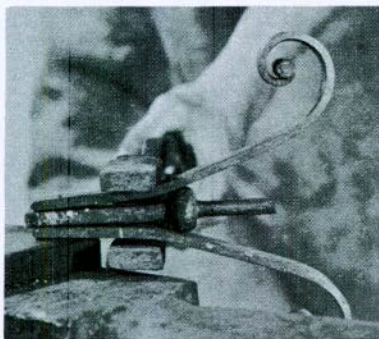
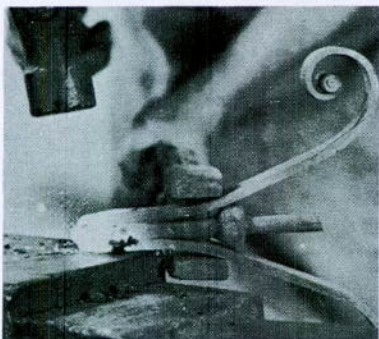


Fig. 36 .

**A**

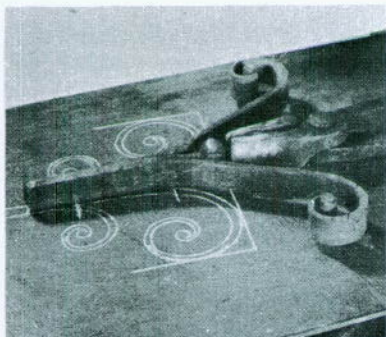
To make the top of the centre panel, swage down the metal on one side of the ball to a  $\frac{3}{8}$ -inch pin, and flatten the bar on the other side. Measure the scrolls as described on page 67 D and grip them to the flattened bar with the tongs.

**B**

Take a **LIGHT WELDING** heat, and weld the ends together.

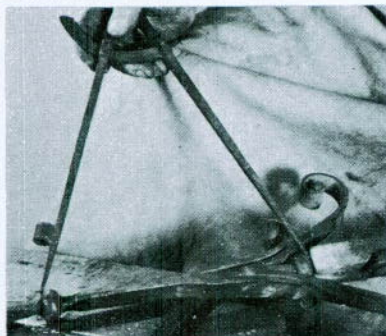
**C**

Now grip the pin in a suitable pair of tongs. Take a **FULL WELDING** heat and weld securely. Draw out the weld.



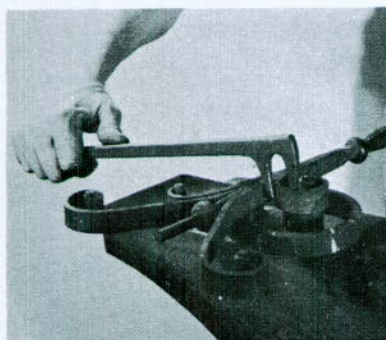
**D**

*Weld the second pair of scrolls at the position marked on the drawing.*



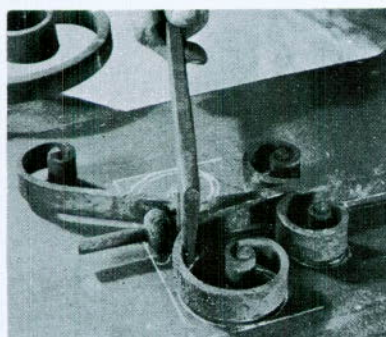
**E**

*Weld on the lower ball, and draw out the weld to length. Here the length of the finished weld is being checked with dividers.*



**F**

*Finish the two pairs of scrolls with scroll tool and wrench.*



**G**

*Set them to the chalked plate.*

First transfer the whole panel of scrolls on to one or more convenient pieces of plate (see page 12). Decide how best to build up the panel, where to place the welds, and how far to roll the scrolls before welding them.

The panel for this gate is made up in five parts:

1. The top scroll to K.
2. The next two scrolls and the piece between them to L.
3. The two middle scrolls and the piece between them to M.
4. The lower pair of scrolls and the piece to N.
5. The bottom scroll.

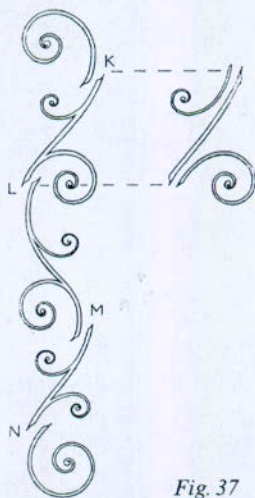


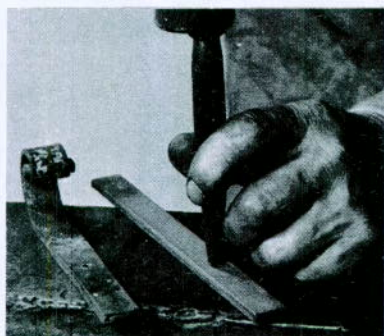
Fig. 37

First make the three pairs of small scrolls between K and N, as follows:

Mark the drawing at the points where the scrolls branch from the pieces which form the stem. Measure the length from these marks to the snub in each case. Forge the fishtail snubs on each of the six scrolls.

Mark off the scroll bars to length, centre-punch them, add  $1\frac{1}{2}$  inches for the weld and cut off.

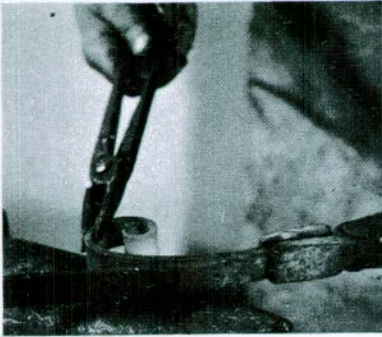
Cut the three intermediate pieces which form the stem, centre-punch marking them at either end and making the same allowances for the welds.



