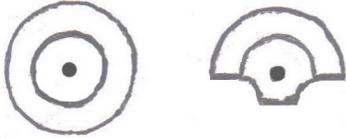


Grind from 45mm length of 5/8" (16mm) bar stock to profile below

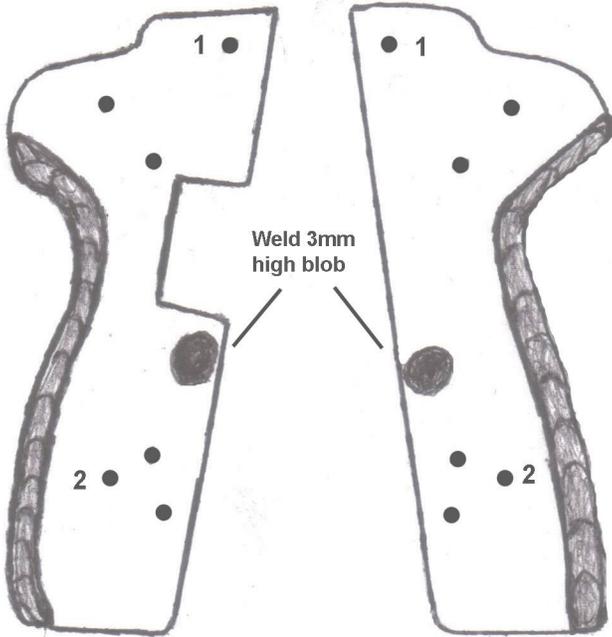


Extractor

Bend from 2mm x 5mm steel strip
Secure with m3 bolt



THE DIY SHEET METAL SELF-LOADING PISTOL



Grind or file down

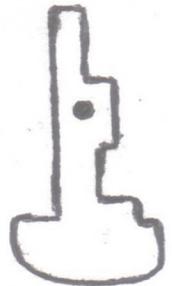


Sear

Magazine catch



Sear compression spring
(10 x 5)



Weld along edges

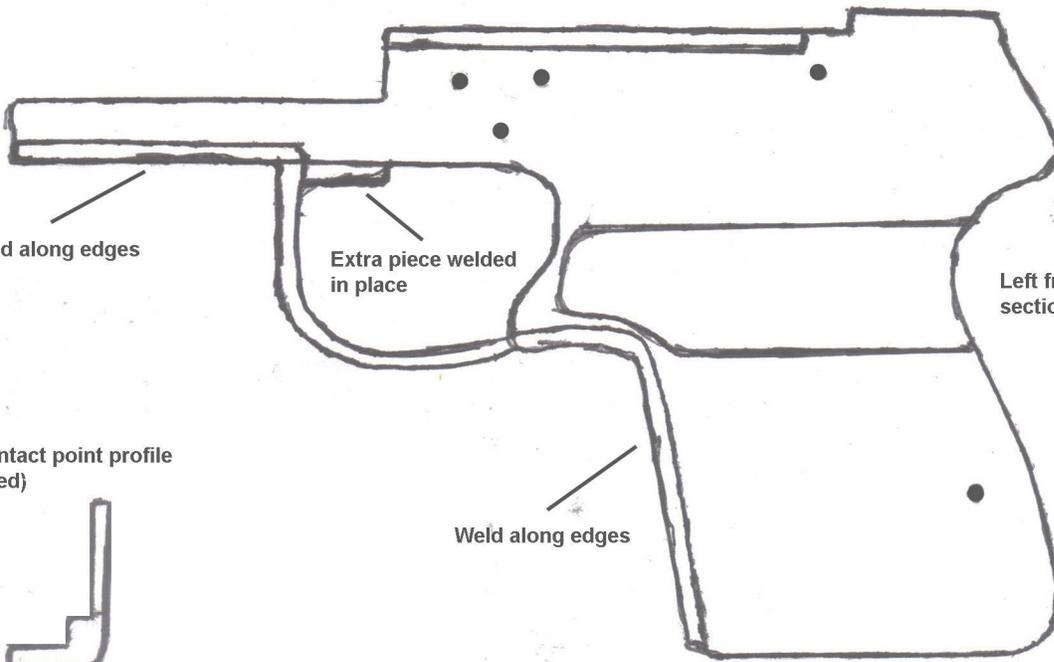
Extra piece welded in place

Left frame plate has section cut out for trigger bar

Sear contact point profile
(mirrored)



Weld along edges



The DIY Sheet Metal Self-Loading Pistol



Practical Scrap Metal Small Arms

Plans on pages 12 to 15

Introduction

The pistol design described in this publication is constructed almost entirely from sheet metal and bar stock, allowing for quick and simplified construction without the use of a milling machine or lathe. It is a semi-automatic, hammer fired, straight blow-back design and at 5 ½ inches long, comparable in size to the Walther PPK.

