IV.—THE NEWCASTLE GALLEY.

By W. R. G. Whiting.

[Read on 25th September, 1935.]

The text of the accounts of expenditure on this vessel was published in *Arch. Ael.*[4] II, 142, by R. J. Whitwell and C. Johnson, with a discussion of the historical circumstances, notes on the construction and a glossary.

Nineteen similar galleys were ordered by Edward I at the same time. The summaries of the accounts of the two from London were printed in the *Antiquaries Journal*, VII, 424, and the complete account of the single Southampton galley in the *Mariner's Mirror*, 1928, the Latin text being given for each.

The Newcastle accounts are more detailed than either of these and are to be preferred as a basis for enquiry into size, design and analysis of expense. The southern accounts have been examined for amplification and comparison purposes, but a comprehensive discussion of the three sets of information ought to be undertaken in the future.

Certain facts and inferences have emerged from this analysis of the Newcastle accounts, made from the point of view of the shipbuilder, and it is hoped they will prove of general interest in the following summary.

The accounts were kept by the master shipwright himself in the form of a weekly statement showing wages and material costs as incurred. The numbers employed in each

trade, the days worked, rates of pay and total of wages are recorded. Labour is followed by particulars of materials, which are described in kind, number and cost, frequently by weight and supplier, and in a few valuable instances by dimensions.

Materials were almost invariably ordered as needed, a circumstance which enables the order of construction to be traced. From the relative price, quantity and priority, and in some cases from the source of supply or the known requirements of the design, much also may be inferred and certain errors avoided.

The cost of the galley, complete with barge and ship's boat ready for her maiden trip on September 10th, 1295, was £183 12s. The modern value of this sum may be deduced from the fact that the skilled carpenters' wages were 3d. a day, whilst the price paid for timber appears to have averaged about 2½d. a cubic foot. Corresponding rates to-day are about 11s. for labour and 7s. 6d. for timber of the class used in the galley. Bearing in mind that only about 30 per cent. of the total cost was spent in direct wages, the average equivalence may be put at 40 to 1.

The sum expended represents therefore about £7,000 by present standards, although such a vessel might be built now for substantially less, owing to the use of labour-saving machinery. But the point is that Edward and his Parliament, in ordering twenty such galleys, contemplated spending something like £140,000, whilst the pay and expenses of the fleet in commission would amount to almost half this sum each month. The project therefore entailed a not inconsiderable charge on the resources of the country at that time.

It is evident that the provision of the fleet was an important military measure, having as object the protection of our shores. That strategic aim was to be obtained by the tactical advantage of speed, the only quality in which a galley could be superior to the sailing vessels of the day.

Speed in fact was the vital problem dominating the design of all naval galleys, classical or mediaeval, and all discussion as to dimensions and draught of such craft is liable to serious error if the technical basis of speed as a complex function of dimensions, displacement and power available is not fully understood.

The King's writ ordered the bailiffs of Newcastle upon Tyne *fieri faciatis unam bonam Galeam de Sexies viginti Remis*. The natural assumption that the galley was to mount 120 pulling oars is not tenable. With one possible exception no western European galley ever carried more than a single bank (vertical tier) of oars. Oars cannot be spaced closer than is dictated by the need of clearance from man to man, arms fully stretched to the oar. This spacing at an efficient minimum is 3 feet 3 inches if the oars are arranged singly, and greater if arranged in staggered pairs or triplets, dependent on the lay-out. No evidence exists that a staggered system was ever fitted outside of the Mediterranean, though the provision for our galley of oars of two distinct lengths does admit of the possibility. The more probable explanation is that the short oars were for use in heavy weather, or when making a long passage at easy speed. The corresponding galley at Southampton had 60 oars only, apparently of one length.

Confining attention for the moment to the single oar probability, a sixty-oar side would require an oared span of 192 feet; the length on water line of the shortest possible galley so fitted would be about 215 feet. Now sea-going galleys of this length are unknown to history, the timber bought at Newcastle is insufficient for a vessel of this size, the art of construction at that date forbids such a dimension, but the fundamental objection is that 120 men are insufficient to give such a vessel an adequate speed.

Scandinavian practice in their long ships was to carry two men for each oar, who rowed by turns.[1] This practice,

[1] Prof. O. Rygh, *Trans. Inst. Nav. Arch.*, vol. XXII, p. 305.

which may be shown to lead to better average speeds than any other, is the most probable for English galleys in view of the close connection of both Normandy and England with Scandinavia. A galley might in that case come to be described by the number of the crew carried, apart from fighting men. Now the crew of the Newcastle galley on departure to join Osbert of Spaldington's fleet was a master and 119 men. Obviously all these men cannot have rowed simultaneously, since navigating and deck duties must be provided for, so that at any rate the literal interpretation of 120 oars is without substance.

