

# History Of British Lighthouses Before 1700

by Ken Trethewey \*



ABOVE: A painting of the North Foreland lighthouse in its form from 1691 to 1793. [Artist: Michael Rooker, 1746-1801). The painting was made in 1780 and is held by the Royal Academy of Art. <https://www.royalacademy.org.uk/art-artists/work-of-art/the-north-foreland-lighthouse-kent>]

It could be argued that it was the coal industry that initiated the building of lighthouses on the English coastline. The transport of coal away from the developing coalfields of the northeast greatly increased shipping traffic up and down the east coast, and the hazards seamen encountered along the way caused many to focus their minds on improvements to safety.

By 1600 there was a fleet of two hundred colliers supplying London with coal; yet more sailed to Edinburgh where the Isle of May light at the entrance to the Firth of Forth was established in 1635. By 1700 the London fleet had increased to a thousand ships employing ten thousand seamen.<sup>1</sup> Yet, by 1600 there was hardly a single working lighthouse in England, in the way it would be recognised today.<sup>2</sup> The image on page 2 is of

Dungeness, established in 1615. It could be claimed as the earliest structure that met the criterion for a lighthouse in the new age. Others might argue that the Tynemouth Castle light took the prize. It is known to have been alight on a turret at the east end of the priory church in 1582, and was almost certainly in use much earlier, but, set up and managed by monks, falls into the category of Ecclesiastical lights. So there is no common agreement on the answer to the ambiguous question of which was the earliest lighthouse since there are many criteria such as purpose, design, management and finance to be applied. Tynemouth and Dungeness were open coal fires on elevated platforms that, by a modern definition should be better called lightstructures rather than lighthouses.<sup>3</sup>

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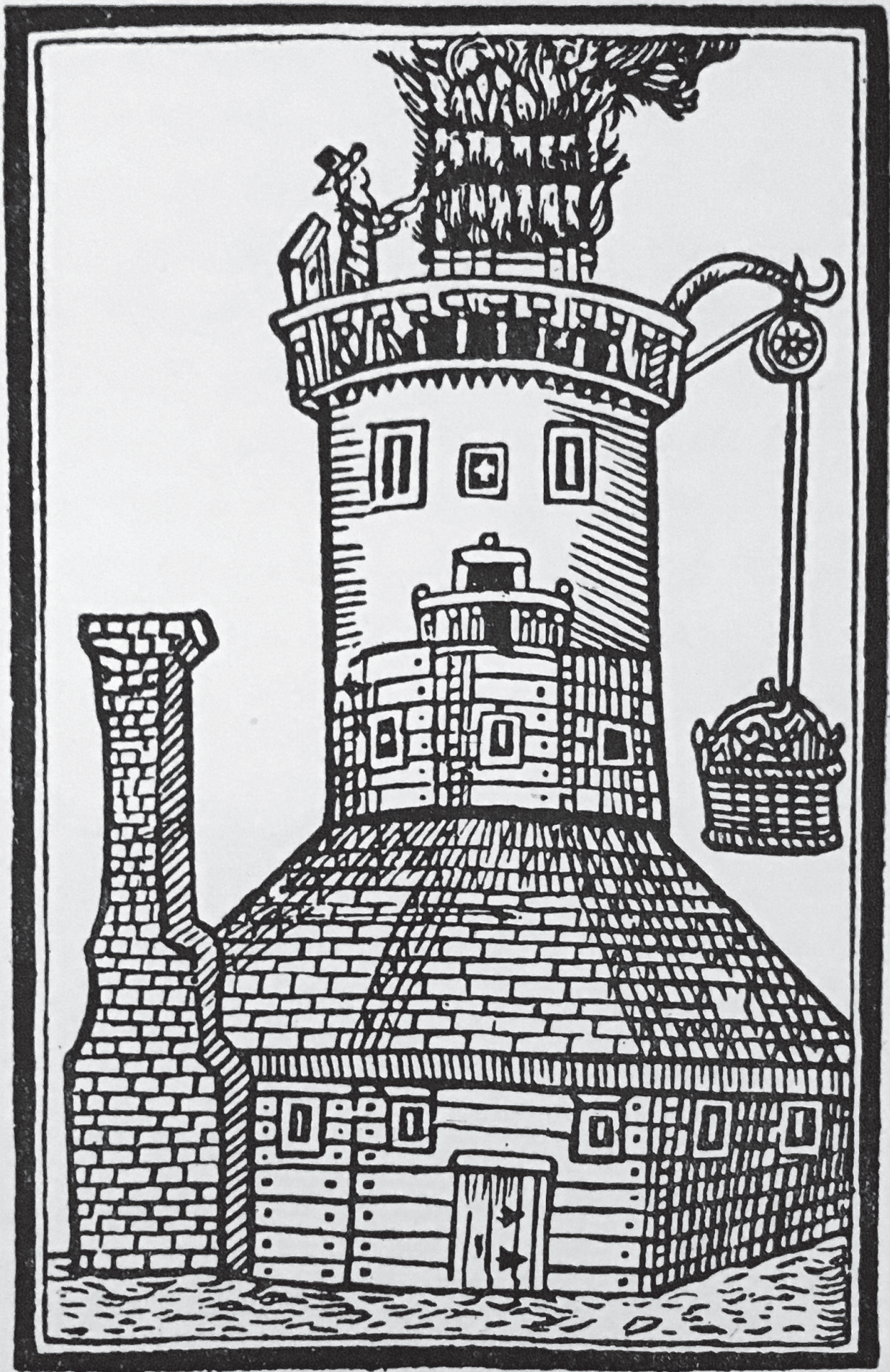
1 Long, Neville: *Lights of East Anglia*, Lavenham Press (1983), p1.

