising the artist, Bill Bokius, in order to get the colors correct. The painted image was then re-photographed to obtain the final color image. Innes solved three problems with this method. First, as photographers well know, photographing pairs is much more difficult than photographing a single fish. Second, Innes did not have to worry about backgrounds when he was photographing the fish and the backgrounds could be prepared in advance to suit the subject. Thirdly, since the color films of the day were slow compared to black and white films, it was much easier to freeze the movement of the fish using black and white film.

There is one last book that deserves mention in this selection of the best from the decade of the 1930's and indeed, except perhaps for *Exotic Aquarium Fishes*, it was the best of them all. In a way the two did not compete; their concepts were vastly different and their purposes were clearly distinct. The book was called *1001 Questions Answered About Your Aquarium* and it too appeared in 1935. Both of its authors were professional aquarists - Ida M. Mellen, author of numerous works on aquarium fishes dating from the 1920's and former Chief Aquarist of the New York Aquarium; and Robert J. Lanier, former Superintendent of the Steinhart Aquarium in San Francisco and the Shedd Aquarium in Chicago, and the Foreman of the New York Aquarium. They were excellent aquarists with enviable qualifications. Miss Mellen, another of those important hobbyists I have remarked are overlooked by the aquarium world, had a keen sense of aquarium history, something not shared by any of her contemporaries.

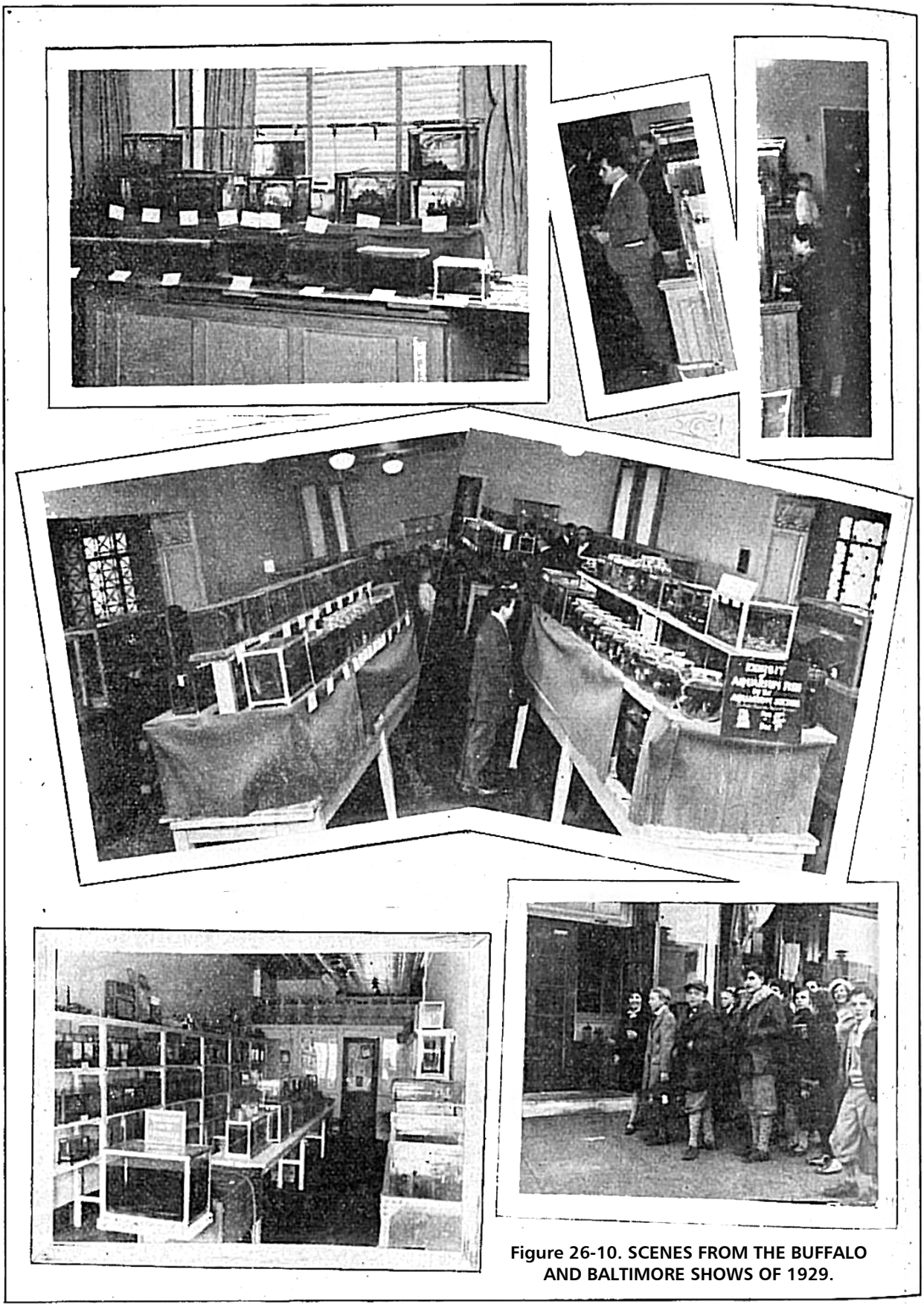


Figure 26-10. SCENES FROM THE BUFFALO AND BALTIMORE SHOWS OF 1929.

1001 Questions is a book I re-read year after year. As beautiful as *Exotic Aquarium Fishes* was it did not quite match the Lanier/Mellen effort in its information content. In addition, *1001 Questions* was the epitome of efficiency. If a question deserved an answer but one sentence long, then one sentence was all it received. It had its faults, to be sure. The questions and answer arrangement was sometimes infuriating to work with when specific information was desired, as the book is a series of couplets arranged in chapters grouping related entries. Furthermore it lacked adequate illustrations. The book, although pedagogical in nature, was readable and interesting. I should hate to ever lose my copy. I note with amusement that, despite its title, the book actually has 1074 questions!

During the 1930's several bitter clashes arose between Dr. George S. Myers and Walter L. Brind. In the February 1935 issue of AQUARIUM NEWS (Rochester) Brind attempted to describe a new species of knifefish he named *Rhamphichthys cingulatus*. In a note to the magazine Myers pointed out a host of errors Brind committed in the attempt, finishing with the statement: "Until he describes the fish in a careful scientific manner, and places a type specimen in some scientific museum, no one will ever be able to be sure just what fish he was trying to describe."

Myers, of course, was right. Indeed, Brind did not even come close to placing the fish in the right genus. Coincidentally, at the same time Brind was writing in AQUARIUM NEWS, the ichthyologist, F. R. LaMonte, properly described the fish in a publication of the American Museum of Natural History as *Gymnotus coatesi*. Brind replied to Myers in print, trying in an ineffectual manner to point out that ichthyologists made mistakes in nomenclature also, e.g., "Many of the names given have been inappropriate - witness '*Danio alboliniatus'* -the 'White Lined Danio' - a name given upon dissecting a preserved specimen in which the rose-pink line had faded to white. Museum authorities changed the first name '*Danio'* to '*Brachydanio,*' - the first name being given in error."

Brind was in the habit of naming fishes in a fantastically careless and haphazard manner. In a May 1936 article entitled "The Absinthe Fish," Brind wrote:

> "And, in spite of the fact that a tiny sip of real French absinthe accompanied my inspection as hereinafter described of this jewel among jewels of the finny world, my story now written was typed by myself on the next day after I met 'The Absinthe Fish', which I have been pleased to call *Tetra brilliantissima*, because no matter what high-falutin' appellation museum 'wise guys' may assign to it, hereafter or, for the matter of that, may already have assigned to it, judging from some poor pickled specimen (and I am not 'pickled' when writing this), the name I have given it - both the English one and the 'scientific' one - exactly fit it better than any other names could do".

The fish Brind was describing was the neon tetra, but the ichthyological world ignored him. Ultimately, Dr. Myers described the fish in a professional manner as *Hyphessobrycon innesi*. At this, Brind blew his stack. In an intemperate article published in 1937 titled "Hit Or Miss Scientific (?) Nomenclature of Fishes," Brind claimed that the neon tetra was really a *Hemigrammus*, not a *Hyphessobrycon*. In what amounted to a libelous attack, he stated: "Why let alleged 'ichthyologists' continue to bamboozle us poor aquarists?"

For the most part, professionals and aquarists alike ignored these wild forays by Brind into the naming of new fishes, but a few of his scientific names did stick, e.g., the Firemouth Cichlid, *Cichlasoma meeki* (Brind), in that at least Brind is recognized as the author of the species. In the 1930's the International Rules of Zoological Nomenclature were much more lax than they are today.

One battle (albeit a more friendly one) that George Myers did not win occurred somewhat earlier, in 1933 in fact. In the May, June, and July issues of THE HOME AQUARIUM BULLETIN that year, Milton Schoenfeld was engaged in expounding on the "Nomenclature of Fish." In addition to explaining the whys and wherefores of scientific terminology, Schoenfeld made free with his comments on the system and Academia in general. The following are some examples:

Smells and Food Values

The following —a reprint from the "New Orleans Item" of August 14th, tells the story of "Why Our Shrimp Smells" better than it has been told before.

Shrimp Smell? Eat 'Em and Like It!
"Beneficial," Says Viosca

Orleanians who have occasionally noticed a peculiar odor in shrimp purchased at the markets this summer need not be afraid to eat the shrimp, according to a letter which has been addressed by Percy Viosca, director of the fisheries division of the Department of Conservation, to Mr. "A. Labas," of The Item.

The letter written in answer to a complaint, which Mr. "A. Labas" addressed to Dr. W. H. Robin, follows, in part:

"Your column addressed to Dr. W. H. Robin, superintendent of public health, in The Item edition of August 2, calls to mind a number of complaints which have reached the Department of Conservation from time to time, as the cause of the strong odor sometimes noticeable in market shrimp.

"The odor is not that of formaldehyde, as you state, but resembles that of iodoform and is due to the presence of an iodine compound. This odor appears at irregular intervals in shrimp caught in the Gulf of Mexico when they feed on certain marine organisms. These only appear in the gulf at times of high salinity in the water, and consequently the flavor does not exist in shrimp taken in lakes and bays, or when the salinity of the Gulf is reduced by rains or floods.

"One of the organisms causing the trouble is a worm-like creature with the high sounding name of Balanoglossus kowalevskii. You state that a shrimp that eats something with such odor deserves to die. Perhaps a shrimp that eats an organism with such an indigestible name deserves to smell like that. At any rate, the odor is due to something they feed upon and not to any preservative. Ice is the cheapest and only preservative used in bringing shrimp to market. The odor is noticeable as well in living or freshly caught shrimp.

Iodine's Value Proven

"The flavor due to the iodine compound is often found in such varied seafoods as lobsters, clams, crabs, croakers and other marine creatures. It is the compound producing such flavors which distinguish sea-foods from fresh water fish, and when not too strong are rather desirable. Such shrimp are far from harmful being on the contrary of medicinal value, foods with high iodine content being particularly indicated in certain types of goitre. The prevalence of goitre in certain inland cities where little or no sea-foods are consumed, by the poorer classes, and its virtual absence in New Orleans, where practically everyone eats sea-foods, is testimony to the value of the iodine content."

We feel entitled to repeat our claim that "next to Live Food our CRESCENT BRAND SHRIMP comes nearer to filling the bill than any other known fish food."

Our shrimp reaches you as it comes from the water, nothing added—nothing missing. Some shrimp is bleached in hot water after grinding to make a good looking article and one without much smell. This removes a lot of food value and minerals. OUR SHRIMP has a STRONG ODOR but is BEST for all FISH.

ORDER YOUR SUPPLY TODAY

Crescent Fish Farm

1624 Mandeville Street NEW ORLEANS, LA.

(SELECT STOCK OUR SPECIALTY)

Figure 26-11. AN ODD PROBLEM WITH SHRIMP FISH FOODS!

On the International Rules of Zoological Nomenclature:

> "... the lucidity of an Egyptian hieroglyphic. There are not five men in the country who have the necessary knowledge, skill and experience to use this code successfully. In order to use it, as applied to fish, one must be a dyed-in-the-wool fish nut, an etymologist, a genealogist, an historian, a chronologist, a Philadelphia lawyer, a controversialist, and a jig-saw puzzlist."

On names:

> "All cases of lockjaw are not due to tetanus; ichthyologists are responsible for many. Have you ever noticed the enthusiasm displayed by ichthyologists when they give the five scientific names which the guppy has born? I can forgive them the first four, but the fifth! *Acanthophacelus melanzonus*! Twenty-five letters for an inch long fish! Two more letters and the alphabet would have been bankrupt."

In short, by the time Schoenfeld had finished his series, aquarists were laughing until their sides split at the expense of the scientific fraternity.

Dr. Myers, no mean slouch at humor himself, took up the gauntlet with vigor. In the August 1933 issue Myers presented his rejoinder in which he let loose with both barrels, e.g., "No, it must have been the smoke of battle that obscured his vision and led him to emulate Don Quixote." Myers very correctly pointed out that aquarists themselves perpetrated a good deal of the nomenclatural mischief. He also corrected Schoenfeld on several technical points in his series and pointed out that some of Schoenfeld's proposed solutions only led to more confusion. The general tone of Dr. Myers' reply, however, was somewhat sarcastic. As a consequence, Schoenfeld replied with a vengeance in a two-part rejoinder that appeared in the September and October issues of the magazine. Where Brind only sputtered and stumbled about when the wrath of Dr. Myers descended on him, Schoenfeld actually enjoyed the whole business. As Schoenfeld was armed with an excellent education and a superb wit, he promptly hoisted Dr. Myers' hide on his own petard by liberally quoting from Myers' own publications. Myers clearly lost this one and never jousted with "Don Quixote de la Schoenfeld" again!

Looking at this most famous of all aquarium battles with a somewhat dispassionate eye, it would be fair to say that both sides were partially right. Aquarists and ichthyologists are human and as such, are privileged to commit human foibles and to become ridiculous at times. Dr. Myers certainly didn't give aquarists much quarter but Milton Schoenfeld gave no more in return. Thirty-six years later the charges and countercharges still have their point. In any event, those professional ichthyologists who have taken a keen interest in the aquarium hobby, such as Drs. Myers, Hubbs, and Gordon have enriched it beyond what aquarists really deserve. For this, the hobby should be eternally grateful to them.



Figure 26-12.
IMPORTANT HOBBY FIGURES IN THE LATE 1920'S AND 1930'S.
RIGHT: RICHARD BÜTTNER.
LEFT: WILLIAM G. HOLBEIN.

CHAPTER 27:
THE FIRST ONE HUNDRED YEARS COMES TO A CLOSE

During the 1930's a number of German aquarists immigrated to the United States and became involved in an important way in the commercial side of the hobby. Foremost among them was Ferdinand ("Fred") Cochu (Figure 27-3) who was born in Hamburg, Germany in 1910. He worked in the different departments of the famous Aquarium Hamburg, Germany's most important aquarium fish import/export firm, where he learned the trade. Arriving in the United States in 1929, Cochu established Paramount Aquarium four years later. Other important commercial figures of German origin included Richard Büttner (Figure 27-1) of Empire Aquarium, and Karl Griem of Amazonica. Büttner was especially interested in killifishes and after his retirement he was made a Fellow of the American Killifish Association. He also wrote for Inneses THE AQUARIUM and was the object of some amusement when he became the first aquarist of note to be bitten by a piranha. Since his name is pronounced BIT'-NER, the piranha became known as "The fish that bit Büttner!"

In 1937 Paramount absorbed Amazonica when, because of ill health, Griem was forced to leave his business and return to Germany. Subsequently his Vice President, Marius Kramer, joined Paramount. Later, Hugo Schnelle, the Chief of Aquarium Hamburg and the brother-in-law of Fred Cochu, came to the United States and managed Paramount while Cochu supervised its financial affairs. In 1941 Paramount also took over Empire Aquarium from Büttner. Cochu made many expeditions to various rainforests in search of new aquarium fishes, and he has several species named after him. One of Paramount's collectors, August Rabaut, was responsible for the initial collection of the Neon Tetra.

Frederick H. Stoye (Figure 27-1) later interviewed Rabaut and secured the following details:

"The arrival of 4 one-inch-long fishes in New York in 1936 caused quite a furor in aquarium circles. Offers of more than 100 dollars were made for a pair of these indescribably beautiful fishes. Friend Innes and myself, the recipients of the first Neon Tetras to reach our country, had no desire to part with them, as they were gifts from friends in Paris.

"Why, the reader will ask, has this most strikingly colored of all freshwater aquarium fishes escaped the notice of collectors until now? Thereby hangs a tale.

"In the early days of the hobby, seafaring men of various nations imported practically all new fishes. The sailors had little time for excursions inshore and the fishes brought by them were caught near the seaports. As the interest in aquaria increased, some men who had made a living by collecting animals, birds and butterflies in the tropics, devoted their efforts to small freshwater fishes. Today several firms have fish collectors in various parts of the world, mainly in Brazil, the Guyana's, the Argentine, Malaysia, etc. To keep expenses at a reasonable level and to assure adequate and safe transportation for the fishes collected the majority of these expeditions follow well-established lines of travel. Inaccessible localities remote from civilization are rarely visited.

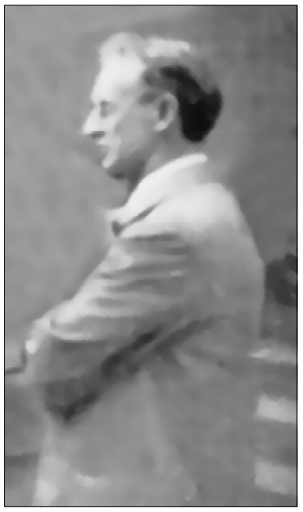
"For the discovery and importation of the Neon Tetra we are greatly indebted to the intrepid French collector, A. Rabaut, whose roving disposition led him into many parts of South America. He spent years in Venezuela prospecting for emeralds; at another time he hunted alligators for their skins. One cannot mention an outpost of civilization in Brazil, Venezuela, Colombia, or Peru that has not been visited by him repeatedly. His wide experience fits him perfectly to explore out-of-the-way places, and his willingness to take a long chance has been responsible for the finding of *Hyphessobrycon innesi*.

Figure 27-1. Movers and Shakers of the Thirties.











TOP: MILTON SCHOENFELD, RITTER of Vineland Tropical Fish Hatchery, AUGUST M. ROTH, WILLIAM E. SCHAUMBERG, and WILLIAM T. INNES.
MIDDLE LEFT TO RIGHT: HERMANN RABENAU, FREDERICK H. STOYE, RICHARD BÜTTNER, AUGUST M. ROTH, and CARL MERTENS.
BOTTOM LEFT TO RIGHT: WILLIAM A. STERNKE, JOHN W. DOSCHER, and J. LOUIS TROEMNER.







"The quest for new fishes led Rabaut beyond the regions regularly visited by fish collectors. His successful Neon expedition started from France in February 1936. A month later he and his wife, who accompanies him on his travels, reached Manaos, the seaport on the mighty Amazon, almost 1,000 miles from the ocean. After preparations to go further into the interior, he traveled almost another 1,000 miles by riverboat to the neighborhood of the Colombian frontier, a trip of over 15 days. Then he went by canoe up the Putumayo (called Ica in Brazil), a northern tributary of the Amazon, into the Amazonas district of Colombia.

"After a base had been established, trips on foot, lasting several days, were made into the primeval forest, yet untrodden by the foot of white men.

"Small forest streams, bare of aquatic vegetation, their bottom consisting of mud to a depth of several feet, were explored. This was very difficult, as the banks of the narrow rills, only from two or three feet wide, were overgrown by plants, covered by dead leaves, and crisscrossed by a maze of dead forest giants. Everything had to be cleared away before net and seine could be used. The darkness of the forest made it difficult to see anything in the water. Persistent search revealed the beautiful Neon Tetra. The water depth was from one to three feet and the temperature 74 to 76 degrees. Rabaut built boxes out of mahogany and cedar lined with pitch, for storing and transporting the fishes. He spent over 3 months in the wilderness before a worthwhile number of fishes had been collected and laboriously carried on the backs of natives and then by canoe to his base, a wooden can or two at a time.

"Air was supplied by hand-pump, even in the depth of the forest, and natives were 24 hours at this back-breaking task. Food had to be taken along because no game or fruit was to be found. Fish was the only fresh food, and this was plentiful."

Prior to World War II Paramount was the largest importer and distributor of aquarium fishes in this country, and the most influential. During the Great Depression, an intense trade war developed among the importers, wrecking prices and demoralizing the fish business in general. Paramount was one of the survivors of this battle of the giants and this closely-knit group of Germans was a major force in the aquarium hobby during the decade of the 1930's.

Another important commercial figure, not of this clique, however, was James B. Maris who founded the firm that manufactured the famous "Marco" line of aquarium pumps. For years, the name "Marco" was a household word among aquarists.

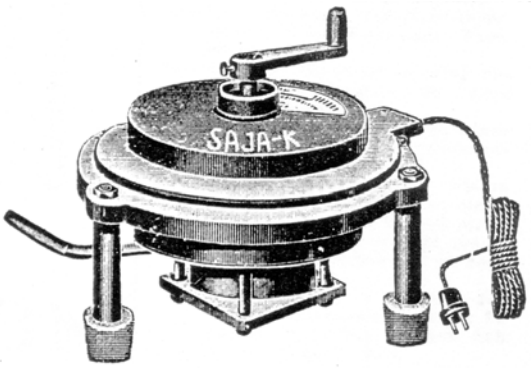
In late October of 1934 the Bay Ridge Aquarium Society (Brooklyn) held an exhibition of aquarium fishes where, as a special feature, there was a spectacular assemblage of guppies. The society offered a special gold medal award for, in the opinion of the judges, the finest male guppy exhibited in the show, prompting the foremost guppy specialists of the day to enter the competition. Some of the guppies shown sold for as much as $5.00 a pair, a fancy price to pay in the middle of the depression!

The award went to Charles E. Visel of Brooklyn, one of the oldest of the "old timers" in the hobby in America at the time and a gentleman of considerable stature among aquarists. After many years of breeding fancy goldfish and accumulating many awards and prizes for them, he turned his talents to the breeding of guppies.

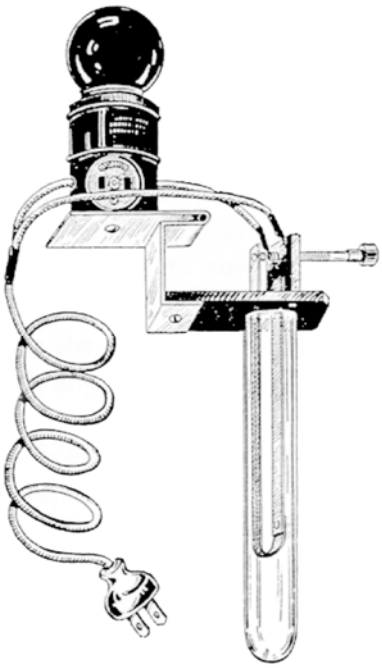
Visel's gold medal winner was a half-black veil tail almost two inches long. The length of its tail fully equaled the length of its body. Furthermore its tail was coal black, the color extending into the body halfway towards the head. In addition, the dorsal was extremely long and also black. In short, the fish was very close to what present-day fanciers know as the "half black veiltail" guppy. The tail, however, did not have the height or shape of the broadtail guppy of today and should not be confused with it, as some fanciers have done in the past.

Another guppy fancier of note was Henry Kissel, Jr., of Cliffside, New Jersey. Kissel was an important fig-

Figure 27-2. Equipment of the Thirties

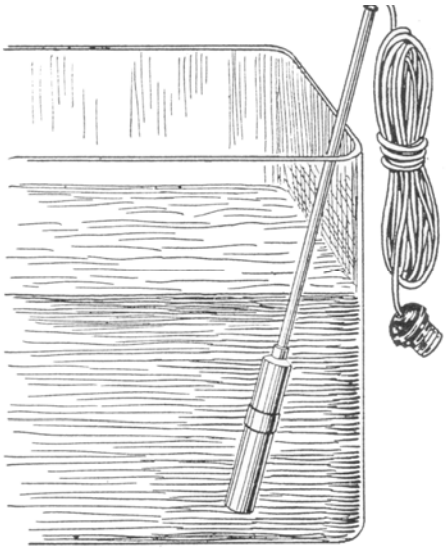


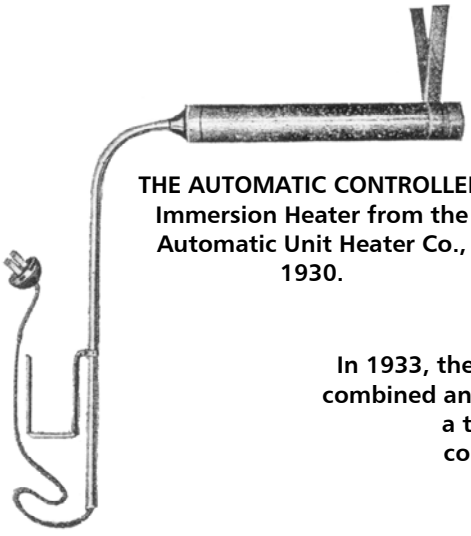
THIS NEW MODEL OF THE SA-JA PUMP was announced in 1934. Despite the handle on the top that was used to get it started (it worked like a centrifugal pump) it did run on electricity. DC or AC models could be purchased for $14.00



The "CASCO" Thermostat. This device controlled from one to six heaters. It cost $4.50 in 1932.

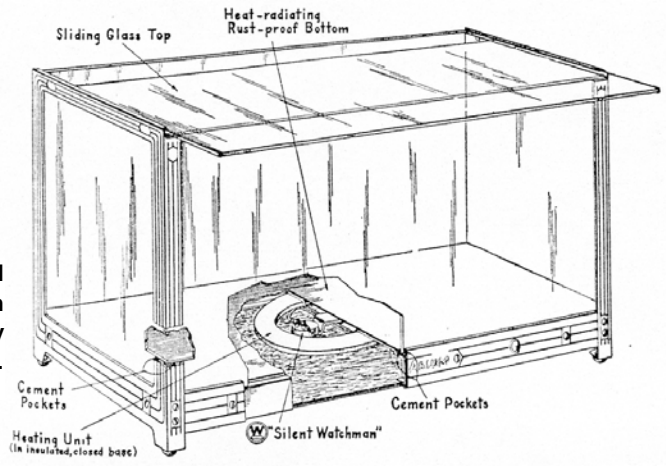
The CHIL-BRAKER. The small size of this heater sold for $2.50 in 1930. It was made out of aluminum and came in sizes varying from 25 to 75 watts.





THE AUTOMATIC CONTROLLED Immersion Heater from the Automatic Unit Heater Co., 1930.

In 1933, the TROPIC-ARIUM combined an aquarium with a thermostatically controlled heater.



ure in the hobby in the 1930's and developed one of the three commonly recognized guppy strains of the time, i.e., the "lacetail," also known as the "peacock tail" since its outstanding characteristic was a lace-like pattern on the tail.

That the tropical fish hobby survived the early years of the Great Depression is evidenced by the following article that appeared in the December 22, 1935 issue of the NEW YORK TIMES:

"FISH HOBBY IS GAINING
Fancy Aquaria and New Species of Tropicals Lure the Collector

"Keeping an aquarium is a hobby that has grown rapidly during the past four or five years, and this year the Christmas scene in many homes will be enlivened by the appearance of gorgeously colored tropical fish swimming in aquaria of the latest modernistic design.

"In a period of depression when most businesses have, like the Red Queen, had to run as fast as they could to keep in the same place, this hobby has raised a modest little trade in tropical fish into a flourishing million-dollar industry. While it is not essentially a holiday business (it flourishes most in the later Winter and in the Spring), dealers report this year a gratifying volume of holiday buying.

"One house - attributing the trend to the warlike spirit that is rampant in Europe - reported an unusual demand for Siamese fighting fish - those gaudily hued little demons which are so ferocious that they must be kept in solitary state in private containers.

"Popular Varieties.

"Another dealer said he was having a rush on varieties, such as the Mexican swordfish and the guppy, which multiply rapidly. 'There seems to be a growing interest, especially where there are children, in fish-breeding,' he said.

"Nearly all the stores are showing handsome new designs in aquaria. In the old days fanciers of goldfish were content with a simple round bowl. Today the trend is toward larger, more ornate containers. Some are bound and trimmed in chromium, brass or copper, and some come equipped with indirect-lighting systems so that the fish may be observed at night as well as by daylight. For the fighting fish there are tall, cylindrical containers and others designed more or less on the lines of a lamp.

"Interest in tropical fish varies all the way from the casual owner, who keeps one or two varieties, to the veritable fanatic, who haunts the shops in quest of new species to add to an already apparently endless variety.

"Hundreds of thousands of diminutive inhabitants of streams and rivers in far parts of the world are shipped into the port of New York each month by boat and even by plane. As fast as they arrive they are snapped up by collectors all over the country. Orders have to be placed two years in advance for some of the rarer varieties. Fish shows are becoming an institution, aquarium societies meet regularly in many cities and even the five-and-tens dispense guppies, angel fish and other tropicals.

"Aquaria as Decorations.

"The reason is fairly obvious. A tropical fish aquarium with the sunlight playing through the water, touching up the green of plants and bringing out the brilliant hues and delicate lines of its small hostages, is a colorful addition to the home. As pets, fish require little attention or space. They do not snarl at visitors, nor must they be walked around the block at night. Their life goes on interestingly in their glass tank. They are extremely amenable to selective breeding and hybridization.

"While the hobby only recently has acquired widespread popularity here, in Europe interest in tropical fish has been growing ever since a pair of paradise fish, sent home in 1869 by a French military attaché in Indo-China, caught the fancy of the Paris of Empress Eugenie.

"What launched it in America nobody quite knows. In the metropolitan area alone there are sixteen aquarium societies and each organization has from 30 to 200 members. Their meetings are usually lively affairs - if somewhat incomprehensible to an outsider. Moot questions of food, temperature and breeding are argued heatedly.



Figure 27-3. TOP: FERDINAND COCHU (1910-1994), The Founder of Paramount Aquarium. BOTTOM: FRANKLIN BARRETT, A CLOSE FRIEND OF WILLIAM T. INNES.

"Selective Breeding.

"Most fans breed for color and fin development. One man has been concentrating for almost eighteen years on guppy standardization. Many of the brilliant color schemes and lace-like fins are entirely the result of selective breeding and cross-breeding. They are rarely seen in nature and might disappear if the fish were left to themselves.

"Among collectors today there is a big demand for blue scalares, a largish 'two dimensional' fish in striking pastel shades with golden brown and blue predominating. A pair costs $40 or $50.

"Siamese fighting fish brought $30 a pair when they were first introduced seven or eight years ago. Now specimens can be had for as little as $1. Mollies were $15 a pair at one time. Now every dealer has dozens for $1 and $1.50.

"But the best example of tropical fish economics is supplied by the angel fish. Recently one dealer advertised them for 5 cents each and another immediately cut his price to $35 a thousand. Three years ago a fancier couldn't consider buying them unless he had at least $30 to spend for a pair."

Unfortunately, the recession of 1936-1937 caught up with the hobby and public interest in the home aquarium began to wane and was partially transferred to dogs of the toy variety. Chihuahuas, for example, sold at extremely high prices. It would not be unfair to say that the hobby went to the dogs! In 1937 one famous aquarist, Billy Niebuhr, converted his aquaria to mouse cages and bred mice instead of fish. Henry Kissel, another of the old timers in the hobby, also converted to mice completely, turning his fish conservatory into a mouse house. Such were the fads in pets during the latter portion of the 1930's. The following appeared in THE CHRISTIAN SCIENCE MONITOR, November 30, 1937, titled: "Aquarium Hobby Wanes as Prices of Fish Decline":

"TORONTO

"It is easier to find fancy fish today than fish fanciers. As a result, the tropical fish aquarium as a hobby is on the decline in the eastern part of North America, but interest in the hobby is increasing in Great Britain, Australia, Germany and California.

"This was explained by William T. Innes, Philadelphia, judge of the tropical fish section at the Royal Winter Fair here and an authority as a tropical fish fancier, in an address to members of the Toronto Aquarium Society. In his opinion the turn will come too for Canada and the eastern states.

"Guppies, swordtails, platys, moons and other types of miniature tropical fish are now being bred by only about half the number of fanciers as was the case a few years ago, he continued, giving as reasons over production and lack of a sufficient market.

"It is possible to breed fish faster than to develop an interest in the hobby, and this resulted in a drop in prices, which in turn destroyed the

interest of would-be fanciers, as there is not the same thrill in owning a fish worth 20 cents as when it is sold for $2."

As Ida M. Mellen observed, men largely controlled the fashion in pets, and the popular ones were those the men liked best. For example, during the 1930's about 80% of the aquariums in the country were owned by men and many were often heard remarking that they would prefer "something big enough to see." Consequently, larger and larger tropicals were introduced until some specimens eight inches long, usually cichlids, were commonly found in the home aquarium.

The recession of 1936-37 saw the closing of many of the fish departments in pet shops and of the pet stores themselves. Fish that sold formerly for $1.00 a pair now could be purchased for 10 cents each and, as I mentioned previously, price wars broke out among the fish suppliers. All this was a prelude to World War II.

The effect of the War on the American hobby was apparent even before December 7, 1941. Towards the end of 1940 Dr. Albert W. Herre, who had been in Malaysia working for Stanford University and the U.S. Bureau of Fisheries, wrote to the San Francisco Aquarium Society:

"Dear Friends: In spite of the turmoil and terrible war going on, may this be a happy Christmas for you and may the New Year bring peace to all the world. It is 8 PM, raining hard, and as black as a tropical night can be. I have just finished my "machan," Malay for food or "eats" of any sort. Have disposed of Heinz canned chicken soup (put up in England), Libby's pork and beans (put up in Canada), with liberal allowances of plain boiled rice, some green vegetables a good deal like cucumbers, boiled and served in a fluid and VERY hot sauce, topped off with rice and Alpine milk from England, sweetened with preserved peach from Tasmania. I shall now have the pleasure of a little chat with you, my dear friends.

"Please extend my greetings to the members of the Aquarium Society. I know you all and all the Society "fans" would have enjoyed a trip I took last week. Left Singapore at 7 am in an old touring car, a Fiat of the vintage of 1925. Went with a Chinese dealer in aquarium fish. We went about 50 or 55 miles, near Kota Tinggi, Johore, where the dealer's men and I worked a brook running through a rubber estate. He got about 400 specimens of *Acanthophthalmus kuhlii* - mixed in were a few specimens of muraeniformis, a very handsome species only known from Jahore. Then we drove back about 35 miles and crossed over to the west side of the peninsula, and north again to Kulai. A little beyond there we entered a large pineapple plantation and worked a jungle swamp. Here hundreds of *Rasbora maculata*, a very tiny species, were secured and also a tank of *Rasbora heteromorpha*.

"A number of specimens of *Sphaerichthys osphromenoides* were taken, but they were very scarce, much to my disappointment. The dealer distributes them under the name of 'Air ship fish.' In his place of business he has many rare fish, such as *Parosphronemus deissneri*, discovered in 1855 (?) in Banka and not seen again until I collected it in the state of Malacca in 1934. He finds it abundantly in northern Jahore. Malaya is certainly a region abounding in rare and lovely fishes made for the delight of aquarists. They belong mainly to the Cyprinidae and Anabantidae, but there are some very odd and



Figure 27-4. PREPARING NEON TETRAS FOR SHIPPING. The German shipping can was the main container until after World War II.

attractive loaches and catfishes, as well as some very handsome gobies of the Brachygobius group. Here at Tapah I have obtained a very unusual loach, and this morning got a quantity of a *Puntius* (*Barbus*) described by Duncker in 1904 and rarely seen since, which would be a handsome addition to your tanks.

"This is a quiet and peaceful country, far removed from the strife and ravages of war. Every one is confident, as I am, that Hitlerism will be overthrown and the dictators suppressed.

"As I am on the move, it will scarcely be worth while to try writing me, especially since mail is greatly delayed and subject to indefinite holdup by various censor offices."

The war, when it did finally involve the United States directly, took its toll on the hobby. Fish farms were short of labor as their employees went either into the Armed Services or war plants. Priority of war shipments delayed fish shipments from Florida fish farms to such an extent that several went bankrupt. The importing business was, of course, terminated. Several importers were actually classified as German aliens and so had their freedom severely restricted. All metals used in aquarium pumps were controlled by the Government and were no longer available to aquarists. Much the same held for other items of aquarium equipment as well.

The aquarium magazine publishing situation also was bad. With little to sell, advertising fell off drastically. AQUATIC LIFE went first to a quarterly, and later both it and THE AQUARIUM JOURNAL suspended publication until the duration. The last issue of AQUATIC LIFE was January 1942; it resumed publication in 1951 under the title, AQUATIC LIFE & THE AQUATIC WORLD. Only THE AQUARIUM, through the efforts of William T. Innes, struggled on through these years. The hobby had to make do with what it had and with what it could improvise. As with everything else, the turning point came only with the end of the war.

The following article that appeared in the February 1935 issue of AQUATIC LIFE - when the hobby was doing well during the Depression - is a look into the future as the author saw it at the time, and readers will find it interesting to compare his forecast with what actually occurred after the end of World War II.

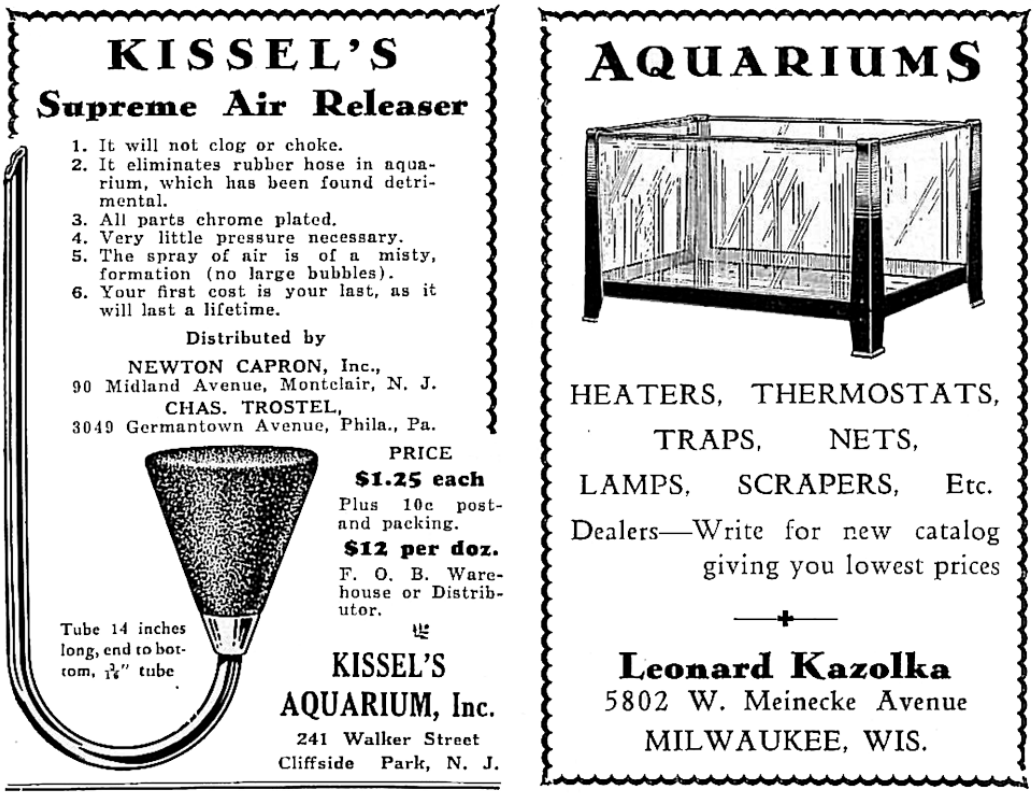


Figure 27-5. ADS FROM THE 1930'S

"The Aquarium of the Future by Mark Henderson

"Sometimes we wonder what the outcome of aquariums is going to be. When our choice of fishes is so great we have but little idea of what we would choose to stock it. Frankly, it has given me no little concern. In a few leisure moments the following thoughts came to me - disconnected I'll admit and yet each potent.

"Around me was a battery of aquariums. One differed from the other only in change of its dimensions. Each was built according to the 1, 1 and 2 for width, height and length, the makers seemingly dared not violate a standard practice. Even economy in materials, something which may have been done to materially decrease construction costs, was not in evidence and in these days, whenever economy can be affected and is flagrantly thrown to the winds, there must be bats in someone's belfry.

"Several years ago a restaurateur in my city had a few odd shaped aquariums built into .his walls at points which permitted easy setting. There was one, as I remember, just inside his front lobby. Proportionately it was wrong. It was about 20 inches long, 30 inches high and only about8 inches wide. After an aquarium society meeting, we, of the hungry type, were prone to drop in for a sandwich and a glass of ... (soda water). On every occasion when we went, we all stood at this aquarium, commented on how beautifully the Cabomba grew in that electrically lighted arrangement, commented on the appeal that aquarium made to the eye and then sat 'at tables to discuss what was wrong with the aquarium. We never finished condemning it; neither did we ever refuse to marvel at it. And not one of us has nerve enough to attempt an aquarium similarly proportioned for our own use. We were bound by convention, unwilling to try what possibilities we thought the aquarium had, we, as you can understand talked against it and yet every one of us, unbound by rule, would have done the same thing - duplicated it.

"Nowadays, we are a little more free in our opinions and I am inclined to believe the aquarium of the future, especially the one for the home, will be built in a proportion to fit into a recess which may already exist. Its length and height may be out of all proportions in the older aquarist's eyes but it is going to be pleasing to those who own it. The number of gadgets available today precludes trouble from which the old aquarist needed to suffer. There was sound reasoning behind his proportion for an aquarium; he was not blessed with present day accessories.

"A window was chosen for light. Electric light was not considered worthwhile and still fewer of us were blessed with it for our own household purposes; then too the rate charged for current was high in relation to that we pay today. Now we have been shown that results equaling, in some instances surpassing those with daylight, are obtained by the use of electric current.

"The aquarium of the future will be more beautifully planted than is our present day one. Aquarium planting will be studied from the artistic standpoint and be made as much an issue as is flower arrangement in Japan, limited however to those with an aquarium. There will certainly rise a school which will teach us how



Figure 27-6. A FANTASTIC CAST IRON AQUARIUM IN THE SHAPE OF A HOUSE. It was made by the Hans Jensen Mfg. Co. (Jewel Aquariums) in 1930 (see page 315) and is 20.5" long by 11" deep by 12" tall.

best to get accent, highlights if that is a better term and sufficient contrast as well into the aquarium. No one willingly condemns the *Vallisneria* and *Sagittaria* plantings but all will admit they are conventional and this must be got-ten away from.

"With our present knowledge of aeration, coupled with the inexpensiveness of suit-able equipment, we can safely use plants of the more decorative type in our set-ups.

"And it is safe to say we will find more use for nature's plans in our plantings. The aquarium with a staggering of plants will not compare with the one where plants are colonized which, after all is said and done, is by far the better way to set them.

"After only minor experimentation, from which conclusive opinions cannot be drawn, I incline to believe the aquarium of the future will have its water colored by harmless dyes which, when used with the proper setting materially enhance the picture made. By wisely selecting the color, the prominence of one fish can be increased while others are subordinated, both in the same aquarium.

"It must be obvious that such an arrangement is feasible. Visit any show, of any character and we will find some object shown to advantage at the expense of something else near it. A garden show will clearly demonstrate this.

"And it must also be clear that when all fishes in the same aquarium are vying for attention, ones attention is divided. An aquarium entered in a "beautiful contest" at one of the northern shows several years ago would, no doubt have been an easy winner had it not been for the presence of so many competitive fishes. Nothing stood apart as individual and had not this been true, first place would have undoubtedly been won by it.

"The aquarium of the future then is one which will differ in setting, location and lighting from that which we now encourage.

"One of the most interesting aquariums of the entirely different from conventional type was recently seen in the den of a friend who has made good use of them. Two gallon drum globes were used; yes, I also know they are wrong? But these drums were set in recesses specially provided for in the building of his deep sea room; nothing but his basement converted into ship's quarters and used as a den. The drums were all lighted from the top by concealed lights and, to give realistic effect, rims of brass, screw plates and all, in perfect facsimile; of porthole covers, completely changed the appearance of the drums so that they all resembled the ship. The effect of the fishes, swimming round outside the boat, almost convinced one that he was cruising the tropics."

