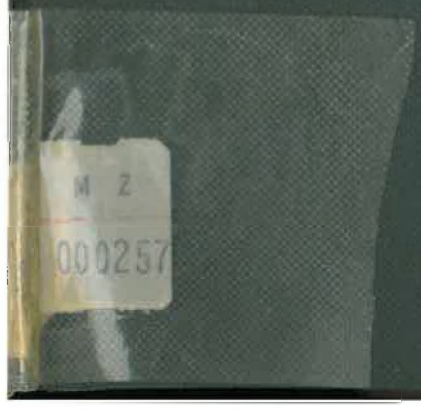
INSTRUCTIONS
RELATING TO THE
MEASUREMENT OF SHIPS
1913



ISSUED BY THE
BOARD OF TRADE.

INSTRUCTIONS

AS TO THE

TONNAGE MEASUREMENT OF SHIPS.

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CONTENTS.

NOTE.—This edition supersedes the edition issued in 1907. The contents have been re-arranged and to a large extent re-written; and the printed circulars and other instructions issued since 1907 have been embodied.

INSTRUCTIONS

AS TO THE

TONNAGE MEASUREMENT OF SHIPS.

PART I.—MEASUREMENT OF BRITISH VESSELS.

Preliminary.

1. Authority for instructions.—These instructions are issued by the Board of Trade under the provisions of the Merchant Shipping Acts for the assistance and guidance of their officers in measuring the tonnage of ships.

2. Fees and expenses.—Instructions as to the fees and expenses payable in connection with tonnage measurement are contained in the pamphlet entitled "List of fees and expenses payable in connection with Board of Trade surveys."*

3. Law relating to tonnage.—The tonnage regulations of the Merchant Shipping Acts, 1894 to 1907, are inserted in Appendix 1, page 61, and the Surveyors are expected to make themselves thoroughly conversant therewith, and also with the following instructions regarding their application. Whenever in the course of these instructions reference is made to "the Act" or to a section or schedule by number only, the reference is to the Merchant Shipping Act, 1894.

4. Surveyors to refer to Principal Surveyor for Tonnage.—The Measuring Surveyor will in all cases obey and be immediately responsible to the Principal Surveyor for Tonnage with regard to these instructions, and when in doubt upon any point, he should refer it to him for direction, and the Principal Surveyor will, if necessary, submit it for the consideration and decision of the Board of Trade.

5. Gross and net tonnage.—For the purpose of the tonnage regulations of the Merchant Shipping Acts, the ton is a unit of volume containing 100 cubic feet. The Act provides that, for the purpose of ascertaining the register or net tonnage of a ship, the gross tonnage shall first be ascertained in accordance with the directions contained in the second schedule, and the deductions provided for in the Acts shall then be made from the gross tonnage so ascertained.

* Obtainable from the publishers of this book, price 2*d*.

(26005—4.) Wt. 17765—225. 2500. 4/13. D & S.

GROSS TONNAGE.

6. Items of gross tonnage.—The gross tonnage consists of the sum of the following items:—

(*a*) The cubical capacity of the vessel below the tonnage deck;

(*b*) The cubical capacity of each space between decks above the tonnage deck;

(*c*) The cubical capacity of the permanent closed in spaces on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew; and

(*d*) The "excess of hatchways."

7. Application of Rules I. and II. respectively.—The Act provides that the gross tonnage must always be ascertained by Rule I. in the second schedule, except in the case of ships which, requiring to be measured for any purpose other than registry, have cargo on board, and ships which, requiring to be measured for the purpose of registry, cannot be measured by Rule I., in which cases Rule II. may be employed. The Surveyors should note, however, that Rule II. is not to be adopted in any case without the special sanction of the Board of Trade, except in the case of pleasure yachts under 50 feet in length, which may be measured for registry under Rule II. without special authority if the application of Rule I. is impossible owing to some or all of the fittings of the vessel being in place at the time of measurement.

Any ship which has been measured under Rule II. may at any subsequent period be remeasured under Rule I., on the application of the owner, and the payment of the prescribed fees.

MEASUREMENT UNDER RULE I.

Space beneath the Tonnage Deck.

8. Definition of tonnage deck.—The tonnage deck is the upper deck in all ships which have less than three decks, and the second deck from below in all other ships; but the protective deck of a war ship is not to be considered as a deck within the meaning of Section 77 (6).

9. Modification of rules for vessels with double bottoms.—The rules for measurement under the tonnage deck are contained in pars. (1) to (3) of Rule I., but in the application of these rules to vessels with double bottoms for water ballast, regard must be had to the provisions of Section 81 in respect of the depth measurements in every case. In the case of vessels in which the

double bottoms are designed with a rise transversely, regard must also be had to the modifications made by the Board of Trade under Sec. 77 (7) to meet such cases in respect of the position and number of breadths to be measured, and the mode of computing the areas. The rules as modified under these sections are printed on pages 66 to 68, and must be followed in all cases so far as they apply.

10. Measurement to be made at an early stage.—In order that the measurement of the gross tonnage may be effected under proper conditions, the Surveyors should watch the progress of the building of all steam vessels within the limits of their port, so that the measurements may be taken when the hold is ready and while it is still sufficiently clear for the purpose. At the same time, it will be understood that the responsibility for applying for measurement rests with the builders or owners, as the case may be.

11. It is of great importance, not only that the rules given by the Act should be followed, but that all the required measurements should be taken, and the calculations made, in one uniform and correct manner, so that one general system may prevail in this respect throughout the various ports of the kingdom. For this purpose the following practical directions are given, showing the several progressive steps, briefly stated, to be observed in the practical operation of measurement by Rule I.

The measurements made at the ship may be recorded in the notebook provided for the purpose (form Surveys 58A), and they are subsequently to be entered in the printed formula appropriate to the case. (*See* par. 42 and Appendix 2, page 71).

12. Length.—The length at the tonnage deck, in all vessels of the usual sheer*, is to be taken on the upper surface of the deck, at such a parallel distance from the middle line of the ship as to clear the several hatchways

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* It is found that the length taken on the surface or sheer line of the deck, in vessels of the usual sheer, is as eligible for the practical purposes of tonnage as when taken on the perfect straight line or chord of the sheer; for the difference in the two lengths thus taken, in the case of a vessel having more than the usual sheer of 3 feet in 250, amounts to about 2½ inches, giving a difference in the tonnage of only about one-tenth per cent.

But in the case of the Dutch galiots, or doggers, as they are termed, which have a depth of sheer of about 5 feet in 100, the difference in the two lengths amounts to about 11 inches, giving an increase of about 1 per cent. in the tonnage due to the increased length. Therefore, in all such cases of unusually large sheer, the length for computation must be taken by means of a tape or line stretched tightly from end to end of the deck.

and other obstacles that may present themselves. Having fixed upon the ends of this parallel line as far, both forward and aft, as may be found convenient, mark them on the deck, and square them into the middle line of the ship; then take the distances from the points thus determined on the middle line to the inside of the plank at the bow and stern respectively, or to the inside of the angle irons or frames in iron or steel ships if not ceiled at bow and stern, making the requisite deductions for the rakes of the bow and stern, as set forth in the Rule, and as shown in Figure 1; the sum of these two distances, added to the length of the parallel line marked on the deck as aforesaid, gives the whole length required.

13. Points of division of the length, or stations of the transverse areas.—Having divided the length into the number of equal parts required by the Rule, set off the points of division by marking their places on the tonnage deck with a piece of chalk (thus showing the positions of the different transverse areas on the tonnage deck), and number them successively 1, 2, 3, 4, &c., No. 1 being at the extreme point of the length at the bow, No. 2 at the first point of division just marked on the deck, and so on successively, the last number being at the extreme point of the length at the stern. (See Figure 1.)

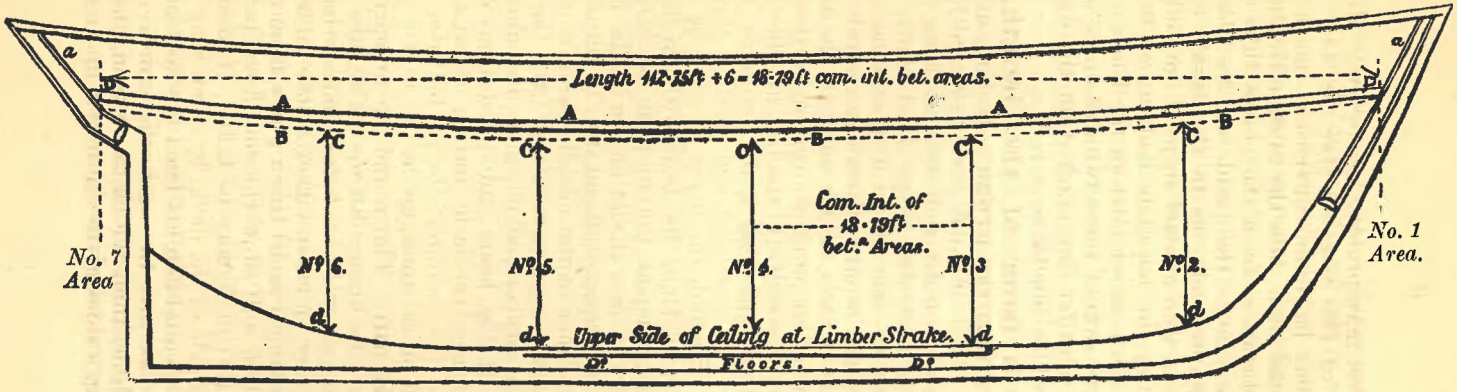
14. The *positions* at which the *areas* have to be taken are next to be transferred from the deck to the keelson in the hold, and for this purpose a line is to be extended down the main hatchway in a direction perpendicular to the keel, by means of a square placed on the upper side of the keelson; the distance of the midship area from this line at the tonnage deck is then to be set off from the point thus determined on the keelson, which gives the station of the midship area on the keelson; and the stations of the others are obtained on the keelson by setting off, afore and abaft the midship one, the common interval between them, as already marked off on the tonnage deck.

15. Round of Beam.—The round up or spring of the beam, which must be known before taking the exact length of the vessel, as well as before measuring the depths of the areas, may be taken either at the under side of the deck, by stretching a small line tightly from end to end of the beam, which will show the round or spring of the beam at the centre; or it may be taken, if more convenient, at the upper side of the deck, by stretching a line tightly across, held at equal heights from the deck at each side of the ship, so as just to touch the crown of the deck at the middle line; then the distance from the deck to the line at the ship's sides gives the round up or spring

Figure I.

Showing the length of a vessel at the tonnage deck, its points of division for the stations of the areas, and the depth at each area, as measured under Rule I (1).

(The diagram, being merely descriptive, is not drawn to scale.)



References.

A A A, represents the upper side of the tonnage deck.
B B B, (plain line) „ under side of deck or beam line.
a, *a*, represents „ inside plank or lining at bow and stern.
D D, (dotted line) „ length, taken on the upper side of the deck from plank to plank, shewing the deduction at each end (namely, the distance from the inside plank to the upright dotted line at D), as prescribed by the Rule, on account of the rakes of the bow and stern. These deductions are necessary in consequence of the length being taken above its right position; the right position being at the head or top of the areas, shown by the dotted line passing through the points C, C, &c., at one-third of the round of the beam below the deck line.

The length being in this case 112·75 feet, is divided into six equal parts, giving the stations of the areas, with the common interval of 18·79 feet between them.

C*d*, C*d*, &c., represent the stations and depths of the areas of the five points of division.
C, C, C, &c., show the upper points of the depths, at one-third of the round of the beam below the deck or beam line.
d, *d*, *d*, &c., show the lower points of the depths, at the upper side of the ceiling at the inside of the limber strake.

of the beam. It is necessary to take the round of beam at each point of division of the length except when the vessel has a parallel or nearly parallel breadth.

16. Measurement of transverse areas.—In the case of steam vessels which at the time of measurement have their machinery fitted, and in which the prescribed transverse sections or areas falling in the engine room cannot be measured, other areas are to be measured in places which are clear in lieu of such as are obstructed, and as near to them as possible, the new positions being noted in the Surveyor's formula accordingly.

The whole of the areas are then to be computed by the Surveyor in the prescribed manner.

The extreme points of the length at the bow and stern, though described as being the positions of the first and last areas, do not, in vessels of usual form, yield any area, as the vertical transverse section at each of those places vanishes into a mere horizontal line. Therefore, in the computation for tonnage, where the first and last areas form part of the process, a cipher must be employed in their places. But in vessels of unusual form, as, for instance, in barges or other craft in which the bow and stern are upright, with breadth also at those places, the extreme points of the length will yield areas; in which cases such areas must be measured and used in the computation as the Rule directs.

17. Depths.—The depth of the midship area is to be taken from the under side of the tonnage deck to the upper side of the floor timber at the inside of the limber strake, placing the measuring staff parallel to the middle plane of the ship, and also square to the keel by means of a square placed on the upper side of the keelson. From the depth thus ascertained is to be deducted one-third of the round of the beam, and also the average thickness of the ceiling on the floor timber. (See Figure II., page 10.)

The depths at the other areas are to be taken in the same manner, taking care where the keelson curves upwards, to place the measuring staff square to the line in continuation of the upper side of the keelson in midships.

In vessels with a raised platform in the bottom, and no ceiling fitted, the depths are to be taken down through the platform to the upper side of the usual floor timbers, deducting therefrom the thickness of the platform in question.

18. If the vessel has a double bottom for water ballast, the depths are to be taken to the upper side of the inner plating of the double bottom, which is deemed to represent the floor timber, provided the Surveyor can certify

that the space between the inner and outer plating is not available for the carriage of cargo, stores, or fuel. This question will not, however, arise as a rule in the case of double bottoms for water ballast constructed on the cellular principle where the floors extend the full depth of the space; but as regards double bottoms other than those of cellular construction the Surveyors must satisfy themselves that the requirements of Section 81 are complied with.

19. The division of the depth into four, five, six, or seven equal parts, as the case requires, and subdivision of the lowest part into four equal parts, which is necessary when the depth is divided into five or seven equal parts, gives the points of division at which the intermediate breadths between the upper and lower ones are to be taken.

When the under deck tonnage is measured in parts in consequence of a break or breaks in the double bottom, the tonnage depth at the middle of the tonnage length will determine the number of parts into which all the remaining tonnage depths are to be divided.

20. Breadths.—The depth at any area being ascertained as above directed, and divided into the required number of equal parts, the points of division at which the breadths are to be taken are to be marked on the staff; and the staff being refixed in its original position, the breadths of the areas are then to be taken by extending a staff or tape *horizontally athwart* through each point, from plank to plank, to its average thickness between the respective points of measurement. (See Figure II., page 10.)

In the case of iron or steel vessels of the usual construction having no ceiling on the sides, the breadths are to be taken to the inner edge of the angle irons or frames.

21. In the case of batten or spar ceiling, the spacing being not more than about one foot, the breadths are to be taken to the face of the battens or bars, as the case may be. If, however, the battens or bars are more than one foot apart, the breadths must be taken to the average thickness between the respective points of measurement. When spar ceiling is fitted of a greater thickness than three inches, this dimension is to be regarded as the maximum for which allowance is to be made when measuring the horizontal breadths, but when the thickness is less than this, the actual thickness only is to be allowed.

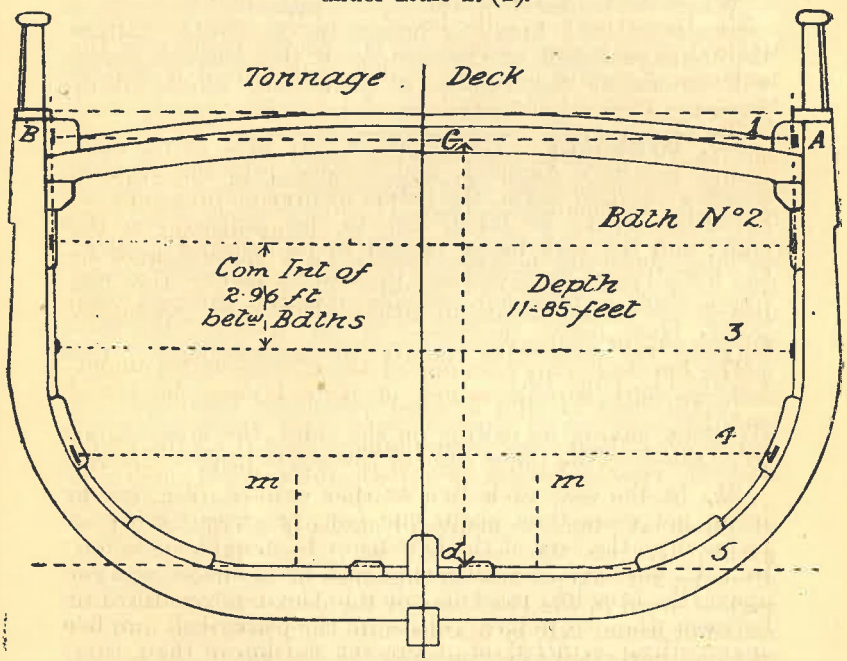
22. When the holds are insulated for refrigerating purposes, and the casing extends beyond the edges of the frames or above the top of the floors or double bottom, a

maximum allowance of three inches may be made when measuring the horizontal breadths and also the depths of areas; but if the projection is less than three inches, only the actual projection is to be allowed.