2 It is always difficult to be exact in statements like these.

The leading lights at Tynemouth were certainly lighthouses, and therefore would qualify as being the first, but were intended only to assist ships at the entrance to the river.

3 The topic is discussed at length in the book, *Ancient Lighthouses* by Ken Trethewey and in the article [http://www.pharology.eu/whatisalighthouse/What\\_Is\\_A\\_Lighthouse.pdf](http://www.pharology.eu/whatisalighthouse/What_Is_A_Lighthouse.pdf)





ABOVE: The coal-fired lightstructure at Dungeness (1616).[ Image in the public domain.]





ABOVE: A satellite image of the British Isles showing the most significant sites of lights shown for navigational aids before 1700. White pins are just some of the early Ecclesiastical lights that had been extinguished by 1600. Yellow pins are sites of lights shown in the 17th century, except for those at Tynemouth that slightly preceded them. They are the first lighthouses of what might be called the British Industrial Age. Details are given in Table 1. Some of these lights were shown only over a short period, often subject to political arguments between lighthouse entrepreneurs, representatives of the Crown and of mariners themselves over financial arrangements and the effectiveness or otherwise of the lights. The idea that lighthouses could be a business from which profits could be made, as well as a tax upon sea trade, took a long time to achieve popular acceptance. But by the 18th century, lighthouse building was in full development. In the 17th century, with Hook Head, St. Catherine's extinguished, Eddystone and St. Agnes not lit until the very end of the century, and a light shown from St. Ann's Head for only five years, it is clear that the most significant activity was along the east coast - especially in the southern North Sea, where the biggest problems to shipping were caused by sandbanks.

| Lighthouse Site                              | Year          |
|--|---------------|
| Tynemouth (2)(candles)                       | 1540          |
| Tynemouth Castle (coal)                      | 1582          |
| Caister (aka Caistor) (2) (candles) (TH)     | 1600          |
| Lowestoft (2) (candles) (TH)                 | 1609 and 1676 |
| Dungeness (coal)                             | 1616          |
| Wintertonness (aka Thwart Lights)(2) (coal)  | 1617          |
| Lizard (2) (coal)                            | 1619-1630     |
| Isle of May (coal)                           | 1635          |
| Orfordness (2) (coal)                        | 1637          |
| North Foreland (coal)                        | 1634          |
| South Foreland (2) (coal)                    | 1634          |
| Harwich (2) (coal at rear; candles at front) | 1665          |
| Hunstanton (2) (coal)                        | 1666          |
| Milford Haven (aka St. Ann's Head)           | 1662-1668     |
| Spurn Point (2) (coal)                       | 1674          |
| Corton (2) (coal)                            | 1675-1678     |
| Scilly (aka St. Agnes) (coal) (TH)           | 1680          |
| Eddystone (candles)                          | 1698-1703     |

