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Memoir of an English Lighthouse Engineer

An Autobiography by Kenneth Sutton-Jones

Part I

This autobiography by Kenneth Sutton-Jones was published originally as *Grandpa's Lighthouse & Light Housework* by Peter Williams Associates, Milford Haven, Pembrokeeshire, SA73 3AK United Kingdom. Copyright © 2005. It will be presented in *The Keeper's Log* as a series of articles.

AUTHOR'S INTRODUCTION

'For Those in Peril on the Sea'

Imagine you are sailing from the West Atlantic inbound for Plymouth in winter, three hundred years ago. Your ship, a massive and magnificent four-master at the behest of current and winds, is running before the rising westerly gale. The pall of cloud denies observation of stars. As the vessel pitches you cannot see where sea meets cloud, which in any case, is low enough to form a fog with the spume from the wave tops. Yet, you are making good progress towards your desired landfall off the south west of Ireland, as indicated by the log and compass. You could be standing into danger if the wind turns southwesterly and be in hazard from the Blasket Islands and offshore reefs around Dingle and Bantry Bays. There are no lighthouses to guide you. Luckily, a few years ago, in 1708, the dreaded Eddystone reef off Plymouth was marked by Rudyerd's wooden lighthouse—if only there could be more lighthouses! That is how it was on most coasts until well-engineered lighthouses were built in the 19th century and the Trinity Brethren had their Charter to take over poorly run private beacons, and eventually, establish a reliable and properly managed lighthouse service, emulated since by many other lighthouse authorities.

When I went aboard the Eddystone tower in 1938 it was the mighty granite tower built in 1882 by Sir James Douglass. I arrived in fog; one of the keepers was aloft on the gallery sounding the explosive signal every five minutes. A wonderful aroma of cooking counteracted the "paraffin smell" of the oil burners used in the enormous revolving first order biform lens. The three keepers each spent two months at the station followed by a month on leave (if weather did not delay the relief). This later changed to a month "on" followed by a month "off". In 1939 the Principal Keeper was taken ill whilst on duty. After much use of semaphore and lamp signaling to alert those ashore to his incapacity, he was rescued. The poor man was taken off by being hoisted off the tower and lowered into a rolling plunging boat. This highlights the plight of being isolated in a wave-swept tower at that time.

The use of the helicopter was to come. Construction of helipads above the lantern spoiled the appearance of such awe-inspiring structures at Wolf Rock, Bishop Rock, Eddystone, Longships, Smalls and others, but the hazardous and "alarming" means of many past reliefs became "history," much to the benefit of all concerned.

Grandpa's Lighthouse and Light Housework is written in three volumes, they define important stages in the development of pharology (the science of lighthouses) experienced by me during sixty years of involvement since my early "captivation" in 1927. My training (1937-1945) at the famous lighthouse equipment designers and makers, Chance Brothers, followed. This included wartime, and then active involvement in the refurbishment, development, and re-equipment of light stations in many countries from 1946 to 1952, at which date, Chance Brothers Lighthouse Works reached its centenary. Next came the modernisation of stations at the close of the British Empire.

Threats of oil dry-up and the acute economic problems of shipping changed the maritime scene. So did the impact of developments in the technology used by ships and light stations. Radar, communications, electronics, and the use of satellite positioning on the ships, combined with the use of alternative solar and wind power sources on the lighthouses. These, along with the establishment of a world system of channel marking, all served to make change in the world's lighthouse services inevitable. Navigators could now position their ships with less reference to lighthouses. Finally, the demanning of lighthouses and light vessels was made possible by the radio monitoring of the lighthouse equipment by centralised surveillance units, usually at the headquarters of each lighthouse service.

Losing the "romance" of lighthouses is unfortunate, and for me, unbearable. These volumes are a personal view about character building and my reflections on my work viewed at retirement at the age of 79.

I close my writing on these many subjects at the age of 84 years.

Kenneth Sutton-Jones
Ashurstwood, Sussex
January 2004

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CHAPTER 1
The Debut

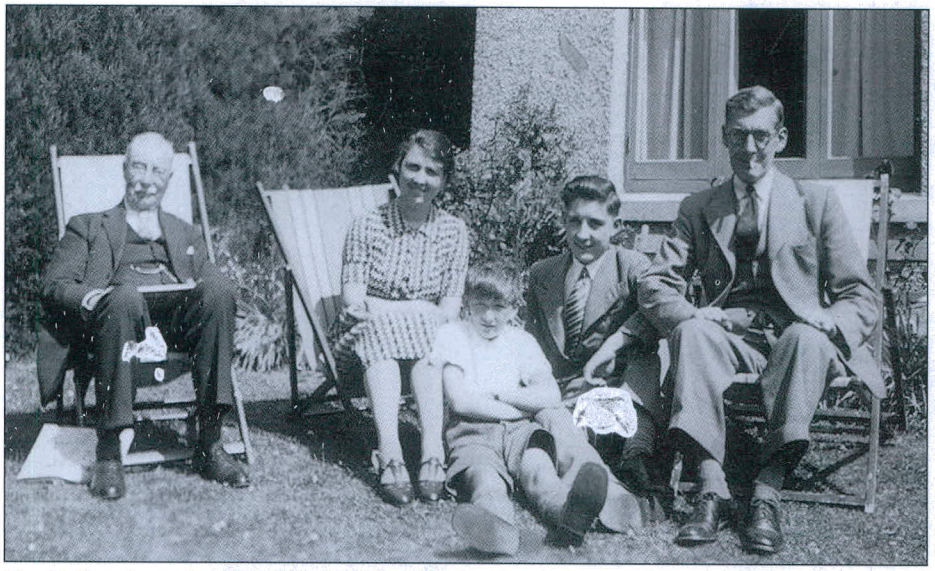
Just twenty months after the First World War (1914-1918), I was born on a Friday in August 1920, (Kenneth Charles Sutton-Jones) to Charles and Minnie at their home, 66 Shirley Park Road in Addiscombe, an eastern district of Croydon, Surrey. Here I spent my first four years. It was a pleasant two-story villa probably built thirty years previously.

Charles, a certified accountant, worked in a publisher's office in the shadow of Saint Paul's Cathedral in London. Getting there required a rail journey via Cannon Street Station, and the Southern Railway from Clock House Station, within walking distance from home. Minnie and Charles were thirty-ish, and had been married at Addiscombe Parish Church in 1914. Both had endured the War helping in the Ambulance and Volunteer Nursing Services. My father, Charles, was the eldest of six sons and two daughters; both of the latter went on into their late nineties. The family home was in Nunhead, south east London. I had long and fond memories of my grandma (Matilda Adelaide), an embodiment of correctness and rectitude mixed with kindness.

My mother, Minnie, was the youngest of a family of three daughters and two sons, all except one surviving well into their eighties, Minnie dying just eight weeks short of her 107th birthday. The family home was originally in West Dulwich. My grandfather died at 96 years.

I was born into the time of Empire when the globe was strewn with dominions, dependencies, and colonial territories, all (or most) "proudly" British. There were not many telephones, few privately owned cars, and much use still made of the horse, motorcycle, pedal cycle and a splendid railway system. Foreign travel was by sea. "Wireless" (now radio) was in its infancy and my father's hobby was constructing crystal sets with headphones from purchased parts (very much to my mother's annoyance). He was ahead of his peers in the purchase of a small motorcar, a Rover Chummy. Initially, one was taken out in a motorbike and sidecar, but by 1924, family outings to Hayes Common and even further afield by car were the "norm".

My mother's sister, Annie, had married Thomas Clarke, an employee of Thomas Cook, in Egypt. They arrived home after some years to Ashburton Avenue, Addiscombe, to become our near neighbors. Rosemary Anne was born to them in 1922 and she became a playmate as did her sister, Barbara Louise, who was born later. Meanwhile, Charles and Minnie made friends in the area; Mr. and Mrs. Letts lived in the adjacent house and Mr. and Mrs. Lee, living nearby, became close to us.



The Sutton-Jones family. Left to right: Grandfather T. B. Carpenter, Mother Minnie, Brother Barry, the author Kenneth, Father Charles.

A new housing development was taking shape three miles to the south in Shirley, and in 1924, we moved to a more modern house with four bedrooms and a garage at 20 Shirley Church Road. The house was called "Homelea", and became my boyhood home for a period of thirteen years, and my parents' for over thirty years.

During the four years spent in the previous home I recall the great kindness of everyone, particularly Mrs. Letts, and the delight of seeing, for the first time, my father's Rover Chummy. My mother would refer to the new home in Shirley as being "in a more select place". Although it faced south, high trees across the road, occluded the sun. The road was at a higher level than the ground floor, so there was a sloping drive down to the main door and garage. The windows of three of the four bedrooms faced north down the garden and this made the house cold. It was more "grand" but I felt sad at the loss of the cosy home and friends we had known. Nevertheless, Shirley Hills open space and parks were nearby; shops were at a considerable distance.

The horse-drawn milk wagon came daily with its large churn from which a supply was ladled into jugs and bowls carried out by residents for filling. The lamplighter, complete with tubular pole, did his evening round turning on the gas tap and igniting the mantle at each lamp post. Also, one awaited the handbell rung by the vendor of muffins and crumpets, carried aloft on his tray as he passed by the window.

The devoted Ernest Pattenden, owner of the general store three miles away in Addiscombe,



My Godmother, Louisa Coe.

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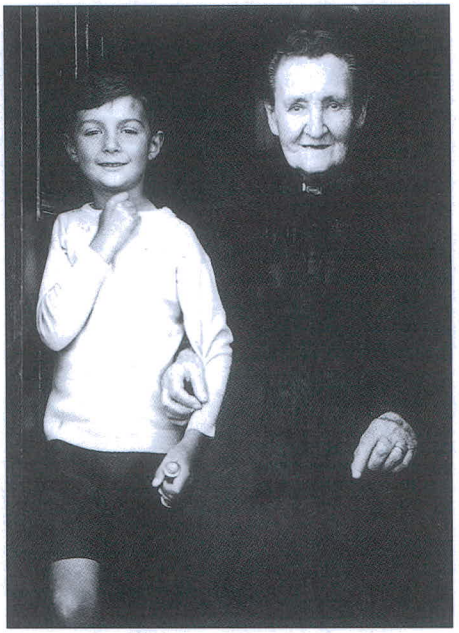
came weekly on his bicycle (to the side door, of course), book in hand whilst my mother laboriously dictated her order. He reappeared later in the day to deliver the goods. We had a large garden with rockeries, lawns, flowerbeds and a fishpond, all created by my father over the years. It was here that afternoon tea was served to family and friends and on special occasions.

