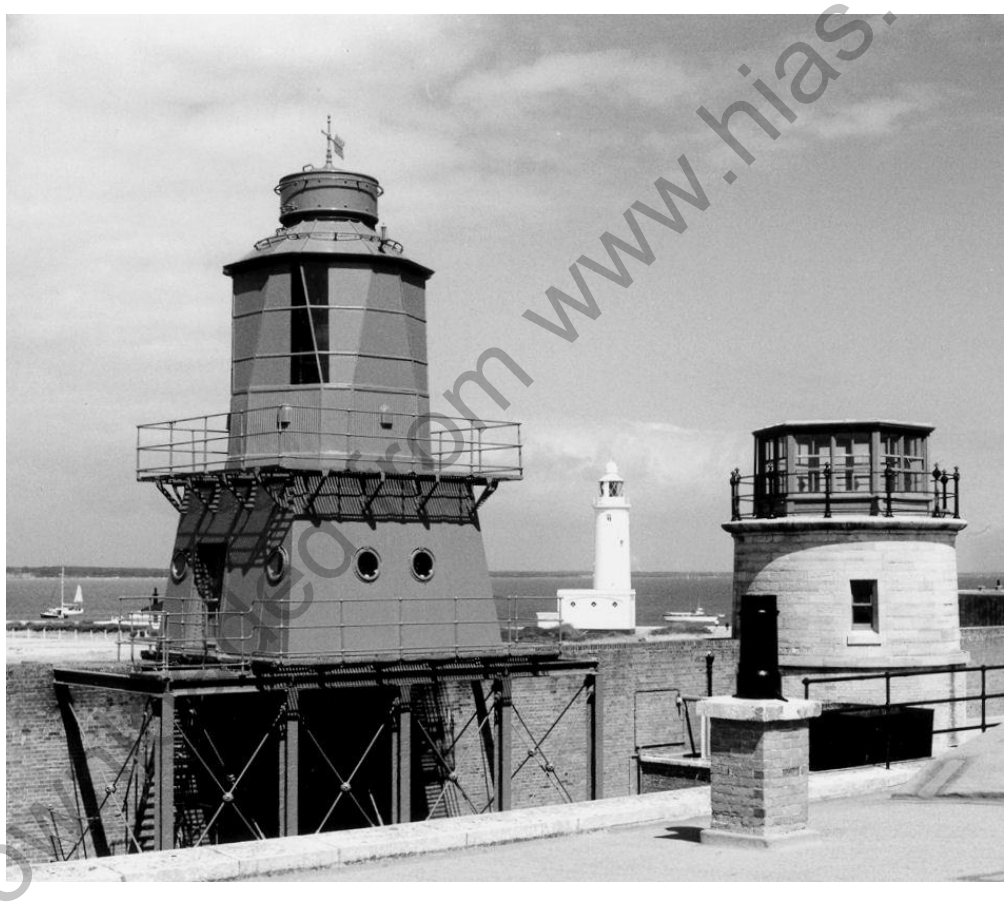
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Hampshire Industrial Archaeology Society

Journal



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No. 14

2006

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Cover photograph:

Hurst Spit lighthouses; the 1865 low light is on the right and the replacement 1911 low light is on the left. In the distance between the two, stands the 1865 high light with the acetylene generator house at its base. (Jude James)

Hampshire Industrial Archaeology Society

(formerly Southampton University Industrial Archaeology Group)

Journal No. 14, 2006

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The Contributors

Roger Hedge & Jude James

Roger Hedge moved from a village school in Bedfordshire, thence, via the 11 plus taken at an LCC school, to Dulwich College and next to Imperial College where he graduated in Chemical Engineering. He was always active in the professional world and was one-time Southern Region Secretary, for 12 years, embracing the ever-evolving range of umbrella bodies from the CEI to the Engineering Council. He spent his working life in commercial R&D in a variety of industries. As well as IA, he is active in Experimental Archaeology, being Chairman of the Friends of Butser Ancient Farm, as well as being a past Chairman of HIAS. He was a founder member of the Friends of Hurst Castle and is still on their Committee.

Jude James was born in Barton on Sea and is an established local historian. He graduated in history from Reading University and later gained a postgraduate diploma in English Local History from Portsmouth. He has lectured and published widely and his book about Hurst Castle and its environs is the definitive record, not just of the Castle but its surrounds and life on the Spit. It has been reprinted by St Barbe Museum, Lymington in 2003 under the title '*Hurst Castle, An illustrated history'*. He is a past President of the Hampshire Field Club and Archaeological Society and was instrumental in helping form the Friends of Hurst Castle.

John Horne

John Horne is an engineer, now retired, who has lived near Southampton since 1969, though originally from Liverpool. He served several terms as Secretary and then Chairman of the former SUIAG. Interested in most aspects of industrial and business history, he concentrates on transport and Public Utility matters. Current projects include a 'Virtual Archive' for the Gas Industry and the listing of material donated by Vosper-Thornycroft when they left their Woolston shipyard.

Jeff Pain

Jeff Pain has been a member of the IA group since its early days in the 1960s. He was born in Southampton and, apart from wartime, has always lived and worked in the area. Educated at Taunton's School, he followed his father into the shipping world, being employed in Freight, Passenger and Ship Agency work. After the reorganisation of shipping, he spent twenty years or so with Pirelli, first at Southampton and, when

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that closed, at Eastleigh. His main interest has always been in transport covering ships, railways and aircraft, with road interest limited to trams and buses.

Martin Gregory
Martin Gregory's interest in the history of technology goes back over 40 years. He has researched and built model steam and Stirling engines for many years and also works on the history of the sewing machine. He has been a member of HIAS and its predecessor for over 30 years, has served as Secretary and Chairman and is the present editor of the Journal.

Luc Feron & Ian Sturton
Luc Feron is a retired electrical engineer and lives at Auriol in Provence. He has used the French equivalents of the British Admiralty's 'Ships' Covers' to produce a definitive series of articles on post-1850 French warships, published in *Marines* magazine, and a major monograph on the ill-fated battleship *Bouvet*. He is also a skilled model maker. Ian Sturton is a chemistry technician and free-lance naval historian.

Editorial and Acknowledgements

Welcome to Issue 14 of our *Journal*. Once again the *Journal* has articles on a wide variety of subjects, four of which are contributed by members of the Society.
Navigation lights have been important for seafarers for centuries. Roger Hedge and Jude James' article deals with two land based lights at Hurst Castle on the Solent, while John Horne's article covers the use of oil gas for buoys and lightships in the Solent in the days before electricity. Jeff Pain writes on the plight of refugees in the chaos after the First World War and the use of what is now Southampton Airport. The article on Winchester's refuse disposal systems follows on from an article on the same City's sewage pumping station in Journal No. 13. The final article shows that, in the late nineteenth century, it was possible to produce large pieces of armour plate but nearly impossible to modify them after production.

