LLOYD'S REGISTER

OF

BRITISH AND FOREIGN SHIPPING.

SUGGESTIONS

FOR THE

CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS.

INDEX

TO

SUGGESTIONS FOR THE CONSTRUCTION AND CLASSIFICATION OF COMPOSITE SHIPS.

SUGGESTIONS

FOR

THE CONSTRUCTION AND CLASSIFICATION

OF

COMPOSITE SHIPS.

All vessels constructed with iron frames, or part iron and wood frames, and wood planking, to be classed A for a term of years, according to the timber material used in their construction, as set forth in Table I, provided the workmanship be well executed, subject to the surveys and conditions hereinafter stated.*

VESSELS BUILT UNDER A ROOF.

An additional year will be allowed to vessels built under a substantial and efficient roof, kept in good repair, and which extends on each side beyond the vessel's breadth, and beyond each of her ends to an extent equal to half her midship breadth.

COPPER OR YELLOW METAL BOLTS.

Two additional years will be allowed to vessels, whether planked with one or two thicknesses, if fastened with wrought copper or yellow metal bolts, from the lower part of keel up to the height of one-fifth of the midship depth of hold, below the upper side of the upper deck and parallel thereto forward and aft, in one, two, or three-decked ships, and below the upper side of the main or tonnage deck in spar-decked ships, but the whole of the fastenings above this height may be of iron, if properly galvanized, and dowelled or clenched over.

Such ships to be marked C. F. (*Copper fastened*).

IRON BOLTS AND GALVANIZED IRON BOLTS.

Vessels will be allowed to be fastened with galvanized or plain iron bolts, if efficiently dowelled or clenched over; but the butt bolts, and also those which are used in fastening the fore hood ends before the iron

* ***Expunging*** *or withdrawal of Character.—The eleventh, twelfth, and thirteenth Columns left blank, indicate that the Vessel has never been classed in the Register Book. Three dots ... in Column* 12 *indicate that the Vessel was at one time Classed by this Society, but that the Class has been withdrawn at owner's request. A black line with date under it in Column* 13 *indicates that, at that date, the Vessel,* from reported defects, *was not entitled to a Character in the Register Book. A red line with date under it in this Column indicates that the Class was withdrawn from non-compliance, at that date, with the Society's Rules.*

stem plate, the after hood ends abaft the sternpost plate, extending from the keel up to the height of one-fifth the depth of hold below the upper side of the upper deck, in one, two, or three-decked vessels, or below the upper side of the main or tonnage deck in spar-decked vessels, those which fasten the planking to the dead-wood, the lower edge of the garboard strakes, and the wood keel, and stem scarphs, must be of wrought copper or yellow metal.

All vessels fastened with galvanized iron to be marked G. I. B. (*Galvanized Iron Bolts*), and with plain iron bolts (I. B.); and in addition all Iron fastened Ships will be marked "*Expl. T. S.*," (*Experimental Triennial Survey*).

All vessels fastened with galvanized or plain iron bolts in the bottom, previous to being sheathed with copper or yellow metal, must be sheathed with wood not less than 1¼in. thick, wrought hot on the best hair felt, and properly rabbeted into the stem, sternpost, keel, and into the planking at its upper edge; efficiently fastened to the bottom planks with yellow metal or copper nails, arranged to come between the frames, and be well caulked. The condition of the bolts and caulking of the bottom and planking to be ascertained at the periodical Surveys as per Section 43. *The wood sheathing to be allowed to remain on the bottom as long as the bottom planks, bolts, and caulking prove satisfactory.*

SURVEYS WHILE BUILDING.

SPECIAL SURVEY.

Section 1. The Surveyors are to examine the whole of the materials and the workmanship as it progresses, from the laying of the keel to the completion of the vessel, and to point out as early as possible anything that may be objectionable.

COMMON SURVEY.

Section 2. First.—Examination of the wood keel, stem, sternpost, deadwood, and frames before they are painted or coated.

Second.—Of all the beams, stringers, plates, &c., when in place, riveted-up ready to receive the planking.

Third.—When the vessel is planked outside, dubbed fair, and all the fastenings completed, but before she is either caulked, coated, or cemented, so that the inside and outside of the planking, and the bolts and their nuts, may be carefully examined.

Fourth.—When the vessel is caulked, but before the bolt-heads are cemented or have dowels fitted over them.

Fifth.—When the vessel is completed, launched, and equipped.

SUGGESTIONS AS TO THE BUILDING OF COMPOSITE SHIPS.

QUALITY OF IRON, MAKER'S NAME, AND WORKMANSHIP.

Section 3. The whole of the iron to be of good malleable quality, to be capable of bearing a longitudinal strain of twenty tons per square inch, and all plate, beam, and angle iron, to be legibly stamped in not less than two places with the manufacturer's trade mark, or his name, and the place where made, which is also to be stated in the Report of survey.

Any brittle or inferior iron, defective planking, timber, or other objectionable materials to be rejected.

The workmanship to be well executed, and submitted to the closest inspection before coating or painting.

RIVETS AND RIVETING.

Section 4. The rivets to be of the best quality, and to be of the diameter as per Table H, the rivet holes to be regularly and equally spaced, and carefully punched opposite each other in the adjoining parts from the faying services in the laps, lining pieces, butt-straps, and frames, and to be countersunk where required; the rivets not to be nearer to the butts or edges of the plating, lining pieces to butts, or of any angle iron, than a space equal to their own diameter, and not to be further apart from centre to centre than five times their diameter, or nearer than four times their diameter from centre to centre, and to be spaced through the frames and outside plating, and in reversed angle iron a distance equal to nine times their diameter from centre to centre.

All butts of iron plating, excepting those of poops and top-gallant forecastles, to be at least double riveted, and a space equal to twice the diameter of the rivets to be between each row; where treble riveting is adopted, a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets in the back row.

SCANTLINGS.

Section 5. The scantlings given in Table H are intended for ships the length of which, measured from the fore part of stem to the after part of the sternpost, on the range of the upper deck, does not exceed ten times their depth of hold, taken from the upper part of the floors to the top of the upper deck beams, or seven times their moulded breadth.

In vessels exceeding ten depths, or seven breadths in length, the builders are to submit their plans for giving them additional longitudinal strength to the Committee, through the Resident Surveyors, who are to express their opinions thereon.

The depth for defining the proportions of spar-decked vessels is to be measured from the top of the floor-plates to the upper side of the middle or tonnage deck beams. (*See* Section 24.)

WOOD KEEL.

Section 6. The wood keel to be of the dimensions set forth in Table H, to be free from all defects, the scarphs to be either vertical or horizontal, and to be tabled, the width of the tabling to be one-third the siding or moulding of the keel, as the case may be, and from $\frac{3}{4}$ of an inch to $1\frac{1}{4}$ inch deep, according to the size of the keel, and bolted with copper or yellow metal bolts, which are to be driven on and clenched on rings of the same metal; the bolts are to be in size and number as required by Table K.

GARBOARD STRAKE.

Section 7. The garboard strakes not to be less than two-thirds the depth of keel prescribed in Table H, and properly rabbeted into it, to be fitted closely to the iron keel plate, and to be of sufficient width. The butts of the garboard strake to have not less than four feet six inches shift from the butts of the garboard strake on the opposite side of the vessel, nor less than the same shift clear of the keel scarphs. For bolting, see Section 33.

STEM AND STERNPOST.

Section 8. The stem and sternpost to be of the dimensions set forth in Table H, and of materials according to class as prescribed in Table I. Where necessary to scarph the stem, it must be a flat scarph, and its length not less than seven-tenths of that prescribed in Table K for keel scarphs, and tabled and bolted in the same manner. The hood ends to be well and efficiently rabbeted into the stem and sternpost.

APRON, INNER STERNPOST, AND DEADWOOD.

Section 9. The apron, inner sternpost, and deadwood, to be of materials according to class as prescribed in Table I; the apron and inner sternpost to be of sufficient siding and moulding for the knight-heads and counter timbers respectively, to be secured to them, and to take the hood end fastenings.

SPACING OF IRON FRAMES.

Section 10. The spacing of the iron frames not to exceed 18 inches from moulding edge to moulding edge all fore and aft, a four feet length of angle iron, the size of the frame, is to be riveted to each floor and to the keel plate, back to back with the frame.

KEEL PLATE.

Section 11. The keel plate to be of the breadth and thickness prescribed in Table H, and to be made continuous up the apron and up the inner sternpost as high as practicable, but in all cases to extend above the lower deck or hold beam stringer angle iron. Forward and aft the plate is to be curved to the form of the bearding line, and to be one-sixteenth of an inch thicker than prescribed in the Table, where it passes over the deadwoods, apron, and inner sternpost; and to be sided as required by the form of the vessel, to have an angle iron of the size given in Table H for stringer angle irons riveted on each edge, flanged to the form of the vessel to receive the plank fastenings. The keel plate to maintain its breadth for three-fifths the length of the keel in midships, and then to be gradually reduced until its edges conform with the flange of the angle iron on the keel plate forward and aft; the butts of the keel plates to be shifted clear of the keel scarphs.

FRAMES.

Section 12. The frames to be of the dimensions set forth in Table H, and the narrow flange to be of a parallel thickness, and the bolts are to be so placed that the nuts of the screw bolts may fit closely to the frames; the frames to be in as long lengths as possible, fitted and riveted on to the keel plate, and extended as near to the middle line as practicable, according to the plan of construction adopted, and in all cases to extend to the gunwale, and where raised quarter decks, poops, forecastles, and spar decks are constructed to extend to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; if the frames be welded, the welds to be perfect with not less than four feet shifts from the welds of next frames, or if butted, to have not less than four feet shifts with four feet lengths of angle iron of the same size as the frames, fitted back to back, riveted to them, and secured to the outside planking.

FLOOR-PLATES.

Section 13. The floor-plates to be in thickness according to Table H, but at each end of the vessel, for one quarter of her length, they may be reduced one-sixteenth of an inch where the midship floor-plates

are six-sixteenths and under ten-sixteenths of an inch, and two-sixteenths of an inch where the plates are ten-sixteenths and above in thickness.

