INTERESTING EXPERIMENTS WITH SIMPLE APPARATUS.

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Several very interesting philosophical experiments, which are seldom attempted by those who are not supplied with costly apparatus, may be performed in a satisfactory manner by the use of a pair of Argand lamp chimneys and a supply of rubber and glass tubing (nursing tube). These can be obtained at any drug store, and the cost need not exceed fifty cents, except in experiment Fig. 14, shown in engraving.

The rubber tubing can be conveniently coupled to any desired length by using pieces of the glass pipe.

The stand, a section of which is shown in Fig. 3, although not absolutely necessary, is very convenient, and should be made of some heavy material.

The necessary corks should be of good quality. Rubber corks, if they are obtainable, serve the purpose in a most satisfactory manner.

By referring to the illustration, Fig. 1 will be seen to represent a level with its air bubble in proper position. To prove its accuracy, reverse the glass on a surface to which the level has been applied. Fig. 2 represents a siphon arranged to show that water seeks its level.

Tantalus' cup is shown in Fig. 3. A piece of glass pipe through the cork, at the lower end of the chimney, couples the curved pipe above to the discharge pipe below.

The arrangement of apparatus in Fig. 4 will also show that water seeks its level.

In the fountain the end of the glass tube should be drawn out to small size by heating in the flame of a spirit lamp. If the jet is perpendicular, it may be made to support a pith ball. If it is discharged at an angle, the parabolic course of a jet of water may be traced.

With the same arrangement the equilibrium tubes may be produced. See Fig. 5. If the water rises somewhat higher in the glass tube than in the chimney, it is due to capillary attraction.

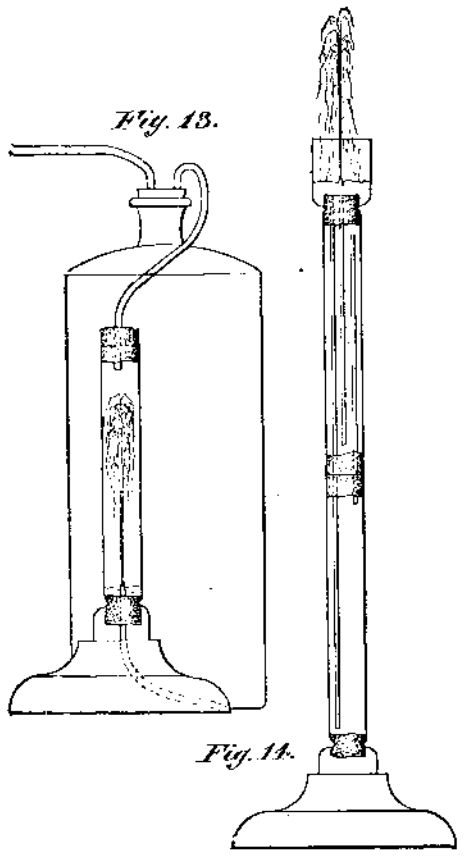
The experiment with the fountain may be varied by removing the rubber tube, pushing the fountain nozzle through the cork into the chimney, and immersing the apparatus in water, as shown in Fig. 6. There will be a jet in the chimney, which will also illustrate the theory for the action of artesian wells.

Torricelli's principle is shown in Fig. 7. Choose a chimney with a level edge, invert it, and connect the rubber tube with the small end of the chimney by means of a piece of glass tube put through a cork. Wet a piece of blotting paper and use it in making an air-tight joint between the upper edge of the chimney and any plane surface, as a pane of glass or a tea plate. Fill the chimney with water, press it against the plane surface, and it will adhere with more than sufficient force to support itself.

A similar but less striking experiment, shown in Fig. 8, is performed by filling the chimney with water, leaving the large end open. Dampen a piece of paper, press it against the edge of the chimney, and invert it. The water will not escape, and the paper will retain its position.

