1. INTRODUCTION

Before commencing construction of your Wayfarer; it would be worthwhile to take a close look at the plans, and perhaps develop an appreciation for some of the finer points of her design and construction. At this stage we also recommend reading right through the Construction Manual to acquire an over-view of the whole construction process.

The Wayfarer was designed in the 50's as a collaborative venture between the prominent British racing dinghy designer, Ian Proctor, and Small Craft Ltd., a company devoted to building a range of wooden sailing dinghies, and supplying kits for home construction.

She was conceived as a replacement for some of the local wooden one-design boats existing around the coast of Britain at that time; many of which dated back to the 19th century, and were becoming obsolete and difficult to maintain. She is also one of a generation of one-design boats whose production had been made feasible by the availability of reliable high-grade marine plywood.

Most of these designs are still going strong; and have now spread far from their original home to become thriving classes, with sail numbers in the 1000's, in Europe, North America and Australasia. Many of them having in the process become translated into fibreglass construction to lower production costs; although racing experience has shown very little difference in performance between the two systems of construction. If anything, perhaps, the wooden hulls have the racing edge because the strength/stiffness to weight characteristics of wood are superior to plastics.

While most of the classes have tended to be relatively specialized; favouring racing over cruising, or vice versa; the Wayfarer is unique in that she performs outstandingly in both roles. Other characteristics which have brought her continuing success are integral to her design and construction.

Unlike most sailing dinghies, which require the addition of bulky inflated or foamed buoyancy; the Wayfarer utilizes the volumes contained by the Fore and Aft Bulkheads as buoyancy chambers. It is relatively simple, using catches and neoprene gaskets, to make completely water-tight access covers to these chambers, thus enabling them to perform a dual role as storage lockers.

The Fore and Aft Bulkheads give the hull great stiffness, which is supplemented by the Knees and Floors spaced at approximately one quarter intervals along the length of the cockpit. Floors and Knees are the transverse members; occurring respectively at the bottom and side of the frame. Their purpose is to maintain the longitudinal frame members, the Chines and Gunwhales, in correct relationship to the Hog and main Keel member running the length of the hull.

In another respect, that is her size, the Wayfarer seems an ideal boat. At 16' long, and with a 6' beam, she is large enough to accommodate up to six adults for day-sailing; or two persons and a large quantity of gear for extended cruises. She is also stable and seaworthy enough to under take open-sea crossings in most weather conditions; as the well-documented exploits of helmsmen like Frank Dye and Peter Clutterbuck testify.

She is also a very satisfying size to build; taking little more time than a boat several feet shorter; yet still quite manageable for the home constructor. At the end of it all; one has the sense of having built a 'real' boat.

Returning to the system of construction; it can be appreciated that this is a true system in which each part contributes to the integrity of the whole. The Chines, Gunwhales and central Hog; in combination with the transverse members, constitute the skeleton of the boat. Once these frame members have been appropriately planed; the planking panels can be fastened to them. This is done sequentially; starting with the wide bottom panels, which are lapped by the bilge panels, and are in turn lapped by the topside panels.

When the hull has been planked; the Keel is fitted to protect the edges of the bottom planks. Together with the two Bilge Keels, it provides an essential 'wearing surface'; strong enough to absorb shocks and abrasion from beaching and also able to support the boat more or less upright on a beach or dried-out mooring.

At this point in the construction process, the hull is separated from the Building Jig and turned right-side up. The hull shell has now achieved its final form; the edge-curvature and bends built into the planking will ensure that it retains this form. At this stage it might make a tolerable rowboat; but would not be able to withstand the stresses imposed on a sailboat.

What makes a boat sail, very basically, is the resultant of the forces exerted by the wind on the sails being resisted by the action of the Centreboard in the water. The force on the sails is transmitted to the hull by the Mast, which is braced by the Forestay and Shrouds; while the Centreboard Case enables the Centreboard to resist the lateral forces.

In even a moderate wind, these forces can be considerable; while in a gale they will be immense - so it is interesting to see how the Wayfarer hull is designed to cope with them.

The Centreboard Case is glued and screwed to the Hog continuously over a length of approximately 6'. Along its bottom edge, it is braced by four Floors; while on top it is braced laterally by the Thwart, which transmits forces to the planking; and in turn resists forces imposed on the planking from outside. At the forward end, the Centreboard Case is sandwiched between the two Kingposts.

As befits their name, the Kingposts perform a central role in the structural system of the hull. Acting as levers, they resist torque forces in the forward end of the Centreboard Case. They are braced at the top by the Foredeck Carlins in a lateral direction, and by the Foredeck Kingplank in a fore and aft direction. Note how these three members occur

directly under the Shrouds and Forestay respectively. They thus resist forces which would otherwise tend to 'fold' the hull inwards.

The Kingplank, Deck Beams and Carlins; supported at the centre by the Kingposts; also provide a frame for the decks, which act as diaphragms, and further stiffen the hull horizontally.

The downwards thrust and torque forces of the Mast are transmitted through the Mast Step Block which is mounted on top of the Centreboard Case. Hence these forces are distributed downwards along the Hog, and upwards via the Kingposts into the Kingplank and Carlins.

While this may seem like a complicated digression; it will help to demonstrate the purpose of some of the various components which make up the hull structure. It will also help to explain how a relatively light-weight boat with a lively racing performance is able to survive ocean storms loaded down with equipment and supplies; and may also explain why most of the original wood Wayfarers, many of them built in the 50's, are still sound structurally, and sailing regularly.

This Manual: Is a document in process of evolution. It incorporates the accumulated experience of several seasoned boat builders, and some not-so-experienced kit-assemblers. It is produced in the form of a binder so that it can be added to in the form of your notes, sketches or cuttings during the building process and beyond.

You may find that you disagree with some of the techniques described, or are able to suggest alternatives which may improve or simplify the process. We welcome any feed-back of this kind; and will consider all contributions for inclusion in future editions of the Manual.

2. SCHEDULE OF COMPONENTS, FASTENINGS AND FITTINGS

(i) Schedule of Components

Component		No. of
W 1	Stem	1
W 1a	Stem Doubler	2
W 2	Hog	1
W 3	Transom	1
W 3a	Transom Beam	1
W 3b	Transom Fashion-piece: Bilge	2
W 3c	Transom Fashion-piece: Bottom	2
W 3d	Transom Beam Doubler	1
W 4	Stern Knee	1
W 5	Forward Bulkhead	1
W 5a	Forward Bulkhead Beam	1
W 5b	Forward Bulkhead Side Framing	2
W 5c	Forward Bulkhead Bilge Framing	2
W 5d	Forward Bulkhead Bottom Framing	1
W 5e	Forward Bulkhead Hatch Framing - bottom	1
W 5f	Forward Bulkhead Hatch Framing - side	2
W 6	Aft Bulkhead	1
W 6a	Aft Bulkhead - Bottom Framing	2
W 6b	Aft Bulkhead - Bilge Framing	2
W 6c	Aft Bulkhead Knee	2
W 6d	Aft Bulkhead Beam	1
W 6e	Aft Bulkhead - Doubler	2
W 6f	Aft Bulkhead - Biscuit	2
W 7-5	Floor #5	1
W 7-7	Floor #7	2
W 7-9	Floor #9	2
W 7-11	Floor #11	1
W 7-13	Floor #13	1
W 8-7	Deck and Seat Knee	2
W 8-9	Deck Knee #9	2
W 8-11	Deck Knee #11	2
W 9	Gunwhale	2
W 10	Lower Chine	2
W 10a	Upper Chine	2
W 11	Bottom Planking - Forward	2
W 11a	Bottom Planking - aft	2
W 12	Bilge Planking Fwd.	2
W 12a	Bilge Planking Mid.	2
W 12b	Bilge Planking Aft	2
W 13	Topside Planking - Forward	2
W 13a	Topside Planking - Mid.	2
W 13b	Topside Planking Aft	2

