

# The bankruptcy of W & T Gilbert, optical and mathematical instrument makers

D J Bryden FSA

## Introduction

### *The Gilbert dynasty*

The Gilbert family of London scientific instrument-makers ran from John Gilbert, mathematical instrument-maker of Tower Hill, apprenticeship completed 1717, through four generations to William Dormer Gilbert, died 1844 when trading from Fenchurch Street. There was a chain of father to son apprenticeships in the Grocers' Company. Mathematical instrument-maker John Gilbert II brought in additional technical expertise in the third generation, having his second son, William, train under leading optical instrument-maker Peter Dollond, a member of the Spectacle Makers Company. William continued the business after John Gilbert II and his elder son John died within months of each other in 1791. In the early 1790s he was in partnership James Gilkerson at Tower Hill, having earlier joined Henry Gregory and Gabriel Wright at Leadenhall Street.<sup>1</sup> The partnership with Gilkerson at Tower Hill may have continued beyond the 1809 indicated by Clifton.<sup>2</sup> At Leadenhall Street, William Gilbert continued in partnership with Gabriel Wright until about 1806; they had been joined in the last half of the 1790s by one of Wright's former apprentices, Benjamin Hooke. From 1806, with his sons William Dormer, apprenticed 1795, free 1802, and Thomas, apprenticed 1801, free 1809, the business traded as William Gilbert & Sons. Some London directories refer to 'Gilbert & Co.' and some surviving instruments are similarly signed.

From about 1819 the two brothers ran the business at 148 Leadenhall Street under their joint names. There was a sleeping partner, Charles Stock, but on 2 September 1824 that partnership was dissolved. The official notification closed: 'Messrs. W. and T. Gilbert will liquidate the present dependencies of the firm, and will continue the business.'<sup>3</sup> Clifton's *Directory* indicates that W. & T. Gilbert continued until 1831, when William Dormer Gilbert took full responsibility for the business, leaving 148 Leadenhall Street in the late 1830s. W D Gilbert is noted as having been bankrupt in 1828 and having a workshop at Woodford in Essex in 1826. The manufactory at Buckhurst Hill, Woodford, was actually that of the partners. Together and individually, they were declared bankrupt in April 1828.<sup>4</sup> The business was heavily indebted when Stock left in 1824. Presumably there were family tensions: Stock was husband of the elder sister of Thomas Gilbert's wife,<sup>5</sup> and his investment was not liquidated; the 1828 assignees paid him an allowance of £10 per week during the winding-up process.

### *The Gilberts at Woodford*

The periodical press recorded the death in June 1813 'At Woodford Essex, in his 59th year, Mr. Wm. Gilbert, optician of Leadenhall Street.'<sup>6</sup> He was buried at All Saints, Chingford, Essex.<sup>7</sup> It appears it was his sons who moved the manufacturing aspect of the instrument making business out of the city of London into buildings erected in the grounds of the family home at Buckhurst Lodge, near Woodford Bridge—probably not long after mid 1820, when they tried to sub-let the lease on the Woodford property.<sup>8</sup> This was a far-sighted step. London optical instrument maker Thomas Ribright left London in the mid 1760s converting a rural Hertfordshire corn mill to grind spectacle lenses by water power, but the primary advantage of that move was keeping manufacturing methods secret and his activities undisturbed by the inherent conservatism of the London guilds.<sup>9</sup> A hundred years later, Troughton & Simms, the leading English precision instrument makers, finding their Fleet Street premises too restricting, moved out to a green-field site in Charlton close to the Woolwich Dockyard.<sup>10</sup> The Gilbert brothers made a similar

### THE picked STOCK OF Messrs. GILBERT

Who for many years held the highest place in the estimation of the Public, as Opticians and Mathematical Instrument Makers: the whole of which (with few exceptions) is finished, perfect, and suitable for private Persons. Among a great variety will be found achromatic, refracting, reflecting, marine, and other telescopes; opera and eye glasses, spectacles, barometers, thermometers, and saccharometers; camera obscuras, air pump, dials, mathematical, surveying, and drawing instruments, in cases, sets, and single pieces; mirrors, rules, levels, magnifiers, protractors, Gunter's scales, magic lanterns, callipers, prisms, and a variety of every description; also the iron bookcases, counter, show cases, desks, partitions, and other shop fixtures.

Box A. Text of press advertisement for sale of stock and fittings at 148 Leadenhall Street, 29 June 1828

move four decades earlier, and like Thomas Ribright installed powered machinery to grind lenses. In contrast to Troughton & Simms, the Gilberts' move failed to yield commercial dividends. The business was forced into bankruptcy. The tools and machinery at the Woodford works were sold at auction and the manufactory closed.

### The bankruptcy

#### *Auction of assets*

Papers for the Gilberts' 1828 bankruptcy are preserved in the National Archives.<sup>11</sup> The assignees early decided against continuing operations, either under the brothers, or their own direct management. Some creditors will have been aware that the business had been financially stressed for a good few years. The assignees went to law to question the legality of the re-payment of a loan of £2,500 taken out in July 1827 to fulfil a routine order for goods from the Honourable East India Company (EIC). That loan was repaid in full on 29 November 1827 but the assignees maintained that from mid 1827 the partners had been insolvent, with an 'act of bankruptcy' committed on 30 November. The ruling, that the contracted repayment did not constitute a fraudulent preference, was upheld on appeal. En passant, the evidence indicates that Thomas Gilbert managed the shop in Leadenhall Street, with William Dormer Gilbert responsible for the manufactory at Woodford and that the partners had offered to pay eight shillings in the pound at a meeting of some creditors held in December 1827.<sup>12</sup> The stock at 148 Leadenhall Street was auctioned on site on 24th June 1828 and at Woodford there was a three day sale, commencing 1 July of their 'LEASEHOLD PREMISES and MANUFACTORY, Buckhurst-hill; the extensive unmanufactured Stock, costly Fixtures and Implements in Trade; Household Furniture, Plate, Linen, China, Glass, and Effects'.<sup>13</sup> Following that brief advertisement there were more detailed ones. Of particular interest are the descriptions of the 'Picked Stock' at Leadenhall Street (Box A) and the machinery, equipment and stock at Woodford (Box B).<sup>14</sup>

The stock advertised for sale at Leadenhall Street represents the typical holdings of a London instrument-selling business. No sale catalogue survives, neither does the listing – list P, noted in the overall balance sheet – so stock quantities are unknown. The bankruptcy papers record a book cost of £1,328 for stock and fixtures at Leadenhall Street, with an estimated asset value of £371. The auction achieved gross sales of £571.<sup>15</sup> The advertisement relating to the Woodford manufactory is more revealing. [Box B] The machinery for batch grinding large numbers of lenses has been the subject of an earlier study.<sup>16</sup> Now,

To working Opticians and Others - WOODFORD. - Messrs GILBERTS valuable LEASEHOLD PREMISES AND MANUFACTORY, extensive unmanufactured Stock, Glass Mill, with Machinery and Apparatus: Dollond's complete 5 feet Transit Instrument, a costly 26 inch Circular Dividing Engine, two ditto Brass Trigonometrical Instruments; 2½ Tons of various Metals;† Erections and Fittings-up of Foundry and Workrooms; Utensils, Tools, and valuable Effects.

THE STOCK comprises a large quantity of telescope and object glasses of various focuses; reading, mirror, camera and parallel glasses; brass and other telescopes, solar microscopes, perambulators, camera obscuras theodolites, prismatic compasses, transits and quadrants, brass rolling press, silvering bench, 3000 bench and other tools, capital horse mill and lathe, several excellent foot ditto, 8-day turret clock, sets of stocks and dies, boring bits, large quantity of moulds and patterns, and a variety of valuable property, particularly deserving the attention of the trade.

Box B. Text of press advertisement for the sale at Woodford, 1–3 July 1828.

†The *Morning Chronicle* advertisement inserts 'Buildings Materials' here.

that horse powered 'glass mill' is seen in the context of the manufactory as a whole. There are various work rooms, a 26-inch dividing engine, many lathes, including one driven by the horse mill, a foundry with a large stock of moulds, and large numbers of bench and other tools. No sale catalogue survives, but the bankruptcy papers include a 20 page listing of the contents of the manufactory, with the partners' cost value of every item. These 'assets' had a book cost of £8,533 but were valued at £1,055. At auction they realised £544.

The key financial documents are the summary balance sheet certified by the Bankruptcy Commissioners, (Box C) together with associated listings.<sup>17</sup> Under cross examination Thomas Gilbert noted that wholesale ironmongers Mortimer & Co, who in effect acted as their bankers, had held a Warrant of Attorney on the business since 1820, giving them preferential right to any or all property owned by the business.<sup>18</sup> The bankruptcy papers indicate that until mid 1824 the business had been sustained by various advances, and when Stock left the partnership, most existing creditors, including those who had advanced money, agreed to be paid off at 10 shillings in the pound – but payments were not immediate, rather to be made within two years. A proportion of the debts of at least two trade suppliers date back to this financial restructuring. The 1828 bankruptcy papers allow identification of those who had advanced capital sums. Nevertheless, the business remained chronically short of working capital. Under cross-examination by the Commissioners, it appears that Mortimer & Co. had routinely advanced money at 5% for completion of EIC orders. The Gilberts paid off the 1827 loan as soon as EIC made payment, but had insufficient cash in hand to meet the demands of other creditors – and it was these creditors who forced the bankruptcy four months later.

#### *Creditor analysis*

Following examination by the Commissioners, creditors completed a pro-forma swearing to the total sum owed; usually 'for goods sold and delivered', but occasionally for 'work done' or 'wages'. Some had been given a bond or a 'Bill of Exchange' by the Gilberts, usually payable two or three months from

Bankrupt Dr	£	s	d	Pr Contra Cr	£	s	d
Debts as pr List D	11,905	2	6	Debts due considered good as per List C	681	7	11
We dissolved partnership with Mr Stock in July 1824 at which time certain Creditors having agreed to take 10/ in the pound left a balance in our favour of Capital	612	17	0	Stock at Cost prices as per List P [£]9861-0-1 valued at	1425	0	0
Profits	6,995	3	3	Loss between the Stock at Cost price and the valuation	8436	0	1
				Losses as pr List G	1714	0	11
				Expenses as pr List E	6739	15	11
				Doubtful Debts as per List C	129	14	11
				Bad Debts as pr List C	387	3	0
	19513	2	9		19513	2	9

Box C. Bankrupts balance sheet presented to the Commissioners of Bankruptcy, 17 May 1828

the date of signing, but these had not been honoured. A creditor in need of cash might realise such a bond by selling (presumably at a discount) to a third party; some third parties appear on the list. Those living away from London, provided attested sworn statements. Not all pro-forma or sworn statements have been preserved. In total 118 trade creditors were owed £5,130, in sums ranging from as little as six shillings to just under £600. 55% of the trade creditors owed £20 or less – a sub total of £410. In contrast 11 creditors were owed more than £100, their sub-total £2,898, with ironmonger Joseph Hunt owed almost £600 and optical turner Martha Grant £517, some of the latter's debt dated from the 1824 re-organisation of the business. In addition a further 18 creditors, owed £6,686, were listed separately at the end of the document, who appear to have advanced money to the partners from time to time. (Box D). In his evidence, Thomas Gilbert indicated that some of these loans dated back to the 1824 dissolution of their partnership with Charles Stock. The sworn statement of one 1828 creditor, Dorset surgeon J S Daniell, indicated that he had loaned the partners £1,290 in 1818 and had never received any interest.<sup>19</sup>

