Check list

1. Rotate the top roller by hand; check that it turns easily, and that it is not eccentric, bent or damaged.
2. Rotate the handle; check that it also turns easily, and that the two bottom rollers are not eccentric, bent or damaged.
3. Remove the top roller. Check that the two bottom rollers are parallel both horizontally (by looking across the machine) and vertically (by looking at the gap between the rollers from on top of the machine).
4. Check that the handle arm C4 has been welded to crank pin C6 so that it continues in the same direction from spindle B2 as crank box C3. If the arm is attached so that it crosses back over the spindle centre, the user will have much less leverage while rolling metal. (Refer to Fig. 14 for correct layout).
5. Check that there is not excessive play in the connecting bars C1, and that the welds on the cranks C2 and C3 are good.
6. With the cranks C2 vertical, check that they are both parallel and that the cranks C3 are both horizontal, and in line.
7. Check that the hand screws G operate freely.
8. Check that the vertical play in the free ends of the top bearing blocks D is not excessive. Examine all wooden parts for cracks.
9. All moving parts should be oiled.
Uses of the machine

This machine will roll sheet steel up to 16 gauge (approx. 1.5mm thick) x 1 metre wide. It will roll complete cylinders down to 75mm diameter (using the given sizes of rollers).

Some of the shapes and suggested items which this machine can help produce are illustrated below.

- **CYLINDERS:**
  - air ducts, flue pipes,
  - water pipes.

- **CURVES:**
  - troughs, gutters,
  - machine guards.

- Buckets, bins
- Stoves
- Mudguards
- Flat strip hoops
Description

The machine comprises:
- Three steel rollers, driven by
- Two crank assemblies and handle.
- Two wooden bearing assemblies, mounted on
- The base frame.

Figure 2
THE ROLLERS

These are made of thick wall tubing. The top roller A has a smaller tube welded down the centre to receive the pins A3. The bottom rollers B have solid spindles B1 and B2. The top roller A can be lifted off by withdrawing the pins A3. This allows for the removal of a complete cylinder of sheet metal once rolled. (See figures 2 and 6).

![Figure 3](image)

THE CRANK ASSEMBLIES

These link the two bottom rollers, the handle being welded on to the extended connecting rod pin on the front roller spindle.

![Figure 4](image)

It is necessary that the two bottom rollers rotate together in order to pull the sheet through as the handle is turned. (Bicycle gears and chains could also be used. See Further Suggestions section.)
THE BEARINGS

The bearing blocks D and E are made of hard wood (e.g. oak or mahogany). The bracket F is steel strip. There is a steel capping strip E1 which is fitted on top of block E for additional strength. When hand screw G is turned the top bearing block D is raised or lowered, pivoting on bolt F1, thus raising or lowering the top roller.

THE BASE FRAME

The machine could be mounted to a bench top. It could have a fold-away frame or simply a rigid frame as described in this manual. The main requirements are rigidity, and suitable height for operation.
## Construction

### The Rollers Assembly — Parts

<table>
<thead>
<tr>
<th>Part</th>
<th>Name</th>
<th>Quantity</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Top roller</td>
<td>1</td>
<td>55 dia. × 1050 steam or galvanised steel pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tubing</td>
</tr>
<tr>
<td>A1</td>
<td>Top roller sleeve</td>
<td>1</td>
<td>20 dia. × 1050 MS tubing</td>
</tr>
<tr>
<td>A2</td>
<td>Top roller bushes</td>
<td>4</td>
<td>47 dia. × 5 MS plate</td>
</tr>
<tr>
<td>A3</td>
<td>Top roller pin</td>
<td>2</td>
<td>15 dia. × 410 MS bar</td>
</tr>
<tr>
<td>A4</td>
<td>Locating pin</td>
<td>2</td>
<td>5 dia. × 10 MS bar</td>
</tr>
<tr>
<td>B</td>
<td>Bottom roller</td>
<td>2</td>
<td>55 dia. × 1050 steam or galvanised steel pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tubing</td>
</tr>
<tr>
<td>B1</td>
<td>Driven roller spindle</td>
<td>1</td>
<td>20 dia. × 1200 MS bar</td>
</tr>
<tr>
<td>B2</td>
<td>Drive roller spindle</td>
<td>1</td>
<td>20 dia. × 1200 MS bar</td>
</tr>
<tr>
<td>B3</td>
<td>Bottom roller bushes</td>
<td>6</td>
<td>47 dia. × 5 MS plate</td>
</tr>
<tr>
<td>B4</td>
<td>Washer</td>
<td>4</td>
<td>35 dia. × 2</td>
</tr>
</tbody>
</table>

---

![Diagram of the rollers assembly](image)

Figure 6
ROLLERS ASSEMBLY

Cut the three rollers to length and file ends square. Cut the tubing for the top roller sleeve A1 and the round bar for the bottom roller spindles B1 and B2. The top roller bushes can be made either by hand or on a lathe. In both cases first mark out the centres of the four circles on flat strip or sheet (5mm thick). Centre punch and scribe the circles (diameter to suit internal bore of tubing being used). Drill with a small drill e.g. 4mm and enlarge to 20mm (or size to suit outside diameter or pipe being used for A1). Cut off the bushes and cut off the corners (Figure 7).

