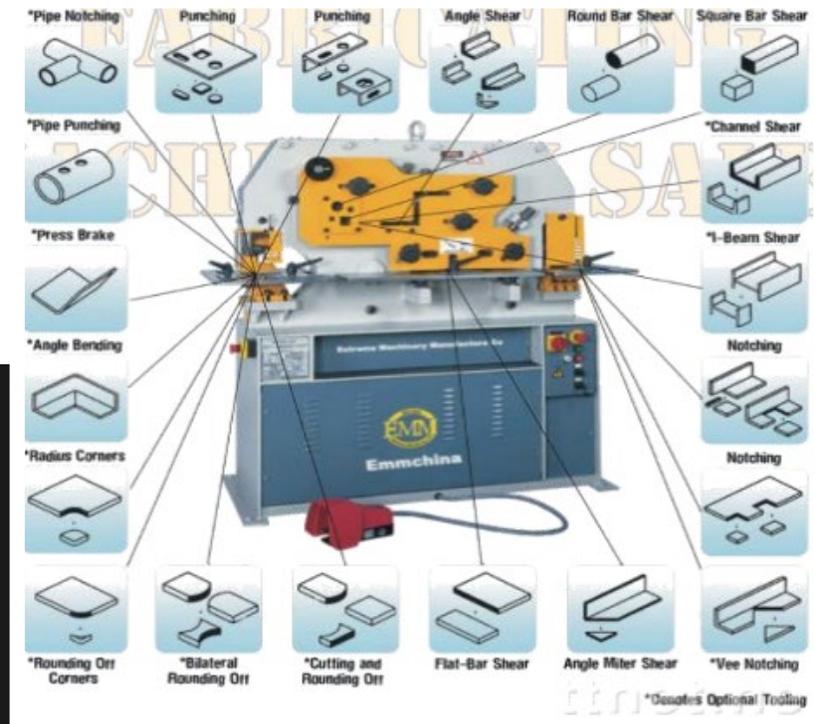


Introduction to Ironworkers and Notchers

An ironworker is probably the most versatile tool to a metal fabricator and thus, equaled with its affordability, is one of the first machines a fabrication shop will own. Synonymous with the term used for structural steel workers, the term “Ironworker” means a one stop machine for a myriad of processes necessary in today’s fabrication shops. While not meant for accuracy or high production needs, an Ironworker can make quick work of many different types of materials and perform many different processes necessary in a Fab Shop. Materials like: Plate, Tube, Angle and Rod stock can all be processed on an Ironworker. Capable of Punching, Shearing, Bending, Notching and Coping (a type of shearing) an Ironworker is an extremely flexible, versatile and necessary machine in any Fabrication or Weld Shop.

Below is a graphical depiction of the typical features and capabilities available on today’s Ironworkers.



Main Processes Involved in an Ironworker

Punching

Forcing a hardened punch forced through a given material into a hardened and like shaped hole called a “die”. Punched holes are typically round but can be oblong, squared or custom shaped dependent on the shape of the punch and die. The punched hole WILL have the same size and shape of the punch. Punching consists of 3 items added to the standard Ironworker; Punch, Die and Stripper.

Punch: Typically mounted in the Ram of the Ironworker a punch is a hardened tool steel shape that can withstand the tons of force required to force it through solid plate steel, stainless steel or aluminum.

Stripper: The stripper is better explained as a holddown device that securely holds the material being punched down while the punch is being inserted, and more importantly while the punch is being retracted. Without a stripper in place the punched material would stick to the punch and retract upwards with it.



Die: The Die is the hardened tool steel opposite of the punch. The die is typically made of the same or like material as the punch. The die must have clearance and thus be bigger than the punch being inserted into it as the closer to the size of the punch the greater the tonnage required to push the punch through the material. Adversely if the die is too much larger than the punch the material will not break clean and rather tend to be deformed around the punched area. A good typical rule-of-thumb is that the die clearance should be approximately 10% of the thickness of the material being punched ($\frac{1}{4}$ " Material being punched would have a die that is 0.025" larger p/side than the punch). [HERE](#) is a good demonstration of punching on an Ironworker.