Most of the remaining business creditors can be put into three distinct groups: those from whom the business probably bought-in items for re-sale (Box E); those supplying raw materials and parts (Box F); and those supplying labour or special services (Box G).<sup>20</sup>

#### *Instrument trade creditors*

To provide a full range of instruments at their London shop, or to meet specific orders, the Gilberts bought in stock from others. In total there are 118 trade related creditors. Of these 58% were owed under £20 each, to a total of just over £400, whilst 10 creditors (8.5%) were owed over £100 each, totalling almost £2,765. Of these, Thomas Lefevre (£293) like Martha Grant (£518) had been owed money since the 1824 partnership dissolution. With two exceptions, the Edinburgh instrument maker Alexander Adie, and the Sheffield opticians Ashmore & Osborne, the instrument-trade creditors were London based. Many

AULD, Robert since 1824, their accountant	24	8	7
BERREY, John Alexander: Agent, Six Clerks Office, Chancery Lane – pre July 1824 debt	49	18	6
CORNEY & Son ? wine merchant &c, Old Broad Street	120	1	1
COWLES, Jacob: Formerly a mariner with EIC 1st officer from at least 1801, Captain 1812 & 1815; subsequently trading in London as a 'merchant'. He held an un-discharged Bill of £56.19.6 of 1823 – the whole debt dated back to pre July 1824	204	12	4
DANIELLS, Joseph Stainer: Surgeon, Blandford. Submitted SS for £1290 lent in 1818	659	2	9
DANIELL, Allen	48	0	0
EDWARDS, Thomas, Esq: Woodford. Pf for £90.	93	19	6
GREENHILL, John; Farmer, Ham Frith, West Ham Pf re loan of £350 made 13 vi 1827 to Thomas Gilbert SS re loan of £350 made 13 vi 1827 to William Dormer Gilbert	305	6	10
GREY, WITHWORTH & GILBIE Co: merchants, Leadenhall Street	239	5	8
HARMAN, Jeremiah: merchant and banker, 3 Adam's Court, Old Broad Street	2	2	0
HOOKE, John: Gentleman, New North Street, Red Lion Square. SS re annuities of £195 & £2906. Had 2 bonds of £1,500 each	3100	6	0
LOXLEY, FRY & THORN: Attorneys/Solicitors 80 Cheapside	156	17	11
MORTIMER & Co.: Wholesale Iron Mongers and tinplate merchants, Bush Lane Hugh Hamilton Mortimer – Pf cash loan £202 dates back to pre July 1824 Mortimers made a loan of £2,500 in 1827 to finance an EIC order, over which there was the legal dispute. In essence they acted as the Gilbert's bankers, frequently advancing significant sums of money. Had a warrant of attorney over the business since 1820	169	10	4
ORMISTON, James: ? merchant/banker, Bread Street, Cheapside. Held a bond of £1,000	1062	10	0
SPARROW & Co: Bankers, Chelmsford. Held Greenhill's Bill of £200 SS by Henry Simpson of Braintree: Banker + his partners James Goodere Sparrow, George Brown and William Walford – claimed owed £350 from 2 ix 1824 by the Gilberts & Charles Stock.	201	17	10
TURNER, Mathew	6	6	0
TYRRELL, Timothy: Attorney and Remembrancer to the City of London Corporation	179	2	
WILLIAMS, Wm, executors of Henry Thomas Windsor of Devonshire Square; Gentleman – Pf	61	16	4

Box D. Loans made to the Partnership. Pf = Pro-forma SS = sworn statement

of the names in Box E are of well-known instrument-makers. The purchases from Adie probably relate to the 'sympiesometer', a form of air barometer patented by Adie in 1818. A prototype had been used with success on a voyage to the East Indies in 1816 and another on the 1818 Admiralty sponsored North West Passage expedition. Users noted particular advantages over the conventional mercury barometer – the sympiesometer was more robust in the demanding marine environment and responded to pressure changes more rapidly giving earlier warning of changes in the weather, an attractive feature to the masters of EIC vessels carrying valuable cargo.<sup>21</sup>

Barometer maker John Corti, noted by Goodison as 'an important supplier of barometers to the trade', was owed over £270.<sup>22</sup> Corti presumably supplied wholesale barometers and thermometers for over-the-counter sale at Leadenhall Street, and/or provided the glass tubes for barometers. The inventory of the Woodford workshop indicates that the Gilbert's made some barometers themselves: '2 Barometer Plates, circular', valued at 10s each; plus a related set of pulleys valued at 4s.6d., and 'Barometer patterns' valued at £1; for mountain barometers there were listed 'cylinders' (£1.1s.) and 'a lot of seasoned cisterns' (£2.18s.) but there is no evidence that there were glass blowing facilities at Woodford. Money was owed to two other barometer makers, John Endicott (£30) and Joseph Hicks (£82). Both Corti and Hicks supplied goods to the assignees as they were winding up the business. It is not surprising to find two globe makers, Barden and Newton, amongst the creditors: globe manufacture remained a specialist trade, and most instrument-makers had to buy in for re-sale.<sup>23</sup> Another specialist, rule-maker John Brown Morris, was owed £161; he too supplied goods to the assignees. Amongst the mathematical instrument-makers Thomas Lefevre of Islington was owed over £290 and Charles Lefevre of Bethnal Green £134.

ADIE, A.	<b>Edinburgh</b>	M., O. & Ph. IMkr	101	7	6
ARCH, A.	Cornhill	Bookseller	1	5	0
ASHMORE & OSBORNE	<b>Sheffield</b>	O. IMkr	10	19	10
BARDIN, E. M.	Salisbury Square	Globe Mkr	56	10	6
BATE, R. B.	Poultry	M. IMkr	26	5	0
CARPENTER, P.	Regent Street	O. IMkr	10	19	6
CARY, W.	Strand	M., O. IMkr &c	1	0	0
CORTI, J.	Eyre Street Hill	Barometer Mkr	272	8	10
DE GRAVE, M. & Son	St Martins Le Grand	Scale Mkr	4	5	6
DOLLOND, G.	St Paul's Church yard	M., O. & Ph. IMkr	7	5	10
ELLIOTT, H.	Lower Ashby Street	Jeweller	24	12	0
ELLIOTT, T.	Aldersgate Street	M., O. & Drawing IMkr	68	11	0
ENDICOTT, J.	Fetter Lane	Barometer Mkr	30	1	6
GRANT, M +work performed	Kirby Street	Optical Turner	517	13	4
HICKS, J	Clerkenwell	Barometer Mkr	82	13	0
HILLIER, James	Fieldgate Street	Hour Glass Mfr	10	0	0
HOEY, W.	Blackfriars	Optician	25	7	0
HUNT, J. & Son	Tothill Street	Glass Grinders	67	13	6
JUDSON, T.S.	Waterloo Road	Spectacle Mkr	50	1	0
KNIGHT, R.&G.	Foster Lane	Ironmonger &c	20	9	3
LEALAND, P.	Somers Town	M. IMkr	23	12	0
LE FEVRE, C.	Bethnal Green	M. IMkr	134	3	0
LE FEVRE, T.	Islington	M. IMkr	293	3	2
LITTLEWORTH, W.	Mitre Street	M. IMkr & Optician	5	8	11½
LITTLEWORTH, G.	Sharps Court	M. IMkr & Optician	1	15	8
LORKIN, T.	New Gravel Lane	M. IMkr & Optician, Chandler &c	31	19	5
MARRIOTT, W.	King Street	M., O. & Ph. IMkr	4	8	0
MORRIS, J.B.	Walnut Tree Walk	Rule Mkr	161	12	3
MOULDER, J.	Galway Street	Optical Turner	66	15	0
NEWMAN, J.	Regent Street	Ph. IMkr	10	4	0
NEWMAN, R.	Somers Town	Optician & M.IMkr	13	14	0
NEWTON, J. & W.	Chancery Lane	Globe Mkr	12	18	0
PARSONS, W.	Kirby Street	M., O. & Ph. IMkr	51	19	0
PHELPS, T.	Holgate Lane	Spectacle Mkr	29	16	4
POPE, W.	Ball Alley	Naut. IMkr		17	6
PYE, H.	Nelson Bldgs	M. & Ph. IMkr	1	5	0
SCHMALCALDER, C.	399 Strand	M. IMkr	83	17	8
SHARP, S.	Drury Lane	Optician	1	17	0
TULLEY, C. & Son	Islington	O. IMkr	5	0	0
VANDOME & Co	Leadenhall Street	Scale Mkr	4	6	0
WHITEHOUSE, D.	Clerkenwell	Optician	7	0	0

Box E. Creditors: Probably Supplying Instruments &c for re-sale

M = mathematical O = optical Ph = Philosophical IMkr = instrument maker Mfr = manufacturer



