

BUILDING MODEL BRIDGES

MANY of the road bridges crossing the railway lines of Britain, are easily built in model form for layouts using the simplest of tools and the cheapest of materials. This month's project, a model of the road over rail bridge at Hendon, is one which can be completed in quite a short time using two different thicknesses of cardboard, styrene sheet, balsa wood and Polyfilla for the road surface. The tools required are few and every enthusiast should have most of them in his kit.

The first step in the construction of the bridge is the marking out of the two bridge side pieces. I used $\frac{1}{8}$ th inch thick cardboard, which I was only able to buy in large sheets, approximately 3 ft. by 2 ft. These I cut to a more convenient size.

Before marking the shape of the bridge on to the cardboard, it might be as well to make a rough drawing of the bridge to suit the location in which it is to be used. The dimensions given in this article can, however, be followed and the resulting bridge fitted with retaining walls to suit the type of embankment or ground.

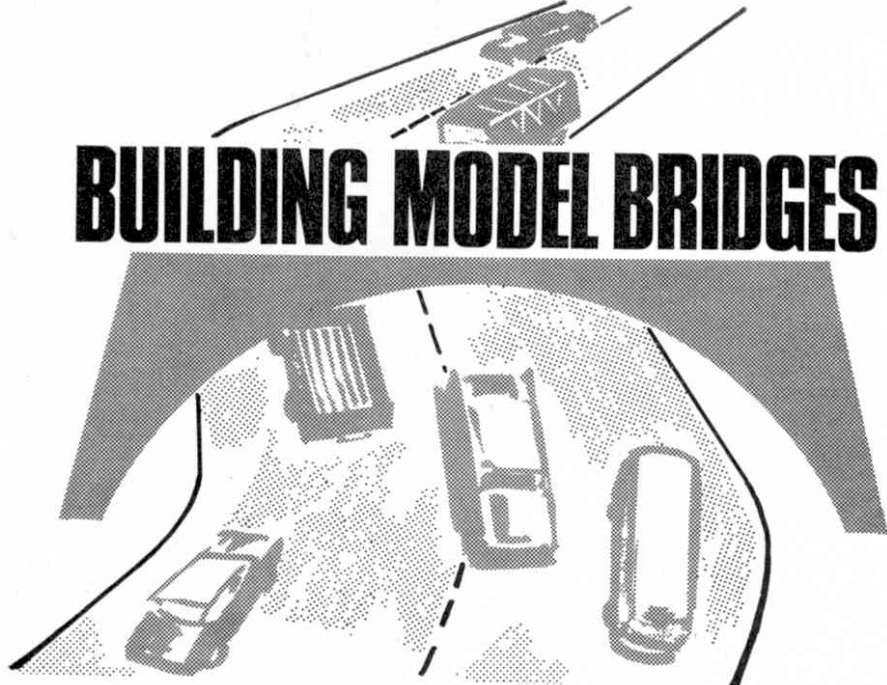
When making the drawing, I found it useful to have a photograph of the type of bridge I wanted to model. This could then act as a guide for structural details, such as girdering, brick piers, etc.

Keep it square!

The various components should be reproduced on $\frac{1}{8}$ in. thick cardboard using both inch and millimetre rulers. It is essential that all lines be at right angles to one another and, although not absolutely necessary, you may find a set square of help when doing this. Two sides will be required, each $13\frac{1}{2}$ ins. by 5 ins. and a rectangle of that size is marked on to the cardboard. The bridge portals are then marked on, leaving a gap in each side for the ends of the girders underneath the parapet of the bridge; $\frac{1}{8}$ th inch thick card is very heavy material and a heavy duty modelling knife is essential. I used the eclipse 44 multiple tool to reduce the number of cuts per line.

A steel straight edge will be necessary to act as a guide for the knife and when cutting, constant pressure should be kept on the knife to ensure an even cut. Several strokes will probably be required before the card separates and you will find that a block of wood underneath will help to prevent any damage occurring to the table or work surface. Do not in any event risk tearing the card because this makes it difficult to lay the brickpaper evenly.

