

MANUFAX

(REGISTERED TRADE MARK)

HANDBOOK OF INSTRUCTIONS

PRICE

2/6^{D.}



"MANUFAX" REAL MODEL CONSTRUCTIONAL ENGINEERING

INTRODUCTION

"MANUFAX" models are built with miniature laminated steel girders, true to $\frac{1}{8}$ " scale of the five principal standard girders used in engineering and are easily connected together in a simple manner by the specially designed clips. These clips are then locked in position by means of the hand-riveting tool provided for the purpose, thereby giving the models great strength and a most realistic appearance.

In the "MANUFAX" construction system there are NO NUTS, BOLTS, or RIVETS used, and there are no holes to drill. No special skill is required to build the models, especially if the instructions and the drawings are carefully followed.

Nearly every form of steel construction can be faithfully reproduced and many useful articles can be made with "MANUFAX."

The special tools required are few and easy to use, and each has been designed for its particular purpose. in the "MANUFAX" Model Construction System. Although "MANUFAX" designs are shown lock-mounted, this is not essential as the specially designed clips are sufficient to hold the model rigid, and if it is intended to dismantle the model later on, it is preferable to omit this operation. Only by actual building any of the many models can one realize the spirit of achievement and satisfaction derived from constructing with "MANUFAX."

MANUFAX

INSTRUCTION BOOK

REFERRING TO

THE "MANUFAX" REAL MODEL CONSTRUCTION ENGINEERING OUTFIT.

"MANUFAX" is a registered name, and "MANUFAX" Tools, Girders and Clips are fully protected by British and Foreign Patents.

CHAPTER I.

"MANUFAX" MATERIAL

Before proceeding to build a "Manufax" model, it is very necessary to be quite familiar with the raw material and clips used in its construction.

Engineers use five principal drawn steel sections or members (generally included in the single term "girders") for building the immense variety of structural works with which they have to deal. They are: the "H" Girder, the Channel, the Tee, the Angle and the Flat Bar. The Brace Section, as shown in Fig. 1 (6), is a special "Manufax" section. In addition to these sections, square and round, are also used.

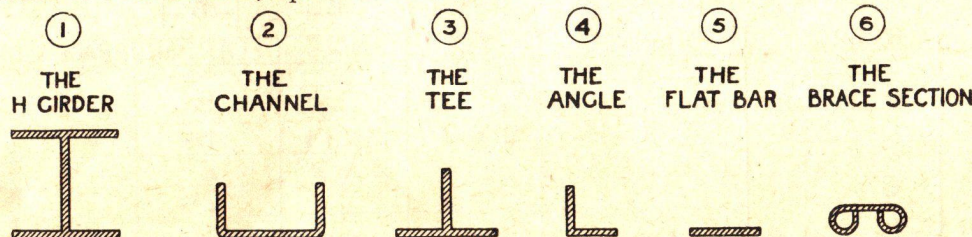


Fig. 1

The patent "Manufax" constructional sections or members (in future referred to as "girders" for short) are formed from thin gauge mild steel sheets, cut to size and then bent or folded into the desired shapes. By this means they form perfect true-to-scale replicas of the five principal girders used in engineering, and models built with them in the "Manufax" way are therefore faithful, true-to-scale copies of the actual structures as they would be built by engineers.

The Brace Section No. 6 shown in Fig. 1 is a special "Manufax" section which is used in addition to the five principal girders.

The "Manufax" girders are therefore:—

- (1) "H" Girder. (2) Channel. (3) Tee Bar. (4) Angle Bar. (5) Flat Bar. (6) Brace Section.

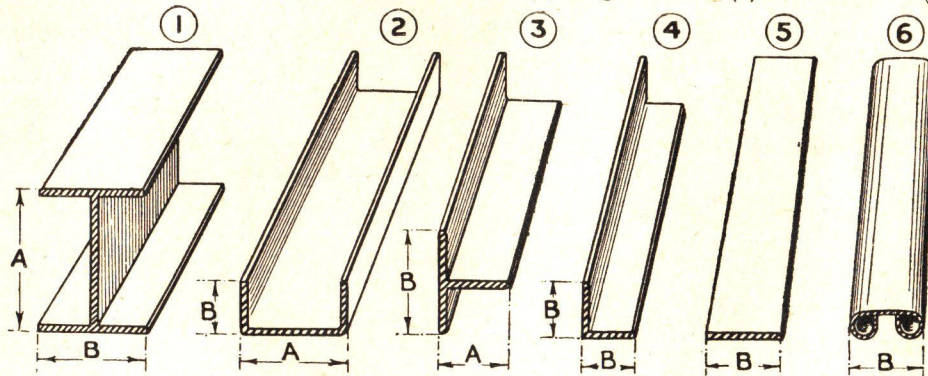


Fig. 1

	H GIRDER	CHANNEL	TEE	ANGLE	FLAT BAR	BRACE SECTION
	Dimensions	Dimensions	Dimensions	Dimensions	Dimensions	Dimensions
	A WEB B FLANGE	A WEB B FLANGE	A WEB B FLANGE	B FLANGES	B	B
G.1	3 X 3	3 X 1½	3 X 2	1½ X 1½	1½	2½
G.2	4 X 3			2 X 2	2	
G.3	6 X 3				2½	
					3	
TRUE 1/8" SCALE SECTIONS.						

As the names of these sections actually describe their shape, they can easily be identified.

It is usual to give a special designation to the different parts of the girders, so that, when referring to them, the exact way in which they are used is at once apparent.

Referring to the illustrations (Fig. 1).—Those parts marked "A" are called the "WEB," and those marked "B" the "FLANGE." The angle bar has only flanges, and the flat bar explains itself.

The "Manufax" girders are constructed to be one-eighth of the size of the standard sections used in ordinary engineering practice, and therefore models constructed with "Manufax" material are true to the scale $1\frac{1}{2}$ " to the foot.

"H" Girder.

Referring to (1) Fig 1.—This is a model 3×3 "H" girder and has a web $\frac{3}{8}$ in. deep and flanges $\frac{3}{8}$ in. in width, and is therefore one-eighth of a standard 3 in. \times 3 in. girder.

Similarly, the 4×3 girder has a web $\frac{1}{2}$ in. deep with flanges $\frac{3}{8}$ in. in width, equivalent to a 4 in. \times 3 in. girder to a scale of one-eighth.

The 6×3 girder has a web $\frac{3}{4}$ in. deep with $\frac{3}{8}$ in. flanges, equivalent to a 6 in. \times 3 in. girder to a scale of one-eighth.

The Changing dimension "A" refers to the depth of the web. The unchanging dimensions "B" to the width of the flanges. This applies to channel, tee and angle girder sections as well as "H" girders.

For manufacturing reasons, all the "Manufax" girder sections are, in the first instance, produced in the standard 14 in. "A" lengths only.

"Manufax" clips now about to be described, which are used to make the joints between the different members, are equally important and take an absolutely vital share in making the building of "Manufax" models practicable.

In engineering practice, the different members of a steel structure are joined together either by welding or by bolts, rivets or screws, and to accommodate these, holes must be drilled.

It is, however, not possible to use the former method for joining thin sheet steel, and the more usual methods of drilling holes, then riveting and bolting the parts together require such extreme nicety and skill to bring the holes into true alignment that they could not possibly be applied to building "Manufax" models.

By the invention of the special "Manufax" clips, however, this difficulty is entirely overcome, as, by their means, any joint required in structural engineering model building can be easily and quickly made *without the need for holes, bolts, rivets or screws, and yet* the "Manufax" joints are secure and correct in appearance.

The "Manufax" clips are likewise made of sheet steel of just the right gauge. Referring to Fig. 2—in which, as examples, simple socket and cross clips are shown, it will be seen that they consist essentially of a body or base part (A) with projections or lugs (B), so arranged that when the latter are bent or folded over the flanges or other suitable

parts of the girders being joined together, they can be firmly locked in position by the special **LOCKING TOOL** provided (see instructions in use of tools), which not only makes the joint rigid and secure, but gives it the appearance of being actually riveted.

Referring to the illustrated list of clips, Fig. 3 (pages 5 to 7), it will be seen that the special "Manufax" clips number 27, and for purposes of identification are designated by a number and name, in some cases in combination with figures, showing the size of the section to which they apply.

For example: No. 1— 3×3 is a socket clip to fit the 3×3 girder. No. 1— 4×3 is a socket clip made to fit a 4×3 girder.

"Manufax" clips are readily fixed in position by bending the lugs round the flanges of the girders and then lock-riveted if desired.

The clips, while temporarily held in position, can be moved and adjusted until located in exactly the right place, when they are permanently fixed by the "Manufax" patent **LOCKING TOOL** and the joint completed.

Should, however, a mistake have been made, the clips can be readily removed without damage to the girder in question, but a fresh clip is required for remaking the joint.

There are special "Manufax" bracket clips for all axles, spindles and shafting, designed to give a long bearing surface combined with rigid support; in addition, adjustable bearing brackets allow the axles, etc., to be set at any desired angle.

Measuring and Marking.

Nearly all "Manufax" Design Sheets illustrate models drawn to full size. To cut the "Manufax" girders for the particular part being constructed, place the girder over the drawing, mark off with a pencil or scribe the correct length required and cut with the snips; where a scale drawing is shown (in which case it will be clearly indicated on the drawing) use a rule to measure off the required lengths.

EXAMPLES OF CLIP CONSTRUCTION

SHOWING BODY OR BASE **A**
& PROJECTIONS OR LUGS **B**

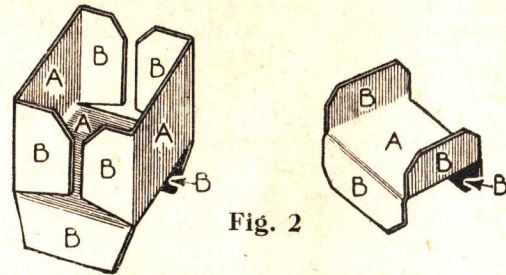


Fig. 2

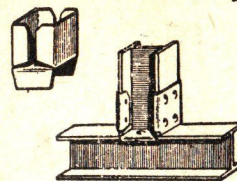
Before commencing "MANUFAX" Model Building read carefully the following instructions on the use of the Tools and make a few practice joints.

MANUFAX

CLIP NOS. & NAMES
SHOWING THEIR APPLICATION

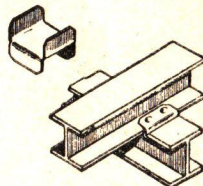
Fig. 3

☆ N° 1



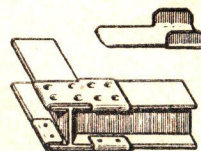
SOCKET CLIP 3x3.4x3.

☆ N° 2



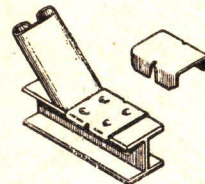
CROSS CLIP 2x2 3x3

☆ N° 3



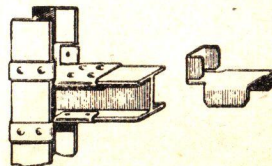
END CLIP

☆ N° 4



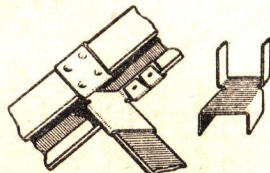
STAPLE CLIP

☆ N° 5



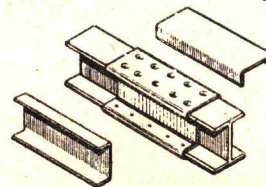
WEB CLIP

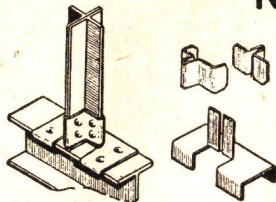
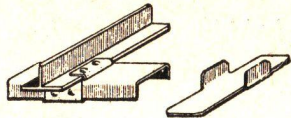
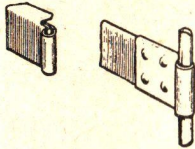
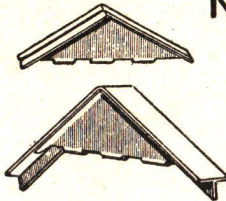
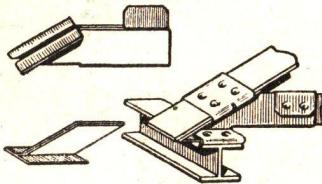
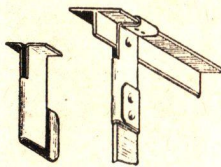
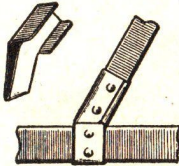
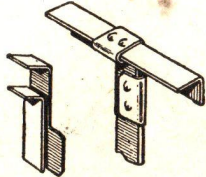
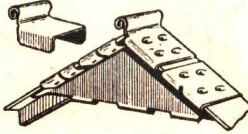
N° 6

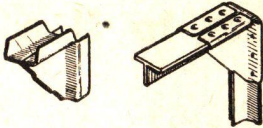
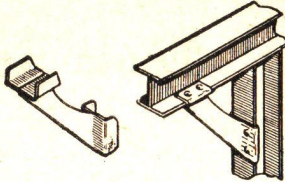
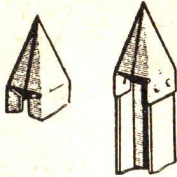
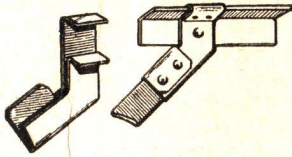
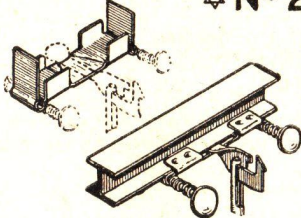
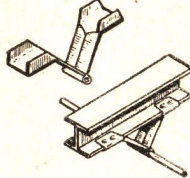
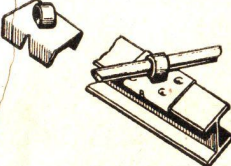
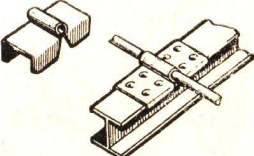
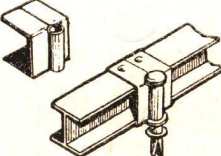


STAIR CLIP LH & RH

CAPPING CHANNEL N° 8

3x3.4x3.
N° 7 JOINTING CHANNEL

<p>N° 9</p>  <p>DOUBLE TEE CLIP</p>	<p>☆ N° 10</p>  <p>DOUBLE END CLIP</p>	<p>☆ N° 11</p>  <p>HINGE CLIP</p>
<p>N° 12</p>  <p>APEX CLIP</p>	<p>TIE BARHEEL CLIP N° 13</p>  <p>N° 14 TRUSS FOOT CLIP</p>	<p>N° 15</p>  <p>TEE CLIP 3/16. 1/4.</p>
<p>☆ N° 16</p>  <p>BRACE CLIP 3/16. 1/4</p>	<p>N° 17</p>  <p>ANGLE BARCLIP 3/16. 1/4.</p>	<p>N° 18</p>  <p>RIDGE CLIP</p>

<p>N° 19</p>  <p>BRACKET (INSIDE)</p>	<p>N° 20</p>  <p>BRACKET (OUTSIDE)</p>	<p>N° 21</p>  <p>FINIAL CLIP</p>
<p>N° 22</p>  <p>45° ANGLE BAR CLIP 3/16.1/4</p>	<p>☆ N° 23</p>  <p>COUPLING CLIP</p>	<p>☆ N° 24</p>  <p>ADJUSTABLE BEARING 5/16.7/16</p>
<p>N° 25</p>  <p>ANGLE BEARING</p>	<p>N° 26</p>  <p>HORIZONTAL BEARING</p>	<p>N° 27</p>  <p>SWIVEL BEARING</p>

CHAPTER II.

The Special "Manufax" Tools and How to Use Them

Introduction.

The tools will cut and shape all the "Manufax" girder sections to such sizes as will cover all the requirements for building a large variety of models.

In order therefore, to build a model to any desired design, it is necessary to cut and shape these lengths into the required number of parts of the exact length and form demanded by the particular design before they can be joined together by means of the special "Manufax" clips in order to complete the model. To enable these operations to be correctly and quickly made, the specially designed "Manufax" tools are supplied: SNIPS, MANDREL, FILE, PLIERS, LOCKING-TOOL, MEASURING AND MARKING GAUGE, SCRIBER, GIRDER CUTTER, HAMMER AND WORK BOARD.

The hammer and work board need no explanation, but it is strongly stressed that the work board is used at all times, as its surface is ideal in assisting in "Manufax" construction and prevents damage to the material and the table or bench top.

In the following pages a description of these tools is given with an explanation of their particular purpose and of the best way of using them.

The Special "Manufax" Snips.

The short, sturdy shape and special point of the blades enables very fine shaving to be cut from the edges of the flanges and brace bars, etc., without the blades springing apart, as they would in ordinary shears. Fig. 4 shows the edge of the flange of a 4×3 girder being trimmed to fit between the flanges of a 3×3 girder. Other uses for the snips will be illustrated under "'Manufax' Joints."

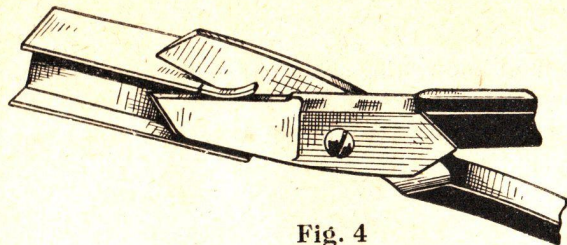


Fig. 4

The "Manufax" Mandrel.

This steel bar is for the purpose of tapping clips home on the girders. It is also for general use where hammering on a metal base is necessary, such as straightening girders, clips, etc. When tapping the socket-clips on the girders, as shown in Fig. 5 (A), care should be taken to strike a series of light blows with the hammer on the edge of the base of the clip only. When properly home, if daylight cannot be seen through the joints between the clips and the girder it is ready for lock riveting.

Fig. 5 (B) shows a clip incorrectly fitted and 5 (C) shows the clip as it should be fitted, ready for lock-riveting.

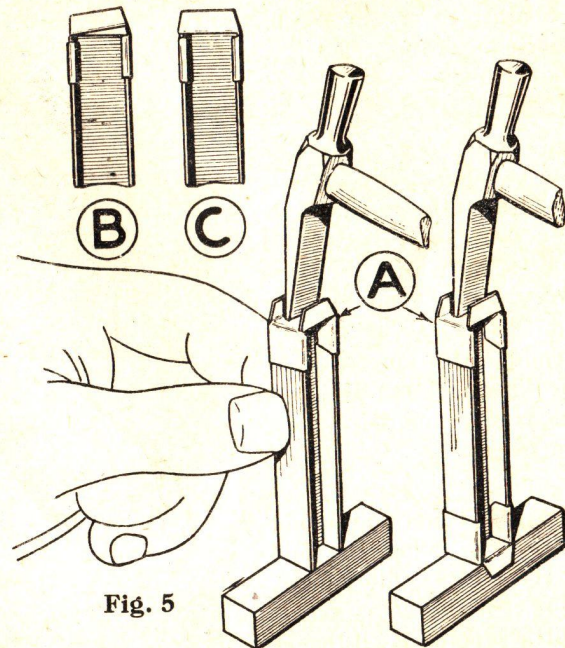


Fig. 5

File.