Table 1: List of the earliest lighthouse sites of the British Industrial Age from 1540 to 1698. [Stevenson, p96, p258-9] Whilst the majority of lights were established to assist the shipping of coal between London and Edinburgh, clearly the East Anglian and Kentish coastlines were significant from an early age for other reasons, not least of which was to combat the ever-changing sandbanks. This is indicated by the number of sites where two lights - indicated by (2) - were shown. Apart from those managed by Trinity House of London, indicated by (TH), the remainder were privately owned and operated. The majority of lights were lit by coal, the rest by candles.

### *Ecclesiastical Lights*

Earlier aids to navigation (later called Ecclesiastical Lights) that had been shown randomly right through the Middle Ages from hermitages, monasteries, abbeys and other Christian sites were almost totally lost from 1538 onwards when Henry VIII ravaged the established Roman Catholic Church during what is politely called the Reformation. One of the casualties was a long-established light shown from a dangerous headland called Hook Head in southern Ireland. Legend tells of a light having been shown from a monastery established by a monk called Dubhan in the sixth century. After the Romans left and extinguished the Dover Pharos for the last time, this becomes a strong candidate for the next oldest known location for a navigational



ABOVE: St. Catherine's Oratory on the Isle of Wight, the best preserved Ecclesiastical lighthouse in the UK dating to 1323. The outline of the chapel that was originally attached to the structure is clearly visible.

light in the British Isles. Later, the Hook Head site<sup>4</sup> became a coal fire lightstructure - possibly quite similar to those at Dungeness or North Foreland shown here. Hook Head is a contender for the first lightstructure of its kind and we are confident that the monks who tended it were the first formally recognized lightkeepers. Like so many others, Hook Head lighthouse - an Ecclesiastical light - ceased to operate for a long period after 1538, if not before.

In England, another Ecclesiastical light that suffered the same fate during the Reformation was St. Catherine's Oratory on the Isle of Wight. Monks showed a light from a tower from 1323 onwards after the Pope ordered Walter de Godeton to build a lighthouse as a penance for his sin of stealing wine.

It is unfortunate that no firm evidence has been found to suggest the existence of an early lightstructure on Spurn Point, the entrance to the river Humber and the port of Hull. Henry VI had granted a Patent to Richard Reedbarrow in 1427 to show a light from a tower there:

*“to make a Toure to be uppon day light a redy*

<sup>4</sup> Hook Head lightstructure was built by the Lord of Leinster in the period 1210 - 1230.





ABOVE: The two lighthouses at Tynemouth which, when aligned, show the safe channel into the River Tyne at Tynemouth. These two towers date from 1810 and replaced two earlier lighthouses of 1727, but the earliest lights were shown in similar fashion from 1540 after the granting of a Patent by Henry VIII to the Trinity House of Newcastle upon Tyne in 1536.

*Bekyn, wheryn shall be light gevyng by nyght,*<sup>5</sup>

Whether Reedbarrow actually built his lighthouse is not known. There is no known record of a light of any significance at Spurn Point until two lightstructures were definitely built there by Justinian Angel in 1674. Even if it indeed was built in that earlier time we must place it in the category of Ecclesiastical lights. Nevertheless, it is clear that the 1427 document established the principal for obtaining planning permission in this, the first Patent of its kind, as well as the principle by which it was paid for - that of charging light dues from passing ships. It is possible that the application was made through Reedbarrow's links to the charitable guild of mariners called the Trinity House of Kingston upon Hull.<sup>6</sup> Again, there is no proof that this was the case, but, if it were, it would predate any similar agreement with the Trinity House of London who, after being given their own Charter by Henry VIII in 1514, were very slow to assume their responsibilities in this regard.<sup>7</sup> (Even as late as

5 De Boer, G: A History of the Spurn Lighthouses, East Yorkshire Local History Society (1964), p5.

6 Five Trinity Houses were established in Britain: at London, Kingston upon Hull, Newcastle upon Tyne, Leith (Edinburgh) and Dover. All combined objectives of Christian charity and the provision of aids to mariners.

