

# Design and Fabrication of Rolling, Bending and Riveting Tool

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**Abstract** - In this project we design and fabricate a hand operated metal working tool that allows one to roll curves and circles, form angle bends, and to join pieces of metal strip together by riveting. Rolling is accomplished by repeatedly passing the material backwards and forwards through rollers. Bending function provides a useful tool for bending all manner of components out of flat strip, square bar, and solid round rod. Riveting is simply achieved by placing a rivet into pre-punched holes, of metal strip to be joined, and then squeeze the rivet and hence form joint. Combining 3 functions into 1 tool makes these Rolling / Bending / Riveting process highly versatile. Since this tool is portable and require no electrical power, they are well suited to "on-site" fabrication.

**Key Words:** Rolling, Bending, Riveting, Tool, Fabricate.

## 1. INTRODUCTION

Often, by design or coincidence, a tool may share key functional attributes with one or more other tools. In this case, some tools can substitute for other tools, either as a makeshift solution or as a matter of practical efficiency. "One tool does it all" is a motto of some importance for workers who cannot practically carry every specialized tool to the location of every work task; such as a carpenter who does not necessarily work in a shop all day and needs to do jobs in a customer's house. Tool substitution may be divided broadly into two classes: substitution "by-design", or "multi-purpose", and substitution as makeshift. Substitution "by-design" would be tools that are designed specifically to accomplish multiple tasks using only that one tool.

Substitution as makeshift is when human ingenuity comes into play and a tool is used for its unintended purpose such as a mechanic using a long screw driver to separate a cars control arm from a ball joint instead of using a tuning fork. In many cases, the designed secondary functions of tools are not widely known. As an example of the former, many wood-cutting hand saws integrate a carpenter's square by incorporating a specially shaped handle that allows 90° and 45° angles to be marked by aligning the appropriate part of the handle with an edge and scribing along the back edge of the saw. The latter is illustrated by the saying "All tools can be used as hammers." Nearly all tools can be used to function as a hammer, even though very few tools are intentionally designed for it and even fewer work as well as the original.

Tools are also often used to substitute for many mechanical apparatuses, especially in older mechanical devices. In many cases a cheap tool could be used to occupy the place of a missing mechanical part. A window roller in a car could

easily be replaced with a pair of vise-grips or regular pliers. A transmission shifter or ignition switch would be able to be replaced with a screw-driver. Again, these would be considered tools that are being used for their unintended purposes, substitution as makeshift. Tools such as a rotary tool would be considered the substitution "by-design", or "multi-purpose". This class of tools allows the use of one tool that has at least two different capabilities. "Multi-purpose" tools are basically multiple tools in one device/tool. Tools such as this are often power tools that come with many different attachments like a rotary tool does, so you could say that a power drill is a "multi-purpose" tool because you can do more than just one thing with a power drill.

### 1.1 Roll Forming

Roll forming, roll bending or plate rolling is a continuous bending operation in which a long strip of metal (typically coiled steel) is passed through consecutive sets of rolls, or stands, each performing only an incremental part of the bend, until the desired cross-section profile is obtained. Roll forming is ideal for producing parts with long lengths or in large quantities. There are 3 main processes: 4 rollers, 3 rollers and 2 rollers, each of which has as different advantages according to the desired specifications of the output plate.

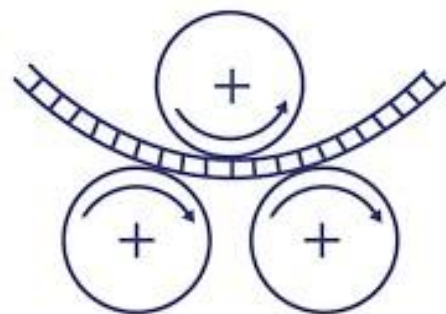


Fig -1: Roll Forming

### 1.2 Bending

Bending is a manufacturing process that produces a V-shape, U-shape, or channel shape along a straight axis in ductile materials, most commonly sheet metal. Commonly used equipment include box and pan brakes, brake presses, and other specialized machine presses. Typical products that are made like this are boxes such as electrical enclosures and rectangular ductwork.

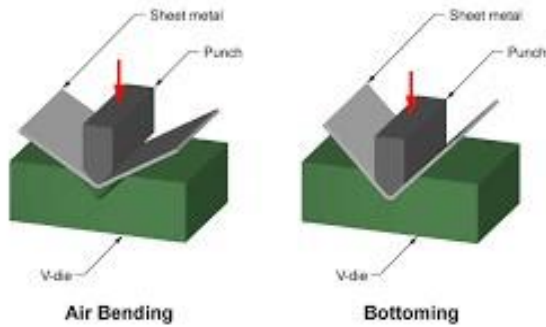


Fig -2: Bending

### 1.2 Riveting

A metal pin for passing through holes in two or more plates or pieces to hold them together, usually made with a head at one end, the other end being hammered into a head after insertion.



Fig -3: Riveting

## 2. DESIGN OF ROLLING, BENDING AND RIVETING TOOL

The tool has been designed using Solidworks software and is shown in figure below.

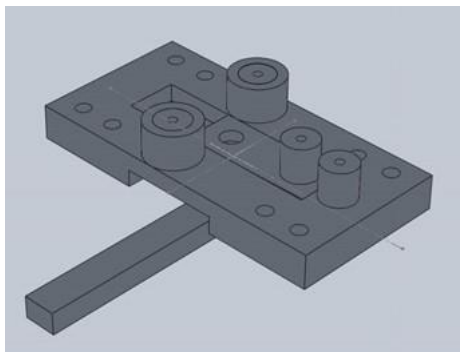


Fig -4: Design using Solidworks

### 3. TOOL DESCRIPTION

This rolling, bending and riveting tool consists of 165mm W x 290mm D x 115mm H x 440mm Handle Length of hardened steel and weighted up to 8kg. The maximum working capacity stated is for Hot Rolled Mild Steel Bar and Annealed Bright Mild Steel Bar. Working beyond these limits or with material of greater hardness may reduce the operational life of the machines. Max working capacity for a Rolling, Bending and Riveting tool are as follows:

Riveting - 5mm Diameter Rivet (based on the thickness of work stock it may vary).