23. Upper breadth.—On referring to Figure II. below, it will be observed that, as the horizontal direction of the upper breadth passes through the deck, it cannot be taken when the deck is laid, and therefore must be measured on the upper side of the deck, as shown by the upper dotted line, allowing within the rough-tree timbers the thickness of the ceiling between decks below, as shown by the Figure.

Figure II.

Illustrating the measurement of the midship area, under Rule I. (2).



References.

C *d* represents the *Depth*, the upper point C being at one-third of the round of the beam from the beam line, and the lower point *d* at the upper side of the ceiling at the inside of the limber strake.

This midship depth, being under 16 feet, is divided into four equal parts, giving the position of the breadths at 2·96 feet apart.

A B represents the *Upper Breadth* passing through the point C, which is the upper boundary of the area.

m m represents the *Lower Breadth* taken horizontally through the point *d*.

By this method, the upper breadth is taken from 4 to 6 inches above its proper position (as seen by inspection of the Figure); and, in vessels which have upright sides, this will be perfectly correct; but in the case of inclining sides, the necessary allowance must be made for the deviation of the sides from the upright in the 4 or 6 inches additional height, as aforesaid.

In the case of three-deck ships, the upper breadth of each transverse section is to be taken on the tonnage deck from side to side, allowing for the average thickness of plank or spar ceiling as the case may be.

24. Lowest breadth.—It is manifest also from the figure that the lowest breadth, when the vessel has no horizontal flat or floor, is limited to the distance between the two limber strakes; and that, in flat-floored vessels, it is bounded by the extent of the horizontal flatness of the vessel, as shown in the Figure between the points *m*, *m*.

25. In setting down the breadths of the areas according to their progressive numbers in the proper column in the formula, it should be noted that breadth No. 1 is that at the upper point of the depth.

26. In all cases the appropriate formula according to the length and depth of the vessel is to be used for computing the under-deck tonnage. A list of formulæ is given in Appendix 2, page 71, of these Instructions. The Form Surveys 50 A is used as a supplement to the ordinary formula in large vessels when room cannot be found on the ordinary formula for entering the full details and computations of spaces above deck, exempted spaces, engine room, &c.

27. The following epitome of the directions for under-deck measurement contained in Rule I. may be found useful.

Length.—Taken inside on tonnage deck (*i.e.*, the upper deck in vessels having less than three decks, and the second deck from below in all other vessels) from inside of plank at stem to inside of midship stern timber or plank there (as the case may be); the length so taken, allowing for rake of bow in thickness of the deck, and for rake of stern in the thickness of the deck and one-third of round of beam, is to be divided into the prescribed number of equal parts (thus determining the stations of the areas), according to the length as follows:—

Class 1.—Length of 50 feet and under, into 4 equal parts.
,, 2.—Length above 50 to 120 feet, into 6 equal parts.
,, 3.—Length above 120 to 180 feet, into 8 equal parts.

Class 4.—Length above 180 to 225 feet, into 10 equal parts.

,, 5.—Length of 225 feet and upwards, into 12 equal parts.

Areas.—Area No. 1 is at the extreme limit of the bow. Area No. 2 is at the first point of division of the length. The rest are numbered in succession, the last being at the extreme limit of the stern.

Depths.—Taken at each point of division of the length, or station of each area, from the under side of tonnage deck to ceiling at inner edge of limber strake, deducting therefrom one-third of the round of the beam; the depths so taken are to be divided into four equal parts, if midship depth does not exceed sixteen feet, otherwise into six equal parts. But if the vessel has a double bottom for water ballast and the Surveyor can certify it as not available for cargo, stores, or fuel, and if the inner bottom has a rise transversely: then the depths are to be divided into five or seven equal parts as the case requires instead of four or six, and the lower part is to be subdivided into four equal parts.

Breadths.—Taken at each point of division of the depths, and also at the upper and lower points of the depths. The upper breadth of each area is to be set down as No. 1 in its respective column in the formula, and the rest in succession.

Where breaks in the double bottom exist and the vessel is measured in parts, lengths of 30 feet and under are to be divided by 2.

Measurement of Spaces between Decks.

28. The *spaces between decks* above the tonnage deck, in the case of ships of three or more decks, are to be measured and added to the underdeck tonnage. The directions for the measurement of these spaces are so fully detailed in Rule I. (4) as to require no notice here. (*See* par. 41 as to the measurement of 'tween deck spaces in round-sterned ships.)

Excess of Hatchways.

29. In all new vessels, and in all vessels coming in for remeasurement, the cubical contents of the hatchways are to be obtained thus: multiply the length and breadth together and the product by the mean depth taken from the top of beam to the underside of the hatch. From the aggregate tonnage of the hatchways deduct one-half per cent. of the gross tonnage, and add the remainder to the gross tonnage of the ship.

Measurement of Spaces on the Upper Deck.

30. The Act provides that if there be a break, poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, it must be measured and included in the gross tonnage.

31. In carrying out this direction, and deciding whether or not deck erections should be measured and added to the tonnage, the Surveyor should have regard to the character and structural condition of such erections at the time when they are presented to his notice.

32. Poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing, but otherwise so closed in as to be not only available, but also actually fitted and used for the berthing or accommodation of passengers, must be measured and added to the tonnage.

33. Subject to the foregoing exception, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing them, should not be measured and included in the tonnage. Whenever any portion of such erection is occupied by timber, stores, or other goods, the tonnage of such space is ascertained and recorded by the Officers of Customs and Excise in accordance with Section 85.

34. The minimum width and height of the permanent openings in the bulkheads is fixed at three feet and four feet respectively, and if coamings are fitted thereto their height must not exceed two feet.

A single opening at one side of a bulkhead is not considered sufficient to entitle the space thus partitioned off to exemption, unless, in addition to this, there are a number of freeing ports and scuppers fitted on each side of the space claimed. In such cases the Owner's application for exemption and also a sketch of the space drawn to scale must be forwarded to the Principal Surveyor for Tonnage for examination, and exemption must not be allowed without the Board's approval.

35. Shelter deck spaces.—When exemption from measurement is claimed for the space between the upper and shelter decks on the ground of a permanent middle line opening in the shelter deck, the length of this opening must not be less than four feet clear, and the width must at least be equal to that of the after cargo hatch upon the same deck. The distance between the after edge of the deck opening and the aft side of the sternpost must not be

less than one-twentieth the registered length of the vessel, or if the opening is placed forward the fore side must not be less than one-fifth the length of the vessel from the stem. When the permanent deck opening is situated aft, there must be at least two openings in all the transverse bulkheads in the 'tween decks on the fore side of it to entitle the space to exemption, and these openings must comply as regards dimensions and size of coamings (if any) with the requirements of par. 34 above.

There must also be on each side at least one freeing port of good size abreast the deck opening, and a suitable number of scuppers not less than $3\frac{1}{2}$ inches diameter distributed throughout the space.

The coamings to the deck opening must not exceed 12 inches mean height above the deck, and the opening must be fenced with guard-rails and stanchions, the latter being so fitted as not to lend themselves to battening down the opening.

If portable wood covers are fitted the lashings beneath for holding them down are to be of hemp.

All openings in the upper deck must be provided with proper means for closing and battening down.

36. The tonnage measurement of all spaces above the upper deck that the Surveyor has *not* included in the gross tonnage of the vessel should be given in detail on the Formula, which, when forwarded to the Tonnage Office for test and examination, should be accompanied by any plans, sketches (drawn to scale), or explanation required for the proper consideration of the exemption of such spaces.

Should there be no spaces above the upper deck which have been exempted, this should be noted on the Formula.

The Surveyor should be careful to record in the space provided on the certificate of survey, Form Surveys 59, the principal dimensions, tonnage, and position of all spaces above the upper deck that are not included in the cubical contents forming the ship's registered tonnage.

37. Shelter for deck passengers.—The Act provides that no addition shall be made to the tonnage in respect of any building erected on the upper deck for the shelter of deck passengers and approved by the Board of Trade. When application is made, or when the Surveyors think there is a claim for the exemption of any such space fitted for the shelter of *deck passengers* on short voyages, who would otherwise be exposed to spray and shipment of seas, and other inclemencies of the weather, the Surveyors should apply to the Board, through the Principal Surveyor for Tonnage, for directions, describing the erection and how it is secured, with any particulars

they think necessary. A scale drawing showing the space or spaces and indicating the w.c. arrangements for the men and women respectively should always accompany the application.

38. Closed-in spaces which may be exempted.—The following *exceptions* to the general rule of measuring all closed-in or weather-protected spaces are allowed:—

(*a*) Any closed-in space or spaces solely appropriated to and fitted with machinery.

(*b*) The wheel-house for sheltering the man or men at the wheel.

(*c*) The cook-house and also the bakeries when fitted with ovens and used entirely for such purposes.

(*d*) The condenser space.

Provided always that the spaces are no larger than required for the purposes mentioned.

(*e*) *Water-closets or privies* for the officers and crew; and in the case of vessels fitted particularly for passengers, an additional one may be allowed for every 50 persons; not more than 12 are, however, generally necessary.

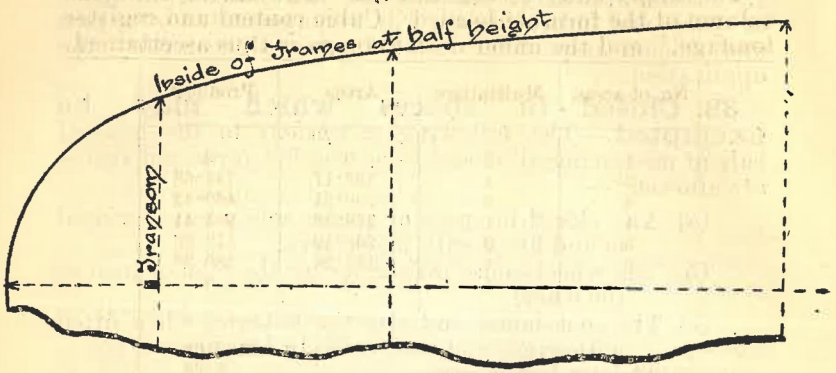
39. Method of measuring erections.—Rule I. (5) contains full directions for ascertaining the cubic capacity of such spaces above deck as, in accordance with the Act and the above instructions, are required to be measured and added to the tonnage; and the only points that seem to require special notice are those dealt with in the following two paragraphs.

40. Break.—A break is the space above the line of upper deck when the deck is cut off and continued at a higher elevation. The height of a break is the distance from the under side of the upper deck to the under side of the break deck.

41. Round-sterned ships.—The after breadth of a break, poop, or space in upper 'tween decks of similar form, should as a rule be measured in iron and steel ships at the transom plate connected with the rudder post, and in wood ships at a corresponding position. The breadth should be measured at the middle of the height of the space. (*See* Figure III., page 16.)

If, however, there are any special features in the design of the vessel which may suggest the desirability of a modification of this rule, full particulars of the case should be forwarded to the Principal Surveyor for Tonnage for consideration accompanied with scale drawings relating to the question.

Figure III.



42. Worked example of measurement under Rule I.—The following example shows the application of Rule I. to a vessel remarkably sharp at the bow and stern, and very full amidships. It also shows the method of filling up and using the formula referred to in par 11.

The length of the vessel is supposed to be 112·75 feet, and this being between 50 and 120 feet must be divided by 6 to find the common interval between areas, viz., 112·75 ÷ 6 = 18·792 feet.

That part of the formula relating to the computation of the areas is then filled up as follows:—

		Area 1.		Area 2.		Area 3.		Area 4.		Area 5.		Area 6.		Area 7.	
Depths		Feet. ——		Feet. 12·65.		Feet. 12·3.		Feet. 11·85.		Feet. 11·4.		Feet. 10·9.		Feet. ——	
Com. Inter. between Breadths.		——		3·162.		3·075.		2·962.		2·85.		2·725.		——	
No. of Bths.	Multipliers.	Bths. Ft.	Products.	Bths. Ft.	Products.	Bths. Ft.	Products.	Bths. Ft.	Products.	Bths. Ft.	Products.	Bths. Ft.	Products.	Bths. Ft.	Products.
1	1	—	—	19·35	19·35	20·2	20·2	20·4	20·4	20·2	20·2	19·1	19·1	—	—
2	4	—	—	18·85	75·4	20·4	81·6	20·5	82·	20·35	81·4	18·65	74·6	—	—
3	2	—	—	16·65	33·3	20·15	40·3	20·25	40·5	20·	40·	14·95	29·9	—	—
4	4	—	—	11·85	47·4	19·6	78·4	19·85	79·4	17·8	71·2	8·75	35·0	—	—
5	1	—	—	1·85	1·85	3·	3·	6·35	6·35	6·35	6·35	1·	1·	—	—
½ of Com. Inter. betw. Bths.		——		177·3 1·05		223·5 *1·03		228·65 ·99		219·15 ·95		159·6 ·91		——	
		0		186·165		230·205		226·363		208·192		145·236		0	
		Ar. 1.		Ar. 2.		Ar. 3.		Ar. 4.		Ar. 5.		Ar. 6.		Ar. 7.	

* *See* paragraph 95.

The areas thus ascertained are next inserted in the column of the formula headed "Cubic content and register tonnage," and the under deck tonnage is thus ascertained.

No. of areas.	Multipliers.	Areas.	Products.
1	1	0	0
2	4	186·17	744·68
3	2	230·21	460·42
4	4	226·36	905·44
5	2	208·19	416·38
6	4	145·24	580·96
7	1	0	0
			3107·88
⅓ com. inter. between areas			6·26
			19455·32
Under deck tonnage			194·55

The tonnage of the closed-in space on deck (in this case a break) is then ascertained, the column headed "Closed-in space" being filled up as follows:—

Mean Length 32·15 Feet.

Com. Inter. between Breadths 16·075 Feet.

No. of Breadths.	Multipliers.	Breadths. Feet.	Products.
1	1	20·	20·
2	4	18·6	74·4
3	1	17·15	17·15
		111·55	
⅓ com. inter. between breadths ...		5·36*	
		597·91	
Height		2·	
		1195·82 cubic feet.	
		11·96 tons.	

The tonnage of the break being added to the under deck tonnage gives the gross tonnage. The gross tonnage is therefore:—

194·55 under deck.
11·96 break of deck.

206·51 Gross Tonnage.

* *See* paragraph 95.

Measurement under Rule II.

43. Alteration of factors.—It should be noted that the decimal factors of tonnage originally prescribed by this Rule, as given in the Act, have been altered, under the provisions of Section 77 (7), to ·0017 for ships built of wood, and ·0018 for those built of iron.*

44. Tonnage deck.—For the purpose of measurement by Rule II., the upper deck is always the tonnage deck, whatever may be the number of decks; so that the tonnage of the 'tween decks, which has to be measured separately under Rule I., is measured and included in the first operation of Rule II. by girting, and separate measurement of the 'tween decks is unnecessary.

45. Tables for reference.—In measuring the length of wooden vessels under Rule II., the following tables may be found useful:—

(*a*) Usual thickness of the side or shells of vessels at the upper deck:—

Tonnage.	50	150	250	350	500	700	1000	1500
Whole thickness at upper deck.	Ins. 8½	Ins. 10½	Ins. 12¼	Ins. 12¾	Ins. 13½	Ins. 14½	Ins. 15¼	Ins. 15½

(*b*) Usual *distance* between the after side of the sternpost and its rabbet at the wing transom, or if there is no wing transom, at the point where the counter plank meets or crosses the rabbet:—

Tonnage.	50	150	250	350	500	700	1000	1500
Distance between aft side of post and its rabbet at the wing transom.	Ins. 8	Ins. 10	Ins. 12	Ins. 14	Ins. 16	Ins. 18	Ins. 19	Ins. 21

46. Spaces on deck.—It will be observed that in Rule II., as in the case of Rule I., all *closed-in spaces* on the upper deck are to be measured, but in a more summary manner than is directed by Rule I., and in determining what spaces are to be measured the surveyors should be guided by paragraphs 30 to 38 above.

* *See* Customs General Order No. 72 of 1858.

47. The hatchways are to be dealt with as directed in par. 29 above.

48. Example of Rule II.—The following example shows the application of Rule II. to a vessel remarkably sharp at the bow and stern and very full amidships. The vessel is the same as the one referred to in the worked example of Rule I. given in par. 42, and the surveyors should note the difference which may arise between Rules I. and II. in a vessel of such unusual shape.