My thanks are due to all who have contributed to this edition of the *Journal*. Acknowledgements and thanks for the provision of illustrations are made as follows:
Aerofilms Ltd, (Fig. 1); E. A. Course, (Fig. 37); L. Feron collection, (Figs. 43, 44); J. M. Gregory, (Figs. 27-29, 31, 34, 38, 39, 42); Hampshire Record Office, (Figs. 35, 36); R. W. Hedge, (Figs. 6, 8, 9); J. B. Horne, (Fig. 11); J. James, (Figs. 2-5, 7); M. King collection, (Fig. 14); Ordnance Survey, (Figs. 10, 15); J. Pain, (Figs. 16-26); J. Roche collection, (Figs. 41, 45); N. Smith, (Figs. 12, 13); I. Sturton, (Fig. 40); Winchester City, (Figs. 30, 32, 33).
The authors and HIAS have made every effort to trace copyright holders of illustrations, but if we have inadvertently overlooked any, we apologise.

Martin Gregory
April 2006

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On site acetylene generation for the Hurst Spit lighthouses (1923-1968)

Roger Hedge and Jude James

Hurst Spit is a prominent shingle bar to the westward side of Christchurch Bay and running from Milford on Sea and Keyhaven to within a kilometre or so of the Isle of Wight. Ever since the time of Henry VIII it has afforded a location for a series of fortifications to defend the entrance to the Solent. In addition, it has proved to be a prime location for a sequence of navigation lights and beacons.



Figure 1. An aerial view of Hurst Spit in 1954. The castle and fortifications are at the bottom. The High Light and acetylene generator building are on the right near the jetty. The Low Light is on the left hand half of the castle gun emplacements. (Aerofilms Ltd.)

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Figure 2. The High Light and acetylene generator building

The most prominent of these lighthouses is that known as the High Light erected in 1867. Adjacent to that is a listed building which contains an acetylene (ethyne) production unit (Figure 2). This unit supplied acetylene to power the High Light and its partner Low Light. The Low Light was originally built into the Castle wall but later, when the offshore Shingle Bank shifted materially, was replaced by a steel erection just inside the wall. Acetylene gas was produced from 1923 to 1968 when the production methods were deemed inefficient and uneconomic. Thereafter, acetylene was imported in pressurised cylinders until, in 1997, a diesel electric unit was installed in a new building and the earlier lighting systems replaced. The first record of production of acetylene is for April 1923.

The material for this article is based on the records and researches of Jude James, details from a conducted visit made by Roger Hedge and the statements made to us both by Peter Hobby, who operated the unit for many years. A discussion was held on 17th January 2006

between Peter and Roger, which elicited many important details previously not recorded. Subsequent meetings and discussions were held to clarify and expand detailed points. When Peter took over in 1952, a year after the sudden death of his uncle who had been the lighthouse keeper, the operation of the light was already automated so Peter's title was 'lighthouse attendant' not 'lighthouse keeper'.

Over time, the succession of lighthouses built on the Spit progressed from lamps burning spermacetti oil to the use of an Argand oil burning lamp and thence to an acetylene burning lamp fitted with an incandescent mantle. The mechanics of the acetylene fired lamp are of historic interest. One of the most intriguing features is the way in which a new mantle was inserted automatically when a mantle disintegrated. When a mantle failed the flame impinged on a wooden peg which burnt away allowing a carousel to step round to the next mantle. This carousel held three mantles in all. The picture of the lantern (Figure 3) does not allow one to see this detail clearly.

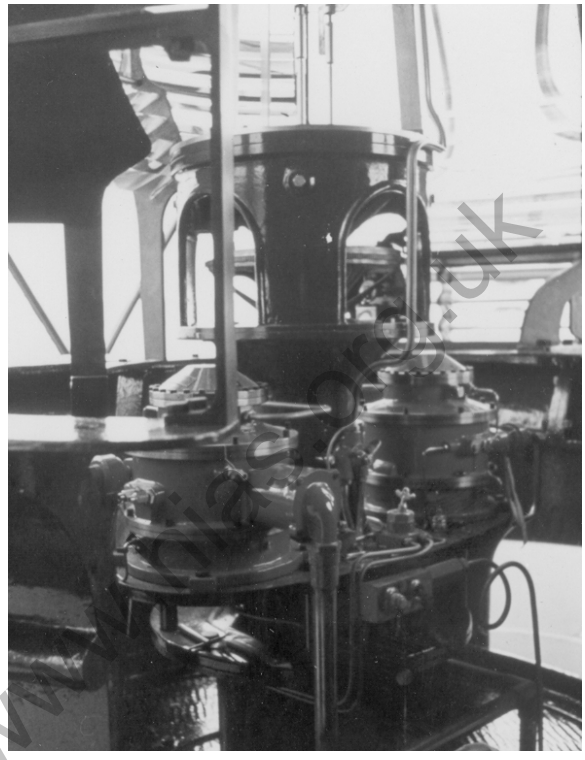


Figure 3. The acetylene burner in the lantern. The mantle is at the top of the picture.

This article concentrates on the acetylene generation equipment and process. Although taken out of use, the equipment comes under the listing process, as it is within the curtilage of the building. Whilst not a cast iron guarantee of continued preservation, representations made to Trinity House have gained an assurance that they appreciate the significance of the production unit. It is the only such unit in the UK since its sister unit on the Farne Islands has now been removed. Both units were built, maintained and serviced by Moyes of Glasgow. The fact that Trinity House went to the expense and trauma of going through the planning process to get the new diesel electric generator building erected is some confirmation of their intent.

