

THE BLACKSMITH'S CRAFT



THE BLACKSMITH'S CRAFT

The
BLACKSMITH'S CRAFT

*an introduction to Smithing for apprentices
and craftsmen*

Published by
RURAL DEVELOPMENT
COMMISSION

THE BLACKSMITH'S CRAFT

- First published Spring, 1952*
Second impression (revised) July, 1955
Third impression April, 1961
Fourth impression June, 1964
Fifth impression August, 1968
Sixth impression May, 1973
Seventh impression April, 1975
Eighth impression July, 1976
Ninth impression August, 1979
Tenth impression August, 1983
Eleventh impression August, 1990
Twelfth impression October, 1995
Thirteenth impression September, 1997



This book is the copyright of the
RURAL DEVELOPMENT COMMISSION
141 Castle Street, Salisbury, Wiltshire SP1 3TP

Printed and bound in Great Britain by
Biddles Ltd, Guildford and King's Lynn
ISBN 1 869964 14 4 RDC 10/95/IK

Contents

<i>PREFACE</i>	<i>PAGE</i> ix
<i>SAFETY AT WORK</i>	x
<i>INTRODUCTION</i>	xi

PART I

CHAPTER		
1	THE BLACKSMITH'S EQUIPMENT	1
	The Hearth	1
	The Blast	2
	The Anvil	3
	The Bench	4
	The Vices	5
	Tool Racks	6
	Tong Racks	6
	Floor Mandrel	6
	The Swage Block	6
2	THE BLACKSMITH'S TOOLS	7
	Hammers	8
	Tongs	8
	Cold Chisels	8
	Hot Chisels	9
	Cold Sets	10
	Hot Sets	10
	Hardies	11
	Punches for Hot Work	11
	Drifts	11
	Fullers	12
	Flatters and Set Hammers	12
	Swages	13
	Hand Mandrel	13
	Bolster for Harrow Tines	13
3	THE BLACKSMITH'S FIRE	14
	Fuel	14
	Fire Tools	15
	The Fire	15
	Management of the Fire	17

CHAPTER	PAGE
4 THE BLACKSMITH'S WORK	19
Taking a Heat	19
Drawing Down	20
Bending	20
Upsetting or Jumping Up	20
Hot Cutting	21
Punching and Drifting	21
Fire Welding	21
Instructions for Fire Welding	21
Heat Treatment	23
5 THE BLACKSMITH'S MATERIALS	24
Wrought Iron	24
Mild Steel	25
Medium Carbon Steel	25
High Carbon Steel	25
Alloy Steels	26

PART II

CUTTING OFF COLD METAL	28
Lesson	
1 DRAWING DOWN	30
2 CHAIN STAPLE AND U-BOLT	32
3 'S' HOOK	34
4 UNWELDED EYE	35
5 HARROW GAUGE OR SCRIBER	36
6 SQUARE LATCH KEEP	39
7 BARBED GATE HOOK	40
8 SPLIT LINK	41
9 WELDED AND DRAWN DOWN POINT	42
10 CHAIN LINKS	44
11 HOLDFAST	46
12 PIPE HOOK	48

Illustrations

PART I

FIGURE

1	<i>Plough Fitting</i>	xi
2	<i>The Hearth</i>	1
3	<i>The Blast</i>	2
4	<i>The Anvil</i>	3
5	<i>The Anvil</i>	4
6	<i>The Bench</i>	5
7	<i>Tool Rack</i>	6
8	<i>Floor Mandrel</i>	6
9	<i>The Swage Block</i>	7
10	<i>Hammers</i>	8
11	<i>Tongs</i>	8
12	<i>Cold Chisels</i>	9
13	<i>Hot Chisels</i>	9
14	<i>Cold Sets</i>	10
15	<i>Hot Sets</i>	10
16	<i>Hardies</i>	11
17	<i>Punches</i>	11
18	<i>Drifts</i>	11
19	<i>Small Fullers</i>	12
20	<i>Large Fullers</i>	12
21	<i>Flatters</i>	12
22	<i>Swages</i>	13
23	<i>Hand Mandrels</i>	13
24	<i>Bolster for Harrow Tines</i>	13
25	<i>Bolster for Harrow Tines</i>	14
26	<i>Fire Tools</i>	15
27	<i>The Swab</i>	15
28	<i>The Fire</i>	16
29	<i>Preparation for Lighting the Fire</i>	16
30	<i>Kindling the Fire</i>	17
31	<i>The Fire Breaking Through</i>	17
32	<i>Removing Hot Clinker</i>	18