The aquarium historian of the future must, however, certainly recognize the following post World War II milestones in the hobby: the resurgence of interest in the marine side of the hobby and the specialized equipment developed in this area; the importation of many new species of aquarium fishes; the introduction of silicone aquarium sealants and the revolution they brought about in aquarium construction, new types of aquarium lighting, the invention of the nylon spawning mop for killifishes, improvements in and development of many new kinds of filtration; the development of specialty aquarium groups for the guppy, killifishes, cichlids, bettas, catfishes, and others; a resurgence in the interest in native fishes; the plethora of new book and magazines about the hobby, and perhaps the most significant of all, the influence of the Internet on the hobby.

The story ends here but not without a bit of sadness for it seems as if I am saying farewell to old friends. How I regret that I could not have known all the aquarium greats personally - William Damon Emerson, Hugo Mullert, Eugene Smith, Richard Dorn - or to have participated in the laying of the cornerstones of this great hobby of ours. But, rather than end on a sad note, I would like to share with you a brief but

intimate look at one of the great aquarists of the period - William Thornton Innes. During the early 1920's at the height of Prohibition in the United States, Innes and his friend Franklin Barrett, the pioneering goldfish fancier and aquarist of Philadelphia, traveled to Canada to meet another pioneering aquarist, E. Calver Bayliss. In a letter dated Christmas Day, 1956, Bill Innes had this to say:

> "Frank Barrett is living but in a nursing home. I think he is about 87. I am nearly 83. I will never forget coming back from Toronto with him. The conductor had passed and Frank thought the coast clear, so he pulled out a bottle of whisky and took a swig. Right back of the conductor was the customs officer. He arrested Barrett, took him off the train at Niagara where he was fined $20 and the rest of the whisky confiscated. Besides, he had to stay another day at Niagara in a hotel!! I had a quart under the seat which he didn't find!"

To all these men, warm and human, with their strengths and frailties, we present-day aquarists owe much.

"Knowing that
Nature
never did betray
The Heart
that loved her..."



ADDENDUM: THE HISTORIAN AND THE FORKS IN THE ROAD

There are many forks in the research road and not all the paths lead to the desired destination. Although they are strewn with tangents, dead ends, and irrelevancies, they sometimes reward the weary traveler with a welcome break in his journey. Such was the case with my history when I came across, quite serendipitously, the following materials involving Robert Warington, Philip Gosse, James A. Cutting, P.T. Barnum, Mark Twain, and others. This material is presented here for the entertainment of those readers who are not averse to taking a respite now and then from the fatigue caused by following a long story from start to finish.

A1. THE WARINGTON-GOSSE AQUARIUM CONTROVERSY

As I pointed out in Chapter 2, Robert Warington is credited as being the first to enunciate the principles of the aquarium; in Chapter 3 we learned that the earliest aquariums were known as "Warrington (sic) cases." Warington published the details on the development and management of the fresh- and sea-water aquarium in a series of nine papers that appeared between 1851 and 1867 in various journals, including the JOURNAL OF THE CHEMICAL SOCIETY, the ANNALS AND MAGAZINE OF NATURAL HISTORY, the PROCEEDINGS OF THE ROYAL INSTITUTION and the PROCEEDINGS OF THE ROYAL SOCIETY. Although Nathaniel Ward had set up a fresh water aquarium in 1841 and George Johnston established one for salt water in 1842, these were empirical developments whereas Warington's research was technical and scholarly.

However, in the October 1852 issue of the ANNALS AND MAGAZINE OF NATURAL HISTORY, Philip Gosse's independent paper on the principle of the salt water aquarium appeared simultaneously with Warington's. Coincidentally, both authors had dated their contributions 10 September 1852. In a magnanimous gesture reminiscent of Alfred Wallace and Charles Darwin, Gosse immediately conceded priority of publication to Warington. As might be expected, this placed the two men on very cordial terms. In fact, in a letter to Warington shortly afterwards, Gosse stated that no rivalry existed and that he "rejoiced" to see that his success had exceed his own, referring to the fact that Warington had kept the integrity of a marine tank for six months, longer than Gosse had at that time. Gosse also offered to help provide Warington with specimens of algae, zoöphytes and other marine organisms, asking only that Warington provide him with jars so that Gosse could ship them to him via rail. Gosse ended his letter wishing him further success and congratulations on what he had already achieved.

Warington publicly acknowledged this assistance: "…offered in the kindest manner possible to supply me with materials, and from that period he has always most heartily responded to my wants." One would think, therefore, that this would be the beginning of a lifelong, warm friendship but, alas, it was not to be.

Warington, a chemist, had an important job - Chemical Operator of the Society of Apothecaries, London. The primary purpose of the Society was to exercise control over the practice of what we should nowadays recognize as the greater part of the twin professions of medicine and pharmacy, and as such was responsible for the standardization and prevention of adulteration of drugs. It was a full time occupation and Warington's interest in the aquarium perforce had to be an avocation. Gosse, on the other hand, was a professional nature writer and his books were extremely popular with both scientists and the public alike. As a result, it was Gosse to whom people turned as the "expert" of the day. It was Gosse who was asked in 1852 to supply the Zoological Gardens with an aquarium, and it was Gosse's work that Kinglsey turned to for the details of keeping an aquarium when he wrote *Glaucus; or The Wonders of the Shore*.

Exacerbating the matter was a letter written to Warington in 1853 by William Thompson, a naturalist and

regular contributor to the ANNALS AND MAGAZINE OF NATURAL HISTORY and also, according to Gosse, an important supplier of specimens. In his letter he advised Warington that: "I need not apologise for sending this as I consider you the first projector and originator of the Marine Vivarium. I hesitate very much as to the propriety of according to Mr. Gosse any honour for the originality, of his paper in the ANNALS for October 1852."

Matters came to a head in 1854 when Gosse published a paper in the ANNALS AND MAGAZINE OF NATURAL HISTORY on the preparation of artificial salt water (the formula is presented in Chapter 6 of this history). Warington responded with a vengeance, describing Gosse's formula, which was based on an analysis of Brighton salt water published by the mineral water manufacturer Schweitzer, as "erroneous." Furthermore, he also claimed that Gosse had consulted him about the feasibility of artificial salt water in January 1854.

Gosse, who was a zoologist, not a chemist, in actuality had made three errors: (1) he had miscalculated the proportions of the salts necessary; (2) he had assumed incorrectly that Schweitzer had referred to crystalline magnesium sulphate (Epsom salts) when, as was common practice among the chemists of the day, he had referred to the anhydrous form; and (3) he had used more water than was proper by failing to allow for the saline volume in his standard volume. However, the differences between Warington and Gosse's formulae for artificial salt water were not all that great. Warington used slightly greater amounts of sodium, potassium and magnesium chlorides and magnesium sulphate, and also included the magnesium bromide and calcium carbonate and sulphate that Gosse had considered too insignificant to include. Because the major factor in artificial salts for the coldwater marine aquarium is total salinity and hence specific gravity, it is scarcely surprising that Gosse's much simpler recipe worked.

Gosse responded heatedly, stating that he was writing for "practical people, to whom minute accuracy was impossible." Furthermore, he wrote, his formula worked. As to Warington's claim concerning the consultation, he retorted angrily: "If Mr. Warington supposes that I obtained from him one atom of information previously unknown to me, on the subject of making sea-water from its constituent salts, he is most thoroughly mistaken."

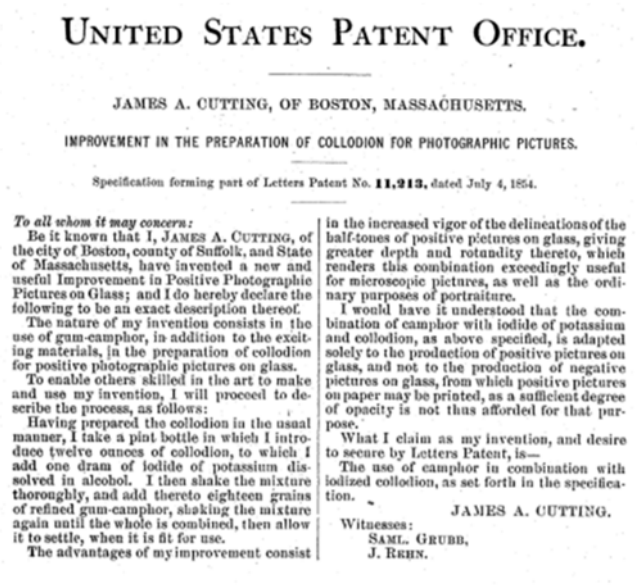
And there the first aquarium controversy of record ended. In the best possible of all worlds these two men would have been close friends throughout their lives. Their natural talents complemented each other and both were deeply religious, considering the aquarium to be a microcosm of the whole world created by God. It was a conflict that never should have happened.

A2. THE MADNESS OF JAMES AMBROSE CUTTING

James Ambrose Cutting first appears in Boston, Massachusetts in 1853, as a "daguerreian" operating at 41 Tremont Street. In 1854 his gallery was located at 142 Hanover Street, and in 1855 he was listed in the directory as "ambrotype pictures" at 49 Tremont Street, in partnership with D.W. Bowdoin as Cut-



Figure A1-1. Perhaps Warington should have been satisfied that the aquarium at that time was popularly known as the "Warrington case," not the Gosse case!"



UNITED STATES PATENT OFFICE.

JAMES A. CUTTING, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN THE PREPARATION OF COLLODION FOR PHOTOGRAPHIC PICTURES.

Specification forming part of Letters Patent No. **11,213**, dated July 4, 1854.

To all whom it may concern:

Be it known that I, JAMES A. CUTTING, of the city of Boston, county of Suffolk, and State of Massachusetts, have invented a new and useful Improvement in Positive Photographic Pictures on Glass; and I do hereby declare the following to be an exact description thereof.

The nature of my invention consists in the use of gum-camphor, in addition to the exciting materials, in the preparation of collodion for positive photographic pictures on glass.

To enable others skilled in the art to make and use my invention, I will proceed to describe the process, as follows:

Having prepared the collodion in the usual manner, I take a pint bottle in which I introduce twelve ounces of collodion, to which I add one dram of iodide of potassium dissolved in alcohol. I then shake the mixture thoroughly, and add thereto eighteen grains of refined gum-camphor, shaking the mixture again until the whole is combined, then allow it to settle, when it is fit for use.

The advantages of my improvement consist in the increased vigor of the delineations of the half-tones of positive pictures on glass, giving greater depth and rotundity thereto, which renders this combination exceedingly useful for microscopic pictures, as well as the ordinary purposes of portraiture.

I would have it understood that the combination of camphor with iodide of potassium and collodion, as above specified, is adapted solely to the production of positive pictures on glass, and not to the production of negative pictures on glass, from which positive pictures on paper may be printed, as a sufficient degree of opacity is not thus afforded for that purpose.

What I claim as my invention, and desire to secure by Letters Patent, is—

The use of camphor in combination with iodized collodion, as set forth in the specification.

JAMES A. CUTTING.

Witnesses:
SAML. GRUBB,
J. REHN.

Figure A2-1. IN 1854, JAMES AMBROSE CUTTING OF BOSTON, MASSACHUSETTS WAS AWARDED THREE PATENTS FOR CREATING COLLODION POSITIVE PHOTOGRAPHS ON GLASS. This process became known as the "imperishable picture" or Ambrotype. This is the first of his three patents.

ting and Bowdoin. In 1855 or 1856, Cutting traveled to Iowa where he opened a sawmill. Following the sawmill purchase in Iowa, Cutting returned to Boston. In 1856 Cutting was listed as James A. Cutting & Co., "daguerreians," at 123 Washington Street, Boston. He also seems to have continued the listing as Cutting and Bowdoin at 49 Tremont Street. From 1857 to 1859 he was again listed as "ambrotype pictures" at 10 Tremont Row, in partnership with A.A. Turner as Cutting and Turner. The 1859 listing was the last for Cutting in the Boston directories as a photographer.

In addition to his significance in the early history of the aquarium hobby in America, James Ambrose Cutting was an important figure in the early history of public aquaria. As explained in Chapter 4, in partnership with Henry D. Butler he opened a public aquarium in Boston in 1859 called "The Aquarial Gardens," re-named "The Boston Aquarial and Zoological Gardens" after a move in 1860. In 1862, P.T. Barnum bought the Gardens but Cutting remained to manage several of the attractions.

However, disillusioned with Barnum's typical exhibition shenanigans, Cutting, with a new partner, once again went into business for himself, opening the "New Boston Aquarial and Zoological Gardens" in 1862. Before the end of the year, however, the venture was a failure and Cutting was committed to the Worcester Insane Asylum in Worcester, Massachusetts. A detailed account of Cutting's public aquarium activities in the Boston area from 1859 to 1862 can be found in Jerry Ryan's excellent book, "The Forgotten Aquariums of Boston."

Ryan ends his account of Cutting with the following speculation: "We do not know whether the psychological collapse of Cutting was the cause or the effect of this failed venture." There is some evidence, however, to suggest that, although the failure of the New Boston Aquarial and Zoological Gardens may have been the proverbial straw that broke the camel's back, it was not the major cause of Cutting's collapse.

As mentioned by Ryan, Cutting was an inventor, starting with a patent for an improved beehive in 1844 and a device for aerating aquaria in 1861. His major and most profitable patents, however, were in photography. In 1880 an English sculptor, Frederick Scott Archer, was the first to publish a photographic invention that used collodion, generally known as the "wet plate process." In 1854 Cutting, along with his partner, Isaac Rehn of Philadelphia, obtained two patents that would give them, in effect, a monopoly on the entire practice of collodion photography in the United States.

The first patent involved a particular way of making ambrotype photographs. An ambrotype is a collodion coated glass plate that, when coated with black on the other side, appears as a positive. Cutting's particular mode of packaging called for using balsam of fir, used in cementing lenses together, to seal a second piece of glass of the same size to the rear of the image plate, thus protecting the image thereafter against infiltration of air or moisture, or against damage in handling.

The term "Ambrotype," by the way, had nothing to do with Cutting's middle name. The name was coined a year after Cutting received his patent by the historian, Marcus A. Root, who derived the name from a Greek word meaning "imperishable," referring to the fact that the image was sealed between two glass plates and therefore durable. Although the name "Ambrose"

is also derived from the same Greek root, it was a popular name at the time, e.g., General Ambrose Burnside, of Civil War fame.

The more important patent, however, involved the use of potassium bromide in combination with collodion to prepare collodion negatives, and this was the major cause of grief for Cutting. In those days the U.S. Patent Office awarded patents without a great deal of care to ensure that the invention was not already in use or that the applicant was its originator. In fact, there is evidence that the formula spelled out in Cutting's bromide patent was derived from the experiments of two other men, both of whom had passed on their findings to him. Samuel D. Humphrey, the publisher of the photographic magazine known as HUMPHREY'S JOURNAL," took Cutting to task by name: "…cast aside our productions as the result of their studies, which have been pirated from themselves and appropriated solely to purposes of satisfying a morbid propensity for gain."

Cutting was also criticized for a patent he obtained in 1858 dealing with lithography. Henry Garbanati, writing in the AMERICAN JOURNAL OF PHOTOGRAPHY that year wrote: "The practice of the Commissioners granting to almost all who apply, patents for the products of other men's brains, because of scant trifling, and perhaps, valueless variation, is becoming of so serious a matter, that it almost necessitates a "Vigilance Committee" to examine into the various claims."

In 1860 Cutting instituted lawsuits against those infringing upon his patents. The first of these was brought against Abraham Bogardus for violating the Ambrotype patent but was thrown out of court on the grounds that the name "Ambrotype" was not included in the Cutting patent. Actually, many others were effectively sidestepping this patent simply by the expedient of using an adhesive other than balsam of fir.

Bogardus was also sued for violating the bromide patent and here Cutting succeeded in obtaining an injunction, settling the suit out of court. However, when the same bromide suit was brought against C.D. Fredericks, it was never resolved in court. It also was very expensive for Cutting. During this time, therefore, Cutting was a pariah among photographers, was vilified in the photographic publications of the day, and his income seriously diminished by the erosion of his patent protection.

On April 7, 1868, the nation's photographers gathered for the first time in a National Photographic Convention, the purpose of the gathering being to map a campaign of resistance to the imminent possible extension by the government of the bromide patent which would, in effect, allow Cutting and his agents to license virtually all photographic practice. Many of photography's biggest names were on hand for the convention including even Mathew Brady.

On the eve of the convention, HUMPHREY'S JOURNAL ran this brief notice, which would make it appear that the delegates were meeting unnecessarily:

> "We are informed by Mr. Tomlinson, the party owning the patent for New York and Brooklyn, that no measures whatever are being taken to



Figure A2-2. AMBROTYPE, CIRCA 1861. Cutting held two major patents involving Ambrotypes. Simply changing the cement used to bind the pieces together easily circumvented the first. The second, utilizing potassium bromide in combination with collodion to prepare collodion negatives, was more difficult to avoid and was the main cause of the Ambrotype controversy.

> renew it; that the thing is 'dead' and will never again rear its head to trouble photographers. But it is best to be on the alert…Cutting is dead; he died in a madhouse and left no heirs. Was the ill success of his Patent the cause of his insanity? We are told that it was…"

Thus, according to William A. Tomlinson, Cutting's New York agent, it was the loss of his legal battles and subsequently his source of funds that was the major contributing factor to his mental deterioration, not the failure of the "New Boston Aquarial and Zoological Gardens."

One glimpse into the darker side of Cutting's nature is afforded when, in 1868 in sworn testimony regarding the bromide patent, John A. Whipple, one of the foremost American photographers of the nineteenth century and who, speaking of his business dealings with Cutting, made this statement: "I had no confidence in him as a business man or in his strict honesty; I never had any settlement with him, or could bring him to a settlement, of our affairs, and finally dissolved partnership with him."

As a result of Whipple's testimony and that of others, the U.S. Patent Office examiner who in 1854 had recommended award of the so-called bromide patent to Cutting, now stated fourteen years later that the patent was wrongfully granted, and that its extension to the administrator of Cutting's estate should be denied. His recommendation was officially adopted a month later. As Ryan notes, "A tragic ending for a gifted scientist and naturalist."

A3. MARK TWAIN'S AQUARIUM

If Mark Twain (née Samuel L. Clemens, was born in 1835 and died in 1910) had an aquarium and his life spanned the time covered by this history of the aquarium hobby, why didn't I mention this renowned and celebrated personage in this history? The answer is that everything is not as it seems.

In some way or another, we are all collectors. Some people collect the strangest things: Bowling pins, metal bottle caps, automobile hubcaps, old electronic appliances, and so on. Most collectors, however, collect things to which they in some way have a personal association. I have a friend who does a lot of sewing and, in order to keep her young daughter occupied while she was so engaged, at one time bought her a child's sewing machine. One thing led to another, and now she has a collection of children's sewing machines, most of which are over 75 years old. In Clemens's case, at the ripe old age of seventy-two, he began collecting surrogate granddaughters, characterizing his collection as "gems of the first water." Within a year his collection numbered a dozen young women whose ages ran from ten to sixteen.

Why surrogate granddaughters? After his wife's death in 1904, Clemens experienced a long period of unrest and isolation. His daughters, Clara and Jean, were busy with their studies and the day-today minutiae of their daily lives, and although Clemens was actively engaged in dinner parties, banquets, and the inevitable public speaking, he was rather lonely after the festivities were over at the end of the day. He was, in other words, ripe for grandfatherhood but he had no grandchildren.

In 1908, while Clemens was vacationing in Bermuda, he visited a small islet on the island and chanced upon



Figure A3-2. MARK TWAIN PLAYING CARDS WITH SEVERAL OF HIS "ANGELFISH."

an aquarium housed in a former gunpowder and cannon storehouse. Elizabeth Wallace describes the event in her *Mark Twain and the Happy Island:*

> "The fish in the aquarium were very wonderful in their coloring and form, but Mr. Clemens didn't seem to think that they were very sociable. And it wasn't pleasant to see the octopus dine off a retiring and harmless crab, nor to see the keeper stuffing live eels down the lazy moray's throat. There were four-eyed fish and squirrelfish and parrotfish, and I don't know how many other kinds of streaked and barred and polka dotted curiosities. But the kind that Mr. Clemens picked out as his favorite was the Angelfish. They were plump, and had fins like wings, and were gorgeous in their coloring and had pretty little pursed-up mouths that suggested maidenly modesty. Their wings suggested spirituality, and their coloring femininity.
>
> "These traits appealed especially to Mr. Clemens, and, not long after, Mr. Clemens's aquarium was established. In this aquarium there were to be none but Angelfish admitted. To be an Angelfish one must be a girl, and one must be young, and one must have won Mr. Clemens's heart. This latter was not hard to do, for he always made the overtures when he first met, or saw, any promising candidate. Margaret was, I think, morally speaking, the first real Angelfish, but Irene was the first one to be so-called."

Others were later made members of the aquarium, and to each was given a pretty enameled pin in the shape of an angelfish, which she was to wear as often as possible. The affection Clemens felt for his "Angelfish" was reciprocated as Wallace recounts:

> "The day before they sailed, Margaret said to me, 'Is there a Mrs. Clemens in New York?' I told her that Mrs. Clemens had gone very far away and would never come back. 'Has Mr. Clemens any little girls?' pursued Margaret. I answered that his girls were now big girls, but that he had lost one whom he now remembered as his little girl, and whom he had loved very tenderly, and that this was the reason he loved other little girls so much. It made him less lonely when he had them about him. Margaret thought for a moment; then, her brown eyes full of tenderness, 'I wish I was Mrs. Clemens, and then I would just care for him and care for him, and love him awfully!' "

The girl that was "lost" was Sara, Clemens's oldest daughter who had died very young. Clemens never talked down to these young girls and always considered their opinions with an unpretentious dignity. Margaret accordingly felt for him the deep affection that children have for an older person who understands them and treats them with respect. This wonderful comprehension that he had of children, and his perfect sympathy for them, was a reflection of the simplicity of his own character. When he was with his "Angelfish," all pretentious wisdom, all sophisticated phrases, all acquired and meaningless conventions were set aside.

Thus is revealed the mystery of Mark Twain's Aquarium. For Clemens, this host of young "Angelfish" who visited and wrote him until he was too ill to reply, all played important parts in the last years of his life, and helped soften the loss of his wife and eldest daughter, his estrangement from daughters Jean and Clara and the decline of his health and literary powers.



A4. DID BARNUM PAINT HIS ANGELFISH?

This story starts not with fish but with, of all things pigeons. One day while Barnum was engaged in his office at the American Museum, a man with marked Teutonic features and accent approached the door and asked if he would like to buy a pair of living "golden pigeons." "Sure," Barnum replied, "I would like a flock of golden pigeons, if I could buy them for their weight in silver; for there are no golden pigeons in existence, unless they are made from the pure metal."



Figure A4-1. THE FEJEE MERMAID. It was no wonder that Barnum's neighbor wouldn't believe that he hadn't painted his angelfish. The Fejee Mermaid, another of Barnum's "humbugs," was a clever fabrication of a creature that had a fish's body and tail with the breasts of an orangutan, and the head of a baboon.

The visitor proceeded to enter Barnum's office and closed the door after him. He then removed the lid from a small basket that he carried in his hand and sure enough, there were snugly ensconced a pair of beautiful, living, ruff-necked pigeons as yellow as saffron and as bright as a gold coin fresh from the mint.

Barnum was somewhat dumbfounded at this sight and quickly asked the man where the birds came from. Rather than answering directly, his German visitor asked Barnum what he himself thought. Barnum caught his meaning right away and quickly answered that he thought it was some sort of trickery, referred to in those days as a "humbug." The German admitted this immediately and confessed that he colored them himself. It turned out that he was a chemist and had worked out a method for coloring birds any hue desired, and yet retaining a natural gloss on the feathers that gave every shade the appearance of reality.

"I can paint a green pigeon or a blue pigeon, a gray pigeon or a black pigeon, a brown pigeon or a pigeon half blue and half green," said the German; "and if you prefer it, I can paint them pink or purple, or give you a little of each color, and make you a rainbow pigeon." The idea of a "rainbow pigeon" did not strike Barnum as particularly desirable but he did buy the pair of golden pigeons for ten dollars and marked them, "Golden Pigeons from California."

I mentioned in Chapter 4 that Emile Guillaudeu was one of the many men who had worked in obscurity for Barnum for years. Guillaudeu was the naturalist and taxidermist of the American Museum and had been associated with that establishment since the year it was founded, in 1810. A Frenchman, Guillaudeu read everything about natural history that was ever published in his own or in the English language. At the time of this story he was seventy-five years old, but was still mentally alert and took as much interest in natural history as he ever did.

When he saw the so-called "Golden Pigeons from California," he was awestruck. He examined them with great delight for half an hour, admiring their beautiful color and commenting on their close resemblance to the American ruff-neck pigeon. He told Barnum that the golden pigeons could not be from California, however, as Audubon mentioned no such bird in his work on American Ornithology.

Barnum, suppressing a smile of amusement, replied that he had better take the Audubon book home with him that night, and perhaps by studying him attentively he would see occasion to change his mind. The next day Guillaudeu called at Barnum's office and remarked: "Mr. B., those pigeons are a more rare bird than you imagine. They are not mentioned by Linneaus, Cuvier, Goldsmith, or any other writer on Natural History so far as I have been able to discover. I expect they must have come from some unexplored portion of Australia."

Not willing to let the cat out of the bag and seeing the possibility for a good exhibit, he did not let on about the hoax to Guillaudeu or anyone else at the time. He did, however, take Guillaudeu's advice and re-named them, "Golden Pigeons from Australia." It was under that name that the pigeons were exhibited, drawing large crowds. Poor Guillaudeu! It must have been a real tribulation to work for Barnum in those days. To Barnum's credit, however, many of his employees stayed with him for years.

Now to the "fishy" part of this story. Barnum had his agents, including William Damon, scour the Caribbean for tropical marine fish, and all sorts of brilliantly colored species were brought back to the American Museum, The angelfishes, in particular, were extremely popular with visitors. One day, after regarding for a few minutes the "Golden Angel Fish" swimming in one of the aquariums at the American Museum, a neighbor lady who lived next to Barnum in Connecticut abruptly told him, "You can't humbug me, Mr. Barnum; that fish is painted!" The following is Barnum's own account of the exchange:

> "Nonsense!" said I, with a laugh; "the thing is impossible!"
>
> "I don't care, I know it is painted; it is as plain as can be."
>
> "But, my dear Mrs. H., paint would not adhere to a fish while in the water; and if it would, it would kill him. Besides," I added, with an extra serious air, "we never allow humbugging here!"
>
> "Oh, here is just the place to look for such things," she replied with a smile; "and I must say I more than half believe that Angel Fish is painted."

In the afternoon of the same day Barnum met her again, her eyes glistening with excitement, saying:

> "O, Mr. B., I never saw anything so beautiful as those elegant 'Golden Pigeons' from Australia. I want you to secure some of their eggs for me, and let my pigeons hatch them at home. I should prize them beyond all measure."
>
> "Oh, you don't want Golden Australian Pigeons," Barnum replied; they are painted." "No, they are not painted," said she, with a laugh, "but I half think the Angel Fish is."

Barnum tried to convince her that although the tropical angelfishes were unpainted, the pigeons definitely were, and he roared with laughter as he replied, "Now, Mrs. H., I never let a good joke be spoiled, even if it serves to expose my own secrets. I assure you, upon honor, that the Golden Australian Pigeons, as they are labeled, are really painted; and that in their natural state they are nothing more nor less than the common, ruff-necked white American pigeons!"



A5. WAS THE BALANCED AQUARIUM PRINCIPLE RESPONSIBLE FOR THE SUCCESS OF THE VICTORIANS?

As was previously pointed out in my discussion of the Warington-Gosse aquarium controversy, Philip Gosse's independent paper on what has come to be known as the "Balanced Aquarium" principle appeared simultaneously with Warington's in the October 1852 issue of the ANNALS AND MAGAZINE OF NATURAL HISTORY. Some historians have intimated that it was this precept that made possible the successful keeping of aquarium fishes, thus marking the beginning of the aquarium hobby. One of the leading aquarium writers of the day – H. Noel Humphreys – observed in 1857 that, "The successful treatment of aquatic plants and animals, in the confined space of a glass aquarium, depends entirely upon the discovery that there exists in nature a self-adjusting balance between the supply of oxygen created in water, with the quantity consumed by aquatic animals." If the statement were true, it would indeed enable us to date the origins of the aquarium hobby fairly precisely.

Briefly stated, the "Balanced Aquarium" is one in which the products of animal and of plant life more or less completely counterbalance each other. The fish absorb oxygen but emit carbon dioxide. The former is necessary for fish life and the latter, if exceeded, can be fatal. The plants absorb carbon dioxide, thus removing that danger to the fish, and return, under the influence of light, oxygen required by the fish.

It is interesting to note that Warington himself did not rely upon the so-called balanced aquarium principle to maintain his aquaria over time. When the decaying leaves of the *Valisneria* he used started to foul the water in his freshwater experiments, he introduced common pond snails to feed on the decaying vegetable matter. When he expanded his experiments to saltwater aquaria, he used their marine analog, the common sea snail or periwinkle (*Littorina littorea*). Even this, however, was not sufficient, and he had to either add

new water directly or drip the water into his tanks from a height, the latter an early form of artificial aeration. In an article in LIVING AGE (August 14, 1852) titled "The Parlor Aquarium," the author (anonymous) discusses Warington's 1851 article in some detail. However, when he tried using certain freshwater plants in his own aquaria, he ran into some difficulty with the Balanced Aquarium principle:

> "Experiments of our own have led to the conclusion, that some families of aquatic plants are altogether unsuitable for the Parlor Aquarium - such as potamogeton, chara, &c., which very soon communicate a putrescent odor to the water in which they are grown, rendering it highly disagreeable in a sitting-room."

Indeed, in his book, *The Aquarium: an Unveiling of the Wonders of the Deep Sea* (1854), Gosse described how he arranged to have two to three gallons of salt water dripped into his 15-gallon tank each day as "artificial aeration."

What, then, was responsible for the success that the British Victorians enjoyed during this brief, fifteen-year or so period? In addition to the plethora of books and articles that provided instruction and assistance to newcomers, a major factor was the development of a holding system that optimized the gas exchanges misguidedly attributed to the plants – in short, the aquarium itself. The major designs of the day, unlike the typical glass jars used in the past to hold fishes, were shallow relative to their diameter. This is, of course, just what is needed for efficient gas exchange since a shallow tank has a greater air-water interface than a deeper tank of the same volume.

Gosse himself criticized the deeper designs. One of these was the slope-back tank, roughly 2' x 3' with a depth of almost two feet, on which Gosse commented: "Its depth also is too great; a foot of water is as much as is needful for a parlour Aquarium." And, not to put too fine a point on it, Gosse was Gospel. One day, for example, when he and his son were on a collecting expedition, they came upon a group of women similarly engaged and quite taken with what they assumed they had just found was a rarity. Overcome with curiosity, Gosse (who was not recognized by the women) asked to examine their specimen and, after doing so, pronounced it a far more common species. The women, however, refused to believe him and, as his son reported, they "…drew themselves up with dignity, and sarcastically remarked that it WAS the rarity, and that Gosse is our authority!"

Finally, the following is a quote from William Alford Lloyd's *Official Handbook to The Marine Aquarium of the Crystal Palace,* 1872:

> "The reason why aquaria in private houses met with such small success may be found in the natural difficulty of the whole thing… and to the difficulty of producing a sufficiently comprehensive and practical manual of instructions on the subject. Such capability is also greatly affected by the proportions of the vessel containing the water, as if the fluid is spread out in shallow masses, its absorption of air by mere surface contact with it, and its consequent good condition is much greater than when it is piled up (so to speak) in tall masses. 'The balance of existence' between plants and animals in a streamless aquarium is never easy to maintain, and therefore amateurs have usually to choose between the meagreness of a tank with but very few and small animals in it, and one with so many that the destruction of the whole can be very quickly brought about by some small adverse circumstance."

Lloyd produced twelve practical articles on aquaria in the following numbers of CASSELL'S POPULAR RECREATOR published in 1873 and 1874: 4, 8, 12, 16, 20, 24, 30, 32, 35, 38, 41, and 45. They are illustrated by fourteen woodcuts, of which eight are especially valuable as representing, drawn to an accurate scale, how many creatures, and of what kinds and sizes, can be maintained in aquaria of a named water capacity, of a given water distribution as to surface, and at a given temperature. Lloyd was the first aquarist on record, therefore, to provide guidelines for the stocking of an aquarium using both volume and surface area as the criteria.

Example 1: Let's examine a typical aquarium widely used before the aquarium craze began in England, i.e.,

the glass cylinder. I'll assume a 30-inch depth and an 12-inch diameter (see the glass jars in the cabinet aquarium in Figure 2-4 in Chapter 2). This is an aquarium of a little less than 15 gallons with a surface area of 113 square inches.

The equilibrium oxygen concentration of an aquarium containing fish depends upon a number of factors, the most important being:

1. The species of the fish;
2. The weight of the fish;
3. The number of fish;
4. The volume of the tank;
5. The surface area of the tank;
6. The solubility of oxygen in the water; and
7. The mass transfer coefficient of oxygen.

The last-named is extremely dependent upon the degree and type of agitation in the water and may vary between values of less than 1.0 cm/hour for stagnant water to values of the order of 180 cm/hour for highly aerated water (Table A5-1).

I'll make the following additional assumptions:

1. The tank contains 3 fish, each weighing 25 grams (this is a fairly large fish, typical of the native fishes commonly kept in British home aquariums of the mid-1800's; medakas (*Oryzias latipes*), for example, average only 0.35 grams);
2. Each fish consumes oxygen at a rate of 100 ml/kg (this is a value typical for a young trout weighing 25 grams);
3. To survive, the fish require an oxygen concentration of no less than 6 ppm.
3. The solubility of oxygen in the water, Cs, is 10 ppm.

Under these assumptions, C, the equilibrium oxygen concentration of an aquarium in ppm (i.e., the value of oxygen in the aquarium an infinite time after the fish have been added) is given by (Downing and Truesdale, 1956):

$$K = (f*A)/1000*V$$

where f is the mass transfer coefficient, cm/hour, A is the area, square centimeters, and V is the volume, liters.

$$K_1 = 0.0000143*N*W*O$$

where N is the number of fish, W is the weight of each fish, grams, and O is the oxygen consumption of the fish, ml/kg per hour.

Transforming prior measurements into metric equivalents, A = 729 square centimeters and V = 55.64 liters. We will assume f = 1 cm/hour, Cs = 10, N = 3 fish, W = 25 grams/fish, and O = 100 ml/kg per hour. These are all reasonable figures derived from experimental data. The calculations are as follows:

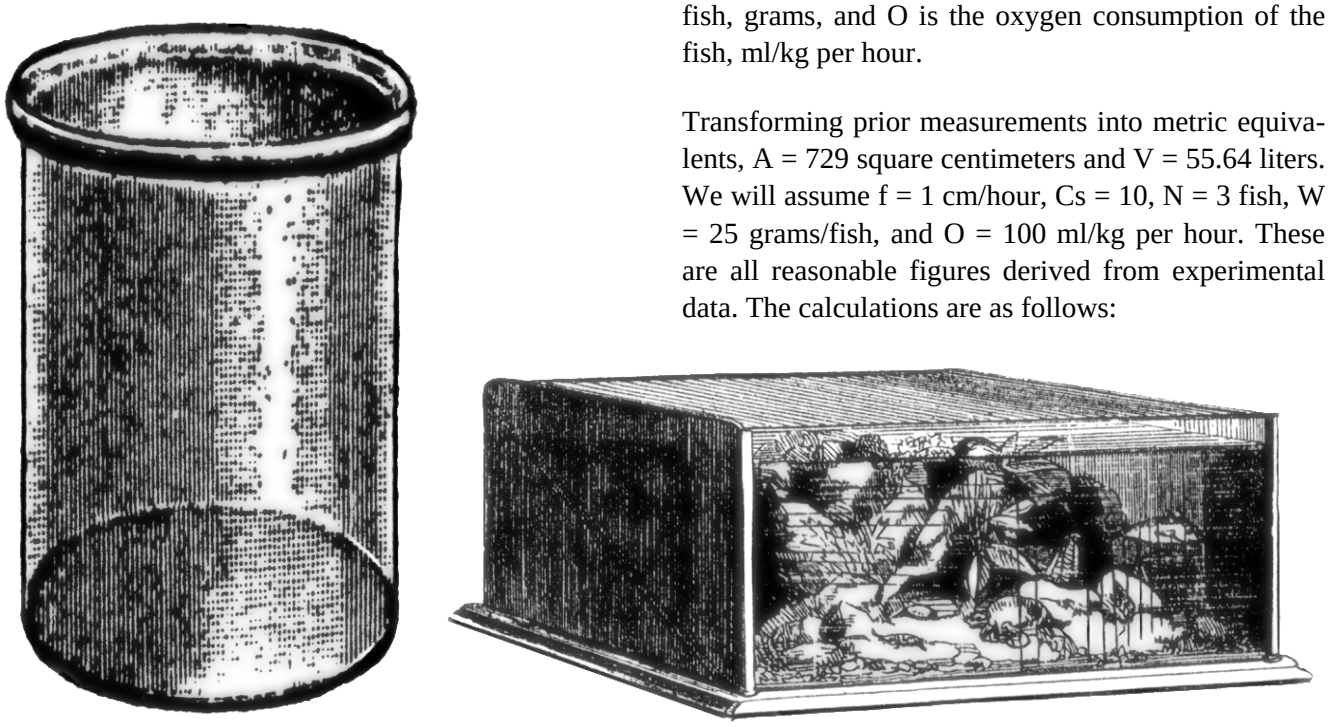


Figure A5-1. LEFT: TANK DESIGN USED IN EXAMPLES 1 AND 2. RIGHT: TANK DESIGN USED IN EXAMPLE 3.

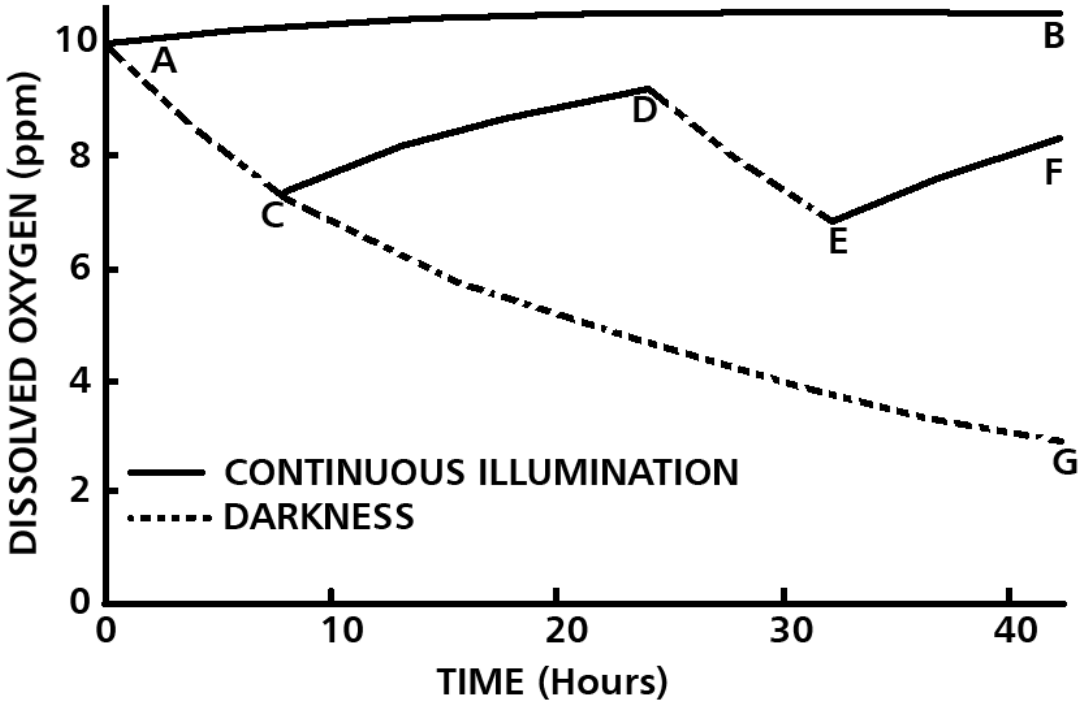


Figure A5-2. IF A PLANTED TANK IS CONTINUOUSLY ILLUMINATED, THE OXYGEN CONCENTRATION IN THE WATER REMAINS APPROXIMATELY CONSTANT (Curve AB). If a planted tank is kept in darkness, the oxygen concentration decreases over time (Curve ACG). If the tank is illuminated a portion of the day, the oxygen concentration decreases during periods of darkness and increases during the other times (Curve ACDEF). It will come to an equilibrium concentration somewhere between point B and G, but always lower than point A or B.

$$K = (1*729)/(1000*55.64) = 0.013$$
$$K_1 = 0.0000143*3*25*100 = 0.10725$$
$$C = 10 - .10725/.013 = 1.75 \text{ ppm}$$

Since the fish require an oxygen concentration of no less than 6 ppm, the fish will not survive.

Example 2: The question is now posed - would the fish survive if there were plants in the aquarium? Experiments have shown that *Valisneria spiralis* produces oxygen at a constant rate of 0.63 mg/hour per leaf and consumes oxygen at about 10 per cent of this rate. If we add 12 *Valisneria spiralis* leaves to the aquarium then K_3 is 12*0.63 = 7.56 mg/hour or 0.0756 ppm/hour and K_2 is 0.00756 ppm/hour. Therefore,

$$C = 10 – (0.10725 + 0.00756 - .0756)/.013 = 7.0 \text{ ppm}$$

and the fish will survive.

Example 3: One should not, however, leap to the conclusion that it was the balanced aquarium principle that made possible the successful keeping of aquarium fishes. Consider the design of the aquaria introduced at the same time the principle became generally known. A tank 18” x 18” x 10.5” will have the same volume as the cylindrical tank in the previous examples and is of proportions common to the times. The surface area is now 324 square inches or 2090 square centimeters. Without plants, K = (1*2090)/(1000*55.64) = 0.0376 and K_1 remains unchanged at 0.10725. Therefore,

$$C = 10 - .10725/.0376 = 7.1 \text{ ppm.}$$

In other words, changing the design of the aquarium in this example has the same effect as adding plants, and bear in mind that this discussion concerns only oxygen and carbon dioxide and not the role of plants in the ammonia-nitrite-nitrate cycle. In point of fact, it has an even more positive consequence since it was assumed in Example 2 that the light would be on continuously. A more reasonable assumption would be 8 hours each day and this means that, during the remaining 16 hours when the tank would be in darkness, it would start its downwards journey towards its dark-

DESCRIPTION OF AERATION	APPROXIMATE VALUES OF f
Stagnant water	0.2-0.5
Slowly stirred water: no appreciable disturbance of the surface	1.0-5.0
Slowly stirred water: slight disturbance at the surface	1.0-10
Diffused air bubbles, 1-5 mm. in diameter	180
Diffused air bubbles, 2 mm. in diameter	96
Diffused oxygen bubbles, 2.4 mm. in diameter	90

Table A5-1. MASS TRANSFER COEFFICIENTS FOR VARIOUS AERATION CONDITIONS.

ness oxygen equilibrium of 1.2 ppm. Although the presence of plants does assist in the oxygen maintenance of an aquarium, clearly it was not the plants that provided the main contribution to the success of these Victorian aquarists but rather the new designs of aquaria that were discussed in the books of the time and supplied by the various enterprises that were established to sell them.

Thus, provided due credit is given to Ward for what later was to be termed the "Warrington Case," it might even be said, tongue in cheek, that the success of the Victorian aquarists was due mainly to the politicians, not the naturalists. After all, it was the abolition of the glass tax in 1845 that made these glass-sided containers affordable, easing the way to the aquarium hobby!

POSTSCRIPT

Aquarists desirous of making these calculations for common aquarium fishes need, of course, data to enter into the equations given. Most of this information can be obtained easily and, in fact, the data used here will suffice except for three factors: (1) the weight of the fish, (2) the oxygen consumption of the fish, and (3) f, the mass transfer coefficient. Table A5-1 provides mass transfer coefficients reported in the literature for various aeration conditions. In my examples I used a value of f equal to 1.0 to approximate the conditions in an aquarium with no aeration.

