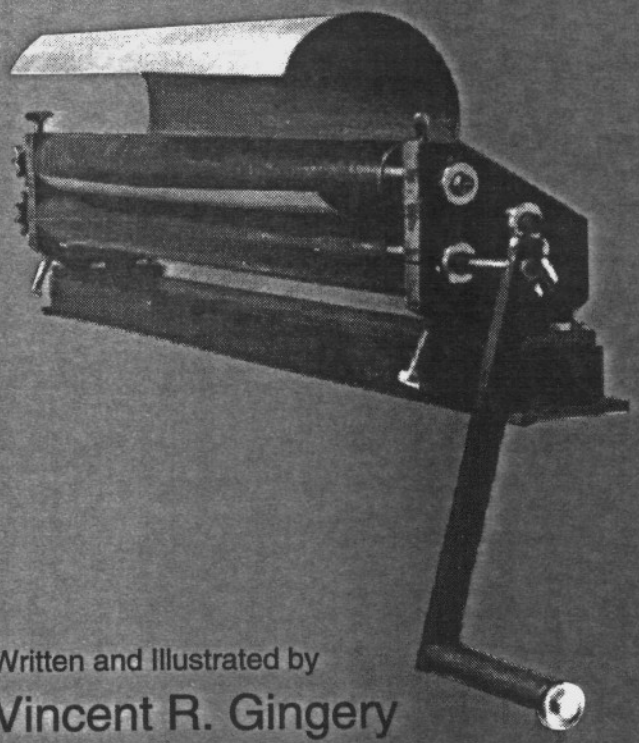
How to Build a

Slip Roll Machine



Written and Illustrated by
Vincent R. Gingery

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A Slip Roll Machine

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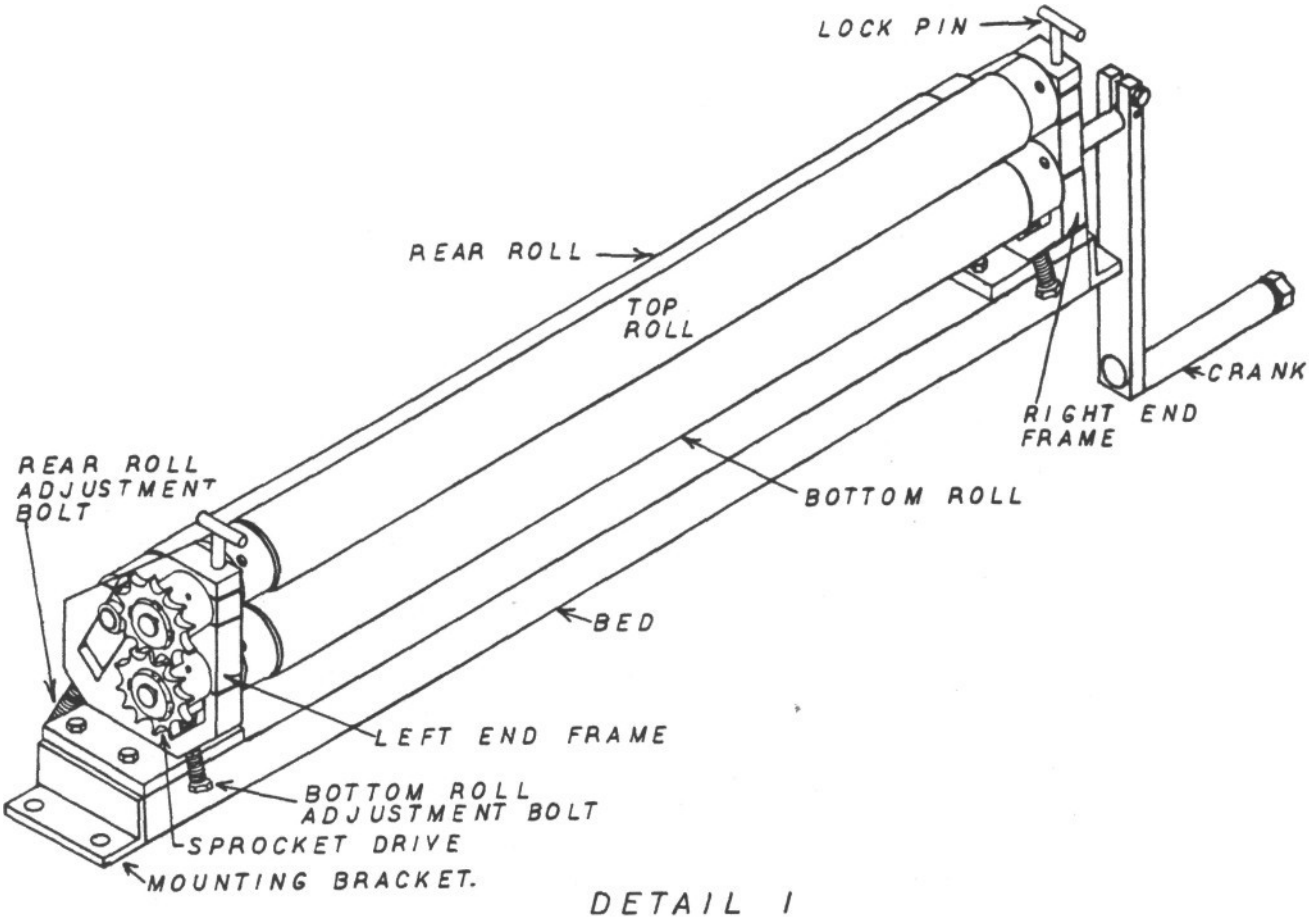


DETAIL 1

INTRODUCTION

Forming machines sometimes referred to as rolls are used for curving sheet metal or forming cylinders of various diameters.

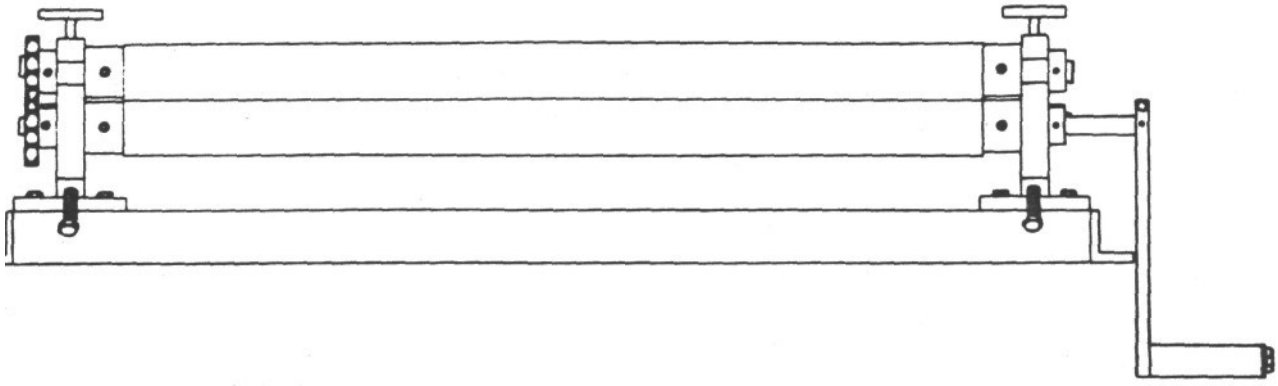
The forming machine in this manual consists of a left and right end frame housing, three 1 1/2" rolls two of which are connected by a sprocket drive and powered by means of a hand crank.

The two front rolls grip the sheet metal and force it against the rear roll, which forces the material up and around the top front roll curving the sheet and forming the cylinder.

The rear or forming roll adjusts at an angle of 60 degrees up or down in reference to the top front roll. This is accomplished by turning an adjustment bolt located in the rear of the left and right end frames. If a tapered cylinder is desired one end of the rear forming roll can be adjusted higher or lower than the other.

The radius of curve or diameter of cylinder that can be formed depends on the position of the rear roll in relation to the front upper roll.

The lower front roll can be adjusted up or down to allow sufficient clearance for the material to be formed. This is accomplished through an adjustment bolt located on the front of each left and right end housing.



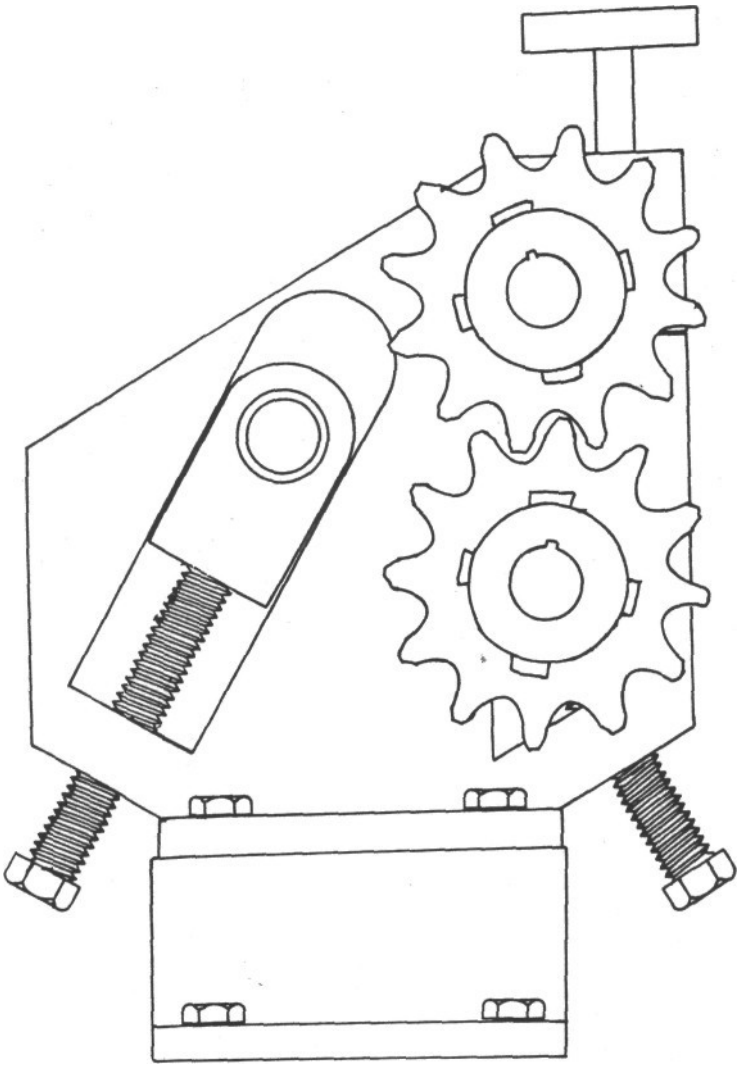
FRONT VIEW

DETAIL 2

There are two common types of forming machines. They are the solid housing type and the slip roll type. The one detailed in this manual is the slip roll type which means that the top front roll can easily be removed allowing the formed cylinder to be removed without distortion.

The right and left end frame are each cut from a piece of 3/4" H.R.S. plate. There are cutouts made in each end frame for the top, bottom, and rear roll bushing assemblies. A lock pin in the top of each end frame holds the top roll in place. By removing these lock pins the top roll can easily be removed. See detail 5 on page 8.

The left and right end frame mounting bases are each made from a piece of 3/8" flat bar. Four mounting holes are drilled in each base and it is then welded to the end frame.



LEFT END VIEW

DETAIL 3

The left and right end frames are each bolted to the bed.

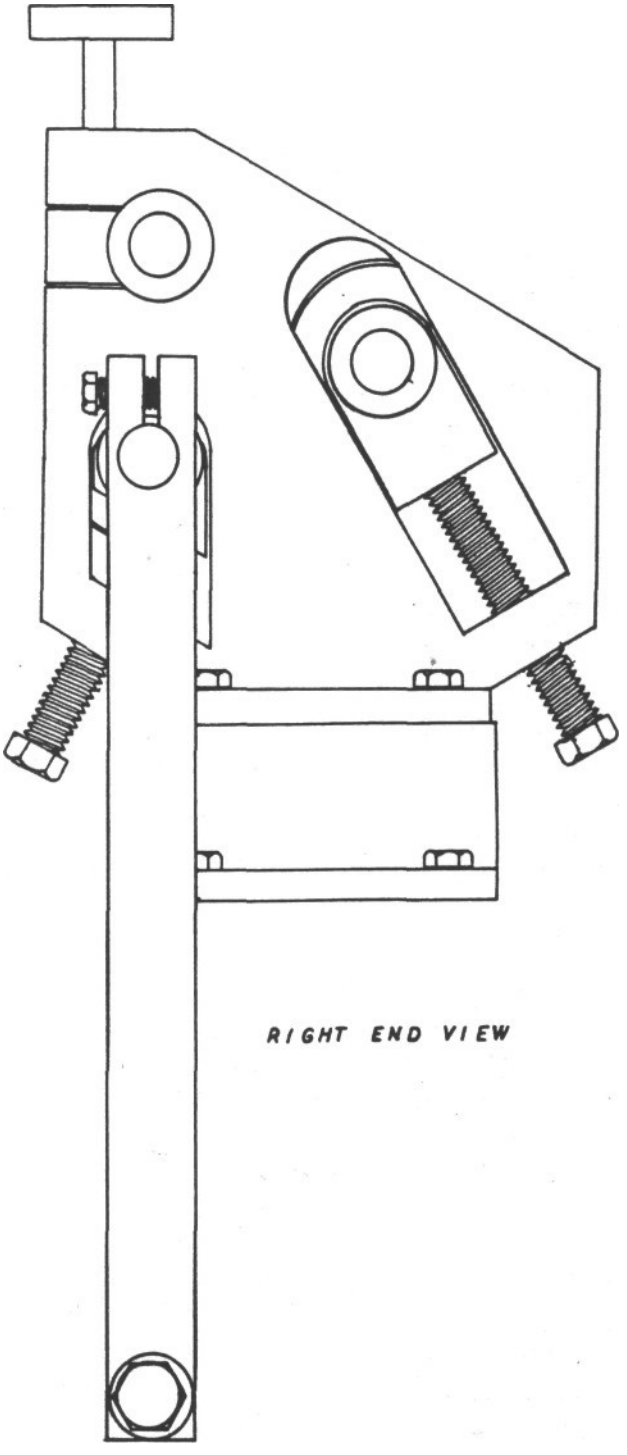
The top, bottom and rear roll bushing housings are cut from a piece of 3/4" x 1" H.R.S..

The roll bushings used are 1/2" I.D. 5/8" O.D. bronze. The rear and bottom roll bushings are pressed into their respective housings.

The top front roll bushings are held in place by what is referred to as the top roll lock pin.

The front bottom roll is adjusted on each side by a 3/8" - 16 x 2" bolt and the rear roll is adjusted on each side with a 3/8" - 16 x 2 1/2" bolt.

The slip roll bed is a piece of 3" x 1 1/2" channel. A mounting bracket cut from a piece of 1 1/2" x 1 1/2" x 1/4" angle is welded to each end.



RIGHT END VIEW

DETAIL 4

The top, bottom and rear rolls are made from 1 1/2" black pipe 24" long.

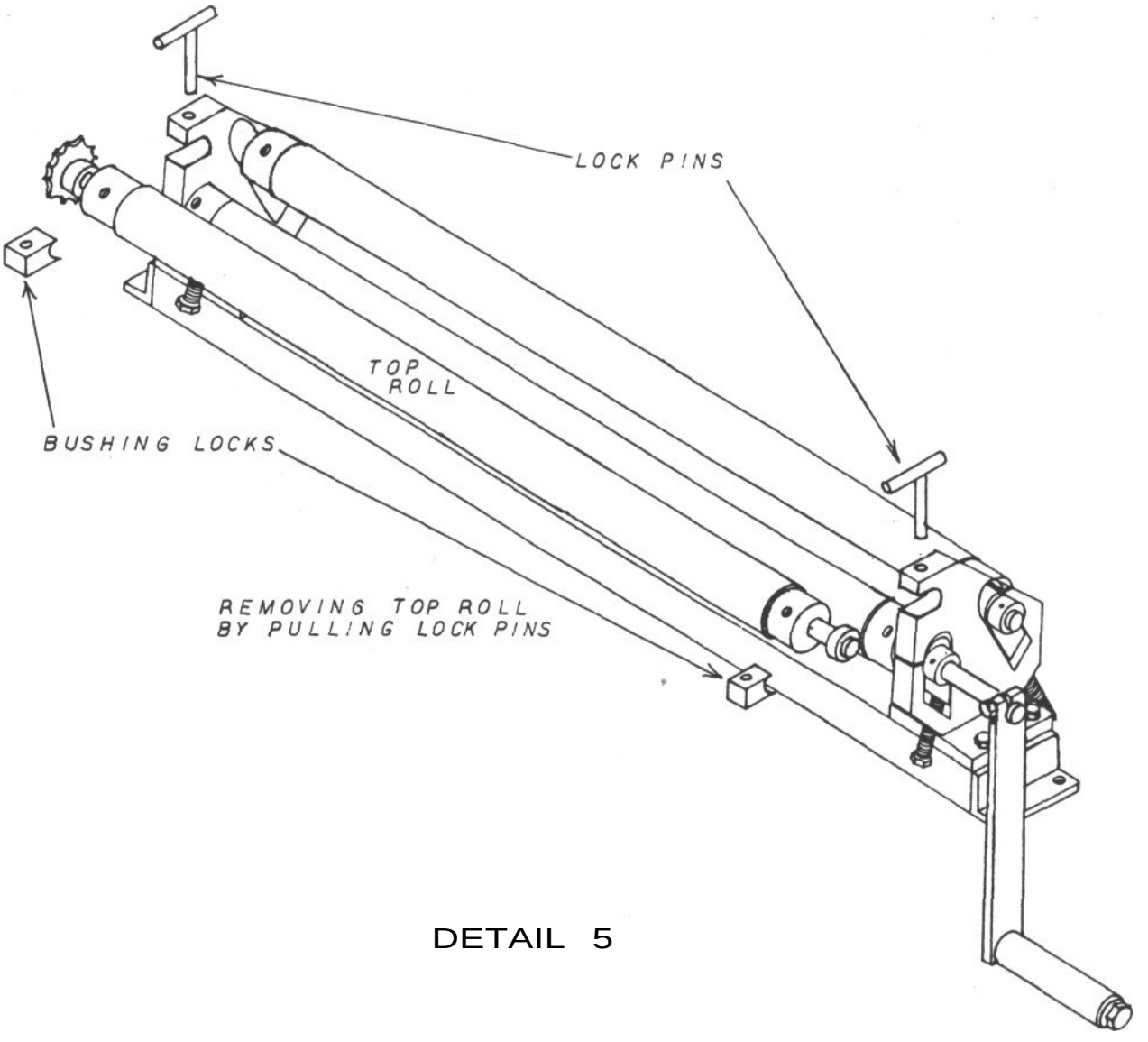
A sprocket hub with a 1/2" bore is pressed into each end of each roll. The roll shafts are made from 1/2" round rod suitable for use with bronze bushings.

The bottom and top front rolls are driven by two #40 12 tooth sprockets that serve as gears. These sprockets are readily available at most farm supply and industrial supply stores. The rolls are powered by turning the hand crank which is connected to the bottom front roll in a clockwise direction.

The original slip roll that I built was chain driven. All three rolls were powered. It just didn't seem to work right and every once in a while the chain would jam. Through experimentation I found that I could put two sprockets together and use them as gears. This worked so well that I abandoned the chain idea completely.