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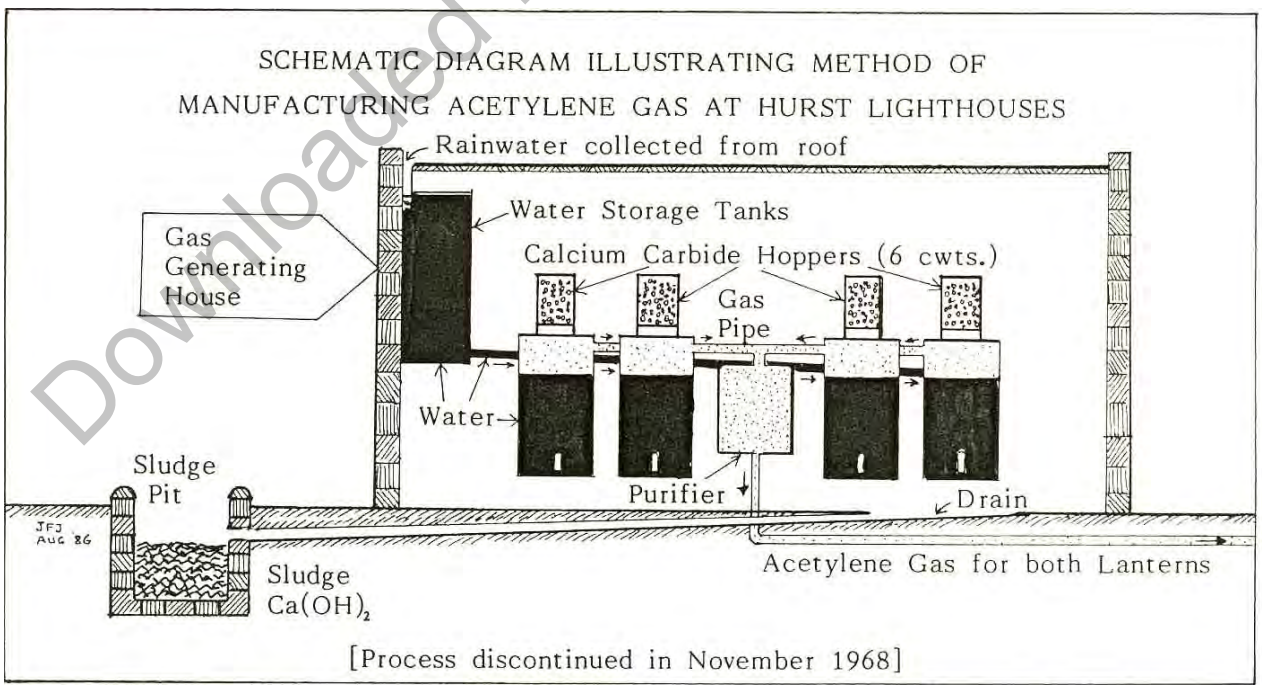


Figure 4. Cross-section of the acetylene generator building showing the arrangement of generators.

The process of producing acetylene gas was essentially extremely simple and was that used for carbide headlamps for bicycles and early motor cars. Solid calcium carbide reacts vigorously with water to produce acetylene instantly. Thus water and calcium carbide are the only ingredients required. The reaction creates a solid waste product in the form of a sludge, calcium hydroxide or slaked lime which presents a disposal problem.

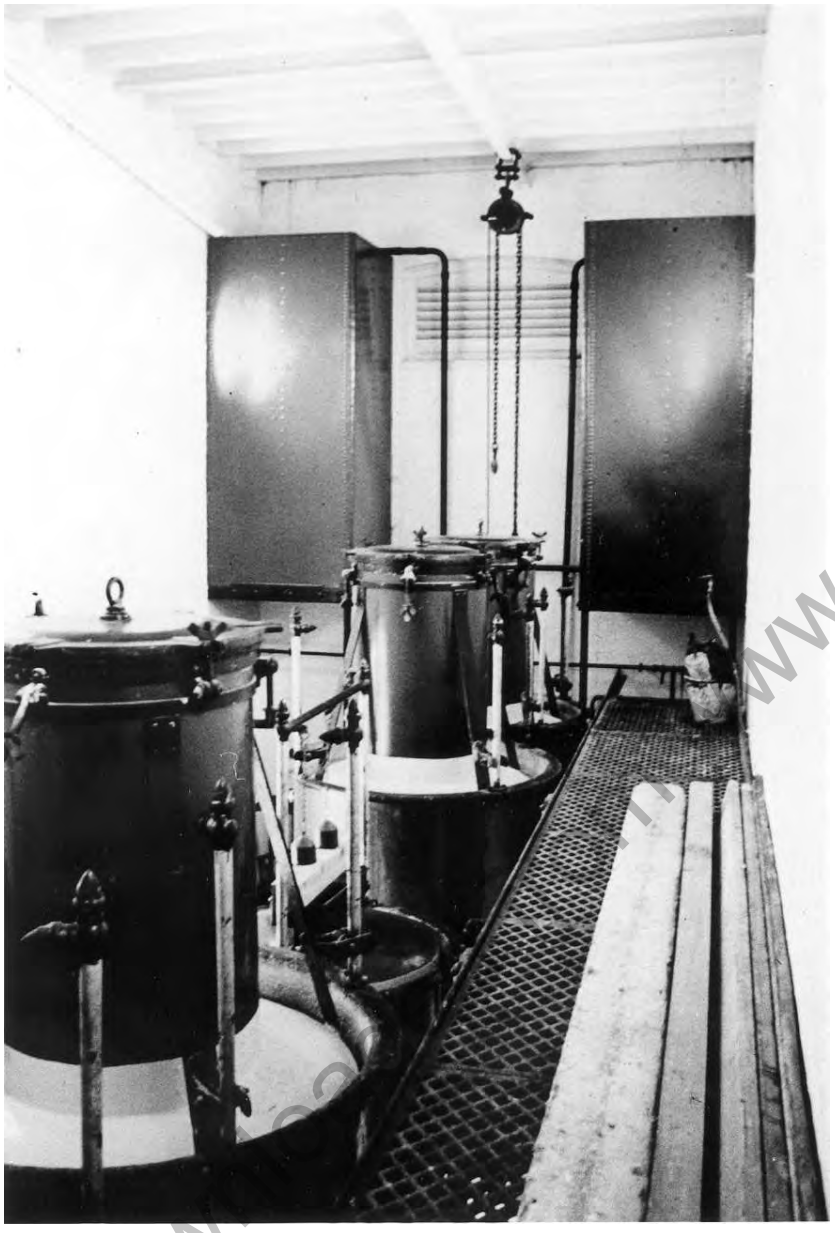


Figure 5. The interior of the acetylene generator building in 1968 after it was taken out of service.

A cross-section of the generator building (Figure 4), drawn by Jude James for his book *Hurst Castle, an Illustrated History*, and a photograph (Figure 5) of the units taken from inside the generator building, show the layout of the generators. The large tanks in the background are the water tanks and the hoppers, with generating cylinders below, are in the centre ground. This photograph was taken in by Jude James in 1968, after the unit was shut down and shows only three of the four generating sets.

The Spit was isolated from any main services for most of its life and reliance on rain to supply water required very large storage reserves. This, of course, applied equally to the Castle and its garrison. Rain was collected from the roof and when the internal tanks were full, it spilled over into a storage well. This well had a hand operated pump to allow the main tanks to be topped up from it. In the sixteen years of Peter's responsibility for the unit this was never required, though in some years of drought it was a close run thing.

