tor was the next progressive step, but the crowning improvement in the illuminating apparatus of light houses was the utilization by Fresnel of there fractive power of glass, when cut into properly shaped lenses, to direct the light into parallel beams.

Since the days of Argand and Fresnel little has been done to improve the *theory* of lighthouse illumination. The principles adopted by them are still recognized as accurate, and progress has been in the direction of increasing the size and power of the apparatus, without departing from their general principles.

Spermaceti oil obtained from whales, seal oil and various fish oils, as illuminants, gave place to Colza oil, a vegetable product, and it, in turn, has been displaced by petroleum, a much cheaper illuminant, and capable of producing a much larger and more brilliant flame.

The English lighthouses burn petroleum in lamps having as many as ten concentric wicks, with an intensity of 2619 standard candles.

Of late years many experiments have been made with a view to replace oil by coal gas, acetylene gas and electric light, but petroleum is still generally used. It has the advantage over other forms of illuminants of being cheap and easily stored, and of giving a light with a clear yellow colour, which, it is claimed, penetrates fog better than the whiter lights obtained from more modern illuminants. In the endeavour to secure the best possible light producer many very powerful lamps have been invented, including a gas burner made by Mr. Wigham, of Dublin, containing 108 gas jets. He has superposed three such burners in the foci of separate lenses in a single lighthouse. The difficulty of using this apparatus consists in the great heat evolved, as well as in the immense lantern required to contain the superposed lenses, and to give sufficient air for and ventilation to the flames. Mr. Wigham has lately utilized the Auer light principle in his multiple jet gas burners, and must secure very great illum-