The depth of the floor-plates at middle line to be regulated by the following rule, viz., to the vessel's depth, measured from the top of the keel to the top of the upper or spar deck beams amidships add the extreme breadth of the vessel, two-fifths of that sum in inches to be the depth of the floor-plates at the middle line well fore and aft, but at the extreme fore and after ends they must be deeper, so as to form an efficient connection between the two sides of the vessel.

The floor-plates are to extend up the bilges not less than to a perpendicular height of *twice* and *a half* the depth of floors amidships, from upper side of keel at middle line; and in no case to be less moulded in any part than a fair taper between the depth at middle line, and the moulding at their extreme ends, which is to be not less than the moulding of the frames. The ends of the floors to maintain the height prescribed amidships, for one quarter of the vessel's length; they may then be gradually lowered forward and aft until the upper edges of the floor-plates are level, which place is to be determined by the form of the vessel, and from that point to the vessel's ends they are to be gradually increased in depth, so as to efficiently connect the sides of the vessel; the upper parts of the floors forward and aft are to be high enough to give ample room between the reverse frames on each side of the vessel for fitting the keelson angle irons.

In vessels having considerable rise of floor, the depth of the floor-plates on a square at the quarter of the vessel's extreme moulded breadth, set out from the middle line, is to be not less than three-fifths the depth of the floor-plate at the middle line, and the floor-plate is to be extended up the bilges by a fair taper from middle line, until it terminates at the moulding of the frames.

A floor-plate to be fitted and riveted to every frame and to be extended across the middle line, but where a vertical centre plate is adopted at middle line, then the floor-plates are to be efficiently connected to it on each side by double vertical angle irons of not less size than the reversed frames.

When floors extend from side to side, and are made in two lengths, the butts are to have double butt straps, one on each side of the floor-plates, and three-fourths the thickness of the floor-plates, or else the floor-plates must be lapped and treble riveted.

WATERCOURSES.

Section 14. Watercourses are to be formed through all the floor-plates, on each side of the middle line, and at the bilges above the frames, so as to allow water to reach the pumps freely, and also through the vertical centre plate, and intercostal keelsons when such keelsons are adopted.

REVERSED FRAMES.

Section 15. Reversed angle irons on frames to be in size as per Table H. All vessels under 200 tons to have reversed angle iron riveted to every frame and floor-plate across the middle line, extended to the height of the upper part of the bilge, and to the gunwale on alternate frames, and to have double reversed angle irons in way of all keelsons and stringers in hold; and in addition all vessels of 200 tons and upwards, to have reversed angle iron extended to the upper deck beam stringer on alternate frames, and where raised quarter decks and spar decks are constructed, to their deck stringers respectively, except when constructed of a rounded form at the gunwale, then they may terminate at the lower part of the curve; and on the

remaining frames reversed angle irons are to be fitted to above the height of the lower deck or hold beam stringer angle iron if the vessel has two decks or tiers of beams, and to above the height of the middle deck beam stringer angle iron if the vessel has three decks or tiers of beams; the rivets for securing the reversed angle iron to the frames and floor-plates to be in diameter as specified in Table H, and be spaced not to exceed a distance of nine times their own diameter from centre to centre; butts of reversed angle iron to be secured with butt straps.

MIDDLE LINE KEELSON.

Section 16. The middle line keelson, if of single plate, and standing above the floor-plates, to be of the thickness prescribed in Table H, to be two-thirds of the depth of floor-plates, and to have an angle iron, of the size given in Table H, fitted and riveted on *each* side, top and bottom, extending all fore and aft, the bottom angle irons to be riveted to a foundation plate the breadth of which is to be not less than three and a half times the flange of the angle iron fitted upon it, and the top angle irons to a rider plate on the top, the breadth of which is to be not less than the breadths of the flanges of the angle irons attached to them and the thickness of the keelson plates combined, to be properly shifted, and to be of the thickness given in Table H for box keelson plates, and the lower plates to be riveted to double reversed angle irons attached to each of the floors; but the foundation plate may be dispensed with if the combined widths of the horizontal flanges of the bottom angle irons are equal to the breadth prescribed for the foundation plate, and double riveted to the angle irons on the floors.

BOX KEELSON.

If a box keelson be adopted, it is to be formed of plates, properly shifted, of the thickness given in Table H, with a foundation plate, the depth of the box to be not less than two-thirds the depth of the floor-plates, and the breadth of it, two-thirds of its depth; the lower angle irons of the box keelson to be of the size given for the frames, and the top ones the size of the reversed frames, and the keelson to be well stayed in way of the masts.

INTERCOSTAL KEELSON.

If an intercostal keelson be adopted, it is to be of the thickness prescribed in Table H, and riveted to vertical angle irons of not less size than the reversed frames attached to all floor-plates, the plates to extend from the keel plate to the top of the floors, a bulb plate of not less thickness than the lower deck beams, or other bars of equal strength, to be let down below the top of the floors sufficiently for the intercostal plates to be riveted to them; in all cases these bars are to be fitted between two longitudinal angle irons on the floors, extending all fore and aft, of the size given for keelson angle iron in Table H, and riveted thereto. The intercostal plates to be fitted close to the floors, and to the flat keel plate.

VERTICAL CENTRE PLATE.

If the middle line keelson be formed of a vertical centre plate, extending from the keel plate to the top of the floors, it must be not less in thickness than that given in Table H, riveted to two fore and aft angle irons of the size given for stringer angle irons in Table H, attached to the keel plate. To strengthen the floor-plates transversely at their intersection at the middle line, in addition to double vertical angle irons, of not less size than the reversed frames, riveted to their ends, and to the vertical centre plate, there is to be a flat keelson plate of the same breadth and thickness as the keel plate, riveted to double reversed angle irons on the upper

edge of floors, and to two fore and aft angle irons of the size given for stringer angle irons in Table H, on the top edge of the vertical centre plate; but should the vertical centre plate be extended above the upper edge of the floors, then it is to be riveted to two fore and aft angle irons of the size given in Table H, for stringer angle irons, and to *two* flat plates of the thickness given for box keelson plates, and half the breadth of the keel plates, one on each side of the middle line, which are to be well riveted to double reversed angle irons on the top of each floor, one of these reversed angle irons to reeve through the vertical centre plate, and in all cases the vertical centre plate to be extended to the stem and sternpost plates, and riveted thereto.

BILGE KEELSONS AND STRINGERS.

Section 17. All vessels to have bilge keelsons fitted and riveted to double reversed angle irons to each floor, secured in an efficient manner, and to extend all fore and aft, and placed at the lower turn of the bilges according to the form of the bottom; to be formed of double angle irons of the size given in Table H, with bulb plate not less than the size given for hold beams, fitted between them for one-half the length of the vessel in midships; and in addition, in vessels of 300 tons and under 700 tons, a stringer will be required between the bilge keelson and hold beams, formed of double angle irons back to back, well riveted to double reversed angle irons and to each other; at the fore and after ends of the vessel the bilge keelson and stringer angle irons to be efficiently connected by plates forming hooks and crutches, which are to be properly riveted to the apron and inner sternpost plates; and such vessels to have intercostal plates fitted midway between the main and bilge keelsons, for three-fifths the vessel's length of keel in midships, these plates to be the thickness of the floor-plates, and connected thereto with angle irons of the size of the reversed frames.

In vessels of 700 tons and under 1,000 tons, in addition to the foregoing, a bulb plate, not less in thickness than the hold beams, is to be let down and riveted to the side intercostal plates, to be inserted between double angle irons on the top of the floors of the size given for stringer angle irons in Table H, and to be extended for three-fifths the length of the keel in midships, but the double angle irons to extend as far forward and aft as practicable.

In vessels of 1,000 tons and upwards, of a depth not requiring orlop beams, in addition to the foregoing, another stringer must be introduced formed of double angle irons fitted back to back to extend fore and aft, and riveted to double reversed angle irons and to each other; this stringer and the one below it are to be arranged so as to be equally spaced between the bilge keelson and hold beams, and a foundation plate, of the same thickness as the floors, is to be fitted for three-fifths the vessel's length of keel amidships under the bilge keelson, to be riveted to double reversed frames to the floors, and to which the bilge keelson is to be riveted. The breadth of the foundation plate is not to be less than three and a half times the flange of the angle iron fitted upon it.

Where bulb iron is used for keelsons or stringers, the joins to be overlapped and riveted; the length of the overlap must not be less than the depth of the bulb plate, but iron of other form than bulb may be used for them if of equal strength.

All angle irons for keelsons and stringers are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron or plate iron not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than the angle irons they connect.

SPACING OF BEAMS.

Section 18. The spacing of the upper deck beams in no case to exceed 4 feet 6 inches from centre to centre.

Vessels of 11 feet depth of hold and under, to have a stringer formed of double angle irons back to back, of the size given in Table H, placed midway between the floors and deck beams, fitted and riveted to reversed angle iron attached to each frame, to extend all fore and aft, and connected by plates at the ends forming hook and crutch, which are to be secured to the apron and inner sternpost.

Vessels over 11 and under 13 feet depth of hold, to have a hold beam stringer plate of the same thickness as the upper deck stringer plate, but only two-thirds its breadth, efficiently secured to the side by an angle iron riveted to it and to the reversed frames of the size given in Table H for stringer angle iron, to extend all fore and aft, and to be properly connected at the fore and after ends. Bracket or knee plates to be fitted and riveted to the stringers at alternate frames on the under side, and the inner edge of the stringer plate to be stiffened by an angle iron of the same size as given for the reversed angle iron on the frames; or if preferred, a stringer may be formed of bulb plate of the size given for hold beams fitted between two stringer angle irons, passing all fore and aft, properly riveted to double reversed angle iron on the frames, and to each other, or, a stringer may be introduced of any other form of equal strength.

Vessels of 13 feet and under 15 feet depth of hold, to have a hold beam under every alternate upper deck beam.

Vessels of 15 feet depth of hold and under 18 feet, to have hold or lower deck beams spaced not more than 4 feet 6 inches, and nine feet from centre to centre alternately, and always to be placed under upper deck beams.