A welder is used in this project to weld the end frame to the mounting base and also to weld the mounting brackets to the slip roll bed. Cutting was done with a bandsaw. The holes were drilled with a drill press. You will also need a 7/16", a 1/2", and a 9/16" wrench, A 3/32" alien wrench, and a set of drill bits size 1/8" through 1". The larger drill bits should have a 1/2" cut down shank. If your shop is not equipped with the larger size drill bits and you plan on buying them be sure and shop around before you buy. It may be that you can save several dollars. I bought a complete set of drill bits from K.I.T. TOOLS for the same price as one drill bit from the local hardware store. To order a catalogue from K.I.T. tools call 1-800-521-6579. You will also need tap sizes 1/4-20, 3/8-16, 1/2-20 and die size 1/2-20.

No project would be complete without mentioning safety. There are many hazards in this project both hidden and obvious and no effort has been made to point out all of them. The author of this manual is not an engineer and no engineering has been applied to this project. Each detail presented in this manual is subject to your own appraisal and you are fully responsible for your own safety and that of any others who may be injured due to your pursuit of this activity. Take your time and think each step through. When welding use an approved welding hood. Make sure the work area is well ventilated and that there are no flammable liquids or rags in or close to the work area. When working in the shop one should always wear safety glasses. When drilling, particularly when using the larger drill sizes make sure the work is securely clamped to the table. Also keep any loose clothing and long hair out of the way when drilling. Let's get started.



DETAIL 5

MATERIALLIST

2 pcs. 3/4" x 4 5/8" x 4 7/16" Hot Roll Steel, (left and right end housing)

2 pcs. 3/8" x 3" x 3" H.R.S (end housing mounting base)

1 pc. 3/4" x 1" H.R.S. 8" long (top, bottom and rear bushing housing)

8- 1/2" I.D. 5/8" O.D. bronze bushings (Top, bottom and rear roll bushings also, crank handle bushings)

1/4" round rod 7" long (top roll bushing lock)

2- 3/8" - 16 x 2" bolts (front roll adjusting bolts)

2- 3/8" - 16 x 2 1/2" bolts (rear roll adjusting bolts)

1- pc. 1/2" round rod 29 1/2" long suitable for use with bronze bushings (top roll shaft)

MATERIAL LIST (CONTINUED)

1- pc. 1/2" round rod 32 1/4" long suitable for use with bronze bushings (bottom roll shaft)

1- pc. 1/2" round rod 29" long suitable for use with bronze bushings, (rear roll shaft)

3- pcs. 1 1/2" black pipe 24" long (top, bottom and rear roll)

1- pc. 3" x 1 1/2" channel 29 7/8" long (bed)

2- pcs. 1 1/2" x 1 1/2" - 1/4" angle (bed mounting brackets)

8- 5/16" - 18 x 1" bolts (to mount left and right end housing to bed)

8- 5/16" lock washers

8- 5/16 - 18 nuts

6- 1/2" bore sprocket hubs G. & G. or Weasler part # 20008 available at most farm supply stores and industrial supply houses, (top, bottom and rear roll hubs) see detail 23 on page 24 for detailed drawing.

4- 1/2" shaft collars (hold right side top, bottom and rear roll bushing assemblies in place, also holds left rear roll bushing assembly in place)

2- 1/2" bore, 12 tooth, ANSI #40 roller chain sprockets G. & G. or Weasler part # 4012 available at most farm supply stores and industrial supply houses. (Drive sprocket assembly)

2- 1/2" bore sprocket hubs G. & G. or Weasler part # 10008.(Drive sprocket assembly.)

1- pc. 3/8" x 3/4" flat bar 10" long (crank arm)

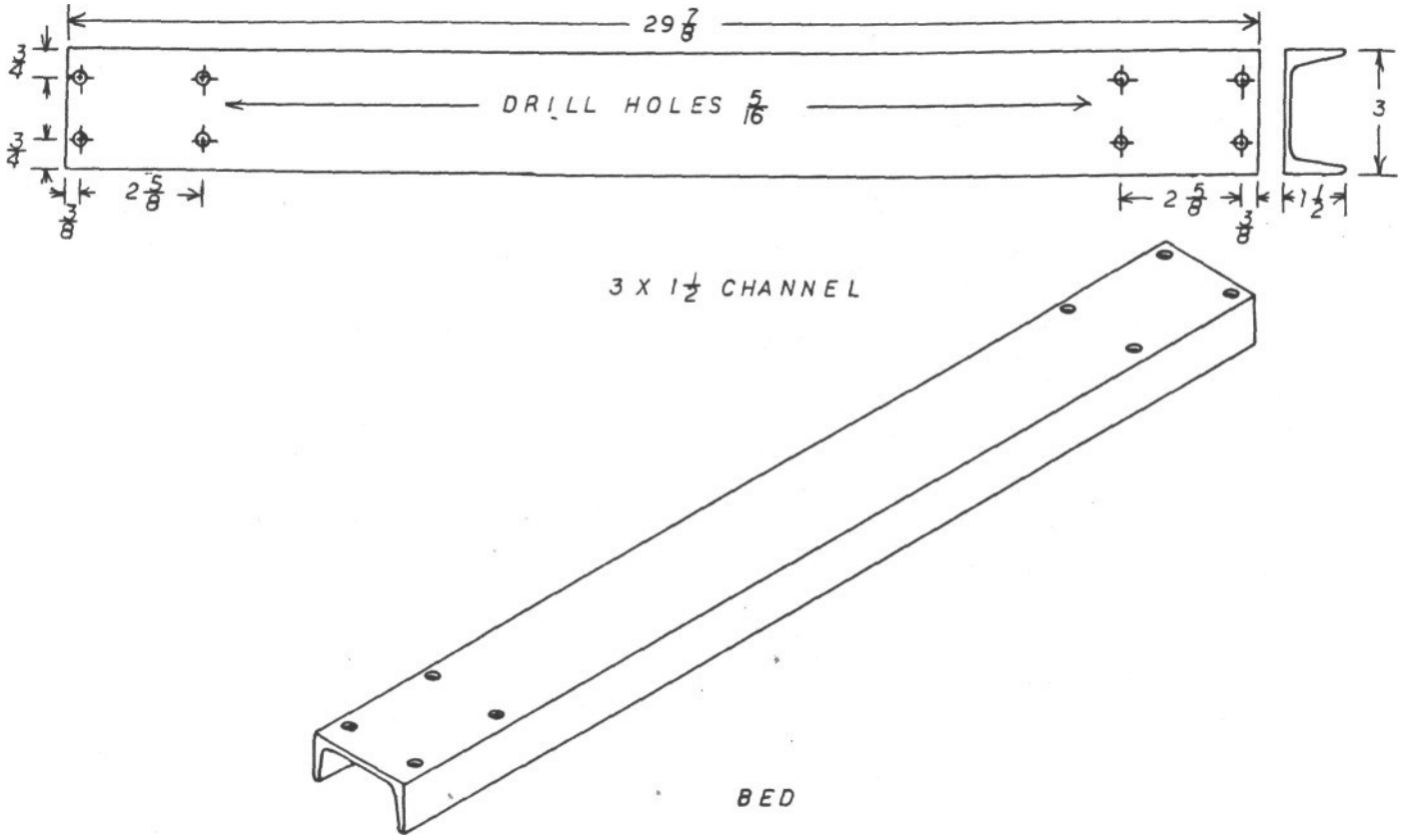
1- 1/4" - 20 x 3/4" bolt (crank arm clamp bolt)

1- 1/8" x 3/4" roll pin (to secure crank arm to roll shaft)

1- pc. 1/2" round rod 5" long suitable for use with bronze bushings (crank handle shaft)

1- 5/16" - 18 x l/2"bolt (to secure crank handle to shaft)

1- 3/8" flat washer (to be used with bolt to secure crank handle to shaft)



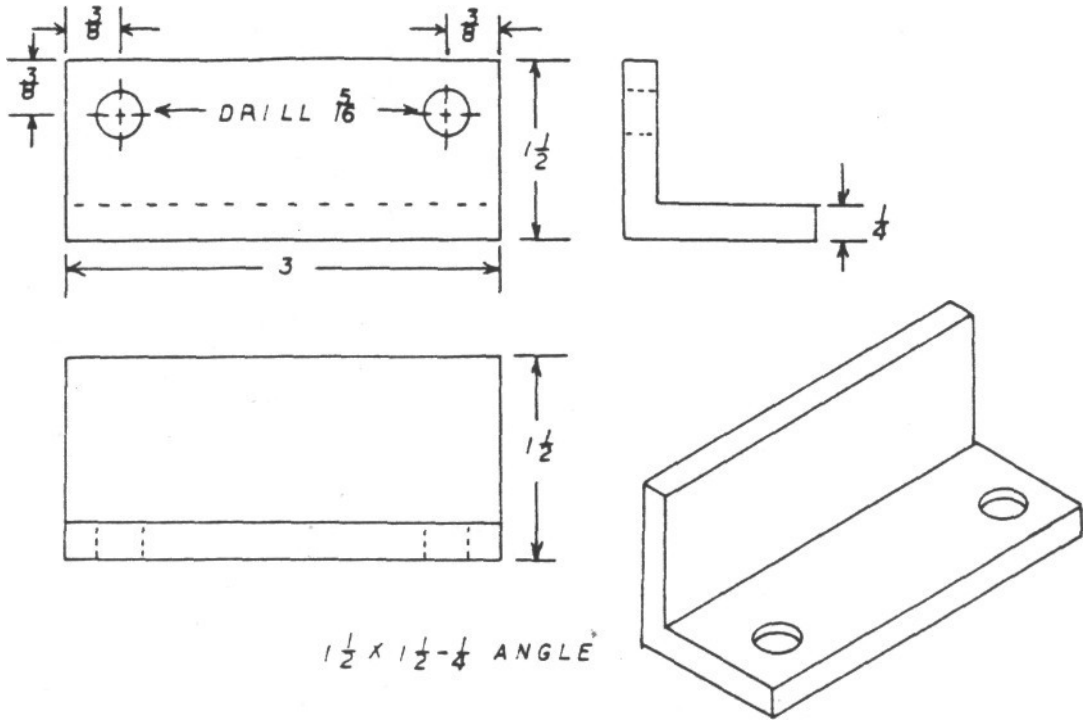
DETAIL 6

THE SLIP ROLL BED

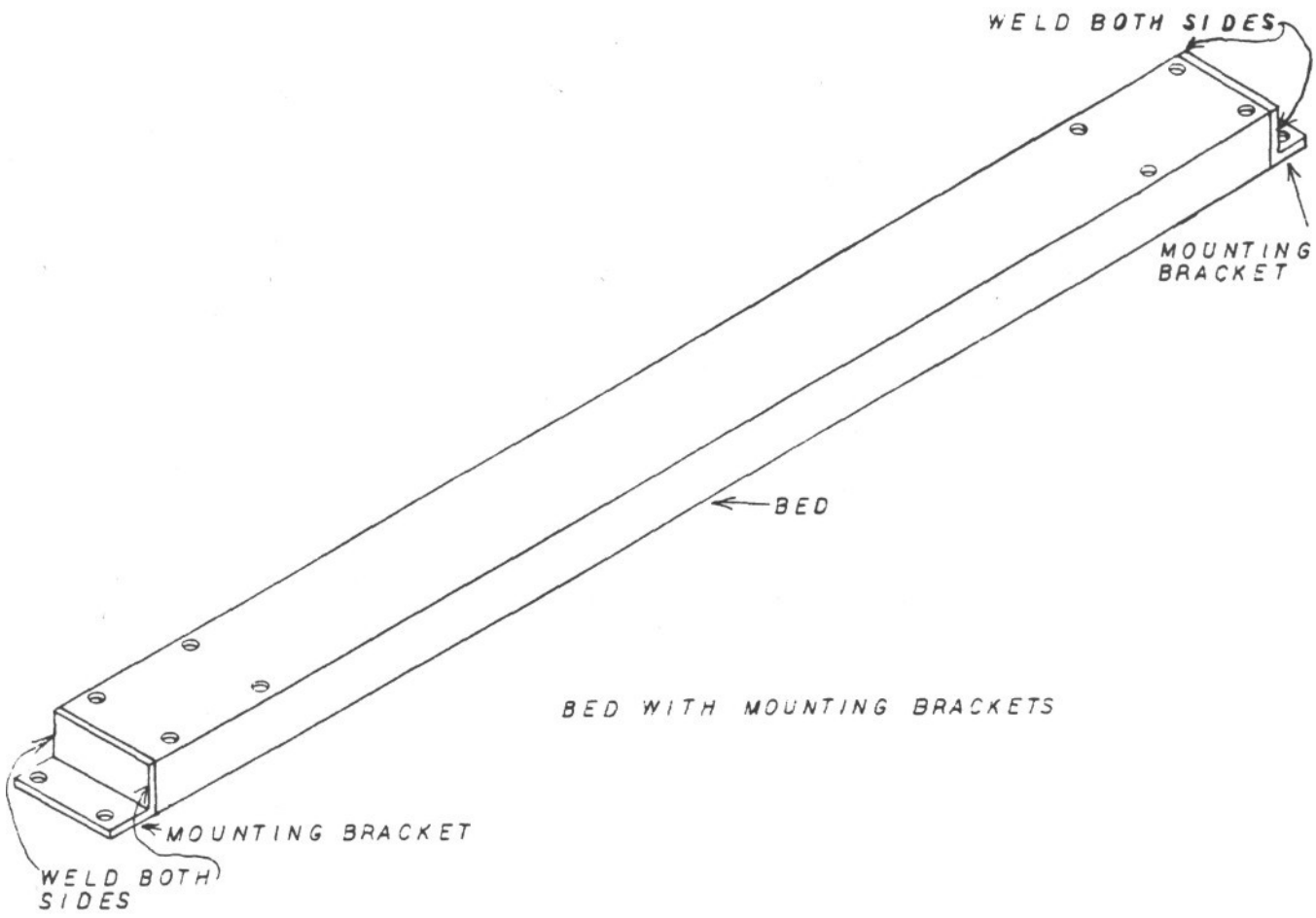
The slip roll bed is made from a piece of 3" x 1 1/2" channel 29 7/8" long. Four 5/16" holes are drilled in each end as shown in detail 6 on page 11. These holes are for mounting the left and right end frame housings.

The bed mounting brackets are next. Two are required. They are made from 1 1/2" x 1 1/2" x 1/4" angle 3" long. Two 5/16" mounting holes are drilled in one side. These holes are used to mount the slip roll to a bench or stand. The other side of the angle with no holes is welded to the bed. See detail 7 on page 12.

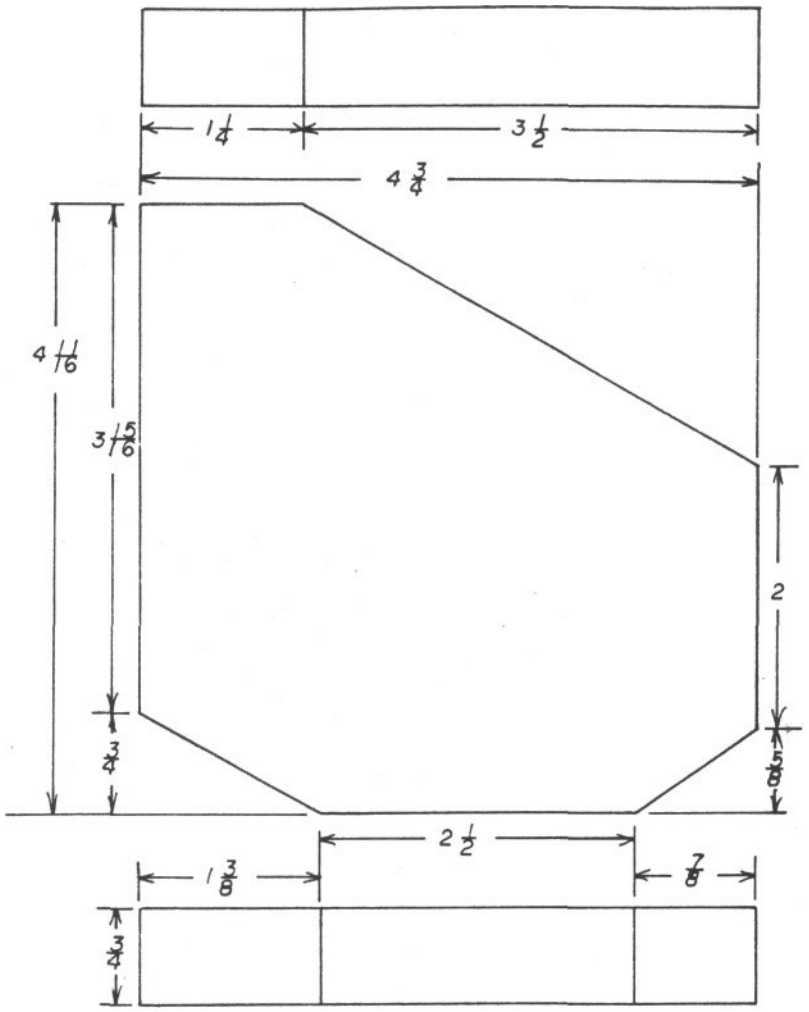
To complete the slip roll bed weld the mounting brackets we just made to each end of the bed as shown in detail 8 on page 12.



