

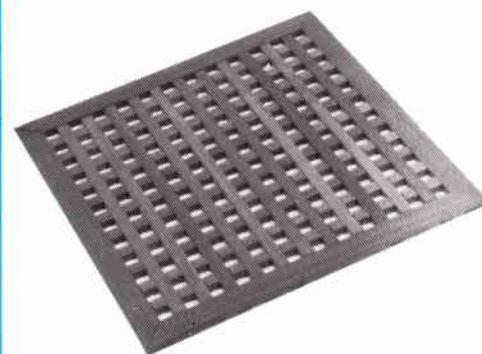
Cockpit Grating (or Wooden Bathroom Mat)

Designed and constructed by John Holman

Containing 169 half-lap joints, this is an example of a project unthinkable with a handsaw and chisel, but quite easy on a Triton workcentre. No tedious measuring or marking is required; instead the cuts are made accurately using reference marks on your workstops.

The size chosen in this example — 810mm square — is the largest square grate that can be made on a Triton fitted with a 9¼" saw (This size fits neatly in front of — or even inside — a standard 900mm shower recess).

The mat or grate consists of a grid of 30mm wide strips, spaced 30mm apart, surrounded by a frame 60mm wide with half-lap mitred corners.

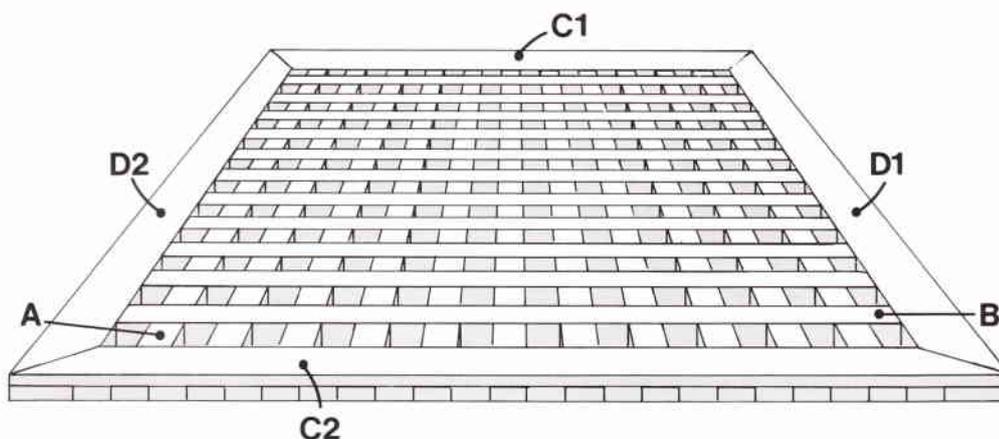


Component Specifications

Part No.	Description	Quantity	Width	Thickness	Length
A	Lower grid component	11	30 ×	22 ×	810*
B	Upper grid component	11	30 ×	22 ×	810*
C1	Frame component	1	60 ×	22 ×	810*
C2	Frame component	1	60 ×	22 ×	810*
D1	Frame component	1	60 ×	22 ×	810*
D2	Frame component	1	60 ×	22 ×	810*

All dimensions are in mm

** Note: These exact lengths are cut during construction. Do not pre-cut.*



Tool Requirements

- ESSENTIAL** Triton workcentre and your power saw, Triton extension table or outboard work support (see Jig Guide), workstop packing, try or carpenter's square, drill and drill bits, 450mm sash clamps or similar, screwdriver, hammer and pencil.
- USEFUL** Length gauge fitted to your workstops, a tungsten-carbide tipped saw blade to ensure a good quality cut, T-square, 900mm sash clamps, dust particle mask, ear muffs, safety glasses.

Construction Details

Material Shopping List

1. WOOD Because the mat is likely to be constantly damp, a highly durable timber is needed. Cypress Pine, Jarrah, Tallowood, and Merbau are all suitable. Most of these timbers can be obtained as decking timbers, and some are available with a grooved, "non-slip" surface. Decking material dimensions are usually 70×22mm. Shop for:

70×22mm unseasoned decking (in multiples of 900mm, eg. 1.8 or 2.7m lengths) — a total of 13.5m of **straight** timber is needed.

Also obtain a **900mm length of straight hardwood** (say 50×25 or 40×19mm). This will be used to provide cleats to hold your material when cutting.

