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THE DIVING HELMET

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Key Words

Equipment, history.

Abstract

Safe and effective commercial diving did not become viable until the invention of the surface-supplied diving helmet. Though simple in principle of operation, the idea did not dawn until the early 1800s. In 1856, Robert Stevenson MP, President of the Institution of Civil Engineers remarked at a meeting chaired by Isambard Kingdom Brunel, "Nothing had so much contributed to extend and facilitate marine engineering, as the invention of the diving dress".¹ The honour for this invention falls on two lowly seamen who were brought up during the Napoleonic wars, in Deptford, a squalid dockland in the suburbs of London. This paper describes how brothers, John and Charles Deane, came upon the idea of the diving helmet and their uphill struggle to turn it into a commercial success. Their story inevitably covers "firsts" in many categories, including marine civil engineering, salvage, treasure hunting, military activities and of course, underwater medicine.

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The earliest diving helmet

Charles Anthony Deane filed his patent for a smoke helmet and dress on 4 November 1823.² At this time he had given up his seafaring career with the Honourable East India Company and had settled down as a ship's caulker, working in a private ship-building yard in his home town of

Deptford, near London. Six months later, as was the custom, Charles Deane enrolled the full specifications of his patent. Then on 15 May 1824, just a few weeks later, he sold an Indenture of Assignment for the patent to his employer, the wealthy owner of the shipyard, Edward George Barnard for the considerable sum of £417.³



Figure 1. 1823 Smoke helmet, photographed at Siebe Gorman. This is the helmet patented in 1823 by Charles Anthony Deane and manufactured by Augustus Siebe. In 1829 it was used as the prototype for a diving helmet.

As with all inventions, the next step was to prove the most difficult, that is, turning it into a commercial success. Both Deane and Barnard worked closely together in the venture and they approached the Admiralty on 7 December 1824 and again on 15 March 1825 to try to gain its interest and support.^{4,5} But the Admiralty could see no advantage in it and turned them away. The last recorded attempt to promote the smoke helmet and dress was in 1829 when the equipment was demonstrated at a meeting of the Society for Preventing Loss of Life by Fire at 18 Aldermanbury, London.⁶

That might have been the end of the matter, but the proceedings took a new and unexpected twist. While Charles Deane had been in London pursuing his caulking and smoke helmet venture, his younger brother John had been working with the expert salvagers of Whitstable, Kent. There, an exciting, challenging and potentially lucrative career could be obtained recovering lost anchors and their cables from

the sea bed. There were also major bonuses when a stranded vessel could be saved or a valuable cargo recovered from a wreck. But the methods used were crude, involving long poles with tongs on the ends, worked from the surface. Even a small diving bell had been tried. When John and Charles Deane compared notes, the idea dawned. Charles's smoke helmet was really like a small diving bell. So the two brothers set about modifying a smoke helmet and made a prototype diving helmet. In 1828 they tested their idea in Croydon Canal, just half a mile from Charles's home in Deptford and the system was brought to "full perfection".⁷



Figure 2. 1830, Deane helmet (France), the first dedicated diving helmet.

They were ready for their first serious attempt at commercial exploitation by the following year. As if in answer to a prayer, the Honourable the East India Company ship *Carn Brea Castle* was wrecked in shallow water off the Isle of Wight on 5 July 1829. The Lloyds Underwriters routinely approached the Whitstable salvagers when such an event occurred and it is through them that the Deanes would have had the invitation and opportunity to try out their new technique. Despite the crude nature of the equipment, which included a "leathern headpiece" and air supplied by a bellows, the venture was a complete success and most of the valuable cargo of the ship was saved before the next storm smashed her to pieces.⁸

Augustus Siebe was then commissioned by the Deanes for the first time to manufacture the next generation of the Deanes' diving equipment. The first reports of the

Deanes using a piston, force pump, an open helmet and a Mackintosh waterproof diving dress came in 1830.⁹ Figure 3 shows the principle of an open helmet, which only has one air pipe. The disadvantage was that bending forward caused water to enter the suit at the neck and could cause loss of air from the helmet leading to flooding.

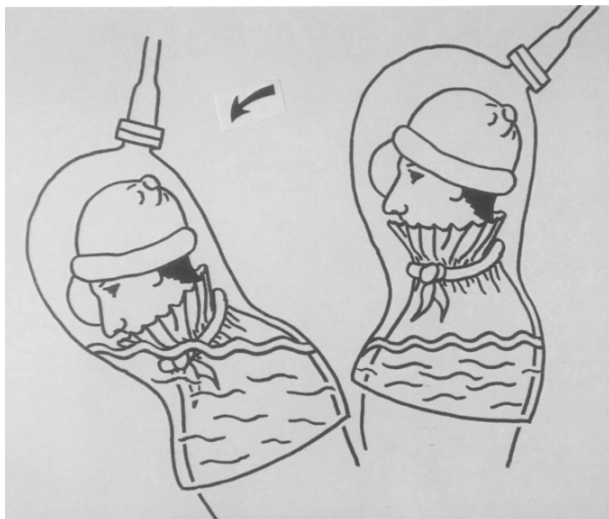


Figure 3. Open helmet principle. The helmet required only one air pipe, but bending forward caused water to enter the suit at neck and/or loss of air from helmet (flooding).