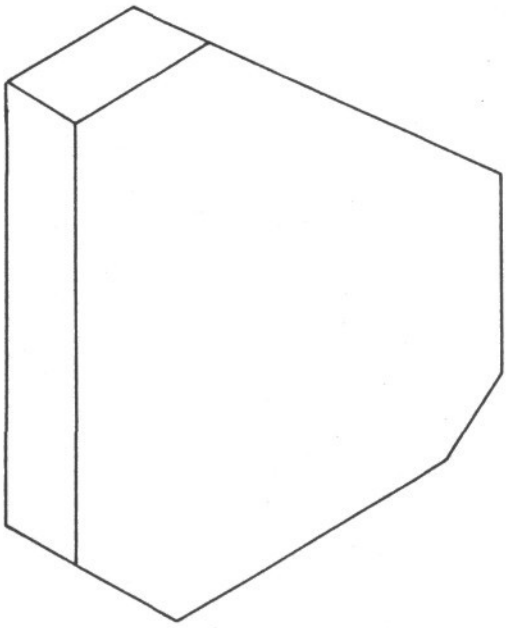
BED MOUNTING BRACKET
MAKE 2



BED WITH MOUNTING BRACKETS



END FRAME BLANK
MAKE TWO



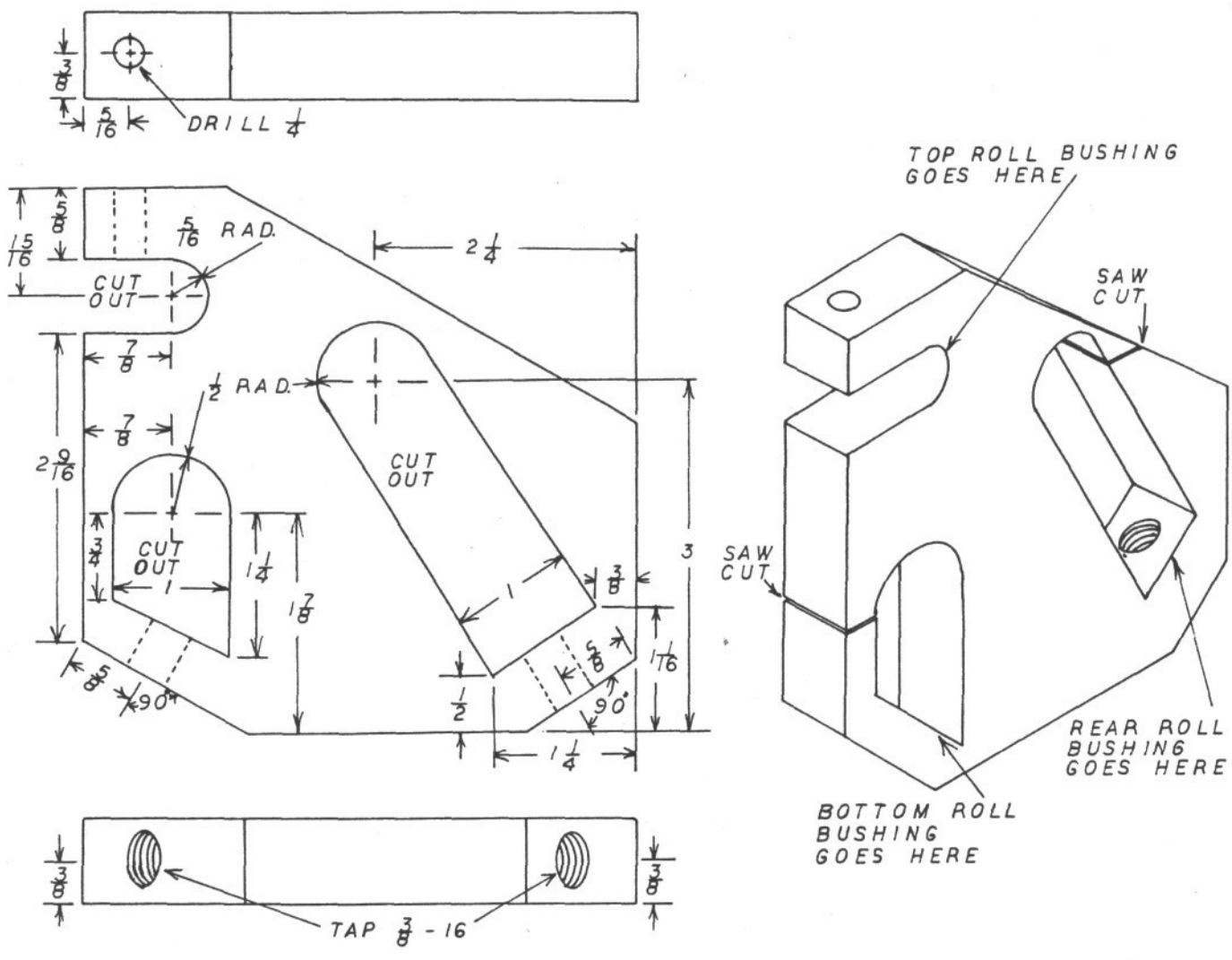
4 11/16 X 4 3/4 X 3/4 H.R.S.

DETAIL 9

THE LEFT AND RIGHT END FRAME HOUSING

Cut The left and right end frame housing blanks. These are each cut from a piece of 3/4" H.R.S. plate measuring 4 11/16" x 4 3/4". The frame housing dimensions are given in detail 9 on page 13.

Prepare the left and right end frame blanks by spraying steel blue layout fluid on one side of each blank. Using the layout die is not absolutely necessary but it sure makes your scribe lines more visible. When the layout die has dried, layout the top, bottom and rear roll bushing cut outs. Dimensions are given in detail 10 on page 14. Repeat with the other end housing.

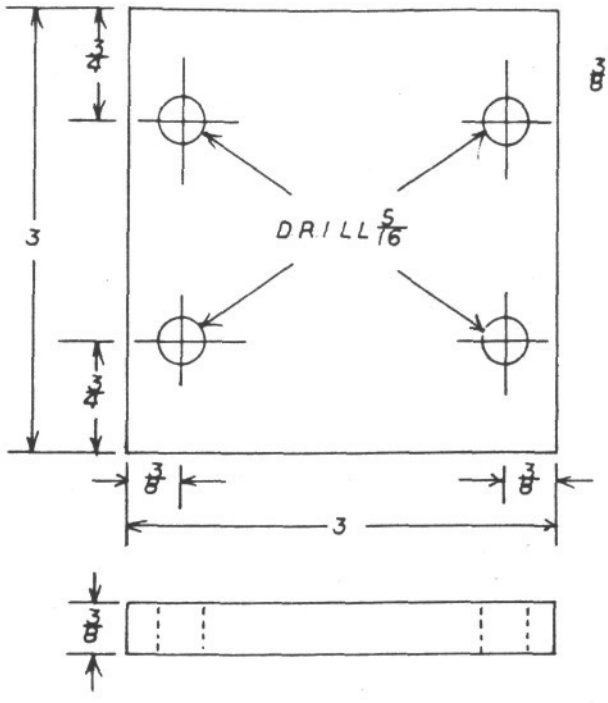


END FRAME HOUSING

DETAIL 10

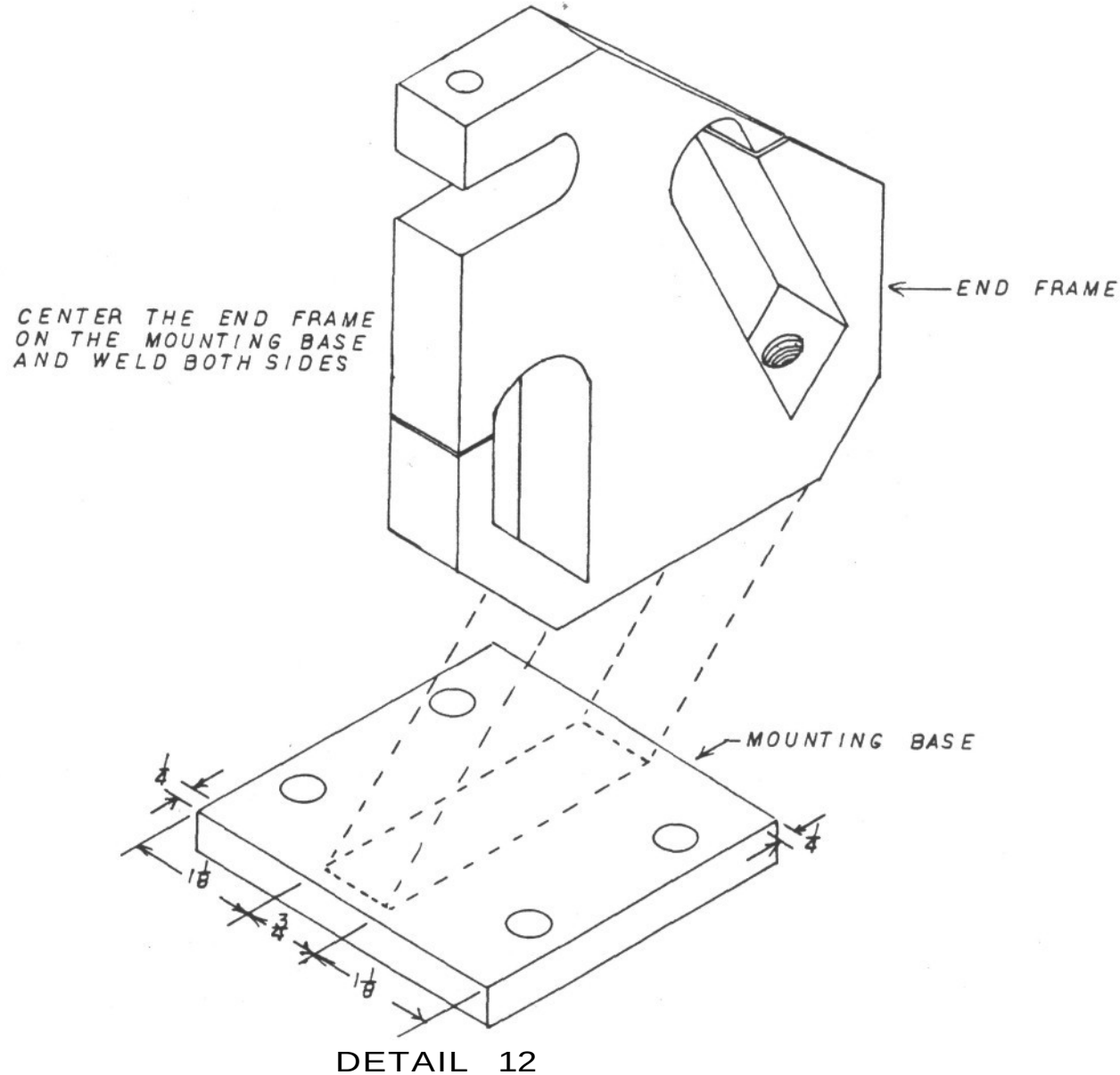
To make the cutouts in the housing blank, begin with the bottom front roll cut out. To gain the 1/2" radius at the top of the cutout step drill a 1" hole at the center point shown. Step drilling means to first drill a small hole and then gradually enlarge that hole by using increasingly larger drill sizes until the desired hole size is achieved, in this case 1".

Notice in detail 10 on page 14 the reference made to a saw cut. There are two of these saw cuts in each end frame. One is located at the front of the end frame housing and also at the rear of the frame housing. These saw cuts show where the band saw blade entered to make the bottom and rear bushing cutouts. The location at which you enter is not critical and the cuts do not seem to hurt the strength of the end housing.

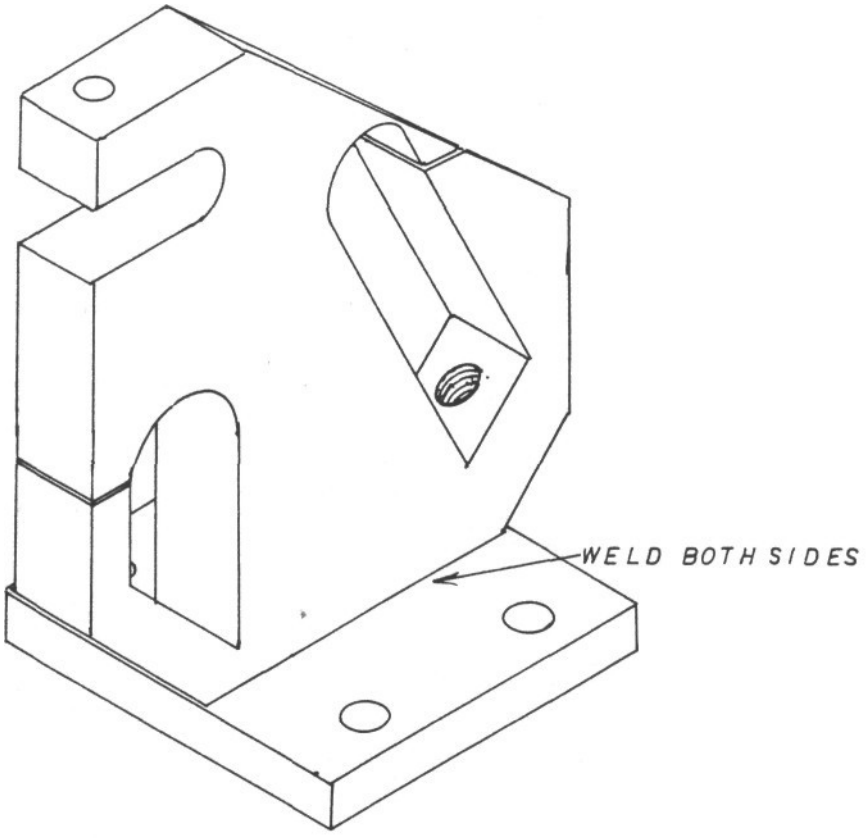


END FRAME MOUNTING BASE
MAKE 2

DETAIL 11



DETAIL 12



END FRAME WELDED TO BASE

DETAIL 13

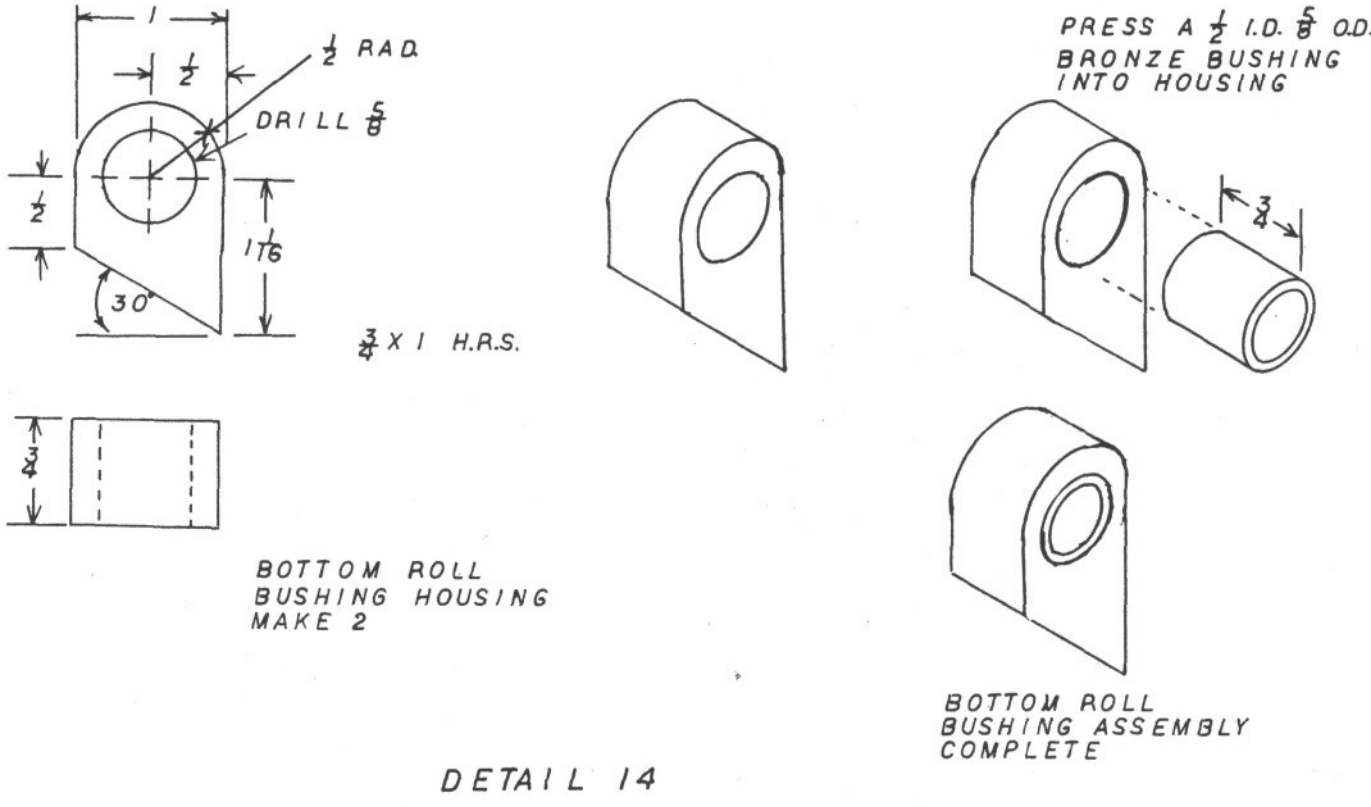
Complete the bottom roll bushing cut out using a hacksaw with an 18 teeth per inch blade or a band saw with a 14 t.p.i. blade. Follow the lines you scribed earlier.

Next make the rear bushing cut out following the same method as was used with the bottom roll bushing cut out.

For the top roll bushing cut out, step drill a 5/8" hole at the point shown. Then make the cut out following the scribed lines.

Drill and tap two 3/8" - 16 holes in the bottom of each end frame. These are for the front bottom and rear roll adjustment bolts. Also drill a 1/4" hole in the top of each end frame 5/8" deep for the top roll bushing lock pin. Refer to detail 10 on page 14.

The end frame mounting base is next. Material used is a piece of 3" x 3" x 3/8" flat bar. Two are required. Drill four 5/16" holes in each one of the mounting bases. See detail 11 on page 15 for hole locations.



DETAIL 14

It is necessary to center each end frame on the mounting base before it is welded in place. Detail 12 on page 15 shows how to do this. Scribe a line 1 1/8" from each side of the mounting base and 1/4" from each end. Set the left end frame on the mounting base and line it up between the scribe lines. When centered weld both sides. Repeat with the right end frame.

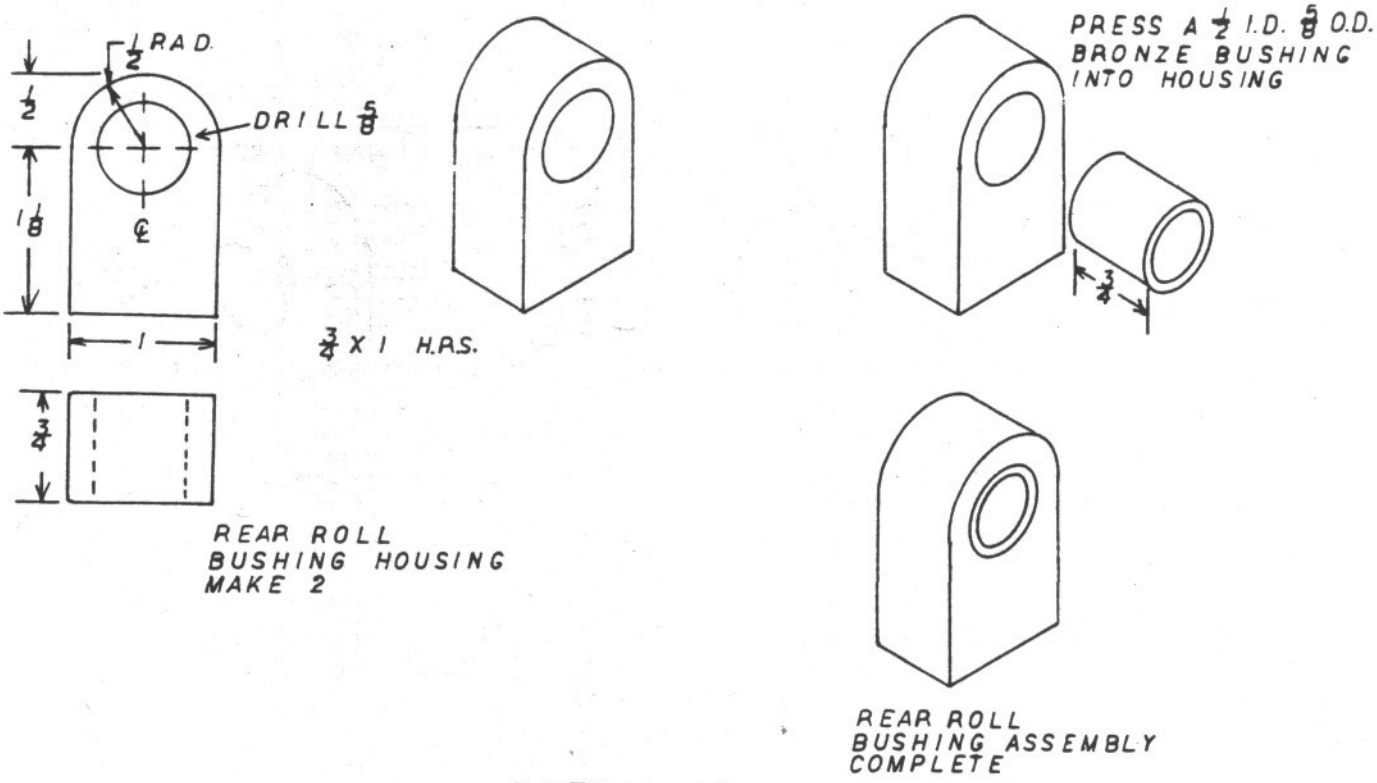
FRONT, BOTTOM AND REAR ROLL BUSHING ASSEMBLIES

There are six 1/2" I.D. 5/8" O.D. bronze bushings 3/4" long required to build the top, bottom and rear roll, bushing assemblies.

