

The Construction of Ramsgate Harbour

Robert B. Matkin

To cite this article: Robert B. Matkin (1976) The Construction of Ramsgate Harbour, Transactions of the Newcomen Society, 48:1, 53-72, DOI: [10.1179/tns.1976.005](https://doi.org/10.1179/tns.1976.005)

To link to this article: <https://doi.org/10.1179/tns.1976.005>



Published online: 31 Jan 2014.



Submit your article to this journal [↗](#)



Article views: 22



View related articles [↗](#)

The Construction of Ramsgate Harbour

by

ROBERT B. MATKIN, M.A., C.Eng., F.I.GasE.

Read at the Science Museum on 9 February 1977

The main work on the construction of Ramsgate Harbour occurred between 1750 and 1850 and this paper concentrates on that period.

THE HARBOUR TO 1749

There has been a harbour of some form at Ramsgate, Isle of Thanet, for many years, the town itself possibly being founded during the Roman occupation. In 1575, the Lord Warden of the Cinque Ports empowered the inhabitants of the town to levy rates and dues on all ships entering the harbour. The idea of a harbour of refuge somewhere between Ramsgate and Deal was considered by Commissioners appointed by Queen Elizabeth I, and in 1678 there is a reference to the upkeep of Ramsgate Pier costing about £50 per annum. Ramsgate was, in 1701, linked to the Cinque Port of Sandwich and headed a list of ten leading Kentish ports. It was also marked 15th of all ports in England, although a painting of 1721 rather belies that statement. Since 1688, Ramsgate has steadily increased in size. At the early date it was due to the importance it held by consequence of the successful trading with Russia and the Baltic. The wooden pier which formed a small harbour for shipping and a defence to the town against high seas had, by 1748, extended seawards 200 feet from the base of the east cliff with a head 200 feet to the WSW. It was capable of sheltering 40 ships of 20-300 tons burthen.

In 1744, the House of Commons presented an address to King George II regarding a proposal to build a harbour of refuge at Sandwich which lies some 5 miles SW of Ramsgate. Labelye had published a copper plate of his survey of the coast in 1737 and it can be seen that the Downs, where shipping normally anchored in stormy weather, lie between the Goodwin Sands and Sandwich whilst Ramsgate lies to the NNE. The plan was seemingly approved and no account appears as to why the scheme was suspended, certainly the country was at war with France and Spain and the cost of the proposed harbour at £389,000 was perhaps too large for the Government to spend at such a time. On 16 December 1748, there was a violent storm from the south and a large number of ships were driven from their anchors in the Downs and found safety in Ramsgate harbour.

Attention now became focussed on Ramsgate and early in 1749 several merchants of the City of London and others – 131 of them – petitioned the House of Commons that Ramsgate, not Sandwich, was the proper place for the reception of shipping when in distress in the Downs. Sandwich objected, but for various sound reasons Ramsgate was chosen. An Act was passed and approval given for the construction of a harbour of refuge 'proper and convenient' for the reception of ships up to 300 tons burthen. The first meeting of the Board of Trustees for the harbour was held at the Guildhall, London, on the first Tuesday in July 1749.

1749 TO THE SUSPENSION OF WORK IN 1755

The first act of the Trustees was to appoint a Committee to visit Ramsgate. A Mr. Robins and

THE CONSTRUCTION OF RAMSGATE HARBOUR

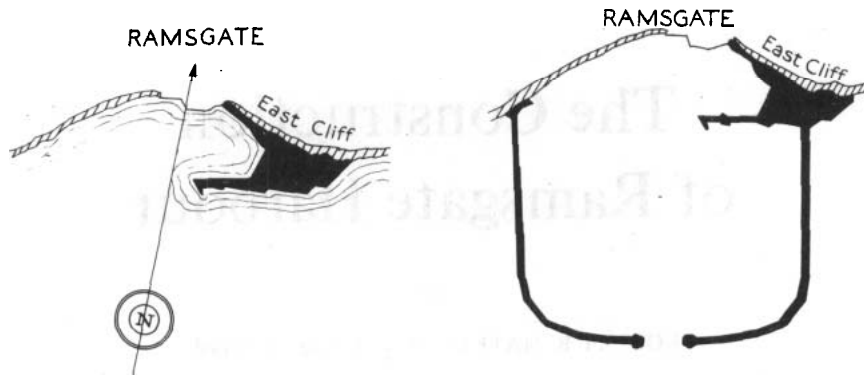


Fig. 1. Ramsgate. Pre 1749.

Fig. 2. Ramsgate Harbour 1749.

Mr. Turner of Gosport attended them. After judging the sullage build up, caused by the existing pier, the Committee concluded, that with two piers going out into deeper water, the amount of sullage filling the harbour would be so small, that only a little expense was needed to prevent its increase. A SSW bearing was chosen for the direction of the harbour entrance as being the most suitable for vessels running in from the Downs, for two main reasons:

1. The tidal stream off Ramsgate changes every six hours from N and E to S and W.
2. The most dangerous winds from the Downs are from SSE to SSW.

Following a meeting at Lloyds Coffee House on July 28, the Trustees advertised for engineers to deliver plans for the erection of two piers, in wood or stone. Several plans and models were offered by persons 'acquainted with Engineering'.

The Committee had made certain conditions regarding construction:

1. Foundations below LW mark not to be made by throwing in loose stones at random.
2. No caissons needed if piers are not carried into water deeper than 6½ feet.
3. Foundations of piers covered at LW be laid with a base of square stone somewhat higher than the LW mark.

It should be remembered that at this period, marine engineering was still a young science. The following points were also noted:

- a. By erecting two heads, the harbour would contain upwards of 200 merchant ships.
- b. The chalk at Ramsgate is hard and ships would rake a dock for themselves without hurting their keels.
- c. There is no backwater at Ramsgate and none would be needed as the shore is clean. The tide being strong, no sand could lie to make a bar.

Finally the Committee reported that a person, experienced in his profession – they don't say who – had surveyed the area and checked the foundations. It was estimated that two pier heads may be carried out 1460 feet N and S and about 2900 feet circumference with a width between heads of 300 feet. After considering various plans and estimates, the Trustees on 12 January 1750, decided that the whole of the harbour work should be carried out by contract in accordance with the plans submitted by W. Ockenden (one of the Trustees and of whom it was said 'was an Engineer but no seaman') for the east pier and to be made of stone, and by Captain Robert Brooke (of Margate) for the west pier to be made of wood. In less than a month, the east pier was commenced and Thomas Preston appointed Mason or Foreman of Stone Work. Purbeck stone was to be used.

The Committee had, on 9 January 1750, made a further survey to determine the position from where the two piers were to begin. They decided:

- a. West pier - S by E in a direct line from a pile they caused to be drove under the cliff, building to commence 40 feet from the cliff.

THE CONSTRUCTION OF RAMSGATE HARBOUR

- b. East pier - to run from the land between the saw mill and flag staff, S by E, parallel to the west pier.

Ockenden and Brooke early disagreed about the choice of materials for the piers, the former wanting stone for both whilst Brooke wanted wood as at Margate. It was cheaper, he argued, and would stand the force of the sea which the stone would not. The Trustees compromised by adding the words 'subject to future alterations' to both their contracts. By July 1750, the stone pier was 390 feet long and the wood pier was 460 feet from the cliff. Ashlar, cheaper than shell lime, was used for backing the pier, it being set with Tarras mortar. The core was well beaten chalk mixed with gravel, not mortar. The base was 40 feet wide tapering to 30 feet at the top which was 18 feet from the foundations.

Captain William Read was the first Haven Master, appointed in 1751 with the task of hoisting a Union flag on the old pier head when there was 10 feet of water. In January 1752, William Etheridge, a Carpenter on Westminster Bridge, was appointed Resident Surveyor and Engineer at a salary of £200 per annum. Etheridge and Preston did not get on well together, disagreeing on many points. One was the method of laying the foundation stones below LW mark, Preston wanted to use a trench 10" or 12" deep, Etheridge favoured the use of caissons. An extremely low tide in May 1753 enabled the Surveyor to draw a base line along the bottom of the harbour and from this he determined, graphically, the point where the middle of the entrance must be placed. It was noted at the time that where the western pier was to be built (now of stone under a revised plan) the water was much shallower than expected. It was regretted the harbour had been placed so much to the west as it would now be necessary to extend the whole work a further 100 feet beyond the original design.