And in vessels of 18 feet depth of hold and above, a hold or lower deck beam to be placed under every upper deck beam.

PANTING (TO PREVENT).

In vessels exceeding 12 feet in depth from the lower side of the lower deck beams, and having fine ends, extra beams will be required both forward and aft between the lower deck beams and floors to prevent "panting," the sizes, arrangement, and security of them to be to the satisfaction of the Surveyors.

TWO-DECKED VESSELS WITH ORLOP BEAMS.

All two-decked vessels exceeding 24 feet in depth from the top of the floors to the upper side of the upper deck beams, and three-decked vessels exceeding 24 feet to the upper side of the middle deck beams, and where the depth from the under side of the lower deck beams exceeds 15 feet, such vessels to have orlop beams under every second lower deck beam with a stringer plate on their ends, of the same breadth and thickness as the lower deck stringer, passing all fore and aft, supported by brackets riveted to every other frame between the beams; the orlop beams to be secured to lugs welded to the lower deck beam pillars; but in the case of flush-deck ships, a depth of 25 feet will be allowed, provided the lower hold does not exceed 16 feet in depth from the under side of lower deck beams. Should a house be constructed on such flush-deck ship, for lodging crew or for store room, the same not to extend within 10 feet of the sternpost.

THREE-DECKED VESSELS.

In vessels having three decks, viz., upper, middle, and lower, and where cargo may be carried on the middle and lower decks, the beams, iron sheerstrake, upper deck stringers, and stringer angle irons and flat of upper deck are to bear the same proportion to the vessel's dimensions as in those having two decks, and the middle and lower deck beams, and stringers, are to be of the same size in proportion to the vessel's length and breadth, as they would be in the lower deck of a vessel having only two decks; but one-sixth reduction will be allowed in the thickness of the outside planking, for one-fifth of the depth of hold below the upper deck stringer.

In all cases the middle deck is to be perfectly laid and caulked.

BEAMS.

Section 19. Beams to be of bulb plate with double angle irons on the top edge, or of T bulb iron, or of any other approved form of equal strength.

The upper deck beams to be one quarter of an inch in depth to every foot in length of the midship beam, and to be in thickness one-sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added; if of T bulb the united breadth of the top flanges to be not less than three-fourths the depth of the beam, and where beams are formed of bulb plate with double angle irons on the top edge, the flanges of each of the angle irons are not to be less in their united breadth than three-fourths the depth of the beam, and to be one-sixteenth of an inch in thickness for every inch of the two sides of the angle iron.

MIDDLE-DECK, HOLD, AND ORLOP BEAMS.

Middle-deck, hold, and orlop beams to be one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams.

All beams to be efficiently connected to the frames by bracket ends, or knee plates, the arms of each to be not less than twice and a half the depth of the beams in length, and of not less thickness than the beams.

PILLARS.

Section 20. All beams for at least three-quarters the length of the vessel in midships to be pillared, and in addition, the beams under the bowsprit, pall bitt, windlass, and capstan are to be pillared; the pillars to have not less than two rivets in each of their ends, so as to form a continuous tie from the keelson to the upper deck, or spar deck, and to be of the sizes given in Table H.

ENGINE-ROOM AND BOILER SPACE.

Section 21. In the construction of steam vessels, care must be taken that the engine and boiler bearers are properly constructed, and where they might interfere with the longitudinal strength of the vessel, they must be extended a sufficient distance beyond the engine and boiler space to compensate for such interruption; and after the machinery and boilers are fitted, as many hold or lower deck beams are to be introduced as may be practicable, and knee or bracket plates are to be added and riveted to the stringer plates, and to alternate frames which have no beams in the said space, and the vessel is to be otherwise made secure where necessary in the engine room, to the satisfaction of the Surveyors.

RAISED QUARTER-DECKS.

Section 22. The frames in all cases, and reversed angle iron on alternate frames, where practicable, are to extend to the raised quarter-deck stringer.

A reduction of one-half in the breadth and one-fifth in the thickness will be allowed for the sheerstrake of the raised quarter deck, and one-fifth in the scantlings, of the beams, stringers, stringer angle iron, and flat of deck of raised quarter deck, from that given in Table H for the upper deck of such ships; one-fifth reduction will also be allowed for the outside planking, or plating, of the raised quarter deck from that given for topsides in Table H.

The upper deck beam stringer plate is to maintain its breadth to the break of the quarter deck, and then it may be gradually reduced in breadth until it terminates at the sixth frame abaft the break, and the upper deck sheerstrake plate is to extend to the stern.

POOPS AND FORECASTLES.

Section 23. In full poops and top-gallant forecastles, the frames are to be extended to their stringer plates; a reduction of one-fourth will be allowed from the dimensions required by Table H for the upper deck sheerstrake, stringer plate, angle iron on stringers, beams, and flat of deck; the same reduction will be allowed for the outside planking, or plating, of the poop or forecastle, from the thickness given for topsides in Table H; where plating alone is adopted, it need not in any case exceed six-sixteenths of an inch in thickness, and may be single riveted. An iron or wood spirketting to be fitted and efficiently secured and caulked in the poop and forecastle, to prevent water from going into the 'tween decks. The united lengths of poop and forecastle not to exceed three-fifths of the entire length of the upper deck.

Where the poop or the forecastle is constructed of a rounded form at the gunwale, the frames need not extend beyond the lower part of the curve, and the beams may be of plain angle iron not less in dimensions than the size required in Table H for the main frames, one to be placed to every alternate frame, to scarph the main frames with not less than two feet lengths and be properly riveted to them; the breast beams are not to be less in size than the angle iron for stringers prescribed in Table H, with an angle iron of the size of the reversed frames riveted to them, and the rounded gunwale when not intended to be planked over, its plating must be of the thickness required for sheerstrakes of poops; but when intended to be planked over, the thickness prescribed for the stringer plates on beams of poops will be sufficient; in either case the plating must extend the breadth of the rounded form, and in such cases stringers on beam ends will not be required.

TONNAGE, HAVING REFERENCE TO SCANTLINGS, &c.

In flush-decked vessels having either one, two, or three decks (not being spar or awning decked), the tonnage under the upper deck, *without abatement of the tonnage of the space for the crew, or for the propelling power of steam vessels,* is to regulate all the scantlings of the hull, and also the equipment of the vessel.

In vessels having a *raised quarter deck,* or a poop, or top-gallant forecastle, or deck houses, or awning deck, or spar deck, the total tonnage below the tonnage deck is to regulate the scantlings of the hull; but the register tonnage, as cut on the main beam of sailing vessels and of steam vessels, *with the addition of the*

tonnage of the space required for propelling power, is to regulate the equipment, and also the size of the main piece of rudder and windlass, and the keel and keelsons and their number, and the scantling of the stringer plates on the upper and lower deck beams, and the requirements as to double riveting.

But in vessels where the tonnage of the erections above the tonnage deck is less than that required for crew space, *then* the *difference* between the tonnage of these erections and the tonnage of the space allowed for crew is to be *added* to the register tonnage, cut on the main beam, for the tonnage that is to regulate the equipment and the size of the main piece of rudder and windlass, and the keel and keelsons and their number, the scantling of the stringer plates on the upper and lower deck beams, and the requirements for double riveting.

SPAR-DECKED VESSELS.

Section 24. A spar-decked vessel is one having three decks or tiers of beams, where the space between the main and the spar deck is to be used only for the accommodation of crew and passengers, or to enclose the engine openings of steam vessels. The total depth of such vessels, measured from the top of floor-plates to the top of spar deck beams in midships, must not exceed thirteen-sixteenths, nor be less than twelve-sixteenths of the ship's extreme breadth. All frames and reverse angle irons on alternate frames are to extend to the spar deck stringer plate, except when constructed with a rounded form at the gunwale, then they may terminate at the lower part of the curve, but the reverse angle irons on the remaining frames are required to extend above the height of the main deck waterway or spirketting; in such ships the gross tonnage below the main or tonnage deck is to regulate all scantlings below this deck, but the total tonnage is to regulate the scantlings of the keelsons and their number, the stringers in the hold, the size of the main piece of rudder, and windlass.

These vessels are to have a main or middle complete deck, perfectly laid and caulked, and a main or middle deck iron sheerstrake, each of the thickness prescribed by Table H, and the main deck stringer plate is to be fitted and connected to the iron sheerstrake by angle iron between the frames of the size given for stringers, and in addition an inner stringer angle iron passing continuously fore and aft must be riveted to the reversed frames and to the main deck stringer plate. The upper part of the sheerstrake is to be not less in height than the main deck waterway or spirketting, as the case may be, and the space between the waterway, or spirketting, and the sheerstrake, all fore and aft, is to be filled in and made water-tight.

In such vessels a reduction of one-fourth from the dimensions required by Table H for the corresponding parts in the range of the upper deck in ships with two decks will be allowed from the dimensions of all beams, stringers, thickness of deck, and the outside planking, or plating, from the main deck upwards. If plating alone be adopted between the main and spar decks, the thickness need not exceed six-sixteenths of an inch in any case, the butts to be *double* riveted, but the edges may be single riveted.

When the spar deck is constructed of a rounded form at the gunwale, the beams may be of plain angle iron, if fitted to alternate frames, not less in dimensions than the sizes required in Table H for the main frames, to scarph the main frames with not less than two feet lengths, and be properly riveted to them. All hatchway and mast beams are to be of increased strength, and if of plain angle iron not to be less than the sizes given for stringer angle irons in Table H, with other angle irons of the size of the reversed frames riveted to them back to back. The rounded gunwale to be plated and properly constructed to the satisfaction of the Surveyor.

DECK HOUSES.

Deck houses or other erections will be allowed on a spar deck, but only to the extent of one-tenth its total superficial area; they are not to exceed seven feet in height, nor be placed nearer to either end of the vessel than one-fifth of her extreme length.

Vessels to which the Rule applies as regards an entire spar deck, will be noted in the Register Book thus, "*Spar decked.*"

EQUIPMENT.

