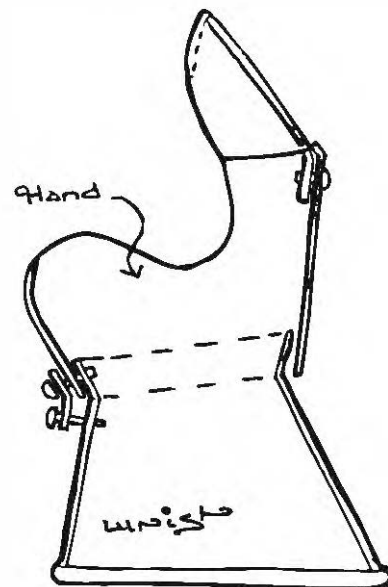
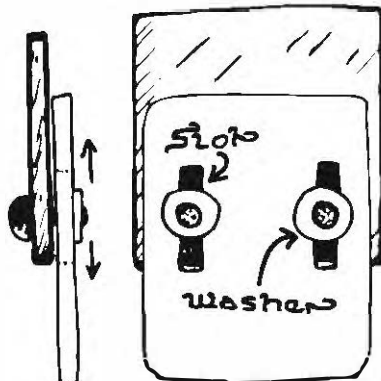
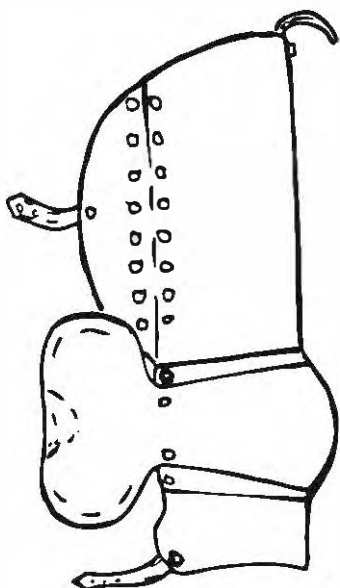
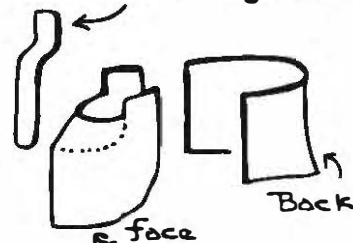
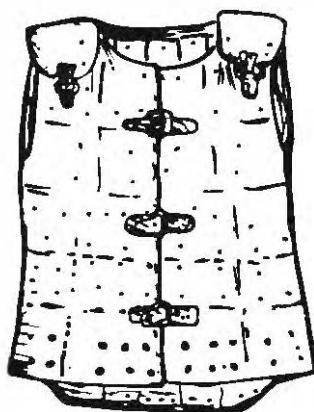
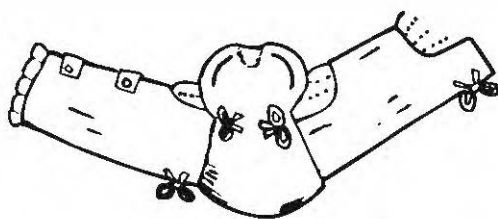
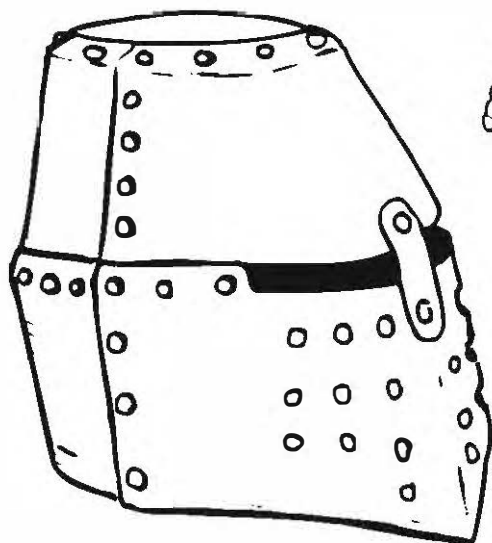
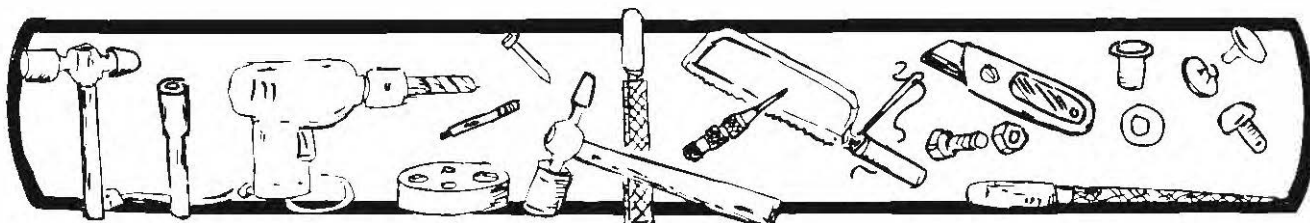


