# George Blaxland Sr.
# (1800-1874)

# George Blaxland Jr.
# (1833-1912)

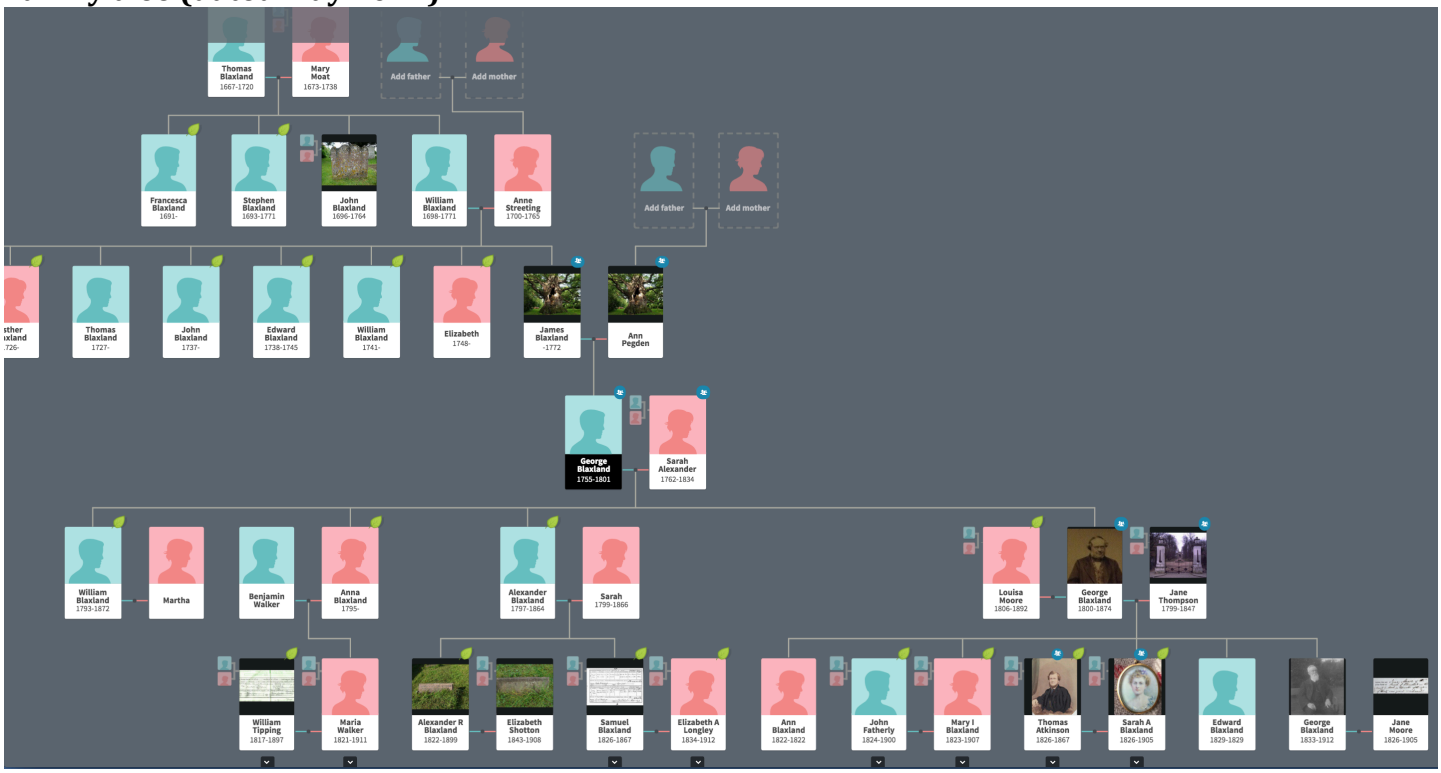
Notes from Joss Hawthorn (Jan 29, 2018)

jbh@aao.gov.au

*With thanks:*

Judith Blaxland Aisbitt (1933-2017)
Charles E. G. Pease, Kinloch, Pennyghael, Isle of Mull
Dr. Catharina Clement
Sir Richard Alexander Bt.
Dr. Stephen Blaxland, Bury St. Edmunds
Michael Fowler, Corby, Northants.
Simon Green & Brian Proctor, Historians, Gateshead, Newcastle
British Newspaper Archives
Grace's Guide to British Industrial History
A History of Naval Architecture, John Fincham 1850

**Family tree (dated May 2021):**




Our extended family has grown up with proud stories of the Blaxland achievements in exploration (Gregory) and in marine engineering (both Georges, father and son). For my family, the latter are direct relatives, and Gregory is a more distant cousin. The direct family lineage is shown with the blue symbols; green leaves just mean there are unread notes suggested by Ancestry.com. This is a tiny fragment of our very extensive tree.

## Blaxland Quaker history

The Blaxland family has a strong Quaker history up to the end of the 18th Century. George Blaxland Sr. appears in the Quaker registers of the Hitchin, Hertfordshire Monthly Meeting (HMM) and thus was evidently raised in a Quaker household. It would be reasonable to assume that his early education was a Quaker one. As noted by Charles Pease:

"My view is that as a young man, he may well have followed the pathway of many young Quakers and sought both guidance, and experience in working his way with other such families, for such was often the case. Young Quakers would seek the guidance of those more experienced, and find a place with a reliable family which would have met with the approbation of their peers, the nature of a very close society whose members kept themselves very much to themselves. It may be that George gained his initial experience away from home, and his nautical inclinations would possibly lead him to some port or place that might prove to his later advantage. There are two points there that I find telling: first, Jarrow was a place with a strong nautical background, thus a logical place for George to gain some early experience of his craft.

The second point is that in the marriage document (see below), it is written that Joshua Richardson (a Friend, or otherwise called a Quaker) Solemnly Affirms (since Quakers do not take Oaths) that he understands that no record of George's birth is on record (because he was brought up as a Quaker) but that he is of full age (21) to marry. Joshua was mistaken, for the HMM did record his birth, and of course, George was of full-age to marry. But this marriage was not according to Quaker tradition and from it we might presume two more things. First, that George married Jane outside the Quaker manner and, secondly, that Jane was not a member of the Society of Friends. One may also infer that George had become distanced from the Quakers and chose to accept the more Worldly nature of general society, or that he was simply prepared for the consequence of that time, of marrying a non Quaker – Disownment.

Disownment was a heavy sentence for a Quaker, a sort of ex-communication. It entailed being excluded from the Society in any formal sense, but did not exclude one being able to continue to attend Quaker meetings. The general remedy to that was to persist in attending Quaker meetings and over time, make it clear by both expression and action, that one regretted having strayed from the path and display a sense of deepest contrition, following which there was a chance of gaining one's re-admission to the Society. A bonus would be that the outcasts' spouse, rejecting worldly ways, became a Quaker too."

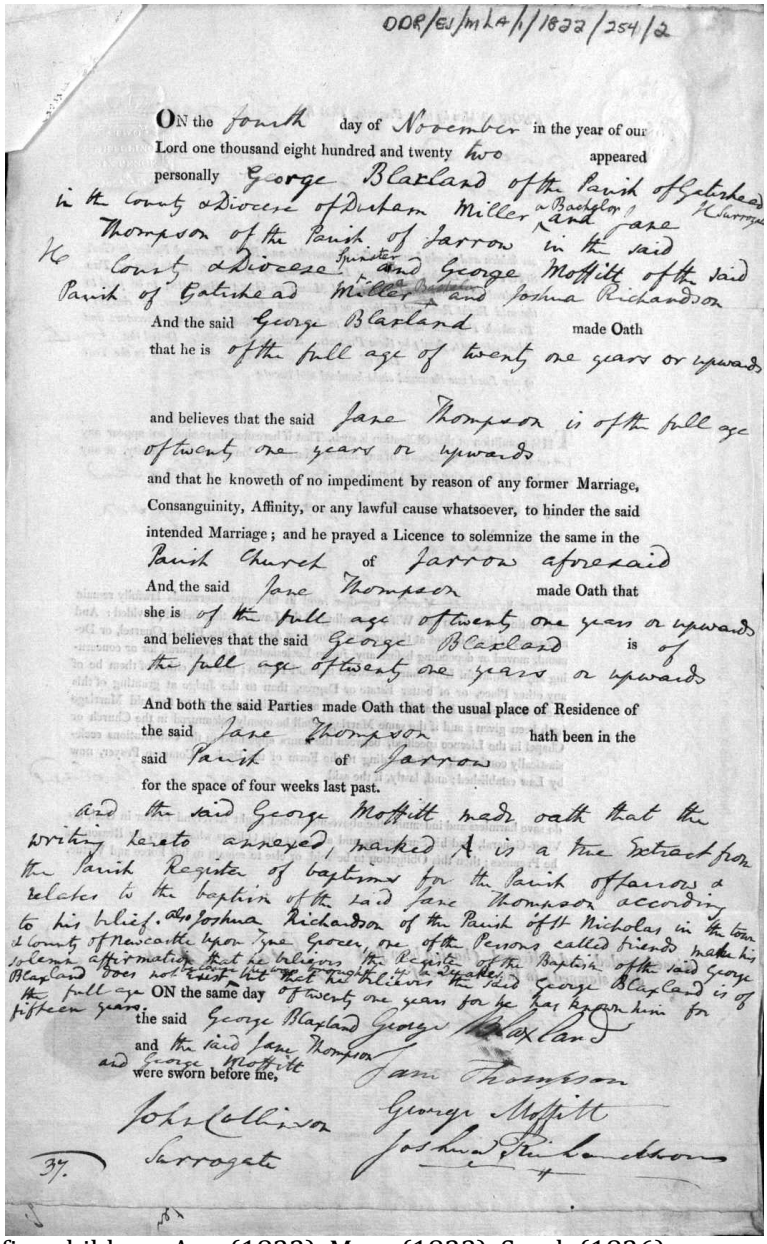
My sense is that the Blaxlands were never too far removed from the Quaker tradition because the various registers (see below) continue to record details about father, son and later offspring.

## George Blaxland Sr. – forebears

According to Michael Fowler (2nd cousin), George Blaxland Sr.'s father George was a school master in Hitchin. His mother was Sarah Alexander and her parents William and Elizabeth also ran a school in Rochester where they must have met. George Blaxland Sr. was born in 1800, the last of four children, with his father dying on 1st Feb 1801 aged only 46. Sarah continued to run the school and then married John Tanner Richardson in 1808.

Michael has done excellent research on the amazing Quaker school system at that time and place, and there were numerous impressive pupils that appear in the Dictionary of National Biography, e.g. Samuel Tuke, renowned mental health reformer. Hitchin Quakers established Ackworth in Yorks (http://www.ackworthschool.com/). Sarah's father William served his apprenticeship as a shipwright in the dockyard till 1775/6. As a Quaker he was a pacifist and left the dockyard and set up a Quaker school in Rochester run first by himself then William Rickman. One presumes George Blaxland served his apprenticeship as a schoolmaster at the school where he met William's daughter Sarah, marrying her on 5th September 1792, then setting up his own Quaker school at Bancroft, Hitchin.

I have not been able to find much on George Sr.'s early years although he is discussed in Grace's Guide to British Industrial History. The marriage document indicates that, at the age of 21, George was a "miller." At some point, he formed an interest in marine engineering and became Superintendent of H.M. (Royal) Dockyard at Sheerness, Kent. I discuss much of this below. In 1874, he died at Gillingham House, Gillingham, Kent; I still retain his original letters.



DDR/EJ/MLA/1822/254/2

ON the fourth day of November in the year of our Lord one thousand eight hundred and twenty two appeared personally George Blaxland of the Parish of Gateshead in the County & Diocese of Durham Miller a Bachelor and Jane Thompson of the Parish of Jarrow in the said County & Diocese Spinster and George Moffitt of the said Parish of Gateshead Miller and Joshua Richardson

And the said George Blaxland made Oath that he is of the full age of twenty one years or upwards

and believes that the said Jane Thompson is of the full age of twenty one years or upwards

and that he knoweth of no impediment by reason of any former Marriage, Consanguinity, Affinity, or any lawful cause whatsoever, to hinder the said intended Marriage; and he prayed a Licence to solemnize the same in the Parish Church of Jarrow aforesaid

And the said Jane Thompson made Oath that she is of the full age of twenty one years or upwards and believes that the said George Blaxland is of the full age of twenty one years or upwards

And both the said Parties made Oath that the usual place of Residence of the said Jane Thompson hath been in the said Parish of Jarrow for the space of four weeks last past.

and the said George Moffitt made oath that the writing hereto annexed, marked A is a true Extract from the Parish Register of baptisms for the Parish of Jarrow relative to the baptism of the said Jane Thompson according to his belief. Also Joshua Richardson of the Parish of St Nicholas in the town & County of Newcastle upon Tyne Grocer, one of the Persons called Friends maketh his solemn affirmation that he believes the Register of the Baptisms of the said George Blaxland does not exist but that he believes the said George Blaxland is of the full age of twenty one years for he has known him for fifteen years.

ON the same day the said George Blaxland George Blaxland and the said Jane Thompson Jane Thompson and George Moffitt George Moffitt were sworn before me, John Collinson Joshua Richardson

Surrogate

37.

## George Blaxland Sr. – First Marriage

Jane (Thompson) Blaxland was born about 1799. This is approximate, since the normal civil records are incomplete when compared with the much more exacting Quaker method of recording just about everything about a person. Nevertheless, the absence of a Quaker record suggests that Jane was not a Quaker.

*FindMyPast* (not *Ancestry*) provides crucial independent evidence of this family. In 1841, George Blaxland Sr. (40, engineer) was living in Wish Cottage, Woolwich Road, Greenwich, with his wife Jane, children Ann (17), Mary (16), Sarah (14), and George (7), together with Mary Thompson (25) of independent means and John Hudson (25, engineer). This is strong corroboration of Jane as mother of George Jr. Mary was clearly her sister.

The marriage document is shown here. George and Jane were married at Jarrow, Co. Durham on 4th November 1822. Note that both George and Jane's signatures are recorded. *Ancestry* trees link to the wrong Jane; I will communicate this to the different families. Being of the full age means they were both on their first marriage and about 21. George & Jane had five children: Ann (1822), Mary (1823), Sarah (1826), Edward (1829) and George (1833); Sarah is the direct descendant of our family line. Michael Fowler suggests that Ann and Edward died young because they disappear from the record after the family move to Gateshead.

**Windmill fire of 14 February 1824 and what followed.**

After I contacted him via the Carr's Hill wikipedia page, Gateshead historian Simon Green found some intriguing documents on the Tyne valley windmills and George Blaxland's role (May 2021).

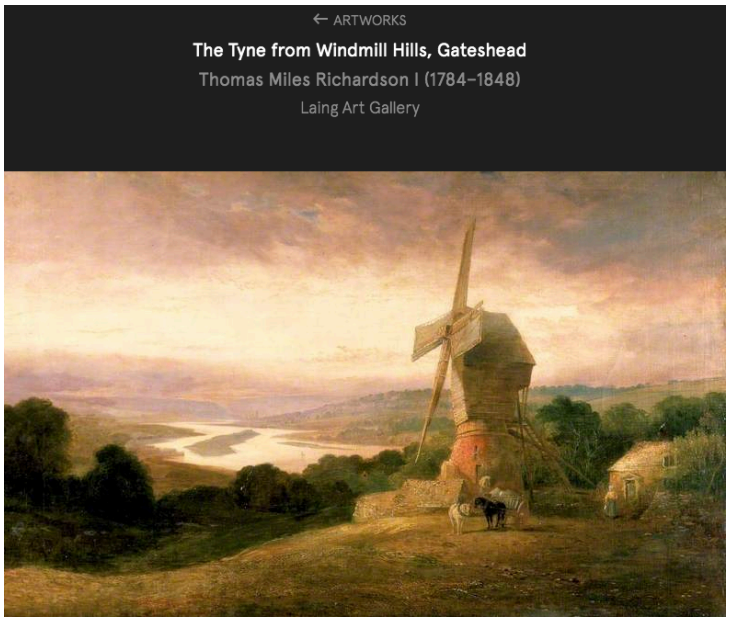
This document shows that George was in possession of a windmill in his early 20s. This report implies that George, at only 23 years of age, was already suffering ill health. Recall that, at the age of 21, George is recorded on his marriage certificate as a miller (aka milner). Just a few years' later, George & Jane, with their two young children (at this time) managed to escape a windmill fire unharmed. As it turns out, the fire occurred in suspicious circumstances.

**GEORGE BLAXLAND 1823.**

Newcastle Courant April 26th 1823, To be let and entered upon immediately. A wind corn mill on the Windmill Hills has three pairs of millstones , a bolting & shelling mill ,with every other convenience for the **manufacture of flour .** The tenant will fall into a beneficial business, which is at present attached to the mill. Apply to Mr George Blaxland who is under the necessity of declining in consequence of ill health. Two horses ,two carts & other materials ,may be had at a moderate valuation. Windmill Hills 24th April 1823.

The incident was reported a week later in the Durham Chronicle, Saturday 21 February, 1824:

**On Saturday night last, about 10 o'clock, the windmill belonging to Mr Geo. Blaxland, at Carr's Hill, near Gateshead, was discovered to be on fire. The flames raged with such fury by 11 o'clock, as to alarm the inhabitants of the surrounding district to a considerable distance. The fire engine from Gateshead about this period arrived at the spot, but *without their pipes*, and about 12 o'clock an engine of the Newcastle Fire Office made its appearance, but it came too late to be of any service, as the devouring element had destroyed almost every thing about the mill capable of being consumed. Measures were taken to cut off the connexion with Mr Blaxland's dwelling house, which was adjoining, and though the family had retired to rest, they succeeded in escaping and carrying off the furniture in safety to a neighbour's. The property was insured. As the mill had not been at work since the morning, and the premises had been examined, and appeared secure, a short time before the fire, doubts are entertained how it originated.**




This was the age of windmills, and the Tyne valley and surrounding hills in Newcastle had several large facilities. Mackenzie's 1834 history of Durham indicates that Carr's Hill had three wind-powered mills: Carr Hill Mill (dating back to 1662), Felling Mill, St John's Mill (that replaced George's mill). But there were four mills – see below.

It seems that the fire was treated as suspicious and there may have been an investigation. The iron was valuable and must have been removed and stored before the fire broke out.

In the following year, George was in financial difficulty which is odd if the windmill was insured. If the investigation raised suspicion, he would not have been able to claim any money.

**NEWCASTLE CHRONICLE February 28th 1824 , page 3.**

In our last week's paper we mentioned that the Windmill belonging to Mr George Blaxland , on Carr's Hill had been burnt down ; since then a quantity of the iron ,having been discovered concealed about the neighbourhood , strong suspicions have been excited that it has been thework of incendries.

The retyping of original notes come from Brian Proctor, communicated by Simon Green. I need to search for the original article on BNA.

The following articles from 1825-6, in the years after the windmill fire, are excellent finds. The note "Bankrupt?" comes from Brian Proctor. The indication here is that George Blaxland had declared bankruptcy, presumably because the insurance was not paid, but see below for another possibility.

The article seems to imply, possibly, that the insurance money was paid out to replace the windmill at the same location. Otherwise, where did this money come from? Did the cost of rebuilding drive George to bankruptcy?

Either way, it appears that George was looking to sell the windmill property in early 1826. Note that Mr Ingledew is once again involved, and so this may have been part of the ongoing bankruptcy process.

It's impressive that, just a decade later, George had reinvented himself, and become very successful, as did his son George. He must have been very resourceful and inventive by nature.

**George Blaxland ( BANKRUPT ? )**

Newcastle Courant August 13th 1825 page 1.

Whereas George Blaxland of Carr's Hill near Gateshead in the County of Durham , miller ,hath by indenture of lease ,release ,and assignment ,bearing date respectively on the 28th and 29th days of July last conveyed and assigned all his estate and effects bothe real and personal ,until a trustee , in trust for the equal benefit of such of his creditors ,as shall execute the same , on or before the 29th August instant. Notice is thereby given that the same release and assignment is lodged at the office of Mr Henry Ingledew, solicitor , Dean Street ,Newcastle upon Tyne for the perusal and signature of the creditors of the said George Blaxland ,who may choose to accept of the provision thereby made . All persons indebted to the said George Blaxland are requested to pay their respective debts immediately to Mr Ingledew.

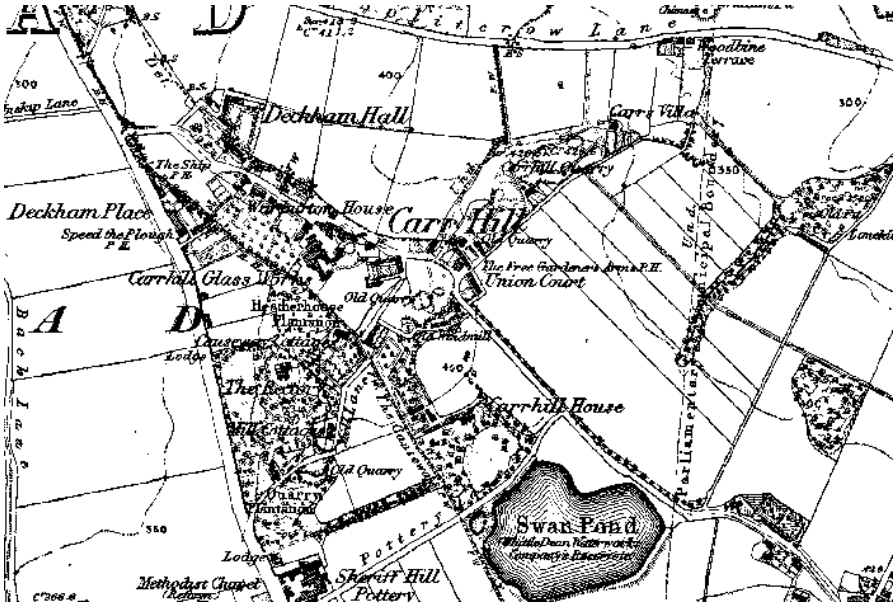
**WINDMILL AT CARR'S HILL**

Newcastle Courant 7th ,14 , January 1826

To be let or sold and entered upon immediately

Wind Corn Mill. That newly erected and substantially built wind corn mill with the dwelling house ,stable , gardens, and garth attached thereto , situation at or near Carr's Hill , in the parish of St John ; Gateshead ,in the county of Durham called **St John's Mill** and lately in the occupation of George Blaxland. The mill works two pairs of stones and a cylinder ,and contains a shelling mill and is well adapted and conveniently situated for carrying on an extensive trade.Apply to the printer of this paper ,or to Mr H. Ingle dew , Newcastle ,either of whom will treat for letting or sale. Mr Blaxland in the house will shew the premises. **NOTE:** In the 1851 Census there are cottages named St John's Mill. They appear to be near St John's Rectory. By 1871 called Rectory Cottages, but on 1856 Ordinance Survey Map they are called 'Mill Cottages.'.