W 14	Keel	1
W 15	Bilge Keel	2
W 16	Centreboard Case - Side	2
W 16a	Centreboard Case - Capping	1
W 16b	Centreboard Case - Bottom Ledger	2
W 16c	Centreboard Case - Top Ledger	2
W 16-1	Centreboard Case- Aft Bottom Filler	1
W 16-2	Centreboard Case - Aft Top Filler	1
W 16-3	Centreboard Case - Forward Mid Filler	1
W 16-4	Centreboard Case - Forward Bottom Filler	1
W 16-5	Centreboard Case - Forward Top Filler	1
W 17	Bow Chock	1
W 18	Floor Doubler #9	2
W 19	Floor Kingplank Chock	1
W 20	Floor Kingplank	1
W 21	Floorboard	4
W 21a	Floorboard Turnbutton and Block	16
W 22	Floorboard Cleat	1
W 23a	Floorboard Forward Stiffener	2
W 23b	Floorboard Mid Stiffener	4
W 23c	Floorboard Aft Stiffener	2
W 24	Toe-rail	1
W 25-2	Deck Beam #2	1
W 25-3	Deck Beam #3	1
W 25-4	Deck Beam #4	1
W 26	King Plank	1
W 27	Kingpost	2
W 27a	Kingpost Biscuit	2
W 27m	Kingpost Packing for Metal Mast	2
W 28	Foredeck Stiffner	2
W 29	Foredeck Carlin	2
W 30	Carlin Chock	2
W 31	Thwart Chock	2
W 32	Thwart	1
W 33	Stern Deck Beam Socket	2
W 34	Stern Deck Beam	1
W 35	Stern Deck Framing Long	4
W 36	Stern Deck Framing Short	1
W 37	Carlin	2
W 38	Oarlock and Jam cleat Chock	4
W 39	Side Bench Forward	4
W 40	Side Bench Aft	4
W 41	Side Bench Socket	2
W 42	Side Bench Cleat	6
W 43	Side Bench Support	2
W 44	Side Bench Support Socket	2
W 45	Boom Crutch Stop	2
W 46	Fore Deck	2
W 47	Side Deck Forward	2
W 47a	Side Deck Aft	2
W 48	Stern Deck	2

W 49	Sheerbead Outer	2
W 49a	Sheerbead Inner	2
W 50	Washboard	2
W 51	Mast Step Packing	1
W 52	Mast Stop	1
W 53	Forward Hatch Cover	1
W 54	Aft Hatch Cover	1
W 55	Forward Hatch Cover Framing Long	2
W 56	Forward Hatch Cover Framing Short	2
W 57	Aft Hatch Cover Framing Long	2
W 58	Aft Hatch Cover Framing Short	2
W 59	Aft Bulkhead Hatch - way Filler	1
W 62	Rudder Stock Cheek	2
W 62a	Rudder Stock Filler	1
W 63	Rudder Blade	1
W 64	Centreboard	1
W 65	Tiller	1

M 2	Building Mould #2	1
M 7	Building Mould #7	1
M 9	Building Mould #9	1
M 11	Building Mould #11	1

Brass Keel Band: 3/4" half-oval 12' long 2

Closed-cell Neoprene Gasket Material: 14' length

(ii) **Schedule of Fastenings**

Jig Bolts

1/4" x 2"	42
1/4" x 3"	13
washers	110

Steel Screws

For Jig and Temporary Fastenings

6 x 3/4"	125
8 x 1 1/2"	40
8 x 2"	30

Stainless Steel Screws

6 x 3/4"	300
8 x 3/4"	600
8 x 1"	40
8 x 1 1/4"	150
8 x 1 1/2"	300
8 x 2"	40
10 x 1 1/2"	30
10 x 2"	30
12 x 2 1/2"	30

(Includes screws incorporated in pre-assembled sub-assemblies)

Brass Pins

1/2 lb.

Epoxy Package

2 gals. Resin		Plastic Spreader	
2 qts. Hardener		7" Sponge Rollers	10
Mini-pump for Resin		Glue Brushes	10
Mini-pump for Hardener		Skin Protection Cream	
Cotton Micro-fibres	1 lb.	Surgical Gloves	
Micro-balloons	9 oz.		

(iii) **Schedule of Fittings supplied with Hull Kit**

1	Stem Head Fitting with screws
1	Rigging Screw
2	Shroud Plates, bolts, nuts and washers
2	Shroud Plate Flanges and screws
2	Shroud Adjusters
1	Transom Pintle and screws
1	Rudder Gudgeon and screws
1	Transom Fitting, bolts, nuts and washers
1	Rudder Pintle and screws
1	Rudder Pivot Bolt; 2 1/2" x 3/8" dia. (65 x 9 mm), washers and nut
1	Tiller Hood with internal sheave and screws
1	Tiller Retaining Pin
1	Jam Cleat for Rudder Down-haul
1	Mainsheet Track and screws
2	Track End Stops
1	Sheet Horse Slide
2	Sheet Horse Slide Stops
1	Main Sheet Single and Swivel Block
1	Main Sheet Sister and Swivel Block
2	Halyard Cleats
2	Sliding Genoa Fairleads and screws
2	Cam Cleats and screws
2	Cam Cleat Pads

2	Jib Fairleads and Screws
1	Rubber Centreboard Stop, bolt and nut
1	Centreboard Brake
1	Centreboard Pivot; 4" x 3/8" dia. (90 x 9 mm), washers and nut
1	Centreboard Locking Pin
8	Hatch Cover Striker Plates and Screws
8	Hatch Catches, screws and washers
6	Drain Sockets and screws
2	Side Bench Fixing Plates, bolts, wing-nuts, washers and screws
2	Side Bench Support Hinges
8	Screws and washers for Floorboard Turnbuttons

Supplied with Mast and Boom

Proctor Boom-vang lever, wire strops, shackles and mini-block
Standing Rigging, Main and Jib Halyards.

3. DESCRIPTION OF THE BUILDING JIG

The Wayfarer is a One-Design boat. This means that, unlike the Development Classes (eg. International 14), where individual designers are encouraged to develop hulls to their own design to achieve the maximum possible performance within certain basic rules; every Wayfarer is, as near as possible, identical. It is reassuring to know that your Wayfarer can never be outclassed in racing by later developments, and hence its value diminished.

To maintain this strict control over the dimensions of the hull; the Designer issues full-size plans on dimensionally-stable film to licensed builders from which templates are made. From these templates are prefabricated the various Bulkheads, Transom, Knees, Floors, etc.

The key to the correct assembly of these components into a Wayfarer hull is the Building Jig. This guarantees that the Bulkheads and Transom will be set up in exactly the correct horizontal and vertical relationship. In addition, it includes four Moulds, which do not remain in the complete hull; but correctly locate the Stem, Floors, Knees and Centreboard Case until the hull is planked and self-supporting.

In common with other One-Design classes, the Wayfarer International Class Rules accept that no two boats can be absolutely identical; and that genuine errors can occur during construction. Hence certain measurement tolerances are specified as acceptable.

