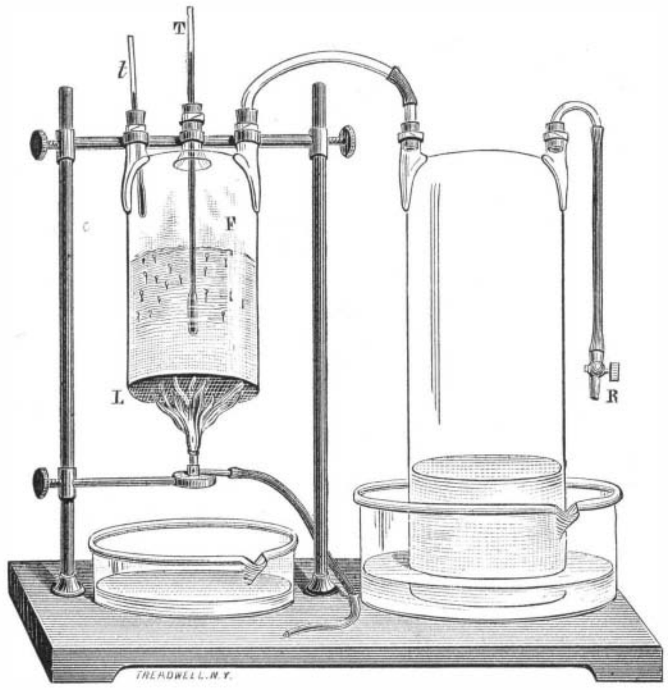
WATER HELD IN A CAGE AND BOILED IN A SIEVE.

If Mr. Romilly has not succeeded in performing the feat of navigating the sea in a sieve, which in the days of witchcraft was supposed to be the chief accomplishment of the professor of the black art, he has done something apparently as wonderful in lifting water in a sieve, holding it in a cage, and afterward boiling it in the former receptacle. Of course there is nothing really marvelous about the performance, when the natural laws which govern it are considered; but as a series of admirable experiments in capillary attraction, it is none the less striking and remarkable.

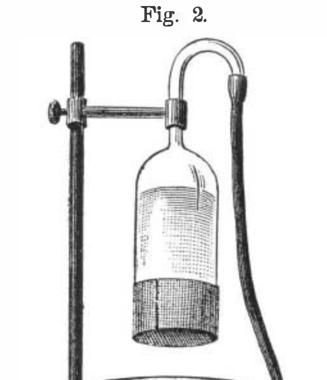
Mr. Romilly's investigations were undertaken with a view of determining whether a tissue or sieve extended beneath a bell glass filled with water would sustain the water in the glass, the idea being suggested by Mr. Jamin's successful experiments in sustaining water in numerous fine capillary tubes. A bell glass about 8 inches in diameter was closed with a bobbinet having large meshes, each from 0·08 to 0·12 inch square. The glass was then placed mouth downwards in a vessel of water; and by exhausting the air above the water was drawn up into the cylinder to the desired height. The air pipe cock was then closed. On removing the glass, the water was maintained therein, and at each mesh of the tissue appeared a water meniscus, while a large general meniscus formed in the center of the fabric. The height of the water in the glass was immaterial to the success of the experiment. A large tube, 8 inches in diameter, and 6·4 feet long, was closed above with a rubber stopper, through which the aspirating pipe passed. Water, entirely filling the tube, was sustained by the aid of a piece of extremely fine lace fastened over the lower end.



ROMILLY'S EXPERIMENTS IN CAPILLARITY.—Fig. 1.

If, instead of securing the tissue over the mouth of the tube or glass, it be held in place by the hand, the water above is still sustained, while the shape of the meniscus below can be changed at will. By gradually lowering the fabric by slowly sliding the hand down the glass, the meniscus is caused to enlarge; and with a bell glass 2·4 inches in diameter, and lace having meshes, 0·8 inch square, the meniscus assumes a curve of from 1·2 to 1·6 inch in depth. This curvature augments with the fineness of the meshes. On this another interesting experiment is based. A square of wire gauze, the edges of which extend beyond the sides of the glass, is held against the mouth of the same by the finger during the aspiration of the water. On lifting the bell glass, the finger is removed, when the gauze remains in place, and the water is sustained as well as if the fabric were permanently fastened. The gauze may be replaced by a ring of metal of the same diameter, over which lace is stretched. When the fabric is perfectly horizontal and fastened in place, if the bell glass is inclined, the water runs out, but the degree of inclination seems to depend upon the size of the meshes. Thus with meshes 0·16 inch square, the least inclination determines the escape of the water; with those 0·04 inch square, an angle of 45° may be safely attained; while with meshes of from 0·02 to 0·03 inch square the following experiment may be accomplished: A glass tube of from 1·2 to 1·6 inches in diameter has, attached to its end by sealing wax, a little hemispherical tea strainer, such as is frequently suspended from teapot spouts to prevent tea leaves entering the cups. In the other end of the tube are a rubber stopper and an aspiratory pipe, as already described. The tube now being filled with water, the latter is maintained by the strainer even if the tube is turned to 45°, or reversed, provided no air bubble is allowed to touch or traverse the metallic gauze. In other words, when the tube is turned with the strainer uppermost, the water is held in the latter as in a cage. The sides of the latter may be from 1·2 to 1·6 inches high with wire gauze of meshes 0·04 inch square; if the meshes are 0·02 inch square, the height may be 2·8 to 3·2 inches.