**A**

*Here is a scroll with the tip rolled, and an intermediate piece being punched.*

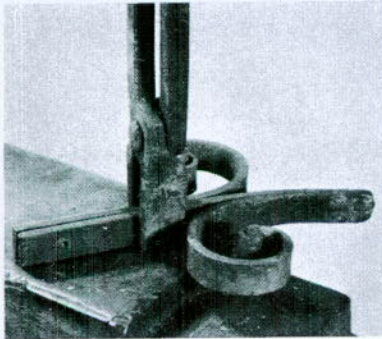




**B**

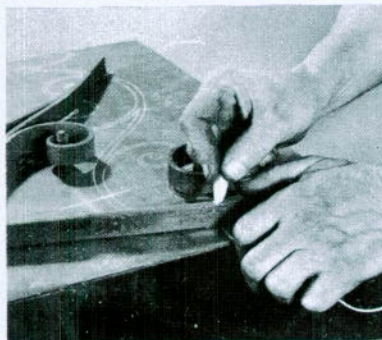
*Next grip one of the scroll bars and the connecting piece in tongs as on page 67, weld up to the centre-punch marks and draw out the weld.*

*Roll the scroll a little more so that it clears the far end of the connecting piece.*



**C**

*Now weld on the second scroll in the same way.*



**D**

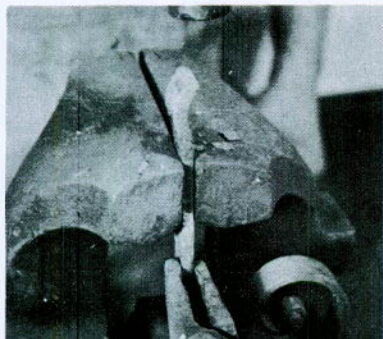
*Lay the piece in position on the plate and mark where the end of the stem comes.*

*Roll the beginning of the top scroll. Lay it in place on the plate and mark both the scroll and the plate with chalk where the bar becomes straight.*



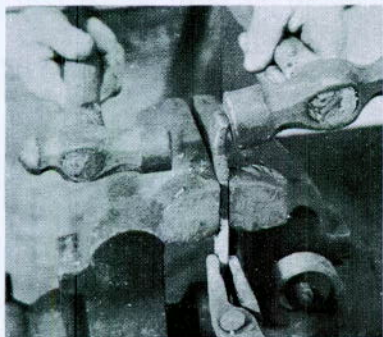
**E**

*Measure the distance between these two marks with string. Then mark off this length on the top scroll, add an allowance for welding and cut off.*



**F**

*Upset the end of the partly-formed top scroll in the vice.*



**G**

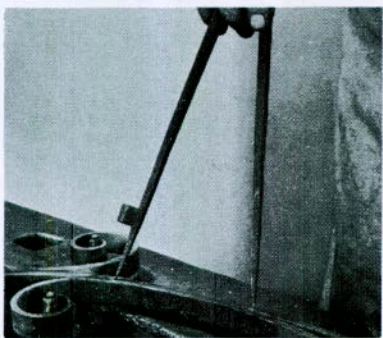
*The end is bound to buckle. Straighten it with a light hammer against your hand hammer.*



**H**

*Weld the top scroll to the pair of partly-formed scrolls which have already been welded to their connecting piece and then set to the chalk drawing.*

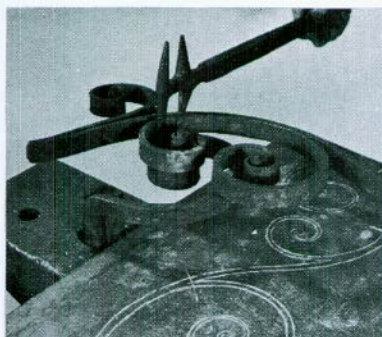
*Weld on the next section of the stem to which a pair of scrolls have already been welded.*



**J**

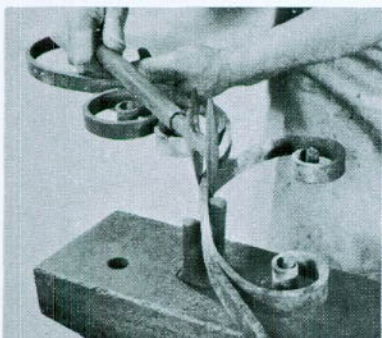
*Check the length with dividers before rolling up each pair of scrolls. It is essential that this measurement is correct.*

*The remaining pair of scrolls and the bottom scroll are welded on in the same way and set to the drawing.*



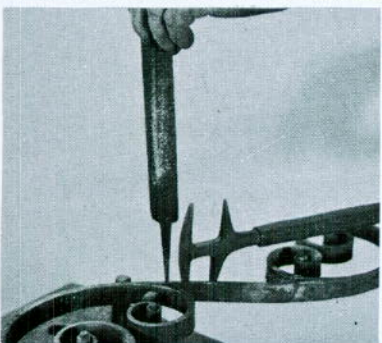
**K**

*Much of the rolling can be done on a scroll tool.*



**L**

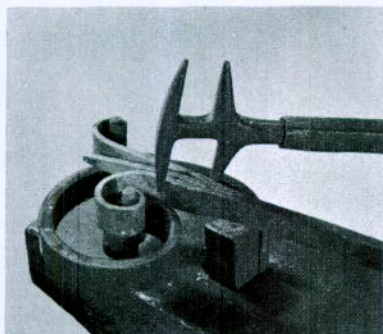
*But some parts will need horns and wrench.*



**M**

*A file tang is useful in setting the scrolls accurately near the branch of the weld.*





A

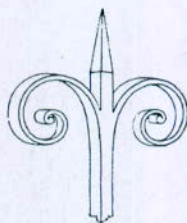


Fig. 38

The partly rolled dog bar scrolls are welded to the short centre spike as on page 72 and finished on the scroll tool. The drawing shows the complete scrolls.

## Lesson 26

## HANGING FOR THE GATE

The gate is supported by the turning pin at the bottom of the back stile (see page 68) which turns in an iron socket let into the ground.

The top is held by a bearing. A bar is built into the gate post, and fitted at the end with a strap which passes round a 'journal', a part of the back stile rounded for this purpose and described under fitting on page 85.