*Wikipedia entry for Carr Hill:* Carr Hill by 1820 was a modern and populous village,[12] situated on a hill, still isolated from Gateshead and Felling.[13] A variety of industries had developed alongside Warburton's pottery and were prospering; a flint glass manufacturer, under the management of Alexander Elliot,[14] three corn mills - Carr Hill Mill, Felling Windmill and St John's Mill[15] (the latter built after an earlier mill was destroyed by a mysterious fire in 1824)[16] – and a fire brick kiln.[17]




Note reference to George's mysterious fire – the reference is to this book:

*Proctor, Brian (2006). Carr Hill Notes: Part One. Gateshead Libraries.*

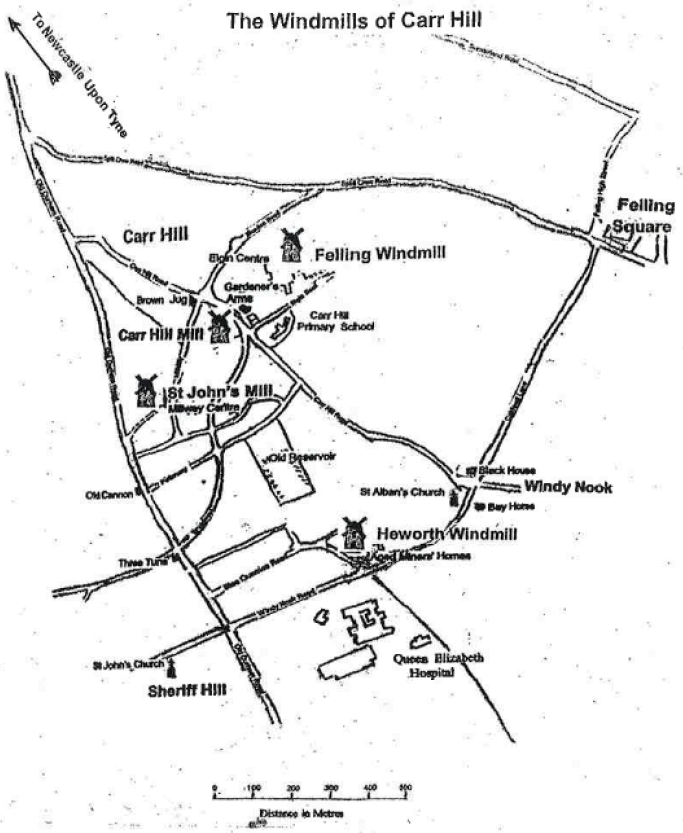
The typed articles above come from this book. The ordnance survey map of Carr's Hill is from 1862.

Two interesting updates from Simon Green were communicated to me in the weeks that followed the breakthrough research discussed above. Thomas Miles Richardson's (1784-1848) first notable painting was the view towards Newcastle from Gateshead Fell appears to show what may have been George's windmill, or what followed after the fire, St. John's Mill. It is the black-capped tower on the RHS above Newcastle.

Simon also sent along a map of the location of *four* windmills. I presume this maps dates to after 1826 given that George's mill was rebuilt and renamed after the fire to St. John's Mill.

Carr Hill Notes , Set One

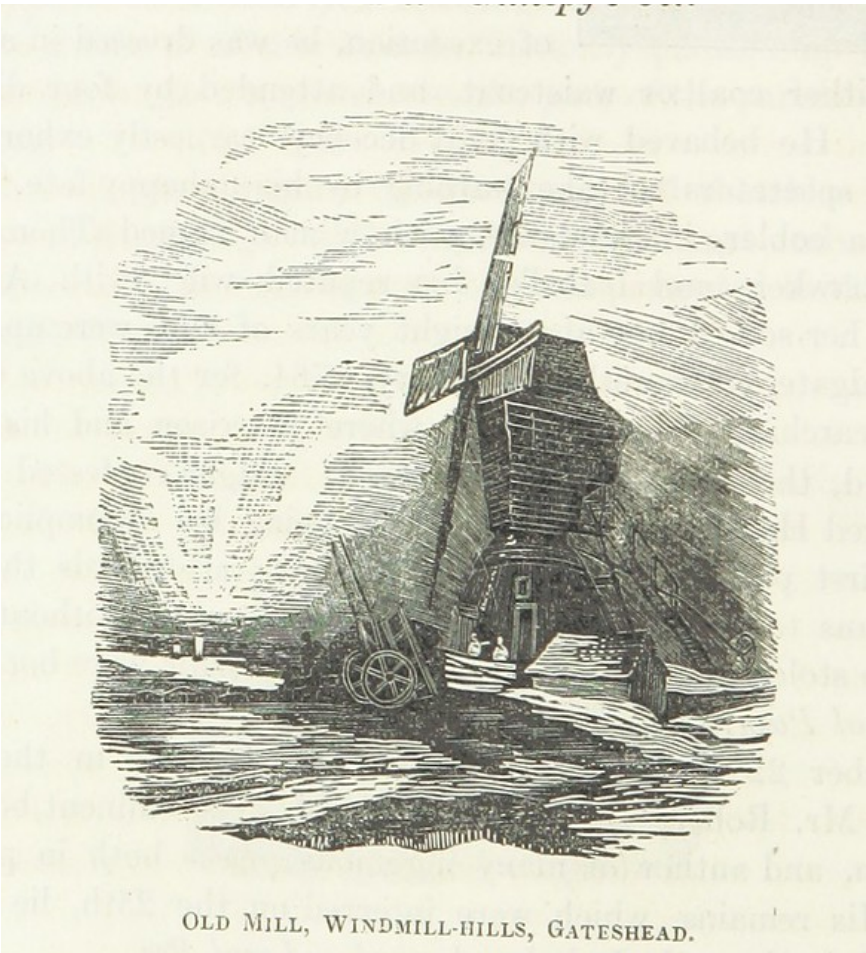
Notes on the 17th century windmill at Carr Hill and other notes on Carr Hill




By Brian Proctor

Sheriff Hill today:

This drawing from Moses Aaron Richardson (son of Thomas) dates to 1841: “The Local Historian's Table Book of remarkable occurrences, historical facts, traditions, legendary and descriptive ballads, connected with the Counties of Newcastle-upon-Tyne, Northumberland, and Durham.”



OLD MILL, WINDMILL-HILLS, GATESHEAD.

The lower image dates to about 1870 by artist Miles Birket Foster. It is titled “Newcastle upon Tyne from the Windmill Hills, Gateshead.” This appears to be the time when the windmills fell into disrepair as industry moved into factories.

## George Blaxland Sr. – Marine Engineering and the Screw Propeller

Matt Ridley's outstanding book "How Innovation Works" has a section titled Turning the Screw. The text below paraphrases this section. Steam engines installed on trains were already well under way in the 1830s. The idea of getting them onto ships occurred to many but awaited the invention of a decent screw propellor. One historian has linked patents for propellors to 470 names, with George Blaxland as one of them. Paddle boats dominated the market and sailing technology peaked as late as 1870, so demonstrations were called for if screw propellors were to force a wedge between paddles and sails.

In 1835, a 27-yr old farmer in Hendon, outside London, by the name of Francis Smith (later Sir Francis Pettit Smith) built a model boat with a screw actuated by a spring and tried it on a pond. In 1836, he built a better one andtook out a patent on "propelling vessels by means of a screw revolving beneath the water." A few weeks later, a Swedish engineer – John Ericsson – independently submitted a patent for a similar device. George Blaxland won a famous court case against Smith, as mentioned below.

Smith was already building a full-scale boat of 10 tonnes with a 6 HP engine, with the help of Thomas Pilgrim, an engineer. In November 1836, the boat was launched in Paddington canal, but suffered a lucky accident. Smith's propellor was a wooden screw with two complete turns around a wooden shaft. A collision knocked off one of the turns and the boat went much faster. This unexpected discovery is related to turbulence and drag. In 1837, Smith redesigned the propellor in metal with a single turn of screw and the boat went out to sea and round the Kent coast and back, proving its worth in rough weather.

Smith struggled to be taken seriously. The Admiralty asked for a demonstration with a larger vessel capable of at least 5 knots. Smith formed a company and built a 237-ton ship called the Archimedes, fitted it with an 80 HP steam engine. In October 1839, he took on the *Widgeon* at Dover and the *Vulcan* at Portsmouth, two of the Navy's fastest paddle steamers. Still the Admiralty demurred, and meanwhile Smith toured Europe with the *Archimedes*. In 1841, the Admiralty commissioned a screw ship *Rattler* launched in 1843 and in service the following year. In 1845, *Rattler* was pitted against a paddle steamer of similar weight and horse power, *Alecto* in a tug of war, the two ships being attached by a line astern. *Alecto* was humiliatingly dragged backwards at 2 knots.

In the US, Ericsson became the true winner by making his fortune. He built a series of ships including the *Princeton* for the US Navy. France also launched the screw-driven *Napoléon*. The world's navies essentially switched to screws overnight. The design of the screw continued to evolve as the understanding of turbulence and drag improved. The blade shape eventually became narrow near the shaft, wide further out, then tapering to a rounded end.

**Blaxland's steam boat demonstration, 24 May 1841.**


RIVER TRENT
STEAM PACKET COMPANY.
The Directors feel great pleasure in announcing to the Public that a small experimental
STEAM BOAT
has arrived from London, fitted with Mr. Blaxland's Patent Propeller, and beg to state that several
Trips will be made this Afternoon,
FROM THE
TRENT BRIDGES to COLWICK WEIR,
to afford an opportunity for all persons who may wish to witness the effect and power of this excellent invention.
ROBERT FREE, SECRETARY.
N.B. Mr. Dunnicliffes excellent Band will attend.
Company's Offices, Carlton Street, May 24, 1841.
R. SUTTON, PRINTER, BRIDLESMITH-GATE, NOTTINGHAM

Sometime between 1824 and 1841, George moved on from being a miller to a marine engineer. As a miller, he would have learnt many skills relating to crank shafts and gears. He must have seen the benefits of steam engines over wind-powered engines; it is intriguing that we are going back to wind-powered turbines in the 2020s. This sign has been in the family for 180 years, currently in the possession of Rosalind Aisbitt, a cousin in Cambridge, UK. (Judith believed that it was lost in the 1960s, but her brother Rollo had taken possession of it. The poster came to light in 2020, thanks to daugher Rosalind's keen eye.) George named the boat the Jane or the Little Jane, after his beloved wife.

Thanks to the BNA, I was able to find some nice articles in the *Nottingham Review and General Advertiser for the Midland Counties*. These appear on the

day of the event and a week later, shown below. The later article even mentions the trip across to France and back, an event that has been in the family folklore for generations. This is the first evidence support the lore.

***21 May 1841***

STEAM PACKET ON THE TRENT.—A small steamer on a new principle, arrived at Newark from London, on Tuesday morning. On the day previous, a number of gentlemen from Nottingham visited Newark, for the purpose of returning home in it, as a test of the capabilities of similarly constructed steamers. The voyage from London in so small a vessel, (which is merely an open whale boat), with a rough sea and strong head wind is a feat of dexterity and daring almost incredible. The arrival at Newark excited great curiosity, and many hundreds eagerly ran to see the sight. There was however some disappointment in seeing so small a vessel, not knowing that it was merely a experimental trip previous to completing the vessels intended for this river. The Captain, and Mr. Blaxland, the engineer, remained at Newark until Wednesday morning, when they left for Nottingham, and during their stay made short trips up and down the river for the purpose of showing and explaining the principle of the propeller, to the no small gratification of several gentlemen who accompanied her, and who do not hesitate to pronounce the invention to be admirably adapted for river navigation, and exactly suited for the Trent.

Understanding that the boat would be at Newark on Monday, the directors agreed to go down the river, and having taken some short trips there, to return up the stream in it to Nottingham. A boat belonging to Mr. Barnsdall of this town, was prepared for the occasion, and on Monday a party of the directors, accompanied by Mr. Free, the secretary, proceeded to Newark, breakfasting on the route, at Hoveringham; but on their arrival at Newark, they found it had not arrived. It not making its appearance during the day they returned to Nottingham, leaving the secretary to superintend any further arrangements. The boat arrived on Tuesday morning, and, during the day, made several trips round Newark, greatly delighting the inhabitants of that place. Owing to the bad state of the weather, the directors did not proceed to Newark again and the boat therefore completed its journey to Nottingham, having on board of it, the secretary, Mr. Blaxland, Captain Fairburn, and a seaman, the same party, with the exception of the secretary, who had brought it from London. On arriving at Nottingham it was moored off the Trent Bridge. It had been previously agreed that it should proceed up the canal to Nottingham, but owing to the canal being let off for repairs, it could not be so arranged, and therefore it was brought to at the place we have mentioned. With reference to the powers of the propeller to perform any journey which may be placed before it let whatever impediments remain in the way, or whatever obstacles present themselves, little need be said when we state on the authority of Captain Fairburn, who took the care of this boat from London to Nottingham, that she breasted the seas like a gull, and mounted the snowy waves as

"a bird that seeketh its mother's nest,"

on the way to Boston; with a strong easterly wind dead against her, and the tide hard ahead, it is a convincing proof that the powers of this invention are most wonderful. Unlike the bulky paddle wheels, which with a strong head wind and current, impede in no slight degree the vessel to which they are attached, the propeller, fixed beneath the water astern, and working with the utmost ease, drives the vessel through every opposition without presenting any more surface than the bows to the furious element. No doubt can be entertained of the powers of the propeller.—[We had prepared further remarks, but the lateness of the week precludes us from saying more at present.]

***28 May 1841***

STEAMER ON THE TRENT.—This steamer is the "washing-tub with a tobacco-pipe" described in the following extract from a private letter from Boulogne, dated Oct 15, which appeared in many London papers:—"The douaniers were in a state of excitement this afternoon. If report was to be believed, war had been declared by England against France. At a distance from the heights a nondescript vessel was seen—to all appearance a washing-tub, with a tobacco-pipe (fuming and spitting out tiny volumes of smoke) in the centre. What can the object of this strange craft be, was the general inquiry? No one could answer the question. The custom-house gentry took the alarm, and despatched a pilot boat to reconnoitre. All was anxiety, and the little steamer neared the harbour; anxious inquiries were made, and from one of the four men on board the answer was given, 'from Dover.' 'Q. Your tonnage?—A. One ton. Q. Your steam power?—A. Two horse. Q. Your object?—A. An experimental trip.' The last reply was not believed. So the douaniers went on board disbelieving the statement, expecting at least to discover some important dispatches of an intended invasion of France or something of that sorts, but in so doing the official nearly capsized the little bark, and to save himself caught hold of a rod heated by the steam, and *Sacrés Anglais* followed. The fact that a cockle-shell with a two-horse power had voyaged from Dover to Boulogne, at the rate of six or seven knots an hour, and with a head wind was incredible. The fact was, however, established, and the welcome of the four intrepid British tars (nay, two only were of the sea, the other two being mechanics) was again 'Sacrés Anglais! *Mon Dieu!* they can do anything' To encourage men in the pursuit of scientific objects, the Custom-house authorities immediately levied port fines on the little barque to the amount of 30s., it being undeniable that there were no secret despatches on board, nor any smuggled goods, or anything else contraband; still the 30s. must be paid, I suppose for the excitement occasioned to the authorities."—Several experimental trips were made in the early part of the week, from the Trent Bridge to Colwick Weir, accompanied by Mr. Dunnicliff's excellent band. The novelty of the affair attracted great numbers of spectators.—The result of the trips was satisfactory in the highest degree, and it is confidently stated, that in the course of three months a steamer will be built, and regularly worked on the Trent. The river was crowded with boats, and the whole of the crew of the Nautilus were present. The proceedings ended with dancing, and amid waiving of hats and much cheering, the prosperity of the Trent Steam Ship Navigation Company was given, and loudly responded to.

**Jane's untimely death.**

Jane's death was recorded in the parish records of Greenwich in September 1847. She was buried at Nunhead in Surrey on the 21st of that month so possibly died around the 14th or thereabouts. The Nunhead Cemetery records her as being buried there, and would be maintained by the London Borough of Southwark. Nunhead (picture below) is the least well known of the Magnificent Seven Cemeteries of London, consecrated in 1840 (240,000 buried there).

The witness Joshua Richardson (1799-1886) is interesting; he gave his Affirmation at George & Jane's wedding. George Blaxland's mother, Sarah Alexander, was the second wife of John Richardson and Joshua Richardson's step-mother. Thus, Joshua spoke on behalf of his step-brother George. Charles Pease sent detailed notes on Joshua's career in civil engineering.

Charles Pease:
"The question is whether their marriage was sufficient to get George disowned by the Society of Friends. There are Quaker records marking the birth of some of their children which at least suggests that there may have been hope that he would eventually return to the fold. At any rate, the record that you so kindly attached suggests that he was at least "not in membership", if not disowned. Friends' House in London would possibly have a record in their archives. I find nothing as yet in the yearly Quaker publication The Annual Monitor and other usual sources. But I suspect that with a strong Quaker background, George would still have maintained his links with his extended family."

Here's the registered birth of Edward where the family is indicated "not in membership."


## George Blaxland Sr. – his battle with Francis Pettit Smith

This image of George Sr. (right) comes from a larger photograph that belonged to Judith's grandmother, Jane Aisbitt (née Atkinson); Jane indicates that it was taken sometime between 1865 to 1867 (in his mid 60s), about 8 years before he died. George was one of the main inventors of the screw propeller, although some websites credit his main rival, Francis Pettit Smith as the main inventor. For example, the 2015 article below almost manages to paint George Blaxland Sr. out of the picture. As I show, this precludes much of the important history of the screw propeller. I start with the recent article as it helps to set the scene of George Blaxland Sr.'s world at the tail end of the Industrial Revolution when industrial innovation was everywhere on both sides of the Atlantic, as exemplified by huge world fairs (e.g. Crystal Palace 1851).


History has not been kind to George's memory in part because Francis was eventually knighted and ended up with influential friends who pushed his case. In 2007, English Heritage posted this plaque at Fountain House, 17 Sydenham Hill, Sydenham. But George and Francis both had patents (31st May 1836, 25th Nov. 1840 resp.), both received stipends from government for their work, both carried out sophisticated trials in full view of the media, and both died in the same year (1874). I have George's original 1840 patent and seal on my wall in Mosman, Sydney. This document (see below) was used in part to win a court case of patent infringement against Sir Francis Pettit Smith in the 1850s. It was described as a pyrrhic victory with all remaining monies going to the lawyers – shades of Dicken's Jarndyce & Jarndyce case in Bleak House (1853). It's tempting to think Dickens was inspired by this public case, but such outcomes were commonplace. I present new information from London legal archives on that case below. Interestingly, there are letters in support of both George and Francis in the newspapers of the day. But they both missed out on substantial wealth from their inventions. The propeller would continue to evolve and others crossed the pond to make their fortune.

*The House Husband article (June 2015):*

"It didn't take long for the trading classes to realise that the screw propeller was streets ahead of the paddle wheel when it came to the open seas. After Francis Pettit Smith (right) created his Archimedes Screw, shipbuilders and owners bought into the technology immediately. Not so the Royal Navy. The Admiralty was a bit stodgy about change and were never early adopters. This might have been a leftover of the Establishment rules that had governed the Naval Fleet since 1719. Obviously there were amendments through the years but once changed, they didn't like changing again. So, when screw propulsion was set to replace the only recent paddle wheel, they were obviously a bit reticent. Francis Pettit Smith was not a great and famous marine engineer. Born the son of a lifelong postmaster from Kent, Frank was a poor farmer for the first 37 years of his life. He had an idea that a propeller was better than a paddle and, to prove it, he built a little model ship with his original screw and a spring to wind it up. The model flew across the water of a small reservoir so, with the help of a friend, he built a bigger and better model. This model was put through lots of tests at Hendon, near his farm.

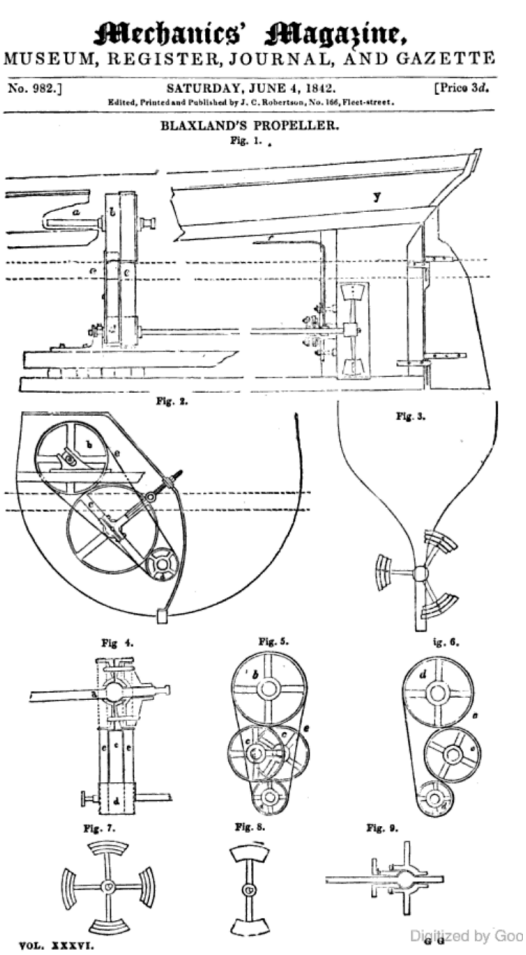
Eventually, he took out a patent and, with the promise of purchase by the Admiralty, he formed the Propeller Steamship Company which built the Archimedes. Sadly, the Admiralty didn't buy the Archimedes and poor Frank went broke, winding up once more as a farmer, this time on the island of Guernsey [JBH: interesting that George Blaxland moved to the Channel Islands at this time]. It's even sadder when you think that, having let Isambard Kingdom Brunel take a trial run on the Archimedes, Smith changed the great engineer's mind about propulsion, prompting him to put a screw on the SS Great Britain (shown here in Bristol).

