GRANITE AND LIME: THE BUILDING OF CHATHAM DOCKYARD'S FIRST STONE DRY DOCK

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Between the years 1816 and 1821 a total of £160,000 (approximately £50m in today's money) was expended upon the construction of a new dry dock within the royal dockyard at Chatham. Representing an important land-mark in the yard's history, this dock was not only larger than any of the existing dry docks at Chatham, but it was also the first in the yard to be built of stone. Finally, it had the added refinement of an attached engine-house that was built to accommodate a 50 h.p. Boulton and Watt steam engine used for the purpose of pumping the dock dry.

However, before proceeding further, it is worth commenting on both the nature and purpose of a dry dock. Having the appearance of a broad and deep trench, a dry dock was, of necessity, situated alongside the deep water channel of a river or harbour. Designed for the task of cleaning and repairing the underside of a ship's hull, a vessel that had first been floated into the dock would then be held in a stationary position through the use of shores wedged between the vessel and the sides of the dock. At this point the dock would be slowly drained, with additional shores added at periodic intervals so as to ensure that the otherwise unsupported vessel would not topple to one side. Of particular importance for a dry dock was the addition of water-tight gates (or some other means of sealing the entrance), which would prevent the further incursion of water during the period of work upon the hull of the secured vessel. These gates would eventually be re-opened, allowing the vessel to make a return to deep water and a further period of service.

At Chatham, immediately prior to the construction of the new stone dock, the yard possessed a total of four dry docks that were used not only for the repair and cleaning of hulls but also for the occasional construction of new vessels. This latter function only

applied when the yard at Chatham was called upon to construct a vessel that was too large for any of the building slips. As for those four dry docks, all were of considerable age, each having originally been laid down during the seventeenth century. Over the years, of course, they had seen numerous repairs together with an occasional increase in their overall dimensions. Yet, such improvements could not alter the fact that each of these docks was a product of seventeenth-century technology and could not compare with more recent docks built at Portsmouth and Plymouth.

Undoubtedly, the most serious problem presented by the docks at Chatham was their shallowness. Built for ships of an earlier age, they did not have sufficient depth for the accommodation of the larger eighteenth-century warships. According to John Rennie's calculations, made in 1814, it was the no. 2 Dock at Chatham which had the greatest depth of water, this being 18 ft. 3 in. on a spring tide and 14 ft. 9 in. with a neap tide.[1] Yet, even with that additional depth acquired at the height of a spring tide, this dock still required a further 3 ft. of water for a first rate (these being the capital ships of the day) to make an unobstructed entry. As it happens, such vessels were brought into dry dock at Chatham, but to do so these ships had to be heaved onto blocks that were often 3 ft. above the base of the keel.[2]

A second factor that militated against the efficiency of Chatham's existing dry docks was that they were constructed of timber rather than stone. Originally this had made a great deal of sense, it being cheaper and easier to build in timber. However, docks constructed from this particular material lacked durability, with those at Chatham seemingly in need of frequent repair. On occasions, one of these dry docks might even be unavailable during a sudden emergency, causing severe problems for a newly mobilizing fleet. In fact, this is exactly what happened in 1776. With Chatham fully engaged upon preparing ships for North America, it was discovered that the apron, or raised entrance area to the no. 2 Dock, had 'blown in such a manner the whole must be taken up, and piles drove to secure the groundways'.[3] In the meantime, of course, the dock was totally unavailable, with the necessary work having to be undertaken by dockyard artisans who

[1] According to Rennie's calculations made in 1814 the dry docks at Chatham produced the following water depths: No. 1 dock: 17 ft. 11 in. (on a spring tide) and 13 ft. 10 in. (on a neap tide); no. 2 dock: 18 ft. 3 in. and 14 ft. 9 in.; no. 3 dock: 17 ft. 9 in. and 14 ft. 3 in.; no. 4 dock: 17 ft. 11 in. and 14 ft. 5 in.

[2] Ships were heaved over these blocks by ropes attached to capstans set in the sides of the dock.

[3] [N]ational [M]aritime [M]useum CHA/E/32 21 June, 1776.

had to abandon other duties connected with the mobilization of the fleet.

Although it would not have been impossible to completely modernize the dry docks at Chatham, any proposals were normally pushed aside on grounds of expense. The Chatham dry docks, as they stood, were of a very simple design, their shallowness partly resulting from the method used for drainage. Unlike a series of dry docks subsequently built at Portsmouth and Plymouth, those at Chatham had no attached pumping system. Instead, all four of Chatham's docks relied upon gravity drainage, with water receding from these docks during the normal fall of tide. To provide the necessary additional depth, these docks would not only have to be rebuilt (preferably in stone) but the increased depth would have taken them to a point that was beneath the River Medway's low tide level. As a result, a sophisticated pumping system would also have to be introduced in order to remove large amounts of accumulated water.[4]