2. FASTENING

- * 4 — 20mm/8G brass screws
- * One packet (usually 144) of 19mm brass escutcheon pins or similar.
- * 8 — 40mm/8G steel screws for cleats.

Safety Notes

The method of sawing out the waste for the half-lap joints which is used in this project means that a large amount of sawdust is created. If you have any respiratory problems or allergies to sawdust be sure to wear appropriate protective equipment.

Set up your workcentre in the table saw mode and cut a rebate in the hardwood about 5mm deep and 25mm wide. If you are unfamiliar with rebating procedures, refer to your Operating Manual for details and safety precautions.

Refit the safety guard. Measure, mark and crosscut your rebated hardwood to make two cleats 450mm

General Points

1. The hardwood cleats hold your material firmly together during cutting of the half-lap joints, ensuring uniformity and accuracy.
2. The "left-hand/right-hand" instructions dotted through the text may appear confusing at first reading, but by using reference marks instead of measurements the work proceeds more easily, quickly and accurately. The designations LEFT-HAND (LH) and RIGHT-HAND (RH) refer to an operator standing at the front (switch-box) end of the workcentre.
3. The nature of mitred half-lap joints means that the mating pieces are not identical. Careful study of the instructions is recommended.

long. This can be done in the table saw mode using your protractor. Put your cleats aside.

2 Decking is usually arrised or rounded on its edges. Rounded edges are not wanted in this project, so set the rip fence to first remove one arris (say 66 or 67mm) and rip off one edge from all your decking material.

Select 3.6m of the material which is to be used for the frame Components **C1, C2, D1 & D2**. Set the rip fence to 60mm and rip off the opposite arris.

Reset the fence to 30mm and with the previously square edge against the fence rip all the remaining material to 30mm for the grid Components (**A&B**). Great accuracy in this width cutting is not essential ($\pm 0.5\text{mm}$ is acceptable) as long as all your material is the same width. Always use a push stick when narrow ripping.