The assumption that 60 oars were actually mounted brings the oared span to 94 feet and the minimum water line length to about 115 feet. If oars in staggered pairs were fitted, from 80 to 90 might have been mounted within the same length. There are strong arguments that the design was purely Scandinavian, but whether this second hypothesis be ignored or not, the length is limited by that of the keel logs purchased, viz., 108 feet aggregate, which by comparison with the well-known Gokstad long ship[2] leads to a dimension of 118 feet on the water line and an overall length of 135 feet, more or less, depending on the precise sweep of the ends.

The question of beam and depth is somewhat more involved. The beam cannot have been less than 17 feet 6 inches in view of the lengths of oar recorded and the need of preserving a central space for the fighting men. Much greater beam on the other hand adds gravely to constructional difficulties and militates against ease of propulsion. Depth is restricted similarly. If less than 7 feet or so the provision of adequate longitudinal strength would have been impracticable, whilst if appreciably greater it is impossible to arrange oars at efficient inclinations and yet permit the rowers to see the blades over the wash strake. The dimensions of 20 feet extreme beam and

[2] Colin Archer, *Trans. Inst. Nav. Arch.*, vol. XXII, p. 299, and Glas. Arch. Soc. *Trans.* I, 121.

7 feet 6 inches moulded depth (as suggested in *Arch. Ael.*[4] vol. II) may be considered as likely probabilities, coupled with a moulded draught of 4 feet.

Such a vessel would weigh, complete with 200 crew and soldiers, about 100 tons. F. H. Alexander has shown[3] that the crew of a naval whaler do useful work at the rate of one-fifth horse power per man. The Gokstad long ship rowed 32 oars and displaced 29 tons. Accepting Alexander's figure her speed may be calculated, and proves to be $7\frac{1}{4}$ miles per hour. Similarly the Newcastle galley, if propelled by 60 rowers, would attain 7 m.p.h., and if by 90 then about 8. These speeds are the same as those known to have been reached by classical galleys, and would suffice to overhaul mediaeval merchant ships in a reasonable time in light airs or against contrary winds. When running before the wind the galley would be faster under sail than oars, and much faster than any merchantman.

Table I summarizes the expenditure under usual heads of charge and indicates probable weights. The money figures are fairly precise, as the descriptions in the accounts rarely involve any ambiguity.

TABLE I. SUMMARY OF COST AND WEIGHT.

Description.	Cost. £ s. d.	Weight.
1. Direct labour	52 4 8	—
2. Contracts and travelling: principally haulage	3 11 4	—
3. Timber: includes that used in the yard	44 10 11	58 tons
4. Iron: chiefly made into seamnails	19 0 3	6·3
5. Paint	2 10 4	·1
6. General stores: includes those used in the yard	10 5 1	2·6
7. Outfit	22 11 4	5·2
8. Spars and rig: requisitioned from ships in port	29 2 10	13
(Untraced discrepancy of 4/9) Totals	£183 16 9	85·2 tons

[3] *Trans. Inst. Nav. Arch.*, vol. LXI, p. 232.

These figures include the galley, barge and ship's boat, the last named being a repaired requisitioned item. The barge may be taken as responsible for about 6 per cent. of the total cost and weight. The weights given are the minimum probably worked in. Final allocation is:

	Labour.	Material.	Equipped Weight.
Galley with its boat .	£49 (2150)	£124 (4300)	80 tons
Barge . . .	3 (130)	7 (240)	5 ,,

Figures in brackets are to-day's equivalents.
Weight of galley with 120 crew, 80 soldiers and effects, 100 tons.

The weights suggested are naturally less exact. That for the timber, which forms two-thirds of the whole, is based on the consideration that certain items of stated length must be assigned at least a minimum section. The cubic contents and hence the weights of these items may then be calculated, the values being the lowest probable. But since the price is given the rate per cubic foot is also ascertainable, and it is this figure which, with suitable adjustments, is applicable to all the purchases of timber and enables one finally to arrive at an approximation to the content and weight of every category of timber purchased.

The items of stated length are the keel, some of the planking and the wales. These serve as a guide to rates generally, which are obviously less for short timber than for long, for elm than for Murray fir, and more for plank than for log of equal length because of the great labour of sawing.

This point has been dealt with rather fully because on it depends the establishment of an approximate weight for the complete vessel, which in turn forms a valuable check on the dimensions. For the dimensions, in conjunction with a coefficient of fineness appropriate to such a galley, determine the displacement, which must itself prove to be in agreement with the weight of the structure, with outfit, stores and men added.