To make the bearing, the bar is forged with a convex end, the strap fitted to it, and a hole drilled through to make a machined bearing (see Lesson 32 B).

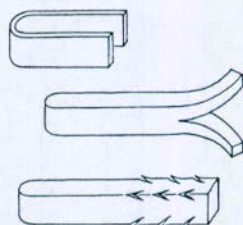
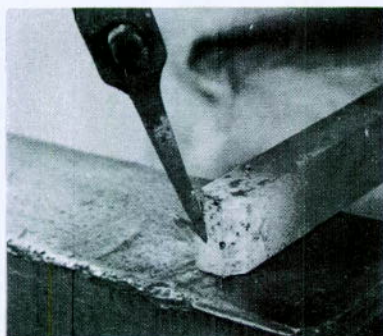
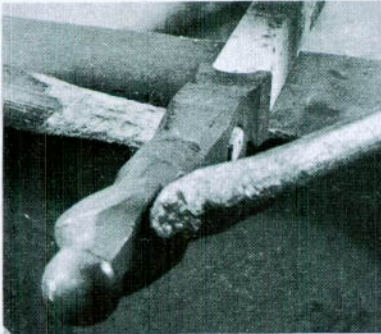


Fig. 39



B

*Cut a piece of bar to length and trim off the corners with a hot set.*



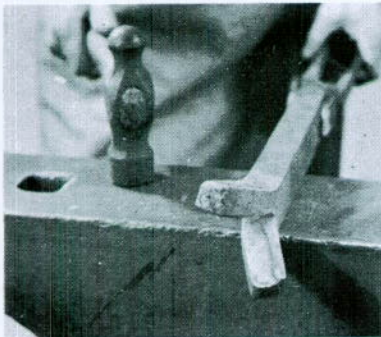
**C**

*Swage the end to a half circle.*



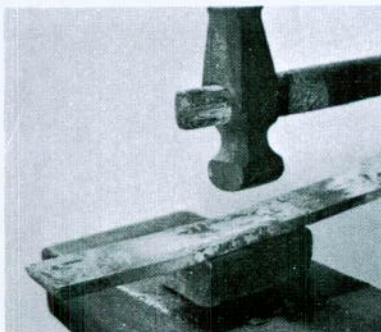
**D**

*Heat the other end of the bar and if it is to be set in stone with lead, rag it with a hot set, as shown here –*



**E**

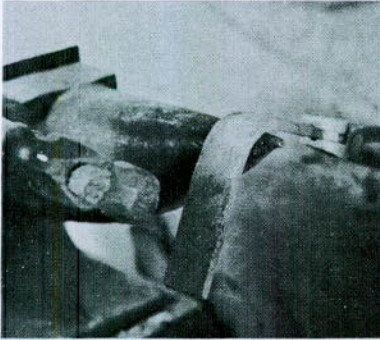
*– or if it is to be set in brickwork, split it and splay it out.*



**F**

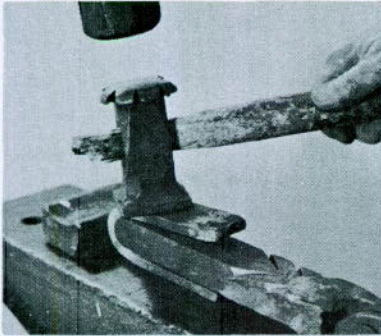
*Next make the strap. As a flat bar will hollow if it is bent to a small radius, it should be dished before bending. Use a large bottom swage and a cheese fuller.*





**G**

*Now bend the strap, rounded side outwards, over the bick. Instead of hollowing, the strap will have a pleasantly rounded look, and fit closely to the journal.*



**H**

*Dress the strap down solidly on to the bar, and put aside until the fitting.*

THE LATCH PIVOT

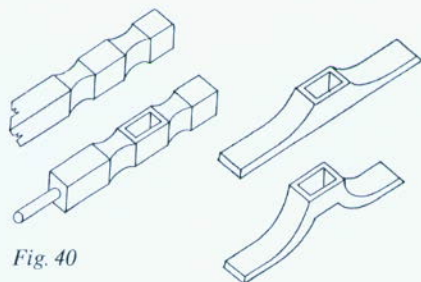
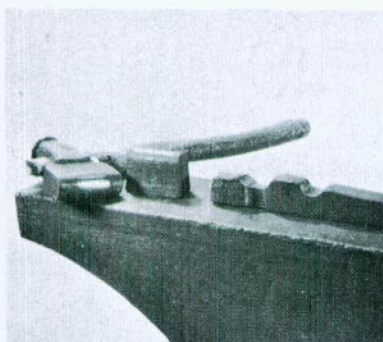
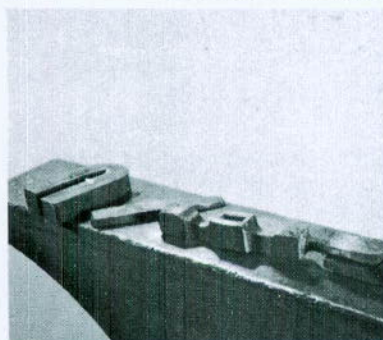


Fig. 40



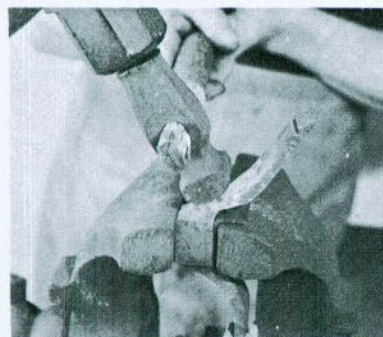
**A**

*Take a piece of metal as big as the largest section of the latch pivot, and fuller it like this.*



**B**

*Punch and drift the slot and cut off. Draw down the ends with cheese fuller and flatter.*



**C**

*Make the sharp bend in the vice with the aid of a cheese fuller; note the sheet metal clamp in the vice to prevent galling.*

