



CHAPTER XVII

THE MOLE AND HARBOUR

THE story of the English Occupation of Tangier would be incomplete without some account of the building of the Mole, the greatest engineering work till then attempted by Englishmen.¹ It has been seen that without two essentials, a good harbour, and an effective seaward line of defence, Tangier was practically useless; its value as a naval station and as the starting-point of a colony was nothing, unless ships could ride in the bay without fear of storm or enemy. If the successful building of the Mole were impossible, the Occupation was foredoomed to failure, and the money spent upon it irretrievably lost. From the very beginning this question was one of the chief points to engage the attention of the Government. Before the Portuguese treaty was signed Charles had learned, on good authority, that the harbour, though naturally poor, was capable of improvement. The Occupation was scarcely accomplished when Lord Sandwich, in accordance with instructions from home, made a survey of the bay in order to find the best position for a Mole, which should afford protection to shipping from the violent storms of the Atlantic and the strong Levant winds.

Four months after the establishment of the Tangier committee a contract for building the Mole was given by it to Lord Rutherford (afterwards Earl of Teviot, Governor of Tangier), Sir John Lawson, and Mr (afterwards Sir

¹ The principal authorities for this chapter, besides letters from the Engineers and Governors in the State Papers, are "An Account of the Mole at Tangier," by Sir H. Cholmley, and "A Short Account," etc., by Sir H. Cholmley, and the Dartmouth MSS., Report, and Rawlinson MSS., A. 341 (Bodleian Library).

Hugh) Cholmley. The price agreed upon was 13s. per cubic yard.¹

The site chosen by Sandwich was on the north side of the bay, where a ledge of rocks afforded a natural though inadequate protection from the Atlantic. The work was put in hand under the immediate supervision of Mr Cholmley, who acted as resident-engineer from 1663 to 1674.² He had made a special study of the subject and had gained practical experience in the construction of a pier at Whitby. The circumstances at Tangier, however, added enormously to the usual difficulties of such undertakings.

Cholmley came out in June 1663, bringing with him "about 40 masons, miners, and other proper artists and workmen," whom he had with difficulty persuaded to come to "a place where, in the beginning, so many men had died." The main work of the Mole was eventually done by soldiers of the garrison.³

The foundations were begun in August 1663, but for

¹ C.O. 279, 2, 16-21. Contract for the Mole, 30th March 1662/3, also Rawl. MSS., A. 341, f. 95 (copy). "A Mole or Peere of Stone," from York Castle 400 yards E.N.E. and thence 200 yards E.S.E.; 30 yards broad in foundation; 20,000 cubical yards to be completed before 30th June 1664, and yearly at least 30,000 cubical yards, till finished. Also a lesser piece from the east end of the city to the great Mole, with mooring posts and rings. The Commissioners agreed to advance £2,000 for tools and materials, to be deducted from future payments; 13s. per cubic yard to be paid quarterly.

£3,250 in April next.

£3,250 in October next.

£3,250 in January next.

The Mole to be kept in repair for five years after completion, at £6,000 per annum.

The contract not to hold good if the contractors cannot get stone within three miles of Tangier in safety.

² He was the third son of Sir Hugh Cholmley of Whitby, Kt. and Bart; born at Fyling Hall, Yorks, 21st July 1632; educated at Paul's School and Trinity Hall, Cambs. Succeeded his nephew in the baronetcy, 1665; married in 1655 Lady Anne Compton, eldest daughter of the Earl of Northampton; he had two daughters; died at Whitby 9th January 1688; buried in Whitby Church (Cholmley "Memoirs").

³ Rawl. MSS., A. 341, 24, 10th March 1672/3. Mem. that thirty-six seamen were employed on the Mole, and fifteen Italians and Dutchmen, the rest soldiers. Cholmley mentions "a gang of 5 stout and laborious Irishmen" killed or hurt by an accident at the quarries, October 1671. Prisoners were sometimes set to work on the Mole; but this custom was discouraged by the resident-engineer. In April 1678, two hundred and forty-eight men were at work on the Mole, and also some slaves, formerly belonging to the Tangier Galleys (C.O. 279, 22, 146).

some time progress was retarded by the want of materials. In February 1664 Cholmley was called home by the death of his elder brother¹ and did not return till 18th January 1664/5, when he found that more delay had been caused owing to his workmen "being forced to the duty of soldiers," after Teviot's death in May 1664, while "crosse weather" also hindered the work. A survey made immediately after his return shows that 10,558 cubic yards had been thrown into the sea to form the base of the work.²

The engineers soon found that the cost of the work had been considerably under-estimated. Sir Hugh Cholmley, in enumerating the special difficulties in his way, pointed out that the Mole was 1,200 miles from any English possession, and that it was the first great pier ever undertaken in deep tidal water. Other difficulties were, the softness of the stone from the local quarries, the uncertain weather, and "the very bad and dilatory payment by tallies" anticipated from twenty-four to thirty months, "notwithstanding Sir Hugh Cholmley his daily complaints." "Instead of money," he said, "he never got anything but orders upon the Exchequer, which were scarce passable upon any terms."

Finding it impossible to carry on the work at the original contract price, Cholmley and Lawson, the two surviving contractors, represented their difficulties to the Commissioners, and the price was increased to 17s. per cubic yard, by an Order in Council of 31st March 1665.

After Cholmley's return, rapid progress was made on the Mole. He soon had about two hundred soldiers at work under his energetic supervision, and would have liked a hundred or two more if they could have been spared from the fortifications. The winter of 1664-65 was very stormy, and Cholmley said he found it hard to keep the men to their work, as they and he also were daily wet to the skin both by sea and rain.

Fortunately plenty of stone was found close at hand,

¹ Sir William Cholmley, Bart., died in 1663, and was succeeded by his son Hugh, who died 2nd July 1665, when his uncle, Hugh Cholmley of Tangier, succeeded to the baronetcy.

² Fitzgerald, Lieutenant - Governor, to Lords Commissioners, 25th January 1664/5 (C.O. 279, 4, 15).

which, though soft at first, soon gathered "a mossy coat," and hardened in the water. The stone quarries, named "Whitby" by some Yorkshire miners, lay close to the shore just west of Tangier. The stone was blasted, says Cholmley, by means of mines both large and small, *i.e.*, small drill mines, blasting about 200 or 300 tons of stone, and large ones with 30 barrels of powder, which brought down as much as 10,000 tons.

The stone was at first carried to the Mole by boat, but stormy weather made this so difficult that Cholmley had carts built, and brought it along the shore.¹ He also built "a little town" at Whitby, with quarters for the workmen and their families, stabling for ninety horses and store-houses for provisions and materials of all sorts. Oak for piles, and "deales," were usually sent out from home, though Cholmley sometimes obtained very good wood from Spain.

