The Tall Ship Glenlee

Large Print Guide

This guide will follow the one-way system currently in place.

The interpretation text for our two exhibitions are at the back of this guide.

Please return this guide to the ticket pavilion at the end of your visit.

Welcome Sign ‘Sail back in time’

Glenlee is a lucky ship. Once one of over 700 Clydebuilt steel barques, just five still remain. These ships carried cargoes over all of the world and overcame nature and mishaps alike. Like the ships of steel, the crew who sailed them were also made of stern stuff.

Glenlee, like Cutty Sark, the only other square-rigged cargo vessel in the UK, survived by finding use as a training ship. Now returned to the Clyde, Glenlee is a museum ship representing Scotland and Glasgow’s shipbuilding heritage and maritime tradition.

Step back in time and enjoy your visit.

Forward Deckhouse

‘I heard the seas coming aboard in the forenoon and heard that Jock had got his bunk wet. I have had that experience on one or two occasions and find it rather unpleasant.’ Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship.

Up to 16 men would eat, sleep and spend what little leisure time they had in this deckhouse. During their free time, sailors would play instruments, craft model ships, and play cards. Scrimshaw was also a popular pastime. This involved soaking a whale's tooth, walrus tusk, or other bone in brine to soften it. It was then engraved using a sharp needle. The scratch lines were rubbed with a mixture of black ink and soot to make the engraving stand out against the white background. Shark fishing and albatross hunting were also popular, though this may have been unlucky as it is considered very unlucky to kill an albatross.

'It was a mistake to kill the albatross as we have now a heavy wind and not getting nearer port.' Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship.

Conditions on the deckhouse would depend on where the ship was in the world, with the crew experiencing both frigid temperatures and stifling heat at different points. The smoke from oil lamps and sailor's tobacco darkened the deckhouse, and after months at sea, it would smell of lamp smoke, tobacco, and stale sweat. Beds were straw mattresses, known as 'donkey's Breakfast'. The

deckhouse was often flooded during turbulent weather.

Captain’s Gig

The gig was the captain’s own personal transport.

It was used to take him ashore, and usually rowed by the apprentices. Ships like Glenlee often anchored several miles from the shore.

The gig was designed by Paul Gartside and built by our team in the boatbuilding workshop.

Galley

‘I spent the morning in the sail locker sorting the potatoes. Dumping the rotten ones and after cutting off the rat eaten portions the rats had satisfied their hunger on and placing them for immediate use.’ Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship

‘We are to get no more puddings for dinner from now on as we do not eat them but give them to the men. The cook told the steward we gave them

away. He used a whole tin of milk in a rice pudding for us today and as usual it went to the men much to his disgust.’ Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship

The cook was vital, and his skills would make a huge difference on a long voyage. Ingredients were often limited to items such as salt beef and pork. Products such as cheese, rice and oatmeal were sometimes available but were often full of maggots and rat droppings after being stored below.

During stormy weather, the cook could only offer ship’s biscuits, often full of small beetles called weevils. There was no access to refrigeration, meaning food was hard to preserve. The cook would use various spices or mix ingredients into stews or curries to hide the taste. The poor quality of the food would contribute to the low life expectancy and poor health of many sailors during these times. Although officers and apprentices ate the same food as the men, their portions were larger, and they were often given a dessert.

Pinnace

The pinnace, which can be seen above, was the crew's workboat. It could be used in different ways, such as fetching stores, gathering firewood for the galley, filling water barrels or for allowing the crew to go ashore. If somebody fell overboard, the crew would launch the pinnace.

The boat you can see was built by a team led by John McAndrew, a long-term volunteer at The Tall Ship.

Anchor Chains

'We hove up our anchor to the strains of various shanties. We're bound for Rio Grande being sung with great lustre and were on the move at about 10am.' Extract from the 1918 personal log of Ernest Andersen, an apprentice on board this ship

Glenlee carried eight hundred feet of anchor chain port and starboard. Teams of between eight and sixteen men would push the open spokes of the capstan round to pull the anchor chains in, raising the anchor. This was hard work that could take as long as six hours. Working songs, known as sea shanties, were sung to help with boredom and

boost morale. The rhythm also helped the men to move together and keep a steady pace.

The Heads

This would have been the ship's toilet (no longer in use today!). It is called the heads because it is at the head of the ship, also known as the bow.

