

## WILLIAM HOOPER (1818-1878) AND THE EARLY WEEKS OF ANAESTHESIA IN ENGLAND

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Past President, HAS

The discovery of a complete Hooper ether inhaler (Figure 1) and the need to test the claim that it was the very apparatus used by James Robinson to anaesthetise Miss Lonsdale at the Gower Street house of Dr Boott on 19th December 1846 for the extraction of a firmly rooted molar tooth, was the cause of this enquiry into exactly what vaporizers were used during the first few days of general anaesthesia in London, and into the place of Hooper's apparatus in the sequence of events. It was immediately obvious that the account of this period in Dr Duncum's book is not sufficiently detailed.<sup>1</sup> It relies largely on selective quotes from Boott, Robinson, and Liston, and a little research showed that it contains some inaccuracies.

The first thing to be established is the exact design of the apparatus that Robinson used on the morning of Saturday 19th, and who made it. The apparatus illustrated by Duncum, which all will recognise, is shown in Figure 2, but this is not the apparatus that Robinson used on that first occasion. In the letter that Boott received from Bigelow, Morton's inhaler is described as 'a small two-necked glass globe',<sup>2</sup> and one would have expected Robinson, knowing that it worked, to devise something similar, which is what he did.

Figure 3 is the illustration of Robinson's first ether inhaler that appeared in the *Medical Times*.<sup>3</sup> It was described as: 'merely the lower part of Nooth's old soda-water apparatus, at the bottom of which are placed twenty or thirty pieces of sponge, cut in a triangular shape, so as to present as many surfaces for the evaporation of the ether as possible'. Added to this was a mouthpiece with two valves, a breathing tube and stopcock, and a nose clip. Miss Lonsdale apparently had a painful unerupted wisdom tooth, and the ether worked so well that one wonders whether she had been taking something to relieve the pain; perhaps she was already premedicated with the readily available laudanum. In any event, this inhaler did not work so well subsequently.

What exactly happened next is uncertain. William Squire, the medical student who actually administered the ether at University College Hospital while Robert Liston amputated a leg the following Monday, 21st December, published his account much later, on almost the forty second anniversary,<sup>4</sup> and some details are not entirely clear. William was the nephew of Peter Squire, who was pharmacist to the Queen, and a friend of Liston. William reminisced that he heard about Morton's use of ether from Liston on Saturday, December 19th. It seems that Liston was already aware that Robinson had successfully extracted a tooth without pain, but that a second trial had not been a success. So Liston had taken some ether from the hospital to either Boott's or Robinson's house, in case the fault lay with Robinson's ether; but William's impression was that the glass vessel used was too small, and he thought that Robinson had gone on to try a sponge covered with a cloth, with more success. Liston then took William to Peter Squire's establishment in Oxford Street, where he says that ether was given on a sponge to one of the assistants. There was coughing, some excitement, then insensibility, but not of long duration. Also there was a strong smell of ether, and it seemed better if a stronger store of vapour were built up and contained in a vessel. So Peter Squire improvised a suitable inhaler, and William described it, forty two years later, in accordance with this illustration, (Figure 4) which is taken from Duncum.<sup>5</sup>