Ft.	
44	main girth under keel from deck to deck at ship's
22·7	main breadth. [sides.
2)66·7	
33·35 squared is	1112·22
	109 length as prescribed by Act.
	121231·98*.
	·0017 factor for wooden vessels.
	206·0927 tons under deck.
	11·93 ditto of break of deck, as [below.
	218·02 gross tonnage.

Break of Deck.

lgth.		bdth.		ht.		cub. ft.		tons.
32·15	×	18·55	×	2	=	1192·76	÷ 100 =	11·93

REGISTER TONNAGE.

49. The Surveyors should note the following instructions relating to the various deductions made from the gross tonnage in order to ascertain the register or net tonnage.

Allowance for Propelling Power.

50. Engine room always to be measured.—Notwithstanding the rateable allowance for propelling power for which the Act provides, the surveyors will observe that it will always be necessary to measure the engine room, whatever may be its size, in order to ascertain whether the allowance to be deducted for the propelling power is to be regulated by the general percentages prescribed by the Act, or by the actual contents of the engine room, ascertained by measurement.

* As the decimals in this multiplicand are never of any value, as regards the resulting product, they may be discarded.

51. Items of engine-room tonnage.—The tonnage of the engine room may include the following items under Sec. 78:—

(*a*) Space below the crown of the engine room;

(*b*) Space between the crown and the upper deck framed in for the machinery or for the admission of light and air;

(*c*) Space similarly framed in above the upper deck; and

(*d*) The contents of the shaft-trunk or trunks in screw vessels.

52. Directions for measurement.—The measurement of the engine-room space is to be made in accordance with Rule III. in the Second Schedule.

Space beneath the Crown.

53. Meaning of "crown."—The crown or top of the main space of the actual engine room, from which the depth of the main space is to be taken, will either be at the under-side of a deck, or, if the side bulkheads are curved, at the point or height at which the curve terminates.

54. Measurement in parts.—In the case of engine rooms of irregular form, the space is to be measured in parts with a view to obtaining the correct cubic contents.

55. Length.—As regards the length of the actual engine room, that length only is to be measured which is requisite for containing the boilers and machinery, with the addition, when the fire grates are in a fore and aft direction, of such length as is necessary for the stoking or working of the fires in a fore and aft direction clear of the machinery. The additional length on this account may be about one foot more than the length of the fire grates. This length will be found, generally speaking, to be from about five feet to nine feet, and in any case where it may appear to the Surveyor that a greater length should be allowed, he must submit all particulars with plans to the Principal Surveyor for Tonnage for consideration.

No such additional length is, however, required when the boilers are placed with the fire grates athwartships, as in such a case the stoking or working of the fires in an athwartship direction does not interfere with the position of the engines. The clear central space required between the boilers when the stoking is athwartships is from about eight to eleven feet. The point to which the after boundary of the length of the engine room is to be measured, should be no further aft of the after cylinder, or of its valve casing, than is necessary for safe working; but in no case without special instructions should the

actual point of measurement be more than four feet from such cylinder or valve casing.

With regard to the length to be allowed between the engines and boilers, the Surveyor should in no case allow more than may appear to him necessary for the safe working of the machinery.

56. The restrictions of the main engine and boiler space referred to in the foregoing paragraph are not to be applied to trawlers, tugs, or yachts, nor to the ordinary screw or paddle steamers obtaining the allowance of 32 or 37 per cent. of the gross tonnage respectively.

If in any other case a departure from either of the above Rules as to length appears to be necessary, owing to the high power of the engines, or to any peculiarity in the arrangement of the machinery, the Surveyor should, before fixing the length to be allowed, forward all particulars with plans to the Principal Surveyor for Tonnage for consideration.

57. Form Surveys 128.—Particulars of the engine and boiler space should be recorded on the Form Surveys 128, which should be attached to the formula when the latter is submitted with the engine spaces inserted.

Spaces between Crown and Upper Deck.

58. The engine spaces between the crown and the upper deck, if any, are to be measured separately, and their cubical contents added to the main space.

Spaces above the Upper Deck.

59. On the request of the owner in writing, engine spaces above the upper deck may be measured under Section 78 (2) and their contents added to the gross tonnage, as well as to the actual engine room, if they are (*a*) reasonable in extent, (*b*) safe and seaworthy, and (*c*) so constructed that they cannot be used for any purpose other than the machinery, or for admission of light and air to the machinery and boilers of the ship. In dealing with these cases, the Surveyor should in each instance submit a detailed description and measurement of the spaces and a Form Surveys 117, together with sketches or tracings, to the Principal Surveyor for Tonnage, and should not in any case complete the measurement until he receives instructions in respect thereof. In construing the words "reasonable in extent" the Surveyor should note that—

(i.) The length should not exceed the length of the propelling space, and if any portion is plated over, the length of the plated part should be deducted from the full length; and

(ii.) Whatever the breadth of the casing may be, no greater breadth is to be allowed for the purpose

of propelling space deduction than one-half the extreme inside breadth of the ship amidships.

These erections have in the past in some cases greatly exceeded all reasonable requirements for the admission of light and air. The Surveyor should be careful to report whether the extra erections are necessary at all, and whether light and air could not be safely admitted to the engine space and boiler space without these erections being carried up above the "crown," and, if such is the case, he should not regard them as "reasonable in extent" within the meaning of this section, and should not allow their contents to contribute to the deductions from gross tonnage.

The Surveyor will say in his report whether, in his judgment, the spaces are safe and seaworthy, but if in any case he has any doubt on these points he should state it in his report on Form Surveys 117.

When approved, each such space must be permanently marked on the inside thereof, "certified as part of the engine room."

Shaft Trunks.

60. When there is no built tunnel, the following rules should be observed in the case of a vessel with a single screw. The thrust block space should be taken of such length and breadth as will admit of a man getting round it to remove the holding down nut, and the height need not exceed seven feet. The tunnel allowed should be of ordinary dimensions suitable for the vessel.

When the vessel is a twin screw, and the space aft of the engines is open from side to side, the space should not be included in the engine-room measurement for a greater height than six feet mean, and any space therein appropriated for stores, or for any purpose other than the propelling power, should be deducted from the space to be included in the engine room.

61. Escape ladderways from trunk shaft.—When a trunked ladderway is fitted from the deck to the after part of the shaft trunk, the trunk-way is to be measured and its cubical capacity included with that of the shaft trunk in estimating the allowance for propelling power, provided that it is no larger than is necessary for the purposes of access to and escape from the tunnel.

62. Spaces not to be included.—The cubical contents of the engine space having been ascertained as described above, the cubical capacity of any cabins or store rooms which may be fitted in the engine room, and also any space occupied by, and necessary for, the safe working of machinery not used in propelling the ship, must be deducted, and the remainder being divided by 100 will be the net tonnage of the actual engine room.

63. Mode of calculating allowance for propelling power.—The net tonnage of the actual engine room having been ascertained according to the rules in the Act, and to the foregoing directions, the method of estimating the allowance to be deducted for the propelling power under Sec. 78 (1) and the Act of 1907 remains to be considered; and in proceeding to ascertain this allowance the following are the principal points for the measurer to consider.

64. Engine rooms of usual size.—When the tonnage of the actual engine room, as above ascertained, amounts, in the case of paddle vessels to between 20 and 30 per cent., and in the case of screw vessels to between 13 and 20 per cent. of the gross tonnage of the vessel, the allowance is to be, in the case of paddle vessels, 37 per cent. ($\frac{37}{100}$ths), and in the case of screw vessels 32 per cent. ($\frac{32}{100}$ ths), of such gross tonnage.

If the tonnage of the actual engine room does not lie between the above-mentioned limits for paddle and screw steamers respectively, the Act provides that the allowance for propelling power may be calculated in the same manner, or as an alternative, the Board of Trade or the owners may require the allowance to consist of $1\frac{1}{2}$ times the tonnage of the actual engine room in paddle vessels, and $1\frac{3}{4}$ times the tonnage of the actual engine room in screw vessels.

65. Small engine rooms.—In all cases where the actual engine room is not greater than 20 per cent. or 13 per cent. of the gross tonnage, according as the vessel is a paddle or a screw steamer, the Board require the last-mentioned scale to be adopted, unless express directions to the contrary are given in any particular case.

66. Large engine rooms.—If the tonnage of the actual engine room is not less than 30 per cent. or 20 per cent. of the gross tonnage, according as the vessel is a paddle or a screw steamer, the allowance is to be calculated in the manner explained in the first part of par. 64 above, unless the owner exercises his option of having it calculated by the alternative method explained in par. 65, in which case the provisions of the Merchant Shipping Act, 1907, must be taken into consideration.

67. Restriction on allowance for propelling power.—The Merchant Shipping Act, 1907, provides that in all steamships, except tugs exclusively used in towing, the deduction for propelling power is not to exceed 55 per cent. of that portion of the tonnage which remains after deducting from the gross tonnage any crew space and other deductions allowed under Section 79 of the Merchant

Shipping Act, 1894, and when preparing the tonnage formula the Surveyor should be careful that the deduction to be allowed does not exceed this limit.

It should be carefully noted, however, that the Act does not come into operation until the 1st January, 1914, in the case of ships either contracted for, commenced or built before the 1st May, 1907.

Whenever a tonnage formula is forwarded for a new steamship intended to be employed as a tug, the Surveyor should also furnish a report stating whether or not the vessel is to have a passenger certificate, or is to be used for the carriage of cargoes, as it is only in tugs constructed and used *exclusively for towing* that the 55 per cent. limit for propelling space deduction is not to be applied.

The Surveyor should note that the foregoing instruction does not supersede any of the provisions of Rule III., or of paragraphs 50 to 62 of these instructions.

68. Worked example.—The following worked example shows the calculation of the allowance for propelling power in the case of the vessel referred to in par. 42 above.

EXAMPLE OF CALCULATION FOR ENGINE ROOM DEDUCTION.

SCREW STEAMER.

Measurement of actual Engine Room.

		Ft.	
Breadth, fore end		12·1	
Ditto	middle	12·2	
Ditto	after end	12·	
		3)36·3	
		12·1	mean breadth.
Shaft Trunk.		11·85	mean depth.
Ft.			
36 long.		143·38	
2 broad.		25	length.
72		3584·5÷100=35·85	engine room.
3 deep.		2·16	shaft trunk.
216÷100=2·16	Tons.	38·01	actual engine room.

The actual engine room being thus 38·01 tons and the gross tonnage being 206·51 tons (*see* par. 42), the percentage is 38·01 × 100 ÷ 206·51 = 18·4 per cent.

As the actual engine room is thus between 13 and 20 per cent. of the gross tonnage, the allowance for propelling power in accordance with the Act is 32 per cent. of the gross tonnage, *i.e.*, 206·51 × ·32 = 66·08 tons.

If, however, the actual engine room did not exceed 13 per cent. of the gross tonnage—if, for instance, it had amounted to only 26·8 tons (which is barely 13 per cent. of 206·51)—the allowance would then be one and three quarters times 26·8 tons, *i.e.*, 26·8 + 26·8 × ·75 = 46·9 tons.

But if on the other hand the actual engine room amounted to 20 per cent. or more of the gross tonnage; if, for instance, it measured 59·89 tons, which is 28 per cent. of 206·51 tons, the allowance would then have been one and three-quarters of 59·89 tons, or 104·81 tons, and if the vessel be a tug this would be the amount of the engine-room deduction from gross tonnage.

If, however, the vessel is not a tug, the allowance is subject to restriction under the provisions of the Merchant Shipping Act, 1907. For example, if the deductions under Section 79 amount to 23·15 tons, the allowance would be restricted to 55 per cent. of (206·51 — 23·15) tons = 100·85 tons.

69. Allowance for propelling power the same under Rules I. and II.—The method of measuring the engine room and computing the allowance for propelling power is the same whether the gross tonnage of the vessel has been computed under Rule I. or Rule II.

Deductions under Section 79.

70. The Surveyors should note the following instructions relating to the various deductions from tonnage authorised by Section 79 of the Merchant Shipping Act, 1894, as amended by Section 54 of the Act of 1906.

71. Master's and crew's spaces. — Whenever practicable, the inspection of the master's and crew's spaces should be performed at the same time as the measurement of tonnage, and in considering whether these spaces are eligible for deduction from tonnage the Surveyor should be guided by the provisions of the Merchant Shipping Acts and the Board's "Instructions as to the Survey of Master's and Crew Spaces."*

72. General conditions for deductions.—As regards the deduction of the spaces referred to in the following four paragraphs, the Act provides that the space deducted must be reasonable in extent and properly and efficiently constructed for the purpose for which it is intended, and that it must be marked in the manner prescribed.

* Obtainable from the publishers of this book, price 2*d*.

It should also be noted that no deduction can be allowed in respect of any space which has not been first included in the gross tonnage.

73. Sail-room.—The sail-room, deducted only in the case of a ship wholly propelled by sails, must be set apart and used exclusively for the storage of sails, and the space deducted must not exceed 2½ per cent. of the gross tonnage of the ship. It must be efficiently constructed, and the words: "Certified sail-room . . . . Tons," should be permanently cut in a beam within but near the entrance, and also cut in or painted on or over the doorway or hatchway.

74. Spaces used exclusively for the working of the helm, capstan, and anchor gear.—When situated above the upper deck these spaces are not included in the measurement,* and therefore will not be deductions under this section, but when situated below the upper deck such spaces are to be deducted from the tonnage if the requirements of the Act are complied with.

75. Chart room and boatswain's store.—The chart room, used exclusively for keeping the charts, signals, and other instruments of navigation, and boatswain's store space, are, under the provisions of the Second Schedule, added to the tonnage, and are, therefore, to be deducted wherever situated, subject to compliance with the requirements of the Act.

In small vessels where the cabin or saloon is the only space available for chart purposes, and the Surveyor is satisfied that charts are required, one-half the cabin or saloon, but not more than three tons, may be allowed for this purpose. The boatswain's store space to be allowed should not, as a rule, exceed 1 per cent. of the gross tonnage in vessels of 1,000 tons gross and upwards, but not more than 75 tons should be allowed in any ship, however large. In vessels from 500 to 1,000 tons gross the reasonable limit is about 10 tons, and in vessels of 150 to 500 tons 2 per cent. of the gross tonnage may be allowed. In small vessels under 150 tons the allowance should not, as a rule, exceed 3 tons, and in fishing vessels that have no separate boatswain's store room this amount may be allowed for the boatswain's stores carried in the net room.

76. Donkey engine and boiler space.—(1) If situated within the boundary of the engine room or the casing above it, and if the machinery is used in connection with the main machinery for propelling the vessel, the space forms part of the actual engine room, and therefore should not be the subject of a separate allowance. (2) When the donkey boiler is in a house above the upper deck and not connected with the main machinery as

* *See* par. 38 (*a*) and (*b*).

described above, it is not subject to measurement in the gross tonnage of the ship,* and therefore must not form a deduction. (3) In all other cases the space occupied by the donkey engine and boiler, if connected with the main pumps of the ship, is to be allowed as a deduction from the tonnage, if reasonable in extent, and properly and efficiently constructed.

77. Marking.—All the above-mentioned spaces, if deducted from the tonnage, must be marked similarly to the sail room, their proper designation being stated in each case.

78. Water ballast spaces other than double bottoms.—These spaces include all water ballast spaces (other than double bottoms), wherever situated, including forward and after peak tank spaces above the top of the double bottom, or floors, and the Surveyor must see that all such water ballast spaces, whether situated above or below the upper deck, are first included in the gross tonnage whether deduction is claimed or not.

Application for the deduction of the water ballast spaces named above must be made in writing by the builders or owners, and the spaces must comply with the following conditions:—

(1) That they are adapted only for water ballast;
(2) That they are entered by an ordinary-sized oval manhole only; and
(3) That they are marked as required by Section 79.

In every case in which these deductions are claimed the Surveyor, when forwarding the formula to the Principal Surveyor for Tonnage for examination, must report on Form Surveys 129 whether or not the foregoing conditions are fulfilled, and forward scale drawings of the spaces in question.

79. Mode of measurement.—When spaces for water ballast are of rectangular form the tonnage may be ascertained by multiplying together the mean length, breadth and depth of the space, and dividing the product by 100; but the tonnage of peak tanks, and all other water ballast spaces bounded by one or more curved surfaces must be ascertained in the manner provided for in the Second Schedule, Rule I., of the Act.

80. All the particulars and measurements of the spaces deducted under Section 79, including the computation relating to the deduction of spaces for water ballast, must be shown upon the back of Form Surveys 63.

81. Use of forms and submission of measurements to Principal Surveyor.—A list of the forms

* *See* par. 38 (*a*).

used in connection with tonnage measurement is given in Appendix 2, page 71, and reference has already been made, in the course of these instructions, to the use of certain of these forms.