The iron bought is all recorded in stones, and this unit has been assumed to be 14 modern pounds. Suitable

allowances for wastage, as between the iron purchased and that finally built into the ship, have been made as was done with the timber.

Stores, outfit and requisitioned items are more open to doubt, but as the totals have been built up from numerous individual estimates it is hoped that the grosser errors have tended to cancel out.

The upshot of this procedure is that the equipped weight of the galley is placed at 80 tons; with the addition of crew, provisions and effects at 100 tons. This weight is balanced by the displacement if the coefficient of fineness is ·38, and this is, in fact, a figure appropriate to the galley.

Table II is a return of labour prepared from the daily entries. The employment is stated in men-days (a unit of one man working one day). The relative importance and relative rates of pay of the different classes of workers is apparent from this table, and will be seen to be similar to that prevailing to-day. It is interesting to observe that although there was no half holiday the feast days actually kept came to at least as much time off as we should have to-day: it would have been distinctly more had not some of the feasts been omitted owing to the urgency of the work.

The total of men-days compares well with the returns from Southampton (London is not so definite), though the rates of pay and costs of material were much greater in the south.

Contracted work consists chiefly of transport of timber; men, vehicles and barges being provided by master-hauliers.

Table III details the timber bought. The order is that in which the first purchases of each description were made and serves to indicate the sequence of construction. Item 13 (logs) covers a large number of unspecified entries, whilst the trees felled under item 19 represent in most cases timber grown to suitable shape for floors, futtocks and knees.

TABLE II. SUMMARY OF LABOUR AND WAGES.

Time Workers.	Men-days.	Normal Daily Pay.	Total Wages. £	s.	d.	Remarks.
Master shipwrights	282	4d.	5	14	0	Includes gown at 20/- as bonus.
Assistant to above	146	2	1	4	4	Employed 29 weeks only.
Watchman	241	2	2	0	2	Day and night, 1/2 a week.
Carpenters	1479	3	18	5	4	Helped by bound apprentices?
,, assistants	148	2	1	4	8	Lads not fully skilled.
Hammermen	309	2½	3	4	4	Repercussores.
Holders-up	331	2	2	15	2	Tenences.
Painters	157	3	2	2	7	Includes working master painter at 4d. and a girl assistant at 1½d.
Sailor squad	241	3 to 1½	2	2	0	Launching, berthing, rigging.
Labourers	419	1½	2	16	9	Helping carpenters: moving material, etc.
At woods. Foresters	189	3	2	7	4	Includes some carpenters lent to woods.
At woods. Sawyers	101	2½	1	0	10	In woods and at berth.
At woods. Labourers	212	2½ to 1½	1	13	9	Drawing timber from woods.
Total time workers	4255	2·6	46	11	3	
Piece Workers.						
Smiths	330 (approx.)		£5	8	7	About 5½ tons at 1½d. a stone.
Other trades	19	,,		4	10	
Total piece workers	349 (approx.)		£5	13	5	

Total direct labour 4,604 men-days; £52 4s. 8d. Say £2,300 to-day.

Note.—Days worked were 219 in 41 weeks out of a possible 246 weekdays. Average number of men employed was 21.

TABLE III. SUMMARY OF TIMBER.

Week of first purchase, description, modern equivalent, size, price each, etc.	Rate per cu. ft.	Cost. £	s.	d.	Cubic feet.
1. Planks, 2611 (+50?), average price 2·1d. per plank	3d.	23	7	3	1830
2. Keel, 2 logs 56′ and 52′, say 18″ × 9″	4	2	0	0	120
,, Under loute, keel scarph and mast step	2½		4	4	20
,, Scalmae, stem and stern pieces, 5 logs	3		8	8	35
,, Scheldbemes 4 logs	2¼		7	0	40
7. Wranges, floors, 60 unfelled trees at 5d.	1½	1	5	0	200
11. ,, ,, 9 logs	2¼		10	11	60
,, Trenails, 2860 in no., 4d. and 5d./100	—		10	11	—
12. Beams 6 logs	2		10	2	60
,, Cheveronae, 136 spars at 1d., say 7″ × 4″ sq.	1		11	6	140
13. Logs (for framing, etc.) 183 logs	2	4	16	2	580
14. Fotynges, futtocks 102 logs	2	1	10	8	180
16. Weyres, wales, chiefly 50′ long, 18 logs, say 8″ × 4″	3¼	2	7	4	170
17. Lerynges, carlings? 9 logs	2½		11	6	55
19. Unfelled trees 50 in no. about 3¼d. each	1¼		13	4	130
22. Timber for rudder, cunel and roulae	2½		10	0	50
26. Timber for erections, bulwarks, windlasses, etc.	2	1	12	4	220
— Small named items, 18 in no.	2¼	1	15	9	190
— Specified for use in yard	—		18	1	—
Gross weight at 45 lbs. per cubic foot = 82 tons	2½	44	10	11	4080
Nett weight after allowing for wastages = 58 tons					
Detail of plank scantlings at minimum					
26′ long 94 in no. averaging 8·2d. say 7″ × 1½″	4¼	3	4	0	180
Murray 176 ,, 4·0 ,, ,, × 12½′	3½	2	19	3	200
Not desc. 154 ,, 3·0 ,, ,, × 12½′	3¼	1	18	6	140
(4,150 sq. ft. in above; sufficient for inner skin)					
Elm 1580 averaging 1·62d. say 7″ × 1¼″ × 10′	2¾	10	3	4	890
Not desc. 607 ,, 1·84 ,, ,, × 10′	3	4	13	2	370
log (50) to cut for plank ,, ,, × 16½′	2¼		9	0	50
	3	23	7	3	1830