On 14 December 1753, Ockenden submitted a plan to the Trustees for contracting the harbour to a width of 1200 feet, an action which was to put back building work by some years. The only reasons for his plan seem to be a financial saving and the desire to move the west head into possibly deeper water. He does not appear to have consulted anyone, but being a man highly respected by the Trustees for his abilities and opinions, carried the motion by 28 to 15. It was said later that his action was due to mistaken judgement. There was difficulty in demolishing the west pier because the stones were so strongly cemented together. The *'Kentish Post'* in May 1754 reported: 'The intended harbour at Ramsgate has been well planned, but now a new plan, invented by persons who have no knowledge in maritime affairs, will make the harbour incapable of being a safe one'. Etheridge, who approved of the contraction, continued the removal of the old work and started the new wall 278 feet eastwards, joining the two walls with a temporary cross wall of backing stone. At the other end of the old wall, there was a gap between the pier and the land, impassable at high tide. A staircase was built linking the pier wall with the top of the cliff. It was constructed of timber by the carpenter Jacob Steed, and to this day is known as Jacob's Ladder. This appears to have been the last work of Etheridge.

In May 1754, the owners and Masters of ships expressed their apprehension at the probable inconvenience if the harbour were contracted. The Trustees would not rescind their 1753 resolution or stop the work. They did however agree to asking the Admiralty to appoint a proper person to make a survey. By February 1755, a petition had been presented to the House of Commons opposing the contraction and this was referred to a Commons Committee. Sir Piercy Brett and Captain Desmaretz were appointed to carry out the survey and give an opinion as to the proper plan for completion. They reported their findings on 24 December 1755. In the meantime, on 9 May, the Trustees had ordered all work on the harbour to be stopped.

THE SUSPENSION OF WORK, 1755 TO 1760

No estimate of the difference in expense in making the contraction was ever produced to the Trustees. Those who opposed the work did, however, produce some figures for the Commons Committee and these show that the difference between the contracted and original plan was only £2454. One view of the opposition was that with Ramsgate being a tidal harbour, the new position of the heads of the piers would put the east one further into the sea than the west, which is the flood head, thus increasing the chance of sillage collecting in the harbour.

THE CONSTRUCTION OF RAMSGATE HARBOUR

Following the Brett and Desmaretz report, a Bill was brought into Parliament and read on 24 March 1756. Although it did not pass, it put a total stop to the harbour works. Their scheme, which included a plan of soundings at LW springs, indicated that the contraction work should be opposed. Their proposal was an extension of the original, by adding to the straight piers a further 400 feet of wall to seaward, making the heads in 8 feet of water. The pier arms were to be bent inwards with 5 'kants', giving a harbour opening of 275 feet towards the Downs. They also proposed sinking a basin 16 feet deep from LW springs on the east side, to accommodate 50/60 ships of 300 tons afloat in smooth water. The estimate for completing the harbour to this scheme was £195,906-7-6.

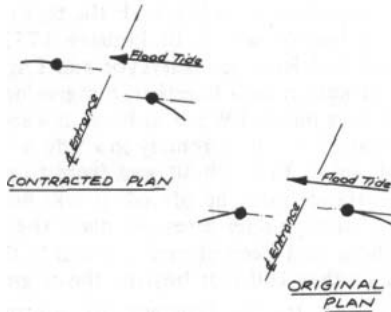


Fig. 3. Position of Heads in relation to Flood Tides. 1755-60.

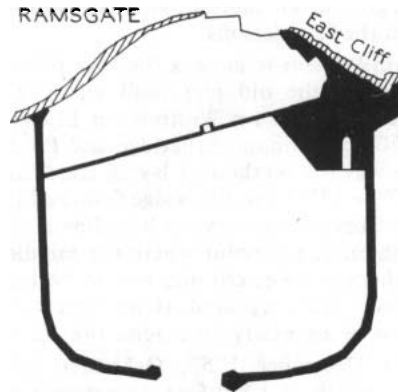


Fig. 4. Ramsgate Harbour 1775.

1760 TO 1774

After asking Parliament for guidance on how they should proceed, the Trustees were told verbally that, as nothing had been done to suspend or alter their original powers of 1749, the best way would be to use their own discretion. Consequently work re-commenced on 30 April 1760. There is no documentary evidence available indicating which plan they intended to follow, but by comparing the piers of Brett and Desmaretz's plan and the one of Smeaton in 1790, the conclusion is that the format of the former was adopted but with the entrance placed 100 feet nearer the shore and facing SSE. Work on taking up the contracted wall was commenced in 1761 and much of the stone raised was stored for re-use in the construction of the piers. It was seen that as the pier walls bent towards each other so the sand was increasing on the harbour side of the east head. At this stage in 1767, this head was considerably further into the flood tide than the west pier and it was decided that the 1768 programme should concentrate on getting the west head forward. This it was hoped would prevent the sand increasing.

The Committee did not visit Ramsgate in 1767 and in the following year only reported on the work of constructing the piers, with no mention of the build up of sand. It was not until November 1769 that the Trustees ordered Preston to bore the harbour in several places and compute, as near as possible, the quantity of sand collected. What Preston replied is not known but it could not have concerned the Trustees very much for they made no visitation the following year. This is quite surprising in retrospect, for since the departure of Etheridge there had been no resident Engineer or Surveyor, it being left to Preston, who was the Mason, to do any reporting.

By 1771 a hopper and two lighters were being employed to clear the sullage, but the method is not indicated. Later the Committee recommended that another, more effectual, method should be found.

At the time of the Committee's visit, the east head had been founded and in order to fix the harbour entrance, three poles with flags on them were erected at a distance of 200, 250 and 300 feet from the east head. It was found the west pier was some 325 feet from the east head and after taking different views of the harbour and upon 'mature consideration', it was decided the entrance width should be 300 feet.

THE CONSTRUCTION OF RAMSGATE HARBOUR

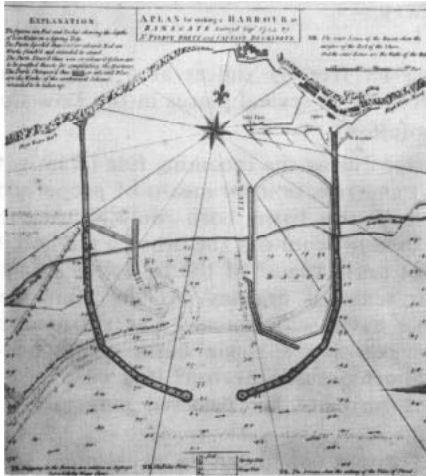


Fig. 5. Brett and Desmaretz Plan 1755.

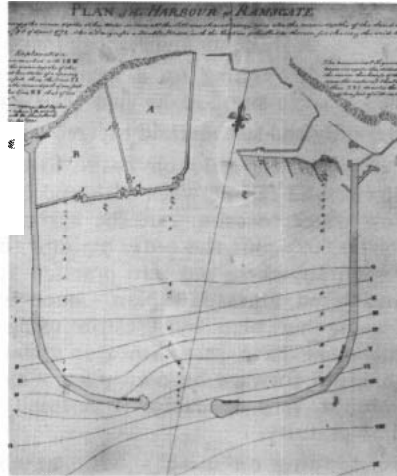


Fig. 6. Smeaton's Plan October 1774.

It is interesting to note that the method that had been used to lay the foundations of the piers below LW springs was by means of caissons (the Etheridge scheme) and by digging a trench (the Preston scheme). 1772 came and went, as did the Committee, reporting only, with satisfaction, that the two pier heads were well forward. Only the sand came and did not go away and nobody took any notice. But matters became very serious in 1773 when, with great concern, the Committee reported the vast quantity of sand and sullage in the harbour, even though more than 52,000 tons had been taken out at a cost of £1,000 over the last three years. By now an engine had been fitted to a lighter to take up the sand and another to throw it up. There are no details of what these engines were like.

On the 15 July, it was unanimously resolved to request Mr. Smeaton to attend at a Committee of the Trustees at Ramsgate, to hear his advice on the cleansing and deepening of the harbour. Smeaton replied he was going to Ireland, but would be very ready to attend them at any further convenient season. He was subsequently invited to Ramsgate in the spring of 1774.

JOHN SMEATON, 1774 TO 1792

Smeaton was connected with the harbour from his first visit on 6 April 1774 until his death in 1792. During this period he was concerned with several aspects of the harbour development but with three in particular:

1. Basin and Sluices.
2. Graving or dry dock.
3. Advanced pier to the east pier head.

Even though all, or parts of these three items were under construction at the same time, they will be considered separately.

Construction of basin and sluices. On the 10 March 1774, before the visit of Smeaton, Preston submitted a plan to the Trustees for cleansing the harbour of its sullage by means of harrowing. As the method needed some explanation, they postponed consideration, but Preston himself abandoned the idea.

Following his visit earlier in the year, Smeaton presented his report on the 24 October. He gave careful consideration to the nature and causes of the sullage brought into, and deposited in the harbour, something, he suggested, that happens to all harbours unless there is a contrary effect, caused by natural or artificial means. He calculated there was 268,700 cu.yds of sullage deposited and, by utilising the present method of clearing, would take all of 12 years to complete, assuming no more came in meanwhile. He considered three methods of clearing the sullage:

THE CONSTRUCTION OF RAMSGATE HARBOUR

1. Rake and let the current float it away.
2. Take up and remove manually.
3. Penning up a head of water and let free by sluices at a favourable time - a method he had seen used effectively at several places in the Low Countries.