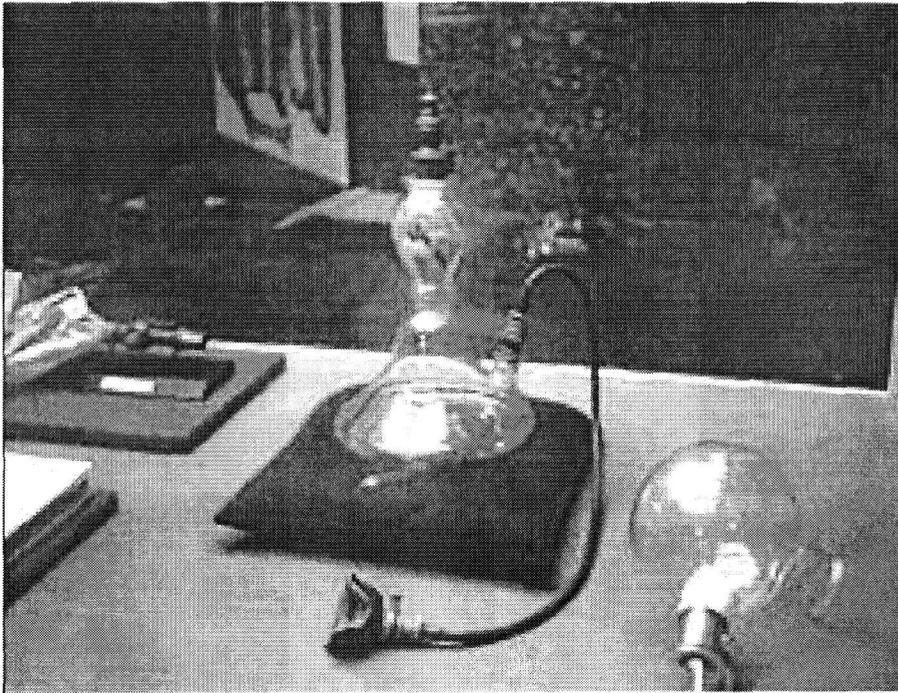


Figure 1

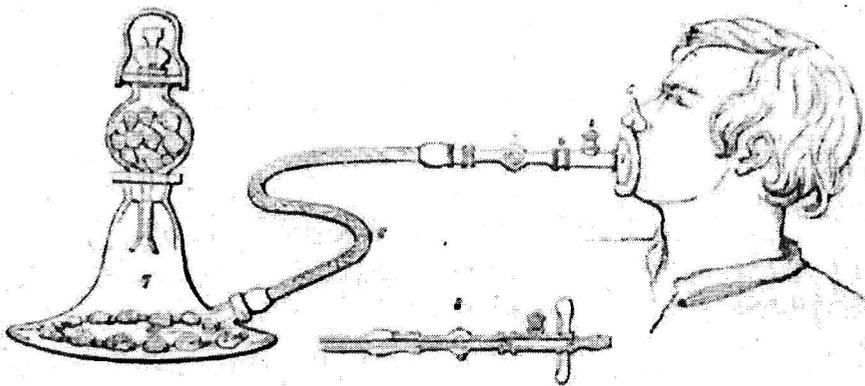


Figure 2

This illustration first appeared in the *Pharmaceutical Journal*,<sup>6</sup> and Duncum says that it was the apparatus used on December 21st; but in early January 1847 Peter Squire himself published a rather different illustration (Figure 5). Squire was president-elect of the Pharmaceutical Society of Great Britain, and this apparatus was depicted in the *Pharmaceutical Journal*.<sup>7</sup>

According to the description it 'resembles a Nooth's apparatus – a sponge wetted with ether being placed in the upper part ...' The vapour, being heavier than air, descended to the lower vessel, to which was attached a flexible tube, a valve to prevent the expired air re-entering the vessel, and a mouthpiece. Squire stipulated that the ether should be washed with water to purify it.

So this was the inhaler used on December 21st. It has always seemed strange that the two earliest apparatuses used in London, Robinson's and Squire's, both made use of Nooth's apparatus, and a case could be made out that William Squire described Robinson's inhaler to his uncle, and that Peter improved its vaporizing properties by the addition of the upper vessel. If that were so, we have to grant priority to Robinson. Squire, some three weeks later, said of his first inhaler that 'the temporary apparatus, which I hastily put together for Mr. Liston ... was afterwards much improved ...'. The improved version was demonstrated at a meeting of the Pharmaceutical Society on January 13th 1847 and illustrated in the *Journal*. It is the one (Figure 4) we are familiar with.<sup>8</sup> Returning to 19th December, in a letter to the *Lancet*, dated December 21st, referring to Miss Lonsdale's anaesthetic, Boot wrote:

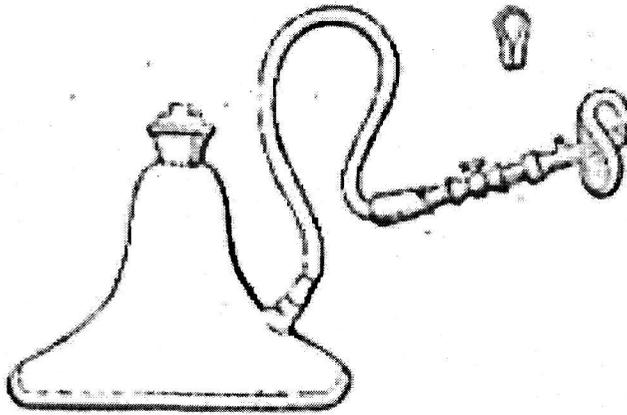
'... the same apparatus was used in three or four cases afterwards, and failed in each case to produce insensibility. I attribute the failure to the defect of the valve in the mouthpiece, by which the expired air was returned to the bottle, instead of passing into the room. The valve was a ball and socket one, and required a very strong expiration to make it act freely'.<sup>9</sup>

From this one would understand that these failed attempts followed immediately, but Robinson, describing these same incidents, (the first two trials in England), wrote:

'that on Dec. 19th, by myself, in the case of Miss Lonsdale, in which I used a very imperfect apparatus, hastily got up, and which was condemned for its ill success in the cases on the 20th and the memorable operations of Mr Liston on the 21st at the Hospital of University College, in which he was assisted by Mr Squires (sic), who used an apparatus of his own construction to induce the state of insensibility into which the patients were thrown'.<sup>10</sup>

This raises the question of whether there were failures on both the 19th and 20th. Also, nowhere does Robinson suggest that Squire copied from him. Having got the preliminary history out of the way, Robinson continued his account: 'having had another apparatus constructed ... I tried it for the first time on my servant ...'. In a letter to the *Medical Times*<sup>11</sup> he wrote that it was made for him by Mr. Elphick of Castle Street, Oxford-Street (which, before the introduction of numbered postal districts was the way of distinguishing this Castle Street, now Great Castle Street, from others). Finding that the inhaler worked perfectly he proceeded to use it for some weeks at least, in his practice, and in several hospitals, in the presence of a number of eminent observers, medical and lay. John Snow was among them.

**PAINLESS SURGICAL OPERATIONS.**  
**DESCRIPTION OF ROBINSON'S INHALER.**



The above woodcut represents the apparatus, invented and employed by Mr. Robinson, for the inhalation of the vapour of ether.