Whilst the various royal dockyards, during the eighteenth century, did occasionally witness the investment of large sums of money into capital equipment and buildings, this had to be undertaken on a clear priority basis. The result, was that attention, throughout much of that period was directed to the strategically important yards of Portsmouth and Plymouth, with only small sums of money directed to Chatham. Eventually, in the 1780s, and the completion of various planned improvements upon these two particular yards, Chatham did see work begin on a number of essential improvements. Even then, however, the authorities were reluctant to undertake any large-scale work, the yard at Chatham suffering the disadvantage of a poor geographical location. Often, ships sailing between the dockyard and the important fleet anchorage off Sheerness, would have to wait several weeks for a suitable wind. A distance of only 15 miles, the length of the river was so crooked 'that there is only six points of the compass for a wind with which a ship of the line can sail down, and ten to sail up and that only for a few days in the spring tide'.[5]

So severe was this particular problem, together with the fact that the River Medway was beginning to silt, that thought had even been given to the total abandonment of the dockyard at Chatham and its

[4] A good understanding of the layout and design of Chatham's four seventeenth-century dry docks can be obtained by examining the eighteenth-century model of the dockyard currently on display at the National Maritime Museum. The model was commissioned in January 1772 with two Chatham shipwrights directed to produce an exact model of the yard to a scale of 40 ft. to the inch.

[5] [B]ritish [M]useum Kings 44.

replacement by a new yard to be sited on the Isle of Grain. First proposed in 1800, this particular scheme was eventually abandoned as a result of the massive financial expenditure that would have been involved. Instead, the authorities decided to live with Chatham and its various geographical deficiencies, considering this to be the cheaper option at a time when money was again scarce.

Only with the final acceptance of Chatham's retention was thought given to a major improvement to the yard's all important docks. At first this was no more than a tacit agreement that the various docks would have to be thoroughly repaired, with money also to be found for a possible fifth dry dock. In 1806, for instance, the Navy Board (a body that was subordinate to the Admiralty and directly responsible for running the nation's dockyards) agreed to the setting aside of a specific area of land for construction of this additional dock.[6] However, no further thought was given to the matter at that point in time. Instead, financial expenditure at Chatham was directed towards the completion of new offices, erection of a replacement smithery and the building of a dockyard church.

Further thought was not to be given to the docks at Chatham until 1813. In that year George Parkin took up the appointment of Master Shipwright at Chatham and began an immediate campaign for a general improvement to the waterside area. Concerned both with the limited length of the various docks together with an additional problem that concerned the decayed state of the river wall, he proposed a scheme that would solve both difficulties at one and the same time. In essence, he suggested a complete rebuilding of the central section of the dockyard's river frontage, with part of the wall moved several yards forward and onto an area of land that would be reclaimed from the Medway for this very purpose. This would have the advantage of not only increasing the acreage of land within the dockyard, but would allow for a general lengthening of the nos. 3 and 4 docks at very little additional cost. A third feature of Parkin's plan was the demolition of an inconveniently sited jetty. This structure was so positioned that it forced piles of mud to gather in front of the four dry docks and created unnecessary difficulties for ships passing through the entrance gates.[7]

The Navy Board appears to have been favourably impressed with Parkin's scheme, choosing to employ John Rennie to undertake a feasibility study. In many ways, Rennie was the obvious choice to undertake this task. A noted civil engineer whose work already

[6] [P]ublic [R]ecords [O]ffice ADM 140/15.
[7] PRO ADM 140/17.

included Waterloo Bridge, he was currently employed by the Navy Board as a general adviser on new building schemes that were then in progress at several royal dockyards. In particular, he had been given permanent accommodation at Sheerness so that he might more conveniently undertake the duties of chief architect in a massive extension scheme designed to completely revitalize this hitherto neglected yard. More important, from the point of view of the task to be undertaken at Chatham, was that Rennie's presence at Sheerness placed him within easy travelling distance of Chatham and clearly in a position to combine the work of both yards.

Following his official letter of appointment that was dispatched on 29 November, 1813, Rennie probably made several visits to Chatham before submitting a final report in August of that same year. Despite a clear statement that he was only to give his opinion on Parkin's projected improvements to the dockyard's river front, Rennie appears to have devoted most of his attention to a number of alternative ideas for the general improvement of the entire yard. Although none of these proposals were to be adopted by the Navy Board, they are worth some attention.

Most ambitious was his suggestion that both Limehouse and Chatham reaches should be turned into a massive enclosed basin that could then be used for the mooring of ships in a controlled level of deep water. The adoption of such a scheme would not only allow Chatham yard to expand on to the Frindsbury peninsula, but would have the additional advantage of obstructing the tidal flow of the river, so forcing more water to remain in the lower reaches of the Medway. This, so Rennie predicted, would help ease navigational problems, as the depth of the Medway would rise throughout the difficult 15 miles that separated Chatham from the river entrance at Sheerness. To compensate the local community for the loss of this stretch of water, which he intended to enclose, Rennie further proposed construction of a canal for use by commercial shipping and which would by-pass the intended basin. Referring specifically to the dry docks, Rennie felt that the scheme would create so much more room, that a whole series of such docks could be built 'as the demands of the public service may require. . .'[8]

However, the Navy Board's interest was that of providing minimum rather than maximum improvements to the dockyard at Chatham. While they probably accepted that such a scheme would have a number of advantages for repairing and refitting warships, the Board could simply not sanction a programme which, at the very

[8] Correspondence to the Navy Board, 27 August, 1814.

