SIMPLE EXPERIMENTS IN PHYSICS AND CHEMISTRY.

Experiment in Capillarity.—A crystallizing vessel having been filled with water to a depth of an inch or two, some mercury is allowed to fall into it from such a height that when it strikes the bottom of the vessel it shall rebound in the form of globules. Owing to surface tension, quite a large number of the globules will remain upon the surface of the liquid and will mutually attract each other with great force and at a distance of an inch or more. They will be strongly repelled, also, by any object wet with water that is made to approach them, such as a wooden match, for example.

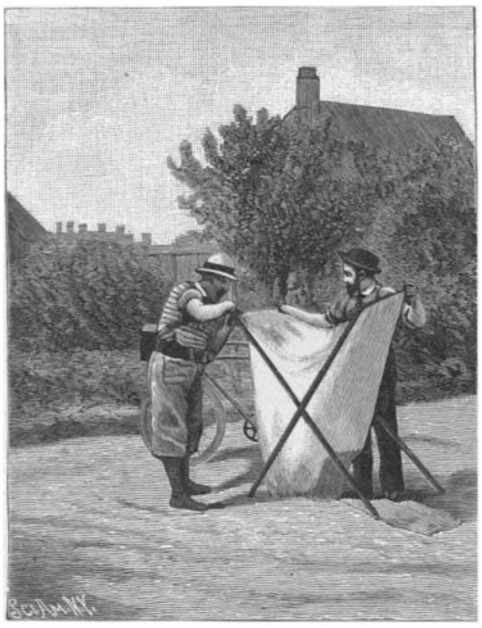


Fig. 1.—MOUNTING THE KITE.

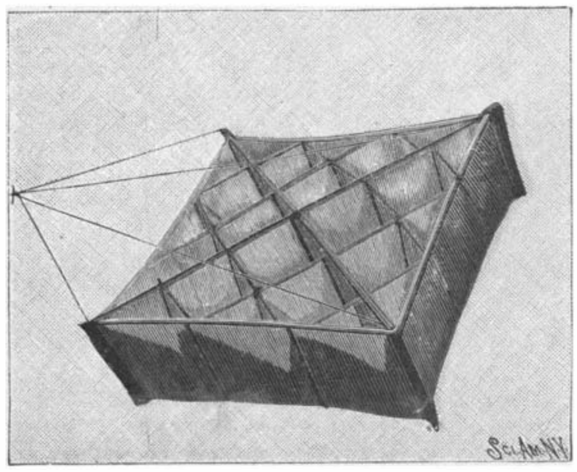


Fig. 2.—THE LECORNU CELLULAR KITE.

Fig. 3.—RAISING THE KITE.

Soft and Elastic Sulphur.—Some roll sulphur is melted in a Florence flask, with very gentle heat, over a Bunsen burner. It is well to remove the flask from the burner before the complete melting of the brimstone and to stir the latter until the fusion is perfect. The flask will then contain sulphur in a very plastic state.

Then the flask is submitted to heat again and the melted sulphur vigorously stirred. After a while the substance will pass abruptly to a pasty state. Such passage from one state to the other does not take place instantaneously unless the sulphur is vigorously stirred, but occurs gradually.

Experiment with Hydrosulphuric Acid.—Some hydrosulphuric acid is ignited at the extremity of a tapering tube which, through a rubber tube, communicates with a Woolf bottle in which the gas is produced. Upon moving the flame over the surface of some water placed in a pan, sulphur will deposit upon the liquid and thus permit of writing a name, drawing a design, etc.

Phosphureted Hydrogen.—A few fragments of calcium phosphide are allowed to fall into a goblet containing some water, and quite a thick layer of sawdust is immediately spread over the surface of the latter. The bubbles of phosphureted hydrogen accumulate beneath the sawdust in forming one very large bubble, which finally lifts the sawdust, bursts, and forms a series of rings of extraordinary size.