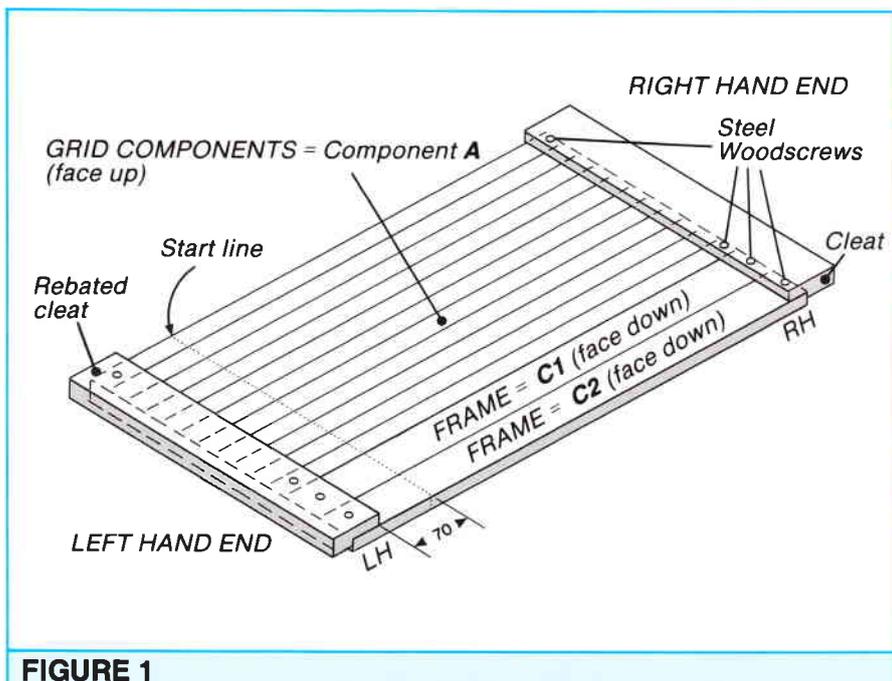


FIGURE 1

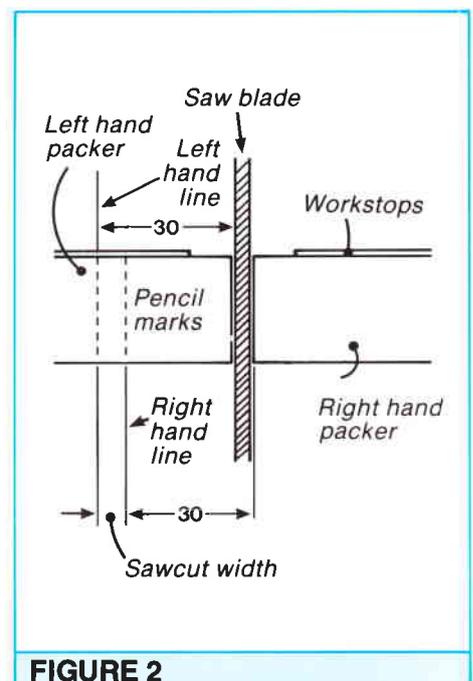


FIGURE 2

3 Convert to the crosscut mode and ensure that your saw is cutting squarely. Using a length gauge on your workstops cut all the material to 900mm lengths, saving the offcuts.

You should now have four frame pieces 60mm wide and 900mm long, and 22 grid pieces 30mm wide and 900mm long, and two cleats 450mm long.

If your material is not grooved on its upper face, select and mark the best face of all pieces, designating “top” near one end.

Separate your material into two bundles, each consisting of two frame and 11 grid pieces. Identify one bundle as parts **A**, **C1** and **C2** (Assembly ‘**A**’) and the other as parts **B**, **D1** and **D2** (Assembly ‘**B**’).

4 Take Assembly ‘**A**’ and set out as shown in **Figure 1**. If any of the grid pieces are bowed slightly, place them to the outside of the bundle, concave side outwards, to help hold the pieces tightly when cramped together. Mark the frame pieces (**C1**, **C2**) LH and RH as shown . . . make the marks close to the ends.

5 Arrange ends in a straight line, and square to the long axis (a T-square helps). Cramp all the pieces together, double check for square and lined up ends, and fit the cleats — rebate down — over each end of the assembly. Screw the cleats onto the assembly as pictured in **Figure 1**, countersinking the steel screws. Try to ensure that the screw holes are directly on the centreline of the workpieces, and drill square, as some strips will need to be turned over later and the same holes used from the opposite side.

Note that the ends of the cleats must not project beyond the assembly — if they do, remove the cleats and trim them down, and refit.

Remove the cramps and place the complete assembly on a flat surface with the two frame pieces (**C1**, **C2**) towards you. Square a line across the assembly about 70mm in from the LH cleat. This becomes the “start” line, used as a reference when cutting begins.

6 A reference line is also required on your workstops. If you have not already added workstop packers (as per length gauge) do this now. If you have a large saw, don’t make them any thicker than about 19mm, or you may not be able to fit in the assembly. Cut a slot through the new packers, or if using existing ones make sure that the gap between them is exactly the width of a saw cut.

Mark the packers as shown in **Figure 2**. Note that the two pencil marks are exactly one saw cut width apart. Do not measure the 30mm with a ruler; instead use a grid offcut as a measure. Square the

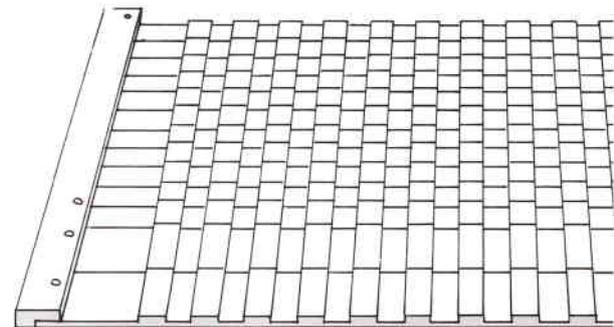


FIGURE 4

marks down across the face of the packer. These marks will be your guide for starting and finishing the trenches you are going to make.

7 Take a long offcut and raise the saw blade to cut about half-way through it. Taking cuts from opposite faces, and adjusting the saw blade height by trial and error as detailed in the operating manual, set the blade height to cut exactly half way through the thickness of the material. Do not disturb this blade setting again.