Figure 3

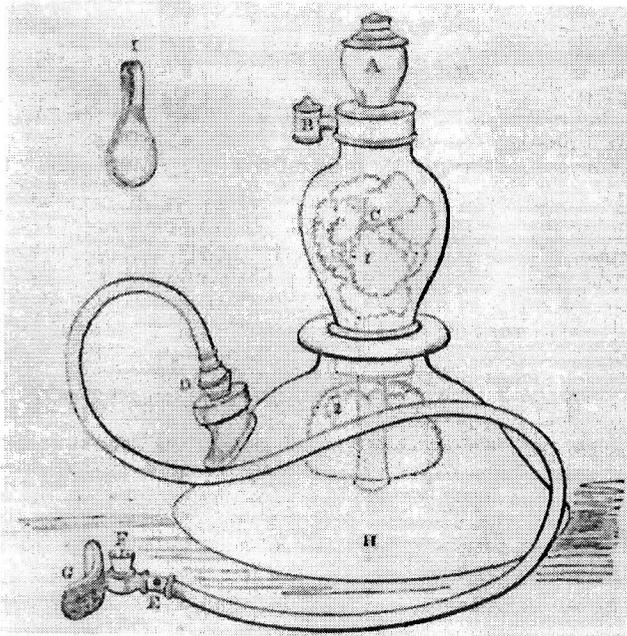


Figure 4



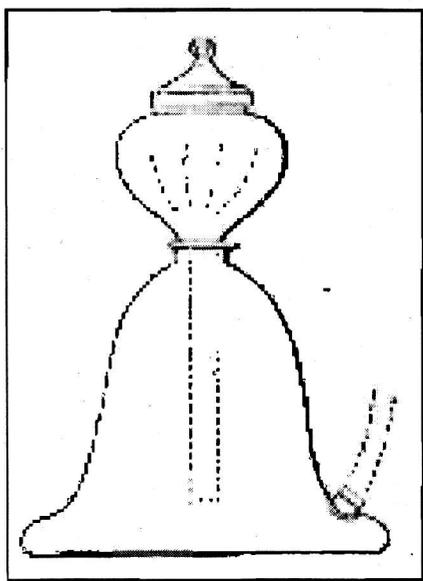


Figure 5

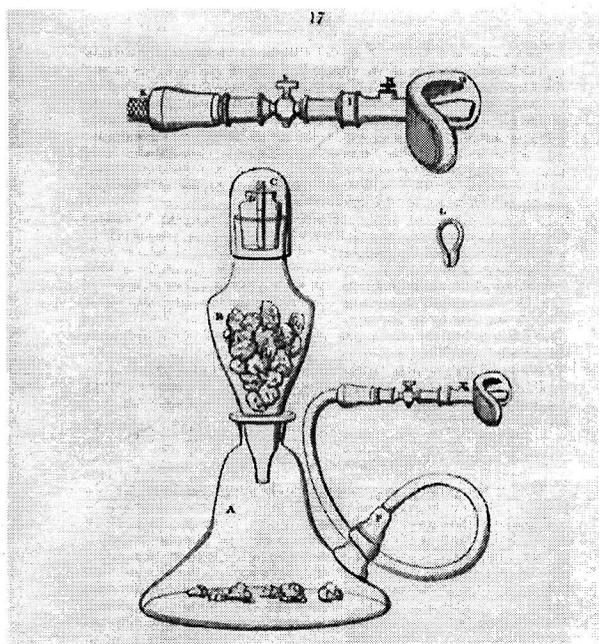


Figure 6

The next speaker was Hooper, who 'gave an account of his apparatus, or rather, of improvements which he had made in the instrument suggested by Dr. Boott and Mr. Robinson, and which had received their sanction.' It had since been modified and improved, had been used in a great many cases, and had never yet failed to produce the desired effect. It resembled Mr Squire's apparatus, but had a double stopper, which could be used to modify the amount of air being drawn through the apparatus. He had improved the valve in the breathing tube, and devised a more flexible mouthpiece, which could be applied closely to the mouth. He considered it important that the patient should not breathe free atmospheric air under any circumstances, but only that which had been mixed with ether vapour in the inhaler. He enumerated a number of cases at various hospitals in which he had used the apparatus with success.<sup>15</sup> The *Lancet* report concluded, entertainingly, that:

'It would be unprofitable to follow the various remaining describers of instruments which were exhibited, many of which had not been tested in practice: they were really so numerous, that it would appear that the whole scientific portion of the members of the Society, as well as that of many others, had been employed in inventing and contriving means for administering the vapour of ether. The modifications attempted were from the most elaborate and complicated pieces of machinery to mere bladders with an elastic tube and stop-cock, the latter having the advantage of not being protected by either 'caveats' or 'patents.' Whatever the form of instrument, however exhibited, it was remarkable that each and every one had answered the purpose for which it was intended; and in this respect, the mere bladder and pipe had been as efficacious as the patented and more expensive items. The object of the exhibition at least was answered, for each had an opportunity of exhibiting his adopted, and, like a fond parent, saw advantages in his own offspring which he failed to find in that of others.'

During discussion it was mentioned that for many years the vapour of ether had been used with the same intention, and the same effects, as nitrous oxide, and a member reminisced that he had known instances in which the ether had been inhaled from a bladder with the effect of producing intoxication, by boys in the street, and the proceeding was only checked by a coroner's inquest.