For legal purposes, the demonstration prototype pictured was built as a non-firearm dummy replica which can only fire 8mm blank rounds used in model guns. It was made with a non-functioning dummy 'barrel' permanently destroyed and welded to the frame. The resulting blank replica is good enough to simulate firing and to evaluate the overall mechanical functionality of the pistol's design. If the reader chooses to build a functioning firearm where legally permitted, the general design would be ideally suited for .25 ACP.

(For academic study purposes only)



(The pistol fully disassembled – note the low number of components.)



(Dummy blank barrel of demonstration prototype pictured)



(An added function of the magazine's follower allows for automatic hold-open when magazine is empty)

Design advantages

- Can be constructed with very limited tools and without the use of a lathe or milling machine
- Loose design tolerances allow plenty of leeway for mistakes and hand-fitting
- Uses a very simple fixed extractor and contains no separate ejector
- Slide is laminated from sheet metal and bar stock rather than being machined from one piece
- Contains a very minimal number of components

A magazine from an 8mm starting pistol was used to speed up the design process for the prototype. A self built alternative can be formed from thin sheet metal (dimensions have been included) or the frame and magazine catch adapted to suit a magazine from another pistol.

In the name of demonstrating minimum functionality, the finished pistol pictured was left 'in the white' without any finishing. It is up to the individual builder to optionally improve upon it's cosmetics with the addition of wood or plastic grip panels and further hand finishing of each component.

Tools:

Hacksaw
Angle grinder
Hand-drill or drill-press
Files
Welder
3mm and 4mm hand taps
Dremel / rotary tool (optional)

Materials:

14 gauge (2mm) mild steel sheet
11 gauge (3mm) mild steel sheet
1/4" (6mm) mild steel plate
5/8" (16mm) mild steel bar
5/32" (4mm) silver steel / hardened steel bar
Compression springs
Spring steel music wire
m4 and m3 bolts

Tools and Construction Techniques

The DIY Sheet Metal Self-Loading Pistol requires very little in the way of tools to construct. No lathe or milling machine is required – instead a number of techniques intended to simulate these are employed using much more affordable tools.

An angle grinder is the poor man's milling machine. It is this highly versatile tool that is used to grind the magazine cuts in the bolt piece using a 3mm grinding disc, which are then hand neatened using a file. When fitted with a 1mm slitting disc it can quickly cut and shape the sheet metal pieces where a hacksaw and file, while perfectly do-able, would be relatively time consuming. Just about any component produced with a milling machine or lathe can be replicated using a cheap angle grinder, of which can be purchased for not much more than the cost of a couple of decent files.

A basic arc / stick welder was also used for construction of the frame and slide. At present several affordable budget models are widely available for purchase via the internet.

For drilling deep holes with accuracy, a drill press with titanium or cobalt drill bits is ideal. Alternatively, an electric hand drill combined with a stand can be used, though the higher speed and wobble will increase drilling time. As with other tools, several very affordable drill presses are available online.

Design formula

The pistol is constructed using steel parts of various thickness laminated in the following manor:

The frame:

Frame side plates: 14 gauge (2mm) x 2
Hammer assembly housing plates: 14 gauge (2mm) x 2
Fire control components and trigger: 1/4" (6mm)
Trigger guard / frame wall strip: 10mm x 2mm

(14mm overall width)

Slide assembly:

Slide side plates: 11 gauge (3mm) x 2
Breech piece: 5/8" (16mm) diameter (sides ground flat to 15mm)

(21.5mm to 22mm overall width)

Barrel assembly

Barrel: 5/8" (16mm) diameter (sides ground down flat to 15mm)
Barrel lug: 1/4" (6mm)

(Barrel is centrally in-line with breech piece)