The tonnage, as per Section 32 of Rules for Wood Ships, is to regulate the equipment. (*See* Sections 71 to 78 of the Rules for Wood Ships, *also* Table No. 22.)

STEAM SHIPS.—BOILERS AND MACHINERY.

In new vessels propelled by steam, and in vessels fitted with new engines or boilers, the machinery is to be submitted to the inspection of the Society's Engineer Surveyors, who will furnish a report to the Committee describing them, in the manner and form, No. 8 annexed. The Committee will thereupon, if found satisfactory, grant a certificate, and insert in the Register Book the notification, "LLOYD'S MC." *in red* (*i.e.* LLOYD'S MACHINERY CERTIFICATE), indicating that the machinery and boilers are certified to be in good order and safe working condition.

Unless this inspection is held, and the Engineer Surveyors are satisfied with the efficiency of the machinery, the figure 1 will be withheld from the vessel's class.

In order to facilitate this inspection, the plans of the boiler are to be examined, and from them the working pressure fixed.

The Surveyors will be guided in fixing the working pressure by Circular No. 336 annexed.

Any novelty in the construction of the machinery or boilers to be reported to the Committee.

The boilers, together with the machinery, to be inspected at different stages of construction.

The boilers to be tested by hydraulic pressure, in the presence of the Engineer Surveyor, to twice the working pressure, and carefully gauged while under test.

Two safety valves to be fitted to each boiler and loaded to the working pressure in the presence of the Surveyor. If common valves are used, their combined areas to be at least half a square inch to each square foot of grate surface. If improved valves are used they are to be tested under steam in the presence of the Surveyor, the accumulation in no case to exceed 10 per cent. of the working pressure.

In winch boilers one safety valve will be allowed, provided its area be not less then half a square inch per square foot of grate surface.

Each valve to be arranged so that no extra load can be added when steam is up, and to be fitted with easing gear which must lift the valve itself. All safety valve spindles to extend through the covers and be fitted with sockets and cross handles, allowing them to be lifted and turned round in their seats and their efficiency tested at any time.

Stop-valves to be fitted so that each boiler can be worked separately.

Each boiler to be fitted with a separate steam gauge, to accurately indicate the pressure.

Each boiler to be fitted with a blow-off cock independent of that communicating with the sea, the blow-off cock to be so constructed that the spanner or key can be fixed or taken off only when it is shut.

COCKS, PIPES, AND SEA CONNECTIONS.

With a view to ensuring better control over cocks, valves, and pipes connecting the engines and boilers with the sea, they are to be fixed as follows, viz. :—

All sea-cocks to be attached to Kingston valves of a height sufficient to lift them up to the level of platforms.

All discharge pipes to be, if possible, carried above the deep load-line, and to have discharge-valves fitted.

No pipes to be carried through the bunkers without being properly protected.

Bilge suction pipes to be arranged to pump direct from each compartment, the roses to be fixed in places where they can be easily accessible.

Cocks and valves connecting all suction pipes to be fixed above the stoke-hold and engine-room platforms.

The arrangement of pumps, bilge injections, suction and delivery pipes, to be such as will not permit of water being run from the sea into the vessel by an act of carelessness or neglect. Any defective arrangement to be reported to the Committee.

PERIODICAL INSPECTION OF MACHINERY.

In all steam vessels the machinery and boilers are to be examined by the Engineer Surveyors, and a report made to the Committee upon their safety and efficiency, within a period not exceeding four years from the date of the Ship's construction, and afterwards every four years from date of last Survey.

IRON SHEERSTRAKE.

Section 25. The iron sheerstrake to be one inch in breadth for every six feet of the vessel's length, for half her length in midships, and to be of the thickness given in Table H; it may then be gradually reduced in breadth and in thickness to three-fourths of the midship breadth and thickness at her ends.

The butts of the iron sheerstrake in all cases to be shifted clear of the butts of the stringer plates on the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates where practicable to be not less than nine feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadths, but carvel plated and single riveted; butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrake to be fitted less than two-thirds of the breadth required by the Rule for sheerstrake, below the upper deck stringer plate. The butt-straps in all cases to be in one piece, whether fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. (*See* Section 30.)

IRON BILGESTRAKE.

Section 26. The bilgestrake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in midships, and from thence to the ends of the vessel they are to be reduced gradually to one-half their midship breadth; the thickness of the plates to be as prescribed in Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for floorheads, such position for the bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be extended to the ends of the vessel in accordance with her form, and properly riveted to the frames.

DIAGONAL PLATES ON FRAMES.

Section 27. The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and fitted in pairs, transversely, all fore and aft, at an angle of 45°, with the butts of each pair meeting between the frames; to be of the thickness given in Table H, and connected to the sheer and bilge strake plates by butt-straps, double riveted, and to be efficiently riveted to each other, and to each frame they cross.

STRINGER PLATES ON ENDS OF BEAMS.

Section 28. All vessels to have stringer plates of the thickness given in Table H upon the ends of each tier of beams. Those upon the ends of the upper deck beams of one, two, and three-decked vessels, to be in width one inch for every seven feet of the vessel's entire length, for half her length in midships, and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width in midships; in no case, however, is the width in midships to be less than eighteen inches. The stringer plates are to be riveted to the beams and properly shifted, fitted home, and riveted to the iron sheerstrake, with an angle iron of the dimensions given in Table H, and the roughtree stanchions are not to pass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to three-fourths the midship breadth of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the dimensions given in Table H, extending all fore and aft, riveted to reverse angle iron on each frame and to the stringer plates.

In cases where a deck is not laid, and the width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such reduction be fully compensated for.

All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted to be connected with angle iron, or plate iron, not less than two feet long, fitted in the throat of them, properly riveted to each flange, and the thickness of the connecting plates not to be less than that of the angle iron they cover.

GUTTER WATERWAYS.

Upper deck gutter waterways are to be flooded to ascertain if there be any leakage, and when completed they are to be properly cemented.

TIE-PLATES.

Section 29. All vessels are to have tie-plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition thereto the beams of the upper and middle decks in three-decked or spar-decked vessels, and of the upper deck in vessels of one or two decks, must have tie-plates fitted from side to side diagonally, in number, one pair for about every thirty-five feet of the vessel's length; these plates in both cases must not be less in width than once and a half the depth of the beams of their respective decks, and of the thickness required for stringer plates; they are to be well riveted to each other and to the beams and stringers, and to have intermediate fastenings into the deck plank between the beams. In all cases their butts to be chain riveted.

Upon hold beams where a deck is not to be laid, a tie formed of double angle iron, of the size given for the main frames of the ship, may be fitted each side of the hatchways in lieu of tie-plates; but if the beams are made of such additional strength laterally as not to require the support given by the said angle irons or tie-plates, double angle irons of the above size fitted at the centre line from opening to opening may be substituted.

HATCHWAYS AND MAST PARTNERS.

All hatchways and mast holes are to be properly framed to receive half beams where required, and the latter to have mast partners at each tier of beams (except at orlop beams), the plating of which is not to be less in thickness than is required for stringer plates, and the united breadths of the plates are not to be less than three times the diameter of the masts; these plates are to be well riveted to each other, and to the beams, and angle iron carlings; and at the decks where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ship is to be properly fitted and riveted to the plate round the mast holes. The mast holes, skylights, and companions, must be properly secured to the satisfaction of the Surveyors. Where wood comings are fitted, plates are to be riveted to the beams to which the deck ends are to be fastened.

SKYLIGHTS.

The skylights to engine rooms, and the comings to which they are attached, are in all cases to be substantially constructed, and efficiently fastened to the beams, and, whether of iron or wood, are not to be less than two feet six inches above the upper deck in one or two-decked vessels, and one foot six inches above spar or awning decks. The skylights to be securely attached to the comings, and the glass in them should be very strong, from three-eighths to half-an inch thick, protected by a strong guard of iron rods, or by a framework of wire; in addition, deadlights of either iron or wood should be fitted having bull's eyes in them, and arrangements made for their efficient security in bad weather. Strong tarpauling covers are in all cases to be provided. In spar-decked vessels, and those having either a poop, awning deck, or bridge house, with the engine room beneath, the hatchways in the upper deck are to be enclosed by iron trunk bulkheads, not less than five-sixteenths of an inch thick, strengthened by angle iron and extended from the upper deck to the beams above, to which they are to be secured. Strong iron doors will be allowed in these trunk bulkheads, provided their lower parts are at least eighteen inches above the upper deck, and arrangements made for their efficient security.

COAL BUNKERS.

Coal bunker pipes, where practicable, are to be formed so as to be at least six inches above the upper deck, fitted with gratings and lids, the latter to have studs to fit in openings made in the pipes for their security, the pipes to be so formed that tarpauling may be securely lashed over them. Where it is necessary to fit flat coal bunker scuttle lids flush with the deck, they must be secured by a bar, or other approved fastening.

BUTT-STRAPS.

Section 30. Butt-straps in all cases, except those of floor plates (*see* Section 13), to be one-sixteenth of an inch thicker than the plates they connect, and to be fitted with the fibre of the iron in the same direction as that of the plates, and riveted as per Section 4.

BUTT-PLATES OF OUTSIDE PLANKING.

Section 31. The plates to which the butts of the outside planking are to be secured, must be of the breadth of the planks, extending from frame to frame, efficiently riveted thereto, and of the thickness given in Table H; but on the bows and quarters, or wherever else the plank ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed.

PLANKING.

Section 32. The material for planking to be in accordance with class in Table I, to be thoroughly seasoned, quite free from sap, wane, or other defects, to be wrought with the heart side to the frames, and with not less than three strakes between the butts, without step butting, and with not less than six-feet shifts; the garboard strakes to be shifted, and of the thickness given in Section 7; the bottom planking is not to be less in thickness than prescribed in Table H, from the garboard strakes up to within a fifth of the depth of hold set down below the upper deck stringer plate; from thence to the plankshеer to be in thickness as prescribed in Table H for topsides; or if preferred, the bottom planking may retain its thickness up to within a fourth of the depth of hold set down below the upper deck stringer plate, and from thence to the plankshеer be gradually diminished in thickness to that prescribed in Table H for topsides; the thickness of the wood sheerstrakes may be the thickness of the iron sheerstrake they cover less than that prescribed by Table H.