I had a very elegant, kind, and devoted godmother, Louisa Coe, a maiden lady, who would walk about six miles from South Norwood to take me to church. Louie became very special to us. Her brother lived in Canada and was the captain of a vessel that traded around the Hudson Bay. The *Baychimo* was its name but it was lost later, having been locked in the ice and foundered. My Godmother possessed a model that had been made by the crew out of local ivory that delighted me. Louie was much loved by us all until her death in the nineteen-sixties.

I started school at Winton House, operated by a dedicated family of teachers, soon after our move to Shirley. The journey of nearly four miles was by bus. One had the choice of selecting a double-decker (outside and open to the elements) and operated by the LGOC (London General Omnibus Company), or a similar vehicle operated by the Thomas Tilling Company. These buses vied with one another to reach our queue, the latter advertising that "Our buses do not jerk when starting", but one chose whichever came first or still had seats available. One was unlucky to be told to "go outside" (upper deck), particularly if it were raining. There were waterproof covers over the seats under which one could hide so as not to pay. It was always best to find a seat within the lower deck and resist the temptation to avoid paying the fare.

T. B. Carpenter (my mother's father) became a great influence; he took me walking. Grandpa was tall, very erect and, then in his seventies, was well known as a designer and master-engraver of silverware for royalty in many countries. Some of these items also came our way and were greatly treasured. We did many circular walks in the locality of Shirley, stopping en route for Grandpa to have his "special" in a local inn. Since children were never admitted, I remained outside with a drink of lemonade. Before continuing the walk I was always asked, "Do you need to pump ship, dear boy?"

Journeys by car became more adventurous, we travelled to 14 Athenlay Road, Nunhead, to visit Grandma (my father's mother). Her teas



On a visit to Grandma Stevens at Looe.

were a delight to us all, including aunts and uncles. At Christmas time, there was singing around the piano. My father's brother, Horace, who lived far away in Australia managed to visit occasionally. Albert had been wounded in the War (1914-1918). Will was an expert in radio communication and sailed with Churchill during the Second World War to facilitate communications; he and his wife resettled eventually in Australia. Harry was away constantly as a purser in a vessel sailing to and from South America. He and Aunt Lucy, with sons, settled in New Zealand. Victor married late in life, living eventually in Sussex. Aunt Winnie married a shoe manufacturer settling eventually in Norfolk. Aunt Connie married a shipping manager and lived in north Kent, eventually joining her sister in Norfolk following the deaths of their husbands. They were an interesting and kindly family but always wanting to know if "Kenneth behaves himself?"

In 1927, Father, Mother and I motored to Cornwall and enjoyed the first of very many holidays at Looe. One summer evening we were walking back along the cliff-top path to the town of East Looe when I pointed to a light far out at sea, "There, it flashed again and again!" (Twice every 30 seconds.) "Daddy, is that some ship?" I pestered my father to find out. Upon enquiring from a Cornish friend we were informed, "Well, t'was the Stone." "Which stone?" "Well, t'is Eddystone", a lighthouse on a rock far out at sea. The steamer from Plymouth called at Looe the following week and embarked passengers for a return visit to take a closer look at Eddystone Lighthouse. I remember the ship's whistle alerted a keeper who responded by waving a towel from a window high up in the tower. So enthralled was I that, thereafter, I made a study of everything I could concerning lighthouses and became a veritable "pharomaniac" (pharology is the science of lighthouses). In the autumn of the following year the family visited Grandpa on holiday in Margate, Kent. The weather became very foggy and I was intrigued by sounds at sea that, I was informed, came from lightships warning vessels to keep clear of numerous dangerous sandbanks offshore.

The North Goodwin light vessel is moored off the northern end of the notorious Goodwin Sands. At the time, a siren blew during fog, firstly "low" but followed by a much higher sound once every minute. Other light vessels at the Tongue Sand, East Goodwin, Gull and other stations could be heard blowing their own recognizable blasts, some "high" followed by "low", etc. This "fuelled" the pharomania within me and I was now thoroughly "hooked"! Thus began an interest with an enormity that has never waned. At the age of eight I was asked to give a lecture at school and to submit an article in the *Wintonian* (school magazine). Around that time the *Crested Eagle* sailed from London down river and off the coast of Kent on a day return trip to Margate. This was very popular especially



"Well t'was the Stone. Which stone? Well, T'is Eddystone."

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North Goodwin Light Vessel stationed off the north end of Goodwin Sands.

during school holidays and it extended my fascination and study of the intricacies of marking the channels at sea and in ports.

It was usual for children to catch quite numerous ailments whilst at primary school. The scourge of smallpox had almost disappeared, the vaccinations being an effective preventative. However, one expected to succumb to chickenpox, mumps and whooping cough, but measles, scarlet fever and even diphtheria were severe and encountered occasionally. In 1929 I was diagnosed as having scarlet fever, appearing with "weals of reddish scales" over my body. Under normal circumstances I would be cared for at home in isolation, but my mother, euphemistically termed as being "in a certain condition", more bluntly, was pregnant, so the doctor considered it advisable to send me to the isolation hospital until I recovered. Assurances concerning my comfort in hospital were given a-plenty. A green ambulance duly arrived with Nurse Osterburg, who appeared charming and disarming enough. The hospital was on the opposite (western) side of Croydon, near the Waddon Marsh, in an area of industrial development alongside the very extensive Beddington Sewage Farm and close to the large Croydon coal-gas plant.

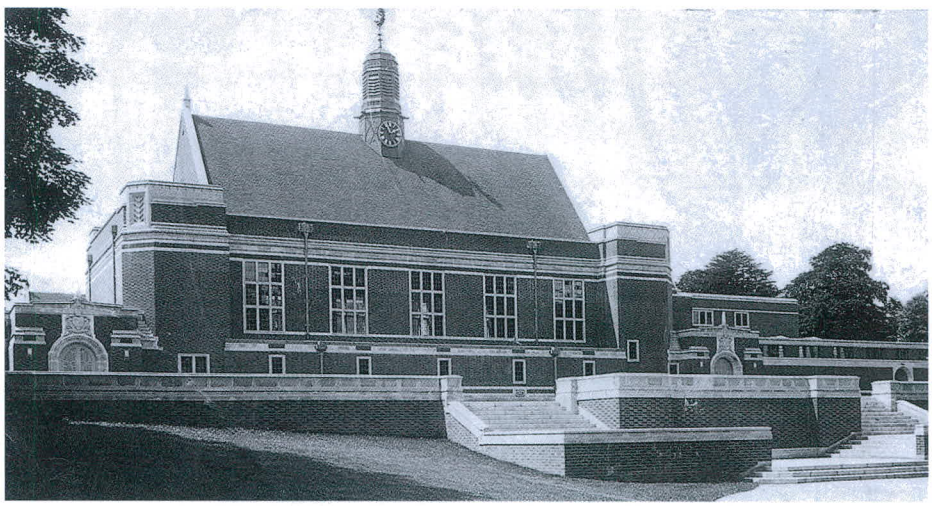
The hospital consisted of a main two-story block in red brick with separate single-story isolation wards, all with toilets at each end of each block. The whole complex resembled what I had seen in a book describing a leper colony abroad. The two-story block had a ward on the ground floor full of boys; I was assured that a similar ward accommodated many girls on the upper floor, each suffering from scarlet fever. All contacts with home and visits were firmly prohibited, so one languished with minimal nursing contact except for checks being made daily by the doctor. We felt forlorn and abandoned, and as the weeks passed, one felt no better. Along with many others, I developed measles in addition. This caused many of us to be incarcerated in the "colonial-type" single units scattered within the grounds (nearer the nauseatingly foul stench coming from the sewage works and farm).

Nurse Osterburg and her like never reappeared, so we felt that we were likely to rot away. Being close to many factories, one was assailed by many sirens and whistles commonly employed at the time for monitoring workers on shifts.

Following an incarceration of eight weeks the blest day came when I was bathed specially and spruced up in my clothes ready for me to be collected at the main gate for the return home. I found difficulty in walking and my parents were horrified by my emaciated appearance. My general physical condition had taken a bad "knock" and it took years for my full vigour to return.

After a few weeks, a Nurse Berwick appeared to prepare for my mother's confinement, and on 29th July 1930, Barry was born, almost ten years to the date of my own birthday. Barry was a fine baby and gave the family much joy. One compares the accoutrements deemed necessary then, which included a massive perambulator, the like of which has long been discarded with the modern mothers' aids. Nurse Berwick, who had been widowed during the war, turned out to be a wonderful companion and friend to the family. Later we were to spend holidays together in her native Scottish Borderland on several occasions.

Meanwhile, the serious financial disasters in America heralded a worldwide recession, and a sombre mood prevailed, which deepened in my life at the thought of having to go to senior school. I managed to secure a place at Whitgift Grammar School located majestically in the center of Croydon. It was a large, gloomy Victorian edifice with the playing field at the rear. It had a separate junior school of even more sombre gloom alongside. Fortunately, its days were numbered because a fine, new school was soon under construction to render the central Croydon School redundant, whereupon it was dismantled to make space for the busy Whitgift Center shopping complex. The new school located in Haling Park, South Croydon, became a fine successor and was known as the Whitgift School.



The new Whitgift Grammar School in Haling Park, South Croyden.