The front of the ship was thought to be the best place for the toilet. This is because it is downwind since winds mostly come from the stern of the ship. Also, when above the waterline waves would often wash out the facilities.

All of the crew would use this toilet except for the mates, who had a toilet just forward of the poop cabin, and the captain, who had his own private bathroom.

Hospital

'Bosun is laid up today. He did not get up at 8 am this morning and when the mate asked why he said he had a pain in his back as an excuse. The mate told the 'old man' and he gave me some

turpentine liniment to rub on his back’. Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship

Life on board a ship like this could be very dangerous. A combination of poor living conditions and extreme weather in different parts of the world meant that disease and illness were not uncommon. The work itself also made life very dangerous for the crew, and accidents would frequently occur during turbulent weather conditions. For example, sometimes the wind would cause blocks and yards to swing dangerously and send waves to wash sailors into the scuppers or over the side. The ship carried no doctor or nurse, and the captain was responsible for all treatment. His lack of medical training meant that incorrect diagnosis and treatment would frequently occur.

The hospital itself was a small and uncomfortable space and was located in a part of the ship that would experience severe turbulence and flooding during extreme weather conditions. Many think it was designed this way on purpose, to discourage the crew from pretending to be ill to be off work.

The Bell

‘I went below at midnight for four hours repose feeling somewhat tired having had no sleep for seventeen hours.’ Extract from the 1918 personal log of Ernest M Andersen, an apprentice on board this ship

The bell was used to let the crew know the time. The crew were split into two teams, Port Watch and Starboard Watch. Throughout each day they worked in four-hour shifts, called ‘watches’, with a couple of two-hour shifts known as ‘dog-watches’. The dog watches meant that the crew changed the pattern each day.

00.00– 04.00 Middle Watch

04.00 – 08.00 Morning Watch

08.00 – 12.00 Forenoon Watch

12.00 – 16.00 Afternoon Watch

16.00 – 18.00 First Dog Watch

18.00 - 20.00 Second Dog Watch

20.00 – 00.00 First Watch

It is not hard to imagine how exhausting this would have been for the crew.

Most of the crew would not have had a wristwatch of their own, so the bell was their way to tell the

time. It was rung every 30 minutes, with 8 bells signalling the end of the watch and the start of a new watch. This is why 8 bells are traditionally sounded at a maritime funeral, to note the end of duty.

Why not have a go at ringing the bell yourself?

Fo’c’sle Deck

The word fo’c’sle is a contraction of fore-castle. The name comes from the fact that earlier ships were often armed and would resemble castles at either end, as on a Spanish galleon.

This would have been a busy part of the ship, as it gave sailors access to the moorings, capstans, anchors and headsails. You will see navigation lamps port and starboard, which would have been lit at night to make Glenlee’s position clear to other ships.

The Deck

The weather deck was laid in 1998, during the restoration of the ship. This deck is still caulked by

our crew, using the traditional method. This involves hammering oakum into the gaps and then sealing it with tar. This is done to keep the deck watertight. Oakum is hemp fibre made from old pieces of rope. To create oakum, prisoners would tease old hemp ropes apart. This is the origin of the saying ‘money for old rope’.

Sailmaker’s Workshop

A good sailmaker could make the difference between a fast ship and a slow one. Working here, and on the weather deck, the sailmaker was responsible for mending, patching and often replacing sails which were damaged or carried away in storms.

Some of the tools on display were donated by Mr Ian Adam in February 2010. They belonged to his father who worked as a sailmaker in Morris & Lorimer’s boat building yard, Sandbank. Can you guess what each tool was used for?

As well as working with sails, the sailmaker was also responsible for measuring and making nettings, tarpaulins and awnings. He was sometimes even expected to use his needle work skills to assist with emergency surgery!

Tween Deck

You are standing in the tween deck, called as such because it is between two decks of the ship. This deck was fitted more loosely so that it could be lifted and re-laid to help with the loading of cargo. For many years, this area would have been full of cargo the ship was transporting. This would not have changed until the ship was purchase by the Spanish Navy, who transformed the ship into a sail training vessel.

Today, this space is used for exhibitions and private functions, such as weddings and parties.

Engine Rooms

Due to current government guidelines regarding social distancing, we are currently unable to provide access to this area.