However, before Frank moved on, there was the little matter of HMS Rattler vs. HMS Alecto, i.e. paddle vs. steamer. [JBH: newspaper and engineering articles state that George was responsible for this trial.] The Admiralty decided it should look into this propeller issue a little deeper so they built a warship to test the new technology. It was built at the Royal Dockyard, Sheerness [JBH: at a time when George Blaxland Sr. was Chief Engineer] with engines by Maudslay, Son and Field on the Thames. Completed in 1843, she then had no less than 24 propellers tried on her. Eventually, the many and varied forms of screw were whittled down to four contenders, Thomas Sunderland, **George Blaxland**, Bennet Woodcroft and Francis Pettit Smith. Tom and **George** fell by the wayside, leaving two of the greatest propeller inventors to battle it out between them. (There was a third, a Swedish Captain called Ericsson who had tried to convince the Admiralty that his screw was best but they ignored him. He then went to the US and was responsible for the propellers on all ships in the US Navy. He became very wealthy and engaged in litigation for most of his later years because of perceived copyright infringements. Several articles – see below – mention that Ericsson's patent was also in 1836 and of very similar design to F.P. Smith.)

It was a very close thing but Frank's screw won out and was fitted onto the Rattler permanently. The Navy then fitted all subsequent screw ships with Frank's propeller, making him very famous but not a jot wealthier. He continued farming but not forgotten, on Guernsey. Bennet Woodcroft did extremely well for himself. As well as developing screw propellers for ships, Bennet Woodcroft made his money from textile machinery in the North. He eventually founded the Patent Museum and worked along with Frank to build up the objects that eventually made up the Science Museum Collection. [JBH: this is a significant act of public service in its own right.]

Back to the Rattler. As well as the propeller tests, the Admiralty wanted to cover all bases so they pitted her against another ship, the paddle steamer HMS Alecto, a ship almost her equal in every other detail. There were a series of 12 tests. They mostly consisted of speed tests over open water. It was quickly clear that the screw was better than the paddle and the Admiralty decided to change after the first few tests. However, given they'd planned them, the rest of the tests had to be run. Which, as it turned out, was a good thing because the final test (some say it was a publicity stunt) was a mighty tug-a-war between the two ships. A massive cable was strung between the sterns of both ships and they fired up their engines to full. The Alecto reached full power the quickest and she was soon pulling the Rattler behind her but then, with a great cheer, Rattler's engines reached capacity and the mammoth struggle was on. It wasn't long before the mighty screw propeller showed it's superiority and Rattler started towing Alecto at an amazing 2.5 knots. It was a great and festive event with thousands lining the shoreline at Portsmouth, a lot of them journalists and artists.

HMS Rattler served the Navy well until being broken up in 1856. She worked to fight the final vestiges of the slave trade as well as taking part in a successful tussle with Chinese pirates then taking part in the Second Anglo-Burmese War. Her greatest claim to fame, however, was her demonstration of the screw propeller which changed the British Navy forever. In 1860, after pressure from his friends, Francis Pettit Smith was appointed Curator of the Patent Museum (which became the Science Museum). Final recognition came in 1871 when he was knighted."
[JBH: A sad epitaph is that Francis was buried 3 yrs later beside his 7-yr old grandson Archimedes in beautiful St. Leonard's Churchyard, Hythe, near Dover, famous for its huge collection of ancient bones.]


Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE
No. 982.] SATURDAY, JUNE 4, 1842. [Price 3d.
Edited, Printed and Published by J. C. Robertson, No. 166, Fleet-street.
BLAXLAND'S PROPELLER.
Fig. 1.
Fig. 2.
Fig. 3.
Fig 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
VOL. XXXVI.
Digitized by Goo

JBH: Gary (House Husband) emailed on 19/1/18 to say that many of the archives are at the Science Museum where he used to volunteer. He also drew from E. C. Smith's (1937) Short History of Marine engineering, and the National Dictionary of Biography which gives more details on Smith's youth and later life.

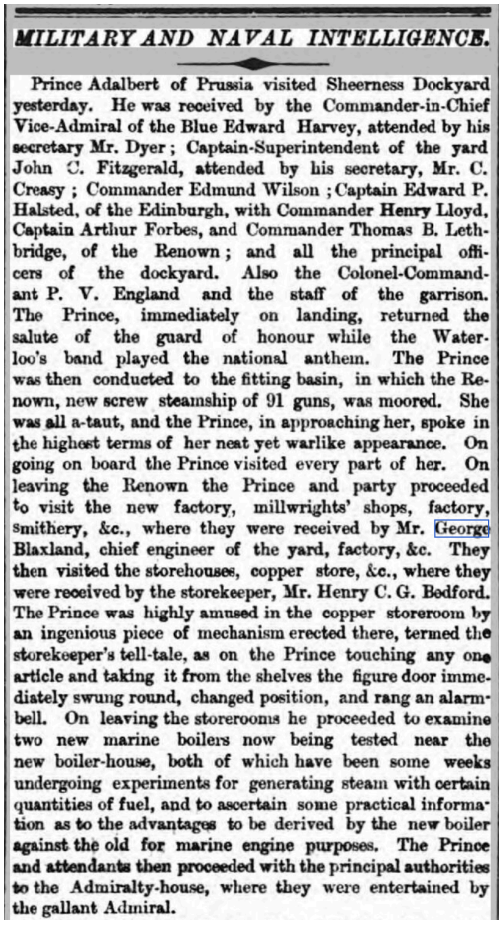
## George Blaxland Sr. – "Blaxland's Propeller"

A long technical discussion published in 1842 of George's invention is given in an Appendix (the first page is shown to the left). The patent approved on 25th Nov. 1840 seems to have been shared with a Mr. Steinman. In summary, George's improvements over Francis' propeller were as follows, i.e. an incremental series of inclined planes that mimic a corkscrew.

Post facto, as early as 1852(?), J.I. Knight is quoted as saying in Mechanics Magazine (vol. 56, p. 174) that neither Smith's, Lowe's, Ericsson's, Woodcroft's, nor Blaxland's propellers is similar to that used today in Her Majesty's ships, except for a very basic principle invented by Boyle and Bernoulli. He goes on to make the case for a Mr. Taylor.

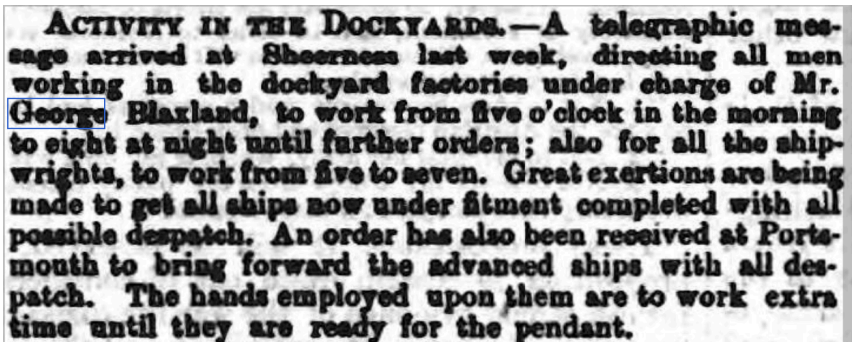
## George Blaxland Sr. – the importance of HM Dockyard

I found this remarkable article (right) in the 29th Jan 1858 issue of the Evening Mail. It refers to the visit by a Prussian prince to the dockyard at Sheerness. After the Rattler vs. Alecto trials, several world navies consulted with Great Britain about installing these propellers. Since the famous trials took place out of this dockyard, such a visit may have been a prelude to that process. George is mentioned.


MILITARY AND NAVAL INTELLIGENCE.

Prince Adalbert of Prussia visited Sheerness Dockyard yesterday. He was received by the Commander-in-Chief Vice-Admiral of the Blue Edward Harvey, attended by his secretary Mr. Dyer; Captain-Superintendent of the yard John C. Fitzgerald, attended by his secretary, Mr. C. Creasy; Commander Edmund Wilson; Captain Edward P. Halsted, of the Edinburgh, with Commander Henry Lloyd, Captain Arthur Forbes, and Commander Thomas B. Lethbridge, of the Renown; and all the principal officers of the dockyard. Also the Colonel-Commandant P. V. England and the staff of the garrison. The Prince, immediately on landing, returned the salute of the guard of honour while the Waterloo's band played the national anthem. The Prince was then conducted to the fitting basin, in which the Renown, new screw steamship of 91 guns, was moored. She was all a-taut, and the Prince, in approaching her, spoke in the highest terms of her neat yet warlike appearance. On going on board the Prince visited every part of her. On leaving the Renown the Prince and party proceeded to visit the new factory, millwrights' shops, factory, smithery, &c., where they were received by Mr. George Blaxland, chief engineer of the yard, factory, &c. They then visited the storehouses, copper store, &c., where they were received by the storekeeper, Mr. Henry C. G. Bedford. The Prince was highly amused in the copper storeroom by an ingenious piece of mechanism erected there, termed the storekeeper's tell-tale, as on the Prince touching any one article and taking it from the shelves the figure door immediately swung round, changed position, and rang an alarm-bell. On leaving the storerooms he proceeded to examine two new marine boilers now being tested near the new boiler-house, both of which have been some weeks undergoing experiments for generating steam with certain quantities of fuel, and to ascertain some practical information as to the advantages to be derived by the new boiler against the old for marine engine purposes. The Prince and attendants then proceeded with the principal authorities to the Admiralty-house, where they were entertained by the gallant Admiral.

Again, this article below was published in the 20th April 1859 issue of the Wolverhampton Chronicle and Staffordshire Advertiser. This must have been a time of extreme urgency. Being "ready for the pendant" is a common term on Navy docks, I think a reference to the small flags posted topsail.


ACTIVITY IN THE DOCKYARDS.—A telegraphic message arrived at Sheerness last week, directing all men working in the dockyard factories under charge of Mr. George Blaxland, to work from five o'clock in the morning to eight at night until further orders; also for all the shipwrights, to work from five to seven. Great exertions are being made to get all ships now under fitment completed with all possible despatch. An order has also been received at Portsmouth to bring forward the advanced ships with all despatch. The hands employed upon them are to work extra time until they are ready for the pendant.

There are quite a few articles to be found of this kind, especially using advanced searches on the British Newspaper Archives.

George did important work on other mechanical structures, *inter alia,*

marine engine boilers. This article, published on 28th November 1857 in the Hampshire Advertiser, refers to the testing of a patented design, work carried out with (Rear Admiral) John Jervis Tucker (1802-1886) for whom rather a lot of information can be found on the web.

A NEW MARINE ENGINE BOILER, patented by Rear Admiral of the Blue John Jervis Tucker and Mr. George Blaxland, Chief Superintendent Engineer at Sheerness Yard, has been under trial for some weeks past, the trial being superintended by Mr. John H. Langley, Inspector of Machinery, on board the *Edinburgh*, for the steam squadron of reserve. The advantages the patent boiler possesses are, doing away entirely with the tubes now used in tubular boilers, generating a larger supply of steam with a less quantity of fuel, and not being subject to the derangements in heavy weather at sea like the present boilers. It is reported that the Admiralty have granted permission for one of the large class gunboats at Sheerness to be fitted with a boiler of the same description as the one now under trial, and she is to proceed to sea for a series of days in company with a gunboat of similar class, having the present tubular boilers fitted, in order fairly to test the effect in a heavy sea.

## George Blaxland Sr. – testing the Blaxland Propeller

There are delightful articles on George's extensive testing of his invention (1841-44), both with and without members of the public. It is believed that he first crossed the English Channel under steam power in "Jane" or "Little Jane" going to Boulogne and back. Two articles appear in the same issue of the Hertford Mercury and Reformer, 4th June 1842 – see the footnote at the bottom of the first article about the second article.

STEAM NAVIGATION ON THE LEE.

THE local importance of the subject to so many of our friends induced us to devote a considerable space last week to an account of the first steam voyage on the River Lee. On that occasion, in consequence of the excavations which were in progress at the time, for the accomplishment of that most desirable improvement to the navigation, —the entire removal of the lock at the bottom of Miss Hadsley's grounds, the vessel came no farther than Ware. On Tuesday last, however, the *Jane* made another trip, and all obstructions being removed, she came right through to Hertford. As the account last week excited considerable interest amongst a large class of our readers, we shall proceed to notice the progress of the *Jane* on Tuesday last. The fine weather on this occasion contrasted most delightfully with the persevering and continued soaking of the previous Tuesday, and we were enabled to look about us and enjoy the scenery on either side.

The *Jane* started, as on the previous occasion, from Enfield Lock, and was attended again by a boat towed in the usual manner by a horse. The miniature steamer, in its progress, excited the wonder of all gazers from banks and bridges. We ourselves joined her at Waltham Bridge. On reaching Broxbourne the view from the vessel was very beautiful: the fine old church, the very prettily-designed railway station house, the mill, the picturesque old bridge, and the general tone of the scenery immediately around, produced an exceedingly striking effect. At this moment, too, a train passed along the railroad *loaded with coal*, thus strikingly exemplifying the prudence and necessity of carrying out the principle of the "Propeller," and adapting it to Barges, for the purpose of reducing the expenses of navigation on the river, so as to compete with the railroad with regard to the carriage of heavy goods at least.

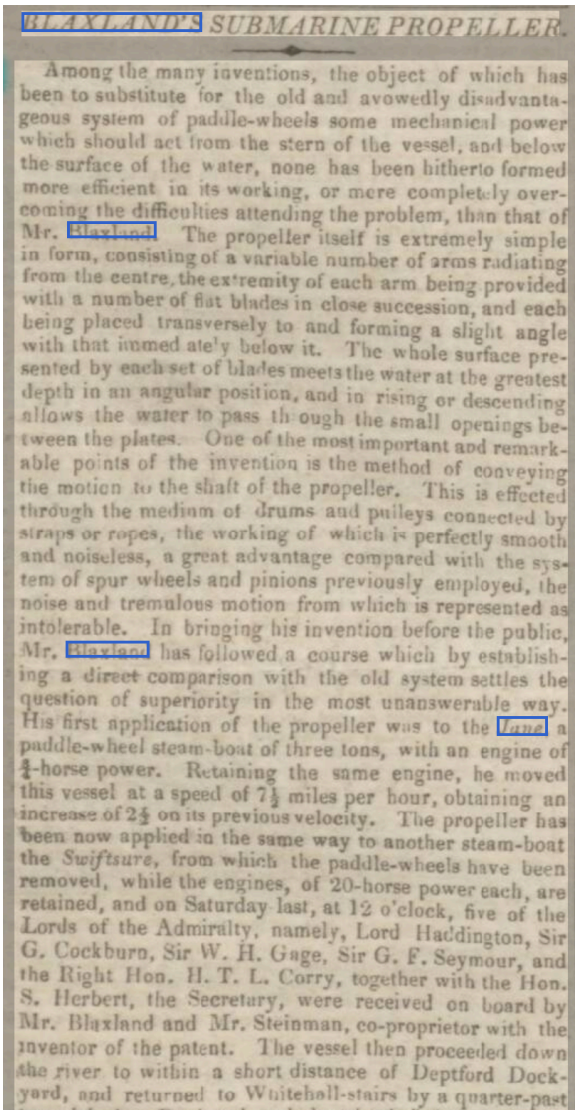
At Stanstead the bridge was crowded by the wondering inhabitants, to whom a steam-boat appeared to be an extraordinary innovation upon the old-fashioned practices.

On arriving at Ware the bridge was crowded by the inhabitants, while maltsters and barge-owners looked out from their summer-houses on the banks, with great interest. The vessel pushed cleverly under the bridge as far as Miss Hadsley's, and then turned round, and again passed under the bridge, so as to give the crowds which were gathered an opportunity of observing her operations.

The Little Jane again turned round and then pursued her way to Hertford. At the lock in the King's Mead, the inhabitants of Hertford crowded to witness her approach. The lock was passed and the vessel went on, the inhabitants crowding the banks and bridges in her course. She passed under the bridge at the Town Mill which was also crowded; she turned close to the mill, and passing along the Folly Wharf, she moored along side Gripper's wharf, where the *voyageurs* landed.

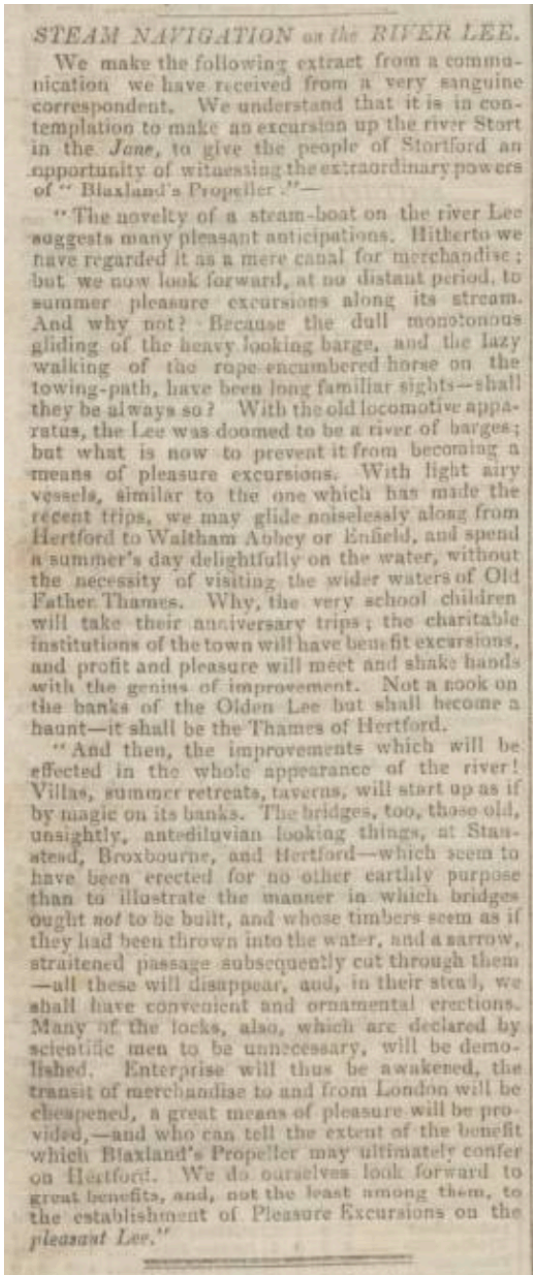
The party, which consisted of Lieutenant Henderson, of the Royal Engineers, Lieutenant Webb, of the Ordnance Department, Waltham Abbey, Mr. Austin, Engineer to the Ordnance Mills, Mr. Gunner, Storekeeper to the Ordnance Department at Enfield Lock, Mr. Matthews, Mr. Griggs, Surveyor to the River Lee, Mr. Marchant, clerk to the trustees, and ourselves, were kindly invited by Mr. Gripper to take refreshment; and due justice being done to his hospitality, the *Jane* about six o'clock "got up her steam," and went on her way back to Enfield Lock. We entered so much into detail last week that it is unnecessary to say more on this occasion than that we are convinced of its practicability for all the purposes of the Lee navigation, and we look with perfect confidence to the day of the Annual Survey of the Trustees, when "Blaxland's Propeller" will be affixed to a Barge belonging to the Trustees. This, we think, is due to the Barge-owners, that an experiment should be made at the expense of the Trust, where the benefits, which we feel confident must result from the invention, will be equally felt by both parties. We shall recur to the subject next week.

[In another column will be found the details of an experiment made, on a large scale, before the Lords of the Admiralty, of the capabilities of this invention.]



BLAXLAND'S SUBMARINE PROPELLER.

Among the many inventions, the object of which has been to substitute for the old and avowedly disadvantageous system of paddle-wheels some mechanical power which should act from the stern of the vessel, and below the surface of the water, none has been hitherto formed more efficient in its working, or more completely overcoming the difficulties attending the problem, than that of Mr. Blaxland. The propeller itself is extremely simple in form, consisting of a variable number of arms radiating from the centre, the extremity of each arm being provided with a number of flat blades in close succession, and each being placed transversely to and forming a slight angle with that immediately below it. The whole surface presented by each set of blades meets the water at the greatest depth in an angular position, and in rising or descending allows the water to pass through the small openings between the plates. One of the most important and remarkable points of the invention is the method of conveying the motion to the shaft of the propeller. This is effected through the medium of drums and pulleys connected by straps or ropes, the working of which is perfectly smooth and noiseless, a great advantage compared with the system of spur wheels and pinions previously employed, the noise and tremulous motion from which is represented as intolerable. In bringing his invention before the public, Mr. Blaxland has followed a course which by establishing a direct comparison with the old system settles the question of superiority in the most unanswerable way. His first application of the propeller was to the *Jane*, a paddle-wheel steam-boat of three tons, with an engine of ¾-horse power. Retaining the same engine, he moved this vessel at a speed of 7½ miles per hour, obtaining an increase of 2¾ on its previous velocity. The propeller has been now applied in the same way to another steam-boat the *Swiftsure*, from which the paddle-wheels have been removed, while the engines, of 20-horse power each, are retained, and on Saturday last, at 12 o'clock, five of the Lords of the Admiralty, namely, Lord Haddington, Sir G. Cockburn, Sir W. H. Gage, Sir G. F. Seymour, and the Right Hon. H. T. L. Corry, together with the Hon. S. Herbert, the Secretary, were received on board by Mr. Blaxland and Mr. Steinman, co-proprietor with the inventor of the patent. The vessel then proceeded down the river to within a short distance of Deptford Dockyard, and returned to Whitehall-stairs by a quarter-past two o'clock. During the whole trip their lordships paid the closest attention to the working of the system, and informed themselves minutely on every particular. The apparatus by which the proper degree of speed is communicated to the propeller, which, in this instance, was moved by ropes laid in grooves over the drums, appeared in particular to raise their admiration at the smoothness and quietness with which it worked, and on leaving the vessel their lordships expressed themselves very much pleased with all they had seen. Mr. Blaxland was ordered to bring the propeller to the Admiralty in the course of the week. That which was used on the occasion was constructed with only two arms, the plates at each extremity being five in number. Notwithstanding the disadvantages presented by the build of the *Swiftsure*, which renders her name somewhat ironical, Mr. Blaxland has succeeded in increasing her speed from 7½ miles to 9 per hour. An increase of speed such as this, which Mr. Blaxland in every instance promises, together with the other advantages of getting rid of such incumbrances, both in weight and bulk, as paddle-wheels and boxes, and the absence of all swell from the motion of the propeller, render it almost beyond a doubt that Mr. Blaxland will shortly see his invention generally adopted. It was expected that the *Jane* would also have been in attendance last Saturday, but this was prevented in consequence of her having been sent to Enfield, where the capabilities of the invention for canal navigation were to be tested.—*Times*.