The distance from our home to school was about six miles and most of my friends cycled, but my mother never allowed me to have a bicycle and so the journeying had to be undertaken by buses (highly variable in punctuality). In those days, school and work-place attendance included Saturday mornings. Afternoons on Wednesdays and Saturdays were mostly for

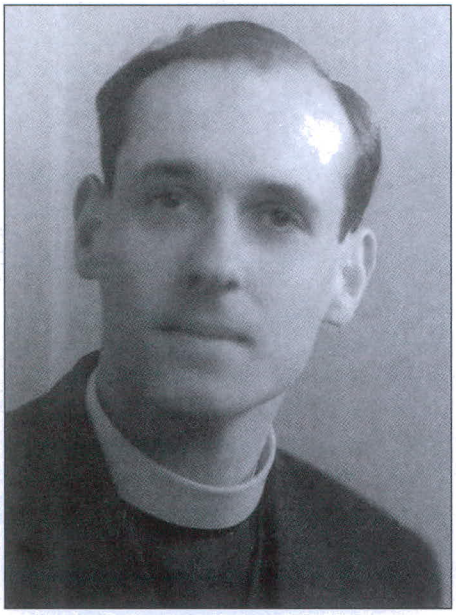
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the boys to play games in teams; rugby-football in winter and cricket in summer. Evenings were spent at homework and revision. The school day was divided into 45-minute periods, which were doubled for science; following each a bell rang and all the pupils hastened to new locations and teachers along lengthy corridors. Much time was wasted in the process. Teaching standards were variable, but in some subjects, remarkably good.

It seemed that Whitgift was very thorough in nurturing boys in the classics but less so in mathematics and science. One was expected to remain at the school into higher education. I was an average pupil, although I excelled in geography, art, and English but was found wanting generally in history and other subjects.

I found a special friend during the first year in the new school, Wilfrid Edgar Dickinson. We were entirely different for he was a classics student excelling in history, French, Latin, and English. His weaknesses were mathematics, geography, and art. We were similar in the senses of what amused us and we became mimics of certain great characters amongst the school's teaching staff.

Wilfrid's mother died soon after our first meeting but I had been to tea at his home



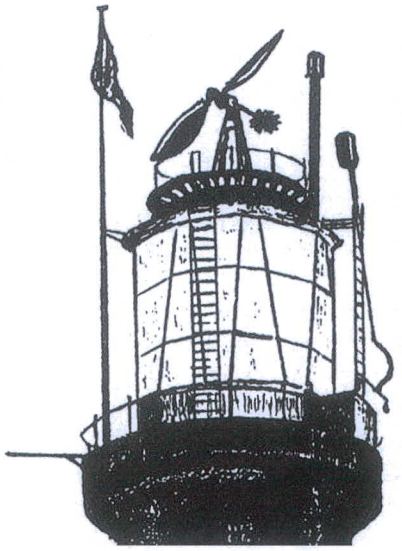
Reverend Wilfrid Dickinson.

and had met this quiet, charming and lovely person, so was able to share Wilfrid's distress. Our friendship has remained close throughout our lives. Dear Wilfrid went to college in Bristol and Lincoln, eventually being ordained as an Anglican Deacon, and later as Vicar, serving within the Diocese of Chelmsford for many years. I was under much pressure to follow in my father's profession of accountancy and company law but was so keenly interested in everything to do with lighthouses, lightships, and navigation marks at sea and into ports for my father to exclaim, "This utter nonsense will get you nowhere", and demand that his son attend more to his future prospects, "for lighthouse mania has turned his head."

Dear Aunt Louie, my Godmother, had been earnest about my attending church occasionally with her but now Wilfrid and I went together to Shirley Church (Minnie and Charles were to become worshippers at Addington Church nearby later in life). However, a classmate at Whitgift had invited me to "Crusaders", a most splendid and effective organization for maturing young fellows into faith in Christ. Their interdenominational meetings in Croydon on Sunday afternoons were well attended. The association with other young men and boys with Christian men in business and the professions was stimulating and resulted in producing practical men-of-God into society. Wilfrid joined also and a Brotherhood-in-Christ blossomed between us.

After a year or two, I realized that the work of God's Holy Spirit was real, and one day, I resolved to hand over my life and future into Christ's Hands for His Will to prevail in me. Since then I have let my Lord down many times but He has called me back in repentance and restoration. I laid my future before God on my knees and went on to succeed in securing my School Certificate and Matriculation, and even distinction in one subject.

My future was under, and at the disposal of, my new Divine Master.



CHAPTER 2
The Diecasting
"A Time of Molding"

Dark clouds were on the horizon. Adolf Hitler was haranguing in the squares of Austrian and German cities, causing hearts to drop a beat and making people anxious lest it would end the peace. Ardent supporters and opponents in school debates "stoked" the uneasy feelings that it must all end in conflict ere long (which was to be the case just two years ahead in 1939). Summer holiday time arrived and we were to go to Looe again, which was to be followed by a period in Scotland, (my father driving several hundred miles along Britain's inadequate roads in the process). We stayed at Nurse Berwick's home near Kelso in the Lowlands. We toured into Fife and Perthshire and enjoyed the beauty of it all. We were introduced to friends of Nurse Berwick in Inchsture near Dundee, in particular, to someone who had designed and was to install a wind generator on the roof of the lighthouse at the Smalls, located in the Irish Sea eighteen miles to the west of Milford Haven. In the course of this, our new friend had met engineers engaged by the lighthouse service, and my own eagerness (or pharomania) was revealed. Some months following the holiday, I received an invitation to an interview that resulted in my being offered a "pupillage" with the world famous firm of Chance Brothers, the major specialists in lighthouse equipment design and manufacture, located at Smethwick, near Birmingham.

Before continuing, I should explain that from the age of nine years I had endeavoured to learn about lighthouses, light vessels and other markers for providing safe passage for various types of vessels traversing the seas, entering and leaving ports, and in canals and rivers. There was so much to assimilate and so very much more to learn and I had hardly begun before the proposal for this pupillage had arrived. My grandfather was a superb designer and his many drawings shown to me had whetted my appetite and stimulated my own resolve to persist with my own artistic and drawing ability. His encouragement was extremely valuable during my years at school

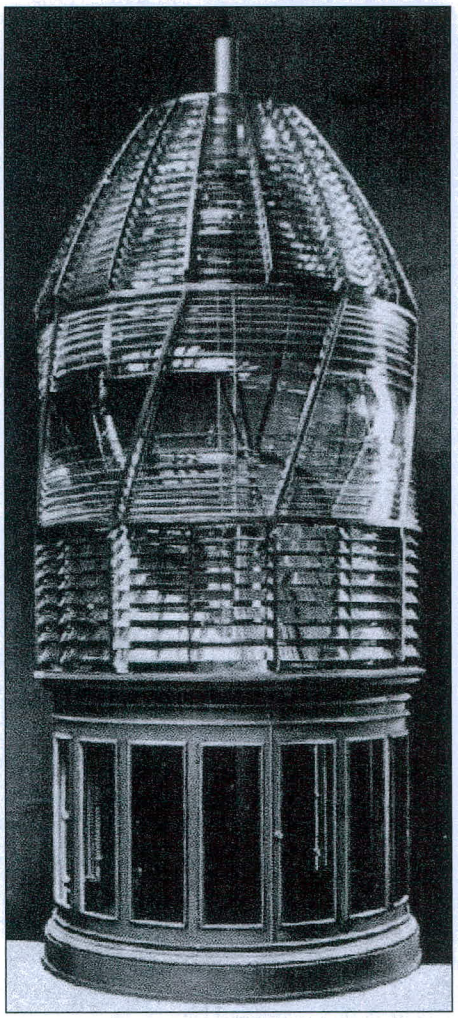
Left – This sketch of The Smalls Lighthouse was made in 1949 and shows the wind generator atop the lantern.

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and in pursuit of my pharological ambition, but I had become a Christian and knew that I must now seek God's Will concerning my future, for I was now His. This made me seek peace and resolve to proceed, or to seek further before embarking on accepting my course at Chance Brothers. A request came for me to attend an interview at the Chance factory and it gave me pleasure that my father wished to go with me. Was he weakening or could this be a part of some message?