After the First World War, engines became essential to the survival of the ship. Engines were more economical than sailing ships as they meant that arrival times could be predicted with more certainty. Engines also allowed ships to use power to escape from danger if necessary. The first engines were installed in 1920 by Italian owners.

In 1950, a significant refit by the Spanish Navy replaced the main engines manufactured in Stockholm. These are the engines you can see on the ship today, cleaned of rust and dirt, and repainted in the engine colours used by the Spanish Navy.

Using Nature's Power

For decades, Glenlee harnessed the power of the wind to propel her across the oceans. In 2009, the Clyde Maritime Trust took the decision to once again utilise the forces of nature to power the ship. In a bid to reduce carbon emissions, the innovative 'green' heating system that you see here, was funded by Community Energy Scotland and Rock Wool Insulation and installed onboard in 2010.

The ship is now heated using a wet heat distribution system (radiators). Water source heat pumps draw heat from the river through thin metal heat collectors ('slim jims') mounted on a floating pontoon next to the ship. The heat pumps are linked with the ventilation system to improve their efficiency by recovering heat from the ventilation and they also provide the domestic hot water. Rock Wool Insulation donated £68,000 worth of

insulation, which has been installed to maximise the effectiveness of the heat pump. The insulation has been cleverly disguised behind ‘cargo’ to retain the authentic, traditional appearance of the ship.

Generating Plant

During the Galatea years, the ship was fitted with two 100kW dynamos each driven by two 160HP Ruston Hornsby 3-cylinder diesel engines. They generated electricity at 110V d.c which was controlled by the switchboard.

The marble switchboard panels were cleaned of dirt deposits and grime that had accumulated over the years which Galatea had spent on the bottom of the Guadalquivir River at Seville. The cleaning revealed the few remaining circuit labels which, together with Spanish archive notes, help us understand how electrical power was used on board.

The Pride of Spain: 1922 – 1979

Galatea was, for thirty-seven years, the pride of the Spanish Navy. Between 1944 and 1959 she covered over 181,000 nautical miles, spent some 2,080 days at sea, and 4,000 officers and men sailed on her. For many, it was a sad say when the ship departed Ferrol, and later, Spain.

Life on board was always a challenge. Galatea regularly made two or three voyages a year into the Atlantic, of about three months each. The ship was manned by 17 officers, 30 petty officers and some 260 ratings. Young men on board learned teamwork and the skills needed to work the ship.

Galatea visited many ports, but during the Spanish Civil War (1936-39), and later the Second World War (1939-45), voyages were restricted. Between 19563 and 1959, she was able to visit more westerly ports and criss-crossed the Atlantic seven times.

Retired from seagoing in 1959, Galatea became a shore-based establishment at Ferrol. Young men were still trained in rigging and maintenance until she was retired from service in 1979. In 1981, she was prepared to be a prime exhibit at Expo ’92 in Seville, but, unfortunately, the funding for this failed and she was docked at Cement Quay on the

Guadalquivir River, until rescued by the Clyde Maritime Trust.

Cargo Hold

Due to government guidelines regarding social distancing, we are currently unable to provide access to this area.

Ensuring safe transportation of cargo was the highest priority for the crew, as it was cargo that created profit for the ship. This ship transported many different kinds of cargo, such as rice, coal, guano, case oil, timber, sugar and wheat. This area would have also contained ballast, which was used to balance the ship. Ballast would usually consist of sand, mud and rocks.

Sail Display

The sail on display is a fore lower topsail given to Glenlee by the sailmakers of Mariehamn, Finland in 2002. It was all sewn by hand and contains around 75,000 stitches! It took a whole winter to make.

The photographs projected onto the sail were taken by Eric Newby. Aged 18, Newby signed on as an apprentice onboard the Finnish four-masted barque, Moshulu. These iconic images document the day-to-day life of the men who lived and worked onboard during the world voyage carrying grain to Europe from South Australia, 1938-39.

Aft Deckhouse Wheel

This wheel was given to us as a gift by The Cutty Sark.

This ship and the Cutty Sark are the only two square-rigged cargo vessels left in the UK.

Having this wheel proudly on display is a wonderful way to celebrate the connection between the two ships.