8 You are now ready to begin trenching. Place Assembly ‘**A**’ in the workcentre against the workstop packers, “start” line to your left. With a large saw you may have to lift

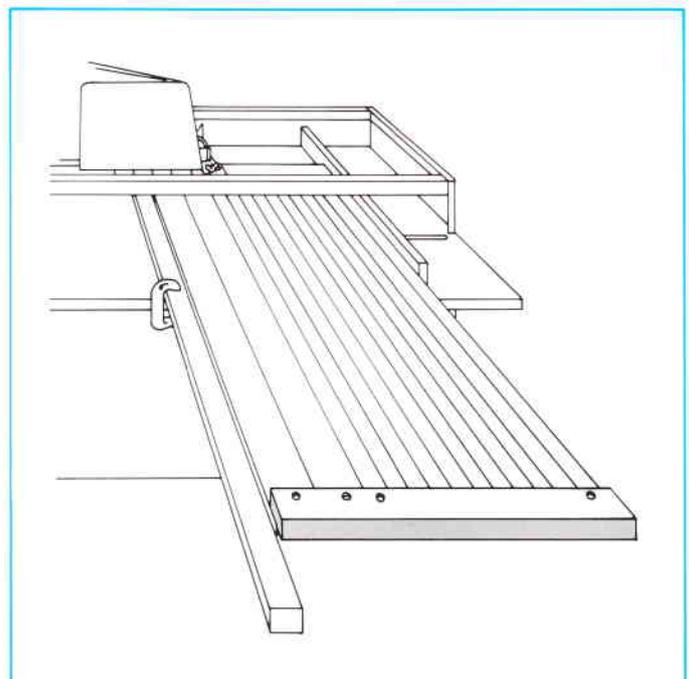


FIGURE 3

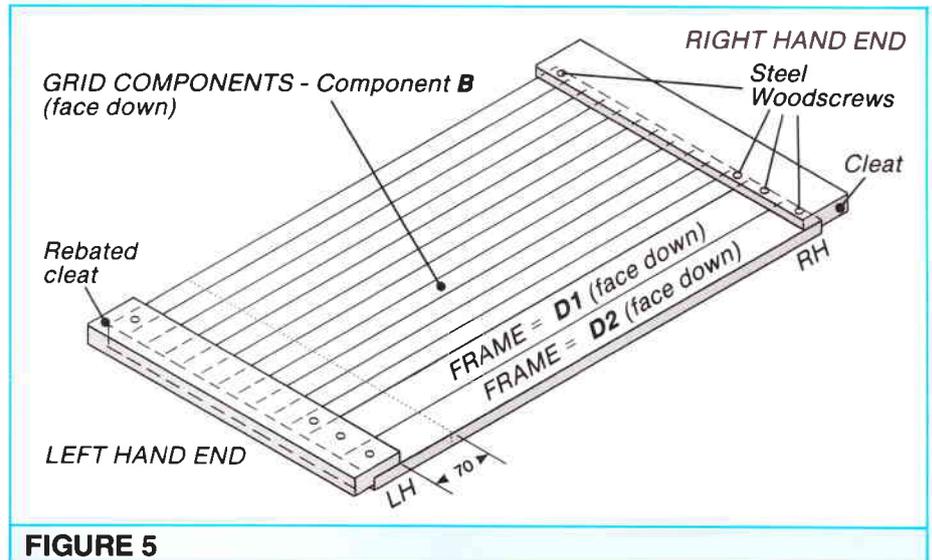
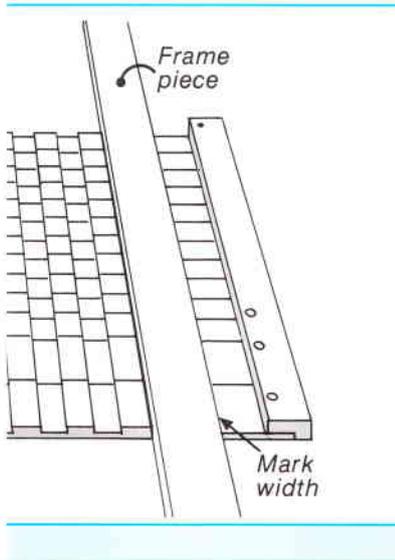


FIGURE 5

the front bearings out of the slide channels to allow the cleats to slide past the blade. Replace the bearings in the channel!