Overview of main components and their construction

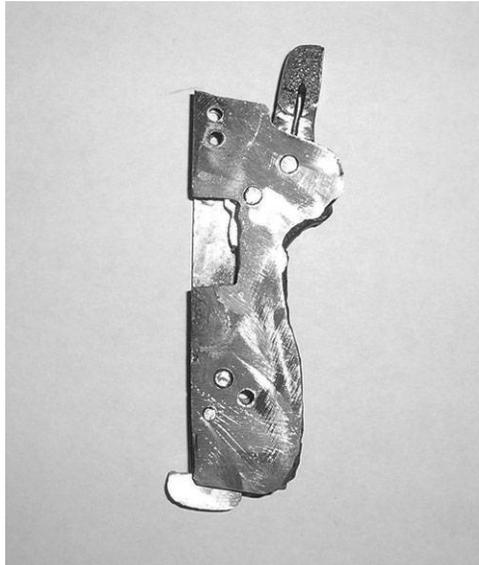
Frame / Receiver



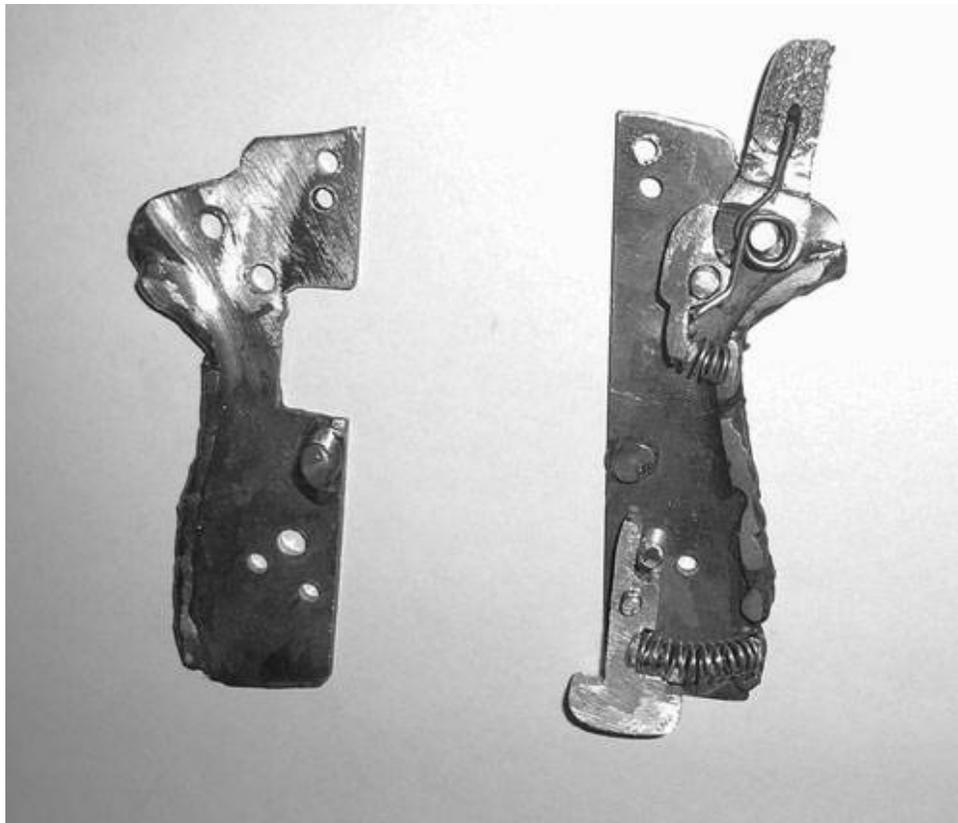
The frame, or receiver of the pistol is comprised of two 14 gauge (2mm) sheet metal pieces and a single 10mm strip bent to form the front magazine-well wall, trigger guard and spring channel. The guide rails for the slide are formed by welding a continuous bead along the top each side then grinding to shape using an angle grinder or dremel type rotary tool. A large cut is made on the left frame panel to accommodate passage of the trigger bar. The spring channel is completed by welding on an additional piece of steel above the trigger guard loop.

The 'barrel' on the demonstration prototype pictured is a non-functioning dummy chambered for 8mm blanks used in model guns. Directly in front of the chamber is an upwards vent hole. The remaining oversized 12mm diameter portion of the dummy barrel is blocked by a 12mm hardened steel spike pinned and welded in place followed by several horizontal bars and holes drilled into it from below. The entire dummy barrel is permanently pinned and welded in place. Built in this configuration the pistol is not legally considered a firearm in most places. Other than this, the design of the pistol itself and all dimensions provided are ideally suited to the .25 ACP cartridge should the appropriate barrel blank or liner be incorporated.