ASBEY, Robert	Woodford	Bricklayer	22	11	5
BAILEY, Wm & Co.	Bankside, Southwark	Iron Merchants	5	12	6
BARLOW, Peter	Royal Military College	Professor of Mathematics	40	18	6
BARRETT, R.J. & T.	Beach Street, Barbican	Brass Founder	26	17	8¼
BLADES, John	Ludgate Hill	Cut-Glass Mfr	14	14	0
BRACHER, Eleanor	Houndsditch	Turner & Gilder	62	4	8
BRAMLEY, Robert	London Wall	Glass Mfr	59	8	0
BRIDGEMAN, John	Chigwell	Tallow Chandler	89	16	9
BRITISH COLOUR Co.	Mansion House Street	Oil & Paint Mfr	69	19	8
BRYCESON, William	Union Terrace,	Binnacle Maker & Brass Mfr	4	0	0
CLARKE, & Son	Fenchurch Street	Builders	–	15	6
COCKS, Sarah	Shoe Lane, Holborn	Pewterer	2	16	2
COOKSON & Co.,	Thames Street	Glass warehouse	11	17	8
COUCHMAN, M.	Great Bell Alley	Printer	3	2	0
COVENTON, William	Robert Street	Case Maker	17	19	0
COX, Henry	Woodford	Plumber	54	13	5
DEXTER	Mile End Road	Sack and Wagon Tilt Mfr	14	3	3
DICKENS & Co	Jamaica Wharf	Coal Merchant	220	0	0
DUNKIN & LEE	Shad Thames	Wharf and Lightermen	48	10	0
FAUNTLEROY & Son	Potter's Fields	Dealers in hard wood and ivory	5	3	6
HABGOOD	Loughton	? Corn Merchant	35	9	0
HALES, Thomas	Fenchurch Street	Wire Drawer	19	3	1½
HARFORD & Co.	Bread Street	Brass Makers, Bristol	317	9	11
HERIOT & HOLDING	Bishopsgate Within	Tin Plate Workers	1	0	6
HINDS, Thomas	Haggerstone	Cabinet Maker	87	14	0
HOLMES, William & Henry	Whitefriars	Glass Manufacturers	169	8	0
HOLROYD & JACKSON	Leadenhall Street	Slop Sellers	1	0	0
HOLTZAPFFEL & DEYERLEIN	Charing Cross	Manufacturer of tools &c	8	16	0
HUNT, Joseph	Fenchurch Street	Ironmonger	503	17	11
JOHNSON & ROSSER	Princes St, Westminster	Emery & Glass-paper Mfr	5	6	6
JOHNSTON, BROOKS & Co	New Street Sq, Holborn	Brass Founders	1	12	0
JONES, Peter	Leadenhall Street	Glazier	26	16	5
JONES, WIGGINS & Co	Aldgate	Stationers	12	14	0
MACKENZIE, & Co	Cornhill	Druggist	10	13	0
MERRILL, J	Houndsditch	Tin Plate Worker	27	0	8
MERRIMAN & Co.	Leadenhall Street	Tin Plate Workers	30	0	0
OLIVERSON & DENBY	Frederick's Place	Solicitors	29	13	3
PARBURY, ALLEN & Co	Leadenhall Street	Bookseller	85	13	0
PARLOUR, Samuel	Addiscombe	Teacher of Mathematics	10	9	0
PEACOCK & BAMPTON	Salisbury Sq, Fleet St.	Stationers	28	3	0
PONDLER & Son	St George's East	Timber Merchant	95	11	5
REEVES & Son	Holborn Bridge	Colour Makers	3	18	10
ROOKER, J	Kennington	Inst. Divider	113	7	5
ROWE, KENTISH & Co.	Change Alley	Engraver	7	1	0
SCANTLEBURY, Robert	Clerkenwell	Shagreen Case Maker	32	2	4
SEYMOUR, W.	Lime Street	Plumber	6	2	5
SIMPSON	Leadenhall Street	Drapers		10	6
WILCOXON & HARDING	Lombard Street	Looking Glass Mfrs.	4	14	0

Box F. Creditors: Probably supplying parts, raw materials or services

BARTON	Woodford		1	17	4
COLE	Woodford		1	16	0
COUCHMAN, Selby Including goods supplied	5 Regent Street, Limehouse		8	0	0
CROUCH, George	Grays Inn Lane	M.IMkr	2	13	0
GILBERT, Henry	Woodford		47	6	0
GRANT, M Including goods supplied	Kirby Street	Optical Turner	517	13	4
HIDER, Edward Walter	Woodford		9	4	4
PRITCHARD, Edward	New Port Street	M.IMkr	24	1	0
SMITH, James	Woodford	7 weeks & 4 days	5	7	0
SMITH, Thomas	Hope Street, Hackney	O, M & Ph IMkr	1	10	5
SWASLAND, James	Woodford	6 weeks	13	4	0
SWYGART, Joseph	Woodford & 34 Crown Street, Grays Inn Lane	5 weeks	9	3	10
USALL	Woodford		5	15	0

Box G. Creditors: owed for 'work and labour' or 'wages'

### *Supply chain creditors*

Given that one of the machines at the Woodford manufactory was for bulk grinding lenses, it is not unexpected to find glass manufacturers W. & H. Holmes of Whitefriars owed £169, and Robert Bramley of London Wall £60. The renowned manufacturer of cut glass, John Blades of Ludgate Hill, was owed £15: he probably supplied the prisms, the key part of the patent compasses made by the business. There is an iron merchant and three ironmongers amongst the supplying creditors, with Joseph Hunt of Fenchurch Street claiming just over £500: he was one of the petitioning creditors who forced the bankruptcy. It would be interesting to know what was supplied by these ironmongers. From at least 1811 the Knight business had also been selling chemical and philosophical instruments,<sup>24</sup> so they might well have been supplying instruments for re-sale. Bailey and Hunt may have been responsible for many of the small tools, screws, hinges etc listed in the Woodford inventory, perhaps also supplying raw tube used to make telescopes. A timber merchant (Pouler) was owed £95. Messrs Fauntleroy & Son, as dealers in hardwood and ivory, supplied material used to make instrument parts. Cabinet maker Thomas Hinds was owed almost £88: perhaps he made the high quality instrument boxes. There was a debt listed to Harford & Co. of Bread Street, backed by a sworn statement from John Scandreth Harford of Blaise Castle, Bristol, claiming £397 on behalf of himself and other partners in Harfords and Bristol Brass & Copper Company. The Gilberts had issued this brass-supplier promissory bonds for £50, £81 and £86. Though the Woodford manufactory had its own foundry, their creditors include Messrs Barrett, brass founders of Beech Street, Barbican, owed just under £27.

### *The workforce*

'Debts due by the Bankrupt' closes with a short list headed 'Woodford Men': the workforce employed at the manufactory; in addition there are pro-forma by independent craftsmen for 'work and labour'. (Box G) Both Selby Couchman (possibly a printer) and Martha Grant (optical turner) were owed for goods supplied and for work done. Henry Gilbert is presumably Henry Robert Gilbert, apprenticed to his father in 1798, but not recorded as taking his freedom. No apprentices are mentioned in the bankruptcy papers, though William Murrell had been booked to W D Gilbert in 1822 and another, Alfred Chrislett, turned over from another master in 1825, both in the Spectacle Makers Company, which their master had joined by purchase in 1813.<sup>25</sup>



Ja. BAILEY	Wages	11	1	0
T. DEAN	Wages		5	0
T. GAUNT	Work Done		2	0
Jas. HILLIER	Work Done	2	12	0
Jos LAW	Wages	13	12	0
W. LITTLEWORT	Work Done	18	1	0
Jno MURRELL	Wages	25	1	0
Jos PALMER	Wages	15	0	0
T. PHELPS	Work Done	1	12	0
Andw ROSS	Wages	23	1	0
J. SMITH.	Work Done	32	8	0
C. WEST	Wages	21	1	0

Box H. Wages paid by assignees during winding-up of business

In liquidising the business assets, the assignees purchased goods, presumably to satisfy cash customers, and were responsible for running costs. They also paid wages, perhaps to bring goods into a state suitable for being sold at the Leadenhall Street auction, and at Woodford. Ironmonger Joseph Hunt (owed almost £600) was allowed £26 for his expenses 'going to and from Woodford'. These were among the costs fully met from the proceeds of the estate. The additional wage costs in Box H provide another indication of workforce size. 'Wages' and 'work done' suggests the former being existing employees, the latter contracted for specific tasks.

'C. West' (Charles Harbeson West), clerk and shopman at Leadenhall Street, gave evidence to the Commissioners that creditors had been told they would receive payment on 1 December 1827. On that date the brothers had only £20 cash in hand and West was instructed to turn away a crowd whose debts he estimated as totalling between £500 and £600. Andrew Ross, due £23 of wages, was subsequently to make a name for himself as an optical instrument maker. Ross is said to have been the Gilberts' foreman at Woodford.<sup>26</sup> He does not appear on the list of debts due to Woodford Men, nor did he submit a pro-forma for wages due. Perhaps the Gilberts valued his expertise, and made sure his wages were promptly paid? Ross' obituary records that it was whilst working for the Gilberts he assisted Professor Barlow in his attempts to produce a fluid lens, and that he divided the astronomical circle for the Cape Observatory.<sup>27</sup> Leaders of the trade learnt of Ross when he submitted proposals for correcting the errors in the dividing engine to the Society of Arts in 1830, receiving a gold medal plus a 50 guinea bounty, and having his proposals and designs widely published.<sup>28</sup>

#### *Debts owed to the Gilberts*

The Gilberts' books were combed for outstanding invoices, producing a list of 'Debts due to the Bankrupt's Estate'. There are 244 entries, but no indication of how long accounts had been outstanding, nor any explanation of why debts were classified 'good', 'bad' or 'doubtful'. The total sum owed to the business was given as £1,198 of which £337 was graded 'bad', and £130 'doubtful'. A bailiff was employed to liquidise the debts: he was paid a pound a day and charged for 21 days, clawing back £166 from 36 debtors. He also charged £3 for postage. Nine debtors paid the assignees directly, bringing in a further £80, including a payment by the EIC of £54. Of those owing money to the Gilberts, 28% owed under £1 and 44% owed between £1 and £5. The assignees and their bailiff were most successful in obtaining payment from the small 'good' debtors. The Gilberts' role as instrument makers to the EIC is underlined by the fact that a third of the debts are associated with goods provided to staff at East India House, to the Military Stores at EIH, to teachers and students at their military and administrative academies at Addiscombe and Haileybury, with the major proportion being to past and present EIC officers and ships, or to captains of Ships chartered by EIC for single voyages.

The debtors include a further 17 masters of other trading vessel, plus three naval officers. One of these (owing £8) was Edward Kendall, who as a naval surveyor had sailed on the arctic expeditions of Parry (1824) and Franklin (1825–7), and on being commissioned Lieutenant joined HMS *Chanticleer* to undertake surveying work in the South Atlantic.<sup>29</sup> The nine invoices logged to EIC ships were presumably for official navigating and related equipment, with those to officers for personal use or as goods shipped as part of the personal trading allowance: telescopes which might sell to well-heeled passengers, or instruments that could be traded at ports of call. Two such accounts, to Captain John Blanchard of EIC *Marquis of Wellington* and to First Officer John Hillman of EIC *Scaleby Castle* are noted as reduced by goods returned. Henry Bell, who owed £10, sailed as Third Officer on *Surat Castle* in the 1815–6 season and completed four other voyages, but he had died and the debt was therefore classed as ‘bad’.<sup>30</sup> Of the eight debts exceeding £20, the largest, both ‘bad’, are to captains of vessels trading to India. William Atkins Bowen, was Fourth Officer of EIC *Calbalva* 1811–12, rising to Second Officer on his third voyage. He was Captain of *Kingston*, chartered by the Company for a voyage in 1818 and again in 1820. Bowen then sailed her to India on his own account. He owed the Gilberts just under £100. The Captain of EIC *Windsor*, Thomas Haviside, had two separately entered ‘bad’ debts, for £10 and for £94. Another Captain, William Hornblow of *Moir*, chartered by the Company in 1819 owed £57, but this was classed as ‘doubtful’ and not recovered. Perhaps the Gilberts were cutting deals with EIC mariners for them to take goods under their personal allowance for speculative export sales, but sharing the profits with the Gilberts. Merchants A D Welch of Leadenhall Street owed £26: they paid two-thirds to the bailiff and the balance to the assignees. Their relationship to the Gilberts was as buyers for resale; they specialised in fitting out those going to India for the Company on civil, military or naval service. Their list of ‘necessaries for a midshipman’, included goods the Gilberts made: ‘Case of Instruments, Gunter’s Scale, Pairs of Compasses, Quadrant, Telescope’. The debtors included other London instrument-makers who were buying from the Gilberts: Thomas Jones, a mere four shillings; W & S Jones, £2, which they paid to the bailiff. The nautical brazier and compass maker Grant Preston returned goods worth £2, leaving 10s. outstanding. The ‘bad’ debt of £55 owed by James Gilkerson may date back to the period when the two concerns were working in partnership. York optician Elizabeth Wisker was listed as owing a ‘doubtful’ £2; London-trained instrument maker George Stebbing, operating from Portsmouth since the turn of the century, a ‘good’ £20. The Gilberts had long been providing stock to the provincial trade. Chester watch and clockmaker Robert Fletcher advertised in 1810 that he had ‘just received from the well known house of Gilbert & Co, opticians in London (late Gilbert and Wright) a fresh supply of Achromatic Telescopes, with three and six magnifying powers on brass stands, Day and Night Glasses, and some portable ones for the pocket’.<sup>31</sup> The 1819 instrument catalogue of Egerton Smith & Co. of Liverpool listed ‘Gilbert’s best achromatic Telescopes, on brass stands, with claw feet, extra magnifying powers, and astronomical eye pieces, in mahogany cases, from 18 inches to 3 feet long, ... Gilbert’s best day and night Glasses, with shades’.<sup>32</sup> Provincial retailers are likely to have bought on credit, paying their supplier for goods sold when they ordered additional stock.