At Ramsgate, only the last method offered a possible solution.

His design was for a double basin, to take in water during the incoming tide (Ramsgate has a considerable rise and fall between high and low water) and release it by means of properly directed sluices at low water to scour out the harbour. With a double basin, both could be used together, via 9 draw gates, to scour the outer harbour, or each used to scour out the other, a method, he says, he had not seen anywhere put into practice. It was not until August of the following year that the Trustees considered Smeaton's plan - such was their sense of urgency. At the same time they considered a further plan by Preston using a single basin with sluices. The situation suggests that Preston must have seen Smeaton's design and realising a single basin would be cheaper than a double, put forward his own plan. Why did he not consult Smeaton? If it were for economy it was no doubt very laudable, it certainly did not turn out for personal monetary gain, for he was paid no gratuity.

Before deciding on using a basin at all, the Trustees conducted an experiment to see the effect of an artificial backwater. A 50 ton lighter was scuttled near the end of the old pier and filled with water. On opening a sluice at low tide, the water ran out in a few minutes making a cavity several feet in diameter. Further tests were done, satisfactorily demonstrating what might be expected by running a great quantity of penned up water through several sluices.

The Trustees determined on Preston's plan and he was ordered to start preparing to build a cross wall and sluices with all speed. Smeaton was given a gratuity of 50 guineas for his trouble and attendance. Two years later, in 1776, Preston died and Hurst was appointed Mason, with Henry Cull as his foreman. Work proceeded on the cross wall and the number and direction of the sluices was fixed. The basin gateway design, giving a passage for vessels to the basin, was approved. In a letter to the Trustees in February 1777, Smeaton, who at this time had been appointed a Consultant to the harbour, wrote that he was fully satisfied with Preston's design and that it would clear the sullage from the harbour. He thought the sluice gate frames should be of cast iron and if they approved, he could depend upon the order being punctually executed at the lowest price, if they were ordered from Carron.

Before 1779, a test was carried out when four of the sluices and the cross wall were completed. The gates were shut at high water and, at low water, men, four to each gate, tried to raise the gates. At the first attempt the spindles of all the starting wheels broke. Eventually, two gates were raised using tackle blocks. The force and power of the streams forced a 7 foot deep channel in the chalk and cleared away the sullage. The stream continued nearly 300 feet beyond the harbour mouth. The difficulty in raising the gates was found to be due to friction. The planking of the gates had been laid to draw crosswise and when this was changed so the planks drew vertically and the spindles renewed in wrought iron, everything worked satisfactorily. It was found that the cross wall caused the water in the harbour to become agitated in rough weather, energy being expended against the wall instead of up the beaches. As a remedy, 150 feet of the wall was taken down at the western end and returned to the cliff. In addition, 100 feet of the wooden portion of the west pier was removed, cliff-wards from the end of the cross wall, the gap so formed being closed by a 'bridge of communication' which had a central support of stone. Construction of the remaining sluices was slow, for by mid 1780 the 5th was not yet in operation although the foundation for a further one, the 6th, had been started and aprons laid to all the others.

By this time a large quantity of sand was collecting in the basin itself. Its removal was necessary to provide an adequate depth of water for shipping. They tried using the sluices in the reverse direction, keeping them shut until high water and then opening them to stir up the mud in the basin. This was partially successful, but the force of the water caused some damage to the crosswall foundations. In the end, six or eight men shovelled the silt into the current flowing to the open sluice as the tide ebbed.

THE CONSTRUCTION OF RAMSGATE HARBOUR

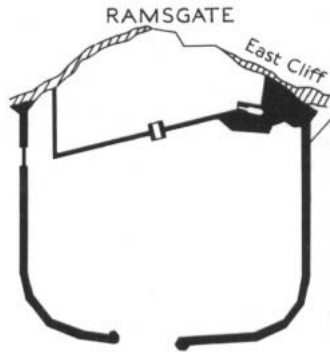


Fig. 9. Ramsgate Harbour, 1783.

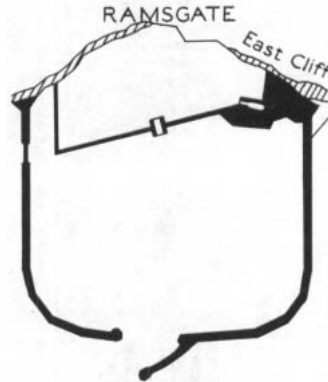


Fig. 10. Ramsgate Harbour 1788.

With the work on the sluices and cross wall now well advanced, there is little to report over the next few years. Barges were occasionally sunk to act as turnwaters and direct the sluice streams against a particular sandbank. To combine the action of the 5th and 6th sluices, Smeaton set a temporary fence in the form of a curve, the resulting stream enabling a greater depth of water to be obtained along the east pier. Later a 7th sluice was constructed eastwards of the 6th. The gateway to the basin, at 30 feet, was found to be too narrow for ships to enter under sail. Instead of widening it, flue walls projecting forward 30 feet were built, the ends being splayed out to a 40 feet opening. Smeaton designed new basin gates to be of fir, elm or beech, the existing ones being considered too light. Sir John Rennie in 1850 said, that if gates were generally made of English oak, they would last 100 years - if the worm was kept out.

On John Rennie's private visit to Ramsgate in 1789 he commented on the drag that was being used to clear the basin - there had been some improvement in the method used in the last few years. He writes in his notebook:

When the tide sets a certain degree, they employ a kind of drag to raise sullage in the basin, worked by 2 horses each. The drags are made of oak with a piece of iron on the underside to loosen the mud. The number of drags depends on the quantity of mud, sometimes as many as 6 horses are supplied by people of the town for which they are paid 7/- per tide for a man and 2 horses.

With the basin being cleared down to the chalk bed with 14 feet of water at the springs from the gate to the crane on the 'wharve', it was now capable of holding 200 sail of shipping of 200-400 tons burthen.

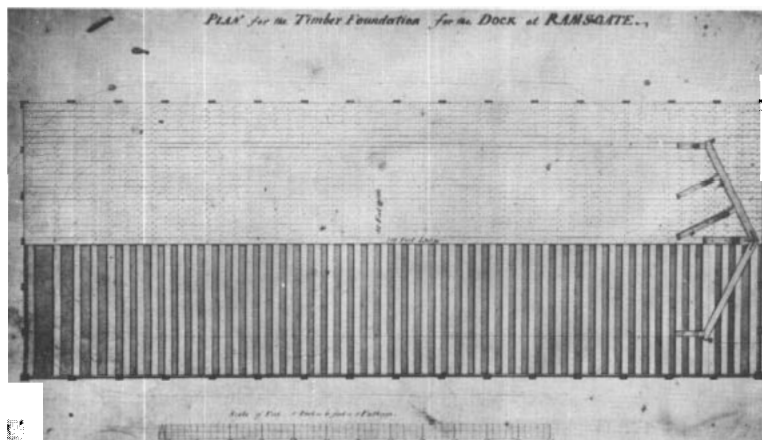


Fig. 11. Smeaton's Plan for Timber Foundations in Dry Dock 1788.

THE CONSTRUCTION OF RAMSGATE HARBOUR

Graving or dry dock. As the basin was gradually cleared of sillage and it became possible for larger ships to enter, discharge their cargo and if necessary undergo repair, there was need for a graving or dry dock. Smeaton was consulted and, early in 1783, after visiting the docks at Liverpool produced his design. The dock was to have a timber floor, a necessity at Ramsgate he considered, as the base was chalk. The foundations would most likely be free of springs but they could be affected in a way clay or solid stone would not be. For his work Smeaton received £100.

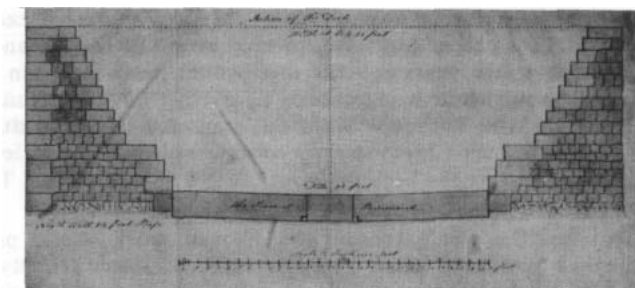


Fig. 12. Section through Dry Dock showing Stone Bottom 1788.

