

Hammering and Marking – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

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Hammering and Marking – Course: Technique for Manual Working of Materials. Instruction Examples for Practical Vocational Training

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Berlin

Original title:
Lehrbeispiele für die berufspraktische Ausbildung
“Hämmern und Kennzeichnen”

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First edition © IBE

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Order No.: 90–33–3103/2

Introduction

The present material contains 7 selected instruction examples which are intended to help practising and consolidating knowledge and skills acquired in the working techniques “hammering and marking” with increasing level of difficulties in the working techniques of lengthening, widening, curving, chasing, flanging and marking.

In order to facilitate the preparation and execution of the work, the necessary materials, measuring and testing tools, hand tools, and accessories are stated for each training example.

Moreover, knowledge, required in addition to knowledge of hammering and marking is mentioned.

The sequence of operations given for each instruction example includes the necessary steps for the production of the workpiece.

For each instruction example a working drawing is attached showing the required shapes and dimensions of the workpiece.

The workpieces produced may be used by the trainees for personal purposes or in the workshop or production shop: the nameplate may be used by the trainee for identification of its personal tools or training pieces, the tables as an aid to determine values needed for the preparation of screwed joints, while the locker number plate, the soldering iron bit, the screw driver and the bowl may be used in the workshop.

Explanation to the specification of material:

The steel is specified according to the value of its tensile strength in the unit “Megapascal” (MPa).

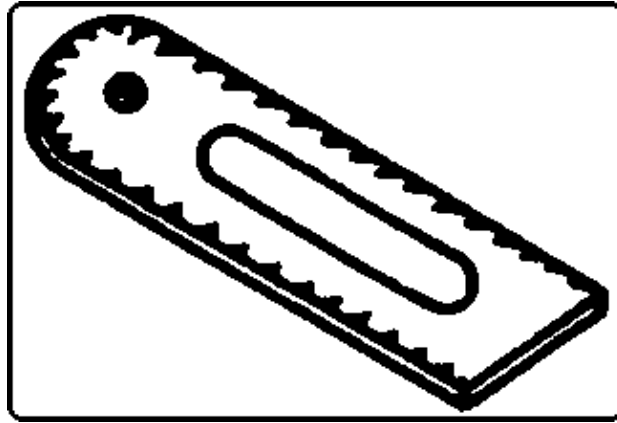
Instruction example 3.1. Nameplate

To practise lengthening of sheet steel by hammer blows with the hammer pane, flattening of a surface section by a sledge and simple marking.

Material

General-purpose constructional steel sheet strip (340 MPa)
Thickness: 2 mm
Width: 15 mm

Length: 80 mm



Hand tools

Hand hacksaw or lever shear, engineers' hammer (500 g) scribe, centre punch, 4 mm dia. drill, bastard file 200 mm (flat), sledge, marking punch (letters).

Measuring and testing tools

Steel measuring tool

Accessories

Surface plate, vice, flat nose plier or pin vice

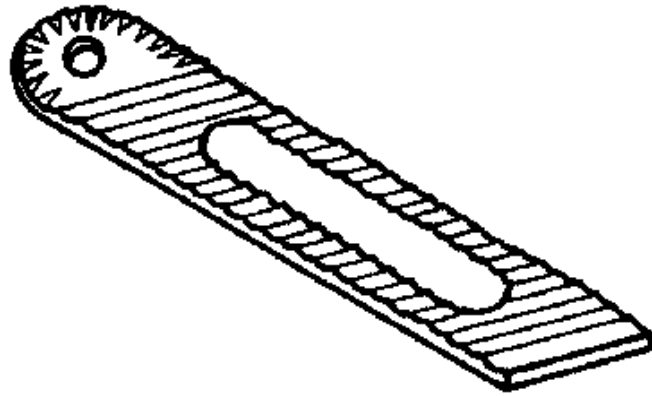
Required previous knowledge

Reading of drawings, measuring and testing, marking and punch-marking.

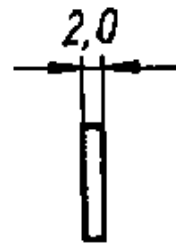
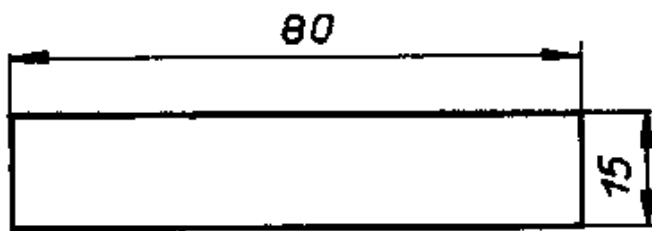
Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	– Check for completeness.
2. Check for initial dimensions, otherwise scribe and cut the sheet strip to size, scribe the 12 mm size	–Stage (1) Use the hand hacksaw or lever shear.
3. Check for initial length, grip the scribed end by means of flat nose plier or pin vice and hammer with the hammer pane steadily towards the other end.	– Stage (2) Use vice anvil or surface plate as support.
4. Straighten the sheet strip, check for size; if necessary, repeat operation 3.	
5. Scribe the area for the name according to the number of letters and flatten it by means of hammer and sledge.	– Stage (3) Clamp the sheet strip adequately!
6. Punch the name.	– Further markings may be applied at the rear side of the sheet.
7. Final inspection.	– Dimensions, appearance.