## The Woodford Manufactory

### *The stock inventory*

The 20 page ‘account of the Stock’ of the factory at Buckhurst Hill is unique historical evidence providing insights into a large manufacturing unit in the trade. It is not all presented as a room by room inventory; some attempt has been made to draw small like things together, perhaps to ensure that the vast numbers of hand tools listed on the first six pages did not leak off the site, secreted by disgruntled workers in lieu of outstanding wages. It continues as if working through the factory area by area. The scale of the operation can be envisaged in the final section which gives estimated cost/value for the various buildings. (Box 1) Presumably the Mill shop was the location of the ‘capital horse mill and lathe’ with the ‘Glass Mill’ powered from the same source. Both are highlighted in press advertising for the dispersal sale. That there was a ‘Mill Stable’ indicates that the horse which drove the mill was not housed in the Buckhurst Hill Lodge ‘four-stall stable’ with its associated ‘double coach house’.<sup>33</sup> Much of the machinery and

Estimate of Old Shop including the Benches and fitting up	470	2	4	
Covering the Mill Track	30	0	0	
[Estimate] Turning Mill Shop including fittings &c	97	9	0	
Do Brick dividing room – fittings &c	67	2	5	
Do Foundry including the furnaces fittings &c	131	14	0	
Do Middle Shop fittings &c	110	4	0	
Do Soldering Forge	5	9	0	
Do Cart and Lumber Shed	52	2	4	
Do Small Wood Shed	5	0	0	
Do Privies	10	0	0	
Do Mill Stable	20	0	0	
Do Sand Binn	2	0	0	
Do Large Brick Shop & fittings	158	12	0	
Do Wood Do attached & Do	67	3	2	
Do Smythy & Do	43	12	6	
Do Adjusting Room & Observatory	104	14	9	
Do Large wood Shed	19	0	0	
[Total	1,414	5	4	]

## Box I. Valuation of Woodford Manufactory Buildings

61	No. 1 Brass smooth tools	107/	326	7	0
61	do Polishers	37/	112	17	0
22	No. 2 Brass smooth tools	59/	64	18	0
22	do Polishers	20/3d	22	5	6
12	No. 3 Brass smooth tools	18/9d	11	5	0
12	do Polishers	14/	8	8	0
31	Pair of Smoothing tools	88/	136	8	0
150	Small tools and polishers	6/2d	46	5	0
28	Brass rough grinding tools	21/	29	8	0
2	Glass Grinders standards & Flanges	16/	2	8	0
	Glass Machine as per old estimate		476	4	0
	Wooden Table for Lens		1	17	6
	Brass bearer for do turned		15	12	0
	Large Tool for do		8	10	0
2	Centering Glass Machines	36/	3	12	0
140	Glass Gauges	1/	7	0	0

## Box J. Glass grinding tools

tools in this area is listed together, with the power driven lathe estimated as costing £241 whilst the Glass Machine ‘as per old estimate’, implies the installation originally cost £476. Associated with the ‘Glass Machine’ are various specialist glass grinding tools. (Box J).

The scale of production from the lens grinding mill is indicated in the sale advertisement: ‘a large quantity of telescope and object glasses of various focuses; reading, mirror, camera and parallel glasses’. These are detailed in the inventory, including two and a half tons of glass, valued at £250. Lens manufacture was undertaken on a significant scale (Box K contains only every fifth entry on the list). What is left undetermined by the extensive listing of lenses and mirrors is whether all were produced in large batches by the glass mill. Barlow’s retrospective description of the Woodford lens grinding mill opened: ‘Our

24	Pattern Object Glasses		3	12	0
41	Dozen pair of spectacle eyes to work over	2/6	5	2	6
60	[Dozen] Sextant Shades	1/6	4	10	0
57	do Various Lenses	15/6	44	3	6
54	Shades	6d	1	7	0
27	Convex Mirrors Black	3/6	4	14	6
7	[Dozen] 4 Inch Crown wirework	2/6		17	6
1087	do Flint to work	4d	18	2	4
3	do Object Glasses	4/		12	0
54	1 Foot 3 draw Common White	2/6	6	15	0
4	Object Glasses	6/6	1	6	0
40	18 Inch [Object Glasses] Crown	4/	8	0	0
80	Perspective do Crown	1/3	5	0	0
37	Erect Sextant [object glasses] White	1/	1	17	0
36	[Object Glasses] Level Telescope White	2/6	4	10	0
641	2¼ for Three feet white to rework	4d	10	14	0
6	Object Glasses	90/	26	0	0
2	3½ Triple [Object Glasses]	80/	3	0	0

Box K. Worked glass (every fifth entry only!)

best opticians never think of applying machinery for grinding the lenses of the larger and finer telescopes, though we are much inclined to believe that it might be done to advantage; but for grinding common magnifying lenses, such as spectacle glasses, and those for common pocket telescopes, &c, a horse mill is sometimes employed and hundreds of spectacle glasses ground at once.<sup>34</sup> Did the Gilberts use machinery to grind all the lenses for all the telescopes they made? Were some lenses, particularly larger aperture objectives, finished using traditional methods or were they ground solely by hand? The listing of tools does not provide a clear-cut answer, for it is only a presumption that the tools noted in Box J are solely fittings for the Glass Machine; some may have been used for conventional grinding and for finishing.

It is equally possible that some of the creditors listed in Box C, such as the optical turners Joseph Moulder and Martha Grant, and the glass grinders, John Hunt & Son, may have been finishing by traditional methods lenses and mirrors ground in bulk by the glass mill. Woodford certainly had large numbers of optical parts for telescopes of many sizes, ranging from the small sighting tubes for sextants to large aperture instruments, plus the mirrors and shades for sextants, all in various stages of completion. That the manufactory was equipped to manufacture complete telescopes is clear from the inventory; there was a drawing-bench and a wide range of conical triblets of various diameters and lengths (Box L) used to manufacture telescope tubes from bought-in raw tube (Box M).<sup>35</sup> William Gilbert, through his association with Gabriel Wright, had long been manufacturing telescopes whose draw-tubes were made from silver-plated tube, under J L Martin's 1782 patent;<sup>36</sup> the Woodford inventory includes a few plated instruments amongst the various telescopes.

Given the number of lenses and the stock of raw tube the number of telescopes (Box N) appears relatively small, but completed stock lines would be sent regularly to Leadenhall Street for over-the-counter sales.

For the historian of manufacturing techniques, the inventory is particularly revealing in the detailed listing of hand tools and machines. The Woodford workshop was set up for relatively large scale production, with the first six pages primarily listing hand tools and small machines. A flavour is provided by listing the first 20 items on page 1 and the last 20 on page 6 (Box O).

Within these pages and elsewhere in the inventory a variety of machine tools with their fittings, plus related apparatus are recorded. All items valued at over £5, and not otherwise included in Box O are

1	Large Conl Tribblet	20 Inches long	7¼ & 4 Dr	6	10	0
1	do do	20 Inches"	9½ & ½	6	10	0
1	do do	21 Inches"	4 & 2	3	0	0
1	do do	36 Inches"	3 & 1¼	3	5	0
1	do do	14 Inches"	4¼ & 1½	2	0	0
1	do do	18 Inches"	2 & 1	1	5	0
1	do do	16 Inches"	1¼ & ½	1	0	0
1	do do	7 Inches"	1 & 5/8	–	15	0
1	do do	10 Inches"	3¾ & ½	1	10	0
1	do do	9 Inches"	21/8 & 5/8	1	5	0
1	do do	13 Inches"	4¼ & 21/8	2	0	0
1	do do	42 Inches"	12 & 4½	4	10	0
1	do do	14 Inches"	2½ & 1¼	3	0	0
1	do do	9½ Inches"	6½ & 6½	2	0	0
1	Large Conl Tribblet	9½ Inches long	4½ & 4½	2	0	0
1	do do	9½ Inches"	5½ & 5½	1	15	0
1	do do	60 Inches"	7 & 4½	10	0	0
1	do do	60 Inches"	4½ & 2	7	10	0
1	Small hand wheel			1	5	0
1	Large do do and Stand			2	10	0
	Draw Bench			21	13	0
14	Tribblets		40/	28	0	0
31	Holes		25/	38	15	0

Box L. Tools for drawing tube to make telescopes

7 Feet	4½ Inch Stout Tube	5/	1	15	0
11 Feet	3 Inch Stout Tube @ pr foot	4/6	2	9	6
5 Feet	1¾ inch do do do	2/		10	0
12	Feet 1½ inch do do do	2/	1	4	0
29	Feet 1¼ inch do do do	1/6	2	3	6
63	Feet 1 inch do do do	2/	1	4	0
17	Feet ¾ inch do do do	1/		17	0
57	Feet ½ inch do do do	9d	2	2	9
20	lb of thick tube per lb	4/8	4	13	6

Box M. Tube to be drawn to make telescope bodies

in Box P. This was an extensive workshop and beyond buying in glass and tube, it was largely self-contained. There was a foundry: witness the moulding trough, eight pairs of moulding frames, and 21 pairs of moulds. The inventory notes 2 tons of brass valued at £200 together with a hundred weight of sheet brass valued at £10. There were also two forges, each with 22 inch bellows, a lined pickling trough, and a soldering forge with 18 inch bellows, plus three anvils and blocks. The casting of iron is indicated by the motley collection of iron and steel, both bar and scrap, like horse shoe nails and old files, ideal for recycling.