STEAM NAVIGATION on the RIVER LEE.

We make the following extract from a communication we have received from a very sanguine correspondent. We understand that it is in contemplation to make an excursion up the river Stort in the *Jane*, to give the people of Stortford an opportunity of witnessing the extraordinary powers of "Blaxland's Propeller."—

"The novelty of a steam-boat on the river Lee suggests many pleasant anticipations. Hitherto we have regarded it as a mere canal for merchandise; but we now look forward, at no distant period, to summer pleasure excursions along its stream. And why not? Because the dull monotonous gliding of the heavy looking barge, and the lazy walking of the rope-encumbered horse on the towing-path, have been long familiar sights—shall they be always so? With the old locomotive apparatus, the Lee was doomed to be a river of barges; but what is now to prevent it from becoming a means of pleasure excursions. With light airy vessels, similar to the one which has made the recent trips, we may glide noiselessly along from Hertford to Waltham Abbey or Enfield, and spend a summer's day delightfully on the water, without the necessity of visiting the wider waters of Old Father Thames. Why, the very school children will take their anniversary trips; the charitable institutions of the town will have benefit excursions, and profit and pleasure will meet and shake hands with the genius of improvement. Not a nook on the banks of the Olden Lee but shall become a haunt—it shall be the Thames of Hertford.

"And then, the improvements which will be effected in the whole appearance of the river! Villas, summer retreats, taverns, will start up as if by magic on its banks. The bridges, too, those old, unsightly, antediluvian looking things, at Stanstead, Broxbourne, and Hertford—which seem to have been erected for no other earthly purpose than to illustrate the manner in which bridges ought *not* to be built, and whose timbers seem as if they had been thrown into the water, and a narrow, straitened passage subsequently cut through them—all these will disappear, and, in their stead, we shall have convenient and ornamental erections. Many of the locks, also, which are declared by scientific men to be unnecessary, will be demolished. Enterprise will thus be awakened, the transit of merchandise to and from London will be cheapened, a great means of pleasure will be provided,—and who can tell the extent of the benefit which Blaxland's Propeller may ultimately confer on Hertford. We do ourselves look forward to great benefits, and, not the least among them, to the establishment of Pleasure Excursions on the *pleasant Lee*."

The Navy did eventually buy into the propeller later in the decade, as did other world navies, including France, Russia and Italy (after it was founded in the 1860s!). Here's the second article (above) in the same issue. It mentions the shared patent and the fact that the propeller would be generally adopted. The follow up article on 11th June 1842 in the same publication is shown to the right.

Some time in the 1960s, Aunt Judith (Blaxland Aisbitt) lost an *original* poster – what a pity! – that was made by George Blaxland Sr. to celebrate the upcoming attempt on the Channel crossing. He was advertising for customers, Judith remembered. She also recalled that the poster said "Little Jane" rather than simply "Jane." I have not been able to track down the poster via the web. But I did find the first independent evidence to Little Jane, shown here. In any event, I think the missing poster may have been the Colwick Weir event above.

What follows is a letter to the Times (June 1843) in response to a discussion in the House of Commons on the merits of the propeller. It gives strong support to George Blaxland's design.

Hatcham Manor House, New Cross, April 24th, 1843.

MR. EDITOR,—The experiments mentioned in the House of Commons by the honourable Secretary of the Admiralty on the 3rd ult., as at that time being made, in order to test the relative merits of the several submarine propellers which had been deemed worthy of a Government investigation being now ended, I beg leave to forward you a short notice of the result.





The propellers selected for trial were Blaxland's, Smith's, (the Archimedean Screw,) and Ericsson's; the vessel in which they have been tried is H.M. steamer Bee, and the place of trial the Government mile at Longreach.

The Bee is a small sea-going vessel, I believe only of 34 tons burthen, built for, and now serving as the tender to the Excellent, gunnery-ship, at Portsmouth. She is fitted with a single engine of 10-horse power, and with paddle-wheels, in order that the Officers under Sir Thomas Hastings, at the Naval School there, may, through her, be instructed in the science of steam navigation. Her lines are particularly unfavourable to a stern propeller.

The following is the result of the trials as regards speed and weight:—

| | Speed. Miles per hour. | | Weight of the Propeller. cwt. | qrs. | lbs. |
|---|---|---|---|---|---|
| Blaxland's..... | 7·1152 | ..... | 0 | 2 | 3 |
| Smith's..... | 6·8 | ..... | 2 | 0 | 7 |
| Ericsson's..... | 5·47 | ..... | 3 | 0 | 11 |

The speed attained by the Bee when propelled with paddle-wheels is 7·7 miles per hour, but it should be remarked that she was laid down expressly for them, and that consequently her engine is placed longitudinally, which position renders necessary the use of bevelled wheels at a considerable loss of power, to communicate the action to the propeller. It should also be remarked that a *single engine* takes as much from the speed of a stern-propeller as it gives to the speed of the wheels, and that when the Bee is moved by the propeller she is encumbered by her wheels and their boxes. It is true that her wheels are partially disconnected from their shaft so that they cease to revolve, and that such of their floats as would otherwise dip in the water are unshipped, but still the shaft revolves within the hollow shafts of the wheels, and is pressed down upon its bearings by the weight of the wheels.

These considerations alone are sufficient to account for the difference of speed between the paddles and Blaxland's Propeller. There is, however, another.

The draught of a vessel for a submarine stern-propeller should be great. The absence of this essential most seriously affected Blaxland's Propeller in the Bee, as its diameter was there confined to the diameter of the screw. The draught of the Great Northern, so the papers inform us, is 17 feet, whilst the diameter of her screw propeller is no more than 12 feet. If Blaxland's Propeller was fitted to her, its diameter would be restricted only by the limits of the draught, and Blaxland's invention is enabled to take advantage of this enlarged diameter, so important to the speed of a submarine propeller, by the circumstance that its arms can be extended to any length without increasing the surface of their blades. This is one of its peculiarities: another is to be found in the application of its stuffing-box to a bearing, for it has no outer journal or carriage, and therefore no danger can accrue to it on the ship's heel taking the ground. The length of the screw in the Bee is two feet, the length of the opening in the dead-wood required by Blaxland's Propeller in the same vessel is only ten inches, and the length of its boss is only four inches.

The Propeller invented by Mr. Blaxland, offers yet other advantages over the screw: it is much less expensive to manufacture, for it can at any time be made by the ship's engineer at sea: it requires *a smaller multiplication of its engine's speed*, and being driven by adhesive drums and bands, instead of cogged wheels and pinions: it is unattended by *noise* and vibration. The efficiency of the speed apparatus (which has also been patented by Mr. Blaxland,) has been particularly remarked upon by the officers who made the trials in their official report to the Admiralty.



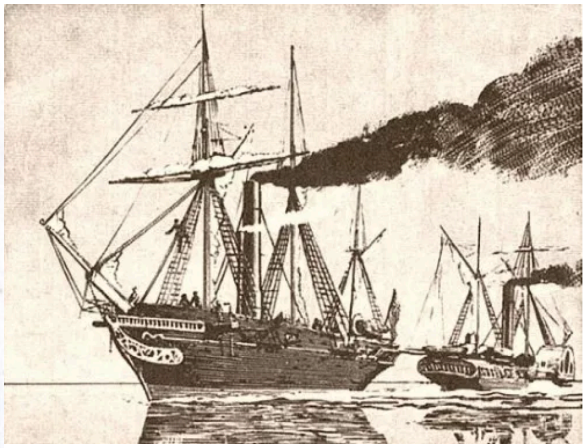


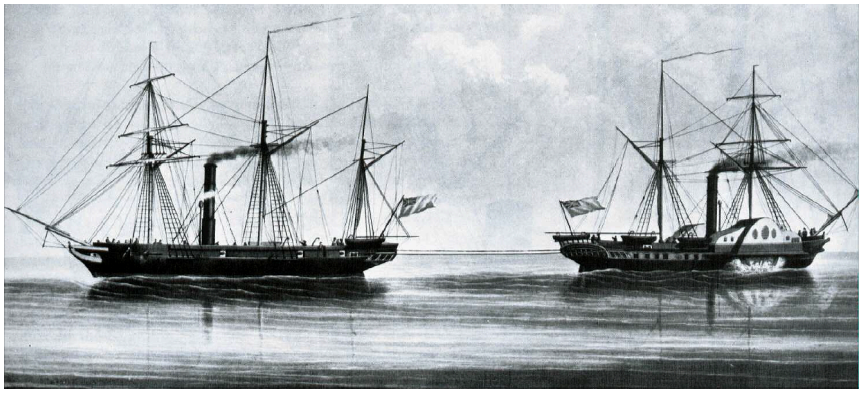
I have only further to add, that since the termination of the Government trials, the Lords of the Admiralty have ordered Mr. Steinman to lay before them drawings showing the adaptation of Mr. Blaxland's invention to a frigate of 800 tons.—I am, &c.,

F. COLLIER CHRISTY.

## George Blaxland Sr. – "Rattler vs. Alecto"

A very detailed history for the sail vs. paddle history leading up to the historic event is left to an Appendix (10 pages). This is a dispassionate account of the history without any mention of inventors. Below, I show an article that specifically gives George Blaxland Sr. credit for convincing the Admiralty to carry out the famous tug of war.




Some illuminating details of the paddler vs. screw steamer battle are given at this website specifically for Victorian Royal Naval vessels - http://www.pdavis.nl/ShowShip.php?id=137 -- the site provides details on specific ships like HMS Rattler (id=137). The ship was launched at Sheerness Dockyard on 12th April 1843, underwent the first set of sea trials in Oct-Nov 1843, and a second set over 1844-45. The ship saw active service for a decade before being broken up in 1856.

| **Name** | **Rattler** | | Explanation |
|---|---|---|---|
| Type | Sloop | | |
| Launched | 12 April 1843 | | |
| Hull | Wooden | Length | 185 feet |
| Propulsion | Screw | Men | 180 |
| Builders measure | 888 tons | | |
| Displacement | 1112 tons | | |
| Guns | 11 | | |
| Fate | 1856 | Last in commission | 1856 |
| Class | | | |
| Ships book | | | |

| Extracts from the *Times* newspaper | |
|---|---|
| Date | Extract |
| Th 16 November 1843 | **THE RATTLER SCREW STEAM-FRIGATE.**<br><br>A third series of experiments was made yesterday to test the steaming power of this ship, and to show what rate of speed could be accomplished by Mr. Smith's screw, with which she is propelled, as compared with what is accomplished by paddle-wheels in vessels of the same class and tonnage. The experiments were made in Long-reach, along the measured mile, so that no mistake might be made as to time and distance. These experiments were completely satisfactory, and proved that, even under the present disadvantages - viz., the vessel not being yet coppered, and the machinery of the engine being worked with straps in the place of cog-wheels, which will ultimately be used, she can perform rather more than nine knots, or ten and a half statute miles, in an hour. This was the mean rate on the average of six trials, and there is little doubt that when perfectly completed the vessel will get through the water by her steam powers at the rate of ten knots an hour. She was attended by the Lightning steamer, considered one of the fastest of the Royal steamers, but she was more than a match for that vessel, and performed her trials to the satisfaction and gratification of all those who witnessed her performances. The Rattler is a very fine model, finely moulded and showing all the points on which the beauty of a sea craft depends. She has Messrs. Maudslay's double cylinder engines of 100-horse power each, and her dimensions are thus: - Extreme length, 195 feet; length on the deck, 176 feet 6 inches; length of the keel for tonnage, 157 feet 9½ inches; extreme breadth, 32 feet 8½ inches; moulded breadth, 31 feet 10 inches; depth in the hold, 18 feet 7½ inches; the burden is 888 tons. These experiments have confirmed the efficiency of the screw propeller as to speed. With respect to the application of the principle to men-of-war, the superiority of the invention must be obvious to all persons. The machinery of the propeller is not liable to be shot away or wounded, and the ships in which it is used are more easily managed and enabled to turn with much more facility. The cost is also less than the old principle, and the saving in weight so great as to be almost in the ratio of hundredweights to tons. The other advantages are, that the apparatus may be made only auxiliary to sailing powers, which it cannot obstruct, and a vast saving of fuel obtained by not always using a sailing vessel as a steamer. |
| Ma 7 October 1844 | 6 October 1844<br><br>The Rattler steam and screw-propeller ship was tried down the river yesterday, the Lords Commissioners of the Admiralty having ordered that she should be tried again with three descriptions of screw propellers, the invention of Mr. Sunderland, Mr. Steinman, and Mr. F.P. Smith, previous to her being brought forward for commission. |
| Ma 21 October 1844 | **HER MAJESTY'S SHIP RATTLER.**<br><br>This fine steam frigate, after having made a great variety of experiments with the different propellers that have been projected by Mr. Smith, Mr. Woodcroft, Mr. Blacland, Mr. Steinman, Mr. Sunderland, and other persons, in order to ascertain their comparative merits, made her final trial in the river, last week. The screw that has been found, to produce the highest rate of speed with the smallest, consumption of power is that of Mr. F.T. [sic] Smith, known as the inventor and adapter of the Archimedean screw. The Admiralty have in consequence determined to send the Rattler to sea, fitted with a propeller in accordance with the suggestions of that gentleman. The trial of last week was made partly with the view of ascertaining the precise rate of the ship in steaming in smooth water with Mr. F.P. Smith's propeller, and partly to determine its effect as compared with what had been done with other propellers that have been recommended to the notice of the Admiralty. On this occasion the average of 12 trials at the measured distance in Long-reach showed a speed of 9.900 knots, or 11½ statute miles, an hour, which rate of speed, considered in comparison with the small amount of power, viz., 200-horse power, the amount of power of the engine of the Rattler in relation with her tonnage, 888 tons, ranks her performance higher in the history of steam navigation, than the performance of any vessel of her class, either in the service of Her Majesty or in the commercial steam navy of the empire. It should be mentioned that the Rattler was built in every respect as a sister ship to Her Majesty's steam-ship the Prometheus, with this difference, that the Prometheus has paddle-wheels. The Prometheus on her trial at the measured distance reached only to the rate of 8¾ knots an hour. The trials with Mr. Steinman's propeller, and also of that of Mr. Sunderland, which were alluded to in The Times the week before last, came off, the former on the 12th instant, and realized a speed of 9.537 knots an hour, and the latter, which realized 8.380 knots an hour on the 10th instant. The Admiralty appears to have been guided in their selection of a permanent propeller screw for the Rattler after Mr. F.P. Smith's not only by the superior speed attained, but also by the diminutiveness of his screw, the length being only 15 inches, and the diameter 10 feet. The Rattler has already got her masts on board; she is rigged with a foremast like a frigate or sloop, her middle and mizenmasts are rigged as schooner masts, her gun carriages are also on board, and she is ordered to be equipped for sea as speedily as possible; and in consequence of the complete success which has attended the application of the screws to her, several others, we believe six, iron ships of a large class are forthwith to be constructed on the same principle. The trials were made under the superintendence of Mr. Lloyd, chief engineer of Woolwich Dockyard, and Captain Smith, R.N., of the Royal Dockyard. There were also present - Captain Newell, R.N., Commanders Cuspin, Brenique, and Sullivan, R.N., Mr. Seaward, Mr. Lambert (of the firm of Messrs. Maudslay, engineer to the Rattler), Mr. C. Christy, Mr. F.P. Smith, and several other gentlemen connected, with nautical and scientific pursuits. |

The letter from F. Collier Christy (see above) is included in the list of Rattler documents. Indeed, the text in yellow is about 10% of the entire reports given for HMS Rattler. An interesting typo is that George is referred to as "Blacland," so searches may need to be broader.

## George Blaxland Sr. vs Francis Pettit Smith – Court Case

The comment on the legal case (below right) is taken from George Blaxland Jr.'s obituary. The case brought before the House of Lords(?) mentions a number of remarkable facts about George Sr. including (i) he *claimed* to be one of the propeller inventors, (ii) he entered into a court case with F. P. Smith spending most of their money on legal fees (2000 GBP, see below), (iii) George was responsible for the Alecto vs. Rattler tug of war, (iv) he went to Boulogne and back, probably the first Channel crossing by screw steamer, (v) the picture of the event was in George Jr.'s possession.

Francis Pettit Smith applied to have his patent extended (14 years on) in Feb. 1850. The document from VII Moore is revealing and recommended to the casual reader. See in particular the bottom half of Moore, p. 831. It says the Admiralty owes Smith 25,000 GBP, still unpaid, for patent licensing. It implies that Smith sued Blaxland but lost to the tune of 2,000 GBP. The document says the true novelty of Smith's design was the placement of the propeller at the back in the dead space that does not affect the draft. The House appears to come down in Smith's favour for an extension.

In cases for extension of the term of Letters Patent, the Attorney-General represents the Government and the public generally [7 Moo. P.C. 136].

An application by the Lords of the Admiralty to enter a caveat and be heard against a petition for an extension, such caveat not having been filed within the time required by the rules of the Privy Council Office, refused, as the Attorney-General was present to watch the interests of the Government [7 Moo. P.C. 136].

Extension of Letters Patent granted for five years; the invention being of great merit and public utility, but the patentee and his grantees had received no remuneration, in consequence of the originality of the patent being disputed at law [7 Moo. P.C. 138].

In granting such prolongation, the Judicial Committee imposed a condition, that the Commissioners for executing the office of High Admiral should have the right of manufacturing such invention, for the service of Her Majesty, without any licence from the patentee [7 Moo. P.C. 138].

This was an application for an extension of the term of three letters patent granted to Francis Pettit **[134]** Smith for England and Ireland and Scotland respectively, for an invention described under the title of "An improved propeller for steam and other vessels." The petition was presented by the patentee, and Sir John Dean Paul, Bart., and John Maltby Sunley, the trustees of the Ship Propeller Company, and Thomas William Dukes, the secretary of the Company.

The petition stated the novelty and utility of the invention, and its adaptation for propelling ships and vessels on and through water, by means of screws or worms

* Present: Lord Brougham, Lord Langdale, Lord Campbell, the Right Hon. Dr. Lushington, and the Right Hon. T. Pemberton Leigh.





applied to such ships, made to revolve below the water-line of the same, thereby providing vessels of war with the means of motion by propellers applied under water, out of the reach of the enemy's shot, and capable of being used in all weathers, and thus dispensing with the old cumbersome paddle-boxes and wheels, and other apparatus connected therewith, so as to contain in vessels so fitted adequate space for a complete broadside or tier of guns fore and aft, which they otherwise could not have, by reason of the collocation of the paddle-boxes, engines, and boilers, thus affording both to the royal and mercantile navies a means of propulsion which, by superseding the old paddle-wheels and boxes, got rid of the impediments to sailing from the swell and surge created by the paddle-wheel and the effect of the wind and sea upon such paddle-wheels and boxes, so that the power of steam was conveniently adapted to sailing vessels, and capable of being applied as an auxiliary power with great economy and advantage to the public. That the invention consisted in the screw, or worm, being placed in a recess or open space formed in that part of the vessel commonly called the "dead rising or dead wood of the run," and made to revolve rapidly under water. **[135]** That in consequence of the inventor's circumstances being insufficient to enable him to furnish the necessary capital for carrying into effect the object of his discovery and invention, he had assigned his rights to the Ship Propeller Company, who had afterwards been incorporated by an Act of Parliament passed in the 2nd and 3rd years of Her present Majesty. That the invention was of great national benefit, as an auxiliary power in the saving of time, in the certainty with which long voyages were made, and the consequent saving of capital. That the patentee was wholly unremunerated for his invention, and the Company had expended a large capital upon which they had got no return. That the losses they had sustained were owing to circumstances over which they had no control.

Upon the opening of the petition, Mr. Crowder, Q.C., for the Lords of the Admiralty, applied for leave to enter a caveat against the extension, on the ground, that the fact of the application had not come to the knowledge of the Lords of the Admiralty, until it was too late, consistently with the rules of the Privy Council Office, to enter a caveat, as they wished a condition to be inserted in the grant, which was of importance to the public, and asked for the hearing of the petition to be postponed.

Sir Frederick Thesiger, Q.C., for the Petitioners, objected to a caveat being then filed; or to any postponement, as great expense had been incurred in bringing their witnesses.

**[136]** The Attorney-General (Sir John Jervis) offered no objection to the application.

Lord Campbell.—I cannot understand why the Attorney-General may not do all that the public interests require without the Admiralty. It must be a very strong measure to induce us, when the case is called on, and there is a competent person before us to take care of the public interest, to postpone the hearing upon a suggestion that might have been acted on long ago. The Petition must go on.

It appeared from the evidence, that the invention was of great merit and public utility, although the novelty of the Patentee's invention had been questioned. The Patentee's merit being, not so much in the invention of the screw, as the place where he placed the screw, in the rising or dead wood of the run. There was no profit. There had been a contract with the Admiralty, who had used it very extensively, and owed £25,000 for its use, but who refused to pay it, in consequence of the litigation and claims of other parties respecting the originality of the invention. There had been large infringements, and an action had been brought by the Patentee against a party for an infringement, but the defendants got a verdict, to the loss of the Patentee of £2000. No actions had been brought against the other parties who had infringed the Patentee's rights.