It was not until 1784 that the plans were approved and the first stone laid. The dock was to be 110 feet long, 31 feet wide and 15 feet deep, the sides being stepped. Smeaton's plan specified the floor to be laid before any stonework was erected, but the Trustees, in their wisdom, considered it better to begin with the walls. Henry Cull, who had recently become Mason, recommended thickening up the north (or basin side) wall and laying the floor in stone. More durable he considered than wood and less susceptible to the worm. His proposal was accepted, but one cannot help wondering why Smeaton, as the Consultant was never asked to give an opinion on this change. It was August 1786 before the dock was completed and, although it appeared a 'neat piece of architecture', water was rising through the pavement, lifting a great part of it. Cull said a similar thing happened at Plymouth New Dock 23 years ago. He suggested taking the floor up and laying it with larger stones. The following August this had been done and the work tested. Cull regrettably had to inform the Trustees that, on trial at high water, the greater part of the pavement became loose and lifted. More serious though was that nearly 100 feet of the north wall also lifted. The Trustees once more turned to Smeaton and asked him to examine the work and suggest ways to render it useful. He reported:

1. Floor is laid of Portland blocks in the form of a shallow inverted arch.
2. Cause of failure was pressure under the floor trying to buoy it upward.
3. A greater degree of curvature on the arch would reduce lateral pressure but not necessarily solve the problem.
4. Failure is not due to bad workmanship but to a construction not suited to the situation.

His conclusion was that the whole base and the greater part of the north wall must be taken up and rebuilt with a wood floor. The walls to be of solid masonry, 10 to 12 feet thick. Smeaton was again asked to prepare a design and in January 1788, he wrote to the Trustees enclosing a section of the dry dock he proposed and also plans he had made in 1783. The plans were not complete, he wrote, as the person in charge should have the opportunity of making alterations for the better.

In a letter to the Secretary, 15 January 1789, Smeaton gave advice on the laying of the floor, suggesting that the planks should be grooved, planed and jointed with 7/16" x 7/8" laths. Nine days later, another letter from Austhorpe suggested that unless the method he previously advised was well done, it would be better to make plain joints, finishing the edges with a toothed plane, the roughness helping to hold the tar and hair in every indenture. Many of his letters contain a post-script of a personal nature, this particular one noted - 'Have had a continual thaw since 13th but ice still 8" thick on my pond'.

By the end of May 1789, sheet piling enclosed the perimeter of the dock, the floor had been laid and the masonry work begun. In a letter to his friend John Gwyn (now Resident Surveyor) in April, Smeaton refers to the fixing of one valve he had designed — one, he said, was less liable to

THE CONSTRUCTION OF RAMSGATE HARBOUR

accident than more. It should also be fitted as low as possible and so be less in danger of being 'fingere'd'. This is one of the last letters he wrote to Gwyn, for Gwyn died in June. The dock was completed in July 1791 and proved to be perfectly satisfactory. It was the only dry dock at that time between the Thames and Bristol, according to the Trustees' Report Book. Was this an error or had the Plymouth dock Cull referred to been abandoned?

Advanced Pier. In 1787, Smeaton's advice was sought regarding the turbulent water in the harbour, caused by NE and E winds. Experienced seamen and pilots had suggested extending the east pier head some 300 to 400 feet in a proper direction, to help keep out the sea and quieten the water. Smeaton agreed, even though a few years ago the idea would have not been possible. Now, with the 7th sluice, there would be sufficient backwater to counteract any effects such a pier would have in bringing more sullage into the harbour. Smeaton presented his plan during a visit he and the Chairman made to Ramsgate over Christmas. Approval was given for an extension approximately 340 feet long, pointing so as to make the harbour mouth face a SSW direction. The distance between the new pier heads was 200 feet.

By June 1788, to allow the pier extension to continue, work was in progress raising stone thrown in to secure the east pier head some 14 years earlier. Some difficulty was experienced in raising it using the usual method of tongs from barges. Cull, the Mason, had suggested in May that a diving chest might be used and, in June, Smeaton took up the idea and had one made. It was ready by the 6 July when Smeaton returned to put it into use.

Instead of being made of wood and sunk by weights externally applied, as in his previous model, this one was in cast iron, 4'-6" high, 4'-6" long and 3'-0" wide, weighing 2½ tons and heavy enough to sink itself. Light was admitted through circular glass windows about 6" diameter. It gave sufficient room for two men to work underwater for as long as necessary or practicable. It raised 100 tons of stones, many weighing over a ton and some from over 12½ feet of water.

Caissons were used in the construction of the pier, each 10 feet long and holding about 500 tons of masonry. Smeaton indicated the type of face, backing and pointing mortar to be used in setting the masonry, together with the quantities and instructions for mixing. Face mortar, for example, was described thus:

- 2 bushels blue lyas lime (from Lyme in Dorsetshire) thrown well in with a shovel but not pressed.
- 1 bushel of Tarras or Pozzolana in powder prepared.
- 2 bushels of fine and coarse sand mixed.

The whole, being well beat to a tough consistence, is best used directly.

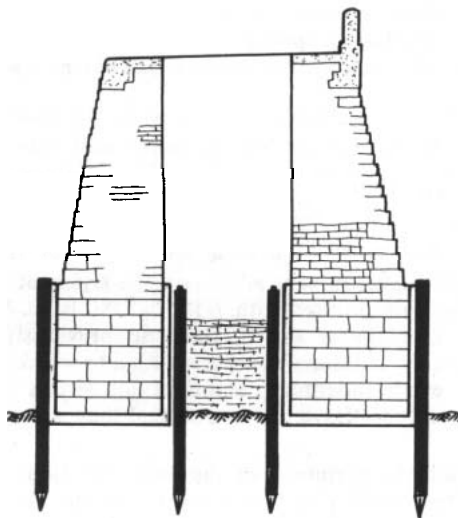


Fig. 13. Section through Advance Pier 1788.

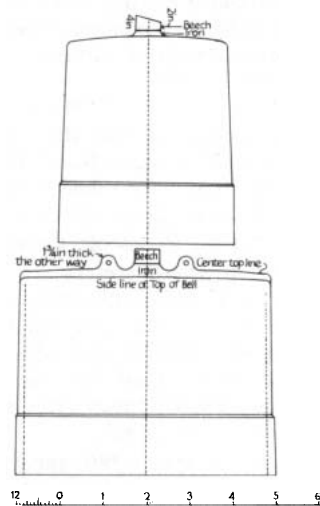


Fig. 14. Smeaton's Diving Bell 1788.

THE CONSTRUCTION OF RAMSGATE HARBOUR

On a visit of the Committee to Ramsgate in August 1789, Smeaton and the Chairman descended in the diving bell to examine the pier foundations. They stayed down $\frac{3}{4}$ hour and found the caissons so deeply buried in sand and silt that they considered this was possibly the best defence against the worm. Their return to the surface was a 'signal of great joy to their friends' who had become apprehensive that something untoward had taken place.

John Rennie, on a private visit to Ramsgate in the same month, noted that the method of supplying the diving machine with air was an air pump 10" diameter and 10" stroke, worked by two men. By pumping steadily, air is kept fresh and not above 3" water is admitted in the bell. After 1789, apart from reports of the number of caissons laid, there is no further mention of the Advanced Pier construction.

General comments. Mention must be made of a few other happenings during Smeaton's time at Ramsgate. A letter he wrote to the Secretary, dated 24 May 1783, Grays Inn, reads:

Mr. Smeaton presents his best compliments to Mr. Evans (Secretary) and begs him to make his most respectful compliments acceptable to the Board of Trustees of Ramsgate Harbour and, if it stands to their good pleasure and convenience, he begs to let them know that at this time a little money would be particularly acceptable to him.

He then goes on to give a detailed schedule of the work he has done and adds:

....at the same time I entirely leave the quantum to their pleasure, begging leave that no pecuniary reward can give him so much satisfaction as the pleasure he feels in having co-operated with the views of the Board.

Following the Chairman's visit to Ramsgate with Smeaton in December 1787, he reported to the Board that the works there had been carried on without the assistance or direction of an Engineer or Resident Surveyor since Etheridge in 1754. Such an important work of the nature and magnitude of Ramsgate harbour needed an able and skilful engineer. As a result, John Smeaton was appointed Engineer on 9 January 1788 at a salary of £250 per annum and John Gwyn as his Resident Surveyor at a salary of £100 per annum. It was at this period that Smeaton examined the proposed position for a lighthouse on the west head. He made an 'exact plan' for a design having a double light and although this was completed, there is no written evidence it was ever erected. A similar construction does, however, appear on an engraving of 1817, alongside Wyatt's lighthouse.

Because the harbour had greatly improved and was of the utmost importance to commercial navigation, the Trustees asked Smeaton in September 1789 to draw up a proper state of the harbour to be published at a convenient opportunity. This he completed in 1791 under the title of '*An Historical Report on Ramsgate Harbour by John Smeaton, Civil Engineer, F.R.S. and Engineer to Ramsgate Harbour*'. In June 1792, the Trustees asked Smeaton to continue his exertions in their employ until the necessary works for completing the harbour are finished - at the same salary as before. In July, the Chairman wrote to him of his concern that it was his intention to withdraw from the service of the Board and particularly lamented the cause. It was therefore with reluctance the Trustees accepted his resignation from Christmas next. The harbour was, to all intents and purposes, completed by the late summer of that year and John Smeaton died on 28 October, still in the service of the Trustees.