The calcium carbide was brought to the site in sealed 1 cwt (50 kg) drums, probably offloaded at the jetty once used for supplying the Castle with all its material needs. Later it must have arrived at the Camber, when use of this jetty ceased in the 1950s. There was a crew of six men who delivered it, carting it to the generator house on 'trolleys', even though the Camber is adjacent to the narrow gauge railway that runs close by. The drums were stacked at one end of the building. Peter was responsible for ordering new supplies, which was usually at six- monthly intervals.

The process was operated on what is known as a 'swing cycle'. That meant that while one pair of tanks was generating gas the other pair was being cleaned out and refilled for the next cycle. A description of the tasks involved will horrify those with any inkling of modern Health and Safety legislation or even simple concern for operator well-being! Operations were largely manual with some occasional help from a lifting gantry. For a start, there was no measuring equipment to test if the working atmosphere had a potentially explosive mixture present ... not even a budgie in cage. All operations of the valves relied entirely on the experience and care of the operator.

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One pair of tanks provided gas for about three months and when the second pair had been cleaned and reloaded, after being exhausted, six months operation was possible. The units were so large and robust that no failure of supply ever occurred. Switch-over from one pair to the other was automatic and could arise at any time, day or night. The attendant only needed to drop by from time to time, as a routine rather than out of need.

It is interesting to note that the lowest level of acetylene generation and use occurred during World War II. The light was only switched on when it was known that vessels were due to enter or leave harbour. An added guarantee of availability of the lights was achieved by bringing in three more lighthouse keepers for the duration!

To describe the functions of the unit and the operating procedure requires a fuller appreciation of the details of the equipment. To complement the photograph of the actual units in Figure 5, Figure 6 has been drawn as a schematic based on several sketches made by Peter Hobby and further interpretation from the original photograph, followed up by a visit to the generator house by Roger Hedge.

The hopper or reservoir containing the supply of carbide is integral with the floating 'lid' of the generating unit (seen as a white surface in Figure 5). This lid has a water seal that maintains a steady pressure, sufficient to create a flow of gas to the lights. The 6 cwt (300 kg) mass of the initial charge of carbide must be a relatively small proportion of the mass of the bucket, the hopper, the fixings, stabilisers and the generator lid, so that the supply pressure to the lights at the end of the cycle would not have been substantially lower.

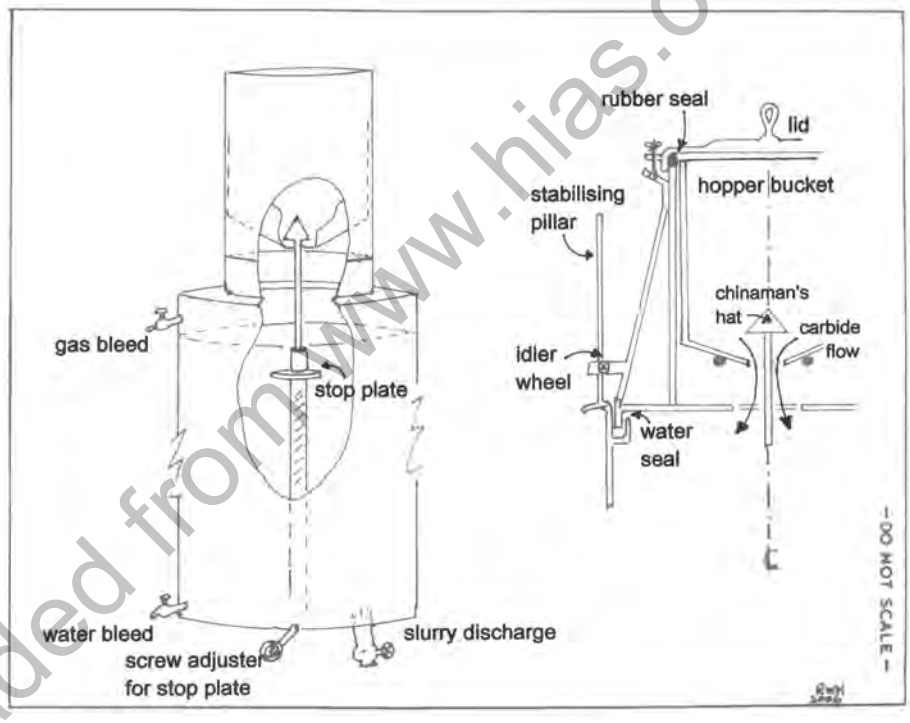


Figure 6. Schematic layout of acetylene generator and carbide hopper.

The flow of carbide into the generating tank was controlled by a 'follower' shaft that had a 'Chinaman's hat' at the top end, around which the powder could flow down into the water. The bottom of the follower shaft rested in a sleeve on a stop plate inside the generating unit. This sleeve is the only bearing to keep the follower shaft steady. The range of positions of the Chinaman's hat as the generator lid rose and fell, controlled the rate of consumption of carbide. The position of the stop plate was set after loading, using the screw shown to raise or lower it. When first setting up the flow of carbide, Peter used to press his ear to the tank to listen to the bubble formation. Car mechanics and steam generator set supervisors will be amongst the many to use related techniques. Also, the grinding of cement clinker has been controlled via a microphone in some factories.

Details of the construction of the hopper are shown in Figure 6. The hopper contains a tight fitting 'bucket' that holds the carbide and the feed device with follower shaft. This bucket has to be removed to allow the generator tank to be emptied and cleaned and when it is removed the follower and Chinaman's hat come out with it. When the bucket is replaced, the follower relocates in the sleeve. The bucket sits on two cross braces to fix its position. The whole assembly is continuous through to the generator. Thus there is a gas tight capping lid over the bucket and hopper, which has a captive rubber ring seal in a groove on the hopper wall.

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This seal was greased each time it was refitted. The lid, with its lifting hook clearly shown, is fastened down by wing nuts, some of which can be seen in the photograph.

The hopper assembly is located on the generator lid by three struts. These are fixed to an upper flange round the hopper and to the generator lid. The upper flange provides the locating brackets for the butterfly nuts holding the lid. The foot of each strut is fitted with a fork holding a pulley that runs up and down one of three vertical stabiliser rods fitted to the rim of the generator tank. Some of these features can be distinguished in Figure 5.

The lifting tackle seen at the rear in Figure 5 was used for removing the lid and then the bucket, for cleaning at the end of a cycle. Once the bucket was removed, bringing with it the follower shaft, a pole was pushed down into the generator tank to stir up the settled residue. This was essential or else the sludge did not flow out for cleaning the generator. Both the hopper and generator equipment were hosed down after the sludge had been discharged.