PART II

33	<i>Cutting off Cold Metal</i>	28
34	<i>Cutting off Cold Metal</i>	28
35	<i>Cutting off Cold Metal</i>	29
36	<i>Cutting off Cold Metal</i>	29

PART III

37	<i>Rings</i>	50
----	--------------	----

Note.—The line drawings and half-tone illustrations in the Lessons in Parts II, III and IV are not included in this list.

Illustrations

PART I

FIGURE

1	<i>Plough Fitting</i>	xi
2	<i>The Hearth</i>	1
3	<i>The Blast</i>	2
4	<i>The Anvil</i>	3
5	<i>The Anvil</i>	4
6	<i>The Bench</i>	5
7	<i>Tool Rack</i>	6
8	<i>Floor Mandrel</i>	6
9	<i>The Swage Block</i>	7
10	<i>Hammers</i>	8
11	<i>Tongs</i>	8
12	<i>Cold Chisels</i>	9
13	<i>Hot Chisels</i>	9
14	<i>Cold Sets</i>	10
15	<i>Hot Sets</i>	10
16	<i>Hardies</i>	11
17	<i>Punches</i>	11
18	<i>Drifts</i>	11
19	<i>Small Fullers</i>	12
20	<i>Large Fullers</i>	12
21	<i>Flatters</i>	12
22	<i>Swages</i>	13
23	<i>Hand Mandrels</i>	13
24	<i>Bolster for Harrow Tines</i>	13
25	<i>Bolster for Harrow Tines</i>	14
26	<i>Fire Tools</i>	15
27	<i>The Swab</i>	15
28	<i>The Fire</i>	16
29	<i>Preparation for Lighting the Fire</i>	16
30	<i>Kindling the Fire</i>	17
31	<i>The Fire Breaking Through</i>	17
32	<i>Removing Hot Clinker</i>	18

PART II

33	<i>Cutting off Cold Metal</i>	28
34	<i>Cutting off Cold Metal</i>	28
35	<i>Cutting off Cold Metal</i>	29
36	<i>Cutting off Cold Metal</i>	29

PART III

37	<i>Rings</i>	50
----	--------------	----

Note.—The line drawings and half-tone illustrations in the Lessons in Parts II, III and IV are not included in this list.

PREFACE

This book has been published by the Rural Development Commission, formerly the Council for Small Industries in Rural Areas, because there appeared to be no text book on blacksmithing today which could meet the needs of craftsmen, technical schools and apprentices' training centres. The lack of such a book was a handicap to the teaching of this subject and particularly to young men who are receiving instruction from the Commission in country workshops. Although written primarily for these men, it will also be of great value to many other craftsmen and apprentices whose work depends on a sound knowledge of the behaviour of iron and steel.

The skill of the smith has been faithfully recorded in sequences of still photographs married to brief descriptive captions. The sequences are arranged in lessons which should not be difficult to follow if text, drawings and photographs are carefully studied. The Commission realizes that some of the methods shown and described are not the only ones possible. In such cases the variations have been carefully considered, and the methods chosen have been those which seemed best for the beginner: as he gains experience, the smith can develop his own variations of a technique.

SAFETY AT WORK

FIRE

Fire can be the main hazard in the forge. It must be the responsibility of each member of staff to familiarise themselves with the fire drill procedure.

Ensure that you know the location and type of the nearest fire extinguishers and how to use them correctly. Be sure that you are aware of the location of the nearest fire alarm to your workspace.