When both sides of the bridge have been removed from the sheet of card, the smaller lightweight modelling knife can be used to clean up those corners where slight furring of the cardboard may have occurred. Any burrs on the edges should



also be removed, since this will show through on the brickpaper.

Dealing with one side of the bridge at a time, buttresses measuring 5 ins. by 16 mm. should be cut from $\frac{1}{8}$ th inch thick balsa sheet. It would be as well to cut a sufficient number for both sides of the bridge and you will need twelve pieces in all, which are glued into position at each end and also along the bridge side. I used 'Uhu' glue for this to ensure a positive joint.

The buttresses on either side of the tunnel portals should be flush with the elongated slots for the girder and care should be taken to position the buttresses in the vertical. It would be as well, in fact, for the set square to be used for this. A wrongly positioned buttress can ruin the appearance of the finished bridge and it is well worth taking extra care when glueing them in place.

Once they are firmly fixed into position, brick overlays can be added on the upper portions and also on the bridge parapet. You will notice from the photographs

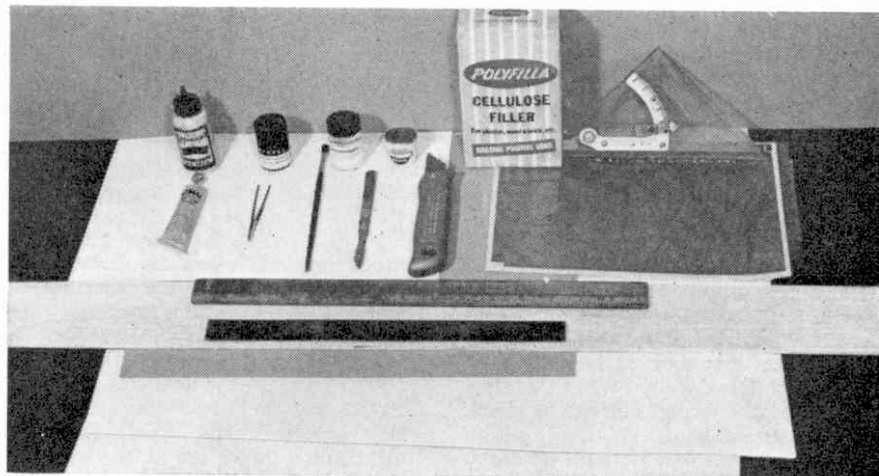
that the overlays include two distinct thicknesses of brick and naturally, the widest is the first to be added. The parapet, being the easiest, is dealt with first and you will need two pieces of $\frac{1}{2}$ in. thick card, 112 mm. long by 16 mm. wide, which are glued flush to the bottom of the two parapets.

The $\frac{1}{8}$ in. thick cardboard that I used, turned out to be slightly over this dimension and the resulting layers of cardboard on the bridge parapet look quite effective. I would therefore advise you, whenever possible, to use cardboard between $\frac{1}{8}$ and $\frac{1}{16}$ in. thick.

For a positive joint between the two surfaces of card, I relied almost entirely upon Lepage's 'Bondfast' glue, which is normally a white opaque substance, but when dry becomes transparent, with a surface that does not shine. The glue also has the further advantage that it does not shrink.

Once the brick overlays have been laid on the parapet wall, the top portions of the buttresses can be dealt with. The

Materials required for bridge construction. Sheets of $\frac{1}{8}$ in. and $\frac{1}{16}$ in. card, $\frac{1}{8}$ in. balsa wood, red brick paper, grey and black poster paint, Bondfast and Uhu glue. Tools required—tweezers, paint brush, modelling knives, set square and rulers.



front surfaces of these also have two layers of brickwork and once again, the widest is glued on first. For the six buttresses on one side, you will need six pieces of $\frac{1}{2}$ in. thick cardboard, 16 mm. long by 16 mm. wide.

Tweezers are useful

The thinner pieces that are laid over these are also 16 mm. long, but 8 mm. wide. When these are dry, the sides of the buttresses can be dealt with and since this task is a little fiddly, you may find a pair of tweezers of help. The inside edges of the four end and two inside buttresses, require a total number of six pieces of $\frac{1}{2}$ in. cardboard, 16 mm. long by 8 mm. wide. These must have a piece cut out to allow for the single overlay of brick on the front of the buttress.