Bending - 25mm x 5mm (flat strip), 10mm (round), 10mm (square bar).

Rolling - 25mm x 6mm or 30mm x 5mm (flat strip), 10mm (round), 10mm (square bar)

### 4. OPERATIONS

The different operations that can be carried out are as follows:

#### 4.1 Rolling Operation

Rolling is achieved by using the winding handle to drive the bar forwards and backwards through the rollers. As this is done with each pass, the long lever is used to gradually increase pressure to roll an ever tighter curve. End stop screw and nut fitted for producing consistent bends and circles/arcs when rolling.



Fig - 5: Rolling Operation

#### 4.2 Bending Operation

For the bending operation, material is placed between the square or diamond shaped former and the side rollers. Operate the lever to gradually bend to required angle.



Fig - 6: Bending Operation

### 4.3 Riveting Operation

Riveting is simply achieved by placing the material to be joined (with rivet in pre-punched hole) between the riveting posts on the machine. Use the lever to squeeze up the rivet to form a strong joint.



Fig - 7: Riveting Operation



Fig - 9: Step 2

### 5. FABRICATION

The following are some of the manufacturing steps to be followed



Fig - 8: Step 1

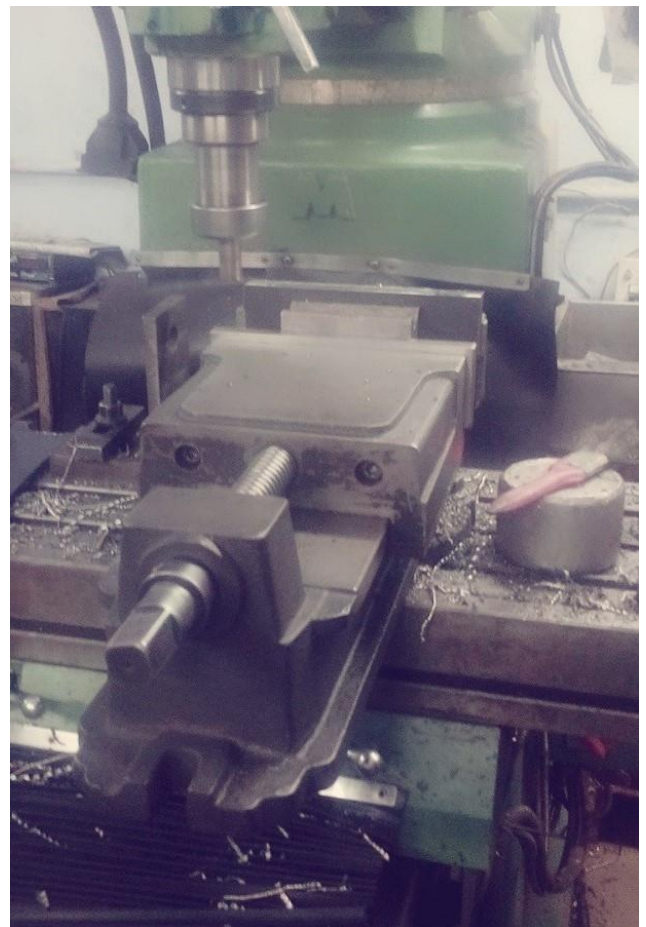


Fig - 10: Step 3



Fig - 11: Step 4



Fig - 12: Step 5



Fig - 13: Step 6



Fig - 14: Step 7

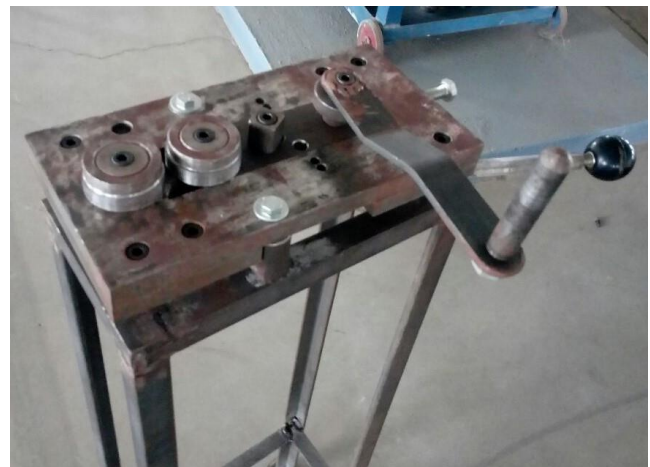


Fig - 15: Completed Model

## 6. ADVANTAGES

- Simple operations, no skilled operator is needed.
- Portable and compact.
- Less cost and
- Easy maintenance

## 7. DISADVANTAGES

- Work material size is limited.
- Angle of bend achievable up to 90 degrees

## 8. APPLICATIONS

1. As many constructive areas men are not using proper machine which give the uniformity in their work
2. In industry instead of using harming tool which will not give the proper stress on the work piece and their work is failed.
3. Used in small and large scale industries for flat strip, square rod, round wire or bar bending, rolling and riveting operation.
4. Used for home appliances and furniture industries.

## 9. CONCLUSIONS

This project provides flexibility in operations. This innovation has made the more desirable and economical. It is designed with the hope that it is very much economical and helpful to constructional areas and some on-site areas.

## REFERENCES

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