In 1830 John Parker Marsh, a commercial bell diver, first copied the Deane patented diving helmet. Barnard brought a case of patent infringement against Marsh in Chancery on 10 November 1831, but eventually lost it on 28 February 1833 because the patent was for a smoke helmet, not a diving helmet.

An undated drawing by Simon Goodrich shows what could have been the next developmental model of the Deane helmet and dress.¹⁰ The helmet appears to have been negatively buoyant as it was not held down by any weights. The jacket and sleeves had been reduced, which removed the necessity to provide the helmet with an exhaust pipe. The excess air, together with the diver's exhaled air, would have escaped at the shoulders. The weights were attached to a separate belt around the waist.

In February and March 1832, Charles Deane carried out several dives for the Admiralty in the Medway and Thames, including the moorings of HMS FIORENZO, HMS IMPERIEUSE, the *Eveline* and HMS CHRISTIAN VII. The attention of the Deanes was then drawn to Portsmouth where the wrecks of HMS BOYNE and HMS ROYAL GEORGE were still causing chronic obstruction problems. The Deanes were, however, too late to get the rights to work on the BOYNE because a competitor named Henry Abbinett, to whom they had sold one of their obsolete sets of equipment, had beaten them to it. So Charles Deane opted

for the rights to work on the ROYAL GEORGE, in the footsteps of Tracey, the Spaldings and Braithwaites. On 16 August 1832, Charles Deane landed on the deck of the ROYAL GEORGE at a depth of about 60 ft (18 m),¹¹ probably the deepest so far achieved in an open helmet. A notable change in his diving dress was that now he wore large weights on the front and back of his chest.

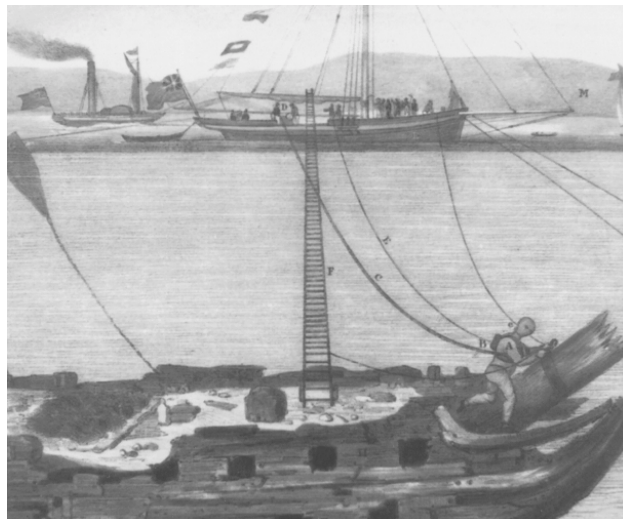


Figure 4. 1832, Charles Anthony Deane on HMS ROYAL GEORGE. He and his brother John salvaged several bronze cannons from this wreck.

The clearest description and illustration of the improvements of the open diving helmet, including the all-important exhaust pipe, appeared in August 1832.¹² This showed a flexible exhaust pipe lashed high on the side of the helmet. This is presumed to have been done whilst the helmet was not in use to keep the vulnerable pipe from being damaged. Also in August that year, John Deane was diving on the wreck of the *Guernsey Lily*, off the Norfolk coast, an ordnance transport vessel sunk in 1799. This was the first evidence of the Deane brothers working independently of each other.

The first use of the diving helmet in a civil engineering function happened in December 1832. The eminent civil engineers Walker and Burges of London had been commissioned to report on the structural integrity of the ageing Blackfriars Bridge across the Thames.¹³ They employed Charles Deane to carry out the underwater survey and even tried out the equipment themselves.