The wet slurry is highly alkaline and therefore corrosive to the skin. Inspection of Figure 4 shows that the slurry was discharged directly onto the concrete floor and ran away in shallow channels to the drainage pit. Peter had only a pair of Wellington boots over his trousers, as protection, not even an apron, while this mix was spattering around and being hurried on its way, as he somewhat gleefully related. These were the days when Trinity House did not even provide overalls or any other workplace needs.

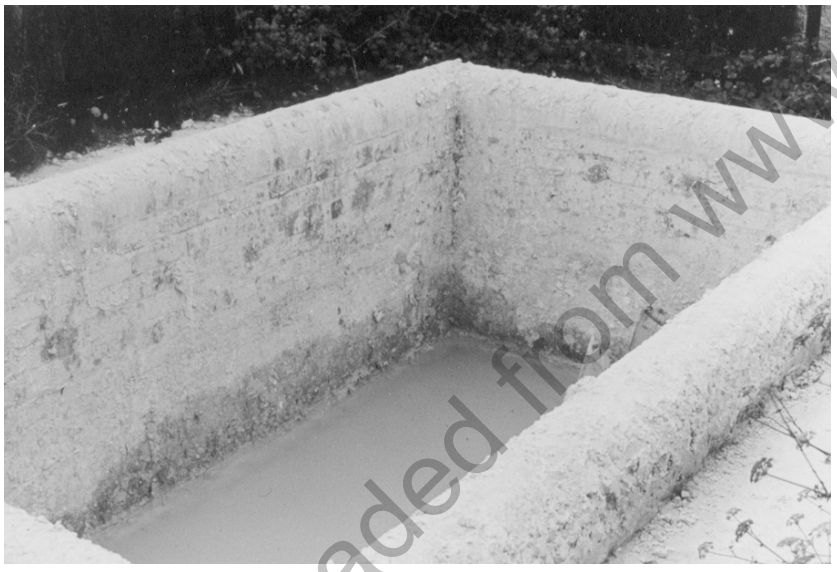


Figure 7. The slurry pit for waste slaked lime.

The slurry pit itself was brick built, about 6 ft (2 m) deep and maybe 10 ft (3 m) by 8 ft (2.5 m) in cross-section, and open to the elements. The only protection was a 3 ft (1 m) high open fence surrounding it. This would now be regarded as inadequate, considering the nature of the contents. The slurry took up to a month or more to dry out sufficiently to be emptied. Peter used to probe it with a stick before jumping in to dig it out. He had to throw shovelfuls up into a wheel barrow stationed above, then climb out to empty the barrow onto the nearby shingle. The pit held about twelve barrow loads. When the unit was decommissioned the pit was back-filled.

Charging the hoppers was equally, if not more, fraught. The new drums of carbide were completely sealed to prevent deterioration by ingress of water from the air. The tops had to be chiselled off!! Then, with arms encircling the drum, it was lifted to the edge of the hopper bucket, now back in place, and tipped straight in as one ‘shot’, with dust flying around. Since this dust reacts freely with water, a large degree of eye and buccal irritation ensued. Peter simply ducked down as fast as he could and moved away until the dust settled. Luckily for him this was done only once every three months on average.

Safe start-up was entirely in the hands of the operator. Water was first introduced to the generator tank and the lid water seal checked visually. The feeder shaft was then released and some carbide ‘joggled’ into the generator until gas pressure settled down and the follower behaved normally. If too much carbide was introduced, the water seal could be spilt out. As soon as this was observed, the gas bleed at the top could be used to stabilise things.

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Any acetylene released was discharged into the work space. Once settings were stabilised, the new loaded pair of tanks was left ready for auto-switching, as and when this occurred. There were no pressure switch interlocks to prevent acetylene being discharged back to an open tank, other than the inbuilt self-sealing nature of the design.

The resultant gas from these operations passed through a purifier and then flowed under pressure through narrow bore tubes to each of the two lights. The exact nature of the purification is unclear. Peter believes the tank contained 'coke', which was replaced only by Moyes' staff at the annual maintenance shut-down. Towards the end of the unit's use, this maintenance shut down was only every three years. This suggests the purifier was mainly to remove water drops and dust. The pipeline to the Low Light, inside the Castle was heavy duty solid lead. Every effort was made to recover this when the unit was replaced by cylinders inside the Castle. This proved impossible and the line lies buried to this day.

Despite all this, Peter, who also looked after the lighthouse, survives, aged 85, to enjoy a long and happy retirement. The authors are indebted to Peter for both his earlier and current contributions to our understanding of the operations involved in producing acetylene. It should be noted that Peter received an MBE following completion of his service with Trinity House. During his time he had to contend with a night time fire in the High Light acetylene supply room, which risked the whole enterprise and certainly himself. Further, he had to face this situation having coped with the long dash along the shingle spit in the dark.



Figure 8. Peter Hobby, MBE

One curiosity, arising from the use of the slurry pit, lingers on to this day. Once the 'slaked lime cake' had been dug out and tipped around the surrounding shingle beach, most of it was washed out to sea. However, on close inspection, the blue-grey residue can still be seen here and there. The resulting alkalinity has led to a localised assemblage of plants that is otherwise absent around the rest of this end of the Spit. This is now seen as a benefit, but can anyone imagine what the response would be nowadays, if a proposal to create it in the same way were put forward!

The replacement electric lights in the two light houses are supplied by a diesel generator mounted in a new brick built house completed in 1997.



Figure 9. The new house for the diesel generator nearing completion in 1997.

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Oil Gas lighting for buoys and lightships in the Solent

John Horne

Pintsch's Oil Gas was made by cracking light Russian mineral oil in small horizontal retorts. The basic technology was British, being based on patents of Taylor and Martineaux in the 1820s. Faraday took a close interest and isolated benzene from the condensate. Sir Walter Scott had an oil gas plant at Abbotsford and actively promoted the system but the portability of oil gas, that is, the use of cylinders of compressed gas, required a good pressure regulator and that was the contribution of Julius Pintsch in the 1870s. Of German origin, the Pintsch Company had a most successful British subsidiary which constructed oil gas works for many British railway companies.

After condensing and purification, the gas was compressed to about 150 psig (10 Bar or1 MPa) by steam-driven compressors. It was stored in large egg-ended pressure vessels which were transported by rail as 'travelling gasholders'. Thus, from a few central gas works, 'travelling gasholders' could be attached to fast trains to maintain a supply throughout the network. Compressed oil gas was widely used for lighting railway carriages and, when railway carriage lighting progressed to electricity, for cooking and water heating in dining cars. The external appearance of an oil gas works was not unlike that of small gasworks supplying small towns. Oil gas works, however, could be distinguished by their particularly pungent odour and the large cigar-shaped tanks into which the gas was compressed.