Total number of planks bought about 2,661.
Total area of plank about 16,700 sq. ft.
For basis of rates see text.

The method by which the figures for rates and contents have been arrived at has been explained. It is interesting to note the great number, over 2,600, of individual planks purchased, and to realize that the greater part of these must have been lying in the timber stores of the district when the galley was ordered. The fact reveals considerable resources and corresponding demand for timber, in a degree which one would hardly expect.

The complete analysis of the iron, paint, stores, outfit, spars and rig is too lengthy for inclusion here, but the following points may be noted:

Iron. 1,054 stone (6½ tons) bought and made into:— seamnails (724 stone, perhaps 70 to 90,000 in number); bolts and straps (152 stone), the remainder being unallocated, yard use or wastage.

Nails. Nine varieties, 25,960 in number, about 10,000 being for the *hecchiae* or decks, a point that will be referred to later.

Caulking materials. Pitch, 140 stone; tar, 16 barrels, say 320 stone; wyldyng (oakum of spun cows' hair if the Norwegian practice was followed[4]), 54 stone.

Paint. Ten varieties of pigment were used for decoration, the price averaging no less than 40s. a lb. in the money of to-day.

Oars. A discrepancy occurs in the accounts for the twenty-eighth week, but 66 long oars and 72 short appears to be the total supplied to galley and barge.

Bunting. Seventy-six ells were bought and made into flags; the principal ones must have been of great size.

Awnings (teldae). These were bought as 44 separate units priced from 4d. to 1s. 3d. each. Total cost 29s., sufficient in area for a complete awning probably.

Messing gear. Three cauldrons and 6 pots, all of brass, were provided, also 80 plates, 40 salsaries, 6 beakers and 6 iron stoves (grydiles).

[4] Prof. O. Rygh, *Trans. Inst. Nav. Arch.*, vol. XXII, p. 305.

Rudders. Two *gubernilia* were bought for £5 from William Jetur of Dovoria. This sum, say £200 of modern money, is inexplicable as a charge for anything resembling rudders or steering oars as commonly understood. References to rudders apart from these two occur in the accounts. Is it possible that a pair of steering compasses are intended? The whole question is intricate and requires further study.

Windlass. This must have been of the horizontal type and not a sort of capstan, since the deck spaces are insufficient for the latter. Numerous entries of timber and labour in connection with it occur, but the forward windlass complete appears to have been one transferred from the *Raynkin* and refitted as necessary. The main windlass adjacent to the mast was well advanced when the latter was stepped, and was probably used for the actual lifting. Each windlass must be thought of as an athwartship barrel armed with as many rows of levers or hand spikes as there are men to work it, furnished outside the barrel supports with warping heads or small barrels to which any rope may be taken. The midship windlass would be primarily for making sail, the forward one for heaving up anchor, of which the heaviest must have weighed close on half a ton.

Spars. One mast, 1 lof, 1 bowsprit and 1 yard are the first four items requisitioned from ships in port. From its association the *lof* appears therefore to have been a spar and was probably a boom, heeled in the *porte-lof*, adapted for bearing out the fore-edge or luff of the sail to windward. The long ships had such a spar termed a *beitiāss* or tacking boom.[5]

The system of construction adopted is evident from the accounts. Two possibilities exist, one that the galley was first fully framed and then planked, the other that the planking was first worked in conformity with a few

[5] Colin Archer, *ibid.*, p. 302, and Magnusson, *Notes on Shipbuilding and Nautical Terms of Old in the North.*

skeleton frames set up at selected positions, light frames being fitted subsequently into the practically finished shell.