The formula of measurement should be forwarded to the Principal Surveyor for Tonnage for test and examination as soon as the measurement of the gross tonnage is completed.

In the case of the removal of any steam vessel before the engine room is fitted, from the port at which she has been built to some other port, for the purpose of taking in and fitting her machinery, the Surveyor at the latter port will, if it is intended that the vessel shall not return to the previous port before sailing on her voyage, be directed to measure the engine room when sufficiently fitted, and the details of this measurement will then be transmitted to the port to which the vessel belongs, for the completion of her registry.

Before the formula can be finally signed by the examiner in the Tonnage Department, it must be accompanied by Form Surveys 63, but to save time and to facilitate the work, this form need not then contain more than a statement of the appropriation and dimensions of the spaces to be deducted from the gross tonnage of the vessel and the number of w.c.'s set apart for the crew and officers respectively. The form will be returned to the Surveyor for completion in due course.

82. When the forms have been completed and finally approved, the particulars of tonnage are to be entered on the Form Surveys 59, which is the certificate of survey referred to in Section 6 of the Act. On completion of this form in other respects, it is to be sent together with the approved formula and the necessary certificate as to crew space* to the Registrar of Shipping at the port of intended registry, and the Form Surveys 59 C should at the same time be sent to the owner informing him that the papers have been forwarded to the Registrar.

83. As soon as the vessel has been registered, the official number should be inserted in the various forms, and the Form Surveys 63 should be forwarded to the Principal Surveyor for Tonnage to be recorded and filed. The Form Surveys 58 A should be retained in the Surveyor's Office.

84. Registry of alterations.—Whenever it comes to the knowledge of the Surveyors that a ship has been so altered as to cause an alteration in her tonnage, they

* *See* par. 34 of the "Instructions as to the Survey of Master's and Crew Spaces."

should see that the necessary action is taken to have the vessel remeasured as far as necessary, and the alteration in tonnage registered under Section 48.

85. In such cases the Surveyor should apply to the Principal Surveyor for Tonnage for the formula and papers of the previous measurement of the ship. No marks or alterations are to be made on these papers, but on completing the re-measurement the Surveyor should prepare fresh papers showing the alterations and forward them for approval to the Principal Surveyor; at the same time the previous papers should be returned.

86. Tonnage measurement of motor boats.—Section 743 of the Act provides that the provisions of the Acts relating to steamers shall apply to ships propelled by electricity or other mechanical power, with such modifications as the Board of Trade may prescribe for the purpose of adaptation. Vessels fitted with oil engines or other motors for propelling purposes (whether auxiliary or otherwise) must therefore be regarded as steamers for the purposes of registry and tonnage measurement. The allowance for propelling power should, in accordance with Section 78, be calculated in the same manner as for vessels propelled by steam power, but the space occupied by storage batteries or oil fuel must not in any case be included in the engine-room measurement on which the allowance is based. As the vessels in question are not wholly propelled by sails, no deduction can be made for sail room under Section 79 (1) (*b*) of the Act.

87. Vessels of special type.—If the Surveyors are called on to measure vessels to which the tonnage regulations of the Act and the directions contained in these instructions are not readily applicable owing to the manner in which the vessels are constructed or fitted, or for any other reason, full particulars of the case accompanied with the necessary drawings should be forwarded to the Principal Surveyor for Tonnage for consideration and submission to the Board if necessary, and the points on which instructions are desired should be clearly stated in the Surveyor's report.

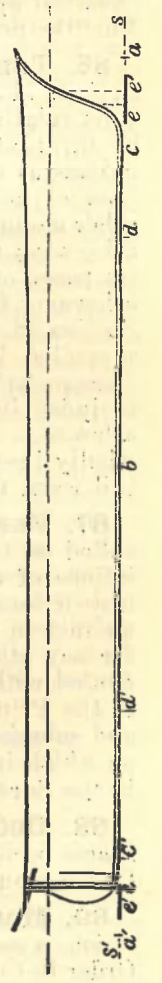
88. Deck cargo spaces.—The measurement of spaces occupied by deck cargo is performed by officers of Customs and Excise.

89. Measurement of Admiralty ships.—Provision is made, by Section 80 of the Act of 1906 and the Order in Council of 22nd March, 1911, for the registry of ships owned by the Admiralty but not forming part of the Royal Navy, viz., Royal Fleet auxiliaries such as oil-

carriers and hospital ships. If any such vessels are submitted for measurement with a view to registry, they should for the present be dealt with in accordance with the tonnage regulations of the Merchant Shipping Acts.

90. Verification of draft of water marks.—Before a vessel can be registered or re-registered, the draft of water marks must be verified, unless the vessel has been exempted from this marking under Section 7 (2).

In verifying the draft of water marks the Surveyor must take proper means to test whether the keel is straight. This may be done by fixing three level sights or battens, one at each end (*a a'* on sketch), the other at the middle of the length of the vessel (*b*); the end ones should be below the line of sight (*s s'*) the middle one above. A ram line or base board (*e e'*) should then be placed at the stem in position of this line of sight, and also at the stern, and the several heights or figures tested square or perpendicular to such line or board. If the keel is not practically straight, but droops at the ends, the points for guidance will be *c c'*, and if low in the middle, *b* will be the point, with a parallel distance below at *d d'* or at any points equidistant from *b*, the greatest care being taken that the marks represent the depths from the lowest part or parts of the keel.



In the case of new vessels, opportunity should be taken of testing the marks at the time the builders are setting them off, when the necessary appliances will be at hand, and the builders will doubtless render every assistance.

91. Official number.—The official number of a British ship is never changed, and in the case of a vessel which is transferred to a foreign flag and is subsequently re-registered as a British ship, the original official number is re-allotted to her on re-registry. If the surveyors, when surveying a vessel for registry, should have any reason to suppose that she has at any time been registered as a British ship, they are to make a special report of the circumstances to the Registrar, and furnish him with the particulars of any official number marked on the main beam, in order that in all cases of

re-registry the official number first given to the vessel may be retained as a permanent mark of the vessel's identity.

92. Number of decks.—When entering on the Form Surveys 59 the particulars as to "Number of Decks," the Surveyors should enumerate as "decks" only those which are without such openings as exempt the spaces beneath from being included in the under-deck tonnage. In the case of vessels having other decks which contain such openings as exempt the spaces beneath from being included in the under-deck tonnage, these should be described separately after setting forth the number of decks proper. For instance, in the case of a vessel having two decks the spaces under which are included in the under-deck tonnage, and in addition a third deck containing such openings as exempt the space beneath from inclusion in such tonnage, the description should be as follows:—"Two decks and shade deck."

93. Description of vessel to be distinguished from description of rig.—In dealing with barges, flats, trows, dumb barges and other similar vessels, the Surveyors should, in filling up the Form Surveys 59, be careful not to confuse the description of the rig with the description of the vessel.

The terms "Schooner," "Brig," "Barque," &c., describe the rig.

The terms "Barge," "Billy-boy," "Trow," "Keel," "Lighter," "Lump," "Wherry," "Mud-flat," "Dumb Barge," "Monkey Boat," "Canal Boat," &c., on the other hand, describe the vessel and not the rig: *e.g.*, what is known as a Barge may be rigged in various ways, or not at all, and the rig of all the other vessels mentioned above is various.

In the case of barges and craft not rigged for sailing outside smooth water, the words "*Dumb Barge*," "*Dumb Flat*," "*Canal Boat*," &c., should be written in the Form Surveys 59 for description of vessel, and under the heading *rig* the words *not rigged* should be written.

Example.

Number of Decks	
Number of Masts	*Nil.*
Rigged ...	*Not.*
Stern ...	
Build ...	
Galleries ...	
Head ...	
Framework and description of vessel	*Wood.*
	Dumb Barge or "*Canal Boat*" or "*Lighter*," &c., as the case may be.
Number of bulkheads	
Number of water ballast tanks, and their capacity in tons ...	

In cases where they are rigged for sailing, *e.g.*, in the case of certain sailing barges on the Thames, the words "Barge, sailing," should be written to describe the vessels, and "spritsail," or "topsail," as the case may be, to denote the rig.

Example.

Number of Decks	
Number of Masts	
Rigged	*Spritsail.*
Stern	
Build	
Galleries	
Head	
Framework and description of vessel	*Wood. Barge Sailing.*
Number of bulkheads	
Number of water ballast tanks, and their capacity in tons ...	

94. Measurement of sea-fishing boats.—The Surveyors should be guided, as regards the measurement of sea-fishing boats, by the instructions contained in Circular 1503, issued in March, 1911, and Circular 1356, issued in October, 1903.

Miscellaneous Rules and Tables.

95. Number of decimal places necessary.—The Act prescribes that all measurements shall be taken in "feet and decimals of feet."

As the usual measure, or scale, is divided only into feet, tenths, and hundredths, the simple linear measurements taken thereby can never contain more than two places of decimals.

But, as in the arithmetical division and subdivision of these measurements any number of decimals may arise, it becomes necessary, in such a practical operation as the measurement of tonnage, to reduce this number to the fewest possible, consistent with practical correctness.

This practical correctness, except in the division and subdivision of the length and depths for ascertaining the "one-third of the common intervals," may be attained without employing more than two places of decimals, by simply taking care to increase the second decimal by one whenever the third amounts to the figure 5 or any higher number. Therefore, with this qualification, and the above exception, two places of decimals only may be used throughout the whole of the computation, as the discrepancy arising therefrom in the tonnage of a vessel of 1,500 tons amounts only to a fraction of a ton.

Example.—Suppose the measured length of a vessel to be 153·29 feet. This being divided by 8 in accordance

with Rule I., gives 19·1612 feet for the common interval between the areas, which, being subdivided by 3, gives 6·387 for *one-third* of the common interval. Up to *this* point three decimals must be retained; but when using this last multiplier in the subsequent computation for tonnage, we need only take 6·39, instead of 6·387. If the third decimal had been under the figure 5, instead of above it, 6·38 simply would have to be taken. The same applies also to the computation of the areas.

96. Decimal equivalents of inches.—The following table of inches, or twelfths of a foot, expressed in their equivalents of tenths or decimals of a foot, with the adjustment to two places of decimals, as set forth in paragraph 95, will be found useful:—

One Foot, or Twelve Inches, the Integer.			
In.	Equivalents in decimals of a foot.	In.	Equivalents in decimals of a foot.
11	·92	4	·33
10	·83	3	·25
9	·75	2	·17
8	·67	1	·08
7	·58	¾	·06
6	·5	½	·04
5	·42	¼	·02

97. Usual thickness of ceiling, &c.—The following table of the usual thickness of ceiling, &c., may be useful for occasional reference:—

Tonnage.	50	150	250	350	500	700	1000	1350	Above 1350
	In.	In.	In.	In.	In.	In.	In.	In.	In.
Average thickness of ceiling between decks.	1½	2	2¼	2¼	2½	2	2¾	3	3½
Average thickness of ceiling below hold beams.	1½	2	2½	2¾	3	3¼	3½	4	4½
Average thickness of bilge plank and limber strake.	2½	3	3¼	3¾	4	4½	5½	6¼	6¼
Average thickness of tonnage deck.	2½	2½	2½	3	3½	3½	4	4	4

98. Reduction of tons to cubic metres.—The gross tonnage, gross deductions, and net tonnage are to be reduced to cubic metres, and the result entered in the form Surveys 59. The factor for conversion is 2·83, and the following table of equivalents will be found useful:—

TONS.	METRES.	TONS.	METRES.	TONS.	METRES.	TONS.	METRES.
1	2·83	26	73·58	51	144·33	76	215·08
2	5·66	27	76·41	52	147·16	77	217·91
3	8·49	28	79·24	53	149·99	78	220·74
4	11·32	29	82·07	54	152·82	79	223·57
5	14·15	30	84·90	55	155·65	80	226·40
6	16·98	31	87·73	56	158·48	81	229·23
7	19·81	32	90·56	57	161·31	82	232·06
8	22·64	33	93·39	58	164·14	83	234·89
9	25·47	34	96·22	59	166·97	84	237·72
10	28·30	35	99·05	60	169·80	85	240·55
11	31·13	36	101·88	61	172·63	86	243·38
12	33·96	37	104·71	62	175·46	87	246·21
13	36·79	38	107·54	63	178·29	88	249·04
14	39·62	39	110·37	64	181·12	89	251·87
15	42·45	40	113·20	65	183·95	90	254·70
16	45·28	41	116·03	66	186·78	91	257·53
17	48·11	42	118·86	67	189·61	92	260·36
18	50·94	43	121·69	68	192·44	93	263·19
19	53·77	44	124·52	69	195·27	94	266·02
20	56·60	45	127·35	70	198·10	95	268·85
21	59·43	46	130·18	71	200·93	96	271·68
22	62·26	47	133·01	72	203·76	97	274·51
23	65·09	48	135·84	73	206·59	98	277·34
24	67·92	49	138·67	74	209·42	99	280·17
25	70·75	50	141·50	75	212·25	100	283·00

99. Measuring tapes.—Tapes should be frequently tested as to their accuracy, and they must be tested each time they are used during damp weather, one standard, as accurately laid down as practicable, being used for the test. At the principal port of the district, a suitable stock of tapes with or without cases should be kept, (together with other implements), from which the Surveyors can draw from time to time on application to the Principal Officer, and at the end of every half year one report from each port should be sent to the Board giving an account on the form Surveys 135 of the number and condition of the implements in stock, and those in use.

Whenever a tape has been exposed to the wet, it should be carefully hung up, dried, cleaned, and afterwards lightly rubbed with a piece of old cloth moistened with a little oil, and the Surveyors should see that the tape-holders do this and preserve the tapes clean and dry.

100. Girting chain for Rule II.—For girting ships in all cases of measurement by Rule II, a curb-chain of about 4½ ozs. to the foot and 70 feet long is supplied. A few feet of water-laid lanyard can be added at each end, in the case of the larger class of vessels. The chain is marked as follows: A ring about 1 inch diameter is infixed at the middle of the length, and from the centre of this ring the chain is tallied each way with small metal tallies 2 feet apart, having the figures 2, 4, 6, 8, &c., successively stamped on them. In girting a vessel it is only necessary to add together the two quantities shown by the tallies at each side of the deck, to obtain the whole girth of the vessel.

In all cases the length of the chain should be frequently tested, and the tallies re-adjusted when necessary. When not galvanized the chain should be kept, when out of use, in a bag of sawdust and whitening.

101. Moorsom's measuring apparatus.—The stanchion, which is for taking depths, is formed of a couplet of rods A and B, of equal lengths (see Figure IV., page 37); the upper or movable one A, is termed the index rod, having an index between *o* and *n* traversing a scale, decimally divided, on the lower fixed rod B; the scale is not shown in the diagram, in order to avoid confusion.

The lift-rods G, G, have one end of each fitted with plates having notches in them for the purpose of lifting the tape into position when the breadths are out of a man's reach and no ladder is at hand for the purpose.

Each lift-rod is provided with a scale on it, decimally divided, for occasional convenience.

The short lift-rods of No. 1 Stanchion are found very useful in taking the main external breadths of ships, by placing a rod on the roughtree rail, and suspending the plumb-line between the plates, moving the rod inwards or outwards till the line just touches the body of the ship. The scale on the lift-rods is also found useful in setting off the position of the breadths on the stanchions.

Apparatus or Stanchion No. 1.
Rods of stanchion, 7 feet long, able to take all depths from 7 feet to 13 feet.
Two lift-rods, 5 feet long.

Apparatus or Stanchion No. 2.
Rods of stanchion, 11 feet long, able to take all depths from 11 feet to 21 feet.
Two lift-rods, 10 feet long.

It may first be observed that the divisions of feet on the scale rod B, commence at the place of the index, when the ends of the rods are well together, and show at that point the constant length of the fixed rod B; by which arrangement it is manifest that the movable index will always show the number of feet, or depth, contained between the upper and lower points of the stanchion.