Lets begin with the front bottom roll bushing assembly. Two are required. Refer to detail 14 on Page 17. The material used is 3/4" x 1" H.R.S.. Cut the housing to size as shown, the outside radius can be formed with a bench grinder. Step drill the 5/8" hole for the bushing. Press the 1/2" bushing into the 5/8" hole. The bottom roll bushing assembly is now complete.

Each assembly will have to be custom fit. A good coarse file and or a bench grinder can be used for this. The bottom roll bushing assembly fits in each end frame as shown in detail 18 on page 20. They should fit just loose enough to allow free and easy adjustment up and down.

The rear roll bushing assembly is made using the same methods as the bottom roll bushing assembly. Detail 15 on page 18 shows the necessary dimensions for this part. It will also have to be custom fit.



DETAIL 15

The top roll bushing lock assembly is used to hold the top roll bushing in place and consists of the top roll bushing, the top roll bushing lock and the top roll bushing lock pin.

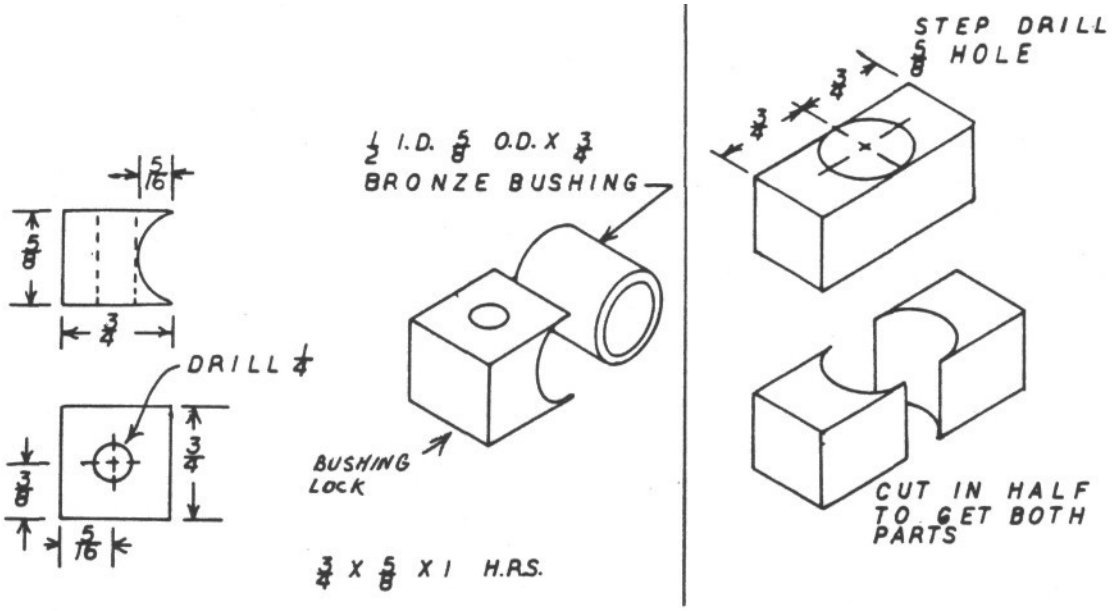
The top roll bushing lock is made from a piece of 3/4" x 1" H.R.S. 1 1/2" long. Two are required. The purpose of this part is to hold the top roll bushing in place. See detail 16 on page 19. A good way to make this part is to make both at the same time. That is, lay out a piece of 5/8" x 3/4" H.R.S. 1 1/2" long. Step drill a 5/8" hole through the center and then cut it in half to get both parts. Detail 16B on page 19 shows this.

Drill the 1/4" hole required for the bushing lock pin. the bushing lock fits in the top roll cut out in the end frame. It is held in place with the lock pin. Care should be taken so that the 1/4" holes in the bushing lock and in the end frame line up.

Finally, custom fit the part to fit the end frame by doing a little file work so that it fits snug but still loose enough to be easily removed.

The bushing lock is made with two pieces of 1/4" round rod cut to size and brazed or welded together as shown in detail 17 on page 19. The purpose of this part is to hold the bushing lock in place which in turn holds the 1/2" I.D. 5/8" O.D. x 3/4" bronze top roll bushing in place. Detail 18 on page 20 shows an exploded view of the installation of the top, bottom and rear roll bushing assemblies.

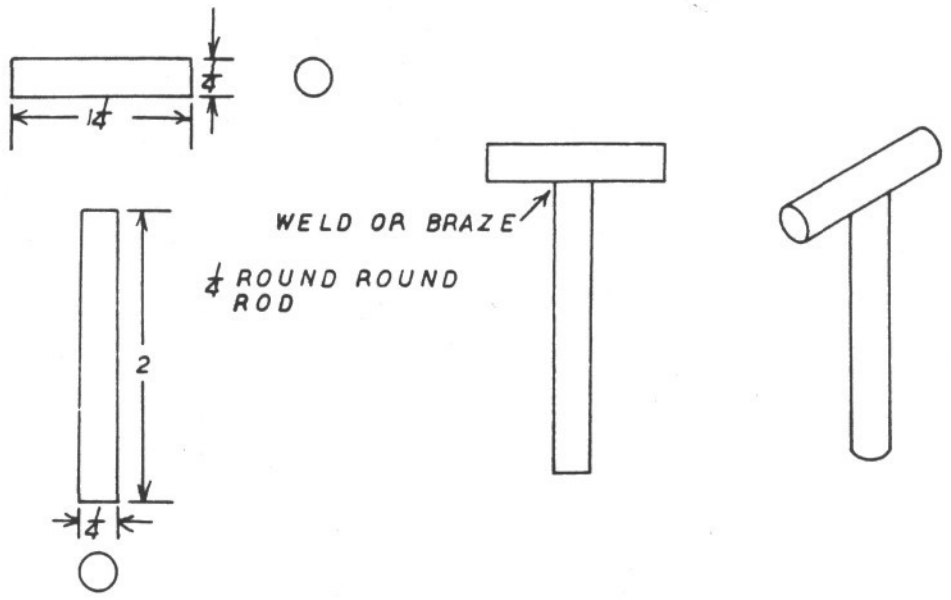
Install the 3/8" - 16 x 2" bottom roll adjustment bolt and the 3/8" - 16 x 2 1/2" rear roll adjustment bolt in each end frame as shown in detail 19 on page 21. Detail 20 on page 21 and detail 21 on page 22 show two views of the end frames complete.



DETAIL 16

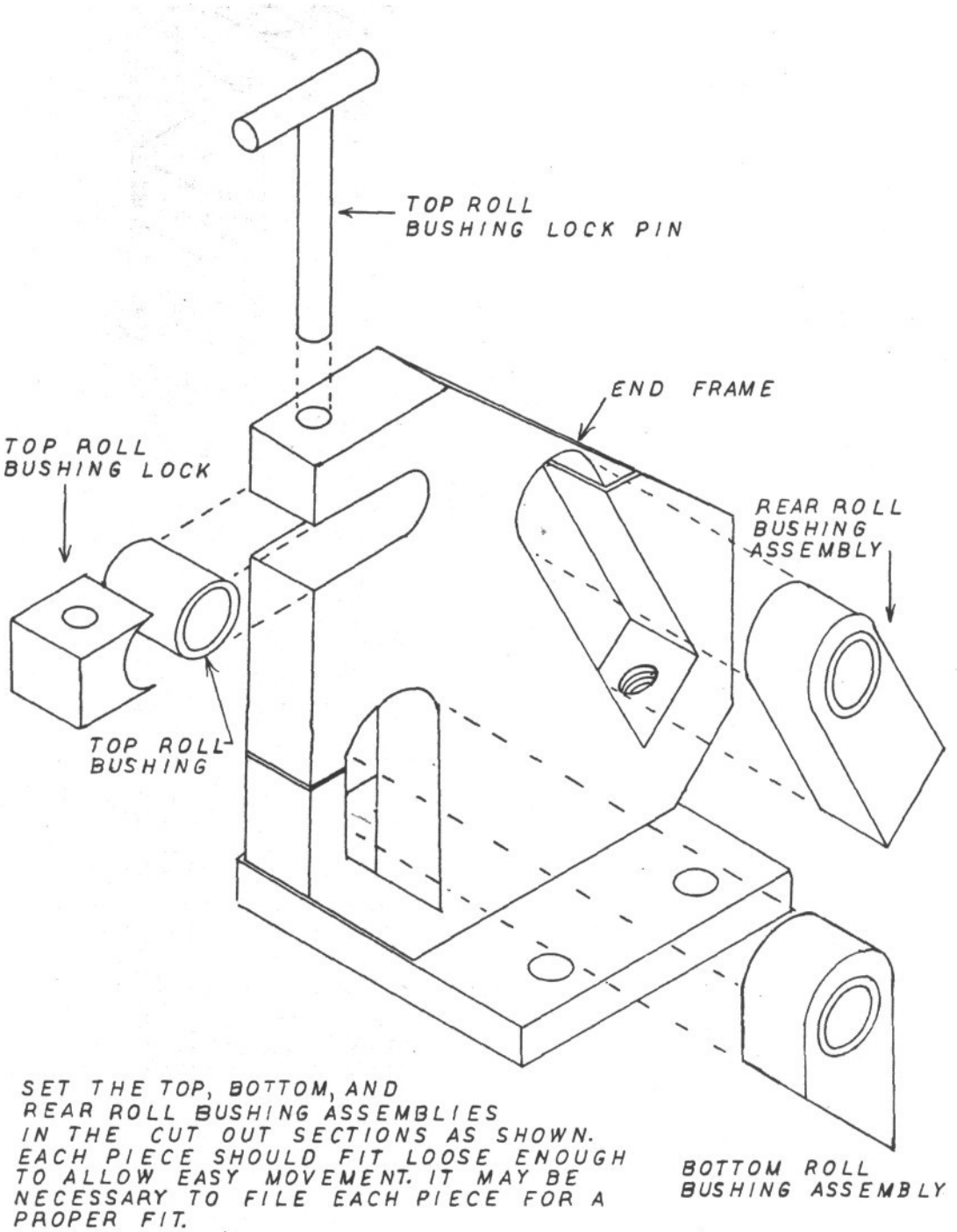
DETAIL 16 B

TOP ROLL BUSHING ASSEMBLY
MAKE 2

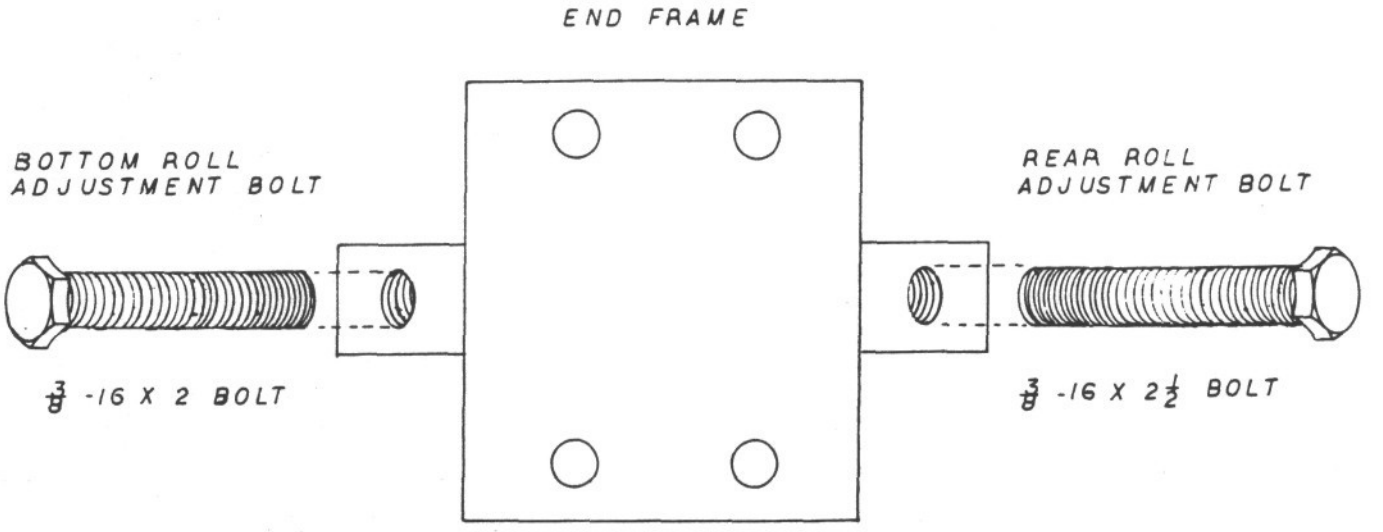


TOP ROLL
BUSHING LOCK
MAKE 2

DETAIL 17

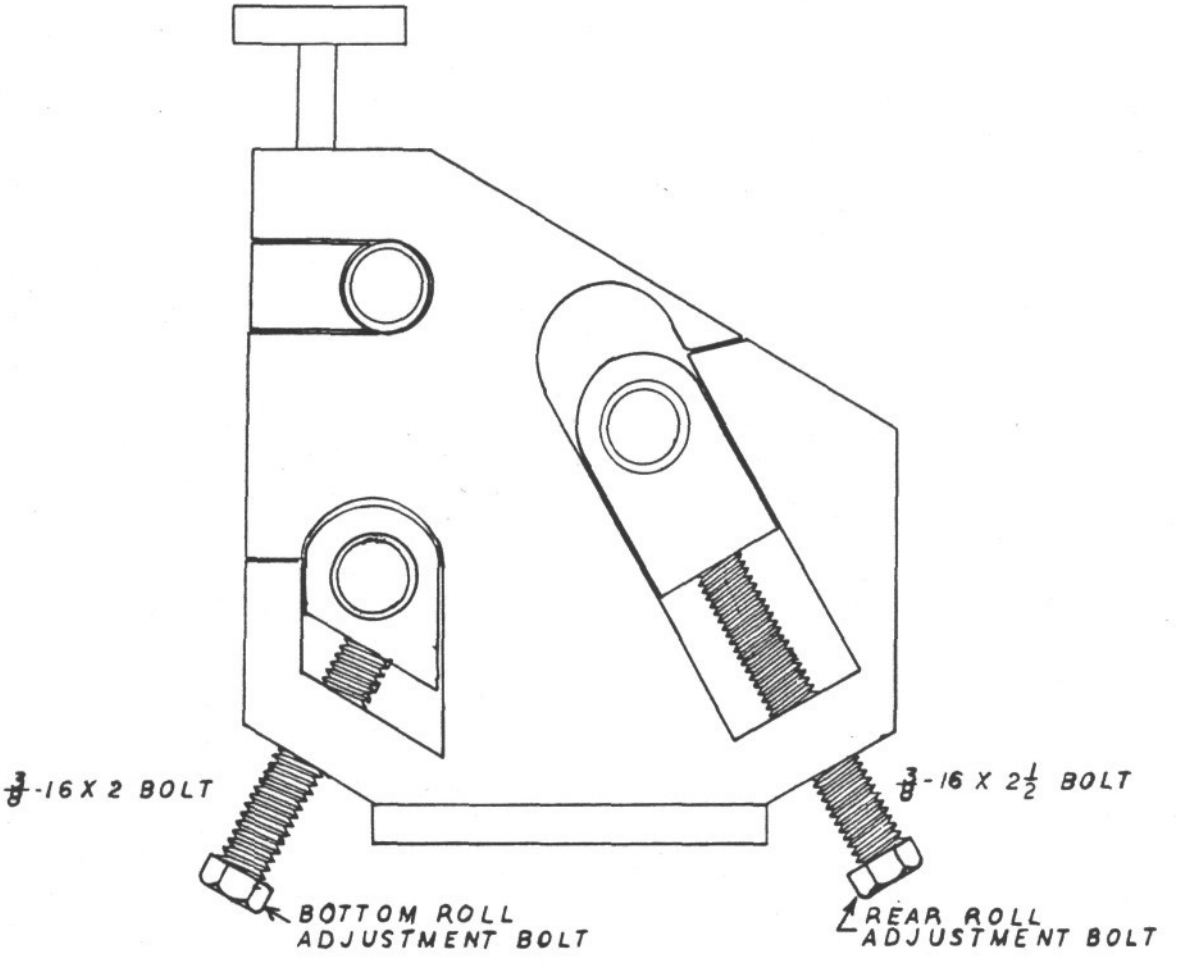

TOP ROLL
BUSHING LOCK PIN
END FRAME
TOP ROLL
BUSHING LOCK
REAR ROLL
BUSHING
ASSEMBLY
TOP ROLL
BUSHING
SET THE TOP, BOTTOM, AND
REAR ROLL BUSHING ASSEMBLIES
IN THE CUT OUT SECTIONS AS SHOWN.
EACH PIECE SHOULD FIT LOOSE ENOUGH
TO ALLOW EASY MOVEMENT. IT MAY BE
NECESSARY TO FILE EACH PIECE FOR A
PROPER FIT.
BOTTOM ROLL
BUSHING ASSEMBLY