Fire control pack

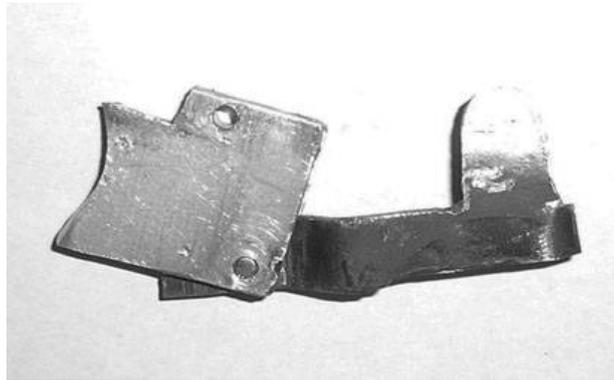


The fire control pack consists of two pieces of 14 gauge (2mm) sheet steel into which the hammer, sear and magazine release catch are housed. When inserted, each pivots on beheaded 10mm long m4 bolts which are threaded and epoxied into one side of the trigger pack to create fixed pins. To enclose this assembly, two continuous weld beads are made along the back inner edge of each side plate as well as a 'blob' of weld opposite. All welds are ground down to a height of 3mm on each side to allow the free movement of the inner components.



The hammer, sear and magazine catch are made from 1/4" (6mm) thick steel and are hand-fitted to operate freely when the pack is closed and inserted into the pistol's frame. The hammer's coil spring is bent from a length of strong spring steel music wire (19 gauge +) and the sear and magazine catch each accept a small compression spring. Cuts are made in one side of the hammer using an angle grinder and dremel to accommodate the hammer coil spring.

Trigger and disconnecter assembly



The trigger assembly consists of a 6mm thick block of aluminum, steel or plastic which is slotted with an angle grinder to accommodate and enable movement of the trigger bar under spring tension. The entire assembly pivots via an m3 bolt.



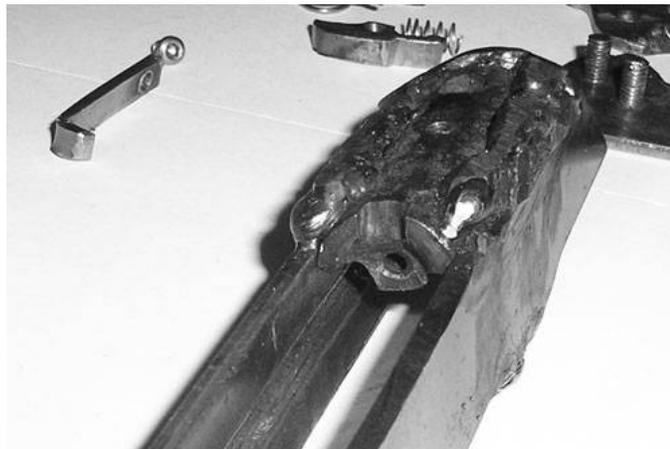
Slide assembly



The slide assembly is constructed from two lengths of 11 gauge (3mm) thick sheet metal strip, a section of 5/8" (16mm) steel bar for the breech piece and a front lug which is removable via four m4 bolts, allowing the pistol to be assembled and disassembled. Each internal side of the slide panels have a shallow channel cut into them using an angle grinder to allow locking with the frame rails. On one slide panel, a tab extends below which makes contact with and lowers the trigger bar out of contact with the sear in order to allow it to re-engage the hammer when pulled back. Once free forward and backward movement is established with the frame rails, the finished breech piece is positioned centrally in-line with the barrel and is substantially welded in place.

Breech piece

The breech piece is made from a length of 16mm mild steel bar. The face is produced using a drill bit roughly equal to the back of the cartridge you are using (8.2 in this case). It is then flattened using the same diameter of drill bit but with the point having been cut off leaving a flat grinding surface. The firing pin hole is drilled at the face end using a 2.5mm drill bit for 3mm deep then drilled from the back using a 4.2mm drill bit to accommodate the 4mm width of the firing pin.