Preparation of Nitrogen.—A bell glass is provided with two metallic combs facing each other and communicating with the poles of a Ruhmkorff coil or a Holtz electrostatic induction machine. Some phosphorus is burned in the bell by the ordinary process. The cupel that contains it is supported by a cork that floats upon the water in which the bell glass rests. As soon as the phosphorus has been completely burned, a silent discharge of electricity is passed through the combs. The electricity immediately precipitates the fumes of phosphoric anhydride, and after this the bell glass will no longer contain anything but pure nitrogen. We would advise the use of a bell glass provided with three apertures, one at the top and two at the sides. The one at the top will serve for collecting the nitrogen when the bell glass is made to descend into the water, and those at the sides will serve for holding the metallic rods of the combs.—A. Bleunard, in La Nature.

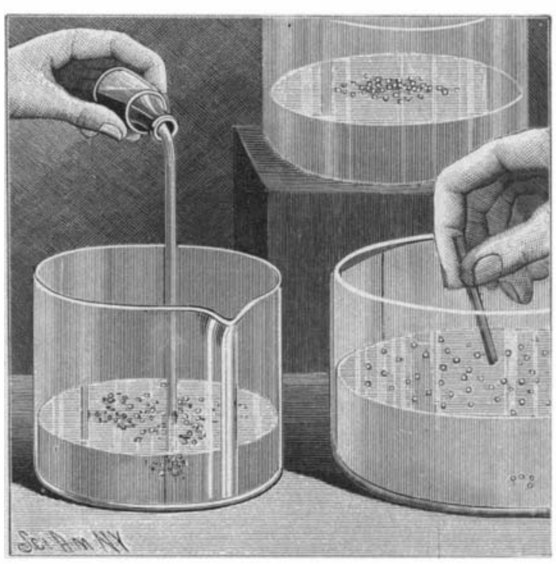


Fig. 1.—EXPERIMENT IN CAPILLARITY.

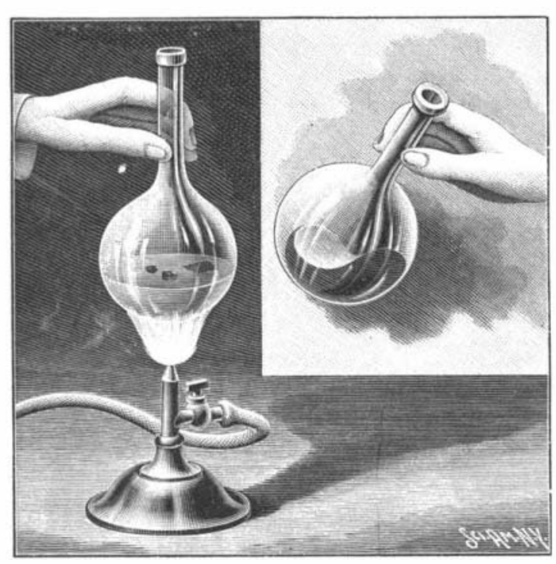


Fig. 2.—EXPERIMENT WITH SULPHUR.

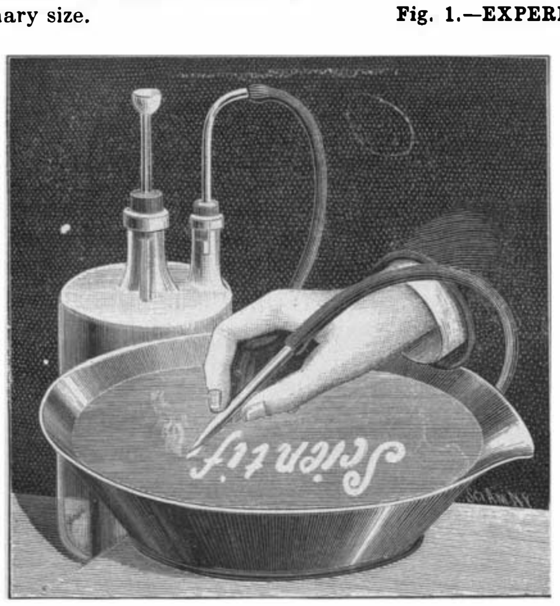


Fig. 3.—WRITING UPON WATER WITH HYDROSULPHURIC ACID.