The file supplied is specially adapted for use on thin sheet steel and should not be used for any other purpose than "Manufax."

Instructions in Use of File.

Hold the girder in the left hand (with the end to be cut uppermost and resting against the edge of the bench or table, as in Fig. 6). Do not press the file hard against the edge of the girder, as this will tend to push the layers of sheet steel out of shape. If, however, this occurs, use the mandrel and hammer to smooth out again before continuing to file.

Files are made to cut only on the forward stroke (for example, when pushing away from the body), therefore rubbing it backwards and forwards with the same pressure only tends to spoil the file. Press lightly but steadily when pushing the file forwards, but take off the pressure on the return stroke.

If at first you do not succeed in filing the end of the girder quite square, do not let this worry you—a little practice is all that is necessary to enable you to obtain correct results.

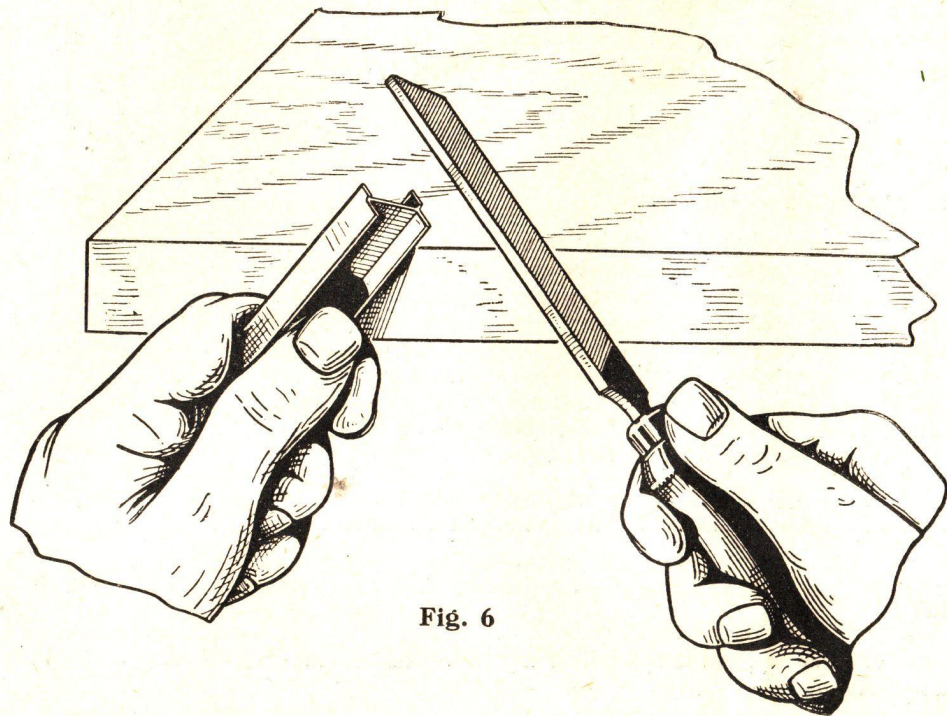


Fig. 6

After straightening the cut end of the girder with the hammer, hold the piece of girder vertically with one flange nearest the body, look along and over the cut edges, when those portions which require filing to bring them all to the same line will be at once apparent—or the marking gauge can be used for this purpose by placing its edge on the scribed line, then all portions above this require filing. In Fig. 7 an example of an incorrectly cut girder is shown. It will be seen that the high portions (A), (B) and (C) must be filed down to the level of the low portions (D) and (E) to make this end square, as per dotted line. Before doing so it is best to turn the girder with the edge of the flanges towards the body (see Fig. 8) and notice whether the web has been cut straight on the scribed line (A).

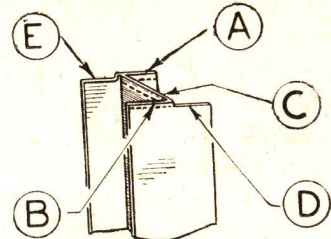


Fig. 7

The error in cutting has been greatly exaggerated in the sketch to show clearly what is to be looked over and corrected. If the web has been cut as shown at (B), Fig. 8, the part at (B) must be filed down and continued along the web until the scribed line has been reached and the girder is true in that direction.

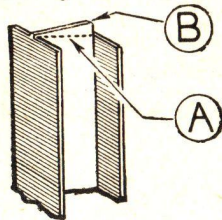


Fig. 8

Notice whether the flange at (E), Fig. 7, has been cut below the scribed line; because if so it must be left alone, as filing the remainder of the girder end down to that level would make the piece of girder shorter than the length required. Practising cutting off and truing up the ends is advisable before attempting to cut lengths for model building. It is time well spent and results in saving of material and faulty work at a later stage.

“Manufax” Pliers.

The “Manufax” pliers are flat-nosed and specially ground for “Manufax” work. Three alterations from the ordinary flat-nose pliers had to be made, i.e.: First, the jaws must be parallel the full length of the opening; second, the sides must be bevelled off; and third, the inside of the jaw must be smooth. The reason for these alterations will be given and appreciated when making the various clip joints used in model building. Like all other “Manufax” special tools, they should be used only for “Manufax.” The correct position in which the pliers should be held is shown at (A), Fig. 9, as this keeps the inside of the lug close against the edge of the flange.

Never use the pliers as at (B) as this will not bend the lug back over until it has formed a curve outwards, as shown at (D), and when this has been pressed flat it will leave the edge of the flanges some distance from the sides of the clip, as at (E). Not only does this spoil the neat appearance of the joint, but it reduces its strength and rigidity in every way. (F) shows the correct position of the sides of the lugs to the edges of the flanges; (C) shows the completed bend.

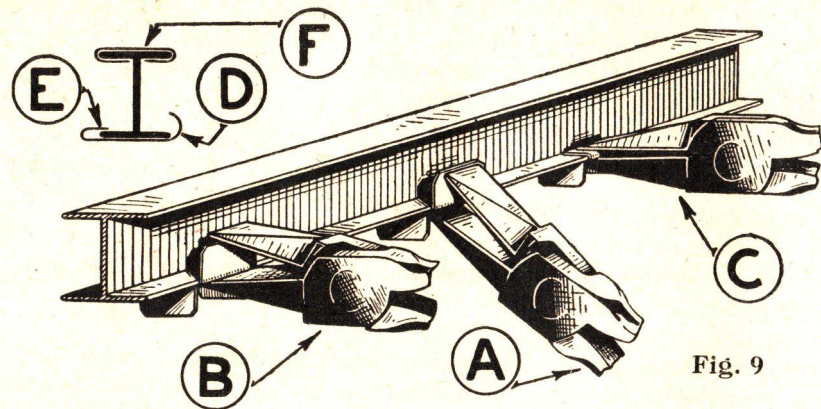


Fig. 9

The pliers are also used for flattening an end of the brace sections (rolled edge type) ready for insertion under the clips, also to remove pieces of the web off the tee-girders, by holding the nose of the pliers hard against the flange and work backwards and forwards until the piece breaks off.

The Special Locking Tool.

This really vital tool in the "Manufax" outfit not only gives a finished riveted appearance to the models, but by means of the specially designed indenting jaws it actually locks the several sheets of steel together and forms a firm, rigid joint. According to which way it is used (with the pin-jaw below or above) it forms the equivalent of either a snap-head rivet or a countersunk rivet.

A snap-head rivet is a rivet of which the head or uppermost part is half round and protrudes above the face of the girder or plate in which it is placed.

A countersunk rivet is the reverse ; that is, the head is level with or countersunk below the top face of the plate or girder. This latter method of riveting allows another girder either parallel or across to lie flat on the face of the riveted girder.

Locking.

When a clip is fixed on a girder or other section, there are always five or more thin sheets of steel to be indented with the locking tool. Examine the jaws of the tool and it will at once be noticed that the hole is larger in diameter and much deeper than the diameter and height of the pin. An enlarged view of the five sheets of steel is given in Fig. 10 (A) before, and in (B) after using the tool. The two upright black lines represent the edges of the hole in the one jaw, and the horizontal black lines the top of the pin in the other jaw.

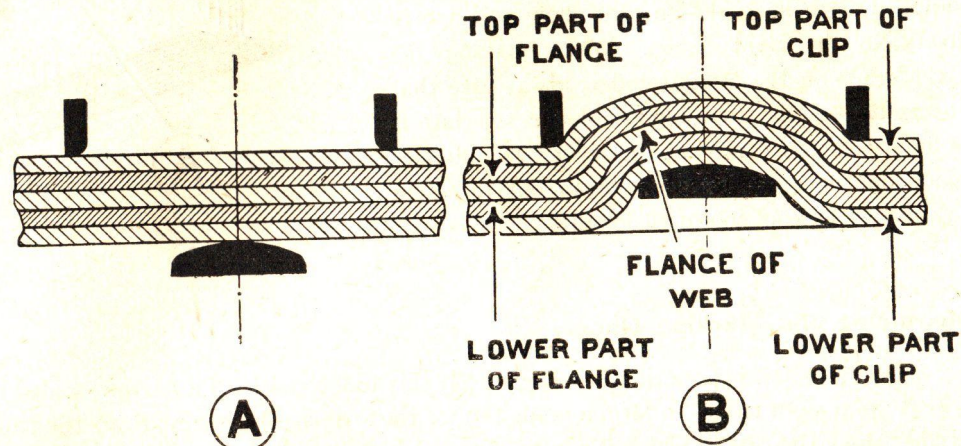


Fig. 10.

It will be seen at (B) that each sheet of metal has been stretched in the hole and pressed above the level of the surrounding parts, thus forming the "lock" with a rivet-shaped head. After the lugs of the clips have been bent under

and pressed tight with the pliers, the round point of the lower jaw is pressed against the web of the girder or tee section, see (A), Fig. 11, so as to bring the pin central in the half flange. Hold the locking tool at right angles to the girder or square with the side of the clip and squeeze the handle hard.

The illustrated and detailed instructions supplied with each design will show you where to make the rivet heads. When making the rivet heads on the opposite edge, always see that the centre of the round nose of the top jaw is in line with the centre of the rivet head already made on the opposite side. Clean out recess in top jaw of locking tool occasionally.

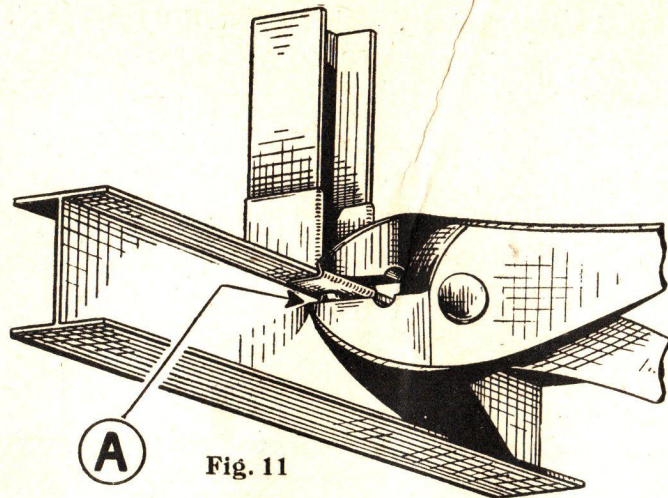


Fig. 11

Measuring and Marking Gauge.

Referring to Fig. 12, it will be seen that this tool consists of a narrow, scaled rule, 7 in. long, one end of which is bent up at right angles to form a guide (D) for the scriber (S) when marking the flanges. The bar (B) is constructed to slide along the rule to which it can be clamped in any desired position by means of the screw (A). The edge of the sliding bar face (C) serves as a stop. The other end of the rule is cut off at an angle of 45° —this is used for marking off right angle braces, etc., as will be explained later. As the lengths of "Manufax" material must usually be cut into pieces of certain definite measurements, it is essential to accurately mark the exact place where to make the cuts.

To Use the Gauge.

The ruled part of the gauge has a measuring distance of 7 in., which is exactly half the length of the standard pieces of "Manufax" material. In order, therefore, to measure off a greater length, *e.g.*, $11\frac{1}{2}$ in., it is only necessary to set the gauge to $2\frac{1}{2}$ in.—the mark on the girder will then, of course, divide it into two parts— $2\frac{1}{2}$ in. and $11\frac{1}{2}$ in. respectively.

To Set the Gauge.

Loosen thumbscrew (A), Fig. 12, by giving it a slight turn to the left—the sliding bar (B) can now be moved along the rule, and the front edge of the sliding bar face (C) be brought in line with the mark on the rule, which indicates the exact measurement required. Now turn thumbscrew to the right and clamp bar and rule together.

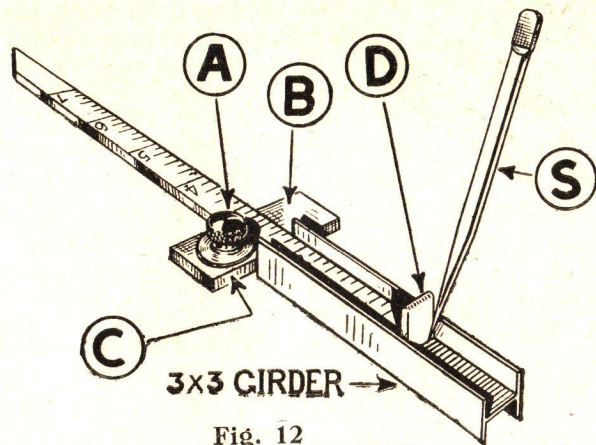


Fig. 12

The Scriber.

The Scriber (S), Fig. 12, scarcely needs a description. It is of the best quality tempered steel and must *on no account* be used for making holes or for any other purpose than "marking off." (It can, if necessary, be quickly sharpened by rubbing the point lightly on a piece of emery cloth.)

How to Mark Off.

It is supposed that an "H" section girder is to be marked, but the method is equally applicable to all other sections. Having set the gauge, lay the rule between the flanges of the girder, and while holding

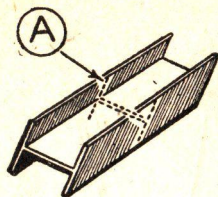


Fig. 13

In the case of the smallest girder, viz, the 3×3 , both inner flanges and the web can be marked at the same time, as the end of the gauge (D) is made to fit just inside the flanges of this size girder. In the case of the 4×3 and the 6×3 girders, however, it is necessary to first mark one inner flange and part of the web, and then to move the gauge

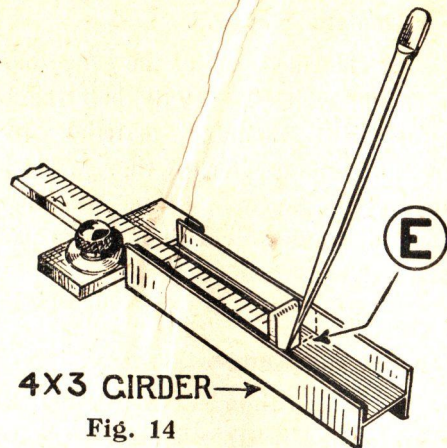


Fig. 14

across the web to the other flange and so complete the marking (see dotted line (E), Fig. 14).

The girder is then turned over and marked in a similar manner on the other side of the web and flanges. When there are several pieces to be cut of the same size, mark them all off as far as possible, at the same time with the same setting of the gauge.

Referring to Fig. 15. This shows how the marking gauge should be placed for scribing off the required length of "H" girder flange to be cut back to allow an "H" girder web to enter another "H" girder. The distance (A) must equal the depth of the side of the "H" girder measured from the web, as shown at (B).

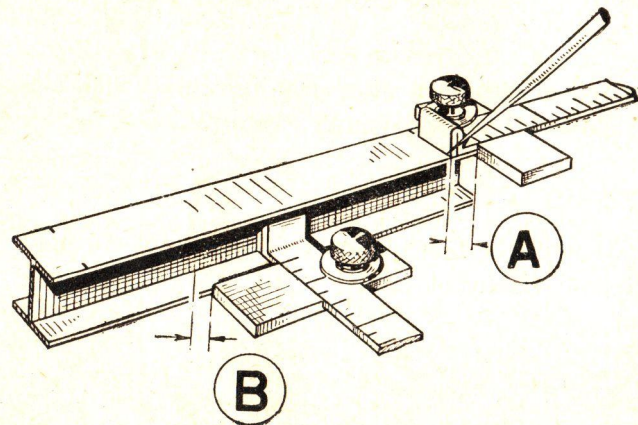


Fig. 15

The Special "Manufax" Girder Cutter.

Referring to Fig. 16, which shows a girder cutter diagrammatically in section, it will be seen that this tool is composed of a top cutting jaw having a sharp blade (C) and a lower anvil jaw (D) in which the blade has been ground quite flat. This arrangement is used to avoid the distortion of the metal, which would occur if two sharp jaws or blades were used, the top blade turning the cut edge downward and the lower blade turning the other side of the cut upwards, as shown at (A) and (B); a very undesirable feature which would entail much extra work to rectify. With a flat topped or anvil jaw, however, the cut end of the metal is left perfectly flat as at (E).

(C) is a sectional view of the cutting jaw after it has passed through the web of the girder, showing the curled edge of the piece cut off while leaving the end of the piece required resting perfectly flat on the lower jaw (D).

A little practice with this tool (provided the following instructions are carefully followed) will enable accurate square or angular cut ends to be made to "H" girders or any other sections.

Instructions in use of Girder Cutter.

When cutting girder or other sections, always hold the part required in the left hand, with the other end pointing away from the body (see Figs. 17 and 18). Pass the jaws of the tool along the web from the end of the girder with the cutting jaw on top [this is easily recognisable by being rounded and polished on top, Fig. 18 (A)]. Move the cutter along until the sharp edge is exactly on the scribed line, squeeze handles, and, if a 3×3 girder, as shown in Fig. 17, the entire web is cut through, leaving the end of the piece required quite flat. Withdraw the tool and slide off from either end.