Completion

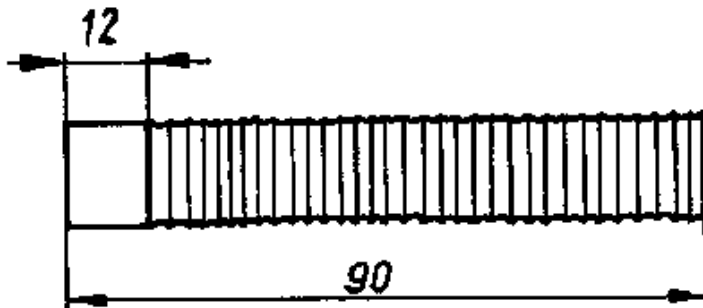
Produce the bore hole and radius according to the size specified under supervision of the instructor, hammer all edges with gentle hammer blows (of the pane) obliquely.



①



②



③



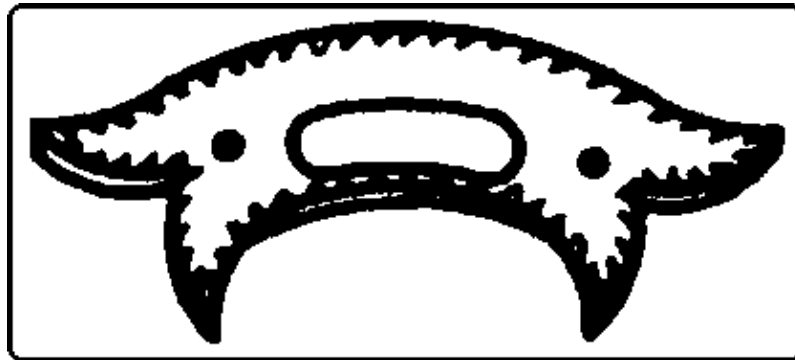
				3.1.
				3103 ⁴
	Nameplate			

Instruction example 3.2. Number Plate for Locker

To practise curving of sheet steel by hammer blows with the pane according to the size specified, flattening of a surface section by a sledge and simple marking.

Material

General-purpose constructional
Steel sheet strip (340 MPa)
Thickness: 2 mm
Width: 20 mm
Length: 80 mm



Hand tools

Hand hacksaw or lever shear, engineers’ hammer (500 g) or curving hammer, scriber, centre punch, 2 mm dia. drill, sledge, marking punch (figures).

Measuring and testing tools

Steel measuring tool, radius gauge (65 mm)

Accessories

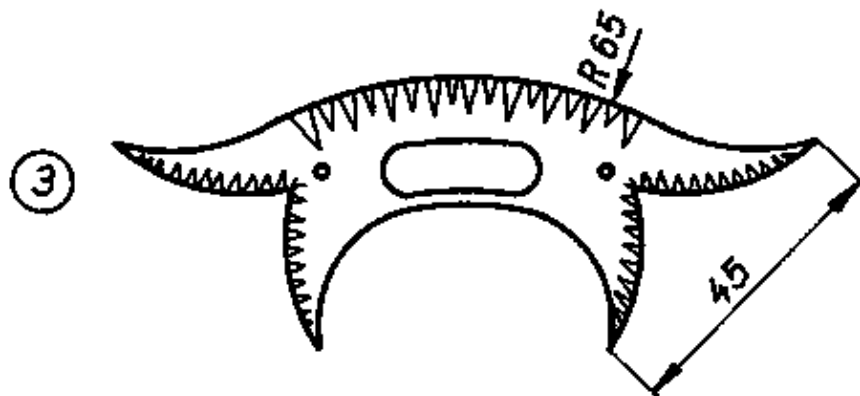
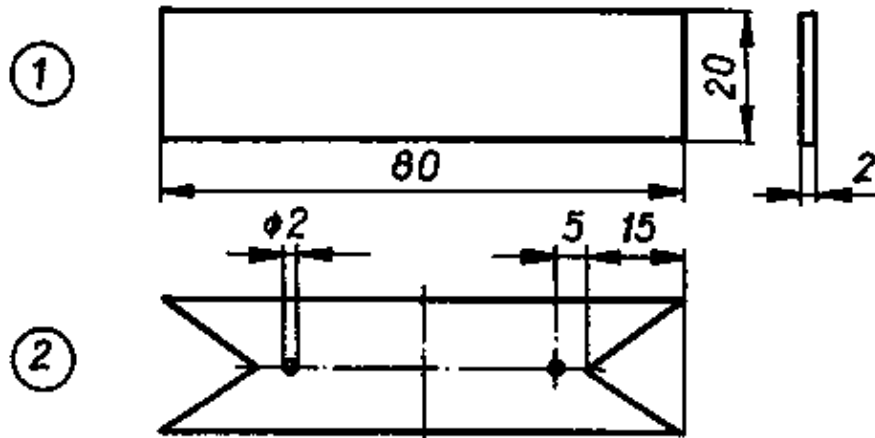
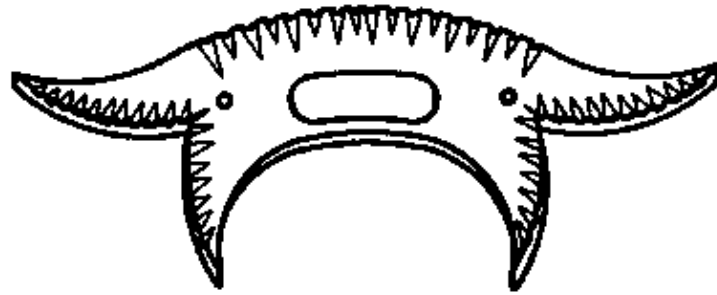
Surface plate, vice, flat nose plier or pin vice