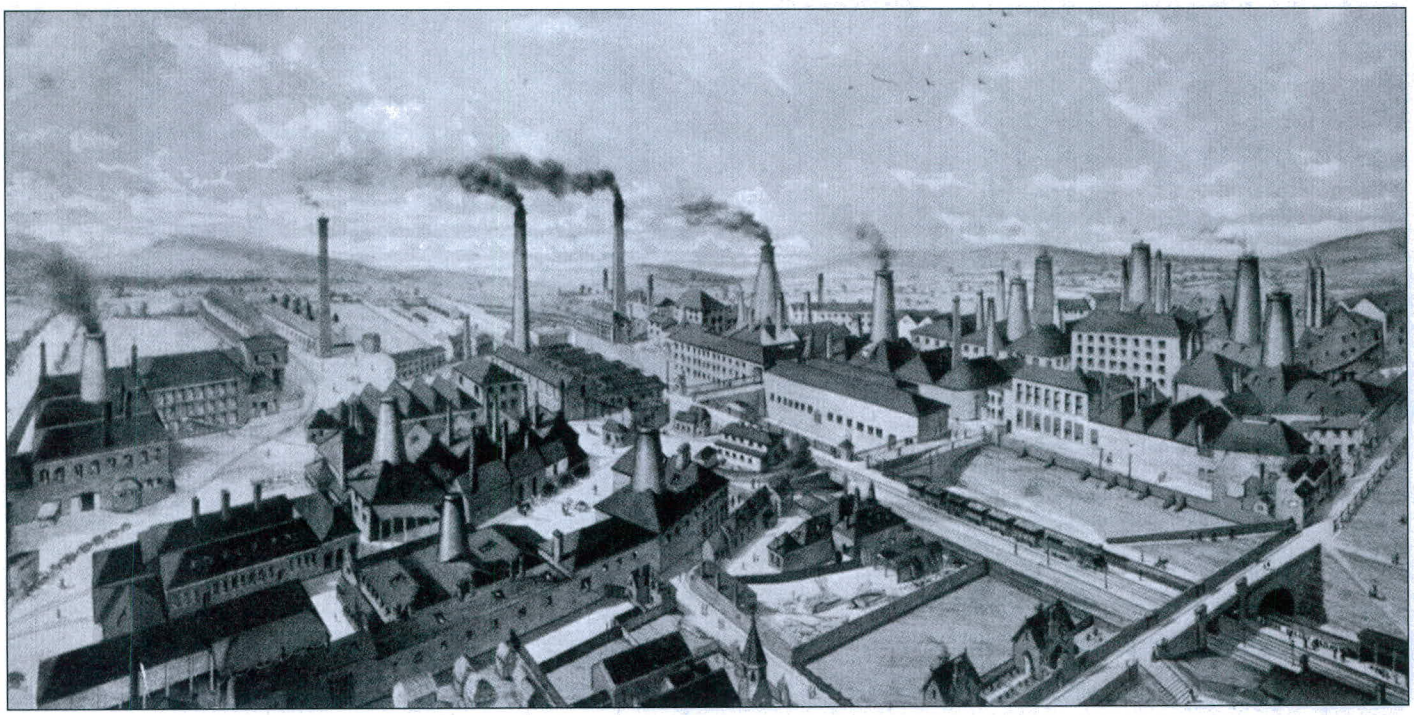
The large factory had three entrances and we stood on the bridge overlooking the railway and canal, which bisected the enormous array of buildings, chimneys, and kilns. We chose an approach that was to take us to the far side of what turned out to be the glassworks ("glassus" to the people of the locality). We were bound for the lighthouse works (or "lightus") and so were escorted across the factory over a bridge and through a tunnel to the "plain" with its administrative center. It was surrounded by various departments making glass. Eventually we arrived within an area where the towers, lanterns, and equipment for lighthouses, lightships, buoys and beacons were manufactured and assembled. Finally, the offices were reached and the managing director and factory manager greeted us. Writings from the Book of Daniel came to mind, "His countenance was changed, and his thoughts troubled him, so that the joints of his loins were loosed, and his knees smote one against another." I brought out some drawings showing some ideas I had thought of and which I now naively had the temerity to discuss, but I had no need to fear. They said how much they liked the neatness of my drawings and went on to discuss when I could start my pupillage, which was to be at 7:30 a.m. "sharp" on the 30th August 1937. My father seemed to approve and so relented his pressure for me to embrace accountancy. In view of my praying, I felt that signals for going ahead with my "pharomania" had now been set at "green".

Belonging to Crusaders, the Christian organisation for young men, gave me access to friends country-wide and so I got into touch with a branch in central Birmingham. I received a reply indicating that a certain Doctor John Connor lodged in Bearwood and that I could find accommodation at the same address if I so desired. It was arranged that I would be under the care of a certain "motherly lady" at a house in Barclay Road, Warley Woods, at a distance of about six miles from the works. Rather than rely upon local trams and buses, I would need a bicycle, and after much heart-searching by my apprehensive mother who "could never forgive herself if Kenneth killed himself", it was approved as my mode of transportation. This was not withstanding that "Brum" [Birmingham] is high, blustery and cold for most of the year and "the rain doe cum down vertical - it cums down 'orizontal so we never 'ave humbrellers, the likes of stook-hup lunderners and no bowler-ats neither", and one gets very wet and worn out! So this was "the die-cast"



Above – A Chance Brothers First Order Fresnel lens.

Below – Chance Brothers Spon Lane Works from an 1857 lithograph.



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setting for a youngster, all of seventeen, away from home but ready to go.

In 1824 Robert Lucas Chance, a London merchant, purchased an existing crown glass factory at West Smethwick, near Birmingham, and thus founded a mighty glass-making enterprise.

Approaching the main entrance one noted, to the left, the rather splendid Victorian-Gothic buildings erected by the Chance family for the purpose of educating the children of the employees. To gain employment with Chance Brothers was to join a technological enterprise under somewhat autocratic but beneficent men who showed concern for those they employed. The perfection of glass was their business. First came window glass but later they pioneered many products used in industry and science and also a high proportion of the processes known in glass manufacture generally. In 1835 a second plant started nearby for producing the special substances required for the glass-making processes at Smethwick. Critical in glass-making was fuel for the kilns and for providing motive power. Chance Brothers used their own coal mine fifteen kilometres [about 9 miles] away, delivering coal by canal barge right into the factory.

When Chance Brothers began in 1824, the acknowledged masters in the art of glass-making were the French and their expertise was called upon in establishing the processes at Smethwick. Although long-standing as an industrial enterprise, Chance Brothers as glass-makers look like newcomers when one considers that glass was being formed in Phoenician times. In 1824 glass for windows was made by gathering a "ball" of glass on the end of a tube from its molten cauldron or pot container made of fireclay. This "ball" was blown and spun into a large shallow disc and deposited onto a flat surface. A number of "panes" could be made from this large disc, but the central tube attachment, or "bullion", was often left and formed a feature of many windowpanes now considered "antique". An impressive advance came in 1840 with the introduction of the polished plate process. Gas then replaced coal for firing the furnaces and kilns. Many clever devices and production techniques introduced by the engineers at Smethwick were brought into use for blowing, molding, annealing and grinding the glass. In 1850 orders were secured for glazing the Crystal Palace that was to house the Great Exhibition of 1851. Over one hundred thousand square meters [328,080 sq. feet] of glass was made and installed, all within a period of three months. A further large order was placed when the Palace was moved and reinstalled in a larger area, upon London's Sydenham Hill. One can imagine the bottle-shaped kiln chimneys of those days, and the sky, heavy with smoke and sulphurous fumes—conditions that would be quite unacceptable today. To window glass manufacture were added coloured antique and optical glass, the latter requiring very pure mixtures and additives. All kinds of blown glass vessels, including heat-resisting laboratory flasks and retorts in complex forms, were processed in large quantities. Paper-thin slivers of glass were produced for examining specimens under the microscope. Glass tubes having an internal bore of great precision, and tinted glasses for spectacles and eye shields became part of Chance Brothers' expanding range. In latter years glass tubes for television and fluorescent lamps became a line of importance until plastics took their place.

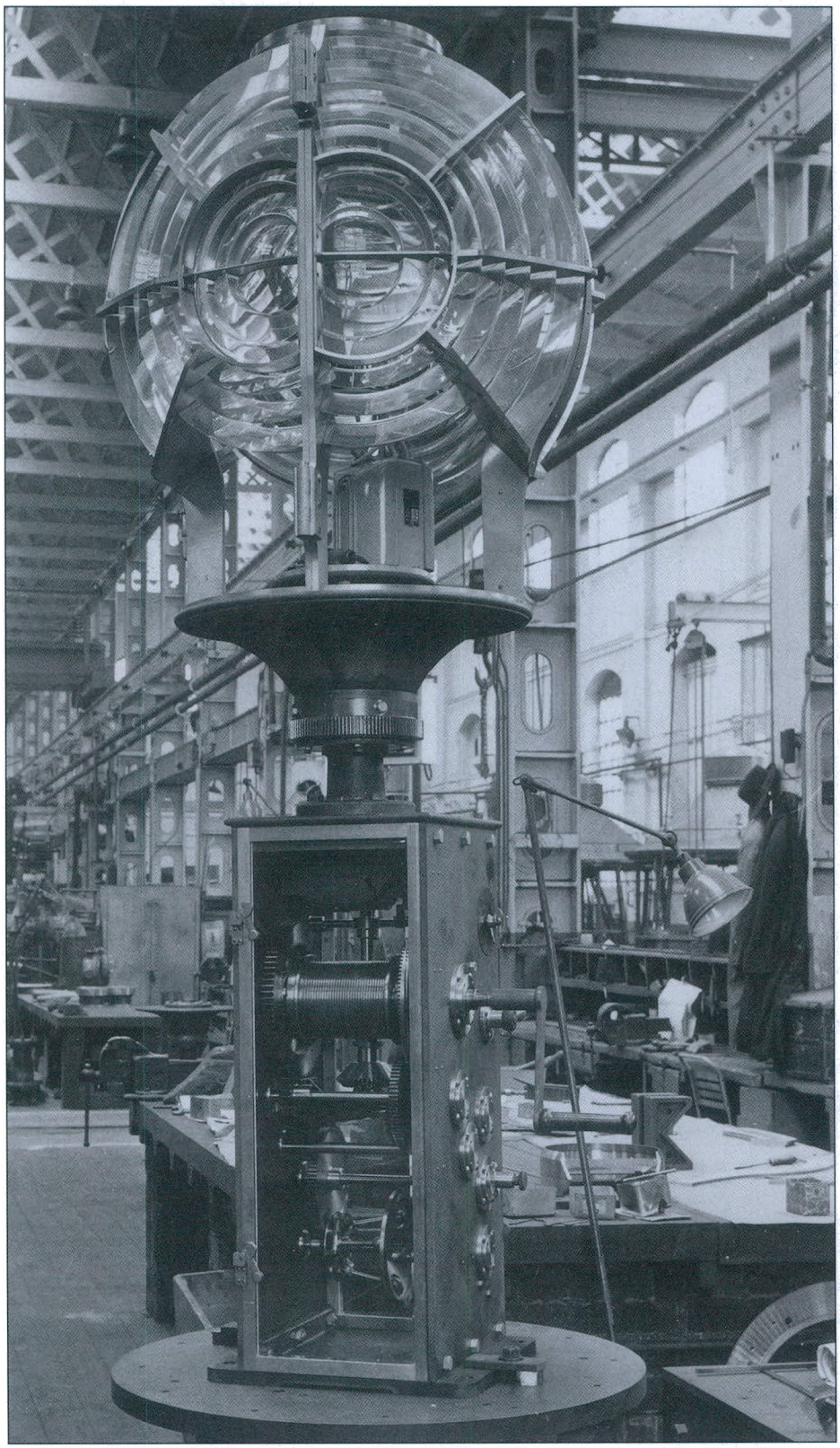


Interior view of the Chance Brothers works.