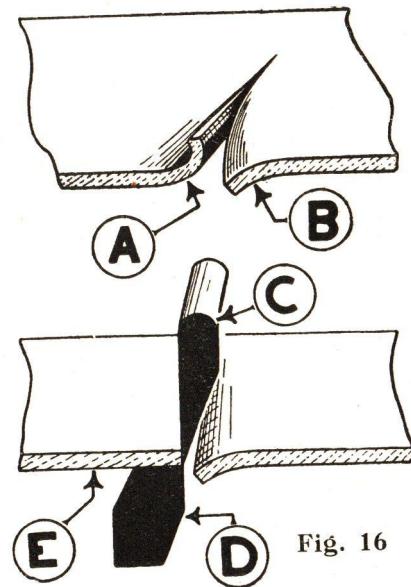


Fig. 16

To cut through the webs of the 4×3 and 6×3 girders, a slightly different but equally easy method is used. To cut the web of the 4×3 girder, proceed as with the 3×3 up to the point where the cutting edge is on the scribed line—make sure the heel (D) of the blade is close against the flange (1),

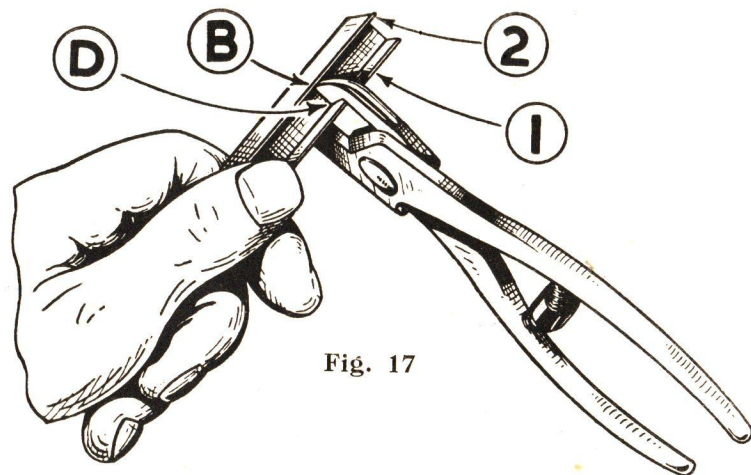


Fig. 17

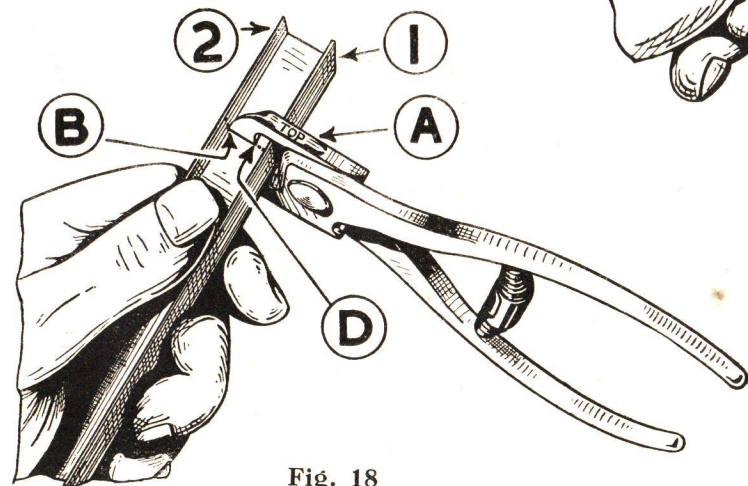


Fig. 18

Fig. 18. Make this cut, then open the jaws and push the tool forward until the point (B) of the jaw is against flange (2), Fig. 18. Make sure that the heel of the blade is in the part of the cut first made, and whilst holding it there make the extra cut by which the web is completely cut through along the scribed line. The web of the 6×3 girder must first be cut

from one side as just described for the 4×3 girder, and it is then withdrawn and reversed, so that the other flange now lies in the recessed neck of the jaws, and the cut the full width of the web is then completed.

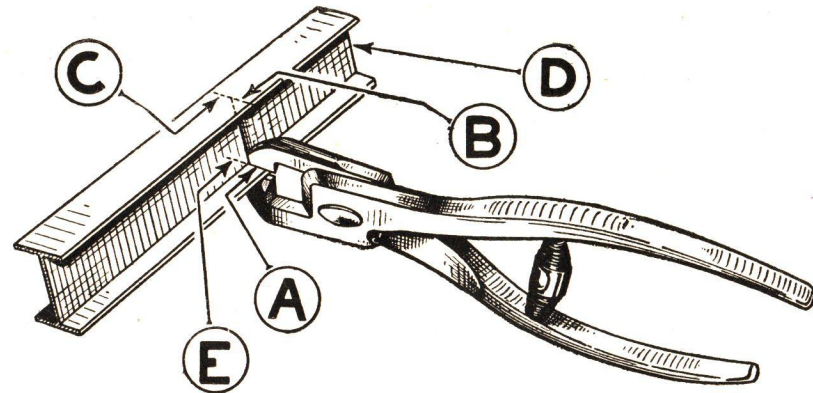


Fig. 19

The marked flanges, in the order (A), (C), (B) and (E), are next cut in the manner shown in Fig. 19. The end from (E) being the part required, is held in the left hand and the point of the top jaw of cutter is pushed into the cut slot in the web, as at (A), Fig. 19. See that the remainder of the top blade is in line with the scribed line before making the cut. When cuts (A) and (C) have been made, complete by cutting (B) and (E). These last two cuts can be made from the outside of the flange by bringing the point of the cutting blade in exact line with the previous cuts and holding the tool square with the side of the girder. Although the part (D), Fig. 19, may not be required for the actual model in hand, it should be kept for a possible future use. The cut end must be straightened on the anvil (See Fig. 20). After a little practice these cuts can be made so accurately that the piece will drop off as the last cut is made. At first, however, it is possible that the several cuts will not coincide and the two pieces will remain joined by a thin strand which has not been cut through—by bending one of the pieces backwards and forwards once or twice this is easily broken and the parts separated. The flanges can also be cut through (after the web is cut) with the special “Manufax” snips, the blades of this tool having been ground specially for work of a similar nature.

Special "Manufax" Anvil.

This tool is designed to accommodate all sizes and sections of "Manufax" girders, besides serving as an ordinary anvil.

Instructions in Use of Anvil.

The web should always be straightened first. Lay the anvil flat, grooved side upwards, and place the girder so that one flange is in the groove and the other flange on the outside of the anvil, as in Fig. 20 (A). The cut edge of the web must then be given light blows with the flat end of the hammer. The blows should only be of just sufficient strength to straighten the edge, as the metal would otherwise expand and the shape of the girder be distorted. After the web has been straightened, the anvil

is stood on its side and each part of the cut flanges is made flat by lightly tapping with the round end of the hammer. (See Fig. 20 (B).) When straightening the 6×3 girder web, the side of the anvil is used, as shown at (C), Fig. 20, flanges being straightened while in the same position.

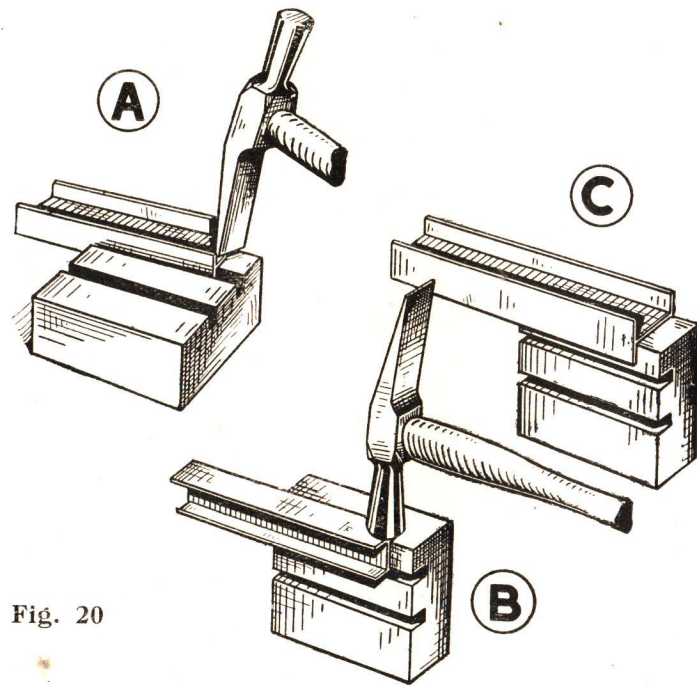


Fig. 20

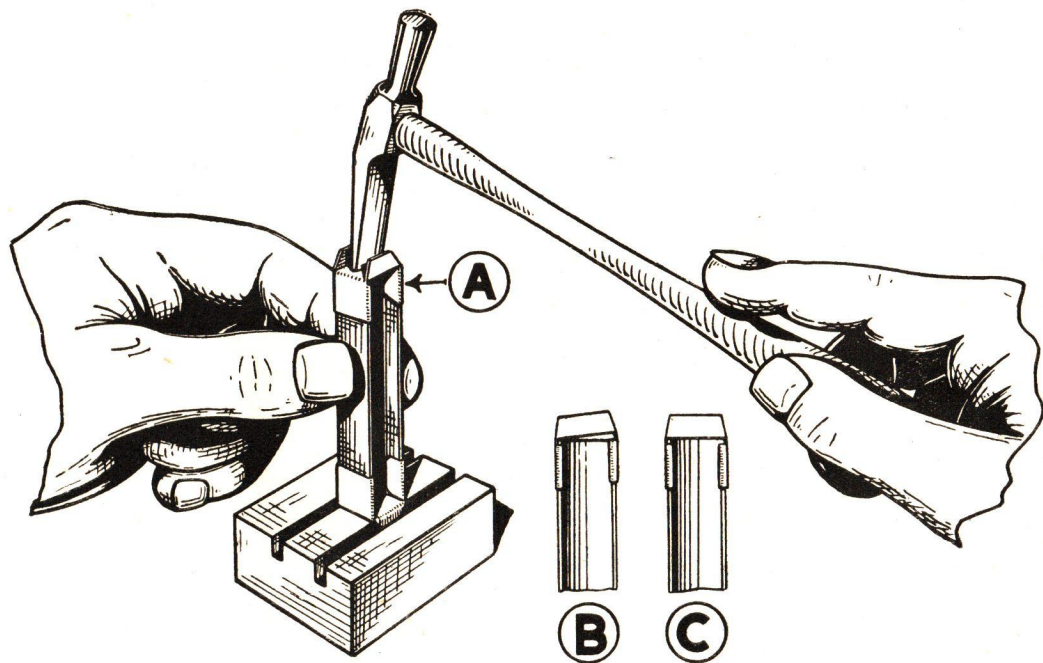


Fig. 21

Fig. 21 (A) shows the method of tapping the clips on to the "H" girder so that they form close contact with the ends of the "H" girder. Always tap lightly on the edge above the flanges with a series of light blows. (B) shows a clip incorrectly fitted; (C) shows a clip correctly fitted close to the end of the girder.

CHAPTER III.

"MANUFAX" JOINTS AND CONNECTIONS

It is strongly recommended that beginners commence by practising making clip joints, after which a few simple models chosen from our design sheets should be made. By doing this, material will not be wasted and a good knowledge of the "Manufax" system will be gained, before making the more advanced models. This chapter gives full details for fixing of clips, cutting and shaping of girders, etc.

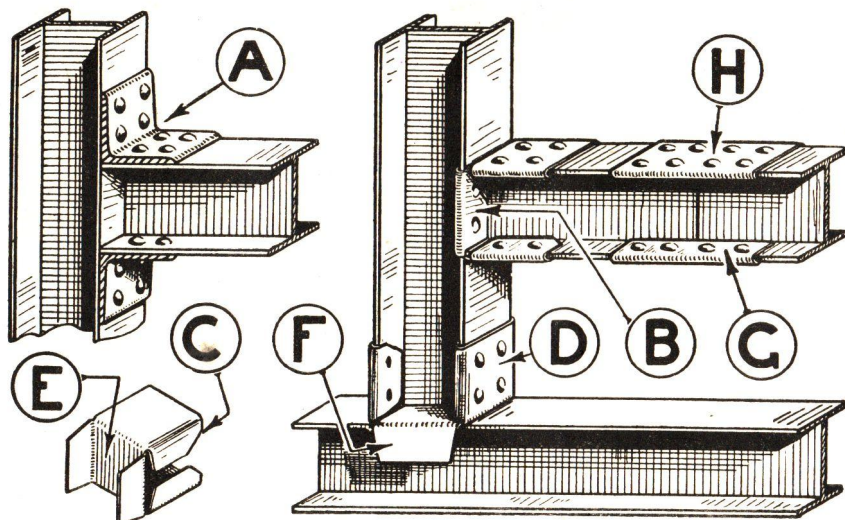
The strength and rigidity of "Manufax" Engineering Models is entirely dependent on the design of the special clips employed.

Every joint used in actual engineering practice has been carefully studied, and a "Manufax" clip has been designed to take its place.

No. 1 Socket Clip Joint.

The principal joint, known as a "socket joint," is one by means of which one girder is joined at right angles to another either in a vertical or horizontal position, and in actual engineering practice this joint (A), Fig. 22, necessitates the use of two angle brackets, drilling 32 holes and using 16 rivets.

To make this joint a No. 1 socket clip is used. See Fig. 23.

**Fig. 22**

The end of the girder is inserted between the four lugs of the clips (A), Fig. 23, which are then pressed inwards and closed tightly on the flanges as at (A), Fig. 5. If the girder is now held up to the light with the edges of the flanges towards the face, it will be seen that the base of the clip (E), Fig. 22, does not fit close to the end of the girder, and more often than not is at an angle as in (B), Fig. 5.

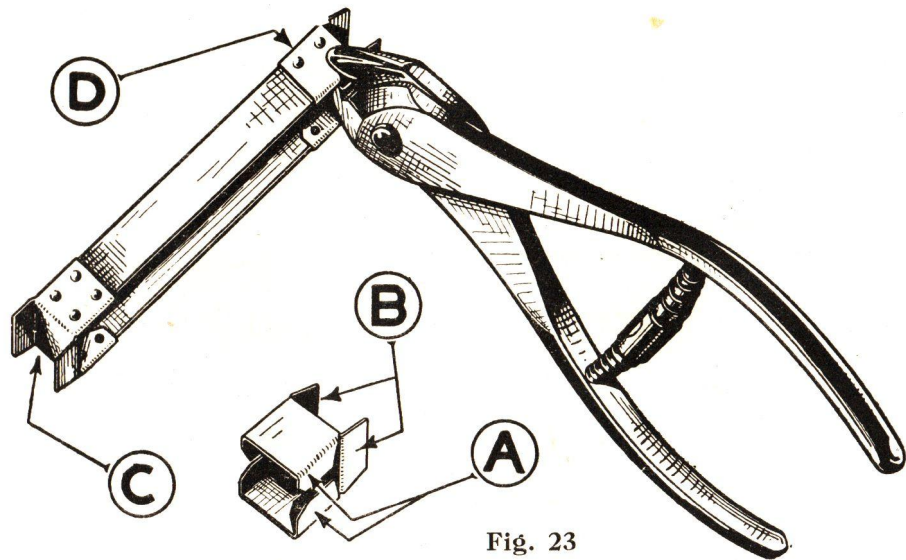


Fig. 23

When the lug has been pressed flat and tight to the flanges, stand the girder on end on the mandrel and then lightly hammer the edges of the base of the clip—see (A), Fig. 5—until the clip is in the correct position, as (C), Fig. 5. If a similar clip has to be fixed to the other end of the girder, this should be done after the top clip is properly bedded, by reversing the girder and repeating the operations.

Before joining the two pieces of girder together by means of the lugs (F), Fig. 22, the clips must be locked to each end of the girder by means of the

“Manufax” special Locking Tool. Fig. 23 shows this operation with end (C) completed and end (D) nearly finished.

To complete the joint, place lugs (F), Fig. 22, one on each side of the cross girder (crosswise) and bend them under the flanges. Do not press them too tight but enough to grip the flange. This will allow the girder to be moved

sideways by gently tapping the side of the clip with the hammer until the exact position on the cross girder is reached. When correct, tighten with the pliers as before and then lock inside the clip (as seen at (A), Fig. 11) on both sides of the girder.

In nearly every case the rivet heads should appear on the upper side of all flanges in a horizontal position (see (H) and (G), Fig. 22) as nearly every model will be seen either on or below the level of the eyes.

On vertical girders the rivet heads should generally show on the outside of the clips, as in (B) and (D), Fig. 22, but occasionally they have to be made on the inside to allow another member of the structure to butt close against the upright girder. This, however, will invariably be stated when necessary, in the instructions given with each "Manufax" design.

No. 2. Cross Clip Joint.

This clip is used where it is necessary to cross one girder over the top of another, or rest the end of a girder on the top of another (see Fig. 24). The lugs (B), Fig. 24, are first bent under the flange of the lower girder (but *not* locked), as at (A), Fig. 24, and when both clips are in position the top girder is laid between the two pair of upright lugs, as at (C), Fig. 24. These are then pressed over slightly with the thumb or nose of the pliers and afterwards completely flattened by pressing from each corner with the pliers, as shown at (E), Fig. 24.

The locking is also done from each corner, as shown at (F), Fig. 24.

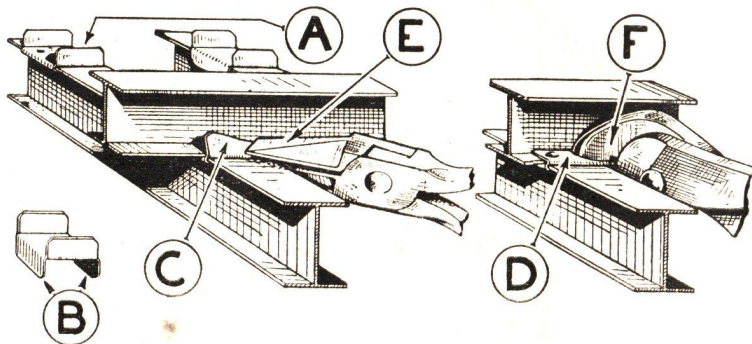


Fig. 24

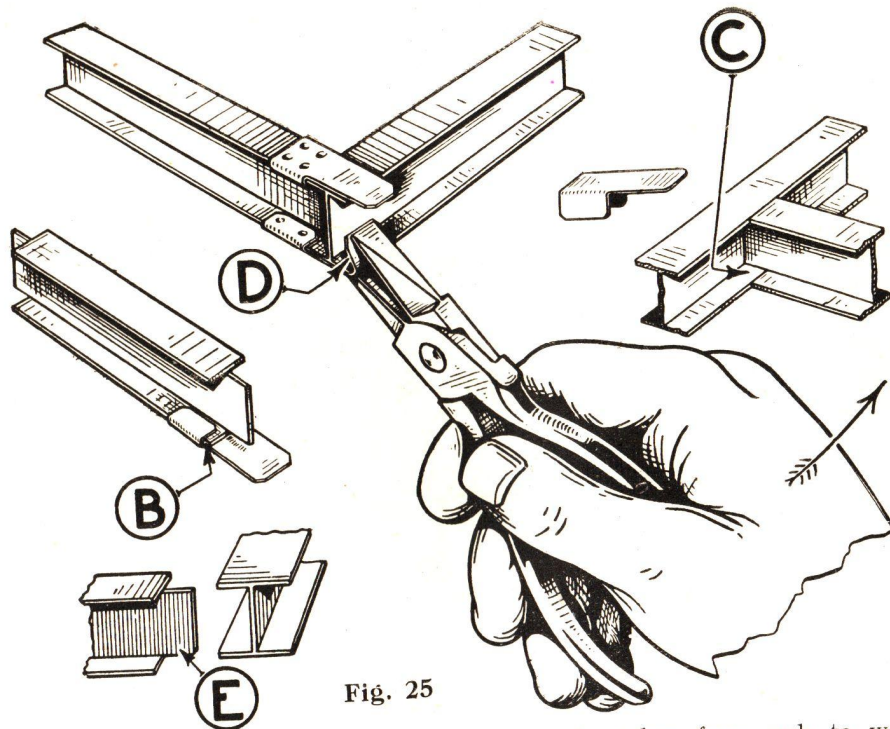


Fig. 25

for the cross-girder, the measurement must be taken from web to web. To fit a cross-girder, a portion of the two flanges at each end must be removed (see (E), Fig. 25) to allow the web part to pass between the flanges of the main girder. The pieces of flange cut away must be equal to the distance of the edge of the flange from the web, that is, the tongue of one girder must fit into the side section of another girder. To do this, after marking

There are several other purposes for which the clip is employed, such as fixing the top end of angle braces to beams, etc., and these will be illustrated and described in the various designs in which they are used.

