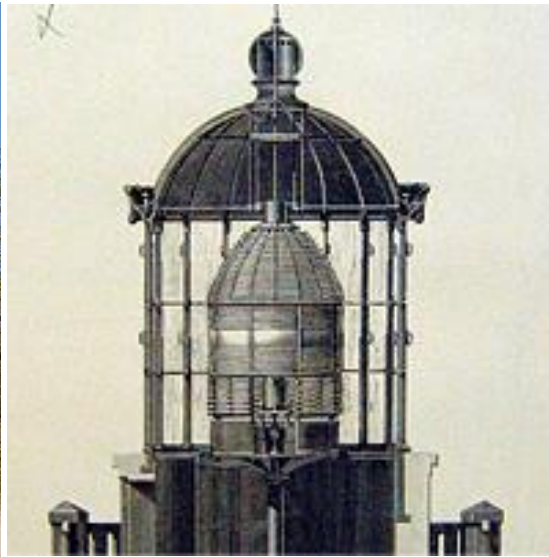


The Properties of Light: Fresnel Lighthouse Lens

Source: https://uslhs.org/sites/default/files/assets/The_Lighthouse_Story.pdf (U.S. Lighthouse Society)

Display selected images of Fresnel lenses



<http://www.splka.org/little.html>

<https://uslhs.org/history/fresnel-lenses>

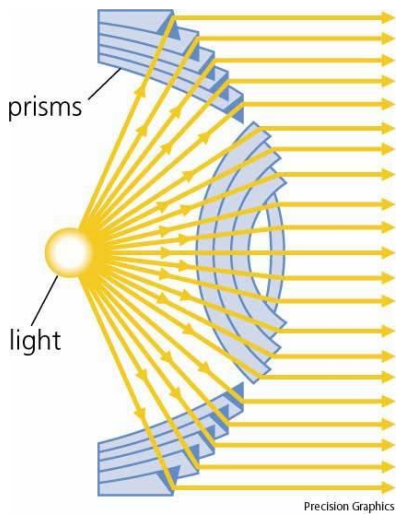
Principles

1. Light travels in a straight line if it is not interrupted.
2. When light strikes a surface, it can be reflected, transmitted, or absorbed, or a combination of all three.
3. Light travels through some objects but not through others.

Exercises

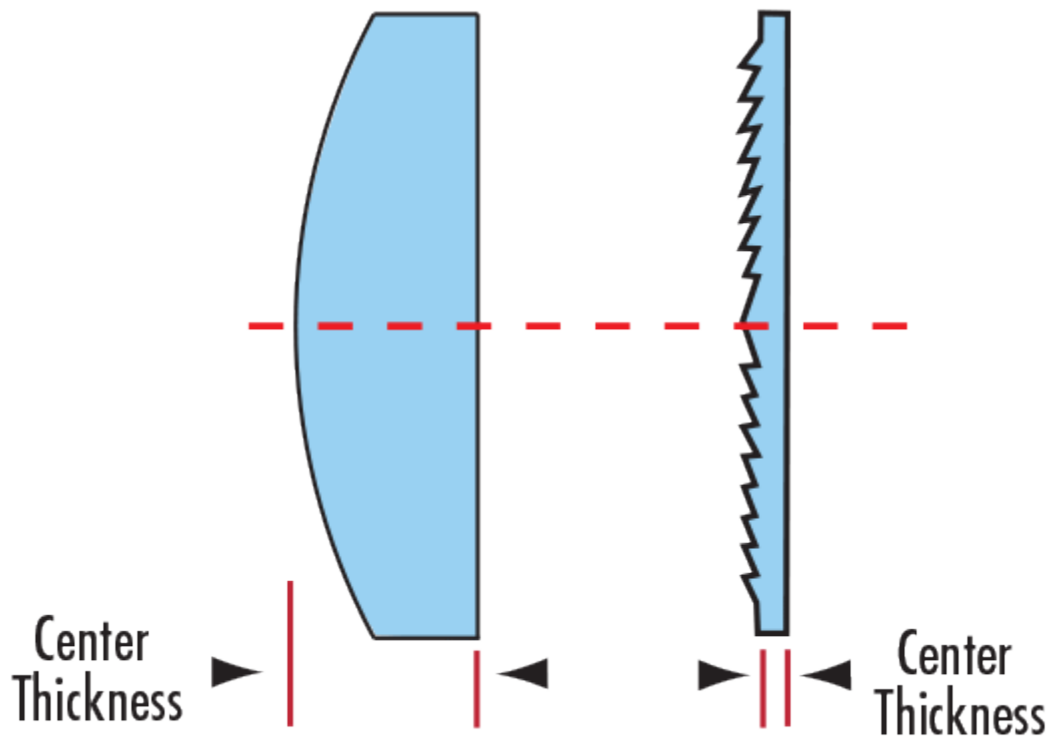
- a. Use a flashlight to explain the principle of reflection, which is used in the parabolic reflector. The silver reflector behind the bulb acts like a mirror, concentrating more light outward, which increases the brightness of the light.
- b. Shine the flashlight on an opaque object, such as a desk; this will block the light. The object absorbs (assimilates or takes in) the light.
- c. Shine the flashlight through a drinking glass, a transparent object (one that lets the light pass through). Most of the light will be transmitted (transferred or passed along).
- d. Using a prism, run the beam of the flashlight horizontally across the room. Place the prism in front of the beam, and it will reflect (bend) the light, breaking its normal path and causing it to shine on the ceiling, spreading out in all directions.