Amongst the talent, scholarship and success brought to the enterprise by the Chance family, perhaps the outstanding contribution came from James Timmins Chance, later knighted for his services to the seafarer. It was he who founded the lighthouse works of Chance Brothers, which had a name for excellence the world over. Yet again the initial skills came from France. In 1813 Frenchman Augustin Fresnel introduced his dioptric lens and launched the part glass was to play for a

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century and a half. That it was a field for the specialist glass manufacturers was recognized in Britain by Sir David Brewster, the inventor of the kaleidoscope and founder member of the British Association for the Advancement of Science. Brewster approached James Chance at a time when massive re-equipment and extension of the use of lighthouses was contemplated. Aided by French experts, Chance Brothers built its first lighthouse optical apparatus and exhibited it at the Great Exhibition of 1851. However, the quality of the glass was considered inferior to the French product, and it took a further five years of painstaking effort to achieve an equivalent standard.



The lens assembly area of the Chance Brothers works.

Although French manufacturers produced many lenses to Fresnel's design for British lighthouses, Chance Brothers was not the first in England to take up the challenge. Between 1831 and 1845, Cookson of South Shields on the English northeast coast, employing Fresnel's brother, built some fifteen sets of lighting apparatus for coasts of England and Ireland and for others abroad, but their work was discontinued.

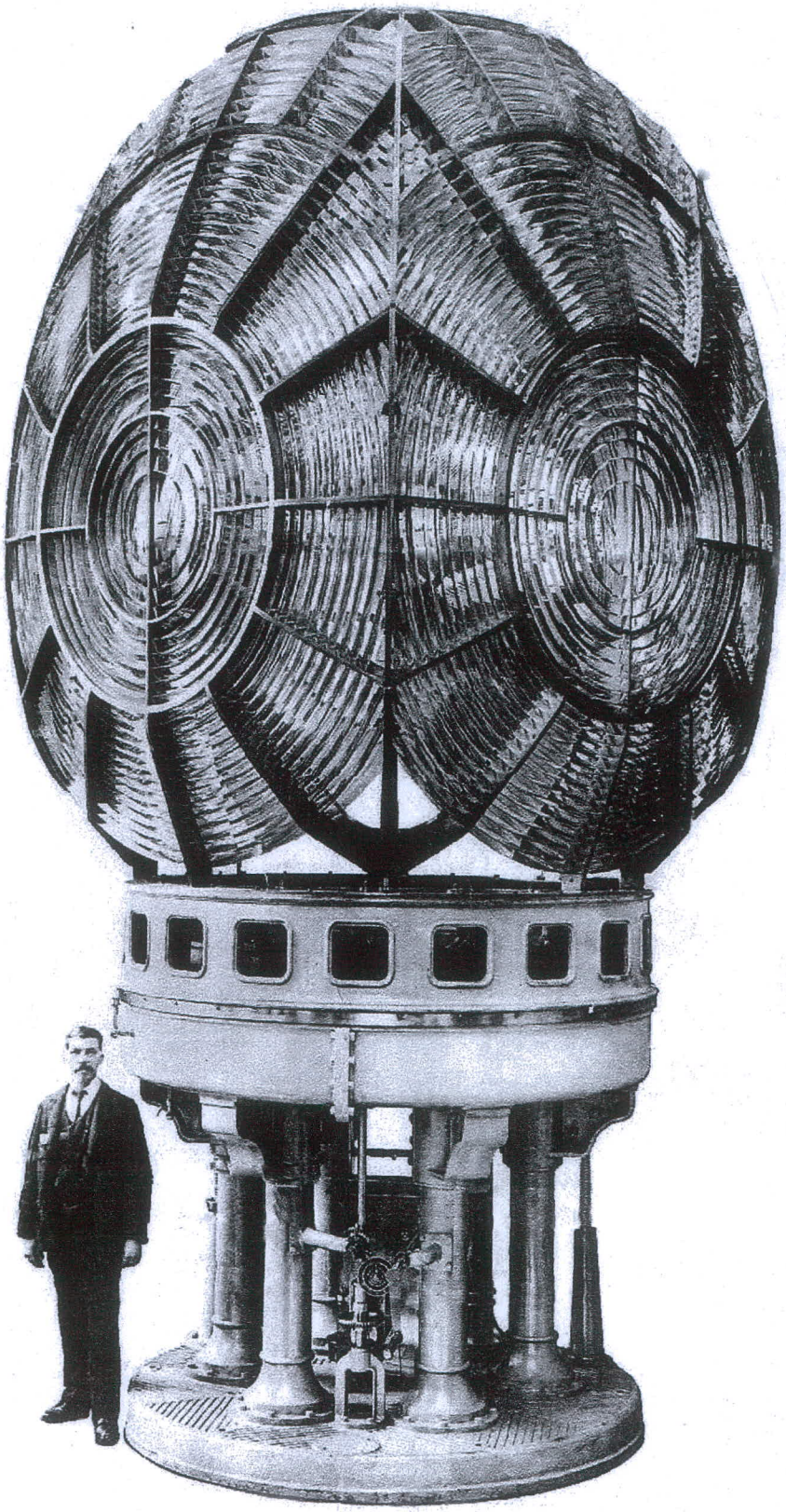
In 1857 a Royal Commission investigated reports of ineffectiveness of lights in lighthouses. The influential British scientists, Faraday and Airy, with the assistance of James Chance, ascertained that the incorrect setting of the prisms of glass within the lens framework had been the fault. Once rectified, the desired improvement was obtained. None of these frames had been supplied by Chance Brothers but it became clear, that to ensure the accuracy, Chance needed to supply its glass prismatic components fitted within the supporting frame so that height of the particular light above sea level, and therefore the angle of declination (or "dip") to the horizon, could be controlled so that the light would be seen to best effect.

The first years saw complete optics constructed for places as far apart as Britain and New Zealand; Spain became an early customer outside the British Empire. Between 1860 and 1867 one hundred eighty major lights were equipped by Chance. Another "technological maestro", Dr. John Hopkinson, was engaged in 1872. It was he who developed the group-flashing lens by arranging the panels of prisms with their axes off-center. This allowed the identification of lighthouses, one from the other, by flashing sequence, or characteristic, to become much more positive.

Not only were there experts and administrators but also, over the years, a host of highly skilled artisans, fitters, machinists, glass-processors, metal founders, smiths in copper and iron, and instrument makers; all weaned on the skills demanded for providing effective, robust and reliable apparatus for ensuring safety at sea. The Chance lighthouse factory was complete for providing everything required in the era of the attended lighthouse and had started the process of establishing the major semi-watched equivalent.

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I was to join Chance Brothers as a pupil in lighthouse engineering on the 30th August 1937, and I left my lodgings at 7 a.m. on what was the first of the dank days of autumn and with fog, which made it additionally grey and somber. After cycling some miles, I found myself amongst cloth-capped men all making for the factory gates. Upon reaching them I dismounted before an impressive commissionaire who announced (in the vernacular), "This is Chances, do you want 'glassus' or 'lightus'?" (glassworks or lighthouse works). I informed him of my destination and to whom I had to report. "Gawd 'elp yer", he replied, and called a "cloth cap" to show me the way. From a turret atop a high block of offices a bell began to toll. My escort advised, "Five minutes before bull blows seven-thirty." By then all had to be clocked in.



A hyperadial lens manufactured for Manora Point Lighthouse in Pakistan. With a focal length of 1200mm it is one of the largest lenses ever built.

The maze of buildings loomed out of the fog and we followed a winding course. The "glassus" worked three shifts and a line of men was to be seen blowing enormous globes of glass, lifting them against a glowing background of furnace. After rounding several more corners my taciturn guide uttered his parting words, "In there". I thanked him and was about to enquire further when an ear-shattering steam whistle blew into a full bellow and died slowly into its characteristic sigh. The bull had blown at seven-thirty!

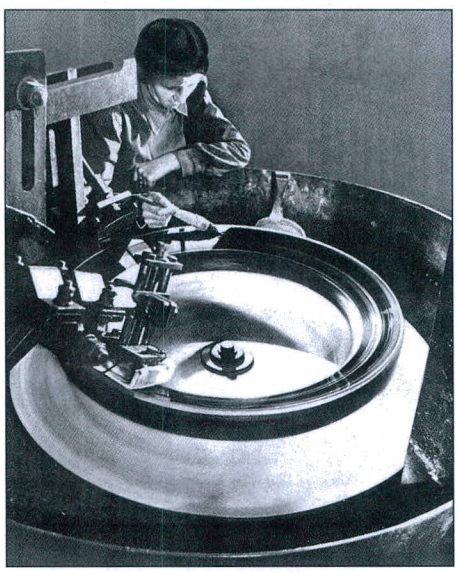
The workshop was long and high. I noted the bay window of an office above me on the side wall, with entry by a flight of stairs, which I climbed. The office door was open and seated inside was a bald-headed man with rimless spectacles. He peered at me for a moment, and then asked who I was. I enlightened him, whereupon he suggested I return outside, close the door and knock. But then without further ado he tapped the window and the chargehand, Arthur, appeared. With a finger pointed at me the foreman said, "See him, take him downstairs, give him a file and see what he can do." With these remarks I was passed into the chargehand's care and was set the task of dressing a pile of castings by smoothing and removing the ribs and seams left by the foundry following the pouring of the metal. This was the unskilled drudgery one endured before any attempt at learning a skill could be made, and although remote from the object of learning lighthouse engineering, in retrospect these were essential lessons. Towards the end of the first day the foreman, who had removed his spectacles but put on his cap, asked how I fared, then above the noise of my rasping on metal he added, "Hold the file on the skew and don't make so much (unprintable) row." I attempted to comply. To the men, I was regarded as a stuck-up lad from the south. I discovered there was industrial rivalry between London and the Midlands. Londoners were "stook-up with bowler 'ats and humbrellas, summat we in the Midlands can't abear". The la-di-da speech was offensive to the Midland

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ear. But they were a wonderful group of men. Harry, my immediate boss, possessed a pallid "moon" of a face of almost monastic serenity under his inevitable cap. He never shouted, yet his piping voice prevailed above the noisy workshop. He was afflicted with feet which were not only large, but also noxious over a surprising distance. He laughed about them and took great pains washing with a whole variety of proffered remedies, all of them ineffective. We were advised to "put up with it" for he was much closer to the root cause than any of us.