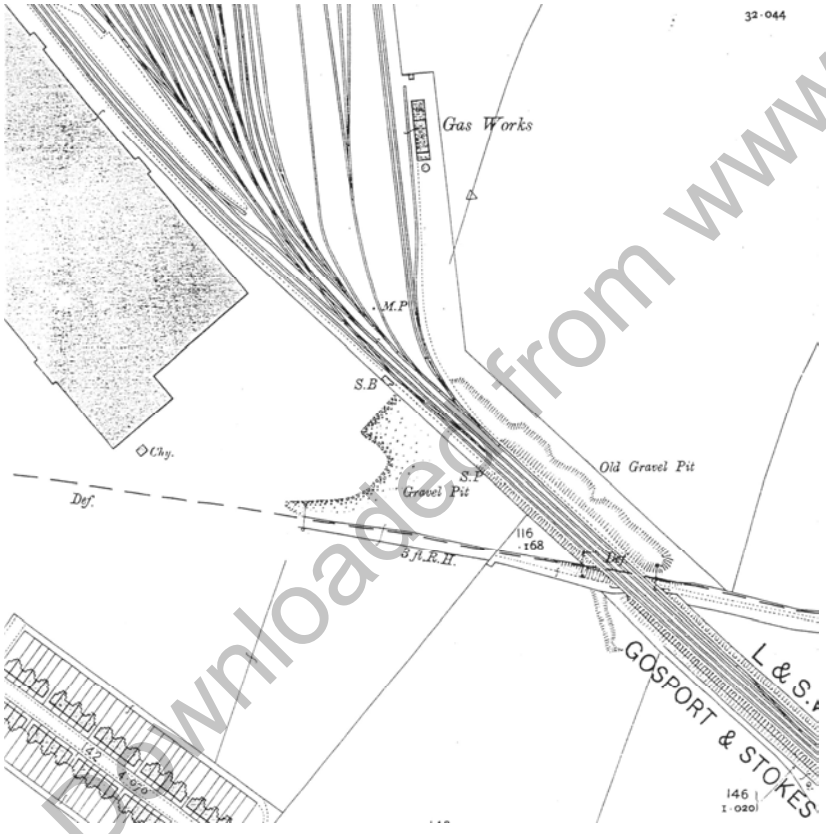


Figure 10. Ordnance survey map of 1908 showing location of L&SWR oil gas works.

The London and South Western Railway built a Pintsch oil gas works at Eastleigh in 1892 for carriage lighting at its new carriage and wagon works. When the Railway came to move its locomotive works from Nine Elms to Eastleigh it was found that the oil gas works had been put in the wrong place. By 1908 it had been relocated on the eastern edge of the Eastleigh site, near the point (SU 462184) where the sidings into the carriage works diverge from the Eastleigh to Gosport railway line. It comprised a range of buildings on a north-south axis measuring about 27 ft by 125 ft (8.3 m by 38 m), with a single gasholder of only 15 ft (5 m) diameter at the south end.

The Elder Brethren of Trinity House are responsible for many of the buoys and navigational aids around the Isle of Wight. The introduction of compressed oil gas on the Pintsch system gave a very bright and reliable light which was an enormous advance on the oil lamps previously used. The oil gas system came to be widely applied for floating lightships and important buoys, which automatically lighted and extinguished themselves by means of an ingenious 'sun valve'. This bi-metallic valve reduced gas consumption considerably, so that the lamps could burn for two or three months, whereas previously the gas reservoirs had needed topping-up every few weeks. Most buoys were unlit before the introduction of oil gas which greatly improved the safety of navigation at night. Trinity House owned an oil gas works at Blackwall on the Thames, but their intention to build one on the Solent was frustrated.

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In the late 1890s, the Elder Brethren purchased land adjoining Thetis Wharf at East Cowes in order to construct an oil gas works but they encountered major opposition from the town. Had the works been built, there is no doubt that its smell could have reached the nostrils of Her Majesty at Osborne and perhaps this is one reason why the scheme was abandoned. Certainly, the townsfolk objected. In April 1900, Trinity House enquired of the Southampton Harbour Board for a supply of oil gas and eventually the Board did oblige.

The Southampton Harbour Board took advantage of an oil gas supply from the London and South Western Railway carriage and wagon works at Eastleigh to convert their Calshot light vessel and many of the harbour buoys to oil gas. Supplies of gas were purchased at high pressure from the Railway Company who themselves had an interest in seeing the port well lit, being prominent in the steamer traffic to the Channel Islands and to France. As owners of Southampton Docks they were successful in attracting trans-Atlantic trade away from Liverpool, and a well lit port was part of their strategy. The Harbour Board's responsibility extended to a line near Calshot Spit, beyond which lay Trinity House territory.

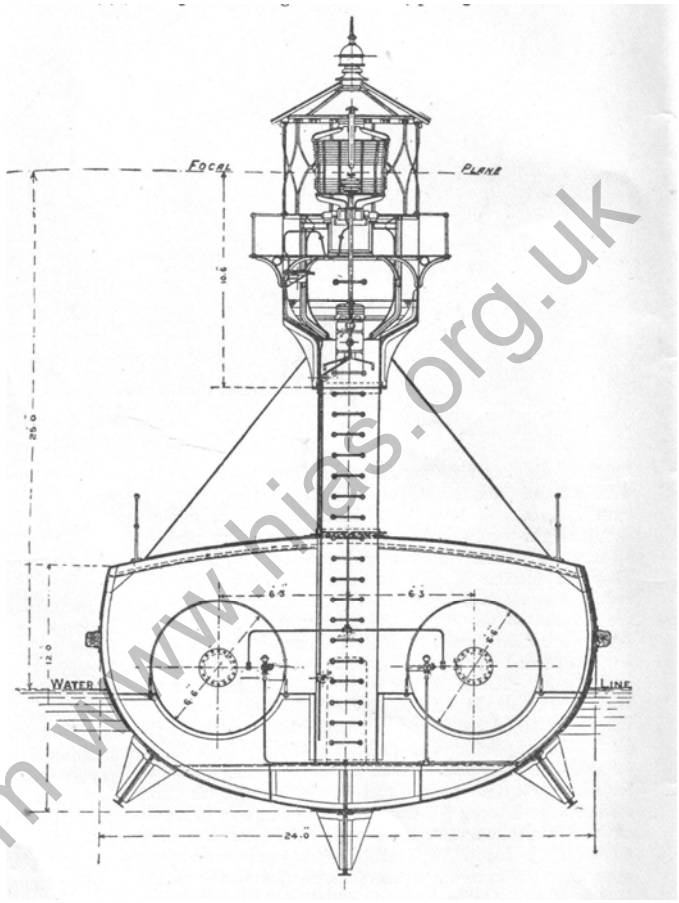


Figure 11. The Otter Rock light vessel which was very similar to, though slightly larger than, the Calshot light vessel. The two cylindrical oil gas tanks fill much of the hull.