SAMUEL WYATT, 1793 TO 1807

Wyatt was appointed to carry on the work of Engineer for a trial period in 1793, it was not until the following year that it was made permanent, at which time Henry Cull was made his resident deputy. Wyatt's salary was £200 per annum, the standard it appears for Engineers to great public works in the late 18th century. His main task was to supervise the constant work of maintenance and design new buildings.

Britain was at war with France from 1793 and the harbour was involved in the embarkation of troops. The roadway under the west cliff, now termed the Military Road, was improved and all avenues and roads to the sea were fortified with barred gates. The Secretary of the Trustees wrote to the Ramsgate Gentlemen:

'Sir, the Trustees, co-operating with the Gentlemen of the Association for the defence of the town of Ramsgate and for the shipping in the harbour, will provide an armed boat and six men to cruise every night outside the harbour'.

THE CONSTRUCTION OF RAMSGATE HARBOUR

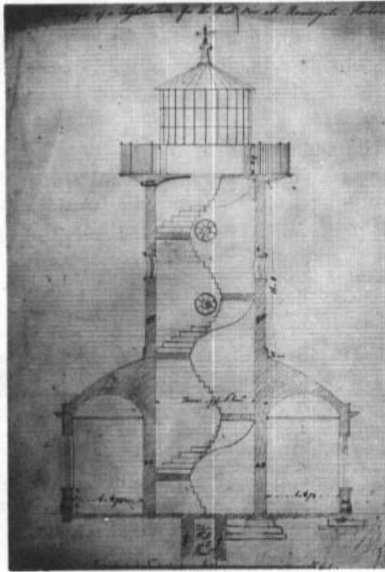


Fig. 15. Wyatt's Lighthouse 1794.



Fig. 16. Shaw's Lighthouse 1843.

Wyatt's first important work was to design the lighthouse for the west pier head. In May 1794, construction started with 22 masons and 38 labourers. 34 feet to the top of the gallery railing and 9 feet in diameter, the design was said to be one of his prettiest. It had a spiral staircase winding round a central well in which descended a weight. This revolved the lamp in the lantern and, rather like a grandfather clock, it was wound up every day. Ramsgate was one of the first lighthouses to have a revolving light, emitting flashes at regular intervals. Wrapped around the first storey was a circular house for the light keeper. The lighthouse contained 3 powerful Argand lamps and reflectors. It was completed by September 1795 and the first keeper was appointed two months later.

The Trustees, on their annual visitations, used a local hotel for their meeting. It was felt that having their own Committee Room, appropriate to the new architectural dignity of the harbour, would be advantageous. Wyatt was asked to prepare the necessary plans and estimated cost, which came out at £4,800. It had no sleeping quarters but there was an entrance hall, kitchen and housekeeper's rooms. A handsome stone staircase led up right and left to two ante-rooms from either of which the great room was entered. A large segmented bow window gave a beautiful view over the harbour. A copper covered dome, copper provided by Wyatt's cousin Charles Wyatt, crowned the structure. It was to be used once a year.

In November 1801, the Trustees decided to have a lifeboat built to a plan of Henry Greathead of South Shields. It was 30 feet long and 10 feet wide with a cork lining from deck to thwarts. It came into service the following year, placing Ramsgate amongst the first 12 ports in the country to provide such a service.

In 1802 a boom was placed across the entrance as a harbour defence, but there is no further mention of it. Eight guns were provided for defence and, to save carrying gunpowder through the streets in a covered wagon, a 30 x 11 feet magazine to contain 500 barrels was built. An additional gate was proposed for the basin. Wyatt's design was such, that at some future date it could be converted into a dry dock. Although adopted by the Trustees, it was never built in that form.

The country was again at war in 1805 with the harbour being used for the embarkation of British and German troops. The Military Road needed widening and soldiers were provided by the Government to carry out labouring duties. Wyatt advised increasing the roadway width to 60 feet. This would give an opportunity to construct warehouses and for supporting the cliff where

THE CONSTRUCTION OF RAMSGATE HARBOUR

it was most dangerous. John Rennie, in 1806, was asked to report jointly with Wyatt on the encroachment of such a plan into the basin, which would effectively reduce the quantity of backwater. They found the plan fully justified. Samuel Wyatt died on 7 February 1807, four days after he had prepared his final version of a dry dock in the cross wall, plans for which were rejected by the Trustees the following April. John Rennie was appointed Engineer to Ramsgate Harbour six days later on 13 February.

JOHN RENNIE, 1807 TO 1821

The Trustees ordered that construction of a clockhouse in the pier yard should commence to the design submitted by George Louch (Wyatt's deputy since 1802). The plan and end view submitted could have been drawn from a design by Wyatt when the building was proposed in 1806. Rennie advised raising the two ends to form two store rooms and that the modification would improve the appearance of the building.

By 1810, the return portion of the cross wall to the cliff had been removed and the wall extended to meet the west pier. Stairs were added in the outward angle consisting of 40 steps of Dundee stone. Work on the new entrance gates was proceeding and two iron swing bridges for foot passengers, were to be provided over the openings.

In 1810 there is mention for the first time of the use of steam power to remove silt from the harbour. Jolliffe and Banks contracted to do the work, but they so damaged the chalk bed with their excavator *Teazer*, that the Trustees decided to buy their own dredger. It was to be a Rennie design with an 8 HP Boulton and Watt engine.

Although only completed 17 years earlier, several stones fell out of the east pier head and it had to be repaired. It was decided a failure must have occurred in the foundation, mention being made of a vein of soft chalk running across the harbour and under the Advanced Pier. A fracture had been noticed two years earlier by Louch and Finneymore, the Harbour Master, but neither took much notice. K.B. Martin has written that Finneymore must have been a negligent Officer, the Trustees thinking the same for when Finneymore made application for an advance of salary, they dispensed with his services instead. A Lt. John Woolward was appointed in his place. By 1812, work was in progress repairing the east head. Rennie originally had the idea of surrounding the head with a dam, but found the water too deep and exposed. Instead he decided to use a modified version of Smeaton's diving bell to set the masonry. The new bell, of cast iron, was 6 feet high, 4½ feet wide and 6 feet long and had one end thicker and heavier than the other that it might sink lower and thus allow the air to escape more readily. On the top were 8 solid bulls eyes of cast glass, made watertight by leather and copper collars covered with white lead. Two seats, with footboards, were fixed along the sides. Air was forced in by a double air pump through 8 feet long lengths of hose connecting to a 2½" diameter hole in the bell. The total weight was 5 tons. The bell was suspended from a platform on the pier, on which had been drawn an accurate plan to size of the new pier head. By means of rack and pinions, the suspended bell could be made to rotate and traverse to the exact location it was required to place the masonry underwater.

In 1814, the Committee visited the harbour and saw how the east pier head had been laid and secured underwater by means of the diving bell, at less expense than expected. For their great zeal and skill, gratuities were given, Rennie had a piece of plate value £50, Nathaniel Gott (deputy to Rennie in place of Louch who had died) had a £25 annuity invested for him and the two men who worked in the bell each received £15. The Committee also had an inscription engraved on a copper plate placed on the top of a new granite mooring stone near the centre of the new pier head.

George Gwyn produced a 22" square plan of the harbour in 1815, the first since Smeaton's in 1790. This plan, when brought up to date in 1850 and shown at a Committee of Inquiry caused a Captain Vetch to comment that 'he considered it defective and altogether unworthy of such a harbour'. Gott designed and constructed a house on the quay for the heating of pitch and tar for ships undergoing repair. Because of its shape, it was locally called the vinegar bottle. The clockhouse was completed in 1817. In an upper central room was a fireproof repository for plans and papers. Above the clockroom was a small turret with the pier clock and a strong bell, striking the hours. The Astronomer Royal and others, proposed that an observatory be set up in the

THE CONSTRUCTION OF RAMSGATE HARBOUR

clockhouse and a transit line be laid for the correction of ships' chronometers. This was completed in 1819. The transit or meridian line was, I say was for it was levered from the floor and stolen in 1975, a brass strip, engraved at determined points along its 4.5 metre length. It is understood to have been similar to the one still in existence at Greenwich. To complete the observatory, an astronomical clock having a grid iron pendulum and made under the control of Captain Kater, was installed.

In 1820, the Trustees purchased their own excavator. Rennie produced a plan for a 'mud boat' powered for excavation by an 8 HP engine that had been used for pumping water from foundations. Gilbert Caught, a local shipbuilder, agreed to build the 168 ton boat at £10-15-0 a ton. It was completed in July when Rennie reported the engine was too small.