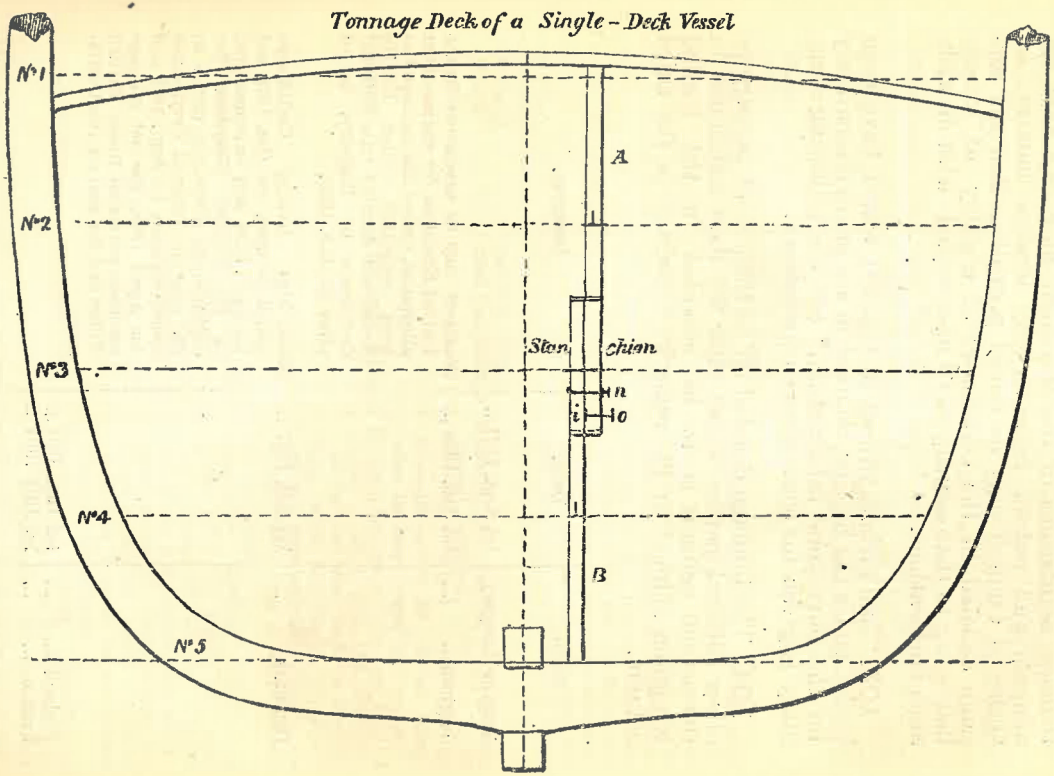
At the station of the area to be measured, the stanchion is to be placed, at the inside of the limber strake, perpendicular, or square, to the line of the keel or keelson, and also parallel to the middle longitudinal plane of the ship, and forced up firmly under the deck and fixed in such position by the compressor *n*; from the depth thus shown by the index, is then to be made the necessary allowance, as prescribed by the Act, for one-third of the round of the beam, and the average thickness of the ceiling (the head of the stanchion being supposed to be in contact with the underside of the deck, and the heel on the floor timber), and the remainder is the depth of the area.

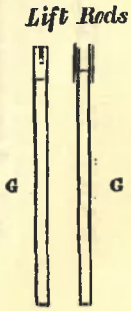
The depth of an area being taken as above, is to be divided into the required number of equal parts. And supposing the stanchion as above fixed, to be still in position, set off on it, above the average thickness of the ceiling, the said equal division, which gives the position, or height, of the first breadth above the limber strake; and from this, when the stanchion is taken down, the heights of the remaining breadths are to be set off, successively at equal distances.

The heights of all the breadths being thus severally marked on the stanchion, it is then set up again and firmly fixed in the position as afore-mentioned, and the breadths may be readily and correctly measured by means of the tape held at right angles across the stanchion at each of the heights marked thereon. In case any of the breadths required are out of a man's reach, and no ladder is at hand, the tape is to be lifted into position by means of the lift-rods.

FIGURE IV.—DESCRIPTION OF MOORSOM'S MEASURING APPARATUS.

(The Diagram being merely descriptive, is not drawn to scale.)





General References to Figure.

The Diagram represents the Midship Section or Area of a Ship, with the Measuring Apparatus in position at the inside of the limber strake.

A B, is termed the Stanchion, | G, G, are termed the two Lift Rods.

PART II.—MEASUREMENT OF FOREIGN SHIPS.

102. Acceptance of foreign tonnage certificates.—Section 84 of the Act provides that, if the tonnage regulations of the Merchant Shipping Acts are adopted and put in force by any foreign country, an Order in Council may be issued providing that the tonnage denoted in the certificates of registry of vessels belonging to that country shall be accepted, with or without qualifications.

103. The various Orders in Council which have been issued under the Section referred to are printed separately for the Surveyors' information,* but the following summary is given for convenience of reference.

104. The tonnage denoted on certificates of registry or other national papers issued after the date mentioned in the second column is to be accepted in the United Kingdom subject to the remarks contained in the third column.

Name.	Date.	Remarks.
Austria-Hungary	1st Sept. 1871...	
Belgium	1st Jan. 1884 ...	Steamers may be remeasured in the United Kingdom for engine-room allowance, unless the tonnage has been estimated under British Rules and denoted on a National Certificate of Registry, issued after 1st Jan. 1898.
Denmark ...	1st Oct. 1867 ...	Steamships having Certificates issued between 1st Oct. 1878 and 1st April 1895, may be remeasured in the United Kingdom for engine-room allowance, unless in the case of National Certificates issued between 1st Sept. 1882 and 1st April 1895, the net tonnage has been estimated under British Rules and denoted on the Certificate.
Finland	1st June 1877...	
France	1st July 1904...	

* *See* Circulars 1297, 1386 and 1523.

Name.	Date.	Remarks.
Germany ...	1st Jan. 1873 ...	Steamships having Certificates issued between 1st Jan. 1873 and 1st July 1895, may be remeasured in the United Kingdom for engine-room allowance, unless in the case of National Certificates issued between 20th June 1888 and 1st July 1895, the net tonnage has been estimated under British Rules and denoted on the Certificate.
Greece	14th July 1909 (O.S. 1st July 1909.)	Greek vessels unprovided with a National Certificate dated on or after the 14th July 1909, or a valid Certificate of British tonnage, are subject to remeasurement in the United Kingdom.
Hayti	26th Jan. 1882...	
Italy	10th Feb. 1906...	
Japan	1st July 1884...	
Netherlands ...	1st Jan. 1876 ...	Steamships having Certificates issued between 1st Jan. 1876 and 18th Sept. 1899, may be remeasured in the United Kingdom for engine-room allowance, unless the net tonnage has been estimated under British Rules and denoted on a separate National Certificate, issued between the 6th Jan. 1888 and the 18th Sept. 1899.
Norway	1st Oct. 1893 ...	
Russia	20th Dec. 1879...	Steamships having Certificates issued between 20th Dec. 1879 and 2nd March 1900, may be remeasured in the United Kingdom for engine-room allowance.
Spain	1st April 1910...	If the Certificate does not bear a note* stating that the measurements have been made in accordance with the Board of Trade rules, instructions should be sought as to the remeasurement of the vessel.
Sweden	1st April 1875 (Sailing ships); 1st April 1881 (Steamships).	Steamships having Certificates dated after 1st April 1881 may be remeasured in the United Kingdom for engine-room allowance, unless the net tonnage has been estimated under British Rules and denoted on a separate National Certificate.
United States ...	1st Jan. 1865 ...	Steamships having Certificates issued before 1st April 1895 may be remeasured in the United Kingdom for engine-room allowance.

* In Spanish :—"El cálculo de arqueos y los descuentos en este certificado insertos se han llevado a cabo con sujeccion a las reglas dictadas por el Board of Trade."

105. When British tonnage certificates are compulsory.—Vessels belonging to any country not mentioned above, or vessels which, though belonging to one of the countries mentioned, hold certificates issued before the respective dates given above, are subject to measurement for tonnage in ports of the United Kingdom, and must obtain a certificate of British tonnage (form Surveys 60). For this purpose they must be measured by the Board's Surveyors in accordance with the requirements of the Acts and these instructions, and the Surveyor should note that, if the vessel has cargo on board, or if the holds are so lumbered with stores, dunnage, or ballast, or so fitted with bulkheads or cabins, as to prevent the prescribed measurements by Rule I being correctly taken, she may be measured by Rule II subject to the approval of the Board of Trade. In such case the reasons for adopting Rule II should be stated in the space provided in the certificate.

Foreign ships measured by Rule II may at any subsequent period be remeasured under Rule I, on the master making application and paying the prescribed fees.

The formula of measurement together with form Surveys 60 in duplicate is to be sent to the office of the Principal Surveyor for Tonnage for test and examination, before the certificate is issued.

106. The certificate remains in force for three years from the date of issue, unless alterations affecting the tonnage of the vessel are made, in which case a new certificate must be obtained. At the end of three years, a fresh form bearing the date of the last survey may be issued, if the principal dimensions of the vessel, on being tried, are found to agree with those stated in the certificate, and if the Surveyor has no reason to doubt the accuracy of the tonnage.

107. When certificates are optional.—Vessels measured under foreign regulations which agree with the tonnage regulations of the Merchant Shipping Acts, except as regards the allowance for propelling power, may, if desired, be remeasured in the United Kingdom for engine room allowance, as indicated in the list above, and may be supplied with certificates of British tonnage, indicating the allowance for propelling power as ascertained by the British rules. In all such cases the registered dimensions and gross tonnage are to be accepted as they appear upon the National Certificate of Registry and the deductions for propelling power only are to be dealt with in the manner applicable to British ships. The Surveyors must be careful not to include the engine

and boiler casings above the upper deck in the measurement of the actual engine room unless they are clearly indicated upon the National Certificate of Registry as being included in the gross tonnage. No alterations whatever are to be made in such other deductions as may be shown upon the National Certificate of Registry in arriving at the net register tonnage upon the form Surveys 60.

Whenever practicable the Surveyor, when forwarding the formula and form Surveys 60 to the Principal Surveyor for Tonnage for examination, should accompany these with a copy of the respective items forming the gross tonnage and the deductions, as shown upon the National Certificate of Registry.

108. In order to make it clear that the certificates of British tonnage issued in these cases do not attest the gross tonnage or any of the deductions except the allowance for propelling power, the form Surveys 60 must, before issue, be altered to read as follows:—

> "I hereby certify that I have measured the *engine and boiler spaces of the* . . . , of . . . , in accordance with Rule , as prescribed by the Merchant Shipping Acts, 1894 to 1907, and, by this Rule, the gross tonnage *according to her national papers being* . . . , the net register tonnage is . ."

On the back of the certificate the words "According to British Rules" should be inserted against the propelling power allowance, and the words "According to national papers" inserted against the gross tonnage and other deductions.

109. In the case of new vessels constructed in the United Kingdom for foreign owners, whether belonging to a country in respect of which an Order in Council has been issued or not, certificates of British tonnage may be issued if desired, calculated in the usual manner, but they will only remain in force until the National Certificate of Registry has been granted, and a note to this effect will in such cases be inserted on the certificate before it is issued.

110. Certificates of British tonnage may be issued on similar conditions to British vessels transferred in the United Kingdom to foreign owners. If in such cases the ship, on being surveyed, is found to agree with the tonnage set forth in the copy of the certificate of British Registry, which is to be furnished by the owner, a certificate of tonnage is to be issued in accordance with the tonnage set forth therein.

111. When certificates are not to be given.—Except as stated above, certificates of British tonnage are not to be issued to vessels belonging to countries which have adopted the tonnage regulations of the Merchant Shipping Acts, and in respect of which an Order in Council has been issued as explained above; but if at any time there is reason to believe that the National Certificate of Registry of any such vessel does not correctly set forth the tonnage, the Surveyor should report full particulars of the case to the Board of Trade.

112. General.—The Surveyors should note that Collectors of Customs are instructed that if, owing to the language in which the national certificate is issued, difficulty is experienced in ascertaining the tonnage of a vessel belonging to a country in respect of which an Order in Council has been issued, the master or agent of such vessel is to be required to furnish all necessary information as to the contents of the certificate.

113. It will be understood that, in all cases, fees must be paid for the issue or renewal of certificates of British tonnage in accordance with the printed list of fees and expenses. The fee for a copy of a certificate of British tonnage is two shillings and sixpence.

PART III.—SUEZ CANAL SPECIAL TONNAGE CERTIFICATES.

114. General.—The transit dues of the Suez Canal are charged on the basis of the net tonnage ascertained in accordance with the system of measurement recommended by the International Commission which assembled at Constantinople in 1873.

Extracts from the report of the Commission,* including the regulations for tonnage measurement, are printed on pages 50 to 60, and in accordance with the recommendations of the Commission, the Board of Trade are prepared to issue certificates (Form Surveys 60A) of the tonnage of vessels calculated in the manner prescribed by the rules in question.

115. When a shipowner wishes a ship to be measured for a special certificate under the rules applicable to the Suez Canal, application should be made on the form Surveys 6, and the fee† should be paid to the Superintendent of a Mercantile Marine Office. In the case of unregistered structures of special types, *e.g.*, floating docks, &c., the applicants should be referred to the London Office of the Suez Canal Company.

116. The Surveyor should, on receipt of the application, apply to the Principal Surveyor for Tonnage in London for the formula and papers of the previous measurement of the ship.

Gross Tonnage.

117. Under-deck measurement.—For the purpose of the special certificate it will be the duty of the measuring Surveyor to include in the gross measurement the entire cubic contents of the ship under the uppermost deck, except the space (if any) between the inner and outer plating (upon whatever system constructed) known as a double bottom for water ballast, which can be certified as not available for the carriage of cargo, stores, or fuel. The deep water ballast tanks known as fore or after peak tanks are to be included in the tonnage measurement.

118. In the case of vessels which have already been measured for British tonnage, it will not be necessary to re-measure the tonnage under the uppermost deck, unless the Surveyor finds that some space has formerly been exempted that must under the Suez Canal Rules be included, or *vice versâ*, or unless the British under-deck tonnage is measured under the modified rule set out on pages 66 to 68.

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* The report is printed as a Parliamentary Paper [C.—943], 1874.

† *See* paragraph 2.

119. Spaces above deck.—For the purpose of the special certificate the Surveyor must also include in the gross tonnage the entire cubic contents of every covered and closed-in space above the uppermost deck, and with regard to such spaces he should be guided by par. 1 of the Regulations, pages 52-3, and by the instructions contained in the following eleven paragraphs (120 to 130) which relate only to spaces entitled to exemption from British tonnage measurement. It should be noted that spaces covered only by planks separated from one another by intervals exceeding one inch in breadth are not to be included in the gross tonnage.

120. Open spaces.—If the permanent opening measured at the end of the erection (forecastle, bridge space, or poop) is equal to, or greater than one-half the breadth of the deck in way of it, and is not fitted with a coaming, the portion of the erection measured from the open end, and not exceeding in length such half-breadth, is (subject to the following paragraph) to be regarded as an " open space " and described as such on the back of the Suez Canal Certificate. When, however, a coaming is fitted to such an opening the space within it is to be included in the gross tonnage in every case, and only the exemptions provided for in paragraphs 123 to 130 are to be allowed.

121. If in the interior of an erection, in consequence of any arrangement whatever, and at a distance from the open end less than half the breadth of the deck as above defined, the opening is at this point less than the said half-breadth, only the length of the space between that point and the open end of the erection is to be regarded as an " open space " and described as such on the back of the Suez Canal Certificate.

122. The above instructions respecting " open spaces " apply to deck erections extending from side to side whether situated in the lowest or any other tier, but in all cases where the openings in these erections are less than the half-breadth of the deck in way of them they are to be measured in the gross tonnage and only the exemptions provided for in paragraphs 123 to 130 are to be allowed. When, however, two side-to-side erections are separated by an interval the length of which is less than the least half-breadth of the deck in way of such interval, then, whatever be the breadth of the permanent openings, the erections less the interval are to be measured in the gross tonnage, and only the exemptions provided for in paragraphs 123 to 130 are to be allowed.

123. Exempted spaces.*—In the case of shelter deck spaces with one or more openings in the shelter deck and sides of the vessel the whole of the space under the shelter deck should be included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if any) in the sides of the ship.

124. In all cases where a vessel is fitted with forecastle, bridge space and poop, there shall be exempted from measurement: (*a*) such length of the forecastle, measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship; (*b*) such length of the poop measured from the inside of the stern timber at half height of the said poop as shall be equal to one-tenth of the full length of the ship; (*c*) such length of the bridge as is equal to the length of the actual deck openings to engine and boiler spaces, it being understood that such openings shall not be considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

125. In all cases where the poop and bridge, or forecastle and bridge, are combined and continuous, then only that length in each case which is due to the openings of engine and boiler spaces as defined under 124 (*c*) above shall be exempted from measurement.

126. From the side-to-side erections referred to in the foregoing paragraphs 124 and 125 further exemptions may also be allowed for the portions of the spaces abreast of the permanent openings (if any) in the side plating, and also for the "open spaces" referred to in pars. 120-122 above.

127. When the engines are aft and the light and air casings are situated in an ordinary poop, the space is to be dealt with as for a combined poop and bridge, but the bridge space is to benefit only by the exemption of the portion abreast the permanent openings (if any) in the side plating or "open spaces" at the ends.

128. By "full length of the ship" shall be understood, in all cases, such length as is comprised between the inside of stem at half height of the forecastle to the inside of the stern timber at half height of the poop.