The number of buoys which Trinity House had intended to supply form East Cowes must have been quite large. When their plans for the extra gas works had to be abandoned and they approached the Southampton Harbour Board, the Board asked the Railway Company for a much greater supply of compressed oil gas by rail from Eastleigh works, to cover the needs of both authorities. Unfortunately, the Railway Company replied in May 1900 that they 'regretted they were unable to supply the additional quantity of gas required and that they were not prepared to extend their Oil Gas Works for the purpose inasmuch as their new carriages were being fitted with electric light instead of oil gas.'

The Harbour Board's reaction was to do the job themselves. A sub-committee went to Eastleigh where they were shown round by Mr. W. Panter, the Railway Company Carriage and Wagon Superintendent. Pintsch's Patent Lighting Company were asked for a quotation and estimated that it would cost £600 to build a gas works on the Board's wharf at Southampton, capable of feeding twelve or more buoys and beacons. The only problem was the site which was likely to be unpopular with the public as it was close to the (then) centre of town, and upwind of it!

Advice was sought from Professor Vivien B. Lewes, a noted enthusiast for novel means of gas making. His view was that a mixture of 20% acetylene (ethyne) and 80% coal gas would serve better than oil gas and would probably be cheaper. Coal gas would be bought from the mains and a small acetylene gas plant alongside the slipway could be built for about £700, including a low pressure gasholder, 25 ft (7.7 m) diameter in which the two gases, after mixing, would stand overnight before being compressed. The buoys would need no modification. Calcium carbide, from which the acetylene would be made, would be delivered directly to the slip. The process was almost odourless and the only waste product would be slaked lime.

Mr. T. Matthews, the Engineer of Trinity House which owned an oil gas works on the Thames at Blackwall, pointed out that he had 'devoted much time to the improvement of gas buoy illuminating apparatus, in the latest patterns of which one and two-ring burners were employed. But I fear that such burners would give

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great trouble if they had to consume gas so rich in carbon as the gas suggested by Professor Lewes.' The Professor had to agree with Mr. Matthews that cylindrical or Argand burners were unsuitable for use with acetylene. Matthews view was 'that no action should be taken until difficulty was experienced in getting oil gas from the Railway Company, and that then, unless better arrangements could be made, Trinity House should establish Gas Works of their own.' Southampton Harbour Board then resolved 'to recommend that a suitable oil Gas Works be established as requested by the Elder Brethren, Trinity House, subject to a satisfactory agreement being entered into with the Trinity Corporation.'

In the event, neither Mr. Matthews nor the Southampton Harbour Board realised their ambition to build another oil gas works. The reasons went unrecorded, but it is worth noting that the Railway Company and their successors continued to run the oil gas works at Eastleigh for another half century despite the replacement of oil gas by electricity for railway carriage lighting. Perhaps the Railway Company found they could meet the demands of the Harbour Board after all, or perhaps Trinity House found another source of supply. It should be remembered that the London and South Western Railway had an earlier oil gas works at Nine Elms and a fleet of 'travelling gasholder' wagons, so they had other resources to call upon.

Professor Lewes, then lecturing at the Royal Naval College, Greenwich, was on the right track when he recommended acetylene but was a little too early. The compression of acetylene, even when mixed with other gases, was a dangerous process and, understandably, became hedged about with restrictive legislation. The break-through came with the development of the 'dissolved acetylene' process in which large volumes of the gas are dissolved in acetone (propanone). The acetylene cylinders with which we are familiar today use this process. Dissolved acetylene in cylinders became very widely used for supplying floating lights and remote beacons, including Hurst Castle lights (page 3).

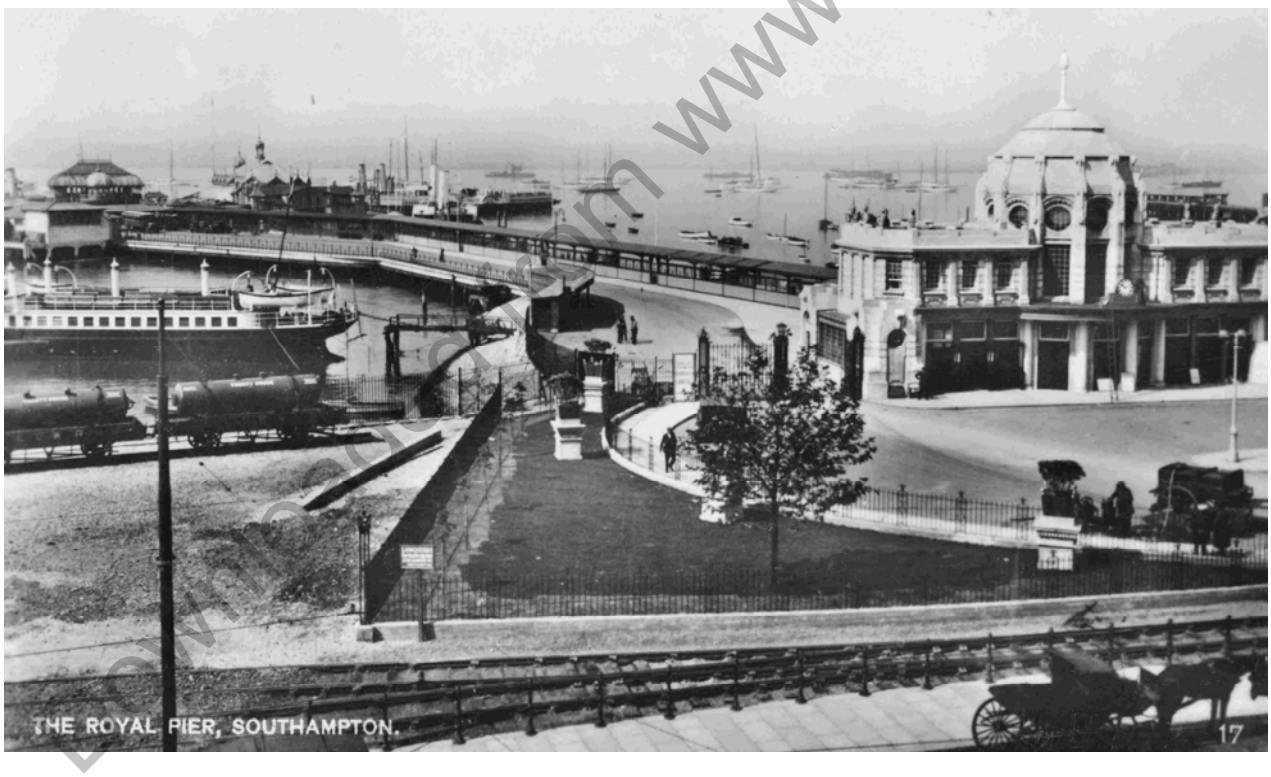


Figure 12. Postcard of the Royal Pier, Southampton in the 1920s. Two Trinity House 'travelling gasholder' wagons can be seen on the siding at the left of the picture.

