Nailsea and the Glassworks Part 2

HE Dommett

Robert Lucas Chance

By the year 1810, the glassworks had entered a different phase. Perhaps the drive and excitement associated with a new enterprise had dwindled, the excise tax was as crippling as ever, and the once flourishing trade links with America had all but vanished. The partnership therefore decided to appoint Robert Lucas Chance as manager of the Nailsea works. This was not merely a family appointment of a grandson by an indulgent grandfather, John Robert Lucas. Robert Lucas Chance, by the time of the appointment, had already proved his worth. He was described by H St George Gray in a 1923 article *Notes on the Nailsea G1assworks* (1) '. . . born October 8th 1782, the eldest surviving son of William Chance, said to have had great mental capacity with a passion for work, entered his father's business at Birmingham at the age of twelve'. . . . He became a partner January 1st 1804 and continued to manage these works for about seven years.

In 1810 he had shares in the Nailsea Works, and early in 1811 he came down to manage the business. He had an additional attraction in coming to Somerset for on May 7 of the same year he married Louisa, the youngest daughter of Edward Homer and they resided at the house at Wraxall where James E Homer later lived.

Sir Hugh Chance in his article *Nailsea Glassworks* commented:

> Lucas Chance as he was known soon realised that the weakness in operation [at Nailsea] lay. in the supervision of manufacture so he "posted" up to Dumbarton Crown and Bottle Works. Pulling Hartley out of bed, Lucas Chance persuaded him to come to Nailsea where he remained until he joined Lucas as partner in 1827 at the Spon Lane glassworks, near Birmingham, which Lucas had purchased in 1822. Lucas Chance stayed at Nailsea until 1815 when he moved to London to establish himself as a glass merchant, specialising in the reviving export trade to America, and sold his shares in the Nailsea concern.(2)

The year 1815 was quite eventful for the partners, as it was then that the Stanton Wick Glasshouse was closed, perhaps on the advice of Lucas Chance.

Stanton Wick Glasshouse

Stanton Wick formed a link with Stourbridge, the cradle of factory glassmaking. Its foundation approximately 1685 is described by D R Guttery in his book *From Broad Glass to Cut Crystal* 1956.

Among the valuable glass documents in the Palfrey collection, is part of a statement of accounts which records the first known business connection between the Foleys and the glassmen. Coleman's glasshouse (The Lye at Stourbridge) had been burned down in 1658. Robert Foley set up the partners who had been working there in Chelwood, Somerset, not far from Bristol where he had trading premises, to make window glass for himself for sale in Bristol, or for the coastwise traffic of which that city was the chief port.

An authority on the history of Stanton Wick Glasshouse,(3) Nailsea historian and former BIAS member, the late B J Greenhill pinpointed the importance of Lionel Lyde, a native of Stanton Drew, on whose land the glasshouse was located. One of the Lyde family, Elizabeth (1700-1768) married a John Adams, probably the same man who is recorded in *Sarah Farley's Journal* of 13 January, 1767 under a sub-heading 'dividends:- John Adams of Chelwood, Glassman'. A John Adams is also recorded in Sketchleys, Bristol Directory, 1775, 'Adam John, Bottle Warehouse upon the Key'. The Bristol pollbooks of 1788 contains an entry 'John Adams, glassmaker, Stanton Drew'. With such material at hand Greenhill had doubts as to which John Adams was father of Anna, who had been married to Robert Lucas of Bristol in 1781, and he was equally dubious about the identity of the glasshouse itself. He had a valid point and one is forced to the conclusion that names Stanton Wick, Wick, and Chelwood mentioned by various writers referred to one, and only one, glasshouse at Stanton Wick.(4)

According to an 1815 sale notice, at no time was John Robert Lucas owner of the Stanton Wick glasshouse. Its description is scant, referring only to 'pot rooms, stone, stabling, etc' but nevertheless, of importance:- 'The glasshouse is held on an old lease by John Robert Lucas at 8£ per annum.'

The renewal of the Nailsea partnership in 1807 may have signalled the closure of the bottle-making operation at Nailsea, the cash injection being needed to upgrade Stanton Wick in handling all the Lucas bottlemaking operations. The eventual closure of Stanton Wick in 1815 could also have signalled the abandonment of all the Lucas bottlemaking operations.