Basic Armouring

A practical Introduction to Armour Making



Paul Blackwell * Second Edition



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By Paul Blackwell

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Ye Small Print—Cautionary Note and Disclaimer

Combat re-enactment in any form carries an element of risk (hey they used to do this for real!) Even making armour can be hazardous, if you drop a hammer on your foot, cut yourself on a sharp piece of metal or do something even more disastrous! It must be pointed out, therefore, that if you partake in silly hobbies such as these you do so at your own risk!

The advice and information in this booklet is given in good faith (most having been tried out by the author) however as I have no control over what you do, or how you do it, I can accept no liability for injury suffered by yourself or others while making or using armour.

Ye Nice Note

Having said all that I'll just add that I've been playing for ages and am still in one piece and having fun.

Cheers, Paul



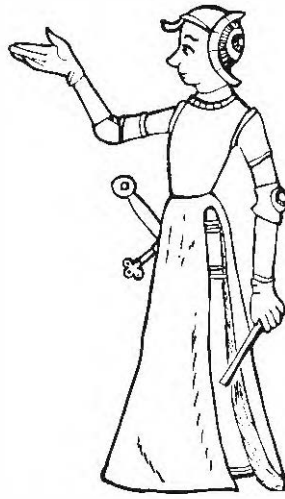


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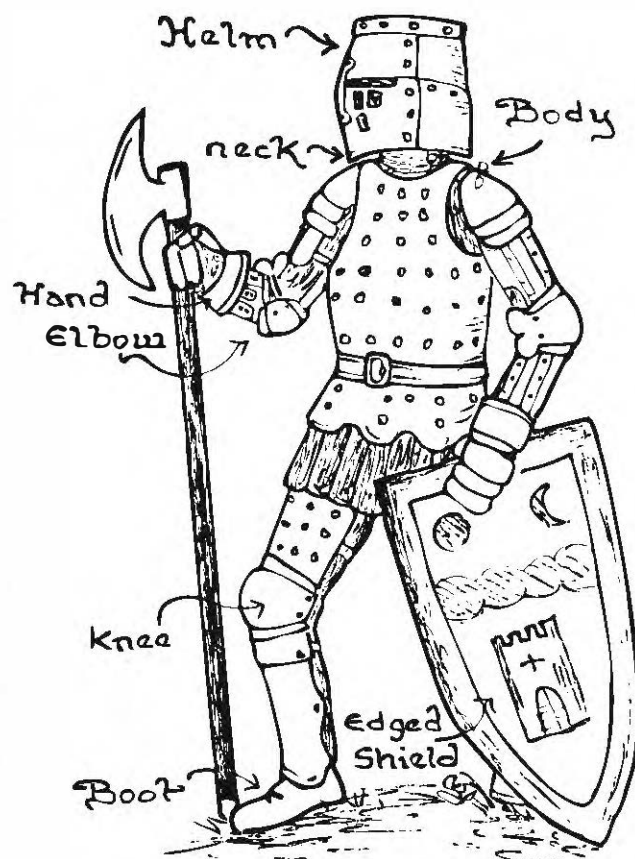
Stepping out into the world of medieval combat recreation can, like any other sport, be somewhat daunting. To start with where do you get all the equipment you need, especially all that nice shiny armour? Well here are your options:

1. Borrow it (a good way to start if spare stuff is available)
2. Buy it new (can be expensive)
3. Buy it second hand (cheaper but will it fit or be worn out already?)
4. Make it yourself.
5. Any combination of the above!