129. The exemptions provided for in paragraphs 124 and 125 above apply, in their entirety, only to deck erections situated in the lowest tier; the only exemptions to be

* These exemptions were agreed on between the Board of Trade and the Suez Canal Company in 1904 and were embodied in what were known as "the 1904 Rules."

made in side-to-side erections situated above this tier, and besides the " open spaces " (if any), are those portions immediately abreast of any permanent openings which may exist in the side plating.

130. In the case of shelter deck spaces, the exemptions provided for may be allowed on the written request of the owners, either in the shelter deck space as provided for in paragraph 123 above, or in the erections on the shelter deck as provided for in paragraphs 124 and 125, but in no case are exemptions to be allowed under paragraph 123 in addition to exemptions under paragraphs 124 and 125.

131. Light and air casings over engines and boilers.—The engine and boiler casings in the shelter deck spaces are to be included in the gross tonnage and in the engine-room measurement, even if situated in part within an otherwise exempted space abreast permanent side openings.

132. In the case of side-to-side erections above the lowest tier the light and air casings may be included in the gross tonnage and actual engine room provided the owner makes a written application for same, and also on condition that the side-to-side spaces beneath it have been similarly treated. When, however, the spaces are so dealt with no exemption is to be made from such spaces for any other portion whatever, either in the tier in question or in those beneath it.

133. Subject to the foregoing the light and air casings in all erections above the first tier are to be exempted from measurement.

134. Full particulars to be sent to Principal Surveyor.—In every case the Surveyors when sending the formula and form Surveys 60A to the Principal Surveyor for Tonnage for examination should also forward a scale plan of the deck spaces showing the dimensions of the " open spaces," the position and width of the openings in the bulkheads and sides, and the termination of the deck or covering of the space, as well as all other necessary particulars. If a plan is unobtainable the particulars should be inserted on form Surveys 131, 131A, 131B, or 131C as the case may require. The dimensions and tonnage of the exempted spaces should be shown in the columns provided for the purpose in the form Surveys 60A.

135. Marking of exempted spaces. — All exempted spaces must be permanently and conspicuously marked by a plate securely fixed to each side of the vessel to indicate the limits and length allowed, corresponding with the particulars shown upon the back of the Suez Canal Certificate; the centre of such plates should be marked

thus * and the inscription upon them should be as follows:—

"This space ~ feet in length from the inside of "the { stem / or / stern timber } at the half height of the "space to this mark is exempted from Suez "Canal tonnage upon the ground that no cargo "or stores are carried therein."

136. Access.—The Surveyors must see that some satisfactory means are provided either by manhole or hatchway for gaining access to the exempted parts, in the event of the parts adjacent being filled with cargo. It would be well in all cases for the manhole or other opening to terminate at the point to which the exempted space extends.

137. The regulations of the Suez Canal Company provide that if at any time a vessel shall perform transit with cargo or stores carried in any portion of any exempted space, then the whole of that space shall be added to the net tonnage, and can only be again exempted from measurement after a bona-fide change in the ownership of the vessel.

Net Tonnage.

138. Allowance for propelling power.—Having ascertained the gross tonnage in the manner described above, the measuring Surveyor will then proceed to measure the engine room, boiler space, and shaft trunk as for a Certificate of British Registry, and note in the proper place in the survey form and on the certificate the cubic contents of each.

139. In cases where the owners elect not to use the "Danube rule" (*see* § 9, page 51), but to have the actual bunker space as well as the actual engine space measured and deducted, the Surveyor will measure separately the bunkers, and record the cubic capacity of each in the proper place in the form. In doing this he is not to include any bunkers that are not absolutely permanent, or from which the coals cannot be directly trimmed into the engine room or stokehold, or into which any access can be obtained otherwise than through the ordinary coal shoots on deck and from the doors opening into the engine room or stokehold. He is to be specially careful that thwartship bunkers which can be in any way extended are not included in the measurements for deductions.

140. In no case, except in the case of tugs, is the engine room allowance to exceed 50 per cent. of the gross tonnage of the ship.

141. Crew space deductions.—In measuring the deductions for crew space the Surveyor will be careful to ascertain the cubic contents of each space as at present, but he must bear in mind that no deduction is to be made for the accommodation of the captain, purser, clerk, &c., or for the berths of stewards, cooks in passenger steamers, or passengers' servants. Passages exclusively for access to deducted crew spaces may themselves be included in the deductions.

142. The following special deductions in respect of accommodation spaces are allowed:—

(*a*) Doctors' cabins, if actually occupied by the doctors.

(*b*) All spaces fitted as bath rooms, or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bath rooms as are available for passengers when no bath room for their exclusive use is provided.

(*c*) A mess-room, if there is any, for the exclusive use of the officers; a second mess-room, if there is any, for the exclusive use of the engineers; and a third mess-room, if there is any, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess-room in ships having passenger accommodation, which are not also provided with a passengers' mess-room.

143. No deduction is to be allowed for crew space or for officers' cabins, unless the regulations as to lighting, seaworthiness, and ventilation are complied with, nor unless the words "certified to accommodate —— seamen," "certified to accommodate —— officer or —— officers," as the case may be, are cut in or painted on or over the doorway of each deducted space.

144. All water-closets having been included in the first place in the gross tonnage, those that are to be included in the deduction from tonnage are to have the words "certified for the use of —— crew" cut in or painted on or over the door.

145. In the case of passenger steamers on which there is only one galley, neither the galley nor the space occupied by the cook should be included in the deductions from the gross tonnage.

When there are two or more galleys, however, the space occupied by the galley or galleys exclusively used for the crew should be included in the deductions, and the words "certified for the use of the crew" should be cut in or painted on or over each doorway of the space.

146. Navigation space deductions.—Articles 12 and 14 of the Regulations (pages 57 and 58) allow the

deduction of any covered and closed-in spaces on the upper deck used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals and other instruments of navigation. Under this rule the wheelhouse, chart-room, winch-house, look-out house, signal house, steam-steering house, and the spaces provided for the storage of electric search-lights and wireless telegraphy appliances on the upper deck are to be deducted from the gross tonnage, in which, however, they are in every case first to be included.

147. The chart-room may be deducted, even if it is also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart-room, that room alone is deducted; but, in all cases, the room used as a chart-room must, if it is to be deducted, be situated on the upper deck.

148. When the donkey boiler in a closed-in space on the upper deck is not exclusively used for the working of the helm, the capstan, and anchor gear, or any of them, but is also available for hoisting the cargo, the space is not to be included in the deductions from the gross tonnage.

This instruction does not apply to the donkey boiler house on the upper deck of men-of-war and troop ships.

149. Marking of deducted spaces.—In granting deduction for the chart-house, winch-house, and wheelhouse, or any other covered and closed-in space on the uppermost deck used for navigating the ship, the Surveyor must see that the words "certified for use in navigating the ship" are cut in or painted on or over the doorway of the space, and in like manner all spaces deducted from the gross tonnage are to have cut over them or painted on them a notice stating the purpose for which they are certified.

150. General.—In no case is any space to be deducted from the tonnage that is not first included in the gross tonnage, and in no case is the sum total of the deductions (other than the allowance for propelling power) to exceed 5 per cent. of the gross tonnage of the ship.

151. No deduction is to be made for passenger accommodation, captains' or passengers' water-closets or lavatories, &c., passengers' cooking houses, or luggage store rooms, or for any other purpose than those indicated above.

152. It may happen that there are in certain ships some awnings or other constructions used merely for shelter (*see* second part of note to paragraph 1, page 53), the space under which is not to be included in the gross tonnage, and

is therefore not to be deducted afterwards. When this is so, the Surveyor should make a careful note of the particulars in the proper place in the forms.

153. When the Surveyor is in any doubt whether any space should be exempted or deducted, he should apply for instructions to the Principal Surveyor for Tonnage.

154. A formula and certificate showing the dimensions and computations is to be sent to the Principal Surveyor for Tonnage for the purpose of test and examination a few days before the vessel is expected to sail, so that any question which may arise regarding the spaces shown therein may be dealt with before the vessel leaves the port of survey.

EXTRACTS FROM THE REPORT OF THE INTERNATIONAL TONNAGE COMMISSION ASSEMBLED AT CONSTANTINOPLE IN 1873.

In discussing and fixing the rules of measurement anexed to this Report, the Commission has been guided by the following considerations, which it also submits to the approbation of maritime powers.

§ 1. Every trading ship, whatever may be her nationality, ought to be furnished with a certificate of registry declaring (*a*) the gross tonnage, expressing her total capacity, and (*b*) the net tonnage, giving her capacity after the deduction made of space recognised as unavailable for earning freight.

§ 2. This certificate of registry delivered by the competent Government authorities filled in from measurements effected in accordance with the rules proposed by the International Commission shall be officially recognised in every country as the true basis for the application of ship's dues and taxes. These dues and taxes shall invariably be applied to the net tonnage of a ship.

§ 3. Gross tonnage is best arrived at by Moorsom's system, as defined by the rules of measurement adopted by the Commission and annexed to this Report.

§ 4. Gross tonnage comprehends the measurement of the whole space below the upper deck, as well as all spaces comprised within permanent constructions above that deck, which are covered and closed in. (For the definition *see* the annexed Rules of Measurement.)

§ 5. To determine net tonnage the deductions from gross tonnage are: 1. General deductions applicable alike to sailing and steam vessels. 2. Special deductions applicable to steamers only.

§ 6. General deductions refer (*a*) to the accommodation of the crew (stewards and passengers' servants are not to be considered as part of the crew), (*b*) to officers' cabins (the captains' not included therein), (*c*) to cook houses and closets exclusively for the use of the crew, situated either above or below the upper deck, and (*d*) to covered and closed-in spaces, if there are any, on the upper deck, employed for working the ship. These spaces are to be measured separately, and the sum of them deducted. The sum total of these deductions is, however, in no case to exceed 5 per cent. of the gross tonnage, but this percentage may be distributed among the several spaces according to the practice and requirements of different countries. Besides the above-named spaces it was proposed in the Commission to deduct further spaces occupied by the captain's cabin, the sail room, and other places used for stowing ropes and other gear; but these latter deductions were not approved by an absolute majority of votes.

§ 7. The Commission recommends the abolition of any system by which the net tonnage of a steamer would be derived from a percentage on her total capacity.

§ 8. Deductions special to steamers relate (*a*) to the engine room and boilers, (*b*) to the shaft trunk in a screw ship, and (*c*) to permanent coal bunkers. The spaces *a*, *b*, and *c* to be accurately measured.

§ 9. If the ship has not permanent bunkers, or if she has only lateral bunkers, and her coal is stowed in bunkers shut off from the hold by moveable partitions, then the spaces of these lateral and temporary bunkers are not to be measured. In this case the rule to be applied is that in force on the Danube, namely, an allowance is made for the coal space by giving 50 per cent. of the space occupied by the engine in a paddle wheel steamer, and 75 per cent. in a screw steamer (*see* Article 16 of the rules annexed).

§ 10. Ships furnished with permanent bunkers may nevertheless be measured under the Danube rule. In this latter case the net tonnage will be fixed according to the rules of the above paragraph.

§ 11. In no case (except that of tugs) shall the total of these special deductions of steamships exceed 50 per cent. of the gross tonnage.

§ 12. For tugs when used exclusively as tugs, the special deductions may be made without any limit for space actually occupied by the engine room and coal bunkers.

§ 13. Provisionally, and until all the governments have adopted uniform rules for net tonnage, and with the object of attaining in the meantime a certain uniformity of practice, a special certificate may be delivered to any steamer

by the competent authority of the country to which she belongs, which certificate shall be recognised officially in foreign ports as establishing the net tonnage upon which dues are to be paid.

§ 14. In those countries which have adopted Moorsom's system, the above-named special certificate shall be prepared at pleasure either according to the rule applicable to ships with fixed bunkers, or according to the Danube rule.

§ 15. In countries where Moorsom's system has not yet been, but will be adopted, steamers may be measured under Rule 2 of the Merchant Shipping Act of 1854, with the factors 0·0017 and 0·0018. From the gross tonnage thus found the special deductions given by the above § § 6 to 12 shall be made.

The annexed special certificate as specified in § 13 shall state the gross tonnage and the net tonnage of the ship, such net tonnage to be determined at pleasure either according to the rule applicable to ships with fixed bunkers, or according to the Danube rule.

§ 16. Open vessels are not comprised within the proposed international rules of measurement.

§ 17. It is recommended that a penal provision shall be enacted to the effect that if any of the permanent spaces which have been deducted shall be employed either for the use of merchandise or passengers, or in any way profitably employed for earning freight, that space shall be added to the net tonnage, and never more be allowed as a deduction.

Regulations for the Measurement of Tonnage recommended by the International Tonnage Commission assembled at Constantinople in 1873.

General Principles.

1. The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception) below the upper deck, as well as of all permanently covered and closed-in spaces on that deck.

N.B.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise, or for the berthing and accommodation of the passengers or of the officers and crew. Thus any one or more openings, either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent

such spaces being comprised in the gross tonnage, if they can be easily closed-in after admeasurement, and thus better fitted for the transport of goods and passengers.

But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off," and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

2. "Deck loads" are not comprised in the measurement.

3. Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

4. The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

RULE I.—FOR EMPTY VESSELS.

Art. 1.—The length for the admeasurement of ships having one or more decks is taken on the tonnage deck, which is—

(*a.*) The upper deck for vessels having one or two decks.

(*b.*) The second deck from below for vessels having more than two decks.

Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following Table, according to the class in such Table to which the ship belongs:—

Art. 2.—Class 1. Ships of which the tonnage deck is, according to the above measurement, 50 feet long or under, into four equal parts.

Class 2. Ships of which the tonnage deck is, according to the above measurement, above 50 feet long and not exceeding 120 feet, into six equal parts.

Class 3. Ships of which the tonnage deck is, according to the above measurement, above 120 feet long and not exceeding 180 feet, into eight equal parts.

Class 4. Ships of which the tonnage deck is, according to the above measurement, above 180 feet long and not exceeding 225 feet, into ten equal parts.

Class 5. Ships of which the tonnage deck is, according to the above measurement, above 225 feet long, into twelve equal parts.*

Art. 3.—Then, the hold being first sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such ship to each point of division of the length as follows:—Measure the depth at each point of division, from a point at a distance of one-third of the round of the beam below such deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling which is between the bilge planks and the limber strake. Then, if the depth at the midship division of the length do not exceed 16 feet, divide each depth into four equal parts; then measure the inside horizontal breadth at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement. Number these breadths from above (*i.e.*, numbering the upper breadth 1, and so on down to the lowest breadth). Multiply the second and fourth by four, and the third by two; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four, and measure, as before directed, the horizontal breadths at the five points of division, and also at the upper and lower points of the depth; number them from above, as before; multiply the second, fourth, and sixth by four, and the third and fifth by two; add these products together, and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

* A greater number of divisions is not prohibited so long as they are an even number.

Art. 4.—The area of the transverse sections can also be measured with the same precision by the following method of polar co-ordinates:—

Divide each transverse half-section into five angular sectors, having the same angle at the apex (this angle is equal to $\frac{90}{5}$ of a degree = 18 degrees), and take for the area of each of these sectors the area of the sector of the circle comprised between its extreme radii, and described by the mean radius.

In making the measurement, measure the mean radius of each sector, of which the two extreme radii would make, the one with the horizontal line and the other with the vertical line, an angle of 9 degrees, while the others are uniformly 18 degrees apart.

In order to obtain their directions, place on the plane of the section a semi-circle properly divided, and turned so that its horizontal diameter may pass through the third of the round of the beam, and that its centre may be found in the central longitudinal vertical plane of the ship; the radii are to be measured by means of a tape fixed in the centre of the semi-circle.

In order to calculate the area of the section, square the mean radii thus measured, add them together, and the sum multiplied by ·31416 shall be deemed to be the area of the section.

Art. 5.—Number the transverse sections measured by one of these methods successively 1, 2, 3, &c., giving No. 1 to the extreme limit of the length at the bow, and the last number to the extreme limit of the length at the stern; then, whether the length be divided according to the table into four or twelve parts, as in Classes 1 and 5, or any intermediate number, as in Classes 2, 3, and 4, multiply the second and every even-numbered area by four, and the third and every odd-numbered area (except the first and last) by two; add these products together, and to the sum add the first and last, if they yield anything; multiply the quantity thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck. The tonnage of this volume is obtained by dividing it by 100, if the measurements are taken in English feet, and by 2·83 if the measurements are taken in mètres.*

Art. 6.—If the ship has a third deck, commonly called a spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:—Measure in feet the inside length of the space at the

* In these rules the multiplier ·353 may be used instead of the divisor 2·83 to give mètres.

middle of its height from the plank at the side of the stem to the lining on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage deck is divided, as above directed; measure (also at the middle of its height) the inside breadth of its space at each of the points of division, also the breadth at the stem and the breadth at the stern; number them successively 1, 2, 3, &c., commencing at the stem; multiply the second and all the other even-numbered breadths by four, and the third and all the other odd-numbered breadths (except the first and last) by two; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths, and the result will give in superficial feet the mean horizontal area of such space; measure the mean height of such space, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, or by 2·83 if the measurements are taken in mètres, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the ship ascertained as aforesaid; and if the ship has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforesaid.