The decision to close Stanton Wick was possibly a result of a recommendation by Lucas Chance to concentrate on quality window glass production. Whatever the actual reasons for the closure the partnership saw no reason to dispense with all their Stanton Wick workers. They transferred them to Nailsea. Not only did they bring their individual skills, but the Nailsea Glassworks inherited a tradition stretching back to the 16th century glassmakers of Stourbridge and the Weald. The settlement papers demonstrate a wide range of experience by listing the parish of birth and glassworking background of the new Nailsea workers, eight of whom were born at Stanton Drew, and a further three worked there having been born elsewhere. Other workers came from Bristol and as far afield as Warrington, Newcastle and Peebles.

John Hartley Crown Glass Maker

John, who was rated as the finest crown glass maker in Britain, was also a devout man. So, whereas there is no record of Robert Lucas Chance being involved in local affairs, John was intimately concerned. In the year 1827, Robert Lucas Chance persuaded John Hartley to leave Nailsea, and join him at Spon Lane, Birmingham. John Hartley died in 1833, his place being taken by his sons at which time the firm became Chance and Hartleys. In 1836 the Hartley brothers founded a new firm in Sunderland after which Spon Lane became the well known firm Chance Brothers and Company. The departure of John Hartley to Birmingham was a severe blow to the village of Nailsea, for he was a much loved member of the community.

Lucas Coathupe and Company

Earlier than 1821, the company became known as Lucas, Coathupe and Homer, the principal share holders being J R Lucas, William Coathupe, Edward Homer and James Edward Homer. Edward died and in 1825 the company title became Lucas, Lucas, Coathupe and Company. There were two further changes, a Pigot National Commercial Directory shows the firm trading in the name Lucas, Coathupe and Homer, and in 1835 the firm's name became Lucas,Coathupes and Homer and Company.

The period has special significance because documents exist that allow a detailed examination of the works to be made. A billhead carrying the title Lucas, Coathupe and Company shows a picture of the glassworks, and a plan of the glassworks carrying the same heading was traced in the Bristol Archives which lends support to the authenticity of the picture. The billhead shows three cones in operation and the plan matches this but omits the alkali operation, which provides a series of interesting points.

The plan shows the existence of a kelp room which suggests it was prepared approximately 1825 perhaps for association with the partnership papers. Additionally it suggests that until the formation of the partnership the firm had not the capital to invest in the sulphuric acid process (of Roebuck 1746) and the Leblanc process (of 1791) for the production of sodium carbonate from common salt, although the first British factory was opened 1794. According to 1821 documents the firm had a capital of £72,000, so no doubt the partners felt that to remain competitive the time was ripe for modernisation. Thus, by 1830 the partnership was able to prepare the bill heading advertising the information 'Lucas, Coathupe and Co, Manufacturers of Crown Window Glass and Alcalis'. The picture includes the pan shed, a building with the slotted walls on the right hand side and, to the rear, a tall chimney associated with the production of sodium sulphate, a stage in the alkali process.(5)

The Coathupes and the Coathupe Notes

The death of J R Lucas in 1829 was one that saddened family, partners, workers and the Bristol business community. Documents show that he insisted not only on the quality of his products, but the maintenance of an administration structured to this aim. After his death, William Coathupe, the ex-clerk and founding partner, perhaps the organising brain, continued in partnership faithfully adhering to the Lucas code. By 1835, in failing health, he formed a new partnership Lucas, Coathupes, Homer, and Cliffe. The Lucas holding remained although there was no participation by the family. William was a member of this partnership, but he faded from the business, his mantle falling on his sons Oliver, Charles Thornton, and Edward, the latter not being involved in management.

Oliver no doubt had already been well schooled by his father Charles Thornton Coathupe on the other hand probably received scientific training, glassmaking being a secondary activity. Although he may have had a reasonable knowledge of the craft he did not trust his memory for facts, and therefore embarked on a two year period of observation and experiments, carefully entering the results in a tiny notebook, small enough to be slipped into a waistcoat pocket.

After his death someone must have tossed his notebook to the rear of a deep recess and there it remained for over a century. During the clearance of a house in Wraxall after World War II, it was discovered and given to the late Mr B J Greenhill. It was an exciting find because the working of an 1835/6 glasshouse could be examined and interpreted.