Large ships are built on the former plan, which requires more time and a much more intricate technique: small boats are invariably built on the latter plan. The dividing line is usually well below the size of our Newcastle galley:[6] nevertheless, since planking, seamnails, pitch, tar and oakum were bought in quantity in the first fortnight, whilst the first framing material was still standing in Elswick Wood in the seventh week, it is clear that some measure of strength and durability was sacrificed to speed and simplicity in this case. That is to say the galley was built as a boat is and not as a ship.

This same method had always been employed in the long ships and may have become traditional. But the planking, though worked first, was, it is suggested, worked differently, the distinction, which is that between clinker and carvel build, being evident from figs. 1 and 2. A galley of the Newcastle length and proportions must have relatively thick planking, 2½ inches or 3 inches, if the Gokstad standard of strength is to be maintained. Formidable practical difficulties lie in the way of working so great a thickness on the overlapping principle, nor could it be fitted edge to edge readily unless the framing were completed first. If, however, two thicknesses of plank were fitted, each of half the requisite thickness, a practicable and simple construction results.

About 4,000 sq. ft. would be needed for each thickness, whilst from Table III the total area of plank is seen to be estimated at 16 to 17,000 sq. ft. The shell would therefore absorb about half the plank bought, the better half in point of quality, much of the remainder being utilized for the decks, accommodation, erections, etc., whilst staging, templates and the barge require the residue.

[6] Lane, *Venetian Ships*, chap. v. All Venetian galleys were framed first.

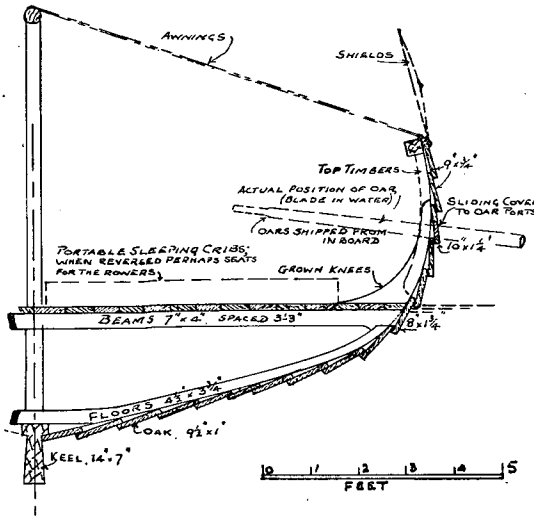

FIG. I. MIDSHIP SECTION OF GOKSTAD LONG SHIP, CIRCA A.D. 700.

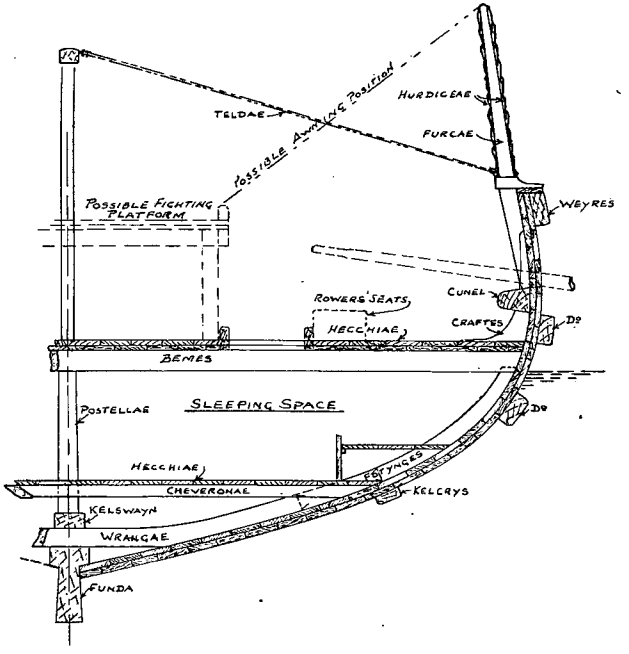

FIG. 2. CONJECTURAL MIDSHIP SECTION OF NEWCASTLE GALLEY.

The large quantity of seamnails manufactured supports this view about carvel-worked double planking. There were over three pounds of nails provided per square foot of hull, a quantity which is far too high for the wide-spaced lines of riveting of a single skin. The employment of pitch, tar and oakum from the outset is also in agreement with this view. In fact a clinker-built boat is not caulked, strictly speaking, at all.