Necessary additional knowledge

Reading of drawings, measuring and testing, marking and punch-marking

Sequence of operations	Comments
1. Arrange the working place, prepare the working tools.	– Check for completeness.
2. Check for initial dimensions, otherwise cut the sheet strip to size according to size specified and scribe the notches.	– Stage (1) Use hand hacksaw or lever shear.
3. Saw out the notches of 15 mm length at both ends, scribe the bore holes, prick-punch and drill the holes of 2 mm dia.	– Stage (2) Drill under supervision of the instructor.

4. Grip the sheet strip at one end by means of flat nose plier or pin vice and hammer with the hammer pane from the centre of the sheet strip outward, then straighten the sheet strip.	– Stage (3) Work on upper edge only (as per drawing)!
5. Check radius 65 for size, if necessary repeat operation 4.	– Use the radius gauge.
6. Curve the inner edges of the notches at both ends of the sheet strip by hammer blows with the hammer pane as per drawing until the corner-to-corner size of 45 mm is reached.	
7. Flatten the area for the number according to the number of figures by means of hammer and sledge.	
8. Mark the number by means of marking punch.	
9. Final inspection.	– Dimensions, appearance, quality of the number.



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	Number Plate for Locker		3103

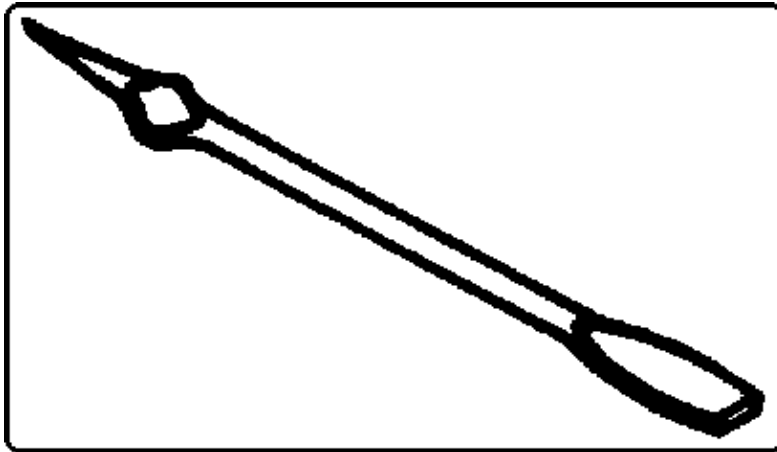
Number Plate for Locker

Instruction example 3.3. Screw Driver

To practise widening of round stock by hammering with the hammer pane.

Material

Round stock of cold work steel
(1 – 1.1 % carbon).
Diameter: 5 mm
Length: optional



Hand tools

Engineers' hammer (500g), smooth-cut file 200 mm (flat), hand hacksaw.

Measuring tools

Steel measuring tool, vernier caliper.

Accessories

Vice or surface plate.

Required previous knowledge

Reading of drawings, measuring and testing, scribing.