The weight and oxygen consumption factors - W and O - pose a more difficult problem since the values reported in the literature mostly involve non-aquarium fishes, such as trout. This data would not be applicable to our smaller aquarium fishes or to those used to living in warmer waters. The oxygen consumption of a fish – which ranges roughly from 70 to 770 ml/kg/hour* - depends largely on the species, size, physiological condition, and on several environmental factors. It should be noted that the smaller the fish the larger is its oxygen consumption on a body weight basis.

However, we do have this data for at least one common aquarium fish, i.e., the zebra danio, *Brachydanio rerio*: The average weight is 0.59 grams and they consume 320 ml/kg of fish per hour of oxygen. So, for the tank of Example 3, was can calculate the number of zebra danios it can hold without aeration.

K remains unchanged at 0.0376 and K_1 = 0.0000143*X*0.59*320 or K_1 = .002688X where X is the number of zebra danios.

Now since $K_1=K(C_s - C)$, assuming that we wish a oxygen concentration of 7 ppm, substituting .002688X for K_1 and solving for X we obtain:

ml	mg	mmol
1	1.429	0.0447
0.7	1	0.0313
22.37	31.97	1

Table A5-2. CONVERSION FACTORS.

$X=K(C_s - C)/.002688 = 0.0376(10 - 7)/.002688 = 41.96$. In other words (and rounding off), this unaerated tank could support 42 zebra danios.

Two notes should be observed in using the equations. (1) When calculating the final oxygen values, any negative results should be interpreted to mean a zero oxygen concentration. (2) The units used here are ml/kg/hour; some literature values are given in ml/g/hour, mg/kg/hour, or mmol/hour and must be converted accordingly. Table A5-2 provides the conversion actors:

Although one can scour the Internet for oxygen consumption figures, this is time-consuming and the units used will vary greatly with the references. I suggest using the graph shown in Figure A5-3 since the figures for teleost fishes kept in the aquarium are fairly constant.

To use the graph, one must first pick a weight for the fish in question (and notice that the figure in the graph is in grams). The oxygen consumption in units of ml/hour is

$$O = 22370*Y$$

where Y is the oxygen consumption read off the graph at weight X. For example, if the weight of the fish is 0.9 grams the graph indicates that the oxygen consumption is .02 mmol/hour. Thus the ml/hour is 22370(0.02)= 447.4 (a fairly typical value found in the literature for aquarium fishes).

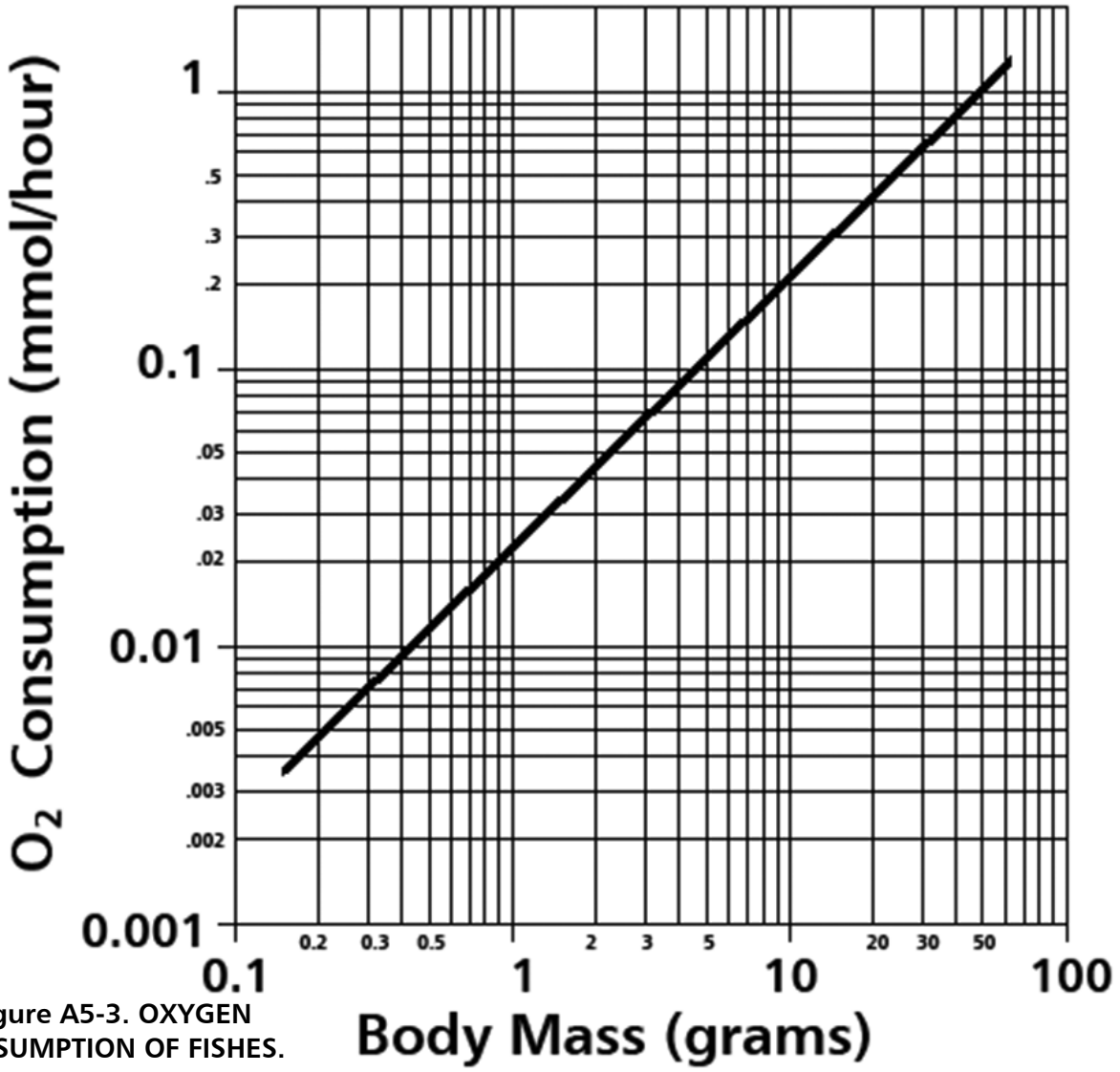


Figure A5-3. OXYGEN CONSUMPTION OF FISHES.

A6. THE HISTORY OF GLASS IN THE AQUARIUM

When one thinks of the word "aquarium" one automatically thinks of glass, although strictly speaking an aquarium need not have any glass at all. For an item of such importance to the hobby it is remarkable that little has been written in the aquarium literature about its history, its nature, or its manufacture. Glass is usually classified into several categories, e.g., art glass, industrial glass, i.e., glass used in other products such as light bulbs, practical glass, e.g., drinking glasses, glass used for cooking, etc., and the flat glass typically used for windows. We will be concerned here primarily with colorless forms of practical and flat glass.

Glass is an ideal material for use in an aquarium for at least two reasons: (1) It is relatively inert, and (2) Provided it is transparent, the contents of the aquarium can be viewed from the side, a great advantage over other materials.

Glass is basically a combination of silica (silicon dioxide), soda (sodium carbonate), and lime (calcium oxide). Soda serves as a flux to reduce the melting point of the silica, forming "water-glass" or sodium silicate. Since sodium silicate is water soluble, the lime fixes the glass so it will not dissolve in water. The silica historically was obtained from sand, the soda ash from burning certain plants - often seaweed or from dry lakebed deposits - and lime from burning limestone. Early glass was usually colored or opaque due to impurities – especially iron - in the ingredients.

Although the origin of glass making is a mystery, the most widely quoted is a myth handed down to us from the Roman historian, Pliny the Elder (23 – 79 AD), in his book, *Natural History*. According to Pliny, around 5000 BC, Syrian merchants made an overnight stop in Phoenicia, propped up a cooking pot on some blocks of natron they were carrying as cargo and made a fire over which to cook a meal. Natron, a mixture primarily of sodium bicarbonate and soda ash, was used by the Egyptians for mummification and was also added to castor oil to produce a smokeless fuel which allowed Egyptian artisans to paint inside ancient tombs without the artwork becoming discolored with soot. Overnight, the sand and the soda were fused by the heat to produce a vitreous, opaque product, and this according to the story was the origin of glass.

The Romans

The recorded history of aquarium glass, however, starts with the Romans. In Pliny's words: "… there is no other material nowadays that is more pliable or more adaptable, even to painting. However, the most highly valued glass is colorless and transparent…" With the discovery in the first Century AD in Alexandria of clear glass through the introduction of manganese oxide, glass began to be used for architectural purposes. Roman glass is a soda-lime type, its main ingredient - silica - being fluxed by sodium and calcium oxides, together with potassium, magnesium, and aluminum oxides. The characteristic pale blue-



Figure A6-1. Figure 1: SYRIAN MERCHANTS, ACCORDING TO TRADITION, DISCOVERED GLASS AFTER THEY MADE A FIRE OVER BLOCKS OF NATRON AND IT FUSED WITH THE SAND.

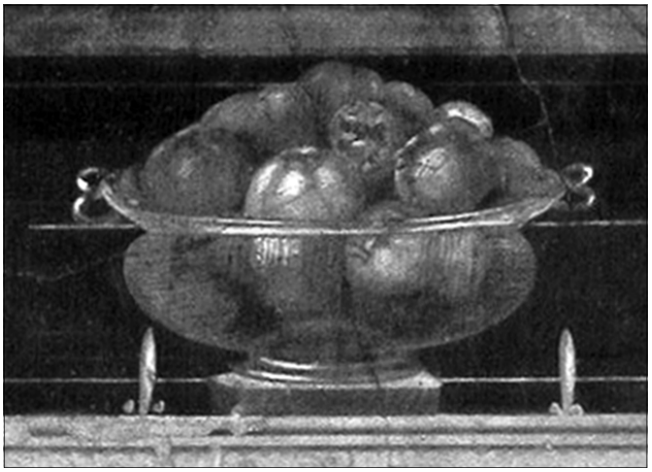


Figure A6-2. A 1ST CENTURY B.C. WALL-PAINTING IN THE HOUSE OF OPLONTIS, IN THE BAY OF NAPLES, WHICH DEPICTS A CLEAR, BLOWN GLASS BOWL FILLED WITH FRUIT.



Figure A6-3. ROMAN CLEAR GLASS FOOTED BOWL.

green color of much Roman glass is the result of an impurity in the sand, namely iron oxide. Manganese was used as a decolorizer, since in small quantities it has the effect of neutralizing the blue-greens of the iron oxide. However, because window glass in Rome was intended to provide insulation and security rather than illumination or as a way of viewing the world outside, little if any attention was paid to making it perfectly transparent or of even thickness. The Romans did not discover the art of grinding and polishing cast glass to make it transparent. As a result, the glass was more translucent than it was transparent. Instead of glass, the rich often used thin, translucent sheets of alabaster to enclose wall openings since, when cut into thin sheets, alabaster is translucent enough to be used for small windows.

That the Romans were able to produce a fairly clear flat glass is shown by the 1st Century AD glass bowl pictured in the painting in Figure A6-2 and in the image in Figure A6-3. For window panes, however, Roman glassmakers employed a method known as cast glass. However, the precise technique of making it has been lost, since the Romans abandoned its use in the 3rd century AD. It produced panes of uneven thickness that were glossy on one side and pitted, with a matte finish, on the other, and sported distinctive tool marks on the edges and corners. A team of British glassmakers, however, were able to reproduce this glass.

Initially they had no idea what to do, other than to pull and stretch a hot disc of the glass in order to form a rectangular shape, their first attempts producing the oddly-shaped but promising pieces shown on the left in Figure A6-4. Several attempts later they learned how to stretch the glass in a controlled manner and





Figure A6-4. THE ROMAN GLASS EXPERIMENT. British glass makers were able to duplicate Roman window panes by casting the glass, then manipulating the glass by pulling and stretching it.

discovered the “dos and don’ts” of making a window pane in this way. On the right is an example of a pane they made using a blue-green, soda-lime-silica glass with a typical Roman composition.

11th to the 14th Centuries - Cylinder Glass

Towards the year AD 1000, a significant change in European glassmaking techniques took place. Given the difficulties in importing raw materials, soda glass was gradually replaced by glass made using the potash obtained from the burning of trees. At this point, glass made north of the Alps began to differ from glass made in the Mediterranean area, with Italy, for example, sticking to soda ash as its dominant raw material.

The 11th century saw the further development by German glass craftsmen - then later by Venetian craftsmen in the 13th century - of the blown pane technique, i.e., the “cylinder” method, for the production of glass sheets. By blowing a hollow glass sphere and swinging it vertically, gravity would pull the glass into a cylindrical “pod” measuring up to 39 inches long with a width of up to 18 inches. While still hot, the ends of the pod were cut off; the tube was then slit lengthwise and opened out into a flat sheet while still warm (Figures A6-5 and A6-5). This was the earliest window glass in general use.

Crown Glass

The Crown glass process was first perfected by French glassmakers in the 1320s, notably around Rouen. The process was kept a careful trade secret. As a result, crown glass was not made in London until 1678. In this process, glass was blown into a “crown” or hollow globe. This was then flattened by reheating and spinning out the bowl-shaped piece of glass (bullion) into a flat disk by centrifugal force, up to 5 or 6 feet in diameter (Figure A6-7). The glass was then cut to the size required. Because of the manufacturing process, the best and thinnest glass is in a band at the edge of the disk, with the glass becoming thicker and more distorting towards the center. Due to the distribution of the best glass, in order to fill large window spaces many small diamond shapes would be cut from the edge of the disk and these would be mounted into a lead lattice work and fitted in the window. By



Figure A6-5. BLOWING CYLINDER GLASS. Using gravity, the glassmaker would first construct an elongated cylinder.

the 18th Century quality was often very good with an almost unmarked fire-finished surface. Crown was the preferred choice for window glass, together with some imported Cylinder glass until the mid-19th Century.

During this time the Italian city of Venice assumed its role as the glassmaking center of the western

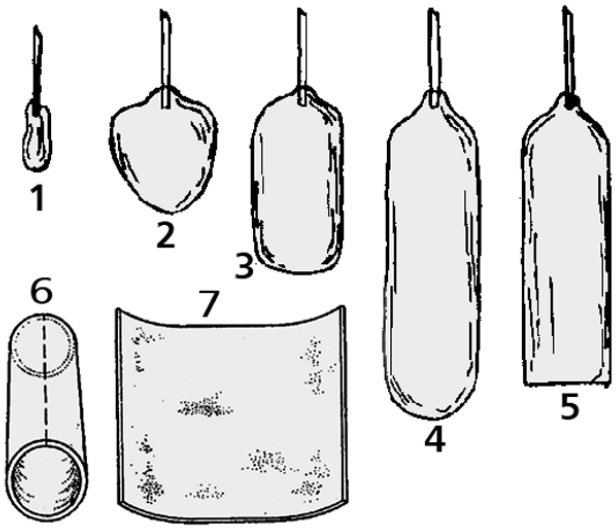


Figure A6-6. THE CYLINDER GLASS PROCESS. While still hot, the ends of the pod were cut off; the tube was then slit lengthwise and opened out into a flat sheet while still warm.

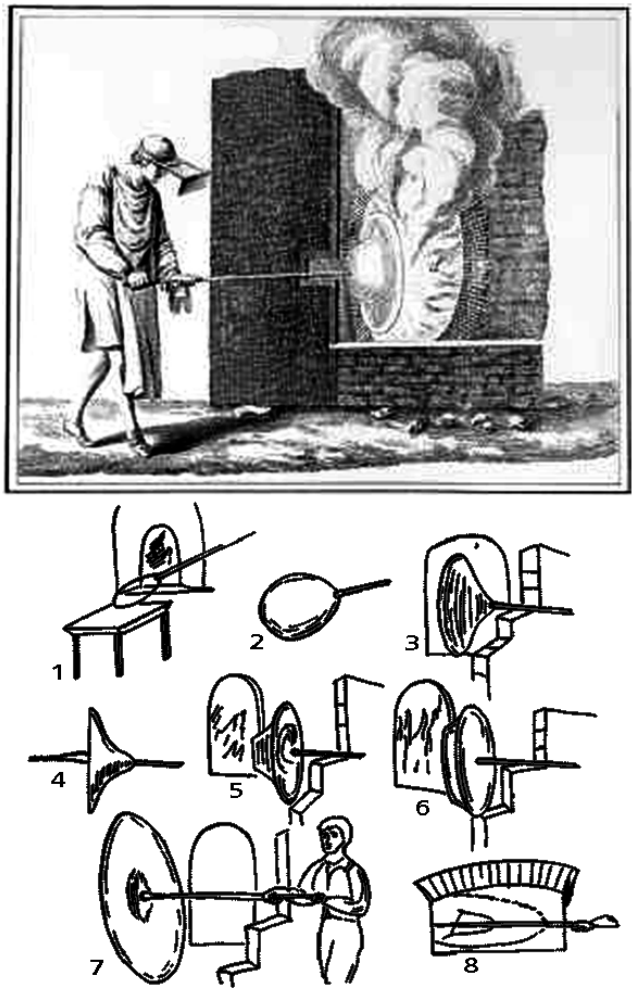


Figure A6-7. CROWN GLASS. By spinning the disk, a flat round piece of glass is obtained.

world. The Venetian merchant fleet ruled the Mediterranean waves and helped supply Venice's glass craftsmen with the technical know-how of their counterparts in Syria, and with the artistic influence of Islam.

15th and 16th Century - Venetian Glass

Since the earliest times it had been the aim of glassmakers to produce a glass as clear as rock crystal. In 1450 AD, Angelo Barovier, working on the Venetian island of Murano, invented a clear, almost transparent glass, somewhat grey and cloudy by modern standards, called "vetro cristallo" or "cristallo veneziano" (this is where the word "crystal" comes from). The most common form of silica used in glass making is sand, and while it has a relatively low melting point when compared to pure silica, it also contains many impurities that can discolor the glass. In Barovier's innovation, ordinary sand was replaced by quartz pebbles collected from the riverbeds of the Ticino and the Adige rivers. These pebbles, called "cogoli," were a source of nearly pure, naturally occurring silica. To further inhibit colorization, manganese was added to the final mixture. Manganese - or magnesium - was often called "glassmakers' soap" for its ability to counteract the discoloration caused by iron and other impurities and, as we have seen, was first used by the Romans. Murano glassware quickly became popular throughout Europe, and Italy built up a thriving export trade.

As I have previously written, Guillaume Rondelet asserted that his wife Jeanne had kept a fish alive in a glass of water for three years. The dates of these three years are unknown but we do know that they were married in 1538. Although the type of glass is not known for certain, it is not unreasonable to suppose that it was of this clear glass type imported from Italy that was regarded with such great favor at the time (Figure A6-8).

The importance of the glass-making industry for the Republic of Venice is demonstrated by the strict protectionism which in 1547 led the Council of Ten to take a draconian decision: "If a worker transports his art to a foreign country, to the detriment of the Republic, he will be ordered to return. If he fails to obey, his

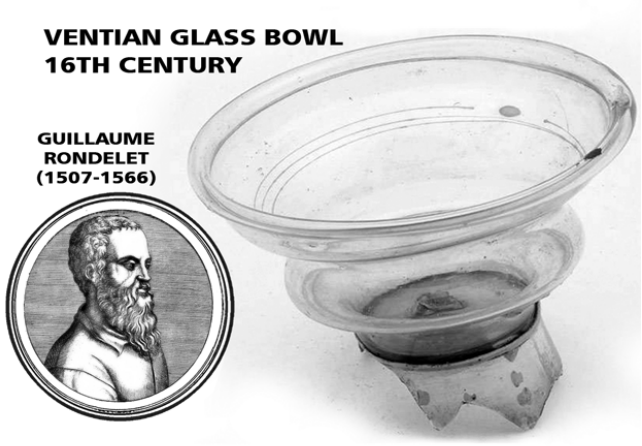


Figure A6-8. A VENETIAN GLASS BOWL FROM THE 16TH CENTURY. This was the type of container that Jeanne Rondelet might have kept her fish alive in for three years.

close relatives will be put in prison and if, despite their imprisonment, he obstinately continues to live abroad, someone will be assigned to kill him and, after his death, his relatives will be set free."

The stubborn obduracy of Venetian protectionism became apparent in the 17th century to the dismay of the French, who wanted to import Murano glass-making techniques into the France of Louis XIV. In the autumn of 1664 the French Minister entrusted this mission to the French ambassador to Venice who informed him of the city's severe measures of prohibition. "At any attempt to approach the glass-makers," he reported, "one risks being thrown into the sea." In spite of this, he managed to contact a local who procured for him three deserters. In May of the following year the French sent a secret agent to Venice who organized their escape. In 1666 the Venetians, outraged, replaced their ambassador to Paris with a new one who was requested to apply the law. Two of the glassmakers were in fact poisoned; the others, after various maneuvers, were driven out of the country. This was not the last time protectionism was practiced in the Western world. British craftsmen were banned from settling abroad by a British Parliamentary Act of 1719 that attempted to "Prevent the Inconveniences arising from Seducing Artificers in the Manufactures of Great Britain into Foreign Parts." Symptomatic of such policies, in 1784 British agents attempted to prevent John Frederick Amelung from sailing from Bremen, Germany, to Baltimore with a team of British glassmakers.

17th Century – Plate Glass

Glass produced by the cylinder method was limited in size and thickness. This changed with the development in France in 1688 of a method for making plate glass. In this process, the raw materials were shoveled into clay pots, which were heated in furnaces and ladled into a box mounted on a four-wheeled platform. The platform was rolled across a casting table and the molten glass flowed through a hole in the bottom of the box (Figure A6-9). The glass was then flattened by a large metal roller into a plate. The plate was then moved into an oven and allowed to cool, hardening as it did so. It was then ground with a mixture of fine sand and water and polished with a solution of tripoli stone and emery. The result was flat glass with good optical transmission qualities. The method, however, took 16 days from start to finish and produced glass so expensive that only the very rich could afford it.

17th To 19th Century - Glass Containers in England

The earliest use of glass for aquaria during the 17th and 18th Centuries was in clear, all-glass containers. A 17th Century example includes the paradise fish kept in a glass of water by Margaret Penn, the mother of William Penn of Pennsylvania, as reported by Samuel

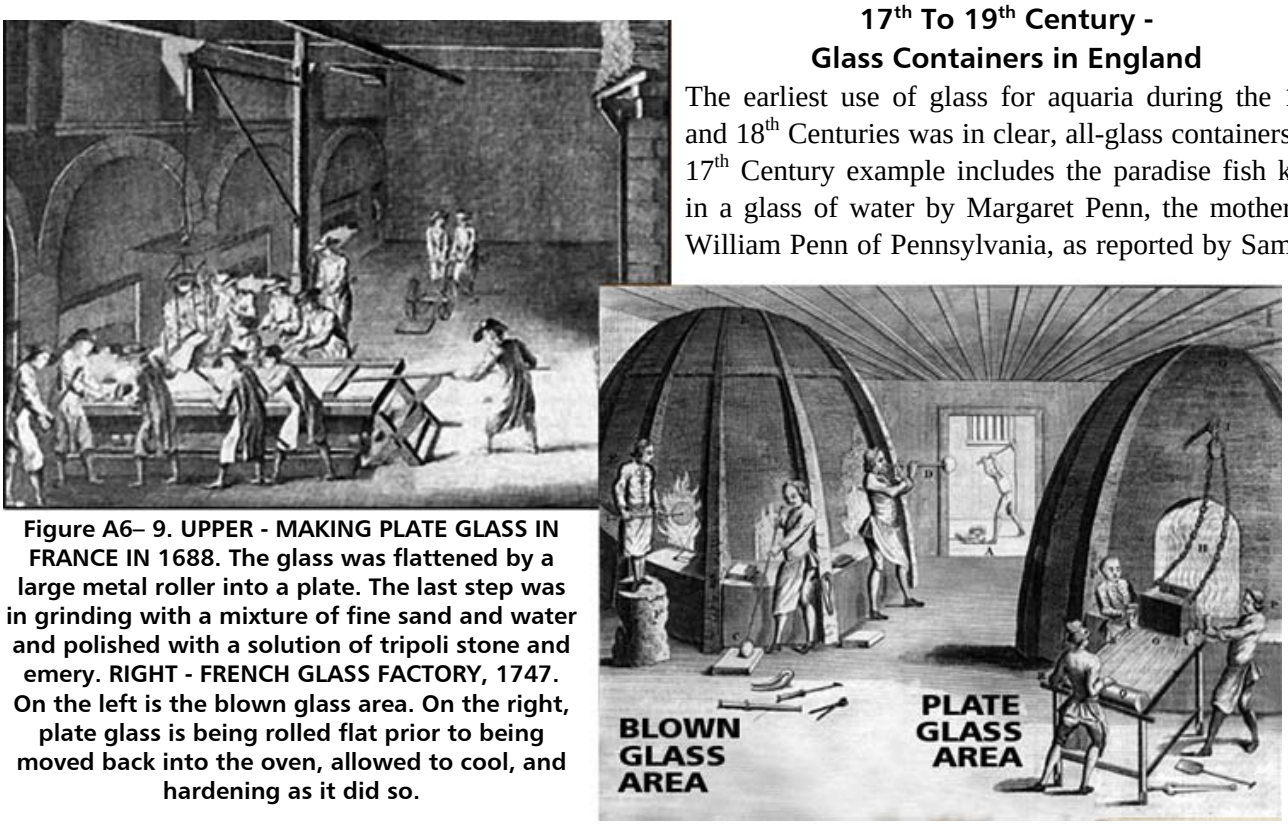


Figure A6– 9. UPPER - MAKING PLATE GLASS IN FRANCE IN 1688. The glass was flattened by a large metal roller into a plate. The last step was in grinding with a mixture of fine sand and water and polished with a solution of tripoli stone and emery. RIGHT - FRENCH GLASS FACTORY, 1747. On the left is the blown glass area. On the right, plate glass is being rolled flat prior to being moved back into the oven, allowed to cool, and hardening as it did so.

Pepys in 1665. The glass used by "Lady Penn" undoubtedly was high-quality German or Venetian soda glass (Figure A6-10).

18th Century examples include the sticklebacks kept in glass jars by William Arderon in 1748, the goldfish kept in punch bowls reported by John Hawkins in 1760, and the marine creatures kept by John Graham Dalyell in 1790. Early 19th Century examples abound, and include such fish keepers as Edward Forbes, John and Harry Goodsir, George Day, George Johnston, and Anna Thynne. All of these aquarists kept their fish in clear glass containers (Figure A6-11).

The material for this glass was most likely English lead crystal, then referred to as "flint" glass. In 1676, George Ravenscroft, a glass maker in London, introduced a process that mixed lead oxide and potash into a silica batch, using used flint nodules found in the chalk deposits of southeast England as a source of high purity silica. During this period, flint glass became the predominant material in drinking-glass production throughout England. Drinking glasses in those days came in many different sizes and shapes. They often had bowls, which had a small capacity by today's standards, two ounces or less. Others were enormous, and were probably used for beer or as ceremonial glasses.

In an act passed in 1745 it was decreed that from March 25, 1746, flint glass would pay a duty of 9s 4d per hundredweight [112 lbs], and bottle glass 2s 4d per hundredweight, although exports were exempt. This weight-related tax was imposed on all glassware intended for retail in the British Isles, although exports were exempt. The definition of "flint" and "bottle" glass as used in this act and the emendations that followed referred to clear glass and colored glass, respectively. The "flint" glass referred to, therefore, was not restricted to leaded glass.

In order to help pay for the Napoleonic Wars (1769-1820) the glass tax was continually increased As of July 5, 1775, "… upon the material or metal of all Plate or Flint Glass, and of all Enamel Stained or Paste Glass 18s 8d for every hundredweight." From May 10, 1787, the rate was raised to 21s 4-1/2d, but bottle glass paid about a fifth of this, i.e., 4s 1/4d per hundredweight. These duties levied on British glass drove the makers to ornament their wares with engraving, cutting, gilding, and painting to compensate for the use of less glass in the making of any one article. A further result was the widespread introduction of the colored glass since the duty on glass objects was higher on clear glass than on colored glass. Glass used for aquarium purposes, therefore, was more expensive than that used for other purposes. The tax was finally repealed in 1845.

17th to 19th Century - Flat Glass in England

Although a type of cylinder glass known as broad sheet was first made in Sussex in 1226, it was of poor quality and fairly opaque. Its manufacture slowly decreased and ceased by the early 16th Century.

In 1773, English polished plate by the French process was produced in that country. By 1800, a steam engine was used to carry out the grinding and polishing of the cast glass. The glass used by Ward for his Wardian cases in the 1830s and 1840s was more likely polished plate, which was especially suited for those long ocean voyages since it was



Figure A6-10. THE TYPE OF GLASS THAT MIGHT HAVE BEEN USED BY LADY PENN IN 1665.



Figure A6-11:
LEFT: GLASS JAR (SODA GLASS), 1748.
RIGHT: GLASS BOWL (LEADED GLASS), 1790.

thick and strong.

Distortion of the image is often seen in early plate glass even when perfectly flat. This is caused by an inhomogeneity in the composition of the glass due to imperfect mixing of the raw materials. The mechanical stirring of molten glass was not introduced until 1798 and was perfected in 1805. Robert Lucas Chance took out a British patent for the process in 1838, but it was not routinely adopted for about another decade.

A breakthrough occurred in 1834 when an improved cylinder sheet was introduced into England by Chance using a German process that produced finer quality and larger panes. It was similar to the broad sheet process, except that larger cylinders were produced by swinging the cylinder in a trench (see Number 2 in Figure A6-14). The resulting cylinders were up to 18 inches in diameter and a remarkable 7 feet in length. The glass was allowed to cool before cutting the cylinder, which was then re-heated and flattened. This glass (1/8" thick) was used to glaze The Crystal Palace in 1851, and it subsequently edged out crown glass in the period that followed, the process being used extensively until early in the 20th Century to make window glass.

However, the glass of choice in the first aquaria that used sheet glass in England was not crown or cylinder glass – it was plate glass. As Allen (1976) states: "The aquarium, almost overnight, turned into a national craze. Ladies of fashion, it is credibly recorded, had palatial plate-glass tanks erected in their drawing-rooms…" Allen's source most likely is the Reverend Wood who in 1869 wrote: "Some years ago, a complete aquarium mania ran through the country. Every one must needs have an aquarium, either of sea or fresh water, the former being preferred. The fashionable lady had magnificent plate-glass aquaria in her drawing room, and the schoolboy managed to keep an aquarium of lesser pretensions in his study." Hibberd, in his *Rustic Adornments for Homes of Taste* (1856), describes the construction of one of his marine aquaria: "This tank is made wholly of slate, except the front, which is plate glass…"

There were a number of reasons for the popularity of plate glass. Although it was more expensive than cylinder (a sheet of ½" plate glass before polishing, for example, ends up ¼" thick), the repeal of the glass tax reduced its price markedly. Secondly, many of the tanks of the day were rather large and required the strength of plate glass. Since it was a common practice to use heavy slate on three sides of the tank, it was in keeping using plate on the front glass rather than making it the weakest link in the construction. Finally, for safety reasons the authorities of the day cautioned against using the thinner cylinder glass even though it was more expensive. This was not an issue for the dil-



Figure A6-12. Left: English fish bowl, circa 1790-1820, blown glass with enamel and gilded decoration, height 12 inches.
Right: American fish bowl, circa 1840-1860, height 9-3/8 inches.

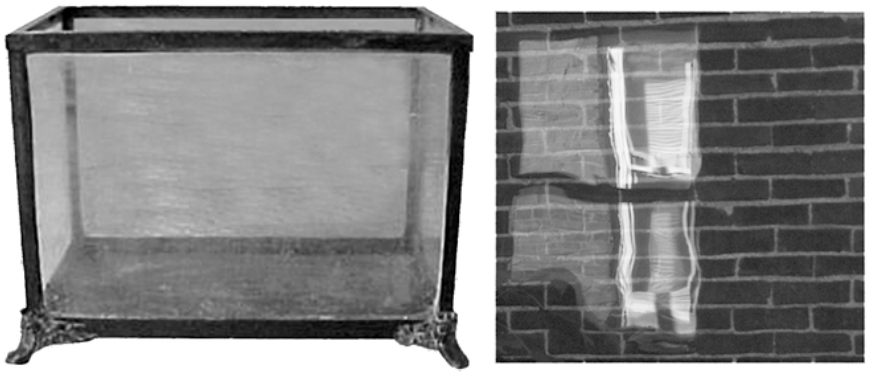


Figure A6-13:
CYLINDER GLASS IS WAVY BECAUSE THE OUTSIDE DIAMETER OF A CYLINDER IS GREATER THAN ITS INSIDE DIAMETER.

ettante aquarists of the day since they were of the Middle Class and subsequently cost was not an overriding concern. This not to say that cylinder glass was not used as Wood referred to an "aquarium of lesser pretensions" kept by schoolboys," and these may well have been constructed of this less expensive glass.

19th and 20th Centuries -

Glass in the United States

In the United States, glass development basically followed that of Great Britain, i.e., crown glass followed by cylinder glass. Plate glass, however, was not made in this country until much later in the 19th Century and had to be imported. Actually, American glass was not all that good and all sort of window glass was imported as well. Table A6-1 shows the importation of glass into the United States for the year ending June 1856. It should be noted that French plate, where the process originated, was deemed to be of better quality than English plate and so was Belgian plate. French and Belgian window glass was less expensive than others and cylinder glass from both of these countries were commonly lumped together and termed "French glass."

The first recorded mention of flat glass for aquaria in the United States was made by Annie Rebecca Coggeshall in the 1858 issue of *THE ATLANTIC MONTHLY* titled "My Aquarium," where we learn that her tank was made of double-flint glass. "Double-flint glass," however, merely meant that the glass was clear and was most likely identical to the double strength cylinder glass (i.e., 1/8") used to glaze the Crystal Palace seven years earlier. David Williams Cheever, writing in the August 1860 issue of THE ATLANTIC MONTHLY recommended plate or thick crown glass. The latter was the same thickness as double strength cylinder glass and had better transparency.

In 1863, in her book *The Employments of Women: a Cyclopaedia of Woman's Work*, Virginia Penny writes: "One of the most innocent and pleasing amusements that has attracted attention for some time is the making of aquaria. The cases are formed of plate glass, square, oblong, circular, or any shape to please the fancy of the owner." There was never any doubt, of course, that plate was the de rigueur choice of glass for public aquaria. The Aquarial Gardens in 1859 used plate glass for their tanks. Ryan (2002) states: "The glass of the tanks was certainly more opaque than glass in aquariums today and visitors

TABLE A6-1: IMPORTATION OF GLASS INTO THE U.S.,YEAR ENDING JUNE 1856

		Window Glass (mainly crown and cylinder)		
	Polished Plate, $	Square Feet	Dollars	¢/sq. ft.
Belgium	29,907	13,207,500	406,631	3.01
France	214,995	643,126	20,074	3.12
Germany	40,523	201,053	6,479	3.22
England	130,316	1,403,382	55,012	3.92
Other	57,464	12,843	511	3.98

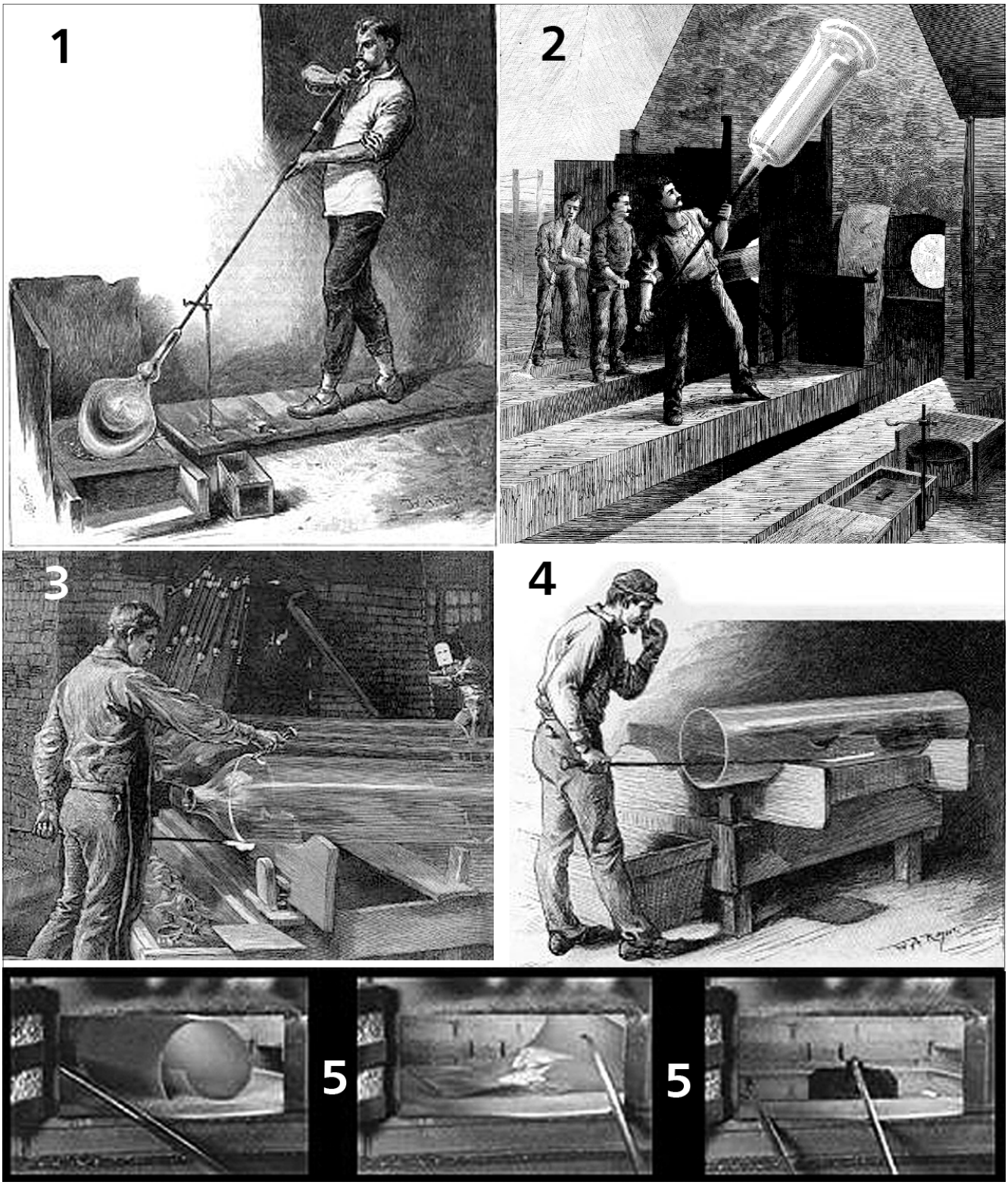


Figure A6-14: THE CYLINDER GLASS PROCESS.
1. The glass is gathered from the furnace. 2. The blower keeps it distended by blowing while he swings it over a deep trench which is provided next to his working platform. In this way the glass is extended into the form of a long cylinder closed at the lower end. 3. An assistant applies a cold iron which cracks the ends off. 4. The cylinder is scored lengthwise. 5. The split cylinder is passed to the flattening furnace; when soft the cylinder is flattened with some form of rubbing implement, which frequently takes the form of a block of charred wood.

were advised to look through that part of the glass nearest the object to prevent dizziness," and in 1877 William S. Ward described the one-inch thick plate glass used in the New York Aquarium.

In 1870 the domestic output of plate glass was less than one percent. Thanks to American ingenuity and protective U.S. tariffs the domestic production of plate glass rose steadily to 82 percent by 1890, bringing its price down considerably. In 1879, for example, imported plate glass sold for $2.5/sq. ft. In 1889, American-produced plate glass cost $1/sq. ft.

However, although plate glass continued to be used for larger tanks, double-thick "French glass" (or double-thick "English glass," sometimes referred to as "English 26-ounce glass") was often used for aquariums in the 18-gallon range. This type of glass was nothing more than 1/8" thick cylinder glass and was often used for the smaller tanks if second hand polished plate or broken plate window glass was not available. Regardless of tank size, however, bottoms frequently were made of rough or rolled plate, the type commonly used for skylights. In the plate glass process, after the glass is melted it is poured onto a water-cooled steel table and then rolled to a preliminary thickness. The cooled glass, called rough plate, is translucent, not transparent. It is, of course, considerably cheaper than the finished polished plate. Sometimes the ends were made of single-strength (3/32") French glass, also commonly called "ordinary" glass.

The blowing of the cylinder - which typically was a foot in diameter and five feet long -was the most difficult and expensive part of the cylinder glass process. It required the most delicate skill and the labor was so severe that few men were equal to it. Some way had to be found to replace the skilled labor in this stage with a mechanical counterpart. This turned out to be the Lubbers process.

The Lubbers process (Figure A6-15) originated in the United States in the 1890's and was the first mechanical method of drawing glass. It began with forty-foot high cylinders of glass drawn vertically from a circu-

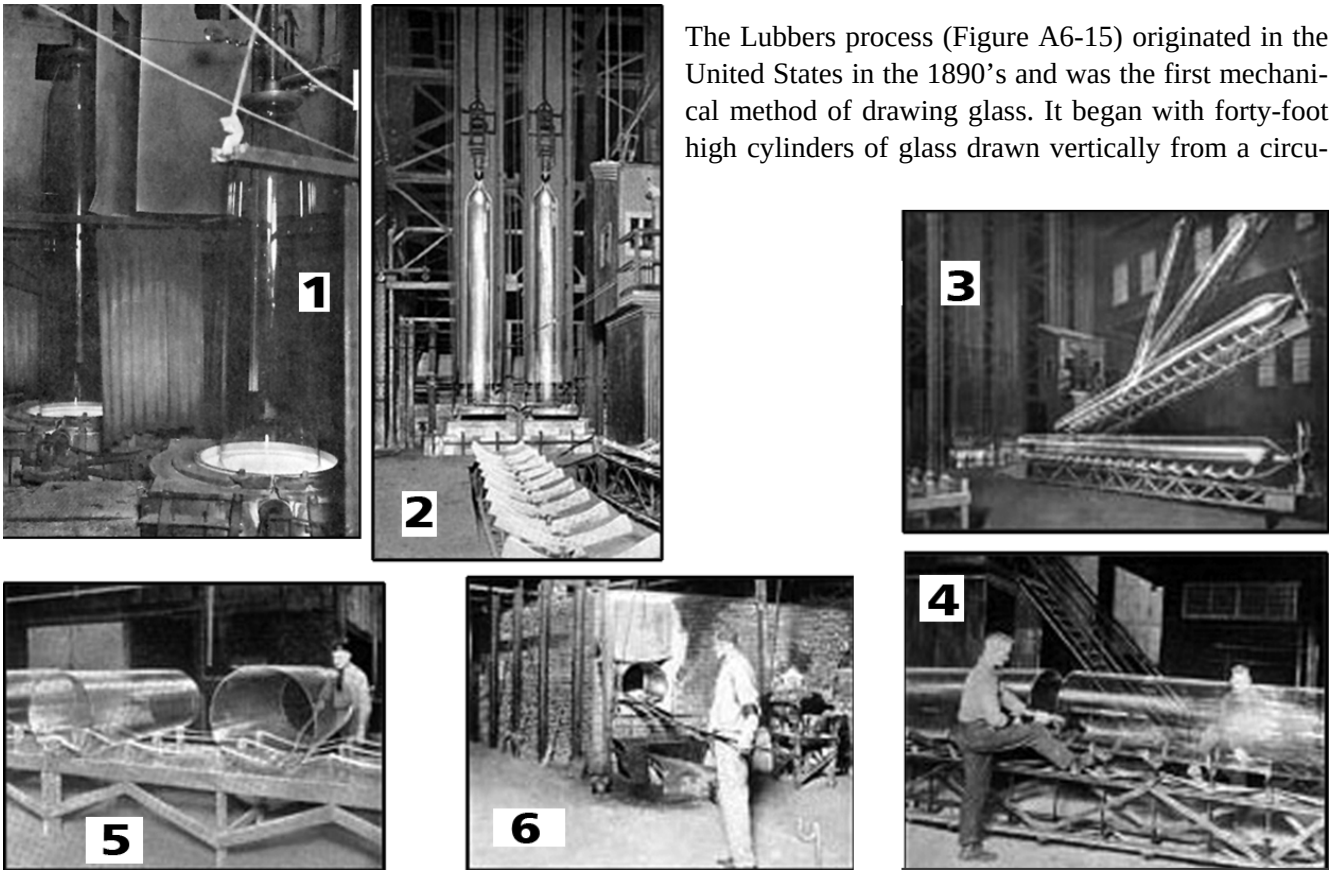


Figure A6-15. IN THE LUBBERS PROCESS a flat disk – called the "bait" - was lowered into a cylindrical furnace of molten glass. The "baits," with their gathers of molten glass, were pulled skywards as compressed air was blown into the cylinders. The giant cylinders were then gently lowered into wooden racks. The glass was annealed and then cut into 7 to 10 foot cylinders, which were then cut lengthways, re-heated, and flattened.

lar tank. A flat disk – called the "bait" - was lowered into a cylindrical furnace of molten glass. The "baits," with their gathers of molten glass, were pulled skywards as compressed air was blown into the cylinders. The giant cylinders were then gently lowered into wooden racks. The glass was annealed and then cut into 7 to 10 foot cylinders, which were then cut lengthways, re-heated, and flattened. The drawing process produced waves and surface distortions that varied throughout the draw and because the quality of the glass was poor, there was no question of it driving the hand blown process off the market immediately. However, the considerable increase in output made it economically attractive, and by 1915 all window glass was being blown from cylinders with mechanical assistance and it replaced the previous glass types used in the smaller aquariums.