1821 was a most notable year for Ramsgate Harbour in more ways than one. Boulton and Watt provided a larger boiler in the mud boat which, by May, was working satisfactorily, sending out 100 tons of silt daily. 19 July was the coronation of King George IV. All work ceased at noon and the men were given a good plain dinner and a quart of ale each. At 1 pm, a Grand Salute was fired. On 4 October John Rennie died. He was the third Engineer to die in service with the Trustees.

SIR JOHN RENNIE, 1821 TO 1850.

1850 did not end the appointment of Rennie as Engineer but it is the terminal date for the main considerations of this paper. Following John Rennie's death, there were two candidates for the vacancy. One was a Mr. Chapman of Newcastle and, in the absence of other information, it is assumed this was William Chapman, a good friend of Rennie. The other applicant was John Rennie Junior. There is no further reference to Chapman, perhaps the Trustees considered him too old at 72.

John Rennie attended a meeting of the Trustees on 12 October 1821 and stated 'that as he had been brought up to the profession of Civil Engineer, he hoped he might say he felt competent to conduct the present works at Ramsgate begun by his late father. With the Trustees permission, he would do himself the honour of making a formal application'. This he did, and on 14 December was appointed Engineer on the same terms as his father. In his autobiography, Rennie says that, according to then professional scale, he could have commanded a salary of at least treble the sum of £200 he was given, but he accepted because the appointment was permanent and, upon his retirement, should be entitled to an adequate pension. As such, he thought it better not to decline.

King George IV arrived unexpectedly with the Royal Squadron at Ramsgate on 8 November 1821, on his return from Hanover. The original plan was to land at Margate, but the King had been so gratified at the reception he had had when embarking at Ramsgate the previous September, that he considered it a just compliment to return there. In December, the Trustees received a letter saying that, in consequence of the zeal and loyalty expressed to the King by Ramsgate, the Harbour was to be nominated a Royal Harbour and to raise the Standard on suitable days. An obelisk of stone, provided free from the quarries at Dublin, and designed by Shaw, was erected in honour of the visit. The first stone was laid by Lord Liverpool, then Prime Minister, in November 1822 and the work was completed in 1823. A collection of gold and silver coins of the realm, 12 English farthings, one penny, an Irish halfpenny and a new Coronation Medal sent by the King, were deposited in a hermetically sealed glass box and placed in an aperture cut in the solid granite.

Shaw prepared a drawing for a new Jacob's Ladder (the third), this time of stone, to be built into the side of the cliff. It was opened to the public in 1826 and Shaw received a fee of 100 guineas. The ladder apparently had other uses than legal communication between cliff top and pier, for it offered facilities for smuggling coin and plate. Young boys, employed locally, were sent to carry parcels to and from the cliff where they were met by someone coming up the ladder. The boys' masters kept at a considerable distance to avoid detection.

By 1830, the first signs of serious deterioration of the west pier appeared when several cracks were observed in the lighthouse. Martin considered that the shape of the pier heads caused serious eddies when the sluices ran violently. The whole basin of 30,000 tons of water was let go

THE CONSTRUCTION OF RAMSGATE HARBOUR

in 15 minutes, it was no wonder the violent force broke up the chalk and eroded the foundations.

In 1835, Sir John Rennie (knighted in 1831 for his work on London Bridge) made a report on the state of the 'great entrance' to the basin. He considered that it should be increased in width to 40 feet and deepened by 2½ feet. 30,000 cubic feet of Cornish granite would be required. The improvement was completed in 1837 and the Duke of Wellington, in the Trinity House steam yacht *Vista*, was the first to pass through. A wing wall was built on the east side of the new entrance. It had eight rectangular openings to allow waves to pass through, preventing any recoil which might inconvenience ships entering the basin.

In February 1838, to augment the dry dock facilities, a Morton's (of Edinburgh) Patent Slip was installed in the outer harbour alongside the east pier at a cost of £14,000 and is still used. It is capable of handling ships up to 500 tons. A travelling cradle, running on inclined rails is lowered down the ramp and immersed. The ship is floated on, secured and hauled up by a winch. The ribs, originally 10 feet apart, are firmly attached at the middle and ends to long oak bearers supported by rollers at 3 feet centres. Pawls prevent the cradle from running back.

Following the collapse of some twenty feet of lower courses of stone in the west pier head in 1840, the head and lighthouse were re-built at a cost of £20,000. The new pier head was circular, thus offering less obstruction to the currents, sluice running and vessels entering the harbour. The solid masonry below LW mark was of hard Whitby sandstone and the upper part of Cornish granite. The outer walls were let 5 feet into solid chalk.

1840 saw the first screw steamer, the *Archimedes* arriving at Ramsgate with I.K. Brunel on board after trials between Dover and Calais. A three masted topsail schooner engined by the Rennie Brothers, her screw propeller was designed by Sir Francis Pettit Smith. Her progress across the harbour was regarded with 'wonder and astonishment' as she showed no visible means of advance.

John Shaw's new lighthouse, placed 31 feet westwards, was built of best Cornish granite at an estimated cost of £900. It was kept shorter than the previous light which had come in line with the gas lights on the cliff. The lighthouse, designed in 1841, was lit for the first time in July 1843. The Harbour Master and his Deputy went out to the Small Downs to observe it. They found it distinctly visible although there was a hazy moon and heavy spray covered the boat. Andrew Turnbull, the Master Carpenter, invented a self-registering tide gauge which was fixed in a well in the lighthouse. Sir John suggested that a time register should be fitted to the gauge. Mr Dent, a chronometer maker of London, made and fitted one in the following year. The pole of the gauge is connected with a cylinder carrying a roll of paper on which a pencil attached to the hand of the clock records the rise and fall of the tide. The diagrams are still sent regularly to the Admiralty for the Hydrographic Office, the first being sent in 1844.

In 1846, Sir John Rennie was asked to furnish an estimate for a new steam dredger of 25 or 35 hp. The design submitted had one set of buckets in the middle of the vessel to dredge mud and silt. If it were necessary to dredge chalk, this would have to be broken up first. The quoted prices were £7150 for 25 hp and £7750 for 35 hp. The 25 hp model was chosen because one built by the Rennies for the Government had been seen at Chatham. It was to have two different sets of buckets for chalk and mud. Despite an estimated delivery date of early 1847, it was not until April 1848 that it arrived in Ramsgate, having been towed from London by the Trustees' tug. It was late in the year before it was working properly, the bottom plate of the boiler having given way at one stage.

Also in 1846, the South Eastern Railway was completed from Ashford to Ramsgate and a twice daily steamboat service to Ostend, by the vessels *Princess Maud* and *Princess Mary*, was started. Sadly this was not a success for the service finished within three years.

The clock in the clockhouse was also replaced in 1846 by an 8 day Tunnell clock supplied by Dent. It had four gas illuminated dials 5 feet diameter and cost £200 complete. It was similar to the one installed at the Royal Exchange, London. The clock mechanism was fixed in the same room as the meridian line, the hands being driven by vertical rods to prevent deterioration of the clockwork from the gas lighting behind the dials. At Dent's suggestion GMT was kept at Ramsgate for the convenience of shipping from 1 November, 1848.

By 1849, Sir John's salary was reduced to £105 per annum. However, it was raised to

THE CONSTRUCTION OF RAMSGATE HARBOUR

200 guineas in 1850, assuming that he would make more frequent visits to Ramsgate.

In July, 1850, Lt. Burstall RN, surveyed the harbour entrance and approaches in HM Steam Vessel *Widgeon*. Soundings were taken to a standard level for LW springs. To ensure accuracy, two sets of soundings were recorded, one taken with a rod shod so as not to pierce the sullage and the other with a sharp pointed rod to reach the chalk.

The final work of Sir John Rennie in the harbour during the period of this paper was further repairs to the west pier walls. Late in 1850, he was reporting that a 45 feet long by 8 feet wide dam was in place by the third 'kant'. After the water had been pumped out, he found the bottom of the gully 2 feet below the masonry resting on the caissons. The chalk on which the caissons rested was soft, porous and readily crumbling. Six feet from the wall, the bottom of the gully was 3'-4" to 3'-9" below the caisson stonework. He concluded that it would all have to be repaired by underpinning to at least one foot below the intended bottom of the gully, until it rested on solid chalk.

The revenue to the harbour collected by the enforcement of tolls on ships passing east or west of the Goodwin Sands is another story that has been recorded elsewhere. But it was through these tolls that, in 1850, events occurred that marked the beginning of the end of the Trustees' control of the Royal Harbour. A motion was to be placed on the House of Commons list for 11 June 1850, by a Mr Mackinnon, Member for Lymington, for a Select Committee to enquire into the 'Revenue, Conditions and Expenditure of this Trust of Ramsgate Royal Harbour'. It appears that he was wanting a reduction in the existing toll rates, something that the Trustees were already considering. The Trustees met the Lords of the Admiralty to ascertain their opinion of the matter. Their Lordships undertook to confer privately with Mackinnon. As a result it was understood that he had promised to withdraw the motion. He did not honour his promise, however, and the motion was brought forward and carried.