Coathupe Notes

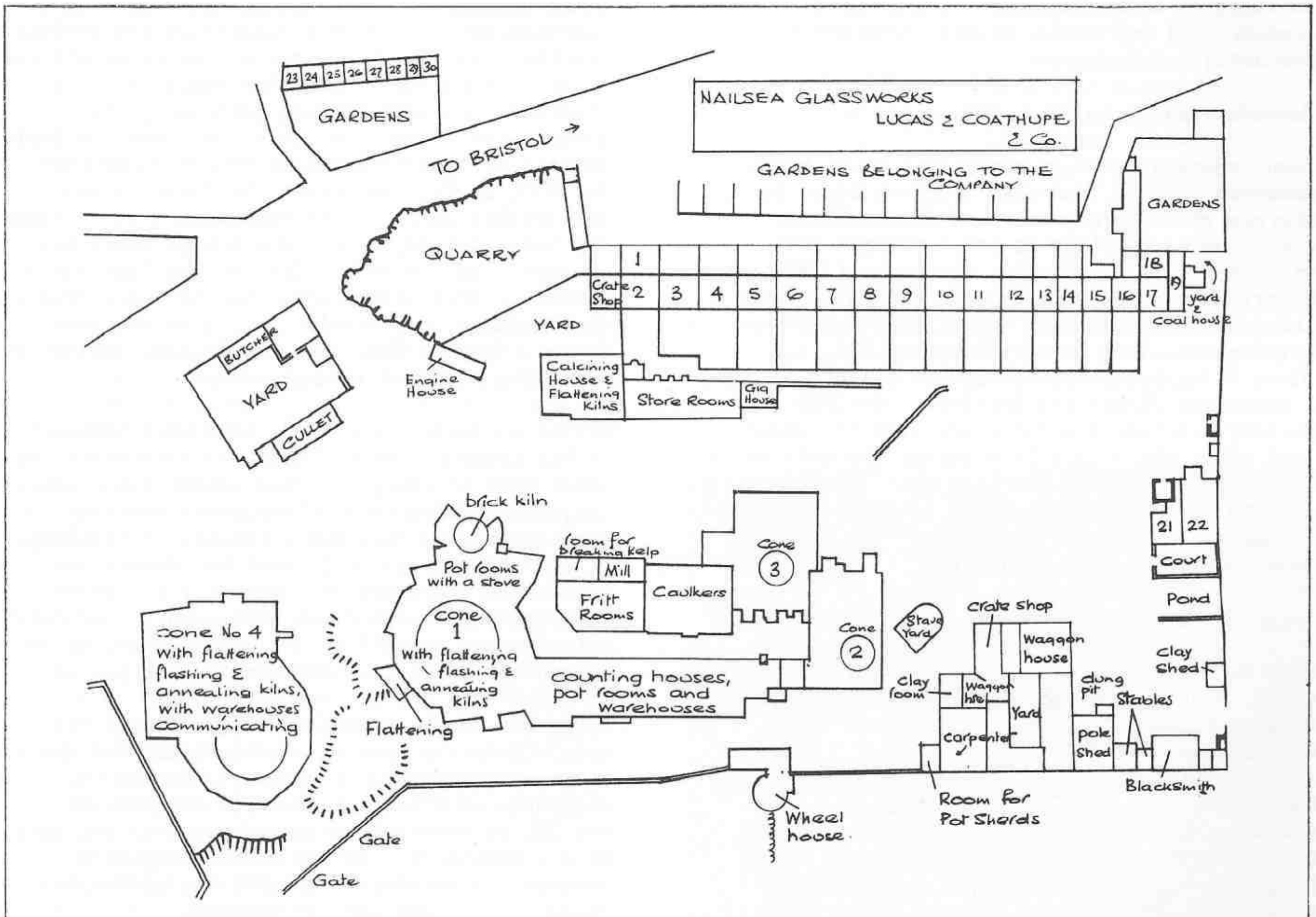
Alkali

The notes confirm the use of the Leblanc process for the manufacture of sulphuric acid and follow each step describing the dimensions of equipment and the amount of material used:-

Sulphur and nitre was burnt, the sulphur dioxide so formed being directed to the vitriol chamber to form sulphuric acid. The chamber measured 74ft at its rear and 64ft in the front, the average internal measurements being 69ft by 26ft by 12ft a total capacity of 19,872cu ft. Coathupe calculated that 1/10ins of liquid in the chamber represented 8 5/8cu ft of vitriol, and 6ins of liquid amounted to 826cu ft. The burner in use was a Tennant furnace.

