

# Metal Working Processes, Tools, and Machines (sheet and small section steel)

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CHAB Stove Camp

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# “Raw” Materials

- Plain steel sheet
- Galvanized steel sheet – flat, corrugated, d-rib
- Stainless steel sheet
- Plain steel rod, rebar, bar, angle
- Slotted angle
- Expanded metal
- Hardware cloth
- Steel pipe, conduit

# Why Steel?

- Cheap
- Durable
- Takes high temperatures
- Not too difficult to work
- Stainless - takes heat better but is harder and much more expensive and less heat conductive

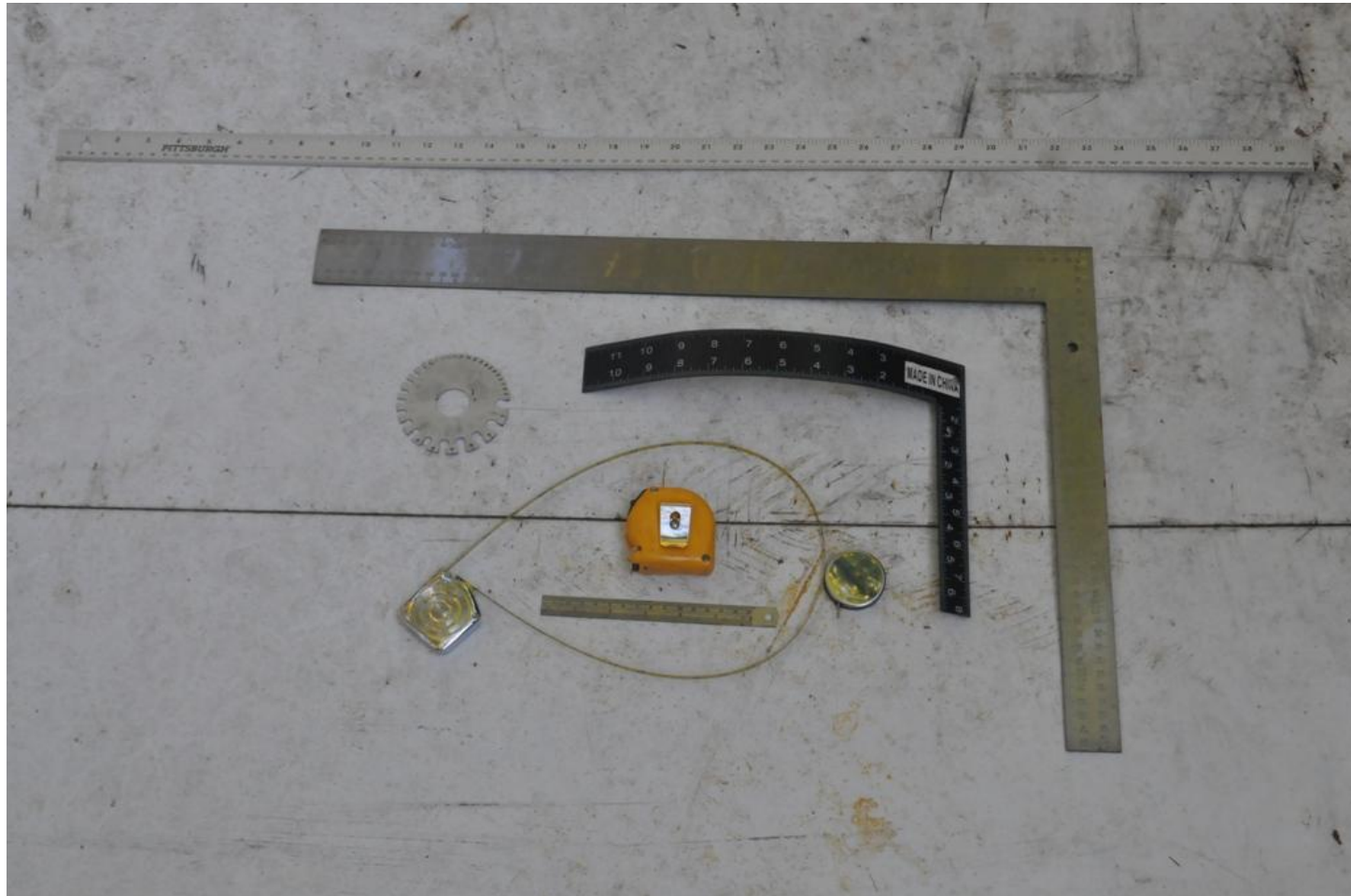
# “Processed” materials

- Stovepipe
- Steel buckets
- Steel drums/barrels
- Stainless steel “Cornys”
- Pots and bowls
- Cast iron grates

# Measuring and Marking

- Scale/ruler
- Tape measure (length and diameter)
- Square
- Protractor
- Scribe (w or w/o blacking and bluing)
- Pens, pencils
- Dividers/compass
- Snap punch
- Center punch
- Sheet metal gauge

# Measuring tools



# Marking tools



# Making Holes

- “Church key” can opener
- Twist drills (lousy in sheet metal)
- Step drills (great in sheet metal) –small
- Hole saws (bimetal and carbide teeth) - large
- Hollow punches
- Hand punches
- Knockout punches
- Foot lever punches



# Twist drills



# Step drills



# Hole saws

**Bimetal**



**Carbide**



# Hollow punches



# Hand punches



# Knockout punches



# Foot lever punch



# Cutting

- Hammer and chisel
- Hand and power snips
- Hand and power nibblers
- hand notchers
- Hand and foot lever notchers
- Slotted angle shear
- Angle shear, notcher
- Circle cutter
- Circle shear
- Hand lever shear
- Foot shear
- Rotary can openers
- Drum deheader
- Angle grinder
- Hand and power saws (hack, jig, circular, chop, ...)