When doing this, I have found it best to place the piece of card in the required position, scribing the portion to be removed with a modelling knife. In this way you will be certain of the overlay being the correct shape. The inside faces of the buttresses on either side of the tunnel portals have a double thickness of cardboard, as on the bridge parapet and you will find it necessary to lay three separate pieces, two for the lower portion and one for the upper—each 8 mm. long by 5 mm. wide.

All that now remains is for the lower brick overlays to be placed into position and you will need, for the front surface of the buttress, six pieces of $\frac{1}{2}$ in. thick cardboard, each 16 mm. long by 16 mm. wide. Each buttress should also have, on its lower end, two pieces of $\frac{1}{2}$ in. thick cardboard 16 mm. long by 6 mm. wide. When all these components have been glued to the assembly, the first side can be left to dry, while work begins on the other side.

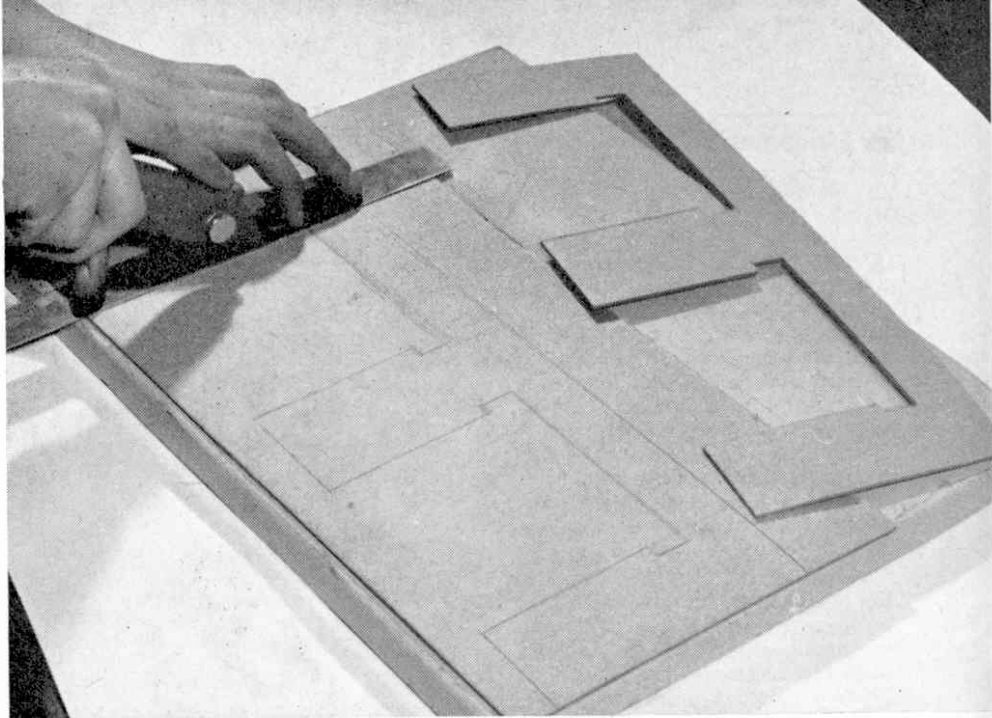
Positioning the roadway

Using $\frac{1}{8}$ in. thick balsa wood sheet 3 in. wide, the roadway which is $13\frac{1}{2}$ in. long, can be cut out. A total number of six spacing pieces will be required, also from $\frac{1}{8}$ in. thick balsa wood—two $3\frac{3}{8}$ in. long by 3 in. wide and four $3\frac{1}{2}$ in. long by 3 in. wide. To join the two sides together, I would suggest placing the bridge face down on the working surface, glueing the roadway into position at the bottom of the parapet.