Visual evidence of Rennie's presence at Chatham exists in the form of this datum stone that was used in the surveying of the dockyard during the period in which the new dock was being constructed. This stone lies immediately beneath the officers' terrace amidst an increasing quantity of undergrowth.

least, was estimated to cost £0.54m (possibly £500m at today's prices). Instead, the Board showed itself determined to pursue Parkin's original scheme, with Rennie now appointed to supervise overall progress upon the intended works.

Forced, therefore, to direct himself specifically to the plans for an improved riverside wall and a series of lengthened docks, Rennie reluctantly dropped his own grandiose ideas for the improvement of Chatham. Instead, he made a simpler recommendation, suggesting that before work should begin upon the actual repair and lengthening of nos. 3 and 4 docks, a new dry dock should be built on the site that had originally been allocated for such a purpose eight years earlier.[9]

This new dock, so Rennie indicated, would have to be given floors set 4 ft. below the low tide level, allowing it to accommodate the largest warships of the day. This, of course, would make the old system of gravity drainage quite impossible, necessitating the introduction of some form of pumping device. Rather than introduce manual or horse-powered pumps, Rennie indicated his desire to use steam. His estimated costs for construction of the dock amounted to £143,000 with an additional £14,700 to cover construction of an engine-house, drain and well, together with the purchase and installation of steam machinery.[10]

The Admiralty, who were also concerned with the most effective methods for improving Chatham dockyard, decided to support this particular recommendation, but suggested a means by which overall costs could be reduced. Noting that Rennie's dock was to have its floors and sides constructed of Aberdeen granite, the Admiralty proposed that only its sides should be built of stone, with the floor finished in timber.[11] Although there appears to be no surviving correspondence on the matter, it was likely to be a suggestion that Rennie would have vigorously opposed. Primarily, such an alteration would have a weakening effect on the finished structure as timber floors were subject to possible subsidence. On the other hand, the existence of a bonded stone floor that connected the two sides of the dock as a single unit, provided an unequalled degree of rigidity that would offset the need for frequent maintenance. But, as the Admiralty was aware, such a design feature was a relatively new development, having been pioneered at Portsmouth only fourteen years earlier. As members of that Board could point out, most of the existing stone docks had been completed with timber floors and,

[9] PRO ADM 106/3183. 29 August, 1815.
[10] *Ibid.*
[11] *Ibid.*

despite their need for regular repairs, appeared to be reasonable value for money.

In order to facilitate discussions on this matter two drawings of the dock to be built at Chatham were now produced. Identical in terms of length, height and width, they differed only with regard to the floor. The first of the two drawings, dated 16 March, 1816,[12] and showing the timber floor, is signed by William Miller,[13] the other, which is dated September 1816,[14] carries the signature of John Rennie, junior.

Despite that expressed Admiralty desire for economy, their final decision did eventually favour construction of the stone-floored dock, a decision that was also supported by the Navy Board. As a result, and bearing in mind that it was this dock that was actually built, some attention should now be given to the outline design as produced by John Rennie junior with, one assumes, the approval of his father. Beginning with its dimensions, it should be noted that the dock had a length (from its head to the entrance gate) of 225 ft. and a maximum width of 90 ft. Internally, it was characterised by stepped stone sides, these steps rising from the base of the floor to ground level of the dockyard. These steps were an essential feature of the dock, for they were used both as a working area and as wedges to hold the shores resting against the sides of the otherwise unsupported vessel that stood within the dry dock. These steps were, in fact, divided into two separate groups, with a higher set of four being much steeper than a lower group of thirteen. Dividing the two sets was a broad central step that was primarly designed as a walkway. Access to the dock was by means of six sets of stone staircases, these being positioned at the head, midship and aft sections of the dock. Finally, for the easy delivery of material to be used in the repair and building of ships, there were a number of stone slides (or ramps) which, at varying intervals, ran over the top of the stepped sides.

A particularly unusual arrangement demonstrated by the draft plan of the new dock was the use of a comparatively sophisticated entrance arrangement. As far as the existing timber docks at Chatham were concerned, the entrance of a vessel was through a simple pair of gates that were set either side of the slightly narrowing aft end of the dock. Held shut by a series of timber shores wedged

[12] PRO ADM 140/31.

[13] William Miller was a senior draftsman to the Navy Board serving under the Surveyor of Buildings. It must be assumed that he was working from plans previously submitted by John Rennie.