This booklet is a primer for those who want to try the fourth option; it sets out to show you how to make simple, but practical, armour. Beware though, armour making can become a hobby in its own right and this book is but an introduction! In time you may want to make even fancier, more complex and more authentic armour, in the meanwhile this book should get you out on the field! Enjoy.

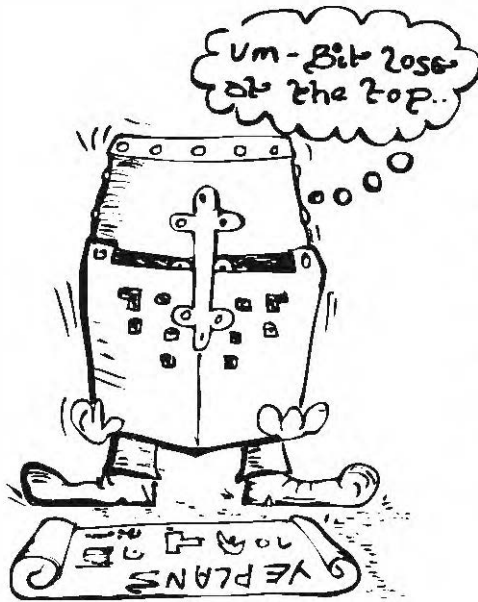
Before you begin armouring

Decide what you need! This may seem obvious but experience has shown that people can rush out, make something entirely inappropriate, then wonder why no one will let them play in it! Sad but true. To avoid this first check out what the local armour requirements are — read the rules, ask a marshal or another fighter, people like to help (more fighters equals more fun). A lot can be learnt by simply talking to experienced fighters. “Oh you don’t want one of those — they weigh a ton — stops you running about! Want to buy my old one?” Try and decide on a style that will suit both the way you want to look and the way you want to fight then start



thinking about how to achieve it. The sketch to the right shows what is generally required. (For more information see Chapters 18 and 20.)

Fitting



Obviously your armour should fit you. This means patterns etc. will need adjusting. Therefore don't just go out and copy an existing piece and expect it to fit — it probably won't. If you have been borrowing armour you will probably have noticed this effect already; universal fit means that it universally doesn't quite fit anybody. What is not so obvious is that your armour should fit you and what ever else you are wearing. Padding can change your size and shape considerably so build your armour around it, not the tee shirt you wear in the workshop. Armour should also allow you to move; if it catches, rubs painfully or jams then you've done something wrong — fix it.



Chapter 2 — Materials

World wide period armours were made out of just about anything; cloth, metal, leather, bone, horn, bamboo; basically if it was available and it worked it was used! European armours tend to be less esoteric and generally stick to metal and leather over cloth. When looking for materials shop around, look for off cuts, remnants, or consider buying in bulk. Armour doesn't have to cost a fortune.

Steel

Sheet steel is easily obtainable these days; look in the Yellow Pages under *Metal Stockists*. In the 1800s Sir Henry Bessemer invented a new process for making steel. Modern steel is therefore very different to period stuff; in fact it's a lot better! *Mild Steel* is the easiest and cheapest to get hold of and the most convenient to work. For one thing you can easily cold work it - which means you don't need a forge. Mild steel contains less than 0.25% carbon, has a non-fibrous structure and will take a high polish - it does rust however. It comes as either bright rolled sheets which are shiny and hence easiest to polish or hot rolled, which are marginally easier to work and come in a black colour. *Galvanised steel* is mild steel with a coating on it to stop it rusting which is fine until you scratch it; it is a nasty grey colour and isn't suitable for anything that involves a lot of shape changing. I tend to avoid the stuff! *Stainless steel* comes to a variety of specifications; it's more expensive than mild and more difficult to work, however, if you get the right stuff it won't rust. If you plan to do anything dramatic to stainless you will need to *anneal* it, which will require heat, more of which later.