The drawing process produced waves and surface distortions that varied throughout the draw. The selection of cut sheets was made and classified AA, A, B, or Greenhouse solely on the optical qualities of the sheet. "AA" quality was the highest, with "A" being the highest standard grade for commercial glazing purposes. "B" quality, however, was quite satisfactory for most window glazing.

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The cylinder drawn process, however, was to become less and less competitive with the implementation of the Belgian Fourcault process for producing sheet glass by drawing a continuous ribbon of flat glass until it cooled sufficiently to allow it to be cut. In the Fourcault process a slotted block made of refractory material was pushed down into the molten glass. As the hot extruded glass rises through the slot it was grasped by was called an iron "bait." Surface tension and viscosity led the glass to follow the bait as it was drawn up between rollers (Figure A6-16). As it rose,

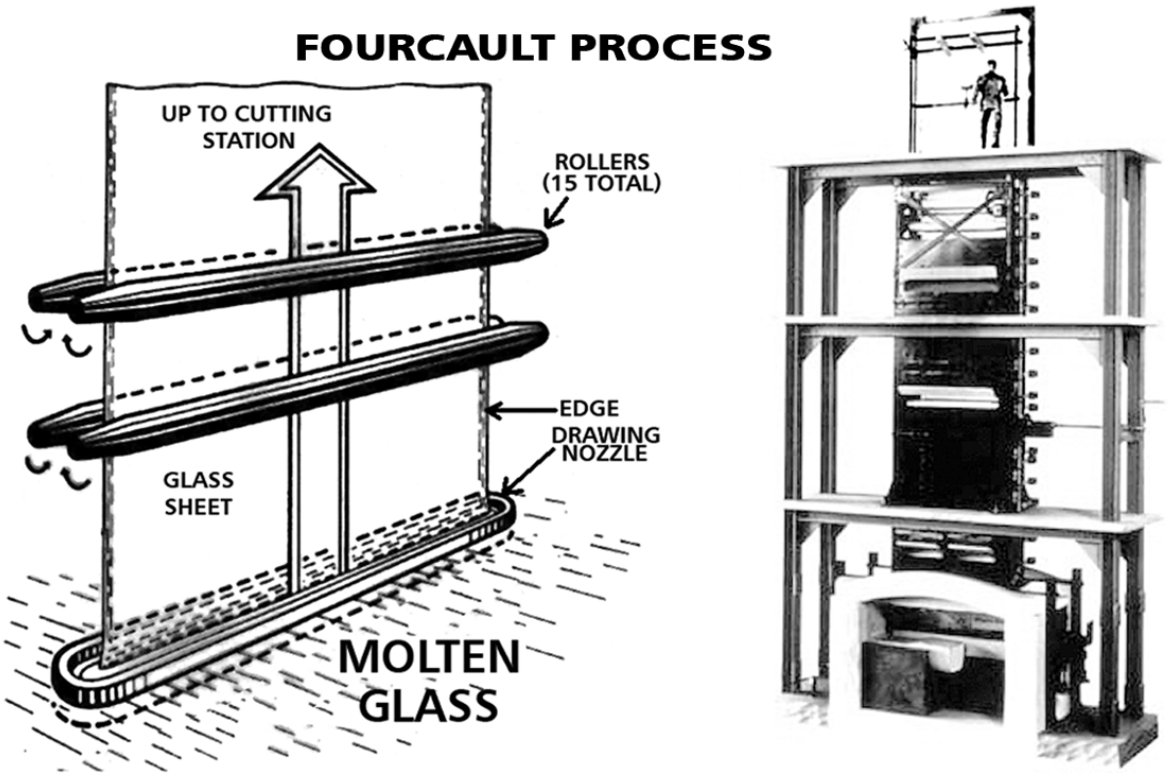


Figure A6-16. THE FOURCAULT PROCESS. As the hot extruded glass rose through the slot it was grasped by an iron "bait." Surface tension and viscosity led the glass to follow the bait as it was drawn up between rollers. As it rose, the glass cooled rapidly, annealed, and was broken at the top of the machine by automatic cutters.

the glass cooled rapidly, annealed, and was broken at the top of the machine by automatic cutters. Unfortunately, since the surface of the molten glass cooled more rapidly than the center, it resulted in internal stresses that sometimes caused the glass sheet to crack, shatter or even explode some time later. The glass was clear but had thickness variations due to the small temperature changes it underwent as it was hardening.

The Colburn/Libbey-Owen process also drew its sheet vertically from an open bath, the glass ribbon being drawn vertically from the tank for about 30 inches by a metal bait before being bent over a roller into the horizontal plane ready for cutting and annealing (Figure A6-17). The process was twice as fast as the Fourcault process so the glass had less time to cool and so the annealing process eliminated or limited the stresses previously mentioned. However, the bending tended to spoil the surface of the glass.

The third process, the Pittsburg process, combined and enhanced the main features of the Fourcault and Libbey-Owens processes. The glass was drawn from the melt and conveyed vertically through an annealing shaft around 40 feet long prior to cutting.

By 1928 these processes replaced the mechanical cylinder-drawing machines.

As has been mentioned, plate glass had been invented in 1688 by French artisans, the process taking 16 days. In the late 1880s the rolled plate process was introduced whereby glass was poured onto an inclined metal plane and then passed between rollers, followed by grinding and polishing (Figure A6-18). The process typically followed these steps:

1. The molten glass was poured onto a water cooled steel table 32 feet long and 20 feet wide. The roller, also water cooled, weighed 25 tons. The glass was rolled to ½ inch thick.
2. The rolled sheet was moved to a cooling oven, or lehr, 800 feet long to make a 5 hour trip from red hot to room temperature. At the end of the trip inspectors crawled over it marking all imperfections that would be cut away before the glass was polished. At this point the cooled glass, called rough plate, was translucent, not transparent.
3. Cut sheets of rough plate were embedded in wet Plaster of Paris on circular polishing tables. Many sheets fitted carefully onto one table, with each table weighing 70 tons. The polishing wheels were driven by 500 horsepower motors.
4. Iron polishing plates weighing 124,000 lbs were lowered onto the glass and fed with water and increasing finer grades of sand. The final polish was

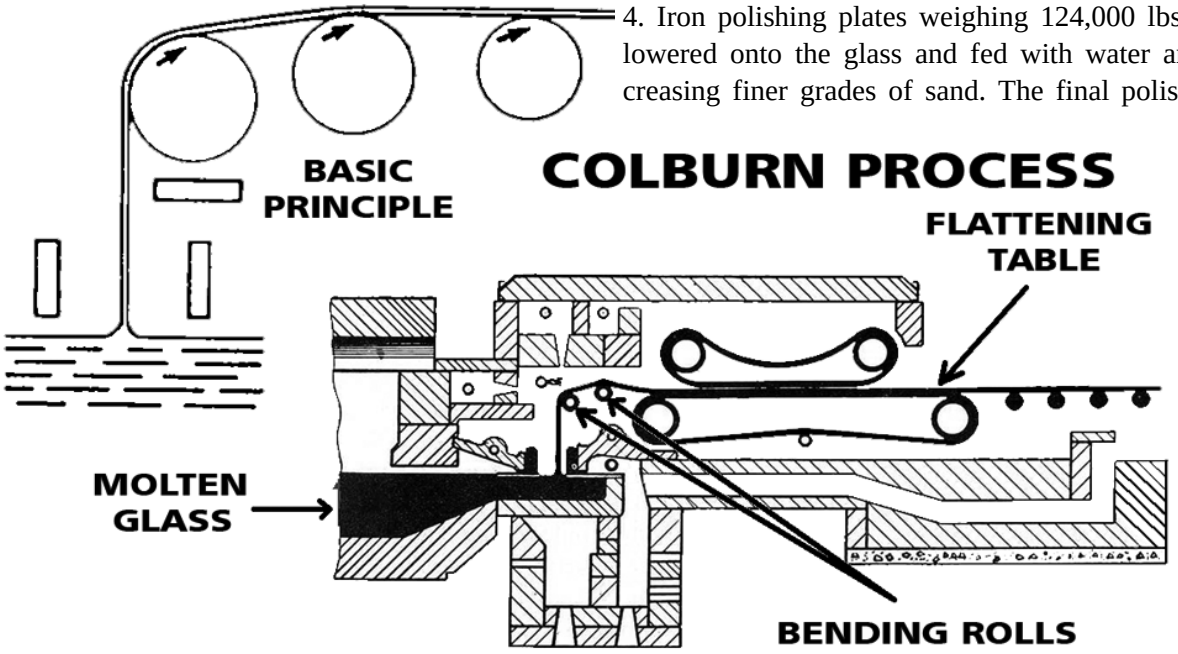


Figure A6-17. THE COLBURN/LIBBEY-OWEN PROCESS also drew its sheet vertically from an open bath, the glass ribbon being drawn vertically from the tank for about 30 inches by a metal bait before being bent over a roller into the horizontal plane ready for cutting and annealing.

done with emery powder which gave the glass a satin finish.
5. The glass was moved to a second set of felt wheels and polished to perfect transparency with rouge, also known as iron oxide or super fine rust.
6. Once the first side was polished, the plates were turned over and the second side was polished in the same way.
7. Finally the glass was washed in muriatic acid to remove the plaster. Each ½ inch plate was now ¼ inch thick.
8. The finished product was inspected, defective areas cut off and the sheets cut to size for shipping.

Note that it is just the rolling, grinding, and polishing operations that distinguish plate glass from sheet glass.

Continuous ribbon production, achieved by flowing glass from a tank furnace over a weir and then onto rollers, was invented at the Ford Motor Company in 1920 (Figure A6-19). In 1925 the Pilkington Bros. in Great Britain developed a continuous grinding and polishing process in 1925 and this became common by about 1930. As a result of these technological improvements, the cost of plate glass was lowered and it became popular in the 1930s. From 1937 on, both sides of the glass were ground and polished simultaneously. This removed the roller marks from the glass, making high-quality flat glass possible.

The larger aquaria continued to be made with plate glass. One extremely large Jewel tank of 1928, for example, had one-inch thick plate glass and weighed 1,750 pounds! In 1930, Henry Kissel used plate glass in the 50-gallon tanks in his hatchery, and in 1932 Franklin Barrett of Philadelphia sold tanks up to 15 gallons (24" x 12" x 12") made entirely of double strength window glass, although many 15-gallon tanks of the time were made of 3/16" plate glass. The popular Metaframe aquariums of Post-World War II were made of double strength window glass.

Aquarium glass was made via these continuous processes until after World War II when, in 1959, a British glassmaker invented the float process. According to lore, an Englishman named Alastair Pilkington was washing his dishes and observed a plate floating on the smooth surface of the water. This supposedly inspired him to wonder if smooth glass could be produced by floating molten glass on the smooth surface of some other liquid. In the float process, a continuous ribbon of glass moves out of the melting furnace and then floats across the surface of an enclosed bath of molten tin. The semi-molten ribbon is held in a chemically controlled atmosphere at a high temperature for

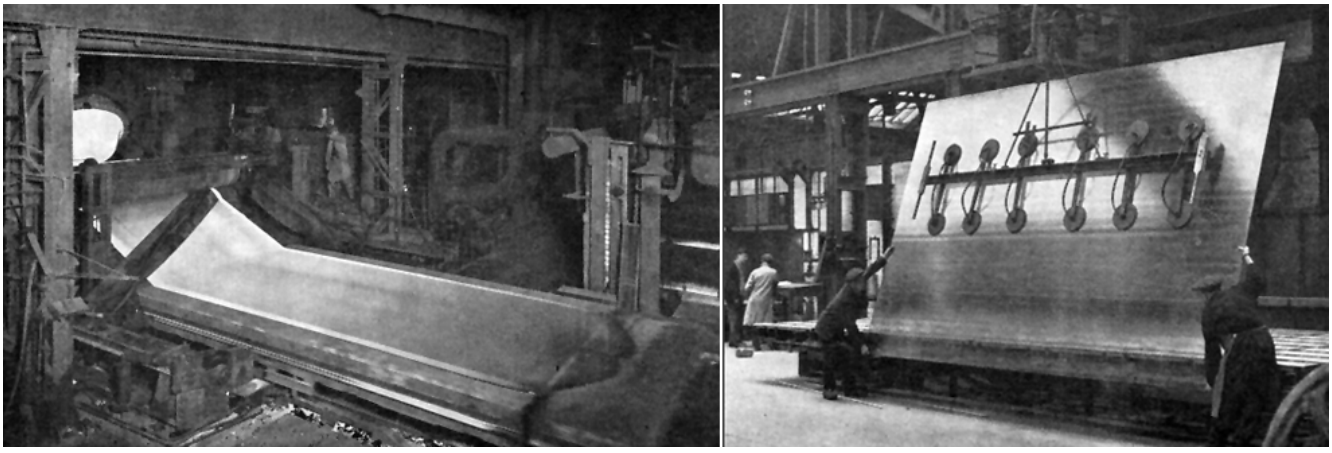


Figure A6-18. PLATE GLASS. At the turn of the Century, molten glass was poured onto a water cooled steel table rolled to a thickness of ½ inch. The rolled sheet was then moved to a cooling oven to make a 5 hour trip from red hot to room temperature. At the end of the trip inspectors crawled over it, marking all imperfections that would be cut away before the glass was polished. At this point the cooled glass was translucent, not transparent. The sheets were embedded in wet Plaster of Paris on circular polishing tables and iron polishing plates were lowered onto the glass. These were fed with water and increasingly finer grades of sand, the final polish done with emery powder. Once the first side was polished, the plates were turned over and the second side was polished in the same way. Finally the glass was washed in muriatic acid to remove the plaster. Each ½ inch plate was now ¼ inch thick.

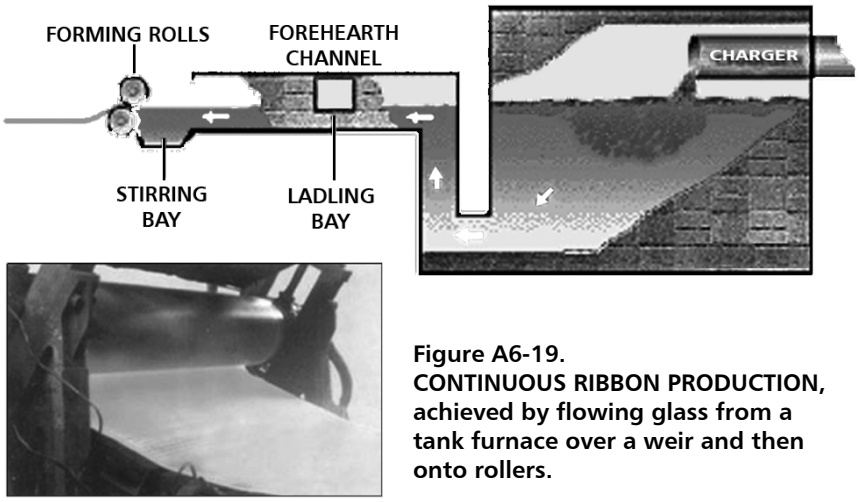


Figure A6-19.
CONTINUOUS RIBBON PRODUCTION, achieved by flowing glass from a tank furnace over a weir and then onto rollers.

The first float license was granted, to PPG, in 1962 and in 1963 it became the first U.S. company to manufacture glass using the process. The other types of glass slowly began to be phased out. Pilkington, for example, stopped making polished plate glass in 1967 and others soon followed suit and by 1980 float was the predominate type of flat glass. The float glass process now produces 90% of the world's flat glass, and is the process used for all of our present-day glass-sided aquaria.

a long enough time for the irregularities to flow out and for the surfaces to be flat and parallel. Because the surface of the molten tin is dead flat, the glass also becomes flat. The ribbon is then cooled down while still advancing across the molten tin until the surfaces are hard enough to be taken out of the bath without the rollers marking the bottom surface; so a ribbon is produces with a uniform thickness and bright polished surfaces without the need for further processing (Figures A6-21 and A6-22). The tin bath is pressurized by a mixture of nitrogen and hydrogen to keep the tin from oxidizing.

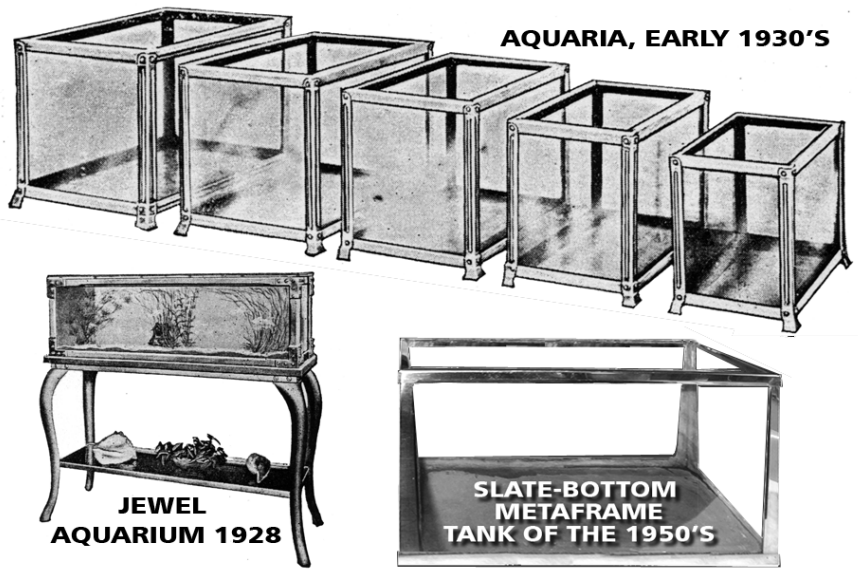


Figure A6-20. EARLY AQUARIUMS - From Plate Glass to Window Glass.

TABLE A6-2: AQUARIA SOLD IN 1932 BY FRANKLIN BARRETT OF PHILADELPHIA. ALL WERE OF GALVANIZED ELECTRIC WELDED FRAME CONSTRUCTION WITH SLATE BOTTOMS AND DOUBLE-STRENGTH GLASS MADE BY THE SHEET-DRAWN PROCESS

	SIZE, INCHES	CAPACITY, GALLONS	PRICE, $
1	10 x 6 x 8	2	1.00
2	10 x 7 x 9	3-1/4	1.5
3	14 x 8 x 10	5	2.00
4	16 x 9 x 11	6 1/2	2.5
5	18 x 10 x 12	9-1/4	3.00
6	20 x10 x 12	10-1/4	3.5
7	24 x12 x 12	15	6.00

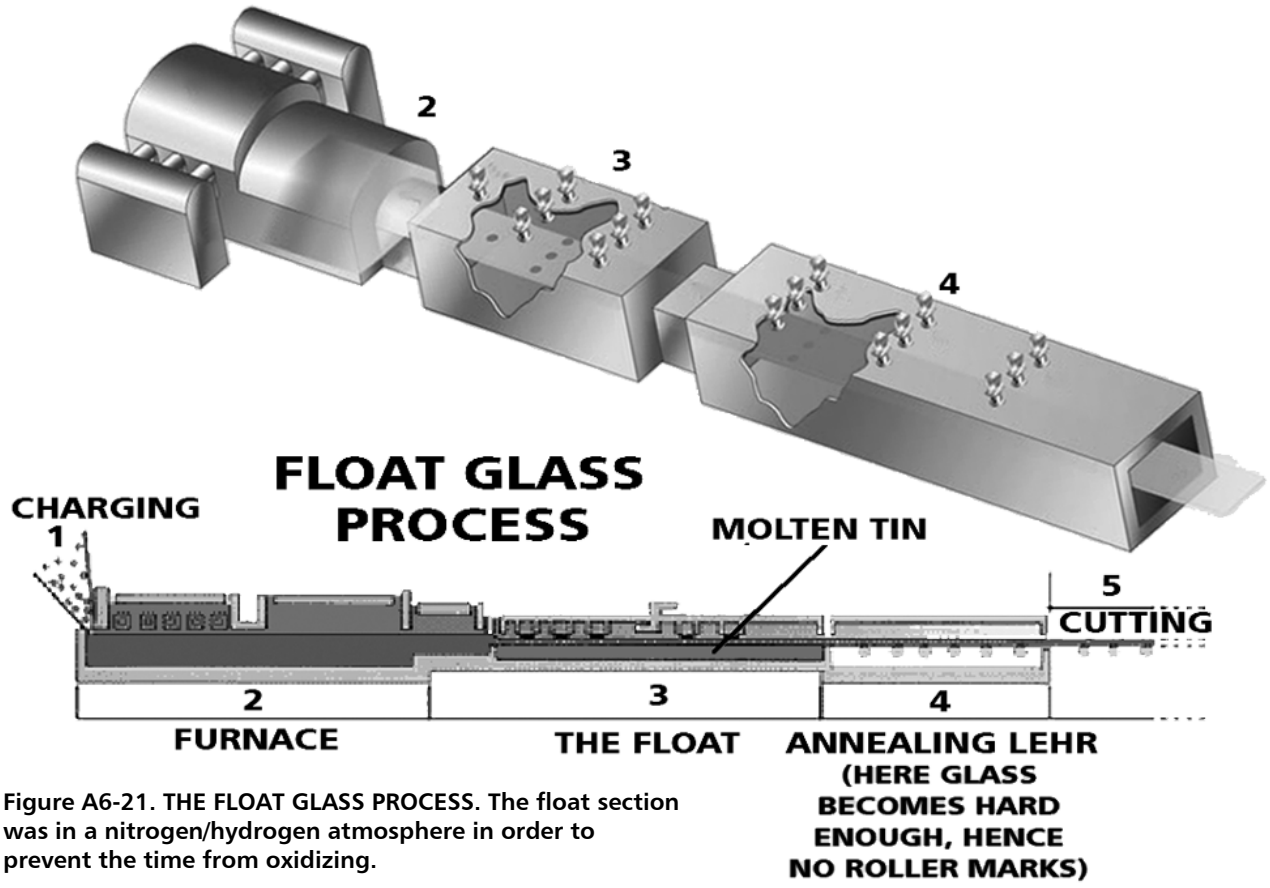


Figure A6-21. THE FLOAT GLASS PROCESS. The float section was in a nitrogen/hydrogen atmosphere in order to prevent the time from oxidizing.



Figure A6-22. FLOAT GLASS AS IT EXITS FROM THE ANNEALING OVEN.

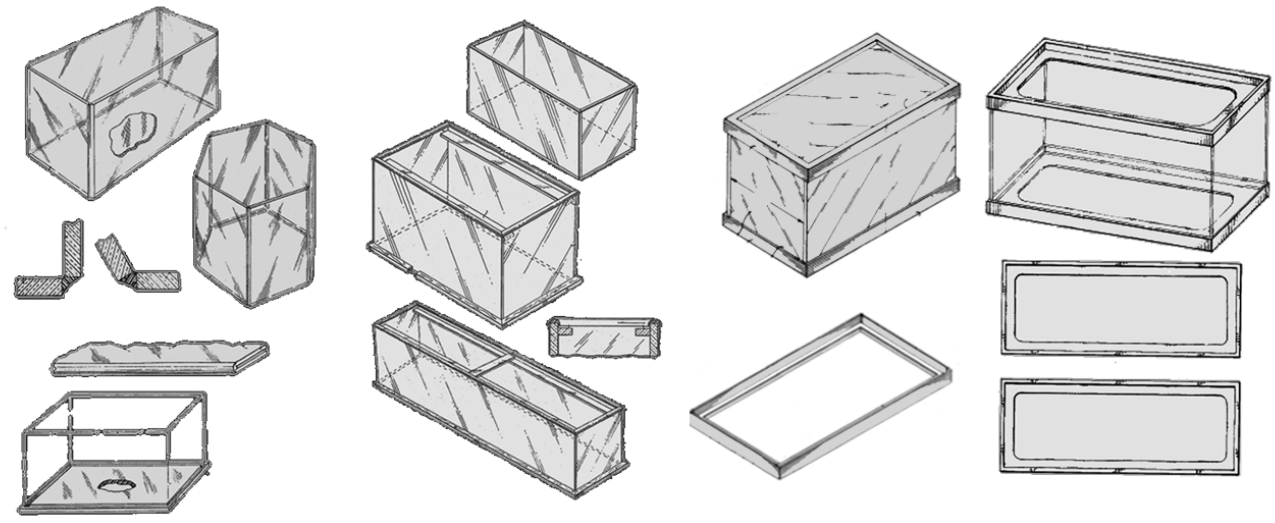
Another technological development – although not specifically tied to a particular type of glass – that was to revolutionize the glass aquarium was the invention of rubber-like polymers called polydimethsiloxanes or RTVs, the latter standing for "room temperature vulcanizing," or simply a rubber which cures at room temperature. Silicone rubber adhesives are made from a complicated process that turns elemental silicon metal made from sand (silica) into a rubbery polymer. When cured, silicone rubber adhesives/sealants have excellent resistance to moisture that makes them exceptionally suited for bonding glass together to form an all-glass aquarium.

In 1963 Dow Corning Trademarked the name, "Silastic," but it was another nine years before the first patent was awarded that involved using this material to bond glass in an aquarium. The patent was filed in 1970 and was awarded to Jerry C. Callan of Dallas, Texas in 1972 (Figure A6-24). Callan described forming his bonds on the outside of the tank rather than the inside because he got his inspiration from a furniture design that constructed corners in a similar manner. The following is the relevant claim, with some legal jargon removed, in the patent:



FIGURE A6-23. A PRESENT DAY AQUARIUM GLAZED WITH FLOAT GLASS.

"A container comprising a number of transpar-



CALLAN PATENT OF 1972 | **BATTERSHALL/HOFFMAN PATENT OF 1973** | **HALL PATENT OF 1973** | **SHALOM PATENT OF 1975**

Figure A6-24. FRAMELESS GLASS TANK PATENTS.

TABLE A6-3: FLAT GLASS AND THE AQUARIUM

TYPE	DESCRIPTION	AQUARIUM SIGNIFICANCE
CAST GLASS	The earliest and most primitive form of window glass, it was made by casting molten glass as a thick slab onto a bench or flat surface, often within a mold. It was also later used as the base material for plate glass production, prior to hand or machine polishing and finishing.	This glass was more translucent than transparent. Although some authors ascribe its use in the aquarium to the 1st Century AD, there is no evidence that shows this to be true.
CYLINDER GLASS	This was a handmade mouth-blown glass made by blowing a bottle-shaped cylinder and removing the two ends. The cylinder was then cut, reheated, and unrolled to produce a flat piece of glass that was then annealed slowly. It is characterized by a naturally distorted movement without pattern.	This was the predominant type of glass used for smaller aquaria between the 1840s and 1915.
CROWN GLASS	This was a handmade mouth-blown and spun glass, made by first blowing a sphere that was then opened out at one end and spun into a flat disc. Several panes of crown glass could be cut out of each disc. It is characterized by a curvilinear, naturally distorted movement. Often the panes are slightly bowed as a result of a secondary annealing process.	Of little interest in the history of the aquarium, although in 1860 David Cheever recommended thick crown glass as an alternative to plate glass.
POLISHED PLATE GLASS	This was slab glass, ground and polished on both sides. Although expensive, it was truly flat.	It saw its first use in aquaria in the mid 19th Century and, until the introduction of float glass, this was the predominant glass used in aquariums over 15-gallons. It was frequently used in smaller aquaria as well.
DRAWN SHEET GLASS	First produced in the early 20th century, this was a machine-made glass drawn vertically out of a glass furnace in sheet form between rollers. It is characterized by some movement in the glass in the vertical plane, but is of consistent thickness and flatness.	By 1928 this glass had completely replaced cylinder glass in smaller aquaria.
FLOAT GLASS	Introduced in 1959, this is the ubiquitous glass of today, made by floating molten glass over a bed of liquid tin. It is a truly flat, functional glass.	Float glass replaced both plate glass and drawn sheet glass for all sizes of aquaria. It is now the only glass used in aquaria.



Figure A6-25. ANOTHER MODERN AQUARIUM GLAZED WITH FLOAT GLASS.

ent panel members interconnected by joints along adjacent outwardly divergent non-parallel edge surfaces of the panel members, each joint including a translucent room temperature vulcanizing plastic adhesive fillet adhered to the adjacent edge surfaces whereby the panels are secured together along the joints forming a water-tight light transmitting seal between the panels along the joints and permitting substantial relative movement between the panels along the joints for compensating for irregularities in the adjacent edge surfaces while retaining a water-tight condition along the joints."

Texas was also the genesis of an all-glass design patented in 1973 to Barry W. Battershall and William F. Hoffman of Plano, Texas. Although this too was for an all-glass design, it was awarded on the basis of the introduction of lateral and cross braces on the long sides of the tank: "The general purpose of this invention is to provide a frameless aquarium which embraces all the advantages of similarly employed frameless aquariums and possesses none of the afore described disadvantages. To attain this, a system of lateral and cross braces are utilized in conjunction with thin aquarium walls so that the breakage of the walls is prevented." The patent had in mind aquariums greater than 50 gallons (Figure A6-24). Unlike Callan's, the joints shown in their drawings are butt joints. The Hall patent (Saginaw, Michigan) of 1973 and the Samuel Shalom patent (New York City) of 1975 were for all-glass tanks that had top and bottom frames somewhat characteristic of today's aquaria (Figure A6-24), although the latter had an inner lip.

It might be thought from the foregoing that the frameless, all-glass aquarium was an invention of the 1970s. This, however, a misconception and I direct the reader's attention now to the February 1888 issue of THE LADIES' HOME JOURNAL containing an article entitled, "Making a Home Aquarium," by J. Oliver Nugent.

The magazines of the day, like the newspapers, tended to be large and THE LADIES' HOME JOURNAL was no exception, measuring a whopping 16 inches high and 11 inches wide, and containing 38 pages. Finding themselves in a surprise rain shower, a woman could open up such an issue and hold it over her head as a

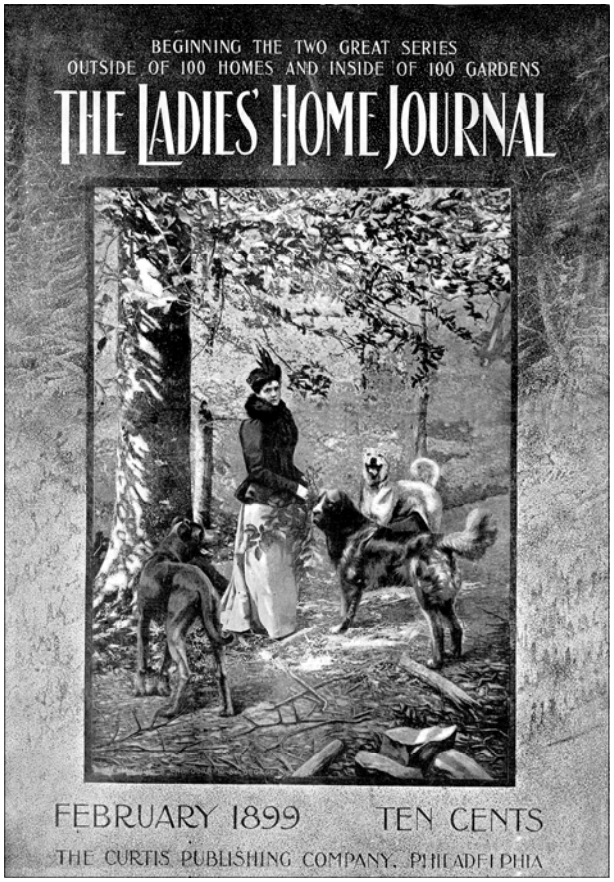


Figure A6-26. FRONT COVER, LADIES HOME JOURNAL, FEBRUARY 1888.

substitute umbrella affording protection even for those enormous hats of the period! The accompanying images show both the front and rear covers of this issue, the rear cover featuring a full page ad for a corset designed for the "Five Million Stout Women in America." In this regard, perhaps things have not changed all that much. The ad reads in the fine print,

> "Whom Nature has endowed with a superabundance of flesh, who are seeking a corset that affords all necessary support, and at the same time provides perfect comfort, should wear ROYAL WORCESTER CORSET, THE DOWAGER STYLE 550. A positive boon for fleshy women, and at a price within reach of all."

Advertisers evidently didn't mince words!

This particular issue contained several delightful articles including "Food for Men and Women Over Fifty, "What it Means to be Engaged, and, the article in question, "Making a Home Aquarium." The article is quite detailed and has a few surprises. Most aquarists would assume that today's all-glass frameless tank is a relatively new on the aquarium scene but the article actually describes the construction of a frameless tank, albeit using "crockery mender" in lieu of silicone. There were a number of adhesives that were sold (or made at home) under this name and the article gives no indication as to the kind used. However, the following are two very common recipes taken verbatim from the book, *Dr. Chase's Recipes; Or, Information for Everybody: An Invaluable Collection of About Eight Hundred Practical Recipes*," published by A. W. Chase, M.D. in 1864:

"Russian Cement

"Much is said about cement; but there is probably nothing so white and clear, and certainly nothing better than the following: Russian-isinglass dissolved in pure soft water, snow water is best; for it takes 12 hours to soften it by soaking in pure soft water, then considerable heat to dissolve it; after which it is applicable to



Figure A6-27. FRONT COVER, LADIES HOME JOURNAL, FEBRUARY 1888.

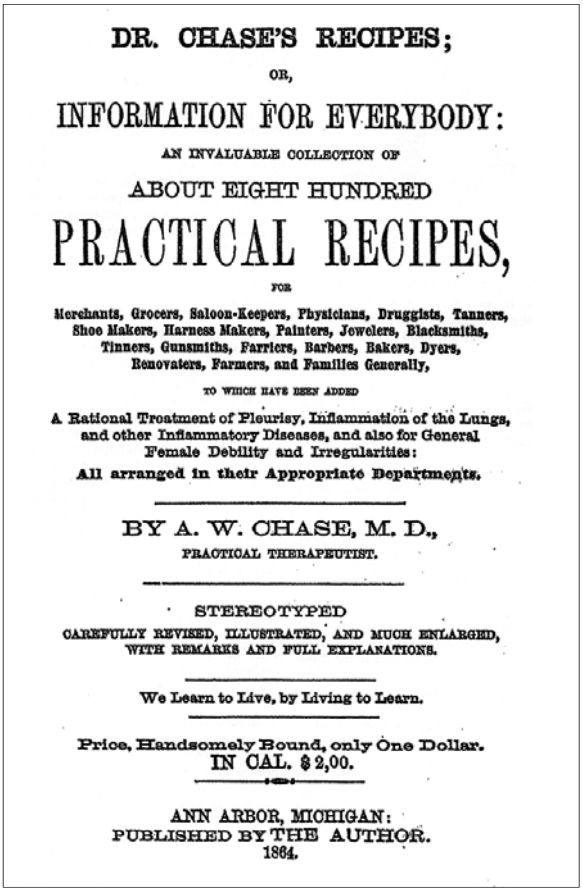

DR. CHASE'S RECIPES;
OR,
INFORMATION FOR EVERYBODY:
AN INVALUABLE COLLECTION OF
ABOUT EIGHT HUNDRED
PRACTICAL RECIPES,
FOR
Merchants, Grocers, Saloon-Keepers, Physicians, Druggists, Tanners, Shoe Makers, Harness Makers, Painters, Jewelers, Blacksmiths, Tinners, Gunsmiths, Farriers, Barbers, Bakers, Dyers, Renovaters, Farmers, and Families Generally,
TO WHICH HAVE BEEN ADDED
A Rational Treatment of Pleurisy, Inflammation of the Lungs, and other Inflammatory Diseases, and also for General Female Debility and Irregularities:
All arranged in their Appropriate Departments.
BY A. W. CHASE, M. D.,
PRACTICAL THERAPEUTIST.
STEREOTYPED
CAREFULLY REVISED, ILLUSTRATED, AND MUCH ENLARGED, WITH REMARKS AND FULL EXPLANATIONS.
We Learn to Live, by Living to Learn.
Price, Handsomely Bound, only One Dollar.
IN CAL. $2,00.
ANN ARBOR, MICHIGAN:
PUBLISHED BY THE AUTHOR.
1864.

Figure A6-28. "DR. CHASE'S RECIPES," 1864.

statuary, china, glass, alabaster, &c., &c.

"In all cements the pieces must be secured until dry. It is easy to reason that if twelve to fifteen hours are required to soften this isinglass that no dish-washing, will ever effect (*sic*) it. You may judge from the price whether you get the Russian, for thirty-seven cents per ounce, is as low as the genuine article can be purchased in small quantities, whilst the common, bear a price of only from ten to twelve cents, and even less."

(***Author's Note:*** **Russian isinglass is a fish glue but unlike ordinary fish glue, which is prepared from the waste products (heads, trimmings, and bones), Russian isinglass is prepared by using only the inner membrane of the air bladder of the sturgeon. The sevryuga (*Acipenser stellatus*) and the osëtr (*A. güldenstädtii*) yield the best Russian isinglass.)**

"Cement, Cheap And Valuable

"A durable cement is made by burning oyster-shells and pulverizing the lime from them very fine; then mixing it with white of egg to a thick paste and applying it to the china or glass, and securing the pieces together until dry.

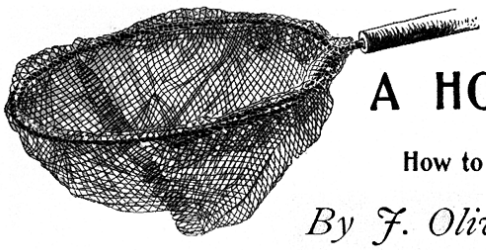
"When it is dry, it takes a very long soaking for it to become soft again. I have lifted thirty pounds by the stem of a wine-glass which had been broken, and mended with this cement. Common lime will do, but it is not so good; either should be fresh burned, and only mix what is needed, for when once dry you cannot soften it."

It should be noted that although crockery cement could be subjected to water for fairly long periods without softening or dissolving (so mended crockery could be hand-washed), it could not withstand the long periods that would be experienced in the aquarium and so the joints of the aquarium had to be isolated from water; this was the purpose of the white lead. The white lead used was generally a mixture of lead carbonate and lead hydroxide, ground into a fine powder and mixed with linseed oil. To protect the fish, therefore, the white lead was coated with an asphaltum varnish. Aquarists of the day had to be careful using white lead since it was also toxic to humans if inhaled or ingested.

The leatherette (originally a trademark, it was a covering fabric produced from a strong, machine-glazed base paper, which was coated and embossed, or printed and embossed, in imitation of grained leather) used to bind the corners of the aquarium mentioned in the article provided no significant support as its purpose was primarily cosmetic to hide the asphaltum-covered white lead.

The plants of the days were native plants collected locally. The "Mermaid weed" mentioned in the article is *Myriophyllum*. The triton alluded to is one of the common aquatic salamanders of the genus *Triturus*. Although not specifically identified, judging by the plants and other animals mentioned the fish intended for this aquarium were undoubtedly native fishes or possibly goldfish.

An interesting aspect of the advice given concerns the feeding of crackers and raw beef. In reality, this is a fairly well-balanced diet that would have suited the omnivorous native fishes of the day quite well. The following is the complete article by Nugent:



MAKING A HOME AQUARIUM

How to Construct, Stock and Keep One

By F. Oliver Nugent

"Many people make the mistake of buying a globe in which to keep fish. This form of aquarium is not suitable for the purpose; it distorts every object placed in the water, and subjects a fish to a change of shape and size with every movement. A square or oblong tank is preferable. Any one wishing to build a tank should first decide upon the size; then get five pieces of glass, which, when put together, will form a box of the required dimensions. Plate glass from an eighth to a quarter of an inch in thickness is strong enough for any tank.

"Measure the pane of glass to be used for the bottom, and obtain a piece of well-seasoned wood from one to two inches longer and wider than the measurement of glass, and about one inch and a half thick. Then buy ten cents' worth of white lead and a bottle of some good crockery mender to use as cement. An eighth of a card of leatherette is needed to bind the corners. You will need, also, a piece of fine wire to go around the tank, and ten cents' worth of asphaltum varnish.

"Build the tank in the following manner: Place the piece of glass which is to be used as the bottom in the centre of a board, and mark the exact size of glass on the board. Stand the sides upright, care being taken to hold them perfectly still, and run the pencil closely around the outside of them; then with a rule carry the lines out to the edge of the board. Saw a groove between the lines about half an inch deep. Smear the under side of the bottom piece of glass with crockery cement and place in position on the board as shown in Figure 1.

"Lay a heavy weight upon it for five minutes. During this process take enough white lead to fill the grooves and fasten the corners. Pour in a little crockery cement and mix thoroughly. Smear with pure crockery cement the edges of the glass already fixedto the board, gently, so as not to move it. Fill the grooves with the mixture of white lead and cement; smear the bottom and the two end edges of each side piece with crockery cement and press them into the grooves, as illustrated in Figure 1.

"Tie a piece of strong twine around the outside to keep the corners close together, and measure the depth of the tank on the inside and cut four strips of leatherette, an inch in width, the exact length. Crease them in the centre, allowing the right side to face in. Give them a coating of white-lead mixture, and place them all of the corners. Figure 2 shows the glass sides in position.

"Cut four more strips about an inch longer. Crease with the right side out, then take off the

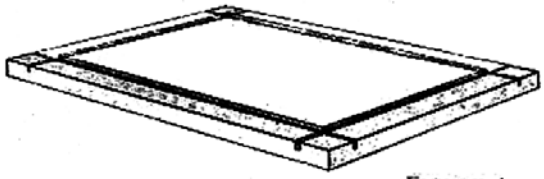


FIGURE 1

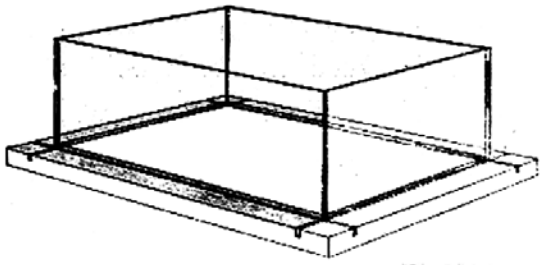


FIGURE 2

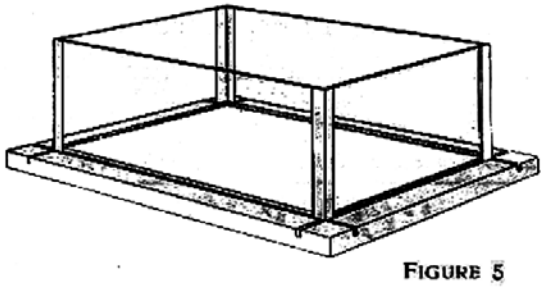


FIGURE 5

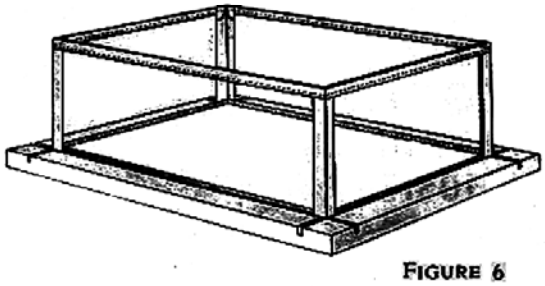


FIGURE 6

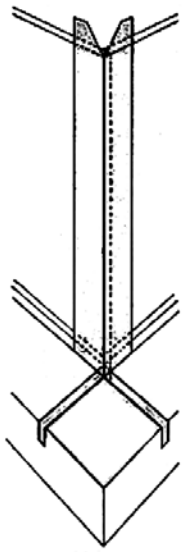


FIGURE 4

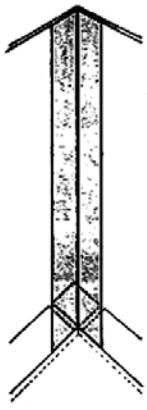


FIGURE 3

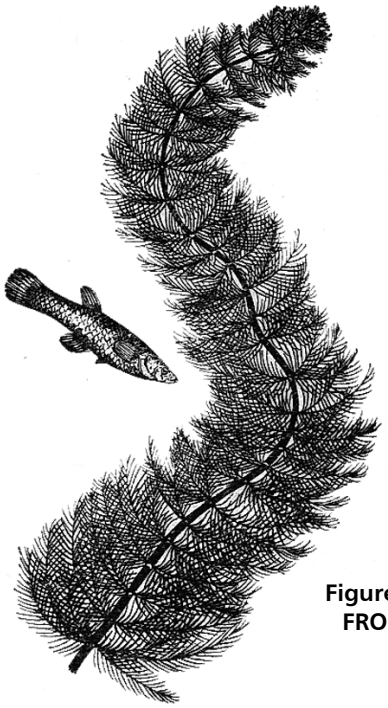
Figure A6-46. FIGURES FROM THE NUGENT ARTICLE.

twine, coat strips with lead mixture, and place them on the outside of the corners. Figure 3 shows the tape on inside corners.