7 Despite being given the authority by Royal Charter, the Corporation's efforts were directed more towards their pilotage

1786, Trinity House was responsible for only four lighthouses, and it was not until 1832 that they finally took control of all lighthouses in England and Wales.<sup>8</sup>)

Nevertheless, soon after, the London Trinity House began to take responsibility for some lights from the start of the 17th century. In 1607 they took charge of two leading lights already erected without authority at Caister by a man called Bushell. A channel through sandbanks close to shore at the busy fishing port of Lowestoft was given two leading lights in 1609.<sup>9</sup> The approach was to assign a fixed site on which to build a rear light, higher than the front light that was less permanent and could be moved to change the alignment when the channel was affected by the movement of the sandbanks. This was a common feature along this coastline, with similar pairs of lights shown from Corton, Harwich, Orfordness, Lowestoft, Caister and Wintertonness. Intended for local boats entering and leaving ports, they were not really designed for passing ships, but assisted offshore mariners nevertheless.

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and charitable work.

8 Stevenson, David A.: The World's Lighthouses Before 1820. Oxford University Press (1959), p65.

9 Stevenson, p97, says these were candle lights, though other sources talk of coal fires.





ABOVE: The high, rear light of a pair of leading lights established in the 17th century at Harwich. A low light was located on the beach some 200 m distant.

## The Industrial Age Begins

Then, in the 16th century, came the rise of the coal industry; the traffic between Newcastle and London focused minds. Whilst, on the one hand, Henry VIII had brought about the termination of the Ecclesiastical lights, he also played a critical role in the process of building a new cohort of lighthouses according to a modern formula - what we might call "Lighthouses of the Industrial Age." It was his 1536 Charter that authorized the Trinity House of Newcastle upon Tyne to:

*"build and imbatle two towers, one at the entrance of the haven of Tyne, the other on the hill adjoining, in each of which a light was to be maintained every night, for the support of which they were empowered to receive 4d for every foreign ship and 2d for every English vessel entering the port of Tyne."*

From this Charter came the two leading lights that have been shown at the entrance to the River Tyne ever since. This is of significance to us as a definition of three principles of lighthouse provision:

**The maintenance of a light, not on a casual basis but every night;**

**The right to tax shipping in support of the provision;**

**The use of two lights that, in alignment, indicate a safe channel.**

With finance now a vital consideration the establishment of lighthouses became a business rather than just a charitable act performed by members of the Church. The tax with regard to lights was called *lightage* or *light dues*.

Two of the earliest sites were at the North and South Forelands in Kent. A Patent<sup>10</sup> was awarded to Sir John Meldrum for both sites in 1634 and he successfully initiated three elevated coal lights - one at North Foreland and two leading lights at South Foreland - that were in use almost continuously thereafter. Only the lower of the two South Foreland lights was discontinued in 1904. The image of North Foreland on page 1 of this article is the best representation presently known of a lightstructure of this type.

Table 1 lists eighteen sites of lights in the new British Industrial age from 1540 to 1698. Inspection shows that no fewer than fourteen sites were on the east coast. Naturally, in these early times there was no common blueprint for aspirant lighthouse builders.<sup>11</sup> Building a structure was one thing. Even worse, the methods of lighting were primitive to say the least.

## How Do You Light a Lighthouse?

Today, we take so much for granted. Even as late as the 21st century, lighting technology has been revolutionized by the introduction of the light emitting diode or LED. It is tiny, very bright for its size and uses only small amounts of electricity.