[14] PRO ADM 140/32.

between the gates and the side walls of the dock, these gates were opened and closed through the application of manual power. The new dock dispensed with such a simple, if labour expensive arrangement, introducing an entry neck that could be sealed at both ends. On the side of the neck closest to the dock was a pair of timber gates that could be opened and closed through the use of a capstan and chain device. The capstan was turned by only a small number of labourers, while the chains adhering to the gate held them firmly closed and overcame the necessity of using numerous timber shores for wedging purposes. According to Rennie's draft plan, these gates spanned an entrance area of 57 ft. and opened out into a special recess that prevented them accidentally becoming entangled with any vessel being floated into the dock.[15]

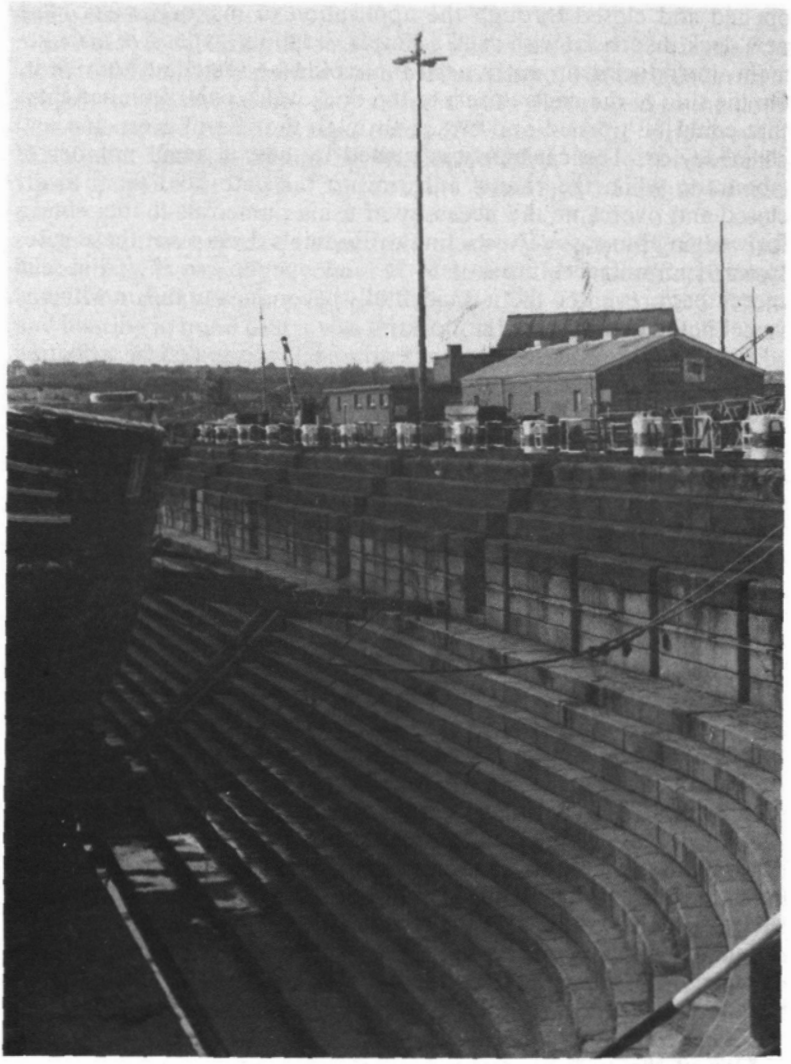
The river side end of the short entry neck was sealed by a floating chest known as a caisson. Filled with water, a caisson could rest on the bed of the river, but once pumped free of water, could be floated and re-positioned. Fixed into grooves that ran along the sides and bottom of the entry neck, it had the advantage of being completely removable and so allowed for the creation of a much wider entrance which was free of the additional need for a gate recess point. The use of a caisson was, during this second decade of the nineteenth century, a fairly novel innovation. Eventually, however, caissons were to completely replace the earlier entry gate system. That Rennie chose to use a caisson as the first of two entry seals results from a further drawback of the use of gates, this being that no matter how well they were sealed, water always leaked both through the central join and hinge areas. By introducing a short neck, any water gaining access past the caisson could be drained away before it reached the gates.