Fig. 2.



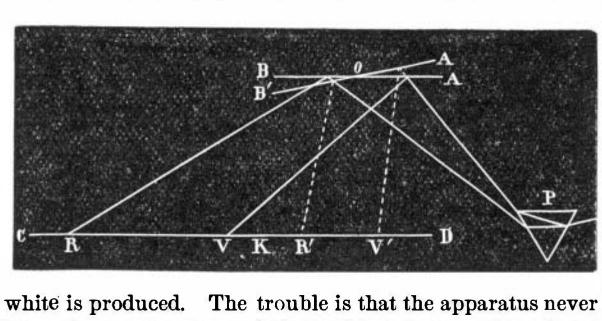
Another curious experiment is illustrated in Fig. 1. A large bell glass is continued downward by a piece of wire gauze 1·2 inches in length and of the same diameter as the glass. The meshes are 0·04 inch square, and the fabric extends across the bottom. If, after having filled the cylinder with water, the horizontal base only is placed on a surface of water, and the air pipe above is opened, the water in the glass will run out. If then, before the level of the escaping water has passed the bottom of the glass, the aspiration pump be started, the water will remount in the glass, and not a single air bubble will enter through the side of the wire gauze addition, although that portion is wholly exposed. And further, the water level may be allowed to descend half the height of the gauze addition; and yet, when the pump is set in motion, no air will be drawn through the wire gauze, a thin pellicle of liquid seemingly cutting off access of the atmosphere, while the water rises in the glass as before. With wire gauze, having meshes from 0·02 to 0·03 inch square, this effect is augmented, and the water level may be allowed to fall 1·6 inches below the bottom edge of the bell glass.

The temperature of the meniscus formed does not influence its resistance. A bell glass, covered below with gauze which sustained the water, was placed over a gas burner. The flame spread over the watery surface, and the water boiled without falling. An almost invisible gauze suffices for this experiment, and it may be either affixed to the glass or attached to a metallic ring and simply applied, as already described. When ebullition becomes violent, the water falls; but by regulating the flame by the indications of a thermometer in the bell glass, lowering the heat when 212° is exceeded, the experiment may be indefinitely continued. In order to insure success, however, it is better to connect the bell glass in which the water is to be boiled with another plunged in a vessel of water. The two glasses are connected so that the water is drawn by aspiration into each simultaneously. The dilatation of the heated air then distributes its effect over both glasses and the water does not fall. The water is likely to fall little by little, with a single glass, as steam is raised. Fig. 2 shows the disposition of apparatus for the above experiment. The bell glass, F, has three necks, and is 6 inches in diameter. T is one thermometer, for denoting the temperature of the water, and *t* is another, for showing that of the air. The gauze is held in place beneath F by a simple rubber band.

Neither before nor during ebullition do the meniscus bubbles become displaced, to rise to the surface. As it is necessary to replace the water in the glass which may be evaporated during the boiling, this may be done in a curious way, in keeping with the odd nature of the entire series of experiments. As soon as ebullition is well established, and the water level has somewhat fallen, a curved pipette is filled with cold water, which is ejected therefrom in a jet against the gauze. The jet penetrates the gauze and the level is quickly re-established.

A NEW EXPERIMENT FOR THE SYNTHESIS OF SUNLIGHT.