Outside planks (except the garboard strakes) are not to be more than twelve inches broad; they are to be fitted quite close to the frames and plates, and to each other at their inner edges, and wrought with proper seams outside in proportion to their thickness; the hood ends may be reduced one-fifth from the thickness given in Table H at the stem or sternpost, and one-third at the buttock. The caulking edge of the keel seam, and hood end seams of the planking at the stem and sternpost, need not exceed from two and a half inches to four inches, in proportion to the tonnage of the vessel; which can be arranged by trimming the back rabbet from the bearding line to the rabbet line, as required, so as not to unnecessarily reduce the keel, stem, and sternpost. Furrens or pads are in no case to be used.

BOLTS.

Section 33. The bolts to be not less than the sizes given in Table K; the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

The wood keel to have a vertical bolt through the keel plate between each frame. The stem, sternpost, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel.

The screw-pointed bolts for fastening the planking when less than five inches thick, to be of such form under the heads as will prevent them from turning; their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness; the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths of the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred.

All outside planks ten inches broad and above, to be double fastened; eight inches and a half and under ten inches, double and single fastened alternately; and under eight and a half inches, single fastened; and all butts to be double fastened.

The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one-fifth the depth of hold set down below the upper deck stringer plate, are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the plankshеer they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and in the bottom they are to be carefully covered (after the seams in the bottom are all caulked) with turned well-seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be driven with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used the sinking of them within the surface of the planking to be optional to the above extent.

PLANKING OF TWO THICKNESSES.

Section 34. If the vessel is to be planked with two thicknesses, the whole of the inside thickness must be of material required by Table I for the upper part of the vessel, and the outside thickness, if worked longitudinally, must be of the same material as is prescribed for a vessel constructed with a single thickness of planking, but if the outside thickness is to be worked diagonally, American Rock Elm may be used. If either or both thicknesses be worked longitudinally, or diagonally, each thickness need only be one-half that prescribed in Table H, but thick garboard strakes will be required to be fitted and fastened as in the case of vessels with a single thickness of planking. When the outside thickness is worked diagonally, a longitudinal strake of plank must be rabbeted into the garboard strake, and the ends of the diagonal planks butted against it; there must also be one or more longitudinal strakes of plank of the materials prescribed in Table I for the upper part of the vessel, fitted above the upper ends of the diagonal planking; and if the topsides be of a single thickness, the upper edge of the said longitudinal planking must be partly let into the topside plank or be rabbeted into a solid strake, so that it may be efficiently caulked. In all such cases both thicknesses must be caulked, and the outer thickness wrought hot on the *best hair felt*.

If both thicknesses of plank be worked diagonally, transversely to each other, from keel to gunwale, the bilge and diagonal plates may be dispensed with; but where the thicknesses are otherwise arranged, the bilge and diagonal plates must be fitted as in vessels with single thickness, the diagonal plates may however be extended to ten feet apart on a square with three pairs crossing each other in the centre.

When the inner thickness of plank is wrought diagonally, all the planks must be double fastened to the frames, but when wrought longitudinally, they may be fastened as per Section 33, the bolts in either case must be of the size prescribed in Table K. The outer thickness of plank must be secured to the inner by nut and screw bolts, or else by wrought copper bolts, driven through the inner thickness and clenched inside upon copper or yellow metal rings; a reduction of one-fifth of the diameter from that prescribed in Table K will be allowed when nut and screw bolts are used for fastening the outer thickness of plank, and a reduction of one-third when it is intended to use wrought copper and to clench the bolts of this thickness.

In vessels claiming the additional period for copper or yellow metal bolts, the fastenings in both thicknesses must be of the description and to the height required in those having only one thickness. Where two thicknesses of planking are adopted, dowelling will not be allowed in either thickness.

When the planking is composed of two thicknesses, the outside thickness of planking should not exceed ten inches in breadth, and may be single fastened, but the fastenings are not to exceed twenty inches apart on an edge; if, however, planks are used in the lower part of the bottom more than ten inches but not exceeding twelve inches in breadth, their fastenings are not to exceed eighteen inches apart on an edge.

All iron work, and all iron and wood surfaces which come in contact with each other, are to be properly coated with good paint, or other suitable composition.

CAULKING.

Section 35. It is indispensable that the caulking should be well executed, and no material used but the best brown oakum, with tarred spun yarn for the inner thread of bottom. The Surveyors are required

to see the caulking thoroughly tested with a beetle and horse, especially in new vessels, and at all surveys when the sheathing is stripped off the bottom.

In vessels with two thicknesses of planking, the condition of the caulking of the outside thickness is to be ascertained, in new vessels, by having a few pieces cut out from the bottom planking so as to expose the oakum; but it will not be necessary to have pieces cut out in vessels with single bottoms, as it can be ascertained whether the oakum is properly driven into the seams by inserting a thin knife into them from within the vessel.

KNIGHTHEADS, HAWSE TIMBERS, UPPER-DECK WATERWAYS, AND PLANKSHEER.

Section 36. Where the knightheads, hawse timbers, upper-deck waterways, and plankshеer are of wood, they must be of materials according to class in Table I, and fastened with bolts as in Table K.

The knightheads and hawse timbers are to be of sufficient siding and moulding, and to have boxing either outside or inside above the upper deck; they are to extend high enough for the efficient security of the bowsprit, and sufficiently below the upper deck to insure strength; to be well bolted, and connected by substantial hooks.

WATERWAYS.

Where the roughtree stanchions are of wood the depth and moulding of the upper deck waterway must be sufficient to give them support; but the depth of the waterway is in no case to be less than three times the thickness of the upper deck, excepting where the plankshеer covers it, and it will be required to be well bolted through the sheerstrakes or spirketting plate and upper deck stringer plate.

DECKS.

Section 37. The flat of all decks to be of good quality, properly seasoned, free from sap, and objectionable knots, the thickness and fastenings as per Table H.

DECK BOLTS.

The upper deck plank to be fastened by screw bolts from the upper side with nuts at the under side of the angle iron of the beams, and to the tie-plates (*see* Section 29). The bolts must be properly sunk with oakum and white lead under their heads, and be carefully covered over with turned dowels, with the fibre in the same direction as the deck plank, bedded in white lead, marine glue, or other suitable composition.

When the deck planks are six inches in width and under, single fastening will be sufficient; but when they are above six inches and not exceeding eight inches in width, there must be two bolts in each plank in every beam, one of which may be a short screw bolt; and planks exceeding eight inches in width must be double fastened with nut and screw bolts.

If the deck is of teak it may be one-eighth less in thickness than prescribed in Table H.

Upper decks must be renewed when worn in thickness as follows, viz.:—When a deck originally 4 inches thick is worn to 3 inches; 3½ inches to 2⅝ inches; 3 inches to 2¼ inches.

CEILING.

Section 38. All vessels to be closely ceiled from the main keelson to the upper part of the bilges, the ceiling to be secured in such a manner as to be easily removed, and from the upper part of the bilges upwards, either close ceiling or batten and space may be adopted, but the latter is considered preferable. It is recommended that the ceiling on the floors should be made in hatches, where practicable, of convenient sizes, so as to be lifted when required for the purpose of survey, or for cleaning and painting. The thickness of the ceiling in the hold from the main keelson to the upper part of the bilges, to be in accordance with Table H, and one-third less in thickness from thence upwards.

RUDDER.

Section 39. The main piece of rudder to be of timber, according to class in Table I, of dimensions as per Table H, and the pintles as per Table K. In screw steamers, the size of the main piece of rudder must be increased in diameter not less than one-eighth above the dimensions given in Table H, and the pintles and braces in the same proportion.

RUDDER BRACES.

The lower rudder brace is to extend on the bottom planking sufficiently to receive not less than three bolts before the hood ends in addition to the bolts in the sternposts; the remaining braces will not be required to pass the hood ends, but the ends of their arms should be made ⊣ shaped, or of other suitable form, so as to receive three through bolts in the sternpost.

CHAIN PLATE AND PREVENTER BOLTS.

Section 40. The chain plate and preventer bolts to be of the sizes given in Table K. When the chain and preventer plates are fitted on wood topsides, and the chain and preventer bolts are arranged to pass through below the iron sheerstrake, a plate is to be riveted to the frames, before working the wood topsides, of the same thickness as the sheerstrake, sufficiently wide to take the said bolts, and fillings of wood may be introduced between the frames for the bolts to pass through and be clenched upon plates, or otherwise secured to the satisfaction of the Surveyors.

CEMENT.

Section 41. All vessels to be efficiently cemented in the bottom, to the upper part of the bilges, care to be taken to have proper watercourses above the cement all fore and aft.

Section 42. The Surveyors in their Reports of vessels for original classification, which have partial deficiencies in either the workmanship, materials, or construction, are to state the same for the consideration of the Committee, when such vessels will be liable to have a reduced number of years assigned to them than they would otherwise have been entitled to.

The Surveyors in submitting their Reports of vessels not already classed, are in all cases, where practicable, to forward a Sketch of the Midship Section, and other drawings where necessary, to be furnished by the Builders, with figured dimensions of the component parts marked thereon.

Builders wishing to adopt plans other than those described herein, are to submit them, in the usual manner, through the Resident Surveyors (who are to state their opinions thereon), for the Committee's consideration and approval.

PERIODICAL SURVEYS DURING CLASSIFICATION.

PERIODICAL SURVEYS.

Section 43. All vessels to be surveyed annually if practicable; and whenever the copper, yellow metal, wood, or other sheathing, is stripped off, the condition of the planking, fastenings, and caulking to be ascertained.

Vessels marked C.F. to be subject to a special survey every *four* years; and those marked G.I.B and I.B. to be subject to a special survey every *three* years. Such Special Surveys will be noted in the Register Book.

When these Special Surveys are held, the vessel to be placed on blocks of a proper height in a dry dock, or upon ways; if she is sheathed with wood, a sufficient quantity must be removed for the examination of the bolts, caulking, and planking.