With plans finalised as to the nature and size of the new docks at Chatham, the Navy Board proceeded to make arrangements for employment of a firm of constructors to undertake the task in hand. With tenders presumably received from several different companies, that received from John Usborne and Benson was eventually accepted. The contract, which was signed on 16 February, 1816, stipulated that payment would be made by the Navy Board upon completion of every £1000 unit of work. To ensure that construction was performed to the required standard, John Rennie was to be given access to the works at all times.[16]

One of the earliest, if not the earliest visit that Rennie made to

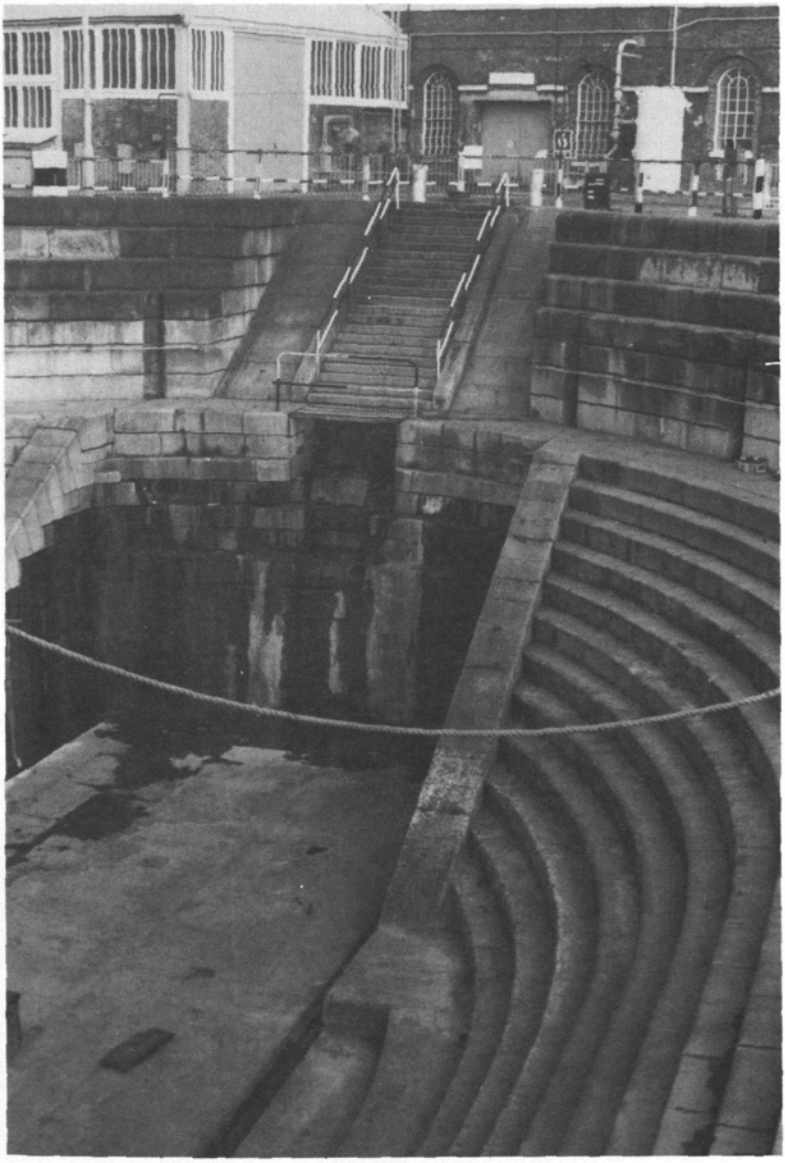
[15] *Ibid.*
[16] PRO ADM 106/3183. 16 February, 1816.

PLATE II



The no. 3 dock, construction of which was overseen by John Rennie, has seen remarkably few alterations since its completion. The stepped side and broad working step are clearly visible as is its stone bottom. At the time this photo was taken (May 1989), the vessel in dock was *H.M.S. Gannet*, a nineteenth-century sloop undergoing restoration for future display.

PLATE III



A detailed view of the head of the no. 3 dock and showing one of the stone stairways used for the purpose of gaining access into the dock.

Chatham once construction was under way occurred in August 1816. Noting that work was proceeding upon the coffer dam, he seemed singularly unimpressed with the overall level of progress. In a letter written to the Admiralty, he pointed out that 'the gauge piles of the coffer dam are drove only in part . . . a considerable number of the Beech timbers they have laterly delivered for Bearing piles are so crooked and ill-shaped that they are by no means fit for the purpose'.[17]

This initial criticism was to be the first of a number of similar observations that Rennie made over the next few years. In September 1816, he complained of a 'want of exertion'[18] while twelve months later he accused John Usborne and Benson of 'mismanagement'.[19] The situation had not improved by March 1818 when, as a result of slow progress, he indicated that, if matters did not radically improve, then it would be several years before the dock would be completed.[20] Reading between the lines, it would appear that the contractors were overly concerned with trying to reduce their overheads and so ensure higher profits. This, so it must be assumed, had led to the employment of too few workers and the frequent acceptance of inferior materials. Similarly, when purchasing such essential items as stone and lime, there was a tendency to under order, so leaving the work force with insufficient quantities for the work in hand. The inevitable result was that, after a few weeks, the entire project was brought to a standstill until more of these items had arrived. Finally, in June 1817, the building contractors nearly had a strike on their hands when they attempted to reduce the daily wage of each labourer from 3*s*. 6*d*. to 3*s*. -*d*.[21]