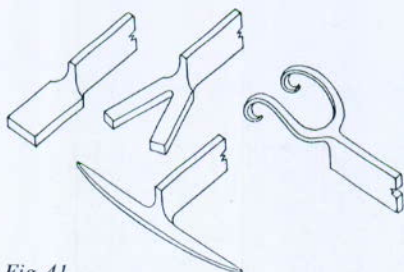
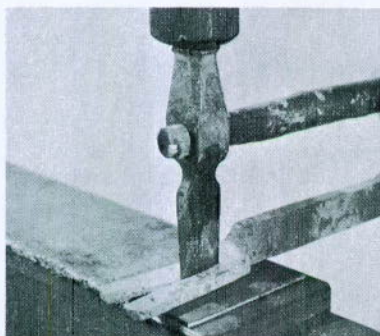
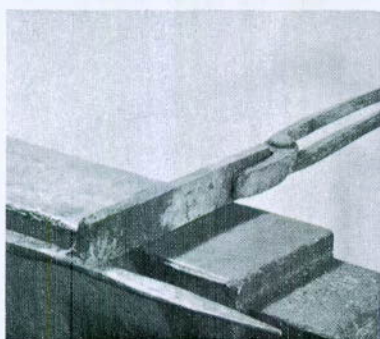


Fig. 41



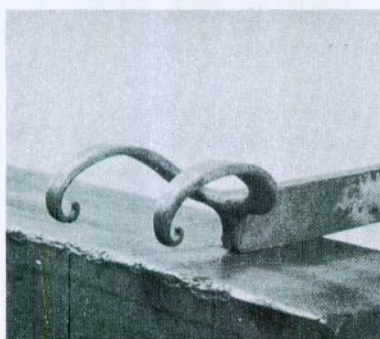
**A**

*Flatten the end of the latch bar offset and split it as shown.*



**B**

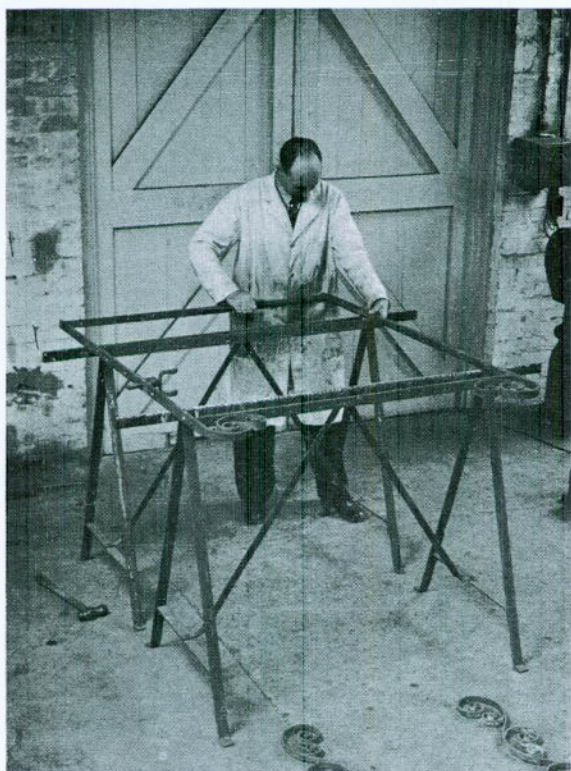
*Turn the two ends to a right angle, and draw each to a long tapering point of oval section.*



**C**

*Curve these ends and scroll the tops like this.*





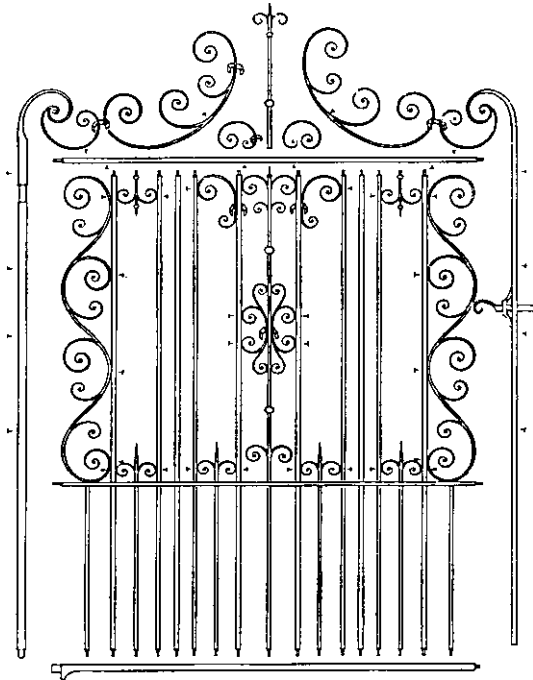
Assembling the gate

## FITTING AND ASSEMBLING THE GATE

When all the parts have been forged, the gate is ready to be fitted together and finally assembled.

This includes making the journal on the back stile, slotting and fitting the heel bars; drilling the front stile and the top and bottom rails; making the square holes in the middle rail, fitting the uprights and riveting them all together; fitting and fixing the scroll-work and the latch and completing the hinge piece.

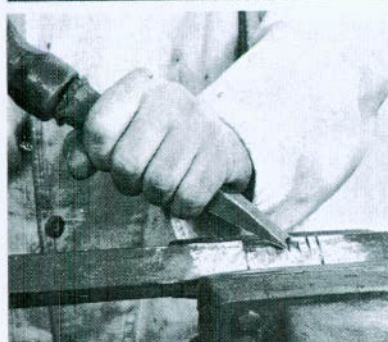
When the final assembly is complete and any roughnesses have been dressed off, the job is ready for painting.