Four centuries ago when the earliest lighthouses of the Industrial Age were still very basic, the only methods for providing light suitable for use as navigational aids were by the physical burning of fuels:

**Small fires of wax in the shape of candles;**

**Medium-sized fires of animal or vegetable oils;**

**Larger fires of wood or coal.**

<sup>10</sup> In these times Patents were licences, rather than associated with intellectual property.

<sup>11</sup> This is best illustrated by the much reproduced design of Henry Winstanley at the Eddystone in 1698 with its plethora of fanciful features and decorations.





ABOVE LEFT: The St. Agnes lighthouse (1680) on the Isles of Scilly which was lit by coal burned in the cast iron chauffer (grate) ABOVE RIGHT. The unique item can be seen in the gardens of Tresco Abbey.

Oil technology was still very under-developed - no better than candles - and in the 1600s lights for navigational aids were almost always made by candles or coal fires. All available methods were inefficient and unreliable, especially in the care of humans who were not paid enough to take seriously the hard labour in difficult circumstances. In that sense, technology was not ready for lighthouses.

## Candles

When candles were used it was clearly necessary to protect the delicate flames in some way - that is, behind glass in a lantern or in the window of a house. Here we can see how, in the English culture, language plays a part since the showing of a light from a house introduced a new word into the English language.<sup>12</sup> When coal fires were used there was, at first, no such constraint and the fires were larger and brighter, although still unreliable, so, even as late as 1800, candles remained in use on Smeaton's Eddystone lighthouse - one of the finest lighthouses yet constructed.

It was at Caister-on-Sea (aka Caistor), just north of Great Yarmouth in Norfolk, that a builder had erected two candle-lit lights around 1600.

12 A complete discussion of the etymology of lighthouses is given in the book, *Ancient Lighthouses*. Also available at [http://www.pharology.eu/resources/journalarticles/01\\_Literature.pdf](http://www.pharology.eu/resources/journalarticles/01_Literature.pdf) and [https://www.academia.edu/38933752/Ancient\\_Lighthouses\\_Part\\_1\\_The\\_Literature](https://www.academia.edu/38933752/Ancient_Lighthouses_Part_1_The_Literature)

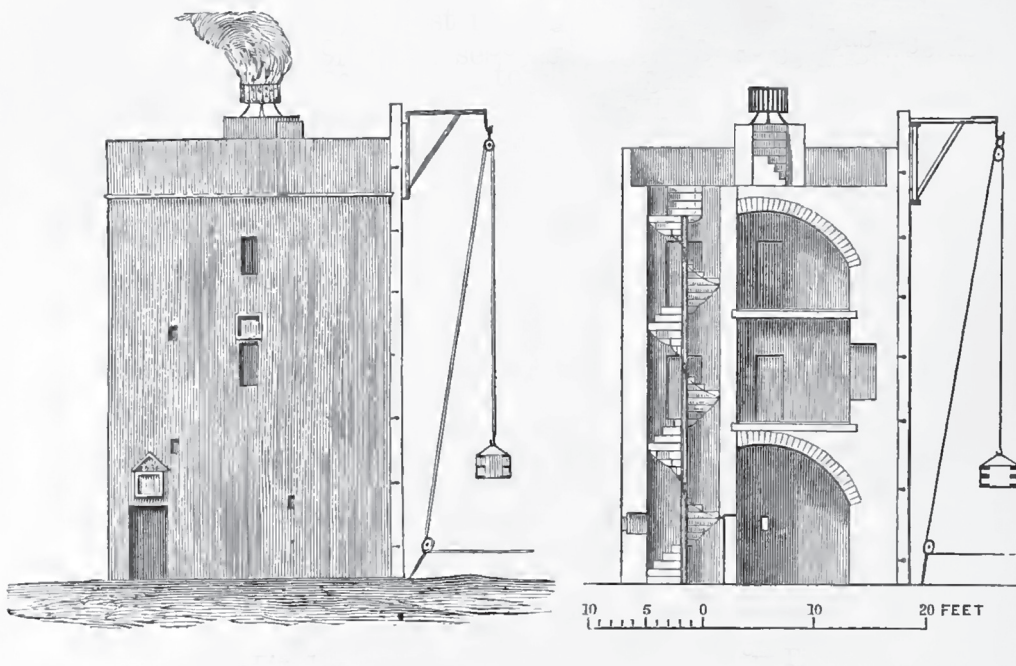
A few years later, in 1607 these were the first lit navigational aids to be acquired by Trinity House who found it difficult to ensure that those appointed to look after them did so efficiently and reliably.<sup>13</sup> Although an important event in the timeline of lighthouses, the structure used to show the lights is not known. Similar reliability issues were experienced at Lowestoft where in 1609, Trinity House, for the first time, pro-actively responded to a demand for lights. Two lanterns containing candles were set up on the beach where they offered a leading line into the Stanford Channel and marked the southern approach to Yarmouth Roads which, in the seventeenth century, was a key roadstead and anchorage, in frequent use both by vessels engaged in the local herring trade and by colliers on the route from Newcastle to London.<sup>14</sup>

