

ing at the hole, will depict on a white screen held at a distance of several feet from the hole a circular *image* or inverted picture of the sun, which may be considered as the circular base of a cone of rays having the pin-hole for its vertex. In this case, the illumination of the screen, if placed at a great distance, is feeble, and, if near, the circular patch of light inconveniently small. But if instead of a pin-hole, be substituted a convex glass lens of short focus, the whole of the sun-light received on it will be concentrated in the very small image of the sun formed in its focus, and, diverging *thence* will spread out into a much wider cone of light, and form a much larger circular and brilliantly illuminated area on the screen, affording every facility for the examination of the shadows of objects thrown upon it; with the additional convenience that by a reflector outside of the window, the illuminating sunbeam may be thrown horizontally, at whatever time of day the experiment is made.

(104.) The condition essential to the distinct exhibition of all phænomena of this class—that of a very brilliant light emanating from a very small point—being thus secured, let an opake body of any form be placed between the point and the screen, so as to cast a shadow on it. It would naturally be expected under such circumstances that the termination of the shadow on all sides should be a clear and sharply-marked outline, separating a uniformly bright space on the outside from a uniformly dark one within, and free from that external gradation from light to darkness which constitutes what