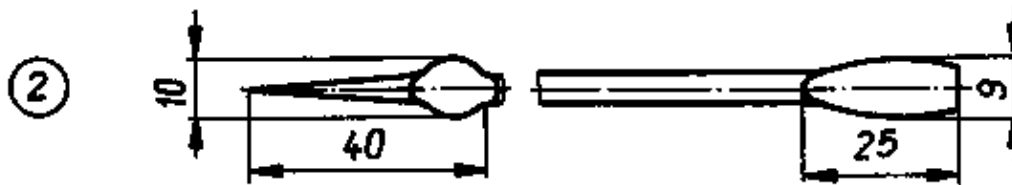
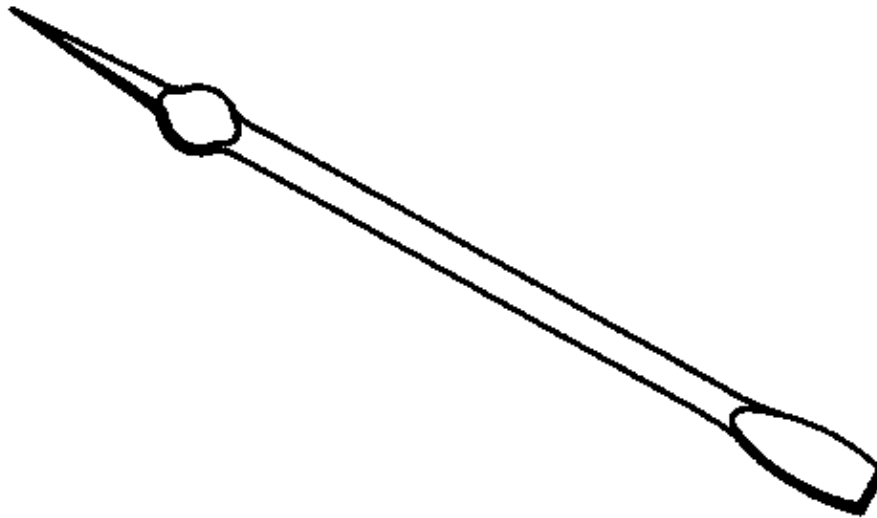
Sequence of operations	Comments
1. Arrange the working place, prepare working materials.	Check for completeness.
2. Saw round stock to length.	Stage (1)
3. Hammer both sides of screw driver blade with the hammer pane to the size specified.	Stage (2) Don't hammer notches!
4. Scribe handle end and hammer handle enlargement (other end of round stock) with hammer pane.	Make sure that the face is uniform 1
5. Straighten round stock.	
6. Final inspection.	Dimensions, appearance.

Completion

File the screw driver blade with the smooth-cut file to smooth the faces, file a point to the handle end, harden the blade, fix a handle.

To continue practising, if necessary

Produce other screw drivers of different diameters 8



			3.3.
	Screw Driver		3103

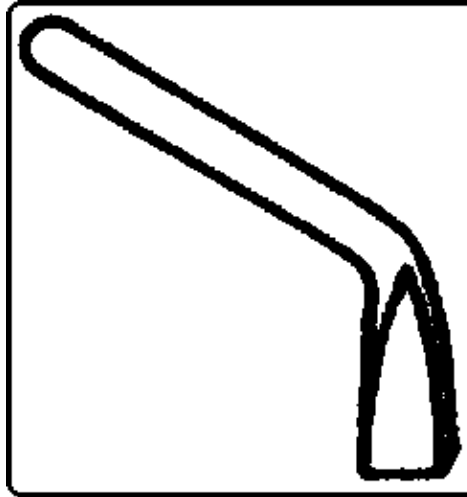
Screw Driver

Instruction example 3.4. Copper Bit of a Soldering Iron

To practise widening of copper by hammering with the hammer pane.

Material

Round stock of copper
8 mm diameter, 120 mm length



Hand tools

Engineers' hammer (500 g), smooth-cut file 200 mm (flat)

Measuring and testing tools

Steel measuring tool, protractor.

Accessories

Surface plate, vice, clamping jaws for round stock.