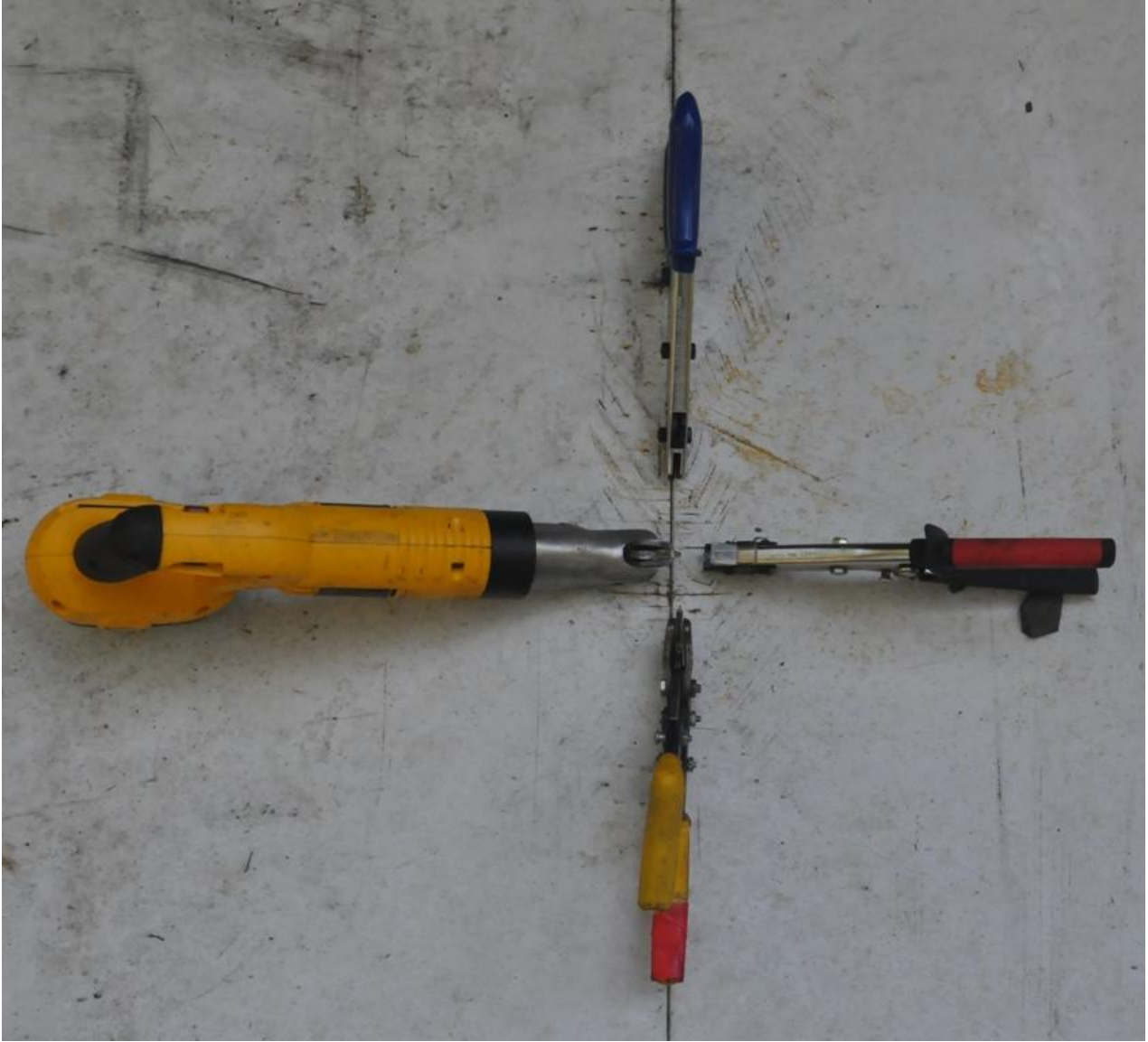


# Snips



# Nibblers







# Hand notchers





# Lever notchers

**Hand lever notcher: 6"-152mm**



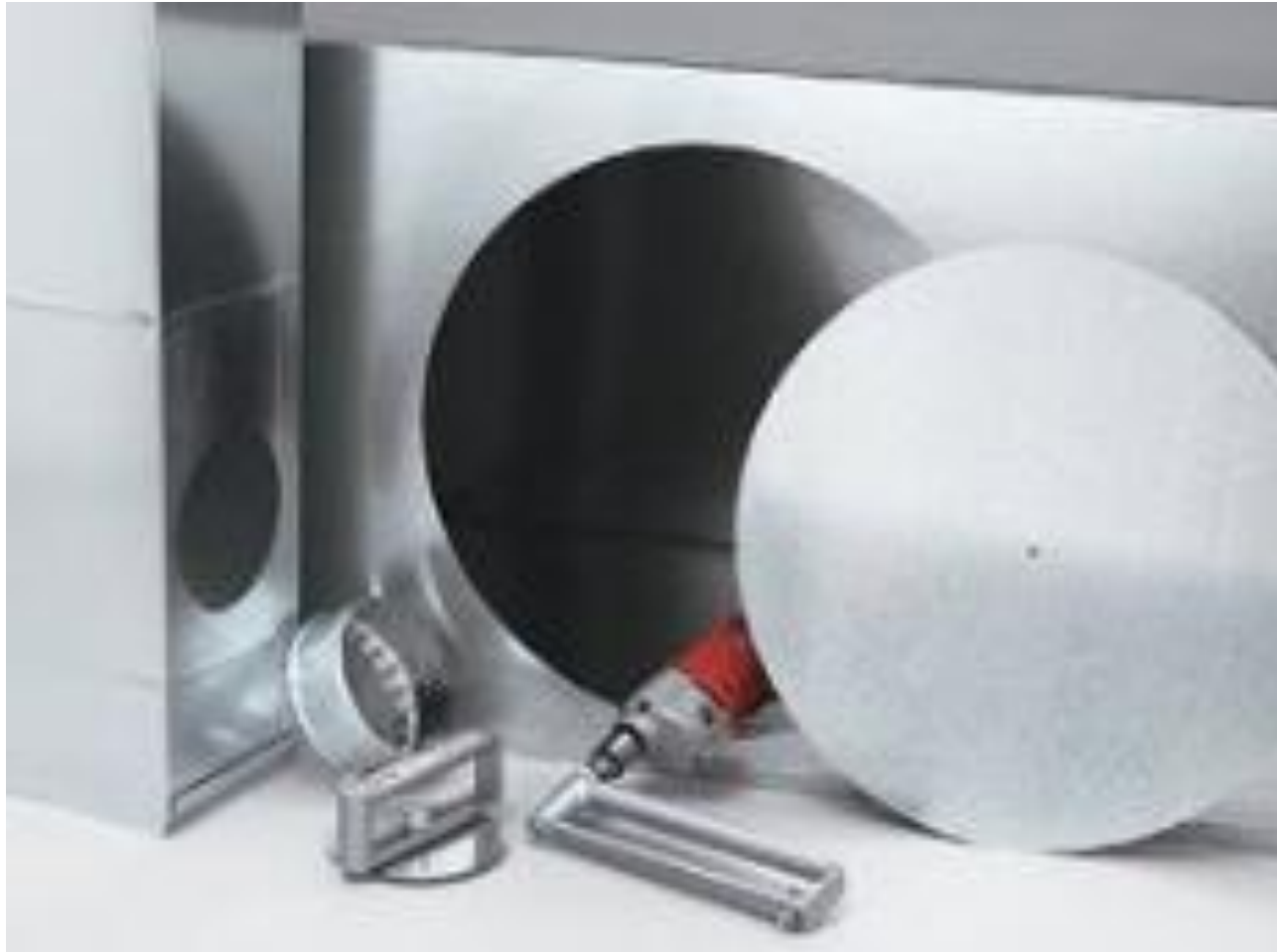
**Foot lever notcher: 3 1/8"-80mm**



# Slotted angle shear

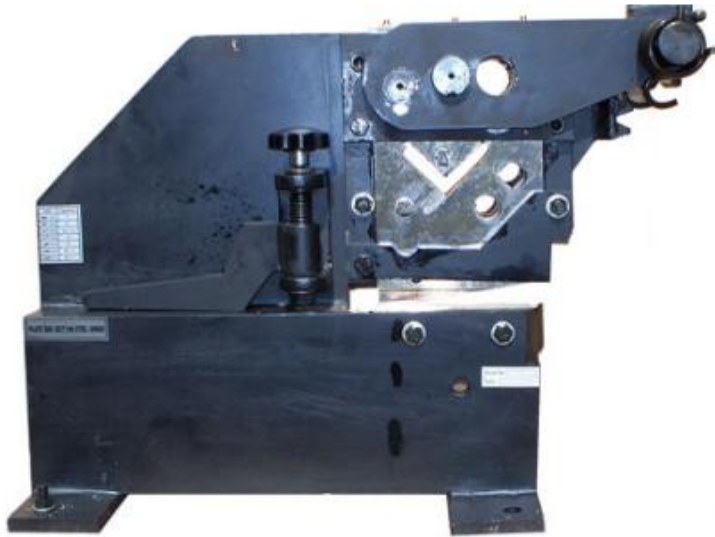


# Circle cutter – electric drill powered





# Hand lever shears



# Shear machines

**Foot shear**



**Circle shear - manual**



# Drum deheaders





# Grinding

- Stones
- Files
- Angle grinder (electric, pneumatic)
- Grinding wheel (hand, foot, electric)