Apart from annoying Rennie, the contractors also managed to disrupt the entire dockyard routine. At one time it was noted that piles of granite were inconveniently situated in key areas of the dockyard while the contractors had also built a small rail line for the removal of excavated soil and which occupied the yard's main thoroughfare. Whilst this latter problem might appear trifling, it does seem that the contractors had originally agreed to remove much of this soil by barges that would tie up at the jetty prior to its later demolition.[22]

[17] *Ibid.*, 29 Aug., 1816.
[18] *Ibid.*, 8 Sept., 1816.
[19] *Ibid.*, 8 Sept., 1817.
[20] *Ibid.*, 21 Mar., 1818.
[21] NMM CHA/B/25 f229 16 June, 1817.
[22] *Ibid.*

As the no. 3 dock neared completion the Navy Board issued instructions for 32-pounder cannons to be sunk in cement and used as bollards. Today, only two of these original bollards remain *in situ* with the nearer, contrary to Navy Board orders, appearing to be an 18-pounder.

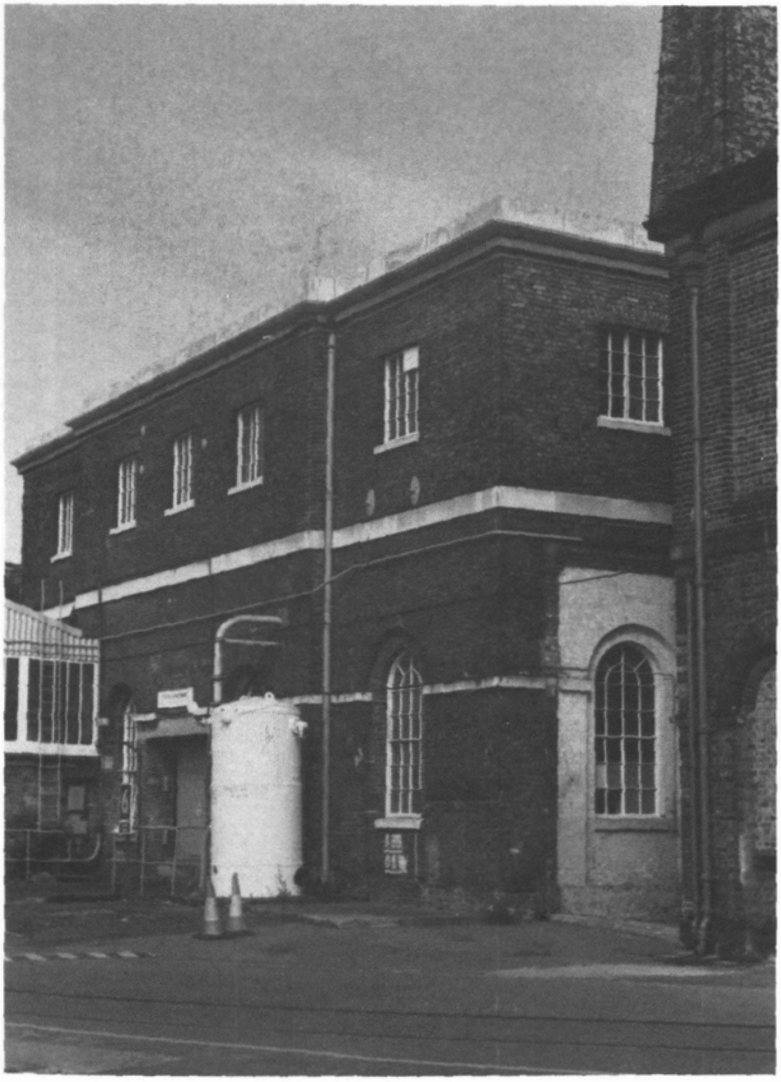
Further disruption to dockyard routine occurred in March 1817 when a series of landslips, caused by excavation on the new dock, prevented ships entering or leaving the adjacent nos. 2 and 3 docks. A further landslip occurred in June when the head of the new dock, together with part of the dockyard road, gave way. Rennie considered the cause of this second slippage to have resulted from a 'want of energy on the part of the contractors' in not having completed the coffer dam and so leading to a 'constant under run of water'.[23] In that same year of 1817 there was a final slip in September, with land breaking away to within 7 ft. of the 'capsill' of the no. 3 dock. Again, no use could be made of this dock until the situation was resolved.[24]

One advantage given to the contractors, and so far unmentioned, was the right to make use of convict labour. First employed from 1819, these civilian convicts, who were accommodated on board the hulked prison ship *Gannymede* (former 6th rate), were brought into the dockyard each morning and employed upon straightforward labouring tasks such as excavation work and the driving in of piles. In return for their services the government, rather than the contractors, was responsible for their pay, each convict allowed between 3*d*. and 4*d*. per day with part of their accummulated income witheld until the day of their release.[25] It is always assumed that it was the sight of these convicts, employed upon both the new dock and general repairs within the yard, that gave the young Charles Dickens (whose father was then a pay clerk at Chatham dockyard) the idea for the future Magwitch of Great Expectations.