If you wish, you can clamp a thin straight-edge across the table in front of and against the assembly to hold it against and parallel to the workstops. Make sure the assembly can slide easily between this guide and the workstops across the full width of the table. An Extension Table or outboard work support jig helps to support the assembly when cutting trenches near either end. (Figure 3)

9 Line up the “start” line with the RH side of the blade or blade notch, switch off power and lock on the trigger strap. Switch on the saw at the switch-box, and make the first cut across the full width of the material, starting with the saw fully back against the front panel. Moving the assembly to the **right** one blade width at a time, make a series of cuts until you have a trench about 70mm wide, right up to the cleat.

10 Slide the assembly to the **left** until the RH edge of the trench you have just made is exactly opposite the LH of the two marks on your workstop packer. Make a cut and pull back the saw. Use the small grid offcut you used to make the marks, and check that the space between the cut and the trench is the same width as the block.

Do not alter the mark if this measurement is slightly different. Because you are cutting all the pieces simultaneously, a slight error here does not greatly matter. Even if you made a mistake in cutting of one whole blade width for example, because all the pieces will be the same the end result is only that the complete project becomes very slightly rectangular instead of square. This

is not an excuse for sloppy workmanship however. Follow the instructions carefully!

11 Now moving the assembly to the **left** one blade width at a time continue to make a trench so that the last cut is made with the LH edge of this trench opposite the RH of the two marks on your packer. This measurement **is** important as it affects the width of the trenches, so creep up to the mark with shaving cuts, checking with your grid offcut until it just drops into the trench. Do not make it a tight fit or you will have trouble assembling the completed grid. Now note whether the mark is exactly opposite the edge of the trench or not; make another mark if necessary.

12 Slide the assembly to the left until the RH edge of the trench you have just made is opposite the LH mark on the packer. Make another similar trench. Repeat this process 9 more times, always starting with the RH edge of the previous trench against the LH mark, and finishing with the LH edge of the trench you are making opposite the RH mark. Check each of the 11 trenches as they are made with your grid offcut, remembering to make it an easy sliding fit.

Start the twelfth trench in the usual way but continue trenching until it is about 70mm wide, finishing near the right hand cleat.

13 Remove the assembly from the workcentre and using one of the other frame pieces, mark its width in the outer trenches as shown in Figure 4. You will cut off the waste later.

Unscrew the cleats but do not disturb the relative positions of the strips.

Construction Details

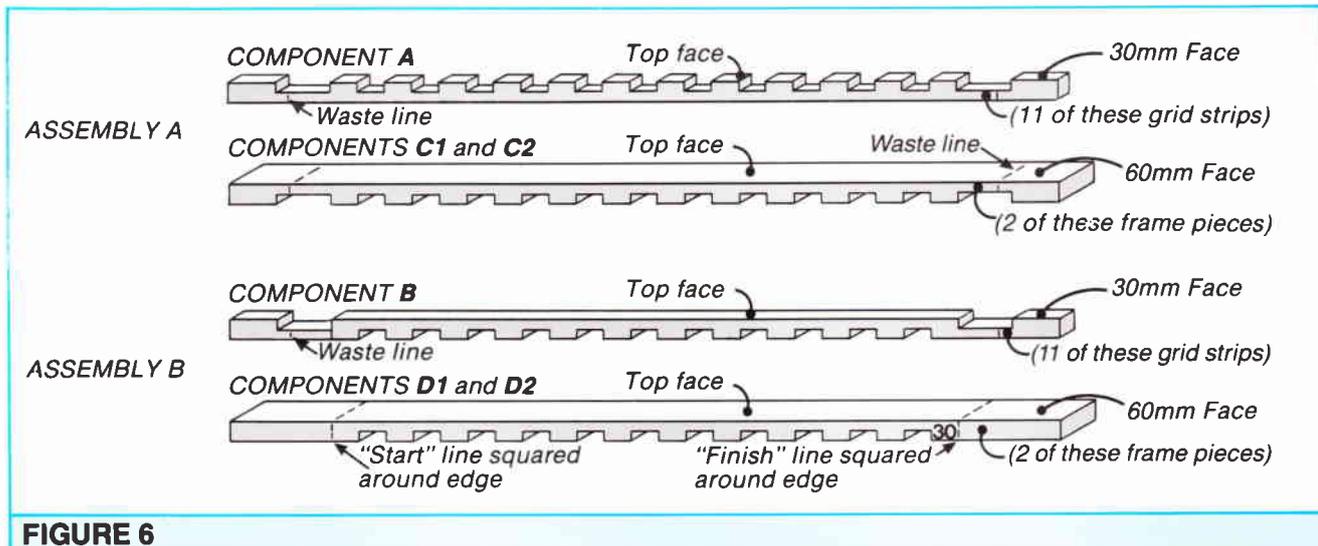


FIGURE 6

14 Make up Assembly 'B' in the same manner as assembly 'A', and as shown in **Figure 5**. Again square across and mark a "start" line 70mm in from the LH side.