The President summed up that while each piece of apparatus exhibited appeared to answer the purpose for which it was intended, the simplest, if effective, must eventually be the most useful.

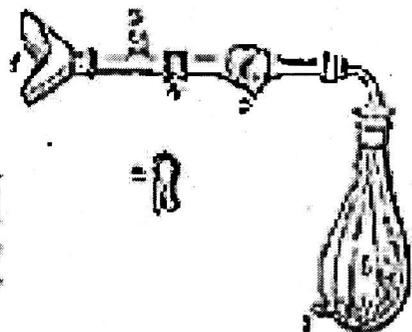
### **Hooper's Apparatus**

Hooper published an advertisement in *The Times* three days later on January 16th.<sup>16</sup> Reports in the journals show that he sold a number of his inhalers very quickly. Outside London it was in use in East Retford on January 14th, Spalding round about the same time, Beccles and Maidstone before January 20th, Derby, Strood, Newcastle Infirmary, and Bristol Royal Infirmary. At the Queen's Hospital, Birmingham, what was described as Professor Parker's modification of Robinson's apparatus was in use. Hooper himself anaesthetised a patient for the extirpation of an eye by Mr Lawrence on January 15th. The following day, Saturday 16th, he anaesthetised at St Bartholomew's for the removal of a finger, but without much success, the patient subsequently admitting to being a heavy drinker. Hooper's assistant, Mr Griffin, gave an Anaesthetic at the Western Institute for Diseases of the Eye, (it appears that Robinson had sent

## PORTABLE ETHER INHALER

OF MR. WILLIAM HOOPER (7, FLEET STREET EAST).

1. Ostrich for the mouth;
2. Nasal spring.
3. Horizontal valve.
4. Vertical exp. valve.
5. Unwayed stop-cock.
6. Vulcanized India Rubber Bottle.
7. A capped tube.



The ether is supplied by being poured into the vulcanized India rubber bottle, through the tube No. 7, the cap of which should be removed during inhalation.

[Mr. Hooper has contrived an inhaler for horses, of which we intend to give a cut next month.]

*Pharmaceutical Journal, 1847*

Figure 7

## HORSE INHALER.

BY MR. W. HOOPER, 7, FLEET STREET EAST.

1. Muzzle.
2. Expiring valve.
- 3 & 4. Bayonet joint & rotating valve.
5. Vulcanized India-rubber bag.
- 6 & 7. Insulating tubes.

*Directions.*—The muzzle and vulcanized India-rubber (connected by a bayonet joint) should be detached before being applied.

The muzzle is fixed to the horse by means of a head-piece similar to a bridle, and a tight India-rubber band placed over it near the top.

The moveable brass piece underneath the muzzle should be closed, and the expiring valve kept open by the bent wire being placed underneath whilst fixing it.



Figure 8

out a circular asking for reports of etherizations. He collected and published a number of replies and newspaper reports in his treatise, but some are undated).<sup>17</sup>

Most of this activity by pharmacists, and even by dentists, faded away soon after John Snow demonstrated his metal ether inhaler,<sup>18</sup> and made his debut as a hospital anaesthetist on Thursday, January, 28th at St George's Hospital; and there the Hooper story would have ended, but that the report of his remarkable communication to a meeting of the Pharmaceutical Society, dated April 14<sup>th</sup>, indicated that he was a man worth spending some time researching.<sup>19</sup> Robinson, as early as the third week of March 1847, had started to investigate the effect of giving a few breaths of oxygen at the end of the anaesthetic.<sup>20</sup> He found that patients recovered more quickly and fully. At the meeting on April 14th Hooper described and demonstrated a modification that he had made to his inhaler at Robinson's request, so that oxygen could be given or not, as required, during the anaesthetic. He said he was happy that physiologists were beginning to take an interest in the matter, and although in his opinion there was no danger in inhaling ether vapour in air, he has no doubt that 'every operating Surgeon and Dentist will adopt' the use of additional oxygen. There is no information about how the oxygen was prepared or stored.