A study of Measurement Form will show that these tolerances are reassuringly generous. In Overall Length, for example, the hull measures correctly if no shorter than 15' 8 1/2", or longer than 15' 10 1/2" - or in metric terms, 4788 - 4840 mm. Similarly, the Beam, measured to the outer edge of the deck excluding Sheerbead, and taken at a point 6' 9" (2057 mm) forward of the aft edge of the Transom, measures correctly if no less than 6' 0 1/2", or greater then 6' 1 1/2" (1842 - 1868 mm).

The Building Jig supplied with each kit has been fabricated to close tolerances and should result, if assembled correctly, in deviations from the median measurement at each station of less than 1/8" (3 mm). For this reason, alterations should not be made which in any way affect the dimensions of jig components. The only modifications which may prove necessary concern minor adjustments to bolt holes when precisely centering Bulkheads and Moulds - reference page 22.

The Jig consists of 2 parallel 2 1/2" x 5/8" (63 x 16 mm) plywood longitudinal runners which are fixed to the floor 2' 6" (762 mm) apart, and spaced by three (3) 2 1/2" x 5/8" x 2' 11" (63 x 16 x 889 mm) transverse members; one at each end, and one at approximately the mid-point. Once this base has been accurately levelled; the upper surface is considered to be the Datum from which all vertical dimensions are measured.

On this surface are placed the horizontal spacers (A, B, etc.), which locate the legs (3, 6, 11, etc.), and hence the Transom, Bulkheads, Mould and Stem in the correct relationship. The legs are braced vertically by 12 plywood gussets, and 2 diagonal braces.

Note: For Copyright reasons; the jig may be used to assemble only the kit it accompanies, unless special authorization is obtained from the kit manufacturer to re-use it. The purchase price of the kit includes a deposit which will be refunded if the jig is returned in good condition. However, if this is impractical because of distance and shipping costs, the purchaser is invited, on completion of the hull, to destroy the jig and recycle the materials.

4. ASSEMBLING THE BUILDING JIG BASE

Refer to Figure 1.

Establish location of the centre-line on the floor; remembering that at maximum beam the hull is approximately 6' 3" (1905 mm) wide including the Sheerbeads; and a minimum working space between the hull and an adjacent wall of approximately 1' 2" (350 mm) will be needed to fasten the planking and Sheerbead. It is best, therefore, to allow approximately 4' 6" (1350 mm) between the centre-line and the wall.

A similar decision must be made with regard to the datum line for all horizontal dimensions; which coincides with the aft face of the Transom; and here a minimum working space of 2' 0" (600 mm) should be allowed - more at the bow if possible.

Using a Framing Square and a 4' metal rule; accurately draw the centre-line on the floor, and the datum line at right-angles to it. Draw parallel lines 1' 3" (381 mm) either side of the centre-line.

Lay one of the 2' 11" (889 mm) long transverse members on the floor so that it overlaps the datum line aft by 3/4" (19 mm) as a support for the Transom legs. Butt the two longer side members up to the aft transverse member, and lay them against the parallel guide lines.

Place the second transverse member; followed by the two shorter side members, and complete the base with a third transverse member at the forward end.

Before finally fixing down to the floor; check accuracy of setting-out and also level. If your floor is 100% level already, you are fortunate indeed. If not, the jig base must be levelled using shims of plywood, hardboard, arborite - whatever comes to hand. If your floor is very uneven; the process of levelling can be simplified by first fixing down two (2) 2 x 4's, or heavier if desired, as a firm base for the plywood

runners.

Having established that the base is level; screw firmly to the floor (on a concrete floor use plastic inserts) so that there is no possibility of the jig lifting at any point. This is particularly important in the case of the forward transverse member.

Fasten the spacers A, B, C, etc., to the base. There should be a 3/4" (19 mm) slot between each spacer into which the legs will fit. Lay one of the 3/4" x 2 1/2" (19 x 63 mm) mould transverse rails (eg. M 7-1) across the jig on edge at each station, and butt the spacers tight against it. Fasten the fourth transverse member at the forward end of the jig, tight against the spacers G; and note that it may not necessarily occur precisely over the corresponding base member. Fasten the forward slotted transverse member, with the stem retaining blocks, directly over the fourth transverse member.

Referring to Figure 1; verify the running dimensions from the aft datum line. Note how the dimensions relate to each Bulkhead and Floor; eg. Aft face of the Transom; Forward face of the Aft Bulkhead; Forward face of Floors and Knees 7, 9, 11; Aft face of the Forward Bulkhead. The Building Mould No. 2 (M 2) is located forward of its supporting legs, so that its forward face will correctly locate the Stem 13' 10 1/4" (4223 mm) from the datum.

Slight deviations from the figured dimensions are inevitable; and are permissible within certain tolerances (refer to Section 1. Introduction). Therefore, the lengths of spacers should not be altered.

5. PREPARATION OF THE FRAME COMPONENTS AND WORKING WITH EPOXY RESIN

Before the frame members are assembled on the Building Jig, some preparatory work is necessary.

One frequent subject of disagreement among boat builders concerns the extent to which components should be prefinished before assembly. Many builders prefer to get working on the assembly as soon as possible, and delay any finishing until at least the planking is complete. The attraction of this approach is that a tangible result is speedily achieved, and one has the illusion of making great progress. The penalty is that it is much more difficult to satisfactorily finish and apply epoxy resin to all the nooks and crannies of a complete hull.

The method we prefer and recommend, is to thoroughly sand, pre-coat and sand again ready for final finishing, all components before they are pre-assembled and bolted to the jig. This operation is made much easier if you can set up a large table; a 4' x 8' sheet of 3/4" plywood on saw-horses is ideal. Staple down waxed paper, which can be bought in rolls, to prevent components bonding to the table.

The function of the epoxy resin is to thoroughly seal the wood against the penetration of moisture, including moisture vapour which can penetrate ordinary varnishes. To ensure the penetration of the resin, as well as improving the finish, the wood should be well sanded first. This particularly applies to plywood which, as a result of the combined heat and pressure applied during the manufacturing process, becomes "case hardened"; in other words the surface pores are closed. Sanding the surface re-opens the pores, and facilitates the penetration of the resin.

A minimum of two coats are necessary to achieve the vapour-seal; however, three coats are preferable; particularly in areas such as the inside of the centreboard case which are likely to be submerged for prolonged periods of time.

The resin is applied using the disposable sponge rollers provided.

For information regarding the use of epoxy, refer to the manufacturer's manual. Be aware that large areas such as the insides of both buoyancy compartments will not be exposed and may require less sanding.

If this technique is new to you, we suggest you get the feel of it by working on an area that doesn't show; eg. forward side of Forward Bulkhead, underside of Fore Deck.

If you are working with the resin in winter in a cold area, it will be necessary to keep the resin in a warm place; eg. next to the furnace or a light-bulb to lower its viscosity. If the temperature of the resin drops too low, it will become too viscous to roll on or penetrate satisfactorily. Similarly, the curing time is directly affected by ambient temperature, and an optimum temperature of around $60^{o}F$ ($15^{o}C$) should be maintained. A small electric shop heater can be invaluable in assisting the curing process. Conversely; in hot areas, or in summer, it will be found that curing is very rapid, and hence lengthy glueing-up operations like fastening the planking are best performed at the coolest time of day or at night.

The plastic mini-pumps provided with the cans of resin and hardener ensure that the two components come together in the correct proportions. We recommend a squirt of each in turn. The proportion should not be varied; increasing the proportion of hardener does not speed the curing process, and will have a detrimental effect on the strength properties of the resin.