Sir Frederick Thesiger, Q.C., Mr. Montagu Smith, and Mr. Webster, for the Petitioners.

The Attorney-General (Sir John Jervis), for the Crown, **[137]** objected to any extension being granted unless a condition was inserted in the new Letters Patent, to enable the public service to use and manufacture the invention, without any licence for that purpose, from the Patentee or his assignees.



End of George Jr. obit.

Mr. Blaxland's father was also an engineer, and for a time was in charge of the engineering department at Sheerness Dockyard. He claimed to be one of the numerous inventors of the screw propeller, and it seems certain that the Government rewarded him along with others on this count. It is on record that he and Francis Pettit Smith, another inventor of the propeller, and, like himself, a recipient of the Government's reward, soon after drifted into litigation. Blaxland won his case, but both spent the bigger part of their rewards on lawyers' fees. Soon after taking up his duties at Sheerness, Mr. George Blaxland, senior, converted a lifeboat into a small screw-propelled steamer, the engine and boiler of which he constructed himself in his spare time. This little vessel succeeded in crossing to Boulogne and back, and was probably the first screw steamer to cross the Channel. Towards the end of 1843 the warship Rattler, a vessel 176ft. long, of 1078 tons displacement, of 437 indicated horse-power, and of 9·6 knots, was launched at Sheerness. This ship was commenced as a paddle-wheel steamer, but was delivered after launching to Maudslays' for experiments with screws. Mr. Blaxland induced the Admiralty to allow the vessel to be tested in a kind of maritime tug-of-war against the paddle-wheeled Alecto, a ship of equal tonnage and horse-power. On April 3rd 1845, the two vessels were harnessed stern to stern off the Nore, and began pulling in opposite directions. The result was not long in doubt. The Rattler, in fact, towed the Alecto stern foremost through the water at a speed of two to three knots. A picture of this remarkable trial was among the late Mr. Blaxland's, jun., most cherished possessions. The result, rightly or wrongly was, of course, claimed as a decisive victory for the screw propeller.

Lord Brougham.—Their Lordships have paid attention to this case, from the great importance of the subject, and also because there are peculiarities in it which require investigation. It differs, in one or two respects, from the cases which have generally come before us. It requires that we should also attend to the peculiar circumstances of each case narrowly, because it is anything rather than to be taken as a matter of course, that when a party applies for an extension of a patent, merely on the ground, that it is a valuable invention, he is to have an extension of it beyond the fourteen years which the Statute gives him.

The parties will, therefore, perceive that it was necessary for us to examine minutely into the peculiarities of this case. Their Lordships are of opinion, that, though there are certainly some peculiarities which are not very satisfactorily explained, especially the length of time during which no steps were taken to sue parties who were clearly infringing the Patent, and the extension of time is not by way of compensation for such infringement, to those who have the Patent right; yet we have also to look to the circumstances, in which the party was placed in respect to the Admiralty, on the one hand, and to the great misadventure he had in steering through the Courts of law, where he unfortunately went against the wrong parties, and, at the expense of £2000, failed in his suit. We have to consider these matters altogether; and, also, that we **[138]** have no clear proof, that there was any very great amount of infringement, because, though it is alleged, on the one hand, that there were 100 merchant vessels, that is a mere statement, and, on the other hand, it is asserted there were 3000 horse power, which also is a mere statement: probably the truth may be between those two extremes.

Now, while their Lordships did not think that, regard being had to the other circumstances of this case, to the great merits of the Patentee, which are undeniable, and to the great advantage likely to accrue to the public from this invention, enough had been made out for them to refuse this application; at the same time, in granting the extension, we are quite clear, that it ought to be with a view to the condition exacted by the Attorney-General, and to which Sir Frederick Thesiger, on the part of his client, intimated that he had no objection. Such a condition must be a part of our recommendation to the Crown for the grant in question; but we cannot tell, it being very important that it should be accurately framed, how to word it, and, therefore, how to word our judgment. Accordingly, we shall just state the amount of time for which we mean to extend the monopoly, adding that, before the close of the sittings, we wish that the parties would each give in that to which they have agreed, and then we will add and annex to it, our recommendation of the extension which, we are of opinion, ought to be for the term of five years.

The condition to be inserted in the new Letters Patent having been agreed upon, by an Order in Council, it was ordered, that new Letters Patent for England, and Ireland, and Scotland, respectively, were to be granted to the Petitioners, John Dean Paul, Bart., and **[139]** John Maltby Sunley, in whom the legal interest in the said original Letters Patent were then vested, for the further term of five years, from and after the expiration of the term in the said Letters Patent; and Her Majesty was further pleased to Order, that "there be inserted a condition, or reservation, in the said new Letters Patent, that it shall be lawful for the Lord High Admiral of the United Kingdom of Great Britain and Ireland, and for the Commissioners for executing the office of High Admiral for the time being, to contract with any person or persons, whomsoever, for the manufacture and fitting, and cause to be manufactured and fitted by any person or persons, whomsoever, at any time or times, and at any place or places, whatsoever, the said Invention, for the service of Her Majesty and Her Majesty's heirs and successors; such person or persons shall be at liberty to manufacture and fit the same accordingly, for the service of Her Majesty, her heirs, and successors, without any licence, let, or hindrance from the Patentee, his executors, administrators, or assigns, and without the Patentee, his executors, administrators, or assigns, being entitled to any compensation or damages, whatsoever, for the same; and that there should also be a condition, that, if the Patentee, his executors, administrators, or assigns, shall not supply, or cause to be supplied, and fit, or cause to be fitted, for Her Majesty's service, the said invention as he or they shall be required to supply or fit the same, in such manner, at such times, and at, and upon, such reasonable prices and terms as shall be settled for



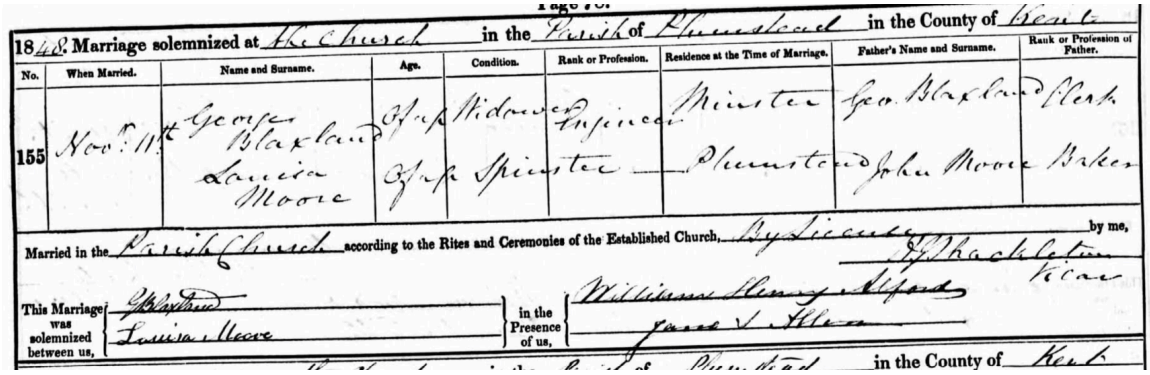


that purpose by the Lord High Admiral of the United Kingdom of Great Britain and Ireland, or by the Commissioners for executing the said office for the time being, then that the said Letters Patent shall be void."

[Mews' Dig. tit. PATENT; F. CONFIRMATION, RENEWAL, AND EXTENSION OF LETTERS PATENT; 2. *Renewal and Extension;* a. *Generally.—Position of Attorney-General—Inadequate Remuneration.* As to extension generally, see 46 and 47 Vict., c. 57, s. 25. As to imposition of conditions, see *Smith's Patent, In re,* 1885, 2 R.P.C. 14.]

## George Blaxland Sr. – Second Marriage & Original Letters (which survive to this day)

A year after the death of his first wife, Jane Thompson, George married Louisa on 11th November 1848 who managed to outlivse him, remaining in Gillingham House for many years. There is no record of children.



1848. Marriage solemnized at The Church in the Parish of Plumstead in the County of Kent

| No. | When Married. | Name and Surname. | Age. | Condition. | Rank or Profession. | Residence at the Time of Marriage. | Father's Name and Surname. | Rank or Profession of Father. |
|---|---|---|---|---|---|---|---|---|
| 155 | Nov.r 11th | George Blaxland | Of Age | Widower | Engineer | Minster | Geo. Blaxland | Clerk |
| | | Louisa Moore | Of Age | Spinster | | Plumstead | John Moore | Baker |

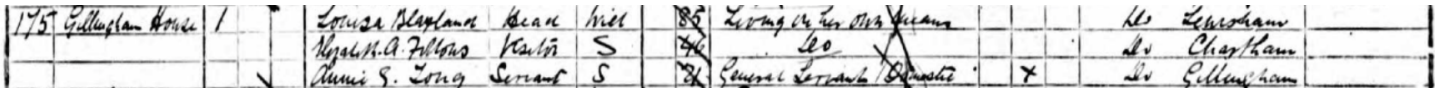
Married in the Parish Church according to the Rites and Ceremonies of the Established Church, By Licence by me, T. Thackeray Vicar

This Marriage was solemnized between us, George Blaxland, Louisa Moore

in the Presence of us, William Henry Gifford, Jane L. Allen

in the County of Kent

They appear together in 1851 and 1871 census polls (Channel Islands then Gillingham House, Kent). By 1891, Louisa is alone with servants.



| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | Gillingham House | 1 | | Louisa Blaxland | Head | Wid | 85 | Living on Her Own Means | | | | Gillingham |
| | | | | Agatha A. Fillans | Visitor | S | 46 | do | | | | Chatham |
| | | | | Annie S. Long | Servant | S | 24 | General Servant Domestic | | X | | Gillingham |

## George Blaxland Sr. – Death & Will

**BLAXLAND George.**

**Effects under £450.**

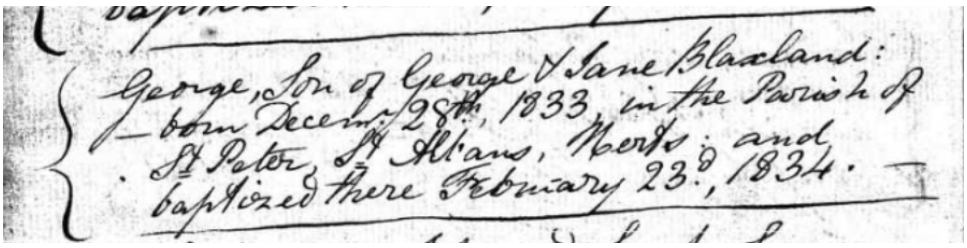
26 October. The Will of George Blaxland late of Gillingham House Gillingham in the County of **Kent** who died 7 September 1874 at Gillingham House was proved at the **Principal Registry** by Louisa Blaxland of Gillingham House Widow the Relict the sole Executrix.

**JBH: need to include copies of George's letters and other details once back in Australia (April 2018); they reveal much of the family.**

❖ ❖ ❖

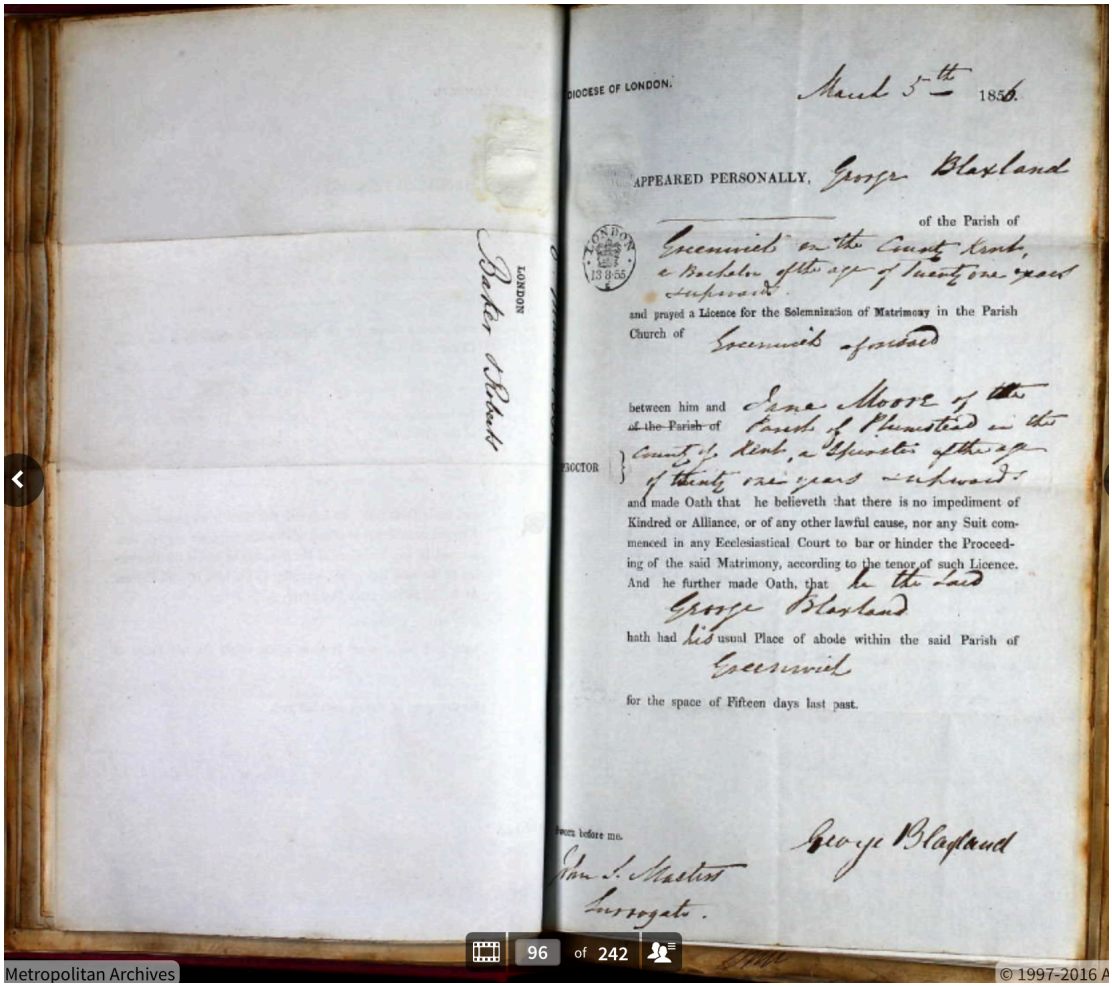
## George Blaxland Jr. – Birth, Baptism, Education, Marriage & Apprenticeship

The 1833 birth and 1834 baptism of George Blaxland Jr. in St. Albans is recorded in the Quaker register.



George, Son of George & Jane Blaxland: born December 28th, 1833, in the Parish of St Peter, St Albans, Herts: and baptized there February 23d, 1834.

On 5th March 1856, George married Jane Moore of Plumstead, Kent; both were 21. The marriage document below includes a copy of George's signature.


DIOCESE OF LONDON.

March 5th 1856.

APPEARED PERSONALLY, George Blaxland

of the Parish of Greenwich in the County Kent,

a Bachelor of the age of twenty one years and upwards

and prayed a Licence for the Solemnization of Matrimony in the Parish Church of Greenwich aforesaid

between him and Jane Moore of the ~~of the Parish of~~ Parish of Plumstead in the County of Kent, a Spinster of the age of twenty one years and upwards

and made Oath that he believeth that there is no impediment of Kindred or Alliance, or of any other lawful cause, nor any Suit commenced in any Ecclesiastical Court to bar or hinder the Proceeding of the said Matrimony, according to the tenor of such Licence. And he further made Oath, that he the said George Blaxland hath had his usual Place of abode within the said Parish of Greenwich for the space of Fifteen days last past.

Sworn before me.

George Blaxland

Jno. S. Masters

Surrogate.

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Metropolitan Archives

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I have taken the text below from his official obituary published on 23rd August 1912 in The Engineer:

> By his death on the 8th August, Mr. George Blaxland of Gillingham, Kent, the engineering profession has lost a member interesting by his own personality and career, as well as from his connection with the past.
>
> George had a privileged education at the Greenwich Naval School. He served his apprenticeship as a mechanical engineer with **Mr. John Penn, of Greenwich** [JBH: see note below], and at an early age *acquired the confidence of his master*. He had barely completed his indentures when he was sent by the firm to supervise the erection and preliminary running of some factory machinery at Genoa. Two years later saw him in Brazil superintending the engines of a warship constructed by his master. Shortly after returning home he was appointed by the Spanish Government to the post of director of machinery at Havannah. Here for several years he had control of the arsenal and the repairs of the Spanish naval vessels arriving at port. His tenure of this office covered the period of the American Civil War, and several ships of war and blockade runners from both sides put into Havannah for repairs, among them the famous Confederate corvette Alabama. After six or seven years in Cuba, he once more returned to England where, in partnership with a Mr. Wyllie [JBH: spelt Wylie in other articles], he set up in business as a marine salvage engineer.

> About this time a severe hurricane at St. Thomas, West Indies sank a floating dock designed by the late Sir Frederick Bramwell as well as the mail steamer Columbia and several other vessels. A contract for salving the dock was entrusted to the new firm. The ensuing operations were attended with great difficulty. The dock pontoons were badly crushed, and only 3ft. or 4ft. of the side walls projected above the surface of the water. Several unsuccessful attempts were made to raise the dock, but in the end Mr. Blaxland refloated and repaired it. His method of doing so is worthy of record, as it is said to mark first use of compressed air for salvage work. He designed special air locks whereby access

to the various pontoons might be obtained, and by means of air pumps constructed on the spot he expelled the water. He and his workmen then entered the pontoons and effected the necessary repairs preparatory to the final raising. The dock is, we believe, still in use at St. Thomas. The same procedure was applied to the steamer Columbia. Mr. Blaxland was again successful, and himself navigated the vessel back to Liverpool although it had been under water for about etghteen months.

Deck scene, Cruiser Alabama
Cape Town, August, 1863.
Lieutenants Armstrong and Sinclair; 32-pounder, Lieutenant Sinclair's division.

Captain Raphael Semmes, *Alabama*'s commanding officer, standing aft of the mainsail by his ship's aft 8-inch smooth bore gun during her visit to Cape Town in August 1863. His executive officer, First Lieutenant John M. Kell, is in the background, standing by the ship's wheel.[10]

NOTE: **John Penn FRS** (1805-1878), Civil Engineer, was a very distinguished man. His citation for the Royal Society read "Inventor of Several Parts of Marine Steam Engines and Machinery Connected with Steam Navigation. Distinguished for his acquaintanceship with the science of mechanics. Eminent as a Mechanician and Engineer. From personal knowledge John Penn CE (Civil Engineer). Signed W Cubitt; Thos. Sopwith, Joseph Whitworth; Rob Stephenson and others. He was of outstanding character and regarded as the model employer, see https://en.wikipedia.org/wiki/John_Penn_(engineer)

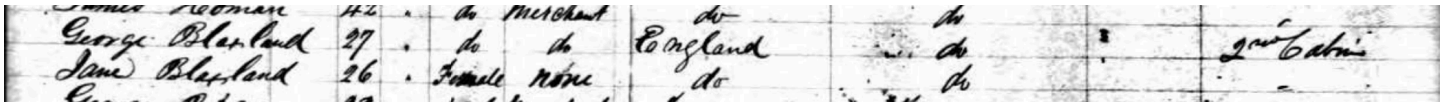
NOTE: George Jr.'s obituary gives some of the story of George Blaxland Sr. and the Alecto-Rattler "paddler vs steamer" trial ending with a comment on Jr.'s prized possession:

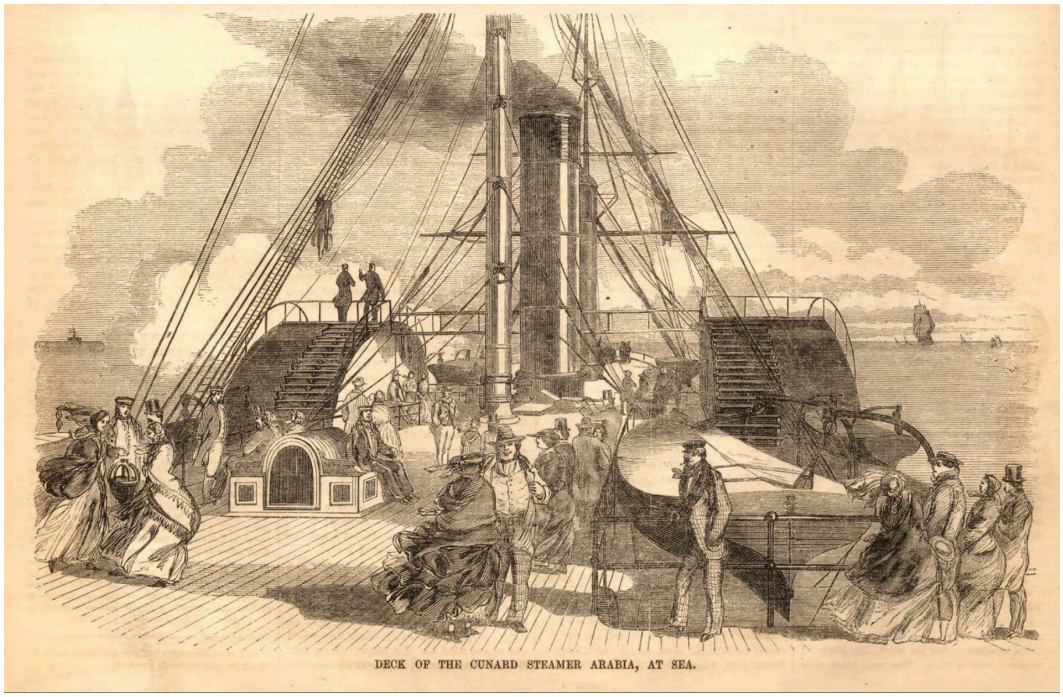
> A picture of the remarkable trial was among the late Mr. Blaxland Jr.'s most cherished possessions. The result, rightly or wrongly, of course, claimed as a decisive victory for the screw propeller.