Punching is such a necessary process that many Ironworker manufacturers offer a simplified form of their machine for punching and forming only. Pictured at right is a popular Piranha model SEPP-35 which stands for Single End Punch Press.

On the following page is a Punching Capacity chart that will help in selecting the right tonnage Ironworker or Punching machine.



Please print this page for future reference.

TONNAGE REQUIRED TO PUNCH ROUND HOLES In ASTM A-36 Structural Steel

Round Hole Diameter	METAL THICKNESS									
	1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"
1/8"	1.5	---	---	---	---	---	---	---	---	---
1/4"	3	5.9	---	---	---	---	---	---	---	---
3/8"	4.4	8.8	13.3	---	---	---	---	---	---	---
1/2"	5.9	11.8	17.7	23.6	29.5	---	---	---	---	---
5/8"	7.4	14.7	22.1	29.4	37.0	44.2	---	---	---	---
3/4"	8.9	17.7	26.5	35.3	44.2	53.0	62.0	---	---	---
7/8"	10.3	20.6	31.0	41.2	51.5	62.0	72.2	82.5	---	---
1"	11.8	23.6	35.3	47.1	59.0	70.7	82.5	94.3	106.0	---
1-1/8"	13.3	26.5	39.7	52.9	66.2	79.4	92.7	106.0	119.0	132.5
1-1/4"	14.7	29.5	44.2	58.9	73.7	88.4	103.1	117.9	132.6	147.3
1-3/8"	16.2	32.4	48.6	64.8	81.0	97.2	113.4	129.6	145.8	162.0
1-1/2"	17.7	35.3	53.0	70.6	88.3	106.0	123.6	141.3	159.0	176.7
1-5/8"	19.2	38.3	57.5	76.6	95.7	114.9	134.0	153.2	172.3	191.5
1-3/4"	20.6	41.2	61.9	82.5	103.1	123.7	144.3	164.9	185.6	206.2
2"	23.5	47.1	70.7	94.3	117.8	141.4	164.9	188.5	212.1	235.6
2-1/4"	26.5	53.0	79.5	106.0	132.5	159.0	185.6	212.1	238.6	---
2-1/2"	29.5	58.9	88.4	117.8	147.3	---	---	---	---	---
2-3/4"	32.4	64.8	97.2	129.6	---	---	---	---	---	---
3"	35.4	70.7	106.0	141.4	---	---	---	---	---	---

Tonnage requirement for other than mild steel (60,000 Pound Shear Strength)	METAL TYPE	MULTIPLIER
	Aluminum(2024-0)	.36
	Brass (1/4 Hard)	.70
	Copper (50% Carbon)	.52
	Steel Cold Drawn (1018)	1.24
	Stainless Steel (303)	1.50

Shearing

Shearing is the term used to describe the process of quickly cutting a plate or sheet of steel down to a given dimension. Typically a plate is positioned between two blades and is held down via a mechanical device called a holddown that firmly grips the material prior to the scissor like action of the cutting blade. The process of shearing is explained in a later section but



note that the Ironworker is equipped with a small shear blade and typically is capable of shearing plate up to 20-30" in width, Angel Iron, and Barstock.



HERE is a good example of shearing Plate on an Ironworker.

[▶ Play Now](#)



HERE is an example of shearing Angle Iron.

[▶ Play Now](#)



HERE is an example of shearing Round Bar.

[▶ Play Now](#)

Notching/Coping

Notching is a processes of shearing whereby small pieces or “bites” of material are removed in order to provide relief for forming or some other need. The process is also referred to as “coping” when dealing with shaped material such as tubing. It is such a necessary process in sheet metal fabrication, that there are machines built solely for the purpose of notching. To the right is a typical and popular model of notcher, the Amada CSH 220.

The notching area on an Ironworker or Notcher consists of a flat table and typically some kind of guides to assist in locating the plate square to the blades or at a

predetrmined angle. Notching only removes metal from the outside of a workpiece. It is capable of making different angle and depth of notches (accomplished by adjusting the location of the workpiece). Notching produces cuts not possible when using the shearing process. To the left is a typical example of a notcher blade assembly.