"Cut a V-shaped piece in the upper end, and turn the ends over so as to end on the inside. Hold tightly in place. Figure 4 shows the tape on outside corners.

"Now wind a piece of fine wire about the outside and cover this with a strip of leatherette. Run along the seams at the bottom of the tank inside and outside with some of the white-lead mixture, and allow it to dry for at least three days. Figure 5 shows the tank with all of the corners bound.

"After making sure that the white lead is thoroughly dry, clean the corner strips and glass. Next give the corners, seams and board a coating of asphaltum varnish. This must be most carefully done, as white lead is poisonous to the fish. Figure 6 represents the tank when it is entirely finished.



MERMAID WEED



SAGITTARIA

Figure A6-29. FIGURES FROM THE NUGENT ARTICLE.



NITELLA



SMALL BLADDERWORT



HORNWORT



WILLOW MOSS

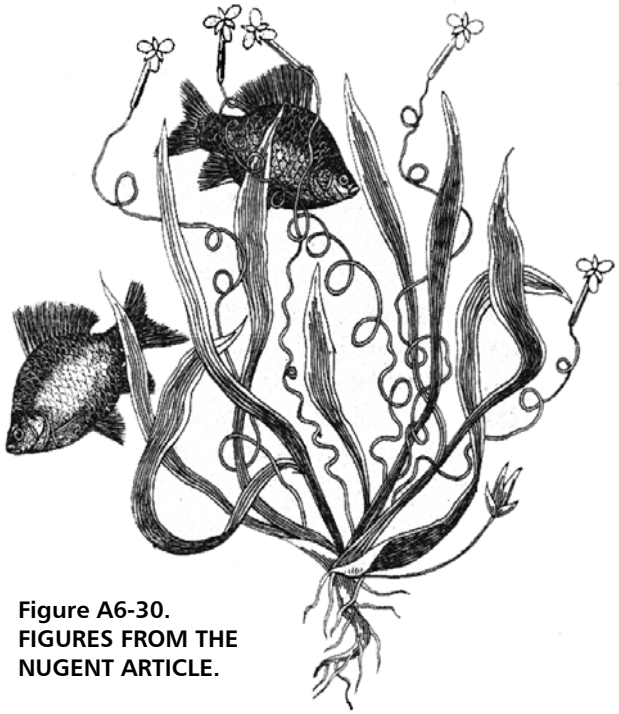
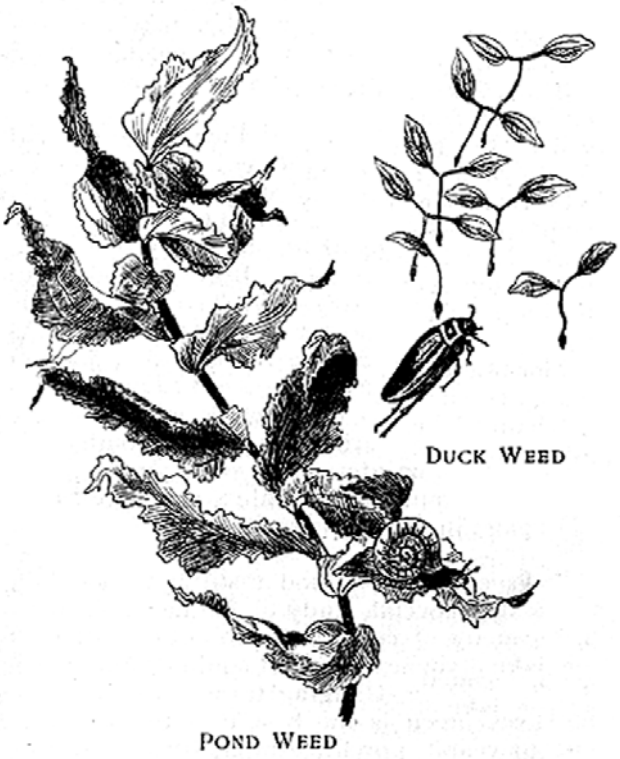


Figure A6-30. FIGURES FROM THE NUGENT ARTICLE.

TAPE GRASS (VALLISNERIA)



"It is always a good rule to fill the tank with water after it has been varnished, and let it stand over night, to remove any free particles of dust, etc. Plenty of work will be found to do while your tank is drying—collecting sand, building arches, and making a net with which to catch specimens of fish.

"A good net may be made by taking a piece of stout wire, forming a loop by twisting one end, running thy other end into a stick, and sewing a piece of mosquito netting to the wire. The sand and pebbles for the aquarium may he collected from the bed of a stream. The arches may be built of any kind of rock and pebbles stuck together with cement.

"Any plant which grows in streams or ponds, or upon their margin, is suitable for the aquarium. One of the most decorative is Mermaid weed. Tapegrass may be found in any slow-running stream.

"The little Bladderwort may be known by its cluster of yellow flowers. Willow moss is extremely useful. The Hornwort is decorative. Pond weed makes a resting place for the insects. Nitella may be found at the bottom of ponds. There are eight kinds of Sagittaria found in this country; of these *Sagittaria natans* is the most satisfactory for the aquarium.

"When the tank is thoroughly clean and dry you may prepare the bed of your aquarium. The sand, thoroughly cleaned, should be distributed evenly upon the bottom of the tank to the depth of two inches or so. Over this strew a layer of pebbles, and place your arches and plants in position. If you find that the plants are insecure a small quantity of clay should be fastened to their roots, besides weighting them with pebbles. Then pour in the water. Never use boiled water.

"While filling, place our left hand, palm up, near the sand, and pour the water gently over your palm, so that it will trickle down without disturbing the roots or washing up the sand. Keep your hand just above the water and gradually fill the tank to within two or three inches of the top. A piece of thin, smooth wood should now be used to disengage and float out in a natural way the foliage of the various plants. The

water in the tank will evaporate according to the temperature; when it evaporates an inch add an equal amount of water. If rightly stocked with animal and plant life it is seldom or never necessary to change the water.

"Before putting in the fish, drop in a few common pond snails and tadpoles. These will consume the decaying vegetation.

"As the tritons feed upon the minute parasitical insects that injure aquatic plants they are really useful in the aquarium. The frog is a relative of the triton, and, in a tadpole state, the two cannot easily he distinguished; as they grow, however, the difference is apparent. Among insects, the boatfly is worth having. You will find him in any stagnant pond. The margined beetle is also quite useful.

"The animals and fish should be fed at a certain hour every day with a few small pieces of cracker. Once a week a small piece of raw beef impaled on a straw should be given to each. If the beef is dropped into the water there is always the danger that one or more greedy fellows will seize it all."

The evolution of glass used for aquariums spans an astonishing period of nineteen centuries, with the last two and a half centuries being the most dramatic and momentous. Whereas the glass of yesteryear suffered from distortion and lack of clarity, today's glass is, as they say, "picture perfect." Changes in the manufacturing process not only produced better glass, but cheaper glass as well. In conjunction with improvements in sealants, the aquarist of today is able to produce aquarium designs that, in their own way, rival the development in the past fifty years of computers, television, and space travel.

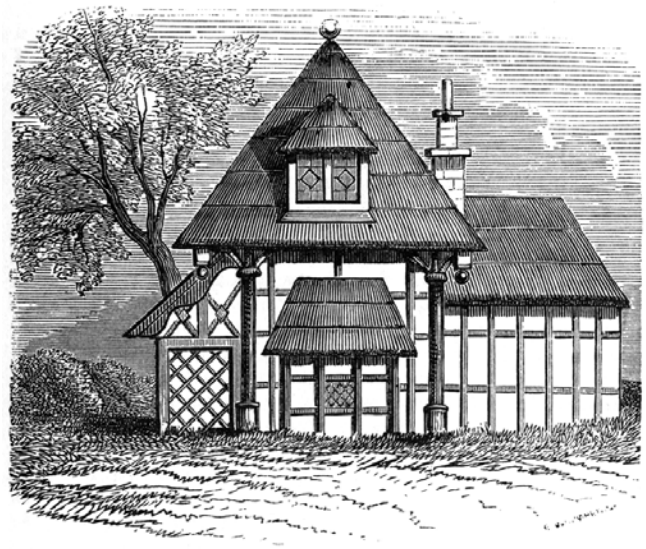


Figure A7-1. SKETCH OF A GARDEN TOOL HOUSE AND READING ROOM FROM *The Amateur's Flower Garden*, 1871.

A7. THE HORTICULTURAL AQUARISTS

Although we as aquarists know Shirley Hibberd from his aquarium books, it is in an entirely different area for which he is universally recognized, for more than anything else he was a horticultural journalist, writer, experimental gardener, and even social reformer (in 1864 he observed that nightingales were still in Stoke Newington, although 'all around the builders are drawing a close cordon of bricks') and must be given credit for bringing ornamental gardening to the masses.

James Shirley Hibberd was born in 1825, at Stepney in Middlesex, just east of London. His mother might perhaps have been a member of the East End's property owning Shirley family, which may explain why he chose to abandon his first name, preferring to be called Shirley. Hibberd's father was a retired sea captain who had other ambitions for his son, namely medicine. But as his father died young, Shirley was only fourteen when his father died, money was short and the young Hibberd was apprenticed to a local bookseller, although he also became a self-taught chemist. After plying this trade for a short while, he had a short spell as a book-binder. In his early years

he joined a small band of social reformers for whom he wrote on war, temperance and vegetarianism (*Porphyry on Abstinence from Animal Food…*,1851; and *An Epitome of the War, from its outbreak to its close*, 1856). He also wrote short essays and pieces of poetry (*Summer Songs* and *Brambles and Bay leaves: essays on the homely and the beautiful*, both in 1855). Before his twenty-fifth birthday he had become editor of a weekly newspaper to which he contributed regular essays. He remained a vegetarian, which was rather unusual at that time.

In 1856 Hibberd wrote two books concerning the aquarium, i.e., *The Book of the Fresh-Water Aquarium* and *The Book of the Marine Aquarium*. These were combined in the same year and published as T*he Book of the Water Cabinet: or, practical instructions on the formation, stocking, and management ... of cabinet collections of river insects and microscopic plants*. Later in the year he wrote his most famous – at least to aquarists – book, *Rustic Adornments for Homes of Taste*. This remarkable book was the most "social" of all his works, as the following quote shows:

"In the Rustic Adornment of the home, it does not require a princely fortune to set up a vase of flowers, or an Aquarium, or a stand of bees that sing to their master all day long, and entrap every spare moment of leisure he is able to shepherd them. He who sets out his garden in accordance with correct principles of taste, will find in it as much amusement, and as genuine a solace from the cark and care of life, as if it were a domain of thousands of acres, perhaps more so. For it is his own work, it represents his own idea, it is a part of himself, and hence redolent of heart-ease."

This 500-page book suggested an entire range of creative and interesting pursuits outside, and indeed inside, the "Home of Taste," and covered such items as aquariums, plant cases, floral ornaments, rockeries, and ferneries. Other books had been written on such subjects, but Hibberd's succeeded by gathering all the ideas into one volume. Even if some of the accessories he suggested - aviaries, beehives, and ornate summerhouses - were absurdly grand for diminutive urban gardens, they were, he said, affordable for people of narrow means. Thus, even the working class could experience and be improved by the pleasure and dignity of garden culture. In its third and final edition, half of *Rustic Adornments* is about the home itself, with plants, flower arrangements, birds and aquaria. Here are the Victorian houseplants, many familiar today, and especially the closed Wardian Cases which maintained moist, pollution-free air within their ornate glazed structures. The other half is about the outside garden.

With the exception of updates of *Rustic Adornments*, and *The Seaweed Collector: a handy guide to the Marine Botanist* published in 1872, Hibberd left the aquarium scene. Hibberd did not originally set out to be a horticultural writer. That came about partly because of personal circumstances. He and his wife Sarah, who was a semi-invalid with a weak heart, had no children. If there was an emptiness in their lives she compensated for it by making their small house in Pentonville, North London, a menagerie, with pets of every description, while James energetically worked off his professional literary frustrations by exerting himself in the garden.

When his literary career did successfully take off in

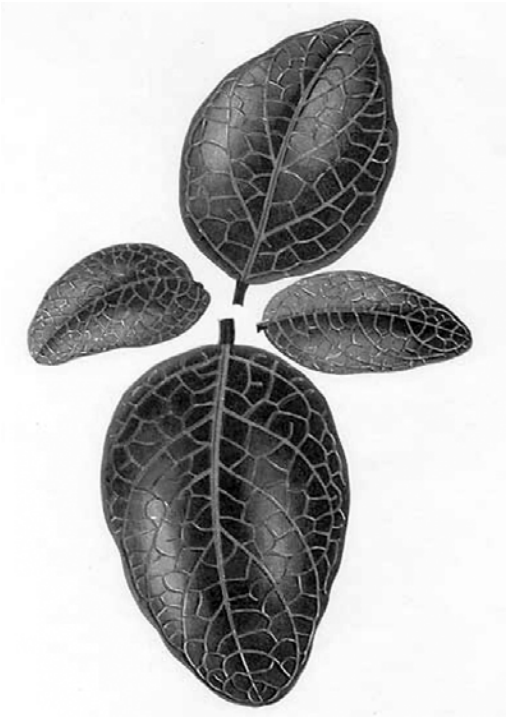


Figure A7-2. *Acanthus Gymnostachum Verschaffelti* FROM *Beautiful Leaved Plants* (1869) BY SHIRLEY HIBBERD.



Figure A7-3. LEFT: POPPY; RIGHT: TULIP.
From Shirley Hibberd's Familiar Garden Flowers, 1894.

1855, it was largely due to *The Town Garden*, a book published that year and largely based on his experiences of starting and cultivating the Pentonville patch. The enthusiasm with which it was greeted revealed that he had tapped into a broad and previously overlooked vein of eager amateur gardeners. These were the lower middle classes, who lived in the terraced and semi-detached houses between the city offices and the suburbs. This was the world of frugal, upwardly mobile clerks who, though decent and ambitious, were lampooned by the working classes for their aloofness, and sneered at by the suburban middle classes for their clumsy lack of social grace.

In 1858 he became editor of a new magazine called THE FLORAL WORLD, and in 1861 of one named THE GARDENER'S WEEKLY MAGAZINE AND FLORAL CABINET, which later became THE GARDENER'S MAGAZINE. He continued in the first post till 1875 and the second until the day of his death. In 1884 he became the first editor of AMATEUR GARDENING, but he held that post for only two years.

Pentonville was being built up (it is now part of North London) so he moved shortly afterwards to Stoke Newington, then still a rural village (it also is now part of North London), and his gardening career began in earnest. Here Hibberd set out to tackle the problems of urban and suburban horticulture. His new garden was an oblong strip, 282 feet long and 36 feet wide, and he ran a plan of it in the first volume of THE FLORAL WORLD. Issue by issue readers were informed with anecdotes and stories of his progress in transforming the unpromising site into a Shangri-La. Hibberd received so many letters from people wishing to visit this horticultural soap opera that he had to put a note in the magazine declaring it was an experimental plot not open to the public.

Apart from revision to *Rustic Adornments*, a volume called *Clever Dogs and Horses* (1868) and *Field Flowers* (1870), Shirley Hibberd's books from this point on were all mostly horticultural. After *Rustic Adornments* came his most important garden books: *Garden Favorites* (1857); *The Rose Book* in 1864; *The Fern Garden*, 1869; *New and Rare Beautiful-leaved Plants*, 1868; *The Amateur's Flower Garden*, and *The Amateur's Greenhouse and Conservatory*, 1871; *The Ivy*, 1872; *The Amateur's Kitchen Garden*, 1877; *Profitable Gardening* (1878), and *Familiar Garden Flowers*, a series, from 1879 on. Of these, *The Fern Garden* is important in that it reflected the current interest in ferns (the book went into eight editions) and also related to an episode in Hibberd's life. He had a lean-to Greenhouse on the west side of his dwelling that he used for tender plants. A neighbor built upwards and blotted out the afternoon sun, so that, to quote Hibberd, "the house became unfit for flowering plants. Instead of bringing an action against the neighbor who devoured my sunshine, I brought an action against myself, and the verdict was that the shady house should forthwith be converted into a fernery."

Besides his writing and editing, Shirley Hibberd was involved with many local horticultural societies and several national ones, notably for florists' flowers like the primrose, carnation and chrysanthemum. But he was essentially a practical man and his books are largely based on his own experience. At Stoke Newington he perfected the "plunging system" for producing a continuous display in a limited area by changing plants as they went out of flower—an intensive method needing resources out of sight, which led to Hibberd's collecting hollies, ivies and other ever-

greens for winter display.

As well as his home garden he laid out others nearby; one devoted to vegetables, one to fruit culture, and one to roses. He ran trials of vegetables and bred some of them, producing, for example, "Hibberd's Prolific Vegetable Marrow. His knowledge of potatoes led the Government to consult him at the time of the Irish potato famine, He compared systems of grafting, training and pruning fruit trees, perhaps his favorite subject, and carried out what were in effect precursors of the trials of new rose varieties now run by the Royal National Rose Society.

In his later years Hibberd involved himself increasingly with the Royal Horticultural Society and he was in great demand as a judge and lecturer. To quote the JOURNAL OF HORTICULTURE, "as an after-dinner speaker at festive gatherings of horticulturists he was perhaps without rival". Posthumous accolades testify to a "vast store of general knowledge and fund of literary and artistic information", and cite him as "a voracious reader, and for style as a writer with no equal in the horticultural press."

During his life Hibberd had been depicted by contemporary horticulturists as being the wildest of eccentrics. He was a teetotaler and a vegetarian at a time when it was regarded as odd to refuse alcohol, and excessively Bohemian to be vegetarian. An animal lover, he wanted cattle to be treated more humanely in slaughterhouses. In garden warfare he was a pacifist who refused even to discourage birds or grubs, regardless of how much damage they might do. There were other ideas by which - such was his reckless fearlessness - he exposed himself to ridicule. These included his advocacy of such gardening innovations as holding fruit branches down with weights to avoid the need for pruning, and growing potatoes on tiles.

From the foregoing one gets a picture of a correct but tolerant man who remained a pillar of the society in which he had involved himself. One eulogy described him as a "kindly and generous man", and he certainly involved himself with the charities associated with gardening. But he had another side to him; he could at times be malicious. In the 1860s, for instance, Hibberd described Andrew Murray, assistant secretary of the Royal Horticultural Society, as the "whitey-brown man" and suggested that a statue of him in mud should be erected among the marble statuary in the Society's South Kensington Garden. This term "whitey-brown man" was originally used to describe British people who lived and worked in India but it is hardly complimentary as is demonstrated by the following quote from Aberigh-MacKay's 1914 book, *Twenty-One Days in India*: "And sometimes the whitey-brown man is objectionable. He is vain, apt to take offence, sly, indolent, sensuous, and, like Reuben, 'unstable as water.' He has a facile smile, a clammy hand, a manner either forward or obsequious, a mincing gait, and not always the snowiest linen. [In very dangerous cases he has a peculiar smell.]"

Walter Page Wright, the founding editor of the magazine POPULAR GARDENING, and a prolific writer at the beginning of the 1900's, described him as pugnacious, dogmatic and self-opinionated. This led to difficulties with William Robinson (1838–1935), a professionally trained gardener who also became a writer and journalist and until the 1870's a good friend of Hibberd's. Rivalry over the magazines they each edited became an unresolved feud, even though their magazines addressed different audiences. While Hibberd wrote for middle-class amateurs in the suburbs, Robinson's THE GARDEN and GARDENING ILLUSTRATED catered to wealthier gardeners with trained staff. Although it is probably true to say that Hibberd sometimes showed the characteristics attributed to him when engaged in editorial diatribes, to his friends and associates he was a pleasant person, as indeed most of his writings sug-

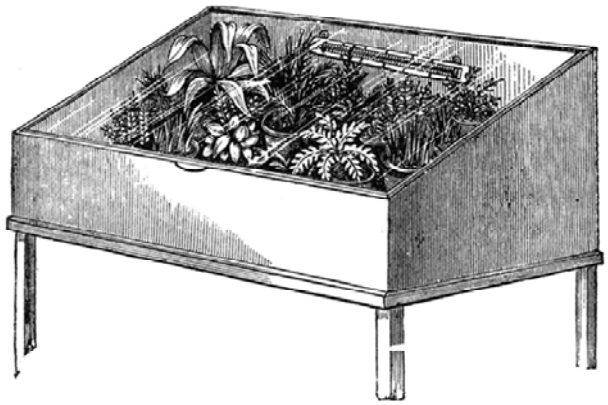


Figure A7-4. A PORTABLE PROPAGATING TABLE, from *The Amateur's Flower Garden*, 1871.

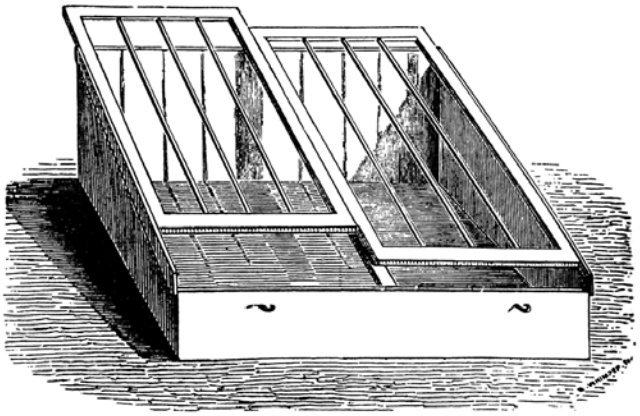


Figure A7-5. FROM *The Amateur's Flower Garden*, 1871.

gest.

In September 23, 1890, Hibberd was called upon to read his paper on the origin of the florist's dahlia (the term Florist at this time meant growers and hybridizers who were interested in improving the flower) at a conference on Dahlias of the Royal Horticultural Society at the Chiswick Gardens. Hibberd died shortly after the conference, although his talk was published in its Proceedings the following year. The following is a short excerpt from his talk, showing his scholarly approach to the subject, an approach that was also manifested in his writings about the aquarium.

> "The first description of the Dahlia occurs in Franciso Hernandez treatise on *The Plants and Animals of New Spain*, Published at Madrid in the year 1615. For 130 years we hear no more of the Dahlia, when it turns up again in 1787 in connection with an interesting event. Nicholas Joseph Thierry de Menonville was sent to America by the French Government of Louis XVI to obtain the cochineal insect and the plant it subsisted on. His instructions were that he was to secure it and the ethics of the case appear to have been of the ancient diplomatic order.
>
> "The expedition was successful; the cochineal was secured. In 1787 Menonville published an account of it, adding many particulars of other things he had seen or heard of. Amongst events of interest, he had seen, in a garden at Guaxaca, flowers that he described as large as Asters, on stems as tall as a man, with leaves like those of the Elder tree. Clearly he had seen single Dahlias in Mexico, and the florists of that place and time were content to grow single flowers, and possibly doted on them."

After the death of his first wife, who had shared his horticultural interests, died in 1880, Hibberd found happiness again in 1884 when he married his cook, Ellen Mantle. Aged twenty-eight, she was thirty-one years his junior. This lady also passed on, apparently in childbirth, leaving him with an infant daughter who was but five when he died. Apart from this child of his second marriage, he had no relatives. However, some 200 friends and admirers attended his funeral. Hibberd was only 66 years old at his death and since his more famous gardening contemporaries – William Robinson and Gertrude Jekyll – survived well into the Twentieth Century, they are better remembered. It is ironic that Hibberd's name is perhaps more familiar today to students of aquarium history than it is to stu-

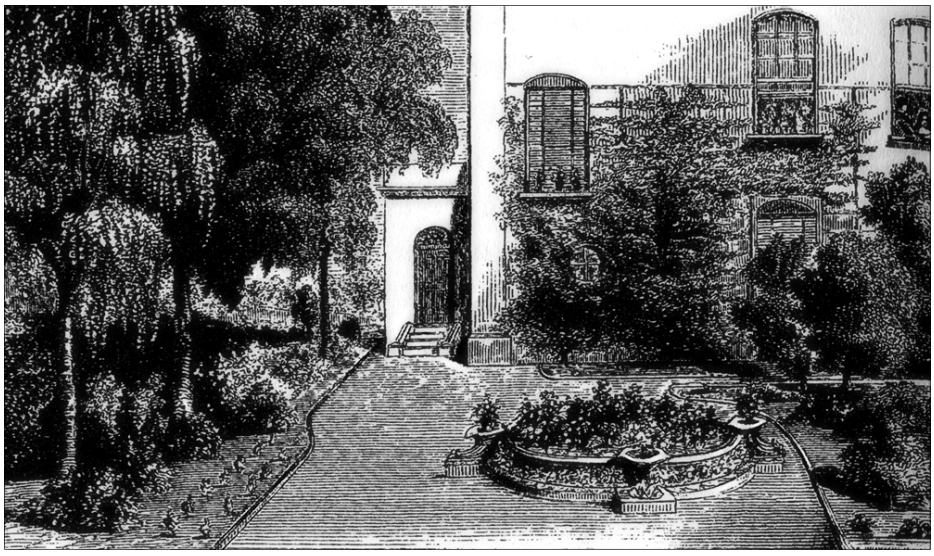


Figure A7-6. HIBBERD'S CELEBRATED HOUSE AND GARDEN IN STOKE NEWINGTON.

dents of gardening history. His opinions were influential and his name a household word. Yet the social world of gardening was such that his championing of the lower middle classes in the suburbs soon led to his being patronized and overshadowed by more fashionable writers, and he was later unfairly airbrushed out of the history books.

I have previously mentioned that one of Hugo Mulertt's duties as Curator at the Packard Institute in Brooklyn, N.Y. was to care for its one-half acre garden. In November 19, 1899 the following article appeared in the BROOKLYN DAILY EAGLE.

"JAPANESE OUTDONE IN DWARFING TREES

Hugo Mulertt Grows Pigmy Maples As Japs Raise Little Pines And Cedars

SECRET IS IN 'STARVATION'

Maples 12 Years Old, 6 Inches To 2 Feet High, Have Exquisitely Beautiful Foliage Of Many Hues

"Hugo Mulertt, curator of Packer Collegiate Institute, has mastered the Japanese art of dwarfing trees so thoroughly that he could grow a whole forest in a hall bedroom and yet not crowd the furniture.

"With the Japanese the art of dwarfing trees is very old - so old that quantities of trees three and four centuries old are now in existence, living testimonials to the skill of many generations of gardeners. For in the land of the Mikado tree training is a hereditary occupation. Cedars and pines are grown from the seed to any size desired and then stopped. Thenceforward the tree exists, healthy and vigorous enough, but never getting any larger. These miniature trees are trained into any shape desired. Sometimes fantastic shapes are cultivated; again the dwarfs are trained into close copies of famous trees in the empire. The trees are grown pots of different sizes and shapes, no two alike. The shape of the pot is always chosen with a view to harmonizing with the shape into which the tree is to be trained.

"Often the Japs form miniature landscapes with these dwarf trees. Some famous mountain is copied in a mound a few feet high. The surface is carefully sodded and the trees arc placed in position, the pots in which they are grown being carefully sunk out of sight in the sod. Then with a tiny rill to represent a river and a china house or two the living picture is complete.

"These dwarf Japanese trees have recently become the rage in New York and Brooklyn. Some enterprising Japs imported a quantity of them. They made an immediate hit. Some very fine specimens have been sold on this market at



Figure A7-7. FROM LEFT TO RIGHT: MULERTT'S JAPANESE DWARF TREES - Pine 25 years old, 12 inches from bottom of pot to topmost bough; Cedar 100 years old, 12 inches from bottom of pot to topmost bough. Mulertt's American Dwarf Trees - Maple 25 years old, 12 inches from bottom of pot to topmost bough, six varieties grafted on one trunk; Red Lace Maple 19 years old, 25 inches from bottom of pot to topmost bough, six varieties grafted on one trunk.

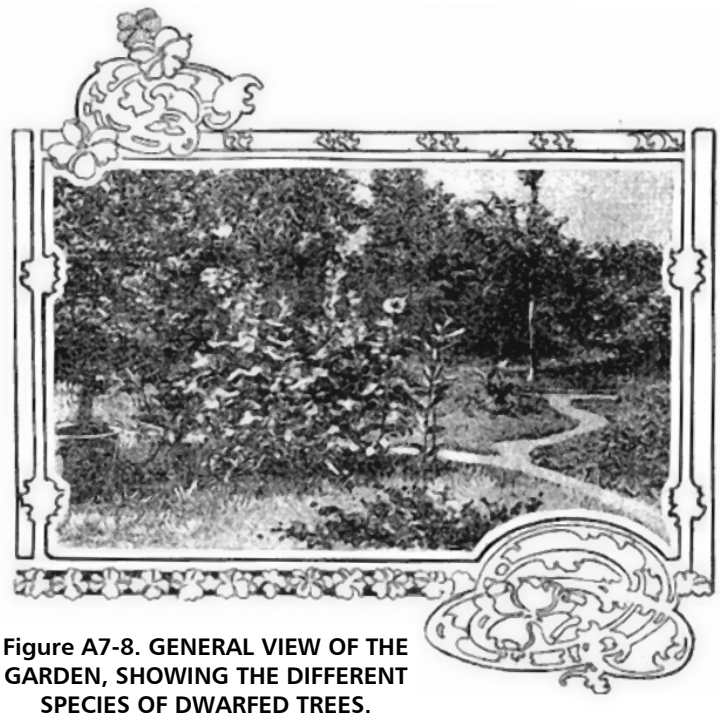


Figure A7-8. GENERAL VIEW OF THE GARDEN, SHOWING THE DIFFERENT SPECIES OF DWARFED TREES.

fancy prices. One fine tree with an authenticated age of 350 Years was sold for $350, or a dollar for each year of its age. A Brooklyn dealer recently secured a lot of dwarf trees. Included in the lot was a cedar 100 years old and 12 inches high. A pine 25 years old was of the same height.

"The secret of Japanese tree training is said to lie in the skillful pruning of roots and branches. The roots of the dwarf trees are cramped is small pots, on the same principle that the feet of Chinese women are stunted. In addition, the trees are periodically taken out of the pots to have their roots trimmed. The gardener's skill is displayed in trimming just enough to prevent growth, yet not enough to impair the health of the tree. It is said that in the course of a hundred years or so these pygmy trees become so accustomed to having their roots trimmed that they really enjoy it, and when the time approaches for the periodical pruning they wave their little limbs in eager appeals to the gardener to take them out and clip their roots. This part of the story, however, is not vouched for; it is merely given for what it is worth.

"While the Japanese confine their efforts largely to evergreens, Mr. Mulertt has made a specialty of dwarfing deciduous trees. He has some fifty specimens, principally maples, but also including larches and bamboos, all twelve years old and from 6 inches to 2 feet high. Mr. Mulertt is an enthusiastic botanist. Twelve years ago he learned of the skill of the Japanese in dwarfing trees and at once resolved to try it. Since then he has made it a hobby. Mr. Mulertt also grows dwarf fish. The method pursued in the cases of both trees and fish are the same and extremely simple. It is nothing, more or less than starvation. At least, that is the way Mr. Mulertt expresses it. In other words, he gives both trees and fish just enough nourishment to keep them alive, but not enough to permit any growth. There is this difference between the treatment given the fish and that for the trees: the trees need pruning; the fish get along without it.

"Dwarf trees can only be grown in pots, for success depends upon confining the roots. The roots must not be permitted to grow too large, for large roots mean a large tree. Occasionally the maples start a shoot out of proportion to the desired size of the tree. These shoots must be trimmed off. After the leaves drop off in the autumn the maples must be carefully laid down and covered first with leaves, and then with earth, but not deep enough to prevent freezing. In fact, the freezing is necessary. The trees are buried to prevent snow and ice from breaking the delicate limbs and destroying the tree. Dwarf bamboos, on the other hand, must not be allowed to freeze.

"These dwarf maples are beautiful in the extreme. The tiny leaves are delicately translucent and very rich in color. Some of Mr. Mulertt's dwarf maples have blood red leaves in spring. In summer they become a rich green and in autumn they change to fiery red. Others have light green and pink leaves.

"One of Mr. Mulertt's rarest curiosities is a maple 12 years old and 16 inches high on which

five varieties of maples have been grafted on one trunk.

"The forms of the leaves of these five varieties differ widely and the difference in coloring is still greater. When in full foliage this tree looks like a bunch of autumn leaves. The effect of these highly colored leaves in a miniature landscape is beautiful in the extreme.

Dwarf trees can be trained into any shape. It is only necessary to tie the limbs rigidly in the position desired and keep them there until they have assumed permanent form. This may require anywhere from three months to three years.

"According to Mr. Mulertt no special skill is required to grow dwarf trees. All that is required is knowledge of plant growth and patience."

This article was followed by the following much more comprehensive one in the July 15, 1900 issue of the BROOKLYN DAILY EAGLE.

"A SECOND VOYAGE TO LILLIPUT
Hugo Mulertt's Interesting Back Yard

"In Hugo Mulertt's back yard at 283 Fenimore street, a person of even dull imagination might believe himself to be in the land of Lilliput. Everything in his landscape garden from the garden as a whole to some goldfish and a dog are dwarfed, except, of course, Mr. Mulertt, and he treats himself as he does his plants, but began so late in life that he had already attained his growth. Except the owner and a few mosquitoes there is nothing but what is in proportion to Swift's diminutive race of beings. If one will but visit this charming little Eden it will not be difficult to identify one's self with Gulliver on his first travel.

"The garden itself, its paths, its shrubs, its fish, its trees, and a dog, all are dwarfed by starvation. It is starvation in one sense, but in another it is merely the absence of over feeding, for while the animal or the vegetable is fed enough to enable it to live, develops and mature, the quantity is sufficiently small to enable them to retain their elfish size. The only thing that the gardener of this extraordinary plot has not been able to dwarf is the mosquitoes. In a manner not entirely unaccountable these pests secure all the nourishment that they desire, and they devour it with an avidity that is by no means pleasing to the visitor. So far from being in keeping with their Lilliputian surroundings, they are of the proportions of Brobdignab, nor does their activity seem to have been diminished by their gluttony. But as all things seem to be compensated for, it is quite in keeping with rule that giant mosquitoes and dwarf trees should he found in one spot.

"It is the theory of Mr. Mulertt that everything in the universe has too much nourishment; that its vitality is uselessly sapped in digesting more food than is required for life and development, and that vegetables and animals, including human beings, would enjoy better health, greater activity and, its the case of men, more peace of mind, by consuming less food than they do at



Figure A7-09. HUGO MULERTT AND HIS DWARFED DACHSHUND.



Figure A7-10. A GROUP OF JAPANESE MAPLE LEAVES FROM HUGO MULERTT'S DWARF GARDEN.

present. The results obtained by the application of this theory in practice to many different forms of life seem to afford evidence of its correctness. Of course there is no way of ascertaining how a tree feels or that it feels at all, for if it has any sensations it is impossible to interpret them; but we can judge of their health from the degree to which they approach perfection of shape, of color, of foliage and of all excrescences. In these respects some of the miniature trees of this garden have been trained and starved to nearly a perfect state. The symmetry of the limbs is as precise as it is beautiful. They spring from the trunk just where they should to produce the most exquisite effect, and the distances between them form a diminishing scale nearly as exact as a geometrical proposition. The foliage is regularly distributed, uniform in size and shape, and of the most beautiful shade of coloring. With all this excellence, of what value is mere bulk? How much more beautiful are these little trees with all their perfection of form and color than a great straggling tree, ill formed and dismally colored!

"Mr. Mulertt's garden is forty-five feet square, and it is safe to say that there are not so many trees and plants anywhere in the world in the sane space of ground. There are more than 125 varieties, to say nothing of the numerous specimens of the same variety. Following are a few of them: 30 roses, 4 peaches, 3 plums, 1 nectarine, 5 grapes, 3 currants, 2 strawberries, 1 gooseberry, 13 bamboo, 8 maples, 3 birches, 1 maidenhair, 3 willows, 9 evergreens, 4 rhododendrons, 3 tea plants, 1 cinnamon, 1 camphor, 4 climbers, making a total of 111 trees and plants, which would be a very fair crop for a ten acre lot. One of the most interesting trees in the garden is a specimen of the chabo heba, which is 110 years old and but a few inches in height. If this same tree had been permitted to grow naturally, it would have been more than thirty feet high. While the size has been kept down it has been made to retain the shape of a large tree in Japan, from which it was copied.

"A very interesting and peculiar feature of the garden is the miniature poet's walk. This is both named and copied after a very famous walk in Germany and is an exact reproduction of it on a small scale. It is bordered by a hedge of nectarine trees, or a species between a peach and a plum. But the extraordinary thing about them is the manner in which they have been forced to grow. They are six years old and spread out in a plane for more than eight feet, but their growth in the other direction has been so curtailed that their thickness is only eighteen inches. A miniature reproduction similar to the foregoing is that of the scene of Mr. Mulertt's boyhood days. The old tree under which he played and the landscape surrounding it he has before him at any time he wishes to recall old memories. It is a wonderful accomplishment, as well as a very gratifying one.

"The tallest tree in the entire garden is Japanese maidenhair, which, owing to the peculiar shape of its leaf took its name from the maidenhair fern. This is ten feet high and about ten years

old, but had it been left to itself for this length of time it would have been more than eighty feet in height. One of the smallest for its age is a specimen of the lace maple – *atropurpureum disectrum* - which is twelve years old and twenty inches high. From the graceful drooping of the foliage, it has a beautiful appearance. Another variety of the maple – A*cer palmatum* - of the same age is twenty inches high, while one of the same kind in the next yard that is but two years old is fifteen feet high.

"There are a great number of bamboo trees of all different sizes and varieties, including a group of dwarfs and several specimens of the black, the green and the golden stripe. A specimen of the shibo-chiku that is twenty-five years old and four feet high would, if permitted to grow, have been nearly thirty feet high. But the most extraordinary one of all is a tree that is ten years old and but six inches in height.

"The evergreens are of the species *retinospora*, and of three varieties, the golden, the dark green and the blue. The blue, which is the oldest, is twelve years old. While Japanese trees are better for dwarfing, is not impossible not impracticable to dwarf American trees, and Mr. Mulertt has achieved some excellent results on our trees. He has a small hemlock that is ten years old, a Scotch birch of three, and an oak of three years that is only 6 inches high. One of the curios of the place is weeping willow that is growing from a cutting brought from Evangeline Island by Dr. Packer. The large tree from which it was taken is more than two hundred years old.

"The same course has been pursued with gold fish and the same results obtained. They are fed just enough to keep them in excellent condition, but not sufficient to permit them to grow. They are bright hued, active, exquisite little in every way, but scarcely larger than minnows. Presenting the same general shape, the same development of scales and fins, and the same beautiful coloring as the larger fish of their species, they still retain the activity of a young one.

"In this land of elfs, perhaps nothing is more wonderful than the dog. He is a dachshund of about one-third the ordinary size, although he is four years old, which is quite a respectable and mature age for a dog. His excellence has been passed upon by expert judges of dogs, and they say that from the tip of his tail, which is long, to the tip of his nose, which is also long, there is not a blemish to be found. This is a wonderful thing for a dog to have said of him, but the pride that he is justly entitled to enjoy and to display, if he wish, does not appear to have made him stuck up. So far as meeting persons of low degree on terms of equal footing, he is the most commonplace dog in the world. Doubtless he feels that his dignity will not be injured by showing friendliness for people below his station. His coat is so sleek that it is useful as a mirror. His occupation is guardian of the place, and his duties, which consist in restraining cats from committing depredations in the garden, he performs with great satisfaction to the owner and intense disgust to the cats. He



Figure A7-11. CHABO-HIBA. This tree in Mulertt's garden is 110 years old; growing naturally it would be over 30 feet high. It is an exact miniature of a tree in Japan. Its height is 24 inches.

is so well trained that he will not walk even on the grass, and as for a flower bed, he would sooner think of cutting off his leg than of trampling the flowers. In the discharge of his duties, if he is compelled to get over a bed in order to get at a cat, he leaps it, but never steps on it. The most remarkable thing about him is the incongruity between his mature judgment, excellent obedience and his buoyant, youthful spirits. While he retails the activity and the playfulness of a puppy, his sports are tempered with a seriousness that dogs only acquire with age. His emotions are those of a savage, but his judgment is that of a sage, and the two are wholly irreconcilable.

"The diminutive garden, the dwarfed trees and the elfish animals are not easily produced, nor could everyone accomplish it. To be sure a path can be made narrow or wide and a flower bed large or small, but it requires a judgment that can be acquired only by long experience to determine the precise amount of water that a dwarfed tree needs. There is only a slight difference between the nourishment on which it will thrive and that on which it will die, and that difference cannot be estimated by guesswork. The same, of course, will apply to dogs and fish or any other living being.

"It is quite generally supposed that the dwarfing of trees is a custom that is confined to Japan. It is true that it originated either there or in China, but at present it is practiced to a considerable extent in Germany. When a German lass is about to become a bride, her grandmother or her mother plants a young tree in a shallow and narrow pot. The marriage ceremony includes the presentation of it to the bride and she cherishes it ever afterward as one of her most valuable possessions, regarding the death or injury of it as an omen of evil. When she becomes a grandmother she passes it on to her progeny and in this way some of the trees while only a few inches in height, attain to a great age. Some varieties of pine have been known to be more than a hundred years old. While Mr. Mulertt has none so old as this, he has some that would be regarded very aged for a man. There was a rose bush in one of the old German cathedrals that had been treated in this manner and that was reputed to be nearly a thousand years old. The cathedral was destroyed by fire and the rose bush perished with it, causing nearly as great and as wide spread grief as the destruction of the sacred Bo tree in Ceylon a few years ago. The latter was one of the priceless relics of Buddhism and its origin must have dated very far back as it was reputed to have been associated with Gautama's visit to the island."

Mulertt's involvement with dwarf trees at the time may come as a surprise since we know him primarily as a breeder of goldfish and as a propagator of aquatic plants. Clearly, however, his interest in plants spanned a rather wide range so we can characterize him as being an avid horticulturist as well. Indeed, he has been given by some given the sobriquet of "Aquatic Horticulturist Extraordinary." Mulertt's span of horticultural interest also included houseplants. While in Cincinnati, in 1887 he published *House plants and their care; also hints for the care of goldfish and canary birds.* The canary portion of this book should come as no surprise as raising canaries was a popular pastime among German immigrants.