The Hatches

This ship was a cargo vessel for many years, with almost all the space below being used as storage for the goods being transported all over the world. Cargo could only be loaded and unloaded through

the hatches. Glenlee has three hatches; the fore hatch, the main hatch and the mizzen hatch. Cargo was loaded and unloaded using huge nets, baskets and ropes. This was a very important task, as the speed of loading and unloading cargo determined when a ship could set sail again. Turnaround time depended on the size and type of cargo and port facilities. In some cases, it would take months! The hatch is covered with heavy canvas and has wooden hatch battens. Think of the phrase ‘Batten down the hatches!’.

The Masts

The first job for apprentice sailors would be to climb to the top of the mast and stand on a wooden button about 300mm wide. The masts tower more than 130 feet above deck level, and the main mast is as high as 10 double decker buses piled on top of one another! This meant the sailors had to overcome any fear of heights they had pretty quickly! The ship has three masts; the fore mast, main mast and mizzen mast. The yards could carry 18,000 square foot of canvas, and would push the ship and her cargo along, which could be as heavy as 4500 tons!

Poop Cabin

The name of this cabin comes from the Latin word ‘Puppis’, which means back, and this is the back of the ship. The area contains the captain’s living quarters, which are far more luxurious than the rest of the ship. There is also the saloon and pantry. The saloon was where the captain would entertain visitors and hold important meetings. The pantry was where food and provisions were stored for the captain and officers. The food was of a higher quality than the rest of the crew would receive. This meant that there was a high risk of theft, so the pantry was usually locked.

The first mate’s cabin and apprentice cabin are also in the poop. The first mate was responsible to the captain for the safety and security of the ship. In the early days of steamships, it was necessary to have served for a time on a sailing ship before becoming an officer like the mate or captain. Apprentices were young men who had their indentures (apprenticeship training) paid for by their families.

You may notice the white lines between the planks in this area. This is white pitch. White pitch was used instead of black pitch to make it clear to the rest of the crew that the area was off-limits. As

many ordinary crew members would have been unable to read, ‘no entry’ wouldn’t work.

Lifeboats

The lifeboats can be seen above. They were the only means of escape if the ship were to sink. In the past, lifeboats often had no buoyancy tanks fitted. This meant that using them was a last resort, as they would leak badly when first launched.

One of the lifeboats we have was built by the team in our boatbuilding workshop. The other lifeboat was probably built in Hong Kong, before 1900.

Last Voyage of the Islamount Exhibition

Master and War, the longest voyage

The last and longest voyage of SV Islamount as a British ship lasted 1,269 days, from 18th May 1916 until 20th October 1919. Circumnavigating the world twice, evading the perils of enemy U-boats in the North Atlantic operating a policy of unrestricted submarine warfare, the cargo conveyed vital supplies to countries of the British Empire. As steam vessels took over from sail this voyage is typical of the final days of wind powered cargo ships.

Master for the voyage was Captain David George from Pembrokeshire, known to his crew as a "Man of Harlech". At 58 years old, George was a Welsh speaker, a family man whose life had been spent at sea since the age of 14, when he was a boy on the Fishguard brigantine Faithful. During the perils of traversing the oceans under sail and the exigencies of War, George would command and be responsible for all on board.

Islamount, owned by Robert Thomas & Co. of Liverpool, by 1918 was under the management of the Shipping Controller, John Wart & Co. of

London. During WW1, over 3,300 merchant ships were sunk and over 17,000 merchant seamen's lives were lost.

Liverpool - New York – Melbourne

May 1916 - December 1916

Islamount departed Liverpool on 18th May 1916 in ballast, taking 48 days to travel to New York with crew and apprentices aboard. Mass desertions occurred there, probably to avoid the war in Europe, leaving George hunting for 8 crew replacements, Mate, Bosun and a Cook. The cargo was case oil for Australia, a fuel much in demand there during the war due to shortages of coal.

Arriving in December 1916 after 122 days at sea, the crew complained to the Master of substandard provisions on the voyage. David George assessed the complaint, found it to be true and replaced all the mouldy and rotten supplies. Reg Mitchell, a Lancashire lad, was just 14 when he signed as an apprentice for four years on Islamount in April 1916. He was to celebrate his 15th birthday in Williamstown, Melbourne.

After loading sacks of wheat in Melbourne, Islamount departed for Bordeaux in February 1917, towed from the harbour by the tug James Patterson, and narrowly avoided disaster.

