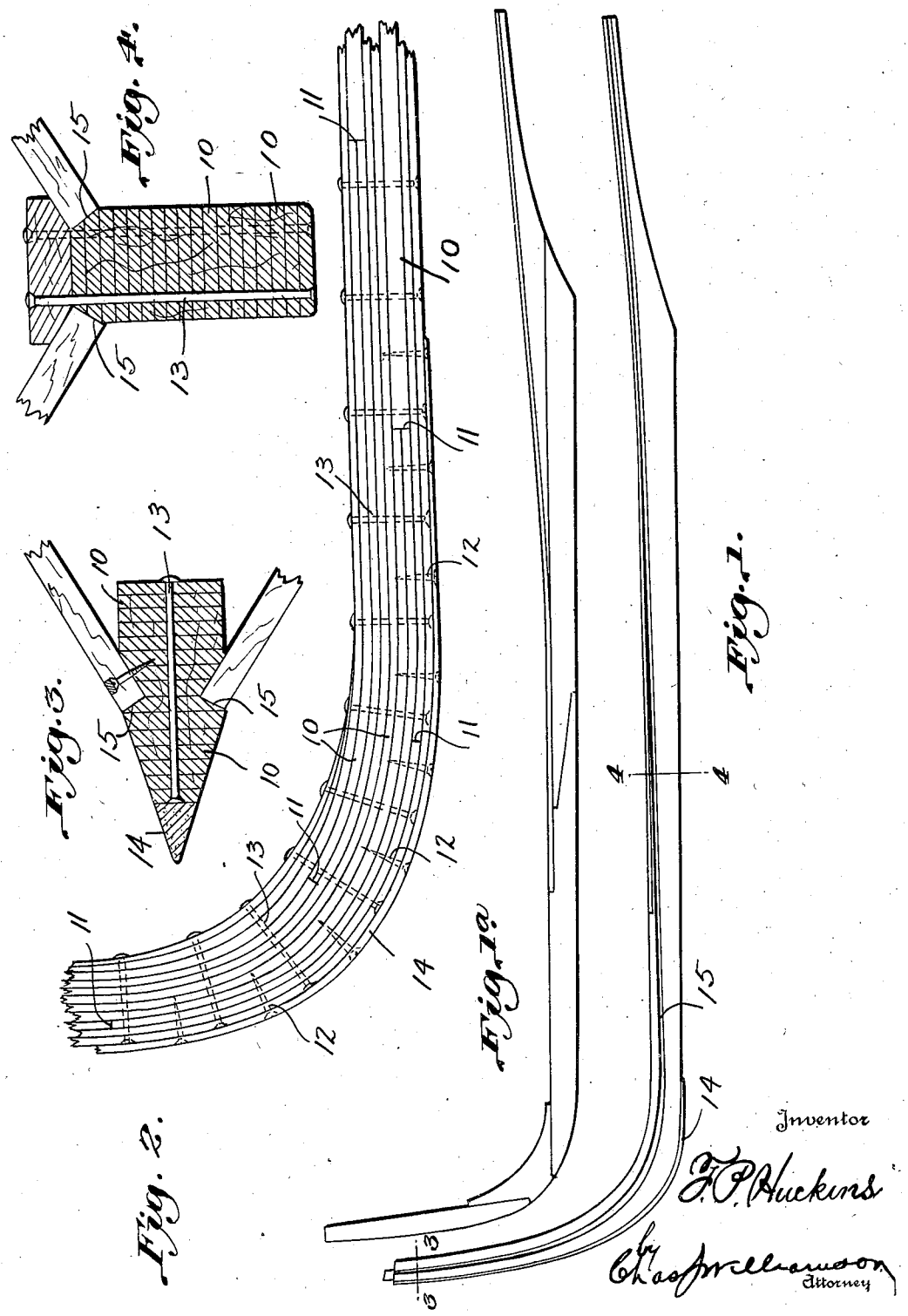
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METHOD OF MAKING KEELS FOR BOATS AND SHIPS

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METHOD OF MAKING KEELS FOR BOATS AND SHIPS

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1 Claim. (Cl. 114—140)

The ordinary practice and one which has long been followed in the construction of keels of boats, or water-craft, does not result in a keel of as much strength as is desirable; being built up from blocks or hunks of timber of considerable width and thickness, curing of these blocks by air-drying is a slow process, requiring several years and, of course, is a serious hindrance to construction and an item of expense, with the alternatives of using kiln-dried timber which seriously damages blocks of such thicknesses by cracking them, or using substantially green timber, which because of its shrinkage and warping weakens the hull structure by strains thereon and throws it and the propeller shafts out of line. Again the location of the joints at points that are unavoidable results in transverse lines or planes of weakness at critical points, such as the forefoot where the keel must withstand the shock of running aground or striking floating obstructions, and under the engines where the greatest tensile strength in the keel is needed. Bad joints, knees and cross-grain unavoidably come at the turn of the forefoot where the stem meets and joins the keel and because it is very difficult to obtain solid timbers over twenty feet long, there is a weak transverse scarf joint for all boats over forty feet long immediately under the longitudinal center of the boat where the motors are located. In making my invention, I have produced a keel free from the structural defects just set forth, and not only that, but one more than double the strength for the same weight and cross-section of the keel of the ordinary construction, with an elastic limit many times greater than that of the ordinary keel and an ability to withstand breaking strain several times as great; and besides these important advantages, a keel embodying my invention may be of smaller cross-section and less area exposed to the stream line of the water so that with the same power and hull, a substantial increase in speed of the boat is obtainable because of reduced friction and cavitation. Other advantages of a keel constructed in accordance with my invention will be evident to those skilled in the art and need not be expressly set forth.