The firing pin itself is made from a section of 5/32" (4mm) silver steel / hardened steel rod. It is retained and moves freely via a short m3 bolt passing through a slot filed into it. To machine the firing pin to a consistent shape it can be rotated in a drill while using a file to simulate turning on a lathe.

The breech piece feed channels are ground to shape using an angle grinder fitted with a 2mm + grinding disc then finished off using a file or dremel type rotary tool.

The extractor is simply a short strip of 2mm sheet steel bent into an 'L' shape and held in place by an m3 bolt. Ideally this should be constructed of spring steel and held in place with two bolts to ensure durability, though regular mild steel will work. It can be make-shift hardened by heating until red then quenching in salt water. As an extractor is not essential for a blow-back design to work, it can be optionally left out.

There is no separate ejector incorporated into this design and instead the next round in the magazine firmly 'kicks' the expelled cartridge upwards.

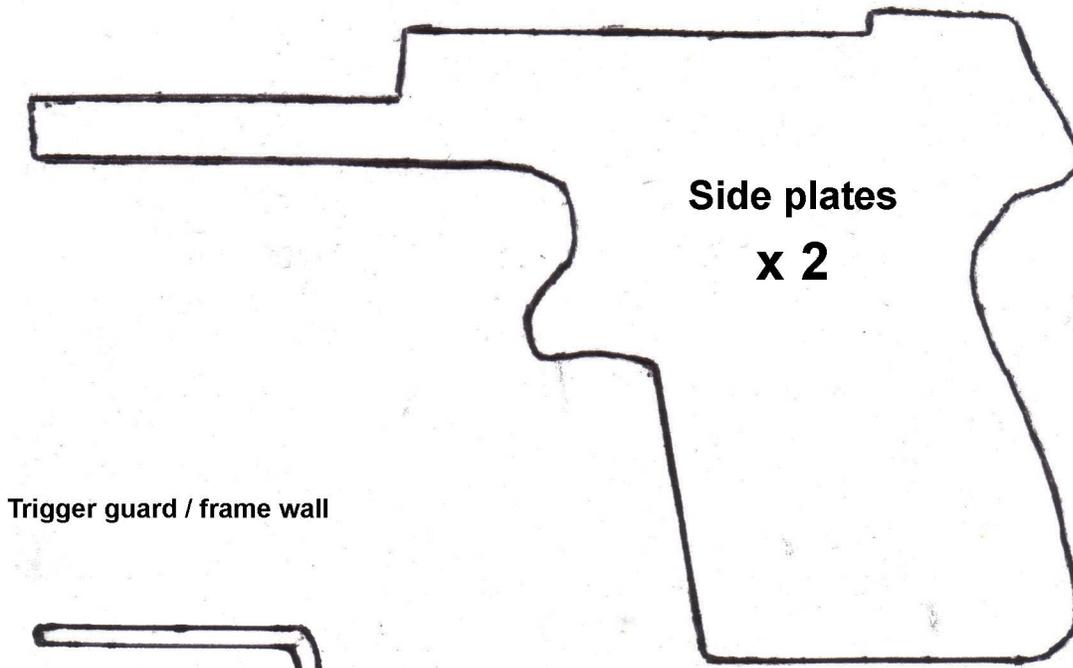
Trigger operation

To test smooth mechanical functioning of the hammer, disconnecter and sear, pull back the slide and release. The hammer should now be cocked and can be released by pulling the trigger. It should fall sharply. Continue to hold down the trigger while at the same time pull back and release the slide again. The hammer should be re-cocked signalling that the disconnecter bar has reset the sear by the action of the slide tab lowering it. Releasing then pulling the trigger again should release the hammer sharply as before. Further hand fitting and oiling should be employed if excess friction is encountered.