Although there are notchers available with variable angled blades, the most common machinery utilizes a 90 degree fixed angle. There are also pipe notcher attachments available for an Ironworker like the one pictured at right.

[HERE](#) is a good example of a notcher in action on sheet metal.



Bending and Forming

Another of the unique and versatile features of an ironworker is its capacity to bend and form metals using various attachments. Although not meant for accuracy an Ironworker is an excellent machine for bending low quantities of brackets, clips etc required in manufacturing processes such as trailers, fencing etc.

[HERE](#) is a good video showing bending on an Ironworker using various bending attachments.



Components of an Ironworker

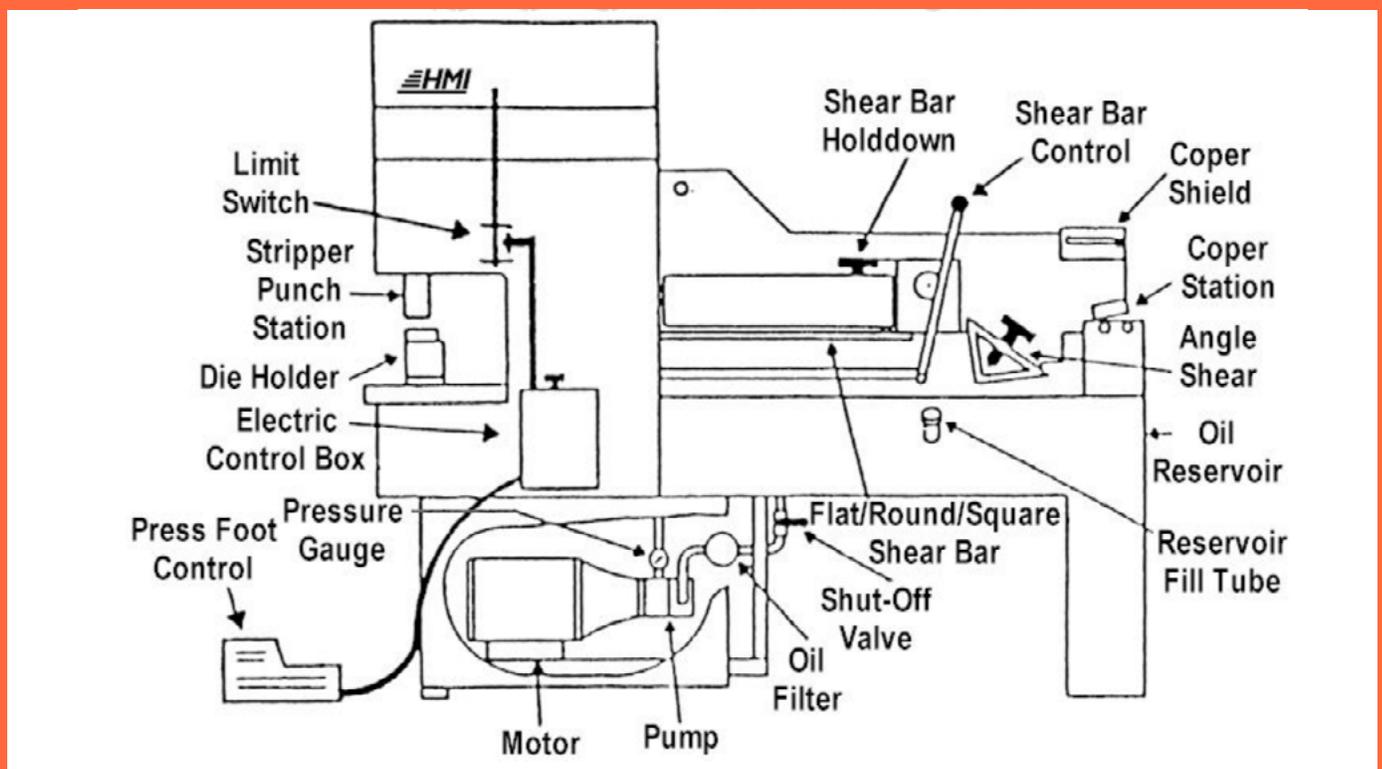
All Ironworkers are made up of the same basic components and they are as follows:

Main Frame

The Main Frame of the machine is what supports all the other components, attachments and drive system. A quality Ironworker has a tough and heavy frame for its material size and rating. Some lightly built Ironworkers are known to be susceptible to having fractured frames, cracked beds or warped rams due to poor design or abuse. Weight is a good indicator of a quality ironworker whereas it suggests a much stiffer and durable machine.