Present opinion is against the view that carvel construction was in use in England at that date, but the detail of certain contemporary seals is favourable to the carvel theory, whilst the evidence of the accounts and the argument of reduced demand on craftsmanship are strongly in support.

Each frame was fitted in three parts or more, as floors and futtocks. In this respect the construction shows an advance on the Gokstad plan. As already mentioned, the frames were fitted into the prepared hull, and cannot have been started until the sixty unfelled trees bought as suitably shaped for floors in the seventh week were made available.

The Gokstad vessel had one frame to each oar space, making a frame spacing of 3 feet 3 inches. Our galley, if similarly built, would have about thirty-seven frames in all, but in view of the sixty trees and eight other logs bought for floors alone, there can be little doubt that intermediate frames were fitted between all main frames. This plan would enable the scantling of each frame to be kept proportionately less and simplify the selection of timber and its preparation.

The wales (*weyres*) which are external longitudinal members, reinforcing the vertical side, are specified in number and length. The quantity agrees with the supposition that three were fitted all fore and aft. No similar members existed in the Gokstad vessel, nor did her shorter length and stumpier proportions require them.

The accounts furnish no evidence, save from the

quantity of plank, as to the internal arrangements. There can be little doubt, however, that a continuous deck at about the water-line level was fitted, as in the long ships. Also, since the galley had to house perhaps two hundred men for days at a time, one may reasonably surmise a platform below this adapted for sleeping and clear of the working deck. It is also possible that a fore and aft fighting platform connected the two end castles, but there are attendant disadvantages to such an erection which make it somewhat improbable.

Broadly speaking, the material shown on the conjectural section agrees with that described in the accounts.

Comparison between the trenails (2,860 in number), wood dowel pins of considerable size, the ends being wedge-secured as a hammerhead is to its shaft, and the aggregate of nails (about 120,000) shows that the vast majority of the fastenings were of iron. No mention of roves, the washers over which an ordinary copper nail is clinched, is made for the Newcastle galley, and the suggestion is hazarded that none were employed but that the seamnails were turned down at the point. Perhaps the point was first split, an easy operation with the iron of the period, and the two parts turned down in opposite directions as was done on the galleys from lake Nemi.

Above the oar-ports and wash strake a bulwark of hurdles was fitted in galleys of this period to serve as an arrow-proof screen. The accounts show that 77 hurdles were bought for the purpose in the first instance, and a further 20, probably as spare, on commissioning. The price was 1½d. (5s.) each, and as the cost of wattle hurdles 6 feet by 4 feet is to-day 3s. 3d., the ones supplied can hardly have been of less size. Seventy-seven should have a combined length of over 460 feet, sufficient to go twice round the galley sides. One may conclude that a double thickness of hurdles was fitted, which may well have been found essential against heavy arrows.

Since sheer-legs were erected for stepping the mast, the

latter must have been fixed and not capable of being lowered as were those of the long ships. It was fitted with a fighting top, if the *castrum capitale* is to be identified as such, of about 6 feet in diameter, judging from the plank bought for the purpose. The structural arrangement of this at the top of a mast, which can scarcely have been less than 60 feet high, must have called for a high degree of skill.

The form taken by the castles at the ends must be open to surmise, but since cabins with locked doors are mentioned, which can scarcely have existed save in the after-castle, some idea of the size of the latter is gained. The bulwarks to the castles were solid and panelled, unlike the hurdles used at the lower level. The details of these parts may well have been of the same general type as the seals of Sandwich (1238), Dover (1284) and Poole (1325) reveal. The conjectural profile of the Newcastle galley is shown on fig. 3. The outline profile and half breadth of the Gokstad vessel (fig. 4) is included for comparison. The portion of Bruce's copy (in the Black Gate Museum) of the Bayeux tapestry showing Norman long ships may also be referred to.

The apparent meanings of certain of the technical terms employed are as follows, in order of occurrence. These amplify the glossary of the original article. Latinized forms are general in the text and have been followed here.

Underloute. A baulk of timber reinforcing the keel in way of the heel of the mast, modified to serve also as a scarph to the keel if the latter is in two parts, in which case a smaller baulk of the same nature might be added above, or to form an under scarph.

Scalmae. The curved timbers, essentially continuations of the keel, forming the stem and stern pieces. This word seems to be unrelated with the Latin for thole pins. Cf. Skal, O.N. for bare head.