DETAIL 18

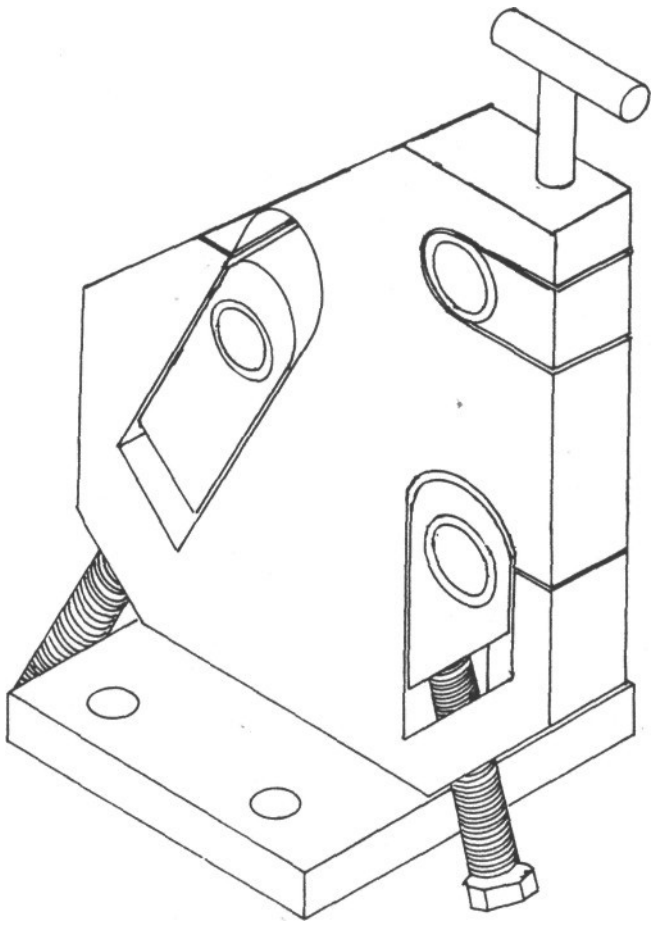


BOTTOM VIEW OF END FRAME SHOWING
REAR AND BOTTOM ROLL ADJUSTMENT BOLTS

DETAIL 19



DETAIL 20



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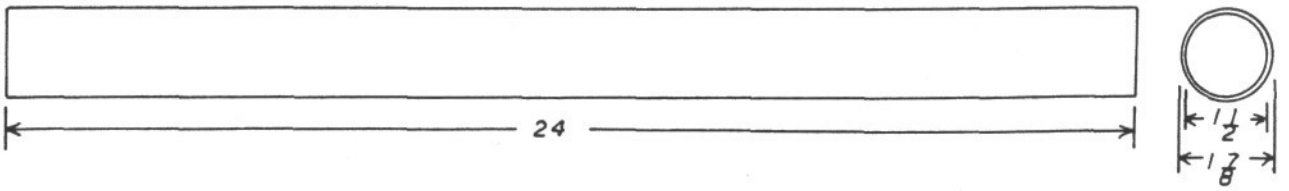
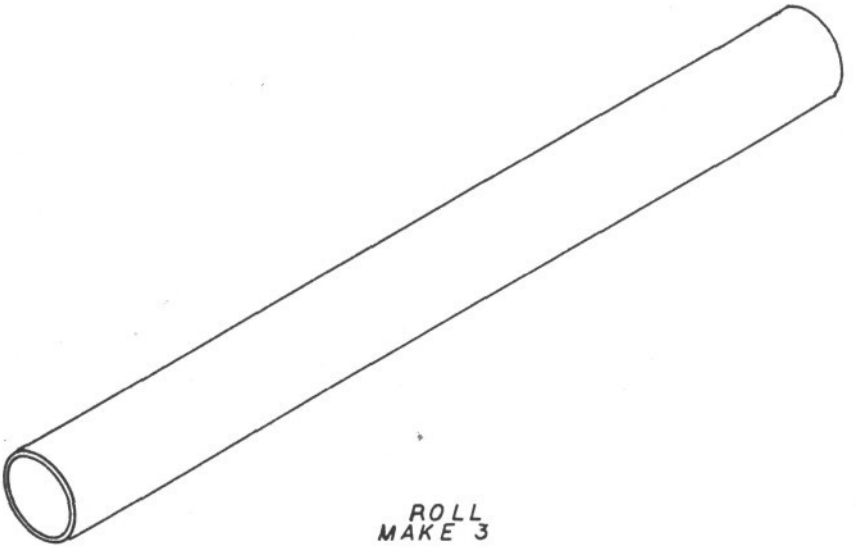


1 1/2 BLACK PIPE

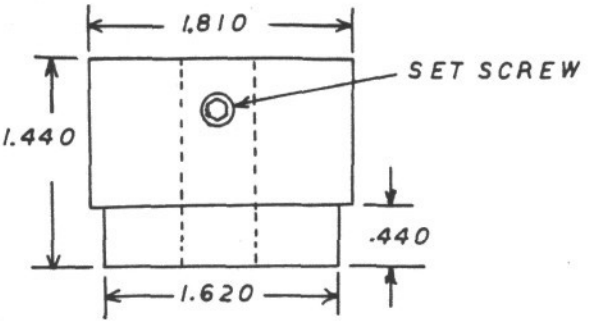


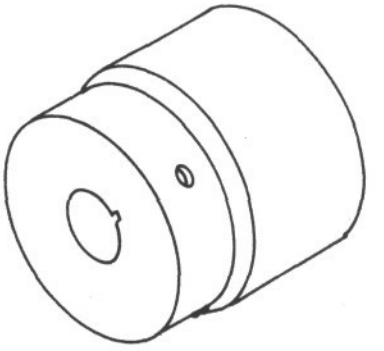
DETAIL 22

THE TOP, BOTTOM. AND REAR ROLLS

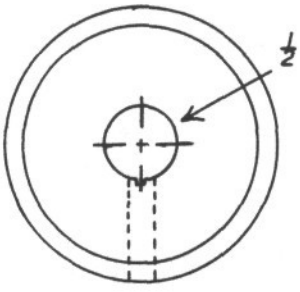
All three rolls are exactly the same and are made from 1 1/2" black pipe 24" long see detail 22 on page 23.

A sprocket hub with a 1/2" bore is pressed into each end of all three rolls. The sprocket hub mentioned can be found in most farm supply and industrial supply stores. Detail 23 on page 24 shows a detailed drawing of the sprocket hub. There are two companies that I found that manufacture these hubs. G. & G. Manufacturing, P.O. Box 12086, Florence Station, Omaha, Nebraska. Their phone # is (402) 453-9595. The other company is WEASLER ENGINEERING, P.O. Box 558 West Bend, WIS. 53095 phone (414) 338-2161. I called each one of these companies. They informed me that they only sell wholesale, but if you have trouble finding these parts they would be more than happy to refer you to a distributer in your area.





SPROCKET HUB
PART # 20008
AVAILABLE AT MOST
FARM SUPPLY STORES

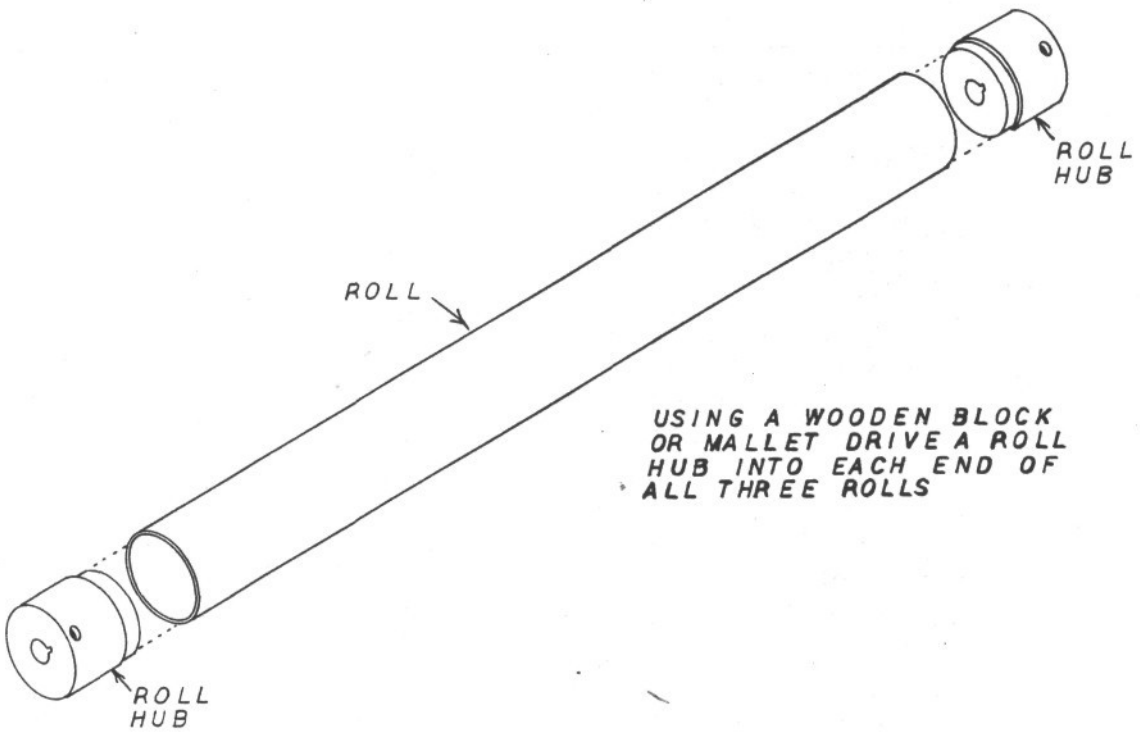


ROLL HUB
6 REQUIRED

DETAIL 23

On the slip roll that I built the sprocket hubs fit tightly in the end of the 1 1/2" black pipe. If for some reason yours fit loosely you can use shims to take up the slack. Care should be used when shimming because if they are shimmed unevenly the rolls will not turn true. If the rolls do not turn true the sheet metal may slip as it is turned through the gripping rolls. I also did not find it necessary to weld or braze the hubs to the 1 1/2" black pipe. If for some reason you do, be careful not to cause the roll to warp by over heating it. A couple of tack welds are all that would be necessary. Detail 24 on page 25 shows the hubs being installed in the ends of a roll.

Make the roll shafts next. The top roll shaft is made from a piece of 1/2" x 29 1/2" round rod suitable for use with bronze bushings. Grind or file 4 flat spots on the shaft at the dimensions shown in detail 25 on page 26. One flat spot is for a sprocket set screw, two flat spots are for the roll hub set screws, and one flat spot is for a 1/2" shaft collar.

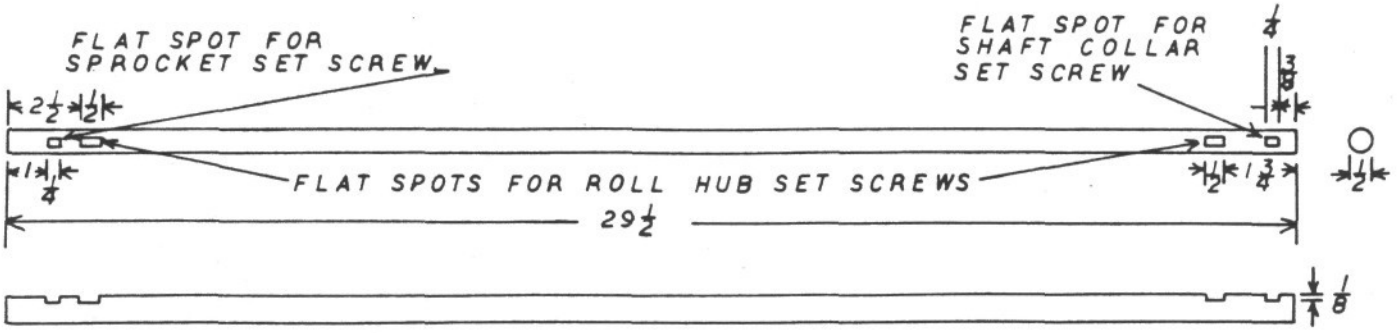


DETAIL 24

The rear roll shaft is also made from 1/2" round suitable for use with bronze bushings. It is 29" long. Grind the flat spots for the roll hub and shaft collar set screws as shown in detail 27 on page 27.

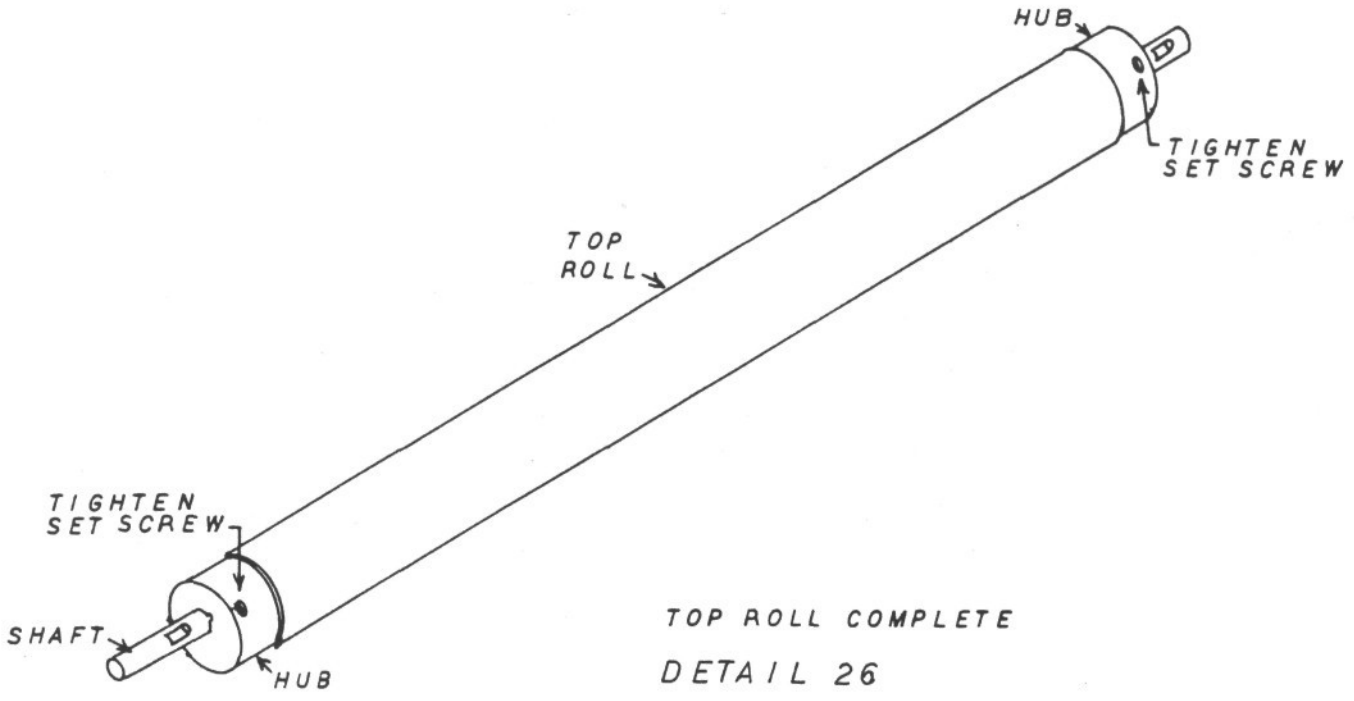
The bottom roll shaft is 32 1/4" long and is also made from 1/2" round rod suitable for use with bronze bushings. Grind the flat spots for the hub, sprocket, and shaft collar set screws as shown. An 1/8" hole is also drilled in one end of this shaft for the 1/8" roll pin necessary to attach the crank handle. See detail 29 on page 28.

Slide each shaft through the 1/2" hole in the roll hub through the roll and the hub on the other side. When the flat spots that you have ground on the shaft for the hub set screws line up tighten the hub set screws.



