ARGAND and WIGHAM

Aime Argand 1750-1803

Argand was a Swiss physicist and chemist who invented the Argand lamp, a great improvement on the traditional oil lamp. His idea was to have a cylindrical wick which air could flow through and around, increasing the intensity of the light produced. He used a cylindrical chimney to enhance the air flow, resulting in a light up to ten times brighter than that of a candle. He carried out many experiments and modifications and concluded that whale oil was the most suitable illuminant. He went on to form a partnership in England with Matthew Boulton and William Parker to manufacture his lamp, which he patented in 1784. He also formed a close relationship with James Watt. Argand died in Geneva at the age of 53 having suffered from severe bouts of malaria for some twenty years.

ILLUMINANTS

Illuminants for lighthouses evolved over the years as technology advanced. Fires fueled by wood or coal held out for a long time, the last one being extinguished in England in 1823. Candles came into use in some lighthouses perhaps no earlier than 1540, when they were used at North Shields. Some sites used oil lamps, which consisted of small containers filled with oil and a floating wick. The next step up was a cresset, which was a stone bowl containing oil and a fixed wick. Though many kinds of oil were used, the most popular were spermaceti and colza.

During the nineteenth century, gas was used in some British lighthouses. This fuel source, though, was not successful, due in part to the need to manufacture the gas at the site. By the end of the century, only small harbor lights that could obtain gas from their towns used it.

Petroleum oil or kerosene began being used around the 1870s in the regular lamps. In the early 1900s the incandescent oil vapor lamp came into use. This lamp vaporized oil and burned it on a mantle, giving off a bright light well suited to the Fresnel lens.

The next step was electricity, which was first used in arc lamps at Dungeness, in England, in 1862. These lamps were used until 1875. Electrified lighthouses originally needed to have a generator, but when power lines came, lighthouses could be quickly electrified. The first British lighthouse to receive electricity in this manner was at South Foreland in 1922.

In more recent years some lighthouses have been converted to use the xenon discharge lamp, which gives off a light infinitely brighter than any other light source previously used.

(Lighthouses, F Ross Holland, 1995)

Argand Lamp and Parabolic Reflector

The Argand lamp was the invention of Ami Argand. His lamp had a hollow, circular wick that permitted oxygen to travel up the inside and outside surfaces, giving a brighter burn. The light of its flame was equivalent to that of seven candles.

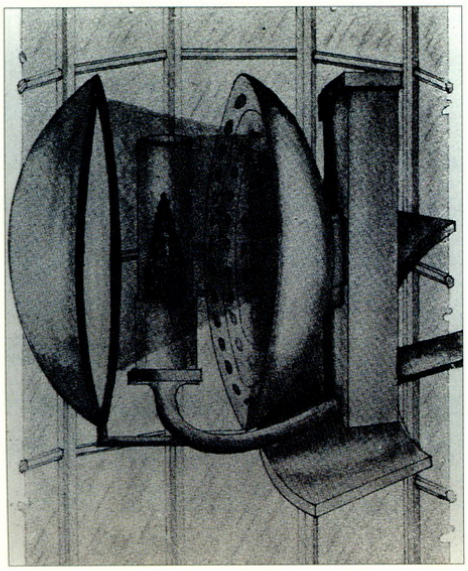
The reflectors were made from thin copper sheets that were molded into a parabolic shape. Once formed, they were silvered on the inside in order to maximize the light reflection. The lamp and reflector were mounted together with the reflector placed behind the lamp. The reflector would then be adjusted in the appropriate manner to help focus the light. The number of sets of lamps and reflectors that were used in a lighthouse depended on the purpose of the light. As many as fifteen or more lamps and reflectors would be used in a coastal lighthouse that required a bright light.

A parabolic reflector.

(Holland)

The American Argand Lamp and Parabolic Reflector

Winslow Lewis' Argand lamp and parabolic reflector resembled the version used in Europe with a few exceptions. The lens used by Lewis had a greenish tint, which probably reduced the candlepower of any light that passed through it. Although the British had long before abandoned this lens, the United States used it for about twenty years before tossing out the last one. Another difference involved the reflectors, many of which apparently were not parabolic. In 1838 naval officers examining lighthouses found a number of the reflectors to be spherical in form, while others were bent so much that their original shape could not be determined. Other reports over the years lamented the thinness of the reflectors as well as the fact that many had been bent out of shape from cleaning. Despite the numerous complaints, Stephen Pleasonton defended Lewis' system, primarily because it was cheaper than the Fresnel lens. He paid no attention when specialists said that the Fresnel lens would pay for itself in a few years in savings on oil.



The Argand lamp, reflector, and so-called magnifying lens used in U.S. lighthouses during the first part of the nineteenth century.

(Holland)

John R Wigham

Regenerative Gas Lamps.

THE application to gas lamps of the principle of regeneration—or, as it should correctly be described, recuperation—by which the air required for the combustion of the gas was heated by the hot products of combustion, made it possible to obtain more light from the gas flame, and the general adoption of this system did much to retain the popularity of gas lighting.