Passing through a dangerous rip current at Point Nepean, at Port Philip Heads, the hawser of the tug James Patterson parted and Islamount was left drifting helplessly and with much water on board. At the third attempt, a new line was passed across and the vessel negotiated her departure. Heading eastwards, rounding Cape Horn, the ship arrived in Bordeaux in July 1917 after 143 days at sea. Islamount had survived perils of the oceans and evaded lurking submarines in the Atlantic to deliver the valuable cargo of wheat.

Bordeaux - New York - Sydney

July 1917 - June 1918

Germany announced unrestricted submarine warfare in February 1917 and this part of Islamount's last voyage was probably the riskiest in terms of survival. Arriving in Bordeaux in July 1917 with a cargo of wheat, vital for war supplies, it is likely that discharge was greatly delayed by bottlenecks within the port as Islamount awaited

berth, dock labour, or onward transport. This, and the instigation of an ocean convoy system from August, may explain the 3 month long wait before finally leaving for Hampton Roads, USA, in October, in ballast.

Reloading with case oil once again in New York at the end of 1917, Islamount was set to return to Australia. There were two new members of the ship's company: an apprentice and a Chief Officer.

Thomas David Davies, the new apprentice, was a Welsh 17-year-old from a seafaring family and already experienced in life at sea. He recounted that the passage from New York proceeded at a cracking pace and arrival off Cape Leeuwin was made in 91 days.

On 23rd May 1918 the hurricane force storm struck. The cargo shifted, topsails were lost, and Islamount lay on her beam ends. All night the crew hung on, at the mercy of the sea, until morning and calmer weather arrived. Under jury rig, it took the battered ship a month to limp into the shelter of Sydney Bay.

Sydney - Cape Town - Samarang

June 1918 - February 1919

After repairs at Vacuum Quay, Sydney, Islamount was ready to load wheat and promptly leave for Table Bay, Cape Town on the 20th August 1918.

Arriving 51 days later on the 9th November 1918 after a quieter passage, the crew were overjoyed to hear of an Armistice to the War. While celebrations were in order, in 1918 Cape Town had already started the ceremony of two minutes silence in respect of all those killed in the war which we continue today.

Black dock labour at the Cape was undergoing considerable unrest and intermittent strikes hindered unloading. To the delight of the crew, entry to dry dock on the 24th December for necessary cleaning, treatment, and painting of Islamount's hull, a task still required today, left them free to enjoy Christmas and Boxing Day at leisure.

One week later, on 8th January, Islamount left, painted and ballasted, bound for Java, a Dutch colony still acting under restrictions of War, to collect a valuable cargo of sugar, vitally required in Europe. The voyage over the Indian Ocean to Batavia was made in just 43 days and papers

presented, the ship went on eastwards to Samarang.

Java Fever, Spanish flu, and many other tropical diseases were rife at Samarang and Captain George allowed no shore leave. Sacks of sugar were ferried out to the ship by local labour in lighters and loaded on board, numbers noted by the apprentices.

Samarang - Port Natal, Durban

February 1919 - June 1919

Departing Samarang fully laden with 26,969 bags of sugar, on the 28th March 1919, Islamount set course for the Indian Ocean and Europe. Even before passing through the Sunda Straits, there was fever on board. First the 2nd Mate fell ill, then the Steward, and on the 8th April Captain George succumbed and the Chief Officer took control of the ship and the crew.

Chief Officer Charles Sleggs, 43 years old, was well qualified and experienced in handling such vessels. Born in Everton, he served for five years on Loch Doon, a barque, like Islamount, built for the Colonial trade and was 2nd Mate on Forrest

Hall, a square-rigged ship, for a year in the global trade.

As the voyage progressed, more crew members fell ill until eight, including George, were incapacitated and the remaining crew could only work the ship. This fragile situation continued, along with rough seas and violent storms that shifted the cargo as the ship rolled and lurched.

In the middle of the Indian Ocean, one of the crew, A Morginsen, died of malaria and was buried at sea that afternoon. Six days later, the log records showed that the "Captain is seriously ill", "very weak" and "dangerously ill".

Sleggs made for Madagascar as the situation was critical but, just on sighting the port light, the wind changed direction and headed Islamount's way. It took 12 days more to make Durban and signal for a tug and a doctor. Six very ill men were transferred to hospital while Sleggs remained, caring for sick seamen and organising sails, provisions, and necessary maintenance. When Captain George was discharged and returned to Islamount three weeks later, the ship was ready to sail.