*Fig. 42*

**A**

*Chalk the back stile and mark the journal from the height and width rod.*

**B**

*Cut into the corners at intervals of about  $\frac{1}{4}$  inch with a hack-saw and cut them away with a cold chisel, so that the bar becomes eight sided. File off all the corners, and the journal is completely round.*

*It is of course quicker to turn it on a lathe, if you have a suitable one.*

**C**

### **Slotting the Back and Front Stiles**

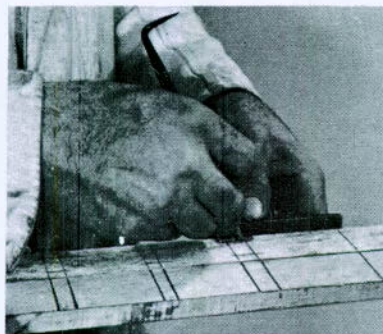
*Next make the slot hole. Mark out and drill two holes. Plug them with small pieces of round bar. Centre-punch mark a central hole between them and drill it out with a pilot drill about  $\frac{3}{16}$  inch.*

**D**

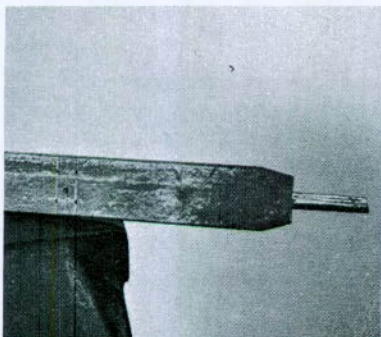
*Drill out to the full size, and knock out what is left of the plugs. The slot can be filed out to size quite easily.*

*Before drilling the back stile for the top rail, or the front stile, make sure that all the uprights are long enough. They should have been monkeyed to  $\frac{1}{8}$  inch, over length. The bars will then only require the minimum of fitting.*

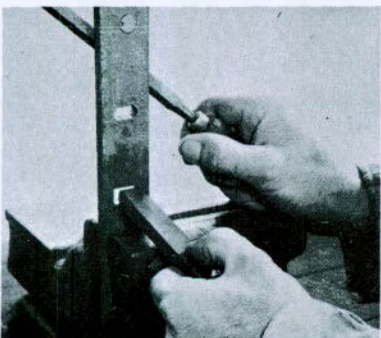


**A**

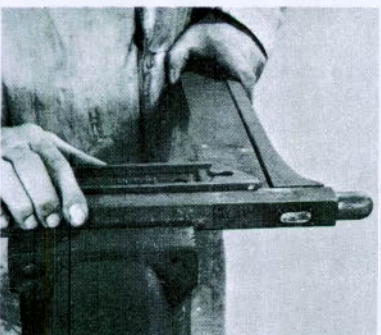
*Mark out the position of the uprights on the middle rail from the height and width rod with a square as on page 58. The ends of the holes can be conveniently marked with a combination square used as a depth gauge.*

**B**

*Centre-punch mark the corners of the holes, and suitable places for drilling and plugging as on the opposite page.*

**C**

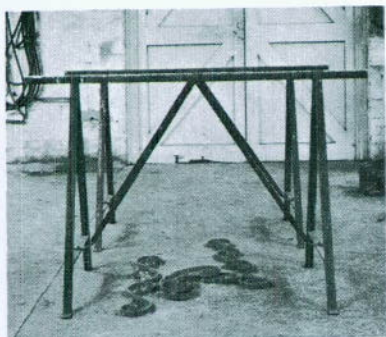
*Here are three stages of making the slot holes for the uprights in the centre rail: a plug in place, drilling completed and plugs removed, and a finished hole after filing.*

**D****Fitting the Heel Bar**

*Fit the heel bar to the back stile: this is the vital joint. The soundness of the assembled gate will depend largely on how carefully this is done.*

*As most gates drop a little when hung, do not set the rail square with the stile, but give it a rise of  $\frac{1}{8}$  inch for each foot the gate is wide. The tapering gap can be clearly seen between the square and the rail.*

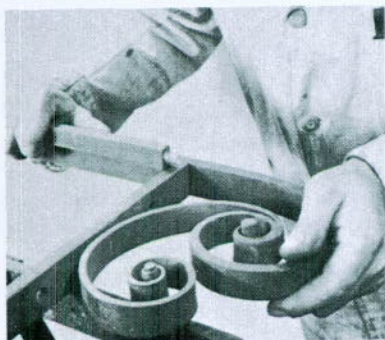
*The heel should be about  $\frac{1}{8}$  inch wider than the stile (see page 60). Do not reduce it yet.*

**A**

*When the heel bars have been fitted, and the remaining round holes for the tenons drilled in the top and bottom rails and the front stile, the frame can be put together, but not riveted up yet. For this you need two trestles. See that they are accurately aligned.*

**B**

*Put the two stiles and the top and bottom rails together on the trestles.*

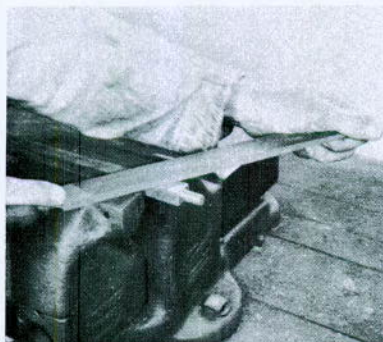
**C**

*Try one of the vertical bars between the top and bottom rails, and file to length, if necessary.*

**D**

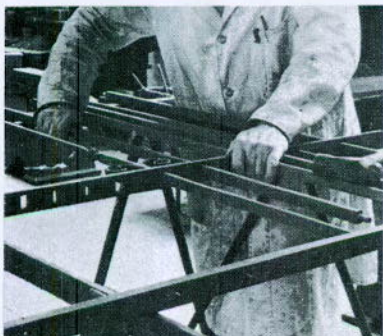
*Now file all the uprights to length, checking with a tenon gauge.*





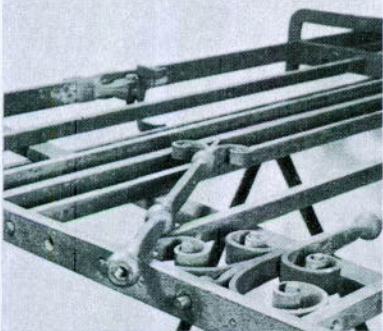
**E**

*The ends of the vertical bars may still be upset slightly from the monkeying. If this is so, dress them with a file. Otherwise you will have to make the holes in the middle rail too big, and once the thickened end has passed through, the bar will be loose.*