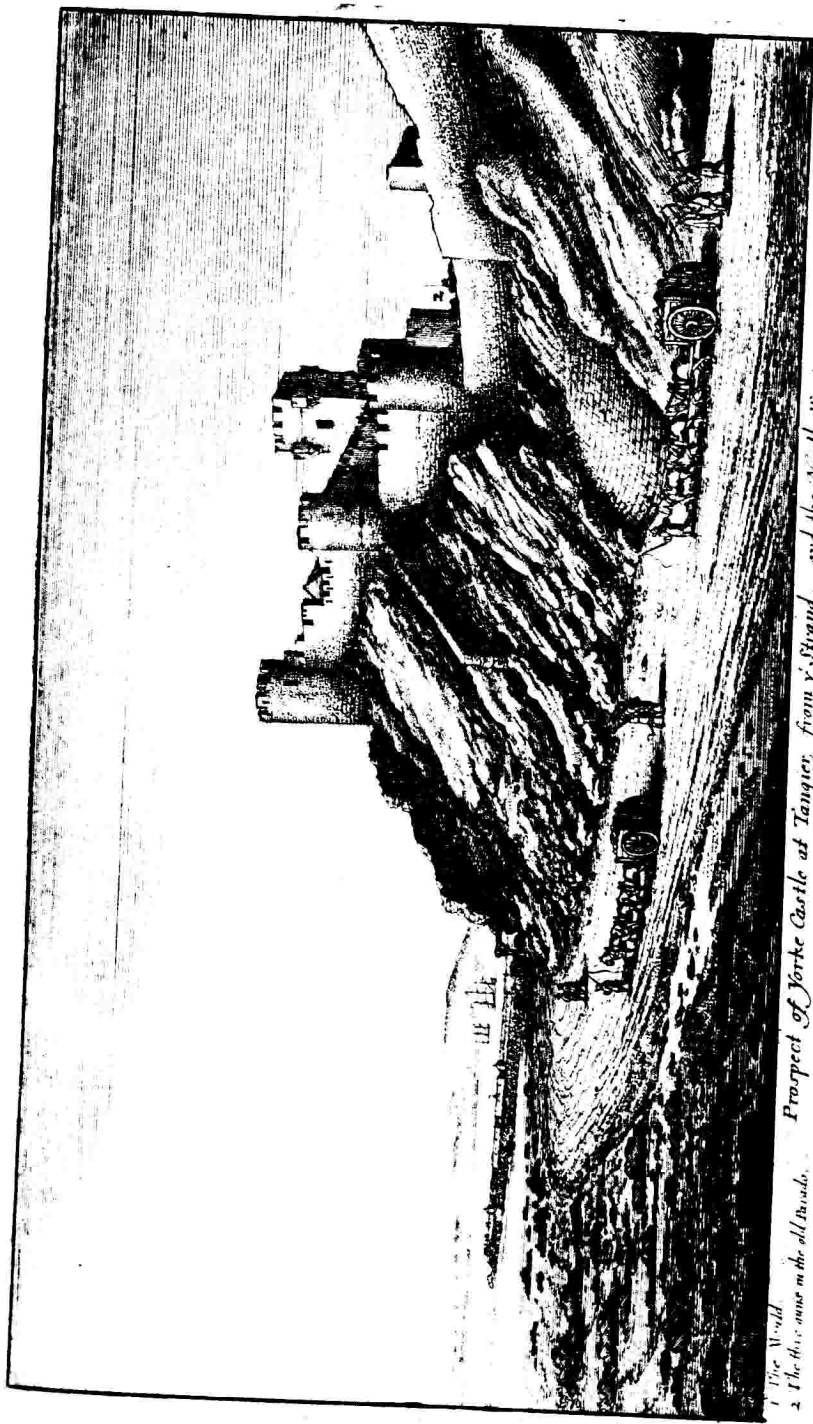
Though many complaints were made of neglect and delay in the work, the harbour being still very unsafe, the Mole was so far advanced in 1665 that a battery of guns was placed on it in time to be of incalculable value during the Dutch war, when the town would otherwise have lain open to an attack from the sea.

The want of money, however, again called Sir Hugh to London. He found it impossible to obtain credit, and could get only "tallies and orders upon the Exchequer which could never be negotiated but with great loss," and he was "further perplexed with an intricate accompt of interest." During his absence from Tangier he appointed Major Taylor his deputy. Much of the actual work was carried out by Henry Shere,² a young and afterwards well-known engineer, who shared with Cholmley the responsibility for the Mole.

There was, unfortunately, frequent friction between the engineers and the military authorities at Tangier; Colonel

¹ In 1678 both methods were in use; there were forty-four horses "w^{ch} drawes in ye carts y^e carie stone" besides several "lighters, sloopes and other intarcations which float greate stones to ye head of ye worke." R. Bolland to Lords Commissioners, 12th April (C.O. 279, 22, 146).

² Sir Henry Shere (or Sheeres). Date of birth unknown. Died in 1710. He wrote several technical and other works. Served in the campaign against Monmouth as an artillery officer ("Dictionary of National Biography").



The World. Prospect of York Castle at Tangier, from y^e Strand, and the North West.

1. The Mould.
2. The three guns in the old Parado.

YORK CASTLE FROM THE NORTH-WEST.
BY WENCESLAUS HOLLAR.

20 inches diam of type

[To face p. 346.]

Fitzgerald, when Lieutenant-Governor, refused to make allowance in his survey of the Mole for anything that he could not see, while Cholmley, not unnaturally, wished to be paid for the foundations which had sunk in the sand, and asked that the cubic yards might be measured by the quantity of materials brought in carts and boats to the Mole, as the sinkage made it very difficult to measure up afterwards the amount of material used.

Colonel Norwood, Lieutenant-Governor in 1666, tried to impose his own ideas on the engineers, who did not proceed as quickly as he thought they ought to do. In two years, he said, they could easily make a good harbour for fourth-rate frigates, if they would only push on the work instead of stopping to strengthen and secure that which was already begun. The difference of opinion is expressed in the following letter written by Norwood to Lord Arlington, during Cholmley's absence in England:—

"I had much adoe to persuade Major Taylor (Sir Hugh Cholmley's cheefe ag^t in this worke) to forbear filling up a great unnecessary peece joyning to the Castle and to imploy all his force to lengthen his worke into the sea, he pretended Sir Hughes especiall commands to finish the first 200 yards before he went on, but I hope the liberty to hinder him by force, and after prevayled uppon him to begin another 50 yards forwards w^{ch} will be done by Christmas to the great advantage of our harbour, wherein we evry yeare lost all our boates w^{ch} by this meanes will be preserved and all small vessells of trade secured.

"Perhaps Sir Hugh will complayne at my straining a point of my authority by intermeddling in the worke of the Mole but I hope his Ma^{ty} will be pleased to justify me herein, I had not patience to see them worke backwards at soe great expence to his 'chequer, since that peece (if it be needfull) may as well be made 7 yeares hence as now, and now can be of no more use to the Mole then the making a Causey at Edinburgh."¹

Sir Hugh tried in vain to bring the Lieutenant-Governor to a more compliant mood by offering "to reward the services the Co^l should do." He complained that despite his advances,

¹ Causeway (?), Norwood to Arlington, 31st August 1666 (C.O. 279, 6, 88, 89).

Norwood persistently sent home undeservedly unfavourable reports of his work.

In August 1668 the Earl of Sandwich was instructed to make an exact survey of the Mole during his visit to Tangier. This he did with the help of Mr Shere, and a favourable report was drawn up, showing that 380 yards of the work were now completed.

In the following year the original contract was cancelled as Cholmley was the only surviving contractor, Sir John Lawson having been killed in the Dutch war. An Order in Council of 27th August 1669 established a department or office for the Mole, under Sir Hugh Cholmley as Surveyor-General.¹ A scheme or "model" drawn up by Sir Hugh² provided that "In the executive part there should be a constitution of the following principall Officers of the Mole."

The Deputy Surveyor. The Comptroller. The Clerk Examiner.	{	Two of these to be a quorum and to meet in an office Saturdays in the afternoon, or as occasion shall require.
---	---	---

These officers were personally to supervise the placing of the stones, work in the quarries, and the loading and despatch of carts and boats.

The *Deputy-Surveyor*, to act in the absence of the Surveyor-General.

The *Comptroller*, to examine all building materials and pass them if fit.

The *Clerk Examiner*, to keep books of all things ordered and done at the office, and the account of men working on the Mole, to be given him by the Muster-Master.

Of officers of lesser note two are essential.

1. The Storekeeper, to keep books of all stores received.

¹ Cholmley, "Short Account of the Mole," etc., p. 3. "Some necessity appearing to proceed in the future work in a more solid way than the contract seemed to oblige, the carrying on of the work was reduced into an Office by Order of the King in Council dated the 27th August 1669, under the care of Sir Hugh Cholmley as Surveyor-General, who framed the method for governing the work and issuing the money under such checs . . . that it hath not since met with one single amendment." Cf. C.O. 279, 12, 96.