The next stage was to mix sea salt and sulphuric acid with clay and roast in a second furnace. The tall chimney on the letter heading was used to carry away hydrochloric acid fumes formed in the process, and there is evidence of pollution from this chimney causing distress to villagers when the wind blew from the north. The residue of this process was then lixiviated in order to extract sulphate of soda. It is of interest to note that in 1836 Gossage utilized the fumes by designing chimneys with water sprays in their interior which flushed the acid into chambers for storage and sale. This process was not introduced into Nailsea and there is no mention of the process by Coathupe.

The sulphate of soda derived from this process was then decomposed into carbonate by mixing and heating. This produced the soda, but the carbon



Plan of the Nailsea Glassworks, c1825

was converted into black ash which for many years was considered useless. Despite the spreading of ash on the muddy roads and paths (one road of Victorian vintage, Black Road, was thought t0 have gained its name from this practice) huge piles of ash disfigured the locality. The piles were eventually eliminated by a Monde process in which sulphur was extracted from the ash which, according to a verbal report to H St George Gray at the turn of the century, was used in Nailsea.

The notes revealed that in the production of sulphuric acid, 384½lb of sulphur, and 22lb of nitre produced 1126 lb of oil of vitriol. The annual consumption in this process amounted to 62tons of sulphur and 68cwt of nitre. In the second stage, the salt used in a year amounted to 187tons and a vitriol production was 165½tons. In the third stage the consumption of sodium sulphate amounted to an astonishing 204½tons per week.

Workers in the alkali section were well paid. A man named Pemberton earned 18 shillings 9 pence per week, Baldwell and Gainer, 10 shillings per week. Men in the pan shed earned 16 shillings 4 pence per week, yard men 14 shillings, and men shovelling and handling black ash 18 shillings per week.

Sand

Isle of Wight sand costing 28 shillings per ton was reckoned to lose only 5% of its weight in the drying process, and contained only 0.5% carbonate of lime. Dried sand ready for use was available at 30 shillings per ton. (It is thought probable the sand was conveyed by sea to Bristol and by road to Nailsea, but the transfer of sand to lighter craft off Clevedon remains a possibility.)

Coathupe also recorded the cost of Easton sand as 16 shillings 6 pence per ton, and dried fit for use 18/- per ton. That this information is recorded inspires curiosity as its use in the manufacture of window glass was unlikely; furthermore the notes contain no reference to bottle making and the existence of the entry is unexplained.

Lime

Quick lime was purchased at 3 pence per bushel which, fresh from the kiln weighed 77lb, but was much more expensive when prepared as an hydrate. Coathupe recorded the limit of lime in glass mixture as 36 lb of hydrate to 112lb of sand and when using dried chalk instead of hydrate of lime, proportions of 7 of chalk to 8 of hydrate were allotted.

Coal

Coathupe carefully recorded details of the cost of coal used in each process quoting prices of brush coal as 2 shillings 8 pence per quarter; 8 bushels of small coal as 1 shilling 4 pence per quarter; haulage from the pit, 1 shilling for 9 quarters.(6) He noted also a bushel of brush coal weighed 821b, a bushel of small coal 84 lb, and then evaluated the costs of coal for each glassworking process.

Founding

62 quarters valued at £4-1-4 plus hauling 6/8 - £4- 8-0

Working

12 quarters of brush coal at £1-12-0 plus hauling 1/4 - £1-13-4

Annealing

45-48 quarters of small coal plus 15 quarters of brush coal for annealing 6 pots between 12th - 19th February

24 quarters of small coal		- £l-12-0
6 quarters of brush coal	16-0	
haulage from pic		3-6
	£2-11-6	

At the Alkali furnaces

Pans and calcars (double work) = 26 quarters of small
Salt Cake Furnaces and boilers = 15 quarters of small
Brazling cullet per week for one glasshouse = $3^2/_3$ quarters of small
Used in the chamber boiler (average over 6 weeks)= 3 quarters per week