Hooper continued with a remarkable statement. Many fully etherised subjects had reported a mental sensation analogous to drowning, with memories of childhood coming to mind. But his personal experience and observations had brought him to believe that full etherisation is not necessary for the relief of pain:

'I look on this fact as of the greatest importance, and which will cause ether to be a greater blessing to mankind than we originally contemplated - the idea of losing the mind having been a great impediment to its use. The five senses appear to be peculiarly independent of each other, as far as the effect of ether is concerned, inasmuch as that of smelling is the first we are deprived of, then that of taste, followed by that of feeling, whilst the sight and hearing remain, and the mind of the patient is perfectly quiescent. At this stage the operation should be commenced by the patient's direction. I quite expect the day will arrive when patients will conduct the inhalation themselves ...'

The sort of unpleasant experience that was putting people off general anaesthesia was described by Robinson's supplier of dental equipment, W Dixon, in a letter of December 29th:

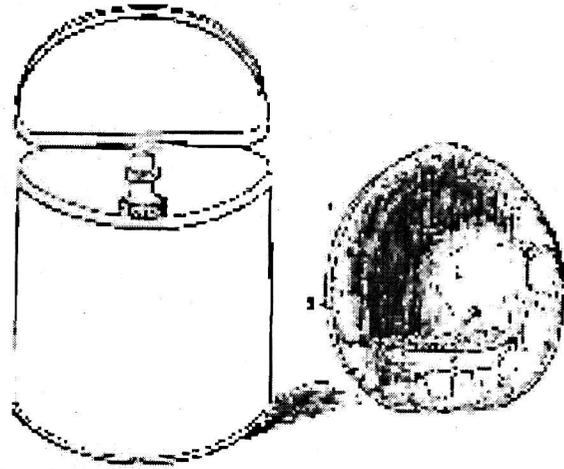
'The sensation of giddiness now came on rapidly ... thoughts of home and its little inmates came, and from them it seemed as if some power was tearing me away .... My thoughts now became fixed on a great struggle which seemed going on between a good and evil principle ... there was a straining of every faculty towards the supposed contest, my eyes seemed as though they would burst from my head.'<sup>21</sup>

For this early period, Hooper's observation about the stage of ether analgesia and the possibility of self-administered inhalational analgesia is a very remarkable one. At the end of his communication Hooper observed that ether acts more efficiently and pleasantly on an empty stomach, and that a meal shortly after its use prevents nauseating and depressing effects.

## CHLOROFORM INHALER.

BY MR. WILLIAM HOOPER, FILL MALL EAST.

This inhaler is constructed in the form of a large mouthpiece, enclosing a sponge (1) and having a pad (2) round the edge to ensure close contact. The cut represents the inner view (1) of the inhaler with the case, which is provided with a bottle of chloroform,



enclosing all that is required in a small compass. (2) is a ridge of metal to confine the sponge, and prevent the chloroform from running into the mouth.

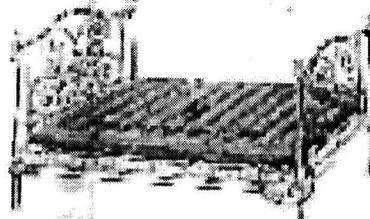
Figure 9

## HOOPER'S ELASTIC MATTRESSES

OR FILLED BEDS.

FOR WATER AT ANY TEMPERATURE

FOR THE PREVENTION AND CURE OF RHEUMATISM.



FOR THE PREVENTION AND CURE OF RHEUMATISM.

HOOPER AND COMPANY

7, FILL MALL EAST, LONDON.

Figure 10

During the next few months Hooper designed a portable ether inhaler<sup>22</sup> (Figure 7), an etheriser for veterinary use<sup>23</sup> (Figure 8), and towards the end of the year a chloroform vaporizer<sup>24</sup> (Figure 9), but by then his attention was probably becoming far removed from anaesthetics. A serendipitous enquiry on the World Wide Web showed that his career had taken an astonishing change of direction.