I think this must be the image that is available (for a fee) at the Science & Society Picture Library. I did purchase a high resolution copy in 2014 from www.scienceandsociety.co.uk but then misplaced it somehow on a discarded computer. One of the images above is the preview image at that website.

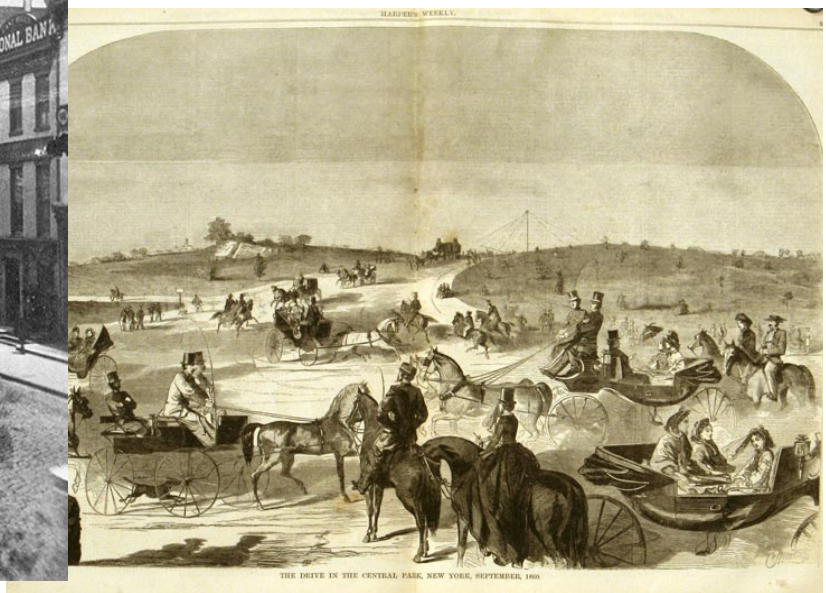
## George and Jane Blaxland – March 1860 paddle steamer journey to New York

It is interesting that George and Jane Blaxland made the paddle steamer journey from Liverpool to New York just one year before the outbreak of the American Civil War and the "draft riots" in the ciy, arriving on 30 March 1860. They travelled on the Cunard steamer Arabia shown below. Before 1861, New York traders were well established and traded between Europe and the Southerners who were mostly in debt to New Yorkers, one of the historical reaons given for New York supporting the Southern cause. Here's the log book entry – they travelled as "Second Cabin" middle class passengers so were allowed on deck, for example.





DECK OF THE CUNARD STEAMER ARABIA, AT SEA.

These are 1860 pictures of New York from Wikipedia - there are many online photographs from this period.. The photograph is Broadway? and the sketch is Central Park, Manhattan (not fully developed at this stage) which was opened the year before from land grabbed from New Yorkes by eminent domain.

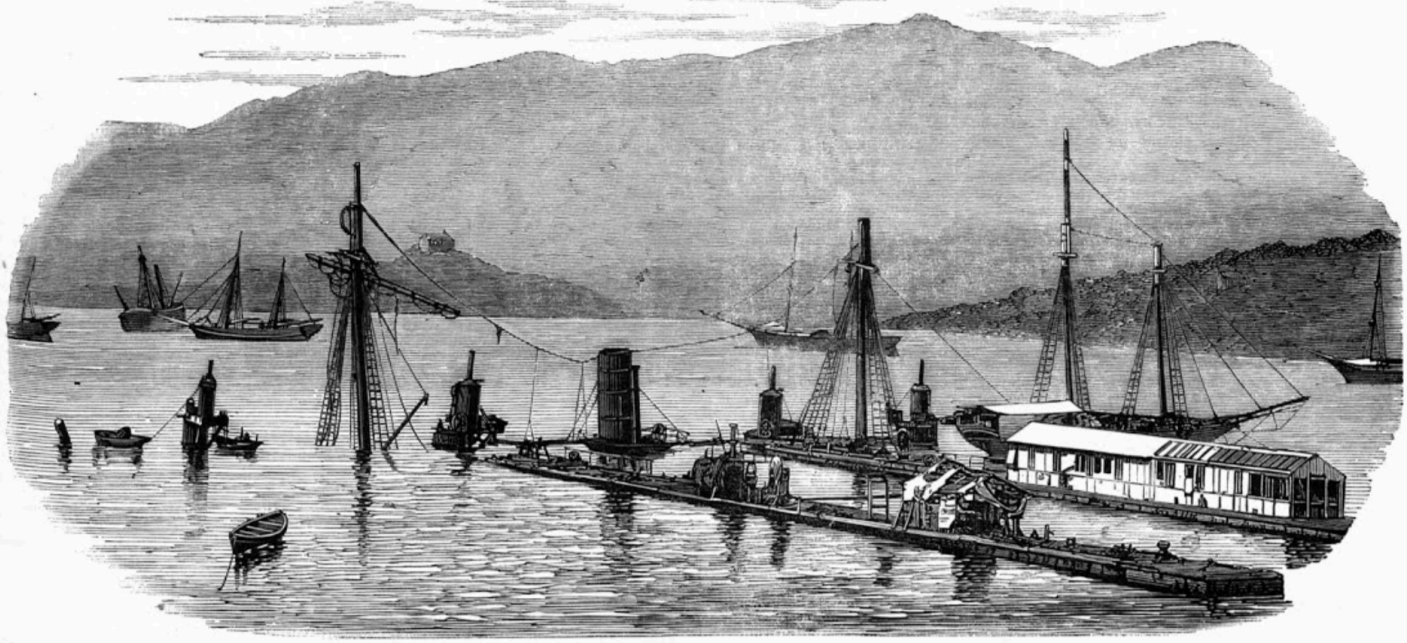
THE DRIVE IN THE CENTRAL PARK, NEW YORK, SEPTEMBER, 1860.

I can't find any record of their return but they must have done so within the year, or so.

## George Blaxland Jr. – West Indies and historic developments in marine salvage engineering

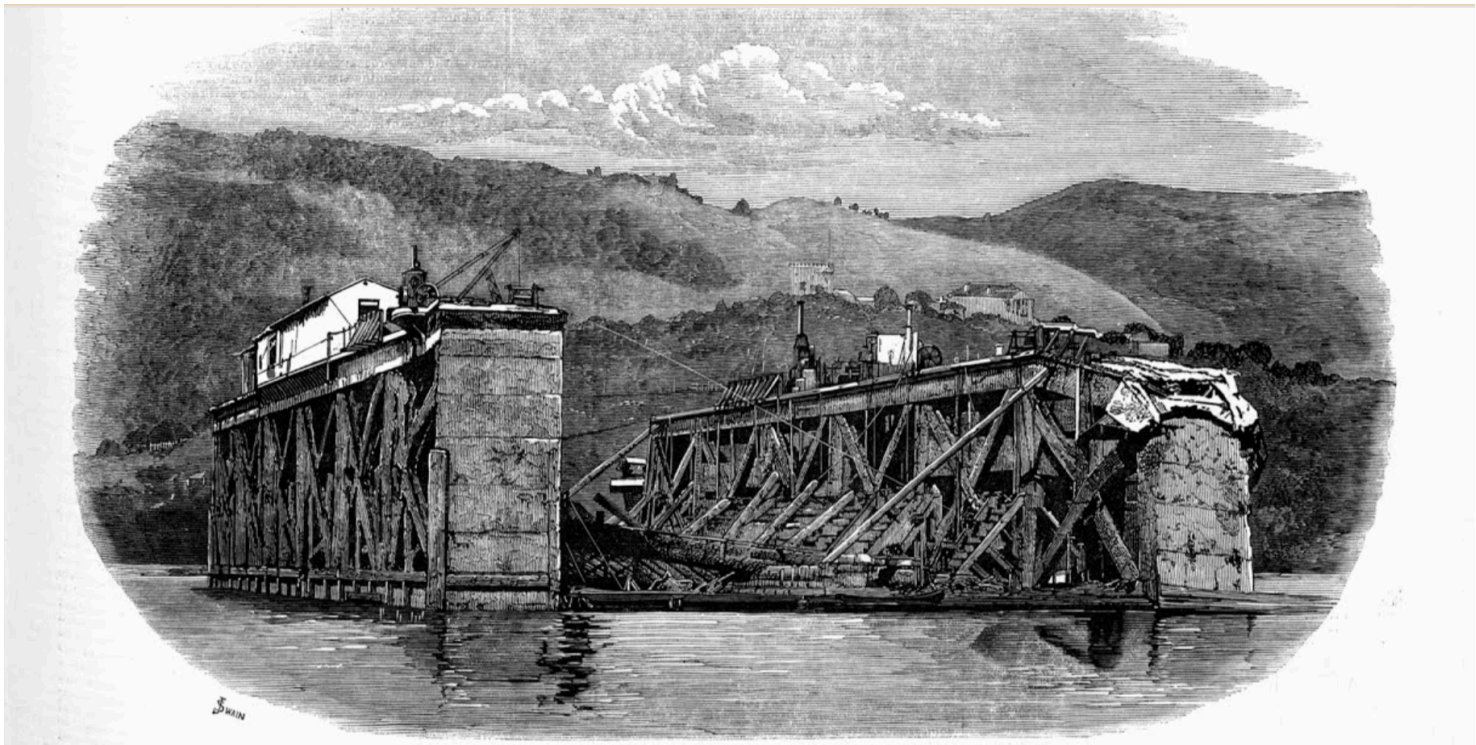
Here is an excellent article from The Engineer (2 pages), with outstanding sketches, of George Blaxland Jr.'s time at St. Thomas, West Indies. He had to solve a very difficult problem inventing marine salvage with compressed air in the process. George was lucky to escape with his life! I found this article through the online British Newspaper Archives. There are numerous reports to this work, and his obit. speaks of this structure being in full use many years later.

# ST. THOMAS' FLOATING DOCK.



IN 1867 a floating dock, designed by Mr. Bramwell, C.E., was, as our readers will remember, sent out to St. Thomas, West India Islands. General particulars of this dock were published in our impression for June 7th, 1867. Shortly after its completion the dock was sunk byan accident. It remained submerged for some time, and has only recently been recovered. As the operation of raising it was an important engineering feat, we have much pleasure in laying the following description of the work before our readers :—

Our illustrations show a portion of the harbour of St. Thomas, West Indies, where the floating dock was sunk by accident in 1867. Afterwards, during the great hurricane of October 27th following, the steamer Colombian and the sailing ship British Empire shared the same fate, both being wrecked at the end of the dock. Our first illustration is taken from a photograph obtained after the British Empire had been raised, and operations commenced for lifting the Colombian. The British Empire was raised in 1868 by Messrs. Wylie and Blaxland and Messrs. Murphy Brothers.



The dock was built at Cardiff and sent out in pieces and fitted together at St. Thomas. It is 300ft. long, 100ft. wide, and 42ft. 3in. high over all. Its gross weight is about 3600 tons, and it is of sufficient capacity to dock the largest steamers in the merchant service. In docking the Wye, belonging to the Royal Mail Company, the accident occurred which caused the dock to sink in about 6½ fathoms of water. Steps were at once taken to recover the dock by the company to whom it belonged, but progress was stopped by the great hurricane of October 27th, 1867, which also caused further injury to the dock by the Colombian and other vessels striking it. The funds of the company having become exhausted they wound up, and a new company was then formed to prosecute the recovery of the dock, and they invited tenders for that purpose. The tenders of Messrs. Wylie and Blaxland, engineers, London, was accepted, those gentlemen working in conjunction with Messrs. Murphy Brothers, professional divers, of Turks Island. These parties undertook to raise the dock for £20,000, partly in cash and partly in bonds, and asked for no payment whatever unless the salvage was effected. The contractors, therefore, ran a risk which we are happy to find they have successfully escaped.

The contract was finally arranged and signed on the 5th May, 1869, and shortly afterwards Mr. George Blaxland, jun., A.I.C.E., under whose superintendence the whole operations were to be conducted, proceeded to St. Thomas, and the work was commenced with vigour. An examination of the pontoons disclosed the fact that several of them could not be pumped out, as the top sides collapsed under pressure. It was then decided to use compressed air in the weaker pontoons, and an air pump which was at hand was set to work for that purpose. Mr. Blaxland, however, had larger air pumps made from his own designs. The defective parts were discovered with the aid of the small air pumps and effectually stopped, although some of them were severe and very awkwardly situated for getting at. Rivets had to be cut away and patches bolted on here and there. However, these preliminaries were satisfactorily finished, and to Mr. J. D. Murphy belongs the credit of having carried out, at a depth varying from 30ft. to 40ft., of these most difficult tasks. These done, and the large air pumps having arrived from England by the end of July, 1870, the pontoons were filled with air and the water pumps started. The dock then rose unequally and unsteadily, lurching over to one side, and it was found impossible to raise the lower side, as the compressed air passed over to the higher side too quickly for the rate of supply. A leaky pontoon was also discovered, and it eventually broke away from the girders and fell to the bottom. The dock was therefore again lowered, and it was decided to expel the water by means of compressed air alone, which had been proved by experience to be the best plan of procedure. For this purpose there were three sets of air pumps employed, each set having three cylinders driven by two combined vertical engines and boilers of 5-horse and 7-horse-power respectively. The manhole covers on the pontoons were removed, and plates, to which were fixed iron pipes, were attached in their places. Through these pipes the water was expelled, the air being admitted through junction pipes from the main air pipes to the several chambers of the pontoons. By this means sufficient water could be displaced in about thirty-six hours to enable the dock to be started. As, however, the floats would not act, owing to rust and damage from collisions, the dock was very unstable. The floats also were full of water, which had to be expelled by compressed air, which operation was successfully carried out by Mr. Blaxland. He drilled two holes in each float, introducing the compressed air through one which expelled the water through the other, the supply of air being stopped when the water had all been forced out. In order to make the bulkheads tight it was necessary to enter the pontoons, but the smallness of the manbole prevented the divers from entering them, so that Mr. Blaxland hit upon the idea of overcoming the difficulty by means of an air lock, which was made in about three weeks. It was attached to one of the pontoons, and Mr. Blaxland and a Negro labourer entered into its upper chamber, where, from the displacement of the india-rubber packing ring of the joint, and mismanagement of those outside, the two had a narrow escape of losing their lives. Fortunately they got out in time, the seething water fast following them, having rapidly reached above their waists. The defective working of the air-lock was, however, soon remedied, and its use was one of the principal appliances in enabling the dock to be successfully raised. The whole of the necessary work having been completed, early on the morning of the 3rd January last the air pumps were set to work once more, and were continued in constant operation until the morning of the 4th, when the dock again commenced to rise. By the morning of the 5th the dock was fully raised, and on the afternoon of the same day was towed across the harbour by the steamer Titian to Long Bay, where it was safely grounded in about 8ft. of water in the position shown in our second engraving.

From the few details given, none but those who have passed some time in the tropics can imagine the difficulties encountered by Mr. Blaxland and those connected with him in his arduous undertaking. We understand that one of the principal considerations in accepting the offer of Messrs. Wylie and Blaxland was the knowledge of the fact that Mr. Blaxland had previously filled the post of Chief Engineer of the Royal Dockyard, Havana, and was accustomed to conduct engineering work in a tropical region. We understand that he only had the services of one English mechanic, formerly under him at Havana, the rest of the work being done by the Messrs. Murphy and a corps of negro assistants. We congratulate Messrs. Wylie and Blaxland and their co-contractors on the successful termination of a most difficult and dangerous work, and on the extremely simple and scientific manner in which it has been carried out; and we likewise congratulate the shareholders on the recovery of a most valuable property, which we hope soon to learn has been repaired and is in constant and remunerative use.

## APPENDIX: Blaxland's Propeller

This is the original patent and seal for George Blaxland's 1840 patent. Today, it hangs on the wall at 1 Harbour St, Mosman, NSW 2088, Australia. Aunt Judith (Blaxland Aisbitt) had it restored in 2015, and JBH shipped it to Australia in 2016. The seal was damaged by a heater at Judith's and Canon Denis Payne's home built into the Roman Abbey at Bury St Edmunds, Suffolk. This was once in the possession of Dr. Stephen Blaxland, Bury St. Edmunds, Suffolk.

# Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE

No. 982.] SATURDAY, JUNE 4, 1842. [Price 3*d*.

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## BLAXLAND'S PROPELLER.

Fig. 1.

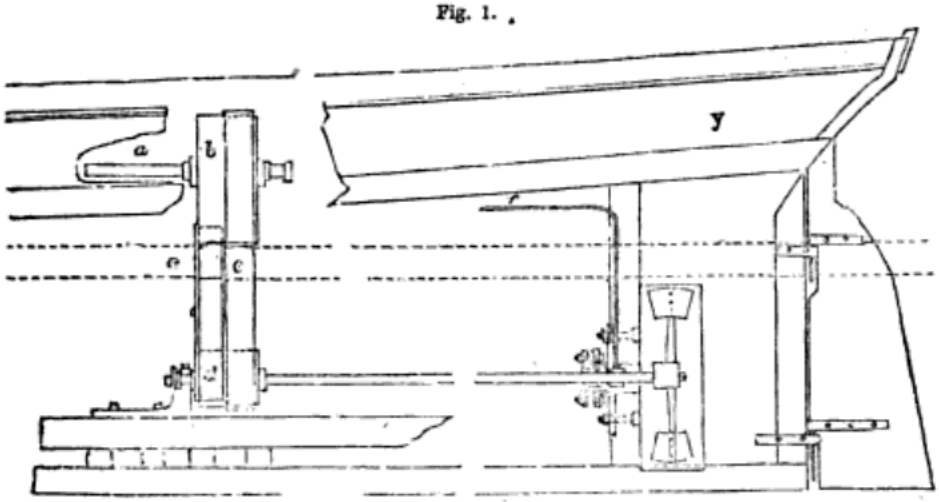



Fig. 2.

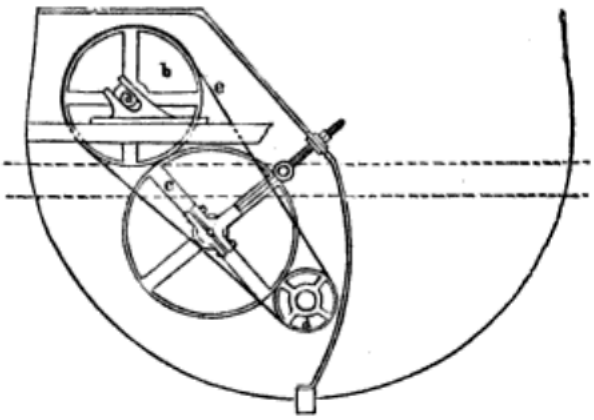



Fig. 3.

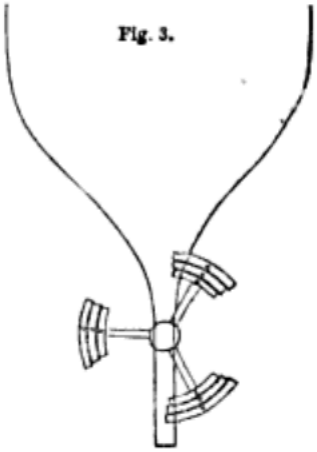


Fig 4.

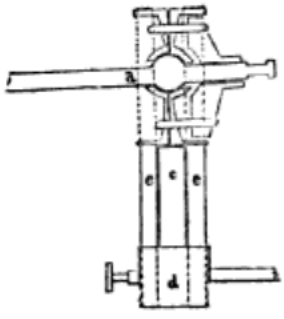



Fig. 5.


ig. 6.

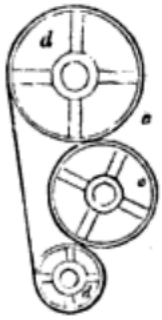
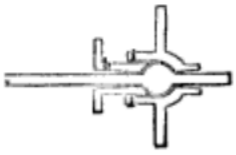



Fig. 7.

Fig. 8.

Fig. 9.



In our last volume (p. 209) we gave an account of some very remarkable experiments made with a new stern propeller, invented by Mr. George Blaxland, as applied to the *Jane*, a little vessel of no more than three tons, with a steam-engine of less than one horse power, in which the enterprising inventor had actually made two or three successful *sea* voyages; and we gave also a brief description of the propeller, with a full exposition of the advantages expected from its adoption.

We mentioned at the same time that the well-known commercial steamer the *Swiftsure* (137 tons burden, 40 horse power) had been purchased for the express purpose of having the new propeller applied to her, and its capabilities tested on a large scale.

Before removing the old paddle-wheels from the vessel, several experiments were made with her to ascertain her then rate of going, when it was found not to exceed, under the most favourable circumstances, 7½ miles an hour.

The removal of the paddle-wheels and boxes relieved the vessel of an overhanging weight of 12 tons, 6 cwt., 2 qrs., 16 lbs.; but as we must set off against this the weight of the propeller and its connexions, which is about 4 tons, the total reduction of tonnage is little more than 8 tons.

The reduction in the width of the vessel, from the removal of the paddle-wheels, has been 14 feet, making her present beam 16 ft. 3 in.; her length is 112 feet.

On Saturday, the 21st ult., a trial of the vessel, as thus altered and newly fitted up with Mr. Blaxland's propeller, was made on the river in the presence of the following members of the Board of Admiralty:—the Earl of Haddington; Admiral Sir George Cockburn; Admiral Sir William Hall Gage; Admiral Sir George Francis Seymour; the Hon. Henry Thomas Lowry Corry, (five of the six Lords,) and the Hon. Sidney Herbert, M.P., Chief Secretary, who expressed themselves in the highest degree pleased and satisfied with her performances.

The speed of the vessel is now full nine miles an hour; showing a gain by the substitution of the propellers for the paddle-wheels of a mile and a half per hour. The lines of the *Swiftsure* are very unfavourable to speed; at the bows particularly, which are as bluff as those of a Dutch lugger. A vessel with a fine cutwater, similar to those of the crack Gravesend boats, would no doubt have exhibited a much greater proportional increase of speed. But had the vessel only gone as well as before, there would have been a great advantage achieved in the removal of the propelling machinery from the sides of the vessel to the stern, and its entire submersion there below the water line. Exemption from risk of damage by shot—an end to the retarding influence of backwater—and the removal of every obstacle to the occasional use of sails, are among the more obvious consequences of this improved arrangement.