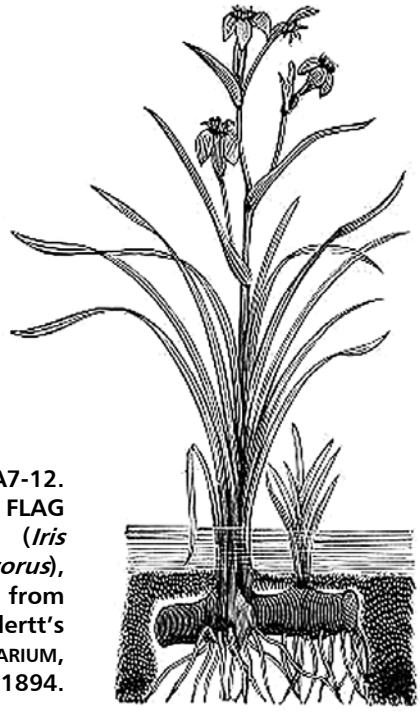


Figure A7-12. YELLOW FLAG (*Iris pseudacorus*), from Mulertt's THE AQUARIUM, July 1894.

A8. THE CRACK IN THE GLASS

The cartoon reproduced on this page appeared in the English satirical magazine, PUNCH, in 1857 and is probably the very first cartoon whose subject is the aquarium hobby. I thought about this cartoon and wondered if these things actually happened and, if so, whether there was an actual account of such an experience. As it turns out I did find such a narrative, but the path was somewhat convoluted, leading me once again to marvel at the many different doors opened to me because of the aquarium hobby.

This story starts with my reading of Rebecca Stott's *Theatres of Glass* (2003), a book dealing with Anna Thynne's experiments with madrepores, a sort of coldwater marine anemone, and with goldfish. What sparked my interest was the fact that Anna Thynne was prompted to publish her paper, "On the Increase of Madrepores" (THE ANNALS AND MAGAZINE OF NATURAL HISTORY, June 1859), by none other than Philip Henry Gosse, another famous personage in the history of the aquarium hobby; Gosse actually wrote the short introduction that introduced the paper. Although Anna Thynne never described the kind of aquarium tank catastrophe I was looking for, this led me to ask myself what happened to Philip Henry Gosse in his later years.

Having a desire at this point to learn more, I read Edmund Gosse's troubled account of his father's life, *Father and Son* (1907) and this led to a bit of serendipity. Philip Gosse remarried in 1860 when his son,



Figure A8-1. "TERRIFIC ACCIDENT. BURSTING OF OLD MRS. TWADDLE'S AQUA-VIVARIUM. The old lady may be observed endeavouring to pick up her favourite eel with the tongs, a work requiring some address." From PUNCH, 1857.



Figure A8-2. ELIZA BRIGHTWEN (1830-1906).

Edmund, was only 11 years old. The second wife, Eliza Brightwen, came from a wealthy Quaker family and when she married the fifty-year-old Philip, she was a forty-seven-year-old spinster.

It is here that serendipity came into the picture once again, ultimately leading me to the end of my quest for an example of the "crack in the glass." By marrying Eliza Brightwen, Edmund Gosse had acquired not only a stepmother but an entirely new collection of aunts and uncles. One new aunt was the wife of one George Brightwen, and oddly enough, the name of the new aunt also was Eliza Brighwen.

Eliza Brightwen (1830-1906) was born Elizabeth Elder in Banff, Scotland. It was just after the death of her mother, in 1837, that Eliza sailed down to England to live with her uncle and aunt. Although Eliza's first name was Elizabeth, her aunt would not allow her to use her given name as her own name was also Elizabeth. Eliza loved her uncle very much and he showed great affection towards her, calling her his "little lassie" until the day he died. When Eliza questioned anything she did not understand regarding natural history, she was directed to her uncle's vast library that contained hundreds of books on nature. This gave her the ability at an early age to research her subject in depth.

A great joy came into Eliza's life when another uncle gave her a four-month-old donkey that she was allowed to keep at her aunt and uncle's house. Due to his long hair, Eliza immediately named him "Shaggy Bray" and from there on spoiled him rotten. The pair was inseparable and the donkey would follow her all over the grounds. Over 50 years later, Eliza would write a whole chapter dedicated to Shaggy Bray in her book, *More about Wild Nature*, published in 1897.

In 1854 Eliza was staying with some friends of the family, Dr. and Mrs. Price, and whilst there was introduced to George Brightwen, a banker employed by the London Discount Company and 10 years older than she. She found George Brightwen a quiet man who seemed more observant than talkative and was not attracted to him at all. Brightwen had a house and servants of his own quite close to the Price's home and he and Eliza would often meet whilst out walking. The next set of lines were written by Eliza in 1855:

> "Soon after the lamps were lighted, in came Mr. Brightwen, looking very pale and agitated. Mrs. Price soon left the room and then, to my dismay, he drew near and made me an offer of marriage. I felt in much perplexity; he was evidently feeling deeply, and I was no coquette to desire for a moment to trifle with earnest, true affection such as he offered me. I did not however, wish to marry, and I was not really at all in love with him; but when I tried to refuse he seemed so pained that I tried to gain time, and said I must consult my uncle and aunt, that I felt esteem and respect but no warmer feeling. He would not press for an immediate decision, but when Mrs. Price returned it seemed somehow to be taken for granted that I had said yes."

This put Eliza between the proverbial rock and hard place. Although George Brightwen was a good man, she could not honestly say that she loved him. Over the next few weeks, however, through friends and relatives Eliza learned that George had been a loving



Figure A8-3. ELIZA BRIGHTWEN in her later years.

son, a kind brother, and a dear nephew. Eliza could also see that his servants were very fond of him and so, slowly, Eliza warmed to the idea of marriage. She felt at home with George and hoped that she would come to love him in time. So it was settled, and Eliza and George were married in June of 1855.

Eliza described their first house as being a modest little semi-detached house with two sitting rooms that opened into each other, a kitchen with a basement room, four bedrooms, and two dressing rooms. Eliza also says that the two women-servants knew their duties, but she did not what her duty was to be around the house. She found time was on her hands and in October 1855 Eliza wrote an essay on the dispersion of seeds, her first attempt to write anything of a scientific subject. It was also about this time that Eliza start to keep a diary, where she wrote, after five months of marriage, how happy she had become. The gamble with George had paid off.

The inspiration for much of Brightwen's nature writing came from her home, the Grove, a fabulous estate peculiarly situated in two counties and three parishes, where she and her family moved in an attempt to alleviate her anxiety-ridden illnesses. Following the death of her husband in 1883, leaving her with no children, Brightwen's constitution improved and upon the recommendation of a family member she took to writing about the natural life at the Grove. She discovered in herself a remarkable gift that enabled her to win the confidence of beasts and birds and, so she thought at least, of bees and butterflies. Nor did she confine herself to living creatures; she actively dissected and examined the dead and extended her observations to the vegetable and the mineral world. Her pets not only increased till they formed almost a menagerie, the billiard-room was transformed into a crowded museum for her specimens. Besides Edmund Gosse, other eminent personages who visited the Grove included Sir Joseph Hooker, botanist and director of the Kew Gardens from 1865 to 1885, and Sir James Paget, a famous British surgeon and physiologist. She was a vice-president of the Selborne Society, a Fellow of the Zoological and Entomological Societies, and an active

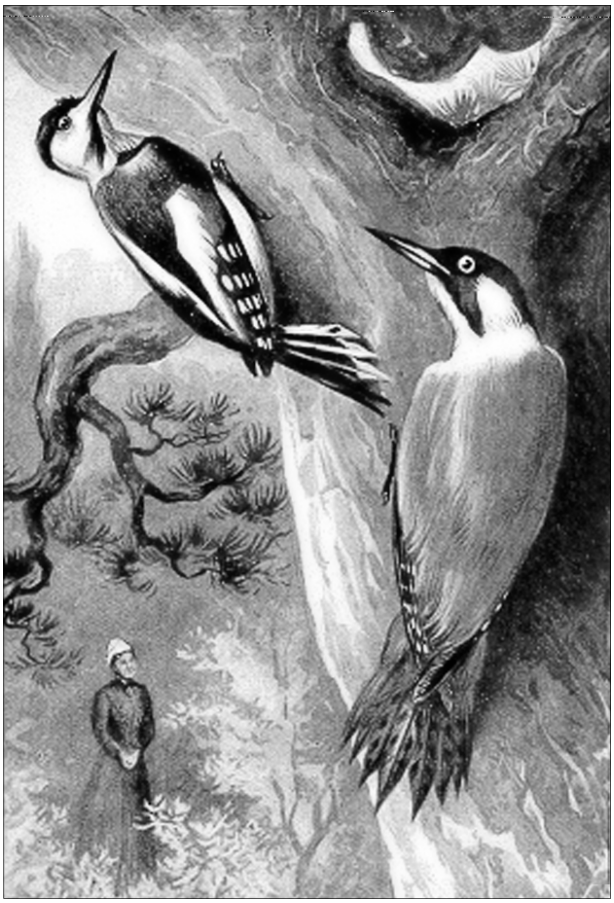


Figure A8-4. DRAWING BY ELIZA BRIGHTWEN.

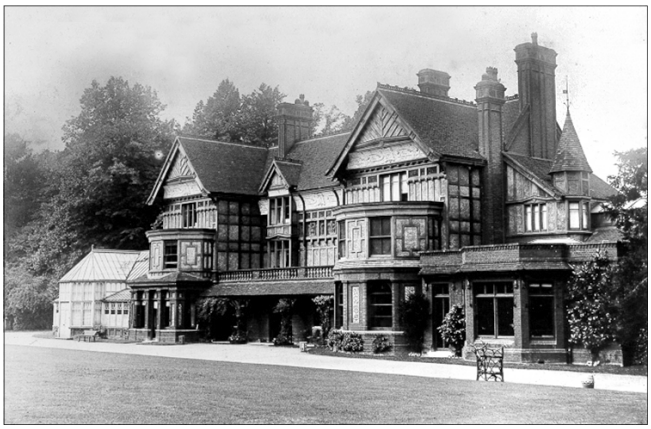


Figure A8-5. ELIZA BRIGHTWEN'S HOME, THE GROVE.

member of various other associations connected with the encouragement of natural history.

All this was done, from 1884 to 1889, without any definite intention further than that of satisfying a growing desire on the part of the eager naturalist. It was not until 1890 that, at the mature age of 60, she became an author, when she was at length persuaded without any anticipation of popularity to publish some of her personal records under the title of *Wild Nature Won by Kindness*.

With the success of her book *Wild Nature Won by Kindness*, Eliza Brightwen went on to write additional nature books; *Inmates of my House and Garden* (1895), *Glimpses into Plant-Life* (1897), *More About Wild Nature* (1897), *Home Work for Willing Hearts* (1890), *Rambles with Nature Students* (1899), *Quiet Hours with Nature* (1904), and *Last Hours with Nature* (1908), published posthumously. In 1909 her autobiography, *The Life and Thoughts of a Naturalist* was published posthumously with an introduction and epilogue by Edmund Gosse. Many of the illustrations in these books were by her own hand and she once exhibited at the London University, in connection with the Selborne Society, a very fine collection of water-color paintings of subjects that ranged over a very wide field of natural history.

These books had a wide circulation not only in English speaking countries but also in other countries as well and while Eliza Brightwen appreciated the popular reception, she maintained a self-effacing attitude as evident in this response to a Who's Who question about her career: "I haven't careered much. Once went down in a diving bell, declined in a balloon, and prefer generally to keep on the surface of the earth."

When Eliza was over seventy years of age and was lying on the sofa in some pain in her drawing room, it was announced to her that the long-lost brood of her wild ducks had returned of their own free will and were at that moment walking in Indian file up the field below the farm. She instantly sprang to her feet, slipped out of the room, floated across the lawn, and laying her hand lightly on a stone vase beside the balustrade, leaped upon the parapet, from which she could command a broad view of the meadow. The action was that of a young girl of sixteen, and it was performed by an old lady who a moment before was the most woebegone of invalids.

Eight days before her death, having received by post a rare beetle from South Africa, alive, she made the latest of her neatly finished drawings. In her dying moments she was attended by those wild creatures, which had long been accustomed to her presence. Two squirrels were gamboling and struggling on the toilet table, and a robin was seated on the edge of her cup. Her last conscious moments were brightened by the sudden cry of the cuckoo, calling from the boughs of the great tulip tree opposite her bedroom window.

This finally brings me to the end of my quest for an example of "the crack in the glass." In 1856 Eliza started a freshwater aquarium holding about twelve gallons of water. It was stocked with fish, lizards, beetles, and aquatic plants (it was actually an aquavivarium whose total size was much greater than twelve gallons), and was a very successful example of the new fad in home aquariums. She recorded that the creatures were kept in good health, and the balance was properly adjusted between the living creatures and the plants so that the water was clear. She kept the aquarium by a window so there was plenty of light for the plants.

One day, in the room containing the aquarium while Eliza was lying on the rug with her head on a cushion, there was a sound resembling a pistol shot, A side of the glass of the aquarium had given way and Eliza was deluged with twelve gallons of water, fish,



Figure A8-6. The billiard-room transformed by Eliza into a crowded museum for her specimens.

and other animals. Eliza rang for the servants to bring sheets and pails as fast as they could, but they were so terrified of the lizards they would not enter the room until Eliza had scooped them up in a basin. The same people who supplied the Zoological Gardens at Regents Park made the next aquarium Eliza had, and this aquarium was still with her in 1894.

The PUNCH cartoon of 1857, therefore, did truly reflect the aquarium hobby of the times and I end this account with one that appeared in PUNCH in 1860. After the validation of the 1857 cartoon by Eliza Brightwen's experience in 1856, I have no doubt that the Victorian ladies of the day had no compunction in adding an octopus or two to their drawing rooms and parlors!

POSTSCRIPT: Philip Gosse was a very devout Christian and his religion permeated all of his books. In his *The Aquarium* (1854), Gosse had just finished discussing the Hairy Broad-Claw crab and segues into a comparison with a bible text: "...the Gospel net, mentioned by our Lord, which is cast into the sea and gathers of every kind; which, when it is full, they draw to shore and sit down, and gather the good unto vessels, but cast the bad away." Gosse finishes with, "May both the writer and the reader be robed in the righteousness of Christ, without which the Christian name and profession will bring only a deeper condemnation." Heady stuff for one who just wants to learn more about the aquarium and its denizens!

When Darwin published his *Origin of Species* in 1859, this brought about a storm of controversy and forced those of a scientific bent to try to reconcile their religion with these new ideas. Gosse belonged to the Plymouth Brethren, a group that relied almost exclusively on the literal truth of the bible. In his attempt at reconciling his religion with these new ideas presented by Darwin, Gosse wrote *Omphalos, An Attempt to Untie the Gordian Knot* (1857), in which one issue he dealt with had to do with Adam's navel, i.e., did Adam have one? In any event, Gosse managed to offend both sides and his book was badly received, the storm of criticism producing his total withdrawal from the natural history scene.

Edmund Gosse informs us that his parents neither knew nor cared anything about current literature. To them, literature and science alike were useful only to keep the student "out of the world," and to provide employment. They felt it was wrong to find pleasure in literature, science, or any pursuit other than reading and discussing the narrow strictures which formed the standards for the Gosse household. "The range of these (books) was limited," explains Ed-



Figure A8-7. One pet that Eliza had when she was a little girl living with her aunt and uncle, was Bray the donkey. Drawing by ELIZA BRIGHTWEN.

mund, ‘‘for storybooks of every description were sternly excluded. No fiction of any kind, religious or secular, was admitted into the house.”

Gosse’s mother believed that “to tell a story,” that is, to compose fictitious narrative of any kind, or to read such “lies” was sin. She would not read any kind of poetry either, except lyrical and subjective poetry. This changed when Philip Gosse married Eliza Brightwen. As pious as she became - she joined the elder Gosse’s congregation - she had a taste for the arts and for poetry. The ban on reading fiction and poetry was lifted, but selectively. Edmund was permitted to read the poems of Sir Walter Scott but not the novels, although he was allowed to read the novels of Dickens. For the first time, he was allowed to attend school - a local school and then a boarding school. He began reading poetry voraciously, as well as writing it, and he began his study of languages.

A9. THE EARLY HISTORY OF WATER CHANGES

Daily water changes were the state of the art at the end of the 18th Century. During the first half of the 19th Century it was the mode of operation which the general public and even the better educated classes of society, believed to be necessary in order to maintain an aquarium. Water changes during that time had a number of beneficial effects on the aquarium, the most important being that they removed organic pollutants caused by overfeeding, and cleared up the algae that covered the glass and plants and those that made the inhabitants hard to see.

During this time aquariums consisted, by and large, of small cylindrical glass containers or bell-shaped jars. Indeed, a collection of such containers was often



Figure A8-8. “A VALUABLE ADDITION TO THE AQUARIUM.” From PUNCH, 1860.

termed a "cabinet aquarium." Although providing a source of replacement freshwater was not an economic hardship on the typical aquarist, the replenishment of saltwater was an expensive proposition, as it had to be transported some distances by train. As a result, only those who were well off financially, such as Sir John Graham Dalyell, Horace Walpole, and Anna Thynne could afford the luxury of keeping saltwater aquaria.

With the birth of the Stage III hobby in Great Britain in the mid-1850's the matter was exacerbated since the size of the typical aquarium was increased significantly so there was an even greater amount of water to be replenished. Another factor was the placement of the new aquaria. The artificial lighting on which we depend so much today to illuminate our aquaria was not available, so it was customary to site the aquarium in front of a window, thus encouraging even greater algal growth. In Germany, a bell-shaped glass aquarium designed to be hung from the ceiling helped solve the algae problem, but it raised another problem in its stead, i.e., an aquatic version of the "Sword of Damocles"!

Thus, this gave way to all sorts of innovative devices, including gravity-powered aerators, reflectors to illuminate the aquarium, and slope-back tanks with dark water chambers to control the growth of algae.

In Chapter 1 readers were introduced to Sir John Graham Dalyell, an Edinburgh barrister who maintained marine animals in cylindrical glass vessels of various sizes as early as 1790. Dalyell found it necessary to change the water once or twice a day, so an arrangement was made to have several gallons of sea water in an earthenware jar brought to him two or three times per week. In Chapter 3 we then met William Alford Lloyd, superintendent of London's Crystal Palace Aquarium and also one of the earliest dealers in aquarium supplies and equipment in London. Lloyd made his mark as an aquarium consultant by designing and installing a system of closed continuous water circulation in his place of business in Portland Road that made it possible to keep animals alive in their tanks without changing the water.

The following is a biographical sketch of Lloyd that appeared in THE ZOOLOGIST, Second Series, Vol. VIII, November, 1873 as part of a review by Edward Newman of the Fifth Edition of Lloyd's *Official Handbook to the Marine Aquarium of the Crystal Palace Aquarium Company"*

> "William Alford Lloyd, the projector of the Crystal Palace Aquarium, and now the Superintendent, and the author of the *Official Handbook*, was born on the 8th of August, 1828, at No. 8, Bush-lane, Cannon-street, in the City of London, the site now occupied by the premises of Messrs. Barron, Squire and Co., wholesale druggists. He was a weak and sickly child, and at five years of age was sent into Wales for the invigoration of his body and improvement of his mind: he was put to a hedge-school at Llwynlleia, in Merionethshire: the spot thus honoured is equidistant from three villages rejoicing in names which I am totally unable to pronounce, and therefore gladly take refuge in letter-press: these villages are Bettwsygwerfilgoch, Cerrigydruidion and Llanfihangel, names a familiarity with which, Mr. Lloyd tells us in his pleasant au-

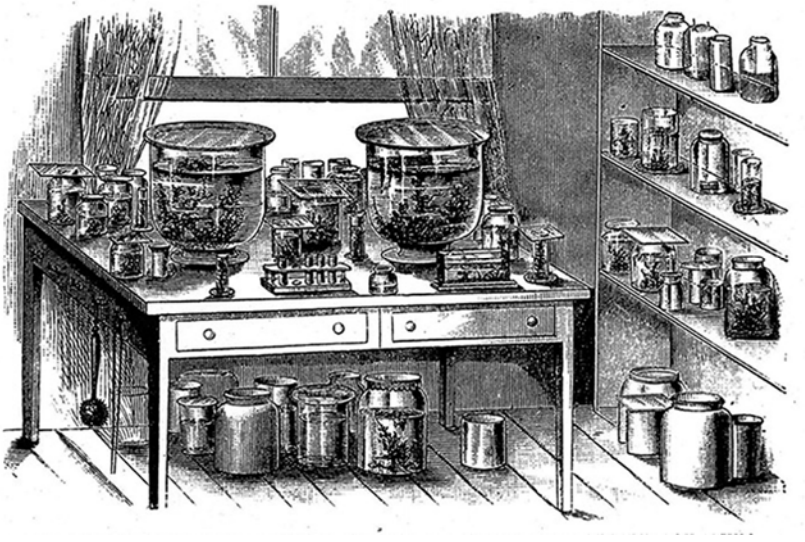


Figure A9-1. A typical collection of bell jars and cylindrical jars used as aquaria from the end of the 18th century to the middle of the 19th century.



FIGURE A9-2. Bell glass jars, late 1700's and early 1800's.

tobiography, largely assisted his speedy acquisition of the German language in after years. Would that they had the same effect on me! Mr. Lloyd's 'school days' might possibly have furnished matter for a narrative as interesting as those of Tom Brown, but he has only given us a very small installment of such a narrative, and I believe even *that* would have been withheld had it not been for the accidental finding a crab, a circumstance that incidentally leads us to an introduction to his school and school-master in the year 1833.

"'I smuggled the crab into the school-room,' says Mr. Lloyd, 'in order to get the schoolmaster, Humphrey, the learned man of the place, to tell me all about it. He was a little thin old man, with a yellow, shrunken face, yellow teeth, and yellow finger-nails, was dressed in a black velvet coat, waistcoat, and knee-breeches, with black stockings and huge shoes. He knew no English; and at intervals throughout the day smoked very coarse tobacco from a short black pipe in the school-room, which was also the dissenting chapel of the place. There were no writing-desks or tables of any kind, but the scholars knelt on the rubble-floor, and used as desks the deal forms on which the congregation sat on Sundays. Humphrey's scholastic fees were all paid in kind: some of the lads brought corn, or oatmeal, or flour, or wool, or bacon, and I remember once trying to carry on my had *my* payment, a big square lump of coal; but it was too heavy, and another boy kindly let me carry his payment of a lump of butter, and he, being stronger, conveyed my coal. Cheese was a luxury known only to the rich: money was seldom seen in the form of coin, and farthings never. I did not take my crab to school as a matter of payment, nor yet for play or idle curiosity, but really and truly to learn something about it from the only person whom I thought could give me help, and his reply was, 'Ah, William Bach! Only learned men in London can give information on such things,' and he smoked his pipe vigorously, and gave me permission to put the crab away during school-time in the chapel pulpit, to be out of the reach of the boys.'

"In 1837 Mr. Lloyd returned to London, and visited the Zoological Gardens, which proved a constant source of amusement and interest to him whenever he obtained a holiday: this continued for many years, during which his reading and learning, equally sources of instruction and amusement, seemed incessant and most miscellaneous.

"In 1838 he obtained the exalted post of errand boy at Messrs. Pontifex and Wood, engineers, of Shoe-lane, and stayed in this place for three years. Unlike any other errand boys whom I have known, his constant study was to acquire a knowledge of the various mechanical contrivances and combinations which he saw around him. We next find him apprenticed to Messrs. Remnant and Edmonds, the bookbinders, in Lovell's-court: but he was far less assiduous in gaining a knowledge of *that* branch of trade. He was out of his time in 1847, and then, and before, seems to have found opportunity for a most extensive and varied course of reading, and just such reading—deeply instructive reading as a lad usually pronounces to be 'slow' and 'dry'; however, he now had reading to his heart's content. The first book he ever bought with his own money was, in 1840, Craik's *Pursuit of Knowledge under Difficulties*. 'No written or

spoken words," says Mr. Lloyd, 'can express the avidity with which I read Craik's book over and over again, or can tell the encouragement I gained from it.' At the same time he met with a memoir of John Hunter, and was absorbed in admiration of the great anatomist.

" 'By my reading I was constantly, as it were, brought into contact with him, and learned how he kept at Brompton many living animals in a small menagerie, observing their habits and forms when alive, and dissecting their bodies when dead, and doing so amidst many difficulties. Reaumur and Huber were two other naturalists of whom I read with mentally wondering eyes.'

"But at this time Mr. Lloyd got involved in figures, and the works of Thomas Simpson and James Ferguson, mathematicians, engrossed a principal share of his time, and, stranger still, Augustus de Morgan's *Elements of Arithmetic*; thus his attention was diverted for a time from facts to figures; from truths to the expression of truths.

"In 1851 he obtained a place in Old-street, at Mr. W. Brown's second-hand book shop, and here, of course, he had an opportunity of indulging his taste for books, and of making his store of knowledge still more extensive: from the *Penny Magazine*, that great source of miscellaneous knowledge, he learned a little of everything.

"The 18th of November, 1852, was a public holiday, the funeral of the Duke of Wellington: this memorable day Mr. Lloyd spent in the Zoological Gardens, and here he met with an incident that gave an aquarian tendency to the whole course of his future life.

"'On arriving there, near the side entrance, was a building I had never seen before, and *which* had risen since my last visit—a conservatory-looking glass erection of not large dimensions, standing on a low wall. The door was fastened, and I could see no one inside, and on my asking of a passing attendant what the place was for, he said it was a Fish House, though some people called it an Aquarium, and that it was destined to contain fish and other such things, even sea-fishes and lobsters, and that it was intended to be opened in the following spring. He added his disbelief in its success and an expression of his sense of the impropriety of its introduction into a zoological garden. I went back to the 'fish house,' and passed round to its rear, and there to my great astonishment, I saw through the glass side of the tank containing perfectly clear water, and wonder of wonders, a living pike! I wish I could write what I then felt; I wish I could now feel as I then felt, but such freshness of wonder comes to one not more than half-a-dozen times in a life. I could not get away from the place—it was at the extreme north-east corner of the building, and the tank has been for years converted into a marine one—but I went to it again, and remained there till it began to grow dusk, and it was time to get home. During the last eight-

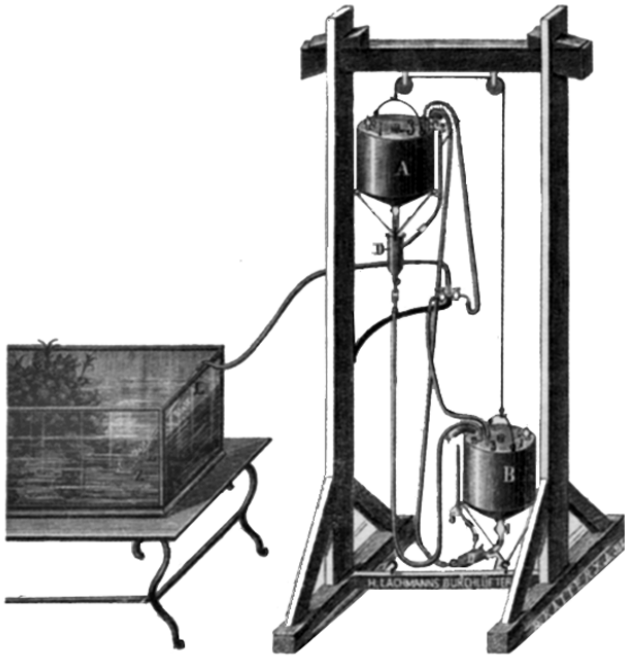


Figure A9-3. An example of man's capacity for exerting maximum effort to accomplish minimal results was this Victorian aeration device. It took some ingenuity on the part of the homeowner to conceal the apparatus from visitors!



Figure A9-4. A HANGING AQUARIUM, 1858. The jar could be positioned away from strong light to minimize algal growth. It was raised and lowered for maintenance via the cords.

een years in London and Hamburg I have never been without a pet jack in an aquarium.'

"This seems to have been Mr. Lloyd's first introduction to freshwater captives. I will now introduce both him and my readers to the denizens of the sea: he says that although now (1873) in the Crystal Palace, with all possible means and appliances at his command, he can look back on a time, twenty years ago, when his pence and half-pence had to be laid out with rigid economy, and I am thus introduced to one of the most interesting passages in his life—the search for sea anemones in the streets of London! He had already set up all his aquariums in wide-mouthed glass bottles filled with artificial sea-water, but these miniature establishments were without living inhabitants: his *modus operandi* for supplying this want is thus described:

" 'I used to sally forth at dead of night, where heaps of oyster-shells were thrown by day from street oyster-stalls, in Smithfield and St. John's-street, and bring them home. The oysters devoured in such poor neighborhoods are not the genteel little smooth natives eaten at luncheon-bars, but big, rough commoners with bold foliations on the upper shell, and deeply ribbed on the lower one; and in and below these hiding-places I could find many little sea anemones of several species, some hopelessly smashed, but others quite perfect, having been protected by the strong projections of the oyster shell and unharmed by rain or other fresh water. The species I found thus were *Actinoloba Dianthus, Sagartia viduata, S. Troglodytes, S. Bellis, S. elegans*, and, but very seldom, *Actinia, Mesembryanthemum*. All these I used to pick off the shells with never-wearying patience and care, and drop them into the fictitious sea-water and transfer them to my bottle, to which they adhered and made themselves happy. I used to feed them with little morsels of oyster-flesh which I found adhering to the inside of the shells, and when the water would become offensive from the *effects* of the food, because the quantity of fluid was too small to hold enough oxygen in solution to decompose the dead animal matter fast enough, I poured the *water* from the little bottles into a great earthenware foot-pan covered with a sheet of glass to keep out dust, and standing in a dark corner of the room. The foot-pan was so very large in comparison with my small bottles that the emptying of them periodically into the pan did not interfere with the *water in* the latter, so that from it I immediately refilled the bottles, one at a time on successive days. The water in the foot-pan on the floor thus *effectually* counteracted all tendency at going wrong in the bottles on the window-sill above.'

"Two years after this, namely, in 1854, Mr. Lloyd sent me two short papers for the *Zoologist*, which show that his love for sea things continued in all its force. These exhibit beyond all question the deep, and I may almost say, the devout attention, with which be studied Nature at this period: his 'Note on the Habits of *Limnea stagnalis'* (ZOOL. 4248) is a master-piece of descriptive writing. Of course I was anxious to know such a man, and in March, 1855, I found him located at 164, St. John-street-road, in company with poverty and sea anemones, sacrificing all worldly considerations to a love of Science. Other papers soon followed, entitled severally 'Occurrence of Edwardsia vestita in Britain' (ZOOL. 5180) and 'Note on a Sea Cucumber in Confinement' (ZOOL. 5181). These exhibit in an especial degree three great qualifications of a naturalist—1st, the knowledge which leads to the instant selection of what is peculiarly worthy of observation; 2ndly, the faculty of observing systematically, or in the words of De la Beche, the knowledge 'how to observe'; and 3rdly, the power of defining the observations: these qualities Mr. Lloyd possessed and possesses in an eminent degree. I have never forgotten, and hope never to forget, that first visit to the *great* aquarian and the appearance of his *little* aquariums; glass bottles or cylindrical vessels, some on the table, some on the window-sill, some in the dark, some in the light,—all contributing to his already large stock of knowledge, all revealing secrets previously hidden.

"In 1856 he removed to Portland-road, and embarked in business; as a matter of course, the aquarium business,—and almost also as a matter of course, unsuccessfully; he was not cut out for business on his own account; he had no skill in buying and selling; but his reputation as an aquarian was established, and in 1859 he was summoned to Paris, and undertook the management of the aquarium in the Jardin d'Acclimatation.

"In 1862 I find Mr. Lloyd again in London, exhibiting an aquarium, worked by compressed air, at the International of 1862, and accompanying the exhibition by the publication of a very clear and compendious account of the principle and construction of aquariums in general and of the Exhibition aquarium in particular.

"While thus occupied he was visited by Dr. H. A. Meyer, who was desirous of establishing an aquarium at Hamburg, and this finally led to an arrangement with Baron Merck for Mr. Lloyd's removal to that city and the construction of an aquarium in the Zoological Gardens there, under his sole superintendence: this was opened in the spring of 1864, and soon became eminently popular as well as successful in a pecuniary



FIGURE A9-5. WILLIAM ALFORD LLOYD, 1815-1880.

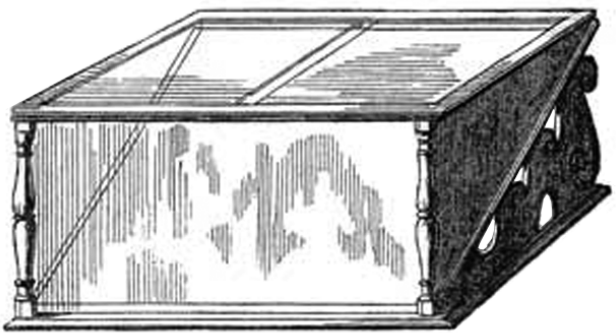


Figure A9-6. A SLOPE-BACK TANK. The side view was that of a triangle.

point of view; the names of the late Dr. Meyer, Professor Mobius, Chief-Justice Schwartz, and the late Baron Ernst von Merck must always be associated with that of Mr. Lloyd in this admirably managed establishment. The sea-water is circulated partly by a water-pressure engine set in motion by the town water-works, which drive a pair of water-pumps (instead of compressing air as was done in Paris), and partly by a steam engine *which* drives two other pumps.

"In 1870 he returned to London, at the summons of the 'Crystal Palace Aquarium Company,' and there he is located at present, and I trust bids fair to become a fixture. And here it is indispensable that I mention that since the Crystal Palace Aquarium was opened two others (at Copenhagen and Brighton) have been completed; five more (at Vienna, Manchester, Southport, San Francisco and Naples) have been commenced; and still three others (at Frankfort, Birkenhead and Rothesay) are partially erected."

In 1854 the Crystal Palace moved from its temporary site in Hyde Park to its more permanent location at Sydenham. It had only been on the site for twelve years when in 1866 it experienced the first of a number of fires, which destroyed the North Transept. The fire left a large desolate area which had become a charred eyesore. There were insufficient funds to reconstruct the north end and it was not until 1870 that a plan was put before the directors to construct a marine aquarium. The directors saw its potential and the derelict basement site was opened as a salt water aquarium on August 22, 1871. The water for the tanks was brought by train from the sea at Brighton.

The aquarium was briefly the largest of its type in the world, holding 120,000 gallons of seawater, of which 100,000 gallons were held in large reservoirs below floor level. There were 60 tanks in all, of which 38 were for the public and the rest for private research. At any one time over 300 species were on display. The aquarium was built on part of the site left vacant by the 1866 Crystal Palace fire and was a popular fad of the day.

What made the Crystal Palace Aquarium special was the fact that it was a marine and not a freshwater exhibit. No one before had created a working marine aquarium of this scale and diversity. The Crystal Palace was lucky to secure the services of William Alford Lloyd, the leading aquarist of his day, who developed a system of continuous circulation of the water, which was kept in the dark as much as possible and at strictly governed temperatures. Machinery to achieve this was doubled up to ensure the continuous flow. Excavations of the reservoirs have also shown that declivities were built into the system. These were designed to increase the 'scouring' action of the water and make the system as natural as possible. The rock face extant in tank 18a is also significant and probably the only one of its type left from this period.

Although not a commercial success, the site is regarded throughout the aquarium world for its technical merit and innovation. Excavations have yielded samples of the vulcanite piping that the water ran through, which was quite cutting edge for its day but necessary, as seawater could not travel through metal conduit. Charles Darwin is said to have been a regular visitor.

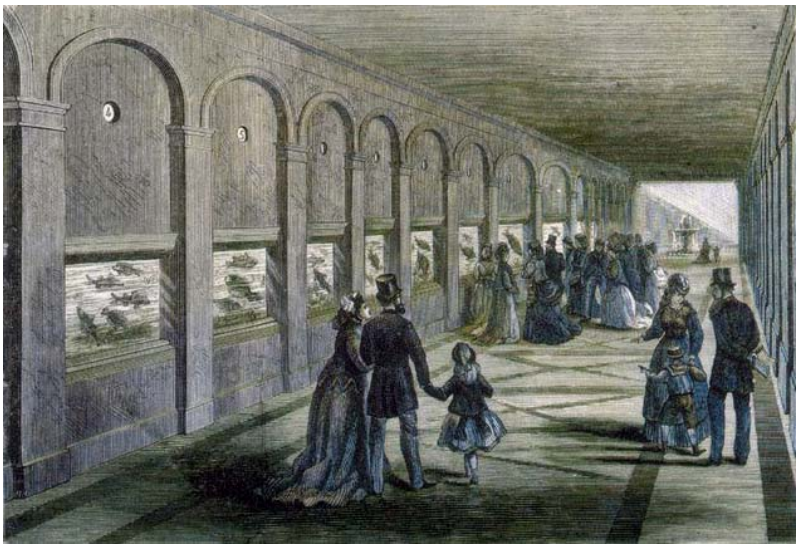
The aquarium was a considerable success until the 1890's when the popularity of marine life gave way to a menagerie of monkeys who occupied the now empty fish tanks. When the Crystal Palace was de-

stroyed by fire in 1936 the north end was not so badly affected, but in April 1941 the north tower was dynamited, destroying the north wing and a large section of the aquarium.

Lloyd at first did not consider a manual change of water to be aquarium keeping, but he later changed his mind through an interesting line of reasoning. He viewed it not as a change of water in the sense of its being lost, but merely as a change of position from a house in Edinburgh to the sea and back again. In other words, the water Dalyell discarded from his glass jars went into a gutter in the street or into the sewer, and then found its way by gravity into the ocean again. Lloyd argued that if Dalyell had reflected on that which was clearly known at the time, namely that water, either salt or fresh, is practically indestructible and that any decaying organic matter in it can be removed and the water thus purified, then he would have saved his servants their weary perambulation of more than twice around the world by his (Lloyd's) calculations.

Lloyd knew that in the oceans, rivers, and lakes, animals and plants are forever dying in large numbers, and that their decomposing remains are prevented from permanently corrupting the water by the constant motion to which the water is subjected, since this motion brings the water into contact with the oxygen in the air at the water's surface. Dalyell had fed the animals in his jars on mussel flesh, which quickly decomposes and makes the water milky, so he threw the water away. But the very act of pouring it off and the motion of it as it trickled onward to the sea purified it, making it an act that was an unconscious imitation of what nature does. As Lloyd put it:

> "Had Sir John but thought of the merely vehicle character of water, and of its incapability of being decomposed save by a very slow and expensive process, he would at once have seen that the minutely disseminated mussel flesh and its juices in the water made that water unfit to support life, only temporarily. It was not the water itself that was not fit; it was only something in the water that was wrong, and if that something were removed the water would be left as good as ever. If, therefore, instead of sending it back into the sea by a long road, and then going to the immense pains to dip it back again, he had poured it into a large receptacle in his own house, such receptacle or reservoir being many times larger than the aggregate contents of all his glass jars, he would have found that in a short time he would have possessed a source of supply for the jars quite as good as the ocean provided. Had he, in addition, placed his reservoir in a cool cellar, and had a pipe connecting it with the study to which Miss Dalyell has incidentally alluded, with a funnel at the upper end of the pipe, in which was placed a piece of straining-cloth or a small hair-sieve, to arrest the coarser pieces of decaying organisms, and if he had poured the water he had used into this funnel, the arrangement would have been still better.
>
> "Yet better would it have been had he possessed another pipe leading upward from the reservoir, through which he could pump up the sea-water as he wanted it. Best of all would have been some form of incessantly-working machinery, by means of which the water would be always coming up, day and night, from this large and cool reservoir into the experimental glasses, for then they would have been con-



The Crystal Palace Marine Aquarium, 1876. What made the Aquarium special was the fact that it was a marine and not a freshwater exhibit. Lloyd was its Superintendent.

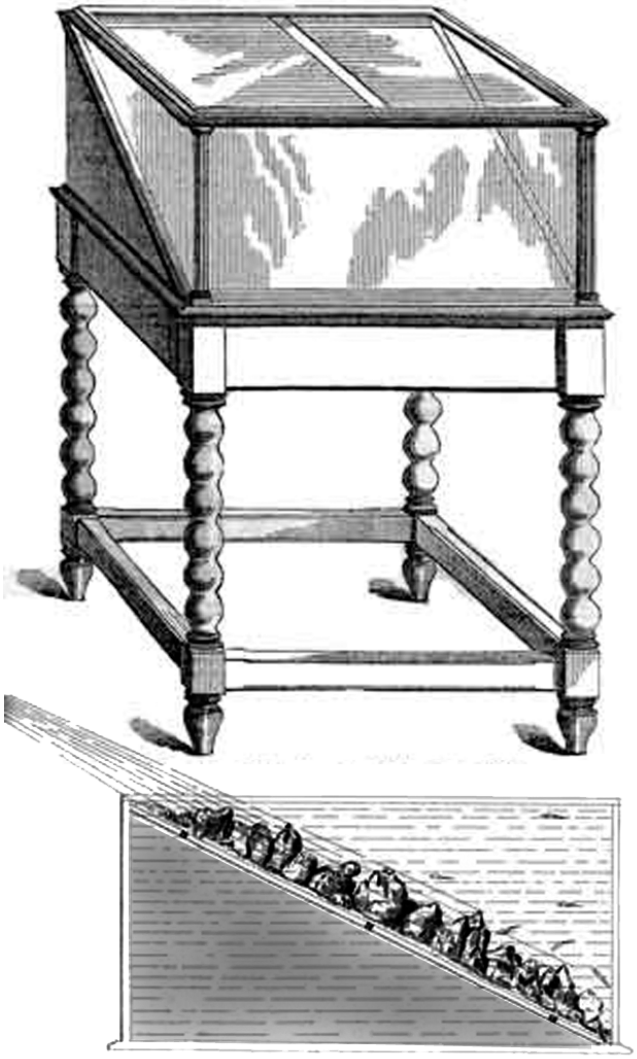


Figure A9-8. THE DARK-CHAMBER SLOPE-BACK TANK. The cross section shows how the slope-back forces the light to come more from above, rather than from the back. The water below the slope is unavailable to the fish and provides an addition to the oxygen supply and, because of the darkness, reduces the motile algae growth.

stantly kept at an even temperature and in a state of constant aeration. This would have done away with the necessity of the everlasting wiping and washing of the glasses; and, they being thus left alone, and in a certain amount of daylight, vegetation would soon have appeared in them, stimulated by the action of that light, without having been visibly introduced, but present everywhere in the seeds or spores of plants, merely waiting to be developed. Such an arrangement, indeed, would have been precisely that of the best modern aquaria as now made, in which the water is so continually and abundantly aerated by ceaselessly moving machinery that impurities have no time to accumulate, but are oxygenated and dissipated as quickly as they form."

Lloyd noted that in the earlier books on aquaria - notably in Gosse's influential *A Naturalist's Rambles on the Devonshire Coast* (1853) and *The Aquarium: an Unveiling of the Wonders of the Deep Sea* (1854), aquaria were associated in concept with conservatories or greenhouses. Indeed, many of the earliest aquariums were combinations of both plants and water. Thus it is not surprising that the aquarium building at the Regent's Park Zoological Gardens, first opened to the public in 1853, was constructed virtually as a conservatory. However, this proved to be a disaster as it was not appreciated, until it was too late, that the temperature of the natural habitats of marine and freshwater plants and animals is much more restricted in range than that experienced in a greenhouse. After an expensive learning period replacing dead fishes, the glass roof and walls were painted over and the problem was greatly reduced.

Actually, the freshwater tanks were more or less a success since Regent's Park had a steam engine that pumped up water, which happened to be from a pure source, for the general use of its gardens and it was a simple matter to connect the freshwater aquaria to this system and to run the water through the fish tanks. Lloyd tried to persuade Regent's Park to outfit the saltwater tanks with a similar system, but the management maintained that a circulatory system did exist in a part of the saltwater exhibit but that it was almost useless. Lloyd pointed out that that was because the reservoir into which the sea water entered after it had run through the show tanks was too small in relation to the volume of the latter, and that the reservoir should be several times greater than the show tanks but got nowhere with his argument. In addition to the pollution that the sea water tanks were undergoing, another problem surfaced when algae started to grow rampart and obscured the contents of the tanks from the visitors.