No. 3. End Clip Joint.

This clip is used when the end of the web of one girder has to be butted at right angles against the web of another girder, either at a corner or at any part along the length of the girder (see Fig. 25). Floor joists in buildings and cross bearers in bridges are often let into the main girder in this manner. When measuring for the length required

off the distance on both sides at each end, cut through the flange from each side with the snips, keeping the point of the snips close up to the web while making the four cuts. Bend each end up (with the pliers) as shown at (A), Fig. 26, and then squeeze together with the pliers, as at (B), Fig. 26. Treat both ends of the girder in a similar manner.

On each turned up and flattened end there are two slight grooves, (C), Fig. 26 (caused in the manufacture), and these act as a guide to show where the next cuts are to be made. Make these cuts with the snips just inside the grooves in a line with the inner sides of the flanges and if the small pieces are not entirely separated from the web, move with the pliers by wriggling until they give way. Hammer flanges flat on mandrel and if necessary file the edge of the flange (D), Fig. 26, smooth where the small piece was broken off.

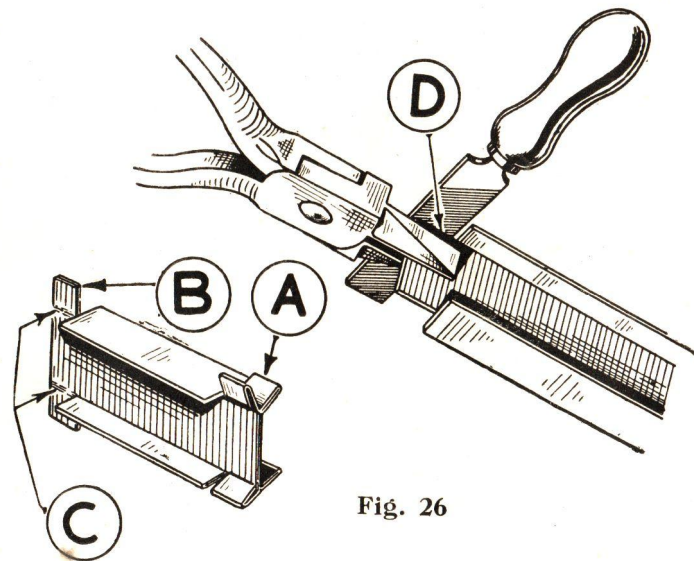


Fig. 26

Try the end between the flanges of the other girder, and if too large, file the edges on both sides until it fits neatly and squarely in between the other flanges, as at (C), Fig. 25. When filing, always hold the flange with the pliers, as shown at (D), Fig. 26; for clearness of illustration a gap has been left between the pliers and the file; in actual practice the pliers should be as close as practicable to the file, and thus act as a guide for the file. A very little practice will enable anyone to carry out this important part of "Manufax" model building in much less time than it has taken to describe the method.

Two No. 3 clips must now be fixed to the cross-girder. The edge of the lugs on the clip must not reach past the end of the flanges but should be back a little (about 1-32 in.), as at (B), Fig. 25. Each clip should be fixed tight with the pliers as it is placed in position. When joining the two girders, keep the end of the one web pressed tightly

against the other web, and while holding them together bend the front end of the clip over the edge of the flange. This is done by holding the end in the pliers, with the front edge of the bottom jaw pressing against the flange and pressing the handles downwards, so that the flange acts as a fulcrum—see (C), Fig. 27. This action simply makes the start of the bend, and it is then necessary to continue the bending movement by pressing the edge of the lug over with the end of the pliers, at the same time keeping the top clip in contact with the girder by pressing with the thumb of the other hand. (See (A), Fig. 27.)

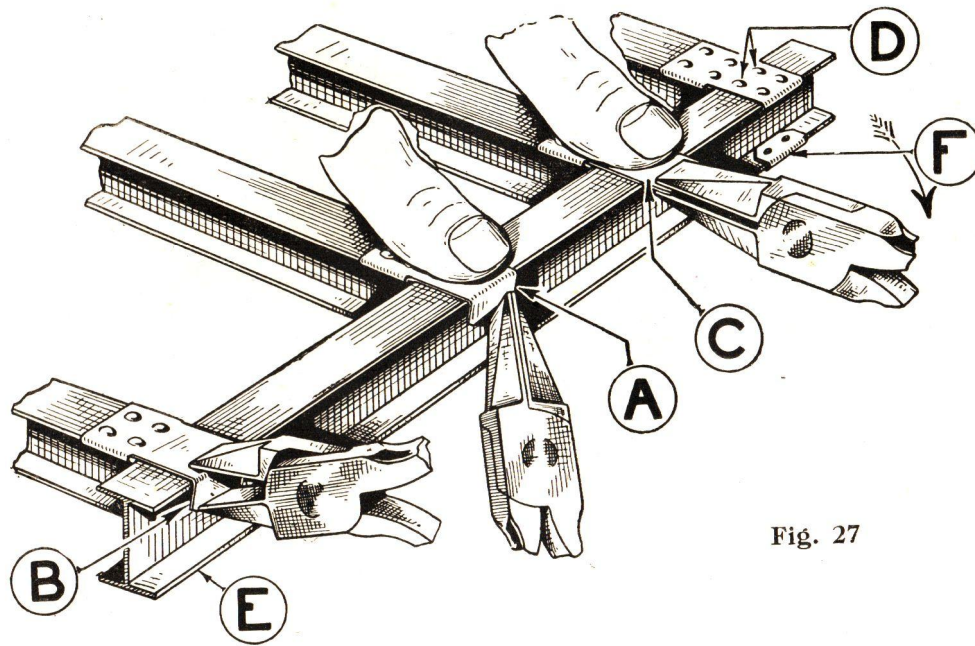


Fig. 27

When the lug has been bent to a right angle (more or less) it can then be closed with the pliers—always remembering the position in which the pliers must be held. (See (B), Fig. 27.) Treat the underside clip in a similar manner, and when both are tightly closed with the pliers, see that the girder is in its correct position. If not, lightly tap the side of the flange (top and bottom) until correctly placed.

The rivet-lock at (D), Fig. 27, is put in from the angle in the same way as for the No. 2 cross clip (F), Fig. 24.

If the bottom flange of the girder (E), Fig. 27, forms the base of a structure, see that the countersunk side of the rivet-locks are on the underside (F), Fig. 27, otherwise the girder will rest only on the heads of the rivet-locks.

No. 4. Staple Clip Joint.

This clip needs but very little explanation. It is used for fastening any flat section either to the inner or outer sides of the flanges. One illustration, Fig. 28, will suffice to explain its method of use. Angle struts or braces connecting the ends of the top and bottom members of a lattice girder (as used in bridge and other structures) are easily coupled up with this clip. (A), (B) and (C), Fig. 28, show the different positions in which it may be fixed. (B), Fig. 29, also shows another of the many joints in which it is used. Both the No. 12 apex clip and the No. 15 tee clip are also finally locked in position with No. 4 staple clips.

Further reference will be made to the staple clip in connection with other joints in this series.

No. 5. Web Clip Joint.

This clip is used when joining cross-girders at right angles to a column girder. In this case the sides of the *flanges* must be cut so that the end of the horizontal or beam girder can enter between the flanges of the upright or column. Fig. 29 shows the position of the girders when joined with No. 5 web clips.

A column girder is the upright or vertical girder, the bottom end of which (in a building) rests on the foundations, the top end of which supports the roof. The beam or horizontal girders are those girders which support the floors and form connections between the column girders.

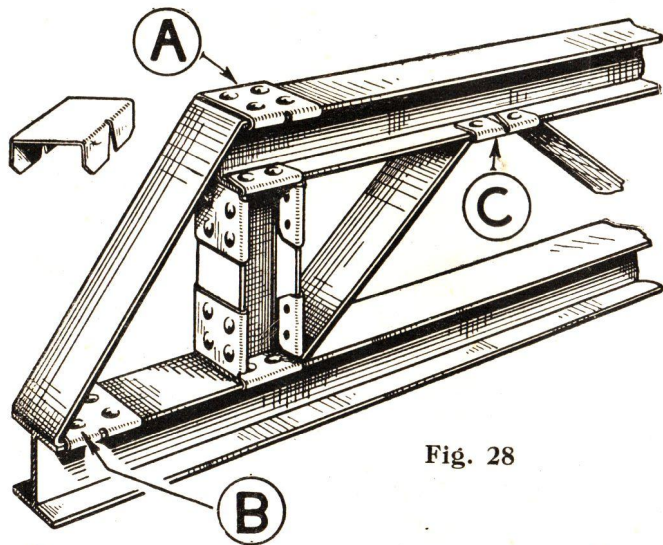


Fig. 28

This joint repeatedly occurs in constructional engineering, *e.g.*, at the outside corners of the framework, where the two sides meet at right angles, and when floor and roof beams cross at the junction of a column.

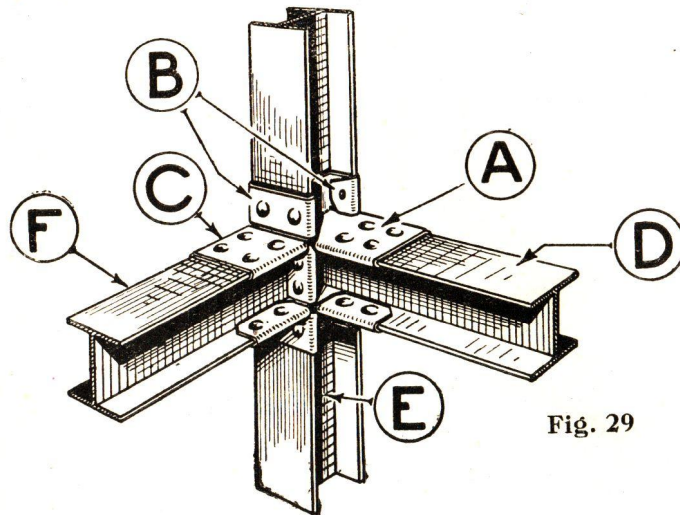


Fig. 29

Fig. 29 shows a structural steelwork corner, where the two horizontal girders (D) and (F) are joined to the corner column (E). Girder (F) is joined up as previously explained with a No. 1 socket clip (as in (B), Fig. 22) and girder (D) with No. 5 web clips, thus bringing the top flanges of both girders on the same level. When the girders have to extend on all four sides of the column (as for the centre support of a floor) the joints described above are duplicated on the other two sides of the column.

When making either the corner or central joints referred to above, always make the No. 1 socket joints first and lock in position before making the No. 5 web joints.

As with No. 3 end clips, where the web is cut to fit between the flanges (see Fig. 25), the overall length or span of the cross-girder is measured between the webs of the two columns or girders between which it is to be fitted.

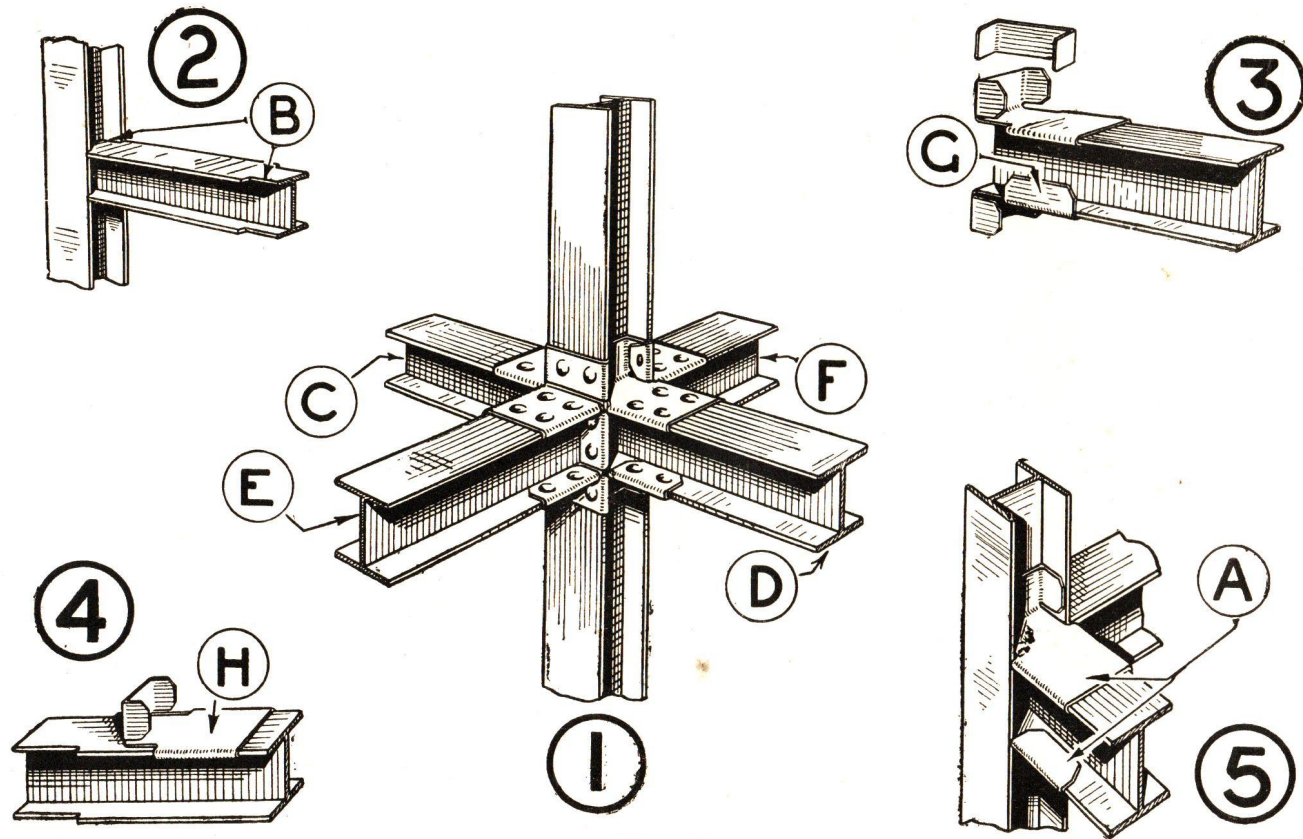


Fig. 30

Before the girder flanges can enter between the flanges of the column, it is necessary to cut away a small portion of the flange on each side, see Group 2 (B), Fig. 30. The length of the piece to be cut away is equal to the depth inside the flange of the column girder, and the depth on each side is equal to the thickness of the flanges. Mark off this distance, then small nicks or cuts about 1-32 in. deep should be made with the point of the snips at each side and exactly on the line.

"Manufax" girder flanges are about 1-32 in. thick, so this amount must be cut off each side from the end up to the side cuts already made. After making the cuts, the ends of the flanges must be straightened on the mandrel.

Try the ends in between the column flanges, and if too large, file lightly on both sides until the end of the girder fits freely in the column. Two No. 5 web clips are required to make the joint, one on each flange of the cross-girder, as shown in Group 3, Fig. 30. The lugs (G), Group 3, are closed lightly over the flanges but must not be pressed tight or locked, as it is necessary to move the clips when fitting the cross-girder to the column.

Slide the clips back from end of girder, as at (H), Group 4, Fig. 30, and fit the girder ends in position on the column. Then slide the clips forward until the upturned ends are completely inside the flanges of the column and touching against the web, see (A), Group 5, Fig. 30. Slight vertical adjustments can now be made by tapping lightly with the hammer until the exact position is reached.

The web clips are held in position by No. 4 staple clips cut in half. These staple clips should be halved at the centre with the snips, see Fig. 34, one cut being necessary. The halves should then be laid on the mandrel and the edges flattened.

Four halves are required for each joint, either for the single girder to column, as shown at (D), Fig. 29, or for two girders to column, as shown at (E, F), Group 1, Fig. 30.

The staple clips are placed on the outside of the column flanges and the lugs bent inwards to close over the small lugs of the upturned ends of the web clip, see (B), Fig. 29. Press tight and rivet lock in position.

The lugs on the girder part of the web clip (G), Group 3, Fig. 30, can now be closed tight and rivet locked, thus completing the joint.

When opposite girders have to be attached to a column, as at (E) and (F), Group 1, Fig. 30, both girders must be correctly placed in position before rivet locking with the half-staple clips.

No. 6. Stair Clip.

This clip, though primarily designed for fixing stair-treads, is used for several other purposes. A description of its primary purpose will, however, be sufficient to demonstrate how the joint is made, and provide sufficient information to enable its use under other conditions, as shown in the "Manufax" designs.

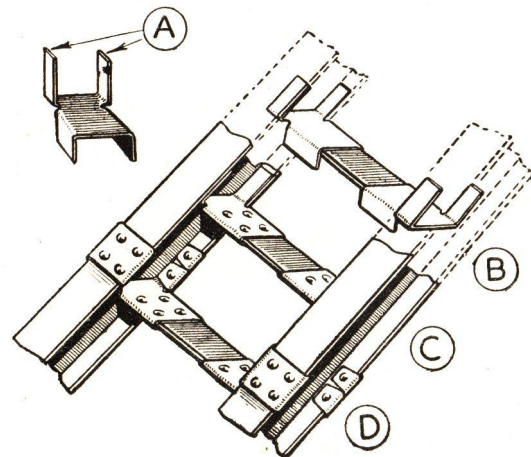


Fig. 31

As will be noticed, the only real difference from the No. 5 web clip is in the upturned end (A), Fig. 31.

In the web clip, the two side lugs are joined to a back piece which fits against the web of the column, whereas in the stair clip the side lugs are only in contact with the flanges of the column or other girder.

This enables the clip (by bending the lugs sideways, as at (B) and (C), Fig. 31), to be placed at any angle between the flanges of a girder or channel. The pitch of the stairs can thus be arranged to suit the structural building being erected. Four full-size No. 4 staple clips are used to clamp and lock the stair clip in position on each side, as shown at (D), Fig. 31.

No. 7. Jointing Channel and No. 8 Capping Channel Joint.

The jointing channel is a piece of channel 2 in. long and of three different widths shaped to fit inside the flanges of the 3×3 , 4×3 and 6×3 "H" girders. Two pieces of jointing channel and two pieces of capping channel No. 8 (each 2 in. long) are required in conjunction for securely joining two lengths of "H" girder end to end.

Fig. 32 (A) shows the two pieces of jointing channel placed in each side of the "H" girder, and (B) shows the finished joint with the two capping pieces securely locked in position.