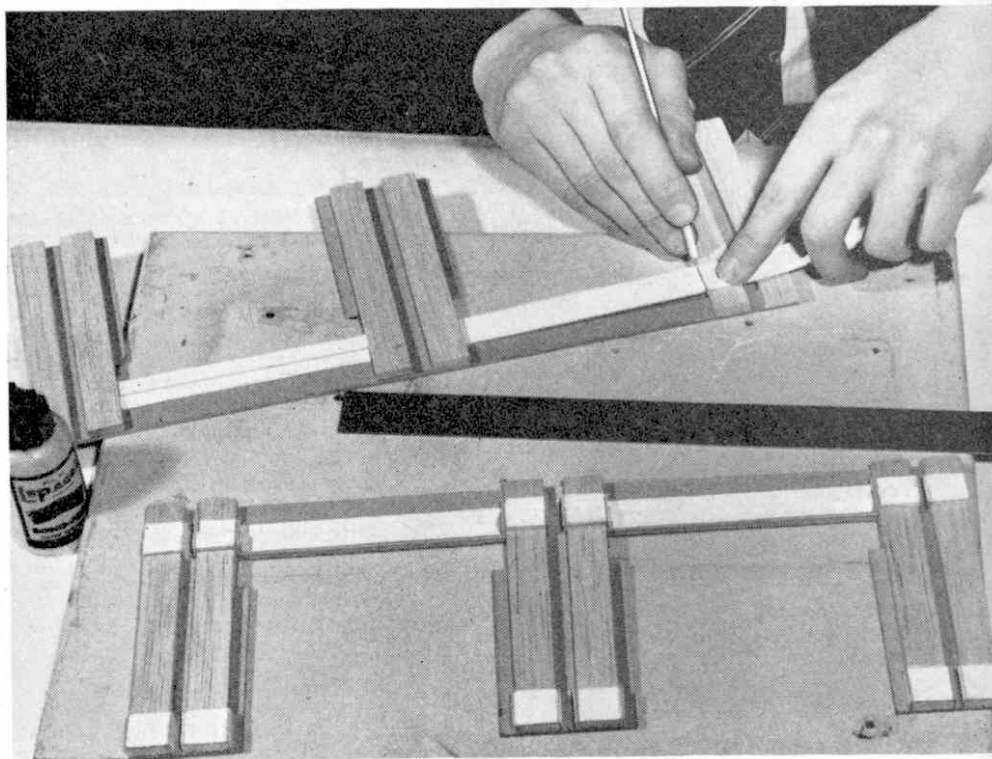
This should be followed by the two end pieces, which fit underneath the roadway and then the four intermediate pieces, which are glued flush with the side portals of the bridge. A gap should be left above the intermediate spacing piers for the girders which are added later.

Once again I used the set square for checking that all members are absolutely upright. If necessary, blocks of wood may be leaned against the spacing pieces to make sure that they do not fall over while the glue is drying. When the glue has set hard, the second side can be glued on to the assembly.

The girders can now be built up from 30 thou. thick styrene sheet and for each



Above: The first operation is the cutting of the two sides from $\frac{1}{8}$ in. card. Here the heavy duty knife and steel rule is used. The light knife later removes any burrs.
Below: The buttresses along the side of the bridge are glued into position and the brick overlays ($\frac{1}{2}$ in. card) are glued over both the parapet walls and buttresses, as shown on lower bridge side.



girder you will require the parts indicated on the component list accompanying this article. The first step in the construction of the girder is to lay either the top or bottom member flat on the work bench, laying it edgeway on the intermediate member. Then, while holding it in position, the plastic sheet solvent is brushed along the joint with a paint brush. This is repeated for the other member of the girder and when the whole assembly has dried, the eight strengthening pieces are glued into position along one side of the girder

assembly. When the complete unit is dry it can be glued in place on the bridge.

After all four girders have been placed in position, the brick papering of the structure can begin. For the bridge shown in the photograph, I have used one of the brickpapers available from the 'Superquick' range. For a bridge of the type we are building, an ordinary red brick is probably the most desirable. Begin the papering with the parapets of the bridge, working from the top downwards and taking care that all cuts in the brickpaper are clean.