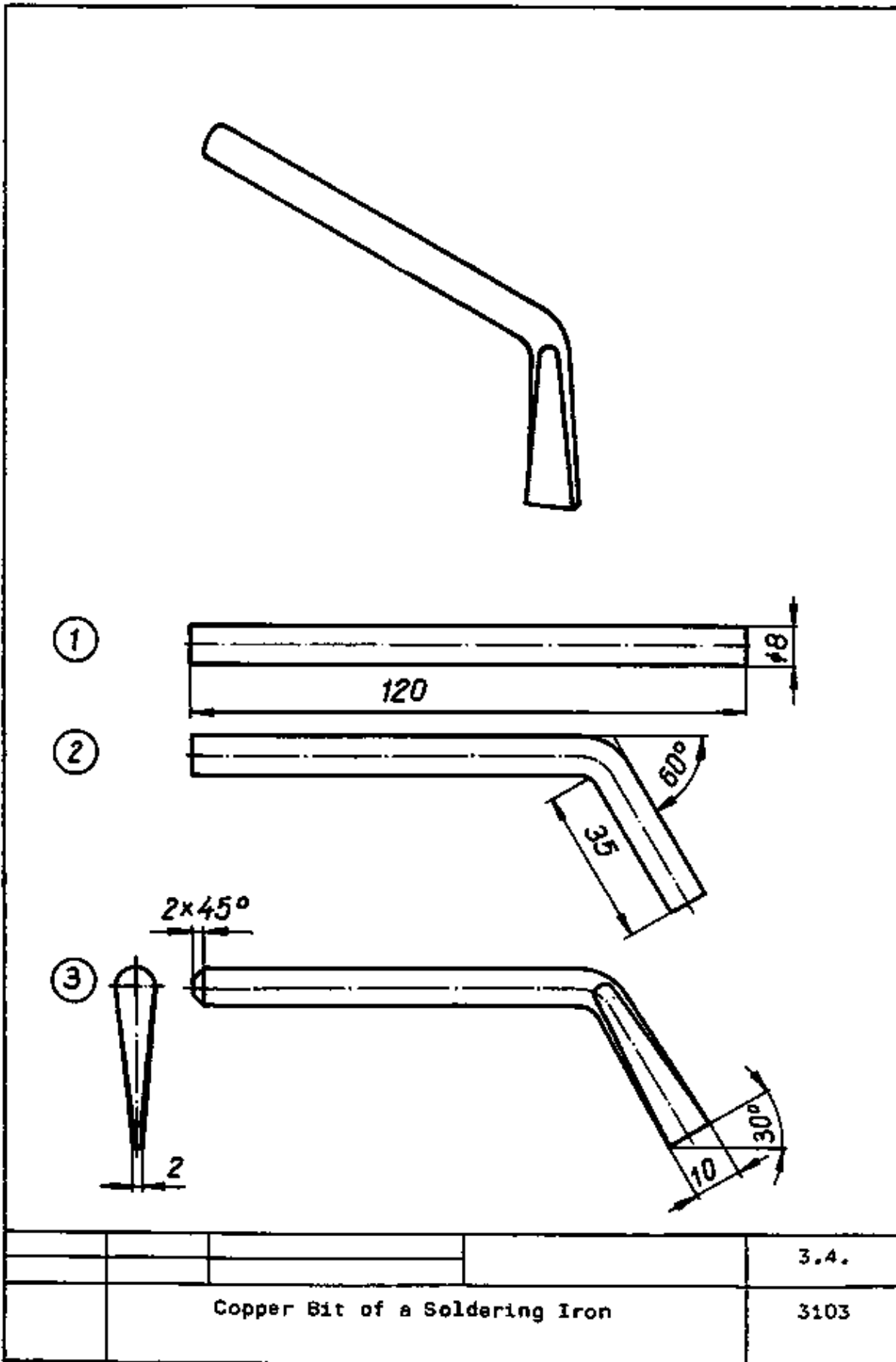
Required previous knowledge

Reading of drawings, measuring and testing, scribing

Sequence of operations	Comments
1. Arrange the working place, prepare working materials.	– Check for completeness.
2. Saw round stock to length.	– Stage (1)
3. Hammer to (60 degrees') angle in vice according to size specified.	– Stage (2) Clamp round stock in clamping jaws for round stock.
4. File 2 x 45 degrees in vice.	
5. Hammer both sides of the flanks of the soldering iron bit with the hammer pane.	– Use surface plate or vice anvil as support.
6. Smooth the flanks with the file.	– Stage (3) Make sure that the specified size is maintained.
7. Final inspection.	– Dimensions, appearance.

To continue practising, if necessary:

Produce soldering iron bits of required diameters (depending on the sizes of the soldering irons used in the workshop).



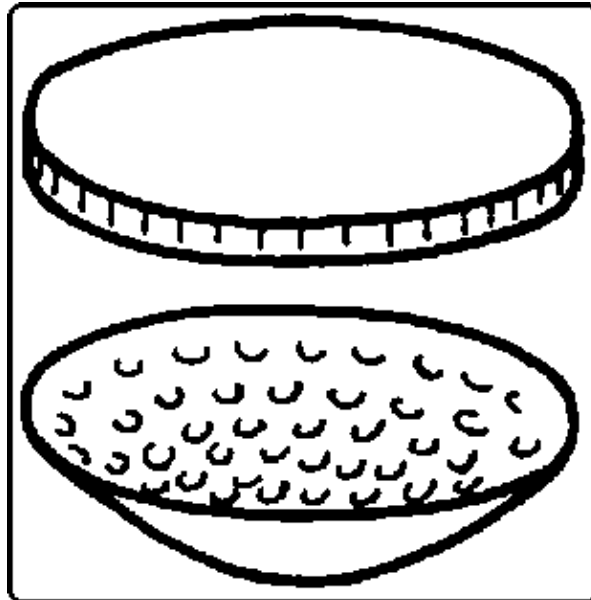
Copper Bit of a Soldering Iron

Instruction example 3.5. Bowl with Cover

To practise chasing and flanging of sheet copper.

Material

2 pcs. of copper sheets
Thickness: 0.8 – 1 mm
Diameter: 50 mm and 55 mm.



Hand tools

Dividers, chasing hammer, engineers' hammer (500 g), lever shear, wooden hammer (radiused).

Measuring and testing tools

Steel measuring tool.