² C.O. 279, 12, 97 *et seq.*

2. Muster-Master, to muster the workers four times a day, and take their names.

The Surveyor-General and one or more officers to examine the accounts regularly, and give warrants on the treasurer accordingly. This model was examined and approved by Christopher Wren and Jonas Moore. It was considered by the Commissioners that salaries should be paid as follows:—

	Per Annum.
To the Surveyor-General	£1,500
The Deputy-Surveyor (Major Taylor)	500
Comptroller (W. Wickham)	250
Clerk Examiner (H. Shere)	250

All these officers to take an oath to carry on the work to His Majesty's advantage (approved and passed 27th August 1669). The salaries paid to minor officials were as follows:¹—

	Per Annum.
Clerke of Stores (Woolaston)	£80
Muster-Master (Sandford)	80
Captain R. Bolland	100
6 overseers	80
	50
	60
	50
	60
Chyrurgeon (Spotswood)	60
Clerke to Office	60
Margaret Gotham ye Cooke 19s. a month.	

On 18th April 1670, Cholmley returned to Tangier, only to find his reputation much impaired by serious damage done to the Mole during the storms of the two past winters, which raised a great controversy as to the best method of building to be employed.

Much attention had recently been drawn to the new Mole at Genoa, and a strong body of opinion, led by Henry Shere, was in favour of imitating it at Tangier. The foundation of the Genoese Mole was built with "chest-work,"

¹ Rawl. MSS., A. 341, 23, 24, "Rates of Wages and Sallaries for the Mole," 10th March 1672/3.

i.e., great wooden chests filled with stones and cement, weighing from 500 to 2,000 tons, sunk onto a base of loose stones and rubble; in 1663 some of the Genoese engineers had been invited to a conference at Tangier to give the benefit of their experience and advice, but their system was strongly opposed by Cholmley, chiefly on account of the great difficulty of making and placing chests in an open bay, which was exposed to frequent winds and storms. At Genoa, he argued, the calmness of the sea made it comparatively easy to work with chests, divers were able to level the foundations for them, and it was possible to float them, half-filled, over the chosen site, and then to fill them up until they sank into position with a precision unobtainable in the rough waters of Tangier Bay, where, even in fine weather, 9 feet of tide left only a few hours in each day during which the chests could be filled up. Even at Genoa, he said, the great chests had to be protected by a massive and costly breakwater, itself almost equal to a second mole, which was constantly under repair. The expedient of using boats instead of chests he also objected to, because, though easier to build and fill in a rough sea, they were even more difficult to place and join together; another objection to both chests and boats was the danger of the work falling to pieces as soon as the wood became worm-eaten. Even if it should be found possible to build the Mole with chests, Cholmley was convinced that no solid and contiguous structure could by itself resist the force of the Atlantic, for he had found at Whitby that neither loose rocks nor solid masonry could withstand the heavy seas, but he "happened to observe that a small tree (set up as a mark for shipping) stood the same seas that laid level the body of a work so massy . . . and concluded that this came because the sea had a free passage about the tree." His own plan was to build the Mole in the way then usual, by casting loose stones into the sea up to low water mark, as a foundation, and building on them with great stones cemented with lime and tarrace¹ and cramped with lead and iron. The main work was

¹ Described by Cholmley as "a certain sand made into mortar which hardens in the water. Our Tangier tarras," he said, "took some time to set; that obtained from Naples was very good."

protected by an outer breakwater consisting of three rows of piles, "shod with iron and well steeled at the points," set four feet apart, "the inward piles being set opposite to the vacancy of the outward," thus : : : : : These piles were driven into a foundation formed by *débris* washed loose by the action of the sea from the outer wall of the mole itself, and prevented the further spreading of the foundations; later on, owing to the destruction of the wood by worm,¹ they were supplemented by pillars built of stones of 2 to 4 tons in weight, which were squared and laid in tarrace and bound with iron and lead solder, forming "cubical bodies" 10 to 12 feet square, of 60 to 100 tons weight, set cornerwise to the incoming tide.

The first meeting of the Mole Office was held on 25th April 1670, after a survey of the work done had been made on 19th April. The Mole was now 400 yards long, and Cholmley thought that only 80 or 100 yards more would be necessary (20 yards per annum.) with a "return" of 60 yards to break the Eastern seas. The harbour was already much improved, several frigates "of good draught" having careened there for cleaning. Cholmley himself made very light of the damage done to his work by sea and storm; he asserted that most of the breaches were due only to the inevitable settling of the foundations, and were in any case all on the outside and all above low water mark, while the fallen stones served to strengthen the foundations; he thought that a continuation of his old system, with an extensive use of masonry piles, was all that would be necessary. Public opinion, however, was against him. Lord Middleton, Governor in 1670, wrote home to say that he agreed with Mr Shere, "a person of great ingenuette" that "cheded worke" was the only means of making the Mole valuable. "To speak plain truth," he says, "all that is doeing nowe is but to patch up the reputatnone of the undertaker."

¹ Pepys, writing to Shere, 11th December 1677, mentions that he is sending "a small cask of temper'd stuff design'd for the killing of the worme," which His Majesty would like to have experimented upon in the Mole (Add. MSS., 19872, f. 33).

With some misgivings, Sir Hugh at length consented to try Mr Shere's plan,¹ and on 18th September the first chest was placed, though not without great difficulty, the work being hindered by a strong Levant wind. Shere, after being out all night, sent word to Cholmley of the failure of the seventh attempt to place the chest, he himself having been hurt by a fall; Sir Hugh at once came out to take his place, and at last succeeded in getting the chest placed, though not very firmly, and the wrong side out. There was considerable friction between the two principal engineers at this time, Shere being anxious to push on the new chest-work, while Cholmley concentrated all his efforts on the piles intended to protect that which was already completed.

The work went on steadily during the next two years, and in 1671, H.M. frigate *Roebuck* and the *Dartford* ketch, were able to clean in Tangier harbour in two or three tides, better, with greater safety and less expense than they could have done in any neighbouring port.²

On 24th July 1671, a meeting was held of naval and military officers and all the "principal people" at Tangier, who agreed that it was advisable to make the proposed "return" to the Mole 50 yards long and 5 broad. They also advised the fixing of two chains 100 yards long, "like those in the Thames," to which the galleys might be fastened "head and stern" by means of small chains with rings and swivels.³

Plans sent home in July and August 1670 and February 1671 show considerable progress, the stone pillars and two chests sent out from England stood well, but the Surveyor-General was very anxious about supplies, some ships with stores having been lost. "If timely care be not taken I must be forced to give over the work," he wrote on 1st May 1670, and a little later he said that "if instead of effectually finding money for the service, the answer be in general terms that all care will be had," he would be obliged to interpret this as a command to send in his resignation.

¹ C.O. 279, 13, 56, 10th March 1669/70. "Profile of a desigine for the Molle at Tangier," by Mr Shere (showing proposed position of a great chest), based on that of Genoa, of which a plan is also given.

² Cholmley to Williamson, 3rd May 1671 (C.O. 279, 14, 206).

³ Cholmley to Creed, 14th August 1671 (C.O. 279, 14, 123).

In February 1672 Cholmley again went home, leaving instructions for the continuation of the Mole. A year later, on 14th February, the length completed was reported to be 437 yards, and on 28th February, 440 yards, "the whole walk curiously flagged soe that it is supposed the like walk is not upon the 'Change of London.'" ¹

During the winter of 1673/4 the harbour afforded shelter on several occasions to the *Mary-Rose* and other ships of the Mediterranean squadron, including the *Cambridge*, *Bristol*, and *Roebuck*.² A naval officer wrote on 29th May 1674:—

"When the Mole is finished, as it is now in a good forwardness, there being safe riding for a Shipp of neere 200 tuns within it, being landlocked every way, it will be . . . for all His Majesty's ships a good security."³

Unfortunately for the reputation of the Surveyor-General, the winter of 1674/5 proved disastrous to the Mole, severe storms causing serious breaches, which furnished a good case to Cholmley's rivals, though he said he "knew to cure the evil . . . if the want of money and perplexities of an exchequer account could give him leave to go to Tangier." He assured the Lords Commissioners that he could repair the breaches made by the storms, carry the Mole 100 yards further into the sea (making a harbour of 4 fathoms at low water), and complete the whole in six years. Finding his proposals ill-received, in June 1675 he sent in another, *i.e.*, that £30,000 per annum be paid for the Mole, quarterly and regularly, in consideration whereof he would complete it (to 500 yards) in four years, with a "return" south-east of 100 yards; the work to be inspected yearly and Sir Hugh either to receive a reward or pay a penalty, according

¹ R. Bolland to Cholmley, 28th February (C.O. 279, 16, 285).