The arrangement was that cylinders of compressed oil gas were transported by rail on a demountable version of the L&SWR 'travelling gasholder' wagon. These were special four-wheeled flat wagons carrying a single pressure tank, which shuttled between Eastleigh works and Town Quay in Southampton. The tank or 'gasholder', having been filled at Eastleigh, was craned aboard the Southampton Harbour Board tender *Princess* which serviced the buoys and lightships. The *Princess* supplied not only the Harbour Board buoys and lightship, but Trinity House buoys around the Isle of Wight and, later, Admiralty gas buoys at the

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entrance to Portsmouth Harbour. The postcard (Figures 12 & 13) of the Royal Pier taken in the 1920s shows such wagons with the tanks prominently labelled "TRINITY HOUSE". There were Southampton Harbour Board ones also.

When the tender came alongside a buoy, a crew member would clamber across with a flexible hose and top-up the reservoir on the buoy. The tank on the tender was pressed to 150 psig (10 Bar) when full, and each buoy was filled to 70 psig (5 Bar). It would have been wasteful for the tender to 'run out of gas' when its own supply fell to 70 psig, so a small steam-driven compressor was purchased from Pintsch in 1898 to enable buoys to be recharged to full pressure until the on-board tank was down to atmospheric pressure.

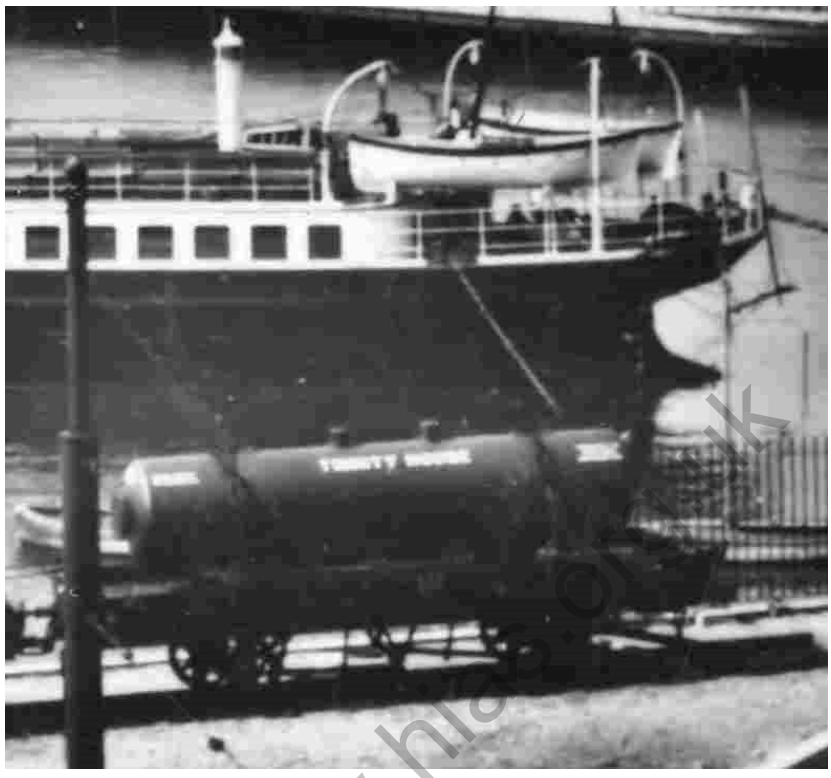


Figure 13. Enlargement of part of Figure 12 to show Trinity House oil gas tank on wagon.

Oil gas for navigation lights enjoyed considerable popularity over several decades. The Clyde Navigation Trust built an oil gas works for lighting that estuary and several other railway-owned harbours took advantage of the oil gas already available from their own works. Buoys and harbour lights at Heysham were gas lit by the Midland Railway and at Barrow by the Furness Railway, for example. The French and the Americans were very keen on the idea with installations lighting the Suez Canal, the southern coast of China and other places where one might not expect to find a little gas works.

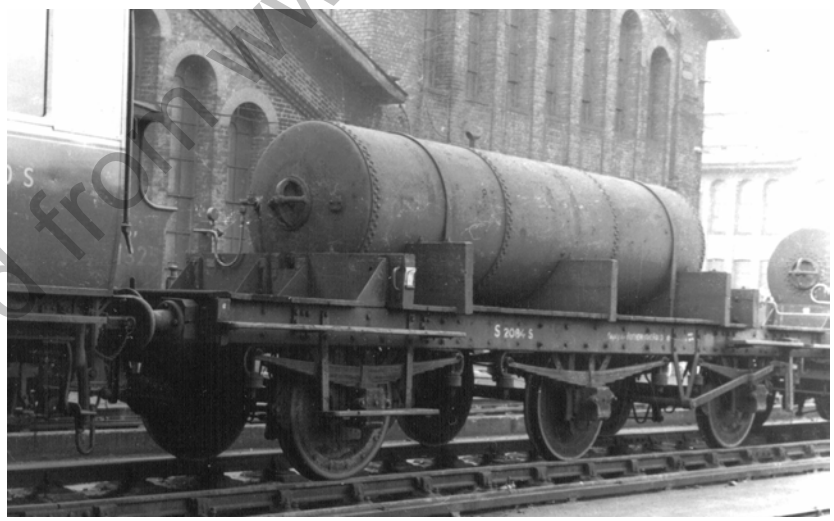


Figure 14. Southern Railway 'travelling gasholder' wagon seen at Bricklayers Arms c 1950. The gas tank is fixed to this wagon and not demountable, as were the Trinity House and SHB ones.

The oil gas works at Eastleigh is believed to have remained in production until the late 1950s by which time many kitchen cars were able to take electricity from the 'third rail' and others were converted to liquefied petroleum gas (LPG). The date when the buoys and lightships ceased to be lit by oil gas has not yet been discovered. When dissolved acetylene became widespread, many buoys were converted to that system. Today they are mostly powered by solar panels and battery packs, although some LPG examples survive as harbour lights.

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