Art. 7.—If there be a break, a poop, or any other permanent closed-in space on the upper deck, available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of such space shall be ascertained as follows:—Measure the internal mean length of such space in feet, and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height, and multiply by it the mean horizontal area; divide the product by 100, or by 2·83 if the measurements are taken in mètres, in order to obtain the tonnage of such space.

Art. 8.—In measuring the length, breadth, and height of the general volume of the ship or that of the other spaces, reduce to the mean thickness the parts of the ceiling which exceed it. When the ceiling is wanting, or when it is not permanently fixed, the length and breadth are reckoned from the frame of the ship.

Rule II.—For Laden Ships.

Art. 9.—When ships have their cargo on board, or when for any other reason their tonnage cannot be ascertained by means of Rule I., proceed in the following manner:—

Measure the length on the upper deck from the outside of the outer plank at the stem to the aftside of the stern-post, deducting therefrom the distance between the aftside of the stern-post and the rabbet of the stern-post at the point where the counter-plank crosses it; measure also the greatest breadth of the ship to the outside of the outer planking or wales, and then, having first marked on the outside of the ship on both sides thereof the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid; then multiply this product by the factor ·17 (seventeen Hundredths) in the case of ships built of wood, and by the factor ·18 (eighteen Hundredths) in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2·83, according as the measurements are taken in English feet or in mètres.

Art. 10.—If there be a break, a poop, or other closed-in space on the upper deck, the tonnage of such space shall be ascertained by multiplying together the mean length, breadth, and depth of such space, and dividing the product by 100 or 2·83, according as the measurements are taken in English feet or mètres; and the quotient so obtained shall be deemed to be the tonnage of such space, and shall, subject to the deduction for a closed-in space appropriated to the crew, as mentioned in Rule I., be added to the tonnage of the ship ascertained as aforesaid.

Deductions to be made from the gross tonnage in order to ascertain the net tonnage.

Art. 11.—To find from the gross tonnage of vessels as above set forth, the official, or net register tonnage, either for sailing vessels or for steam ships, the following mode of operations must be resorted to:—

Sailing Vessels.

Art. 12.—For sailing vessels deduct,—the spaces exclusively and entirely occupied by the crew and the ship's

officers, those taken up by the cook-house and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any, situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent. of the gross tonnage.

Art. 13.—The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result obtained by deducting the total of such allowances from the gross tonnage represents the net or register tonnage of sailing vessels.

Steam Ships.

Art. 14.—For vessels propelled by steam or any other mechanical power, deduct—

1. The same spaces as for sailing vessels (Art. 12), with the limitation to 5 per cent. of the gross tonnage.

2. The spaces occupied by the engines, boilers, coal-bunkers, shaft-trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine-rooms, and for the proper working of the engines themselves. Such deductions cannot exceed 50 per cent. of the gross tonnage.

Art. 15.—The measurement of the spaces allowed for both in sailing vessels and in steam ships (section 1 of Art. 14) is to be effected according to the rules set forth in Articles 12 and 13 for sailing vessels.

Spaces for which allowances are made in steam ships only are measured according to the following rules:—

Ships having Coal Bunkers with Moveable Partitions.

Art. 16.—In ships that do not have fixed bunkers, but transverse bunkers with moveable partitions, with or without lateral bunkers, measure the space occupied by the engine-rooms, and add to it, for screw steamers, 75 per cent., and for paddle steamers 50 per cent. of such space.

By the space occupied by the engine-room is to be understood—that occupied by the engine-room itself and by the boiler-room, together with the space strictly

required for their working, with the addition of the space taken up by the shaft-trunk in screw steamers and the space between decks which encloses the funnels and is necessary for the admission of air and light into the engine-rooms.

These spaces are measured in the following manner:—

(1.) Measure the mean depth of the space from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the machinery; multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown; then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof; add such contents to the cubical contents of the space below the crown; divide the sum by 100 or by 2·83, according as the measures are taken in feet or mètres, and the result shall be deemed to be the tonnage of the said space:

(2.) If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the said space:

(3.) In the case of screw steamers in which the space aforesaid is to be measured, the contents of the shaft-trunk shall be added to and deemed to form part of such space, and shall be ascertained by multiplying together the mean length, breadth, and depth of the trunk, and dividing the product by 100 or by 2·83, according as the measures are taken in feet or in mètres.

Ships with Fixed Coal Bunkers.

Art. 17.—In ships with fixed coal bunkers, measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in Articles 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engines.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or by 2·83 if they are taken in mètres, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft-trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2·83 according as the measurements are taken in English feet or in mètres, gives the tonnage of each space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz.:—

(*a.*) The spaces framed-in round the funnels.

(*b.*) The spaces required for the admission of light and air into the engine-rooms.

(*c.*) The spaces, if any, necessary for the proper working of the engines.

Art. 18.—Instead of the measurement of fixed bunkers, the rules for bunkers with moveable partitions as set forth in Art. 16 may be applied.

Art. 19.—In the case of tugs the allowances are not limited to 50 per cent. of the gross tonnage; all the spaces occupied by machinery, boilers, and coal bunkers are deducted.

Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question cannot exceed 50 per cent. of the gross tonnage.

APPENDIX 1.

TEXT OF THE PRINCIPAL PROVISIONS OF THE MERCHANT SHIPPING ACT, 1894, RELATING TO TONNAGE MEASUREMENT, AS AMENDED BY SUBSEQUENT ACTS.

6. **Survey and Measurement of Ship.**—Every British ship shall before registry be surveyed by a surveyor of ships, and her tonnage ascertained in accordance with the tonnage regulations of this Act, and the surveyor shall grant his certificate specifying the ship's tonnage and build, and such other particulars descriptive of the identity of the ship as may for the time being be required by the Board of Trade, and such certificate shall be delivered to the registrar before registry.

7. **Marking of Ship.**—(1.) Every British ship shall before registry be marked permanently and conspicuously to the satisfaction of the Board of Trade as follows:—

(*a.*) Her name shall be marked on each of her bows, and her name and the name of her port of registry must be marked on her stern, on a dark ground in white or yellow letters, or on a light ground in black letters, such letters to be of a length not less than four inches, and of proportionate breadth:

(*b.*) Her official number and the number denoting her registered tonnage shall be cut in on her main beam:

(*c.*) A scale of feet denoting her draught of water shall be marked on each side of her stem and of her stern post in Roman capital letters or in figures, not less than six inches in length, the lower line of such letters or figures to coincide with the draught line denoted thereby, and those letters or figures must be marked by being cut in and painted white or yellow on a dark ground, or in such other way as the Board of Trade approve.

(2.) The Board of Trade may exempt any class of ships from all or any of the requirements of this section, and a fishing boat entered in the fishing boat register, and lettered and numbered in pursuance of the Fourth Part of this Act, need not have her name and port of registry marked under this section.

(3.) If the scale of feet showing the ship's draught of water is in any respect inaccurate, so as to be likely to mislead, the owner of the ship shall be liable to a fine not exceeding one hundred pounds.

(4.) The marks required by this section shall be permanently continued, and no alteration shall be made therein, except in the event of any of the particulars thereby denoted being altered in the manner provided by this Act.

(5.) If an owner or master of a British ship neglects to cause his ship to be marked as required by this section, or to keep her so marked, or if any person conceals, removes, alters, defaces, or obliterates, or suffers any person under his control to conceal, remove, alter, deface, or obliterate any of the said marks, except in the event aforesaid, or except for the purpose of escaping capture by an enemy, that owner, master, or person shall for each offence be liable to a fine not exceeding one hundred pounds, and on a certificate from a surveyor of ships, or Board of Trade inspector under this Act, that a ship is insufficiently or inaccurately marked, the ship may be detained until the insufficiency or inaccuracy has been remedied.

48. **Registry of Alterations.**—(1.) When a registered ship is so altered as not to correspond with the particulars relating to her tonnage or description contained in the register book, then, if the alteration is made at any port having a registrar, that registrar, or, if it is made elsewhere, the registrar of the first port having a registrar at which the ship arrives after the alteration, shall, on application being made to him

and on receipt of a certificate from the proper surveyor stating the particulars of the alteration, either cause the alteration to be registered, or direct that the ship be registered anew.

(2.) (M.S. Act, 1906, Sec. 53.)—If default is made in registering anew a ship, or in registering an alteration of a ship so altered as aforesaid, the owner of the ship shall be liable on summary conviction to a fine not exceeding one hundred pounds, and in addition to a fine not exceeding five pounds for every day during which the offence continues after conviction.

77. Rules for ascertaining Register Tonnage.—(1.) The tonnage of every ship to be registered, with the exceptions herein-after mentioned, shall, previously to her being registered, be ascertained by Rule I. in the Second Schedule to this Act, and the tonnage of every ship to which that Rule I. can be applied, whether she is about to be registered or not, shall be ascertained by the same rule.

(2.) Ships which, requiring to be measured for any purpose other than registry, have cargo on board, and ships which, requiring to be measured for the purpose of registry, cannot be measured by Rule I., shall be measured by Rule II. in the said Schedule, and the owner of any ship measured under Rule II. may at any subsequent period apply to the Board of Trade to have the ship re-measured under Rule I., and the Board may thereupon, upon payment of such fee not exceeding seven shillings and sixpence for each transverse section as they may authorise, direct the ship to be re-measured accordingly, and the number denoting the register tonnage shall be altered accordingly.

(3.) For the purpose of ascertaining the register tonnage of a ship the allowance and deductions herein-after mentioned shall be made from the tonnage of the ship ascertained as aforesaid.

(4.) In the measurement of a ship for the purpose of ascertaining her register tonnage, no deduction shall be allowed in respect of any space which has not been first included in the measurement of her tonnage.

(5.) In ascertaining the tonnage of open ships Rule IV. in the said Schedule shall be observed.

(6.) Throughout the rules in the Second Schedule to this Act, the tonnage deck shall be taken to be the upper deck in ships which have less than three decks, and to be the second deck from below in all other ships, and in carrying those rules into effect all measurements shall be taken in feet, and fractions of feet shall be expressed in decimals.

(7.) The Board of Trade may make such modifications and alterations as from time to time become necessary in the rules in the Second Schedule to this Act for the purpose of the more accurate and uniform application thereof, and the effectual carrying out of the principle of measurement therein adopted.

(8.) The provisions of this Act relating to tonnage, together with the rules for the time being in force, are in this Act referred to as the tonnage regulations of this Act.

78. Allowance for Engine-room Space in Steamships.—(1.) In the case of any ship propelled by steam or other power requiring engine-room, an allowance shall be made for the space occupied by the propelling power, and the amount so allowed shall be deducted from the gross tonnage of the ship ascertained as in the last preceding section mentioned, and the remainder shall (subject to any deductions herein-after mentioned) be deemed to be the register tonnage of the ship, and that deduction shall be estimated as follows ; (that is to say,)

(*a.*) As regards ships propelled by paddle wheels in which the tonnage of the space solely occupied by and necessary for the proper working of the boilers and machinery is above twenty per cent. and under thirty per cent. of the gross tonnage of the ship, the deduction shall be thirty-seven one-hundredths of the gross tonnage ; and in ships propelled by screws, in which the tonnage of such space is above thirteen per cent. and under twenty per cent. of the gross tonnage, the deduction shall be thirty-two one-hundredths of the gross tonnage :

(*b.*) As regards all other ships, the deduction shall, if the Board of Trade and the owner both agree thereto, be estimated in the same manner; but either they or he may, in their or his discretion, require the space to be measured and the deduction estimated accordingly; and whenever the measurement is so required, the deduction shall consist of the tonnage of the space actually occupied by or required to be enclosed for the proper working of the boilers and machinery, with the addition in the case of ships propelled by paddle wheels of one-half, and in the case of ships propelled by screws of three-fourths of the tonnage of the space; and in the case of ships propelled by screws, the contents of the shaft trunk shall be added to and deemed to form part of the space; and the measurement of the space shall be governed by Rule III. in the Second Schedule to this Act.

(2.) Such portion of the space above the crown of the engine-room and above the upper deck as is framed in for the machinery or for the admission of light and air shall not be included in the measurement of the space occupied by the propelling power, except in pursuance of a request in writing to the Board of Trade by the owner of the ship, but shall not be included in pursuance of that request unless—

(*a.*) That portion is first included in the measurement of the gross tonnage; and

(*b.*) A surveyor of ships certifies that the portion so framed in is reasonable in extent and is so constructed as to be safe and seaworthy, and that it cannot be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the ship.

(3.) Goods or stores shall not be stowed or carried in any space measured for propelling power, and if the same are so carried in any ship, the master and owner of the ship shall each be liable to a fine not exceeding one hundred pounds.

Restriction on Deduction for Space occupied by Propelling Power. (M.S. Act, 1907.) 1. The deduction under section seventy-eight of the Merchant Shipping Act, 1894 (in this Act referred to as "the principal Act"), for the space occupied by the propelling power of a ship shall not in any case exceed fifty-five per cent. of that portion of the tonnage of the ship which remains after deducting from the gross tonnage any deductions allowed under section seventy-nine of the principal Act: Provided that—

(*a.*) This section shall not apply to steam ships constructed for the purpose of towing vessels so long as they are exclusively employed as tugs, but if and when employed for the carriage of passengers, cargoes, or stores, or using graving docks or dry docks or places provided for the repairing of vessels the register tonnage on which dues based on register tonnage may be levied by any harbour or dock authority shall be ascertained in manner provided by the Merchant Shipping Acts, 1894 to 1906, as amended by this Act; and

(*b.*) This section shall not come into operation until the first day of January nineteen hundred and fourteen in the case of the following ships (in this Act referred to as existing ships), namely, ships constructed, or the construction of which has been commenced, before the first day of May nineteen hundred and seven, and ships a contract for the construction of which has been made before the first day of May nineteen hundred and seven, though the construction has not actually commenced before that date.

Provisions as to Ships already Registered.—3. (1.) Where, in ascertaining the tonnage of an existing ship, a deduction has been made for the space occupied by the propelling power of the ship greater than the maximum deduction allowed under this Act, the tonnnage of the ship shall, before the date on which this Act comes into operation as respects

that ship, be recalculated on the basis of allowing the maximum deduction under this Act instead of that previously allowed, and the necessary alteration of the particulars and certificate of the registry of the ship shall be made and shall take effect on that date.

(2.) The registrar of every port of registry shall make any alteration in the particulars of the registry of any ship registered at that port, which is required for the purposes of this section, and shall send notice of the alteration so made to the managing owner of the ship.

(3.) The managing owner of the ship, on the receipt of any such notice of alteration, shall forthwith transmit the notice to the master of the ship, and the master of the ship on receipt of the notice shall produce it to the registrar of the port at which the ship is when the notice is received, if that port is a port having a registrar, and if not to the registrar of the first port having a registrar at which the ship arrives after the notice is received, and the registrar shall alter the certificate of registry of the ship in accordance with the notice.

(4.) If the managing owner or master of a ship fails to comply with the provisions of this section, the managing owner or master, as the case may be, shall be liable on summary conviction, in respect of each offence, to a fine not exceeding fifty pounds.

(5.) The expression "managing owner" in this section includes any person registered under section fifty-nine of the principal Act in cases where there is no managing owner.

79. Deductions for Ascertaining Tonnage.—(1.) In measuring or re-measuring a ship for the purpose of ascertaining her register tonnage, the following deductions shall be made from the space included in the measurement of the tonnage; namely—

(*a.*) In the case of any ship,

(i.) Any space used exclusively for the accommodation of the master; and any space occupied by seamen or apprentices and appropriated to their use, which is certified under the regulations scheduled to this Act with regard thereto;

(ii.) Any space used exclusively for the working of the helm, the capstan, and the anchor gear, or for keeping the charts, signals, and other instruments of navigation, and boatswain's stores; and,

(iii.) The space occupied by the donkey-engine and boiler, if connected with the main pumps of the ship; and

(iv.) **(M.S. Act, 1906, Sec. 54 (1).)** Any space (other than a double bottom) adapted only for water ballast; and

(*b.*) In the case of a ship wholly propelled by sails, any space set apart and used exclusively for the storage of sails.

(M.S. Act, 1906, Sec. 54 (2).) For the purpose of obtaining the benefit of a deduction under [subsection (1) (*a*) (iv.) of] this section the owner of any existing ship who claims to be entitled to the deduction may apply to the Board of Trade to have the necessary re-measurements of his ship made, and the Board of Trade, on the payment of such fee, not exceeding in any case one-fifth of the corresponding maximum fee fixed by the Third Schedule to the principal Act, as they may authorise, shall direct those measurements to be made, and the number denoting the register tonnage shall be altered accordingly.