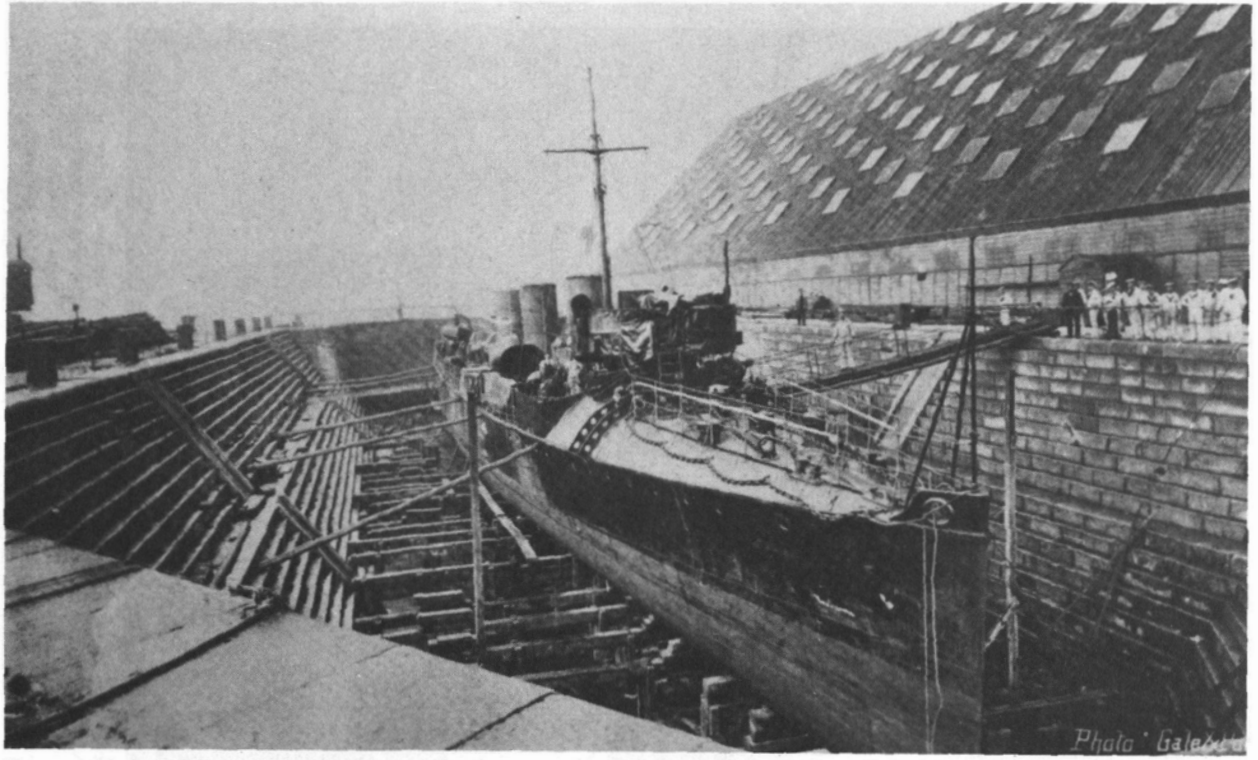
With progress upon the new dock proceeding in fits and starts, John Rennie turned some of his attention towards the design of a new building to house a 50 h.p. steam engine. Linked to pumps which would eventually be fitted to the new dock, the building was to be positioned some 50 yards further to the east and on land which had once been used for timber storage. Rennie's original drawings for this building were completed in April 1816. Comprising an imaginative attempt at introducing a 'fairey tale' castle structure into the midst of a giant industrial complex, this first plan shows a building with tall Gothic windows, mock arrow-loops set in the chimney and heightened boiler-room wings that appear much like flanking towers. Despite all this, the building had a number of functional qualities that

[23] *Ibid.*
[24] *Ibid.*, f359 8 Sept., 1817.
[25] PRO ADM 106/3183. 11 Dec., 1819.

PLATE V



A view of the engine and boiler house designed by John Rennie and later modified by the Navy Board. The boiler, as shown by the original plans, was situated in the central part of the building while the two wings served as engine houses. Designed to accommodate a 50 h.p. Boulton and Watt engine, this was apparently removed in 1929 when it was replaced by electrically-operated machinery.