Mild steel is the best stuff to start off with. It is sold in sheets (generally 2 x 3 meters) of various thicknesses. To be confusing these are often referred to as *gauges* — of course there are different gauge systems from around the world and

Mild Steel for Armour			
Thickness (mm)	Gauge (UK)	Used For	Notes
1.0	20	Edging shields, body plates	Light weight, dents easily
1.2	18	Arms, legs	Will dent, but isn't too heavy
1.5-1.6	16	Elbows, knees, helms	Nice for dishing, can be used for arms and legs
2.0	14	Helms	Starting to get heavy!

MATERIALS

the British gauge system changed when we went metric! Best way round this is to tell the stockist what thickness you want and let him sort out the rest! The table below gives you an idea of what is suitable; the 1.5 to 1.6 mm for 16 gauge is because the old imperial stuff was 1.6mm and the new metric is 1.5. You can still get stuff rolled to the old size if you are lucky! Toughness wise stainless is roughly equivalent to the next gauge up of mild steel.

Leather

Leather is a wonderful material for making armour out of. It can be shaped, left soft to act as a pad, made hard so as to be armour in its own right or just cut into straps to hold everything together! Leather can be purchased from leather factors, warehouses, re-enactors markets (good cheap supplies) or through craft outlets. As with everything else shop around.

Leather for Armour	
Type	Explanation and Use
Rawhide	Untanned, makes good shield edging (dog chews are a good source). Soak in water to make pliable then allow it to dry to make it hard again.
Vegetable tanned	'Period style' leather tanned using natural tannin from tree bark. Straps, coats of plates etc. Can be dyed. Good idea to give it a waterproofing finish (wax, oil).
Chrome tanned	Modern curing process using chromium salts. Straps, coats of plates etc. Comes in a variety of colours.
Suede and Split	No smooth face - not very strong - avoid!
Tooling leather	Vegetable tanned leather without waterproofing finish. When wetted becomes soft and pliable. Can be moulded to shape when wet.
Sole leather	Thick leather; often compressed for extra rigidity. Good for plates etc. Expensive



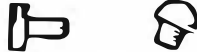
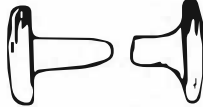


Rivets

The vast majority of your armour is going to be held together by rivets. Look in Yellow Pages under fasteners. Ironmongers, DIY centres, craft shops and leather fittings retailers may also sell certain types. Rivets come very cheap if you buy in bulk (50 plus) rather than in little packers of 10 or so.

Mild steel rivets come in a variety of sizes and lengths — I've ended up with a huge variety! I mainly use 3/16 inch diameter, that's 4.8 mm for you metric types. Length wise I keep lots of 1/4 inch for riveting two pieces of metal together and 3/8 inch for riveting three bits, articulations and the like. It's also worth keeping a few really long ones, you can cut down, for that annoying job where the ones you have don't quite reach. The only other diameter I use a significant number of is 1/8 inch (2.4 mm), for fingers on gauntlets and other fine work.

Tubular rivets with a head size of around 1/2 inch (13 mm) are useful. There is a special tool for setting these things — I find that putting them onto something flat and hitting them with a hammer works fine! The double headed type shown above are superior to the thin back type as they last longer and you can put them in upside down without going, "Darn, that looks wrong!"