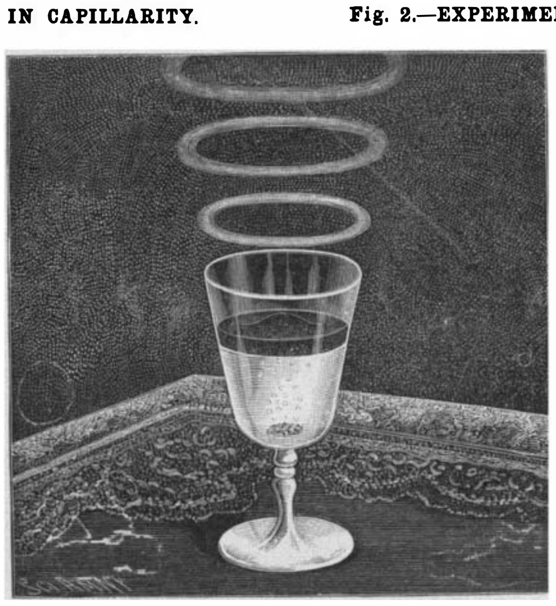


Fig. 4.—RINGS PRODUCED BY PHOSPHURETED HYDROGEN.

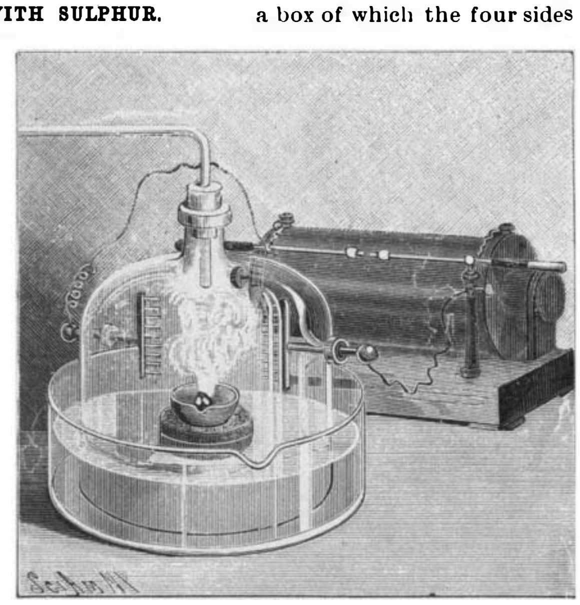


Fig. 5.—PREPARATION OF NITROGEN.

THE LECORNU CELLULAR KITE.

There is no amusement more fascinating, more instructive or more easily engaged in by everybody than kite-flying. Although it is much in favor on the other side of the Atlantic, it is yet too much neglected in France. Almost everywhere in the United States, there are to be found kite clubs analogous to the French bicycle and photographic societies, and which are in the habit of organizing competitions of various kinds. It is a great pity that the sport is not indulged in in France as much as it deserves to be, for the kite is a wonderful apparatus, of which a host of curious and interesting applications may be made. It is almost without a rival for the study of atmospheric electricity and for topographic photography. It may be employed as a life-saving and signaling apparatus, for the practice of wireless telegraphy, for the study of meteorology, and even, as with the balloon, for making ascensions. The ordinary kite is familiar to every one. Whatever be its form, lozenge-shaped, rectangular, elliptical, hexagonal, octagonal, etc., it always consists of a plane surface provided with a bridle to which the string is attached, and with a tail of varying length. This last-named appendage was for a long time looked upon as indispensable, and it seemed as if a tailless kite could not be thought of. But the Oriental kites imported from China and Japan destroyed such an opinion.