# Angle grinders



# Bending

- Pliers benders
- Cleat bender
- Sheet metal brake
- Angle bender

# Pliers benders



# Bending machines

**Cleat bender**

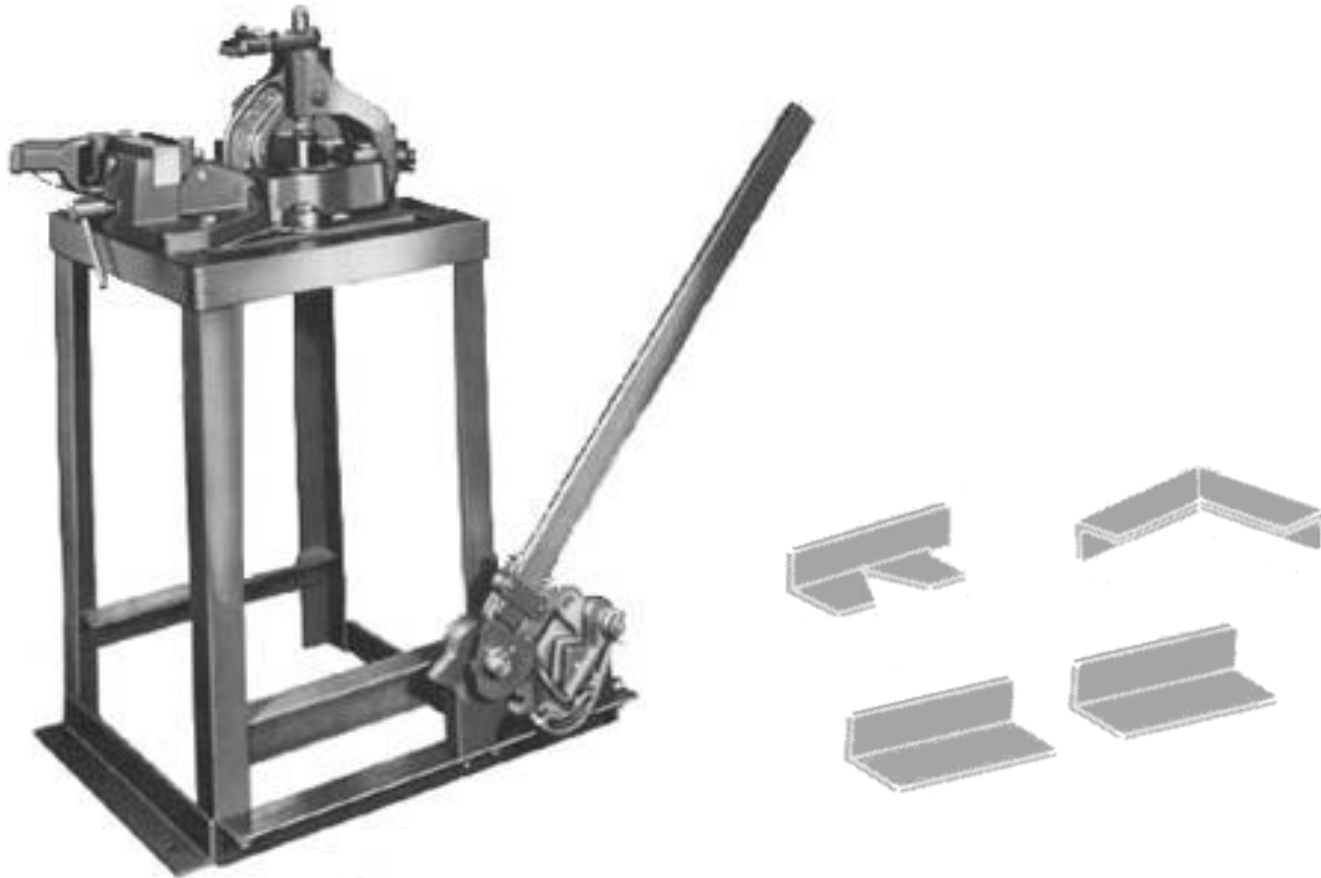
**(1/2" (12.5mm) 180° fold)**



**Sheet metal brake (bender)**



# Angle iron cutter, notcher, bender



# Rolling

## (making cylinders and rings)

- Hand rolling
- Slip roller – sheet metal
- Bead roller, edger, flanger
- Ring roller – bar/angle/rod

# Manual rolling machines

Slip roll



Bead roller



Ring roller





# Joining

- Crimping
- Bending (tab and slot)
- Riveting
- Screwing
- Bolting
- Spot welding
- Welding

# Rivet gun



# Spot welder