Voyage End October 1919

A slow passage north from Port Natal, up the West African coast and out nearly to the Azores, employed the crew in low key jobs, like painting, repairing, general maintenance and sail handling. It took longer than anticipated and Islamount required provisions and water when nearing Gibraltar.

Approaching the Straits, a 7.7 nautical mile narrow passage, the ship lost wind and, heading onto a lee shore, the situation was fraught. The arrival of a tug helped Islamount to anchor and take on supplies, but her perils were not over yet. The ship was subjected to a Mistral of strong offshore winds and storms, taking Islamount a further 27 days to finally reach Cette at voyage end.

With the cargo unloaded the crew were paid off, the apprentices and officers could return to the UK: and what of the men and Islamount afterwards?

Reg Mitchell and Joe Hodgson obtained their 2nd Mates certificates. Reg become a Master with the Athel Line, but was captured at sea during the Second World War, and taken as a Prisoner of War. He died at sea in 1952, at 50 years old. Joe continued in steamships, married Reg's sister, but

died at sea on SS Demodocus off Gibraltar in 1929, aged 30, of pneumonia and heart failure.

Apprentice Ernest 'Andy' Anderson continued at sea, becoming 4th Officer on SS Essequibo. Alan Lewis obtained his certificate as 2nd Mate and probably went into merchant service in India.

Thomas Davies returned to the UK and got experience in steam vessels. Despite illness in 1923 he obtained his 2nd Mates certificate. He was killed on board SS Oranjestad, an oil tanker, in the Battle of Aruba in February 1942, aged 42. His name is recorded on the Tower Hill Memorial, London, for WWII mariners lost at sea.

Chief Officer Charles Sleggs moved into steam vessels, mainly working from US ports. He put his money into Eveline, a shrimp fishing vessel, in Savannah, Georgia, and lost in a storm at sea in 1926.Working his passage back to Liverpool as a trimmer, he contracted pneumonia and died in 1928 aged 51.

Captain David George retired to his house and family in Dinas Cross, Pembrokeshire, now impressively renewed and named Angorfa. He died in 1927, at 69 years old, and was buried in the local cemetery.

And what of Islamount, after such sterling service at sea? Advertised for sale in London, the ship was bought by an Italian firm based in Genoa. Engines were installed, and then the ship was sold in 1922 to the Royal Spanish Navy as a training ship, to be returned to the Clyde in 1993 and restored as the historic and loved vessel Glenlee we know today.

We would like to give special thanks to one of our Trustees, Elizabeth Allen, for her contribution to this exhibition. We would also like to thank photographer Tom Finnie, who helped to prepare photographs for this display

Gerard Windgrove Exhibition

This exhibition showcases the extraordinary talent of the late model-maker Gerald Wingrove. The items on display were used by Wingrove to create a scale model of the Falls of Clyde, sadly unfinished at the time of his death. The tools on display are miniature versions of the equipment that would be used to build a ship, and there are many similarities between how Wingrove created his model and how the Glenlee was built. We have used illustrations from Ian Ramsay's book "How a riveted sailing ship was built" to demonstrate this.

Ian Ramsay

Ian is a retired Shipbuilder, Naval Architect and Marine Consultant, a Chartered Engineer and a fellow of the Royal Institution of Naval Architects, and the Institution of Engineers and Shipbuilders in Scotland. He studied Naval Architecture at the Royal Technical College, while also completing a full apprenticeship as a shipbuilder with A & J Inglis Ltd at Pointhouse Shipyard, now the site of Riverside Museum.

In 1957 he joined Lloyd's Register of Shipping as a ship surveyor until returning to Inglis in 1960 as General Manager and Naval Architect; where he remained until the shipyard was closed in 1963, by its parent Harland and Wolff who were experiencing the first of many financial crises.

He joined Yarrow & Co as Shipyard Manager and in 1971 he was appointed to the Board of Yarrow (Shipbuilders) Ltd as Shipbuilding Director and later under British Shipbuilders' ownership, took on responsibility for Production Planning, Quality Control and Shipyard Development.

In 1984 he entered marine consultancy as Managing Director, and latterly Chairman, of Sir J H Biles & Co, the Scottish firm of consulting naval architects and marine engineers where he developed the ship upkeep business for the Ministry of Defense with Biles being responsible for the survey and preparation of the refit specifications for the Royal Yacht Britannia, all Type 22 Frigates and HMS Challenger.