Candles were made in proportion to the pound weight (1 lb = 454 g - approximately half a kilogram). The Caister light in 1628 used candles at three to the pound; at Harwich in 1676 they were one pound each. As the science evolved the light emitted became standardized in the form of a 'standard candle' that was made of spermaceti wax extracted from the heads of whales. The candles were six to the pound and burned at a rate of 120 grains (7.77 g) per hour. The standard candle thus became a unit of light measurement used through the centuries and later evolved into 'candle power'; later still, the

13 Stevenson p97.

14 Wikipedia, Lowestoft lighthouse, downloaded 2021.





Left: The Isle of May open coal fired light (1635). [Stevenson, Thomas: Lighthouse Construction and Illumination, 1871, Figures 16 and 17.]

candela.<sup>15</sup> Navigational aids made from candles were naturally weak at first, but were easy to maintain. At the end of their useful life candle ends were of some monetary value to poor people; candles made of tallow and beeswax could even be eaten as a last resort!

## Coal

It is not known when the light at Tynemouth Castle was established, but there is reference in 1582 to:

*“... the keepinge of a continuall light in the night season at the easte ende of the church of Tinmouthe castle, as in former times had ben, for the more safegarde of such shippes as should passe by that coast”.*<sup>16</sup>

Important is the phrase that indicates a longer tradition of showing lights there, but unfortunately we cannot assign an earlier date with confidence. Once again we should consider it as an Ecclesiastical light rather than in Industrial one, although here perhaps we have an example of a bridge between the two eras.

Coal was often contained in a metal holder called a brazier or chauffer and raised to a given height above the surrounding area to give it increased visibility over the sea. An original example of a coal chauffer can still be found in the botanical gardens on the island of Tresco in the Isles of Scilly, England. This chauffer was used from 1680 onwards in the

old lighthouse known as Scilly, which is today a private house on the island of St. Agnes.

Wooden lever-arm arrangements were sometimes constructed to give further elevation to coal-burning braziers. The invention is attributed to a Dane called Pederson Groves in 1624.<sup>17</sup> Called swape lights or vippefyr, such a design was used for two lights at Spurn Point from 1674, the lever arm of each light being placed on top of a stone tower, to provide the leading lights for entry into the Humber.<sup>18</sup> Because of their nature, there are no known examples of these old lights in existence today, but replicas of vippefyr can be found in Denmark and Sweden.

A much-quoted statistic is that in 1698, the annual consumption of coal was 100 tons at each of the Forelands lights.<sup>19</sup> Once again, a lack of clarity fogs the data. The record gives the name only as ‘Forelands: 100 tons each’. We must assume that three similar fires consumed 300 tons in total. Elsewhere it was described as 32 chaldrons of coal a year at an average of 30 shillings a chaldron or small cart load.<sup>20</sup> As with lights shown from high elevations, these figures are fogbound. We are confident that the first Dungeness lighthouse was coal-burning from the start in 1615, but the report that it consumed 400 tons of coal per year - four times the amount consumed by just one light on the Forelands and more than one ton per night - is less believable.<sup>21</sup>

15 Scientific measurements of the brightness of lights involve the amount of energy falling upon unit surface area at a given distance. This requires an extension of the units into domains that are outside the scope of this article.