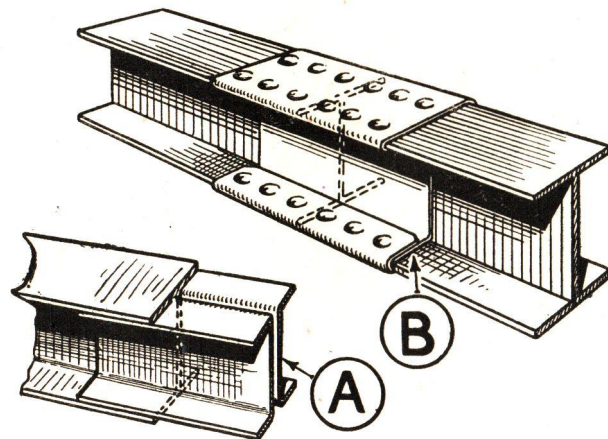


Fig. 32

No. 9. Double Tee Clip Joint.

This joint has a number of useful applications. It is employed when connecting an "H" section girder to a tee girder by means of two tee girders placed back to back, as in Fig. 33 alternatively making a connection in the

same manner between two "H" girders or two tee girders. In making any of the above joints, all three pieces of the clip are used. The base plate (B) with lugs, see Fig. 33, for fixing on to the web of the "H" or tee girders as the case may be, and the two tee clips (D) and (C) are placed round the tee girders, the projecting lugs on (C) being folded over the lugs on (D) and rivet-locked when in position through the upright lugs of (B).

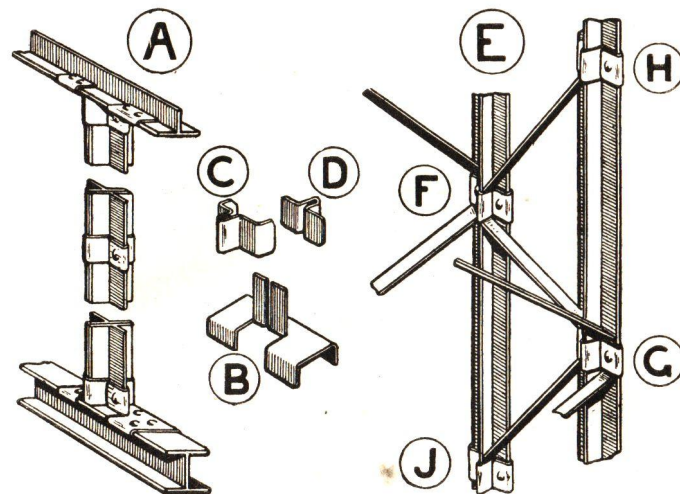


Fig. 33

Illustration (E), Fig. 33, shows a lattice girder construction. This can consist of two or four parallel tee girders (for clearness of illustration only), two are shown on Group (E), Fig. 33. (F), and (G) show how the joints are made using only the two small tee pieces, (C) and (D) of the No. 9 double tee clip, making a double lattice. (H) and (J) show the single lattice construction.

No. 10. Double End Clip Joint.

Fig. 35 (A) shows a No. 10 double end clip in position and fixing a tee girder at right angles to a channel girder.

The long lugs (B) should be bent down at right angles and then turned round and up inside the channel girder. The shorter lugs (C) are clamped down over the flanges of the tee girder, as in Fig. 35 (A). The exact position of the

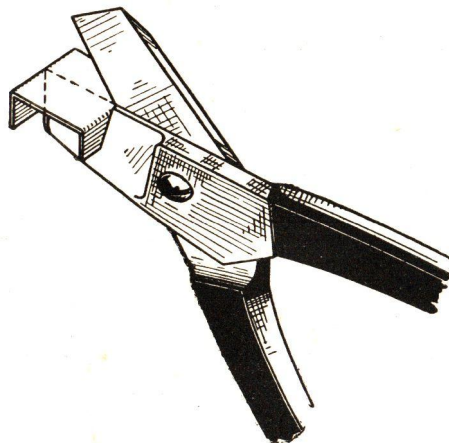


Fig. 34

No. 10 double end clip is shown with the girders dotted in. An "H" girder can be connected in the same manner in place of a tee girder should it be desired. Fig. 35 (D) shows a double end clip fixed on a flat strip to form a fence section, etc. The short lugs (C) are bent round the vertical flat strip. The two narrow horizontal strips are placed under the ends of the double end clip and distanced by the centre of the double end clip. Two half No. 4 staple clips, one each end, are then placed up against the cross strip and the whole is lock-riveted in the desired position.

No. 11. Hinge Clip Joint.

Fig. 36 shows an example of gate construction in which are used four No. 11 hinge clips. In application (A) the lugs on (C) are bent round the flat horizontal bar. In application (B) the lugs on (C) are bent up flat, placed on the face of the web of the "H" girder and held in position as in assembly (B) by two half No. 4 staple clips.

In assembly (D) the one end of the flattened hinge clip is locked in position by the No. 1 socket clip.

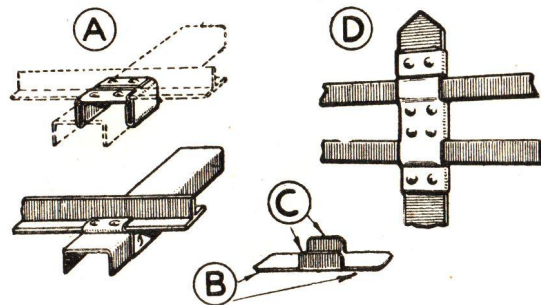


Fig. 35.

No. 16. Brace Clip Joint.

The brace clip is used when joining the flat bars at an angle of 60 degrees. Fig. 37 (A) shows this application, and (B) the completed joint.

No. 23. Coupling Clip Joint.

Fig. 38 shows the application of the No. 23 coupling clip. This clip has only one use, that is, to fit the buffers and coupling to a railway truck. The clip is supplied complete with the buffer and coupling fittings.

In fitting the coupling clip, first place the two buffers with the springs in the loops of the clip facing in the same direction as the wide end of the recess to take the coupling, then bend down the two lugs (A) flat. Place the

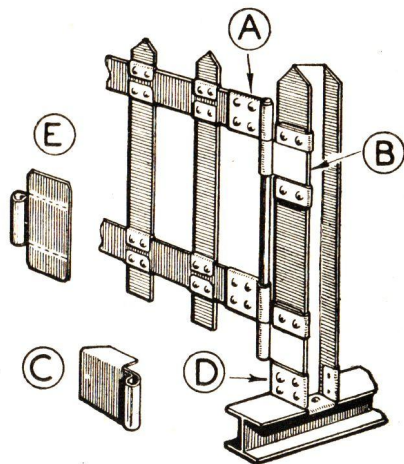


Fig. 36

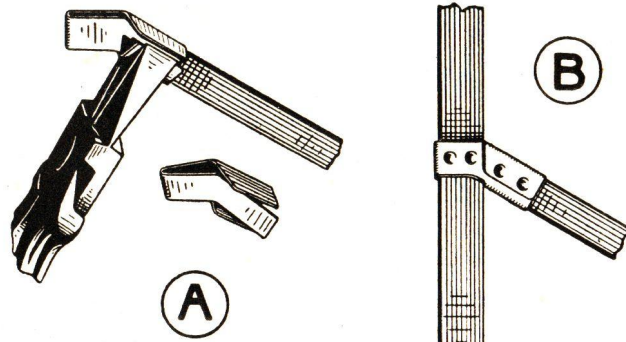


Fig. 37

coupling in the recess with the hook facing in the same direction as the buffers. Apply the complete clip assembly to the face of the flange of the "H" girder to which it is to be fitted. Bend over and lock-rivet the lugs (B) on to the flanges of the "H" girder in the usual manner.

No. 24. Adjustable Bearing Joint.

Fig. 39 shows two No. 24 adjustable bearing clips in position on two parallel "H" girders supporting a cross shaft on which are mounted two pulleys. If required, only one pulley need be mounted on any part of the shaft. The adjustable bearing clips also serve to mount railway wheels in the same manner.

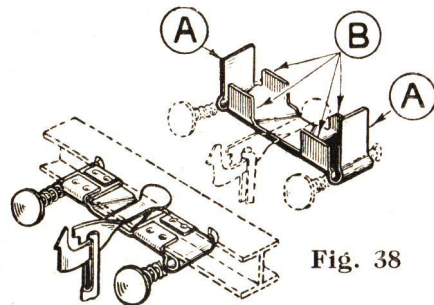


Fig. 38

The adjustment of the bearings being in the distance (A), the greater (A) is, the smaller (B) will be. This adjustment is effected by bending the two side arms of the bearing to the required angle.

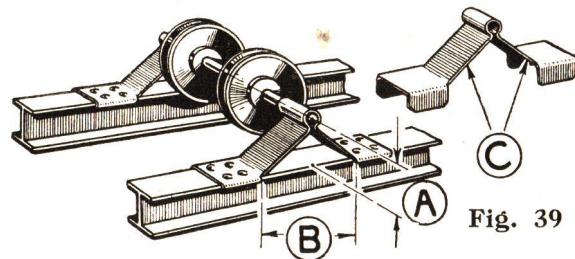


Fig. 39

“MANUFAX” ROOF JOINTS.

No. 12. Apex Clip Joint.

No. 13. Tie Bar Heel Clip Joint.

No. 14. Truss Foot Clip Joint.

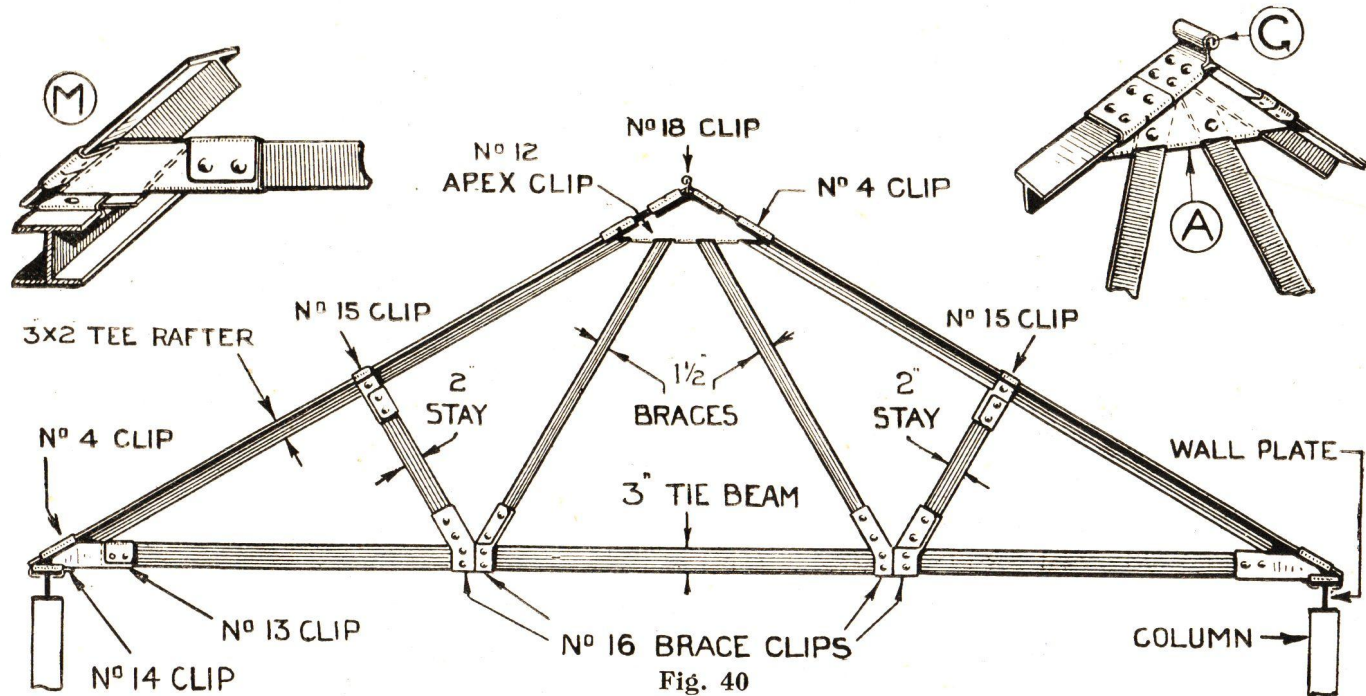


Fig. 40

Fig. 40 illustrates the complete ordinary roof truss and also gives the names of the different members of which the roof framework is composed.

Referring to Fig. 40 (A), it will be seen that the No. 12 apex clip is used for joining the two rafters of a roof at the angle where they meet at the top (ridge) of the truss. Unlike most of the other clips, it is used only for this purpose.

As will be seen, the No. 12 apex clip forms the junction of two tee rafters (one on each side of the roof), the web of each rafter being cut at an angle to allow the flanges to meet at the top. If the length of the rafter is 7 in. or less (the standard length of the girder being 14 in.), the two sides can be made from one length of tee girder by cutting a triangular piece from the web and folding at the point, as at (B) and (C), Fig. 41. To obtain the correct angle for cutting, scribe a line on the face of the flange with the gauge set to the length of rafter required. Then lay the web of the tee in the side opening of an apex clip, see (B), Fig. 41, so that the scribed line on flange is just visible at the top corner of the clip. Scribe line on the web and turn the clip so that the web lies exposed on the other side of the clip. See that the line on the flange is again visible on this other side and again scribe line on the web, thus completing the angle of the piece to be removed.

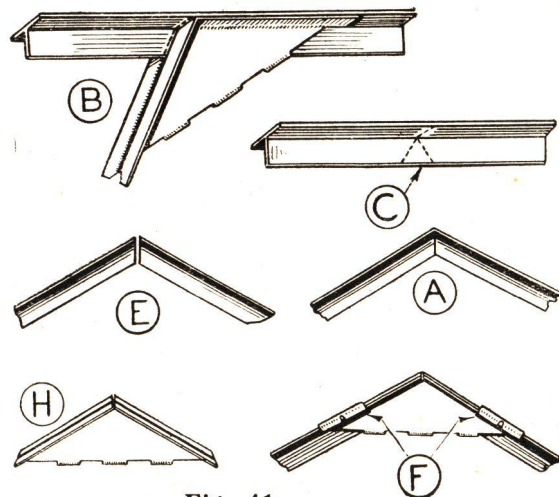


Fig. 41

This small triangular piece (C), Fig. 41, must now be cut out with the snips and the cut edges straightened on the anvil.

The length of each rafter having been decided, marked off and left square at the lower ends; these ends must now be cut to the angle which will allow the beam to fit up to the rafter. This angle is marked off from a No. 13 tie bar heel clip, as at (D), Fig. 42.

If the length of the rafter is greater than 7 in., then two separate pieces of the girder must be used for the truss. The end of each girder must be marked off from the apex clip as before and the two ends butted together to form a close joint at the ridge, as at (E), Fig. 41. The apex clip is held in position with two No. 4 staple clips (F), Fig. 41. In most cases, one clip each side only will be required, thus allowing space for the No. 18 ridge clip, as described later on, to be attached at the end of the rafter at (G), Fig. 40.

Fig. 41 (H) shows the apex clip before it is placed in position to joint the two cut rafters, as shown at (E), Fig. 41, or on the whole bent rafter as shown at (A), Fig. 41.

The No. 13 tie bar heel clip (see (J), Fig. 42) is used for joining the rafter to the tie beam and at the same time also forms in conjunction with the No. 14 truss foot clip (see (K), Fig. 42), the means of connection to the top of the column or wall plate, as shown at (M), Fig. 40.

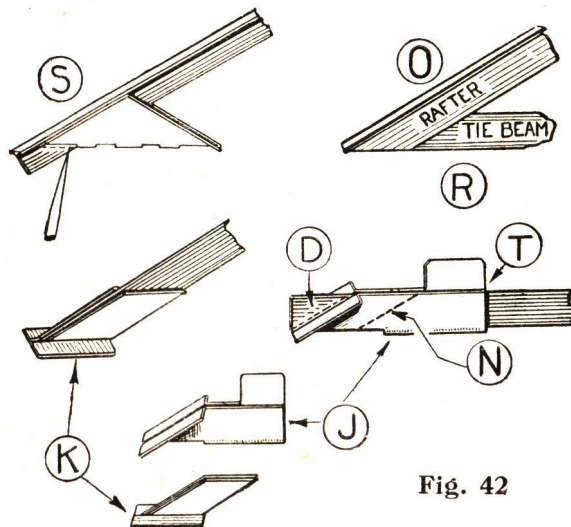
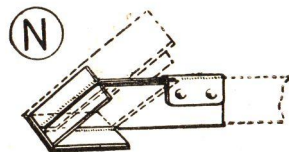


Fig. 42

Referring to Fig. 43 (N) and (P), these show how the No. 13 tie bar heel clip and the No. 14 truss foot clip appear when assembled on the base corner of a roof span. (N) shows the assembly before clipping with the staple clip, and (P) the assembly clipped in position.

To mark off the correct angle on the rafter (O), see Fig. 42, to allow same to fit against the beam (R), Fig. 42 and to fit rafter (O) into the truss foot clip (K), take an apex clip, place on the web of the tee rafter and mark with the scribe, as shown at (S), Fig. 42.

In the completed assembly, as shown at (P), Fig. 43 and as a summary, the sequence of assembly operations is as follows :—



First.—Mark off as at (D), Fig. 42, slide the beam back to dotted line (N), Fig. 42, place the tie bar heel clip in position and clip over the tang (T), but do not rivet-lock.

Second.—Mark off rafter as at (S), Fig. 42, place rafter in between the tangs of the truss foot clip, as shown at (K).

Third.—Place the truss foot assembly inside the tie bar assembly.

Fourth.—Lock the complete truss foot and tie bar assembly to the rafter with a staple clip, as shown at (P), Fig. 43.

Fifth.—Lock the complete roof truss to the wall plate with a cross clip in the position desired, as shown at (V), Fig. 43.

Sixth.—Rivet-lock throughout.

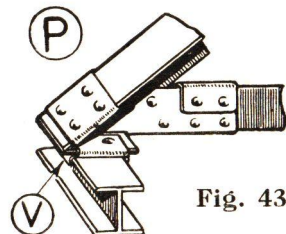


Fig. 43

No. 15. Tee Clip Joint.

The tee clip joint is employed when connecting two tee girders together with a flat bar, as shown at (A), Fig. 44. (B) shows the method of fixing the clip on the tee girders with a half staple clip No. 4. The tee clip is also used in conjunction with the brace clip No. 16 for joining the angle braces to the rafter tie-beam in roof trusses, see Fig. 40.

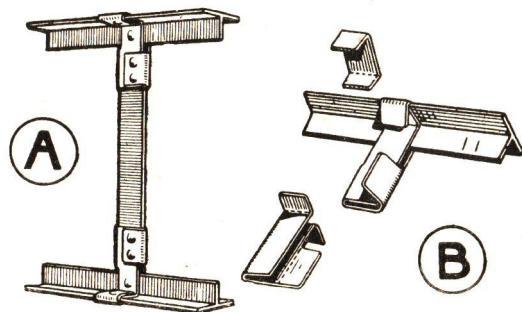


Fig. 44

No. 17. Angle Bar Clip Joint.

Fig. 45 (A) shows an assembly employing two parallel angle sections. The angles can be either facing in opposite directions, as shown in Fig. 44 (A) or both facing the same way, according to which way the two No. 17 angle bar clips are placed on the vertical brace. Fig. 45 (B) shows the angle bar clip making the joint with the angle bar in dotted line. The top portion of the clip should be bent down and the top lug then bent round to lock the angle girder. Rivet-lock the joint, as shown in the illustration.