MATERIALS

Rivets for Armour			
Type	Material	Use	Looks Like
Flat Head	Mild Steel	Helms (‘cos they wreck rattan swords less!)	
Round Head	Mild Steel	Articulations (‘cos they look nice!)	
Flat/Round	Brass	Decoration	
Tubular	Aluminium, often coated to give Brass effect)	Riveting onto leather or cloth. Not authentic but great for straps, buckles, etc.	
Nails	Mild Steel	Can't find a rivet? Cut a nail down!	
Roofing Nails	Mild Steel	Riviting onto leather or cloth —very cheap!	

Wood

Plywood makes good shields — obtainable from any DIY shop, builders merchant or the like.

Brass

Expensive, heavy and not strong enough for important pieces; brass is however great for decoration.

Aluminium

Not at all period. However sometimes turns up as scrap and can be used to make lightweight body plates or the like. Dural, aircraft grade aluminium alloy, is much tougher and can be used to make shields.

Thermoplastic

Not period, surprise! Ideal for lightweight body plates or hidden stiffeners under leather or cloth; sort of inauthentic hard leather. Great for keeping your total armour weight down so as to avoid excess baggage charges when flying to events around Europe. Can shatter if it gets too cold, for exaple, Finland in winter. Guess how I found that out?

Cloth

Used to make undergarments or to hold armour together as in coat of plates and the like. Markets, material remnant shops, re-enactors markets, charity shops, sewing shops and the like are good places to look for materials at reasonable prices. If you are looking for canvas you can also try a tent maker or camping shop.

MATERIALS

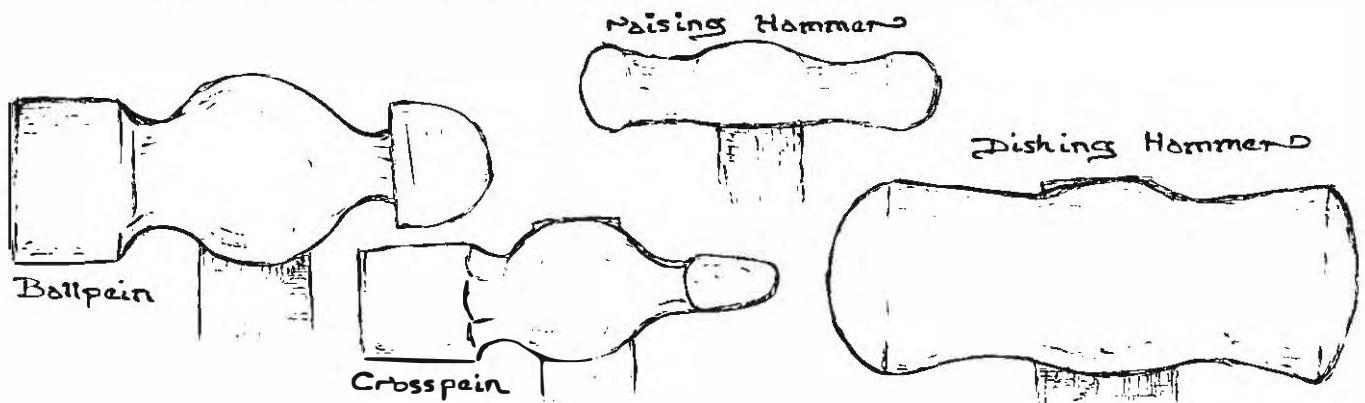


Chapter 3 — Tools

You are going to have to acquire a few basic tools, as you progress you will probably acquire a few more! New tools can be expensive so start looking around second hand tool shops, junk shops, steam rallies, agricultural or engineering auctions or tool sales. You will also need a place to work, somewhere where the noise won't drive the neighbours mad. You are also going to need somewhere with a good floor or you will hammer through it! A shed or garage is fine.

Hammers

You will need a hammer to rivet with; a small ballpeen, about a pound weight, is ideal. You will also need a soft hammer to bend things with, look for a relatively hefty rubber or rawhide mallet. These you should be able to find easily. It's also useful to have a thumping stick for bashing things like nails or cold chisels; basically a fairly heavy hammer whose face you don't mind chewing up!