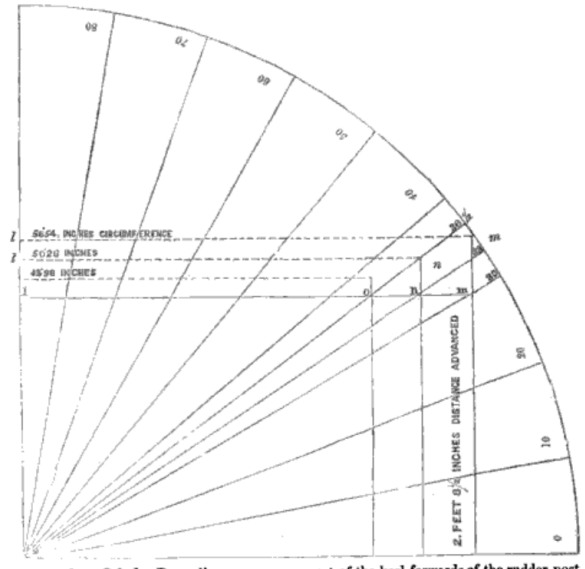
The gear work, by which the power of the engines (a pair of twenties) is communicated to the propeller shaft, and which has been also patented by Mr. Blaxland, is remarkable for its efficiency, and for the smoothness and stillness of its action. Except at the stern of the vessel, immediately above the propeller, not the least tremor is felt, nor noise heard. The vessel moves so silently through the water, and the propeller is so entirely out of sight, that, were it not for the engine chimney, one would be puzzled to conjecture by what means she is propelled.

We had the pleasure of being personally present at a subsequent experiment made with the *Swiftsure*, and of verifying the preceding statements in every particular. Not a single drawback from the utility of the invention were we able to detect. Often before has the paddle-wheel been threatened to be superseded, but never, to our mind, with so good a prospect of success. Mr. Blaxland's propeller accomplishes all that can ever be expected to be accomplished by the screw, whether employed according to Mr. Smith's plan, or to Captain Ericsson's; while it is wholly free from the mechanical objections inseparable from the use of that agent. Whether any other form of propeller, if applied and worked in the same way as Mr. Blaxland's would not answer equally well, we need not at present stop to enquire; for Mr. Blaxland's propeller, and Mr.



Blaxland's method of working, must be taken together; they are part and parcel of one patented invention; they are legally "one and indivisible," and must, in all fairness, be so considered.

The description which we gave of the invention in our last volume, did not point out with sufficient clearness the important part which the gear-work plays in the affair, and was also defective in several other particulars. We have thought it, therefore, due to the importance of the invention, to avail ourselves of the present opportunity to describe it anew, and with more completeness, in all its details; and to save the trouble of reference to the back volume, we have included in the accompanying engravings three which were formerly given.*




1.—*Of the Propeller.*

The principle on which Mr. Blaxland constructs his propeller, is thus clearly explained in his specification:—

"One or more inclined planes or propellers are to be affixed at right angles to a revolving horizontal shaft placed over the after part of the keel forwards of the rudder post, which inclined planes work in the water below the water-line, in an opening formed in the dead wood of the vessel, but without any bearing or journal beyond the inclined plane or planes, so as not in any way to be attached to the rudder post. In order to determine the angles at which the inclined plane or planes is or are to be fixed to the revolving horizontal shaft, I draw a straight line, the length of the circumference, as shown in the diagram, fig. 10, from *l* to *m* 56·54 inches; then I set out the angle at which I intend to set the first or outermost inclined plane, and raise a perpendicular from the length of the

* For the means of giving this more complete description we are indebted to Mr. G. Steinman, the owner of the *Swiftsure*, and part-proprietor of Mr. Blaxland's patent, to whom the highest praise is due for the spirit and liberality with which, regardless of expense and trouble, he has persevered in obtaining a fair trial for the invention which he has taken under his patronage.

circumference, and at that point where it intersects the angular line which is determined upon, will be the distance passed through at one revolution. Then I draw a line parallel to the base line, and in like manner set off the other different distances, as from *l* to *n*, 50·26 inches the circumference. I then find that an angle of 33° is necessary to give the same distance advanced, and in like manner I proceed to set out for the different circumferences or diameters required. I prefer, however, not carrying it further to the centre than where an angle of 45° would be required to give the distance. I rivet the inclined planes, which I prefer divided into three or more parts, each part being separately riveted on to an arm, as shown in fig. 7.

### 2.—*The Gear Work.*

The speed of the revolving shaft upon which the inclined planes are fixed is got up and maintained in the following manner:—

"I place an intermediate friction wheel between the larger driving drum, and the smaller driven drum, as shown at figs. 1 and 2, which friction wheel revolves with the driving drum, and is again borne and communicates its motion to the driven drum I bring the friction wheel into or out of the line of centres by means of a screw as shown in fig. 2, whereby the strap or band *e*, which passes over the said driving and driven drums may be tightened or slackened as occasion may require. In order to keep the drums parallel to each other when the shafts are out of a parallel line, I leave a spherical boss upon the shaft, and make the drum in two parts, so as that the boss of the two parts of the drum may fit the boss on the shaft, and put them together by means of screws, so as to form an universal joint; and a clutch, or driving coupling, is keyed on to the shaft to carry the drum round, as shown at fig. 4. The strap or band may be made to pass upon the surface of the intermediate wheel, as shown at fig. 2; when it may be required for the propeller shaft to rise and fall with the tightening and slacking of the strap, a bearing is used as shown at fig. 9. I grind the part *h*, into the socket *i*, so as to make it watertight, but at the same time to move freely in and out of its socket and the part *h* may be kept up to the spherical part of the shaft by means of a spring or springs, but I do not consider it indispensably necessary that the propeller shaft should rise and fall, having in my experiments allowed the upper shaft *a* only to rise and fall with the tightening or slackening of the strap."

*Explanatory Figures.*

Fig. 1 is a section or side view of the after part of a vessel, showing the invention as used on board the experimental boat *Jane*; *a* is the main driving shaft from the engine, *b* the driving drum; *c* the intermediate friction wheel; *d* the driven drum; *e* the strap; *f* is a pipe carried to any convenient part of the vessel, through which a mixture of oil and tallow is applied to the gland or bearing where the revolving shaft passes through the vessel; the mixture being put into a cylinder, in which a piston is fitted and loaded with a weight so as to force it into the gland or bearing. The propeller is here shown with an undivided inclined plane.

Fig. 2 is a section through fig. 1, showing the mode of tightening the strap by means of the friction wheel and screw as applied on board the *Jane*; the letters in this fig. correspond with those in fig. 1.

Fig. 3 is a section through the stern end of fig. 1, but showing three series of divided planes, each divided into three parts.

Fig. 4 shows a mode of keeping the drums parallel to each other, when the shafts are out of a parallel line, with one intermediate friction wheel, and

Fig. 5 the same with two intermediate friction wheels.

Fig. 6 shows the strap and band when made to pass upon the surface of one intermediate wheel.

Fig. 7, is an end view of a propeller with four series of inclined planes, each divided into three parts.

Fig. 8 is an end view of the propeller used in fig. 1.

Fig. 9 shows the mode used for a bearing, where the propeller shaft passes through the vessel when it is required that the same may rise and fall.

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*Application to River and Canal Purposes.*

On Tuesday, the 24th ult., a trial of the *Jane* was made in the River Lea, in the presence of the following gentlemen:—Ezekiel Harman, Esq., of Theobalds; Thomas Brewin, Esq., of Birmingham; W. C. Mylne, Esq., Engineer to the New River Company; Lieut. Webb, of the Ordnance Department, at Waltham Abbey; Mr. Austin, Engineer to the Ordnance Mills, Waltham Abbey; Mr. Griggs, Surveyor to the river Lea, and Mr. Gunner, store-keeper to the Ordnance.



The boat was steamed from Enfield Lock to Ware, a distance of 14¾ miles and back, and proceeded with hardly a ripple in her wake, whilst a small boat towed by a powerful horse which followed her caused so much surge and commotion that her gunwale was frequently within an inch of the water. When the horse-drawn boat was made fast to the *Jane*, the surge and commotion ceased. The *Jane* remains at Enfield waiting a special general meeting of gentlemen interested in canal navigation, from all parts of England, which is to be shortly held there, to take the applicability of the Blaxland Propeller to Canal purposes, as well as other matters, into their consideration.

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## ON EELS AND EEL LINES—BY COL. MACERONE.

There is some confusion in the Latin terms for eels; *Anguis*, *Anguilla*, *Muræna*, being often applied to the same animal.

To avoid technicalities, I will observe, that in this country we have two kinds of eels; the small dark blue eel found in canals and muddy rivers, and the large silver eel abounding in the Thames, &c.

The *Muræna* is called in England lamprey; it is of a bright yellow brown with black streaks, much after the fashion of some serpents, and is thicker, in proportion to its length, than the common eel. In lieu of gills, it has seven holes on each side, which answer the purpose of separating the air from the water, like the gills of other fish. The only difference is in the division of the openings for the water into the gills.

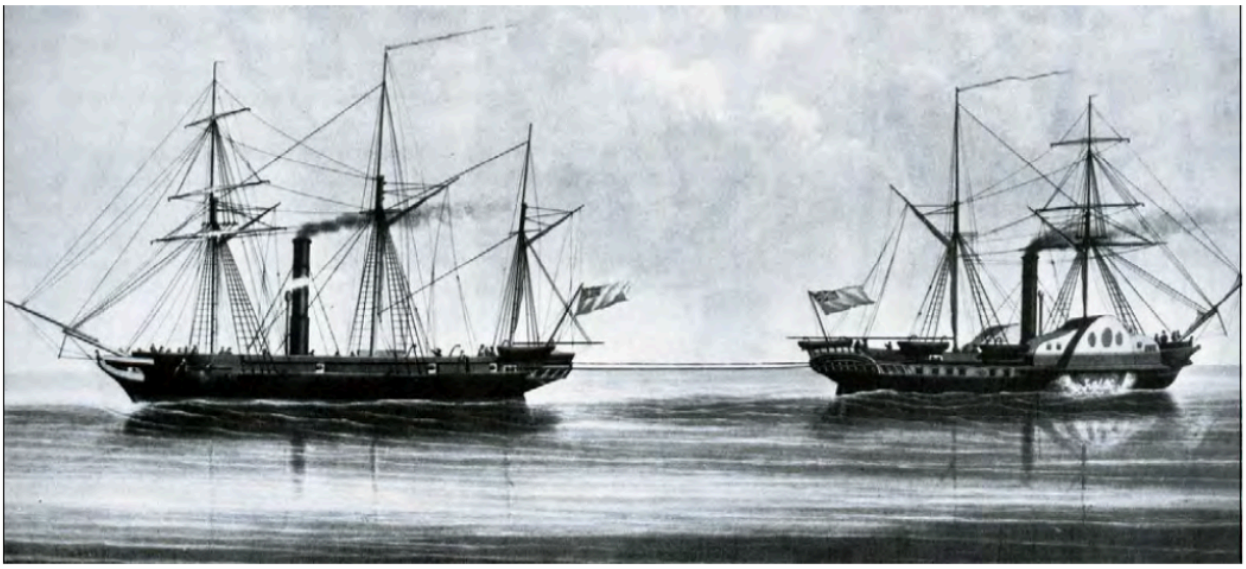
The greatest supply of these *Murenæ*, or large lampreys, is about Puzzuoli, eight miles from Naples, where, it is said, that Lucullus had his marine fishponds, into which he cast the flesh of his offending slaves! I have never caught any lampreys of more than four pounds each. Like the smaller lampreys they have no bones, but only cartilage, and are exceedingly nutritious food. They have never been known to reside permanently in fresh water.

But the common eel is only generally known during its residence in our rivers, lakes, and ponds. Its natural history is very curious, and but little understood. The salmon, shad, grey mullet (*cefalo*), smelt, and some other fish, reside mainly in the sea, and only frequent the rivers for the purpose of spawning; but the eel brings forth its young in the sea, which soon ascend the rivers, wherein they remain until the age of propagating maturity. This age is about four years, when, in large rivers like the Thames, they have acquired the weight of from two to three pounds. At this period, upon the first autumnal floods, they hasten to the sea, never more to return into fresh water. Thus it is that they are then taken in such numbers, and all nearly of the full grown size, in certain wicker or reed apparatus placed across the streams.

In large lakes and waters that have no communication with the sea, eels are often found of a far greater size than in any river, because they are compelled to remain therein, and continue to grow. In the lakes of Albano and Nemi, near Rome, there are eels of ten to fifteen pounds weight. In the year 1827, an eel was caught in its attempt to escape from a lake in the centre of the island of Mauritius, which weighed twenty-seven pounds, and was presented to the governor, Sir Lowry Cole. On the coast of the Adriatic, is the city of Comacchio, in the Papal States. It is surrounded by extensive lakes and swamps, with several estuaries to the sea. The staple article of trade at Comacchio consists of eels. It is in October and November that the great migration of eels takes place. The class of mature ones, *i. e.*, from three to five pounds, hasten to quit the lakes for the sea. In order to intercept them, meandering labyrinth-like constructions of slender reeds are established at the estuaries, into which the eels freely enter, but cannot find their way out. No small ones ever attempt this departure. The quantity thus taken is prodigious. The entire population of Comacchio and its dependencies subsist mainly on the produce. The labour is divided into sections. One set of men build the labyrinths, and take the eels. Another section, including many women, chop them into pieces and roast them. Others make barrels for their package. Another set pack them up with bay-leaves, salt, and vinegar.

**APPENDIX:**

# THE SAIL & THE PADDLE
# PART II



The tug-of-war between the screw-driven *Rattler* (left) and *Alecto* (right) was more of an exhibition to convince public opinion than a scientific test, as the Royal Navy had already ordered seven screw driven ships by March 1845.

So far as the merchant ship was concerned, the propeller was almost universally recognised as the most efficient mans of ship propulsion, but the warship in general remained wedded to sail. This was to some extent understandable, particularly in Britain, which had emerged from the last great war as undisputed master of all the oceans. She still maintained the largest fighting fleet in the world, and the officers and men who had manned that navy in war were still serving in it. A radical change from wood and sail to iron and steam meant starting the navy again from scratch, with the present superiority of numbers wiped out at a stroke. But with the invention of the propeller the overriding objection to steam propulsion in warships, the vulnerable paddlewheel, had been removed , and the steam engine at last had to be admitted into naval ships.

But it was not admitted without a struggle by traditionalists, and there was still much argument in naval circles in all countries as to weather the propeller was really superior to the paddlewheel. The argument was finally settled in 1845, when two virtually identical frigates of 880 tons, H.M.S. *Rattler* and H.M.S. *Alecto*, were both fitted with engines of 220 horsepower, that in H.M.S. *Rattler* driving a propeller and that in H.M.S. *Alecto* a pair of paddlewheels. In March of that year the two ships had a race over 100 miles which the Rattler won by several miles. In a later test, the two ships, tied together with a towing hawser, set off under full engine power in opposite directions. The *Rattler* with her propeller towed the *Alecto* stern first at a speed of 2.7 knots - conclusive proof that a propeller not only drove a ship faster, but also exerted considerably more power.

So wooden warships, or at least those of Britain, were fitted with steam engines, although

they still retained their full complement of masts and sails. The installation was achieved by bringing the ships into drydock, cutting them in half, and lengthening them to accommodate engines and boilers. But, whereas, in the merchant ship, masts and sails were fitted as an auxiliary source of propulsion, for use if the engine failed, in the warship it was the engine that was an auxiliary source of power, for use if the wind were blowing in the wrong direction. In France, the only other nation with a comparable navy, the adoption of the steam engine, even as an auxiliary source of power, progressed much more slowly. By 1854, only nine years after the *Rattler-Alecto* trials, the entire British fleet sent into the Baltic at the start of the Crimean War was fitted with engines; the entire French fleet in the Baltic still relied entirely on sail.

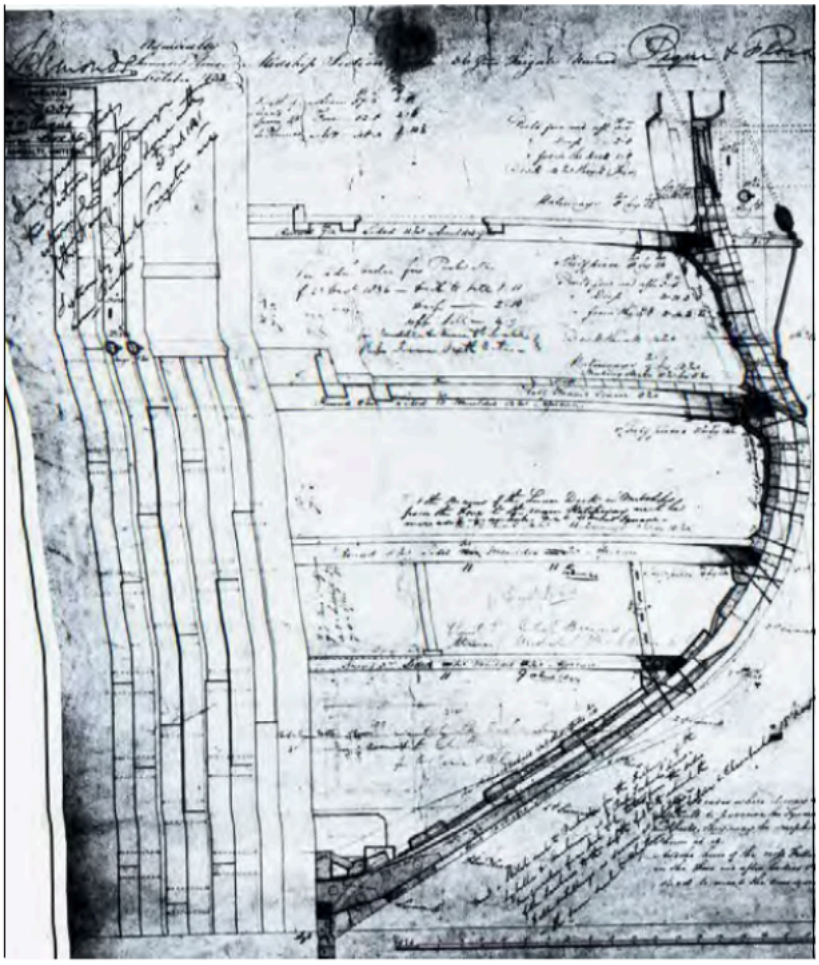
Although the propeller had emerged as the best means of transforming engine power into motion through the water, one problem remained unsolved. The fitting of a propeller entailed making a hole for the shaft in the ship's sternpost, and technology could not yet ensure watertight fitting. There were cases where ships leaked so badly through their stern gland that they had to be beached to save them from sinking. (Wooden-hulled ships faced an additional hazard. Since the vibration of the propeller could shake the sternpost to such an extent that the seams of the planking near the stern opened up and let the sea in.) It was not until 1854 that this particular problem was solved by John Penn, an engineer whose marine steam engines were widely used in ships. Penn discovered that *lignum vitae*, the hard, smooth wood of the guaiacum tree, which grows in the West Indies and has self-lubricating properties, was ideal for the purpose of lining stern glands. It also suffered very little wear as the propeller shaft revolved inside it. It was used for lining stern glands for the next forty years, until the more modern metallic packings were introduced.

It has been mentioned earlier that, in general, navies were slow to implement the advances in shipbuilding which the first half of the century brought, but this does not mean that no improvements in naval shipbuilding were made. The best wooden warships were still those built by France, mainly because, with the exception of the United States, she built appreciably larger than other maritime nations. As late as 1845 the British laid down a 74-gun ship of the line on the exact model of a French ship which they had captured in 1794, so great was their belief in the superiority of French design. But in the meantime the Royal Navy had found a naval architect of genius. As a commander, William Symonds had been given permission by the British Admiralty in 1825 to build a corvette to his own design, and the resulting ship, *Columbine*, of 18 guns, was so outstandingly successful that Symonds was promoted. His success as a designer might have ended there had not the Duke of Portland given him a commission to build a yacht. Named *Pantaloon*, she was such a success that she, too, was purchased for the navy and adapted as a 10-gun brig. Symonds was then instructed by the Admiralty to design more ships,

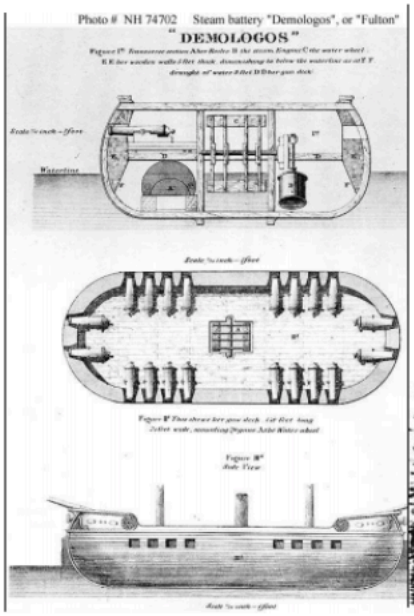
Corvettes

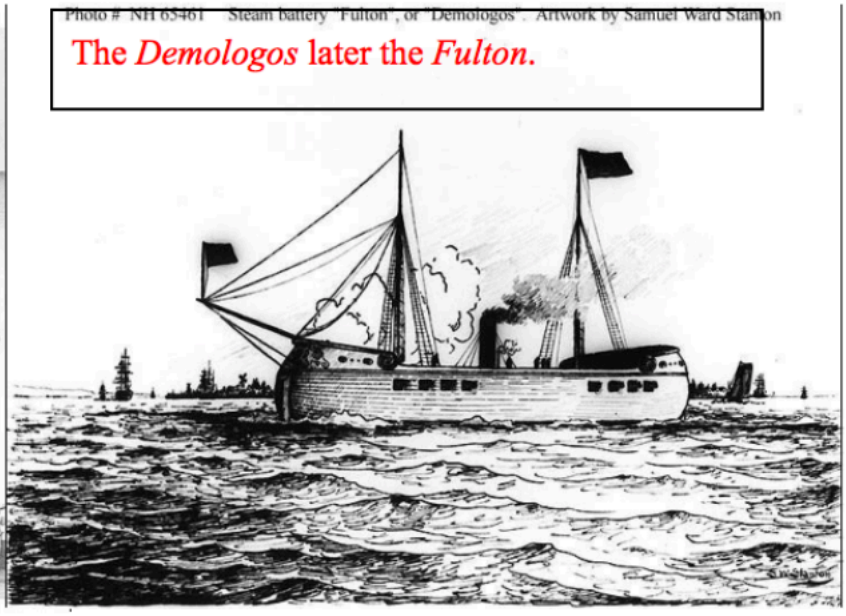
including a fourth-rate of 50 guns, and their general excellence resulted in his being knighted and made Surveyor of the Navy, responsible for all warship design. Within the next fifteen years he was responsible for the design of more than 180 warships.