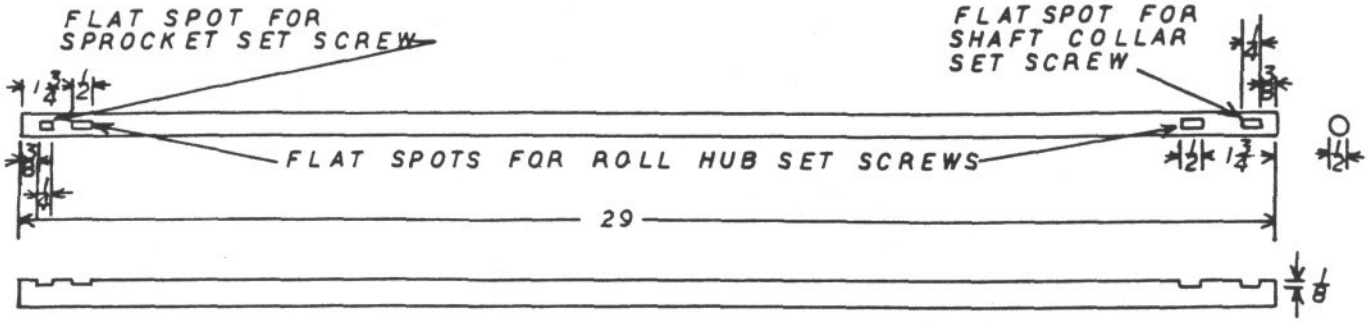
TOP ROLL SHAFT

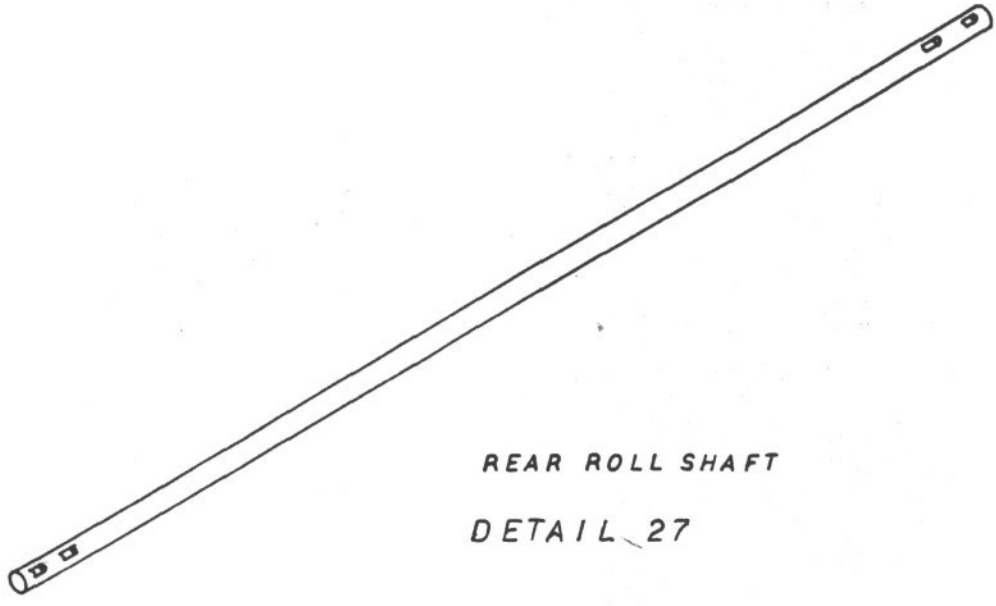
DETAIL 25



TOP ROLL COMPLETE

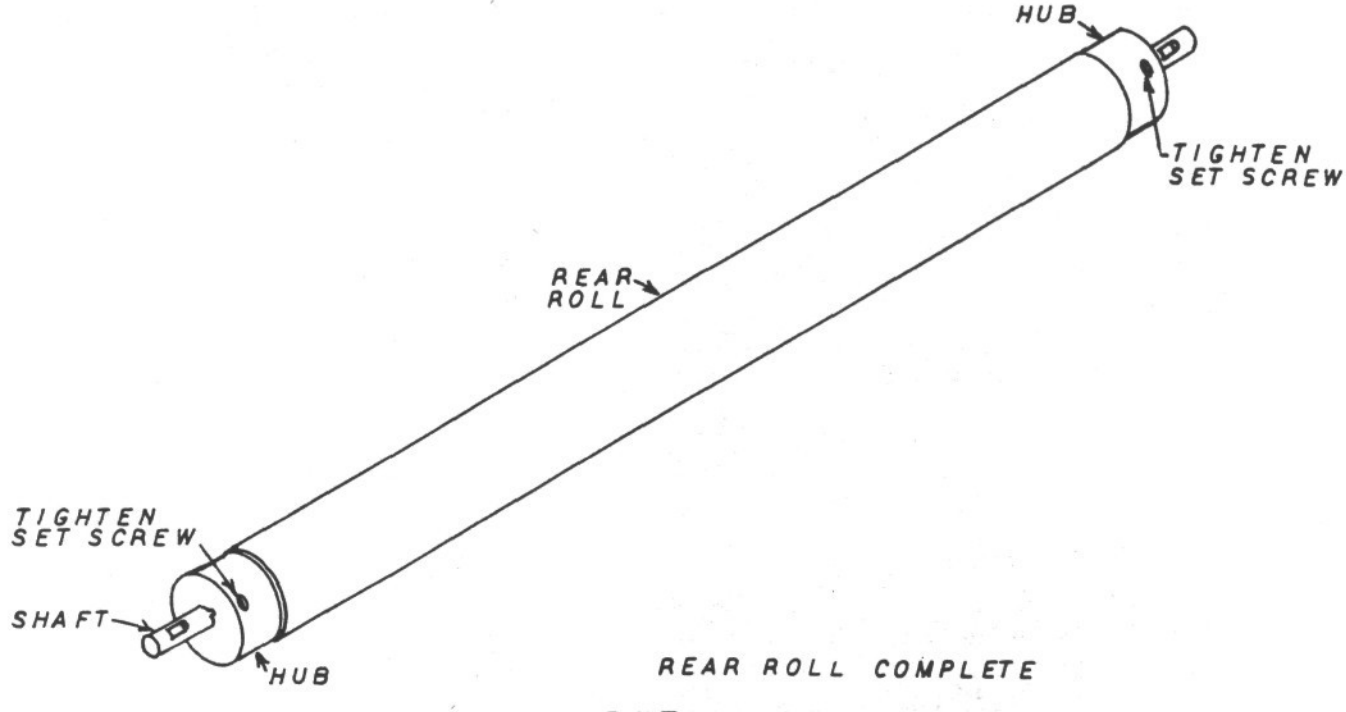
DETAIL 26





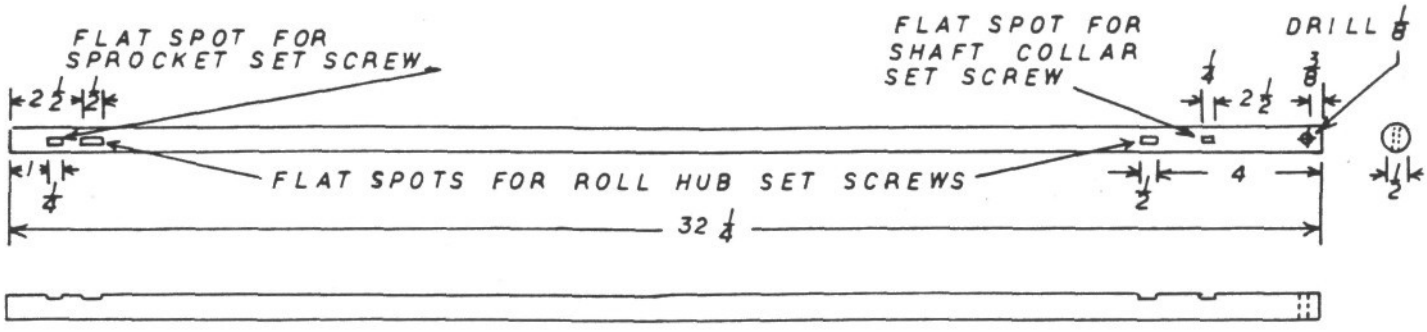
REAR ROLL SHAFT

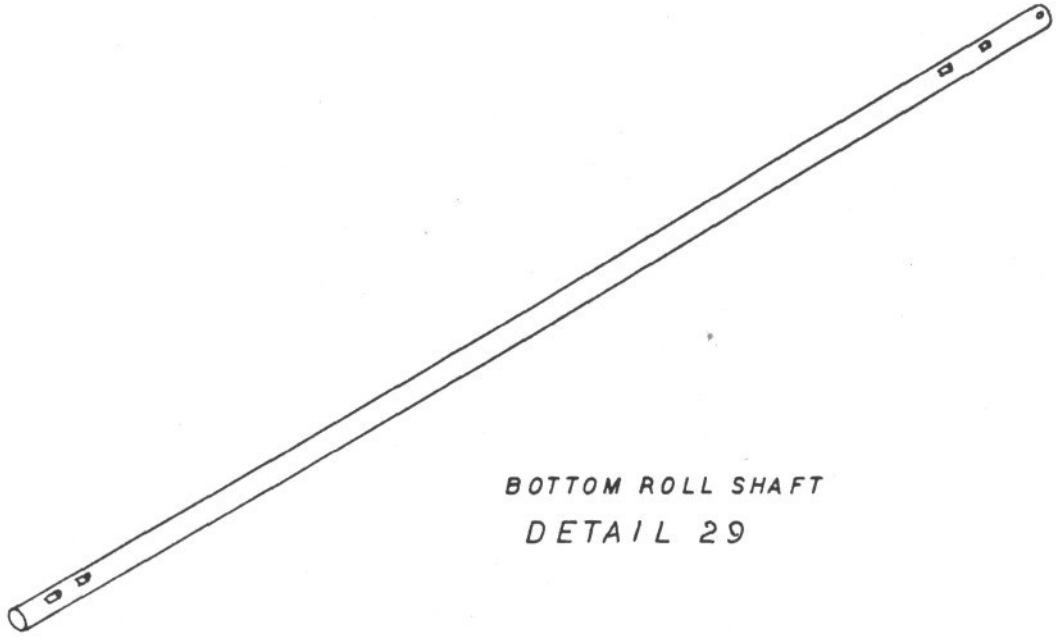
DETAIL 27



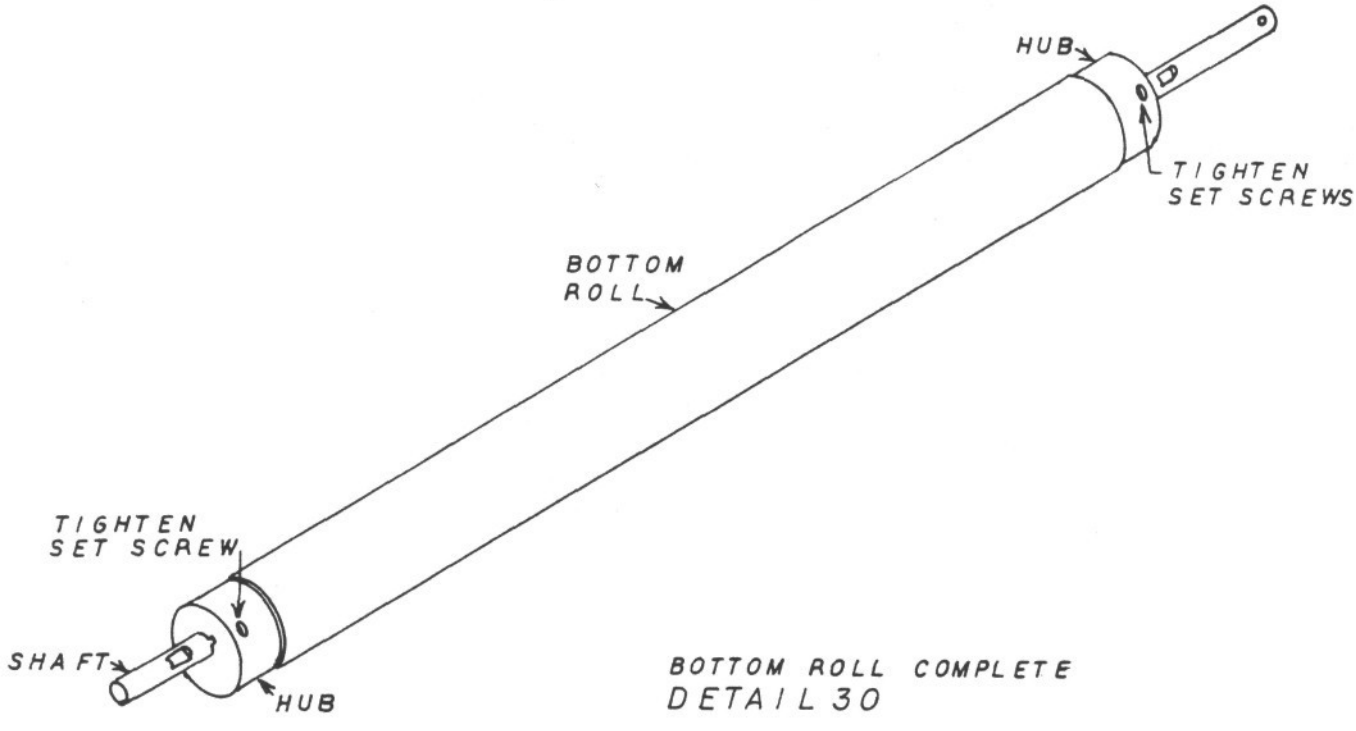
REAR ROLL COMPLETE

DETAIL 28

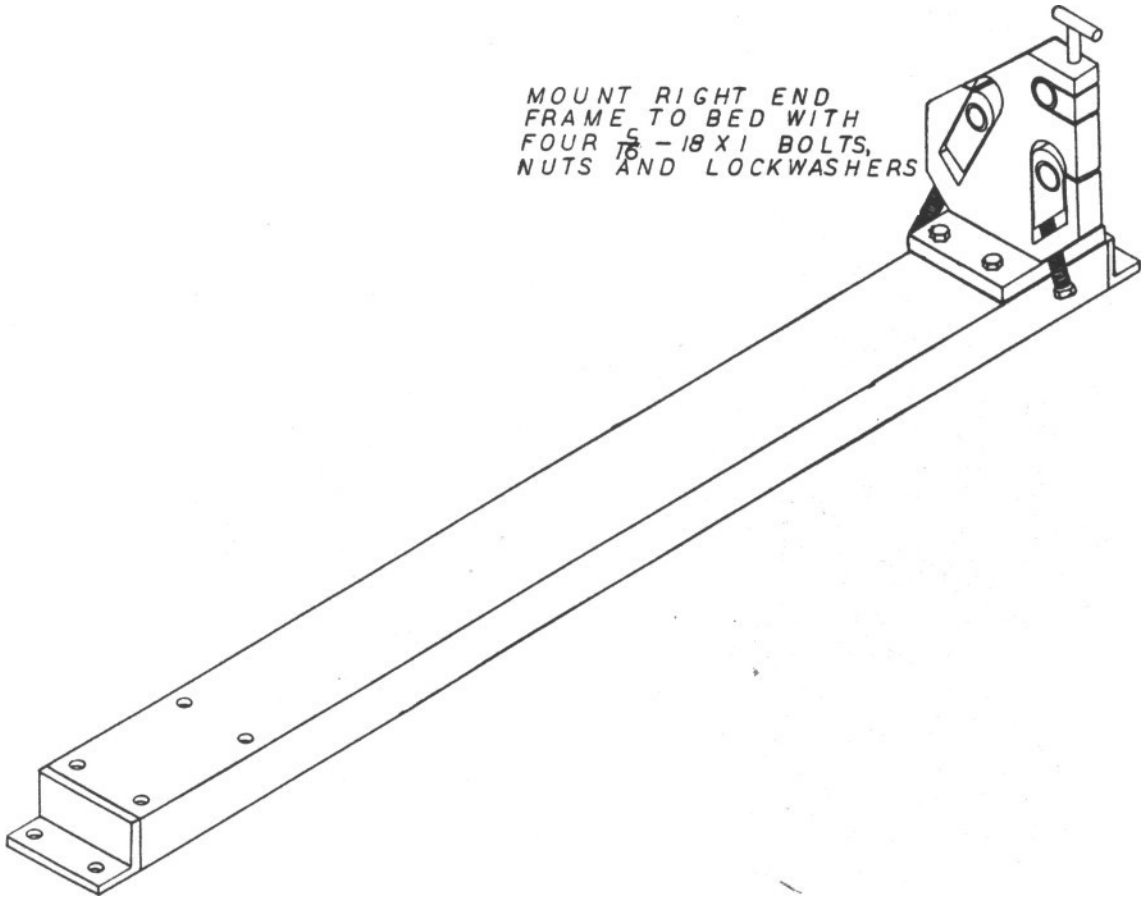




BOTTOM ROLL SHAFT
DETAIL 29



BOTTOM ROLL COMPLETE
DETAIL 30



DETAIL 31

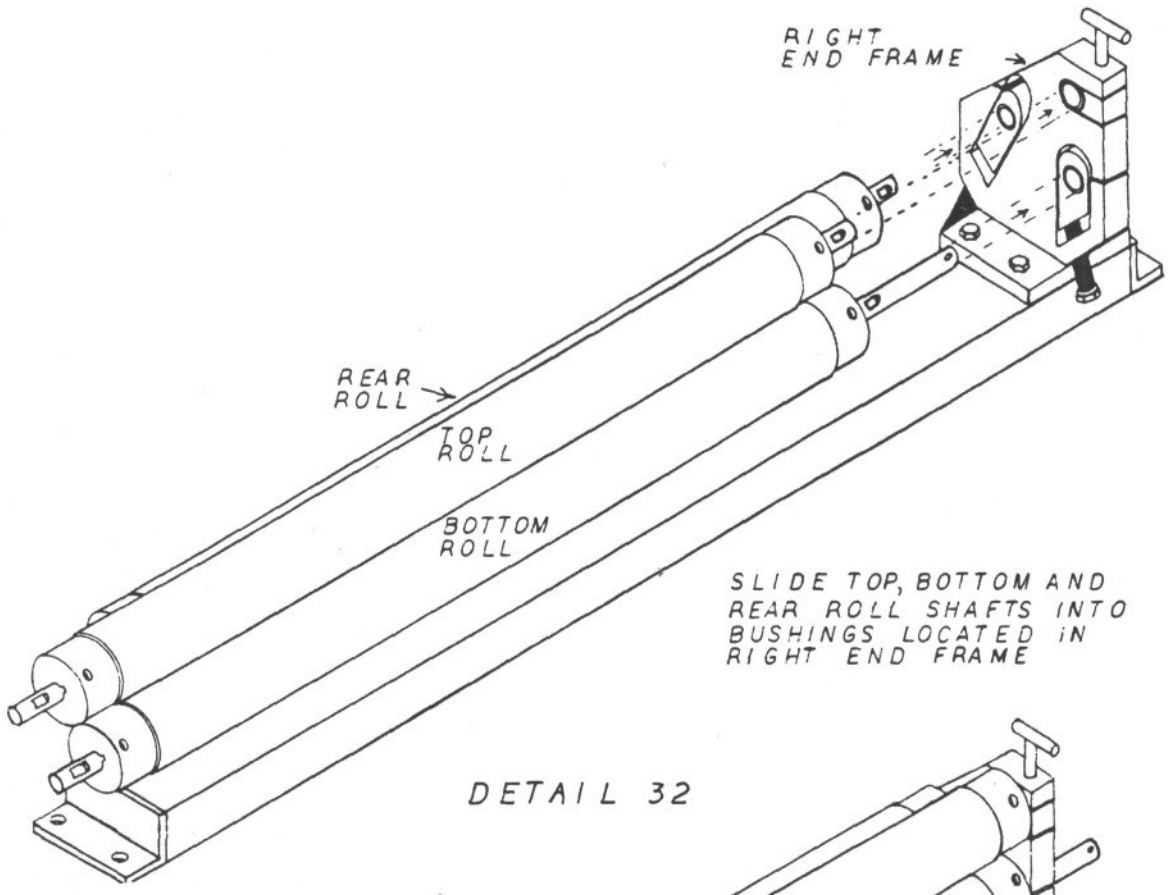
MOUNTING THE ROLL ASSEMBLY TO THE BED

Mount the right side end frame to the slip roll bed using Four 5/16" - 18 x 1" bolts, lockwashers, and nuts. See detail 31 on page 29.

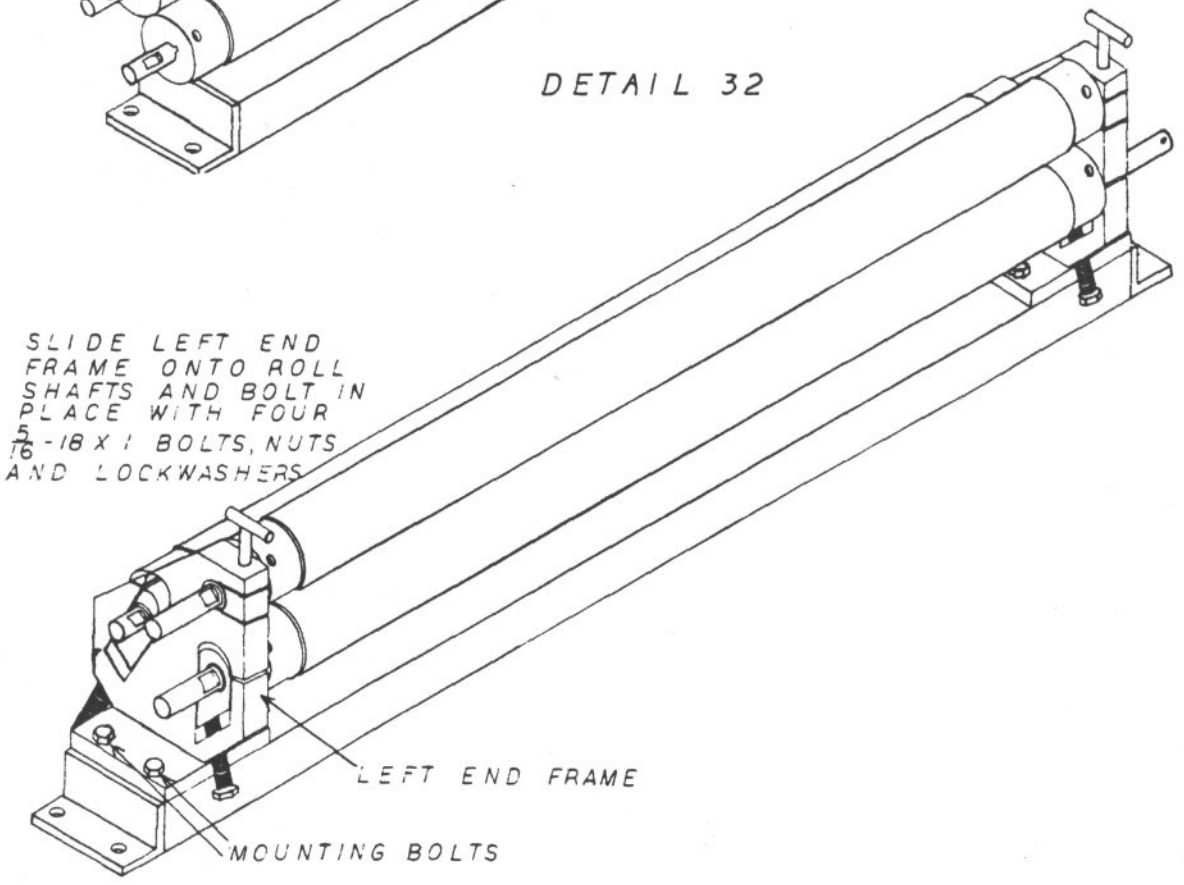
Slide all three rolls into their respective bushing. The rolls will fit flush against the end frame. See detail 32 on page 30

Now take the left end frame and line all three roll shafts, with their respective bushings and slide the frame over until it fits flush against the rolls. The four holes in the base should line up with the four holes in the bed. Secure the base to the bed with four 5/16" - 18 x 1" bolts, lockwashers and nuts.