The Whitstable salvagers were, by now, seriously impressed by the capabilities of the new diving helmet and they decided to try and get hold of the equipment for their operations. Thus Thomas Gann and George Bell of Whitstable, using their lawyer John Bethell of Lincolns Inn Fields, approached Barnard. Bethell also visited Augustus Siebe at Denmark Street, Soho to inspect the equipment. Barnard later accused Bethell of using this opportunity to

spy on Siebe's manufacturing techniques because in 1834 Charles and John Deane discovered divers, using a diving helmet and dress made by Bethell, working on a wreck to which the Deanes had been given the rights by the underwriters. This was followed in 1835 by Bethell patenting his pattern for a diving helmet and dress.¹⁴ Bethell's design was different in several respects. The main one was that it was a "tight" dress. That is, it completely sealed the diver from the water. It was made in two parts. The upper part consisted of the helmet attached to a jacket and the lower part was the trousers. A seal between the two halves was achieved around the waist where the jacket and trousers overlapped and were bound tight by twine tied over an inner metal ring. Bethell was successful in selling several units to the Royal Navy.

Yet another competitor appeared the same year. On 22 June 1835 John William Fraser filed a patent for an "Apparatus for Descending Under Water" but he failed to enrol a specification.¹⁵ He made a second abortive attempt on 15 October with his patent for "Raising Weights from Below the Surface of the Water".¹⁶ Success finally came on 14 November when he refiled his patent for a diving apparatus.¹⁷ This equipment became the second major competitor to that of the Deanes. It was the second so-called tight dress and the main difference was in the attachment of a clever floating exhaust valve for the helmet.

Over the years 1834, 5 and 6, the Deanes worked on and off, on the ROYAL GEORGE. By 1835, they had raised 17 brass and 5 iron cannon from the wreck with a total value of £3,000. Their share must have been a healthy tonic for their bank balances because the following year, in 1836, both the brothers launched important publications. Charles published his "Submarine Researches on the Wrecks of His Majesty's late Ships ROYAL GEORGE, BOYNE and Others"¹⁷ and John published the first ever diving manual which he called "Method of Using Deane's Patent Diving Apparatus".¹⁸

In 1836 the pickings on the ROYAL GEORGE were thinning out and John Deane, who by this stage seemed to be doing all the diving in partnership with William Edwards of Whitstable, was easily persuaded on 16 June 1836 to dive on a "foul" which had snagged some fishermen's nets. This turned out to be no less than the long lost wreck of the Tudor warship MARY ROSE, sunk in 1545. To the delight of the Admiralty, John instantly salvaged several unique pieces of ordnance which were around 300 years old even in the 1830s. The wreck was completely buried so he used gunpowder to excavate into the hull and to remove a 15-foot section of the ship's main mast, the first time explosives had been used in an underwater archaeological project.

Then towards the end of the year a third competitive diving dress patent appeared. William Bush filed his patent for "Improvements in the Means of and in the Apparatus

for building and Working Under Water".¹⁹ Bush was an eccentric civil engineer with bizarre ambitions to build light houses on the Goodwin Sands. His diving dress design included a diving suit which sealed around the waist (like Bethell's) but used a bolted flange to achieve water-tightness. This was an interesting improvement, superior to Bethell's arrangement and perhaps the inspiration for the later bolted flange seal at the corselet introduced by George Edwards. Bush also included a peculiar breathing system in his patent but it was completely impractical and would never have worked. Bush did however later become a major player in the diving salvage business.

1837 was an important year because this is when the disputed Deane smoke helmet patent came to the end of its 14 year life. Augustus Siebe, who presumably out of respect for Deane's patent, had not challenged it. But now the time was ripe to establish himself in his own right. On 22 May 1837 Siebe sent his first letter to the Admiralty offering his diving equipment which he stated he had been manufacturing for eight years and had sold 20 sets.²⁰ This equipment would of course have been the Deane open helmet and dress. The Admiralty still could not see any merit in it and turned it down again.

The Royal Engineers

The Royal Engineers, under the directorship of Colonel Charles William Pasley, were, on the other hand, an entirely different kettle of fish. Pasley was requested by the Lord Mayor of London to clear a shipwreck that was causing chaos in the navigation of the Thames, the brig *William* sunk in the middle of the fairway off Tilbury Fort, opposite to Gravesend in 1836. Pasley had been asked because he had a track record of setting off explosives in the Medway since 1812. Pasley had no experience with the application of the diving helmet at this time so he sought advice from everyone he could identify in the business. John Deane in partnership with William Edwards of Whitstable had offered his services free (expenses only) but Pasley had been misled by a jealous competitor (William Kemp) and he turned Deane's offer down. Pasley fell prey to Kemp's persuasion and was badly advised that he could use untrained Sappers and Miners as divers. This led to a fatal accident in a diving helmet when a diver became tangled in the wreck of the *William*.²¹ He had been wearing a Fraser design of helmet and dress. But Pasley was later awarded the Freedom of London by the Lord Mayor for his successful removal of the *William*.²²

Pasley's success coupled with his astute appreciation of the merits of the diving helmet led Pasley to seek out another opportunity to explore his new-found underwater mining skills. It was inevitable that this search led him directly to Portsmouth and the wreck of the ROYAL GEORGE which was still obstructing the Royal Navy's premier anchorage at Spithead. Pasley quickly discovered

that the Admiralty had given the salvage rights to Charles Deane. But that did not stop Pasley. He pulled a few strings with friends in the Boards of the Admiralty and Ordnance back in London and the ROYAL GEORGE was duly removed from Charles Deane and handed to Pasley.²³ The news so stunned Deane that he ended up with an enforced stay in a lunatic asylum.²⁴ Charles Deane was never the same again and within another ten years he had taken his own life with a single fatal slice of a cut-throat razor.