If we attentively examine the tailless Japanese and Chinese kites we shall see that they are no longer plane, but either (like the Japanese flies) consist of a plane part and two wings forming pockets and inclined toward the rear, or, (like the Chinese apparatus) present curved surfaces. This, in fact, is because the plane kite is unstable. It is like a plank that we should like to keep in equilibrium in a current of water, and at right angles therewith, in holding it by a single rope. It is evident that however carefully we fixed this rope at the center of the thrust, the board would be in a state of unstable equilibrium and would continually revolve around its point of attachment. It would be entirely different if we should fasten a string to the handle of an umbrella and present the concavity of the latter to the current. When we study the stability of the tailless kite, we are thus led to seek forms that are entirely different from those of the flat kite.

Without extending this brief statement of the question any further, we shall merely say that one of the best forms to adopt for the tailless kite is the cell. We mean by this the form obtained with at least three, but generally four planes intersecting each other in pairs according to parallel straight lines. We thus obtain a sort of bottomless box. The walls are of paper or of some light fabric. To make the matter plain, let us conceive of a cell of square section. This will present itself in the form of a box of which the four sides will exist, but of which the top and bottom will be suppressed. If we present this cell to the wind in such a way that two of the sides shall be horizontal and two others vertical, it is evident that the air will pass freely through the cell without exerting any pressure capable of raising it; but if we elevate the front edge of the cell slightly, the wind, in pressing the lower surfaces of the walls that were previously horizontal, will tend to raise the apparatus The latter will have great stability by reason of the existence of the two vertical sides, which, in a manner, play the same part as the keel of a boat.

The sides of the cell that undergo a pressure are the sustaining planes, and the vertical sides the directing ones. If we place two of these cells one behind the other, in leaving between them an interval equal at least to their length, we shall have the Hargrave cellular hovering kite adopted at the Blue Hill Observatory (in the United States), where through the intermedium of meteorological registering apparatus, it is used for exploring the upper regions of the atmosphere. In certain experiments, such apparatus have reached heights of from 5,000 to 6,500 feet.

If, on the contrary, we juxtapose not two but a greater number of cells, say six, eight, twelve, or more, in the same frame, we shall obtain the multicellular hovering kite, which we have devised and constructed after numerous tentatives.

We at the outset placed four rectangular cells one above another, and thus obtained an apparatus having exactly the form of a set of shelves. We tried this upon the beach of Cobourg in 1898; but, since the stability did not prove as great as that which we desired to obtain, we were led to multiply the number of cells and to employ square cells, with one diagonal and horizontal and the other vertical.

Each cell taken isolatedly thus flies upon the side and presents to the wind surfaces that are inclined, one to the right and the other to the left, somewhat as in the case of a boat that is floating upon its keel.

We have in this way constructed a kite of wonderful stability, which rises with the greatest ease and maintains itself in the air with complete immobility.

Our multicellular hovering kite is very easily constructed. It requires as a rigid frame only four wooden rods having the length of one cell and placed at the four corners of the entire affair formed of all the cells, and two cross pieces, one in front and the other behind to give rigidity to the whole.

It may be put together and taken apart in a few minutes with the greatest ease. After being taken apart, it may be rolled up and carried very easily upon a bicycle.

It is so easily managed that any one can send it aloft and maneuver it without difficulty. When it is in the air, it is so stable that ten yards of string may be suddenly paid out without causing it to fall. Finally, its sustaining power is so great that, in a brisk wind, we have been able to make it raise a dummy formed of a child's clothing and fixed to an umbrella. And yet the kite is not of very large size, its dimensions being four feet in length and breadth and 16 inches in depth, while its weight is a little less than four and a half pounds.

We are indebted to La Vie Scientifique for the description of this form of kite.

THE NEW YORK BOTANICAL GARDEN.