Fig. 9 represents Mariotte's vase. The chimney is closed, above and below, with corks, each of which is pierced by a glass tube. When the chimney is filled with water, none will escape below until air descends in the tube and rises in the chimney.

In Barker's mill, Fig. 10, the chimney is inverted and suspended by means of a strong thread. A large cork, in the lower end, serves to hold the bent tubes in position. These tubes should be made of glass, but a piece of the rubber tube will serve the purpose, if curved and held in place by means of a stiff wire. The arms may be reversed and cause the mill to rotate in an opposite direction, or with the arms operating in the same direction there will be no revolution. In Fig. 11 the Cartesian diver is represented by a small vial, which is inverted in the water with sufficient wire wound about its neck to nearly overcome its buoyancy. The chimney is filled with water and the upper cork is pierced by a glass pipe, to which is coupled a length of the rubber tube. A quick expulsion of breath is sufficient to send the vial to the bottom, and when the pressure is removed it will rise again. It will increase the interest of the experiment to have another vial with more ballast, which will not rise until suction is applied. In place of the usual imp attach a small china doll to the vial. It will serve as ballast.



If a piece of tin, cut in the shape of two blades for a screw propeller, be fastened to the vial at the neck and properly bent, it will rotate as it ascends and descends.

Fig. 12 represents a diving bell working on the same principle as the previous experiment. It also illustrates one method adopted to raise sunken ships. See SCIENTIFIC AMERICAN, July 9, 1887, page 23.

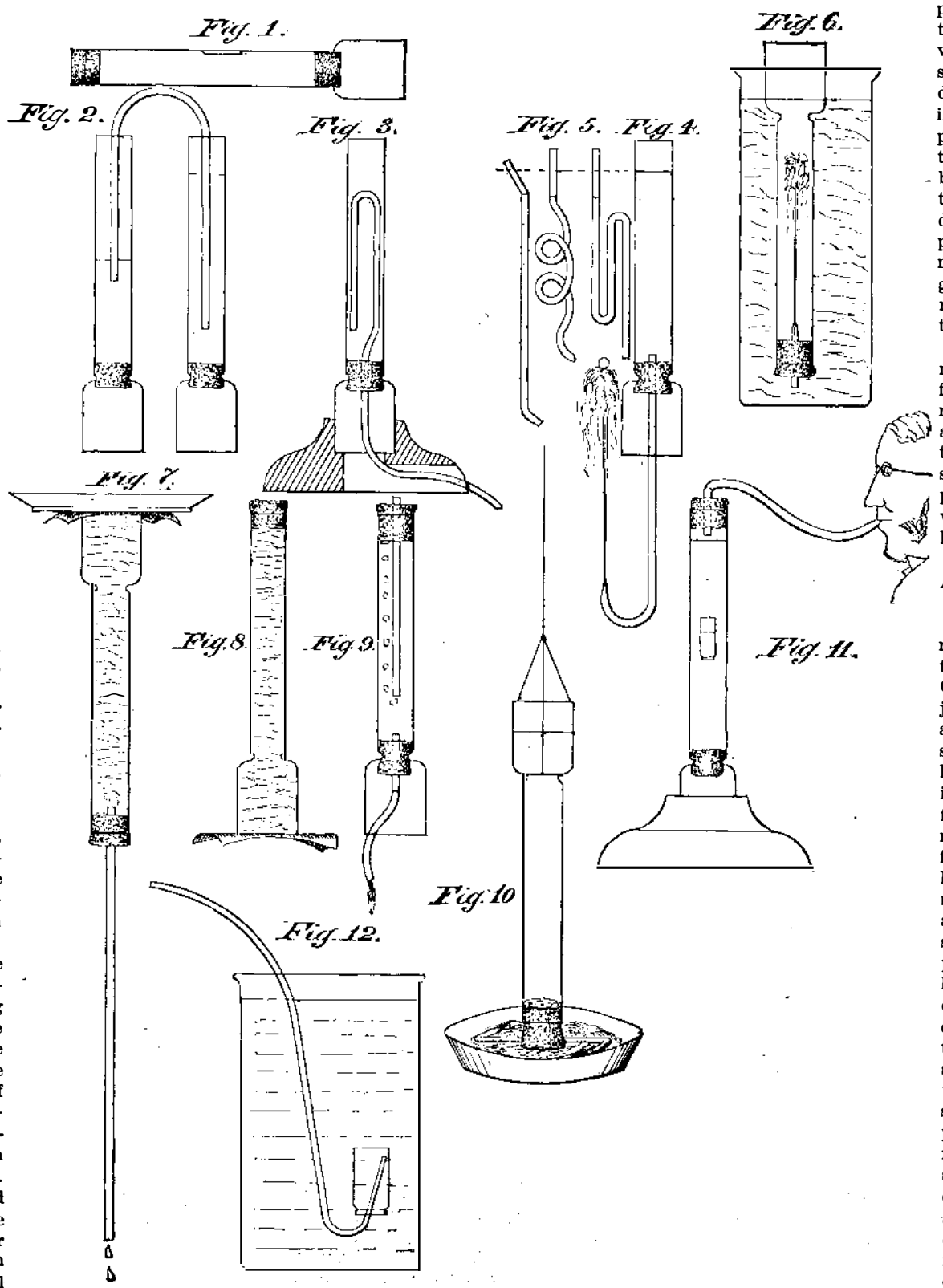
The fountain *in vacuo* is shown in Fig. 13. Push the fountain nozzle through the cork, which closes the lower end of the chimney, and, by means of rubber tube, connect it with a convenient reservoir of water. Arrange the upper end of the chimney as in Fig. 11. Sufficient suction will produce a fountain within the chimney. It will be found more convenient to use a large bottle (see Fig. 13), from which to exhaust sufficient air to make the suction more regular and continuous. Close communication between bottle and chimney by pinching the rubber tube until the action is required.