The inventory lists large numbers of 'patterns' or individual moulds (Box Q), plus 269 unspecified 'Templates and Gauges' valued at 2s.6d each. Together these ensured that parts were cast and machined to specific shapes and sizes. There were eight sets of patterns for theodolites, six for compasses, three for perambulators [= waywisers], three for transit instruments, two for levels and two for circumferentors, indicating that these instruments were made in a range of sizes. Only in the case of [reflecting?] circles

6	Day or Night 3 draw Telescope	25/	7	10	0
9	Level Telescopes	12/	5	8	0
1	1 Foot 3 draw plated Telescope	25/	1	5	0
1	2 Feet Stick Telescope	25/	1	5	0
1	Theodolite Telescope	35/	1	15	0
15	Sextant Telescope	21/	15	15	0
2	do do incomplete	4/		8	0
3	Extra powers for 3 feet Telescope	3/6		10	6
1	Double Gilt Opera Glass	26/	1	6	0
2	Six draw Plated do	20/	2	0	0
2	Large Brass perspective	7/6		15	0
3	do Plated do	13/	1	19	0
1	do do 3 draw do			15	0
1	Five feet trial Telescope		8	8	0
1	42 Inch do do		5	0	0
1	32 Inch do do		3	0	0
2	Short do do	55/	5	10	0
	Large Stand in Yard		17	11	6
3	Three feet Stick trial Telescope		2	14	0
	Two feet D N do do			15	0
	Eighteen Inch do do do			12	0
4	Small do do do	7/	1	8	0
1	Walking Stick Telescope		1	5	0
1	21 Inch do do			16	0
	A 3 ½ feet Stand and case		9	0	0
5	Common Perspective	1/6		7	6
19	Brass Perspectives & Stands	10/6	9	19	6
	Folding Telescope Stand & Case		7	17	6

Box N. Telescopes

were sizes (18 inch and 12 inch) indicated. The existence of so many patterns, templates and gauges does not imply that the Gilberts had embraced the idea of interchangeable parts, a principle then being pioneered and proved in the United States by John Hall and others in association with the making of rifles in the government armoury at Harpers Ferry,<sup>37</sup> rather that they were not making these instruments de novo, but manufacturing to a range of nominal sizes. The Woodford 'Manufactory' was not a factory in the industrial sense, rather a space in which the Gilberts scaled up conventional methods, probably making groups of instruments in batches with craftsmen specialising on different aspects of instrument-making.

#### *Research and development*

Close reading of the inventory indicates that William Dormer Gilbert managed a workshop that was doing more than undertaking relatively large scale production of standard instruments, fulfilling orders from the EIC, and supplying their military, marine and civilian employees. There was also the ambition to contribute to scientific advance by working with those developing novel instruments. Despite short term costs, the long term impact of success in this area would raise the profile of the business, and hopefully lead to profitable future orders. In retrospect, that was recognised by the partnership. The losses detailed in the accounts submitted to the Bankruptcy Commissioners included a sum of 'at least' £700 described as 'Losses in the Manufacture of the following new Instruments: Two fluid Telescopes: A 4 feet Mural Circle: A Polyzonal Lens: A 4 feet Standard Scale: An Instrument for working Nautical Problems'. This



39	Vices	@ 30	58	10	0
1662	Files	10d	69	5	0
163	Lathe Drills	1/	8	3	0
338	Bow Dos	1/	8	9	0
106	Bow Arbors	1/	5	6	0
115	Brass and Box Ferriles	6d	2	17	6
1	Pair 4 Feet Die Stocks and Set Taps & Dies		24	10	0
1	Pair 2 Feet 8 do & do		5	11	6
2	Pair 18 Inch do & do		17	5	0
1	Pair 6 Inch do & do		10	12	6
1	Pair 4 Inch do & do		3	18	0
1	Pair of small square do & do		4	0	0
11	Screw Plates	10/	5	10	0
11	Screw Gauges	1/		11	0
289	Taps	1/	14	9	0
1	Set screw Tool Cutters			8	6
1	Set Die do -do		12	4	6
25	Broaches Large	4/6	5	12	6
162	do Small	5d	3	7	6
915	Turning Tools	6d	22	17	6
*	*	*	*	*	*
	Sampson Post and Iron Chucks		5	10	0
	Mill Tackle		4	17	0
	Cart and Harness		9	0	0
1	Wheel Barrow		1	5	0
	Spade, Shovel & Fork			11	6
	Draw Bench		21	13	0
14	Tribblets	40/	28	0	0
31	Holes	25/	38	15	0
4	Grindstones Fix'd	80/	16	0	0
1	do Large not fix'd		3	0	0
1	do do do		1	10	0
2	Iron Cauldrons	48/	4	16	0
	Circular Plane		28	17	0
	Press Drill & Lever		3	14	0
	Wooden Table for Lense		1	17	6
	Brass bearer for do turned		15	12	0
	Large Tool for do		8	10	0
	Stamps & Dies for Platina Crucibles Steel		38	11	0
	Holes and Tribblets for Pirometers		11	8	0
	Master Gauge		8	8	0

Box O. Hand tools &c. First 20 items p 1 to last 20 items p 6 only

was qualified: 'The loss on the above Items has not been made from any account kept at the period of the losses, but from a perfect recollection of the time & the materials expended during their progress.'

*Fluid Telescope development and other work with Peter Barlow*

Gilbert's primary scientific client was the academic engineer and technical author Peter Barlow (1776–1862). From 1801 Barlow taught mathematics at the Royal Military Academy at Woolwich, and was

1	Set screw Tool Cutters		8	6	0
1	Set Die do -do		12	4	6
	Set of Boring Bits		21	16	0
	Apparatus for Boring		17	6	10
2	Iron surfaces		14	10	0
1	Large 21 Inch Universal do [slide rest and tools]		30	0	0
1	6 Inch Lathe and bed compleat		15	0	0
1	5 Inch do do		7	10	0
1	7 Inch do do		15	0	0
1	6 Inch do do		5	10	0
1	6 Inch do do Wood Turning		7	10	0
1	7 Inch do do do		15	0	0
1	6 Inch do do do		5	0	0
1	6 Inch do do do		14	0	0
1	6 Inch do do do		7	0	0
1	5 Inch do do do		10	0	0
1	5 Inch do do do		12	0	0
3	Edge Lathes	110/	16	10	0
2	Grinding Lathes	120/	12	0	0
1	Brass Eccentric Chuck		5	10	0
	Dead centers & frame		7	0	0
	Stamping Press		8	7	6
	Apparatus for true Screw & Worms		30	0	0
	Standard Scale 40 Inches		10	10	0
1	Do incomplete		63	0	0
	Dove tail slide and circle for dividing Stops		5	0	0
	Apparatus for Dividing Circular & Linear Instruments		300	0	0
	10 Feet Steel Standard Bar		28	9	6
	10 Feet Expansion bar to do		13	19	0
	Carriage Apparatus for Tracing 100 feet		8	0	0
	Oak bearer Brass frame and Carriage		14	0	0
	Silvering Slab and Apparatus		6	6	0
	Parallel drilling apparatus		26	0	0
	Set Steel Gauges Shot		10	0	0
	Brass Rolling Press		7	0	0
	File Cutters, Apparatus and tools		6	5	0
	Circular Dividing Engine		90	0	0
	Brass stand for dividing Stand		15	10	0
	Straight Line Dividing Engine		28	10	0
	Wheel cutting engine		17	0	0
	Large dead centers to lathe Beds with Spindle Chucks		17	0	0
	Bar and apparatus for focus by Solar reflection		7	0	0
	A dividing Plate		9	19	0
	Steel Yard Measure and Brass Expansion bar		7	0	0

Box P. Tools valued at £5 and above

	Sets of Theodolite Patterns		52	16	0
	18 Inch Circle do		4	7	0
	12 Inch do do		3	10	0
	Gunnery Patterns		22	0	0
	Protractor do		1	5	0
	2 Sets of Level do		5	8	0
	2 Sets of Transit do		11	3	0
	1 Large do do		9	7	6
	4 feet Circle do		29	13	0
2	Circumferentor Patterns		5	8	9
	Barometer patterns		1	0	0
	Staff head jointed do			11	0
	Variation Transit do		2	10	0
	Barlow's Plates do		1	0	0
6	Sets of Compass do		11	4	6
	Perambulator do		3	6	6
	Pendulum do		2	17	6
	Lathe do		9	14	0
	Telescope Stand do		4	0	0
	Dividing Engine do		7	15	6
5	Cog Wheel do		8	3	0
	Crane traversing do		4	10	0
	Dipping needle do			12	0
	Clock do		4	0	0
3	Wheels for Perambulators do		6	12	0
	Sundries Patterns		18	0	0
600	Sundries Small do	@ 6d	15	0	0

Box Q. Patterns for creating moulds for casting

initially known from his mathematical publications. *Theoretical and experimental work on the strength of materials*, first published in 1817 (sixth edition, heavily revised, 1867) led to his admission as an honorary member of the Institution of Civil Engineers.<sup>38</sup> In the mid-1820s, aware of the difficulty of getting optical glass for making large aperture refracting telescopes, Barlow took up a late eighteenth century proposal to use a lens filled with a suitable dispersive liquid. His published accounts of the two 'fluid telescopes' with apertures of 3 and 6 inches, acknowledged that his designs had been realised by the Gilbert business during 1827.<sup>39</sup> Perhaps aware of the Gilberts' financial situation, Barlow's paper to the Royal Society read in January 1828 noted: 'It is, however, doubtful whether I shall be able at present to pursue the experiments'. When the article was in proof, Barlow added a footnote indicating that he was to receive money from the Board of Longitude. His application for funding from the Board, indicated that the work to date had been undertaken entirely at his own expense, and asked for £200 so that he could undertake further work with the Gilberts. He got the money,<sup>40</sup> and proceeded speedily. The Gilbert workshop manufactured the three key optical parts, but the telescope tube and mounting were undertaken by others.<sup>41</sup> That was the end of this particular collaboration. Barlow's final 'fluid telescope' was funded by the Royal Society, and undertaken by the Dollond workshop.<sup>42</sup> He was pleased with performance, but others were less enthusiastic, and the design did not take off.<sup>43</sup> At Woodford, the Gilberts were left with a fluid telescope (£60), a press for fluid lenses (2s.6d.) and 'sets of fluid telescopes' (£7.12s.6d). Possibly Barlow had left one of the two instruments completed in 1827 in lieu of payment for work and materials – the partners needed cash!