At the first Special Survey the limber boards, and ceiling equal to one strake fore and aft on both sides in the hold, below the upper turn of bilge, must be removed.

At subsequent Special Surveys, ceiling equal to an additional strake on both sides in the hold, and one strake on both sides in the 'twcen decks (provided it is close ceiled), must be removed; portions of the cement to be cut out to ascertain its condition, and that of the frames and keel plate; bolts of the bottom and keel, if of iron, to be got out for examination,—the number removed, and their condition, to be stated in the Report of Survey. If the frames, floors, &c., are found to be much oxidized, the whole of the ceiling to be removed and the oxidation cut or beaten off, and the iron work, if necessary, renewed, and the whole then to be properly coated or painted.

At the second special survey the windlass to be unhung where necessary, and its wood lining sufficiently stripped for examination, and the chain cables ranged for inspection.

VESSELS NOT SURVEYED WHILE BUILDING.

Section 44. Vessels built in Great Britain, or the British North American Colonies, which have not been surveyed while building, will lose one year of the period to which they might otherwise have been entitled.

When a Character is claimed for such a vessel, she must be placed on high blocks in a dry dock, or on a slip, or other convenient place, so that the keel and bottom may be seen and properly examined. The hold must be cleared, and proper stages made, the outside planking scraped bright from the light water-mark to the waterway seam, a sufficient number of fastenings removed from the keel, the planking of the flat of bottom, the bilges, between the light and load-line, and from the topsides, in order that their condition may be thoroughly ascertained.

Should the vessel be less than four years old from the date of launching, if close ceiled, a quantity of ceiling equal to one strake fore and aft on each side in the 'tween decks, a like quantity at the upper turn of bilge, and one plank at the lower turn of the bilge on each side over the floors in midships, will be required to be removed, and the limber boards lifted; but should the vessel exceed four years of age, unless she be found in a very clean and satisfactory condition, the whole of the ceiling, or such portion as the Surveyors may require, must be removed, excepting in the case of "batten and space ceiling."

WOODEN FLOORS, &c.

Should the vessel however have been constructed with wooden floors, or with iron and wooden frames, and with through fastenings, passing through the ceiling, and she be under four years of age, it will be sufficient if, in lieu of removing the ceiling as above described, a listing be cut out fore and aft on both sides in the 'tween decks 4 inches wide, a ceiling plank at the upper turn of the bilge and at the lower turn of bilge on each side over the floors to be taken out, and the limber boards lifted; but if she exceed four years of age, in addition to the above, a 4-inch listing must be extended fore and aft at the turn of the bilge on each side; and at other parts if considered necessary by the Surveyors.

When the foregoing preparations have been made, a careful survey must be held by two Surveyors (one of them to be an exclusive officer of the Society), who shall submit a report and midship section containing a full description of the vessel, comparing the same with the Rules.

Should a vessel submitted for Classification be sheathed with wood or metal, the same will not be required to be stripped off (if all be found satisfactory to the Surveyors) beyond a sufficient quantity at the keel, hood ends, bilges, and between the light and load water-lines, for the purpose of ascertaining the condition of the caulking and the fastenings.

CONTINUATION OF SHIPS ON THE A CHARACTER.*

Section 45.—If, on the expiration of the term of years originally assigned, or at any age of a vessel, the owner be desirous to have his ship remain or be replaced on the letter A, such continuation will be granted for a period not exceeding two-thirds the number of years assigned originally, provided that a special survey as hereafter described be held by two Surveyors, one of them to be an exclusive officer of the Society, and that all repairs found necessary be completed to their satisfaction. The number of years assigned as continuation to commence from the date of the completion of such repairs.

The ship must be placed in dry dock or laid on blocks upon ways, so that the keel and bottom may be examined.

All sheathing (wood and metal) to be entirely stripped off the bottom and elsewhere.

The hold to be cleared, and proper stages made both inside and outside.

All the outside planking from the light water-mark upwards, including plank sheers and waterways, to be scraped or dubbed bright.

* Where composite vessels are not constructed in accordance with the Committee's printed suggestions, and a deviation is required from a strict compliance with the Rules, special application must be made to the Committee.

All the close ceiling, where the frames and floors are of iron, to be removed from the upper part of the bilges downwards, and where close ceiling is fitted above this height, two strakes of ceiling are in addition to be removed between decks, and two strakes in the hold all fore and aft, when, should the condition of the frames and planking render it, in the opinion of the Surveyors, necessary, the whole of the close ceiling is to be removed.

A plank of the bottom is to be removed on each side, amidships, in way of the bilge plate; and when the iron sheerstrake is covered with planking, an additional plank is to be removed in way of the same.

Not less than twelve bolts on each side, whether of iron or yellow metal, to be driven out in ships of 500 tons and under, and increased in number in proportion to the size of the ship; also cement to be removed in places, for the purpose of ascertaining the condition of the floors, frames, iron keel-plate, butt-straps to outside planking, &c.

Where the middle line bolts are of iron, their condition is to be ascertained; but if this be not practicable, additional intermediate bolts of copper or yellow metal must be driven through and clenched.

The windlass to be unhung, and its wood lining sufficiently stripped for examination.

The cables to be ranged, and the anchors and general equipment examined. The coal bunkers in steamers to be cleared, and all iron-work to be scraped clean.

The annual and special periodical surveys to apply to vessels so continued as required by Section 43 *for ships on original class.*

By Order of the Committee.

BERNARD WAYMOUTH,
Secretary.

No. 2, *White Lion Court, Cornhill, London, E.C.*
1*st July*, 1876.

frames, so as to allow water to reach the pumps freely, and also through the vertical centre pla... as above the keelsons are adopted.

REVERSED FRAMES.—Reversed angle irons on frames to be in size as per Table. All vessels unde... rivetted to every frame and floor plate, across the middle line, extended to the height of the upper... on alternate frames, and to have double reversed angle irons in way of all keelsons and stringers i... 200 tons and upwards, to have reversed angle-iron extended to the upper deck beam stringer on alter... decks and spar-decks are constructed, to their deck stringers respectively, except when constructed of... they may terminate at the lower part of the curve; and on the remaining frames reversed angle-ir... of the lower deck or hold beam stringer angle-iron, if the vessel has two decks or tiers of beams, ... deck beam stringer angle-iron, if the vessel has three decks or tiers of beams, the rivets for securing... and floor plates to be in diameter as specified in Table, and be spaced not to exceed a distance of nine... to centre; butts of reversed angle-iron to be secured with butt straps.

BEAMS.—Beams to be of bulb plate, with double angle-irons on the top edge, or of T bulb iron, or of any o... The upper deck beams to be one quarter of an inch in depth to every foot in length of the mid... sixteenth of an inch for every inch in depth, with one-sixteenth of an inch added; if of T bulb ... be not less than three-fourths the depth of the beam, and where beams are formed of bulb plate w... the flanges of each of the angle-irons are not to be less in their united breadth than three-fo... one-sixteenth of an inch in thickness for every inch of the two sides of the angle-iron. Mi... one-eighth of the depth deeper, and one-sixteenth of an inch thicker than the upper deck beams... with the frames by bracket ends, or knee plates, the arms of each to be not less than twice-and-a-... and of not less thickness than the beams. All beams for at least three-quarters the length of the ... beams under the bowsprit, pall bit, windlass and capstan are to be pillared; the pillars to have ... ends, so as to form a continuous tie from the keelson to the upper deck, or spar-deck, and to be of th...

IRON SHEERSTRAKE.—The iron sheerstrake *to be one inch in breadth for every six feet of the vessel's ...* and to be of the thickness given in Table; it may then be gradually reduced in breadth and in th... breadth and thickness at her ends. The butts of the iron sheerstrake in all cases to be shifted cle... the beam ends, the shift in no case to be less than equal to three spaces of frames, and all plates w... feet long, but if the sheerstrake plates are eighteen feet long they may be of two equal breadth... butts of all plating to be fitted quite close, and in no case is the lower edge of the iron sheerstrak... breadth required by the Rule for sheerstrake below the upper deck stringer plate. The butt strap... fitted outside or inside, and in no case to be in two pieces by being cut at the stringer plate. *See S...* ways the

rly rabboted
ess than four
r of the keel

o the frames,
rd strakes to
le, from the
ksheer to be
urth of the
thickness to
cover less
y are to be
portion to
hird at the
xceed from
bbet from
be used.
gs as per
the beams
carefully
er suitable
above six
ort screw
it may be
e, viz.:—

es above

STERN POSTS, FLOOR PLATES, BEAMS, STRINGERS, &c.

de mark, or his name and the place where made.

Thickness of Outside Plank.			Thickness of Upper Deck, and Planksheer.	Thickness of Wood Ceiling in Hold to upper part	Windlass.	Main Piece of Rudder, from Lower Part of Counter upwards, Pall bitt.	Tonnage.
From the Garboard Strake up to within one-fifth of the Depth	Topsides from the Planksheer to within one-fifth of the Depth	and top-Gallant forecastles, to be where treble treating is adopted			*See Notes to Table.*		*See Notes to*

strake plates to be two-thirds the breadth of the iron sheerstrake, for three-fifths the length of the keel in e ends of the vessel they are to be reduced gradually to one-half their midship breadth; the thickness of Table H, and they are to be fitted at the bilges with the middle of the plate at the height prescribed for bilge plates to be maintained, notwithstanding that the floorheads may be carried higher. They are to be el in accordance with her form, and properly rivetted to the frame.