Plans

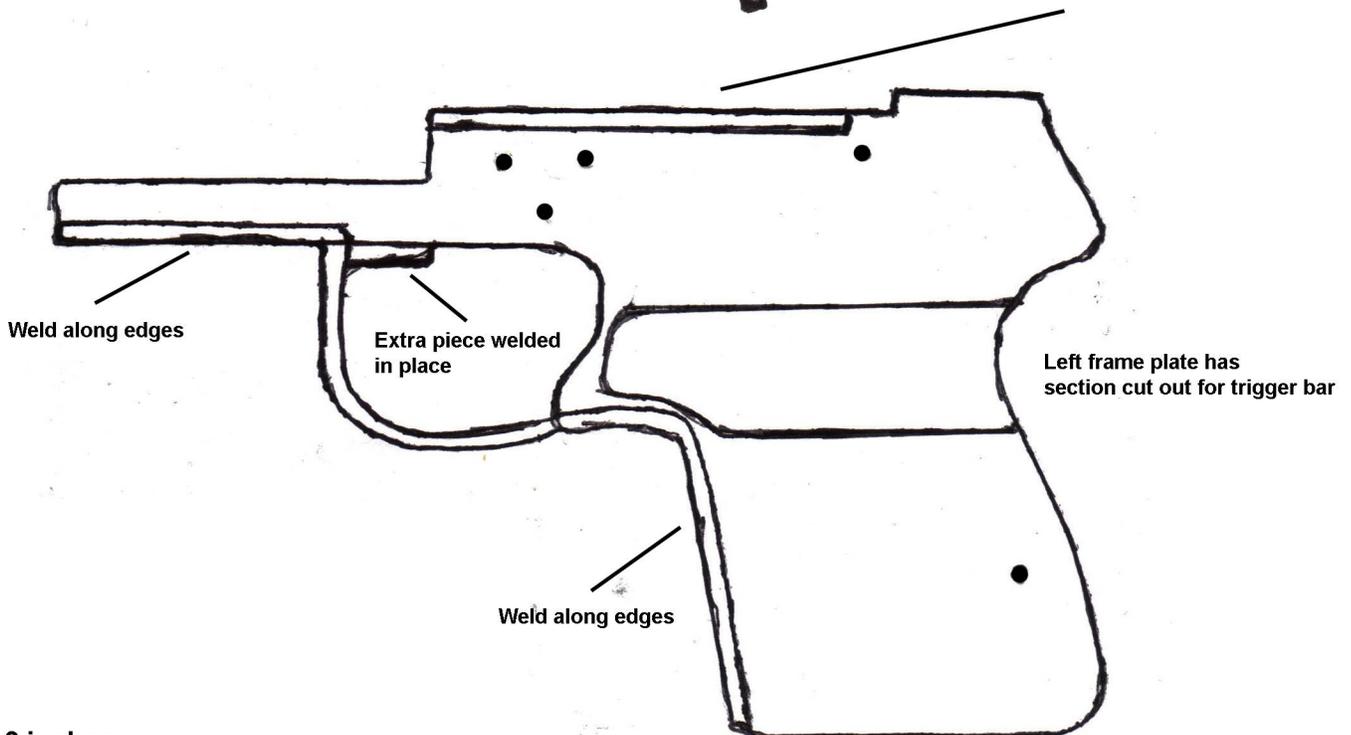
All pages included should be printed out on 8.5 x 11 US letter paper. Each component template is drawn to scale and can be cut out and glued to their respective thickness of material. Make sure the ruler at the bottom left of each sheet is 2 inches in length. Alternatively, enlarge the plans using a computer program until the ruler is the correct length, then trace the parts needed over your computer's screen onto a sheet of paper.

Frame / receiver templates



Bend from a 6" (150mm) length
of 0.4" (10mm) wide 2mm steel strip

Slide rails are formed by welding a continuous
bead then grinding down until 2mm thick

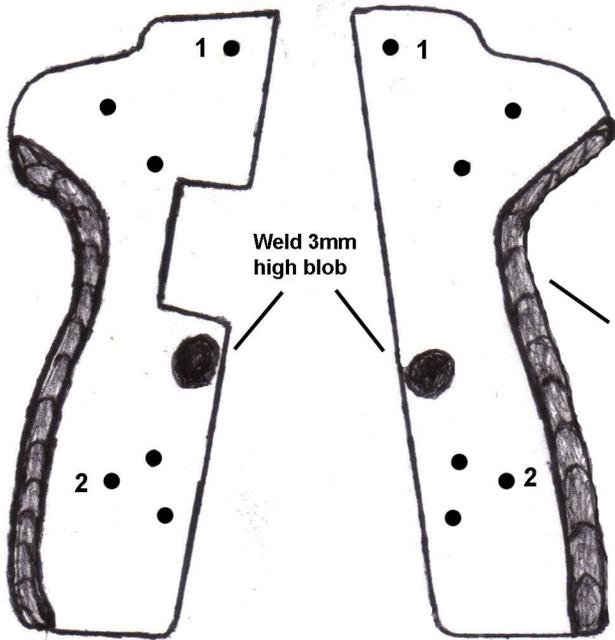


2 inches

Fire control pack templates

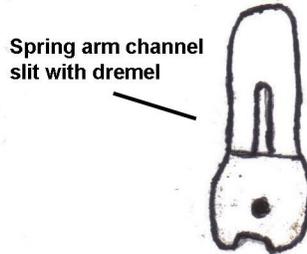
Side panels

Hole 1 accepts a 12mm long pin inserted through frame
 Hole 2 accepts a 17mm long m4 bolt inserted through frame and secured with a nut



