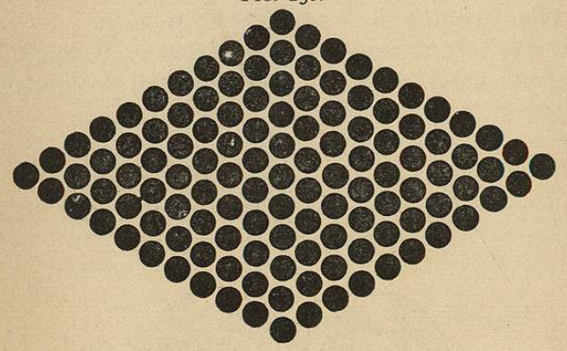
curious optical illusion which, he thinks, accounts for the markings on the diatoms appearing as hexagons.

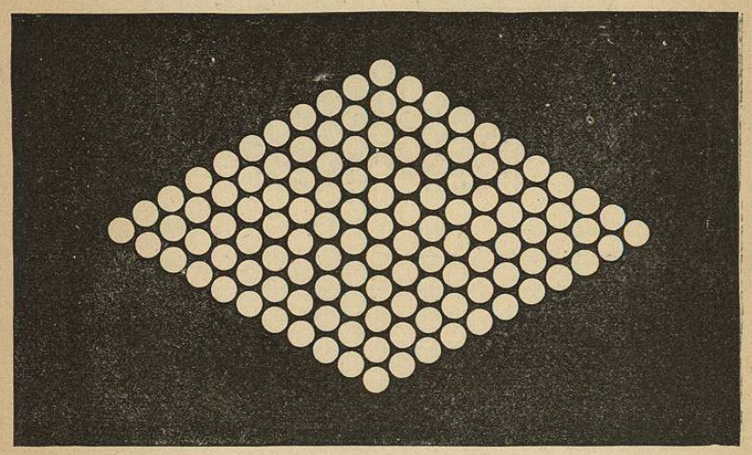
The circular spots (Fig. 238) are arranged as nearly as

Fig. 238.



possible like the markings on the diatom called *Pleurosigma angulatum*. If the figure is viewed through the eyelashes with the eyes partly closed, the circles will appear as hexagons.

Fig. 239.

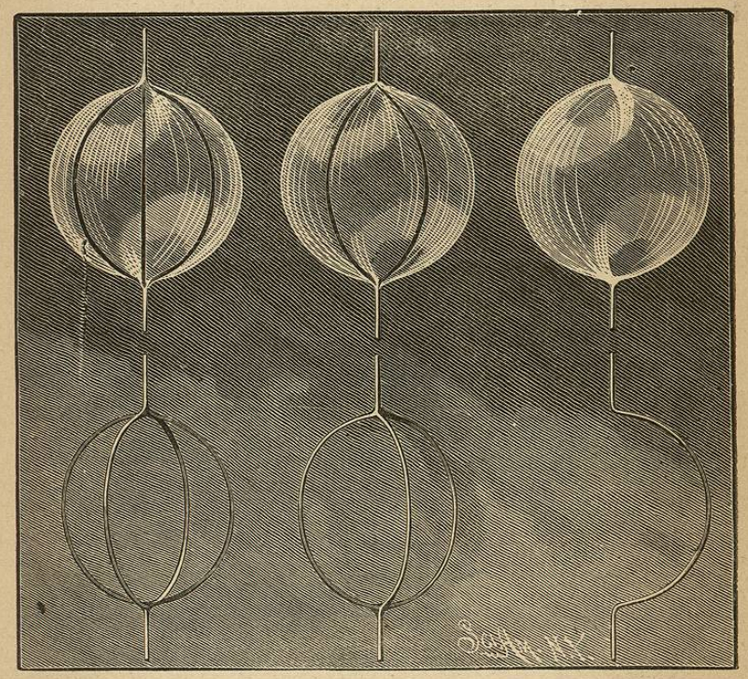


In Fig. 239 is shown a negative reproduction of Fig. 238, in which the spots are white on a black ground. When these figures are compared, the white spots, on account of

irradiation, appear much larger than the black ones, although they are of exactly the same size.

Fig. 240 illustrates an interesting illusion observed by Mr. J. Rapieff, the well known electrician. The apparatus consists of semicircular and circular wire loops, provided with axles, by which they may be twirled between the thumbs and fingers. The lower row of figures shows some of the

Fig. 240.



Rapieff's Optical Illusion.

loops used in the experiment, while the upper figures represent the effects produced. The wire has a polished surface. When the single semicircular loop is twirled, the only effect is to produce a gauzy glimmer of spherical form, as shown in the upper right hand figure. When three of the loops are joined together, each extending from the other at an angle of 120°, the figure produced is similar to that already

described, but with two perfectly distinct curved black lines extending from one axle to the other, as shown in the upper central figure. When four loops are joined at right angles to each other, three jet black lines are shown, as indicated in the upper left hand figure. A circular loop shows a single black line.

This curious effect is produced by holding the apparatus so that the light is reflected as much as possible from the inner surface of the wire. The result is due to the eclipsing of the bright surface by the shaded portion of the upper loop as it passes between the eye and the lower loop. The whole of the loop is not eclipsed at the same instant, but persistence of vision causes the entire eclipse to be seen at once.

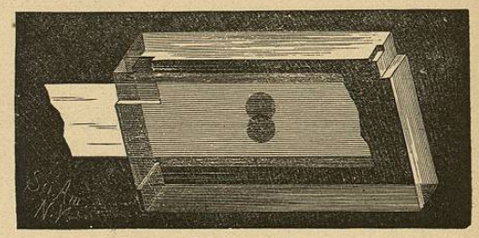
Success in this experiment depends upon holding the loops in the right position relative to the light, as well as the provision of the proper background. The loops should be held over a dark ground, with the axles parallel with the plane of vision.

CHAPTER XII.

POLARIZED LIGHT.

Glass, like all uncrystallized bodies, is said to be single refracting, because it diverts the ray in one direction only. By placing a rhomb of Iceland spar over a small black spot formed on a piece of white paper, two images of the spot appear, showing that the beam of light has been split up into two rays, one of which is called the ordinary ray, the other the extraordinary ray. As the rhomb is turned, the extraordinary ray moves around the ordinary one, and the image of the spot produced by the extraordinary ray appears nearer to the observer than the spot itself. This property of splitting the ray transmitted through the crystal, which was first noticed and commented on by Erasmus Bartholinias, in 1669, is known as double refraction. It is possessed by many crystalline bodies in a greater or less degree. Both rays emerging from the spar have acquired peculiar properties.

FIG. 241.



Iceland Spar.

Newton, after investigating the properties acquired by light in its passage through the spar, concluded that the particles had acquired characteristics analogous to those of magnetized bodies, that is, they had become two-sided, and were, in fact, polarized.