In August 1853 Lloyd set up a series of glass jars, containing both fresh and sea water, each holding from one half to one pint. Being a student at the time he could not afford seawater so he made it up artificially from salts purchased at a local London pharmacy. Indeed, what he kept in his saltwater jars was nothing more than the small anemones he could find uninjured on oyster shells thrown into the streets. During the period from 1853 to 1855 when he still couldn't afford to get genuine sea water for his little jars, he set up a separate reservoir that held about eight or ten times as much as his jars collectively held. As Lloyd puts it:

> "However, from 1853 to 1855, when I could not possibly get new sea-water for my little jars, I merely increased the quantity of water to about eight or ten times as much as those jars collectively held. Thus the aggregate contents of my jars were about six or eight pints; and in a now historical earthenware foot-pan, kept dark in a cool corner at hand, I had five or six gallons more water, containing neither animals nor plants, and when aught occurred to disturb the equilibrium of life in these jars, either from excess of light or heat by standing on a light window-sill, or from excess of food, or from there being too many animals in a small space, instead of throwing away the water thus temporarily rendered unfit to sustain life, I merely restored it to a right condition by pouring the contents of these jars into the foot-pan, which was so large in relation to the dimension of the jars that I could immediately dip them up full from it (the foot-pan) without the water being perceptibly the worse for it, especially when I so contrived matters that these transfers were made, not in one day, but on successive days. Thus, in London, far from the sea, which I had never seen, I was so far, aquarially speaking, as well off as the wealthy Sir John Graham Dalyell, with the ocean almost, at his door. Later on, in 1857-58, I set up another marine aquarium, in which the show-tank held twenty gallons, and the reservoir five hundred gallons of water, in which that water, instead of being intermittently circulating, as in my jar and foot-pan arrangement, circulated constantly, day and night, by means of a pump and pipes, in a cool underground London cellar or kitchen, with a uniform temperature of about 60° F. This answered excellently, especially when I increased the water in the reservoir to one thousand gallons."

When the Crystal Palace Aquarium opened in 1871, Lloyd was its first Superintendent and practiced what he preached. In the saltwater show tanks there were 20,000 gallons of sea water, and in the reservoir 100,000 gallons, a total of 120,000 gallons. Yet, from September 1871 to March 31, 1876 (four and a half years) the following enormous quantity of food was added to this relatively small quantity of unchanged water that always remained sparklingly clear:

1. Sandhoppers (*Tatitrus*), in pounds 12
2. Shrimps (*Crangon*), in quarts 4735
3. Crabs (*Carcinus*), in gallons 137
   Crabs (*Cancer*) large, in numbers 1450
4. Scallops (*Pecten*) large, in numbers 32
5. Oysters (*Ostrea*) large, in numbers 195
6. Cockles (*Cardium*), in gallons 18
7. Mussels (*Mytilus*), in gallons 544
8. Whelks (Buccinum), in gallons 7
   in numbers 100
9. Fish, chiefly Whiting (*Gallus*),
   in pounds 159
10. Smelt roe (*Osmerus*), in pounds 14
11. Green seaweed (*Ulva*), purchased,
    in pounds 400
12. Green seaweed (*Conferva*), grown
    in tanks, quantity unknown.



Crystal Palace Aquarium. Illustration taken from William Alford Lloyd's Hand-Book to the Marine Aquarium of the Crystal Palace Aquarium Company.

In addition, there were occasional and unrecorded supplies from neighboring fishmongers when the regular supply ran short. Any food not eaten by the animals was chemically reduced, without filtering, by the oxygen in the enormous volumes of air constantly being injected into every tank by the aerators driven by steam engines, the speed of which was increased when the water showed any turbidity from an excess of organic matter. The thick beds of sand and gravel at the bottom of each tank were so fully charged with air that one thrust of a stick released a pint of it in bubbles. Lloyd described how, if they had an excessive growth of algae anywhere, they turned in a shoal of gray mullet (*Mugil capita*), which nibbled it down close like sheep in a field of grass!

Lloyd was subsequently appointed as an advisor to the directors of the Royal Westminster Aquarium (situated across Broad Sanctuary from Westminster Abbey and opened in 1876), but resigned when they would not follow his advice during its construction. Neither did Lloyd's engineering ideas go unchallenged by his peers, In March 1876, in a paper he read before the Society of Arts, William Saville-Kent questioned the cost and efficiency of Lloyd's dark-chamber circulating system. He claimed his aquarium designs were cheaper to build and operate because he favored having as small a reservoir as possible for the circulating water, and providing each individual tank with aeration. Saville-Kent did not, however, address the main advantage of Lloyd's design, i.e., that of maintaining the water temperature at a level more advantageous to the fish. At the time Lloyd's concept was the better of the two, although it is Saville-Kent's system that is practiced by the public aquaria of today as a result of the refrigeration technology that allows precise control of temperature.

Another concept of Lloyd's that is not followed today is that of water changes. He was adamant about this, advising aquarists that "The water must not be changed, though it may have added to it from time to time whatever it may lose in fresh water by evaporation, or in any other manner, as, for instance, in such solid matters as are taken from it in the course of the formation of the shells and other hard parts of creatures existing in it." Lloyd had overlooked the fact that because of evaporation, over time dissolved minerals build up in the aquarium water, something that is remedied only by water changes. In a sense then, Lloyd was half-wrong and Dalyell was half-correct.

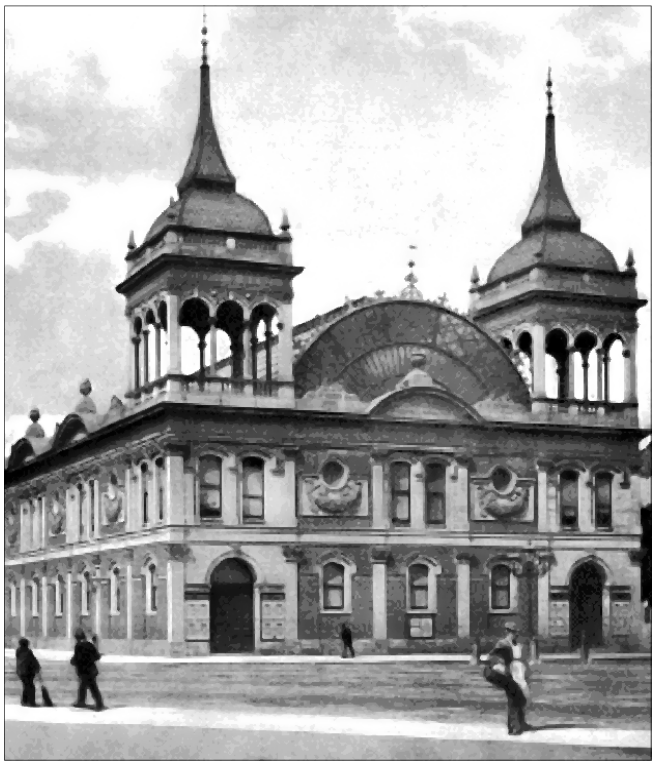


Figure A9-9. THE ROYAL WESTMINSTER AQUARIUM. The Aquarium and Summer and Winter Garden was opened by the Duke of Edinburgh on January 22, 1876. It was located across the road from Westminster Abbey and the Houses of Parliament. Lloyd resigned his post as advisor to the Aquarium because of the Directors "… absolute refusal to allow me to have proper engineering assistance during its construction, and to general mismanagement."

Lloyd once remarked, "Aquarium work, being hydraulic engineering on a small scale, is essentially the work of an engineer, and not that of an architect, unless he is also an engineer and a mathematician." It is interesting to note that, even today, the major credit for the successful keeping of home aquaria must be given to the engineering side of the hobby, i.e., the great advances in aeration and filtration made over the years. This is especially true for beginners who frequently start with the small tanks that every experienced aquarist knows are the hardest to maintain. Modern aeration and filtration in effect rejuvenate the water in situ and, in partnership with controlled artificial lighting, provide a modern twist to what Lloyd fought so hard for with his public aquarium peers.

A10: THE ROMANS

One question that has arisen among some aquarists is "Who were the first aquarium hobbyists?" Historically the contenders have included the Sumerians, Assyrians, Egyptians, Chinese and Romans, all of which whom have been discussed in some detail in Chapter I. However, whether the Sumerians, Assyrians, Greeks, Egyptians, Romans or Chinese used their fishponds for religious, ornamental, agricultural or scientific purposes (we can add this category since we are told by Pliny the Elder that Alexander the Great had several artificial ponds made for Aristotle so that he could study the various specimens) it does not mean that these cultures had an aquarium hobby.

If one is to write about things, one should be able to define one's terms. When the second edition of this book was written, there were difficulties experienced in defining: "aquarium" and "aquarium hobby." "Aquarium hobbyist" posed no problem since if one could define "aquarium hobby," a hobbyist would simply be a member of the aquarium hobby.

Although a number of dictionary definitions for "aquarium hobby" were considered, no selection was made at that time, the matter being abandoned in favor of the Four Stages of the Aquarium Hobby concept I developed in the Third Edition of this book.

Although it had been customary to equate the start of the aquarium hobby with the introduction of the so-called principle of the "balanced aquarium," it was noted that this principle is neither indispensable nor even of any real importance in keeping aquarium fishes. From ancient times to the present day, thousands upon thousands of aquarists have kept fish successfully using no plants whatsoever. In short, the so-called "balanced aquarium" principle is primarily a model of gas exchange that is of little significance in an uncrowded aquarium.

My definition is based upon Occam's razor, a principle of parsimony, economy or succinctness used in problem-solving devised by William of Ockham. I used a version here that states that among competing definitions, the one with the fewest elements should be selected. Other, more complicated definitions may ultimately prove better, but - in the absence of any certainty that they are absolutely required - the fewer elements that are included, the better. Thus the definition of the aquarium hobby I use is: **"A subject or pursuit involving fishes, undertaken primarily for pleasure during one's leisure time and to which a person is notably devoted."** Using this definition, my answer to "Who were the first aquarium hobbyists?" was clearly the Romans. "Piscina" was merely one particular kind of aquarium and this was their name for it.

The Glory of Rome

Rome experienced a period of prosperity and dominance towards the end of the Republican period and the beginning of the Empire that is remembered as part of its golden age. For wealthy Romans, life was good. They lived in beautiful houses – often on the hills outside Rome, away from the noise and the smell. They enjoyed an extravagant lifestyle with luxurious furnishings, surrounded by servants and slaves to cater to their every desire. Many would hold exclusive dinner parties and serve their guests the exotic dishes of the day.

That well-heeled Romans spent large sums on their fishponds is undisputed, and one outstanding example is the so-called Grotto of Tiberius at Sperlonga, a coastal town in the province of Latina, Italy, about halfway between Rome and Naples. The legend that attributed the owner of the property to Tiberius (Emperor from 14 to 37 AD) is based on the fact that on the day of the landslide Tiberius had dined in the grotto's water triclinium. The following is from the Annals of Tacitus:

"It chanced in those days that a serious accident which occurred to Tiberius encouraged these idle speculations and gave the prince himself a reason for greater faith in the friendship and firmness of Sejanus. They were at table in a villa known as the Grotto, built in a natural cavern between the Gulf of Amy-

clae and the mountains of Fundi. A sudden fall of rock at the mouth buried a number of servants, the consequence being a general panic and the flight of the guests present. Sejanus alone hung over Tiberius with knee, face and hands, and opposed himself to the falling stones - an attitude in which he was found by the soldiers who had come to their assistance."

Being at a table in a villa, however, doesn't mean that one is the owner. In any event, archaeological dating of the pool's masonry shows that this famous complex was initiated during the reign of Augustus (the first Emperor of the Roman Empire, 27 BC - 14 AD) rather than of Tiberius. Augustus was a moral man and discouraged luxury of all kinds. Tiberius would not have constructed a complex of such opulence for fear of incurring the wrath of Augustus, his adoptive father.

Figure A10-1 shows an overview of the Villa, placing the fishpond in perspective of its surroundings, and Figure A10-2 shows the fishpond in more detail. The complex consisted of a circular pond inside the cave that measured 70 feet in diameter and was formed by a circular concrete wall 35 inches wide (Figures A10-3 and A10-4). The center of the circular pond was equipped with a roughly square pedestal (8 feet square). Connected to the open side of the circular pond was a rectangular enclosure which measured 102 feet by 63 feet (Figure A10-5). The concrete was here was 35 inches and the depth of both ponds is approximately 5 feet. The rectangular pond was equipped with many amphorae (ceramic wine vessels) incorporated into its walls (these can be seen clearly at the left side of Figure 10-3).

Note that the Romans usually called all species of eel murenae (singular murena), but they also referred to them as anguillae and congri. Thus the common eel (*Anguilla*), congers (*Conger oceanicus*) and Morays (Muraenidae) could be denoted by the term. Although congers and moray eels were more likely to be kept in saltwater ponds, they can also tolerate freshwater. According to Columella, these at the Grotto were particularly well suited for *murena,* being quite at home in fresh or brackish waters. It is therefore easy to suggest that ponds like this one equipped with *amphorae* and designed with little freeboard (*murenae* are not known as jumpers) were probably designed for the raising of eels.

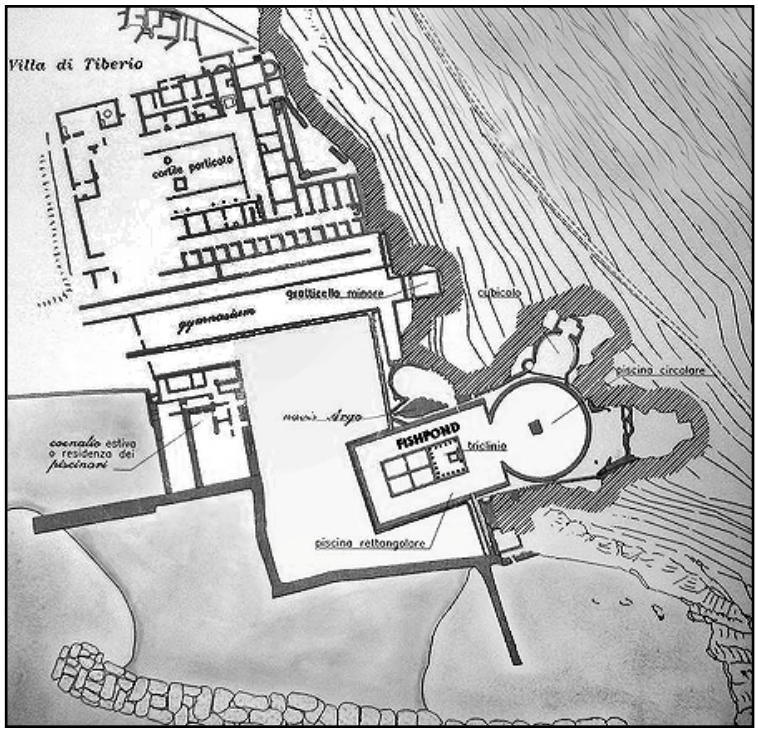


Figure A10-1: An overview of the Villa at Sperlonga, showing the relative size of the fishpond.

Within the rectangular enclosure is a rectangular element, measuring 58 by 26 feet (Figure A10-5). The end facing the circular pond (the grassy area in Figure A10-5) is designed as an outdoor triclinium or dining room (more will be said about triclinia later) , sheltered by a canopy that was supported by 22 small brick columns (148 inches in diameter, height unknown) positioned around the perimeter of the dining platform. The remainder of this island is divided into four rectangular tanks of roughly equal dimensions (17 by 13 feet).

The walls of these tanks have collapsed but the wall of the two next to the triclinium is shown with amphorae in the center of Figure A-10-5. Each of these tanks was connected to the large rectangular pond by 20-inch openings equipped with sets of vertical slots for the placement of movable gates. A small grotto opens off the north side of the rectangular

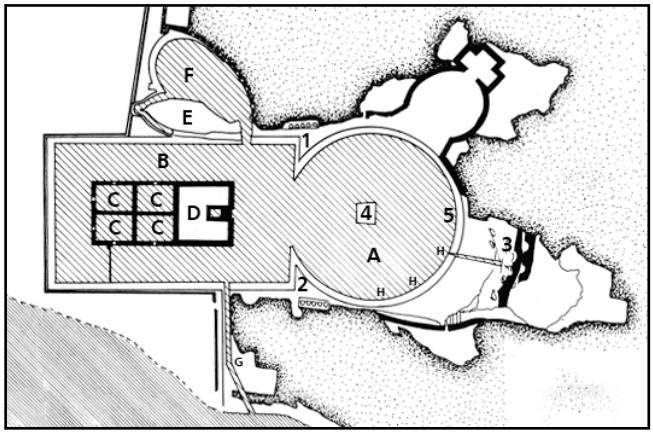


Figure A10-2: The Grotto Fishpond.

A = circular portion
B = rectangular portion
C = small separate tanks
D = covered triclinium
E = Navis Argo
F = small grotto
G = channel to sea
H = freshwater springs

Statuary

1 = Odysseus/Achiles
2 = Odysseus/Diomedes
3 = Polyphemus group
4 = Odysseus/Scilla
5 = Ganymede

pond and forms a roughly oval pond (41.7 by 23 feet). One wall of the grotto is lined with a row of twelve niches, which would have been partially submerged when the pond was full of water, and could have provided some refuge for the fish confined there. The grotto is set off from the main pond by a wall of natural rock cut into the form of a ship's prow. This was once covered with mosaics which included glass tiles and a section of this mosaic bearing the name Navis Argo (Jason's ship) was found and is in the Sperlonga Museum.

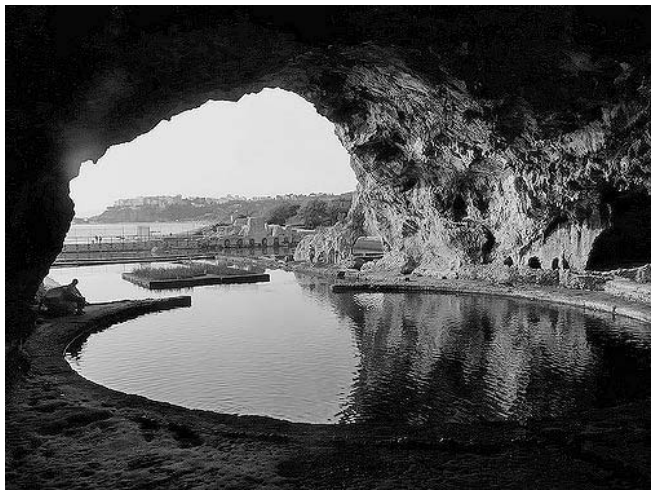


Figure A10-4: The circular portion of the fishpond from the inside showing the rectangular portion in the background.



Figure A10-3: The circular portion of the fishpond seen from the outside.

The pond was supplied with fresh water from springs within the grotto, three of which are located along the circular pond's southeast side. A single channel connected the south side of the pond with the sea. Together these sources would have created a brackish environment within the pond. In addition, the seaward channel provided a conduit that advertised the conditions inside the pond and enticed migrating fish into the enclosure.

Ornate sculptures that re-enacted scenes from famous literature, such as the Odyssey, were arranged in four main groups around the circular pool (Figure A10-6). At the rear of the cave and to the right was a group showing the *Blinding of Polyphemus* (the Cyclops or one-eyed giant) by Odysseus and his men, dominated by the huge figure of Polyphemus lying drunk (Figure A10-7). Forward of this, on an island in the middle of the pool, was a group showing



Figure A10-5: The rectangular portion of the fishpond.

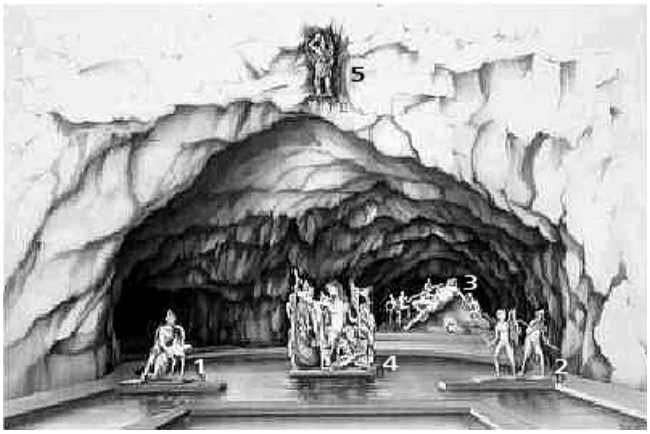


Figure A10-6:
Looking into the Grotto.
1 = Odysseus/Achilles 2 = Odysseus/Diomedes
3 = Polyphemus group 4 = Odysseus/Scilla
5 = Ganymede

Odysseus' ship attacked by the monster Scylla. Two smaller groups placed on the sides of the pool's opening to the main pool outside are one of Odysseus carrying the body of Achilles from the battlefield, and Odysseus about to betray Diomedes after they steal the Trojan cult image of the Palladium from Troy in the course of its siege by the Greeks. On a niche in the cliff face above the entrance to the grotto was *Ganymede carried up by the Eagle*, a disguise of Zeus.

The Grotto was simply a grander, natural version of the *nymphaea* which commonly adorned rich men's villas and domestic gardens in city and country alike. Such a conspicuous display of wealth, common in the late Republic, was discouraged by Augustus, and later emperors came to assume the prestige associated with these properties for themselves.

The Fishpond and Fishkeeping

Many fishponds were located adjacent to villas, in seaside coves and inlets or in lagoons, where they could be fed by both salt and fresh water. More expensive to construct than freshwater ponds, these coastal enclosures were costly and often quite elaborate. Lucius Junius Moderatus Columella, 4 AD - c. 70 AD (Figure A10-8) is the most important writer on agriculture of the Roman Empire. As he flourished during the early part of the first century of the Christian era, we possess in his writings much later information than those of his predecessors in the same labor, concerning the ordering and the cultivation of the fishponds of the Romans. In his eighth book of Husbandry he devotes two chapters to this subject: one on fishponds and the feeding of fish, and the other on the situation of fishponds. Columella recommends that rocks covered with seaweed be placed in the ponds, **"as far as the wit of man can contrive, to represent the appearance of the sea, so that, though they are prisoners, the fish may feel their captivity as little as possible."**

Marcus Terentius Varro, 116 - 27 BC (Figure A10-9) was Rome's greatest scholar and a satirist of stature, a man of immense learning and a prolific author. Most of his works have been lost but one that did survive is his *Rerum Rusticarum Libri* III (Agricultural Topics in Three Books). As Varro asserts, the appeal of fishponds is to the eye rather than the purse, which is emptied rather than filled by them. **"For in the first place they are built at great cost, in the second place they are stocked at great cost, and in the third place they are kept up at great cost."**

Even though these were saltwater ponds, fresh water was used to control salinity and temperature and, more importantly, to create the brackish mix of salt and fresh water so favored by fish. Channels facilitated the circulation of seawater, larger ones directly from the ocean and smaller ones to distribute the water within the fishpond, where shaded areas and amphorae stuck in the walls provided the illusion of security. To prevent the fish from escaping, brass gratings were placed across the channels. Cicero had no patience for all this extravagance, calling aristo-



Figure A10-7: The Polyphemus Group.



Figure A10-8:
Lucius Junius Moderatus Columella, 4 AD - c. 70 AD

crats such as Lucullus and Hortensius "piscinarii" ("fish fanciers") and "Tritons of the fish ponds."

Although seaside fishponds could be excavated from rock, they more commonly were constructed using a hydraulic concrete composed of volcanic ash (pozzolana), lime and aggregate. Hardening when mixed with water, this concrete also was used for the moles or breakwaters that served as a barrier to protect and define the perimeter of the fishpond.

Certain aspects of a Roman pond's design and its livestock helped to emphasize the status of its keeper. Probably the most widely recognized differentia among contemporary piscinae was based upon the origin (from fresh or saline waters) of the fish raised therein. At least in the aristocratic Republican Era, *piscinae salsae* (saltwater ponds) were preferable to *piscinae dulces* (freshwater ponds), especially on property along the Etruscan coast where certain peculiarities of the terrain and tidal currents were most favorable for maricultural operations. Still, rearing marine fish was (then as it is today) a generally more ambitious undertaking.

We know considerably less about freshwater Roman ponds than we do about their marine counterparts. Owing to their relatively modest scale, *piscinae dulces* are far less represented in the archeological record; owing to their comparatively humble function and design (i.e. less illustrious ownership), they were largely ignored in ancient literature. According to Columella, the earliest ponds in Rome contained freshwater. Nevertheless, their plebeian associations assured their rarity through the duration of the Republican Era. Negative perceptions of *piscinae dulces* changed abruptly in the early-first century AD. Freshwater fish-keeping increased in popularity in small part because of the changing demographics and reorganization of public water systems under Augustus, and in large part because freshwater fish had begun to be regarded as Imperial symbols of virtue. Over time it had become not only acceptable but fashionable to incorporate freshwater ponds, graced with newly innovated fountain works, into public and private peristyle gardens alike. In Pompeii as in other epicenters of cosmopolitan culture, "gentlemen gardeners" made displays of their refinement and sensibility through their horticultural prowess, work-



Figure A10-9:
Marcus Terentius Varro (116 BC –27 BC)

ing with exotic plants imported from all corners of the Empire.

One of the most unusual examples of a freshwater fishpond is that in the villa of Manlius Vopiscu in Tivoli, a small city 19 miles east-north-east of Rome that served as a summer escape for rich Romans. The villa is on a hill with a very steep slope, requiring that it and the fishpond be built against the hill on a narrow terrace supported by concrete vaults (Figure A10 -10). The fishpond consists of three adjacent rooms constructed of concrete, the central room measuring 17 x 26 feet, the two on either side being a bit narrower. The vaulted ceilings stand 26 feet above their floors with the bottom 10 feet being the depth of the fishpond. All three tanks are connected by openings in the two side walls that divide the vaulted tanks of the pond. The front of the fishpond is formed by three walls that close off the ends of the three tanks. Since the side walls extend beyond the front walls, they form four buttresses that support the pond on the steep slope of the hill. This arrangement left a clerestory opening at the top of each room that allowed light and air into the confines of the pond.

An aqueduct that was cut into the hill behind the pond supplied water to the fishpond, and a drain at the water level carried away any overflow water. Three large amphorae were incorporated into the central tank that provided refuge from the more aggressive fish. This fishpond is unusual not only in its external appearance, but in the fact that it consists of rooms that are completely enclosed and covered. This is an old fishpond, being dated at the late second century or early first century BC.

Despite the widespread popularity of piscinae in the early Imperial Era, the custom of spending large sums of money on fishkeeping seems to have ebbed by the end of the first century A.D. This can be attributed to several important changes within the Roman power structure. The most dramatic of these changes was the absorption of aristocratic landholdings into the emperor's estates. With Imperial restrictions on displays of power and affluence mounting, the construction of new piscinae effectively ceased. While existing ponds were routinely renovated, they had by the first days of the Holy Roman Empire fallen into hopeless disrepair and were never replaced. In the sixth century A.D. one scholar and bureaucrat, Cassiodorus, organized the construction of several piscinae on a monastic retreat at Vivarium (the single noteworthy attempt to restore the art of Roman pond keeping in the Christian era), only to see them discounted as wasteful and useless - and

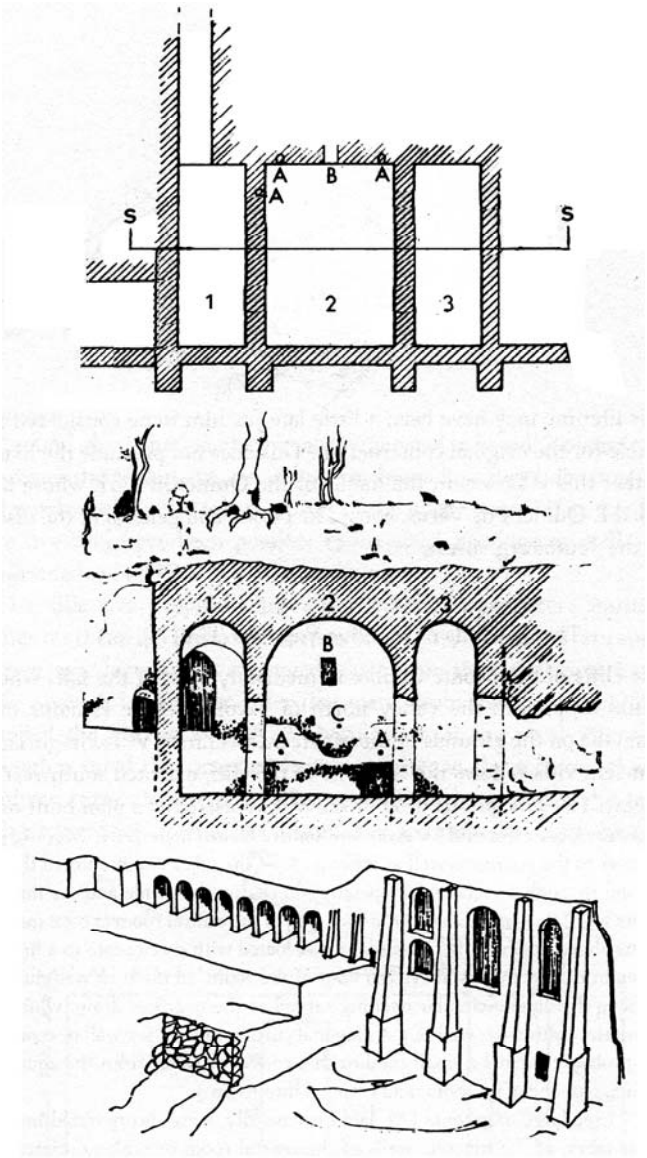


Figure A10-10:
TOP: View from above. S-S denotes cross-section location of middle image.
MIDDLE: A = Amphorae, B = inlet aqueduct, C = outlet drain
BOTTOM: Reconstruction of the front wall of the fishpond.

here the history of piscinae in the first century AD reaches its conclusion.

Roman Aquarists

Lucius Licinius Murena (140 - 91 BC), a soldier and later a politician, is said by Pliny to have invented saltwater fishponds, his cognomen deriving from the murenae that his forefathers and he raised in their ponds. In 63 BC he was elected consul but shortly before taking charge he was accused of corruption. His defense team included the advocate, Quintus Hortensius Hortalus, whom we shall meet shortly. Murena was acquitted even though he was probably guilty.

Lucius Licinius Lucullus (118 – 57/56 BC, Figure A10-11), in the culmination of over twenty years of almost continuous military and government service, became the main conqueror of the eastern kingdoms exhibiting extraordinary generalship in diverse situations (Lucius Licinius Murena was for several years his legate). His command style received unusually favorable attention from ancient military experts, and his campaigns appear to have been studied as examples of skillful generalship.



Figure A10-11:
Lucius Licinius Lucullus (118 – 57/56 BC).

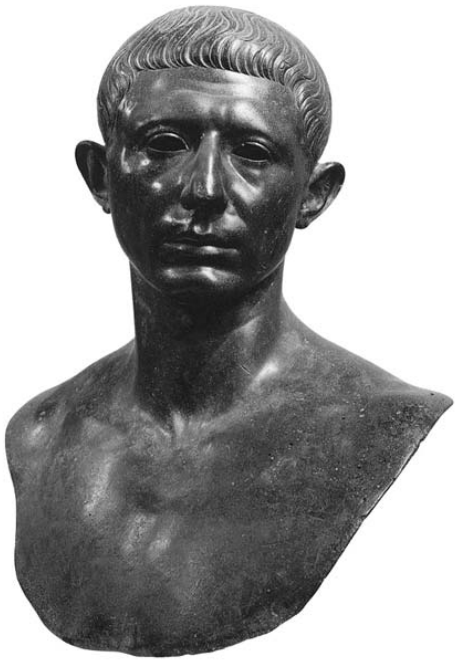


Figure A10-12:
Marcus Porcius Cato Uticensis (95 - 46 BC).

Like Murena, Lucullus returned to Rome from the east with so much captured booty that the whole could not be fully accounted, and poured enormous sums into private building, husbandry and even aquaculture projects which shocked and amazed his contemporaries by their magnitude. He built the horti Lucullani, the famous Gardens of Lucullus, on the Pincian Hill in Rome, and in general became a cultural innovator in the deployment of imperial wealth.

Lucullus was by far the most extravagant of these fish fanciers. A fish pond was to him very much what the yacht is to the modern millionaire. It is his name that we find so frequently in Cicero's letters when he and his set come in for several cleverly-framed rebukes. "No matter," says Cicero, "about the State, if only their fish-ponds escape harm." It was Lucullus who had a channel cut through a mountain near Naples at an immense outlay of money, in order to let salt water into his fish-ponds. This is why his rival Pompey half-jokingly called him "Xerxes in a toga," after the Persian general who cut a channel through the isthmus of Mount Athos for his fleet to pass through. The output of his fishponds seems almost fabulous, and the sums obtained from the fish



Figure A10-13:
Lucius Marcius Philippus (c. 141 - c. 73 BC).

sold from them were incredulous. Yet, there can be no doubt when Cato, guardian to Lucullus' son (Cato's sister, Servilia, was married to Lucullus), disposed of the fish in those ponds for 400,000 sestertii, and at the death of Lucullus they were sold for 3,000,000 sestertii (Note: Sestertii is the plural of sestertius; a loaf of bread cost roughly half a sestertius).

Incidentally, Plutarch tells us that Cato (Marcus Porcius Cato Uticensis, 95 - 46 BC, a politician and statesman in the late Roman Republic, was a noted orator, best remembered for his stubbornness and tenacity, especially in his lengthy conflict with Julius Caesar, as well as his immunity to bribes, his moral integrity, and his famous distaste for the ubiquitous corruption of the period, Figure A10-12) commenced his distinguished career as the most Radical of the period. He opposed every unnecessary expense and, as Censor, would not tolerate expensive fishponds or expensive fish. He declaimed against the extravagance of that age when a fish cost more than an ox. The remedies he instituted to prevent the excesses of the time proved ineffectual and fish, instead of becoming cheaper, became more expensive. At last he saw the inaptness of his policy and, like most Radicals after he had acquired some riches, became a violent Whig. As his thirst for wealth increased and finding his efforts in agriculture rather more amusing than profitable, he turned his thoughts to surer dependencies and employed his money in purchasing and constructing fishponds from which he derived a great revenue, **"such a one,"** he used to say, **"as Jupiter himself could not disappoint him of."**

Marcius Philippus (Lucius Marcius Philippus, c. 141 to c. 73 BC, Figure A10-13) was one of the most distinguished orators of his time. His ponds appear to rank next to those already enumerated and they were particularly celebrated for their magnificence and extent. One time when he was at supper in his friend's house with whom he lodged at Cassinum, he had tasted a pike out of the neighboring river that was set before him and had spitted it out. He followed this imprudent and vulgar action with a jest, **"May I perish,"** said he, **"if I did not think it was a fish!"** Now this comment having been widely circulated, the epicures of luxury would not touch a river-pike, except those procured from a certain part of the Tiber. The result was that this fish fell into disrepute and Varro has recorded: **"That in this age there is not a vain, paltry, sorry fellow who will not say that it is no matter to him whether his fish-pond is well stocked with pikes or frogs, and that, in his opinion, there is no difference between them."** Columella

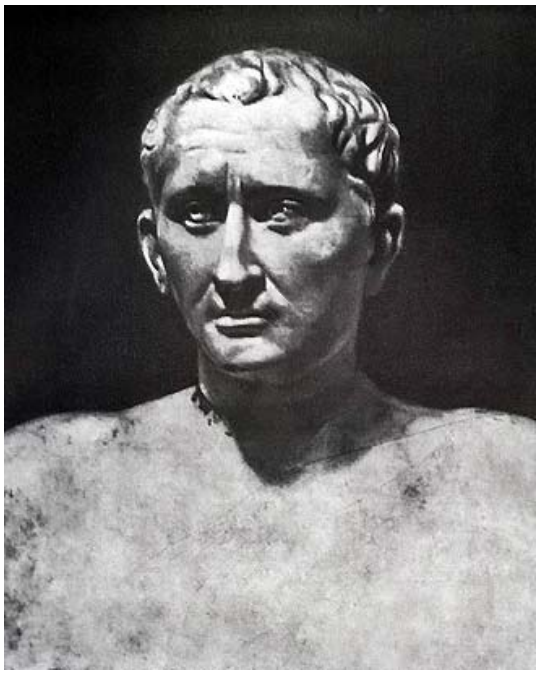


Figure A10-14:
Quintus Hortensius Hortalis (114 BC - 50 BC).

comments on this excessive luxury, and refers to Cato's earlier disapproving remarks against extravagance.

Quintus Hortensius Hortalis, 114 BC - 50 BC, was one of the foremost Roman orators (Figure A10-14). He dominated the courts by using a florid style and by resorting to shameless bribery. Despite his best efforts at legal trickery and intimidation, he was defeated by Cicero in the Verres case, where Cicero was prosecuting Caius Verres for gross misgovernment in Sicily. Cicero's success in this case won him great acclaim and considerably helped his political career. Hortensius later joined Cicero in several *causes célèbres*, with Cicero always speaking last. Hortensius vied with Lucullus and Philippus in the extent of their holdings, which were constructed at immense cost, and some of them so formed that the tide flowed into them. It was with the utmost difficulty that Hortensius could be prevailed on to part with any of them. The following is from Varro:

"Though our friend Quintus Hortensius had ponds built at great expense near Bauli, I was at his villa often enough to know that it was his custom always to send to Puteoli to buy fish for dinner. And it was not enough for him not to feed from his ponds - nay, he must feed his fish with his own hands; and he actually took more pains to keep his mullets from getting hungry than I do to keep my mules at Rosea from getting hungry, and indeed he furnished them nourishment in the way of both food and drink much more generously than I do in caring for my donkeys. For I keep my very valuable asses with the help of a single stable-boy, a bit of barley, and water from the place; while Hortensius in the first place kept an army of fishermen to supply food, and they were continually heaping up minnows for the larger fish to eat. Besides, he used to buy salted fish and throw them into ponds when the sea was disturbed and on account of bad weather this source of supply of the ponds failed to furnish food, and the live food - the fish which supplies the people with supper - could not be brought ashore with the net.' 'You could more easily get Hortensius's consent to take the carriage mules from his travelling-carriage and keep them for your own,' said I, 'than take a barbed mullet from his pond.' "

"And,' he continued, 'he was no less disturbed over his sick fish than he was over his ailing slaves. And so he was less careful to see that a sick slave did not drink cold water than that his fish should have fresh water to drink. In fact he used to say that Marcus Lucullus suffered from carelessness in this respect, and he looked down on his ponds because they did not have suitable tidal-basins, and so, as the water became stagnant, his fish lived in unwholesome quarters; while, on the other hand, after Lucius Lucullus had cut through a mountain near Naples and let a stream of sea-water into his ponds, so that they ebbed and flowed, he (i.e., Hortensius) had no need to yield to Neptune himself in matter of fishing - for he seemed, because of the hot weather, to have led his beloved fish into cooler places, just as the Apulian shepherds are wont to do when they lead their flocks along the cattle-trails into the Sabine hills. But while he was building near Baiae he became so enthusiastic that he allowed the architect to spend money as if it were his own, provided he would run a tunnel from his ponds into the sea and throw up a mole, so that the tide might run into the pond and back to the sea twice a day from the beginning of the moon until the next new moon, and cool off the ponds."

The fishponds of Gaius (or Caius) Lucilius Hirtius (a Praetor in 88 BC) were not less famous than any of the foregoing. Hirtius is stated by Pliny to be the first person to devise a separate pond for lampreys. He was so proud of these fish that he would not sell

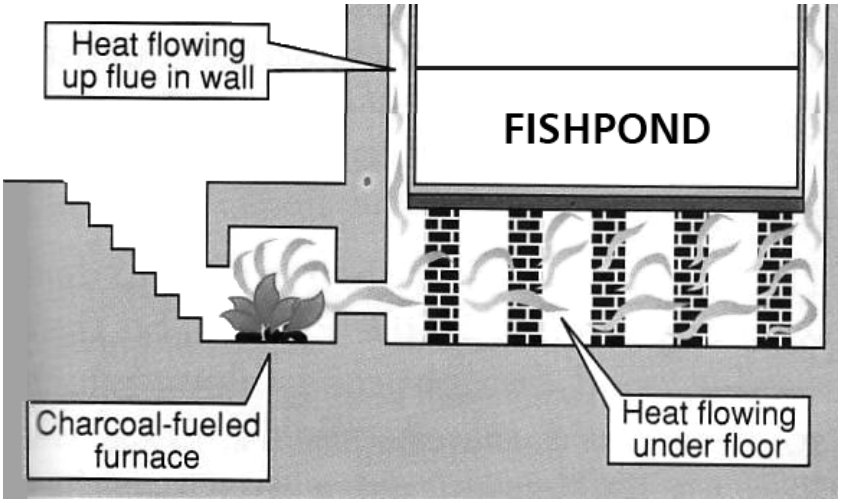


Figure A10-15:
The fishpond heating apparatus (hypocaust) constructed by Caius Sergius Orata



"Don't blame me, Maximus. That bill for jewelry is for your favorite eel, not me!

them at any price but during the triumph of Julius Caesar, when the dictator gave feasts that were never equaled, Hirtius loaned him 2,000 lampreys (Pliny says 6,000 and Varro says 2,000), which he estimated beyond any monetary value, and exacted that they should be replaced by fish of the same description, number and weight. Pliny assures us that his country house was of very meagre pretensions, yet the fishponds about it and their contents sold for 4,000,000 sesterces.

Caius Sergius Orata (140 - 91 BC) was a famed merchant and hydraulic engineer who was in the business of fish farming. At Baiae, in southern Italy, he farmed fish from red mullet to sea-bass and this alone made him rich. His Orata nickname came from his success at raising *aurata* or sea-bass. The only problem he had was the occasional cold spell, which could spell disaster for the more tender fish species. Although Sergius was credited by some with the invention of the hypocaust (underfloor heating), he refined rather than invented the hypocaust system. What is certain is that he used a furnace to produce hot air, which was then passed underneath the bottoms of the fish tanks (Figure A10-15). This was accomplished by keeping the tanks raised off the floor, providing space underneath to allow passage of the heated air. Encouraged by this, Sergius started the first oyster farm in Lago Lucrine (the name means "Money Lake"), and gained a reputation as an oyster connoisseur. He also adapted the idea to relaxing thermal baths and commercialized them as successfully as the oysters. He used to buy villas, construct the baths and then resell them at greater prices which brought him even more fame and cash. In any event, Caius Sergius Orata must be credited as the first aquarist to devise and to use artificial heating.

Relationships with Fish

There are many stories that describe the relationships of Romans to their fish, although to what extent these are factual are often impossible to determine. In one wealthy Roman villa by the seashore of Formiae in Latium, fishponds contained lampreys which were said to swim up to their "master" (*magistrum*). Mullets, at the call of their names by the *nomenculator* (the servant who informed his master of the names of those whom he met) were said to swim out in response also. In one imperial villa, Pliny claimed that the fish came up "one by one" (*"singuli"*) in response to the call of their names. In the Emperor Domitian's fishpond at Baiae, Martial describes how fish came at their master's voice when they were summoned by name.

Pliny also tells us that the emperor Caesar had many country houses where he kept fishes in ponds that would ordinarily come to hand and take food. Nor was this any unusual thing, for fish were commonly so gentle and tractable in fishponds that it was not looked upon with any undue surprise. Some notable instances have been recorded where fish have evinced this kind of domestication, viz., at Floras, a castle in Sicily not far from Syracuse and at the lake of Jupiter Labradius, the eels would take food from the hand and were sometimes adorned with earrings. A pet murena kept by Antonia, the niece of Augustus, was also adorned with earrings, which brought many visitors to witness the spectacle. (Here, an anguillae must be meant, given that the lamprey and moray have no pectoral fins on which to hang such ornaments.)

The same was observable at the temple of Veterum Delubrum, and at Mesopotamia. Perhaps those at the

fountain of Apollo in Lycia, were the most remarkable of all, as they answered to the sound of a whistle with the sagacity of a dog. In the lake of Venus, near Hierapolis the fish used to obey the voice of the wardens and sextons who had the guardianship of that temple. The fish there were so tame that they allowed themselves to be fondled, and would wag their tails like dogs in a fawning and flattering manner. It was said that they would even gape with their mouths wide open, and suffer their admirers to thrust their hands or fingers into their gullets.

Normally shy fishes in the river Helorus in Sicily took bread from human hands and wore earrings and necklaces. Such was also the case with the fish in cisterns near the temple of Fortune in Stephanopolis in Epirus, the fish in the sanctuary of (or in the harbor of) the Old Men in Chios, the eels (anguillae) in the spring of Jupiter in his famous sanctuary at Labranda in Caria, and the fish in the spring of Chabura in Mesopotamia between the Tigris and the Euphrates rivers.