Hooper had become interested in the chemistry and technology of the very recently invented process of vulcanising India rubber, and he wanted to introduce this compound into medical equipment. The effect on natural India rubber, (or latex as we now call it), of sulphur or metallic sulphides, was discovered by 1842 in New York by Charles Goodyear, as a result of some serendipitous experiments. The effect was that the rubber became impervious to the usual solvents, unaffected by temperature change, much more elastic, and mouldable. A process based on Goodyear's discovery was patented in the UK by Thomas Hancock in 1843.

So Hooper was very quick off the mark. In 1845 he established a factory for introducing this new material into the manufacture of medical equipment, in Mitcham, Surrey. Mitcham, at that time an idyllic village celebrated for its lavender fields, and a centre for perfume production, was beginning in the face of strong local opposition to become industrialised, with the spread of the railways across the south of England. Without rubber, breathing tubes for anaesthetic inhalers would have been a problem, so the invention and its exploitation came at just the right time.

Hooper's inventiveness continued to flourish. Those who remember the battle against bedsores during the late 1960s and early 70s, and the innovatory introduction of the water bed and the ripple mattress, will be surprised by the advertisement shown in Figure 10. Hooper's hydrostatic bed was introduced during the 1850s, and was still in production at least until the mid-70s. It was exhibited at the 1862 International Exhibition together with a hydrostatic cushion and bed lift for invalids about which, unfortunately, no information is available.<sup>25</sup> But the most far-reaching result of Hooper's interest in vulcanised rubber was a complete surprise. Apart from its medical applications, he somehow became interested in the use of rubber to insulate electrical cables and developed a process for manufacturing them in continuous lengths. This took him into the cable industry, and eventually into the laying of submarine telegraphy cables.

### **Submarine Telegraphy**

The history of the development of telegraphy runs closely parallel to that of inhalational anaesthesia. Morse, after some ten years of effort and lobbying of Congress,<sup>26</sup> really got telegraphy going in 1845. The first attempt to lay a trans-Atlantic submarine cable was in 1857, but it failed disastrously. The official electrician, Dr Edward Whitehouse, a surgeon and self-taught telegraphist, had formed the idea that signals should be sent through small diameter cable at very high voltage.<sup>27</sup> When the cable laying was completed in August 1858, and signals started to be sent, what happened could have been predicted by any schoolboy. The cable overheated, the gutta percha insulation melted, and the system stopped working within less than a month.

The situation was rescued by William Thomson, later Lord Kelvin, who showed that what was needed was to transmit at low voltage through large diameter cables. The next trans-Atlantic cable was completed in July 1865, but there were still problems with the gutta

percha, and Hooper's rubber-insulated cable was proved to be superior.<sup>28</sup> This brought him contracts from the Indian Government for connecting with Ceylon and the Persian Gulf. In 1870 he formed Hooper's Telegraph Works Limited in Mitcham. Probably his biggest contract was producing and laying the 2,300 nautical miles of cable connecting Vladivostock to Shanghai and Hong Kong. In 1873, to lay cable off the coast of Brazil, Hoopers built their first cables ship, the C S Hooper. At the time it was the second largest cables ship in the world, second only to Brunel's Great Eastern. In all, Hoopers built four cables ships before the end of the 1870s.

Hooper died on September 25th 1878, after what was described on his death certificate as an obscure disease of the brain of some months duration. He was aged sixty, and had accomplished a great deal during his life. His estate was valued at £85,000, a very considerable fortune in those days. In his will he mentions ten surviving children. He appears to have been the perfect example of an inventive, enterprising Victorian entrepreneur.

Two conclusions can fairly be drawn. The Hooper inhaler was not used by Robinson on December 19th; and that while the history of surgery is just the history of surgery, the history of anaesthesia has no bounds.

### Acknowledgements

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