² Cf. Laird Clowes, "Royal Navy," ii. 244, 245. *Mary-Rose*, built 1654, 4th rate, draught, 16 ft. 556 tons, 48 guns; *Bristol*, 4th rate, draught, 15 ft. 8 in. 534 tons, 48 guns; *Cambridge*, 3rd rate, 881 tons, 70 guns, draught 17 ft. 6 in; *Roebuck*, 6 ft. 8 in. 90 tons, 10 guns (*ibid.*, p. 11).

³ Rawl. MSS., C. 353, f. 14, 24. "An Itinerary of Our Voyage from ye Booy in ye Noore into the Streights of Gibraltar. In his Maties Shipp *Mary-Rose*, Capt. Tho^s. Hamilton Commander. A.D. 1673/4."

to the work done. When finished, he undertook to keep the Mole in repair for £2,000 per annum.

Cholmley was bitterly disappointed when his estimate was rejected by the Lords Commissioners in favour of a counter-scheme sent in by Mr Shere, who offered to repair and complete the Mole with "great upright chests" at £10,000 less than the amount required by Sir Hugh.¹ Other engineers offered to do the work at a cheaper rate still, but Shere's proposals were accepted, and he succeeded Cholmley as Surveyor-General in 1676.

Sir Hugh was the more disappointed because he had agreed to the use of a modified form of the Genoese system; "he was for building with chests as well as Mr Shere," he wrote, "differing only in the way of placing these chests," which he would have "so placed that the force of the sea should be wholly dissipated by a slope and gradual interception of the waters, after the imitation of nature, that from that position doth in many places guard the coast meerly by a bank of sand."

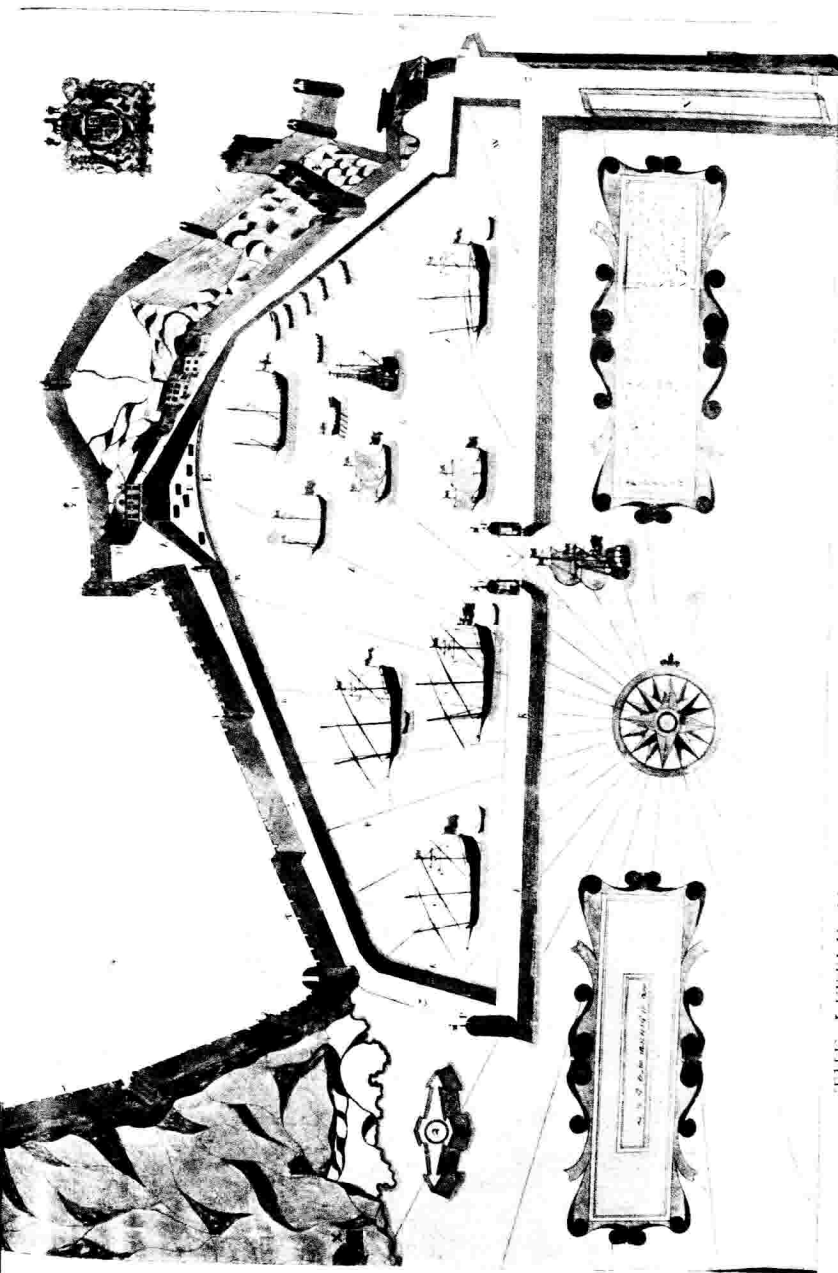
He felt convinced that chests, if used at all, should be not more than 4 feet above low water, for he observed that the lofty perpendicular wall of the Mole at Genoa was more subject to breaches above than below sea-level. Criticising Shere's work, he said: "Chests thus placed wth an upright wall could not be of continuance unless the work was protected in solid and with a slope."

At the time that Cholmley left the work, the Mole, in spite of misfortunes and delays, was the object of much admiration. Henry Teonge, writing of it in 1675, says: "The Mole not finished, but dayly in the summer increased, hath many great gunns on it; and will be (if they goe on with it) a brave safeguard."² "G. P." wrote in 1676:—

"The Mole is in its design the greatest and most noble Undertaking in the World, it is a very pleasant thing to look on . . . now near 470 yards long, and 30 yards broad, several

¹ C.O. 279, 19, 344, and Rawl. MSS., A. 341, 18. Conditions and articles of Contract. Another tender was sent in by Captain Bolland of the Mole Office (Pepys's MSS., 2899, 13).

² 15th July 1675, "Diary," p. 31.



THE LITTLE MOLE, WHARF, AND CUSTOM HOUSE, DECEMBER 1655.

- A. The entrance in y^e little Mole.
- B. The Haven Within.
- C. The Wharf running from y^e Lazaretto.
- D. The place before y^e Custom house.
- E. The Crane Wharffe.
- F. Soldiers Gallie Ample y^e way leading to y^e town.
- G. Tax warehouse under y^e Custom house.
- H. Weighhouse under y^e Custom house.
- I. The Custom house.
- K. East way to y^e Custom house.
- L. West way to y^e Custom house.
- M. Way from Custom house to City.
- N. The Newgate.
- O. New Battery.
- P. The Sentry houses.
- Q. The Lazaretto and Fort.
- R. Wall running within y^e little Mole.
- S. Y^e Ice Tower.
- T. The wall of the Town.
- V. The great Mole.
- W. The place to carry in ships.
- X. Foundation Fort.

pretty Houses upon it and many Families; on the inner side 24 Arched Cellars and before them a curious Walk, with Pillars for the Mooring of Ships. Upon the Mole are a vast number of Great Guns, w^{ch} are almost continually kept warm during fair weather, in giving and paying Salutes to ships which come in and out."¹

Shere began his work as Surveyor-General at the end of June 1676, and was at first fairly successful; he placed one great chest in September in spite of a strong Levant wind and rough sea, and a second was launched in October. Stabling and quarters for the workmen were built on the Mole, as those at Whitby were destroyed by a sudden landslip. In the summer of 1677 several chests were sunk and the necessary repairs were completed.² Sailors from the frigates and merchantmen were called in to help the usual workers, and Colonel Fairborne reported: "Mr Shere's dilligence and care is much to be comended and his sucksess is answerable."