Coathupe also noted allowances to key staff

8 loads of brush coal per annum - 3 managers, 2 flashers, 2 pilers, 8 blowers
1 spare load to Richard and Thomas Sims, William and Samuel Baldwell
6 loads of brush coal per annum - 2 carriers, 3 assistants, 2 skimmers, 8 gatherers
5 loads of brush coal per annum - Edward Thompson + 2 Head founders
Total of Coal Allowance - 795 quarters
The glassmaker's allowance for coal and house rent = £4-15-4 per week
this makes their bare week's work amounting to £7-8-9 per journey and overwork (overtime) = £5-10s per journey

Cullet(7)

The details of cullet in this period is a reflection of its importance technically and economically in a nineteenth century glassworks

Cullet used for topping	= 1 cwt per pot
Cullet used for skimming and glazing a new pot	= 3¾ cwt per pot
Cullet used for 12ins of the bottoms	= 7¼ cwt
Cullet produced from cutting of good crate of glass in export sizes including small	= 28 lb
Cullet produced from cutting of every description of glass (i e starved, bad work)	= 29 lb
Skimmings since the adoption of rings in the pots appear to coincide very generally with an average	= 1 cwt for every 100 tables of glass made

Cullet made in the shape of skimmings, moils and puntys per pound

	cwts	qu	lb
Skimming	8	0	0
Moils	12	0	14
Puntys	0	3	14
Breakage	1	1	6
Total	22	1	6

The total waste of metal in the manufacturing = 3/16 of the weight of the tables drawn

The Dimension of the Furnace

This item is presented exactly as the entries in the Coathupe's notebook in which he records measurements compared with a previous furnace. Such measurements suggest the furnace had been purchased by the new parnership and embraced new features leading to increased efficiency:-

Item 56

Dimensions of a 6 Pot furnace

Length of Sieges	= 13 feet
width of Sieges	= 4 foot 3 inches
Width of Grate Room	= 3 foot 0 inches
Bearing bars to the top of the Sieges	= 3 foot 4 inches
Height of Pots from Siege	= 3 foot 1 inch
Pitch of Crown above the working holes	= 2 foot 7¾ inches

Item 57

Pitch of the Crown above the working holes, in the centre or highest point	= 2 foot 11 1/8 inches
Diameter of the Teaze Holes	= 4 foot 11% inches
Working Holes	12 inches wide and 12 5/8 inches inside
Footholes	15 inches wide and 23 inches high
Puntyholes	5 inches by 5 inches
Inclination of Restings	3 inches

One set of Pots in 11 days
Furnace turned in 7 days

Item 58

From the top of grate bars to top of sieges = 2 foot 0¼ inches
Dead Mug:- 3 foot at bottom varying to 2 foot 10 inches
/Coathupe's note that may be interpreted as the above measurements as being relevant to a new furnace/

The height of the crown of this furnace above the working holes is 8 inches less than those we have used previously, and 4 inches less than the old standard height.

Item 59

A furnace may be very safely turned in 108 hours, and pots may be set in 96 hours afterwards (Total 8½ days)
February 1836

The capacity of the grate room (allowing for the "dead mug") is 69 cubic feet or about 2½ cubic yards.

Pots

Coathupe was fascinated with the manufacture of the pots used in the industry. The pot clay analysed from an approximate 100 quarters of material shows it to have been comprised of 64.3 quarters silex, 276 quarters alumina, 5.9 quarters oxide of iron, 3.3 quarters of lime.

When manufactured, the pots he described as having an inside top diameter 52½ins and outside top diameter of 56ins; the inside bottom diameter was 32ins and outside bottom measurement 40ins. He then observed that carefully dried, the pot could be used 5 to 6 months after manufacture.

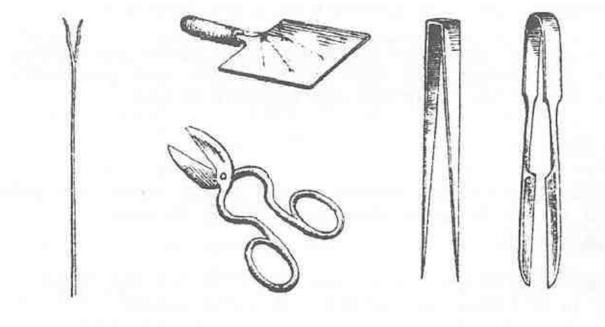
He measured pots in stages and observed after annealing a pot of 56ins external diameter and 42ins external slant height was reduced to 52¼ins and 40ins respectively. After a founding operation it was reduced to 50¼ ns external diameter at the top and 38¼ins external slant height. He observed-

Pots if carefully watched may be turned in the annealing arch in 60 hours, and set in 36 hours afterwards. They may be glazed from an adjacent pot in 5½ hours and charged upon 12 'bottom glass' .