M. Laraut de Lestrade has recently exhibited before the Scientific Congress of Clermont-Ferrand, France, a very beautiful and simple experiment for recomposing sunlight from the spectrum. This experiment is now very imperfectly done by Newton's disk, which is painted with segments of different colors, proportional in extent to the area occupied by the colors respectively of the spectrum; and this is rotated rapidly, so that, by the superposition of a number of colored impressions on the retina, a sensation of white is produced. The trouble is that the apparatus never has and never can accomplish its object; because it is almost impossible to distribute the colors in accurate proportion, and because no pigments ever can approach the spectrum colors in brilliancy and purity, and hence, when combined, can never produce white, but only a dull indefinable gray. M. de Lestrade retains the idea of superposing the prismatic hues in the retina, but he uses the split-up sunbeam itself and not painted representations. P in the annexed diagram is the resolving prism, and the spectrum is received on a rectangular mirror, A B, located eight or ten feet distant. The spectrum is therefore reflected upon the screen, C D, say from R to V. Now suppose the mirror to be slightly turned on a vertical axis to A′ B′; then the reflected spectrum will be moved along to R′ V′, and any point, K, on its path must therefore be traversed by all the spectral colors in succession. Rotate the mirror rapidly, and the rapidity of colored impressions, produced on the eye gazing at K, will produce the sensation of white light. Two mirrors, placed back to back, are of course better than a single mirror in causing the quick displacement of the colors.



One advantage of this admirable experiment—which is, without exception, one of the most ingenious that have ever come under our notice—is that it may be employed for the study of the combinations of the various prismatic colors. For this purpose, a metal screen having a rectangular aperture large enough for the passage of the whole spectrum is suspended a short distance in front of the mirror. Small movable screens of various dimensions are hung before the opening so as to intercept such colored parts of the spectrum as are desired to be stopped out. Then, by turning the mirror, a mixture of colors is obtained very easily, and without reference to their relative proportions in the spectrum.

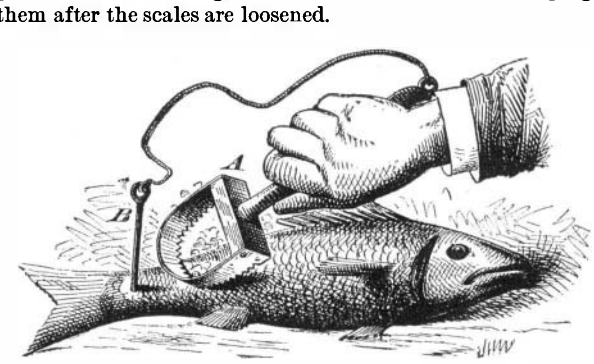
Moles.

A correspondent of the Ohio *Cultivator* says: "There are two kinds of moles in this country—English and American. The English mole is rather small, with short, thick, blue fur; its feet are large, broad, and powerful, used in burrowing; its nose is also very strong, for the same purpose. It runs in burrows, underground generally. I have seen it, when plowed up in corn fields, burrow under the loose soil rapidly, simply by the use of its nose, going, even in hard ground, faster than a dog can follow by digging. I suppose this mole hibernates in extreme cold weather, as I have not noticed it during the colder part of this last winter. I think for this reason that its food must be chiefly worms and insects, as these are all gone in cold weather.

"The other mole is about as large as a half-grown rat. Its fur is grayish brown on the outside, but blue close to the skin. Its feet are not so large or powerful as those of the English mole, and its runs are mostly on the surface of the ground, under grass, weeds, or rubbish. Its nostrils are extended beyond all other parts of the nose. Its smell is very acute, also its hearing, but its vision is poor, making it depend upon its smelling and hearing for its principal guides in the rapid pursuit of insects. The mole's mouth has, in the fore part, four long sharp incisors—two in upper, two in lower jaws, like the squirrel and other rodents. In the back part of the jaw, at this season of the year, the teeth are flat and square, like the grain-eating animals—not rounded and sharp as in the animals entirely insect-eating. So their teeth must have come in contact with some hard substance which ground off the sharp points. Again, they have a double stomach, large and small intestines, etc., while the animals of entirely insect-eating habit have a small and simple stomach, and scarcely any intestines save the œsophagus and pylorus."

IMPROVED FISH SCALER.

The annexed engraving represents a convenient hand implement for removing scales from fish, and for scraping them after the scales are loosened.



A thin metal blade has one edge provided with teeth which are similar to saw teeth, while its opposite edge is plain. This blade is bent to a semicircular form, and its ends are secured to the opposite ends of the head or block, A, this forming a scraping tool which can be very conveniently handled. To the opposite end of the handle is secured one end of a cord, to which is attached a long pointed rod or spear, B.

In cleaning a fish the spear is forced through the tail and the point pressed into the table underneath. The operator then loosens the scales of the fish with the toothed edge of the blade by drawing the implement over the body of the fish from the tail to the head. When the scales are loosened, the implement is turned over and the fish scraped with the plain edge.

Patented February 22, 1876, by Mrs. Sarah Lawton, of San Francisco, Cal.