On 22nd October a survey was made of Shere's work; the report shows that eleven chests had been sunk during the past sixteen months.³ In November, the length of the Mole was advanced to 457½ yards.⁴

¹ "The Present State of Tangier," "G. P." 1676. The Mole at this time was not completed to more than about 450 yards, but foundations were commenced as far as 470 yards from the beginning.

² On 4th July the *Craven* chest was sunk, on the 20th the *Anglesey* was placed; on 1st August another chest of 400 tons was reported sunk, on the 10th another of 100 tons, on the 11th a smaller one. On 1st September the *Peterburgh* chest was sunk, and on 5th October the *Coventry*, "a great chest near 1000 ton, w^{ch} in a manner completes the whole repairs." Fairborne to Williamson, October 1677 (C.O. 279, 21, 165).

³ "Survey of the Mole," 22nd October 1677 (C.O. 279, 21, 228). Since Shere's arrival, 24th June 1676, eleven chests have been sunk, which, with other work done, are computed at 116,306 cubic feet in stone and tarras. Dimensions of the various chests follow—the largest is 83 ft. × 30 × 20. The work has been repaired and secured, and advanced 15 ft. since the last survey of 1st October 1676. Quarters, granaries, storehouses and stables have been erected. The report is attested by Narborough (Admiral), C. Shovell, Walwin Gascoigne (Mayor), Fairborne (Lieutenant-Governor), Trelawny, Boynton, Edward Rothe, and others, representing the naval, military, and civil authorities at Tangier.

⁴ Drafts of the Mole (C.O. 279, 21, 287, 22nd November 1677) showing position of the line of chests, i.e., *Charles*, *York*, *Peterborough*, *Anglesey*, *Coventry*, *Old Chest*, *Craven* (in a breach of the slope work) two breaches needing repair and a small chest placed since the last survey.

Shere had many complaints to make of Sir Hugh's work, which he found it necessary to repair. "My P'decessor . . . has had his Quietus from the King, and I wish he may have it likewise in his conscience," he remarked. "The Talud, or slope-work," he said, was built "in a craz'd and feeble manner," the foundations of the Mole were narrow and badly made and the weight of the strong cemented matter, requiring a broad foundation to support it, endangered the whole structure. On December 1677 Shere wrote that during "seven or eight days pritty reasonable weather," he had not lost a minute in repairing the "slope chests," and had sunk three small chests pointing north-east to prevent stones, etc., from washing into the bay from the end of the Mole. In February 1678 he wrote that unprecedented storms had been well withstood, adding :—

"Wee shall be able to careen with ease most of the Frigotts of Sir John Narborough's squadron within protection this summer if the Lords of the Adm^{ty} shall please to order us a convenient hulk for that purpose, on which subject I have by this occasion written to the Com^{rs} of the Navy."¹

Irregularity of payment still hindered the work and exasperated the Surveyor.

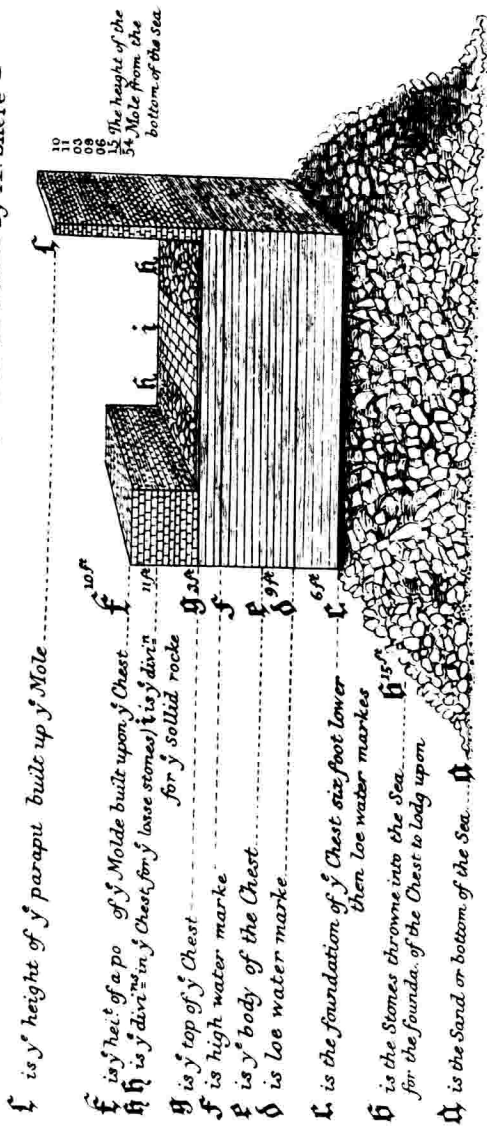
"The want of Sir Hugh Cholmley's arrears is like to prove as fatall to this worke as his conduct," wrote Shere, "and without a very speedy redress in this particular we rowle but Sisyphus's stone . . . this worke is in effect one great Machine, w^{ch} is kept going with half the Force by which it is at first put into motion."²

Notwithstanding the remonstrances of the Surveyor, Pepys, the Treasurer, warned him that he must be careful to buy no materials in advance, for fear of not being able

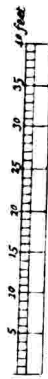
¹ Shere to Lords Commissioners for Tangier, 28th January 1677/8 (C.O. 279, 22, 50).

² Shere to Sir Joseph Williamson, 26th October 1676 (C.O. 279, 19, 230). Cf. Burnet, "History of My Own Times," i. 305, 306. "If the money that was laid out in the mole at different times, had been raised all in a succession, as fast as the work could be carried on, it might have been made a very valuable place. But there were so many discontinuings and so many new undertakings, that after an immense charge the court grew weary of it."

His Maj^{ties} great Chest which contains Sollid of Stone
and Tarris 21,600, cubical feet now Sunk at Tangers
Roade in the Sea — by M. Shere —



An experiment of thirtie severall mixtures of Cement or Tarris
throwne into y^e Sea in bores and there remained thirtie days the
hardest of all y^e sorts was this that is here mentioned.) Five eighths of Roman
Tarris and three of Lime start^{ed} 48 howers beat wth be as fast as war wth as little
water as possible then apply it hot & it will get as hard as stone not wth
standing its being placed in the Sea —



June y^e 25th 1677

THE GREAT CHEST CONSTRUCTED BY MR SHERE, JUNE 1677.

[To face p. 356.]

to pay his workmen,¹ and Shere complained to the Commissioners that "Mr Pepys hath been forc't to refuse acceptance of our bills drawne on him for furnishing the twelve months pay we have issued to the Mole." In June 1678 he wrote again that punctual payments were essential to success, "and (I) am yet . . . without the consolation of your Lord^{ss} least intimation on that behalfe. . . . I see not which way wee shall be able to support the ill consequences thereof, which without speedy redresse must unavoidably determine in a discontinuance of the Service."²

It was a heart-breaking task to carry on work for the Government of Charles II.; it can hardly be wondered that the engineers were driven, one after the other, to the verge of despair. Shere pleaded in vain for financial support for "this poore Languishing Place . . . a jewell, tho' not well polish'd, where neither merett of Service nor Sufferings avales in our Reliefe." The resources available for the maintenance of Tangier were already strained to the utmost. There was no possibility of augmenting the supplies for the Mole, the "discontinuance of the Service" was imminent; just as the attacks of sea and wind seemed to have been successfully repulsed, a new enemy joined the fight against the building of the Mole and threatened the very existence of the garrison. The Moors, envious of the great work done in the harbour, made a determined onslaught upon the place; more than once in 1678 work at the stone-quarries was stopped by a Moorish attack and ambushes were laid for the quarry-men on their way to the shore. These attacks were only preliminary to the great siege of 1680, during which every available man was needed to defend the town against the Moors. Work on the Mole was completely

¹ Pepys to Shere, 11th December 1677 (Add. MSS., 19872, f. 34). "Mr Hewer what with his disbursements for stores by your order and the bills of Exchange he has paid and is by his acceptance obliged to satisfy, has advanced to you to the value of above £2,000 upon the credit of the Quarter w^{ch} is to end at Christmas next, while wee have not yet received so much as Tallyes or assignments from my Lord Treas^r even for the quarter ended at Mich. last."