The experiment in momentum of liquids, shown in the SCIENTIFIC AMERICAN for May 28, 1887, can be performed with the same arrangement, except that the fountain nozzle should be removed and a straight glass tube substituted. Push this tube well into the chimney and hollow the upper cork to a funnel shape, in order to guide the column of water.

If the Mariotte's vase be attached to the fountain *in vacuo*, it will produce sufficient vacuum to perform the experiment.

Hero's fountain, shown in Fig. 14, is more complicated, and will require two chimneys, also some brass or tin tubing, unless glass tube of sufficient length can be obtained. This fountain is described in the SCIENTIFIC AMERICAN for December 4, 1886, but the glass apparatus there shown is not easily procured. The chimneys and tubes answer the purpose very well indeed. The construction will be readily understood by referring to the illustration or to any natural philosophy. Noticethatwhen the water in the upper chamber sinks below the jet tube, the air will force the last few drops in the tube to a surprising height. The fountain may be made similar to the glass apparatus, if enough rubber tube be used, with three chimneys for reservoirs.

These and other experiments which may be performed with this simple apparatus will furnish much valuable information if, during their performance, there is study into the cause of the phenomena and reference, when necessary, to the philosophy.



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An Artesian Well at Frankfort, Dakota.

A correspondent writes: "I recently passed through the town of Frankfort, Moody Co., Dakota, where they have just completed for the town an artesian spouting well of soft water. It discharges a large volume out of an 8 inch iron pipe at a point about 30 feet above ground. They told me the contractor bored 900 feet, and left the pipe about level with the ground. Next morning it had disappeared, and it was found to have sunk 100 feet, and water was pouring out of the hole in large volumes. They had difficulty in getting it under control. The contractor thought it had sunk into a sort of lake or chamber at the bottom. The water is soft and palatable. It is proposed to use the surplus for running their new elevator instead of steam. If such wells can be struck at 1,000 feet at a cost of $3,600, same as this cost, there should not be much trouble in obtaining cheap power on the Dakota prairies."