Upon completion of the no. 3 dock, work started upon converting the adjoining no. 4 (old no. 3) dock into a stone dock of a design not dissimilar to the new no. 3 dock. This photograph, taken at the beginning of the century, shows how ships were accommodated in a dry dock.

included its brick outer walls, stone fire-proof floors and cast-iron roof, supporting columns and joists.[26]

The Navy Board, however, seems to have taken exception to Rennie's flights of fancy, demanding that the building be redesigned without its mock-Gothic additions. The result was a second, unsigned, series of drawings that retain the original ground plan but incorporate the same functional exterior of the steam house, which is still to be found within the historic dockyard at Chatham. As with Rennie's originally planned building, the original fire-proof features were retained.[27]

Construction of this engine-house was not to be placed into the hands of Usborne and Benson, instead the task was handed over to the dockyard's own work force, with a number of labourers preparing the site prior to the arrival in the yard of the finally agreed plans.[28] Although giving the dockyard authorities more control over the progress of works, it did create some problems, with the labour force having sometimes to be directed to other aspects of yard work such as the unloading of merchant ships that supplied Chatham with hemp, mast timbers and oak. In September 1819, as a result of these frequent disruptions to the pace of work, it was agreed to employ an additional gang of labourers whose work would only include construction of the engine-house.[29]

Returning to construction of the dock this, by the early part of 1820, was substantially complete, although the entry neck, gates and caisson had still to be added. Furthermore, consideration had to be given to a few points of detail, including the positioning of bollards that would be used for squaring any vessels entering and leaving the dock 'when it so happens that the Wind and current of tide carry them out of the Line of direction for entering the dock'.[30]

It was on this latter point that George Parkin, whose earlier suggestion had paved the way for this new dock, wrote to the Navy Board in February 1820 requesting details as to where the bollards were to be sited. This particular request was handed over to Edward Holl, Surveyor of Buildings to the Navy Board, who proceeded to produce a detailed plan of the dock that included the location of 26 bollards that were grouped in regular intervals along both sides of the dock. In addition, however, Holl also indicated locations for nine

[26] PRO ADM 140/96.
[27] PRO ADM 140/97.
[28] NMM CHA/B/28. 6 Mar., 1819; 25 May, 1819.
[29] *Ibid.*, 10 Sept., 1819.
[30] NMM CHA/B/30. 16 Apr., 1820.

capstans. These were designed for the raising and lowering of heavy timbers into the dock although they could also be used in the actual process of docking a ship.[31] Unlike bollards, however, they were not simply used to bring a ship onto a certain line, but were used for the purpose of raising vessels on to the blocks should the vessel in question have a draught that was deeper than the dock she was entering. Not surprisingly, capstans were of considerable importance when it came to the docking of ships in Chatham's shallower timber docks. The decision, however, to allocate such a large number of capstans, more than the number to be found around any of Chatham's other docks, evidently came as a surprise to Parkin. After all, the new dry dock had a depth sufficient for the largest of the navy's warships on a neap tide. As a result, he wrote back to the officers of the Navy Board and suggested that all but the foremost pair of capstans should 'be done away'. In support of this, he stated that 'as ships will float into the new dock in this yard we conceive the capstans will be an unnecessary expense and always in the way of other work'.[32] It was a point to which Edward Holl and the Navy Board conceded.

Edward Holl, who had held the position of Surveyor of Buildings to the Navy Board since 1812 was, in effect, the Board's chief civil architect. Since his appointment, therefore, he had paid a great deal of attention to the progress of works at Chatham, liaising closely with John Rennie. In fact, all of Rennie's various proposals and plans had passed through Holl's office, with Holl asked to comment upon their feasibility and value. Sometimes, as in the case of the Gothic-style engine-house, amendments had been suggested, with Rennie's plans redrawn either by Holl, himself, or one of the draughtsmen, such as William Miller, whom Holl had working under him. In addition, on a point of detail, such as the placing of the mechanical capstans, this might not have been a matter that was even referred to Rennie, the engineer having little practical experience of how a dry dock was most efficiently used once it had been completed.

A further example of Holl's contribution to the work in hand at Chatham came in May 1820 when he produced a plan of the drainage system that would eventually link each of the five dry docks to a common drain running towards the engine-house.[33] As it involved many of the ideas that Rennie was pursuing, it is likely that both Holl and Rennie had spent sometime in discussing the various connected

[31] PRO ADM 140/33.
[32] NMM CHA/B/30. 16 Apr., 1820.
[33] PRO ADM 140/34.

points. Certainly, Rennie appears to have had no objections to Holl's finished design, for he produced a similar one of his own in December 1820, the only difference being that it also showed the location of an extended coffer dam that had now been built by the contractors at Chatham for the purpose of extending the river side wall and lengthening the no. 2 dock.[34] Three months later, Rennie produced a further drawing for the works at Chatham, this being a detailed design of the gate sills for the stone dock.

Because of his death in October 1821, Rennie was never to see that first stone dock at Chatham actually completed. Yet, its continued existence within the historic dockyard, serves as a suitable tribute to this great engineer and his frequent visits to Chatham. Without his insistence that the dock was to be built entirely of stone and should only be finished to the highest standards, it could not possibly have survived, in virtually its original state, for over 160 years. Indeed, even at the time of writing, the dock is still in use, having been engaged in the repair of naval warships up until 1984; it currently accommodates the nineteenth-century sloop, *H.M.S. Gannet*, brought into the dockyard for purposes of renovation.

[34] PRO ADM 140/35.