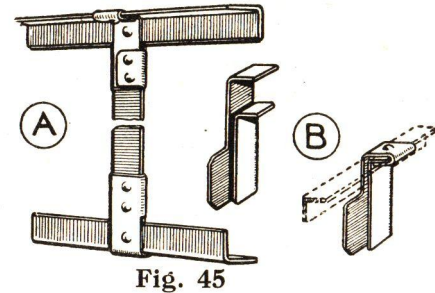


Fig. 45

Fig. 46 shows the application of the No. 18 ridge clip. This clip is placed on the point of the ridge, as illustrated, and the lugs (A) are bent round the flange of the tee girder to embrace the apex clip. The ridge (B) forms a socket for the ridge capping. Securely rivet-lock when in the correct position.

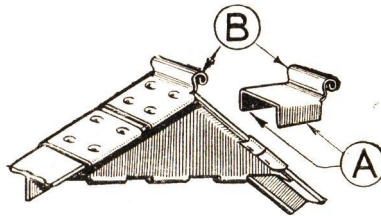


Fig. 46

No. 19. Bracket (inside) Joint.

Fig. 47 shows the three applications of the No. 19 bracket (inside) clip. The joint shown at (A) shows two vertical tee girders joined to an "H" girder. (B) shows a joint formed by mitreing and bending a tee girder and jointing the corner with the bracket (inside) clip. (C) shows a plain flat bar joined in the same manner. If desired, a flat bar can be connected at right angles to an "H" girder by the No. 19 (inside) bracket clip.

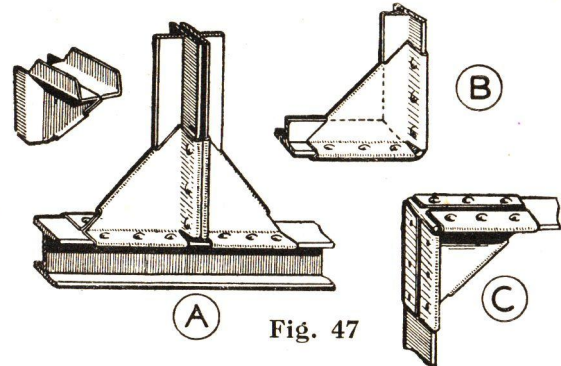


Fig. 47

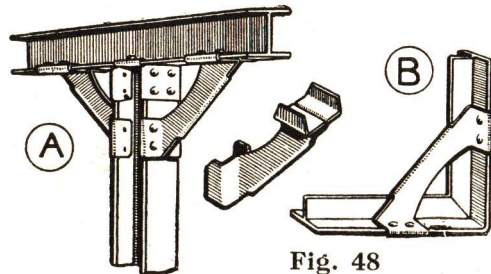


Fig. 48

No. 21. Finial Clip.

The No. 21 finial clip is supplied for capping the ends of upright "H" girders, and Fig. 49 shows clearly its application.

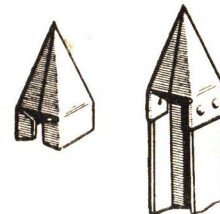


Fig. 49

No. 22. 45° Angle Bar Clip Joint.

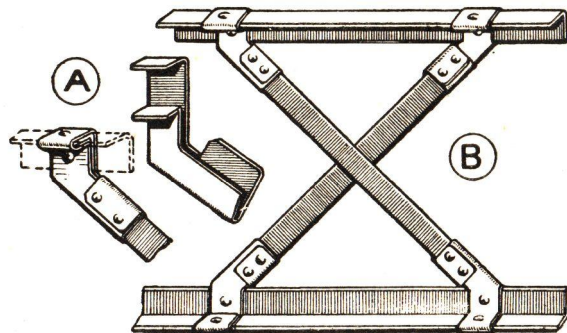


Fig. 50

Fig. 50 shows a No. 22 45° angle bar clip to make the joint. The lower lug (A) of the clip is placed inside the angle of the girder. The top lug is then folded down over the top flange; the completed bend is shown with the girder in dotted line.

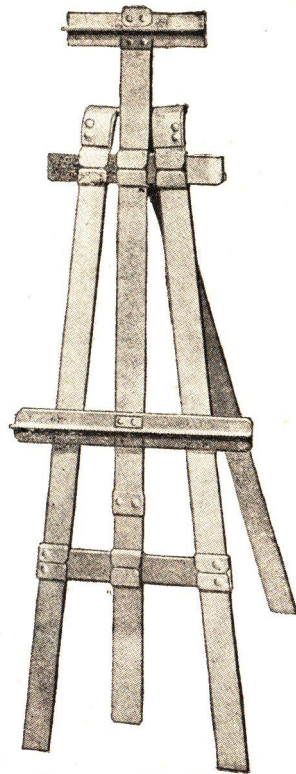
Fig. 50 (B) shows an assembly consisting of two parallel angle girders braced with two flat girders at right angles, joined with four No. 22 45° angle bar clips.

The lugs on the girder part of the web clip (G), Group 3, Fig. 30, can now be closed tight and rivet locked, thus completing the joint.

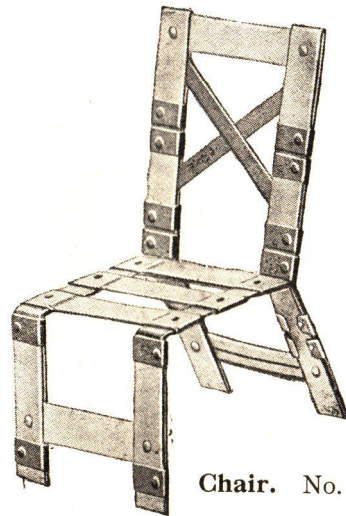
When opposite girders have to be attached to a column, as at (E) and (F), Group 1, Fig. 30, both girders must be correctly placed in position before rivet locking with the half-staple clips.

ILLUSTRATIONS OF SOME GENERAL "MANUFAX" MODELS

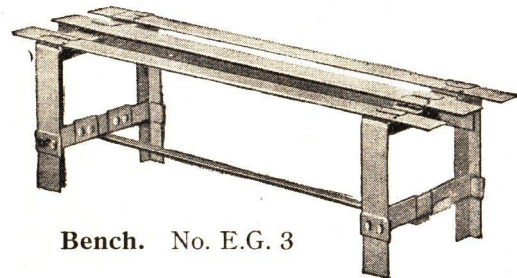
Elementary Series



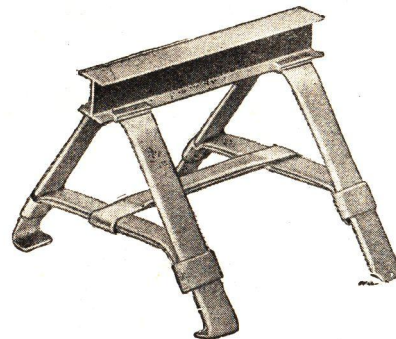
Easel. No. E.G. 1.



Chair. No. E.G. 2



Bench. No. E.G. 3

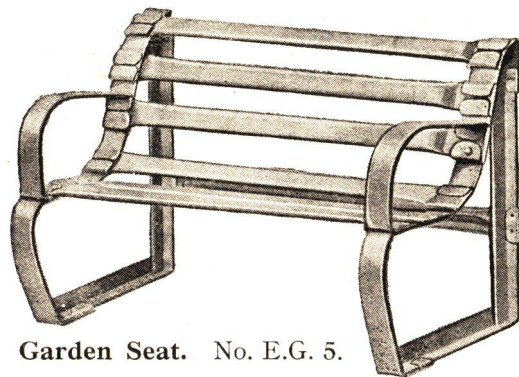


Trestle. No. E.G. 4

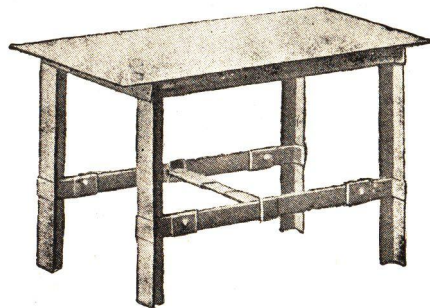
For Detail Full Size Drawing and method of construction of these models, see the Design Sheet.

ILLUSTRATIONS OF SOME GENERAL "MANUFAX" MODELS

Elementary Series



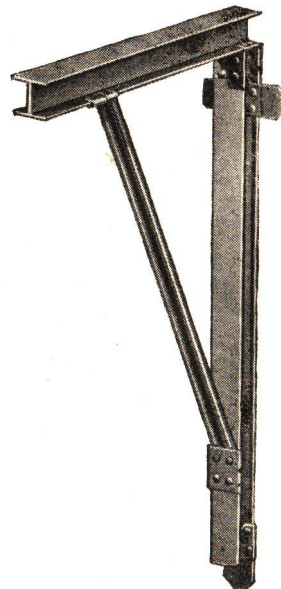
Garden Seat. No. E.G. 5.



Kitchen Table. No. E.G. 6.



Ladder. No. E.G. 8.

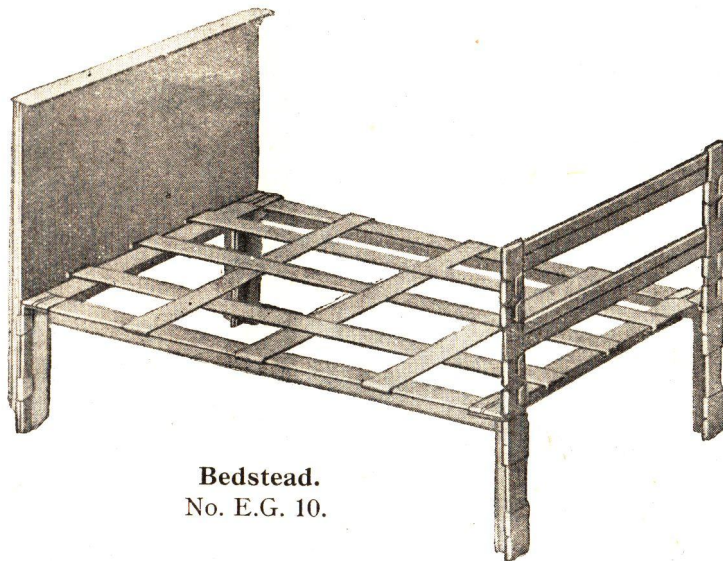


Wall Bracket.
No. E.G. 7.

For Detail Full Size Drawing and method of construction of these models, see the Design Sheets.

ILLUSTRATIONS OF SOME GENERAL "MANUFAX" MODELS

Elementary Series



Bedstead.
No. E.G. 10.

For Detail Full Size Drawing and method of construction of these models, see the Design Sheet.



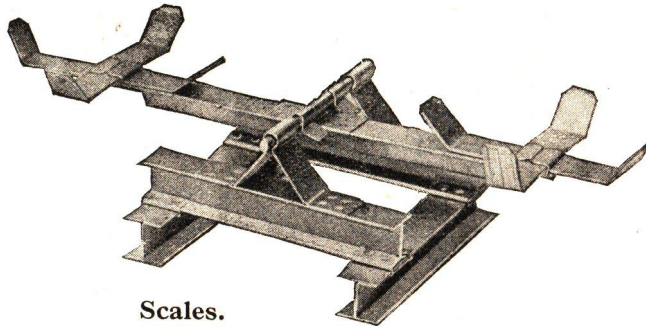
Trestle Table.
No. E.G. 11.



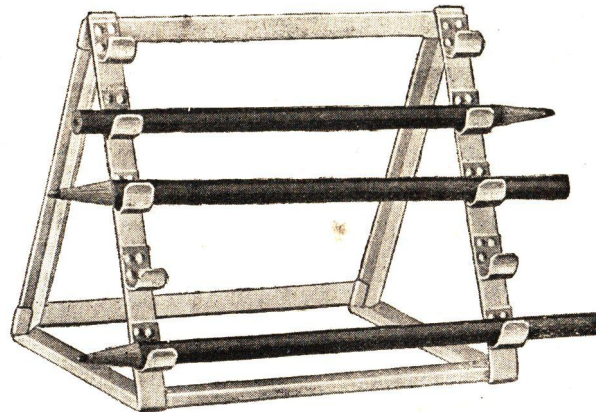
Deck Chair.
No. E.G. 9.

ILLUSTRATIONS OF SOME GENERAL "MANUFAX" MODELS

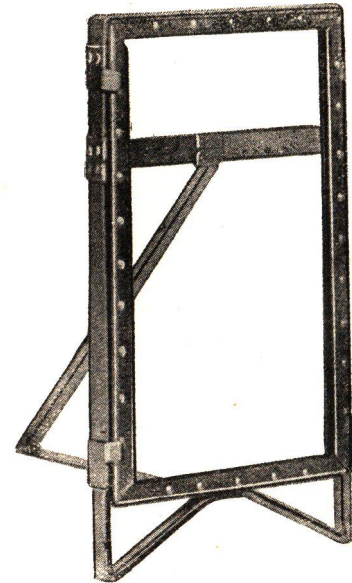
Elementary Series



Scales.
No. E.G. 12



Pen and Pencil Rack.
No. E.G. 13

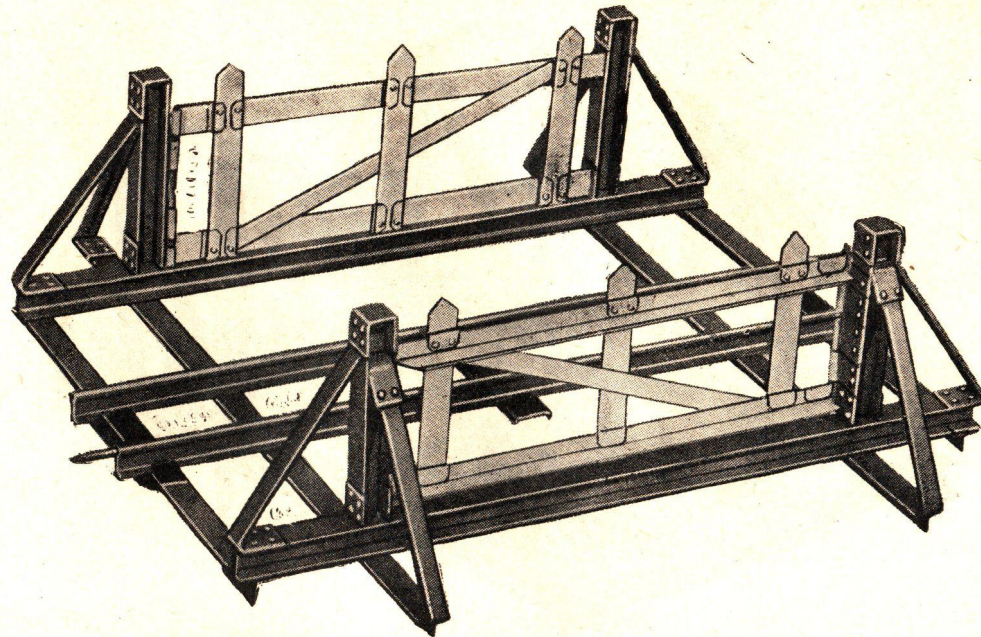


Photograph Frame.
No. E.G. 14

For Detail Full Size Drawing and method of construction of these models, see the Design Sheets.

ILLUSTRATION OF A "MANUFAX" RAILWAY MODEL

Elementary Series



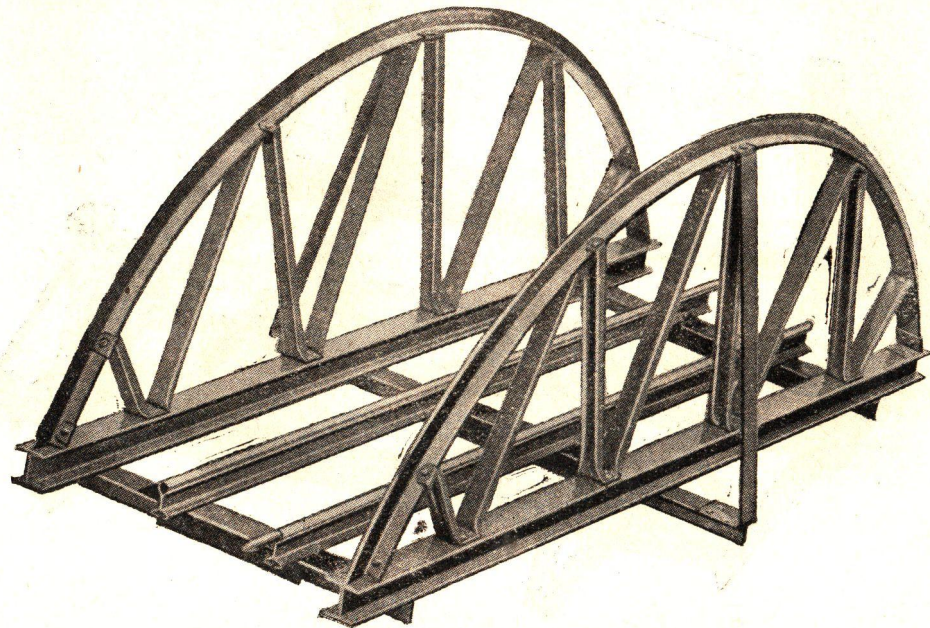
Crossing Gate.

No. E.R. 15.

For Detail Full Size Drawing and method of construction of this model, see the Design Sheet.

ILLUSTRATION OF A "MANUFAX" RAILWAY MODEL

Elementary Series

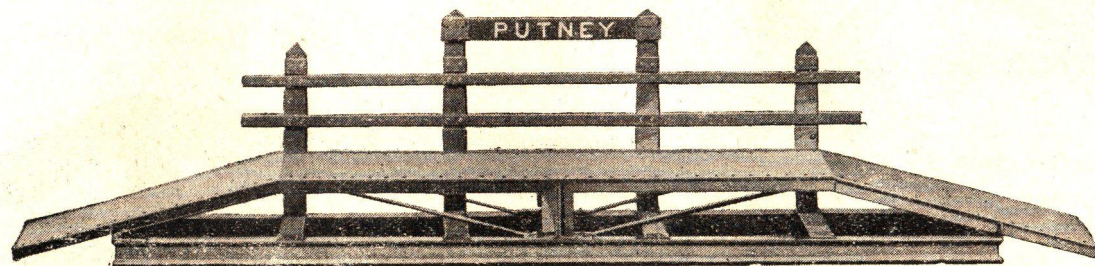


Single Track Bow Bridge for O Gauge 10-in. Rail.
No. E.R. 12.

For Detail Full Size Drawing and method of construction of this model, see the Design Sheet.