One of the earliest successful attempts at heating the air and gas was made by John R. Wigham, of Dublin, about 1865, who constructed a large gas burner of this type for use in a lighthouse off the coast of Ireland. Referring to the Wigham Lamp, a contemporary observer wrote that "the spectacle of so large a pillar of flame (13 feet high by 3 feet wide) giving forth its brilliant light and powerful flashes, was most impressive, and rendered Galley Head Lighthouse the finest and most remarkable in the world." The *Illustrated London News* gave the following account of Wigham's Lighthouse lamp :—

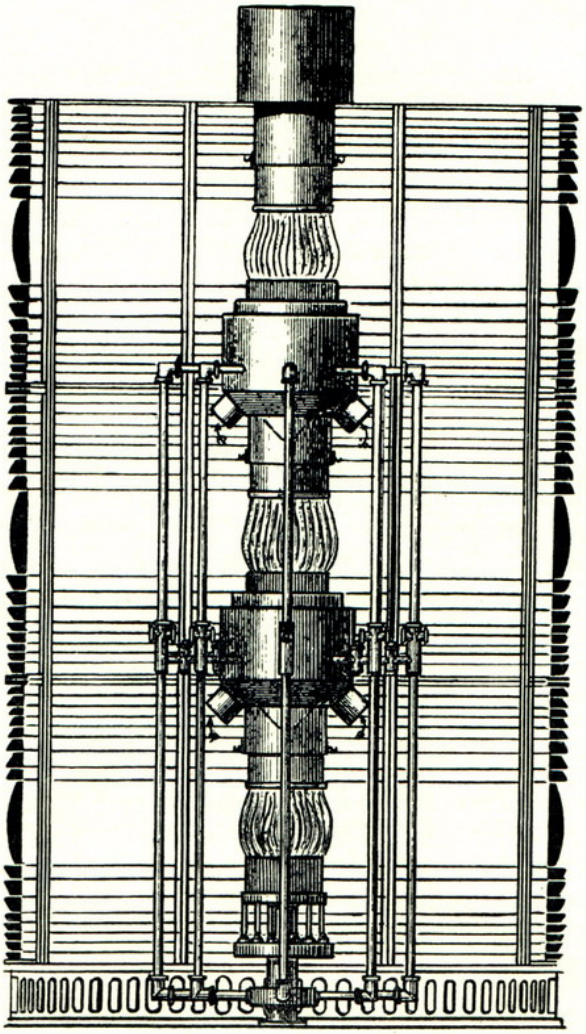
"A correspondence has been laid before Parliament on the advantages of substituting gas for oil in lighthouses. It appears that a kind of gas patented by Mr. J. R. Wigham, of the firm of Messrs. J. Edmundson & Co., of London and Dublin, and burned in a peculiar manner, has been used during the last four years at the Howth Bailey Lighthouse, at the northern extremity of Dublin Bay. It has been found very superior to the oil light. The Commissioners of Irish Lighthouses were so struck with it that they had the same principle applied at the Wicklow Head Lighthouse; and here still greater advantage, especially in regard to economy, was soon found to result from the new plan; for, the light at Wicklow being intermittent, the gas was saved when not required for its illuminating purpose; whereas, under the old system, the oil lamp had necessarily continued to burn, even when its light was intercepted by the eclipsing shade. Under these circumstances, the Irish Lighthouse Board applied to the Board of Trade to investigate the matter; and they deputed the task to Professor Tyndall, of the Royal Institution, London. Having availed himself of the assistance of Mr. Valentin. of the Royal College of Chemistry, Professor Tyndall reported fully upon the whole subject to the Board of Trade in June last. He spoke very favourably of the new system, having observed the lights for several successive days and nights, and compared it with the most powerful oil lamp employed by the Commissioners of Irish Lights, a lamp consisting of four concentric wicks, giving four concentric cylinders of flame. The gas-burner includes under ordinary circumstances twenty-eight jets; but to these can be added in succession, when required, four additional circles of burners, each embracing

(Lighting by Gas: an Outline of its History, Dean Chandler, c.1936 CIBSE Heritage Group Collection)

The Wicklow Head Lighthouse.
Equipped with Wigham's System of Gas Lighting.

twenty jets. Tried in a dark room, the gas flame with twenty-eight jets had more than double the illuminating power of the four-wick oil flame, and with 108 jets the gas had thirteen times the power of the oil lamp. Observations from a point on the North Wall, Dublin, at six miles distance, were disturbed by an accidental obstruction of the oil lamp; but observations were afterwards made from Poolbeg. With the twenty-eight-jet gas burner it was impossible to say which of the two lights was the best. With an oiled calico screen in front of the lights, roughly to represent a fog, the gas flame had slightly the advantage. The sixty-eight-jet burner was then lighted; the decided

superiority of the gas flame was immediately apparent—it exhibited a very brilliant globe of light. With the 108 jets the light was truly splendid; the oil flame, which when burning alone shone brilliantly, appeared to shrink and pale before the flame of the 108 jet burner. The coal employed is a Scotch cannel, delivered at Howth at 35s. a ton. It yields an exceedingly rich gas. The gas in the twenty-eight jet burner at the Howth Bailey is considerably cheaper than the oil flame; but the great increase of illuminating power which the employment of gas places at the disposal of the keeper on foggy nights is most important. In rock lighthouses gas could not be applied, but there are many points on our coasts at which its introduction would not be difficult. Neither its manufacture nor the construction of the burner may at present have reached its maximum perfection. Professor Tyndall recommends the further encouragement of this system of lighting."



Construction of Wigham's Lighthouse Burner.