Our blue billycans were filled with "tay" by adding hot water from a scalding faucet, by the lad known as the "general runabout" or "werks-kid", and there was a morning when he was not present to perform this "rite." Since I was junior, I offered my services and the effect was magical. "He 'ay too stook-up ter fetch tay for we", and from that moment I became "acceptable".

The workshop extended perhaps 120 meters [393 feet] and was very high, 25 meters [82 feet], and 35 meters [114.8 feet] wide with an overhead travelling crane. It was divided into many areas, e.g., construction of optic framework, assembly of clockwork mechanisms and lens-rotating pedestals, assembly of large lighthouse lanterns, construction of staircases for lighthouse towers, assembly of columns and towers for beacons and lighting units, fog signal trumpets (some of enormous size), and many other items. Extended over a large area alongside and to the right was a variety of heavy and light processing machines, e.g., vertical and horizontal boring units, lathes, drills, planing machines, and tooth-cutting units of all types, mostly driven by belting from overhead line shafts.

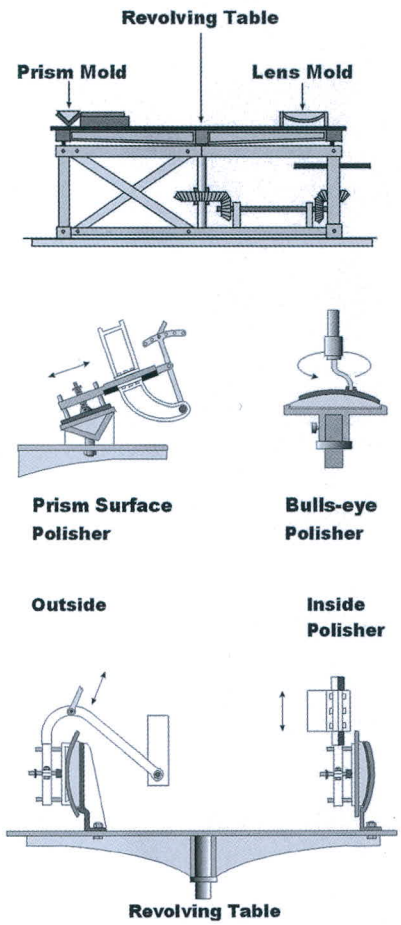


Above – A lens grinding table.
Right – Jigs used to hold lens elements for grinding and polishing.

A part of the higher of the two areas was taken up by a store, and its roof formed a large stage upon which the optical apparatus would be assembled for fitting and test purposes and the framework of the optic would receive its glass prisms. When the whole apparatus was complete and on test, it appeared as something of real beauty, like a jewel, from which light beams of high intensity rotated above our heads, reminding us of the splendour of expert workmanship at its very best.

The autocratic foreman, or "gaffer", gazing from his bay window superintended not only operations in the workshop but acted as coordinator with the design and purchasing departments. The glass founding, grinding, and polishing took place under separate superintendence in a department alongside (described later), but there were pattern makers, iron and copper smiths, plating and electrical switchgear, and power plant assemblers nearby, just across the works yard.

Many intricate forms were cast in iron, brass and gun-metal, and in sand using wooden and metal patterns most ingeniously contrived to allow for shrinkage and other factors by a master patternmaker, an ageing, rotund "Mr. Pickwick" who regarded me disdainfully through small steel-rimmed spectacles.

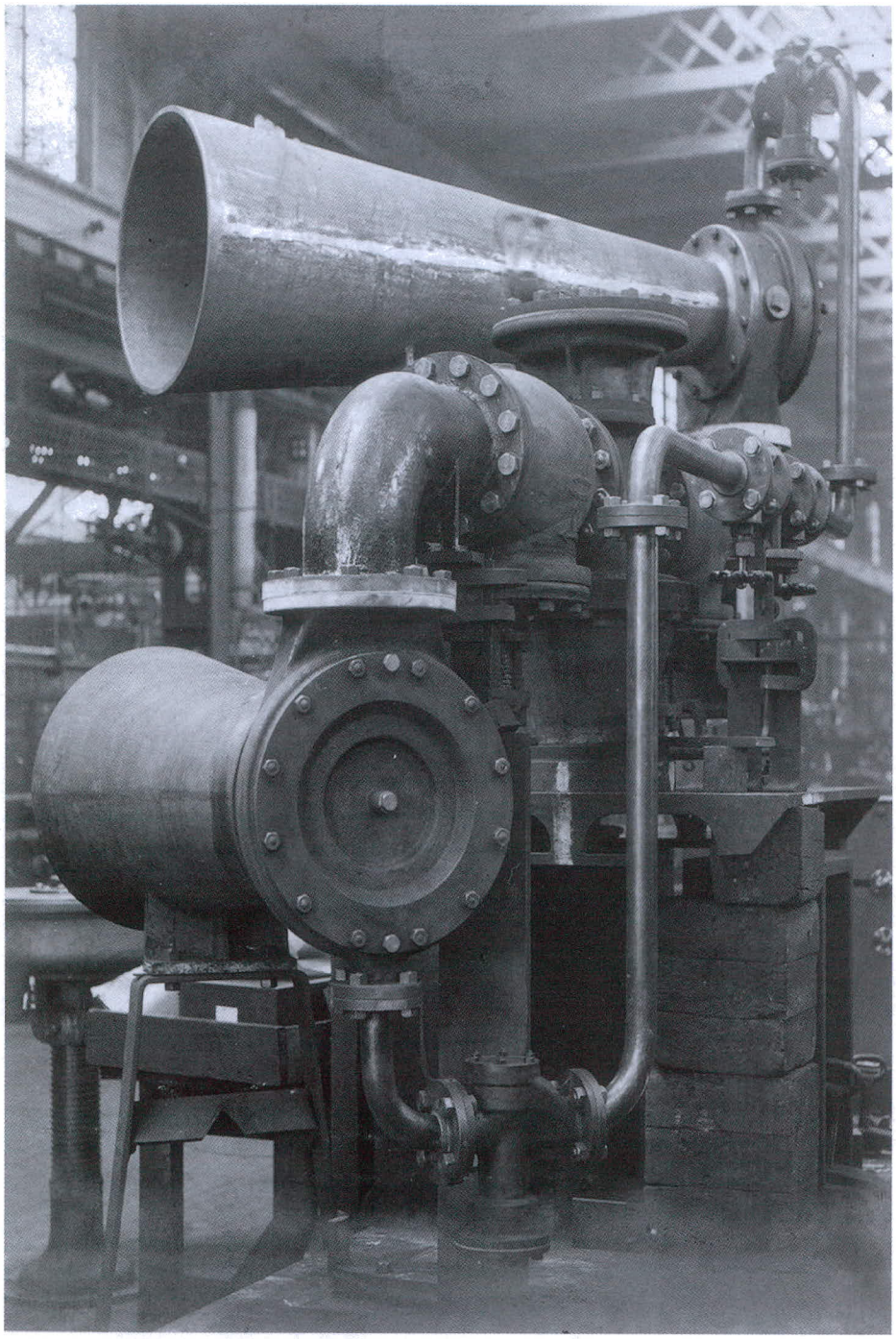


I was intrigued to note steel work being erected and men hurrying through doors carrying prepared struts and curved rails and columns. They were constructing one of many of the tailor-made flights of stairs, ducts, columns, and similar items for fitting eventually within a lighthouse tower destined for somewhere abroad. Outside in the yard reared a high openwork iron tower destined for a lighthouse in what was then known as the Straits Settlements (now part of Malaysia). A dapper, straight-backed man in waistcoat and with spectacles was supervising and I played "truant" from my menial tasks to investigate. They were forging metal in a furnace and winding struts through rollers to conform to carefully prepared templates. Though obviously busy, "straight-back Jim" still made time to explain these mysteries to me.

The "place of necessity" was to be found in a small building at the rear of the high workshop via a small door in the wall. In the course of my first three months I had used these facilities a number of times, but on this cold morning the "necessity" was somewhat urgent. However, at the crucial moment there was a sudden nearby sound of outstanding proportions, an ear shattering "bellow" terminated by an almost "seismic" drop in tone (known as the "grunt"). Completely frustrated by this very efficient "stop valve" ending my "necessity", I left only to suffer a second dose of sound, and yet a third, echoing from the surrounding hills beyond the sports ground adjoining the factory wall. Frank, the chargehand, was testing his fog signal handiwork (known as the diaphone) for air consumption. He explained that the one on test was merely a "G" type instrument and that the more awesome "K" and "L" patterns (often blown simultaneously in pairs) were installed in many lighthouses.

With the development of efficient sound signals and improvements to the concentric wick sources of light came the mercury-float turntable and pedestal, and thus began "the era of magnificence". The original concept of making lenses for lighthouses was extended first to the mounting frames, but then to turntables, rotating machinery, burners, lantern

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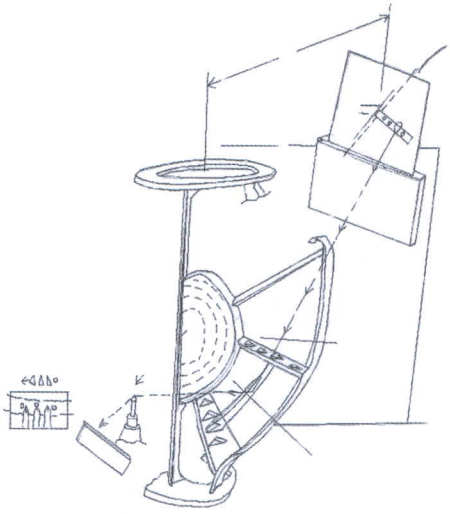


A K-type diaphone fog signal ready for test before leaving the works.

houses, towers, and fittings. For atmospheric conditions where lights were no longer visible, Chances made powerful air-driven foghorns and explosive signals. Later they added the electrical generating plant and switchgear, and automatic devices required after the Second World War for the semi-watched station.