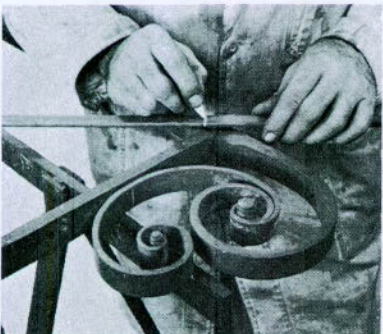
**F**

*Turn the frame so that the rails lie on the trestles, and remove the stiles. Lay the middle rail in position, thread the vertical bars through it, and enter the tenons into the top and bottom rails.*



**G**

*Fit the centre panel bar. On this bar there is one ball above and another below the top rail: these are screwed together. The ball below the rail has a pin forged on it which is screwed; the ball above is drilled and tapped. If they do not tighten up at the right point, file a little off the top ball.*

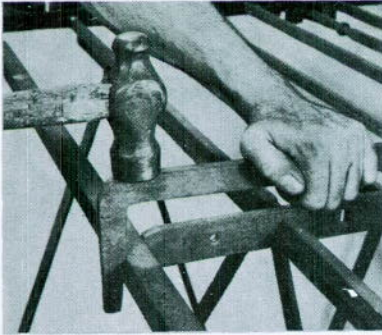


**H**

*Replace the stiles, and see that all the joints fit comfortably.*

*Check the squareness of the whole gate, by the diagonals this time, not forgetting the slight rise mentioned on page 86 D.*

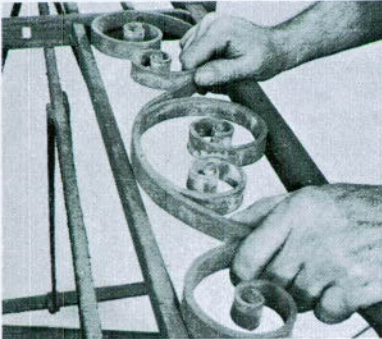




**J**

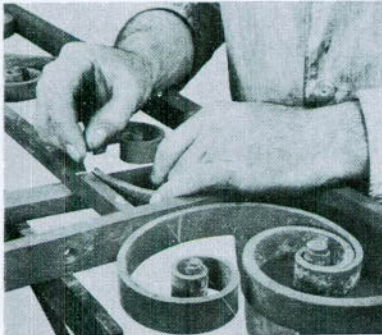
*As the main frame should not be riveted before the scroll-work is fitted and the fixing holes for it drilled, the frame should be clamped up tightly, to hold tenons and bars together while the scroll-work is being fitted.*

*Use a pair of joiner's clamps if you have them; if not, make one or more cramp bars as shown from any material to hand, and force them on.*



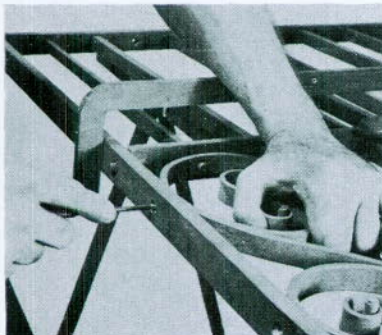
**K**

*Now do the final cold setting of the scroll-work. Scroll-work must never be sprung in or it will certainly distort the frame; any adjustment should be made with the horns and scroll wrench.*



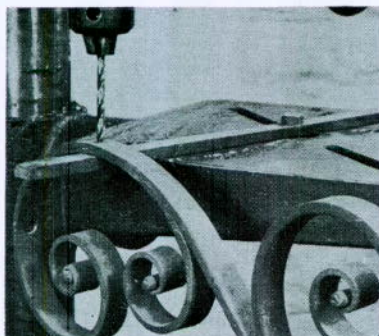
**L**

*Mark the bars where the scrolls are to be screwed to them. Dismantle the gate once more, and drill and countersink the holes.*

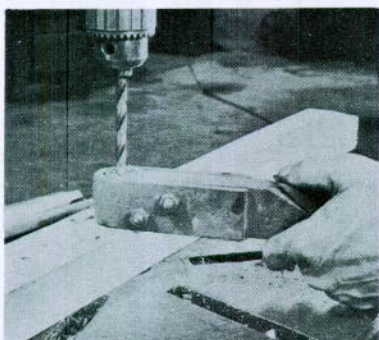


**M**

*Re-assemble the gate, and mark the scrolls through the holes in the bars with a scriber.*

**A**

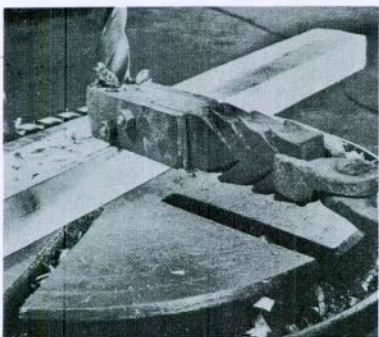
*Centre punch the scrolls, drill them tapping size over a bar bolted to the drilling machine table, and tap them.*

**B****Fitting the Hanging**

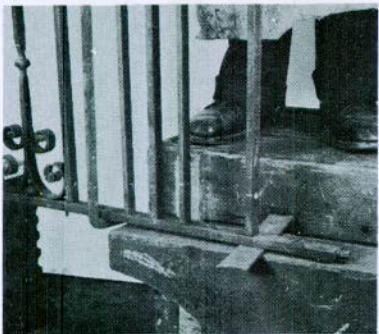
*Take the strap and bar, drill through both and fit two bolts.*

*Mark the centre of the circle where the journal is to come, in such a position that the drill will cut slightly into the strap*