The edges of the two brick overlay courses should have their own strip of brickpaper laid on and you will find that a strip of paper one brick deep will be quite sufficient for this purpose. Once the two parapets have been completed, the buttresses can be dealt with, preferably from the top, so that some form of continuation between the brick courses of the parapet and the brick overlays over the buttresses is assured.

Continue in this fashion until both bridge sides have been completed and then begin on the walls of the tunnel portal. When the brickpaper has dried, the black poster paint can be used, in diluted form, to cover the white lines between the sheets of brickpaper.

I have deliberately dirtied up the bridge with a weak solution of black poster paint, since this does tend to hide any inaccuracies in the sizes of the various pieces of brickpaper. It is also more realistic, for most bridges, especially those situated in towns, are extremely dirty.

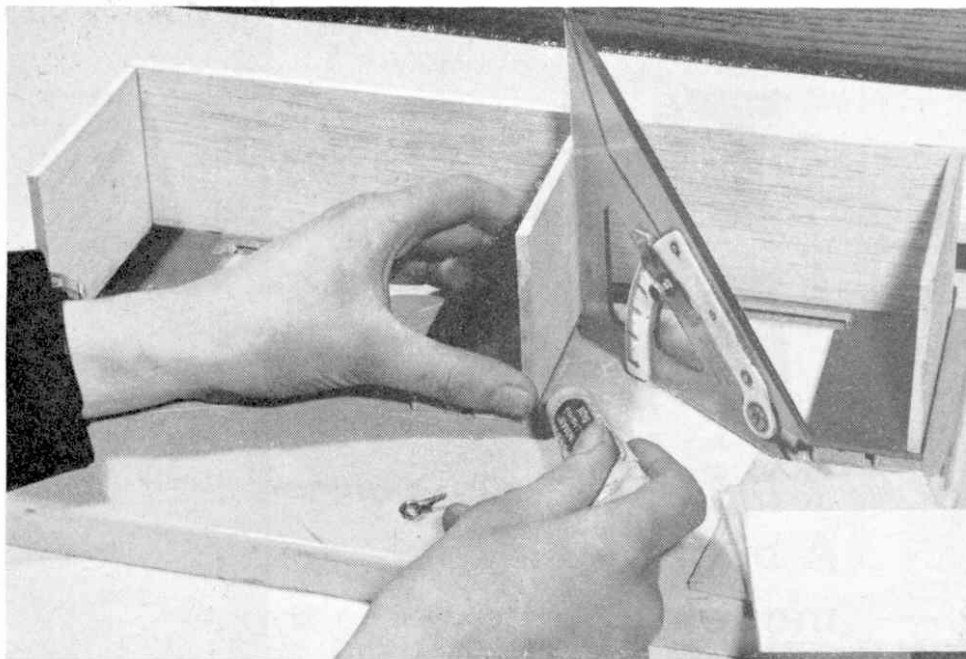
Finishing the model

Only the roadway and the inside parapet walls now remain to be dealt with and I would suggest that the inside parapet walls are the first to be cut from $\frac{1}{32}$ in. thick card. Before gluing them into position, it is advisable to glue the two pavements which are cut from $\frac{1}{32}$ in. card, into position first. The walls should then be glued, edgeways on top of the pavements, to bring them flush with the top of the outside parapets. Twelve buttresses for the inside walls should be cut from balsa wood and glued into position with 'Uhu' glue.

When dry, the two inside walls can be covered with brickpaper and while the glue is setting, the capping stones, which are cut from $\frac{3}{16}$ in. thick balsa wood, can be placed on top of the twelve buttresses.

If the roadway is to look effective, it should be covered with a stiff mixture of plaster or Polyfilla to give a slight camber in the centre of the road. When this is dry, approximately two hours, the surface can be painted either grey or black.