My invention consists in whatever is described by or is included within the terms or scope of the appended claim.

In the drawing:

Fig. 1 is a side elevation of a finished keel embodying my invention;

Fig. 1a is a similar view of a keel of ordinary construction;

Fig. 2 is a detail view in side elevation on a larger scale of the forefoot;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1;

Fig. 4 is a vertical section on the line 4—4 of Fig. 1.

A feature of my invention of fundamental importance is the building up of a keel of laminations or strips of wood superimposed one upon another, these strips or laminations being of a thickness that permits transverse bending to follow the curves which occur in the keel as at the forefoot and these laminations being so relatively placed that where transverse vertical joints are unavoidable where the strips or laminations in the same layer come end to end, the joints in different layers will not occur in the same plane, but the construction will be a broken joint one so that there is no plane of vertical weakness of any greater extent than the thickness of the strip or lamination. The result is that the keel has very great tensile strength and is able to resist great shearing stresses in a transverse direction.

The keel shown consists of longitudinally extending laminations 10, laid one upon the other and the abutting ends, 11, of a lamination of one layer breaking joints with the abutting ends of the laminations of another layer, and preferably the laminations aft of the forefoot are thicker than those at the forefoot and the stem because aft of the forefoot the strips or laminations are straight or substantially straight and do not have to be thin enough for bending. Of course, at no point in the length of the keel does any cross grain occur but the grain of the wood is longitudinal.

Adjacent or contacting surfaces of laminations are glued with water-proof glue, but glue is not depended on to hold the laminations together but at properly close intervals rust-proof nails, 12 are driven from the bottom through a number of the layers, which nails may be of copper and rust-proof rivets, 13, which may be of bronze, are run through the laminations from top to bottom and riveted at top and bottom, holes, of course, being driven through the keel from top to bottom to receive such rivets. On the outer surface of the forefoot and stem, a cutwater, 14, of bronze is secured, as by those of the nails, 12, that are driven at points that they may be so used.

A planking rabbet 15, is cut in each side of the keel throughout the length thereof.

A very important advantage from the use of strips or laminations, which may be in lengths of from ten to forty feet and a thickness of not more than one inch, is that curing by air-drying

may be speedily done, curing not requiring more than three months; or by reason of their thinness kiln drying is feasible without damage, so that the keel may be built of thoroughly seasoned or cured material and without a period of long delay for curing.

Should there be any inherent weakness in a layer or lamination and any tendency to twist in that lamination, the same conditions, of course, will not exist in adjacent laminations and the latter will, therefore, offset and nullify any such inherent weakness and tendency, the result being that the keel once built retains its shape undistorted and is permanent in form.

In building a keel embodying my invention, the procedure may be as follows: A form is bolted to the floor having a form corresponding with the lower or outside edge of the keel to be made. The first or bottom layer is clamped to this form and its upper face covered with water-proof glue and then the second and succeeding layers are similarly applied and glued to one another until the keel is built up to a height somewhat greater than the height of the finished keel. The nailing proceeds as enough layers or laminations have been superimposed one on another convenient for nailing. Care is taken to place the butt ends of the laminations of different layers as far out of vertical alinement as is possible.

The keel roughly built up as described is clamped in a tight condition for a couple of days in order to give the glue opportunity to set. It is then dressed in a machine planer to its finished thickness.

Using the bottom edge as a guide, the contour of the finished keel is laid out by means of templates and the built-up keel is band-sawed to that contour. The stem part in the embodiment of my invention shown in the drawing is faired off with bevelled sides that converge at the front, as shown in Fig. 3. Next the grooves or rabbets, 15, for seating the edges of the planking are cut by a jig.

Holes are then drilled for the bronze rivets and the rivets driven and headed over; the bronze cutwater is next fastened to the stem by bronze drift bolts, and if desired a "rubbing shoe" of oak, not shown in the drawing, may be secured by screws to the keel bottom to take the wear of contact with the bottom in running aground.

The keel being painted is set on the keel blocks and the boat built around it.

The ordinary construction of the keel shown in Fig. 1*a* is illustrated for ready comparison with a keel embodying my invention, in demonstration of the matters in which my keel is superior as hereinbefore pointed out.

What I claim is:

A method of building boats or ships keels of three or more superimposed strips which comprises the acts of superimposing bendable thin lamina-forming strips of wood one upon another and extending longitudinally of the keel throughout the length thereof, bending the strips to correspond with the curved portions of the keel, and joining the strips in a unitary body as the building up proceeds thereby providing a keel in the rough and then finishing the keel to the desired contour and dimensions.

FRANK P. HUCKINS.