² Shere to Lords Commissioners, 5th April and 20th June 1678 (C.O. 279, 22, 140, and 23, 257).

stopped, and the money and materials intended for its completion, as well as the services of the engineers, were transferred to the use of the fortifications.

After the conclusion of peace in 1680, it was hoped that work might be resumed on the Mole, but the question of abandoning Tangier being already under discussion, nothing more was done. Sir Lionel Jenkins wrote to Shere on 14th February 1681, saying:—

"I knew you would be sorry to see the Mole at a stand, but it must be so for some time, so exhausted are we here at home. We expect to see what the new Parliam^t will do . . . the last Parlm^t was not all kinde to Tangier and some of our leading men did declare wth much vehemence that Tanger was not nor ever would be worth the keeping, therefore wish't it blown up in the Ayr."¹

When in 1683 it was decided to evacuate Tangier and to destroy the Mole, it was pretended that the work of Cholmley and Shere had little value, and that nothing but excessive and continued expense would make the harbour of even passable use.

It is true that a strong case was made out against the Mole and harbour in the official report of 1683,² but it should

¹ Jenkins to Shere, 14th February 1681 (Add. MSS., 19872, f. 63).

² Dartmouth MSS., iii. 40-43, Hist. MSS., Commission Report. Report about the Mole, signed by John Berry, John Ashby, H. Kellegrew, William Booth, John Wyborne, Thomas Fowler, Charles Wyde, Cloudesley Shovell, M. Aylmer, Henry Cawerth, Ralph Wren, G. Aylmer, John Tyrell, G. Rooke, Francis Wheeler, George St Loe, Daniel Jones, Ran. M'Donell, William Botham, Thomas Hopton, Th. Leighton, H. Priestman, William Gifford, Anthony Hastings, Daniel Deering, and Thomas Hamilton. 13th October 1683. The first statement of this report was to the effect that the Mole was found "to contain in length 479 yards, from the bastion of York Castle, to the end of the furthestmost chest. The depth of water, at low-water, to be: the first 20 yards, to become solid earth, at the next 20rd, 1^{ft}.; thence to 100rd, 2^{ft}.; thence to 140, 2½^{ft}.; thence to 280, 3½^{ft}.; thence to 300, 4^{ft}.; at 320rd, 4½^{ft}.; at 340, 5^{ft}.; at 360, 6^{ft}.; at 380, 6½^{ft}.; from 400rd to 460, 8^{ft}.; there, 9^{ft}.; and at the very Mole head, 10^{ft}.* And that it flows within the Mole at ordinary tides, right up and down, six, and upon spring tides, near eight foot. . . . In the Mole may at this time ride four or five sixth-rate ships drawing not more than eight foot water, being carefully moored head and stern, and within them cettas and small vessels to the number of 15 or 16."

* Cf. Narborough's "Journal," p. 361, *in/7 a* (note 2).

be remembered that this report was drawn up with the express purpose of providing an excuse for the evacuation of Tangier, and was signed with great reluctance by the naval officers who knew and valued the place as a base of operations against the pirates of Salli and Algiers, while Henry Shere, who, by instruction from Lord Dartmouth, drew up the report, embodying "the ordinary objections made against the Mole, improved the most he could to justify the King's destroying it," told Pepys privately that "he was able to answer them all."¹

The chief points emphasised in the report were: (1) that the depth of water within the Mole was much less than it had been three or four years earlier, owing chiefly to the great quantities of sand continually being washed into the bay and silted up against the Mole, and also to the soft stone of the Mole being converted into sand by the action of the waves; (2) that it was almost impossible to prevent the harbour being choked up by these means; (3) that the ground within the Mole was full of rocks upon which cables were often cut; (4) that the harbour was overlooked by sandhills, and should the Moors bring up cannon, ships lying at anchor would be exposed to fire from them; (5) that if the proposed "return" to the Mole were built, ships would then be so land-locked that it would be difficult to get them out in a Levant wind; (6) that Admiral Herbert and other naval officers found Gibraltar a better harbour than Tangier, and arranged to career there when possible; (7) that the violent storms and seas would probably beat down the Mole if it were carried into deeper water; lastly, it was stated that the water-supply of Tangier was insufficient to supply two or three ships in any reasonable time, "and that little there is, is very bad and pernicious to men's health." This last argument alone, based on a temporary and unusual condition, is enough to lay the report open to the charge of inaccuracy. It appears, too, from previous letters of the engineers, that the stone of the Mole, though soft at first, hardened in the water, and proved sufficiently durable, and that the silting up of sand, though a real difficulty, was not perhaps an

¹ Pepys's "Tangier Journal," 3rd October 1683. Smith's "Life," etc., of Pepys, i. 383.

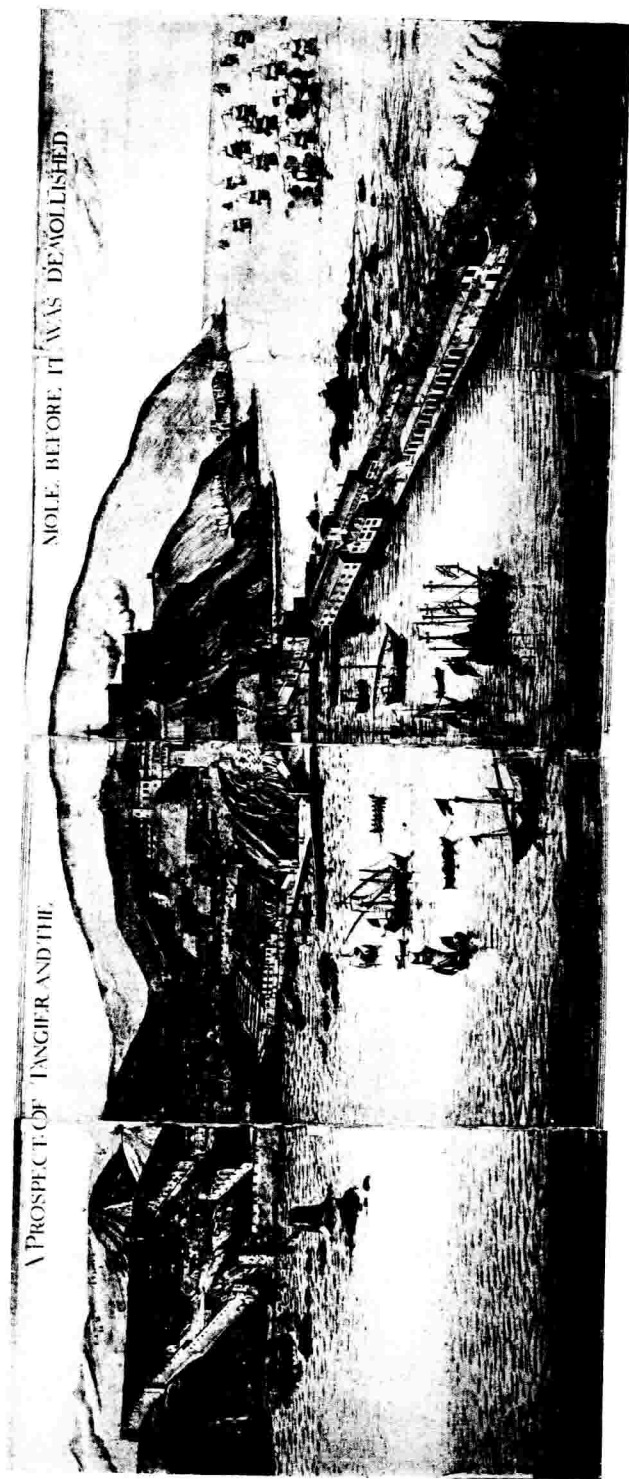
insuperable one. The report came to an end with the foregone conclusion that the harbour of Tangier was "altogether unuseful to his Majesty for the receiving, careening or preserving his Majesty's ships."

