The *Resurgam* Submarine

'A Project for Annoying the Enemy'

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Introduction

What a marvellous adaptation of physics, pneumatics, and mechanics is displayed in a submarine, with which the highest standard of wholesale destruction is reached.[1]

For centuries inventors have been dreaming up schemes to allow people to submerge beneath the waves, stay a while then return again unharmed. Some of these inventors wished to discover what lay hidden in the depths or to recover sunken treasure, pearls or coral. Other inventors wanted to use the sea as a means to hide - to sneak up on an enemy, deliver a swift and fatal blow then escape unseen to safety. The *Resurgam* was intended for the latter task as she was primarily designed as a weapon of war. The title of this book comes from an Admiralty catalogue of inventions[2] that mentions the *Resurgam* under the category of '*Projects for Annoying the Enemy*'. The *Resurgam* submarine would more correctly be called a submersible as it is a vehicle that spends most of its time on the surface but has the capability to submerge, but as she is widely known as the *Resurgam* submarine we will keep it that way in this book. As with all submarines and submersibles, she is referred to as being a boat and not a ship.

The *Resurgam* submarine was the brainchild of an eccentric inventor that he realised in iron, timber, coal and steam. The inventor was George William Garrett, a curate from Manchester who designed and built the *Resurgam* submarine in 1879 using the limited technology available to a Victorian engineer on a small budget. This is not the story of Garrett himself; this story has already been told by William Scanlan-Murphy in his 1987 book *Father of the Submarine* and in Paul Bowers' book *The Garrett Enigma* published in 1999. Instead, this book tells the story of the submarine herself: how she was built, how she may have worked and what happened to her. The book briefly introduces Garrett the inventor then puts *Resurgam* in context by considering some other submarines being developed at the end of the 19th century. Garrett's relationship with his first prospective client, the Royal Navy, is related here as it is crucial to the story; it seems that Garrett was doomed to failure even if the submarine had worked because of Admiralty policy at that time. To experiment with some basic ideas Garrett built a tiny prototype submarine which suffered a number of re-designs and re-builds before she was set aside to make way for her larger and more warlike sister. We can gain some idea of how the *Resurgam* was constructed by reading surviving documents and plans; much of what we know about the *Resurgam* comes from an article that appeared in the 6th January 1882 edition of the journal *The Engineer* under the title *Garrett's Submarine Torpedo Boat*. The end of the tale tells how the *Resurgam* came to be lost in 1880, the truth is unknown but a version of the story can be pieced together from documents and newspaper reports. Unfortunately some aspects of the tale do not fit with what was found by archaeologists underwater so other ideas are explored at the end of the book. We have no reliable accounts of how well this submarine worked so modern analysis

[1] Ostler 1915
[2] National Archives, ADM 12/1023, 59-8

methods have been applied to calculate how well the *Resurgam* may have sailed, dived and kept her crew alive underwater.

This book includes first-hand experience of working underwater on the submarine in 1997, with details added from personal site notebooks, sketches, dive logs and discussions with divers who have been lucky enough to visit her. The *Resurgam* was the subject of Stewart Wareing's dissertation for his MA in Maritime Archaeology & History at the University of Bristol which he kindly made available for this book. Details and background information have been taken from books, journals and newspaper articles, papers in the National Archive and Royal Navy Submarine Museum archive, television programmes, web sites and PhD theses, all of which are listed in the references at the end.

Glossary

Term	Description
ACHWS	Advisory Committee on Historic Wreck Sites
ADU	Archaeological Diving Unit
APS	Acoustic Positioning System
AUSS	American Underwater Search and Survey Ltd
Awash	Of a submarine, running on the surface with her deck just submerged
Beam	The width of the hull
BSAC	British Sub-Aqua Club
Cadw	The Welsh Government's historic environment service
Closed up	With the submarines hatches closed, on the surface or underwater
Concretion	A hard mix of iron corrosion products, dead marine life and seabed material
Conning tower	A tall tower fitted on top of a submarine
Condenser	A condenser is used to condense steam back to water by cooling it
Cutwater	A hollow metal structure fitted on top of a submarine pressure hull
Displacement	The mass of water displaced by the submarine in water
DSV	Dive Support Vessel
Free flooding	A space that can flood with seawater when the submarine dives then drain once it has surfaced
GNSS	Global Navigation Satellite System, Global Positioning System, GPS
GPS	See GNSS
hp	Horsepower, a unit of power. 1 horsepower = 745.7 Watts
Hot well	A sump tank used to collect steam boiler condensate before recirculating it
Hydroplane	A horizontal rudder used to control the diving depth of the submarine

in	inch
Lap	The overlap between hull Strakes
LBL	Long BaseLine, a subsea positioning technique used by APS
NAS	Nautical Archaeology Society
Multibeam Echo Sounder (MBES)	A sonar instrument used to make very high resolution 3D images of the seabed
Pneumatophore	Self-contained breathing device designed and built by Garrett
Pressure hull	The part of the submarine's hull containing the machinery and crew
Receiver of Wreck, RoW	The authority responsible for management of items recovered from shipwrecks
RN	Royal Navy
RNSM	Royal Navy Submarine Museum
ROVTrak	A diver tracking system developed by Sonardyne International Ltd
Scour	An eroded depression in the seabed created by water currents flowing unevenly around an object
Silt	Light granular sediment less coarse than fine sand
Strake	A strip of hull material, in this case an iron plate
Trimmed down	Of a submarine; with all ballast tanks full of water and ready to dive
UT	Ultrasonic Thickness