:—The diagonal plates on the frames to be not less than one-third the breadth of the iron sheerstrake, and ore and aft, at an angle of 45°, with the butts of each pair meeting between the frames; to be of the nnect the sheer and bilge strake plates by butt straps double rivetted, and to be efficiently rivetted to ey cross.

have stringer plates of the thickness given in Table upon the ends of each tier of beams. Those upon the one, two, and three decked vessels *to be in width one inch for every seven feet of the vessel's entire length and from thence to the ends of the vessel they may be gradually reduced to three-fourths the width in* the width in midships to be less than eighteen inches. The stringer plates are to be rivetted to the beams e, and rivetted to the iron sheerstrake, with an angle iron of the dimensions given in Table, and the ass through them. Stringer plates on the ends of beams below the upper deck may be reduced in width to h of the upper deck stringer, which breadth is to extend all fore and aft, and to have an angle iron of the ding all fore and aft, rivetted to reverse angle iron on each frame and to the stringer plates. In cases width of the stringer plate on ends of hold beams is objected to, it may be reduced in width, provided such or. All stringer angle irons are to be in as long lengths as possible, properly shifted, and wherever butted or plate iron not less than two feet long, fitted in the throat of them, properly rivetted to each flange, and plates not to be less than the angle iron they cover. Upper deck gutter waterways are to be flooded to , and when completed they are to be properly cemented.

tie plates ranging all fore and aft upon each side of the hatchways on each tier of beams, and in addition and middle decks in three decked or spar decked vessels, and of the upper deck in vessels of one or two from side to side diagonally, in number one pair for about every 35 feet of the vessel's length; these plates width than once and a half the depth of the beams of their respective decks, and of the thickness required e well rivetted to each other and to the beams and stringers, and to have intermediate fastenings into the n all cases their butts to be chain rivetted. Upon hold beams where a deck is not to be laid, a tie the size given for the main frames of the ship may be fitted each side of the hatchways in lieu of tie plates, ch additional strength laterally as not to require the support given by the said angle irons or tie plates, size fitted at the centre line, from opening to opening, may be substituted. All hatchways and framed to receive half beams where required, and the latter to have mast partners at each tier of beams ing of is not to be less in thickness than is required for stringer plates, and the united breadths of three times the diameter of the masts; these plates to be well rivetted to each other, and to the beams, and cks where the masts are to be wedged, an angle iron of the dimensions required for the main frame of the ivetted to the plate round the mast hole. The mast holes, skylights, and companions must be properly Surveyors. Where wood comings are fitted, plates are to be rivetted to the beams to which the deck ends

es, except those of floor plates (*see Section* 13) to be one-sixteenth of an inch thicker than the plates they fibre of the iron in the same direction as that of the plates, and rivetted as per Section 4.

NKING.—The plates to which the butts of the outside planking are to be secured, must be of the breadth frame to frame, efficiently rivetted thereto, and of the thickness given in Table, but on the bows and k ends may have a tendency to strain off, they are to be one-eighth of an inch thicker than therein prescribed. ivets to be of the best quality, and to be of the diameter as per Table, the rivet holes to be regularly and ached opposite each other in the adjoining parts, from the laying surfaces in the laps, lining pieces, butt ntersunk where required, the rivets not to be nearer to the butts or edges of the plating, lining pieces to a space equal to their own diameter, and not to be further apart from centre to centre than five times their es their diameter from centre to centre, and to be spaced through the frames and outside plating, and in ual to nine times their diameter from centre to centre. All butts of iron plating, excepting those of poops at least double rivetted, and a space equal to twice the diameter of the rivets to be between each row; , a space equal to twice the diameter of the rivet to be between each row, with half the number of rivets

TABLE I.

EXHIBITING THE NUMBER OF YEARS TO BE ASSIGNED TO THE DIFFERENT DESCRIPTIONS OF TIMBER USED IN

COMPOSITE SHIPS,

The same to be of good quality, properly seasoned, and free from defects.

	TIMBER.	KEEL.	Stem, Sternpost, Apron, Inner Sternpost, Deadwood, Knightheads and Hawse Timbers.	Floors, Wood Frames and Ceiling upon them; Beams and Keelsons.	OUTSIDE PLANK.		Upper Deck Waterway, Spirketting, Planksheer, and Roughtree Timbers.	RUDDER, WINDLASS, and PALLBITT. — Main Pieces.
					From Top of Keel to Two-fifths the Depth of Hold (a)	From Two-fifths the Depth of Hold (a) to Gunwale.		
1	East India Teak	14	14	14	14	14	14	14
2	Greenheart, Morra, Iron Bark	14	12	12	14	12	12	14
3	(b) Live Oak, English, African, French, Adriatic, Italian, Spanish, and Portuguese Oaks	14	12	12	12	12	12	14
4	Pitch Pine, Oregon and Huon Pine, Larch, Hackmatack, Cowdie or Kaurie Pine ..	9	8	8	12	10	10	—
5	(b) Northern Continental Oak, and American White Oak..	10	8	8	9	9	8	9
6	Dantzic, Memel, Riga, and American Red Pine	9	8	8	10	9	9	—
7	American Rock Elm	14	—	8	14	6	6	—
8	(c) English and French Elm, Beech, Black Birch, and Black Walnut	14	—	—	12	—	—	—
9	Spruce Fir, Swedish and Norway Red Pine.....	—	—	—	6	6	—	—

(a) That is, two-fifths the depth of hold taken from the top of floors to the top of upper or tonnage deck beams, set up from the keel plate, in midships; which height is not to be exceeded fore and aft on a straight line.

(b) Live Oak, English, French, Adriatic, Italian, Spanish, and Portuguese Oak will be allowed to be used for stems, and for the bow and buttock planks where East India Teak would be liable to break in working, in vessels otherwise built of 14 years' timber material.

(b) Whenever any of the Oaks, or other woods of an acid nature are used, the best Hair Felt, Canvas, or other approved material, in addition to paint, is to be placed between them and the Iron Plates and Angle Irons.

(c) English and French Elm allowed for Garboard Strakes and Planking of flat of bottom in Ships of the 14 years' grade.

Where parties are desirous of using Woods not inserted in the Table, special application to be made to the Committee.

Lloyd's Register of Shipping, London, 23rd March, 1876.

TABLE H.

COMPOSITE SHIPS.—TABLE OF MINIMUM DIMENSIONS OF FRAMES, PLANKING, KEELS, KEELSONS, STEMS, STERN POSTS, FLOOR PLATES, BEAMS, STRINGERS, &c.

All plates, and all beam and angle iron, used in ships intended for classification, are to be stamped legibly in two places with the manufacturer's trade mark, or his name and the place where made.

Tonnage. *See Notes to Table.*	Distance of Frames from Moulding Edge to Moulding Edge all Fore and Aft.	Siding of Keel, Stem, and Stern Post, and Moulding of Stem.	Moulding of Stern Post and Keel.	Breadth and Thickness of Keel Plate, Flat Plate Keelson, and Thickness of Single Plate Vertical Keelson, standing upon Floors. Breadth.	Thickness.	Dimensions of Angle Iron for Frames and the Lower Angle Irons of Box Keelsons.	Dimensions of Angle Iron for Reversed Frames, and the Top Angle Irons of Box Keelsons.	Thickness of Centre Plate Keelson, Sheerstrake, (where not planked over) also of Butt Plates for Planking in Midships.	Thickness of Floor Plates, Hooks, Crutches, Side Intercostal, and Box Keelson.	Thickness of Stringer Plates upon Beam Ends, Tie Plates on Beams, Sheer strake (where planked over) and Topside Plating (where not planked over) Bilge Strake and Diagonal Plates on Frames, and Middle Line Intercostal Keelsons.	Dimensions of Angle Iron on Beam Stringers, Stringers in Hold, and Keelsons.	Diameter of Solid Pillars to Beams. Hold.	Deck.	Thickness of Outside Plank. From the Garboard Strake up to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.	Topsides from the Planksheer to within one-fifth of the Depth of Hold set down below the Upper Deck Stringer.	Thickness of Upper Deck, and Planksheer. *See Notes to Table.*	Thickness of Wood Ceiling in Hold to upper part of Bilges.	Windlass. *See Notes to Table.* Diameter of Iron Spindle.	Diameter of Main Piece.	Main Piece of Rudder, from Lower Part of Counter upwards, Pall Bitt, and Wood Keelson, Sided and Moulded.	Tonnage. *See Notes to Table.*
Tons.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	Tons.
50 and under 100	18	9½	11	19	8/16	2¾×2¾×5/16	2¼×2¼×4/16	6/16	5/16	5/16	3×3×5/16	—	2	4	2½	2¾	1½	2¼	12½	9½	50 and under 100
100 and under 200	18	10½	12	21	9/16	2¾×2¾×6/16	2¼×2¼×5/16	7/16	5/16	6/16	3×3×6/16	2½	2¼	4	3	3	1½	2½	14	11	100 and under 200
200 and under 300	18	11½	13	23	10/16	3×3×6/16	2¼×2¼×5/16	8/16	6/16	7/16	3×3×6/16	2¾	2⅜	4½	3½	3¼	1¾	2¾	15	12	200 and under 300
300 and under 400	18	12½	14	25	10/16	3×3×6/16	2½×2½×5/16	9/16	7/16	8/16	3×3½×6/16	2⅞	2⅜	4½	3½	3½	2	3	16	13	300 and under 400
400 and under 500	18	13	14½	26	11/16	3¼×3½×7/16	2½×2¾×6/16	9/16	7/16	8/16	3×4×6/16	3	2½	5	4	3½	2¼	3¼	17	14	400 and under 500
500 and under 600	18	13½	15	27	11/16	3¼×3½×7/16	2½×3×6/16	10/16	8/16	9/16	3½×4×7/16	3⅛	2½	5	4	3¾	2½	3½	18	14¾	500 and under 600
600 and under 700	18	14	15½	28	12/16	3½×4×6/16	2¾×3×6/16	10/16	8/16	9/16	3½×4½×7/16	3¼	2½	5½	4½	3¾	2½	3⅝	19	15½	600 and under 700
700 and under 800	18	14½	16	29	12/16	3½×4×6/16	3×3×6/16	11/16	9/16	10/16	4×4½×6/16	3⅜	2½	5½	4½	4	2¾	3¾	20	16	700 and under 800
800 and under 900	18	15	16½	30	13/16	3¾×4½×9/16	3×3×7/16	11/16	9/16	10/16	4×5×8/16	3½	2½	6	4¾	4	2¾	4	21	16¼	800 and under 900
900 and under 1000	18	15½	17	31	13/16	3¾×4½×9/16	3×3¼×7/16	12/16	10/16	11/16	4×5×9/16	3½	2⅝	6	4¾	4	2¾	4¼	22	16½	900 and under 1000
1000 and under 1200	18	16	17½	32	14/16	3¾×4¾×9/16	3×3½×8/16	12/16	10/16	11/16	4½×5×9/16	3½	2⅝	6¼	5	4	3	4½	23	16¾	1000 and under 1200
1200 and under 1500	18	16½	18	33	14/16	3¾×4¾×9/16	3½×3½×8/16	13/16	11/16	12/16	4½×5½×9/16	3⅝	2⅝	6¼	5	4	3	4⅝	24	17	1200 and under 1500
1500 and under 2000	18	17	18½	34	15/16	4×5×10/16	3½×4×9/16	13/16	11/16	12/16	5×6×9/16	3¾	2¾	6½	5¼	4	3	4⅝	25½	17½	1500 and under 2000
2000 and under 2500	18	17¼	19	34½	15/16	4×5½×10/16	3½×4½×10/16	14/16	12/16	13/16	5½×6½×10/16	3¾	2¾	7	5¾	4	3	4¾	27	18	2000 and under 2500
2500 and under 3000	18	17¼	19¼	34½	15/16	4×6×11/16	3½×4½×10/16	14/16	12/16	13/16	5½×6½×10/16	3¾	2¾	7½	6	4	3	4¾	28½	19	2500 and under 3000
3000 and under 3500	18	17½	19½	35	16/16	4×6½×11/16	3½×4½×10/16	15/16	12/16	13/16	5½×6½×10/16	3¾	2¾	8	6	4	3	5	30	20	3000 and under 3500