It is not easy to discriminate between expressions of policy and of true opinion on this question, but impartial critics seem nearly always to have spoken highly of the possibilities of the harbour. There were plenty of men, including Henry Shere and Sir William Booth, who, with an eye to Court favour, were conveniently willing to say anything that Lord Dartmouth desired in support of the policy of demolishing Tangier, but some of the sea-captains were less compliant and held to their own opinions with an independence of which their superiors strongly disapproved. Sir William Booth gave Pepys "an account of the ado he had had with some of Herbert's young fellows to get signed the paper My Lord desires, about the mole and harbour of Tangier," and Pepys remarks with great indignation:—

"It is pretty also to see that no kindness obliges these rogues. I have shown my Lord, to his surprise, instances in Shovel, Wheeler and Matt: Elmer [Aylmer] (to all of whom, especially the last (as being Herbert's creatures) he hath thought fit to be very kind since his being here) of their making a difficulty to sign the paper prepared by my Lord's orders for the sea-captains to sign, about the condition of the harbour of Tangier, and the impracticableness of makeing it a good one. Though they have been prevailed with by Booth to sign this, yet they did declare to Booth their satisfaction in the harbour when they signed it, and will be ready to do the like when they come into England. This is your men of honour and gentlemen! At least the two latter."¹

Admiral Sir John Narborough, who made frequent use of the harbour during his command in the Mediterranean used to speak favourably of Tangier, "ever believing that

¹ Pepys's "Tangier Journal," 18th October 1683 (Smith's "Life," etc., of Pepys, i. 411). Cf. Corbett "England in the Mediterranean," ii. 135. "Shovell was only a 'tarpaulin' and presumably not expected by Pepys to forswear himself to oblige his chief." Wheeler and Aylmer both rose to be Commander-in-Chief in the Mediterranean.



TANGIER AND THE MOLE, BEFORE IT WAS DEMOLISHED, 1683.

BY THOMAS PHILLIPS.

station to be the fittest to annoy the Algerens,"¹ and said that he could refit a squadron there in half the time and charge of anywhere out of England.² Another recorded opinion is that of Colonel Sackville, Governor of Tangier, who wrote to the Commissioners in 1681, soon after his arrival:

"I have heard formerly complaints of bad ground and ill rideing for shipping in this port and Bay, I confess I am noe very greate Seaman, but according to my judgement it is to me a very greate instance of the Contrary that in such dreadfull Stormes . . . wee have not suffer'd the least Dammage in our Shipping. The Mole . . . has not receiv'd the least visible dammage, tho' Assaulted by an enemy w^{ch} one would wonder anything could resist."³

On the whole, it seems that the harbour, which was seldom required to afford anchorage to anything of greater draught than a fifth-rate frigate, was susceptible of sufficient improvement to meet the needs of the place and time,⁴ but the advantages gained by the making of the Mole were wilfully destroyed before they could be put to the test of continued use.

The destruction of the Mole in 1683 was the most formidable part of the demolition of Tangier. It was, though unfinished, a solid structure, 1436 feet in length, its mean

¹ Add. MSS., 19872, f. 40. Narborough to Shere, 12/22nd February 1678/9. "I depend wholly on Tangier for a supply of provisions and stores for nere four thousand men about two months hence, soe long our provisions now on board will last."

² A discourse touching Tangier (Pamphlets, Brit. Mus., 583, a. 45). In 1673 Narborough in the *Fairfax* "went into Tangier Rode and Anchored in twenty fathom water sandy ground . . . and went and vewed the Mould, the worke fearme. The Mould is in length from the foote of Yorke Castle battery to the Chests, 404 yards, from the Chests to the end now at worke upon, 20 yards more, at the head of the Mould there is 16 foot at a dead low water, 12 and 14 foote water within the Mould" (A Journal kept by John Narborough, Commander of H.M.'s ship *Fairfax*, 1672/3, Pepys's MSS., 2556).

³ Sackville to Lords Commissioners, 11th February 1680/1 (C.O. 279, 27, 110).

⁴ Budgett Meakin ("Land of the Moors," p. 111) says: "The harbour formed by the Bay of Tangier is an extensive one, good in all weathers except during a strong east wind, but vessels of any size have to anchor a mile or so out, as the shore towards the west is shallow and sandy, but on the east side rocky and shingly."

breadth 110 feet, and mean height from top to low water mark about 18 feet;

"amounting in all by cubical computation to 2,843,280 solid feet, which being cast into tons are 167,251 tons. Of this mass 25,000 tons at least is tarrass work so bound in chests, with timber and iron, and so well performed, that it is by all people agreed (and indeed is found) more difficult to demolish than so much solid rock."¹

Shere reckoned that one thousand men might be employed daily on the Mole, which in that case would take two hundred and nine days to destroy, but that

"the additional difficulty of demolishing the tarras work by great mines and at least 1500 small mines by drills and other more troublesome methods would add at least 25 days to the time above noted."²

It was generally agreed that Mr Shere's chest-work would be hard to demolish, but that the foundations and beginning of the Mole, being built according to Sir Hugh Cholmley's now despised methods, would be comparatively easy to destroy. Lord Dartmouth wrote that the end of the Mole built by Mr Shere was as hard and strong as rock itself, "though the former part is but rubbish and will easily be dispers'd when the water-breakes made by him to secure it are gone."³

It was soon found that Cholmley's work was far more durable than was expected, and gave even more trouble than that of Shere. Lord Dartmouth wrote a month later:—

"The Mole is a very heavy piece of worke and though most of the tarras worke is already destroyed by powder, yet that can take noe effect of the rubbish and body of

¹ Henry Shere to Lord Dartmouth, 6th December, 1683 (Dartmouth MSS., Report, iii. p. 102). Cf. Pepys to Houblon, 19th October 1683. Smith's "Life," etc., i. p. 418. "I have been myself an eyewitness with how much less trouble they cut through the pieces of rock than the plaster with which he (Shere) had bound them together."

² Dartmouth MSS., Report, iii. p. 102. Pepys (Smith, i. pp. 425-426 and 434) says: "Mr Sheres showed me the whole process of a mine made, blown up with a drill, and the manner of plugging up the hole, so as to do mighty execution."

³ "I also went down into a mine, the first made to try the iron cylinders."

³ Dartmouth's Report, 19th October 1683 (C.O. 279, 32, 274).



TANGIER IN

TANGIER IN FEBRUARY 1684.

BY THOMAS PHILLIPS.

[To face p. 362.]

Sir Hugh Cholmlye's parte w^{ch} is very great and must be removed into the harbour by hands and labour, but this good will follow that the harbour will be fully choked up by it. . . . For God's sake, sir, I implore his Maj^{ty} not to thincke the time long, for I protest I doe all that is possible to be done . . . the work is much greater than was imagined."¹

Every available hand was taken for this work on fine days, and upwards of two thousand soldiers and seamen were labouring on the Mole till late on moonlight nights, throwing the *débris* into the sea to choke up the harbour. At last, in January, the Mole was so levelled that the sea had free passage over it, and only for an hour or so at low water could its ruins be seen.

It was reported by Sir John Berry and other naval officers² that the best part of the harbour was filled up,

"and several piers of stone run out besides . . . and in the rest of the harbour vast quantities of stones and rubbish are thrown in and sunk all over it, in boats and other vessels fitted for that purpose." The report continued: "As for the Mole itself, it is so entirely ruined and destroyed, and the harbour so filled with stones and rubbish, and made so unfit to receive, harbour, or protect in any manner, from the weather or from an enemy, any ships or vessels, and that in very many degrees worse than the bay itself naturally would have done, before the building of the Mole, that we do . . . think what has been done does fully and completely answer all the ends of making one and the other in no capacity to give any kind of refuge or protection to the ships or vessels of any pirates, robbers, or any enemies of the Christian faith, or any others."