(2.) The deductions allowed under this section, other than a deduction for a space occupied by seamen or apprentices, and certified as aforesaid, shall be subject to the following provisions; namely,

(*a.*) The space deducted must be certified by a surveyor of ships as reasonable in extent and properly and efficiently constructed for the purpose for which it is intended:

(*b.*) There must be permanently marked in or over every such space a notice stating the purpose to which it is to be applied, and that whilst so applied it is to be deducted from the tonnage of the ship;

(*c.*) The deduction on account of space for storage of sails must not exceed two and a half per cent. of the tonnage of the ship.

81. Measurement of Ships with Double Bottoms for Water Ballast.—In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by a surveyor of ships to be not available for the carriage of cargo, stores, or fuel, then the depth required by the provisions of Rule I., relating to the measurement of transverse areas, shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall, for the purposes of measurement, be deemed to represent the floor timber referred to in that Rule.

82. Tonnage once ascertained to be the Tonnage of Ship.—Whenever the tonnage of any ship has been ascertained and registered in accordance with the tonnage regulations of this Act, the same shall thenceforth be deemed to be the tonnage of the ship, and shall be repeated in every subsequent registry thereof, unless any alteration is made in the form or capacity of the ship, or unless it is discovered that the tonnage of the ship has been erroneously computed; and in either of those cases the ship shall be re-measured, and her tonnage determined and registered according to the tonnage regulations of this Act.

84. Tonnage of Ships of Foreign Countries adopting Tonnage Regulations.—(1.) Whenever it appears to Her Majesty the Queen in Council that the tonnage regulations of this Act have been adopted by any foreign country, and are in force there, Her Majesty in Council may order that the ships of that country shall, without being re-measured in Her Majesty's dominions, be deemed to be of the tonnage denoted in their certificates of registry or other national papers, in the same manner, to the same extent, and for the same purposes as the tonnage denoted in the certificate of registry of a British ship is deemed to be the tonnage of that ship.

(2.) Her Majesty in Council may limit the time during which the order is to remain in operation, and make the Order subject to such conditions and qualifications (if any) as Her Majesty may deem expedient, and the operation of the Order shall be limited and modified accordingly.

(3.) If it is made to appear to Her Majesty that the tonnage of any foreign ship, as measured by the rules of the country to which she belongs, materially differs from that which would be her tonnage if measured under this Act, Her Majesty in Council may order that, notwithstanding any Order in Council for the time being in force under this section, any of the ships of that country may, for all or any of the purposes of this Act, be re-measured in accordance with this Act.

85. Space occupied by Deck Cargo to be Liable to Dues.—(1.) If any ship, British or foreign, other than a home-trade ship as defined by this Act, carries as deck cargo, that is to say, in any uncovered space upon deck, or in any covered space not included in the cubical contents forming the ship's registered tonnage, timber, stores, or other goods, all dues payable on the ship's tonnage shall be payable as if there were added to the ship's registered tonnage the tonnage of the space occupied by those goods at the time at which the dues become payable.

(2.) The space so occupied shall be deemed to be the space limited by the area occupied by the goods and by straight lines enclosing a rectangular space sufficient to include the goods.

(3.) The tonnage of the space shall be ascertained by an officer of the Board of Trade or of Customs, in manner directed as to the measurement of poops or other closed in spaces by Rule I. in the Second Schedule to this Act, and when so ascertained shall be entered by him in the ship's official log book, and also in a memorandum which he shall deliver to the master, and the master shall, when the said dues are demanded, produce that memorandum in like manner as if it were the certificate of registry, or, in the case of a foreign ship, the document equivalent to a certificate of registry, and in default shall be liable to the same penalty as if he had failed to produce the said certificate or document.

(4.) Nothing in this section shall apply to any ship employed exclusively in trading or going from place to place in any river or inland water of which the whole or part is in any British possession or to deck cargo carried by a ship while engaged in the coasting trade of any British possession.

86. Surveyors and Regulations for Measurement of Ships.—All duties in relation to the survey and measurement of ships shall be performed by surveyors of ships under this Act in accordance with regulations made by the Board of Trade.

80. Power to Register Government Ships under the Merchant Shipping Acts. (M.S. Act, 1906).—(1) His Majesty may by Order in Council make regulations with respect to the manner in which Government ships may be registered as British ships for the purpose of the Merchant Shipping Acts, and those Acts, subject to any exceptions and modifications which may be made by Order in Council, either generally or as respects any special class of Government ships, shall apply to Government ships registered in accordance with those regulations as if they were registered in manner provided by those Acts.

(2) Nothing in this Act shall affect the powers of the Legislature of any British possession to regulate any Government ships under the control of the Government of that possession.

(3) In this section the expression "Government ships" means ships not forming part of His Majesty's Navy which belong to His Majesty, or are held by any person on behalf of or for the benefit of the Crown, and for that reason cannot be registered under the principal Act.

743. Application of Act to Ships Propelled by Electricity, &c.—Any provisions of this Act applying to steamers or steamships shall apply to ships propelled by electricity or other mechanical power, with such modifications as the Board of Trade may prescribe for the purpose of adaptation.

SECOND SCHEDULE.

Rules as to the Measurement of Tonnage.

Rule I. as modified by Sec. 81 (*measurement of vessels with double bottoms for water ballast*) *and by the Board of Trade under Sec.* 77 (7) *of the Act.* (The modifications are shown by italics).

(1.) **Measurement of Ships to be Registered ; and other Ships of which the Hold is clear.—Lengths.**—Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam ; divide the length so taken into the number of equal parts required by the following Table, according to the class in such Table to which the ship belongs :

Table.

Class 1. Ships of which the tonnage deck is according to the above measurement 50 feet long or under, into 4 equal parts :

2. Ships of which the tonnage deck is according to the above measurement above 50 feet long and not exceeding 120, into 6 equal parts :

Class 3. Ships of which the tonnage deck is according to the above measurement above 120 feet long, and not exceeding 180, into 8 equal parts :

„ 4. Ships of which the tonnage deck is according to the above measurement above 180 feet long, and not exceeding 225, into 10 equal parts :

„ 5. Ships of which the tonnage deck is according to the above measurement above 225 feet long, into 12 equal parts.

In the case of a break or breaks in a double bottom for water ballast, the length of the vessel is to be taken in parts according to the number of breaks, and each part divided into a number of equal parts according to the class in the above table to which such length belongs.

(2.) **Transverse Areas.**—Then, the hold being first sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of the ship at each point of division of the length *or each point of division of the parts of the length, as the case may require* as follows :—Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below the tonnage deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber (*upper side of the inner plating of the double bottom*)* at the inside of the limber strake, after deducting the average thickness of the ceiling which is between the bilge planks and limber strake; then, if the depth at the midship division of the length do not exceed 16 feet, divide each depth into *five*† equal parts ; then measure the inside horizontal breadth at each of the *four* points of division, and also at the upper point of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement ; number these breadths from above (*i.e.*, numbering the upper breadth one, and so on down to the *fifth* breadth) ; multiply the second and fourth by four, and the third by two ; add these products together, and to the sum add the first breadth and the fifth ; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area *of the upper part of the section ; then find the area between the fifth and lower point of the depth by dividing the depth between such points into four equal parts and measure the horizontal breadths at the three points of division and also at the upper and lower points, and proceed as before, and the sum of two parts shall be deemed to be the transverse area ;* but if the midship depth exceed sixteen feet, divide each depth into *seven* equal parts instead of four, and measure as before directed the horizontal breadths at the *six* points of division, and also at the upper point of the depth ; number them from above as before ; multiply the second, fourth, and sixth by four, and the third and fifth by two ; add these products together, and to the sum add the first breadth and the seventh ; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the products shall be deemed the transverse area *of the upper part of the section ; then find the lower part of the area as before directed, and add the two parts together, and the sum shall be deemed to be the transverse area.*

In all cases where the top of the double bottom is horizontal, it will be sufficient to measure the transverse areas under the ordinary words of the law.

(3.) **Computation from Areas.**—Having thus ascertained the transverse area at each point of division of the length of the ship, *or each point of division of the parts of the length, as the case may*

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* *See* Section 81, Merchant Shipping Act, 1894.

† *See* Report of Royal Commission on Tonnage, p. 799.

require, as required by the above table, proceed to ascertain the register tonnage under the tonnage deck in the following manner:—Number the areas respectively 1, 2, 3, &c., No. 1 being at the extreme limit of the length at the bow, *or of each part of the length*, and the last number at the extreme limit of the length at the stern, *or the extreme limit at the after end of each part of the length*: then whether the length be divided according to the table into four or 12 parts, as in classes 1 and 5, or any intermediate number, as in classes 2, 3, and 4, multiply the second and every even numbered area by four, and the third and every odd numbered area (except the first and last) by two; add these products together, and to the sum add the first and last if they yield anything; multiply the quantity thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space, *or cubical contents of each part if the ship is measured in parts* under the tonnage deck; divide this product, *or if measured in parts the products of the several parts added together*, by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed to be the register tonnage of the ship, subject to any additions and deductions under this Act.

(4.) **In case of Decks above the Tonnage Deck.**—If the ship has a third deck, commonly called a spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:—Measure in feet the inside length of the space at the middle of its height from the plank at the side of the stem to the lining on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage deck is divided as above directed; measure (also at the middle of its height) the inside breadth of the space at each of the points of division, also the breadth at the stem and the breadth at the stern: number them successively 1, 2, 3, &c., commencing at the stem; multiply the second and all the other even numbered breadths by four, and the third and all the other odd numbered breadths (except the first and last) by two; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths, and the result will give in superficial feet the mean horizontal area of the space; measure the mean height of the space, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by one hundred and the quotient shall be deemed to be the tonnage of the space and shall be added to the tonnage of the ship ascertained as aforesaid. If the ship has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforsaid.

(5.) **Poop, Deck-house, Forecastle, and any other Closed-in Space.**—If there be a break, a poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained as follows:—Measure the internal mean length of the space in feet, and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth, and multiply the whole sum by one-third of the common interval between the breadths, the product will give the mean horizontal area of the space; then measure the mean height, and multiply by it the mean horizontal area; divide the product by one hundred, and the quotient shall

be deemed to be the tonnage of the space, and shall be added to the tonnage under the tonnage deck ascertained as aforesaid. Provided that no addition shall be made in respect of any building erected for the shelter of deck passengers, and approved by the Board of Trade.

Rule II.

(As modified by the Board of Trade under Section 77 (7) of the Act.)

(1.) **Measurement of Ships not requiring Registry with Cargo on Board and Ships which cannot be Measured under Rule I.—Length.—Breadth.—Girting of the Ship.**—Measure the length on the uppermost deck from the outside of the outer plank at the stem to the aft side of the stern-post, deducting therefrom the distance between the aft side of the stern-post and the rabbet of the stern-post at the point where the counter plank crosses it; measure also the greatest breadth of the ship to the outside of the outer planking or wales, and then, having first marked on the outside of the ship on both sides thereof the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship on the one side to the height so marked on the other side by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum; multiply the result by the length of ship taken as aforesaid; then multiply this product by the factor ·0017 (*seventeen* ten-thousandths) in the case of ships built of wood, and ·0018 (*eighteen* ten-thousandths) in the case of ships built of iron, and the product shall be deemed the register tonnage of the ship, subject to any additions and deductions under this Act.

(2.) **Poop, Deck-house, Forecastle, and other Closed-in Spaces on Upper Deck.**—If there be a break, a poop, or other closed-in space on the upper deck, the tonnage of that space shall be ascertained by multiplying together the mean length, breadth, and depth of the space, and dividing the product by 100, and the quotient so obtained shall be deemed to be the tonnage of the space, and shall be added to the tonnage of the ship ascertained as aforesaid.

Rule III.

Measurement of allowance for Engine-room Space in Steamships.—(i.) Measure the mean depth of the space from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of those measurements at each end, and another at the middle of the length; take the mean of those breadths: measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the machinery: multiply together these three dimensions of length, breadth, and depth, divide the product by one hundred and the result shall be deemed the tonnage of the space below the crown; then find the cubical contents of the space or spaces, if any, above the crown aforesaid, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof; add such contents to the cubical contents of the space below the crown; divide the sum by 100; and the result shall (subject to the provisions herein-after contained) be deemed to be the tonnage of the space.

(ii.) If in any ship in which the space for propelling power is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured severally in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the said space.

(iii.) In the case of screw steamers in which the space for propelling power is to be measured, the contents of the shaft trunk shall be ascertained by multiplying together the mean length, breadth, and depth of the trunk, and dividing the product by 100.

(iv.) If in any ship in which the space aforesaid is to be measured any alteration be made in the length or capacity of the spaces, or if any cabins be fitted in the space, the ship shall be deemed to be a ship not registered until re-measurement.

Rule IV.

IV. **Measurement of Open Ships.**—In ascertaining the tonnage of open ships the upper edge of the upper strake is to form the boundary line of measurement, and the depths shall be taken from an athwartship line, extended from upper edge to upper edge of the said strake at each division of the length.

TONNAGE MEASUREMENT OF GOVERNMENT SHIPS.

Extracts from Order in Council dated 22nd March, 1911, respecting the registration of ships in the service of the Admiralty, but not forming part of the Royal Navy.

7. The tonnage of Government ships in the service of the Admiralty shall be ascertained in accordance with tonnage regulations to be made by the Board of Trade with the concurrence of the Admiralty; and wherever reference is made to tonnage regulations or to the ascertainment of tonnage thereby in any sections of the Merchant Shipping Acts which are applicable to Government ships, such sections shall be read with reference to Government ships as if the tonnage regulations made under this Order in Council were mentioned therein in lieu of the tonnage regulations mentioned in that Act and any Schedules thereto.

23. The following sections and provisions of the Merchant Shipping Acts shall not apply to Government ships in the service of the Admiralty registered in pursuance of the provisions of this Order in Council, namely :—

The Merchant Shipping Act, 1894: Sections 7 (3) and (5), 48, 84 85. . . . .

The Merchant Shipping Act, 1906: Section 53. . . . .

APPENDIX 2.

LIST OF FORMS USED IN CONNECTION WITH TONNAGE MEASUREMENT.

Name of Form.	Short Title.		Relevant paragraph of Instructions.
Application for tonnage measurement ...	Surveys	6	2, 115
Memorandum of measurements, for use at ship	„	58A	11, 83
Formulae of Measurement under Rule I.:—			
Class 1. For vessels 50 ft. long and under	„	51	11, 26, 42, 81–3
Class 2. From 50 ft. to 120 ft., and midship depth not exceeding 16 ft. ...	„	52	
Class 2A. From 50 ft. to 120 ft., and midship depth exceeding 16 ft.	„	53	
Class 3. From 120 ft. to 180 ft., and midship depth not exceeding 16 ft. ...	„	54	
Class 3A. From 120 ft. to 180 ft., and midship depth exceeding 16 ft. ...	„	55	
Class 4. From 180 ft. to 225 ft., and midship depth not exceeding 16 ft. ...	„	56	
Class 4A. From 180 ft. to 225 ft., and midship depth exceeding 16 ft. ...	„	57	
Class 5. For vessels over 225 ft. long ...	„	58	
For vessels with double bottom for water ballast	„	50	
Form for computing the tonnage of spaces	„	50A	26
Particulars of engine and boiler space ...	„	128	57
Surveyor's certificate as to light and air spaces	„	117	59
Surveyor's report on deductions under Sec. 79	„	63	80, 81, 83
Surveyor's certificate as to water ballast spaces	„	129	78
Sketch for use when builder's drawings are not obtainable	„	131	134
Certificate of survey for registry under Part I. of the Act	„	59	82
Letter advising owner of completion of tonnage measurement	„	59C	82
Report of marking of net tonnage, &c., on ship	„	60B	—
Certificate of British tonnage for issue to foreign ship	„	60	105, 107
Suez Canal special tonnage certificate ...	„	60A	114, 134, 154.
Letter forwarding draft Suez Canal certificate to tonnage department	„	60D	—
Letter to Owners notifying invalidity of Suez Canal Certificate	„	140	—

Name of Form.	Short Title.	Relevant paragraph of Instructions.
Sketches for use in connection with Suez Canal tonnage measurement :—		
Vessel with forecastle, bridge and poop all separate	Survey 131A	134
Vessel with forecastle and bridge combined, and poop	„ 131B	
Vessel with bridge and poop combined, and forecastle	„ 131C	
Report of measurement of sea-fishing vessel for registry under Part IV. of the Act ...	„ 59A	94
Report of measurement of Scottish sea-fishing vessel for registry under Part IV. of the Act	„ 59B	
Half-yearly return of implements	„ 135	99

INDEX.

M. 28543–1912.