Grind or file the bushes down to the scribed line (or turn in a lathe), until two of them slide into the roller A, and two of them are a tight fit. (If turning in a lathe a mandrel will need to be made first.) (Figs. 8 and 9).
Slide the two slightly easier fit bushes A2 on to the sleeve A1 and tack weld in positions shown.

Slide this assembly in to the top roller A and tap in end bushes. Weld to roller and to sleeve.

Cut pins A3, weld the two parts at 90°, making join at 45°. Weld on 5mm dia. locating pins in position shown (Fig.12). The clearance hole in the wood-block bearing should be 8.5mm dia. × 15mm deep.

Pattern for pins A3
Next mark out the bushes for the bottom rollers. Drill holes 20mm or to suit spindle diameter. Cut and file or turn as before. Position one bush on each shaft halfway, and tack weld in place. Insert the spindles into the rollers and tap in the end bushes. Take care to position the spindles accurately, then weld in place.
Detail Drawings of Rolling Machine Components
showing positions of bearing blocks, rollers and hand screw
scale: full size

hand screw G

hardwood bearing blocks
THE CRANK ASSEMBLIES — PARTS

<table>
<thead>
<tr>
<th>Part</th>
<th>Name</th>
<th>Quantity</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Connecting bar</td>
<td>2</td>
<td>12 × 25 × 95 MS bar</td>
</tr>
<tr>
<td>C2</td>
<td>Crank</td>
<td>2</td>
<td>12 × 25 × 65 MS plate</td>
</tr>
<tr>
<td>C3</td>
<td>Crank (box)</td>
<td>2</td>
<td>25 × 25 × 65 MS square tube</td>
</tr>
<tr>
<td>C4</td>
<td>Handle arm</td>
<td>1</td>
<td>25 × 25 × 200 MS square tube</td>
</tr>
<tr>
<td>C5</td>
<td>Crank pin</td>
<td>3</td>
<td>15 dia. × 32 MS bar</td>
</tr>
<tr>
<td>C6</td>
<td>Crank pin</td>
<td>1</td>
<td>15 dia. × 70 MS bar</td>
</tr>
<tr>
<td>C7</td>
<td>Washer</td>
<td>3</td>
<td>25 dia. × 1.5</td>
</tr>
<tr>
<td>C8</td>
<td>Split pin</td>
<td>3</td>
<td>3 dia. × 25</td>
</tr>
<tr>
<td>C9</td>
<td>Handle spindle</td>
<td>1</td>
<td>15 dia. × 175 MS bar</td>
</tr>
<tr>
<td>C10</td>
<td>Handle sleeve</td>
<td>1</td>
<td>20 dia. × 138 MS tube</td>
</tr>
<tr>
<td>C11</td>
<td>Handle</td>
<td>1</td>
<td>25 dia. × 150 MS tube</td>
</tr>
<tr>
<td>C12</td>
<td>Handle bush</td>
<td>1</td>
<td>20 dia. × 15 MS tube</td>
</tr>
</tbody>
</table>

Figure 14
CRANK AND HANDLE ASSEMBLY

Cut, mark and drill accurately connecting bars C1 and cranks C2 and C3. Cut three pins C5 and one C6. Weld the pins C5 and C6 into their respective cranks.

![Diagram of crank and handle assembly](image)

Weld crank pins on back only

Figure 15

Take two washers B4 and slip them on to the short end of the bottom roller spindles. Push on the cranks C2 and weld as indicated. Similarly slide on washers B4 and cranks C3 to the longer end. **DO NOT WELD YET.**

![Diagram of crank and handle assembly](image)

Weld on cranks C2

Do not weld cranks C3 until set up as in text

Figure 16 Figure 17
SETTING UP CRANKS C3

This requires as much care and accuracy as possible. So read carefully, and double check before welding.

The cranks C3 need to be at right angles to the cranks C2. This shortened illustration shows this clearly (Figure 18).

Figure 18

Here are two methods which could be used to set this up:

Method 1. Put the rollers B in a vice. Set crank C2 horizontal with a spirit level. Then using a square with the spirit level, set the crank C3 vertical. Tack weld and check before welding fully.