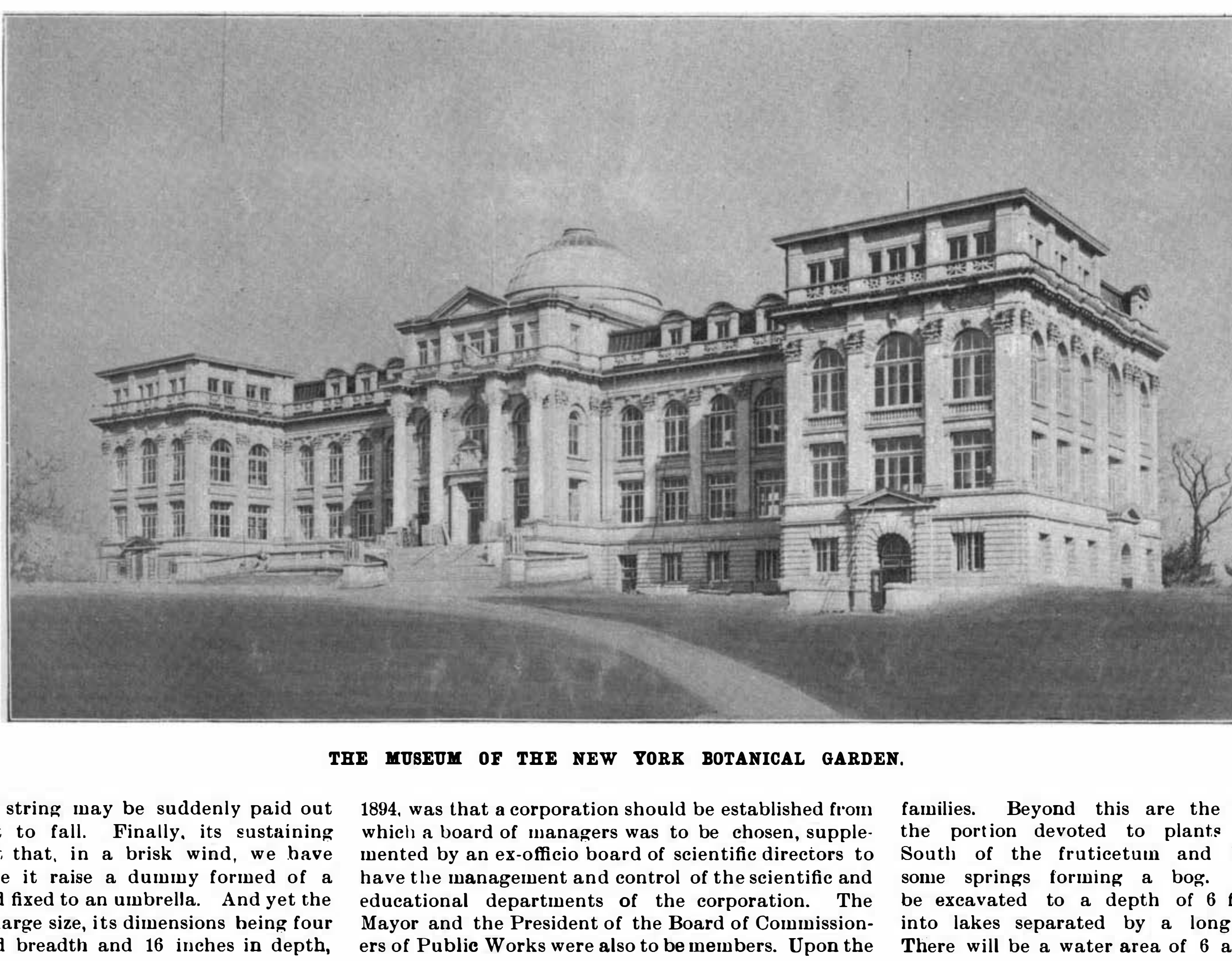
New York city is fortunate in having within its corporate limits a park which contains both a botanical garden and a zoological park. Until within a comparatively short time there were few visitors to Bronx Park, notwithstanding the fact that this tract with its thick woodlands, waterfalls, glens and rustic bridges, is really one of the choicest parks in the country. Its chief merit is that in no sense does it resemble the ordinary park. The Botanical Garden part does not show the imprint of the landscape architect. It is the purpose of its managers to leave the paths as rugged as at present, and only the main arteries of travel will be macadamized and made easy for visitors. The Park is readily reached from the Grand Central Depot by the Harlem Road, and the visitor breaks his journey at Fordham for the Zoological Park and at Bedford Park for the New York Botanical Garden.