Crassus (Marcus Licinius Crassus, who had defeated Spartacus in 73 BC and was a member of the Triumvirate in 60 BC) was said to have adorned a pet eel with earrings and small necklaces "just like some lovely maiden," training it to respond to its name and swimming up to eat what was offered. Rebuked by Domitius for weeping upon the death of the creature, he retorted that his accuser had buried three wives without shedding a tear! Hortensius, who lavished such care on his fishponds, is also said to have wept when his favorite murena died. These examples confirm that the Romans were in a close relationship with their fish and that they viewed them as very similar to domesticated animals and thus capable of a certain amount of interaction with human beings.

Table Manners: Luxury and Cruelty

Romans took their more elaborate meals in a reclining attitude and resting on their elbows. These couches (Figure A10-16) were constructed of wood, bronze, or marble, and situated in dining areas called triclinia or biclinia. In a triclinium three couches were arranged in a U-shaped configuration, and in a biclinium two couches were arranged in either an L-shaped configuration or else placed opposite each other.

The red or barbed mullet, *Mullus barbatus*, a small bottom-feeding saltwater fish that rarely exceeds two pounds (Figure A10-17), was especially prized at the dinner table. By the first century AD, the Romans had become fascinated by larger specimens, for which increasingly extravagant prices were paid. Horace (Quintus Horatius Flaccus, 65 BC to 8 BC, known in the English-speaking world as Horace, was the leading Roman lyric poet during the time of Augustus, Figure A10-18), under the section of his Satires titled "Gourmet eating is ridiculous," berates the foolish host who is taken with the appearance of a three-pound mullet but still must cut it up in portions (**"It's the size that attracts you I see, well then why not a large pike? Because no doubt the pike's natural-**

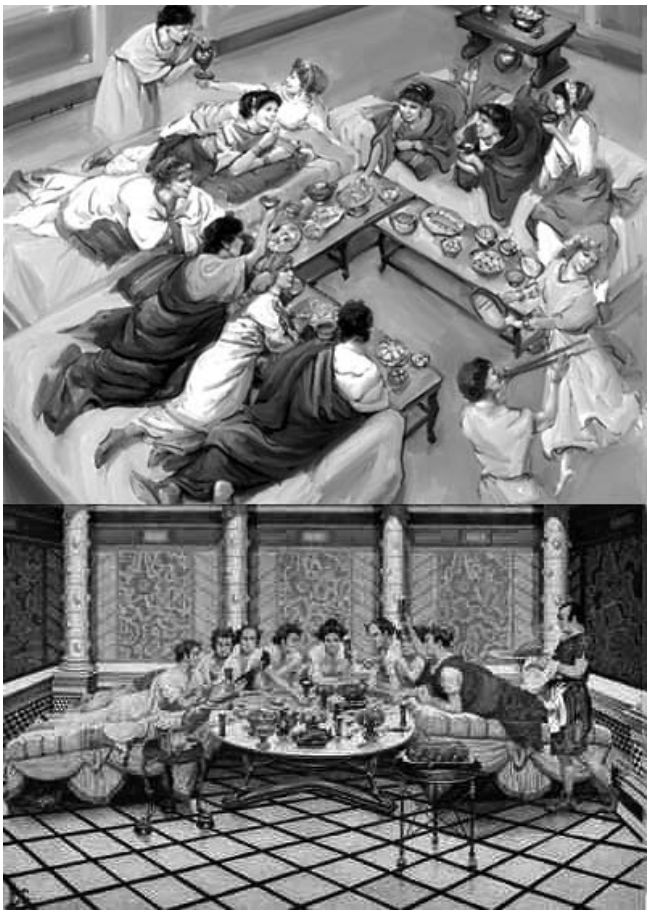


Figure A10-16: Roman triclinia. The bottom view shows that the couches were sloped so that the heads of the guests were higher than the table.

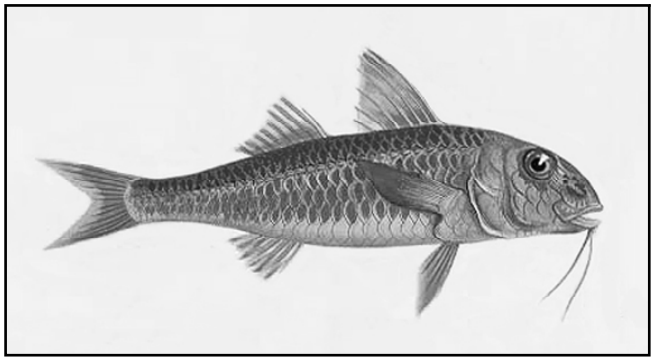


Figure A10-17: ***Mullus barbatus*.**

ly larger, while the mullet's normally much smaller. It's a belly seldom hungry that scorns common fare.").

Martial, or Marcus Valerius Martialis (38–41 AD - circa 103 AD, Figure A10-19), was a Roman poet who brought the Latin epigram - a brief, interesting, memorable, and sometimes surprising or satirical statement -



Figure A10-18:
Horace (Quintus Horatius Flaccus (65 BC - 8 BC).



Figure A10-19: Martial, 38–41 AD - circa 103 AD.

to perfection and provided in it a picture of Roman society during the early empire that is remarkable both for its completeness and for its accurate portrayal of human foibles. Referring to mullets, Martial states that any one that appears to weigh any less is disdained and should be thrown back **("…do you think it better on Laurentum's shore to pull up ugly frogs and thin needle-fish, than to return to its own rocks the captive mullet which shall seem to you of less than three pounds?")**, and this when even a two-pound mullet was expensive and should weigh at least that much to justify its place on a gold inlay dish **("Now, to induce me to buy, either a huge bass or a two-pound mullet, a rich woman friend has proposed a dinner at your house. Let there be some moderation and at length some regard for fairness and justice. Do not insult large gold-inlaid dishes with a small mullet: at the least it ought to weigh two pounds.").**

Martial goes on to satirize someone who sold a slave for twelve hundred sestertii, only to buy a four-pound mullet with the proceeds **("You sold a slave yesterday for twelve hundred sestertii, Calliodorus, that you might dine well once. You have not dined**

well: a four-pound mullet which you bought was the ornament and chief dish of your dinner. A man may cry, 'This is not a fish, not a fish, you profligate,' tis a man, a man, Calliodorus, is what you eat.").

The one put up for sale by Tiberius (Roman Emperor from 14 AD to 37 AD) weighed four and a half pounds. And Juvenal (Decimus Junius Juvenalis, 55/60 - 127 AD) who was the most powerful of all Roman satiric poets speaks of an even larger mullet selling for six thousand sestertii, a thousand for every pound, more than for which the fisherman, himself could have been bought. During the reign of Caligula, Pliny the Elder, i.e., Gaius Plinius Secundus, 23 AD - 79 AD (Figure A10-20), a Roman author, naturalist, and natural philosopher, reported that Apicius (Figure A10-21), i.e., Marcus Gavius Apicius, a Roman gourmet and lover of luxury who lived sometime in the first century AD during the reign of Tiberius and who is alleged to have written the Roman cookbook, "De Re Coquinaria" ("The Art of Cooking"), was said to have paid eight thousand sestertii for a red mullet).

Seneca, being a moralist, also lays into the excessive luxuries of the Romans vis à vis these fish:



Figure A10_20.
Pliny the Elder (Gaius Plinius Secundus, 23 AD - 79 AD).

"Suffer me here to lay aside my subject, and to apply the scourge to luxury! Commend me for a beautiful sight, says one, to an expiring mullet. In the death-struggle, as its life ebbs away, first a ruddy glow, then a pallor suffuses it. How symmetrical are the variations as it changes from tint to tint between life and death! Our somnolent, jaded luxury gets a long respite by means of this. It was late in waking up to find how cruelly it had been circumscribed in being cheated of such a pleasure!"

"Hitherto only fishermen have been able to enjoy this grand and beauteous sight. But why should we at the banquet be satisfied with a cooked, a lifeless fish? Let him expire on the very tray. We used to be surprised at the fastidiousness of our epicures in refusing to touch fish unless it had been caught on the same day, when, as the saying goes, it smacked of the briny. Because it had to be delivered post haste, way had to be made for the breathless porters as they hurried along shouting. To what lengths have refinements now been pushed? A fish killed today has come to be considered as already stinking. 'He was taken out of



Figure A10-21.
Marcus Gavius Apicius, a Roman gourmet and lover of luxury who lived sometime in the 1st century AD during the reign of Tiberius.

the water this day, I assure you.' 'I cannot trust you in a matter of such moment. I must have the evidence of my own senses; let the creature be brought here and breathe out his life before my eyes.' Such a pitch of fastidiousness has the gourmand's palate reached that they will not taste a fish unless they have seen it swimming and throbbing in the very banqueting room."

There was a common practice among wealthy Romans of passing mullets around in glass jars while they died for lack of oxygen or, in the case of Hortensius, to remove them from the water and place them on the banquet table, both with the purpose of having the guests watch as the fish changed colors and gasped out its life. The mullet would then be returned to the kitchen to be cooked. The following description is by Martial:

"A mullet is not thought fresh enough unless it expires in the hand of the banqueter. These fish are handed round enclosed in glass jars, and their colors are observed while they expire; death paints many hues on them as they draw their last struggling breath. Others are pickled alive and killed in the sauce. These are the people who think one is romancing who asserts that a fish can live underground and instead of being caught can be dug up! How inconceivable it would sound to them to hear that a fish swam in sauce and was killed during dinner, but not to be served at dinner; that first it was long admired, and that the eyes were feasted on it before the gullet was!"



Figure A10-22:
Publius Vedius Pollio
(born 1st century BC - died in 15 BC).

Perhaps the height of cruelty was at the hands of Apicius who invented a mode of drowning or suffocating mullets in a certain sauce or pickle, which process was said to add highly to their flavor. A similar fashion prevailed of old in England with regard to lampreys, which were drowned in wine previously to being cooked and eaten. Incidentally, when Apicius had frittered away his fortune of one hundred million sestertii until he only had a mere ten million left (a still considerable wealth) he took fright at the prospect of relative poverty and committed suicide.

Seneca also attacked these practices on the grounds of unbridled cruelty:

"The more skill our jaded luxury has had placed at its disposal, the more refined and elegant the devices that in its frenzy it day by day invents; it spurns everything that is common. We used to hear the remark, 'Nothing can surpass a mullet caught on the rocks'; but now it runs, 'Nothing equals the beauty of an expiring mullet. Let me hold in my own hands the glass vase, to see him jump and quiver.' After long and fulsome praise has been lavished on him, he is taken out of his transparent pond. Then each guest shows off his experience of such scenes by pointing out the hues to his fellows. 'Look how the red bursts forth, deeper than any carmine; look at the veins he has along his sides: see, you would think his belly was covered with blood; what a gleam of dark blue shot forth just under the brow! Now he is stretching himself out, and sinking to a uniform pallid hue!'"

Seneca pulled no punches as he laid into those who condoned the practice:

"Not one of these selfish fellows would sit by a dying friend's bedside; none of them can endure the sight of a father's death a sight they have dearly longed for. How few will attend the funeral of a relative! The last hour of brothers and friends is shunned by them; they are all in a hurry to be in at the death of a mullet! For he has a delicate beauty, don't you know, that nothing can surpass. My impatience makes me sometimes exceed the bounds of decency and use words at random. These drivellers are not satisfied to bring teeth, and palate, and stomach to the revel; they make their very eyes partners in the gluttony."

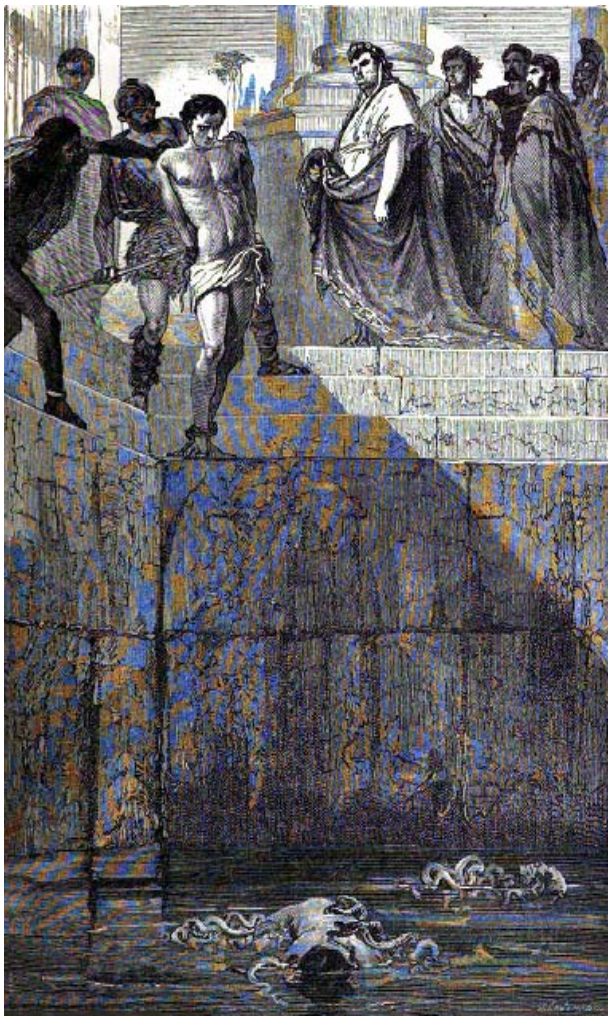


Figure A10-23:
"Esclave romain jeté aux Murenes"
("Roman slave thrown to the Moray eels").
From Figuier's "Les Poissons, les Reptiles et les Oiseaux." The illustrator clearly did not know what a Roman piscina looked like!

Publius Vedius Pollio (born first century BC - died in 15 BC, Figure A10-22) was a Roman equestrian of the first century BC, and a friend of the Roman emperor Augustus, who appointed him to a position of authority in the province of Asia. In later life he became known for his luxurious tastes and cruelty to his slaves - when they displeased him, he had them fed to moray eels (or lampreys; the exact fish is not certain; an artist's rendition of this practice is shown in Figure A10-23) that he maintained for that purpose, which was deemed to be an exceedingly cruel act. In a highly rhetorical passage, the Christian writer Tertullian stated that after executing slaves, Vedius had his lampreys "cooked straight away, so that in their entrails he himself might have a taste of his slaves' bodies too."

When Vedius tried to apply this method of execution to a slave who broke a crystal cup, Augustus (Vedius's guest at the time) was so appalled that he not only intervened to prevent the execution but had all of Vedius's valuable drinking vessels deliberately broken.

This incident, along with Augustus's demolition of the massive villa he inherited after Vedius's death in 15 BC, were frequently referred to in antiquity in discussions of ethics and of the public role of Augustus. Vedius died in 15 BC and among his many heirs, Augustus received a large part of Vedius's estate, including his villa on the Gulf of Naples, along with instructions to erect a suitable monument on the site. The emperor demolished the house and constructed in its place a colonnade in honor of his wife Livia, which he dedicated in 7 BC. During or shortly after Augustus's reign, Ovid praised his demolition of Vedius's house as a grand statement against immoral luxury made even at the emperor's own cost.



Figure A10-24:
Tiberius (42 BC - 37 AD)

Also in the first century AD, Vedius's story was used by the philosopher Seneca and by Pliny the Elder. In two ethical treatises, Seneca used Vedius's treatment of the cup-bearer and Augustus's response to illustrate the extremes to which anger could lead and the need for clemency. Although Pliny the Elder mentioned Vedius's lampreys in his *Natural History* while treating varieties of fish, Pliny was no admirer of Augustus and noted the man's friendship with Augustus while ignoring the story of the latter's clemency. His handling of the story has been seen as "a gratuitous jibe" at the emperor.

Although the Pollio story is not a myth, another story cited frequently is. For example, there is a Bad Tiberius and a Good Tiberius (Figure10-24). Tiberius the monster is all too familiar. This is thanks to the attacks of the three Furies of early imperial historiography: Tacitus, Suetonius, and Cassius Dio. In their portrait of the second Emperor he will forever be for us the old monster who hounds to death family, friends and enemies alike: cold, proud, bitter, gloomy, secretive, duplicitous, savage and depraved.

And yet no modern historian would accept this picture. Suetonius, for example, is at his worst in his *Life of Tiberius*, constantly contradicting himself and repeatedly misunderstanding his sources, whether intentionally or inadvertently; while Tacitus is at his most ambivalent, portraying a man at once noble and vicious, simple and devious. The crucial question is: what were the sources on which Tacitus, Suetonius and Dio depend? There is staggeringly little evidence, and the nature of these lost sources has been hotly debated, with no conclusion in sight. A good example is that from Suetonius:

"A few days after he reached Capreae and was by himself, a fisherman appeared unexpectedly and offered him a huge mullet; whereupon in his alarm that the man had clambered up to him from the back of the island over rough and pathless rocks, he had the poor fellow's face scrubbed with the fish. And because in the midst of his torture the man thanked his stars that he had not given the emperor an enormous crab that he had caught, Tiberius had his face torn with the crab also."

However, the following is from Seneca's epistles volume III, XCV:

"A mullet of monstrous size was presented to the Emperor Tiberius. They say it weighed four and one half pounds (and why should I not tickle the palates of certain epicures by mentioning its weight?). Tiberius ordered it to be sent to the fish-market and put up for sale, remarking: "I shall be taken entirely by surprise, my friends, if either Apicius or Publius Octavius (a noted epicure) does not buy that mullet." The guess came true beyond his expectation: the two men bid, and Octavius won, thereby acquiring a great reputation among his intimates because he had bought for five thousand sesterces a fish which the Emperor had sold, and which even Apicius did not succeed in buying. To pay such a price was disgraceful for Octavius, but not for the individual who purchased the fish in order to present it to Tiberius, though I should be inclined to blame the latter as well; but at any rate he admired a gift of which he thought Caesar worthy."



Figure A10-25:
"Agony of a Red Mullet at the Feast of Hortensius."
From Figuier's "The Ocean World."

Actually, about a hundred years earlier the tale was told in Italy of a vassal who had brought his lord a basket of figs, knowing that he was fond of them but unaware that figs were plentiful

after a large harvest. Insulted, the lord had his servants strip the man, bind him and throw the figs, one after another, into his face. When one almost hit him in the eye, he cried out, **"May the Lord be praised!"** When the signore inquired why, he replied, **"Sire, because I had been encouraged to pick peaches instead, and if I had picked them I would be blind by now."** Laughing, his lord had him untied and dressed, and rewarded him for the novelty of what he had said. The tale passed into proverb, then the figs were replaced by the mullet and crab and hence into Suetonius' account of "history." One has to be careful when reading the ancient Roman writers. Caveat lector!

Fishing at the Dinner Table

An interesting reference to Hortensius and mullets is in the 1868 translation of *The Ocean World* by Louis Figuier (1819-1894), a French chemist and writer on occult subjects.

"The great rival of Cicero, the advocate Hortensius, who attracted crowds of people to the Forum by his eloquent and elegant discourses, had an inordinate passion for this kind of enjoyment. These little inhabitants of the waters were led by a small canal which was carried under the festive table, and his great enjoyment was to witness the agonies of the unhappy fish just taken from its native element and carried to the table, palpitating with its dying convulsions, as it perished beneath his eyes, he in the meanwhile enjoying a sumptuous banquet."

This was accompanied by an artist's representation of what this might look like (see Figure A10-25). However, as we have seen from Varro's account Hortensius was so devoted to his fish that he could not stand to send them off to the banquet table, opting instead to purchase them from the market in Puteoli. Thus he would not have constructed such a conduit from one of his fishponds to his dining table any more than a present-day fish fancier would serve up his pet arowana attributed to dinner guests. Thus, Figuier's account is a myth, nothing more.

However, there is another reference to fish swimming under the dining room table and this one is by Seneca. Lucius Annaeus Seneca (often known simply as Seneca, circa. 4 BC – AD 65, was a Roman philosopher, statesman and dramatist of the Silver Age of Latin literature (Figure A10-26). He was a tutor and later an advisor to Emperor Nero (he was ultimately forced to commit suicide for alleged complicity in a conspiracy to assassinate him). His "Quaestiones Naturales" was one of the few Roman works which deals with scientific matters. It is not a systematic work, but a collection of facts of nature from various writers, Greek and Roman, many of which are curiosities. Composed of seven books, Book III is titled, "Which Treats of the Different Forms of Water," and this is the one I will refer to here.

Bear in mind that what Seneca reports is not necessarily what he himself has observed. Striking and numerous are the examples of his credulous acceptance of statements which, had it occurred to him to test them by actual examination, he could easily have found to be erroneous. He affirms, for instance, more than once, that while lightning melts metals, it freezes wine, and he gravely alleges that when the wine is thawed and imbibed, it either kills or drives mad those who partake of it. He asserts that the waters of certain rivers have the power of dyeing whole flocks of sheep, black fleeces being changed into white and white into black, that some waters are so dense that even the heaviest objects will not sink in them; that the heat of the sun in the Nile valley is so great as to melt silver and the joints of statues. When he proceeds to explain the reason of such abnormalities he expresses no hesitation, but delivers his opin-

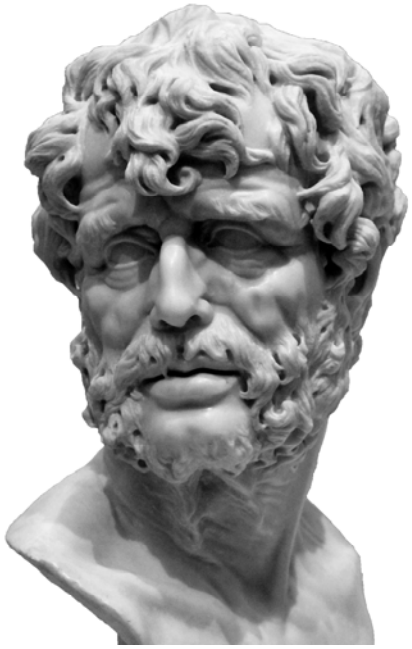


Figure A10-26.
Lucius Annaeus Seneca (circa 4 BC – AD 65).

ion with the assurance of a scientist who has obtained the experimental evidence in his laboratory.

"Here is a proof I have to give you that in the underground recesses are concealed great quantities of water which abound in filthy fish. Any time that the water bursts out, it brings in its train a huge crowd of creatures foul to sight, disgusting and noxious to taste. At any rate, once, near the city of Hydissus in Caria, a flood of underground water threw up to the light of day a number of strange fishes, and all who ate them died. And no wonder. Their bodies were full of oil from their long inactivity; they had been fattened in the darkness without exercise, and deprived of that light whence health is derived. A further proof that fish may be produced in those depths of earth is afforded by the breeding of eels in shady places; they also are heavy through their want of exercise, especially if a considerable depth of mud has hidden them quite out of sight."

In Book III, "Which Treats of the Different Kinds of Water," in a section titled "Denizens of Underground Water" Seneca has this to say:

"Most of these creatures are blind, such as moles and underground rats, which have no sense of sight, since it is unnecessary for them. From these depths fish are, according to Theophrastus, dug up in certain localities." (Note: Theophrastus, born around 371 in Greece, was a successor of Aristotle and a prolific writer on a wide variety of subjects, was clearly describing the existence of cave fishes here.**),**



Figure A10-27:
Pliny the Younger (61 – ca. 112 AD).

Seneca goes on to write (the italics are mine):

"At this point many pleasantries will occur to you to apply to my incredible narrative, which you will politely call a good story. A man will no longer go to fish with net and hook, but with his pickaxe! The next thing will be for someone to go out hunting at sea. Now what reason is there, I ask, why fish should not cross the land if we can cross the sea and change our abodes? You are surprised at this happening. How much more incredible are the achievements of luxury as often as it either counterfeits or vanquishes nature? *Fish are to be found swimming in the dining couch; one is caught right under the table, to be transferred immediately to the table."*

Martial describes the leisure practice of fishing from one's bed just by dropping a line out the bedroom window. The following is taken from his Lib. X., Epigram. XXX., vv. 16—25 (the italics are mine):

"The ocean's surface is ruffled by a gentle breeze; yet is not the sea-floor still, but a slumberous swell bears on the gaudy shallop (Note: A light sailboat used mainly for coastal fishing**) with the assisting air, as from the fluttering of a girl's purple fan, when she shuns the heat, there comes refreshing cool. *The line seeks not its prey in the distant sea, but the fish, descried from above, draws down the cord cast from bed or couch.* If ever Nereus feel the power of Aeolus (**Nereus was a sea-god, and Aeolus the god of the winds**), the table, safe-supplied from its own store, laughs at the storm; the fishpond feeds turbot and home-reared bass; to its master's call swims the dainty lamprey; the usher-summons a favorite gurnard, and, bidden to appear, aged mullets put forth their heads. But when dost thou, Rome, permit to enjoy those delights? How many days of Fo'rmiae (**an ancient town on the Appian Way**) does the year put to the credit of one tied to city business? O happy porters and bailiffs! Those delights are procured for your masters, they belong to you!"**

Note that Martial does not state that this fishing was done in the dining room or that the fish were caught right under the table by the guests. If this were the case, Martial most certainly would have mentioned it. It would have been too good to pass up!

David W. Cheever also claims that Roman **"Pisciculture was carried so far that fishponds were constructed on the roofs of houses. More practical persons conducted a stream of river-water through their dining-rooms, so that the fish swam under the table, and it was only necessary to stoop and pick them out the moment before eating them; and as they were often cooked on the table, their perfect freshness was thus insured."** However, he cites Martial, Book X, Epigram XXX for this and as can be seen from the above quote Martial said no such thing. (The idea of fishponds on the roof of houses also cast doubts on his credibility.)

Gaius Plinius Caecilius Secundus, born Gaius Caecilius or Gaius Caecilius Cilo (61 – ca. 112 AD), better known as Pliny the Younger, was a lawyer, author, and magistrate of Ancient Rome (Figure A10 -27). Pliny's uncle, Pliny the Elder, helped raise and educate him. They were both witnesses to the eruption of Vesuvius on August 24, 79 AD. His Letters deal with a great variety of subjects and taken altogether, they give an absorbingly vivid picture of the days of the early empire, and of the interests of a cultivated Roman gentleman of wealth.

In his letter to Domitius Apollinaris wherein Pliny describes a visit to his Tuscan villa, Pliny describes his summer house as follows:

"In the corner of the portico is a spacious bedchamber leading out of the dining-room, some of its windows looking out upon the terrace, others upon the meadow, while the windows in front face the fish -pond which lies just beneath them, and is pleasant both to eye and ear, as the water falls from a considerable elevation and glistens white as it is caught in the marble basin."

Therefore it was not unusual for a fish pond to be located right under a bedroom window. Furthermore, when describing his villas in Lombardy to his friend, Romanus, Pliny writes (the italics are mine):

"Our situations too are not dissimilar; your buildings are carried on upon the sea-coast, mine are rising upon the side of the Larian Lake (i.e., present-day Lake Como**). I have several villas upon the borders of this lake, but there are two particularly in which, as I take most delight, so they give me most employment. One of them stands upon a rock, and overlooks the lake; the other actually touches it. The first, supported as it were by the lofty buskin, I call my tragic; the other, as resting upon the humble rock, my comic villa. Each has its own peculiar charm, recommending it to its possessor so much more on account of this very difference. The former commands a wider, the latter enjoys a nearer view of the lake. One, by a gentle curve, embraces a little bay; the other, being built upon a greater height, forms two. Here you have a strait walk extending itself along the banks of the lake; there, a spacious terrace that falls by a gentle descent towards it. The former does not feel the force of the waves; the latter breaks them; from that you see the fishing-vessels; *from this you may fish yourself, and throw your line out of your room, and almost from your bed, as from off a boat.*"**

Thus, Pliny fished for sport at his villa on Lake Como, using a rod and line directly out of his window, "paene etiam de lectulo" ("almost from his bed"); this must have been a common practice, as we learned from the ironic words of Martial concerning other people. Figure A10-28 shows a typical Roman bedroom and it is easy to see that one could easily poke a rod out the window from the bed and drop the hook over a nearby fishpond. Thus it appears that the idea of fishing from one's couch in the dining room is most probably based upon the misinterpretation of the practice of fishing from a bedroom using a line dangled outdoors over a nearby fish pond. From Figure A10-16, which shows some triclinia, it is clear that fishing with a line here would not be practical.



Figure A10-28. Reconstructed bedroom, from the House of Publius Fannius Synistor Boscoreale, near Pompeii. Late 1st Century.

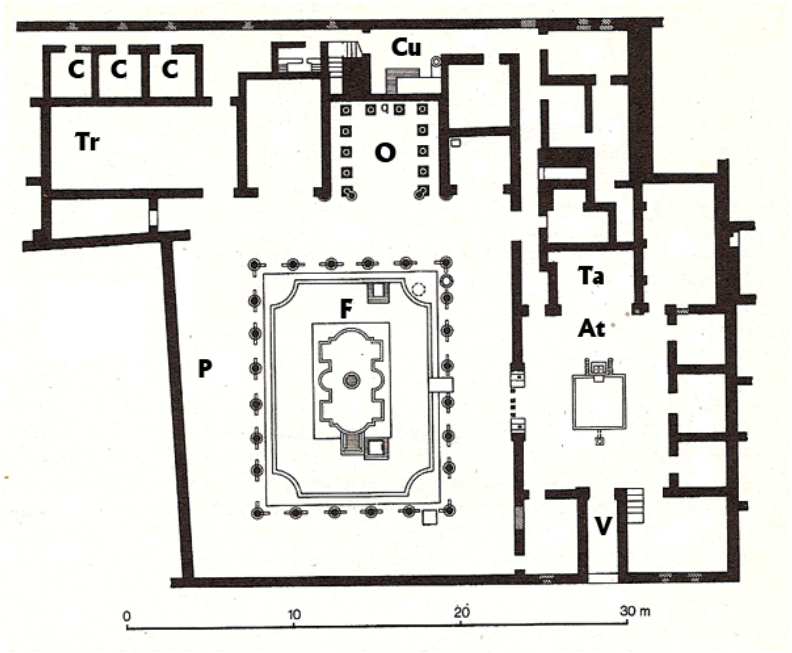


Figure A10-29:
The Casa di Meleagro, Pompeii with a fishpond in the peristyle. Key: C = bedrooms; Cu = kitchen; Tr = triclinium; Ta = tablinum; At = atrium; V = entrance; O = oecus; F = fish pond; P = peristyle.

A peristyle is an open colonnade in a building surrounding a court that usually contains an internal garden, in this case, however, it is a fishpond. Note that the oecus - the principal salon in a Roman house and used occasionally as a triclinium for banquets - faces the fishpond.

The First Aquarium?

The following is from Bernd Brunner's "The Ocean at Home":

"These fish were kept in opaque tanks, often made of marble, in front of the house. The first fish to enter the interior of a house in imperial Rome was the sea barbel, a much cherished and expensive breed. Allegedly, they were kept in small tanks underneath the cushions of the guest beds. Around 50 AD, panes of glass were brought to Rome, Herculanaeum, and Pompeii, to replace one wall of the marble tanks; now it was possible to actually see the hustle and bustle of the fish without having to guess their schematic movements from above."

If true, this would mark the Romans as the inventor of the flat-sided aquarium, not the British centuries later. Brunner obtained this information from the book, "Die Arche Mostar" ("Mostar's Ark"), written by Herrmann Mostar. Mostar (1901- 1973) was a German writer, poet, columnist and, at times, a narrator, playwright and comedian. He also became Germany's most famous critical court reporter. This particular book deals with animals that have lived together with man, including dogs, cats, cocks, hens, doves, songbirds, fish, but also with the quite undesirable such as flies, spiders, bugs, lice, fleas, rats. Mostar provides a wealth of tales and anecdotes from politics and history, in which animals have played sensational and sometimes even decisive role. Unfortunately, Mostar provided no bibliography and several of his historical statements with regard to fish are questionable, to say the least.

Mostar writes:

"Well, all these fish (Mostar is referring here to eels, carp and bream, which he discusses in previous paragraphs**) live in water basins that were made from the most precious marble. However, they were still housed outside of the home; the eel had already made it to the fountain. Most likely the first to come into the interior of the house was - to their sorrow - the world-famous mullet. It was considered the tastiest of all fish; that's why you weighed their weight in silver at first and later in gold, but it was also the most beautiful of all fish, resplendent in glorious red, and it was a curse."**

Higginbotham, however, states that seaside fishponds were either excavated in rock or constructed of concrete. Inland ponds were usually built of concrete walls with masonry facings. The earliest fishponds built with a datable building method employed concrete faced with *opus incertum*. *Opus incertum* was an ancient Roman construction technique, using irregular shaped and random placed uncut stones or fist-sized tuff blocks inserted in a core of Roman concrete called *opus caementicium*. The *opus incertum* used in these fishponds appears to date to the last years of the second century BC or, more probably, the early years of the first century BC. *Opus reticulatum* was a construction technique using small pyramid shaped blocks of tufa set in a core of *opus caementicium*. The tufa blocks cover the surface, with the pointed end into the cement, so the square

bases form a diagonal pattern that resembles a net, hence the name. The masonry facings were often of marble but the fishponds themselves were made of concrete.

According to Higginbotham, Pompeii supplies the most accessible and best-documented group of piscinae built within an urban and, more specifically, a domestic setting:

"The garden pond could be enjoyed and appreciated from different points of vantage, both public and private. The locations of many ponds within Pompeian houses permit the general or remote glimpse suitable for the casual acquaintance or client. Apertures or windows in the atrium and, specifically, in the tablinum (Note: A tablinum is the main room in a Roman house, later used as the formal reception or living room and study or office by the head of the household.) **allowed a more public audience to see the pond. Many of these same piscinae and others could be enjoyed from much more intimate surroundings. The location of dining areas and reception rooms around the garden often took into account the location of the fishpond. Triclinia, set within rooms or shaded by pergolas afforded selected visitors or guests front-row seats to the splendors of the gardens and their ponds. At Pompeii, over twenty examples of piscinae are situated in close proximity to dining facilities with approximately an equal number located where they can be seen easily from reception rooms and garden exedrae** (Note: An exedrae was a semi-circular recess or plinth sometimes set into a building's façade.)**. The connection between ponds and dining areas is not solely aesthetic but has a gastronomic component as well. Fish or eels fresh from the piscina would make an impressive addition to private meals among friends and honored guests."**

None of the fish receptacles discussed here by Higginbotham, however, are located within buildings and none have glass sides. An example of what Higgenbotham was describing is the Casa di Meleagro in Pompeii, shown in Figures A10-29, A10-30 and A10 -31.

Talking about mullets, Mostar continues:

"They put a small tank for them under the cushions of the guest bed, and when it came to the fish course, the head of the house took the fish out of the tank and handed it not to the cook, but to the beautiful Lady of the house or the even more beautiful mistress, and in her slender hands the fish slowly suffocated. Because, alas, it died even more beautiful than when it was alive!"

Re keeping them in small tanks underneath the cushions of the guest beds, even Brunner uses the word, "allegedly."

This business of the hands is similar to a comment



Figure A10-30: The fishpond in the Casa di Meleagro peristyle. The small square tank in the foreground, which was topped with marble revetment and painted blue, was linked to the larger pond by a single pipe. Higginbotham suggests that it probably served as an enclosure for special fish or to hold the fish while the larger pond was being cleaned.



Figure A10-31: The opposite view of the fishpond. Water cascaded down the six small stairs at the rear and also issued forth from a columnar fountain in the center of the pond.
The semi-circular niches provided shade for the fish and protection for the smaller fry.

by Seneca: **"A mullet is not thought fresh enough unless it expires in the hand of the banqueter. These fish are handed round enclosed in glass jars, and their colors are observed while they expire…"** This is no surprise since Mostar goes on to quote him:

"The fear of death made its colors glow even more, and left it trembling. Under exclamations of admiration and in breathless suspense, ladies and gentlemen experienced, as says old Gesner (Note: Conrad Gesner, 1516 to 1565, was a Renaissance Swiss naturalist, often called the 'German Pliny'**): 'his lovely death, wonderful death and alteration of the beautiful colors of his scales of one to the other, so long until he was quite dead,' and Seneca assures us: 'Nothing is better than a dying mullet! It resists the approach of death and these efforts spread via its body into the most brilliant purple, later merging into a general pallor of death, during which it is going through the most wonderful shades of color!'"**

Mostar then claims that the Romans had the first flat-sided aquaria:

"Then, about 55 AD, the first coarse glass panes came to Rome, Herculaneum and Pompeii. Now one could make one wall of the marble basin transparent so that one could see the hustle and bustle of the fish, not just shadowy sliding from above as before, but at the same height with them. And now the ladies and their lords saw the mullet during lovemaking and discovered that love bestowed the same flaming colors of beauty as did death. Where before the fish had so miserably suffocated in their delicate hands they now were in the hands of friends. It was erotic enough for spoiled Rome, eroticism and arousal without cruelty."

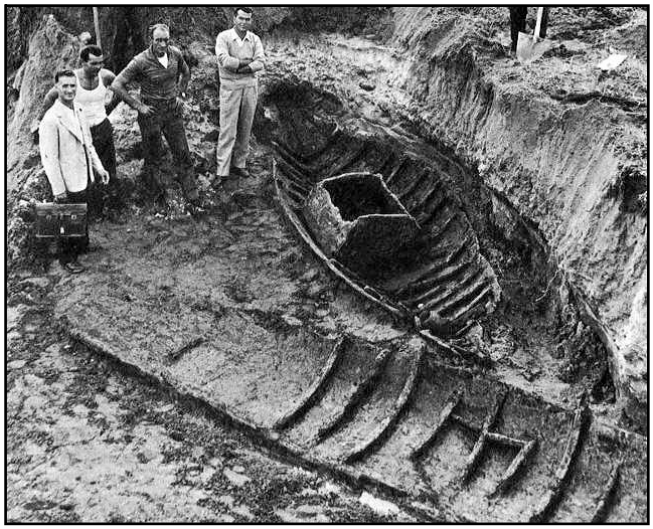


Figure A10-32: Boat with a fish holding tank (circa late second or early third century AD) found at Fiumicino (a coastal town in the central Italy), near what was the entrance to the Claudian harbor. It was constructed with wooden boards and coated with lead.

No such mention of marble tanks with glass sides were ever mentioned by Cicero, Columella, Horace, Juvenal, Martial, Pliny the Elder, Pliny the Younger, Seneca, Tiberius or Petronius, nor were the remains of such tanks ever found in the excavations of Rome, Herculaneum or Pompeii. Neither were they mentioned by Friedländer in his "Roman Life and Manners under the Early Empire. Furthermore, the flat glass produced by the Romans could hardly have served to view fish in any detail as it was more translucent than transparent, and had a distinct color cast to it (see Figure A6-4).

Actually, the only known Roman tanks that contained live fishes are holding tanks associated with transporting fish by boat, fishmonger shops and kitchens. Athenaeus of Naucratis, a Greek historian circa 200 AD, describes a ship built by Archimedes at the behest of the tyrant Hiero II, which had a live tank built into the bow and was constructed of lead and wood. During the construction of the airport at Fiumicino in 1958-59, a boat with a live tank (*navis vivaria*) built with wooden boards and coated with lead was unearthed near what was the entrance to the Claudian harbor (see Figure A10-32). The presence of holding tanks at some fishmonger's shops have been found in the market of Ostia and also at private houses in or near the kitchens. None of these, however, were made of marble or constructed with glass sides.

Mostar, however, provides no references for his assertion and thus cannot be taken seriously. Finally, when one analyzes his statement, he is in effect saying that the Romans witnessed the first breeding activity of a saltwater aquarium fish in an aquarium on record, a patently ridiculous claim.

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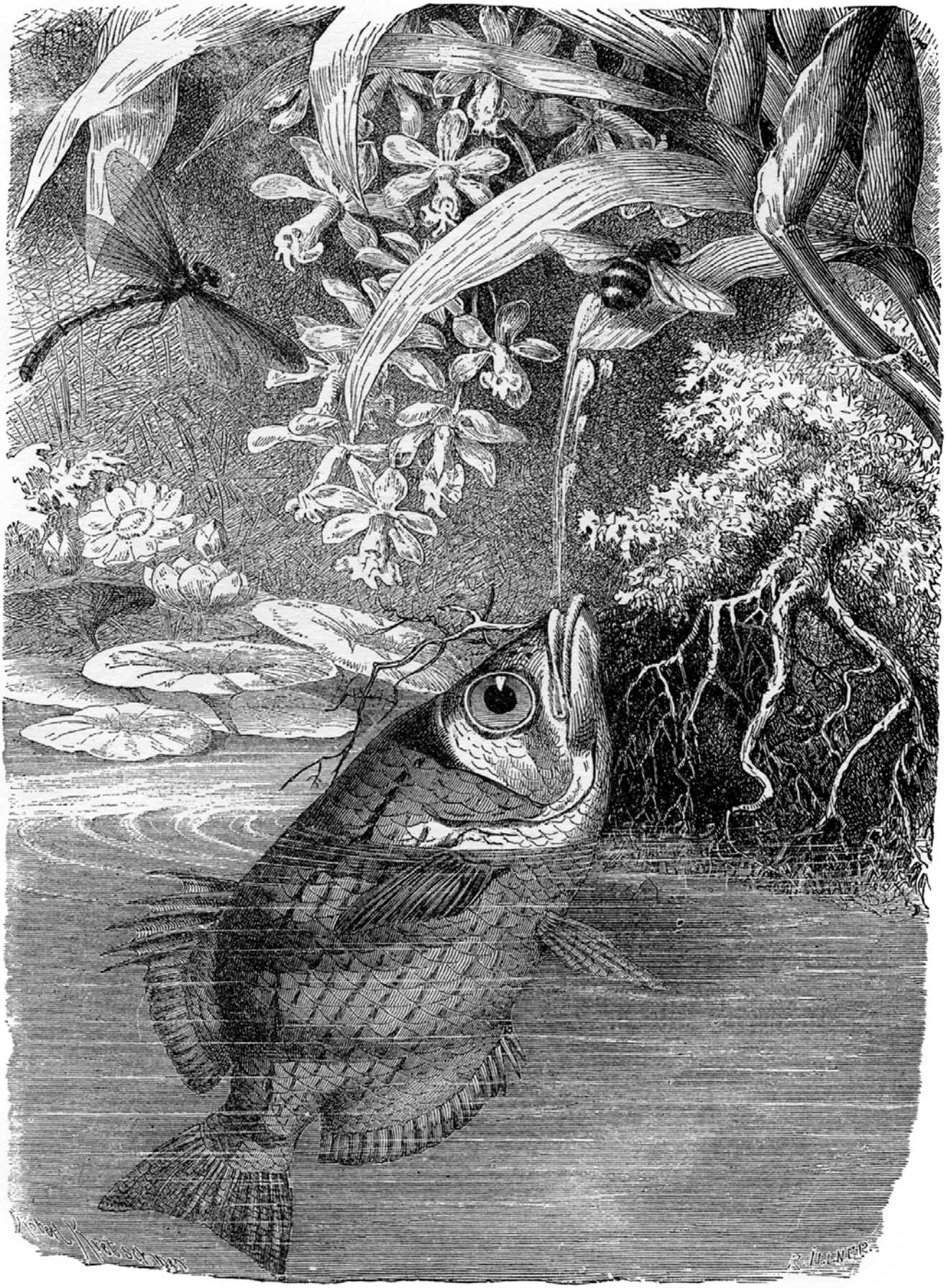
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Oh come with me and you shall see
My beautiful Aquarium; or if that word
You call absurd, we'll say instead
Vivarium.
'Tis a glass, in fluid space
Where over pebbles weedy, small fishes play.
Now do not say you think they are seedy.
My minnows thrive, they're all alive,
My Gudgeons also flourish; Trout, Perch and Jack,
And Stickleback—within the glass I nourish.
Then there's the Roach, and there's the Loach,
And there's the Crawfish crawling; and Efts and Newts—
Don't call them Brutes—o'er one another sprawling.
A pretty sight, how I delight
Of nature in the study. The water here
Is oh! so clear—it would not do if muddy.
My Dickie sings and claps his wings,
I know that what he wishes, is to escape
His cage and scrape acquaintance with the fishes.
Now tell me do, suppose that you
Your mode of life could vary; which would you like,
To be my Pike or to be my canary?

from PUNCH, 1850's







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