Holes through hammer, sear and catch are 4mm

Hammer



Side view



Hammer spring

Bend from spring steel wire (19 gauge+) to profile below - 2 turns



Sear



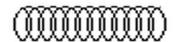
Sear compression spring (10 x 5)



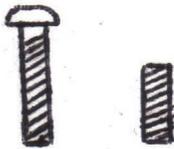
Magazine catch



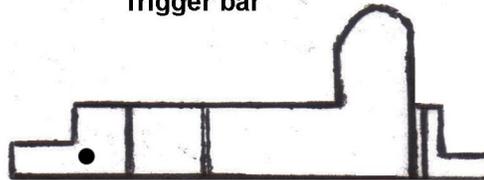
Catch compression spring (20 x 5)



All unmarked holes on right side panel are drilled to 3mm and threaded to accept a 4mm bolt cut flush to 10mm (expoxied in place)



Trigger bar

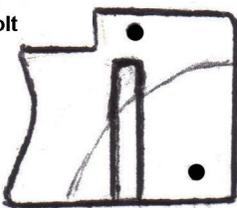


Sear contact point profile (mirrored)



Trigger

Top hole accepts 17mm long m4 bolt through frame



Lower hole accepts 6mm long 3mm pin

Slit side using angle grinder or dremel

Drill 4mm hole to fit 20 x 4 compression spring

Bend on lines to profile below



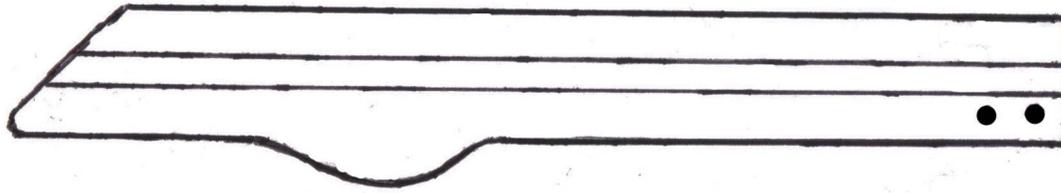
2 inches

Print on 8.5x11 US letter paper

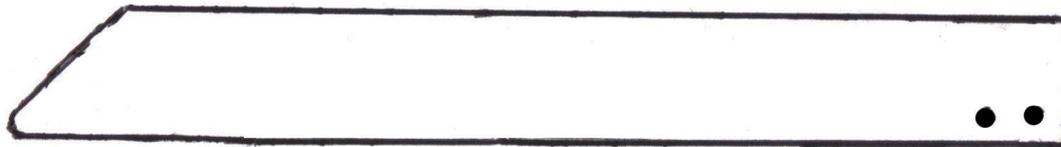
Side Panels and trigger bar: 14 gauge (2mm) steel sheet
 Hammer, sear, magazine catch and trigger: 1/4" (6mm) steel plate

Slide templates

Slide panels



Slide rail channels are formed using angle grinder fitted with 2mm disc until snug with frame



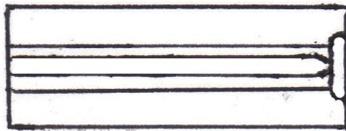
Slide stop
(6mm thick 15mm square)



Secure through slide with four 5mm long m4 screws

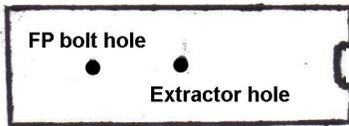
Breech piece

Bottom



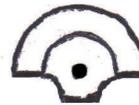
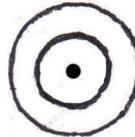
Drill with 4.2mm bit / 40mm deep