ILLUSTRATION OF A "MANUFAX" RAILWAY MODEL

Elementary Series



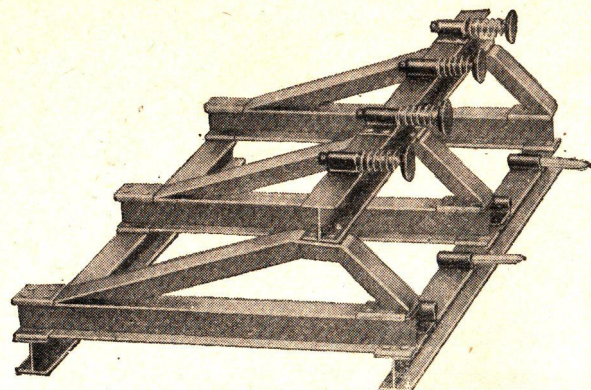
Station Platform.

No. E.R. 13.

For Detail Full Size Drawing and method of construction of this model, see the Design Sheet.

ILLUSTRATIONS OF SOME "MANUFAX" RAILWAY MODELS

Elementary Series



Double Buffer Stop,
O Gauge.
No. E.R. 18.

For Detail Full Size
Drawing and method of
construction of these models,
see the Design Sheet.

Open Wagon, O Gauge.
No. E.R. 19.

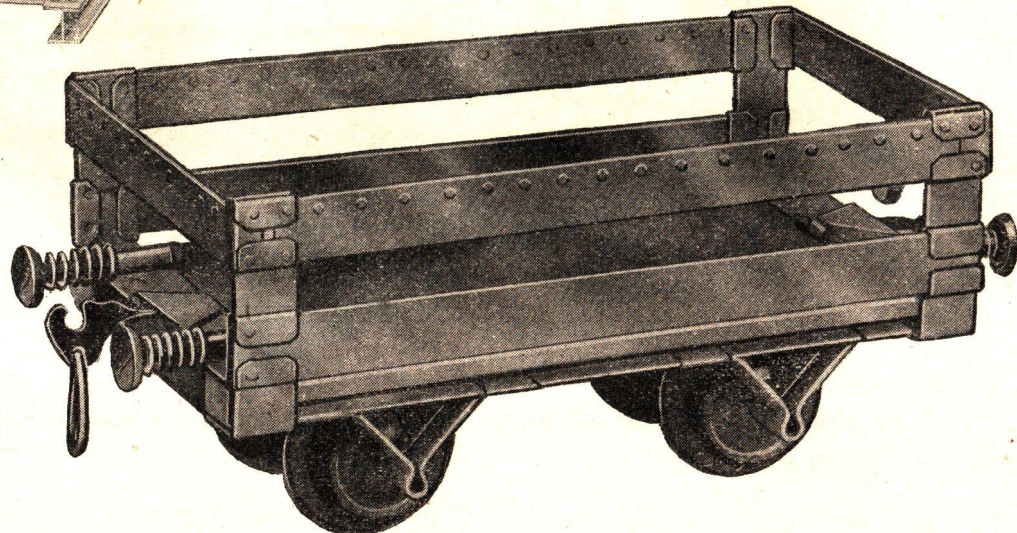
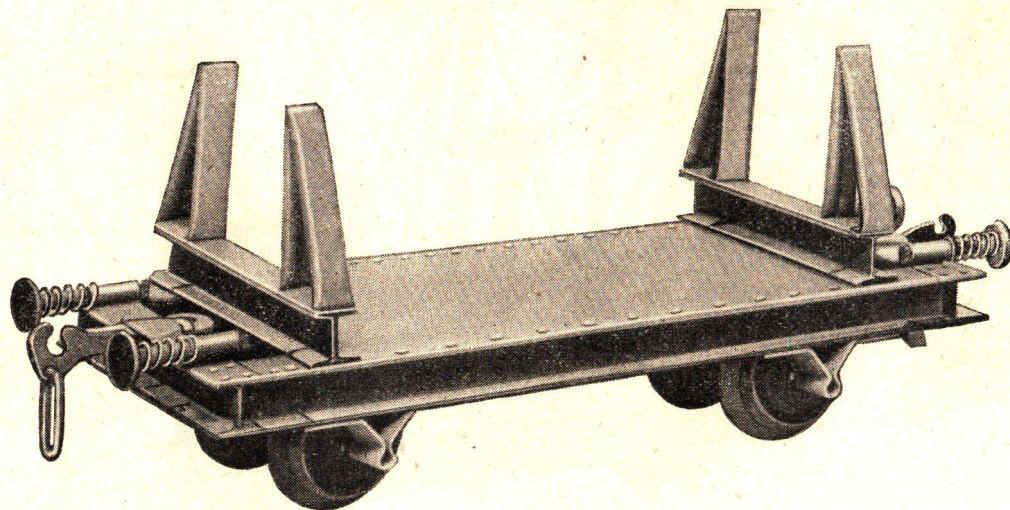


ILLUSTRATION OF A "MANUFAX" RAILWAY MODEL

Elementary Series

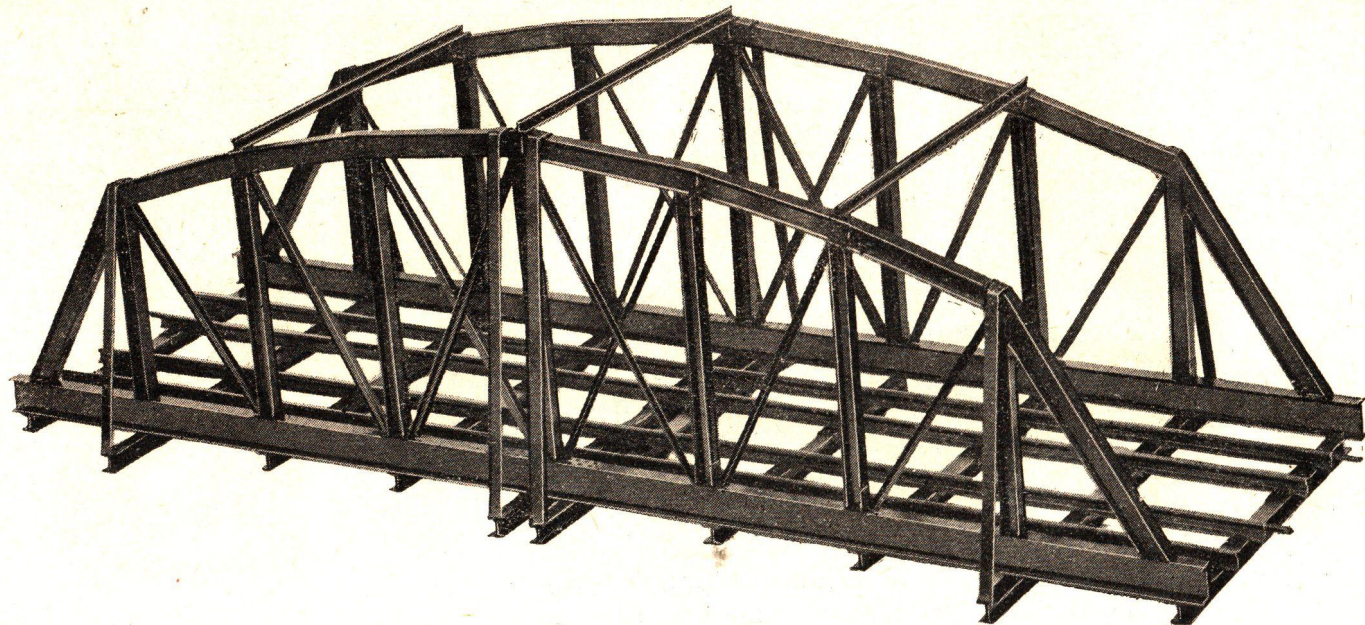


Timber Truck, O Gauge.
No. E.R. 50.

For Detail Full Size Drawing and method of construction of this model, see the Design Sheet.

ILLUSTRATION OF "MANUFAX" RAILWAY BRIDGE MODEL

Advanced Series



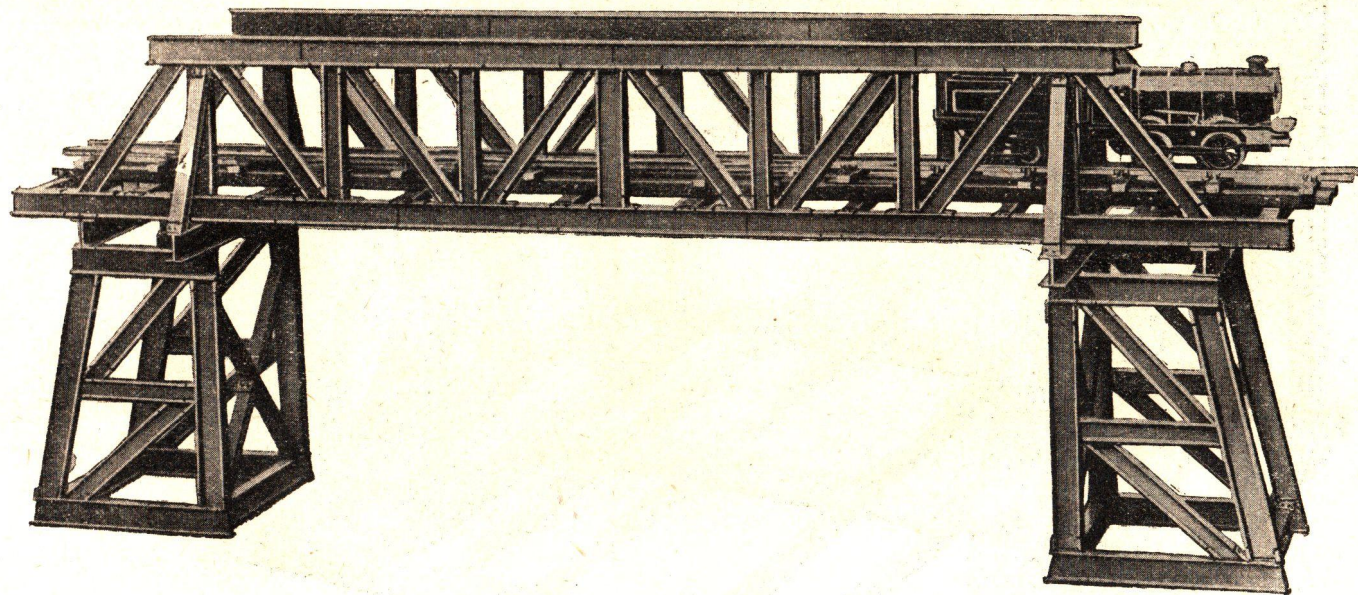
Double Track Arch Bridge, O Gauge.
Length 28 in. 14-in. Rails.

Design No. }
Sheet No. } A.R. 106.

For Detail Full Size Drawing and method of construction of this model, see the Design Sheet.

ILLUSTRATION OF "MANUFAX" RAILWAY BRIDGE MODEL

Special Advanced Series

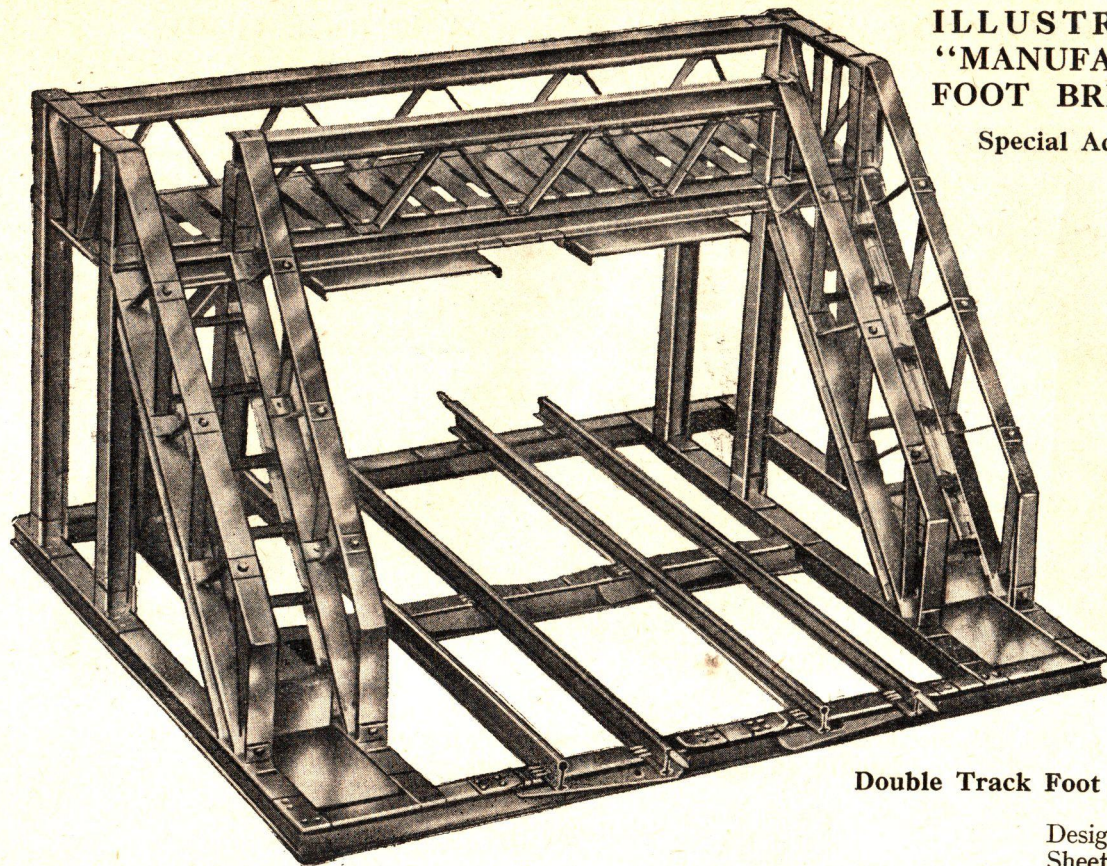


Double Track Girder Railway Bridge with Piers.
Length 44 ins. Height 16 in.

Design No. }
Sheet No. } S.A.R. 201.

ILLUSTRATION OF "MANUFAX" RAILWAY FOOT BRIDGE MODEL

Special Advanced Series

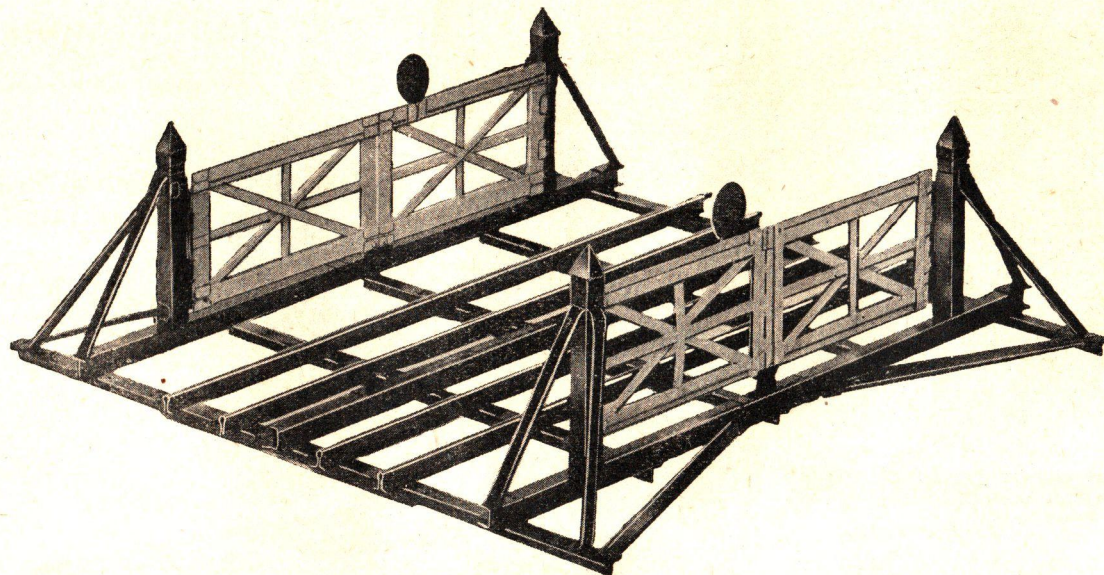


Double Track Foot Bridge, O Gauge.

Design No. } S.A.R. 202.
Sheet No. }

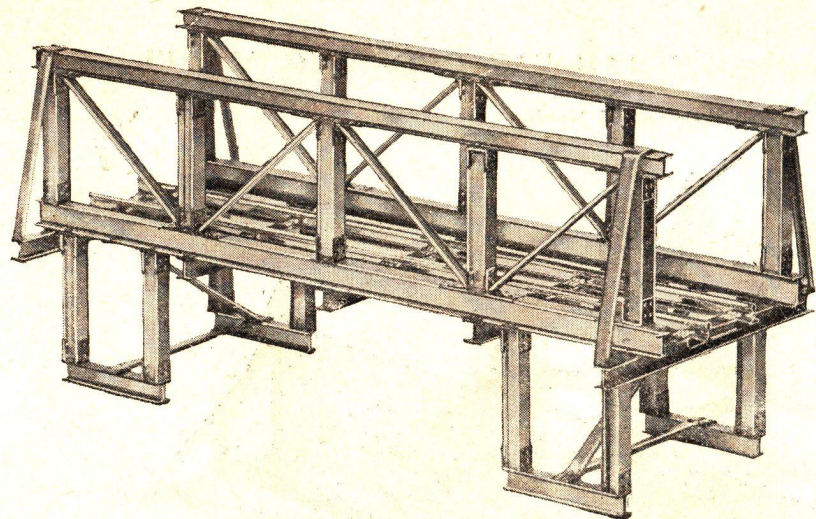
ILLUSTRATION OF "MANUFAX" RAILWAY CROSSING MODEL

Special Advanced Series



Double Track Level Crossing, O Gauge.

Design No. } S.A.R. 203.
Sheet No. }

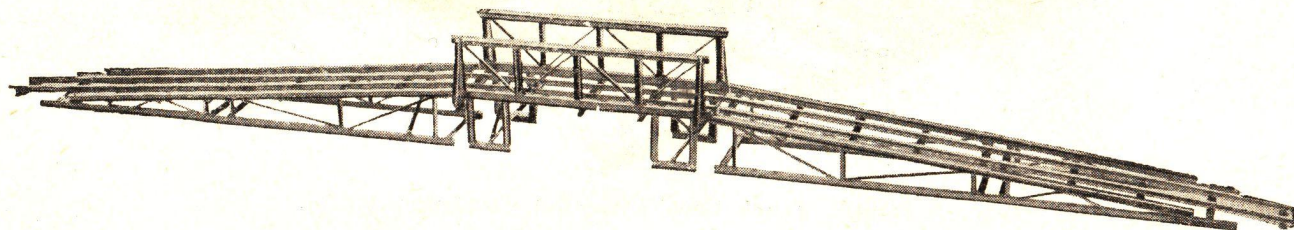


ILLUSTRATIONS OF "MANUFAX" RAILWAY BRIDGE MODELS

Advanced Series

Single Track Railway Bridge with
Piers, O Gauge, 14-in. Rail.