It is best to mix the resin and hardener in waxed paper cups; three squirts of each being the practical maximum. It should be stirred well, and immediately poured out into a paint roller tray. The reason for this is that curing takes the form of a heat-producing chemical reaction. If the heat is concentrated, for example, in a cup; the reaction is sudden and intense. One the other hand, by spreading the resin and maximizing

its surface area, the heat is dissipated and the curing reaction slowed.

Roll the resin onto the wood evenly using long strokes. Do not over-roll, as this will increase unevenness. As soon as the surface has been coated, rapidly brush out any air-bubbles using a small disposable glue-brush. Failure to do this before the resin cures will result in a rough, hard to sand surface. When, in your judgement, sufficient time has elapsed; roll on a second coat; and, if desired, a third. Brush out air-bubbles from each succeeding coat.

As epoxy resin cures, it emits fumes which have been described as smelling like a damp dog in need of a bath. These fumes are to a certain extent toxic, and could be detrimental to health if concentrated in a small unventilated area.

For similar reasons, it is important to protect the skin from any prolonged contact with the mixed resin, which can cause irritation similar to the reaction caused by poison ivy. To minimize this, rub the protective cream into all skin areas likely to come into contact with the resin, and wear plastic gloves.

The degree of toxicity varies between different epoxy formulations; similarly the reaction produced varies between individuals; and at this time the full effects are not public knowledge. Because of this uncertainty, it is advisable to develop the habit of wearing a respirator specifically designed to filter these fumes during prolonged periods of work with the resin.

Dust produced by sanding can perhaps be even more harmful to the system; a dust-filtering respirator or face-mask should therefore be worn, especially when using an electric sander or jig-saw.

When both sides have cured, they should be thoroughly sanded to a satin texture in preparation for glueing and eventual varnishing. Light use of a small Surform plane on lumpy resin will make sanding a great deal

easier.

Epoxy Resin used as a Glue and Filler

The basic epoxy resin is too thin to use as a glue or filler. However, it can be converted into a gap-filling glue of controlled consistency by the simple addition of a variable proportion of the cotton micro-fibres; or into an easily sanded filler by the addition of the red micro-balloons. There are no rules to mixing up the glue or filler; and one learns by experience the proportion of micro-fibres or balloons which will give the desired working properties in a given condition. Thorough mixing is, however, vital.

It is a good idea to keep separate roller-trays for use with the resin and glue/filler; as the latter will form an indestructible lumpy coating, making the tray quite useless as a roller-tray.

A general note about glueing: Glue must be spread evenly on both surfaces to be joined, using a plastic spreader. All joints are also screwed or clamped during the curing process; the purpose being to distribute glue over the whole area of the joint, and to squeeze out any excess. Avoid excessive clamping or screwing pressure, as this causes glue starvation and could lead to failure of the joint. The ideal dimension of an epoxy-glued joint is considerably thicker than that used with other types of glue. Experience will indicate just how much glue is necessary for a given joint, and thus minimize wasteage. It is important that any excess glue is scraped as cleanly as possible off the wood; since once cured it is difficult to sand off satisfactorily, and will show through varnish or paint.

Crystallization of the Resin

This may occur as a result of exposure to extreme temperature changes; eg. during transit in winter. The resin may solidify and become impossible to pour or pump. To rectify the problem; raise the temperature of the resin

to around 110°F (45°C) by immersing the can in a bucket of hot water, meanwhile stirring the resin vigorously. Crystallization of the clarified resin can be prevented by keeping it at a fairly constant room temperature - and perhaps agitating it occasionally.

6. THE SUB-ASSEMBLIES

Transom, Aft and Forward Bulkheads and Centreboard Case are trial-assembled before leaving our shop. They should be dis-assembled, and each component pre-coated with resin as discussed in Section 5.

(i) Transom (W 3)

Refer to Figure 2. Screw the Fashion Pieces (W 3a,b,c) to the Transom; having first coated them evenly with glue - mixed as previously described. This also applies where the Fashion Pieces butt-join to each other. Tighten the screws just sufficiently to squeeze the glue out evenly all round. (Screws: eighteen (18) 8 x 3/4"). Do not, at this stage, finish or fit the Transom Beam Doubler (W 3d). This is fitted later, during the decking process.

(ii) Aft Bulkhead (W 6)

Refer to Figure 3. Assemble in a similar manner to the Transom; except that in this case the screws are driven from the forward side into the framing components. (Screws: thirty-six (36) 8 x 3/4") Do not, at this stage, finish or fit the Aft Bulkhead Beam (W 6d), or the two Aft Bulkhead Biscuits (W 6f). Like the Transom Beam Doubler, these are fitted as part of the decking process.

(iii) Forward Bulkhead (W 5)

Refer to Figure 4. Assemble in a similar manner to the Aft Bulkhead. Before glueing-up; trim and sand the hatch framing halving-joints. (Screws: thirty-two (32) 8 x 3/4").

(iv) **Centreboard Case (W 16)**

Refer to Figure 5. The sides and ledgers must be pre-assembled, screw-holes filled and inside faces well coated with resin before assembling the complete case. (Screws: thirty-two (32) 8 x 3/4"). Care should be taken that the sides are kept flat during the curing process. The filler pieces (W 16-1,2,3,4,5) are then glued and screwed to one side from the outside. (Screws: twenty-eight (28) 8 x 1 1/2"). Apply plenty of glue between the filler pieces, and complete by fastening the other side of the case. Remove any excess glue from the inside. Do not, at this stage, fit the Capping (W 16a).

7. SETTING UP THE FRAME

(i) Transom, Bulkheads, Moulds

These are bolted; or screwed in the case of the Transom, to the appropriate legs (Transom W 3 - legs 3; Aft Bulkhead W 6 - legs 6; etc.). Refer to relevant diagrams for attachment details of each Mould and Bulkhead to the Jig. In each case the bolt holes have been pre-drilled.

The Transom legs (3) are marked with the correct height: 1' 10 1/8" (562 mm) on the Transom above datum. Also, the aft face of the Transom is marked with a centre-line and parallel lines 2' 6" (762 mm) apart. The legs are therefore clamped to the Transom using these marks as a guide. Drill screw holes in the Transom legs, taking care not to drill right through the Transom; and screw on the legs. Set up the Transom on the Jig; and brace the legs vertically with the plywood gussets provided. (Screws: four (4) 8 x 1 1/2" st.).

Continue with the Aft Bulkhead W 6; which is bolted to the legs (6) with 2" bolts; brace as for the Transom. Refer to Figures 6, 7, 8 for method of setting up Moulds M 7, 9, 11 with their respective legs and upper and lower rails.

Bolt the Forward Bulkheads to legs (5) with 2" bolts; brace, and follow with Mould M 2; the purpose of which is to locate the Stem, and to impart the correct curvature to the bow of the boat. Because this Mould must withstand considerable thrust when the Stem and Hog assembly are bent into place; it has to be firmly braced; and two diagonal braces are provided for this purpose. Before finally fastening them, verify that the Mould is vertical.

Before mounting the Centreboard Case on the Jig; the alignment of each frame must be vertical relative to the centre-line. To check this; hold the 4' metal rule against the centre-line marked on each Bulkhead and

Mould, and check that it aligns vertically with the centre-line on the floor. Refer to Figure 9. Some slight adjustment may be necessary; and if so, this is simply done by substituting clamps for the upper pair of bolts. Loosen the clamps and correct alignment; then re-drill the bolt holes with the clamp retightened. Drill from the Bulkhead or Mould side, so that the bolt holes in these components are not enlarged. At the same time; re-check the height of each Bulkhead and Mould relative to the datum; and also that it is horizontal.