Another very ordinary looking door in a side wall, led to the glass grinding room where all the many glass prisms were processed. It was an eerie, darkened world, damp and odorous, reminiscent of some grizzly crypt. Beyond the entrance door one almost stumbled downhill to a lower level where a long slit-drain bisected the length of the floor, which must have exceeded forty meters [131 feet]. In the poor light one made out that down both sides of this central passage, a score or more of great rotating machines was in motion amidst their substantial supporting frames. Power for moving these undulating arms and cranks, with cams rotating over each, was transmitted by belting and line-shafts and caused an all-pervading "drone". Amidst this "unreality" the men and women in attendance appeared to me to be like pallid and work-worn creatures of the dungeon.

The founding of the glass bulls-eye lenses and prismatic rings and segments took place within a nearby building (within the "glassus") whereby men gathered blobs of special glass in the ends of "punty tubes". A squad of men assembled so as to "unroll" these blobs into the annular iron molds (some cylindrical and others segmental) for assembly when very large prismatic rings were required. A period of annealing each filled mold of glass followed in a special oven, and after removal, the rough-looking elements were ground flat on one face and were then stuck with pitch upon a turntable to form a ring. (Each prismatic ring had three faces, two were flat and the third was curved.) The curved face and one of the flat faces were then ground to shape using grinding powders of diminishing coarseness and with rubbing pads fitted to mechanical arms abrading across the faces on the glass surfaces. Conformity to shape was then gauged using templates and feeler-gauges. When complete, the whole prismatic glass ring was inverted and a plaster cast was made to accommodate the shape so that polishing could follow, using polishing media until a jewel-like finish was obtained. Each prism was tested on a special machine where very narrow parallel rays of light were made to traverse across the surface of the glass and conformity with correctness of focal distance was recorded and examined. What appeared to be a rough grinding process achieved results of surprising accuracy. For example, a prismatic ring 1.5 meters [4.9 feet] in diameter displayed a focal conformity to within a circle only two millimetres in diameter around the focal point.

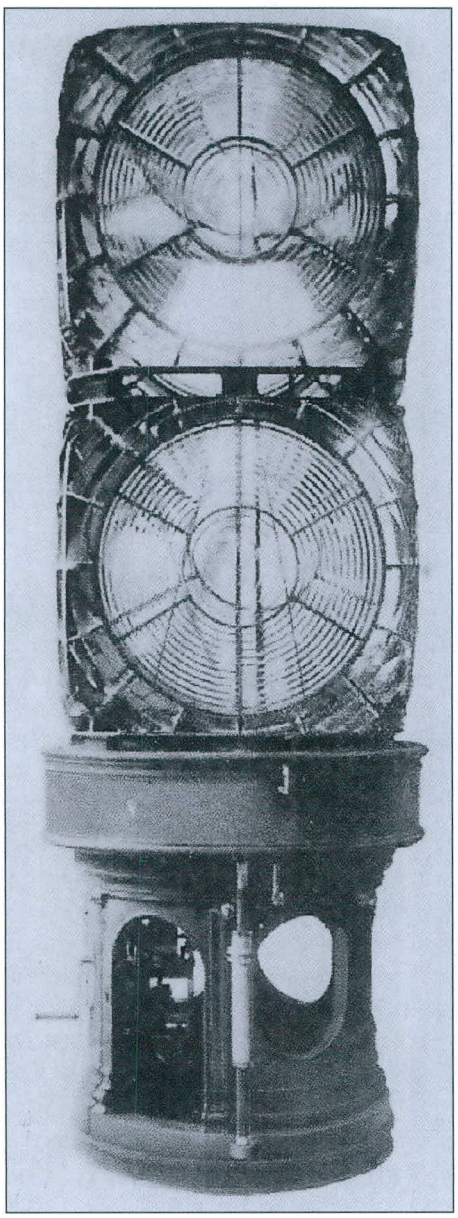


A sketch of the optical method used to set the proper position of each prism in a Fresnel lens.

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The sight of those grey figures sitting beside their machines, painting paste on to the glass as it oscillated and rotated, with the constant sound of water and the droning of the line shafting, made me shiver. The feeling of a ghostly hand receded only as I climbed up the slope out of that dank "cistern" of the processing room into the "sunlit-uplands" of the high workshop.

When the craftsman's touch had completed the work on the lens frame, it glistened like gold and was assembled above our heads on the stage (previously mentioned). The functioning of the lens, when completed, was to take light from the lamp, or burner's mantle, at its focus and to distribute the light produced into horizontal beams. Reference has been made already to the stage atop the stores alongside the inner wall of the high workshop. This wall had enormous windows overlooking the yard and was in sight of the car park, electro-plating shop and the lamp-house situated some fifty meters [164 feet] away. A large area of side wall was fitted with a sliding blackboard so that a target range was established for the purpose of setting the glass prismatic elements in the framework of the optic that is set upon the stage. This process was achieved most ingeniously. In the completed optical apparatus to be installed within the lighthouse lantern on its tower above the waves, the light from the lamp, at its focal centre, is collected by the lens elements and projected horizontally. The beams are depressed a little below horizontal so as to fall on to the blackboard to take up a position of an artificial horizon (necessary because of the curvature of the earth). In setting each prism the process is reversed. A small lamp was positioned on the face of the blackboard to take up the location of an artificial horizon. A pointer was also placed at the focal centre of the lens where the illuminating lamp, burner, etc., would be fitted eventually. With the use of a small mirror, and at the same time, by adjusting the position of the glass prism within the loose slot of the frame, the light from the small lamp on the blackboard is passed backward through the prism and on to the "tip" of the pointer. Adjustment, with the aid of wedges, then determines the locations for every prismatic element in the optic panel being set. When each panel of a complete optic has had all its prisms set in the way described, it is plastered with white lead and finished with red lead protective paint (reminding the onlooker of the beauty of a cluster of diamonds set in a ring, almost). After all the optic panels are completed, re-assembled upon a turntable and support pedestal, the lamp at its focal point is then lighted





Above – Fastnet Lighthouse off the southwest coast of Ireland. First lit in July 1904, it has a characteristic of a white flash every five seconds with a range of 28 nautical miles.

Left – The biform First Order lens made by Chance Brothers for the Fastnet Lighthouse.

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and each beautiful beam is turned towards the blackboard where examining engineers will ascertain if any of the prism elements are lacking in contribution of light. If this is found, the prism must be re-set.

The setting of a large optic could entail the focusing of over one hundred prisms and the whole task demanded days of concentration and patience. Occasionally, the sun succeeded in penetrating the local industrial "smog" and made the setting task more exacting. In my case, it did happen that when the final observations were made, one prism was found to be sending its light on an errant course. The small light seen by me sitting atop the pointer had originated not from the blackboard's lamp, but the reflection of the sun off the roof of a car in the car park. A black mark for me, and a depressed horizon indeed!

Several months after commencing "filing-metal" and having assisted most of the fitting shop gangs with the construction of optic frames, the assembly of lanterns and general mechanical adjustment, the gaffer announced, "Time for a move", and shunted me over to the machine shop gaffer. So far, my working hours had involved me in a weekday regime of 7:30 a.m. to 12:30 p.m. and 1:30 p.m. to 5:15 p.m. and 7:30 a.m. to 12 noon on Saturdays (plus evening school for technical studies).

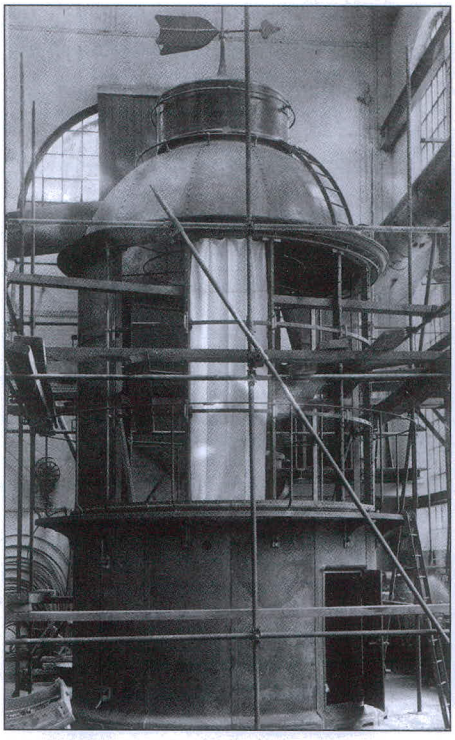
Machine shop work was on shifts at that time consisting of a week working days followed by a week working nights, 7 p.m. to 7 a.m. (turn and turn about), which I found to be very tough, but fascinating. Once the toolmaker had set the tool on the lathe, gear shaper etc., the "work" was mostly watching and checking. "Bobbsy" was the toolmaker who had a bobbing gait as he went from machine to machine striving for perfection in the fashioning, sharpening, and setting of the cutting tool. If one spoiled the product after that, it was considered to one's inability, which rang out. If it did not ring out clearly enough, "the baron" could supply the amplification. "The baron" was "square" and impressively baronial in presence, greying, with penetrating ice-blue eyes behind his spectacles and with a military moustache.

He sat in regal state, surrounded by a low wall, but within view of us all. He terrorized me as he inspected the first fruits of every machine operation for accuracy and finish. One dragged the large plyboard-mounted drawing displaying the dimensions unwillingly before him. The item I had machined had repeatedly been found wanting under his gaze. He certainly disliked my work, dismissing it "unprintable". Following two or three such encounters, my mates took pity on me, and together, produced a highly commendable result, causing "the baron" to revise, somewhat reluctantly, his adverse opinion. Even when I produced another "scrapper" he took pains to show how it must be done, and thereafter, we tolerated one another. The large lens was rotated by power from a falling weight that transmitted the power by gearing to a "race-wheel" bolted to the turntable, upon which the lens was supported. Such a wheel, over one meter in diameter, had hundreds of teeth around the inner circumference.