Symonds's designs owed their great success not only to improved methods of construction, which brought a great increase in structural strength, but also to an improved underwater shape, much less full and heavy than had been previously the case. To some extent he followed the French lead in building large, not so much in overall length as in beam and depth, so that his ships, though shorter than the French, were broader, roomier, and higher between decks. The loss of speed which a shorter overall length might have incurred was more than made up for by the improvement in shape of bottom, which gave his ships a much cleaner run through the water. Another of his improvements was the introduction of a system for standard sizes for masts and yards, so that they became interchangeable, not only between ships of the same class, but also between ships of different classes, 'though not of course for the same purpose. Thus, for example, the topsail yards of a second-rate ship of the line were cut to the same size as



The midships section of the 36-gun frigates *Pique* and *Flora* - sister ships built to the same plan (1832). This is a typical 'Symondite' hull form.




The *Demologos* later the *Fulton*.

the main yards of a frigate, and so on. By this means the eighty-eight different sizes of masts and yards maintained for the Royal Navy were reduced to twenty, with no loss of efficiency.

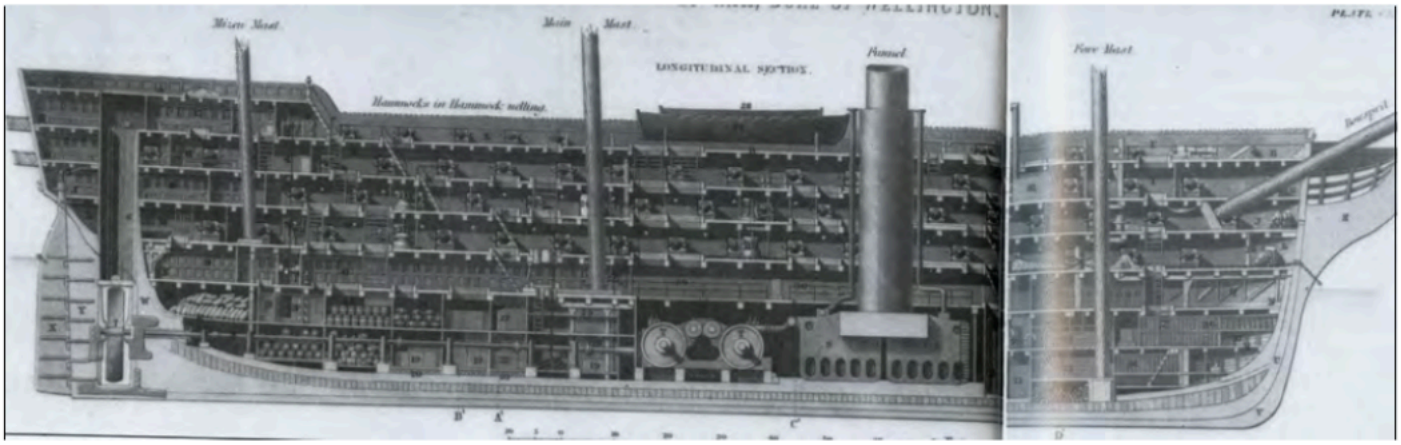
Although, in general, the fighting navies of the world turned their backs on the revolution in shipping brought about by the introduction of the steam engine, there were some small exceptions. The young United States Navy led the way with the *Demologos*, [above] launched in 1814, but completed too late to take part in the war then being fought against Britain. Designed by Robert Fulton (later she was renamed *Fulton*), she was a queer-looking vessel with two wooden hulls abreast, in one of which was the engine and in the other a boiler, and a paddlewheel mounted between them. She carried an armament of 30 guns designed to fire red-hot shot. She finally blew up in a dockyard explosion.

Britain adopted steam for her navy only reluctantly and, at first, purely for auxiliary services. It was Brunel who at last talked the Lords of the Admiralty out of their ultra-conservative attitude, and in 1822 the *Comet*, a wooden paddle steamer of 238 tons equipped with a Boulton and Watt engine of 90 horsepower, was built by contractors in the dockyard at Deptford. She was joined later by the *Monkey*, a similar paddle steamer of 212 tons, which had been built commercially at Rotherhithe and was purchased into the navy. The two vessels were used solely to tow the sailing men-of-war out of harbour when the direction of the wind made it impossible to sail out. In fact, the British Admiralty carried its disapproval of the steam engine to the extent in the official Navy List, and requiring the contractors who built the ships to supply engineers with them.

Turner's *Fighting Temeraire tugged to her Last Berth to be Broken Up* is a fitting contrast between the old and the new. During the Crimean War steamers had to stand-by to tow the lumbering three-deckers in and out of action.

France, Russia and Italy followed the naval lead of Britain by building or acquiring small steam vessels for use with their navies as auxiliaries, but, since in the world strategic situation their navies were of less account than that of Britain, they could afford to experiment. Naturally, their experiments produced nothing revolutionary in the naval sphere; in general they were, like Britain, reluctant to tinker with their capital ships until they knew that they could be sure of the effect. Nevertheless, in Britain, the Surveyor of the Navy was instructed in 1832 to design a steamship, the first to be built in Britain in a naval dockyard by naval personnel. She was the *Gulnare* of 306 tons, mounting three guns, built of wood with paddlewheel propulsion. She

was followed by other small steam gunboats, but until 1840 none were built above 1,000 tons, or with anything but a small armament. As they drew very little water, less than 5 ft. they were thought to have a naval use for inshore bombardment purposes, the risk of damage to their paddlewheels by enemy gunfire being accepted.



Inboard profile of the 131-gun 1st rate *Duke of Wellington* (1852). The addition of a propeller and machinery to a three-decker's hull made for cramped conditions between decks.

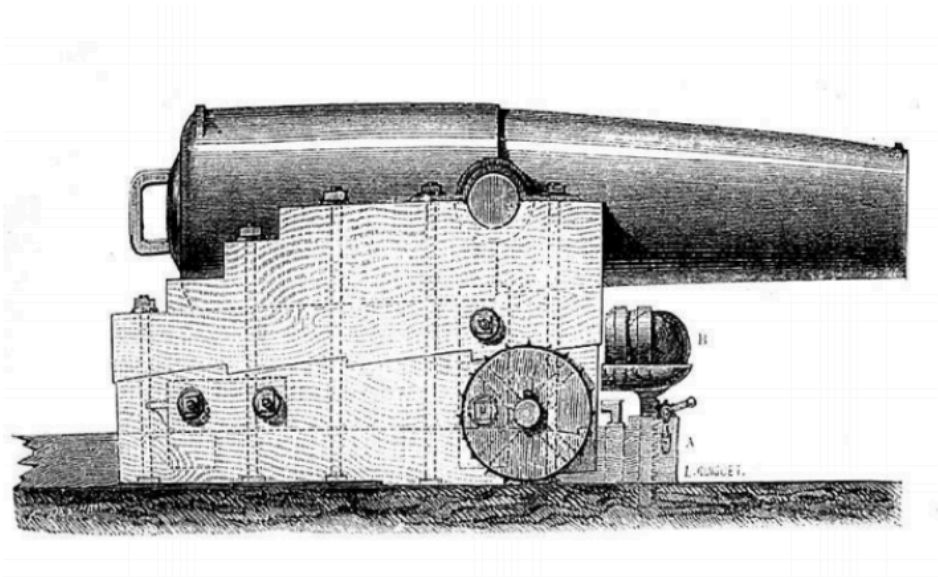
Not all British naval officers were as reluctant as the Board of Admiralty in London to face the implications of the marine steam engine, and in 1825 Lord Cochrane submitted a memorandum asking for 'six steam vessels, having each two guns in the bow and perhaps two in the stern, not less that 68-pounder long guns'. Such a squadron would have proved a formidable weapon against fleets of sailing men-of-war, and if built might well have speeded up the change-over from the sailing to the steam navy, which in fact took another half century. Only one of the six, the *Perseverance*, was built, and not for the British navy, but for the Greek. She played a useful, if fairly unspectacular, part in the Greek War of Independence against Turkey.

Iron did not enter into the Royal Navy's calculations until 1840, when the Admiralty purchased the iron-hulled steam packet *Dover* for no very clear purpose. No trials were carried out with her, and she was not used with the fleet. In the same year, three small iron gunboats were built, each mounting 2 guns, and with paddlewheel propulsion. But they were not followed up with anything larger, even though the way had been shown by John Laird, the Birkenhead shipbuilder, who had designed and built an iron frigate which he offered to the British Admiralty. (On the refusal of the Admiralty even to consider the purchase, she was sold to the Mexican navy.)

Yet the time was coming when the force of public opinion, particularly that of the shipping companies, would drive the Admiralty to begin using iron for warships larger than small gunboats. Orders were placed in 1846 for three iron steam frigates of 1,400 tons, the *Birkenhead*, *Simoon* and *Megaera*, the first fitted with paddlewheels and the other two with propellers. They never made it as warships, for gunnery experiments with an iron hull indicated that iron was still liable to break up and fracture when hit with solid shot, and the three were completed as troopships. (The *Birkenhead's* tragic end off Danger Point, between Simonstown and Cape Town, in February 1852 is still well remembered.)

So it was back to the wooden hull for the British navy, even though some other navies

were persevering with iron, backed with a thick lining of teak or oak to provide additional resistance against damage by solid shot. In Britain, the wooden ships of the line continued to be brought into the dockyards to be lengthened to take an engine and propeller, even the oldest ships being converted to steam. The *Ajax* and *Horatio*, both launched as long ago as 1809 and thus relics of the Napoleonic War, were two of the oldest; another was the *Nelson*, launched in 1814. The first British wooden ship of the line to be designed from the start to incorporate an engine and propeller was the 80-gun second-rate *Agamemnon*, laid down at Woolwich in 1849 and launched in 1852. But in every case, except for that of the smallest vessels, a British warship converted to steam still retained her full complement of masts, yards, and sails as her main means of propulsion. Her engine was a very secondary affair, and elaborate and time consuming arrangements were made to enable the propeller to be raised out of the water whenever she was to use her sails, in order to eliminate the drag exerted by the screw and retain the ship's sailing performance. It was not until 1861 that the lifting propeller was abandoned in the Royal Navy. It was no sudden change of heart about the properties of iron that in the end forced every navy in the world to drop the use of wood for warship building; it was the development of a new form of gun and the outcome of its first use in actual conflict that brought the change. The naval gun during the first half of the nineteenth century remained the gun with which Nelson had won his battles - big muzzle-loading cannon, firing solid round shot. Explosive shells, fired parabolically from mortars, were used solely for bombardment and never considered as a ship-to-ship weapon. But in 1822 a French general of artillery, Henri-Joseph Paixhans, wrote a book called *Nouvelle Force Maritime et Artilleris*, in which he advocated the firing of explosive bombs from the normal naval gun, giving them a flat trajectory instead of a parabolic one, and thus converting the explosive shell into a ship-to-ship weapon. His gun was given its first serious test in 1824, against the old, moored frigate *Pacificateur*, and proved remarkably successful. In 1853 Paixhans' guns were used for the first time in battle, when a Russian squadron of wooden-hulled ships armed with the new French guns encountered at Sinope, in the Black Sea, a Turkish squadron of Wooden-hulled ships armed with conventional naval guns firing solid shot. It was not just the defeat of the Turkish squadron which opened the eyes of the world's navies, but the fact that the explosive shells fired by the Russian ships set all the Turkish ships on fire and they burned down to the waterline.



The lesson of Sinope was underlined two years later at the bombardment of the Kinburn forts in the Crimea. After Sinope the French constructed a flotilla of floating batteries, protected with iron armour, and at the Kinburn bombardment three of them, the *Devastation*, *Tonnante* and *Lave*, steamed to within 1,000 yards of a fort. It turned out that they were relatively impervious to the Russian fire, and they emerged unscathed from a position in which any wooden-hulled

One of the French floating batteries frozen in during the winter of 1855-56 in the Black Sea, after Kinburn.

British iron-hulled armoured floating batteries.

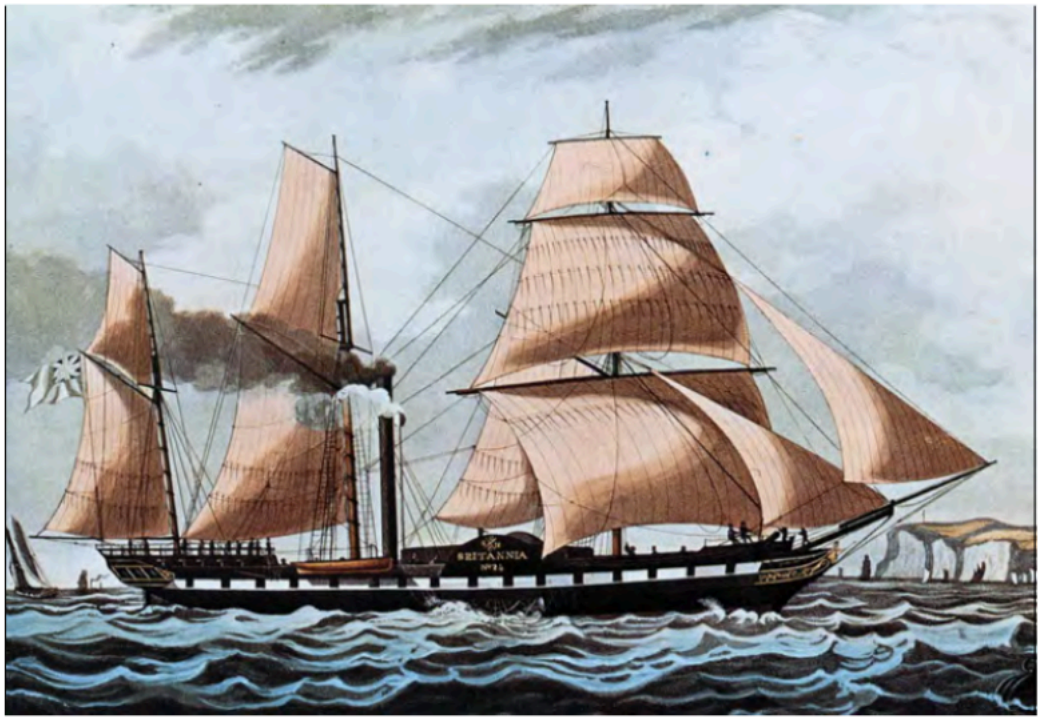
warship in the world would have been blown to bits.
This demonstration of the advantages of iron construction in modern war conditions could not be ignored, and Britain was the first to put this experience to use by building, in 1856, the first iron-hulled armoured warships in the world - the *Terror*, *Thunderbolt*, Erebus and *Aetna*. They were designated 'armoured batteries' and built to a tonnage of 1,950, with an overall length of 108 ft., a beam of 48 ft. 6 in., and a drought of 8 ft. 10 in.. They mounted 16 smooth-bore muzzle-loading 68-pounder guns, and their 200-horsepower engines gave them a speed of 5.5 knots. It was perhaps a small beginning, but the navies of the world had learned their lesson and began to catch up with merchant navies, which had taken to iron with enthusiasm more than twenty years earlier.

Before leaving the iron warship, mention should be made of the British East India Company, which also built warships to protect and enforce their trade monopoly in India and China. It was 1839 that the Company first considered using iron for their warship hulls, and in that year they approached the Birkenhead shipbuilder John Laird to build iron warships for service in the Far East. One of these was the *Nemesis*, a ship of 660-tons, armed with two 32-pounder pivot guns (at the time an innovation in the mounting of guns, when the normal practice was to mount them on wooden carriages in broadside batteries). Although the *Nemesis* only drew 5 ft. of water she made her way out to India under her own steam via the Cape of Good Hope, and during the First China War (1841-42) was taken over by the British Navy and gave excellent service during the naval operations.

Although during the first half of the nineteenth century the world's trade was expanding fast, it was not yet at a stage where shipowners, except monopoly companies like the East India Companies, could contemplate the building of fleet of ships. It was an event in Britain that first introduced this possibility. Until 1838 the mail for overseas had been carried in Post Office 'packets' (small ships built and run by the government solely for the purpose). These

were sailing ships, but by this time it was obvious that the steamship was superseding the sailing ship in the commercial sphere and that, in any service where speed and reliability were essential, the day of the sailing vessel was over. Rather than bear the cost of constructing new steamships to carry the mails, the British government decided to put the carriage out to tender by any ship-owner able to guarantee a regular steamship service that would carry the mails to their destination. The value of the contract was enough to provide the shipowner with a sound economic basis for starting a regular ferry service.

The Government offer of the transatlantic mail service attracted two bidders. One was the Great Western Railway Company, which already owned the *Great Western*, on a regular run between Bristol and New York, and had laid down a larger ship, the *Great Britain*, destined for the same service; the second bidder was a Canadian merchant from Halifax, Samuel Cunard, who owned a number of sailing ships. When the terms of the mail contract were advertised, he crossed to Britain and joined forces with Robert Napier, one of the best known marine engineers of the day, to bid for the contract. His tender for it included a clause that, if successful, he would build four ships and would guarantee to operate a regular service between Liverpool and Boston of two voyages a month, summer and winter. With his tender accepted, Cunard formed a company with the shipowners George Burns, of Glasgow, and David McIver, of Liverpool, and placed orders with Napier for four wooden paddle steamers, each with an overall length of 207-ft. and a tonnage of 1,156, and with an average speed of 8.5 knots. These were the *Acadia*, *Britannia*, *Caledonia* and *Columbia*, and they began their transatlantic service in 1840.



*Britannia*, the Cunard paddle steamer. This was the beginning of the "liner."

It proved so popular and profitable that four years later the company built the *Hibernia* and *Cambria*, both of them larger and faster than the first four. The *Hibernia*, in fact, was the first ship to cross the Atlantic in less than ten days, and was also the first to use the port of New York instead of Boston.

Four years later, with the transatlantic trade still growing, another four ships were built, each of them having a tonnage of 1,820 and a service speed of over 10 knots. So much of the trade was now coming to the Cunard Line that the United States decided to encourage their own shipowners to compete by offering their own mail carriage contract. It was given to the Collins Line, which built four new steamers of over 3,000 tons each, the *Arctic*, *Atlantic*, *Baltic* and *Pacific*, all of them with a small margin of speed over that of the Cunard ships. But though they were fine ships, Cunard replied to the challenge by building the *Africa* and *Asia*, both of around 2,000 tons, and now with twelve ships in his shipping line he was able to offer a much more frequent transatlantic service. Moreover, tragedy befell the Collins Line when the *Arctic* collided with the French steamer *Vista*, and sank with the loss of 323 lives, and when the *Pacific* sailed from Liverpool with 156 people on board and was never seen or heard of again.

In the face of these disasters the Collins Line built the *Adriatic*, larger and faster than the other Collins ships, but so expensive to build that the company went heavily into debt. And it was at this moment that Cunard unveiled his master stroke, the *Persia*. She was the first

The paddle liner *Persia* (1863) gave the Cunard Line mastery of the North Atlantic. She was the biggest ship in the world for a time and also the first liner with an iron hull, but she was one of the last of the big paddle steamers.

transatlantic liner to be built with an iron hull, and at her launch was the biggest ship in the world. Her appearance on the Atlantic killed the Collins Line dead.

It was a government mail contract which gave birth to another of the great shipping lines, the Peninsula & Oriental Steam Navigation Company. It began with Robert Bourne, who had a contract for the carriage of the internal mails in Ireland, which he operated with stage coaches

based on Dublin. Bourne bought a small 206-ton steamer, the *William Fawcett*, to carry the mails across the Irish Sea. The company he formed was the City of Dublin Steam Packet Company, and in 1826 he appointed two young men, Brodie Wilcox and Arthur Anderson, who ran a shipping agency, as his London agents. A second small steamer bought by the company was the *Royal Tar*, and she was used to carry cargoes to Spain and Portugal during the Spanish and Portuguese civil wars. Her reliability and regularity so impressed the Spanish government that they asked for a regular steamer service to be inaugurated and , with the British Government offering a contract to carry the mails to the Iberian Peninsula in 1837, Wilcox and Anderson formed the Peninsula Steam Navigation Company, whose first ship was the *Iberia*, a paddle steamer of 516 tons with an engine developing 180 horsepower. In 1840 the Peninsula Steam Navigation Company was offered the mail contract to Egypt and India. *Oriental* was added to the Company's name, and two more steamers, the *Oriental* of 1,674 tons and the *Great Liverpool* of 1,311 tons, were built to carry the mails through the Mediterranean to Egypt. In 1842 the Suez-Calcutta service was inaugurated by the *Hindustan*, of 2,017 tons, and in the same year the company gained the government mail contract for Australia. With this extension of their Indian route to Singapore, they were now poised to become the most powerful shipping force throughout the Far East.

The *Iberia*

The *Hindustan*

There were other shipping lines starting to operate to different parts of the world around the same time, for these were the years which saw the beginning of the industrial revolution with its immense upsurge of world trade. It was the start of a golden age for shipping, and the next fifty years were to see more changes and more development in the size, design, and power of ship than had occurred during the whole of the previous 2,000 years.