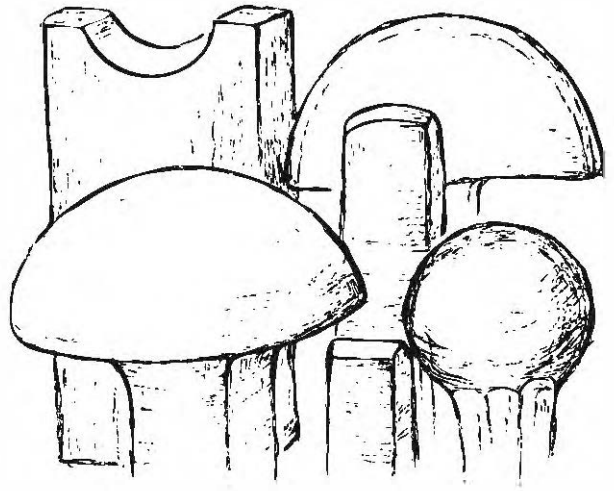
For shaping work you will need hammers with polished faces. Any marks you put into them will be transferred to your work so keep them separate from the general use hammers. A dishing hammer (for making elbows, knees etc.) is a must; anything relatively hefty with a curved face will do. A large round end ballpeen can be used, although the curve will be a bit extreme, or you could always grind a flat faced hammer down a bit. It is probably better though to look for a purpose made dishing hammer. Purchasing one new is a good investment although finding one second-hand shouldn't be too much of a problem. Collecting a variety of dishing hammers will be very useful. A planishing hammer is used to

TOOLS

smooth surfaces and remove hammer marks; any flat-faced hammer will do. If you need to do any raising you will need a hammer for this; a large purpose raising hammer is best but the back of a cross pein can be used.

Formers

You will now need something to hammer onto. No don't rush out and buy an anvil — they can be helpful but are hardly essential, unless you want to be a blacksmith as well. Instead find yourself a tree stump. If you cut a slight hollow into one part of the top this will form a *dishing block*. The rest can be used for hammering onto. Also look for pieces of hardwood as these can be cut into very useful shapes for forming things around. Other things to keep your eyes open for are lengths of metal tube (for bending things over or around), bowling balls and odd chunks of metal. Be inventive, failing that buy some stakes — these come in a variety of shapes and sizes, the mushroom shaped being probably the most useful. Unless you are rich buy them second hand.

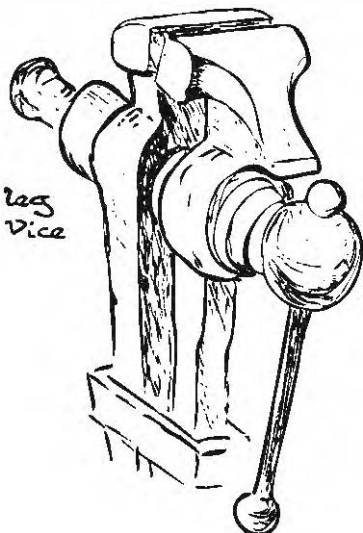


Riveting Block

You will need a smooth, flat, hard, surface to rivet onto. If you want to use round head rivets you will need a rivet snap of the correct size. I use an old lump of stainless steel with curved holes drilled into it.

Workbench

Something for marking things out on, holding a vice or clamps, bashing things on etc. Get something the right height. (Workmates tend to be very low.) I made mine out of an old bed frame and scrap wood.



Vice

For holding things like formers, what you're filing, what you want to thump and a hundred other jobs. The easiest to get is an engineers vice; unfortunately these don't like being thumped! Instead try to get a leg vice, some times called a blacksmiths vice, they are fairly common second hand and are designed to be hammered onto. Mount it onto your workbench.