Place in the workcentre, and check the assembly slides freely between the guide strip (if used) and the workstop packers. This time do not start with a wide trench. Line up the "start" line with the LH mark on the workstop packer, and moving assembly to the left make 11 equally spaced trenches as before. Stop the saw after the 11th trench and withdraw the assembly from the workcentre. Using a grid offcut mark a "finish" line 30mm to the right of the last trench edge.

15 Transfer these "start" and "finish" lines to the top face of the assembly by squaring across both edges to the top face, turning the whole assembly over and joining the two lines across the top face. Turn the assembly face down again and remove the cleat screws. Turn each of the grid strips face up, one by one, keeping them in the same relative positions. Remove the frame strips and put them aside for the moment. Cramp or wedge the grid strips back together, ends aligned, and replace the cleat screws. If your screw holes were central in the strips, they should line up; if not you will have to redrill. If you want to use a guide strip you will also have to cut off the protruding cleat ends which now project 120mm towards you.

16 Place the assembly, face up, back in your workcentre. Align "start" line with the RH side of the blade or blade slot and make a cut. Move assembly to the right one blade width at a time to make trench about 70mm wide. Park saw against the front panel, and slide the assembly to the left until the

"finish" line is aligned with the LH side of the blade. Make another 70mm wide trench by moving the assembly to the left. When making these two trenches you should cut right up to or even remove the "start" and "finish" lines, otherwise the corner mitres of the completed project may not close up properly.

Remove assembly from the workcentre and using a piece of frame material mark the width in the side trenches as before. Do not remove the cleats yet.

Your components should look as pictured in **Figure 6**.

17 Making the half-lap mitres is next. A half-lap mitre joint consists of a mitred rebate with a squared end joined to a square rebate with a mitred end (**Figure 7**). If this sounds or looks confusing, this is what to do . . .

Remove both workstops and fit your protractor set at 45 degrees. Take the two frame pieces **D1** and **D2** and square the "start" and "finish" lines across both edges of each. These lines are

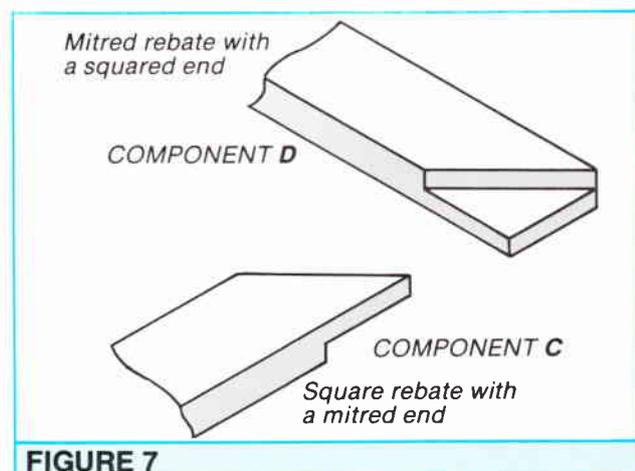


FIGURE 7

Construction Details

your sighting lines for the mitres. Place the LH end of **D1** against face A of the protractor, face up, align the "start" line on the edge of your workpiece with the RH side of the blade and by moving **D1** to the right and back towards you, make a trench at 45 degrees right up to the end of the piece.

Repeat with the RH end of **D2** also face up.

Now place the RH end of **D1** against face B of the protractor. (This time there are no sight lines for starting the cuts; instead the blade will **exit** on the "start" and "finish" lines on the edges of **D1** and **D2**. Take care with the first cut and creep up to the mark if necessary.) Moving your workpiece to the right and away from you one blade width at a time, remove all waste to the end of the piece. Hold your workpiece very firmly against the protractor.