It is good practice at this stage also to check the frame for fairness. To do this, a long flexible lath or batten is tacked to each of the notches cut for the Chines and Gunwhales. By sighting along the batten, it is possible to judge whether minor adjustments to the positions of frame members would improve fairness of the lines.

Insert the Centreboard Case into the slots in Moulds M 7 and 8. The half-Floors W 7-7, 7-9 and Floor W 7-11 may then be bolted to their corresponding Moulds. The half-Floors house into the sockets in the Centreboard Case Ledgers. Bolt holes to locate the Floors and Knees on the Moulds have been pre-drilled and, as a double check, corresponding saw-cerfs have also been cut.

Referring to Figure 10, clamp each component to the Mould so that the saw-cerfs align. It may be necessary to drill out the bolt holes; and, as with the Bulkheads, this is done from the Floor or Knee side, so that the bolt holes which will eventually be plugged are not enlarged.

Do not, at this stage, glue the Floors to the Centreboard Case. This is done after the Hog has been satisfactorily test-fitted.

(ii) **Hog, Stem and Centreboard Case (W 2, W 1, W 16)**

Begin this operation by glueing and screwing the 2 Stem Doublers (W 1a) to the foot of the Stem (Screws: six (6) 8 x 1 1/2"). While the glue is curing the underside of the Hog at the tapered forefoot section should be

planed to the tapering bevels within the marked lines. Sand and round-off the upper side of the Hog and apply 2 coats of resin.

The notches in the Bulkheads and Transom; and undersides of Floors to which the Hog is fastened must be bevelled to correct angles. These angles are determined by once again tacking the flexible lath from Stem to Transom. Using the adjustable bevel gauge, angles are read off at each station, and transferred to a scrap of cardboard or plywood for future reference. Remove the lath and, using a sharp chisel, gently pare off just sufficient material until the correct bevel angle is achieved.

Each transverse frame member has one face which should be kept intact in conformity with the Designer's full-size drawing. Bevelling of notches and edges should generally therefore be done away from Maximum Beam. The Forward Bulkhead and M 7 frame members are bevelled in a forward direction; M 9, 11 and the Aft Bulkhead in an aft direction. In the case of the Transom, the forward plywood face remains intact.

When the Stem and Hog have cured; clamp them securely together using 2 clamps, and place on the Jig to verify alignment and overall length. With the Forefoot settled into the socket fixed to the face of Mould 2; refer to Figure 1 and the Measurement Form. The measurement is taken from the aft face of the Transom (datum) to a line dropped vertically from the forward face of the Stem at the intersection of the upper Gunwhale marking. Ideally, the dimension will be 15' 9 1/2" (4813 mm); mid-way between the minimum and maximum permitted by the Class Rules.

Drill a 1/4" (6 mm) dia. hole through the Stem and 2 down blocks on the Jig for the retaining bolt.

To complete the Forefoot assembly, it is necessary to impart a substantial bend to the forward end of the Hog. At first this may appear a daunting task; especially when the thickness of the Hog is considered. However, there are two alternative methods for achieving this bend; both of which require a little patience, but neither are particularly difficult. It is

essential, however, to have the use of a minimum of three (3) 4" C-clamps- even better to have five (5).

The most elegant method involves saturating the area to be bent with boiling water over a period of an hour or so. It is then clamped into position; the clamps gradually tightened until the full bend is achieved. It must then be left clamped in place for two days to dry out before the clamps can be released prior to glueing.

The second method is quicker, though less elegant, and therefore is considered heretical by most experienced boat builders. However, this method will probably be more convenient for the average home-builder. It involves cutting a series of shallow saw-cerfs on the outside of the bend. Normally this would be done on the inside to avoid splitting the outer fibres, and this is how it is later done with the Keel. However, the inside of the Hog remains visible in the completed hull; and for this reason we prefer to cerf it on the outside. Any weakening that results to the outer surface can be rectified taking advantage of the gap-filling properties of the epoxy glue.

The complete forefoot is a lamination of Stem, Hog, Planking and Keel; and is extremely strong.

Clamp the Stem assembly in the vice; prop the aft end of the Hog so that the first 2 screws can be driven home, inclined inwards and forwards at approximately 15° to the vertical. Cut a series of parallel saw-cerfs approximately 1/4" (6 mm) apart and 1/4" (6 mm) deep.

For the test-assembly; clamp the extreme forward end of the Hog to relieve the screws of any stress. Lower the aft end of the Hog, and apply asecond pair of clamps. Drill and countersink two more screw holes, similarly inclined to the first two. Screw down; repeat the clamping process and drill the third pair of screw holes. If the Hog refuses to pull into place; slightly increase the depths of all the saw-cerfs equally. If a screw head should pull through under stress; the wood can

be repaired with epoxy-filler and re-drilled.

When you are satisfied that the Hog has been coaxed as closely as possible to the final designed curve; remove the screws, release the clamps and prepare to glue up the joint.

Mix up enough glue of a fairly stiff consistency to thoroughly coat both surfaces. Refer to Figures 11 and 12. Drive the first pair of screws until glue squeezes evenly around the forward end. Apply the clamps to take the stress off the screws. As before, lower the aft end of the Hog, and apply an additional clamp or clamps aft of the second screw holes and tighten until the glue squeezes out. Screw down, and clamp once again as close as possible to the third pair of screw holes and screw down. As this joint is probably the most highly stressed in the whole boat, it should be left clamped in place until certain that the glue is thoroughly cured. (Screws: seven (7) 10 x 2").

When cured; fit the assembly onto the Jig; secure forward with the retaining bolt, and weight the aft end of the Hog down onto the Transom (a couple of concrete blocks will be useful here).

Tap the Bulkheads, Moulds, and Transom into a true vertical position; then drill and temporarily screw down Hog. Accurately mark the aft end where it is to be housed into the previously bevelled notch in the Transom; angle the cut to allow for bending, and saw off the excess length.

The Hog requires substantial planing before it can receive the planking; refer to Figure 13, so once again the screw holes must be well countersunk. By removing screws a frame at a time, the approximate final bevel can be planed at each station.

With the Hog roughly planed, and temporarily fastened at each frame; the Centreboard Case should be offered up to it. Place scraps of wood through the slot in the Hog to locate the Centreboard Case and to prevent it from becoming 'pinched' when being screwed in place.

Drill and screw (Screw: one (1) 10 x 2") through Floor No. 11 into the aft end of the Centreboard Case. Follow this by drilling and screwing in pairs at 6" (150 mm) centres, working forward from Floor No. 11. Do not work from both ends towards the middle, as this will produce a bulge in the middle. (Screws: twenty-five (25) 12 x 2 1/2"). Check that the Centreboard Case is a tight fit along its entire length. If any adjustments are necessary, they should be accurately gauged and planed when the Hog has been once more removed from the Jig.

Having completed this test assembly to your satisfaction, the outlines of all Bulkheads, Floors, Transom and Centreboard Case should be pencilled onto the Hog; and it should be removed from the Jig with the screws left in ready for final fastening.

Protect the Moulds with pieces of waxed paper to prevent them from bonding to the frame. Apply a generous quantity of fairly stiff glue to all surfaces, and screw down the Hog. Glue should be squeezed out evenly along the length of the Centreboard Case, as this is a vulnerable joint. Clean off excess glue. (Screws: twelve (12) 10 x 1 1/2").