16 <http://www.twsitelines.info/SMR/731>

17 <https://uslhs.org/lighthouse-lamps-through-time>

18 de Boer, p24.

19 Stevenson p276.

20 Jewell, John: St Margaret’s Bay - The Piccadilly of the Sea; St Margaret’s Historical Society (1988), 24pp, p12.

21 Carpenter, Edward: Dungeness Lighthouses (1996) p3.





ABOVE: A replica of a swape light or vippefyr that was used at Spurn Head (1674). This one is at Skagen in Denmark, here on a hill rather than a stone tower.

Our present understanding is that the chaldron is a unit of measurement of grain or coal that was used extensively from around the fifteenth century.<sup>22</sup> As is often the case, there was some variation, the more so in this case because each chaldron load was taxed and it was in the coal merchants' interests to make their chaldrons larger than it might otherwise have been. Since coal was exported from Newcastle, there was a unit of measure called the Newcastle chaldron that was used only for coal. Before 1695 its weight was 42 hundredweight, that is 4705 lb (2134 kg) - about two tons. In fact, one chaldron was enough to fill three wains (wagons). The London chaldron was defined by a law of 1665 whereby 1 chaldron = 36 bushels, weighing 25 1/3 hundredweights - about 2837 pounds (1287 kg).

By 1700 fifteen major navigational lights existed in Britain, of which twelve were coal fires.<sup>23</sup>

## *Glass And The Lighthouse Lantern*

From ancient times, wood and coal fires were originally used for beacons on headlands and, over the years, would have been refined by the use of improved containers to allow the fuel to burn more efficiently, i.e. with more light emitted per given quantity of fuel and with less smoke. This latter is always a problem because it obscures the light and creates soot which causes other disruption. Later, as the need for more reliability increased, lighthouse fires were enclosed inside structures made of arrays of panes of glass, called lanterns. Unfortunately, unless great efforts were made to control the smoke, the glass was frequently coated in soot which reduced the visibility of the

fires. Like the fires, arguments raged amongst the stakeholders who, on the one hand complained about paying for a service that was so unreliable and the service providers who struggled to meet their objectives in a time of such undeveloped technology. The Forelands were just two of the sites where glazing was being frequently tried and abandoned.

The enclosure of a coal fire behind glass to make a lighthouse lantern seems an obvious improvement to us today, yet it was not easy for seventeenth century engineers. It was all about the glass, the quality of which was random and generally poor until the nineteenth century. In northern Europe, the main method of producing glass from the Middle Ages onwards had been devised in Germany. Molten glass was blown into spheres, which, while still hot, were swung to form cylinders that were cut and flattened before they cooled.

An important variation which specifically targeted the manufacture of window glass was devised in Venice. This resulted in crown glass whereby hollow spheres were blown, reheated and spun into large discs. Panes were cut from these discs, and the best glass was to be found at the edge of the disc where it was clearest and thinnest. In the centre, where it was thickest, the glass was least translucent and these regions known as the bullion or bull's-eye were used on smaller windows.

Glass was manufactured from a few common ingredients – specifically sand, potash, and lime, heated in a furnace. In medieval times, much glass was made in Sussex where good supplies of timber were available for the hot furnaces. However, the timber was valuable for other purposes and glass manufacturers were forced to move to the Midlands and other locations where they could use more readily available coal.

Prior to the 18th century, glass manufacture was primitive and most products were of poor quality. In his short life, the great French scientist Augustin-Jean Fresnel (1788-1827) was to revolutionize the manufacture of specialized optical devices for use in lighthouses based upon the high quality glass made available in his own country, whilst in England, it was not until the Smethwick (Birmingham) company called Chance Brothers became established as the leading glass manufacturer that English lighthouse technology caught up with French. In the meantime, lighthouse builders of the new Industrial Age had to manage with inferior materials for about two centuries years until technology caught up with philosophy.

22 <https://www.sizes.com/units/chaldron.htm>

23 Stevenson, p273.