Cutters

Making armour will involve cutting lots of devious shapes from pieces of metal; a decent cutter is therefore a good invest-

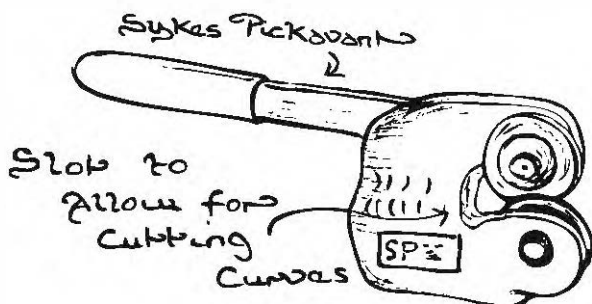
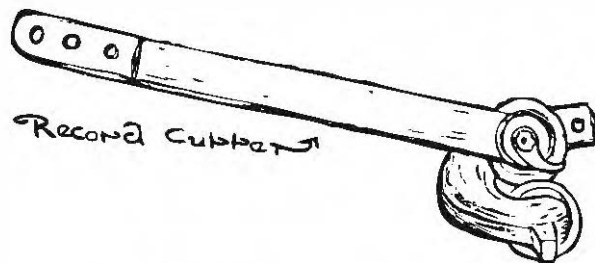
TOOLS

ment. A decent cutter is perhaps the most awkward tool to find at a reasonable price.

The cheapest tool I've ever seen used was a cold chisel. Simply chisel the shapes out on an anvil, then grind them into something useable. Very noisy and time consuming — not recommended.

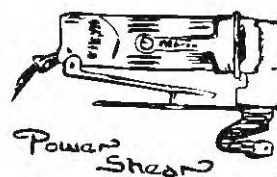
At the bottom end of the more practical range of tools is the humble hack saw — cheap, cheerful but will take you forever. You can use an electric jigsaw but they tend to be very noisy and rather time consuming as well. Make sure you use the correct blade and support the steel to prevent it bouncing around.

Snips, sometimes sold as Tinsnips or Shears will cut thin steel but you will need a gigantic pair to cut 1.2mm or above with any ease. This is actually very period. Compound action snips or Aviation snips give you a mechanical advantage when cutting; they only handle up to 1.2mm steel though.



Once upon a time just about every engineering shop in Britain had a pair of Record wheel cutters — then someone invented power tools. You can still occasionally find them second hand, though as one dealer said “They are as common as rocking horse shit.” They operate like a giant can opener and can cut lines, curves or complex shapes into 1.6mm or thinner steel. They are supposed to mount into a special block, though I've never seen one, but a vice works fine. They also come with an extra handle so you can use them hand held; great for cutting sheets in half. If you see a pair buy them! A similar machine is a Sykes Pickavant Mini Cutter which can also handle up to 16 gauge mild steel.

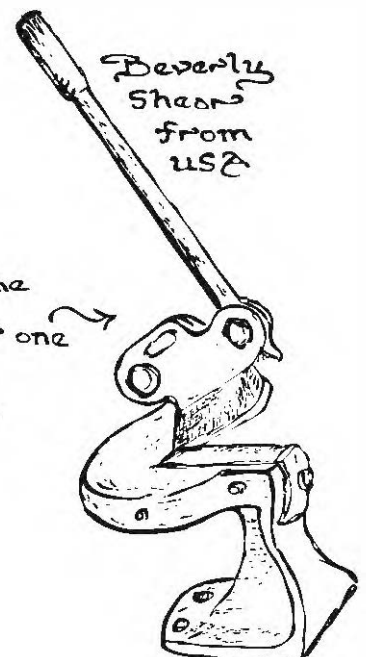
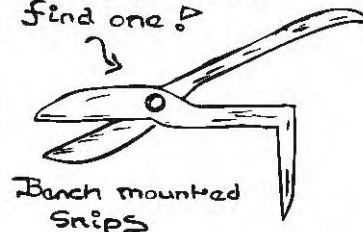
Modern workshops use floor or bench mounting shears, power nibblers or power shears — yep they all sound expensive. The bench-mounted shears are giant guillotines, which cut straight lines very well; they aren't so hot on curves. Nibblers work by punching lots of small lumps out of your sheet, rather messy and very noisy. Power shears are great if you afford them (around £300) and aren't left handed like me. Depending on the input power they can handle thick plates (for example, a Bosch GSC2.8 will cut up to 2.8mm steel). I have seen a nibbler attachment for an electric drill