The Stern Knee reinforces the Transom/Hog connection. It should be a close fit against both components on the centre-line, and may require some adjustment. Screw-fix into it from the underside of the Hog, and screw through it into the Transom. (Screws: three (3) 10 x 2").

(iii) **Gunwhales and Chines (W 9, W 10)**

Plane, sand and epoxy-coat the inner, upper and lower faces. The thicker pair 7/8" (22 mm) are the Lower Chines; ie. the uppermost on the Jig. Before fitting the Chines and Gunwhales; the appropriate notches in the Bulkheads, Transom, Knees and Floors must be bevelled. Follow an identical procedure to that used on the Hog.

These slender longitudinal members should preferably not be drilled or screwed, except at the Stem and the Transom. The process of fastening

them to the frames, therefore, involves a fair amount of ingenuity with clamps, props, cord and wedges. Refer to Figure 14 for an example of how this can be done using scraps of wood and clamps to prop and twist, and lengths of cord tied around the Hog, tensioned by twisting, to draw the Chine or Gunwhale into the notches while the glue is curing.

To bend the Chines and Gunwhales forward of the Forward Bulkhead and aft of the Aft Bulkhead, it will be necessary to ease them into place gradually; at the same time twisting them. The most satisfactory way to do this so that they bed correctly into the notches, is to clamp on levers - 18" scraps of 1" x 2", for example, and pull them inwards by cords looped around the legs of the Jig. Refer to detail; General Arrangement drawing.

To cut the forward end of the Chines and Gunwhales to the correct length and angle; clamp to the Stem in the marked location. Using a straight-edge, project a line out from a position approximately 1/8" (3 mm) aft of the bevel, and at right angles to the Chine or Gunwhale. Refer to Figure 15. Draw a line on the outside face parallel to the rake of the Stem, and a line on the top face converging with the face of the Stem. Carefully saw along these lines - a hack-saw may be found useful here because it will not bind under the pressure of the clamp. Clamp the cut face to the Stem, and check that it is a close fit. If not, the piece may be moved forward a few inches and the process repeated until a correct angle of cut has been achieved. For this reason, any excess length should initially be left aft of the Transom. Drill screw holes at a converging angle with the face of the Stem, and countersink well. Note that the location 1/8" (3 mm) back from the bevel allows for final planing and fairing of the Stem.

Trim the aft end to fit the notch in the Transom. Before fastening the Gunwhales to the Transom, verify that it is at right-angles to the centre-line, and check that the two Gunwhales are exactly the same length.

When a satisfactory fit has been achieved in each case; the outlines of the notches and areas to be glued should be pencilled on. Remove Chines

and Gunwhales and prepare for glueing. Glue up using glue mixed to a fairly stiff consistency; thoroughly coating both surfaces at each joint. Adjust the various props, levers and lashings so that some of the glue squeezes out; over-tightening, however, can result in insufficient glue in the joint.

The Gunwhales are glued first, and here the fairness of curvature is most important. It may happen that pulling the Gunwhale equally hard into every notch results in a slightly uneven curve. Therefore, sight along each Gunwhale, and adjust at each joint until a good compromise is achieved between closeness of fit and fairness of line. The gap-filling properties of the epoxy/micro-fibre mix will prove helpful here.

After fastening the Gunwhales; fasten the Upper Chines followed by the Lower Chines. The latter require considerable bending and twisting fore and aft; but this is not difficult if done gradually; working outwards from midships using the various lashings and clamps. Generally, breakages only occur when the members are abruptly bent from the ends.

Refer to Figure 16 for correct location of Lower Chine relative to Floors 9 and 11. After fastening in place, clean off all glue runs. (Screws: six (6) 8 x 2" at Stem, six (6) 8 x 1 1/2" at Transom).

8. PREPARATION FOR PLANKING

(i) Scarfing the Panels

Scarf joints 2 1/4" (57 mm) wide have been saw-cut. However, to minimize possible shipping damage, they have not been planed to the required feather-edge. To achieve this, the two halves of each joint must be clamped one on the top of the other and flush with the end of the bench. Check, using the edge of the plane, that the slope is aligned over both panels; then plane until perfectly flat and tapering from the pencil line to a feather-edge on both panels. Verify flatness in both directions with the edge of the plane. It will be appreciated that if the planed slope is not flat and continuous over both panels, the resulting scarfed-up plank will not lie flat.

C A U T I O N

LAY THE PANELS ON A FLAT FLOOR AND ALIGN USING THE PENCIL LINES MARKED AT RIGHT-ANGLES TO EACH SCARF. THESE LINES ARE NOT LIKELY TO BE CONTINUOUS; HOWEVER, THEY MUST BE PARALLEL FOR THE COMPLETE PLANK TO BE THE CORRECT SHAPE. AS A DOUBLE CHECK THAT PLANKS ARE CORRECTLY ASSEMBLED PRIOR TO GLUEING, WE RECOMMEND MAKING CARD OR PAPER TEMPLATES FROM THE FRAME. THIS IS PARTICULARLY CRITICAL IN THE CASE OF THE BILGE AND TOPSIDE PLANKS.

Place a strip of waxed paper under each joint. Coat both faces with a fairly thin glue mix. Bring the panels into contact, and when satisfied that they align and are perfectly level, using the straight-edge; tack in place with a central staple to prevent the joint for sliding apart. Place a strip of waxed paper over each joint; followed by a 3/4" (19 mm) wide strip of card located just behind the edge of each joint. Working from the centre, shoot a row of 3/8" (9 mm) staples through the card strip so that the glue is evenly squeezed out of the joint.

Leave undisturbed until satisfied that the glue is completely cured, at which time the card strips will facilitate withdrawal of the staples.

The process of planking the bottom of the boat can be assisted at this stage by moistening the forward three or four feet of the bottom planks. This can be done by spreading newspapers over the planks and sprinkling them with water. Leave for several hours, or overnight.

Once the waxed-paper and staples have been removed from the scarf-joints, it will be necessary to clean off the excess glue (the small Surform plane is useful for this); then plane across the joints because inevitably the glue will have lifted the feather edge. Finally clean-up and sand the whole panel.

(ii) **Fairing-in**

This operation involves planing the correct bevel to all the surfaces of the frame to which the planking will be fastened. Refer to Figure 13 for a typical section at the finished Chine.

Commence by planing flat bevels on the Hog and Chines at each intersection with a transverse frame-member. Maintain symmetry by performing operations in pairs - working on opposite sides of the boat in turn. Figure 17 illustrates the process begun at the point where the Lower Chine intersects with the Aft Bulkhead. Use a straight-edge to determine when the faces have been planed level with the transverse members. Forward of the Forward Bulkhead and Aft of the Aft Bulkhead, where the bottom panels are given a convex curvature; use the straight-edge flat, or a scrap of hardboard, to achieve the correct bevels. Refer to Figure 18.

The flat bevelled areas are connected by planing the intermediate areas. To achieve fair lines it is necessary to lower your eye-level and sight along each Chine and Gunwhale. Plane off any 'bumps' or flat-spots which would otherwise show through the planking.

It will be obvious that the typical angled chine joint; as illustrated in Figure 13 cannot continue as far as the Stem; and at the Stem the three planks come together to form a continuous butt-jointed flat plane. The

'change over joint' is the transition from lap to butt-joint. Refer to Figure 19. It occurs on the Lower Chine at a point 18" (450 mm) forward of the Forward Bulkhead; and on the Upper Chine at a point 13" (330 mm) aft of the Forward Bulkhead. It is useful to pencil-mark the locations of these joints on the outer, upper and lower faces of the Chines.