On 13 December, 1850, the Trustees received a statement summarising the Select Committee report. There appeared to be various discrepancies between the Report and the evidence on which it was presumed to have been founded. The Trustees felt that little use had been made of the detailed evidence submitted. They considered that the scheme, as put forward, would not maintain Ramsgate as an efficient harbour of refuge. That report and its findings are not part of this paper.

POST 1850

Whatever might have been the private or public opinions about the harbour, the last 127 years must surely have demonstrated its usefulness. A few historic facts about the harbour after 1850, will add some justification to the pioneers of the project. The harbour passed into the hands of the Board of Trade in 1862 and passing tolls were abolished. It reverted to Ramsgate Corporation in 1934 and is now under Thanet District Council.

The London, Chatham and Dover Railway opened a station near the harbour in 1863. In 1919, a plan was drawn up to establish a train ferry terminal in the harbour but abandoned for reasons unknown. The harbour was in action during both world wars with troop movements including the Dunkirk evacuation.

The first public hovercraft service in the world commenced operating from a hoverport apron within the harbour in 1966 when the small Westland SRN 6 craft conveyed passengers to Calais or on pleasure trips to the Goodwin Sands. When the larger, vehicle carrying hovercraft came along, the hoverport had to move down the coast to Pegwell Bay. If the early pioneers of the harbour envisaged accommodating ships of up to 300 tons in the outer harbour, what would they have thought of 900 ton Volkswagen car carriers using the basin in 1974, for the regular weekly importation of vehicles. The large ships now have a new concrete pier in the outer harbour and there is a drive on/drive off jetty. The whole of the basin is now a marina with floating berths. Although the majority of the original buildings have long since gone and most of the harbour walls have been renewed, yet the overall outward shape of the place, apart from the advanced pier, has not changed for over 225 years. The Royal Harbour must surely live up to the expectations of John Smeaton when, in 1791, he wrote:

If everything (in the harbour) is duly, properly and attentively performed, I doubt not but to see the time when it will be said, notwithstanding its misfortunes and the obloquy that occasionally has been cast upon it, to be worthy of the expense it has incurred.

THE CONSTRUCTION OF RAMSGATE HARBOUR

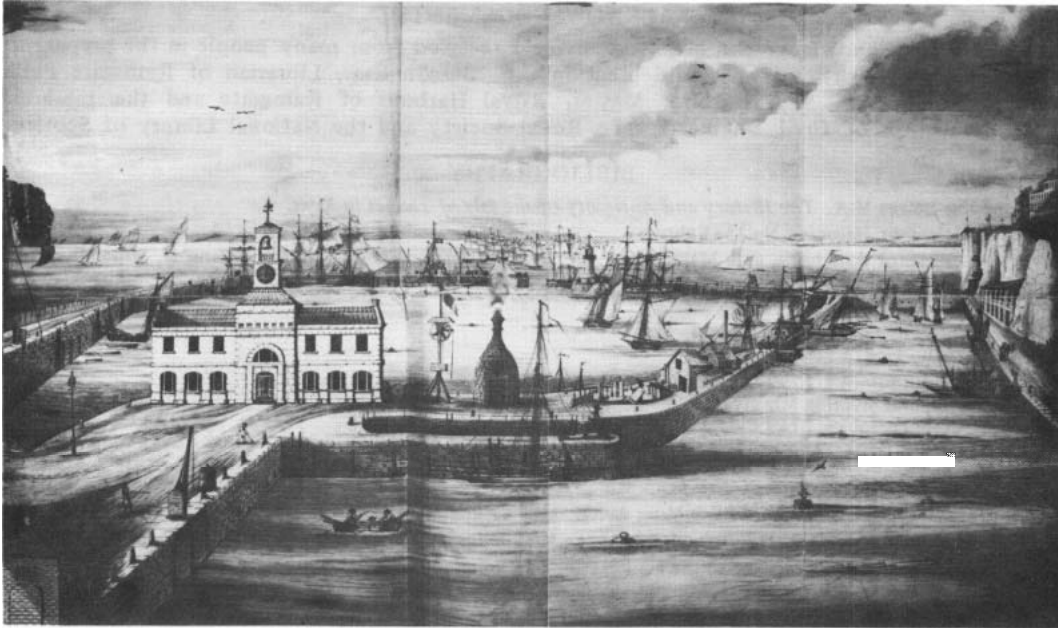


Fig. 17. **K.B. Martin's drawing** of Ramsgate Harbour 1828. Note the Clockhouse, the Vinegar Bottle, the Dry Dock, and Wyatt's Lighthouse.

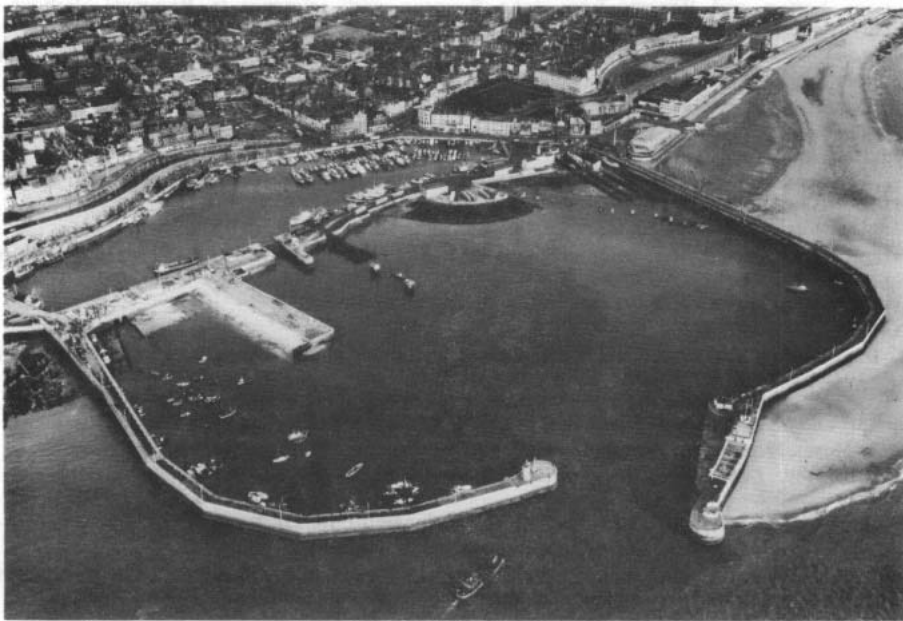


Fig. 18. Ramsgate Harbour from the Air 1975.

Photo: Aeromarine Photos Ltd.

THE CONSTRUCTION OF RAMSGATE HARBOUR

ACKNOWLEDGEMENTS

I wish to acknowledge the help and advice I received from many people in the preparation of this paper. In particular I would mention C.E. Busson Esq., Librarian of Ramsgate Public Library; Captain J.B. Sey, Harbour Master, Royal Harbour of Ramsgate and the Librarians of the Institution of Civil Engineers, The Royal Society and the National Library of Scotland.