Nice if you can afford one

Nice if you can import one

Nice if you can find one!



made by Falcon Tools that claims to cut up to 1.5mm steel but have never tried one. Good hunting!

Hole Maker

To put rivets in you need holes. For cloth push a sharp point through, thus cutting as few fibres as possible. For leather get a punch — belt punches are far superior to the hand punches, with the rotating head, which tend to bend if used a lot. For metal a good old electric drill does fine; use HSS drills not wood working ones, or if you want to drill stainless use Boron Carbide tipped drills. If you put a leather washer on the drill next to the chuck you will prevent it scratching if you push your drill in too far. Period armourers probably punched their holes, the modern equivalent is to use a hand punch such as a 'Whitney metal punch'. I invested in one of their "No.5 junior hand punch" sets a few years ago and found it saved a lot of time and effort! It punches 3/32 to 9/23 inch holes in up to 16 gauge steel. You will also need a centre punch to mark where your holes will go (and give a drill tip something to start off on). After years of cursing the automatic spring loaded punches I gave up and went over to using a good old solid punch and a hammer. So much for modern technology.

Files

A hand file will remove rough edges, finish or shaping your piece or remove that awkward little bit that is jamming things — a small round file will correct that hole that isn't quite in the right place. Files come in a variety of shapes and degrees of coarseness — it's worth having a selection. Keep them clean with a file brush (to stop the teeth clogging) and always use them with a handle.

Polishing

A simple polishing and fine grinding machine can be made by mounting a foam sanding wheel on the front of an electric drill. If you mount the drill in a stand things work even better! 150 grit fine belts will remove sharp edges and do fine shaping; when they get worn they can be used to polish. DIY shops only sell 150 or less grit. The less the number the coarser the paper. Tool shops sell finer grades normally for belt sanders but they fit wheels, just check the diameter when you buy. I find 220 or 280 grit give a nice finish.

A fine polishing machine can be made from a cheap bench grinder. Take the grinding wheels off and replace them with mops. OK they don't run up to the same speed as a proper polishing machine but they cost a tenth of the price and don't need a three phase electric supply! If you put a Sisal mop on one side, a stitched cloth finishing mop on the other and use stainless steel polishing compound you can get a mirror finish with a bit of effort.

Other useful bits

Fine felt tip pen for marking things out, scissors, cardboard and sticky tape for templates, nuts and bolts to hold bits together before you rivet them, cold chisel

TOOLS

for getting things apart when you rivet them in the wrong place, G-clamp to give you that extra hand (evolving without a tail was definitely a mistake), washers, trimming knife for cutting leather, pliers, even more hammers.



Chapter 4 — Safety

If you are going to do something do it well and do it safely. Wear leather gloves whenever possible to stop you getting cuts; hey they even make ones with Kevlar in these days. Throw away sharp edged off cuts, swarf, etc. somewhere safe; not the floor or the bench you are about to put your hand. Remove sharp edges before holding bits with your hands and before wearing it! Wear eye protection especially when drilling, grinding, sanding or polishing. Wear a dust mask when polishing, sanding, grinding, etc. When drilling make sure the item is held firmly and remove any swarf caused by the drilling. Ear protectors are a good idea especially when dishing or using a noisy cutter. Wear toe protection footwear and wear sensible clothing.

Armouring is fun; injuring yourself isn't! DIY shops and industrial clothing/safety shops will sell protective bits — they are a good inexpensive investment, *Honest!*

SAFETY