Ian has been active in Glenlee's restoration and upkeep since her return from Spain, providing much of the technical support necessary on this ongoing project. He has served as a member of the Clyde Maritime Trust and on the Trust's Ship committee for many years. We would like to thank

Ian for his contribution to this exhibition. His book, 'How a riveted sailing ship was built', can be purchased in our gift shop.

Gerald Wingrove Exhibition

Professional model-makers are hard to come by, as only a small number of people have been able to turn their hobby of model making into a full-time job. One such a person was Gerald Wingrove.

Wingrove's fascination with building things began in childhood, no doubt triggered by his father, a French Polisher with a woodshed full of tools. His interest in the sailing ships of the eighteenth and nineteenth centuries developed in his early teens.

He spent two years working as an R.A.F airframe mechanic while on national service in Egypt where, in his spare time, he would make model aircraft.

Wingrove then spent sixteen years working at Broom & Wade Ltd in High Wycombe, operating centre and capstan lathes and other machines, while continuing to make models as a hobby. He would later work from home, making prototypes and patterns for toy companies such as Dinky and

Corgi. He also produced designs and patterns for the film company Century 21, which produced puppet films such as Captain Scarlet, Thunderbirds and the Joe 90 series.

His first major commission was from the National Motor Museum in he Beaulieu, England for which he made sixty models.

One of his largest creations was a twenty-five square feet model of the village and shipyard of Bucklers Hard, commissioned for the Bucklers Hard Maritime Museum.

As well as cars and ships, he has made models of windmills, aircraft, scientific engines, scenic landscapes, farm equipment, and helicopters.

He has produced car models of Bugatti's, Bentleys, Riley's, Mercers, Lea Francis, Amilcars, Invicta and Fraser Nash.

Both he and his models have featured on television and in publications all over the world. His work is in several private collections and museums, including the evolution museum in the Netherlands, the Commonwealth institute and the National Motor Museum.

The Ship's Model

The half model displayed, shows the shape of the hull both above and below the waterline, but this model has had the centre section removed, and a true to scale modelling of the ship's steel structure inserted. When Glenlee was built, a similar half model was made for every new ship, on which the arrangement of the hull steel plates was marked together with other important information. Apart from use as an aid to drawing, the model was used for determining the measurements of the curved steel plates to be ordered.

The Mould Loft

The mould loft was usually situated close to the production areas, and it was often incorporated on an upper floor of the building which also housed the joiners' shop, but it could be situated above a plate-working shop. The photograph shows A & J Inglis Ltd.'s mould loft, which was designed for laying out medium sizes ships of up to 500 feet in length. A & J Inglis' shipyard was on the site of Riverside Museum.

The first step in the production of Glenlee was when the lines plan, defining the shape of the ship,

was issued to the mould loft and that information was then drawn full size in French chalk on to the loft floor. When this work had been done and the loftsmen were satisfied that all chalk lines were fair, their next task was to prepare the scrieve board, which was a full-size sectional view through the hull. The steel construction drawings would be issued to the mould loft, and then to the various steel working trades. The drawings would be used, along with information from the mould loft, for marking, cutting to shape and punching the rivet holes in the plates and bars they were working on.

The Scrieve Board

The scrieve board was prepared on wooden boards and the shape of every rib or frame was cut in, or scrieved, using a sharp knife that gave a fine groove, which was further marked with French chalk: the frames forward of amidships being shown on the right-hand side and those aft of amidships shown on the left-hand side of the scrieve board. It was only necessary to show the shape of one side of the ship, as the other was identical.

On these frame lines were superimposed the seams of the hull plating, and other important information required by the rib forming, beam bending and hull plating tradesmen. The scrieve board and the lines on the mould loft floor were able to provide the information necessary for manufacturing all parts of the ship. Most of the information required by the platers to mark both the outline of plates to be cut and the position of rivet holes to be punched was supplied from the mould loft in the form of wooden templates and marking battens.

Shaping the Frames or Ribs of the Ship

This miniature machine tool was made by Wingrove to form the frames for the model. The full-size practice used in 1896 describes below how the ribs of ships were bent to the desired shape when red hot; having been heated in a coal fired furnace. The first stage was to make a template of the frame, to be shaped from a soft iron bar, which was easily bent but which would maintain its shape. This bar was used to lift the shape for each frame from the scrieve board. When templated, the set bar was placed on the

heavy cast iron bending slabs where its outline was marked in chalk, before being securely clamped on the slabs.