The edges of the Bulkheads, Transom, Floors and Knees must also be bevelled to give a complete area of contact with the planking. Note, once again, that this must be done away from the dimensioned faces; so that the profile of each member at the dimensioned face is not altered in any way. In the case of the Transom, this means that the forward face of the Transom remains intact; and all bevelling takes place toward the aft face.

It is also essential to preserve the curvature at the bottom of the Forward Bulkhead and the Transom. To avoid any danger of planing them flat, try bevelling with the small Surform.

When the transverse members have been correctly bevelled; it is necessary to complete bevelling the Hog, Chines, Gunwhales and Stem. Using a piece of hardboard or thin plywood; check that the planking will make good contact over all areas of the frame. This is particularly important at the Stem, Forward Bulkhead, Aft Bulkhead and Transom.

It will be helpful at this point to mark the outline of the Keel onto the Hog. Class rules specify that the Keel must be a minimum of 2 7/8" (73 mm) wide for a length of 13' 0" (3962 mm) forward of the Transom. Forward of this point it is faired into the Stem at the Forefoot. The planking will therefore terminate in a 3/4" (19 mm) wide flat from deck level right around the Stem to the Forefoot; at which point it 'steps back' to accommodate the end of the Keel. Refer to Figure 24.

The frame will now be ready to receive the planking. Refer to Figures 20 and 21. Perhaps now is the time to scarf up the Bilge Panels so that they may be fastened immediately following the Bottom Panels.

9. PLANKING UP

(i) Bottom Panels (W 11)

If the forward end of the Bottom Planks have been kept moist during the preceding process; it will not be difficult to bend them to the required curvature in the Forefoot area.

Clamp the panel in position so that it projects beyond the Stem and Transom. Refer to Figure 22 and clamp on a lever made from a scrap of plywood. Gradually depress the lever with your knee until the plank lies tight against the face of the Stem, then lash it to the frame. Make sure that the panel extends over the centre-lines of the Hog and the Lower Chine.

Now the centre-line must be gauged onto the Bottom Plank. Refer to Figure 23 for an illustration of a simply made gadget for doing this job. Two pieces of, say, 5/8" (16 mm) plywood are bolted together using bolts and wing-nuts - you can use the bolts that will eventually secure the Side-Benches. One piece of ply is L-shaped, say, 5" x 5" x 1 1/4" (127 x 127 x 32 mm). The other is a rectangle 5" x 1 1/4" (127 x 32 mm). Drill them close to the ends and bolt together loosely so that a pencil can be fitted between them.

Mark with a pencil line 2 1/4" (57 mm) from the inside vertical edge of the L, and use this line to locate the pencil. If the device is held vertically and run from the Transom forward along the Hog; the centre-line will have been accurately gauged on the plank. This is possible to a point just forward of the Forward Bulkhead. Forward of this point some interpolation is necessary as described in the section on Fairing-in, and illustrated in Figure 24. Mark out the edge of the Centreboard Slot.

At 4" (100 mm) centres and at 3/8" (9 mm) in from the marked centre-line; drill and tack-screw using the # 6 x 3/4" steel screws. Work from midships outwards; towards the Stem and Transom alternatively.

Pencil-mark on the inside of the plank the outlines of the Hog, Chines, Bulkheads, Transom and Stem; including the 'step' at the 'change-over joint' and at the Forefoot.

Now remove the panel and trim to the marked centre-line; the edge of the centreboard slot, and the outer Chine edge. Plot the panel edge forward of the 'change-over joint' half way between the marked chine edges, and trim this edge also. Do not, at this stage, trim off the fore and aft projecting pieces; as these will be needed to hold the panel down during the glueing process.

Drill screw-holes 3/8" (9 mm) from the inner edge of the Chine at 4" (100 mm) crs. and inclined at an angle of approximately 70°. Refer to Figure 13. Drill screw-holes at 2 1/2" (63 mm) crs. at the Transom, Bulkheads and Floors. However, do not, at this stage drill screw-holes forward of the 'change-over joint' or Forefoot. Countersink screw-holes well.

Replace the panel on the frame, using the previously-drilled holes along the Hog to locate it. Screw through the pre-drilled holes into the Chine using the 6 x 3/4" steel screws. Forward of the 'change over joint', decrease screw-spacing to approximately 2 1/2" (63 mm). Drill screw-holes around Forefoot 5/8" (16 mm) in from the edge of the Stem, and at 2" (50 mm) crs. Drill and screw to Bulkheads, Transom and Floors.

Forward of the 'change-over joint'; check panel edge for straightness and, if necessary, trim with a rebate plane.* Drive two or three 1" nails into the Hog tight against the panel edge, and mark their locations on the panel. These will be invaluable in rapidly locating the panel when glueing up. Remove the panel once again in preparation for glueing.

It may seem unnecessarily laborious to fit these panels onto the frame, only to remove them again. However, the curing time of the epoxy is too short to permit direct one-shot fixing. It is essential to verify that the panel will fit accurately and make contact with the frame throughout its length before attempting the final glue-up.

* RABBET.

Sand the inside of the panel thoroughly; clean and apply two coats of epoxy. When cured, apply a medium-stiff glue to all the outlined areas on the panel and to the frame members. Apply glue as rapidly as possible; but do not mix up too large a quantity at one time.

Place the panel on the frame, using the nails to locate it. Screw down as rapidly as possible; driving, at first, one screw in every three; working from the middle of the panel outwards. Note, once again, that all the screws along the Hog aft of the Forefoot, and along the Chine aft of the 'change-over joint' are temporary, and will be removed after the glue has cured so that the panel edges may be bevelled to receive the Keel and Bilge Panel respectively. The screws are therefore 6 x 3/4" steel, and should be waxed to facilitate later removal. Wax floor-polish is fine for this purpose. The remainder of the screws are permanent; 8 x 3/4" stainless steel.

To pull the panel down forward of the Forward Bulkhead; clamps should be used ahead of the screws; and not released until all the screws are in place. Use the ply lever ahead of the Stem to minimize stress on the screws.

In a similar way, the projecting panel aft of the Transom should be securely lashed down to the jig to ensure the tightest possible joint at the Transom. Use a lever to twist the lashing, like a tourniquet, to increase the tension. It is also advisable to double up on screws in the 18" (450 mm) or so forward of the Transom.

Thoroughly clean all excess glue from the inside of the panel; on the Chine forward of the 'change-over joint' and on the Hog.

When the glue has cured; remove all clamps and levers; trim excess ply at the Stem sufficiently to allow the second panel to be fastened. Fit second panel and trim with the rebate plane at the centre-line to ensure a tight fit; especially at the Transom, where the planking edges will be visible.

Repeat the test-fitting procedure used on the first panel; and when satisfied that it will fit closely throughout; 'pitch-mark' at a number of points along the centre-line for accurate location.

Glue and fasten exactly as for the first panel. (Screws: one hundred and twenty-five (125) 6 x 3/4" st., one hundred (100) 8 x 3/4").

(ii) **Bilge Panels (W 12)**

When the glue has cured on the second Bottom Panel; remove all temporary screws. Using the rebate plane, clean up the panel edge from the Stem to the 'change-over joint'. Sight along both edges from the Stem to make sure that they are alike.

Make a shallow saw-cut at right-angles to the panel edge at the 'change over joint', so that it continues the angle of the adjacent Chine face. Using a sharp flat chisel; pare away the plywood aft of the saw-cut, a little at a time, until a flat surface has been achieved in continuation of the adjacent Chine face. Refer to Figures 19 and 24.