Beds

A bed is what the operator will be working on as he introduces material to the shear blades, punching/forming station or the notching/coping blade. These beds are the support for only the material in the notching/coping and shearing stations however in the punching station they are an integral part of fixturing the tooling to be used whether punching or forming. A quality ironworker's punching/forming bed should be heavy and solid with conveniences for fixturing like t-slots or drilled and tapped holes.



Hold Down

The “Hold down” refers to the material clamp that is located next to the shear blades and firmly holds the material being sheared to prevent it from moving during the shearing process and most importantly for tipping up which would introduce the material as a wedge between the upper and lower blades forcing the gap to open wider.

Shear, Notcher, and Coper Blades

The cutting (or shearing) blades are tool steel and are hardened for wear resistance and ground for sharpness. They are mounted on the upper moving ram and the lower fixed bed and can be gapped usually just a few thousandths of an inch apart for clean sheared edges. The blades should be easy to remove and replace when worn.



Controls

Typically an Ironworker can be controlled via a pushbutton/joystick operation and a foot pedal for higher production and hands free operation. These controls should be durable and capable of withstanding the many years of use that a typical ironworker sees.

Accessories/Options

An Ironworker can be customized to meet a variety of needs by adding optional accessories that can make the operation of the Ironworker simpler, faster, more accurate and more reliable or customized for a specific application. Several optional accessories for Ironworkers are pictured below.

Common Ironworker options include:

- Hydraulic Cooling Systems
- CNC Gaging (for Punching and Shearing)
- Electrical Actuated Backgages
- Safety Options like light curtains, fencing, etc.
- Roller Feed Tables for Long Materials
- Custom Punching Die sets
- Custom Coping Heads
- Custom Bending/Forming die sets



Types of Ironworker Drive Systems



Hydraulic

Hydraulic pressure is applied through one or more cylinders to force the ram and blades of the machine down. Hydraulic machines can have typically one or two hydraulic cylinders for operation. Hydraulics are controllable in stroke and sometimes in speed with the axis of motion reversible at any time. Most every new Ironworker today is a hydraulically powered system for the controllability and flexibility of the machine tool. A Hydraulic Ironworker is pictured at right.

Mechanical

A motor spins a large flywheel at high speed the operator then engages a clutch which can be activated via pneumatic, hydraulic or mechanical engagement. Once the clutch is engaged the moving flywheel is mated to a crankshaft in which the machines moving ram is attached. The crankshaft then continues to spin cycling the mechanism up and down. This design is older and although available, typically is not seen today on new systems.



Types Of Ironworkers

Single End Punching Presses

Simple one station design for forming or punching using an assortment of available attachments. Single Station is pictured at right.





Single Cylinder Hydraulics

The most common design is where all the Ironworkers blades and mechanisms are actuated through on single hydraulic cylinder making the unit less expensive to build yet fully functional as a single operator machine tool. A single cylinder design is pictured at left.

Dual Cylinder Hydraulics

Dual Cylinder systems are for the higher production demands of weld and fabrication shops. These systems usually have a hydraulic power source shared with two independently actuated hydraulic pistons. One is dedicated to the punching/forming station while the other actuates the shear, notching and coper blades. This design allows for the machine to be used safely by two operators.



Summary

When selecting your ironworker, or any machine for that matter, ensure you are getting the best machine for your application. It is so easy to get trapped in the common pitfall of price, availability, location, freight, etc., all of which will never matter in 6 months after the right (or wrong) machine is on your floor. Remember your salesman can sell you literally whatever your “buying” and that includes discount, location...or the right machine, but only if you ask for it.

Southern Fabricating Machinery Sales staff are your Ironworker experts and are available to assist you in selecting the best Ironworker for your needs. [Contact us](#) today to find out more about Ironworkers and Notching machines and how they can help your manufacturing needs.

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