In the event of a fire, shout a clear warning. Operate the nearest fire alarm. Close all windows and doors. Ensure that you only attempt to fight small fires and with the correct fire extinguisher. Keep calm and do not endanger yourself.

If in doubt, get out. Be alert. Know what you are doing and why.

EYE PROTECTION

There is always a high risk of damage to the eye or eye-sight, especially when working with hot metal (forging). Always ensure that safety spectacles are worn.

MACHINERY

Safety precautions are essential when operating machinery. Remember that any injury is generally severe. Death and amputation are often the result of machinery accidents. Dangerous parts of machinery must be guarded. Guards must always be in place and correctly adjusted. Abrasive wheels must only be mounted by authorised personnel.

GENERAL SAFETY

Never try to do someone else's job. Don't tamper with equipment that you do not understand. Never throw things or play practical jokes on your workmates. Remember to walk – don't run. Wash your hands often throughout the day. Do not wear clothing that is loose and flaps about. Wear suitable footwear which is in good repair. Always report unsafe conditions. Do not carry or move any object which obstructs your field of vision. Do not lift any heavy workpieces or equipment manually.

INTRODUCTION

FORGING is the oldest method of making things from iron and steel. It remains an essential craft, because farmers still need within easy reach of their farms workshops where they can be sure of an efficient and prompt repair service. To give such a service today, the skill of a blacksmith must be combined with the techniques of gas or arc welding and flame cutting, but the craftsman who possesses only the techniques of a welder without a knowledge of forging will be seriously handicapped. His lack of smithing skill will oblige him to use welding and flame cutting for jobs which could be done cheaper and better by forging.

An example is the fitting illustrated in Fig. 1. A welder could easily cut the plate and two gussets with a gas cutter from any scrap available, but he is unlikely to have a suitable piece of tube. Without a knowledge of smithing, the only way to make the tube would be to drill and bore a solid piece of shaft, a slow and expensive job. The blacksmith made the tube in Fig. 1 by rolling a piece of plate round a mandrel and then welding the seam, thus saving time and material.

Metal forged at the correct heat loses none of its strength but if, for instance, a piece of metal is merely heated by a blow pipe flame and pulled or hammered over a vice, its structure is weakened and may give under strain. A blacksmith working hot metal on the anvil comes to understand his material better than he could in any other way. This is especially true of the smith who turns to ornamental ironwork in his spare moments, for this, besides being to many smiths an absorbing creative art and relief from their heavy work, is an excellent way of discovering the characteristic behaviour of iron. For these reasons, a blacksmith who also has a knowledge of welding techniques can give the farmer a much more versatile and useful service than the man who cannot forge his metal.

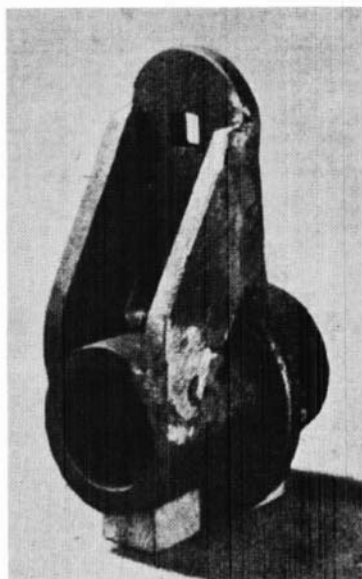


Fig. 1

The basis of the blacksmith's craft is set out in the pages which follow. There are four parts. Part I describes the smith's simple equipment and his tools, his fuel and his fire, the processes he uses in his work and his raw materials. Parts II, III and IV open with a description of a particular technique which is essential to the lessons which are set out step by step in each part. Each of the photographs by which a technique is illustrated shows some detail of particular technical significance such as the position of the body, the correct grip of the tool in the hand, the angle at which the work is held. At the head of each lesson is a line drawing of the piece to be made, so that the progressive stages of the exercise will be more readily understood, and the relation of drawings to solid objects will become familiar.

A smith who has mastered these thirty-seven lessons will know the essentials of his craft.