For once (only) I was in charge of the ancient machine employed for undertaking the tooth cutting. We were dealing with a large wheel destined for Ashrafi (Gulf of Suez). The large, machined gunmetal "hoop" was delivered to me and was clamped to the face of the cutting machine. On the side, and at right angle, was a rotating milling-cutter and this was to be wound in and out to impart the correct form of tooth to the "hoop". Once withdrawn, the lever was pushed and the hoop rotated to the position for the next tooth. The completed wheel was to have two hundred teeth, so that all one had to do was to wind in, wind out, and push the lever the appropriate number of times. On the one hundred and eighth tooth I failed to wind out, but pushed the lever prematurely. There was a horrifying "judder"! The wheel was damaged beyond repair, the cutting mill wheel snapped, and the machine was never the same again. Everyone, it seemed, was awaiting the completion of this toothed wheel and I was left in no doubt that the wrath of the whole Arab world would be added to the company's reprimand. My continuation at Chance Brothers was at stake, but in the end, my future with them would certainly not be in the machine shop.

George assembled the complete lantern base for Ashrafi on to his enormous boring mill. This 3.4-meters [11 feet] diameter assemblage of cast iron units, some 2.5 meters [8 feet] in height, formed the cylindrical wall, or "murette", upon which the lantern's glazed portion would stand. Imagine the extent of loss to the company if George failed to carry out this last boring operation faultlessly. I learned my lesson and resolved to be more diligent in my work. From that moment I matured, just a bit.

What was to be the start of the Second World War began to loom ominously. In addition to our lighthouse contracts, the company became very busy building searchlights and sound locators and other military equipment, which accentuated our sense of dread. A "tub" arrived containing over three hundred steel items for conversion on a machine, to become toothed bevel pinions, each with fourteen teeth; a further "tub" was then delivered containing the same number of similar items for conversion into bevel wheels, each with forty-two teeth. "My machine" cut one tooth at a time by means of oscillating cutters that shaped the tooth to a prescribed profile, each operation taking about two and a half minutes, following which, the lever introduced the next "blank" tooth to be shaped. So the completion of one pinion took about 30 minutes and a wheel about two hours and we had six hundred items to complete. Perhaps the reader can imagine the "crushing boredom" over some twelve weeks on the machine for my mate and myself. His only comment was, "Oh, tek no notice Ken, it'll be all-roite #&%$@ it!"



A lantern under construction.

The machine shop gaffer sent me to Eli in the casting stores without any explanation. Eli instructed me, "See yon big casting? Yo goo t'other end and when I say 'lift', yo goo lifeet" Try as I might, when I attempted to lift my end I found it far too much for my emaciated capability. He questioned, "Caw yo lift? Must be tevvy taive" (too heavy to heave). All good Black Country "lingo".

When Chance Brothers commenced lighthouse manufacturing in 1851 the illuminant was mineral oil, later kerosene. In the 1920s, electricity was to be in vogue and a third important

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"arm" of supply was planned. Most lighthouses would need to have their own plant for generating electricity, and in 1928, a small highly specialized manufacturing company was acquired and transferred from Banbury to "smoky" Smethwick, to the despair of its small staff and workshop personnel. Once at Smethwick their enthusiasm for the work changed their minds. This forethought was indeed justified, for by 1950, the post-war rehabilitation program enabled the company to install apparatus in remote tropical areas to establish what became to be known as the semi-watched electric lighthouse.

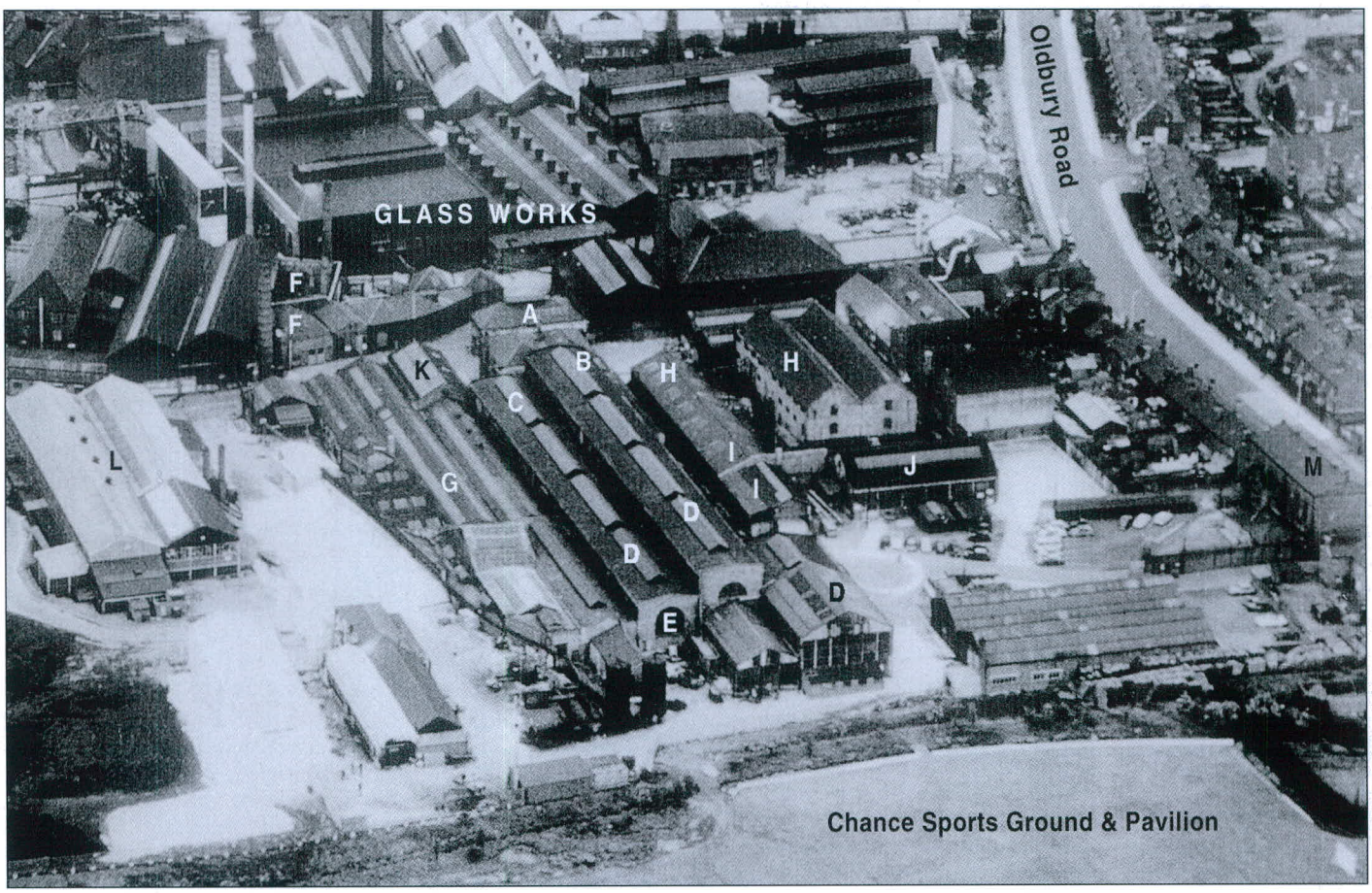
A new workshop was built to undertake this innovation. Later, there would be specialist companies for supplying the items initiating the operation and control required in automatic power plants, switchgear, etc., but at this time, the electric specialists had to provide in-house answers and items of equipment themselves. Accordingly, silvered contacts and many ingenious devices were introduced, which resulted in the exceptional reliability of operation in adverse climates being fully achieved. Not only lighthouses needed reliable automated power supplies, but also the British Post Office and many other government and military establishments; both the United Kingdom and elsewhere were customers for the new specialised technology.

One could say that the company's departure from the original purpose had commenced and would result eventually in the erosion of its involvement with lighthouse services following World War Two.

My next "phase" was to work in the new electrical workshop, which was to play such an important part in the horrible years of war to follow.

But back to the history of the company. In addition to the scientist, technical "genius" and artisan, there now emerged the director-administrator, James Kenward, who led the lighthouse equipment enterprise so notably between 1877 and 1895. He became the link with the colonial offices and those in London at a time when Britain's empire demanded similar aids for safe passage of shipping in the expanding trade during Queen Victoria's reign. After James Kenward, Henry Stobart became director; also an excellent chief draughtsman (which in those days was the equivalent of today's chief engineer), Alfred Perry was followed by W.F.A. Richey, who was the "grand old man" when I began at Chance Brothers in 1937. Harold Gough, probably the ablest of all the designers of lighthouse optics, and a wonderful mathematician and glass technologist, became my own "chief mentor and encourager" to whose memory we owe so much.

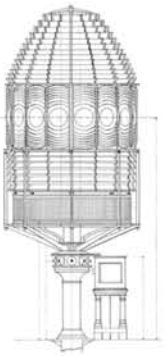
It is recorded that one thousand fifty nine sets of apparatus were constructed between 1855 and 1919, among which were the great lights of Lizard, Eddystone, Fastnet, and Rhu Re in the British Isles, Cape Leeuwin in Australia, Cape Race in Canada, Manora (in what is now Pakistan), and Chilang in China. There were sets too for Mexico, Java, and Ceylon (now Sri Lanka) and numerous other countries.



An aerial view of the Chance Brothers works by the author.

A Main Office
B Design and Estimating
C Machining Department
D Final Assembly Bays
E Fog Signal Testing
F Prism Glass Foundry
G Prism Grinding and Polishing
H Pattern Maker Shop and Stores
I Blacksmith Shop
J Plating
K Tool Room
L Electrical Workshop
M Burner and Lamp Shop

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Thomas Point Shoal Lighthouse, MD

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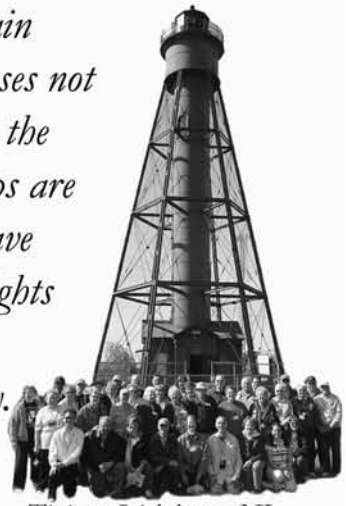
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