At low water the ruins of the Mole may still be seen, a reminder of the wasted work of fifteen years. Between three and four hundred thousand pounds were spent on its construction from first to last,³ besides the cost of the

¹ Dartmouth to Secretary Jenkins, 16th November 1683 (C.O. 279, 32, 274, and also Dartmouth MSS., Report, iii. p. 34, duplicate letter, with some variations in orthography).

² Report of 21st January 1683-4 (Dartmouth MSS., Report, iii. p. 44).

³ See Appendix iv. for accounts for the Mole.

demolition. To those who saw it destroyed, and who forgot the useful purposes it had served throughout the English Occupation of Tangier, it seemed that the money might as well have been poured straight into the sea. The epitaph of the Mole was written in the following verse of *Tangier's Lamentation*.

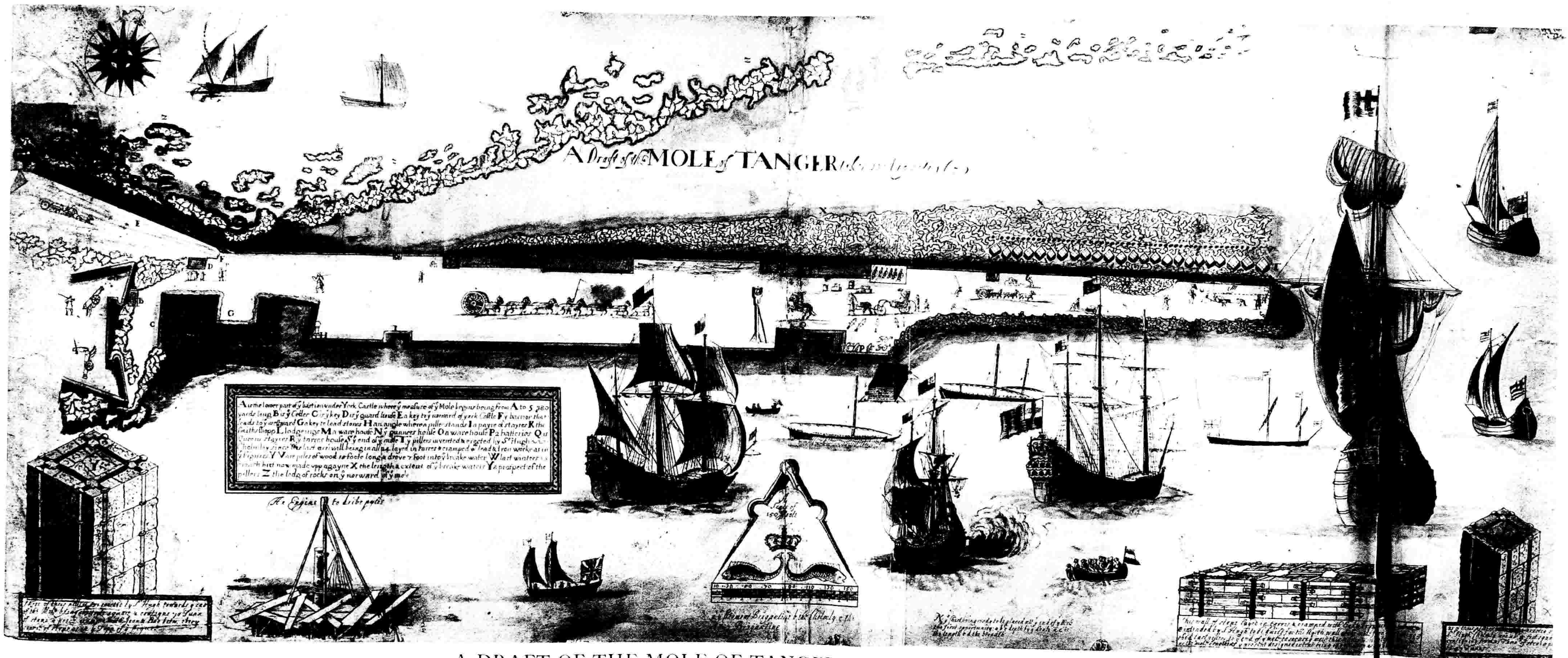
"It would grieve your heart should I impart
The Gold and precious matter
That lies opprest in every Chest
Drown'd underneath the water.
"But now the Mold that forc'd the Main
The Mold so gay and bonny
Is with the Chests blown up again
But ne'er a Cross of Money!"

NOTES BY MR G. H. STEPHENS, C.M.G. (M.INST.C.E.), ON THE PLAN OF
THE MOLE BY SIR HUGH CHOLMLEY, 10th August 1670 (folding plate).

Sir Hugh Cholmley's design for this Mole was evidently, in the first instance, simply a stone rubble mound (or bank) thrown into the sea and brought up to low water level, on which he built a superstructure of ordinary masonry-work, many of the stones of this superstructure being cramped together with lead and iron dowels, and mortar used wherever possible. As the Mole proceeded outwards and therefore became exposed to more turbulent seas, it was found necessary, in view of the breaches made during the winter storms, to modify the design for future work, and in place of a superstructure of ordinary masonry-work, large wooden crates (chests) were towed out and sunk on the rubble mound. These chests were filled partly with large loose stones, and partly with solid masonry-work, with iron straps to the chests.

The stones forming the pillars which modified the force of the waves were cramped together with vertical and horizontal iron straps, and the pillars were maintained in a vertical position by being surrounded at the base by mounds of rubble. The wooden piles forming the outer protecting line were driven through the interstices in the stones of the rubble mound and into the sand beneath.

The modern method of building a breakwater is briefly as follows:—A rubble mound of great width is formed on the site of the breakwater. This mound only stops about 20 ft. below low-water level, and the stones forming the top of it are brought to an even surface by divers. The breakwater itself is composed of concrete blocks, say 50 tons each, deposited on this mound. These blocks are dovetailed into each other, to assist each other in withstanding the force of the sea.



A DRAFT OF THE MOLE OF TANGER. TAKEN 10 AUGUST 1670.

A. is the lower part of y^e bastion under York Castle where y^e measure of y^e Mole begins being from A. to S. 380 yards long. B. is y^e Cellar. C. is y^e key. D. is y^e guard house. E. a key to y^e northward of York Castle. F. y^e barrier that leads to y^e Westward. G. a key to load stones. H. an angle where a pillar stands. I. a payre of stayres. K. the smith's shopp. L. lodgeings. M. a ware-house. N. y^e gunners house. O. a ware-house. P. 2 batteries. Q. is Queens stayres. R. y^e tarres house. S. y^e end of y^e Mole. T. y^e pillars invented & erected

by S^r Hugh Cholmley since his last arrivall, being in all 24, layed in tarres & cramped wth lead & Iron worke as in y^e figures. Y. V. are piles of wood 15 foote long & drove 7 foot into y^e breake water. W. last winter's breach but now made up againe. X. the length & extent of y^e breake waters. Y. a prospect of the pillars. Z. the ledg of rocks on y^e northward of y^e Mole. Three of theis pillars are erected by S^r Hugh toward y^e end of the Mole being abt 15 foote square & conteyne 70 Tunn of

stone a peece cramped with Iron & lead betw^e every course of stone as in y^e T. top of y^e figure. An engine to drive pyles. A scale of 15 p^{er} oile. 10 - 30 - 50 - 70 - 90 - 110 - 130 - 150. a. y^e Clermont Brigantine. b. y^e Cholmley. c. the Anne Brigantine. n. y^e Chest being ready to be placed att y^e end of y^e Mole the first opportunity. a. b. y^e depth by y^e Scale. a. c. is the length. e. d. the breadth.

This wall of stone layed in tarres & cramped with lead & Iron work is intended by S^r Hugh to be built at the North wall of the mole from y^e beginning of the 4 last pillars to y^e end of y^e mole, to secure y^e mole this winter & so on to be continued as the mole lengthens, y^e present designed being 18 yards long as by y^e letter m. 21 of theis pillars erected by S^r Hugh Cholmley are abt 9 foot square conteyning from 35 Tunn of stone to 47 Tunn.