A new pot required about 6¾ wt of thin cullet for glazing.

Certain of his measurements seem contradictory which points to his measuring of different pots Other measurements he took to extremes and apparently irrelevantly, although it is conceded that this may have been necessary for his purposes. One note is worthy of repetition:- 'A pot that has remained in the furnace during' 40 founds without having once turned upon the siege, measured at the jowl next to the fire 1¾ inches, but on the opposite side 3½ inches.'

Statistics were related to the weight of glass at 60º Fahrenheit, presumably cooked for experimental purposes. On the actual amount of glass manufactured in one pot to be compared with the amount that was converted into crown glass, he noted that 12 perpendicular inches of bottoms contained 7cwt 1 quarter, and 32½ perpendicular inches at 60º Fahrenheit the pot contained 23cwt 0 quarters 0lb. The capacity of the pot he calculated as 25cwt at the same temperature. Almost as an afterthought he wrote:- '13 cubic inches of hot metal weighed 1 pound avoidipois' [sig]



Glass blowers' tools

The Nailsea Recipe

A patent window glass mix consisted of alkali - 168 lb, Dry Isle of Wight sand - 448 lb, hydrate lime - 140 lb, charcoal - 12 lb Total weight - *768 lb.*

When withdrawn from the calcar this mix weighed 1111 lb.

Coathupe calculated every 112 lb of mixture prepared for the found consisted of cullet 33.87 lb, sand 45.16 lb, alkali 16.93 lb, hydrated lime 14.11 lb, carbon 1.12 lb, extra moisture 0.72 lb.

Seven founds represented a week's work for two furnaces making 4,700 to 4,800 tables, this comprised of 71½ batches of which 10 1/6 batches were for founding.

A week's consumption of materials weight and cost is tabled as fol1ows:-

	Weight cwt	qu	lb			Cost £ s d
Sand	284	2	11	Prepared sand	at 30/-	21- 6-4
Alkali	106	2	25	Sodium	at 90/-	24- 0-4
Hydrated lime	88	3	21		at 7/-	1-11-6
Cullet in mixture	213	1	22			
Cullet for topping	64	2	6			
Charcoal	7	2	14		at 6/10d	2-12-4
Manganese	0	2	17		at 9/11d	5-7
Arsenic	1	2	0		at 34/-	2-11-0
				Interest on buildings		1- 0-0
				Mixers, wages and coal		10- 0-0

Yearly consumption of material (omitting 6 weeks for furnace building, two furnaces making 4,700 to 4,800 tables:-

	tons	cwt	qu
Sand	654	11	2
Alkali	204	11	0
Lime Hydrate	184	2	0
Cullet	640	0	0
Charcoal	17	10	3
Manganese	1	9	1
Arsenic	3	9	0

The Finished Product - Panes of Glass

Coathupe finally examined the end product of the factory, the panes of glass, and emerges as an early productivity expert. By experimentation he established that his standard size of table would be 50in diameter because it would give him the maximum amount of panes for a set weight of glass. Unfortunately he carried many aspects of this thinking in his head so that the complete range of squares is not indicated, except that they ranged from 4in squares to export sizes of 4ft square.

In packing the glass into crates he calculated amounts in lengths, a length of glass conformed to the measurement of one side of a pane. Packing crates with different size panes produce a bewildering set of combinations whereas calculating the capacity of a crate by lengths a single figure is produced, ideal for comparison with other crates. He must therefore have evolved a system of packing for most of his pane sizes so as to utilize the maximum amount of space in each crate. He achieved this with a fascinating series of calculations, and commenced with recording the weight of all the crates despatched over a calendar year, and calculated the average weight as 3 quarters 27lb per crate.

The weight of 100ft of glass he calculated to be 61 lb and 1ft of glass as weighing .615 lb containing 6,7l5cu ins of glass. He then experimented with an hundredweight of glass in the pot which when worked assumed the use of all the glass in the pot produced a theoretical footage of l82-113ft. However, when allowance was made for breakage, small and 'faded' glass, 'starved' and melted, glass of good size, but bad quality taken over a year, the footage produced from 1cwt of glass (including quarries of less than 6ins and 4ins in size) was reduced to l35 ½ft.