Top



Drill both holes with 2.5mm bit and tap for m3 x 6mm bolts

Grind from 45mm length of 5/8" (16mm) bar stock to profile below



Pin hole at front: 3mm

Breech face is drilled with 8mm bit / flattened with beheaded bit until 3mm deep

Extractor

Bend from 2mm x 5mm steel strip
Secure with m3 bolt



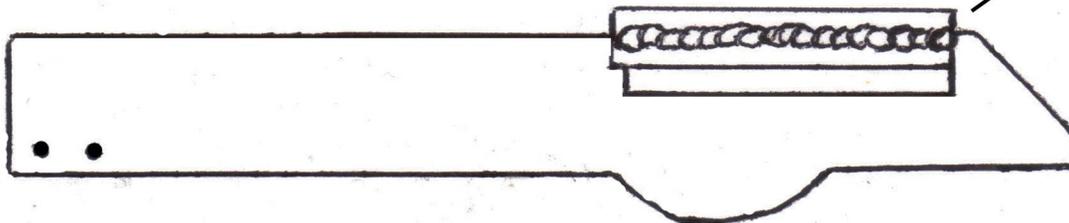
Rounded edge

Firing pin

45mm long 1/6" (4mm) silver / hardened steel bar ground to profile



Weld in place with substantial bead along edges



2 inches

Print on 8.5x11 US letter paper

Slide panels & extractor: 11 gauge (3mm) mild steel
Breech piece: 5/8" (16mm) mild steel bar
Firing pin: 5/32" (4mm) silver steel bar
Slide stop: 1/4" (6mm) mild steel plate

Barrel and magazine templates

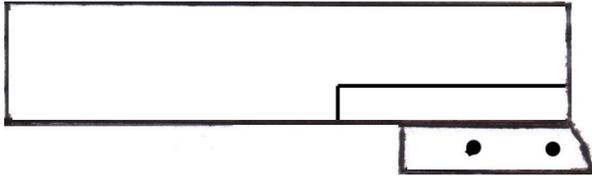
Barrel

3" long 5/8" (16mm) mild steel bar for display dummy

Alternatively 3" long section of .25 barrel blank or liner installed

Grind or file down sides in contact with slide

The pistol's slide spring is 2.5" long and 9mm wide. It can be cut to size from a purchased compression spring or hand wound from 19/20 gauge spring steel wire around a 6mm bar.



Lug: 1/4" (6mm) block, 25mm long - Weld in place

3mm holes to accept 12mm long pins

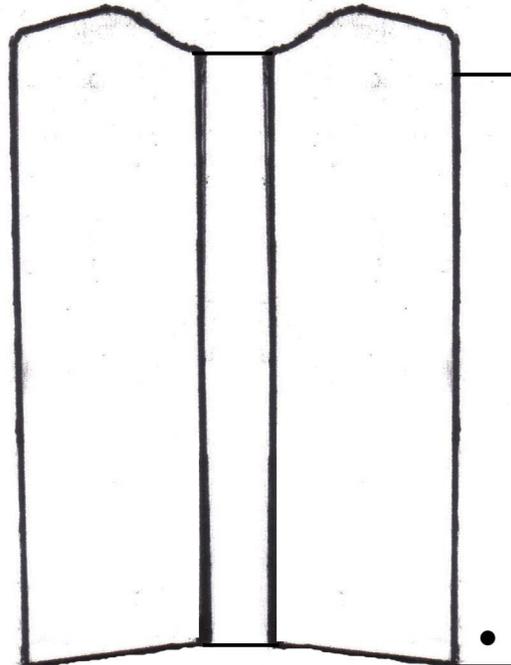
Lower 5mm of barrel sides in contact with frame should be ground down until 12mm in diameter

Magazine

Score on bend lines slightly using dremel

Follower

Bend from 2" long
1/4" wide steel strip



Bend lips inwards until gripping cartridge

Magazine stop

5/8" (15mm+) plastic or aluminum

File down until
8mm thick

3mm hole drilled
through magazine wall and
stop to accept 25mm long pin

Alternatively cut from 10mm x 25mm tube

- Magazine spring can be hand formed using pliers from spring steel wire until at least 1" longer than magazine

- A couple of layers of electrical tape will suffice in securely holding the folded magazine together

2 inches

Print on 8.5x11 US letter paper

Magazine: 24 gauge (0.5mm) steel sheet

Barrel: 5/8" (16mm) mild steel bar

Barrel lug: 1/4" (6mm) steel plate

Magazine stop: 5/8" (15mm+) plastic or aluminum