Timeline

1852 July 4	George Garrett born
1864	Submarine *Hunley* sinks the *Housatonic*
1864	*Ictineo II* launched, possibly the first steam powered submarine
1878 May 8	Garrett files UK Patent No 1838, *Submarine Boats for Placing Torpedoes, etc.*
1879 March	Initial experiments carried out by Cochran & Co.
1879 April	Cochran and Co. awarded the contract to build *Resurgam*
1879 Nov 26	*Resurgam* lowered in to the Great Float in Birkenhead
1879 Dec 10	*Resurgam* leaves for Portsmouth
1879 Dec 12	*Resurgam* arrives at Rhyl
1880 Feb 24	*Resurgam* leaves Rhyl heading for Portsmouth
1880 Feb 25	*Resurgam* founders under tow
1880 May	Garrett demonstrates the pneumatophore in the river Seine
1882	Garrett struck from the clerical register
1882	Submarine *Nordenfelt 1* laid down near Stockholm, launched 1883
1898 Dec	French submarine *Gustave Zédé* successfully attacks a battleship with torpedoes
1900	British Admiralty commissions a series of experiments into anti-submarine warfare
1900 April	*Holland VI* purchased by the US Government
1900 Dec	British Admiralty contract Vickers to build first submarines for the Royal Navy
1902 Feb 26	George Garrett dies
1925	Engineer George Price tells the story of how *Resurgam* was lost
1975	First search for Resurgam, by the Oxford Laboratory for Archaeology
1981	Royal Navy search
1983	Royal Navy Submarine Museum search
1985	George W. Garrett transfers title of the submarine to the RN Submarine Museum
1987	Marine Archaeological Survey search
1989	William Garrett and Richard Bufton search
1992	William Garrett search
1993	William Garrett search
1993	Douglas to Point of Ayr gas pipe installed
1993-95	*Resurgam pulled from the seabed?*
1995 Oct	*Resurgam* located
1996 April	ADU visit to the site with the finder
1996 June	Emergency designation under the Protection of Wrecks Act (1973)
1996 June	Garrett survey with AUSS, ADU visits *Resurgam* with *Terschelling*
1996	Sport divers remove objects from the wreck
1996	Resurgam Committee set up by the RN Submarine Museum
1997 June	SubMap Project (4th -15th)
1998	ADU visit

1998	*Submarine hull is moved*
1998	Resurgam Trust set up
1999 April	ADU visit, confirmed that the submarine had moved
1999 June	Bowyer visits site with Police divers
2000	ADU visit
2001	ADU visit with ROV inspection
2006 July	Missing porthole is handed to the Receiver of Wreck then passed on to the RNSM
2006 Sept	Wessex Archaeology site assessment
2007	BSAC Trafford undertake conservation work on the site
2012	BSAC Chester undertake conservation work on the site

George William Littler Garrett

George William Littler Garrett was born in Lambeth in London on the 4th of July 1852, the third son of John and Georgina Garrett; his father was curate of the local St Mary's Church. In 1857 his father took up a position in Penzance in Cornwall at St Paul's church which overlooks Mounts Bay, and it is in this nautical environment that young George Garrett may have first become interested in the sea. The move to Cornwall was due in part to the interest John's patron had in his work which may have come to the attention of Albert, the Prince Consort, through their Masonic ties. As noted by Murphy 'the *family talent for currying favour with the influential was only matched by a woeful inability to manage money*'. Much of Garrett's life would be affected by his father's financial troubles and George himself would die almost destitute in New York after a period serving with the US Army Engineers during the Spanish-American War.

Figure 1: George Garrett

The financial difficulties began in July 1861 after John Garrett agreed to take over a post in Christ Church, in Moss Side near Manchester after the death of his patron. The previous incumbent had exaggerated the income of the parish and what little John Garrett had to live on was spent on the upkeep of the *'decrepit jerry-built pile of used bricks'* that was his church and the rent for the imposing Greenheys Hall which he chose as his rectory. Despite the problems with the Parish, George was able to board at Rossall School where he showed an interest and aptitude for the sciences. George was withdrawn to the local Manchester Grammar School after his father became embroiled in an embezzlement charge; although found innocent, Garrett Senior was left with fines of £2,500 and could no longer afford the school fees.

George left the Grammar school in 1869 and spent nine months teaching in Seighford village school in Staffordshire, before enrolling as a 'Pensioner' student at the University of Dublin (Figure 1). During this period Garrett took evening lessons in chemistry with Professor Henry Roscoe at Owen's College, taking a particular interest in the chemistry of respiration and breathing in confined spaces. By 1872 Garrett had begun research into human respiration while working at the Kensington Museum and the results of this work would later allow him to design a self-contained breathing apparatus crucial to the development of *Resurgam*. After meeting his future wife, Jane Parker, while working at Pocock College in Cambridge, Garrett was then able to study at Trinity College with help from his fiancée's parents, graduating in 1875 with an Honours degree in Experimental Sciences. Once he had graduated, George was

requested by his father to become the curate in his parish as he was struggling by himself. Instead, Garrett chose to spend a year in Fiji and New Zealand '*teaching and practising navigation in all its branches'* before returning to England the following year where he was ordained as deacon at the age of 25.

The Russia-Turkish war began shortly after George's appointment in May 1877. Garrett read reports of the Russian Navy being repelled by Turkish anti-torpedo boat defences, simply a row of small vessels linked by rope, and he saw the need for a vessel that could submerge and slip under these floating barriers. It was this event that sparked his interest in submarine boats and led Garrett to develop the *Resurgam* submarine.