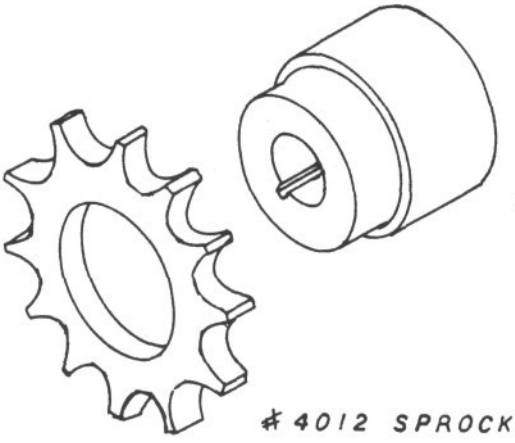
The roll assembly is now bolted to the bed. See detail 33 on page 30. Detail 37 on page 32 gives a right end perspective of the slip roll.



DETAIL 32



DETAIL 33



DETAIL 34

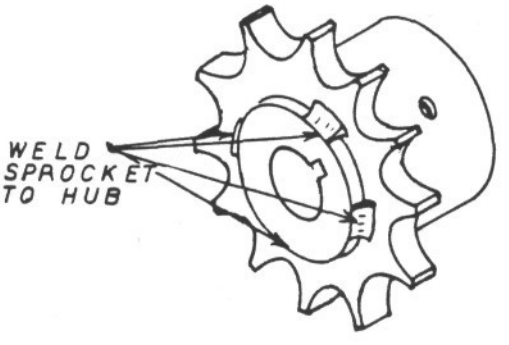
THE SPROCKET DRIVE

Mount the two ANSI #40, 12 tooth sprockets with a 1/2" bore. Detail 34 on this page shows a drawing of the sprocket hub and sprocket, detail 35 on this page shows them assembled. The sprocket is welded to the hub with four 1/2" tack welds. The sprocket and hub are manufactured by the Weasler company.'They are also manufactured by a company called G & G. They are available at most farm supply and industrial supply stores. Further information on these parts can be found on page 23.

One sprocket is mounted on the bottom front left side roll shaft. It should fit flush against the left end frame. The other sprocket is mounted on the top front left side roll shaft. It should also fit flush against the left end frame. See detail 36 on page 32 showing the sprockets mounted. The sprocket teeth should mesh together nicely. If they don't it may be necessary to grind or file a little bit off of each sprocket tooth for a better fit.

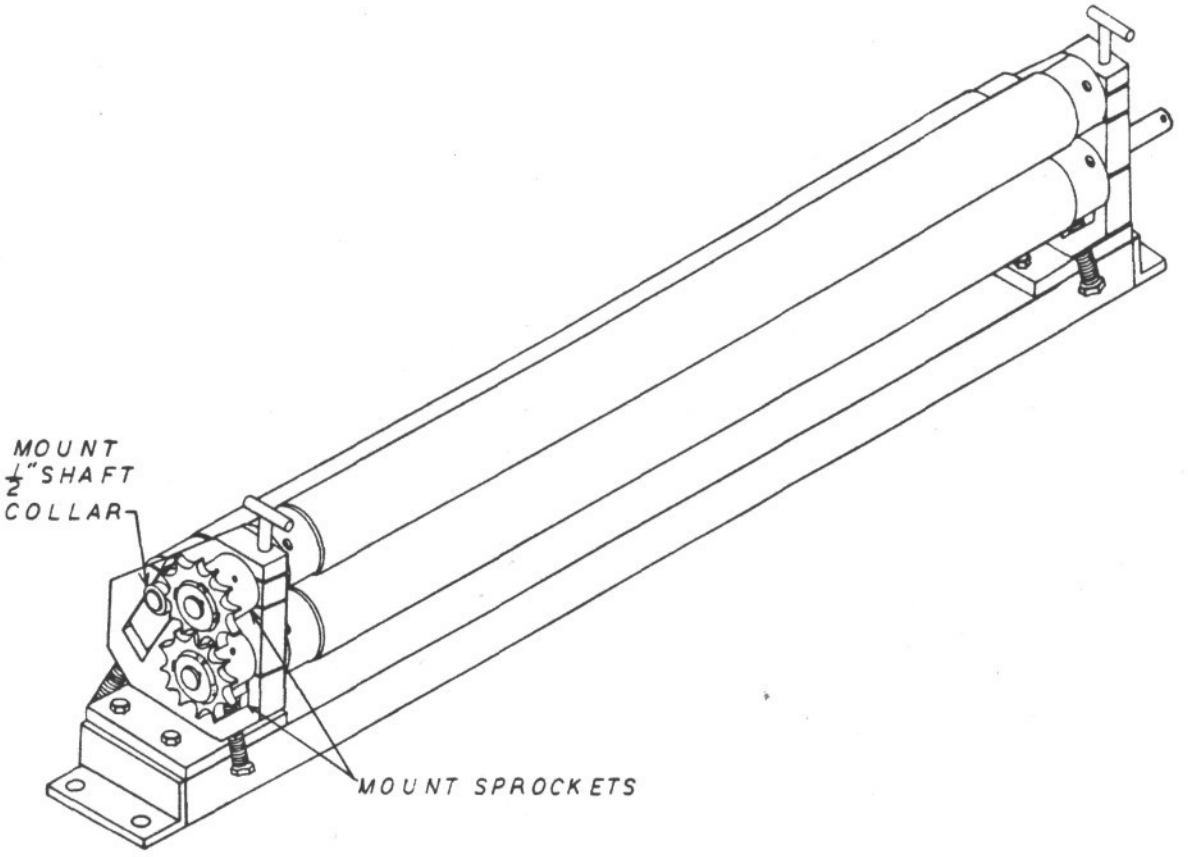
Don't forget to line the sprocket set screws up with the flat spots ground in the shaft and tighten them.

Now would also be a good time to mount a 1/2" shaft collar on the rear left side roll shaft. Line set screw up with flat spot and tighten it. Also mount the three 1/2" shaft collars to the right end roll shafts as shown in detail 37 on page 32.

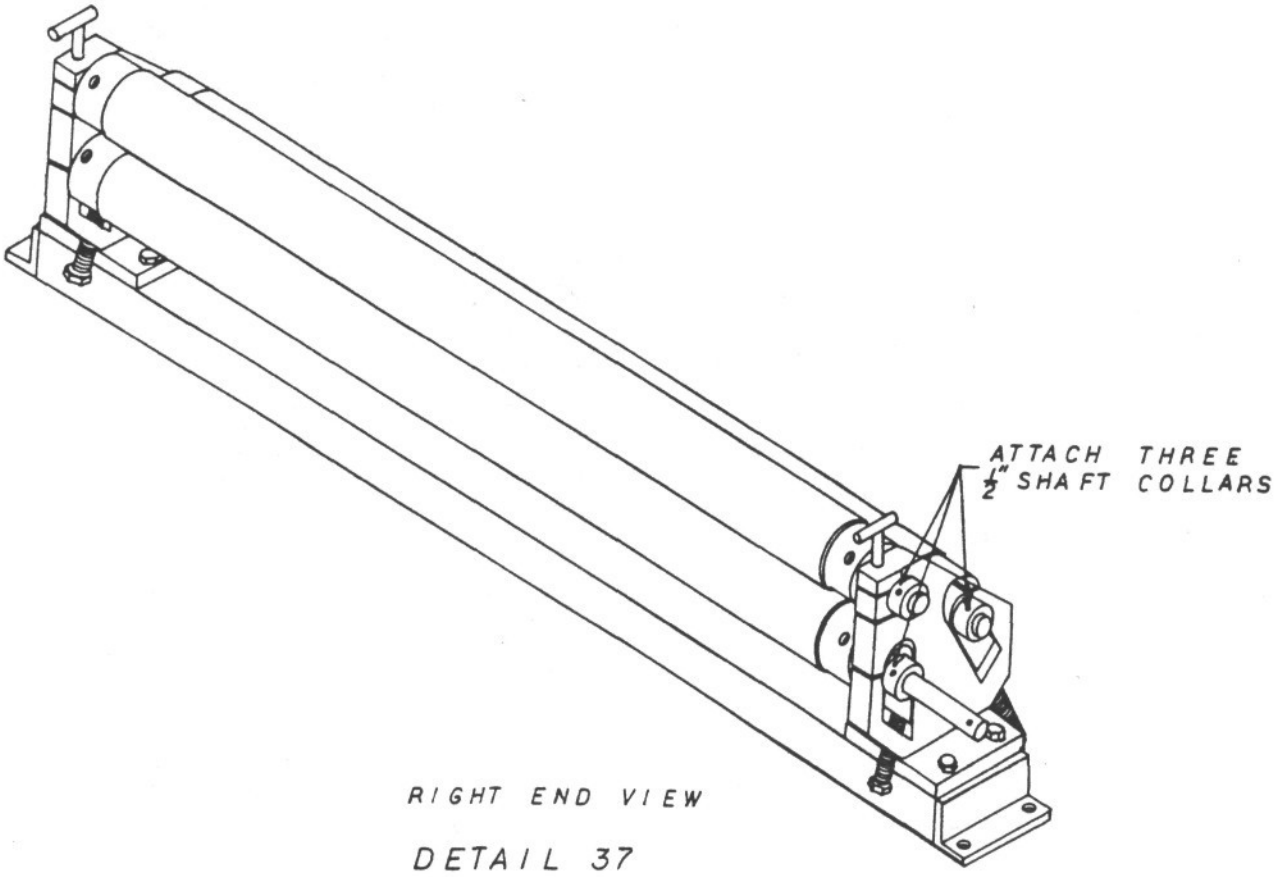


DRIVE SPROCKET
TWO REQUIRED

DETAIL 35

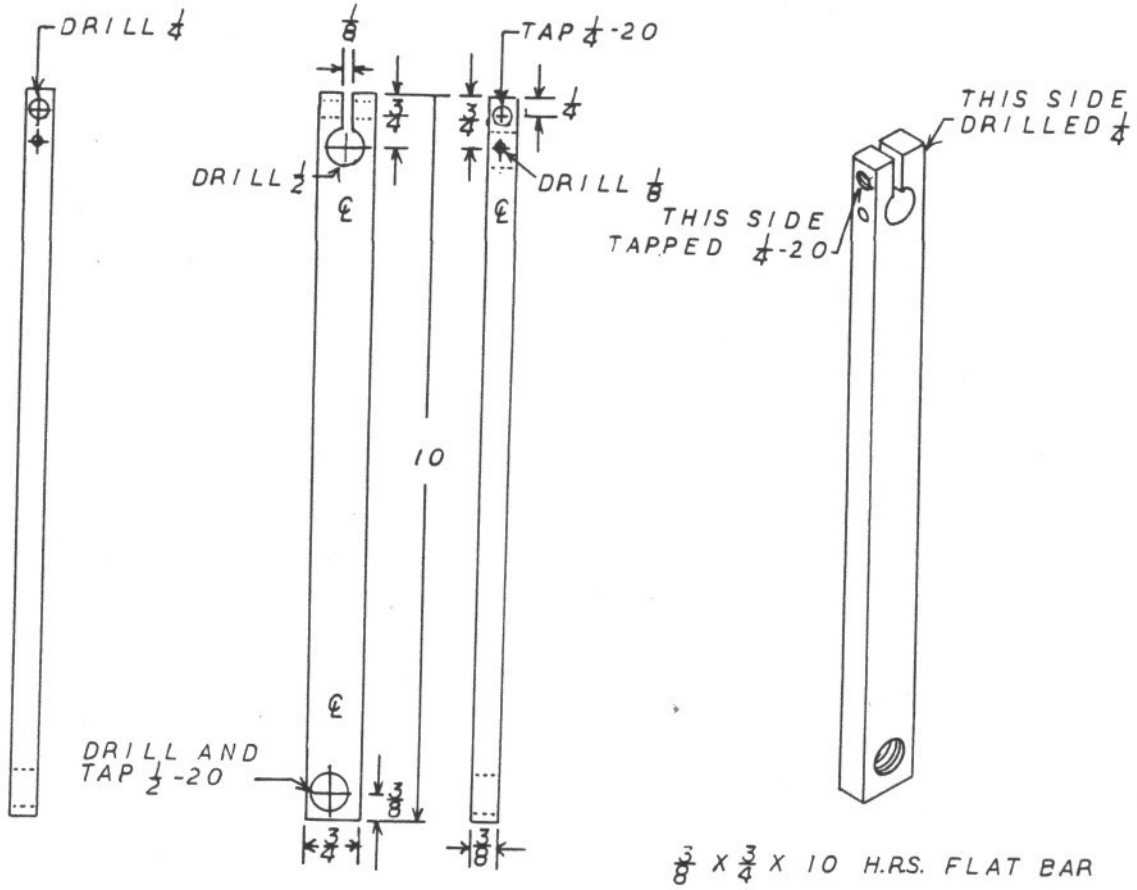


DETAIL 36



RIGHT END VIEW

DETAIL 37



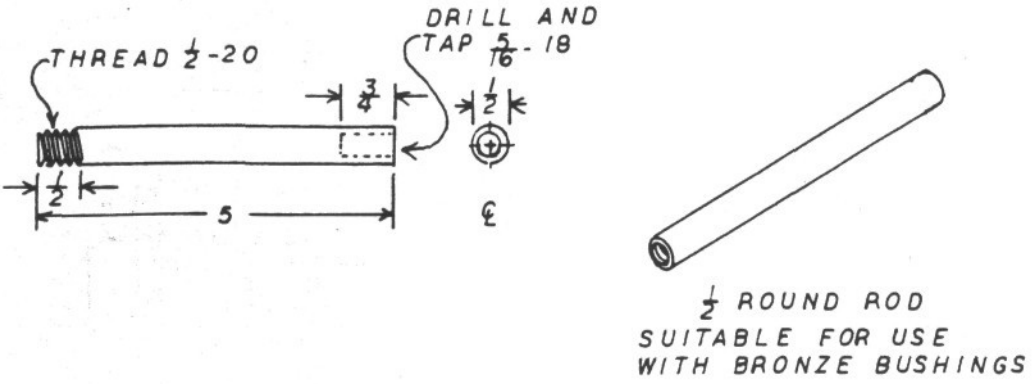
DETAIL 38 CRANK ARM

THE CRANK

The main parts of the crank are the crank arm, handle shaft and crank handle.

Before we start I should mention that I made my crank handle 10" long for leverage. If this length is not comfortable to you it can be shortened.

Hake the crank arm first. Refer to detail 38 on page 33 as we make this part. Cut a piece of 3/8" x 3/4" flat bar 10 inches long. Drill and tap a 1/2" - 20 hole in one end. The crank shaft will thread in to this hole. The other end of the crank arm mounts to the bottom roll shaft so drill a 1/2" hole for it. A 1/8" notch is shown cut from the end of the crank arm and into the 1/2" hole. A 1/4" hole is drilled through one side of this notch and the other side of the notch is drilled and tapped 1/4" - 20. A 1/4" - 20 bolt 3/4" long slips through the drilled side of the notch and threads into the tapped side. When this bolt is tightened the crank arm clamps down on the roll shaft. An 1/8" hole is also drilled through the side of the crank arm. An 1/8" roll pin 3/4" long is inserted through this hole and through the hole in the shaft. Both these methods of securing the crank arm are used because a great deal of pressure is applied to it as we turn the sheet metal through the rolls.



CRANK HANDLE SHAFT

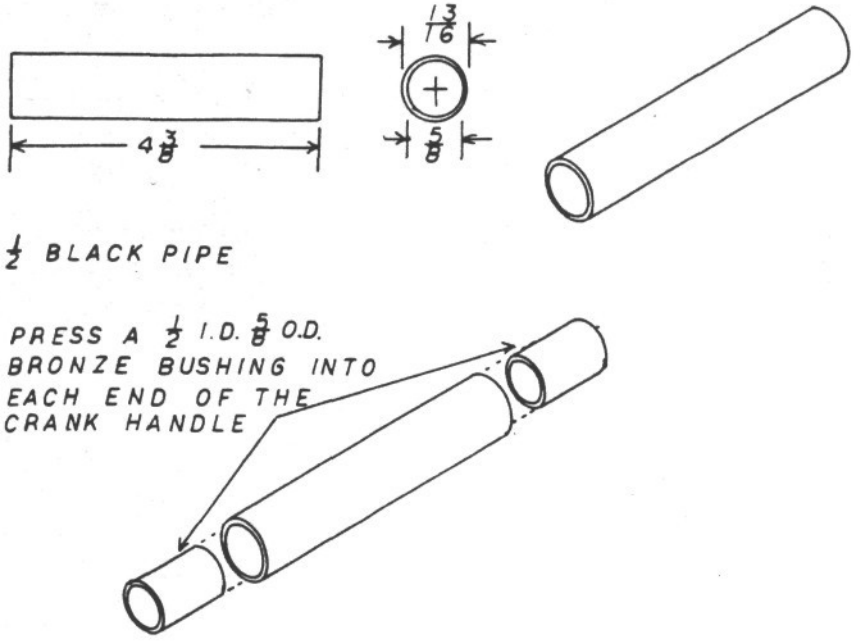
DETAIL 39

See detail 39 on page 34 for a drawing of the crank handle shaft. It is a piece of 1/2" round rod 5" long. Thread one end 1/2" - 20. Drill and tap a 5/16" - 18 hole in the other end. A 5/16" - 18 x 1/2" bolt will thread into the above mentioned hole. This bolt along with a 5/16" flat washer will hold the crank handle in place.

The crank handle is a piece of 1/2" black pipe 4 3/8" long. Press a 1/2" bronze bushing 1 1/8" long into each end of the crank handle. See detail 40 on page 34.

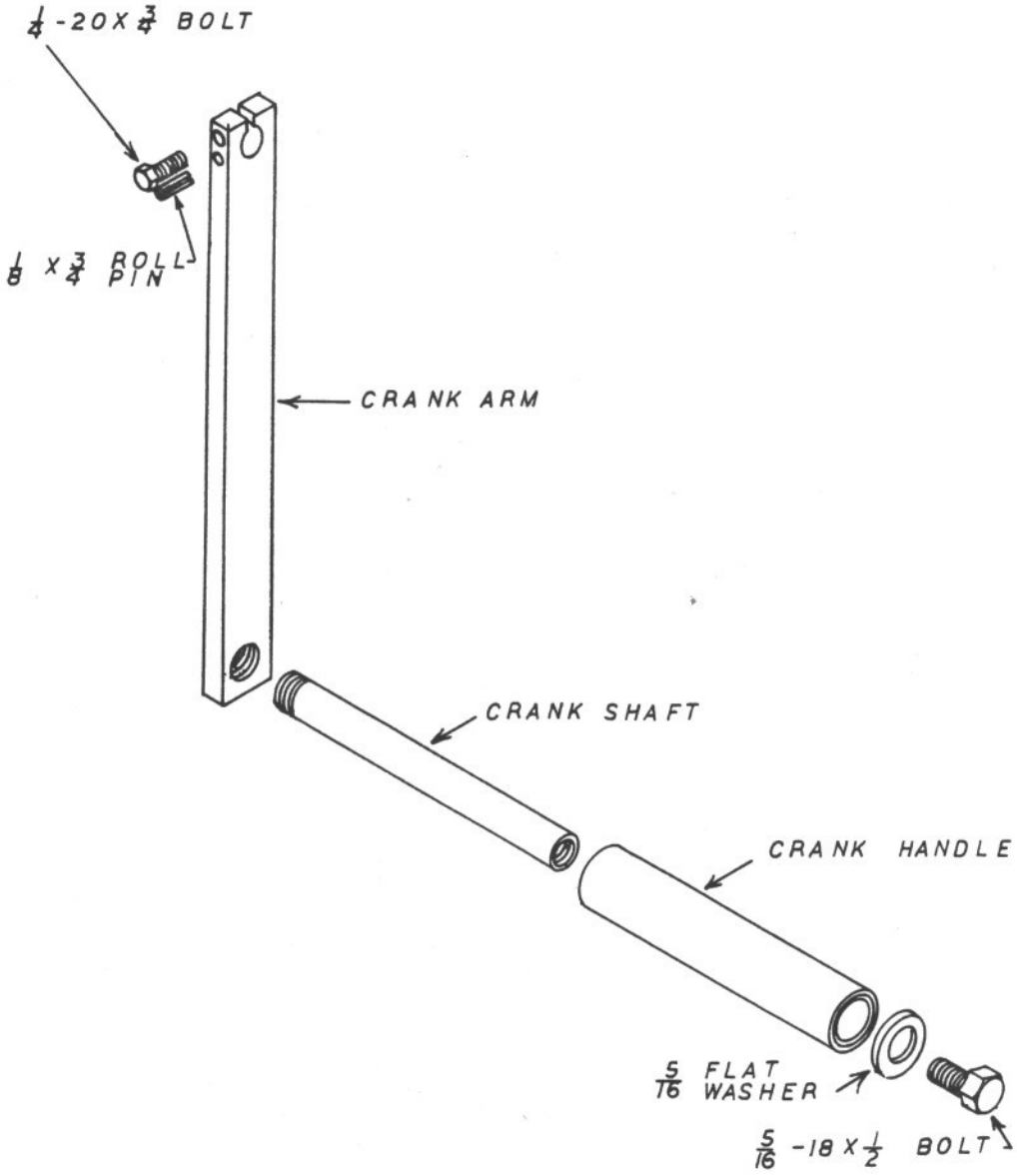
Screw the crank handle shaft into the 1/2" - 20 threaded hole in the crank arm. Slide the handle onto the shaft. The handle is held on the shaft with a 5/16" flat washer and a 5/16" - 18 bolt 1/2" long screwed into the end of the shaft. See the exploded view in detail 41 on page 35.