VIEW OF HERBARIUM, MUSEUM OF BOTANICAL GARDEN.

In 1889, a committee of the Torrey Botanical Club was appointed with authority to procure such legislation and funds as would be necessary for the establishment of a botanical garden in New York city. This committee succeeded in securing the interest and cooperation of the city authorities and of many influential private citizens. The provision of the charter, which was obtained in 1891, and was amended in 1894, was that a corporation should be established from which a board of managers was to be chosen, supplemented by an ex-officio board of scientific directors to have the management and control of the scientific and educational departments of the corporation. The Mayor and the President of the Board of Commissioners of Public Works were also to be members. Upon the corporation securing by subscription a sum of not less than $250,000, the Commissioners of Public Works were directed to set aside and appropriate a portion of the Park land not exceeding 250 acres for establishing and maintaining a botanical garden and museum and to construct and equip within such grounds suitable buildings at a cost not to exceed $500,000. It was also provided that the grounds should be opened to the public daily without charge. The sum of $250,000 was raised by subscription, and on July 31, 1895, the Commissioner of Parks appropriated 250 acres in the northern part of Bronx Park for the purpose of the corporation. About two years were then devoted to the preparation of the plans and the preliminary improvement of unsightly portions of the tract. $500,000 for buildings was made available by vote of the city authorities in the summer of 1897, and the buildings were commenced about the end of that year. The result of the co-operation of the municipal authorities and private individuals has proved most satisfactory in the American Museum of Natural History and the Metropolitan Museum of Art, and the new enterprise in Bronx Park in which the city is a partner will prove no less interesting and valuable to the citizens at large and to science.

The section of the Park given to the city is admirably adapted for the purpose of a botanical garden. It is not too far away to be accessible and is still out of immediate contact with the smoke and vitiated air of a great city. Every variety of growth finds a fitting habitat in the land reserved for the garden. There are broad meadows for the grasses, bogs for the sedges, flags and other plants, and clear running water and quiet lagoons for aquatic vegetation. There are tree-shaded lowlands for ferns and scattered rocks and ledges for mosses and lichens. The tract through which the Bronx River now flows will be left intact for the benefit of the students of forestry, and since Lorillard built a large stone house on the east bank of the gorge a century and a half ago, the trees have been almost totally undisturbed by the ax of the woodman.

The popular features of a botanical garden are not omitted, and as soon as the visitor enters the ground he begins to see the labels attached to trees and plants throughout the garden. The various classes of trees and plants into which the garden is divided are termed "plantations." The swampy forest land is being drained, but will be reserved as a forest area, as these forest features are considered of the greatest importance in the general plan. West of this is the fruticetum, a plateau consisting of 3 or 4 feet of loam resting on a layer of gravel 12 feet or more in depth. This is divided into sections for the planting of shrubs according to the family and following as far as possible a natural sequence and grading broad levels of greensward between the families. Beyond this are the bog gardens and the portion devoted to plants like the willows. South of the fruticetum and bog gardens are some springs forming a bog. This bog is to be excavated to a depth of 6 feet and converted into lakes separated by a longitudinal driveway. There will be a water area of 6 acres when all the



THE MUSEUM OF THE NEW YORK BOTANICAL GARDEN.