Amongst the debts owed by the Gilberts is the sum of £41 owed to Barlow. Unless in extremis they had been borrowing cash from their client, that debt may well be due to a separate project which Barlow had

undertaken with Gilberts. Scientifically trained navigators had become aware that the increasing amount of iron on ships, from the armament to constructional fittings, and freight, had an effect on the reliability of the compass, the key piece of equipment used to indicate the ship's course. In 1820 Barlow published his *Essay on Magnetic Attraction* in which he drew on the facilities of the Woolwich Arsenal to undertake experiments on the impact of different masses of iron at different distances on the compass bearing and the angle of dip.<sup>44</sup> He proposed and tested the viability of an iron correction plate located in proximity to the compass binnacle, to counteract the local effect of the various masses of iron on board. Barlow sent an outline of his ideas to the Admiralty in August 1819, and a copy of his *Essay* to the Board of Longitude in January 1820. The Board, being charged by the Admiralty to investigate the matter, did so with some thoroughness.<sup>45</sup> The positive results of various naval trials were incorporated into a second (1823) edition of the *Essay*, where the expanded text included a footnote noting that the correction 'Plates, with the requisite tables were sold by Messrs. W. & T. Gilbert, 148, Leadenhall Street.'<sup>46</sup>

The significance of Barlow's work had been immediately appreciated following his presentation to the Society of Arts, when over 35 members went to Woolwich in January 1821 to see an experimental demonstration of the principle. The Society of Arts responded with alacrity, Barlow was awarded a gold medal and made a perpetual member. Election to the Royal Society (1823) was recognition by the elite of the scientific establishment. More tangible was payment of a premium of £500 from the Board of Longitude whilst the Admiralty paid him £200 'for his trouble in examining the several Compasses and Cards belonging to the Naval Service'.<sup>47</sup> Trinity House and the Board of the EIC each gave £200 in recognition of the invention of 'Barlow's correcting plate'; Czar Alexander gave a gold watch and rich dress chain following tests at Kronstadt which convinced the Russian Government that its ships should all be fitted with the plate. Mariners were told that 'The Plate, with Instructions for its use, is at present sold by Messrs. W. and T. Gilbert, in London; and we presume that it will soon be obtainable at all principal sea-ports'.<sup>48</sup>

Despite a report to the contrary,<sup>49</sup> Barlow did not patent the plate, though he may well have hoped to generate income from supervising the fitting and calibration of the device to vessels using the techniques described in Parry's *Journal*, when it was fitted in conjunction with an azimuth compass made by the Gilberts using brass from which all residual magnetism had been removed.<sup>50</sup> The Gilberts too will have hoped to sell both their compass and the correction plate: the money noted as owing to Barlow might well have been an agreed royalty on sales of the plate. Unless sales were extensive, the Gilberts cannot have expected to make large sums; the inventory indicates that they had three in stock at Woodford, valued at only 25s each, with the pattern for making them at £1. The real cost and skill was fitting them in the ship, an operation that had to await the vessel being fully loaded, and in a dock where she could be turned through 360°, and the position of the correction plate adjusted so as to counteract local attraction when sailing on any bearing. Naval hydrographer Edward Belcher noted in 1835, 'Every ship in the service can be, or is, supplied with these [Barlow's] plates, but few have yet taken the trouble to have them properly fixed'.<sup>51</sup> It was not until the Victorian era, when there were an increasing number of iron-built ships in the fleet, that the Navy universally adopted compass correction, by which time Barlow's plate had been superseded by improved methods. The 'Model of Ship', valued at £3 10s. in the inventory, might be that used by Barlow when he demonstrated the principle of his correction plate to members of the Society of Arts.

#### *4-foot Mural Circle*

In the years immediately prior to the bankruptcy, the Gilberts were commissioned to make the principal astronomical instruments for observatories being established by the EIC at Bombay and St Helena. The newly appointed astronomer at St Helena was Manuel Johnson, educated by the Company at Addiscombe, and a Lieutenant in the St Helena Artillery. He took delivery of a suite of instruments made by the Gilberts in 1827, including a transit with a 62-inch focus telescope and a four foot mural circle. Having supervised the building of the observatory, Johnson proceeded to install the instruments and use them.<sup>52</sup> He went on to be elected to the Royal Society and from 1839 served for two decades as

Director of the Radcliffe Observatory, Oxford. When the St Helena astronomical observatory was closed the instruments returned to England and in 1852, after repair and upgrading, were installed in the new observatory of Greenwich Hospital School.<sup>53</sup>

The Gilberts also completed a 46-inch focus achromatic telescope and a five foot focus transit instrument for the Bombay observatory in 1826 and they were sent to the Company's astronomer, John Curnin, sent out in advance to supervise construction of the new observatory and installation of the instruments. The mural circle was to follow. Curnin, who had lobbied for larger instruments made by Troughton, dismissed the Gilbert instruments as useless, stating that the transit instrument was 'the worst instrument and the most common that has ever been made in London for a public observatory' and returned them to London. This became the subject of a controversy about the role of the savant, the designer, the maker and the ultimate user of instruments. At the same time there were tensions caused by the competing status of the Royal Society, the Board of Longitude, the Admiralty, founding members of the Astronomical Society of London, and the political establishment generally.<sup>54</sup> The Gilbert instruments may not have been the best possible available, and as Johnson indicated, they had their faults, but he was willing and able to adapt observing methods to minimise the inadequacies. Curnin, in contrast, wanted nothing but the best. He stated that 'Messrs Gilbert are no more capable of making a circle such as I have applied for than of flying to the Moon' and wrote to one of his London contacts 'I trust in God the Honourable Court [of the EIC] has not permitted Messrs Gilbert to have a hand in the circle'.<sup>55</sup> The Company was incensed by Curnin bringing the supposed inadequacies of the Bombay observatory instruments into the public domain, and he was dismissed from his post. The Gilberts were instructed to undertake repairs to the two returned instruments, which had been damaged in transit, but their ultimate fate is uncertain. The Gilberts, however, considered that it had contributed to their losses. This seems highly probable; Dollond had estimated £300 to make the Bombay transit, and £700 for the mural circle, but would not guarantee a delivery date. As the Company's nominated supplier of instruments the Gilberts were asked to quote and their bid of £475 was accepted, but taking on the work may merely have exacerbated their financial problems. The inventory lists two sets of patterns for transits, plus another set for a large transit, and patterns for a four foot circle, valued at £11 3s., £9 7s. 6d., and £29 13s., respectively.

#### *Polyzonal Lens*

The Scottish polymath David Brewster published designs for a large polyzonal or echelon lens using stepped segments of glass in 1812, and later entered a priority dispute over the invention of what is now called the Fresnel lens.<sup>56</sup> Early in 1827, the Dollond workshop having refused to quote, the Northern Lighthouse Board accepted the Gilberts' estimate of £81 for a polyzonal lens of three feet diameter and three feet focus made to Brewster's design, using segments of flint glass. There is no evidence that Brewster visited Woodford to supervise the work. When the lens was completed Peter Barlow, at Brewster's request, tested it and demonstrated it to Trinity House prior to it being sent to Scotland and delivered to the Board in December 1827. The bill, which matched the estimate, was duly paid.<sup>57</sup> Much to Brewster's chagrin, neither Trinity House nor the Northern Lighthouse Board were immediate converts to the idea.<sup>58</sup> By the time the Board had decided to order further lenses the Woodford workshop was no more, so there was no chance to recoup losses from having under-priced. It is possible that the 'Lens Bearer', 'Wooden Table for Lens' plus its 'Brass bearer' and 'Large Tool', valued at £4.13s., £1.17s.6d., £15.12s. and £8.10s. respectively, relate to the making of this large diameter stepped lens.

#### *A 4 feet Standard Scale*

At Woodford, the inventory records a '10 feet Steel Standard Bar', with a related '10 Feet Expansion bar', valued at £28 and £14. There was also a 'Standard Scale of 40 Inches' valued at £11, and another 'incomplete' valued at £63! The latter was presumably the scale on which the Gilberts said that they had made a significant loss, and the high valuation, almost twice that of their linear dividing engine, indicates that it was intended to be a particularly precise standard. The Gilberts were not known as makers of precision metrological equipment. The prize of the government contract for making the new

central reference and county standards of the new Imperial Weights and Measures was held by one of their creditors, R B Bate.<sup>59</sup> The Gilberts made a standard length scale, a 40 inch nominal length brass scale, divided throughout its length to 1/10th of an Imperial inch on one side, and to 1 metre, subdivided to 1mm, on the other. This was owned by the University of Virginia and in the early 1830s was one of the standards brought to Washington as part of an official survey. The standard against which it was evaluated was an 84 inch brass scale by Troughton, divided to 1/10th of an inch on an inlaid silver strip.<sup>60</sup>

#### *An Instrument for working Nautical Problems*

The advertisement for the Woodford sale (Box B) mentions there being 'two costly Brass Trigonometrical instruments'. The inventory entry reads: 'Bordwines two instruments' together valued at £240. There is also the entry 'Bordwine 1st Model' valued at £4. Joseph Bordwine was Professor of Fortification at the EIA's academy at Addiscombe and his design for this instrument was first reported in the November 1823 issue of the *London Magazine*, and widely repeated elsewhere.<sup>61</sup> The analogue device was claimed to allow latitude, longitude and magnetic variation to be speedily found at sea from two separate observations of the sun, without calculation. Reports indicated that it had been patented and that 'the directors have issued orders that this instrument be used throughout their naval department'. In fact there had been no attempt to register a patent, and the extensive publicity revealed that the design had been anticipated by the 'Nautical Indicator' of James Hunter.<sup>62</sup>

#### *Other commissioned work*

In addition to the specific loss-making items noted on the balance sheet submitted to the Commissioners of Bankruptcy, the Woodford inventory points to other commissioned work. They owed £10 to Samuel Parlour, who taught at Addiscombe, initially as a classics master but by the 1820s as a teacher of mathematics.<sup>63</sup> The inventory lists 'Parlour's Model' valued at £6. This is presumably a prototype of the shoulder-mounted harness to hold a high power telescope, so the wearer could view eclipses of the satellites of Jupiter at sea, and hence find longitude. A secondary advantage would be to use a high power telescope to view ship's flag signals at a greater distance. Parlour submitted the design to the Board of Longitude in October 1824. He noted that he had tried out the device on a small coastal sloop but a naval trial judged the whole apparatus over-heavy to wear, and greatly affected by wind-load; the proposal lapsed.<sup>64</sup>

Having the business cited as a maker of novel instruments had the potential to bring in specific orders, and raise the status of the firm. Manufacturing and consulting chemist, Henry Constantine Jennings, took out ten patents between 1812 and 1850. His 'insulated' compass, patented in 1818, was the subject of very complimentary comments by James Horsburgh, the EIC hydrographer.<sup>65</sup> The design lacked scientific credibility and was ignored by the Admiralty and the Board of Longitude.<sup>66</sup> Jennings' log-glass, filled with mercury rather than the conventional sand, was better received. Along with his patented insulated compass, it was among the novel instruments tested on the 1818 North West Passage Expedition. In 1820 Jennings submitted the log-glass to the Society of Arts, backed by a certificate of performance from Captain James Ross RN, who had led the expedition. The Society judged the design 'new, ingenious and likely to be useful to the naval and mercantile service', and he was awarded a silver medal.<sup>67</sup> The printed account added: 'these glasses have been much approved of by nautical men; they are manufactured by Messrs W & T Gilbert, mathematical instrument makers for the Honourable East India Company'. Thomas Lynn, formerly an EIC Commander, and now the owner of a nautical academy based at 148 Leadenhall Street, and the EIC navigation examiner, provided a further plug, describing log-glasses, filled 'with mercury instead of sand, which turned one way run half a minute and the other way a quarter of a minute; these glasses being proof against wet or dampness, are far preferable to sand glasses. They are supplied by Messrs Gilbert.'<sup>68</sup> The Woodford inventory lists three of these log glasses, value at £1 each.<sup>69</sup> Jennings submitted an example of a parallel rule with setting screw to the Society of Arts in 1821, indicating that the Gilberts were making them. A silver Isis medal was initially recommended, but



on re-committal the design was judged 'not superior to others already in use'.<sup>70</sup> Perhaps the 'bad' debt of £2 due by the irascible Jennings, relates to this instrument.