This demonstrates the principle of the Fresnel lens. The prisms and convex lens (curved outwards) work two ways; their shape and location also influence their effectiveness. The convex lens refracts (bends or slants) the rays of light as they pass through. The prisms first refract and then reflect (throw out) the light as it passes through (see diagram below).



<https://jrojel.com/quantum-tunnel-answers-fresnel-lens/>

e. Compare the shapes of a traditional convex lens and the much thinner, lighter Fresnel lens:

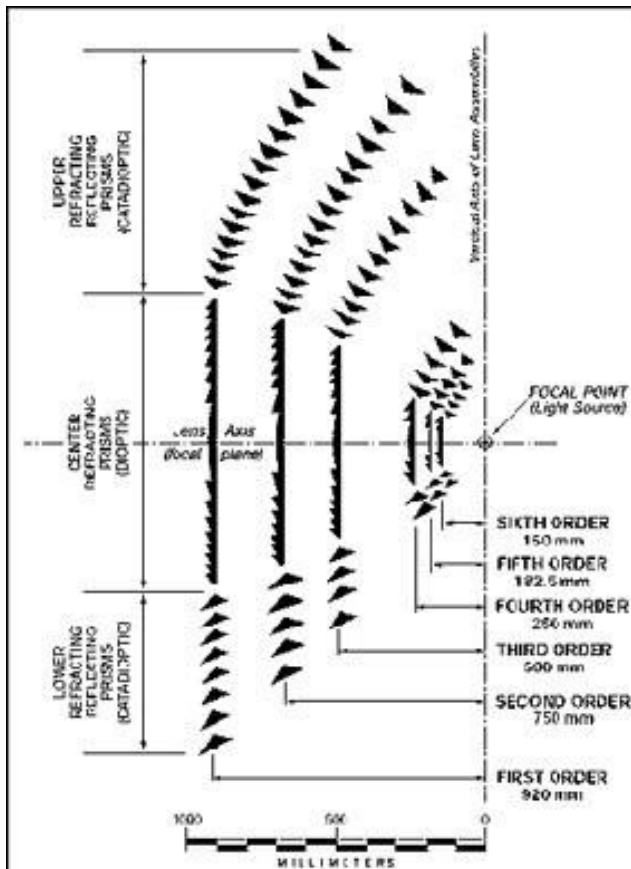


<https://www.edmundoptics.com/knowledge-center/application-notes/optics/advantages-of-fresnel-lenses/>

Video clip explaining the function of the Fresnel lens and comparing it to a traditional convex lens:

<https://www.youtube.com/watch?v=VyQAg4j-7K4>

- f. The Fresnel lens was produced in six sizes, called “orders.” The largest Fresnel lenses, such as the first-order lens, generally were reserved for large coastal lighthouses, and their light shines the farthest. The smallest sixth-order lenses generally marked a small harbor and have the shortest range. The diagram below illustrates the relative size of the six Fresnel lens sizes:



www.nps.org

A first-order lens is over eight feet tall and weighs over 12,000 pounds. A sixth-order lens, on the other hand, is about 1½ feet tall and weighs between 65 and 220 pounds.

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