Accessories

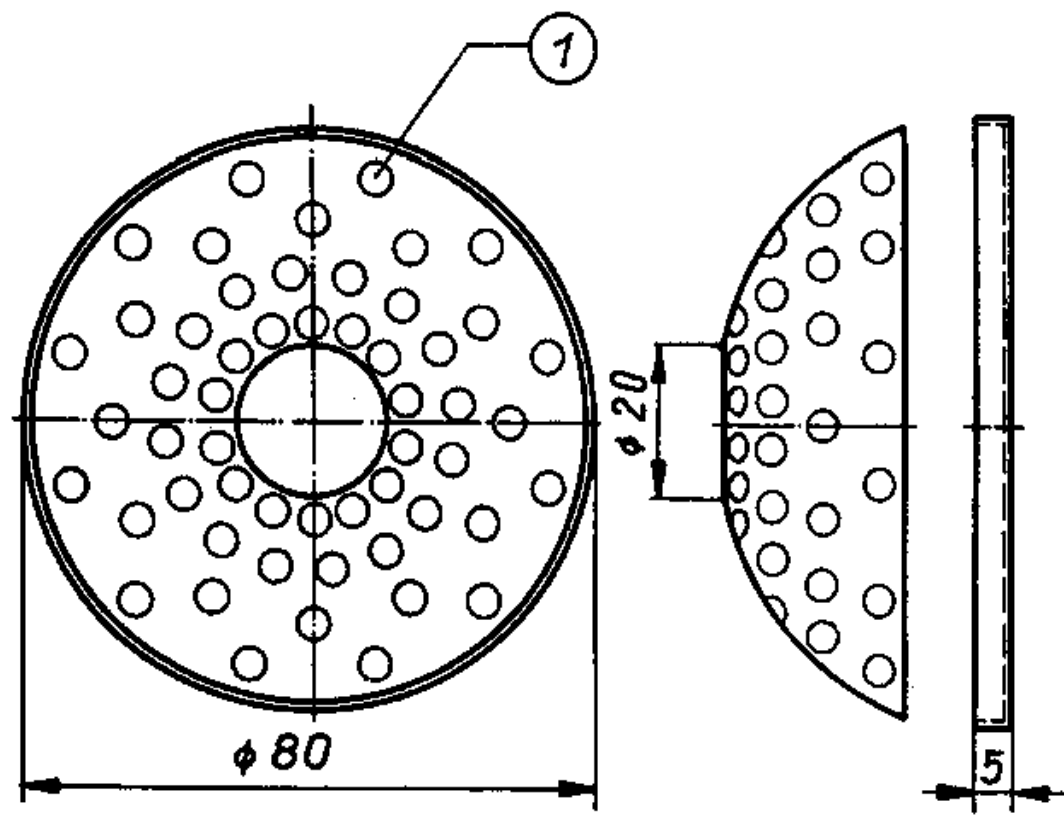
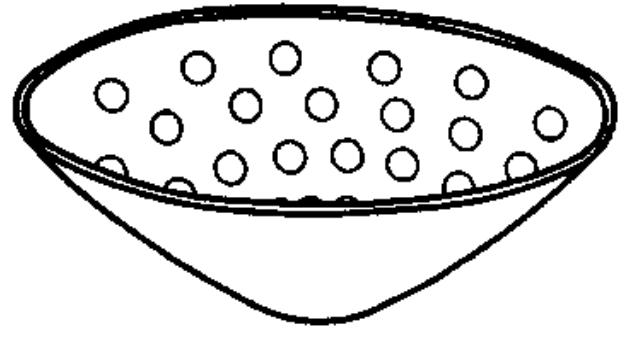
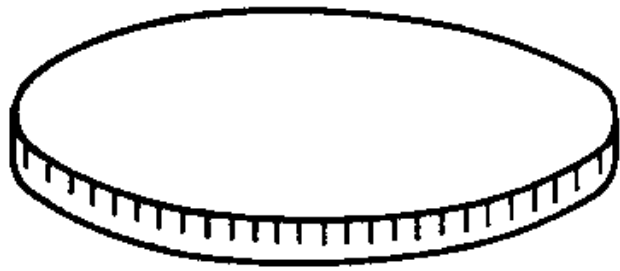
Anvil or surface plate, bordering tool, short piece of steel tube for cover of 80 mm diameter. C clamp, small sand-bag, fire, water.

Required previous knowledge

Reading of drawings, measuring and testing, scribing.

Sequence of operations	Comments
1. Arrange working place, prepare working tools.	– Check for completeness.
2. Check the diameters, otherwise cut copper sheets to size (initial size) by means of lever shear.	– Scribe with dividers.
3. Hammer steadily with chasing hammer spirally from the centre outward.	– Turn sheet with the anvil! (1) hammer-blow marks
4. Fire-anneal in steps (check for clear, short sound), quench in cold water, then continue hammering until bowl form is reached (size 80).	