In 1824, Nicholas Hill's published design of a novel form of pyrometer for measuring high temperatures, closed: 'These instruments are made by Messrs. W. and T. Gilbert, Opticians, Leadenhall-street; and by Mr. Newman, Philosophical Instrument-maker, Lisle-street, Leicester square.'<sup>71</sup> Having tooled up to make them, using platinum for the key parts – the inventory lists 'Holes and Tribblets for Pirometers' valued at £11 and an associated 'Master Gauge', valued at £8 – the Gilberts must have presumed further orders, but the design does not appear to have had any impact. The same would appear to be true of another inventory entry for 'Moyle's Mining Instrument', valued at £9. M P Moyle (1788–1880) was a physician and surgeon at Helston, with active interests in Cornish industry, and remembered for his daily weather registers maintained from 1821 to 1879, and analyses of impurities in the air in Cornish mines.<sup>72</sup> He is known to have designed a simple clinometer,<sup>73</sup> but the valuation of this instrument implies a more sophisticated theodolite-like design. One design that did go into production was the adaption of the standard protractor by Charles Chaplin, instructor in military drawing and surveying at Addiscombe.<sup>74</sup> The inventory lists '7 Chaplin Ivory Protractors' valued at 37 shillings each. Their use was long taught to Addiscombe students. In 1824 the Company Ordnance Department at Bombay held: 'Protractors, circular, Chaplins'.<sup>75</sup> After closure of the Gilbert business, others instrument makers continued to produce the design.<sup>76</sup>

## **Decline of the business**

### *Payment of dividend*

Announcements of a meeting, scheduled for 23 March 1830 to declare a dividend on the partners' estate, appeared in late February. The Commissioners completed a pro-forma authorising a dividend on the Gilberts' business estate. By this date the assignees had liquidated a further £266 of outstanding invoices, but at the same time a further £526 of debts had been proved by their creditors, and due payments of £508 had been made. This left £296 to be divided amongst creditors owed £10,109. The Commissioners declared a miniscule dividend of 'sixpence halfpenny', leaving a balance in hand of under £9. The books were finally closed in June 1835, with most of the balance paid in administrative expenses, and 18s. left in the account of the partners.

### *Dissolution of the Partnership*

The Gilbert business continued. The Certificate of Conformity having been issued in late June 1828,<sup>77</sup> they were free to resume trading, though the Woodford manufactory was gone. They issued a 26 page pamphlet in 1829 describing their new mountain barometer,<sup>78</sup> and by September that year they had adapted P M Roget's log-log scale (1815) for use on a twelve inch diameter circular slide rule.<sup>79</sup> Thomas Gilbert booked two apprentices in 1829: the brothers John T and George W Schmalcalder. Their father was an instrument maker with a sound reputation. He had business links with the Gilberts, who since at least 1815, had been making and selling the 'patent azimuth and surveying compass' under licence from Charles A Schmalcalder, since 1812 patentee of the key prismatic viewing element.<sup>80</sup> Unlike the Gilberts, Schmalcalder was not a member of a City Company and so was unable to give his sons the opportunity of the advantages of membership. William booked an apprentice in 1830.<sup>81</sup> The business could benefit from some cheap labour, and the parents of most apprentices were expected to pay a premium, though Schmalcalder's sons might have been enrolled as a favour, perhaps even in lieu of past payments for use of his patent. However, the brothers dissolved their partnership two days after the 1830 dividend announcement, 'by mutual consent'. 'All debts owing to and by the said partnership will be received and paid by the said William Dormer Gilbert, who will in future carry on the said business'.<sup>82</sup> Thomas Gilbert washed his hands of instrument-making. He and his family went to South Australia with the first group of settlers to the free colony established under the 1834 South Australia Colonisation Act. In London he had been appointed the official Colonial Storekeeper and became a well-regarded member of the new

community, acting as the first postmaster, serving as a JP, a member of various civic committees, and a founder member of a Masonic lodge. He retired as Storekeeper in 1854 and was awarded a government pension. He died in 1873, aged 84. Gilbert Street, in the centre of Adelaide, is named in his memory.<sup>83</sup>

### *Ambition and nemesis*

Given the number of special commissions, it is clear that the Woodford workshop was attempting to lift the status of the business, wanting to be recognised as constructors of precision instruments for leading-edge scientific work.<sup>84</sup> With outstanding loans, and unable to repay investors even an agreed ten shillings in the pound in 1824, the Gilberts might have used the financial cushion of orders as mathematical instrument makers to the EIC to emulate the Holborn business of W & S Jones, and concentrated their efforts on producing off-the-shelf instruments, advertising availability through priced catalogues.<sup>85</sup> Having relocated manufacture to Woodford, they could have focused on working the horse-driven mill for batch-grinding large numbers of lenses to provide both themselves and the London trade with cheap optical parts. However there was an ambition to undertake technically demanding and scientifically prestigious work. The desire to emulate the Troughton workshop may explain the inventory including 'Telescope on tripod and two pendulums, unfinished', valued at £46, together with a pendulum pattern valued at just under £3. Here they presumably hoped to capitalise on contemporary interest in experiments on the length of the seconds pendulum across the globe, following Henry Kater's work in London.<sup>86</sup> The EIC astronomer at Madras took up Kater's idea, but ordered the apparatus through Kater himself.<sup>87</sup> The Admiralty fitted out an exhibition,<sup>88</sup> but there is no evidence that the Gilbert workshop had a supply contract for such pieces, though they must have hoped that the EIC would order such equipment for their overseas observatories. Doubtless it was cheering to read the published comment of David Brewster on their fluid lens work: 'we have no doubt, from our own knowledge of their ingenuity and enterprise, that these able artists will now take a more prominent place in their profession than they have hitherto done.'<sup>89</sup> When Barlow applied for Board of Longitude funding for further development of the fluid lens telescope he concluded: 'it will give me great satisfaction to undertake the direction of these operations, with the aid of Messrs W. and T. Gilbert, to whose liberal and scientific views, as well as to their practical skill and ingenuity, I have been indebted for having thus far proved the practicability of my proposition.'<sup>90</sup> Robert Jamieson closed his report of the success of Barlow's first fluid lens designs: 'we understand it to be the intention of the spirited and ingenious makers to carry the construction to its utmost possible limits. We can only say they have our best wishes. It is always gratifying to see men of sound theoretical knowledge combining their efforts with others of practical skill and ingenuity, because, from such combination of talent, we have every reason to expect valuable results. In the present instance, these interesting experiments are in excellent hands, and we cannot but look forward with confidence to their ultimate success.'<sup>91</sup>

It was not to be. However well earned, the positive comments on specific instruments such as the Gilbert dip circle,<sup>92</sup> or the patent azimuth compass,<sup>93</sup> were tucked away in large works of reference. It was not enough to save a business aiming to become a leading supplier of precision instruments, but undermined by accumulated debt, imperfect pricing, and inadequate quality control. Nowhere was the latter more apparent than with instruments supplied to those undertaking topographic and geodetic surveys in the demanding climate of India, where there was an undercurrent of dissatisfaction with the quality. Gilberts' products were frequently described as 'inferior' with respect to the output of the Troughton workshop.<sup>94</sup> When in England on leave in 1825, George Everest, later to head the survey, came armed with a recommendation from the Governor General that the EIC Directors should use him to supervise the construction of various instruments and that, in place of the Gilberts, he should be permitted to employ the firm of Troughton & Simms, 'the most celebrated artists in England'. Everest knew that one of his surveyors had judged a large Gilbert theodolite as 'utterly useless'. He recommended that the survey use tripods 'made by Messrs. Troughton & Simms, making it an express condition that they be made by these makers alone. Mr Simms and I put our heads together to devise that form, and ... they are a splendid success. They cost 20 per cent less than Mr. Gilbert's rattle traps'.<sup>95</sup> In January 1835, the Military Board indented for a batch of instruments for the 'twelve district land revenue survey parties',

and early in 1836 the instruments arrived in India. Half had been made by Troughton & Simms, and half by W D Gilbert, whose theodolites were immediately reported as 'unserviceable'. The next indent explicitly asked for supply 'entirely by Troughton & Simms, whose instruments are not only procurable at a moderate rate, but of a quality so superior as to gain confidence of every surveyor who has used them'. The EIC Directors got the message. In June 1840 they replied:

Mathematical instruments forwarded by us to India have always been received upon the good faith and responsibility of the makers. From the dissatisfaction expressed on more than one occasion (supported by a return to England of some defective instruments for inspection and readjustment) we had some time prior to the receipt of the present dispatch discontinued our orders to Mr Gilbert, and we will take great care that the parties who are now entrusted with the supply shall furnish only instruments of the most approved description.<sup>96</sup>

To the Commissioners of Bankruptcy, Thomas Gilbert admitted that they had unrealistically estimated the cost of development work. The moving of manufacturing operations to a green-field site in rural Essex allowed a change in the scale of production but appears to have been poorly thought through. Other than status, was there a need to buy an eight day turret clock (valued at £100) to regulate the working hours at the new manufactory? The astronomical observatory doubled up as an 'adjusting room' for checking out finished instruments, but did it need to be equipped with a mural quadrant and a five foot pillar mounted transit instrument by Dollond? The bankruptcy papers suggest that it was William Dormer, the eldest brother, who was the key decision maker. He drew an allowance of £65 during the bankruptcy proceedings; his brother Henry, also working at Woodford was owed £47 for wages – only slightly less than the total sum owed to seven other Woodford employees. In contrast, Thomas Gilbert received an allowance of only £39. Yet it was the younger partner, Thomas, who countersigned every page of the Woodford inventory and valuation – W D Gilbert's signature only appears on the final page. It was Thomas, living in Hackney who managed the Leadenhall Street shop and was largely responsible for answering the questions of the Commissioners and the solicitor acting for the assignees. It was the eldest brother, William, living at Buckhurst Lodge, who was responsible for the everyday manufacturing activities at Woodford, and presumably had direct contact with those who came to the Gilberts with special commissions. By implication, it was William who failed to maintain a formal record of costs for these novel developments, and the claim to have a 'perfect recollection of the time and materials expended' is undermined by the round figure lumping together five loss-making projects. In his subsequent career, Thomas was recognised as a competent administrator. William, however technically adept and ambitious as an instrument-maker, appears to have lacked the management skills to make the investment in the Woodford facilities yield commercial dividends.