[illegible]—The scantlings given in the above Table are intended for Ships the length of which, measured from the fore part of the Stem to the after part of the Stern-post on the range of the Upper Deck, does not exceed seven times their moulded breadth or ten times their depth of Hold, taken from the upper part of Floors to the top of the Upper Deck Beams. *For Ships which exceed these proportions, the plan to be submitted for the Committee's consideration.* The depth for defining the proportions of spar decked vessels, is to be measured from the top of the floor plates to the upper side of the middle or tonnage deck beams.

RIVETS. Diameter of Rivets required for Thickness of Plates	5/8 of an Inch.			3/4 of an Inch.			7/8 of an Inch.			1 Inch.		
	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	13/16	14/16	15/16	16/16

Diameter of Nut and Screw Bolts for Fastening Flat of Deck.

3 ins. and under 3½ ins. - - ½ inch
3½ ,, ,, 4 ,, - - 9/16 ,,
4 inches - - - - - - ⅝ ,,

FRAME
Moment of inertia and sect Modulus

3.145
2.21

TABLE K.

Exhibiting the Sizes of Bolts, and Pintles of Rudder, in **Composite Ships.**

Tonnage.	Deadwood Keel *(b)* Stem *(a)* and Stern Post Bolts.	Bottom Plank, Scarphs of Keel, and Thwartship Garboard, Bolts.	Topside, Waterway, and Plank sheer Bolts.	Chain Plate Bolts.	Pintles of Rudder.	Tonnage.
50 and under 100	$\frac{7}{8}$	$\frac{10}{16}$	$\frac{9}{16}$	$\frac{13}{16}$	2	50 and under 100
100 and under 200	1	$\frac{10}{16}$	$\frac{9}{16}$	$\frac{7}{8}$	$2\frac{1}{4}$	100 and under 200
200 and under 300	$1\frac{1}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	1	$2\frac{1}{2}$	200 and under 300
300 and under 400	$1\frac{1}{16}$	$\frac{12}{16}$	$\frac{10}{16}$	$1\frac{1}{8}$	$2\frac{3}{4}$	300 and under 400
400 and under 500	$1\frac{1}{16}$	$\frac{13}{16}$	$\frac{11}{16}$	$1\frac{1}{8}$	3	400 and under 500
500 and under 600	$1\frac{1}{8}$	$\frac{13}{16}$	$\frac{11}{16}$	$1\frac{1}{8}$	$3\frac{1}{8}$	500 and under 600
600 and under 700	$1\frac{1}{8}$	$\frac{14}{16}$	$\frac{12}{16}$	$1\frac{1}{4}$	$3\frac{1}{4}$	600 and under 700
700 and under 800	$1\frac{1}{8}$	$\frac{14}{16}$	$\frac{12}{16}$	$1\frac{1}{4}$	$3\frac{1}{2}$	700 and under 800
800 and under 900	$1\frac{3}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$1\frac{1}{4}$	$3\frac{1}{2}$	800 and under 900
900 and under 1000	$1\frac{3}{16}$	$\frac{15}{16}$	$\frac{13}{16}$	$1\frac{3}{8}$	$3\frac{5}{8}$	900 and under 1000
1000 and under 1200	$1\frac{1}{4}$	1	$\frac{14}{16}$	$1\frac{3}{8}$	$3\frac{5}{8}$	1000 and under 1200
1200 and under 1500	$1\frac{5}{16}$	1	$\frac{14}{16}$	$1\frac{3}{8}$	$3\frac{3}{4}$	1200 and under 1500
1500 and under 2000	$1\frac{6}{16}$	$1\frac{1}{16}$	$\frac{15}{16}$	$1\frac{1}{2}$	$3\frac{7}{8}$	1500 and under 2000
2000 and under 2500	$1\frac{7}{16}$	$1\frac{2}{16}$	1	$1\frac{1}{2}$	4	2000 and under 2500
2500 and under 3000	$1\frac{8}{16}$	$1\frac{2}{16}$	1	$1\frac{5}{8}$	$4\frac{1}{8}$	2500 and under 3000
3000 and under 3500	$1\frac{8}{16}$	$1\frac{3}{16}$	$1\frac{1}{16}$	$1\frac{3}{4}$	$4\frac{1}{8}$	3000 and under 3500

Tons, ...under	150	150 and under 500	500 and under 1000	1000 and under 2000	2000 and under 3000
(a) Number of Bolts in Scarphs of Keels.	6	7	8	9	10

The length of the keel scarphs to be five times the mean of the siding and moulding of the keel.

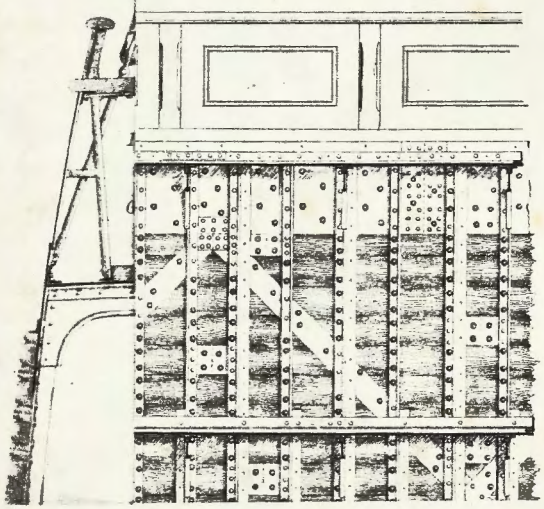
(a) Stem Scarphs are not to be less than seven-tenths the length of the Keel Scarphs, and all Scarphs are to be Tabled.

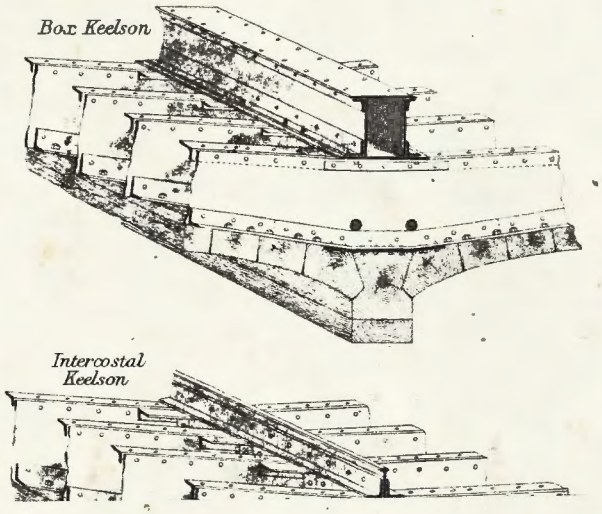
Bolts. 33.—The bolts to be not less than the sizes given in Table, the garboard strakes to be cross-bolted from side to side, with bolts not exceeding four feet six inches apart.

(b) The wood keel to have a vertical bolt through the keel plate between each frame. The stem, stern-post, deadwood, and remainder of the keel, to be through fastened in all cases, and the bolts spaced as in the keel. The screw pointed bolts for fastening the planking when less than five inches thick to be of such form under the heads, as will prevent them from turning, their heads to be once and three-quarters the diameter of the bolts, and two-fifths their diameter in thickness, the nuts in all cases to be of the same description of metal as the bolts they are applied to, and to be in thickness equal to their diameter, and not to have less substance than three-eighths the diameter of the bolts in any part, whatever the form may be, hexagon form being preferred. All outside planks ten inches broad and above, to be double fastened; eight inches-and-a-half and under ten inches, double and single fastened alternately; and under eight inches-and-a-half single fastened; and all butts to be double fastened. The bolt holes in the outside planking to be enlarged with a dowelling machine for the bolt heads, which in the bottom up to within one-fifth the depth of hold set down below the upper deck stringer plate are to be sunk within the surface of the planking one inch and a quarter, when dowels are intended to be used; from thence to the plank sheer they need not be sunk more than three-quarters of an inch; the bolts to be properly driven with oakum and white lead, putty, marine glue, or other suitable composition under their heads, and in the bottom they are to be carefully covered (after the seams of the bottoms are all caulked) with turned well seasoned wood dowels, the fibre of which must be in the same direction as the planking, and be driven with white lead, marine glue, or any other approved composition. Where copper or yellow metal bolts are used, the sinking of them within the surface of the planking to be optional to the above extent.

Lloyd's Register of Shipping, London, 24th February, 1870.

OF COMPOSITE SHIPS





The Shifts of the First and Second Foothooks are not less than ——

[*N.B.—When less than prescribed by the Rule, state how many.*]