5. Produce final form of bowl (if necessary only) by hammering in the sand–bag constantly rotating the bowl.	– Apply gentle hammer blows only! Use wooden hammer (radiused)!
6. Hammer flat face for standing of bowl in opposite direction (size 20)	– Use hammer pane of engineers' hammer.
7. Check second copper sheet for diameter 85, put on steel – tube piece and clamp with C clamp.	– Put centrally on tube piece, scribe checking line dia. 80, if necessary.
8. Bend down (flange) projecting border by means of engineers' hammer and bordering tool or wooden hammer.	
9. Bulge–in and smooth puckers with engineers' hammer.	
10. Final inspection.	– Uniformity of roundness, fitting accuracy of cover.



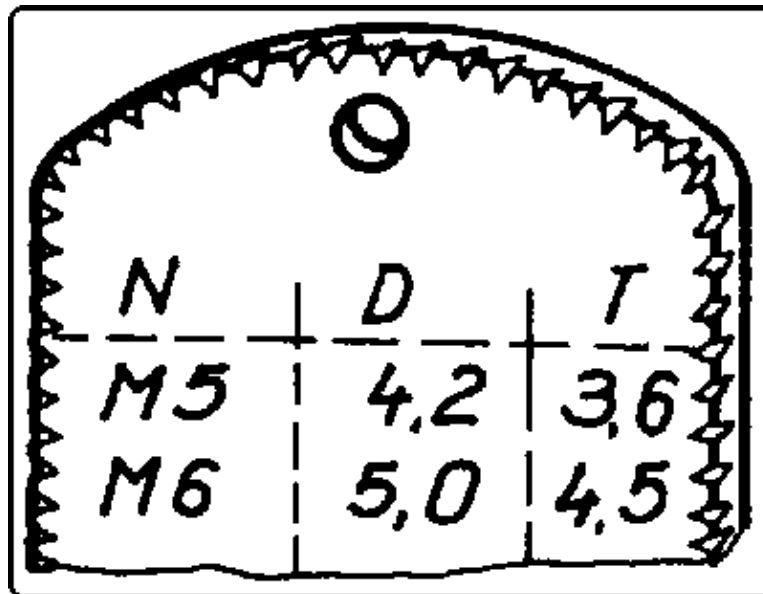
① hammer - blow marks

			3.5.
			16
	Bowl with Cover		3103

Instruction example 3.6. Table to determine Tapping Drill Holes and Bore Depths

Material

General-purpose constructional steel sheet (350 MPa)
 Thickness: 2 mm
 Width: 50 mm
 Length: 80 mm



Hand tools

Hand hacksaw or lever shear, scribe, centre punch, smooth-cut file 200 mm (flat), marking punch (figures and letters), 4.0 mm dia. drill, engineers' hammer (500 g)

Measuring and testing tools

Steel measuring tool, radius gauge 40 mm

Accessories

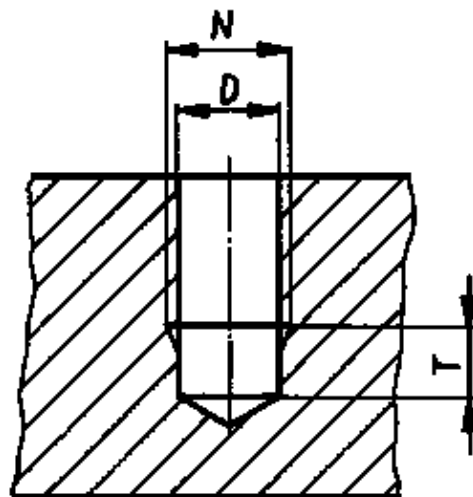
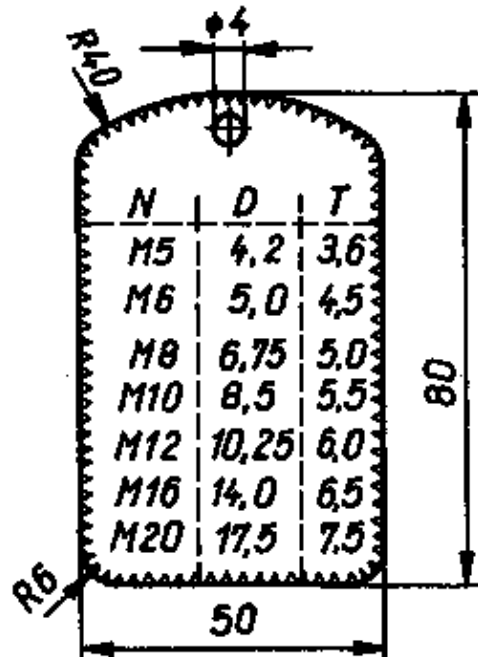
Surface plate

Required previous knowledge

Reading of drawings, measuring and testing, marking and punch-marking.

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	- Check for completeness.
2. Check for initial dimensions, otherwise cut sheet to size (outside dimensions), scribe and file to size with flat file (including radii).	
3. Scribe the grid lines for guidance of the figure and letter punches.	The auxiliary lines must be in accordance with the height of figures and letters.