Figure 19

Method 1
Method 2. Have someone hold a square on C2 while you hold a straight metal bar against C3. Check with one eye the alignment of the metal bar with the square. Tack weld first, check the alignment, then weld fully. The box section cranks C3 can be welded inside and on the ends as shown (Figure 21).

THE HANDLE

Cut pieces C4, C9, C10, C11 and C12. Mark out and drill C4. Weld the spindle C9 in to the handle arm C4 (Figure 22i). Slide tube C11 over C10 with 3 mm protruding, and weld as shown (Figure 22ii). Slide C10/11 onto the spindle followed by bush C12. Weld the end of bush C12 to the end of the spindle C9 (Figure 22iii). Take care not to weld on to C11 as this should rotate freely on the spindle.

THE CONNECTING RODS

The connecting rods C1 should be an easy slide fit on the pivot pins. File out carefully if necessary. Slide one connecting rod on to the longer pin C6 followed by the handle assembly, allowing 2 - 3mm side play. Line up the handle with the crank C3 and weld as shown (Figure 23).
### THE BEARING BLOCK ASSEMBLIES — PARTS

<table>
<thead>
<tr>
<th>Part</th>
<th>Name</th>
<th>Quantity</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>Top bearing block</td>
<td>2</td>
<td>50 × 50 × 210 hardwood</td>
</tr>
<tr>
<td>E</td>
<td>Bottom bearing block</td>
<td>2</td>
<td>50 × 50 × 210 hardwood</td>
</tr>
<tr>
<td>E1</td>
<td>Capping plate</td>
<td>2</td>
<td>40 × 5 × 210 MS strip</td>
</tr>
<tr>
<td>F</td>
<td>Mounting bracket</td>
<td>2</td>
<td>40 × 5 × 280 MS plate</td>
</tr>
<tr>
<td>F1</td>
<td>Pivot bolt</td>
<td>2</td>
<td>12 dia. × 70</td>
</tr>
<tr>
<td>G</td>
<td>Hand screw</td>
<td>2</td>
<td>10 dia. × 140 MS bar</td>
</tr>
<tr>
<td>G1</td>
<td>Threaded spindle</td>
<td>2</td>
<td>12 dia. × 150 studding</td>
</tr>
<tr>
<td>G2</td>
<td>Threaded pin</td>
<td>2</td>
<td>25 dia. × 50 MS bar</td>
</tr>
<tr>
<td>G3</td>
<td>Drilled pin</td>
<td>2</td>
<td>25 dia. × 50 MS bar</td>
</tr>
<tr>
<td>G4</td>
<td>Sleeve</td>
<td>2</td>
<td>12 dia. × 8 MS tube</td>
</tr>
</tbody>
</table>

**Figure 24**
BEARING BLOCK ASSEMBLY

Make two of each part shown opposite. The following describes the fabrication of one assembly. Mark out and drill capping plates E1. Mark out and cut hardwood timber blocks D and E. Drill holes shown and cut rebates on sides of both blocks, and bottom of block E. The two grooves in E can be made by first drilling a 20mm diameter hole, and then cutting down with a saw. (For overall dimensions see list above.) Check that the roller shafts fit the grooves.
Bracket F could be made from one piece of steel heated up and bent, then drilled. It may be easier and more accurate to make it in three pieces. Cut and weld as illustrated (Fig. 26). \( Y = 84 \text{mm} \) for 55 dia. rollers, \( Y = 90 \text{mm} \) for 60 dia. rollers. Clamp on to the wood blocks, with bolt F1 in place whilst tack welding. Unclamp and weld inside and out.

The pins G2 and G3 should be cut next. These should slide easily into the holes in the bearing blocks. Mark the centres, punch and drill accurately with a 3mm drill (Figure 27). Enlarge the holes in G2 (2 only) to tapping size for the 10mm or 12mm threaded spindle. Tap (cut) the threads.
Enlarge the holes in G3 (2 only) to 1 mm less than the tapping size. Take the threaded spindle G1 and turn or file the end to fit the hole in G3. If filing, make it as round and smooth as possible, and with a neat sharp shoulder (Figure 29).

![Figure 29](image)

![Figure 30](image)

Cut and bend the hand screw G and weld on to the spindle G1. Slide pin G2 in to its hole in block D, and pin G3 in to block E. Screw the spindle down through block D and insert the turned end in to its hole in pin G3 (Figure 31 (i)).

![Figure 31](image)

(Steel plate omitted for clarity)

Cut sleeve G4 from pipe (or drill a piece of bar to suit). Turn the assembly upside down and position sleeve G4 on to the protruding end of the spindle G1. Carefully weld the ends together (Figure 31 (ii)).