He estimated that standard production could be reckoned from a hundredweight of glass, working a 50ins table was capable of providing, without extraordinary care, 136ft of the usual export sizes (not quoted), 28 lb of small panes (size not quoted) with a balance of cullet remaining.

Experimenting with tables of greater size he must have decided that although 50¼ins diameter would give him 139.1ft of glass and 50½ins diameter a total footage of 141.11ft, that when cut into panes the thickness of glass was not suitable to meet market demands.

He even analysed the contents of two crates he regarded as standard size (standard size dimensions not give in notes), packed with glass cut from standard 50ins diameter table. The first crate weighed 3 quarters 25 lb and was packed with 141ft export squares together with 12 small squares weighing ½lb (and surprisingly) 21 lb of cullet.

The second crate weighed 3 quarters 20¼1b packed with 136ft comprised of 4ft export squares with smaller squares with a balance of 20 lb of cullet.

Nailsea staff wages

Glassmakers	£ s d
Edward Phillips	3-17-0
John Brooks	2-15-0
Thomas Smart	2- 5-0
2 Flashers at 30/-	3- 0-0
2 Pliers at 30/-	3- 0-0
2 Assistants 20/-	2- 0-0
2 Carries off 21/-	2- 2-0
8 Blowers at 30/-	12- 0-0
1 Blower Practising	1- 5-0
8 Gatherers at 25/-	10- 0-0
1 Spare gatherers 25/-	1- 5-0
2 Skimmers at 25/-	2-10-0
Founders Crew	
Founder	1-10-0
2 Teazers at 23/-	2- 6-0
2 Second Teazers 18/-	1-16-0
2 Spare Men at 15/-	1-10-0
Cave Men	0-16-0
Coal Wheeler	0-15-0
Average pot, money	0-12-0
Sweeping furnace	0- 1-0
Wheeling ashes off	0- 7-0
Drink allowance	5-4
Extra allowance	1-4
Total	9-19-8

Wages for 4 double journeys

	£ s d
2 Part Time gatherers 9/-	0-18-0
1 Punty sticker 12/-	0-12-0
1 Punty sticker 9/-	9-0
2 Punty stickers 7/-	14-0
2 Marver cleaners 5/-	10-0
7 other boys at 4/-	1- 8-0
1 Spare man at 10/-	10-0
2 Blowers behind 20/-	2- 0-0
2 Flashing Fee keepers at 18/-	1-16-0
1 Crambo keeper 15/-	15-0
Total wages (excluding coal allowances)	55-15-0
Metal Mixers	
Edward Gainer	1- 0-0
James Connelly	1-10-0
Assistant Mixer	0-12-0
2 Pan Men at 14/-	1- 8-0
2 Caulker Men 18/-	1-16-0
2 Mill Men at 12/-	1- 4-0
2 Horses at 18/-	1-16-0
24 Qu coal at ¼	1-12-0
Hauling	0- 2-8
Total Wages	11- 0-8

This Coathupe concluded was the staff costs for 72 batches of mixture producing 4,800 tables or 8 double journeys, dated February 1836. He did not here calculate the total cost, an omission rectified in notes dated August 1837 in which he dealt only with bulk costs and covered not only the Nailsea operation but office costs.

(a) Wages and no overwork	
Glassmakers only	£ 59-10-4½
Other departments	81- 6-8½
Other departments in Bristol	30- 1-6
Total per week	170-18-7

(B) Wages etc 5 Journeys overwork	£ s d
Glassmakers only	86-15-0
Other departments	90-19-0
Other departments in Bristol	30- 1-0
Total per week	207-15-0

(c) Wages per journey (no overwork)	£ s d
Glassmakers only	7- 8-9½
Other departments	10- 3-4
Other departments in Bristol	3-15-2¼
Total	21- 7-3¾

Coathupe summarised as follows: subtracting (b) from (a) = £207-16s-3d - £170-l8s-2d = £36-17s-8d for the 5 overjourneys and concluded 4l6 journeys or 10,400 crates cost us in wages and allowances £8,886-16-0 - 52 weeks of working.