Design No. } A.R. 102.
Sheet No. }

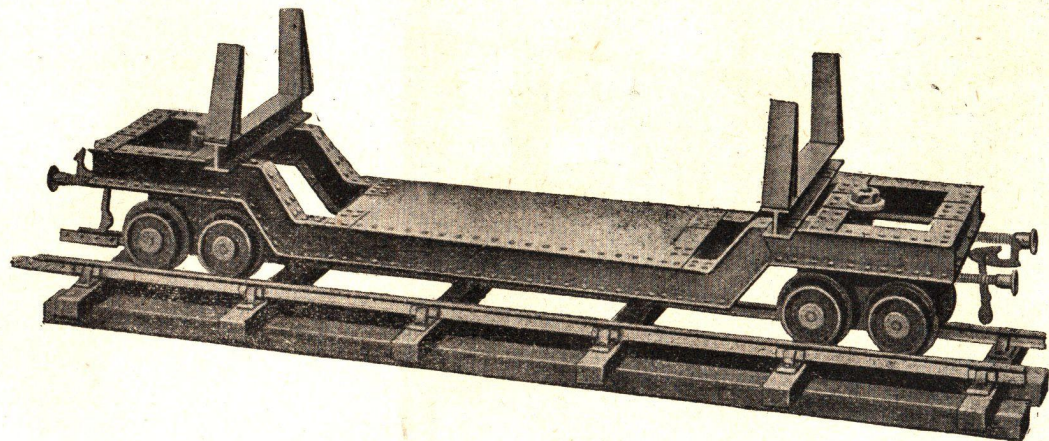


Bridge, A.R. 102, shown fitted with Ramps.

Ramps only { Design No. } A.R. 103.
 { Sheet No. }

ILLUSTRATION OF A "MANUFAX" RAILWAY TROLLEY MODEL

Advanced Series



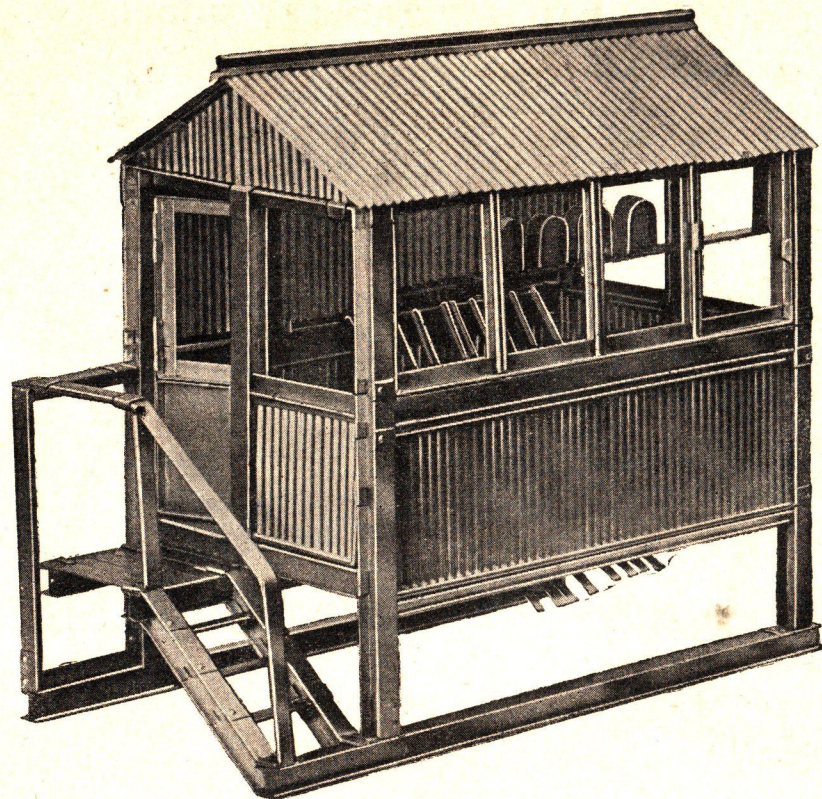
8-Wheel Bogie Trolley, O Gauge, Length 14 in.

Design No. }
Sheet No. } A.R. 105.

A Design Sheet is available for this model.

ILLUSTRATION OF "MANUFAX" SIGNAL-BOX MODEL

Special Advanced Series



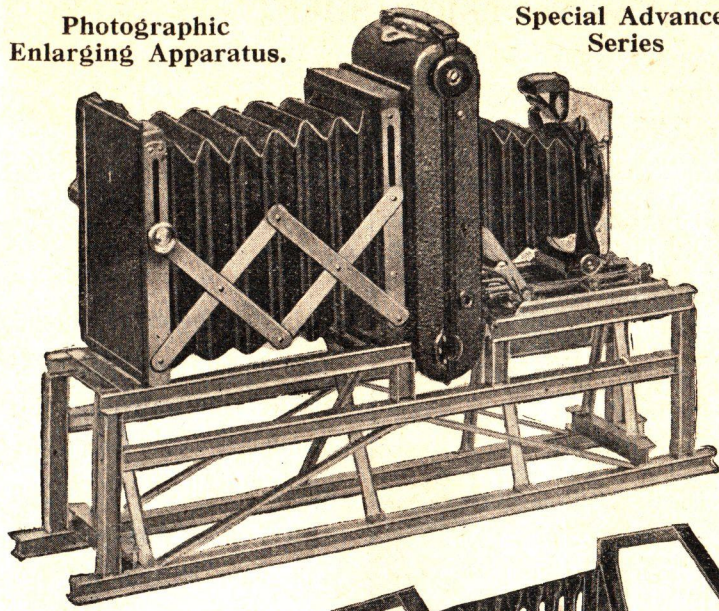
Signal Cabin.

Length 11 in. Height 9 in.

Design No. }
Sheet No. } S.A.R. 204.

ILLUSTRATIONS OF "MANUFAX" PHOTOGRAPHIC EQUIPMENT

Photographic
Enlarging Apparatus.



Special Advanced
Series

"Copy" Stand.

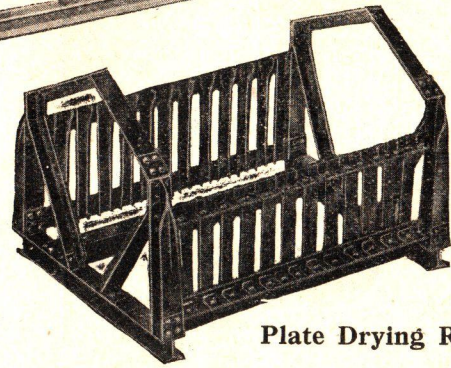
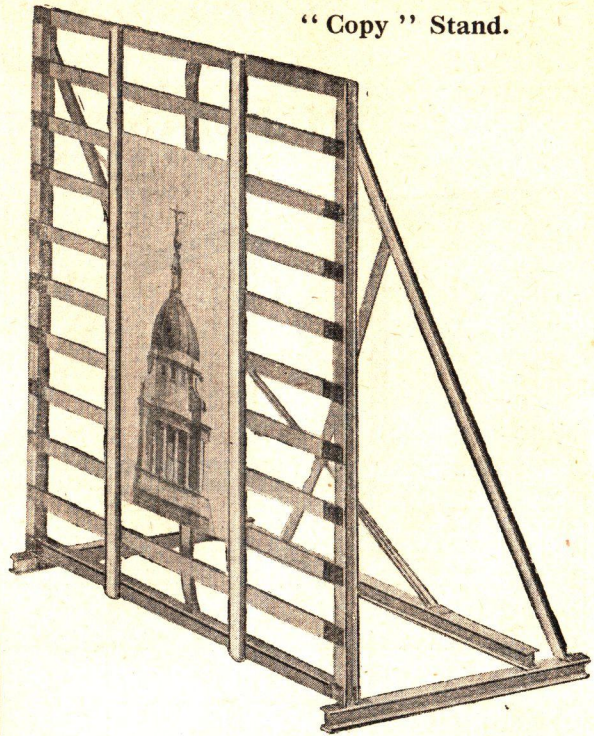
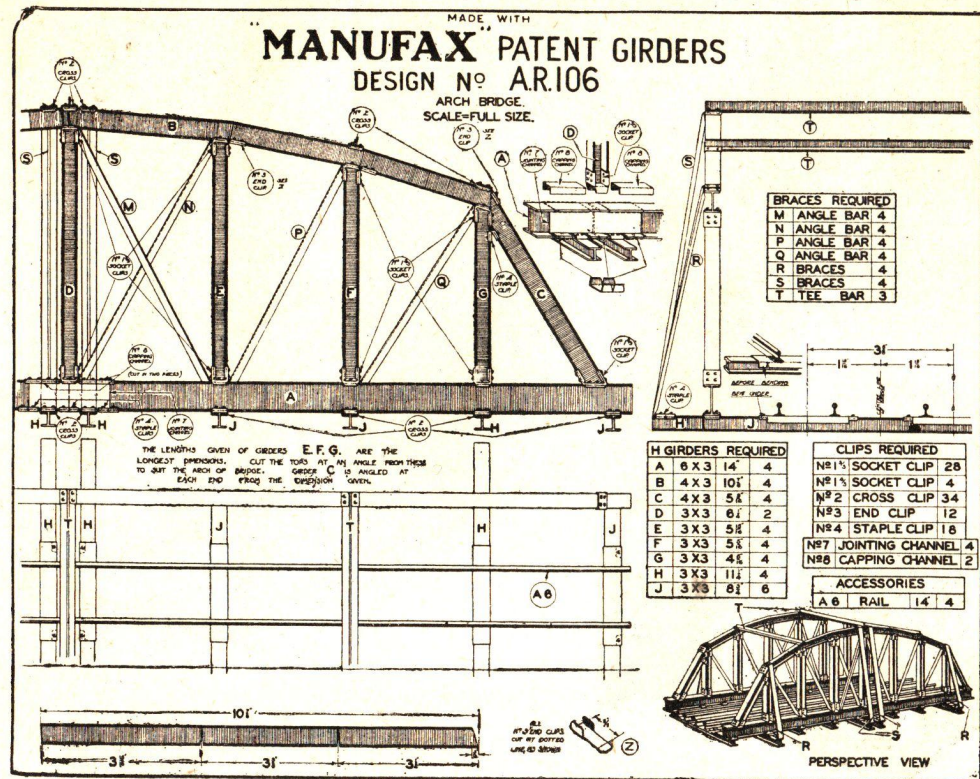


Plate Drying Rack.

These are special examples of
"Manufax" construction.

EXAMPLE OF A "MANUFAX" DESIGN SHEET

(Reduced from full size, 25 ins. by 20 ins.)



Design sheets are obtainable for all the "Manufax" models illustrated in this handbook. There are many more "Manufax" design sheets on the way, so please ask your Dealer for full particulars.

PRICE LIST OF MANUFAX PARTS

GIRDER SECTIONS

14" in Length.

Part No.	Section.	Size.		Price.
		Dimension		
		A.	B.	
G 1	H Girders	3/4"	3/8"	7d. each
G 2	"	1/2"	3/8"	6 1/2d. "
G 3	"	3/8"	3/8"	6d. "
G 9	Channel ..	3/8"	3/16"	2 1/2d. "
G 10	Tee ..	3/8"	3/8"	4 1/2d. "
G 11	Angle ..	1/4"	3/16"	3d. "
G 12	"	"	1/4"	3 1/2d. "
G 13	Brace, Flat	"	3/16"	4 for 3d.
G 14	"	"	1/4"	4 " 3d.
G 16	"	"	3/8"	3 " 3d.
G 17	" Rolled Edge	"	5/16"	4 " 3d.
G 18	" Tubular ..	"	1/8"	4 " 3d.
G 19	"	"	5/32"	—
G 20	Ridge Capping ..	"	"	2 1/2d. each
G 21	Rail ..	"	"	3d. "

ACCESSORIES

Part No.	Description	Price	Part No.	Description	Price
A 2	Swivel Pin, 1" x 3/4"	2 for 1d.	A 12	Washers for Axles	..
A 3	Washer 3/4", for A 2	..	A 13	Bogie Frame
A 4	Swivel Pin ..	4, " 1d.	A 14	Rail Joint Pins
A 5	Coupling Hook ..	3d. pair	A 14A	Deck Plate, size 4 1/8" x 2 1/8"	2d. each
A 6	Buffers (with A 5A)	1 1/2d. each	A 14B	Deck Plate, size 2 1/8" x 2 1/8"	..
A 10	Anvil ..	2/-	A 19	12-gauge (s.w.g.) Wire in 12' lengths	1d. "
A 17	Heavy Railway Wheels and Axles, ..	8d. pair			1d. "
	Corrugated Sheet—				
	Size 24" long x 5" wide	8 for 8d.			
	" 3" x 5"	7 " 8d.			
	" 4" x 5"	5 " 6d.			

For replacement of Tools, prices on application

DESIGN SHEETS—ADVANCED MODELS

No.	Description	Price	No.	Description	Price
AR 102	Single Track Railway Bridge and Ramps ..	6d. each	AR 106	Double Track Arch Bridge and Ramps	6d. each
AR 105	8-Wheel Bogie Trolley (0 Gauge) ..	6d. each	ER 50	4-Wheel Lumber Truck	6d. each

ELEMENTARY MODELS

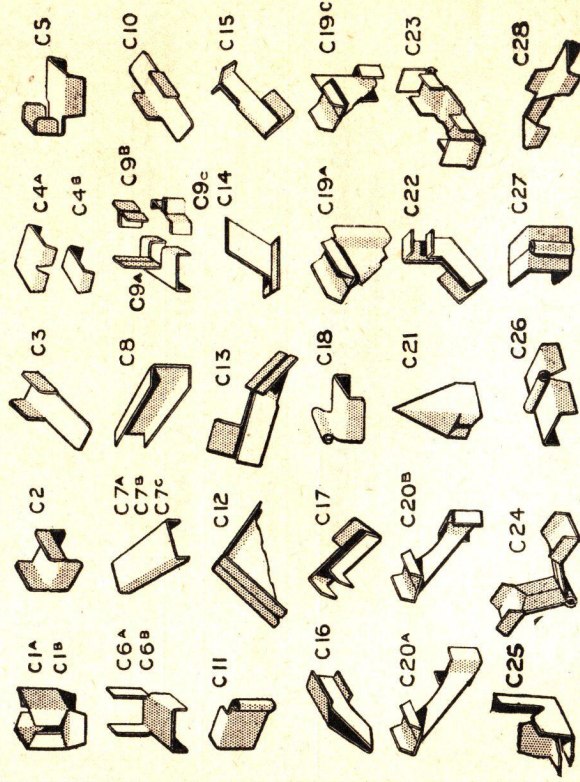
No.	Description	Price	No.	Description	Price
ER 3	Porter's Truck	2d. each	EG 11	Small Table	..
ER 4	Fencing	2d. "	EG 12	Scales	..
ER 5	Luggage Truck	2d. "	EG 2	Chair ..	2d. "
ER 6	Buffers	2d. "	EG 3	Bench ..	2d. "
EG 9	Deck Chair	2d. "	EG 4	Trestle ..	2d. "
EG 8	Ladder ..	2d. "	EG 5	Garden Seat	..
EG 10	Bedstead ..	2d. "	EG 6	Large Table	..

Fittings and accessories, such as pulleys, wheels, shafts, and other mechanical parts, as supplied for other constructional outfits can be used in conjunction with "Manufax" models. When building the "Manufax" way any supplies of these fittings, etc., will therefore be found most useful.

Continued overleaf

PRICE LIST OF MANUFAX PARTS

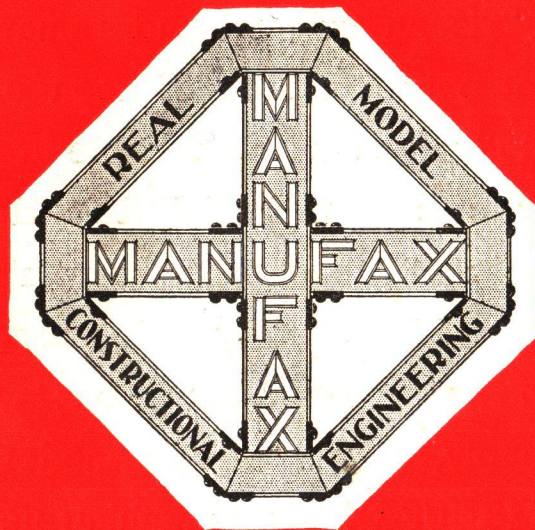
CLIPS



Part No.	Description.	Price Per doz.	Part No.	Description.	Price Per doz.
C 1A	Socket Clip, 3 x 3 ..	1/3d.	C 15	Tee Clip, $\frac{1}{8}$ " or $\frac{1}{4}$ " ..	9d.
C 1B	" " " 4 x 3 ..	1/3d.	C 16	Brace Clip, $\frac{1}{8}$ " or $\frac{1}{4}$ " ..	9d.
C 2	Cross Clip ..	1/3d.	C 17	Angle Bar Clip, $\frac{1}{8}$ " or $\frac{1}{4}$ " ..	1/3d.
C 3	End Clip ..	9d.	C 18	Ridge Clip ..	1/3d.
C 4A	Double Staple Clip ..	1/-	C 19A	Bracket Clip, Inside (flange to flange) ..	1/6d.
C 5	Web Clip ..	9d.	C 19C	Bracket Clip Inside (flange to web) ..	1/6d.
C 6A	Stair Clip (R.H.) ..	9d.	C 20A	Bracket Clip, Outside (flange to flange) ..	1/9d.
C 6B	" " " (L.H.) ..	6d.	C 20B	Bracket Clip, Outside (flange to web) ..	1/9d.
C 7A	Jointing Channel Clip, 3 x 3 ..	6d.	C 21	Finial Clip ..	1/3d.
C 7B	" " " 4 x 3 ..	6d.	C 22	45° Angle Bar Clip, $\frac{1}{8}$ " or $\frac{1}{4}$ " ..	1/3d.
C 7C	" " " 6 x 3 ..	6d.	C 23	Coupling Hook Clip ..	1/6d.
C 8	Capping Channel Clip—used for 3 x 3, 4 x 3, 6 x 3 Girders ..	1/6d.	C 24	Adjustable Bearing, $\frac{1}{8}$ " or $\frac{1}{4}$ " ..	1/6d.
C 9A	Double Tee Clip (Base) ..	9d.	C 25	Angle Corner Clip ..	6d.
C 9B	" " " ..	9d.	C 26	Horizontal Bearing Clip ..	1/9d.
C 10	Double End Clip ..	9d.	C 27	Swivel Bearing Clip ..	1/6d.
C 11	Hinge Clip ..	1/3d.	C 28	Flange Clip ..	6d.
C 12	Apex Clip ..	2/-			
C 13	Tie Bar Foot Clip with ..				
C 14	Truss Foot Clip, in pairs }				

SUPPLIES OF TOOLS AND OTHER MANUFAX PARTS ARE AVAILABLE, AND IF NOT ALREADY IN STOCK WILL BE ORDERED FOR YOU BY YOUR LOCAL MANUFAX AGENT.

“MANUFAX” is an original and remarkable hobby-craft which is not only a source of keen enjoyment and interest, but also serves as a valuable training in true engineering practice. “MANUFAX” develops the imaginative powers and teaches the careful and accurate use of tools. With “MANUFAX” you do not spend time and money assembling a makeshift imitation; you construct, quickly and cheaply, a true-to-scale model to keep and for real use. “MANUFAX” is something new and better



MANUFAX

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