According to the location of the bridge, its ends should now be blended

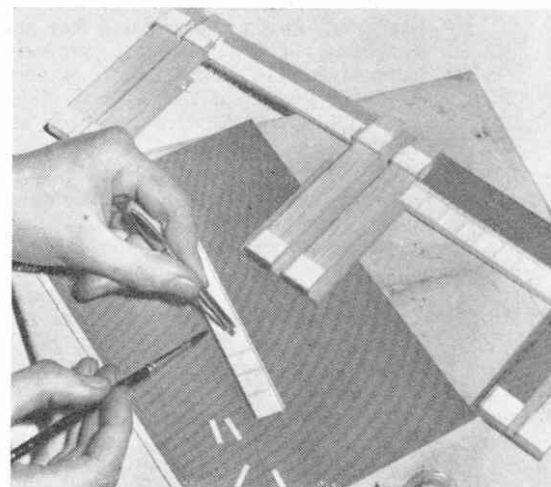


into the layout by fitting appropriate retaining walls to suit existing embankments or any other scenic effects that the layout may have.

COMPONENT LIST FOR BRIDGE

- 12 pieces $\frac{3}{16}$ th thick balsa wood 5 in. long, 16 mm. wide. Buttress.
- 24 pieces $\frac{1}{32}$ nd thick card 16 mm. long, 16 mm. wide. Buttress brick overlays.
- 20 pieces $\frac{1}{32}$ nd thick card 16 mm. long, 6 mm. wide. Buttress brick overlay sides lower.
- 4 pieces of $\frac{1}{32}$ nd thick card 112 mm. long, 16 mm. wide. Parapet brick overlay.
- 4 pieces of $\frac{1}{32}$ nd thick card 112 mm. long, 8 mm. wide. Parapet brick overlay, 2nd thickness.
- 12 pieces of $\frac{1}{32}$ nd thick card, 16 mm. long, 8 mm. wide. Buttress brick overlays, upper second thickness.
- 12 pieces $\frac{1}{32}$ nd thick card, 16 mm. long, 8 mm. wide. Buttress sides inside upper.
- 8 pieces of $\frac{1}{32}$ nd thick card, 8 mm. long, 5 mm. wide. Buttress sides outside upper.
- 16 pieces of $\frac{1}{32}$ nd thick card 8 mm. long, 5 mm. wide. Buttress sides outside upper, first and second thicknesses.
- 2 pieces $\frac{1}{8}$ th thick card 13 $\frac{1}{2}$ in. long, 5 in. wide. Bridge side.
- 1 piece of $\frac{1}{8}$ th balsa 13 $\frac{1}{2}$ in. long, 3 in. wide. Roadway.
- 4 pieces of $\frac{1}{8}$ th balsa 3 $\frac{1}{2}$ in. long, 3 in. wide. Intermediate spacing pieces.
- 2 pieces of $\frac{1}{8}$ th balsa 3 $\frac{1}{8}$ in. long by 3 in. wide. End spacing pieces.

- 8 pieces of 30 thou styrene sheet 112 mm. long, 6 mm. wide. Top and bottom girder members.
- 4 pieces of 30 thou styrene sheet 112 mm. long, 14 mm. wide. Girder spacing member.
- 32 pieces of 30 thou styrene sheet, 14 mm. long, 3 mm. wide. Girder vertical members.
- 2 pieces $\frac{1}{16}$ th in. card 13 $\frac{1}{2}$ in. long by $\frac{1}{16}$ in. wide. Inside parapet wall.
- 12 pieces $\frac{1}{8}$ th balsa wood 1 $\frac{1}{2}$ th in. long 16 mm. wide. Inside parapet wall buttresses.
- 2 pieces $\frac{1}{2}$ in. card 13 $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide. Pavements.
- 12 pieces $\frac{1}{8}$ th in. balsa wood $\frac{3}{8}$ in. long 18 mm. wide. Buttress capping stones.



Top: Next, the spacing pieces can be glued on to one of the sides. The two end pieces are glued on first, followed by shorter pieces. When glue has set the second side is added.

Above: The four styrene girders are positioned under the bridge parapet and joined by solvent such as Synthigoo. Construction of the girder begins with the upper edge having vertical pieces glued edgeways on followed by lower edge. Finally strengthening pieces are added on one side.

Left: After girders are glued, the inside parapet walls, pavements, buttresses and capping stones are affixed. The unit is then covered with brick paper, except for roadway, capping stones pavements and girders. Diluted black poster paint is used to give a 'weathered' appearance and girders painted with a flat grey oil paint.