Scheldbemes. Possibly strong beams, spaced 10 to 20 feet apart, and erected at an early stage as components

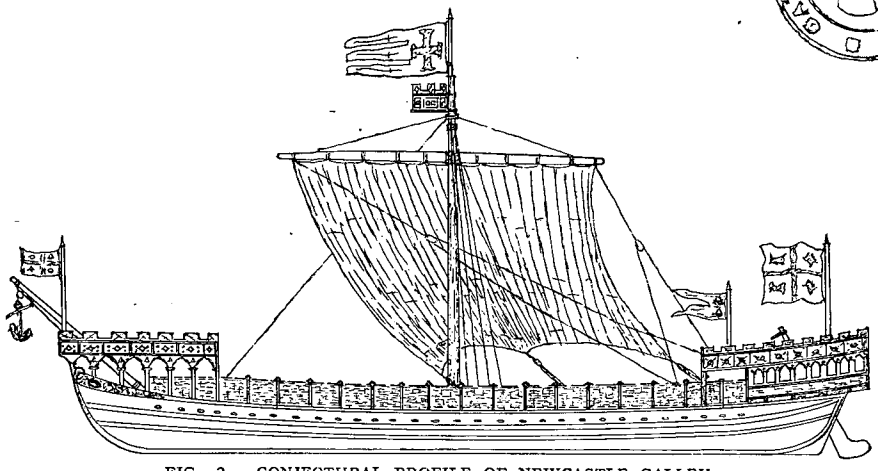

FIG. 3. CONJECTURAL PROFILE OF NEWCASTLE GALLEY.
LENGTH OVERALL, ABOUT 135 FEET.

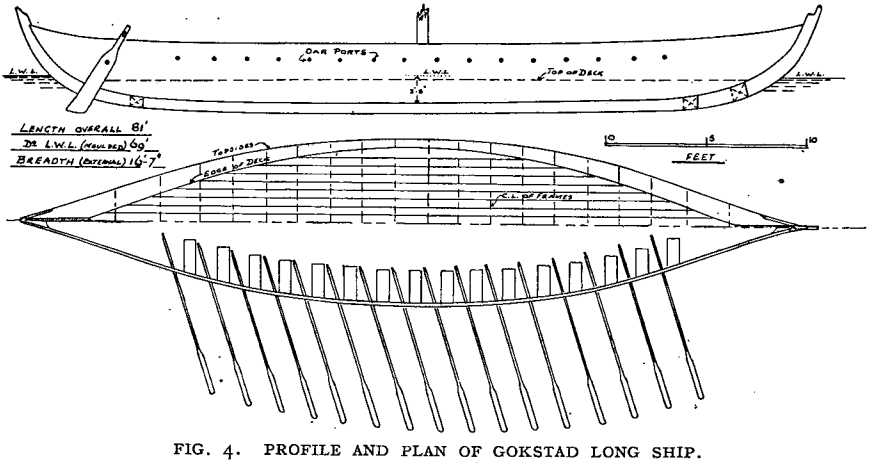

FIG. 4. PROFILE AND PLAN OF GOKSTAD LONG SHIP.
LENGTH OVERALL, 81 FEET.

of the skeleton frames. Alternatively specially heavy beams fitted each side of the mast to carry the mast partners, pull of the rigging, etc.

Spyking. Dogs or spikes, formed of iron rod, each end turned at right angles and sharpened. Used for temporarily securing adjacent parts of the ship, staging, etc.

Stici. The shores or spurs, set up from the ground, to shore up the galley.

Scaffaldum. Staging: also access ladders on the berth and permanent ones in the ship.

Pykewrang. A spar or pike serving as a floor at the extreme ends.

Woyres. Wales, external longitudinal timbers which wind or twist to conform with the ship's side. Cf. w. wire; Sw. vira, to twist.

Lerynges. Possibly risings, shelf pieces; or carlings, short fore and afters supporting half-beams.

Hecchiae. Decks, and ceiling over the bilges, originally all portable, but probably at this period mostly fixed.

Craftes. Knees, strengthening pieces. O.N. Krapti. G. Kraft, strong.

Cunel. Perhaps a longitudinal member worked immediately below the line of oar-ports as reinforcement of the openings and to distribute the oar thrusts. If so, the modern "gunwale" applied to the like member, and certainly unconnected with the fitting of guns, is a corrupt derivative.

Roulae. Greased launching ways placed under any heavy body that has to be moved over soft ground.

Planci. Sleepers placed beneath the standing part of the launching ways to further distribute the weight.

Clone. Possibly a timber-head or bollard for securing mooring ropes to (only in the singular in the text).

Craftnayl. A special form of trenail for securing knees to the connected parts, e.g. beam and top sides.

Bargia. A pinnace acting as tender to the galley,

capable of being beached and of transporting 50 or 60 men at a time from the anchored galley to the shore. A 36 feet naval pinnace carries out such duties to-day and weighs about 5 tons without men. Suitably designed, a boat of this size would keep the sea in any weather the galley could face and would follow her from port to port.