*Drill a pilot hole right through.*

**C**

*Then drill out to full size.*

**D****Riveting the Gate**

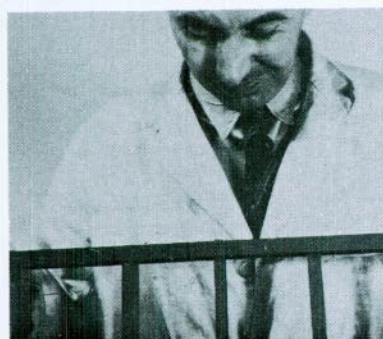
*Here is a single-handed method of riveting upright bars.*

*Rivet the uprights first. Place a strip of metal under the bar on which you are working to raise the other tenons clear of the anvil face. Rivet the end bars top and bottom first, to keep the frame under control.*



**E**

*Rivet each tenon with the peen of the hammer until it grips firmly.*



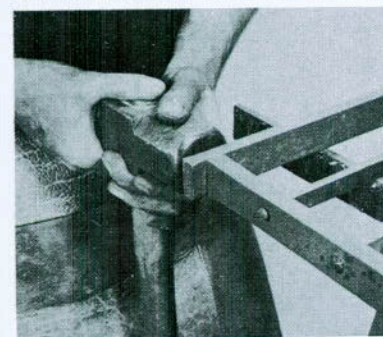
**F**

*Sight the gate for alignment.*



**G**

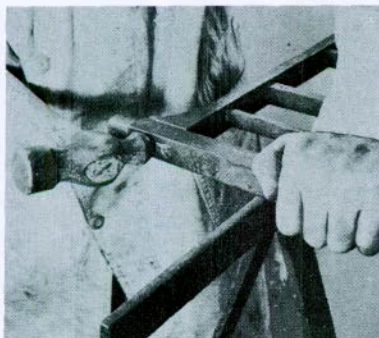
*Check the squareness roughly from time to time, not forgetting the rise.*



**H**

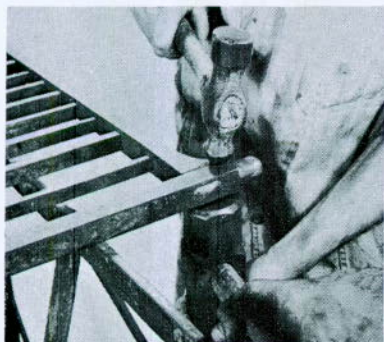
*While your mate holds a sledge hammer against the far end of the bottom rail—*





**J**

– rivet up the tenon of the heel.



**K**

The heel was left a trifle wider than the back stile (see pages 60 and 86).

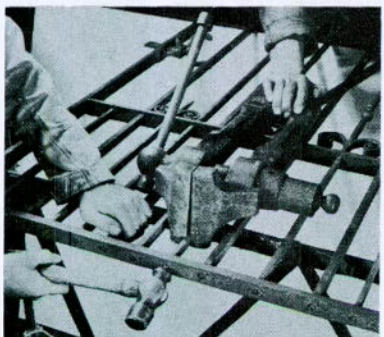
Now, with a sledge hammer below it, burr it up flush with the peen of the hammer. This ensures firm contact at the outside edges and tightens the joint.

Rivet and finish the top heel in the same way.



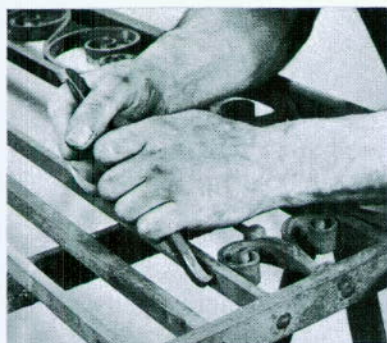
**L**

The small spiked ornaments under the top rail are difficult to rivet up as the spike is not stout enough to resist the blows. Make a holding-up dolly as shown, by drilling and countersinking the end of a heavy bar. This will fit over the spike and rest against the ball. Alternatively use a lead or lead and antimony block held against the spike.

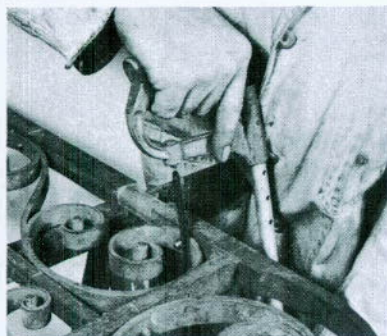


**M**

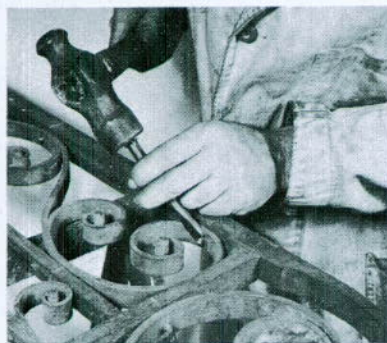
Use a leg vice for riveting dog bars.

**A**

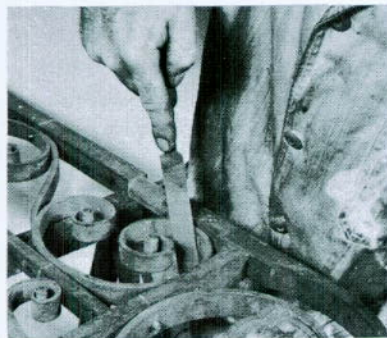
*Secure the scrolls with countersunk screws. Forge a special screwdriver as shown, having one end in line with, and the other at right angle to, the shank.*

**B**

*Either saw them off with a hack-saw—*

**C**

*or cut off the screw ends with a sharp cold chisel—*

**D**

*— and dress them up with a half-round file.*

*The remaining scroll-work is fitted in the same way, except that seven collars are used. Heat the collars and place them on as described on page 41.*

*The gate is now complete except for painting.*

## PART III

### CHAPTER 6

## PAINTING WROUGHT IRONWORK

All ironwork must be protected against corrosion. In particular gates, railings and signs which stand in the open must be painted most carefully if they are not to rust, especially as many smiths now work in mild steel which rusts more easily than pure iron. A thorough protection may be expensive; but a customer who accepts a poor finish to save money will find that he must either pay more in maintenance, or see the work ruined.