Repeat with the LH end of **D2**.

18 Leaving the protractor in place lower the blade fully into the table slot. Now take the frame pieces **C1** and **C2**. Square the edges of the end trenches around the sides with pencil lines. Cut them face up as follows:

Cut the LH end of **C1** against face B of the protractor. The exit line of the saw blade should finish right on the line you have just made. Repeat with the RH end of **C2**.

Cut the RH end of **C1** against face A of the protractor, starting on the pencil line you have just made. Repeat with the LH end of **C2**.

Figure 8 shows the frame components after this cutting.

19 Finally, remove the protractor and replace the RH workstop. Make a trial assembly of the frame structure, and with the corners square, mark the waste on both **D** frames. Cut these off at your marked lines, ensuring your cut is on the waste side of the line.

20 Take the grid Assembly 'B', cleats still attached, and cut away the waste at each end with one saw cut across the full width, following your marked waste line. Remove the cleats from the waste pieces, re-assemble grid Assembly 'A' with cleats and screws and again cut away the waste ends. This completes the saw work.

21 The grate can now be assembled. It is easiest to interlock two opposite ends first, and fill in between them after.

Before tapping each strip into place, very lightly sand the top edges to avoid splinters. Heavy sanding will round the edges and spoil the appearance of the joints. Use a mallet and block if necessary to tap the strips home, taking particular

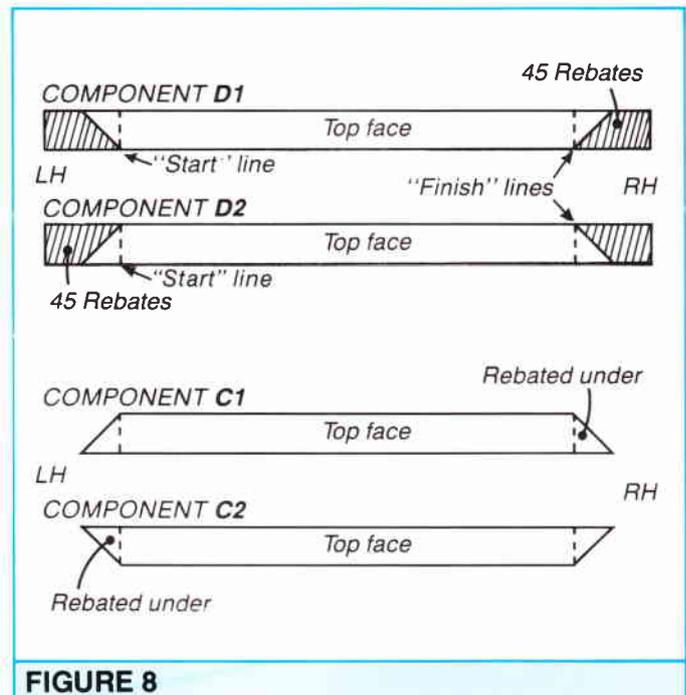


FIGURE 8

care with cypress, which can be very brittle. If assembly seems particularly difficult, check that you haven't altered the relative locations of the grid strips.

22 Tap home the frame pieces similarly, ensuring that the pieces **C1** and **C2** fit onto the ends of the 'A' grid strips, and the **D1** and **D2** pieces likewise onto the ends of the 'B' strips. Cramp up the corners and check the mitres for fit. There is not a great deal you can do at this stage if your mitres are ill-fitting, but a waterproof glue mixed with sawdust — which you have in abundance — makes a good filler. Check the corners with a square and when satisfied, turn the whole unit over, drill and countersink one 8G brass screw in the back of each mitred corner. Screw these to the side of the mitre to clamp the half lap corner joint together.

Nail and punch below the surface the 19mm brass pins, nailing through the centre of the lap joints on the back of each frame piece. It is usually sufficient to nail only around the perimeter, but you can nail the grid intersections if you wish.

23 There is no need to glue, since the design ensures that the grate can not come apart in use. Likewise, all decking materials are durable in water so no finishing is necessary, and could possibly make the unit slippery when wet.

Turn the cockpit grate over again, and check for any projections from the outside edges. Sand or plane them off, or if you have an extension table you could trim the edges with a light shaving cut using your sawblade. Round the corners if you wish, and sand the outside edges. This completes the project.