4. Punch–mark as specified.	
5. Fine–finish the surface. Hammer all outside edges by gentle oblique blows (with the hammer pane).	
6. Final inspection.	Dimensions, uniformity of table figures.



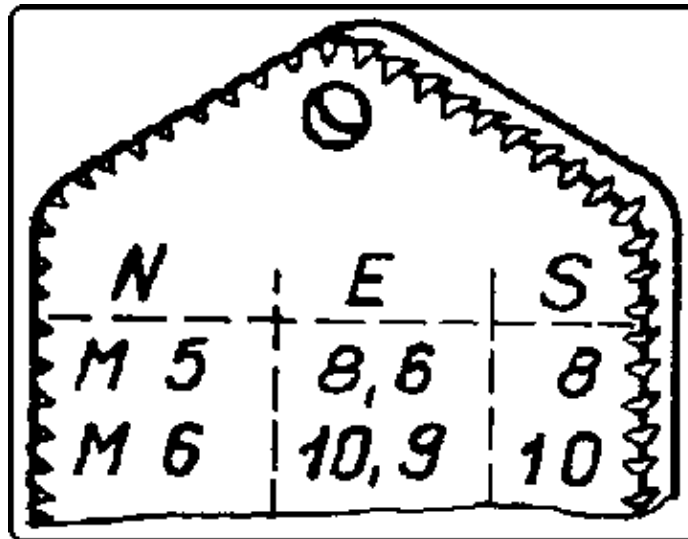
				3.6.
	Table			3103

Table

Instruction example 3.7. Table to determine Widths across Flats and Widths across Corners of Hexagonal-Head Screws

Material

General-purpose constructional steel sheet (380 MPa)
 Thickness: 2 mm
 Width: 50 mm
 Length: 80 mm



Hand tools

Hand hacksaw or lever shear, scribe, centre punch, smooth-cut file 200 mm (flat), marking punch (figures and letters), 4.0 mm dia. drill, engineers' hammer (500 g).

Measuring and testing tools

Steel measuring tool, protractor or angle gauge 60°.

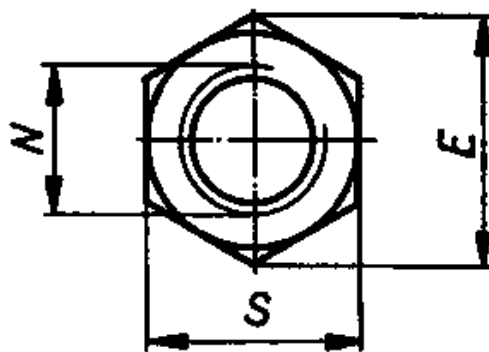
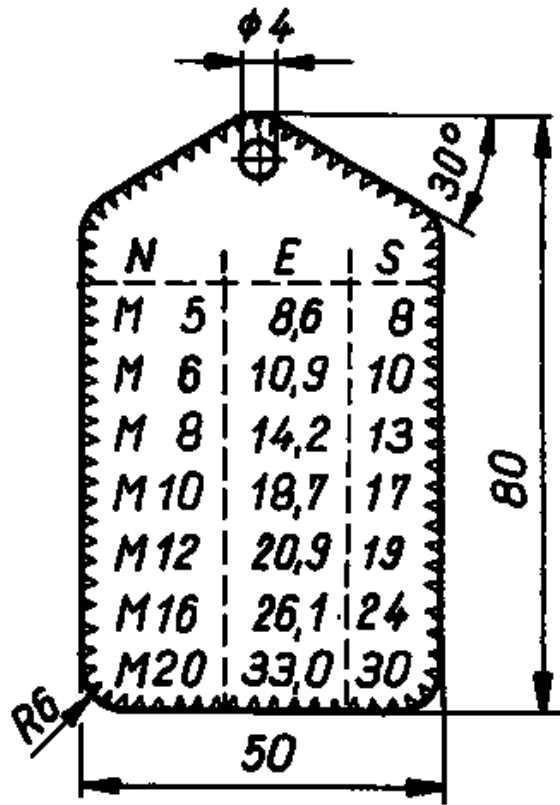
Accessories

Surface plate

Required previous knowledge

Reading of drawings, measuring and testing, marking and punch-marking

Sequence of operations	Comments
1. Arrange the working place, prepare the working materials.	- Check for completeness.
2. Check for initial dimensions otherwise cut sheet to size (outside dimensions), scribe and file to size with flat file (including radii).	
3. Scribe the grid lines for guidance of the figure and letter punches.	- The auxiliary lines must be in accordance with the height of figures and letters.
4. Punch-mark as specified.	
5. Fine-finish the surface. Hammer all outside edges by gentle oblique blows (with the hammer pane).	
6. Final inspection.	- Dimensions, uniformity of table figures.



3.7.

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Table

3103

Table