### PRIMING

Before applying a priming coat, remove all the loose scale produced in forging by chipping, wire brushing, and polishing with emery-cloth. Pieces of loose scale left on the iron will sooner or later crack the skin of the paint. Mill scale, which is not so loose, need only be removed for a bright finish. Any rust on the iron must also be removed. There are several reliable brands of derusting fluid on the market. The main agent in most of these is phosphoric acid, which converts whatever rust remains after wire brushing into a grey deposit, iron phosphite. The metal can usually then be painted without further treatment, but the paint makers' directions should be carefully followed.

When the iron has been thoroughly cleaned of scale, and the rust treated, it is ready for a priming coat. Red lead and red oxide are often recommended, and will protect the metal well, provided they are of good quality and applied at the right consistency. A mixture of red lead powder, japan gold size and *pure* turpentine makes a reliable primer which, although it dries quickly, will not crack. Properly mixed, it dries matt and provides an excellent key to the next coat. Add the japan gold size to the red lead powder until the mixture becomes as stiff as a very thick cream. Then thin it gradually with pure turpentine to the consistency of thin cream. Leave the mixture to stand for one or two hours. Stir vigorously and add a little more turpentine if necessary. Stirring frequently, apply the primer so thinly that the colour of the metal shows through the priming coat. The paint should be dry and ready for a second coat in three to six hours, according to the temperature of the workshop.

This primer will not round off or blot out sharp detail, and will not readily chip. No primer will be efficient if it is applied thickly, for it will bridge the small pits and pores of the metal without entering them. Two thin coats are much better than one thick coat. The first coat at least must be thin enough to fill the pores and crevices, even though it may not cover the whole surface of the metal opaquely.



In the past few years several zinc-based paints have been introduced into the market. Research into these paints was carried out at the Cavendish Laboratory in Cambridge, and stringent tests have proved them to provide a better protection against rust than most other priming paints. These zinc paints can be applied over rusty metal, provided the rust is not loose, because the chemical reaction of the particles of zinc in the paint against the metal reduces the rust and prevents it developing beneath the paint. For this reason zinc paints are generally described as 'cold galvanizing' paints. Most oil-bound finishing paints can be applied over them. There is at least one brand of zinc paint which can be applied to wet metal.

Zinc paints must not be confused with aluminium paints. Some aluminium paints are efficient primers, provided they are made from aluminium leafing paste, but unlike zinc paints they will have no beneficial chemical action on any rust over which they are painted. Take the maker's or dealer's advice before choosing a paint to cover the aluminium primer, because some undercoat and finishing paints are mixed with a base which softens the medium which the aluminium is mixed with. If the next coat of paint picks up the aluminium the job will be spoiled, and you will have to start from the bare metal; this might involve the expense of having the work sand blasted.

### UNDERCOAT

For the undercoat a flat lead paint, either prepared locally by a good ironmonger or a proprietary brand, is usually best. But take care that your primer, undercoat and topcoat paints suit each other chemically. Some prefer a grey undercoat to black, so as to see more easily the parts which have still to be painted when the black topcoat is applied.

### TOPCOAT

Most people prefer an egg-shell black finish, and there are several reliable black lacquers with this finish on the market. Many experienced smiths consider berlin black ideal. Others finish with a gloss paint which is unpleasantly shiny when fresh but soon weathers.

Whatever paint you use, apply it thinly, so that none of the delicacy of the work is spoiled. Thick leathery paint not only blunts the details, it does not protect the work so well. It will crack and blister in summer, and damp will enter through the cracks, rusting the metal beneath the paint.

Wrought ironwork used in the house, such as pokers, tongs and fire-screens, must be as thoroughly protected as outdoor work. For although indoor work will not rust so quickly, damp, dust, and the corrosion of constant handling can wear a handsome piece into scrap iron. Painting protects the work, gives it an even colour, and makes it easier to clean. Alternatively, indoor work is sometimes finished armour bright.

## ARMOUR BRIGHT

If a piece is to be finished armour bright, it must be forged with much greater care and skill than would be needed if it were to be painted. The fire must be clean, and the hammer and anvil must have smooth faces, free of dirt and scale. The metal must also be cleaned of dirt and scale with an old file before it is worked. Scrape the iron but make no attempt to file it up, as this would give an uninteresting machine-like surface. Any resulting marks on the cleaned surface can be removed by draw filing. Clumsy or unnecessary filing are the commonest faults of armour-bright work.

Complete all the fitting before you polish the work. If you have several pieces to finish armour bright, you will save much time and labour by making a 'pickle' of five parts water to one of sulphuric acid, which will remove all the scale, including mill scale, from the iron. The pickle must be mixed in a bath which will not be corroded by the acid. It is important that the water is put *first* into the bath and the acid added to it; otherwise there is danger of an explosion due to the rapid generation of steam. The piece should be taken out of the acid bath and brushed with steel wire once or twice until all the scale is gone. Rinse it first in cold water, then in sulphate of ammonia to destroy any acid that remains, and then in cold water again. Finally dry it in a box of sawdust.

The piece is now ready for polishing. It is much less laborious to use a power polishing bob, but if you work by hand use emery-cloth which, although more expensive than emery-paper, lasts much longer. After polishing, take care not to handle the work with bare hands if it is to be lacquered. Use a duster or rag, otherwise the fingerprints will show through the lacquer.

Armour-bright work is often lacquered to preserve the finish. Lacquering will last much longer if properly stoved by a professional lacquerer. Cold lacquering is practicable, but the temperature must be at least sixty-five degrees fahrenheit, and the atmosphere free from dust.

In this chapter specific brands of paint have not been recommended, because good new paints are continually appearing, and there are many brands which the Commission has not been able to test. But the techniques described, used with good paints, will afford a tough protection and clean finish. They take time, and may therefore prove expensive. But unless wrought ironwork is properly painted by someone (the smith himself may not always be the right man), it will not last, as good ironwork deserves to last, for the enjoyment of many generations.

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