Check that the spindle rotates freely. Apply oil.
### BASE FRAME ASSEMBLY — PARTS

<table>
<thead>
<tr>
<th>Part</th>
<th>Name</th>
<th>Quantity</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Mounting plate</td>
<td>2</td>
<td>50 × 50 × 210 MS angle</td>
</tr>
<tr>
<td>H2</td>
<td>Legs</td>
<td>4</td>
<td>40 × 40 × 850 MS angle</td>
</tr>
<tr>
<td>H3</td>
<td>Tie</td>
<td>2</td>
<td>40 × 40 × 600 MS angle</td>
</tr>
<tr>
<td>H4</td>
<td>Shelf support</td>
<td>2</td>
<td>40 × 40 × 1150 MS angle</td>
</tr>
<tr>
<td>H5</td>
<td>Cross brace</td>
<td>2</td>
<td>20 × 20 × 1300 MS angle</td>
</tr>
<tr>
<td>H6</td>
<td>Bolt, nut and washer</td>
<td>6</td>
<td>10 dia. × 75</td>
</tr>
<tr>
<td>H7</td>
<td>Shelf</td>
<td>1</td>
<td>350 × 12 × 1150 wood</td>
</tr>
</tbody>
</table>

---

![Figure 32](image_url)
Cut mounting plates H1 and drill as shown (Fig. 33). Cut legs H2 and ties H3. Lay out the legs and weld as shown (Fig. 34). Assemble the machine before welding the rest of the base frame.

![Figure 33](image)

![Figure 34](image)

**Assembly**

Using bolts H6 loosely bolt on the bearing block assemblies to the mounting plates H1. Note left and right hand. Note also that the capping plates E1 are held on top of the bearing blocks E by bolts H6. Stand up the legs and clamp to some suitable support. Insert the bottom rollers at the same time inserting the crank pin C5 in to the connecting bar C1. The washers B4 go outside the blocks. Check that the rollers will rotate freely together. If not, the grooved bearings in the right hand block E may need to be filed out slightly. Fit on the other connecting bar, washers and split pins. (Holes should be drilled to allow some clearance.) Check for free rotation on the left-hand bearing block E.

Remove the rear bolts H6 and insert the mounting brackets F and bolts F1. Replace bolts H6 and tighten all four.

The rest of the base frame can now be welded up, H4 and H5. (Check the frame for squareness before welding.) The shelf H7 could be wood or metal.

The top roller can now be added. Use plenty of oil on pins A3 and on the wood bearings in block E.

The machine should now operate.
Operation

To set up the machine for rolling sheet metal first turn the two hand screws G clockwise to raise the top roller until the sheet slides right through (Figure 35). Remove the sheet metal and check that the top roller is the same height both sides. View this from the front.

Turn both hand screws half a turn anti-clockwise to lower the top roller. Push the sheet metal in and at the same time turn the main handle clockwise. It should easily grip the sheet and pull it through. Stop when the end of the sheet is just past the top of the front roller and reverse the rotation (Figure 36).

Stop again at the beginning and increase the pressure on the hand screws (turn anti-clockwise half a turn). Repeat this process until the required curve is achieved. The amount of increase curve added each time varies according to type of metal and thickness being rolled. If you add too much pressure at once it will become difficult to turn the handle.

ROLING CYLINDERS

When rolling cylinders it is best to cut the sheet metal to the correct length first. You may require an overlap for riveting, so remember to add this on. The way to find the length required is to multiply the diameter by \( \frac{\pi}{2} \) (3.142).

For example:

A cylinder of 250mm diameter would require:
250 \times 3.142 = 785.5mm length of metal sheet,
plus 20mm for overlap = 805.5mm
Further suggestions

CHAIN DRIVE
Where the facilities and materials are available the bottom rollers could be connected by chain drive (Fig. 38). In this case the shafts could be short at the other end. This end would need the same lengths, but the cranks would be replaced by the gear wheels. Ones with 18 teeth are ideal. The handle arm would be 50mm longer and welded directly on to the roller spindle.

FOOT REST
It may be found helpful to add a bar or plate to stand on. This could be a straight tube or angle connecting the front two feet, or could be a fold-down plate. (See Figure 39).
ROLLING ROUND BAR

Round bar up to 8mm diameter can be rolled more easily if grooves are cut in the two bottom rollers (Figure 40). This will weaken the tubing unless very thick wall tube has been used. This could be overcome by turning a plug of solid bar or smaller pipe to fit tightly down the roller for 100mm or so (Figure 41). This plug should be welded at the end, and also at four holes drilled through the roller at Z. The holes can be filled in with weld and filed smooth.

The groove could be either cut on a lathe or by one person grinding with an angle grinder as the other person turns the handle. **Eye protection should be worn by both persons.**

The grooves should ideally be half rounds of the sizes of wire and bar that you may wish to roll. Three, five and six millimetres would be useful, or three "V" grooves which allow for some variations. The grooves on the front and back rollers must be in line.