Next, the red-hot frame bar was pulled from the furnace, flowing out like a snake, and placed on the slabs. The frame setters then began a rapid series of pinning and pushing operations using pins or dog placed in the holes in the slab to make the hot frame bar conform to the chalk line on the slab. Speed was essential as the bar was cooling all the time and, when cold, it could not be put back in the furnace to remedy any errors as the furnace was long, narrow and straight and could not accommodate a shaped rib. To speed the process a small, water hydraulic pusher, called an "iron man", was often used. Before the soft iron bar was dogged down it had been turned over and the shape chalk marked at another area of the blocks ready for bending the corresponding rib for the other side of the ship.

Bending the Garboard Plate

The sailing ships of iron and steel construction were built with a longitudinal iron, or steel, spine of rectangular section, called the bar keel, which

formed part of the interconnecting longitudinal and transverse structural parts of the bottom of the ship. In addition to forming a part of the structural backbone of the ship, the bar keel assisted the ship to steer a straight course when sailing. Two important structural parts of the ship which connected the bar keel to the rest of the structure, were the hull plates on each side that were riveted to the bar keel. These were called the garboard plates and they had to be bent to a very tight radius which could either be done cold in a keel bender/flanging machine or hot after the plate had been heated in a furnace.

The adjacent model is a miniature machine tool, designed and made by Wingrove to bend the miniature garboard plates for the model.

Preparing and Cutting the Ship's Plating

Once the rectangular plates had been delivered from the steelworks they were marked to the required shape and in the days before gas burning of steel, they had to be either guillotined or planed; or in the case of manholes or lightening holes, pressed out by a powerful hydraulic press.

The miniature machine tool seen here was designed and made by the model maker to guillotine (cut) the thin sheet metal for the ship’s plates. Below is a photograph of a full-size combined machine that both cuts and also punches the rivet holes in a plate in separate operations.

Guillotine for Cutting Small Brass Sections

This miniature machine tool was designed and made by the model maker to guillotine, or cut, the brass sections that had already been manufactured to scale from brass sheet. The full-size ship is constructed from flat plates and sections such as equal and unequal angles, bulb angles and channels. The view below, which is looking through ship, gives a clear description of how the various parts of a sailing ship related to each other and how they were riveted together.

Deck Beam Forming

The adjacent miniature machine tool was designed by Wingrove to form the model transverse deck beams to a parabolic camber. It was also able to bend and shape other miniature section material for incorporation into the model.

Forming Model Structural Components & Riveting

This miniature machine tool, designed and built by Wingrove, has two uses. With the grooved rollers fitted and the rivet head spiking wheels removed, the required bulb section has been made from brass or other soft metal sheet. The drawing below shows some of the use made of both bulb section and ordinary angle in the construction of the bottom structure of a sailing ship. Interestingly, the drawing also shows the proliferation of rivets to be found in this small part of the ship.

Riveting

With the rivet head spiking tools substituted for the grooved rollers, the machine can be used for creating simulated rivet heads. This is done by making small indentations on the reverse side of the metal strip causing dimples like rivet heads to be raised on the side that is seen. These simulated rivet heads can either be single, in pairs at set distances apart or in rows along the edges of overlapped plates to denote the riveted seams that join them together.

Setting up the Ribs and Deck Beams

The miniature frame assembly jig was made by Wingrove to hold in place and assemble the ships ribs and deck beams on top of the bar keel. To ensure rigidity of the model, the jig has been designed to hold three sets of ribs and beams at any one time.

This photograph is of A Roger & Co's Bay Shipyard in Port Glasgow and the ship in the centre left shows the ribs erected but the transverse deck beams have still to be fitted. Note how closely packed together the various ships are

in this restricted site in Port Glasgow Harbour Wet Dock.

The items on display are the various miniature machine tools that Wingrove had to make in order to replicate, in miniature, the constituent steel parts of a late 19th Century sailing ship. All of the model parts when put together demonstrate exactly how, in true to scale detail, the ship was constructed and this is shown in exemplary manner in his model. The display is a truly lasting memorial to the late Gerald's ingenuity and skill.

Alongside each miniature machine we have shown, where appropriate, a photograph of the shipyard machine that was used to do the same operation on a full-size ship.