In the meantime Pasley was at full gallop in his operations “against the ROYAL GEORGE”. During the first year of his campaign, 1839, he hired two well known Whitstable divers named George Hall and Hiram London who used the Deane pattern diving equipment. Pasley however took the opportunity to get the Whitstable men to train some of his own men. The next year, Hall and London shared the diving work with some of Pasley’s men. The third year saw the departure of the civilian divers back to Whitstable and the whole diving program was taken over by Pasley’s newly-trained Sappers and Miners. Pasley had got what he wanted. By 1842 he had established a fully operational diving capability under his command in the Royal Engineers.

A milestone in the development of the diving helmet was set up on 26 June 1840 when the first Siebe “tight” diving dress (Figure 5) appeared on Pasley’s ROYAL GEORGE operations.²⁵ The background to this event is important from the point of view of who should get credit for what. George Edwards, a noted civil engineer in charge of Lowestoft Harbour had purchased a Deane pattern open diving dress from Siebe in 1837. Edwards had disliked the tendency for water to enter the diving dress if the diver leaned forward so, in 1838, he came up with the idea to seal the helmet to the diving dress around the lower edge of the corselet. This he did using a “loose flange”. He actually showed his idea to Siebe in London on 1 June 1838 and altruistically gave Siebe full and free use of the idea.²⁶ On 7 September 1838 Edwards asked Siebe to build him a diving helmet and dress incorporating his loose flange idea. Siebe said he would be happy to comply especially if Edwards could supply a full set of plans to “... save the expense and time of inventing”.²⁷ In the end Edwards decided to have his first tight dress made in his home town of Lowestoft and he publicly demonstrated it on 15 March 1839 in Lowestoft Harbour. This was the fourth successful tight dress design to be produced.

About a year passed and Siebe was introduced to Pasley by George Hall, one of the Whitstable divers working on the ROYAL GEORGE. Siebe took the opportunity to suggest the tight dress design which Edwards had introduced the previous year. On 19 March 1840 the frugal Pasley gave the instruction that “The New Diving Dress not to be procured unless absolutely necessary. Estimate of Mr Siebe”.²⁸ The big decision was eventually made and on 4 May 1840 the Storekeeper General placed



Figure 5. 1840, the new “tight” dress had a loose flange, designed by George Edwards, added to a Deane helmet manufactured by Augustus Siebe.

the first order for a Siebe-manufactured tight diving dress which was delivered to Portsmouth on 26 June 1840.²⁹ Siebe’s was therefore the fifth pattern of tight diving dress to be produced and certainly not the first, as was later claimed by his successors.

This first tight helmet from Siebe’s manufactory at 5 Denmark Street in Soho, London, had been a one-piece arrangement. Siebe personally delivered his second tight helmet to Pasley in Portsmouth on 26 June 1840. Pasley noted in his diary “Mr Siebe arrives and brings with him his new diving dress of which the head unships”.³⁰ This important design feature had been suggested to Siebe by Pasley and Siebe had been quick to take him up on it. The idea itself had of course originally been proposed back in 1823 in Charles Deane’s smoke helmet patent specification.

At the close of 1840, Pasley produced an invaluable and detailed report describing the various diving suits used on the ROYAL GEORGE operations. After describing Siebe’s tight dress he added “the details of this construction are not entirely Mr Siebe’s invention, as he was assisted by Mr Edwards ... and part of it may also have been copied from other diving dresses ...”.³²

Siebe Gorman

After Siebe's death in 1872, his company was taken over by his son Henry and his son-in-law William Augustus Gorman. They moved to bigger premises and expanded the business. The company quickly consolidated itself as the world leader in diving equipment manufacturing. Part of this strategy was to promote themselves as the sole source of diving expertise and they set about removing the names of Deane and Edwards from their literature, substituting their founder, the late Augustus Siebe as the inventor of just about everything. This campaign was so successful that even today the popular opinion is that A Siebe invented the diving helmet and dress, and as early as 1819! Just about every encyclopaedia still carries this flawed version of the truth. Whoever said "Give a lie a good start and the truth will never catch up" knew what he was talking about.

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