From this point aft; the excess ply must be planed off to produce the broad flat landing to which the Bilge Panel will be glued. The Surform will be useful for the rough planing. Try the surface with the straight-edge, and also with a scrap of hardboard or thin plywood.

When satisfied that the panel will be a close fit throughout; rub some chalk on the edge of the Bottom Panel forward of the 'change-over joint'. Clamp the Bilge Panel in place, and by banging it against the chalked edge, the exact outline of the butt joint will be transferred onto it. Remove the panel; redraw the line in pencil, and accurately cut out.

Test-fit the panel; and, as with the Bottom Panels, mark on the outlines of the Hog, Chines, Bulkheads and Transom; including the location of the upper 'change-over joint'. Remove the panel; mark out the edge forward of the joint and cut out. Drill and countersink screw-holes at 3/8" (9 mm)

from the panel edge, and at 4" (100 mm) crs.; except at the Stem, Bulkheads, Transom and Floors; where they should be at 2" - 2 1/2" (50 - 63 mm) crs.

Test-fit the panel once more; and check the closeness of fit at the butt-joint. If necessary, use the rebate plane to trim the edge. The screws along the over-lapping Lower Chine joint are permanent (stainless steel); while those at the Upper Chine are the 6 x 3/4" steel temporary screws.

In some ways; fastening the Bilge Panel is more complicated than the other panels. It is essential to achieve a good fit and lap throughout its length; especially at the Transom. Do not be tempted to start glueing up until a completely satisfactory test-fit has been achieved. Before removing the panel in preparation for final glueing; knock in a few 1" nails tight against the panel edge; for example at Bulkheads and in the step of the upper 'change-over joint', to give accurate location to the panel.

Glue and screw-fasten; screws along the lap joint at the Lower Chine are permanent # 6 x 3/4" stainless steel; except forward of the change-over joint and for 18" or so forward of the Transom, where the frequency is increased, and # 8 x 3/4" screws are used. Use # 8 x 3/4" screws also at the Bulkheads and Transom.

Once again, as with the Bottom Panels; securely lash the projecting panel aft of the Transom down to the jig, and tension to achieve a tight joint.

Clean off excess glue. Repeat process for second panel. (Screws: one hundred and twenty-five (125) 6 x 3/4" st., one hundred and fifty (150) 8 x 3/4", one hundred (100) 6 x 3/4").

(iii) **Topside Panels (W 13)**

When the glue has cured on the second Bilge Panel, remove all temporary screws.

Cut the 'change-over joint' and plane the bevel as for the Bilge Panels.

Test-fit each panel; checking closeness of fit forward of the 'change-over joint'; mark outlines of frame members; drill and countersink screw-holes.

Glue and screw-fasten; using # 6 x 3/4" stainless steel screws generally at 4" (100 mm) crs., except forward of the change-over joint, for 18" forward of the Transom, and at Bulkheads, Knees and Transom; where the frequency is increased and # 8 x 3/4" screws used.

Once again; securely lash the projecting panel aft of the Transom to the jig and tension to achieve a tight joint.

Clean off excess glue. Repeat process for final panel. (Screws: two hundred (200) 8 x 3/4", one hundred and fifty (150) 6 x 3/4").

(iv) **Fitting the Keel (W 14)**

Remove all the temporary screws along the Hog from the Forefoot aft.

The Keel has been pre-cut to conform with Class Rules, which specify that, for a distance of 13' 0" (3962 mm) forward of the Transom, it must be a minimum of 2 7/8" (73 mm) wide. Therefore; measure this distance from the aft face of the Transom; and mark the outline of the Keel onto the Bottom Planks. From the 13' point forward to the 'step' at the Forefoot, the Keel tapers and is planed to fair into the Forefoot.

Plane a flat landing for the Keel within the marked outline. Like the Hog; the Keel has to be bent to a relatively tight radius at the Forefoot; although as the radius is greater, and the Keel thinner (3/4" as against 7/8"); it is not so difficult.

Cut a series of shallow saw-cerfs on the upper side of the Keel, at approximately 1/2" (13 mm) crs. for the first 8" (200 mm) or so. Drill a central screw-hole 5/8" (16 mm) from the end; followed by two more

approximately 1 1/2" (38 mm) back and spaced 3/4" (19 mm) either side of the centre-line. Continue with a screw spacing of 2" (50 mm) for the remainder of the Forefoot area; then increase the spacing to 12" (300 mm) except at either side of the Centreboard slot, where it should be 6" (150 mm); and for the last 2' 0" (600 mm) at the Transom; where it should also be 6" (150 mm).

As the Keel is bevelled at the Forefoot area, the outer screws are 8 x 1 1/2" temporary steel; those on the centre-line are 8 x 1 1/2" stainless steel, and should be well countersunk.

Apply a generous quantity of stiff-mix glue, and screw keel down. Make sure that the glue completely fills all the voids; particularly at the Centreboard slot, at the Transom, and the saw-cerfs at the Forefoot. (Screws: fifty (50) 8 x 1 1/2").

When the glue has cured; clean up, remove the temporary screws and plane the bevel at the Forefoot. Round off the corners to a maximum radius of 3/16" (5 mm). Cut away the webs in the Centreboard slot Hog and Keel, and clean up slot. Refer to Figure 25.

(v) **Fitting the Bilge Keels (W 15)**

Measure 2' 6" (762 mm) forward of the Transom and 1' 5 1/2" (444 mm) out from the side of the Keel. This point locates the aft end and inside face of the Bilge Keel which run parallel to the Keel.

Drill and countersink for four (4) # 8 x 1 1/2" stainless steel screws each side into the Aft Bulkhead and Floors 7, 9 and 11. Mark the outline of the Bilge-Keels on the planking; remove and drill 6 holes on the centre-line of each, equally spaced between the Floors and Bulkhead, through the planking. Countersink on the inside, so that 8 x 3/4" stainless steel screws can be driven through the planking into the Bilge-Keels; thus drawing the planking tight against them.

Glue and screw-down; ensuring that the glue squeezes out evenly; and all voids are well filled.

When the glue has cured, plane edges to a maximum radius of 3/16" (5 mm) and fair each end to a maximum of 4" (100 mm), as permitted under Class Rules. (Screws: eight (8) 8 x 1 1/2", twelve (12) 8 x 3/4").

(vi) **Preparation for Finishing**

This operation includes planing all the rough planking edges flush with the adjacent surfaces; filling the screw-holes and joints where necessary; and trimming off excess planking at the Stem and Transom.

The planing again involves much eye-work. Plane a little off at a time, and try to visualize how the lines ought to appear when finished. Any abrupt changes in curvature should be planed out; each chine should be a smooth, continuously-changing curve from Stem to Transom.

Remove the jig legs at the Transom and saw off any excess planking and Keel. Finish by carefully planing flush with the Transom.

Plane off the excess planking at the Stem; taking care not to plane any material off the Stem itself. The aim is to achieve a curved edge with a constant overall width of just over 3/4" (19 mm); which will later be protected by the brass keel band.

When satisfied that the planking is complete; sand the entire hull and apply a minimum of two coats of epoxy resin prior to filling.

Fill all the screw-holes and joints where necessary with a stiff mix of resin and micro-balloons. When the filler has cured; plane lightly (use the small Surform), and sand smooth. It will probably be necessary to repeat the process once or twice until all the obvious surface blemishes have been filled. Give particular attention to the outside of the scarf joints in the planking; as any changes of plane will show up under the

final coat of paint.