BIBLIOGRAPHY

- 1736 John Lewes M.A. *The History and Antiquity of the Isle of Thanet in Kent.*
1745 *Gentlemens Magazine* No.15, February.
1749 An Act for Enlarging and Maintaining the Harbour of Ramsgate and for Cleansing, Amending, and Preserving the Haven of Sandwich. (22 George II, cap 40.).
1749 *Gentlemens Magazine* No.18, March.
1749 *London Evening Post*, August 8 - 10.
1749 Trustees of Ramsgate Harbour:
to Minute Books, 1792 - 1862. MT22/32-46.
1863 General Meeting Minutes, 1749 - 1858. MT22/47A to D, 54-56.
Report Books, 1749 - 1862. MT22/48-51.
Letter Books, 1836 - 1863. MT22/17-31.
H.M. Journals, June 1812 - February 1859. MT22/14-16.
(Public Record Office).
1754 *The Kentish Post or Canterbury News Letter*. May 11 and May 29.
1755 Percy Brett and J.P. Desmaretz. *Report and Estimate subjoined relating to the Harbour at Ramsgate.*
1755 True State of Facts relating to the Contracting of Ramsgate Harbour.
1756 State of Facts relating to Ramsgate Harbour, Preliminary Bill.
1756 A Bill for making a more Safe and Commodious Harbour at Ramsgate.
1774 *Report of John Smeaton, Engineer, upon the Harbour of Ramsgate*, 24 October 1774. - (Ramsgate Public Library).
1774 Letters, Reports and Estimates by John Smeaton on Ramsgate Harbour, 1774 - 1789. - (Ramsgate Public Library).
1777 Various Letters and Reports from John Smeaton with reference to Ramsgate Harbour, 1777 - 1788. - (National Library of Scotland).
1781 *Smeaton's Machine Letters*, 4 volumes, 1781 - 1790. - (Library of the Institution of Civil Engineers).
1789 Rennie's Notebook. - (Box 25.3. Acc.5111. Nat.Lib. of Scotland).
1791 John Smeaton. *An Historical Report on Ramsgate Harbour.*
1795 Graeme Speare. *Chart of Channel from Downs to Ramsgate Harbour. Nautical Description, Sailing Directions and Tides.*
1796 An Act for Amending an Act - Maintenance and Improvement of the Harbour of Ramsgate. (37 George III, cap 86).
1799 Rennie's Notebook. - (Box 26.34. Acc.5111. Nat.Lib. of Scotland).
1799 Various Reports and Letters of John Rennie and (Sir) John Rennie, 1799 - 1821. - (National Library of Scotland).
1802 Robert Edward Hunter. *A Short Description of the Isle of Thanet.*
1809 Rennie's Notebook. - (Box 26. Acc.5111. Nat. Lib. of Scotland).
1812 M. Dixon. (Ed). *Reports of the Late John Smeaton made on various occasions in his employment as a Civil Engineer.* - 4 volumes.
1814 An Act to Alter and Amend two Acts made in 32nd and 37th years of his present Majesty, for the Support and Maintenance of Ramsgate Harbour in the County of Kent. - (55 George III, cap 84).
1817 Henry Moses. *Picturesque Views of Ramsgate Harbour and an Historical Account of Ramsgate.*
1817 E.W. Brayley. *Delineation, Historical and Topographical, Isle of Thanet and the Cinque Ports.* - Volumes 1 and 2.
1821 J.W. Spranger, Rear Admiral. *Harbour Life Saving Apparatus, Ramsgate.*
1822 Harbour Master's Journal, Ramsgate - (Ramsgate Public Library).
1831 Kenneth Beacham Martin. *A Brief History of the Origin and Progress of the Royal Harbour of Ramsgate.* (Transcribed from the original manuscript by Robert B Matkin, 1975).
1837 M. Taylor (Ed). *Report of Late John Smeaton*, 2nd Edition, 2 volumes.
1837 A Naval Officer. *A Brief History of Dover and Ramsgate Harbours.*
1839 Kenneth Beacham Martin. *On the Necessity for Harbours of Refuge.*
1840 Report of the Commissioners appointed to Survey the Harbours of the South Eastern Coast. - (House of Commons).

THE CONSTRUCTION OF RAMSGATE HARBOUR

- 1850 Report of Select Committee on Ramsgate and Margate Harbours. - (House of Commons).
1854 Sir John Rennie. *Theory, Formation and Construction of British and Foreign Harbours*.
1862 Samuel Smiles. *Lives of the Engineers*, Volume 2.
1875 *Autobiography of Sir John Rennie*.
1900 Chronicle of Important Events, Alterations and Repairs to the Royal Harbour of Ramsgate. - (Ramsgate Public Library).
1938 *John Smeaton's Diary of his Journey to the Low Countries, 1755*. - (Newcomen Society, Ex.P. No.4).
1950 Catalogue of the Civil and Mechanical Designs, 1741 - 1792, of John Smeaton, FRS, preserved in the Library of the Royal Society. - (Newcomen Society Ex.P.No.5).
1953 J.H. Andrews. *The Thanet Seaports, 1650 - 1750*. (*Archaeologia Cantiana* 66).
1963 C.T.G. Boucher. *Life and Work of a Great Engineer - John Rennie, 1761 - 1821*.
1972 Janet Munslow. *Ramsgate Harbour, 1748 - 1862. The Study of a Harbour of Refuge*. (University of Kent M.A. Thesis).
1973 J.M. Robinson. *Samuel Wyatt at Ramsgate*. (*Architectural History* Volume 18, 1973).
1974 Robert B. Matkin. *Smeaton at Ramsgate*. (*Quest - Journal of the City University*, No.28).

DISCUSSION

Mr. N.D. New asked for a definition of the word caisson as used in the paper. Mr. Matkin said that it was a chest for carrying stone down to the sea bottom; Professor Skempton added that the sides were detachable and the timber bottom was left under the deposited stones.

On a question by Mr. Rex Wailes regarding the vein of soft chalk, Mr. Matkin said that this was common in the Thanet area. Mr. W.J. Allen asked about the erosion which had been noticed in Smeaton's time. The Author replied that this had been caused by the operation of the sluices. They were opened when the water in the inner basin was much higher than that outside in order to scour away silt from the outer harbour. The stream undermined the foundations of the sluice's entrance. Mr. Wailes said that the same effect had been noticed in Holland and Mr. J.C. Robinson asked how often the sluices were used now. Mr. Matkin replied that they were operated in this way about once a year and for the rest of the time the harbour was dredged. How this would be affected by the use of the harbour as a Marina is not clear.

Mr. K. England asked whether a survey had been made of stone quarries before the construction of the harbour. Mr. Matkin said that visits had been made to Purbeck, Portland and Whitby and the most suitable stone for the purpose had been selected; stones that had been used were subject to the worm. It was later found that the best choice had not been made.

Professor Skempton asked why there was a wooden floor to the dry dock; did they want the water to come through? Mr. Matkin replied that the reason appeared to have been because springs of water came up through the chalk, possibly through fissures, and these springs, under pressure from penned in water in the basin, were more easily dispersed under a wooden floor than under one made of solid stone.

Miss J. Elton asked whether the timber floor had been replaced by masonry. The Author replied that there was no evidence that such a replacement had been made, if there is now any timber in the bottom of the dock it is probably some of the original.

Mr. Robinson asked whether the Trustee building was still in existence. Mr. Matkin replied that it was demolished at the beginning of this century. Extensive criticism had been levelled in the mid-19th century against the building of such an edifice. It is interesting to note that the cover of the dome was a tinned copper sheeting, a new process developed by Wyatt's cousin Charles. Mr. Wailes said that he thought this was the Braby tile.

Dr. Denis Smith asked whether there was any reason given for the Trustees reducing Rennie's salary? The Author knew of no reason, but Professor Skempton suggested that it was probably made to draw Rennie's attention to the fact that the Trustees wanted him to attend to his duties at Ramsgate more regularly. Mr. Matkin said the Trustees had spent some of their income in somewhat unusual ways, one being the purchase of a copy of a painting of Smeaton for the Trustee building.

THE CONSTRUCTION OF RAMSGATE HARBOUR

Mr. K. England asked about the recording tide gauge; was the one at Ramsgate the first in this country? The Author replied that the one now at Ramsgate was not the original, it having been installed some 20 to 30 years after the installation of the first tide recorder in 1818 or 1819. The charts are still sent to the Admiralty.

Mr. J.W. Butler had received a letter from Mr. M. Standen and part of this was read to the audience. Since 1967, Mr. Standen had kept a sailing boat in the Ramsgate inner harbour and he reported that dredging of the inner harbour was performed rather ineffectively by a grab dredger. There had been an anticlockwise current in the inner harbour which made it difficult for ships entering but this difficulty had been cleared by the building of the new spur. The east entrance to the inner harbour was walled-up many years ago and a drawbridge is now in position over the one remaining entrance. The graving dock is now partly covered in and there are still stone bollards in the basements of the warehouses beneath Military Road.

Professor Skempton said that he had come across a fifty page manuscript document of evidence given about Ramsgate harbour to a Parliamentary body.

Mr. Matkin said that the Admiralty had looked into harbours of refuge on the Kent coast. The sites chosen had been placed in the order Dover, Foreness Point and Dungeness; Ramsgate harbour had been considered but it was not deep enough, so Dover was chosen as the Harbour of Refuge. Mr. Wailles mentioned that there would be difficulties if Margate had been chosen and Mr. Matkin said that if the Margate jetty ever went the lower parts of the town could be flooded during high tides and a heavy NW to NE wind; the same would happen at Ramsgate if the harbour were not there. The Author added that some of the information that he had acquired on the Ramsgate harbour came from a selection of about 100 drawings by Smeaton, Rennie, Shaw and Wyatt which the Ramsgate Harbour Authority had been about to destroy; fortunately the Authority had contacted the Librarian of Ramsgate Public Library and the drawings are now there.

Mr. J.W. Butler asked about the cast iron parts which had been replaced by wrought iron. The Author replied that wooden handles had been fitted to operate the sluice gates but these were not strong enough. They had been replaced by wrought iron handles which proved to be completely satisfactory.

Mr. New asked about the two floors in the warehouses. Mr. Matkin replied that a roadway (the Military Road) had been built over the warehouses and leading from the harbour to the top of the cliffs.

Mr. Michael Bailey proposed the vote of thanks. The Newcomen Society was recognised by the quality of its papers and this paper fully maintained this standard. The vote of thanks was passed with acclamation.