Hurdiceae. Bulwarks: in the waist, formed of hurdles (see text) mounted portably above the wash strake and supported by stanchions of a more permanent nature. The ends of the stakes of the hurdle would ensure a sighting slot between the top of the wash strake and the lower edge of the bulwark through which the rowers could watch their blades in rough weather: in way of the castles, permanent timber work.

Brand. The figure head. Both galley and barge were so ornamented.

Postella. Stanchions or pillars supporting the decks of the castles.

Spurches or *Spurchae.* Small strong spars suitable for windlass levers, stretchers, etc.

Lista. A capping piece or cover board.

Talon. A heel piece added to the foot of the curved stern post.

Standardum. The principal flag post, probably right aft.

Helmewale do. Flag staffs on the quarters.

Bousprete. A pole at the bow provided to give a good lead to the bowlines and for weighing anchor clear of the stem: a centre line cat head in fact. May have served to drop a grapnel on board an enemy ship.

Gyrdyngis. Ropes brailing up the sail preliminary to reefing.

The masts, spars, sails, all the rigging and most of the anchors, cables and mooring ropes for the galley and barge were requisitioned off vessels in port. One presumes these vessels, seven in number, were detained as a war

measure for fear of their being used to transport hostile troops. Payment was made for the material seized, but this cannot have gone far towards recouping the unfortunate owners. Two of the vessels had supplied from their cargoes some of the galley's planks, so that their enforced stay in Newcastle had already lasted nine months.

It is of interest to note the ports thus definitely connected with Newcastle in trade at the end of the thirteenth century, viz. Stralsund, Staverin, Midelburg and Berwick.

A rough idea of the size of the vessels may be gathered from the gear supplied. The names appear to be those of the owners.

There are a few material points in the 1926 paper which need correction, in addition to the question of oarage dealt with above.

It is in the highest degree improbable that this Newcastle galley bore any resemblance to the Venetian galley depicted by figs. 1, 2 and 3 of the original notes. Sketches of the probable appearance have been given, but it is well to stress the fact that all deductions from a presumed resemblance to Mediterranean galleys are *ipso facto* unlikely. The styles of the ships, and particularly of the galleys, of the two seas were as divergent as were their builders.

In particular, it is important to note that the lower lines are certain to have been fine and rounded, springing from a deep keel at a considerable angle. Flatness at the bottom did not exist in the northern tradition, whilst the deck line certainly had good sheer at the ends in direct opposition to the level deck line of the Mediterranean. It has been aptly remarked that the Norse type of long ship or galley was in essence a gigantic canoe.

Thwarts properly speaking did not exist, since the relation of oar-port to deck necessitated the employment of no more than a low stool as seat, whilst the rowing positions must have approximated to modern fixed seat racing styles.

The seats would not be inclined unless the fitting of staggered oars in pairs can be proved, and in no case would thwart or any other obstruction be carried into the valuable middle line space on deck.[7]

None of the oars were outrigged, and any excrescence from the sides serving as outriggers may therefore be negatived.

The keel, if fitted as in the Gokstad vessel, would ensure the galley having very fair sailing qualities. Her defects in this respect, if they existed, would be more due to the single square sail carried than to form, since such a sail is not readily set very flat when on a wind. If her course lay near the wind, rowing would probably be resorted to, as being faster than beating up under sail.

Hecchiae, translated hatches, must not be thought of as covered openings through the deck but as the deck itself. The Norse long ships had the whole deck fitted in portable sections between beams, so that deck and hatch were identical. Chaucer uses the word similarly (*Legend of Good Women*: "And poureth peas upon the slippery hatches"—a method of defence against boarders). Moreover, the number of nails described as for the hatches was about 10,000, and would suffice for a complete deck. Any space covered by some sort of deck, portable or otherwise, would suffice for shelter and sleep. The word may be cognate with hutch.

The suggestion that the final launching of the galley was effected by wetting the cables seems improbable. The text certainly lends itself to the idea, but the details of such a proceeding are so far-fetched that almost any other explanation is preferable.

In conclusion it is worth mentioning that after five years war service the galley, barge and boat were sold back

[7] Magnusson, *Notes on Shipbuilding and Nautical Terms of Old in the North*, p. 49, and Tuxen, *Proc. Nordisk Oldkyndighed og Historie*, 1886.

to Newcastle by the king for £40. It occurs to one that the Exchequer was fortunate in getting so much: few war-time vessels realized 20 per cent. of their cost when the Great War was over, especially if sold back to their original builders!