The individual bankruptcy papers indicate that both brothers were living beyond the means of the business to support their lifestyles. Thomas Gilbert's household furniture and effects, together with the unexpired lease of his residence at Hackney Grove, were auctioned on 29 June 1828.<sup>97</sup> The inventory of Thomas Gilbert's household furniture &c was valued at £303: they fetched £274. His personal debts amounted to £275, with the preferable debt of wages to a servant, plus rent, rates and taxes, adding a further £74. Nineteen Hackney tradesmen were owed money, including £26 to the butcher, £6 to the cheesemonger, £6 to the grocer, £2 to the greengrocer and £9 to the oilman. Coal (£7) came from a Thames wharf and a baker in Throgmorton Street in the City was owed £17. His Savile Row tailor was owed £53, and an Oxford Street tailor £12. His wine cellar included 48 bottles of sherry, 122 bottles of old port, 90 bottles of port, and 26 pint bottles of port. Given his assets and the administrative costs of the bankruptcy, Thomas Gilbert's creditors would receive about seven shillings in the pound. William Dormer Gilbert had furniture and affects valued at £424: they fetched £327. He had twice the debt of Thomas, £569, plus preferable debts to three servants. He had fewer creditors, and the trades of most have not been ascertained. The largest debt was for £108 owed to Elizabeth and Laura Gilbert (possibly his sisters), who ran a school in Warwick and billed him for the board, lodging and education of his children. Woodford surgeon Thomas Morgan was owed £97 for medical attention to him and his family. The local butcher was owed £72; groceries to the value of £55 had been purchased in Aldgate High Street; a Whitechapel

linen draper was owed £54 and a Cornhill tailor £57. His creditors would receive around 3s.6d. in the pound.

William Dormer Gilbert continued to work as an instrument maker. The experience of personal and business bankruptcy, the dissolution of the Woodford factory, the dispersal of machinery and tools should have caused him to draw in his horns, and limit his ambitions. He was still based at 148 Leadenhall Street when Barlow commissioned him to re-design and manufacture a ‘deflectometer’, an instrument originally devised by Alfred King, engineer to the Liverpool Gasworks, to measure the effects of static and dynamic load on the permanent way of the Liverpool and Manchester Railway.<sup>98</sup> Despite bankruptcy effectively wiping the slate clean, financial stability eluded W D Gilbert. Instruments sent out to India and judged not fit for purpose further undermined his reputation and lost him the business as favoured supply to the EIC. As optician and mathematical instrument-maker of 97 Leadenhall Street he petitioned for release from the Debtors’ Prison for London and Middlesex in November 1839.<sup>99</sup> He continued in business, moving to Fenchurch Street,<sup>100</sup> maintaining a tentative link with the EIC as one of four nominated suppliers of the approved pattern cases of mathematical instruments required by cadets entering the military academy at Addiscombe.<sup>101</sup>

Dogged by financial difficulties, W D Gilbert was admitted as an insolvent debtor to the Queen’s Bench prison where he died in August 1844, aged 63, of a longstanding bowel cancer. Reporting the Coroner’s inquest, the *Morning Post* described him as ‘once a celebrated optician’.<sup>102</sup>

### **The author**

David Bryden FSA spent most of his career as a curator in national and university museums, latterly as Head of the Department of Science, Technology and Working Life at the National Museums of Scotland. His specialist expertise is in early scientific instruments, and the history of the instrument-making trade. Retired and living in rural Worcestershire, he continues to research and publish.

## Notes and references

- 1 Brown, J 1979, *Mathematical Instrument Makers in the Grocers' Company 1688–1800*. Science Museum, London, pp 34, 38–9, 47–8, 83; Clifton, G 1995, *Directory of British Scientific Instrument Makers 1550–1851*. The National Maritime Museum and Zwemmer, London, pp 112–3, 120
- 2 The evidence from Directories is inconsistent. *Johnstone's London Commercial Guide*, 1818, has Gilbert & Sons, mathematical instrument makers at 148 Leadenhall Street, and James Gilkerson, optician at 8 Postern Row, but *Post Office London Directory* for 1814 to 1817 has Gilbert & Gilkerson, mathematical instrument makers at Postern Row Tower Hill *plus* Gilbert & Sons, opticians at 148 Leadenhall Street. *Post Office London Directory* for 1820 has Gilkerson & Co, mathematical instrument makers, Tower Hill *plus* Wm. & Thos. Gilbert, opticians at 148 Leadenhall Street. *Kent's Original London Directory* for 1823 has Gilbert & Co, opticians, 8 Postern Row, Tower Hill, and W. & T. Gilbert, mathematical instrument makers at 148 Leadenhall Street.
- 3 *London Gazette* no.18076, 2 xi 1824
- 4 Clifton 1995 op cit. p 113. Declaration of Insolvency 26 iii 1828; declared Bankrupt 1 iv 1828 – *London Gazette* nos.18456, 28 iii 1828 and 18457, 1 iv 1826. See also *Gazette* notices – nos.18462, 18 iv 1828; 18470, 16 v 1828; Certificate of Conformity 18475, 3 iv 1828; 18498, 22 viii 1828; 18501, 3 ix 1828; Dividend of the separate estate of Thomas Gilbert 18512, 10 x 1828; Dividend of the joint estate 18659, 26 ii 1830. For an outline of bankruptcy procedures, and the instrument trade see Bryden, D J 2014, 'Bankrupt and Insolvent Scientific Instrument Makers: the London Gazette as a source for the history of the English instrument trade: 1720–1849', *Bulletin of the Scientific Instrument Society*, no. 123 pp 28–44 & no. 124, pp 31–38
- 5 Charles Stock, Codham Hall, Essex, married Rebecca Rankin, eldest daughter of William Rankin of Lyons, Bocking, Essex, in 1817 – *Ipswich Journal* 8 xi 1817. He died 4 viii 1835, leaving a widow and five children – *Essex Standard* 21 viii 1834. Thomas Gilbert married Rankin's second daughter Elizabeth – *Morning Post* 15 ix 1820 – see Essex Record Office: D/DS 253/9/3 for the pre-nuptial settlement
- 6 *Gentleman's Magazine*, vol 83, 1813, p 597; *European Magazine*, vol 63, 1813, p 546
- 7 Perry, J 1873, 'Chingford Old Church and memorials', *The Antiquary*, vol 3, p 288
- 8 *Morning Post* 26 iv 1820 and *Daily Advertiser* 2 v 1820, advertise the furnished let for 12 months of a 'family dwelling house, pleasure garden, hot house, kitchen garden, double coach house, four-stall stable, and other convenient outbuildings' plus 7 acres of adjoining land, and 11 acres more available – 'at Woodford in Essex, a little more than the seven-mile stone from Shoreditch Church. For further particulars, inquire of Mr. Gilbert, Optician, No.148 Leadenhall-street, London.' Presumably the property was not let – it was subsequently inhabited by William Dormer Gilbert
- 9 Bryden, D J 2010, 'The Ribrights, Opticians in the Poultry, London: and the use of powered machinery for working lenses and mirrors in Tewin (Hertfordshire)', *Bull. SIS*, no.105, pp 11–12
- 10 McConnell, A 1992, *Instrument Makers to the world: a history of Cooke, Troughton & Simms*. W.Sessions Ltd, York pp 41–42
- 11 The National Archives: B3/2034 and B3/2035 cover the individual bankruptcies of Thomas Gilbert and William Dormer Gilbert, and the pair as business partners. Bankruptcy papers were heavily weeded in the mid 19th century; those that were retained, may, as in this case, be incomplete
- 12 'Hunt &c, assignees of Gilbert v Mortimer &c', in Lloyd, J H & Welsby, W N 1830, *Reports of Cases relating to commerce, manufactures etc., in the courts of common law*. London, pp 60–64, and *Law Journal* vol 8, 1830, pp 62–64. See also *Morning Post* 30 vii 1829; *Globe* 30 vii 1829; *Bell's Weekly Messenger*, 2 viii 1829; *Perry's Bankrupt Gazette* 29 viii 1829; *London Evening Standard* 30 viii 1829; *Morning Chronicle* 14 xi 1829
- 13 *Public Ledger and Daily Advertiser* 13 vi 1828
- 14 *Public Ledger and Daily Advertiser* 18, 23 & 27 vi 1828; *Morning Chronicle* 23 vi 1828



- 15 Here, and elsewhere, sums rounded to nearest pound
- 16 Bryden, D J 2011, 'The use of powered machinery for working lenses in England: W. & T. Gilbert's horse-mill at Woodford, Essex, c.1828', *Bull. SIS.* no.109, pp 36–41
- 17 Total figures taken from summaries in the Bankruptcy papers
- 18 The preamble to 3 Geo 4, c.39 (1822) noted previous custom and practice: 'Whereas injustice is frequently done to creditors by secret warrants of attorney to confess judgements for securing payments of money; whereby persons in a state of insolvency are enabled to keep up the appearance of being in good circumstances, and the persons holding such warrants of attorney have the power of taking the property of such insolvents in execution at any time, to the exclusion of the rest of the creditors'. The new act required agreements to be registered within 21 days, otherwise they were considered fraudulent and invalid; see Chitty, J 1829, *A Collection of Statutes of Practical Utility*, vol 1, London pp 1105–6
- 19 Daniell had practiced in Leadenhall Street; see Cooper, A & Travers, B 1820, *Surgical Essays*, 2nd edn, London Pt II, pp 21–23. He suffered a 50% loss on £1290 in 1824, leaving a debt as just under £660 – ie £645 + interest
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- 21 Clarke, T N et al 1989, *Brass & Glass: Scientific Instrument Making Workshops in Scotland*. National Museums of Scotland, Edinburgh, pp 35–37
- 22 Goodison, N 1969, *English Barometers 1680–1860*. Cassell, London 1969, pp 77, 286
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- 24 Anderson, R G W et al, 1990, *Handlist of Scientific Instrument-Makers' Trade Catalogues 1600–1914*. National Museums of Scotland, Edinburgh, p 46
- 25 Clifton 1995, op cit. p 113
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- 27 *Journal of the Photographic Society of London*, vol 6, 1860, pp 52–4; *British Journal of Photography*, vol 22, 1875, p 150. The circle at the Cape was not commissioned from Ross, but from Thomas Jones – see Airy, G B 1851, 'Results of observations made by the Rev. Fearon Fallows, at the Royal Observatory, Cape of Good Hope', *Memoirs of the Royal Astronomical Society*, vol 19, p 3. The Gilberts made the ill-fated transit instrument for the Bombay Observatory and the transit and mural circle for the EIC St Helena Observatory – see below
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- 30 Careers of EIC marine personnel from Hardy, C 1820, *A Register of Ships employed in the service of the Honourable East India Company from the year 1760 to 1819*. 3rd edn, revised H. C. Hardy. London; and Hardy, C 1835, *Supplement to a register of ships employed in the service of the Hon the United East India Company*. revised H.C. Hardy, London. London-based staff, and those abroad, including EIC military officers are found in the annual *East India Register and Directory*. Merchant shipping is recorded in the annual *Lloyd's Register of Shipping*. Vibart, H M 1894, *Addiscombe, its heroes and men of note*. London; plus Danvers, F C et al, 1894, *Memorials of Old Haileybury College*. London – for staff and students at the Company's seminaries
- 31 *Chester Courant* 8 v 1810
- 32 [Egerton Smith & Co.] 1819, *Hints to the wearers of spectacles*. Liverpool, pp 9, 11
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- 34 Barlow, P 1836, *A treatise on the manufactures and machinery of Great Britain*. London, quoted from Bryden 2011 op cit. p 36
- 35 For tube drawing, probably based on Barlow's experience of the Woodford manufactory, see Smedley, E et al eds 1845, *Encyclopaedia Metropolitana*, vol 8, London, pp 341–2. Part published from the late 1820s; this section also appeared as an independent volume. Barlow 1836 op cit
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