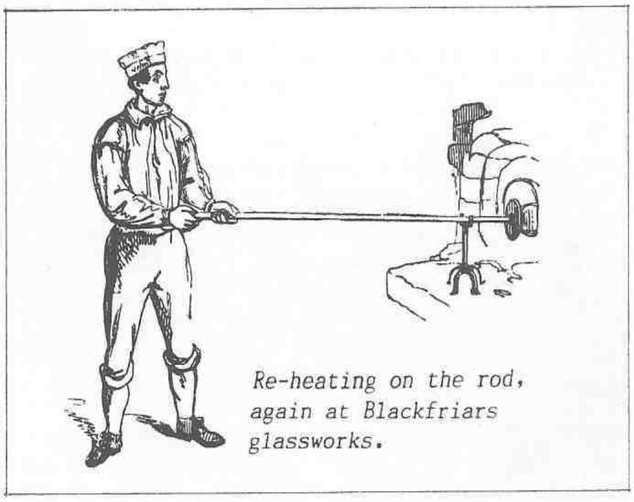
Wages and Coal per journey (overwork)	£ s d
Glassmakers only	5-10-0
Extra packers etc	1-17-6½
	7- 7-6½

and the differences in wages and allowance only about £14 per journey.

From all these calculations he drew up constants from which he could judge and compare other costs.

Per journey of 300 Tables (no overwork) or 10,400 crates p a		
Wages and allowances to Glassmakers only		£7- 8-9½
Wages and allowances to other departments	at Nailsea	£10- 3-4
	at Bristol	£3-15-2
Constant charge per journey		£21- 7-3½

This works out as a wages bill per week		£170- 0-0
	per 52 weeks	£8,886-16-0
and for every journey exceeding 8 per week (glassmakers only) double set		£5-10-0
Extra packers and labourers, constant charge per journey		£7- 8-7
or £29-14-3 per 100 crates		



Re-heating on the rod, again at Blackfriars glassworks.

Summary

It must be emphasised that the notes should be regarded as an aide-memoire to the amount of knowledge already carried in the mind of Charles Thornton Coathupe. No diagrams are available to construct the appearance of the pots used in his calculations. Other calculations appear vague or pointless to an observer, whereas in fact, they would be relevant for Coathupe's purpose. The notes are therefore subject to different interpretations but, overall, show that glassmaking in Nailsea even as early as 1836 was well organised and used management techniques of a quality that bears comparison with modern industry.

Perhaps the importance of Nailsea is its service as a halfway house between the old and the new in glass technology, and as a catalyst for new ideas. It was a factory that developed the minds of two important men, Robert Lucas Chance and James Hartley.

Robert Lucas Chance was a man of remarkable talent who early realised that the centre of gravity of English industry was the Midlands. His judgement was sound, as the firm he founded so long ago functions successfully to the present day.

John Hartley, reputedly the finest crown glassmaker in Britain, was highly regarded in the village because of his work for the Methodist Church. A kindly, helpful man, it was he who probably schooled Coathupe in the craft of glassmaking, and whose sons founded the firm Hartley Brothers, Sunderland.

Charles Thornton Coathupe was a careful, precise man who continued the traditions of his predecessors by the application of organisational and scientific method. It is not generally realised it was he who discovered the Iron Age Wraxall Collar at his home, Birdcombe Court, and now on display at the Bristol Museum. His scientific curiosity prompted him to analyse a sliver of the metal.

In 1708 the village opposed the glassworks, by 1840 it was identified with the glassworks. The village bubbled with activity, not only because of its industry, but with the vitality of the workers. They were aware of knowledge beyond their world of glass.

Acknowledgement is given to Trevor Bowen for copy of 1830 Glassworks Plan.

Notes and References

1. Gray, H St G The Connoisseur March 1923 'Notes on Nailsea Glassworks'

2. Chance, Sir Hugh *Circle of Glass Collectors* No 128 January 1962, 'Nai1sea Glass'

3. Greenhill B J Stanton Wick Glasshouse

4. The Settlement Papers of 1816 quote workers parish and glassworks as Stanton Drew. (*Nailsea Settlement Papers* 1816)

5. The fourth large cone has been unidentified, but thought to have been used for brickmaking.

6. 4 quarters = 1cwt

7. Cullet, derived from waste glass, was required in the manufacturing process as a raw material.