Slide the completed crank assembly onto the bottom right side roll shaft. Drive in the 1/8" roll pin, and tighten the 1/4 - 20 bolt.



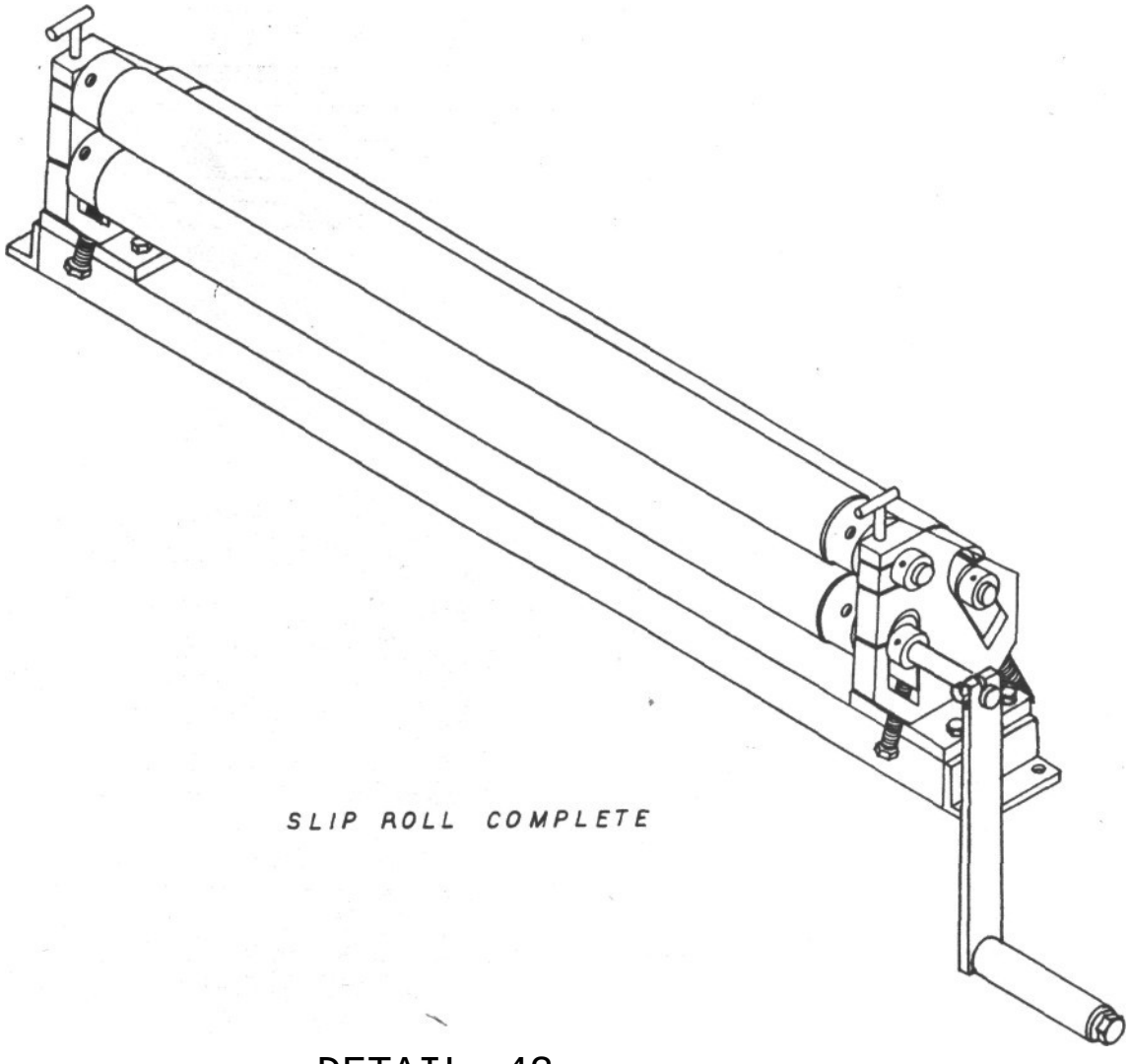
CRANK HANDLE

DETAIL 40



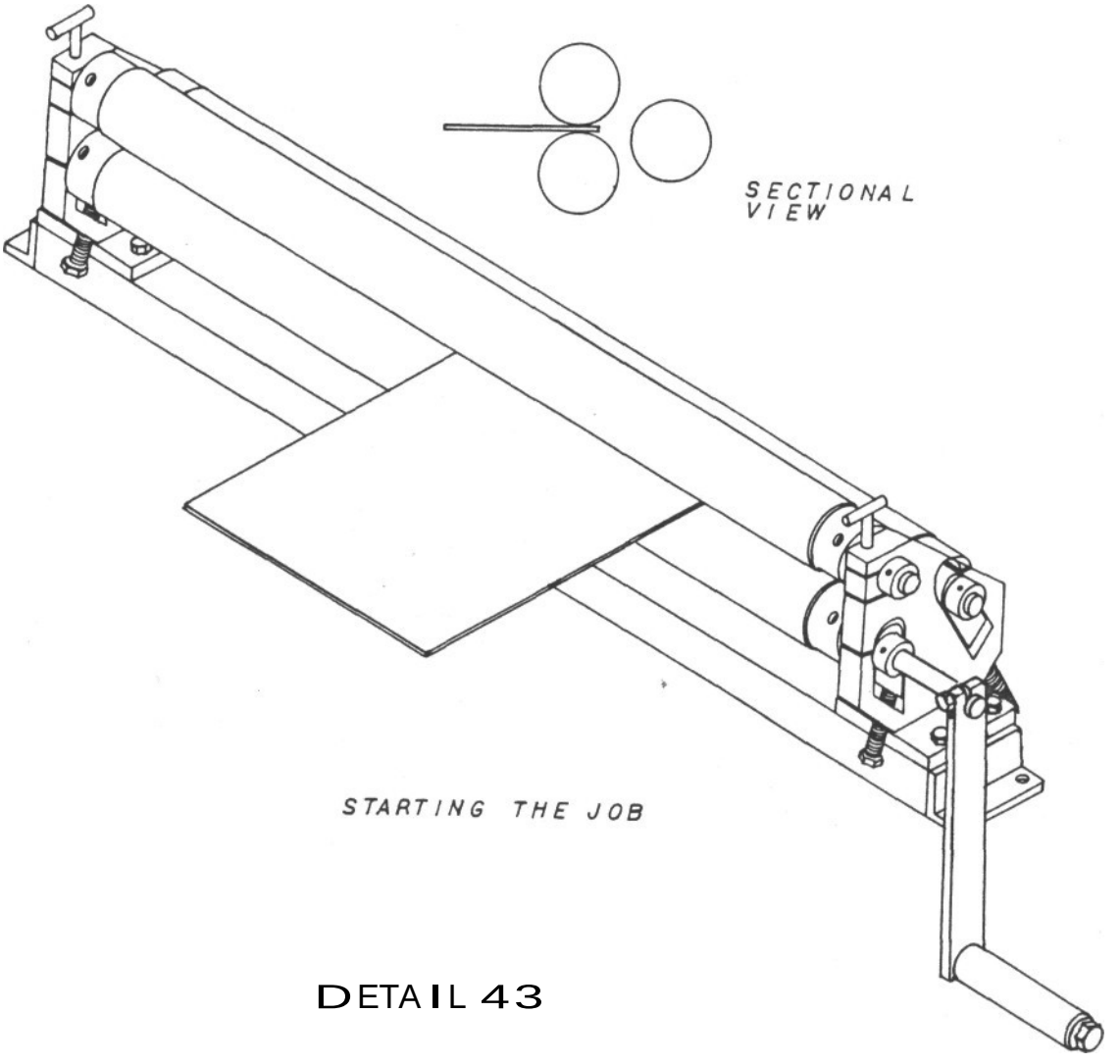
EXPLODED VIEW OF CRANK ASSEMBLY

DETAIL 41



DETAIL 42

Congratulations! Your slip roll project is now complete. It is best to securely mount it to the edge of a sturdy bench, or you could take the project one step further and custom build a stand for your slip roll.



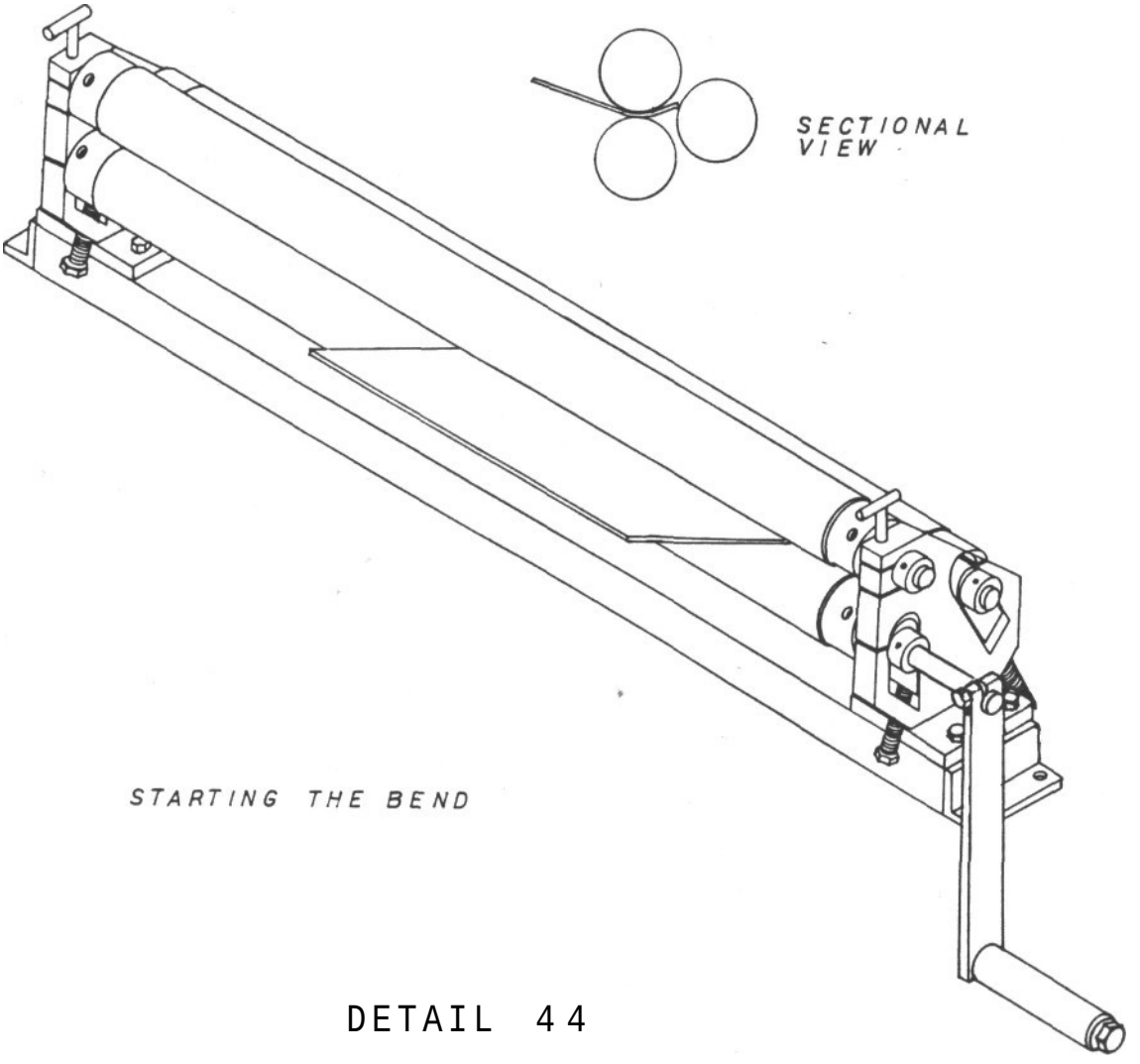
DETAIL 43

OPERATING FORMING MACHINES

The sheet of metal to be formed is inserted through the two front gripping rolls after the rolls have been adjusted as shown in detail 43 on page 37. Adjustment is obtained by adjusting the hand adjusting screw located at each end of the lower front roll. The lower front roll is adjusted up or down until you have sufficient clearance for the thickness of the material to be formed. The material should pass freely through the rolls as the hand crank is turned. Caution should be used because forcing the material through the rolls can cause damage to the machine.

Turn the crank in a clockwise direction. As you feed the sheet through the gripping rolls it will push against the upper side of the rear forming roll see detail 44 on page 38. As the sheet hits the rear roll, it causes the metal to curve upward thus forming the curve or cylinder. See detail 45 on page 39.

Follow these guidelines when you want to change the radius of the curve desired. Lowering the rear forming roll will increase the diameter of the cylinder. Raising the rear forming roll will decrease the diameter of the cylinder.

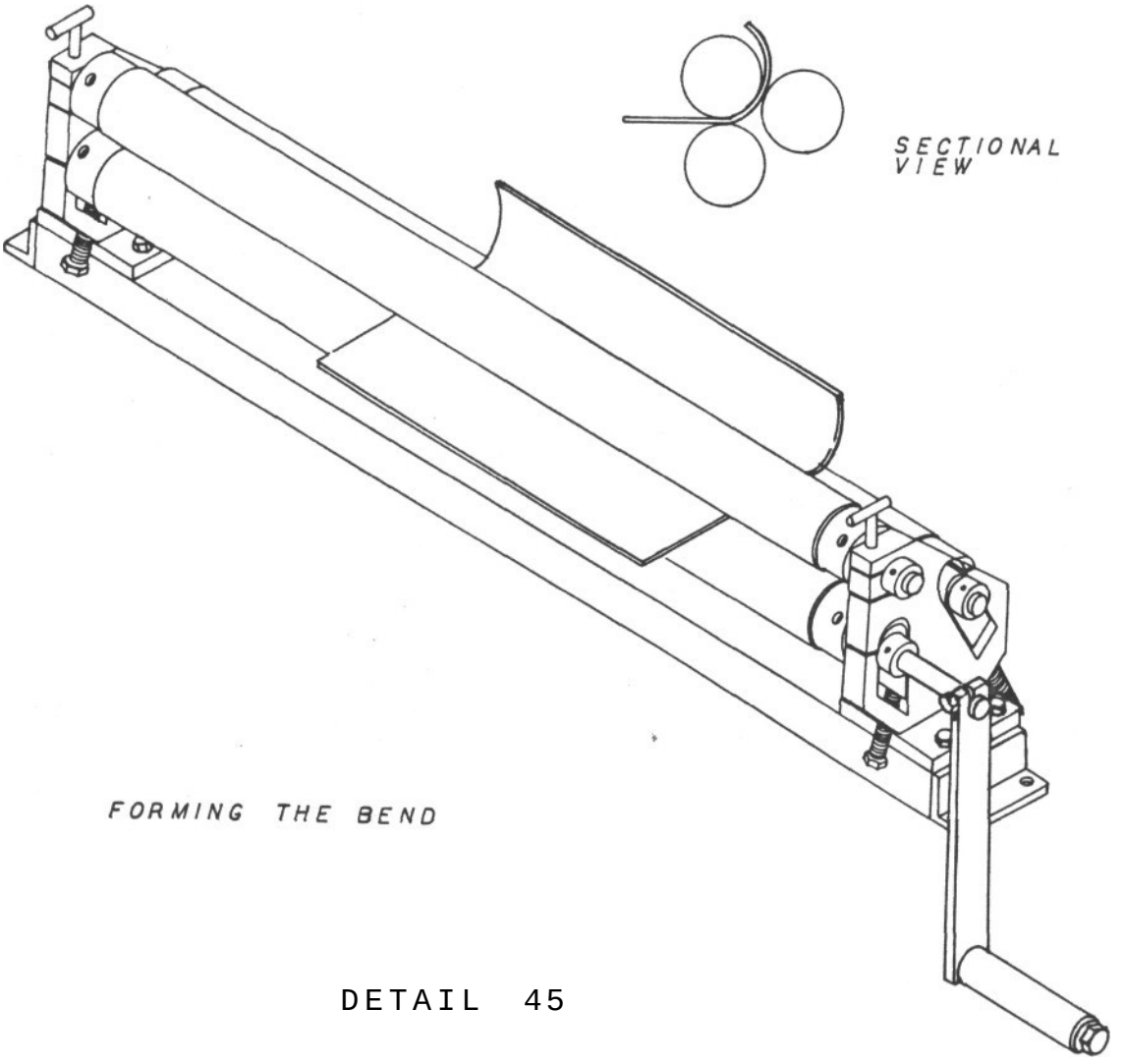


DETAIL 44

There are no set rules for the setting of the rear roll to produce a desired curve because the spring of the metal will affect this setting. Copper and brass have less spring than does steel, and steel has many varying degrees of hardness. It will be found that the adjustments of the rear roll will be decided by experiments with the metal to be formed.

The capacity of a forming machine is based on forming mild steel the full length of the rolls. Definite capacities depend on the diameter and length of the cylinder to be formed, the number of passes through the rolls to obtain a given diameter and the thickness of the material. When a forming machine is over loaded it causes the center of the rear roll to bend slightly causing a bulge in the center of the finished product. I was able to form 22 ga. mild steel easily with the slip roll that I built. I also formed 20 ga. steel successfully, but it had to be done gradually with several passes.

When forming small diameter cylinders up to the full capacity of your slip roll it is necessary to pass the metal through the rolls several times. After the rear roll is properly adjusted the first



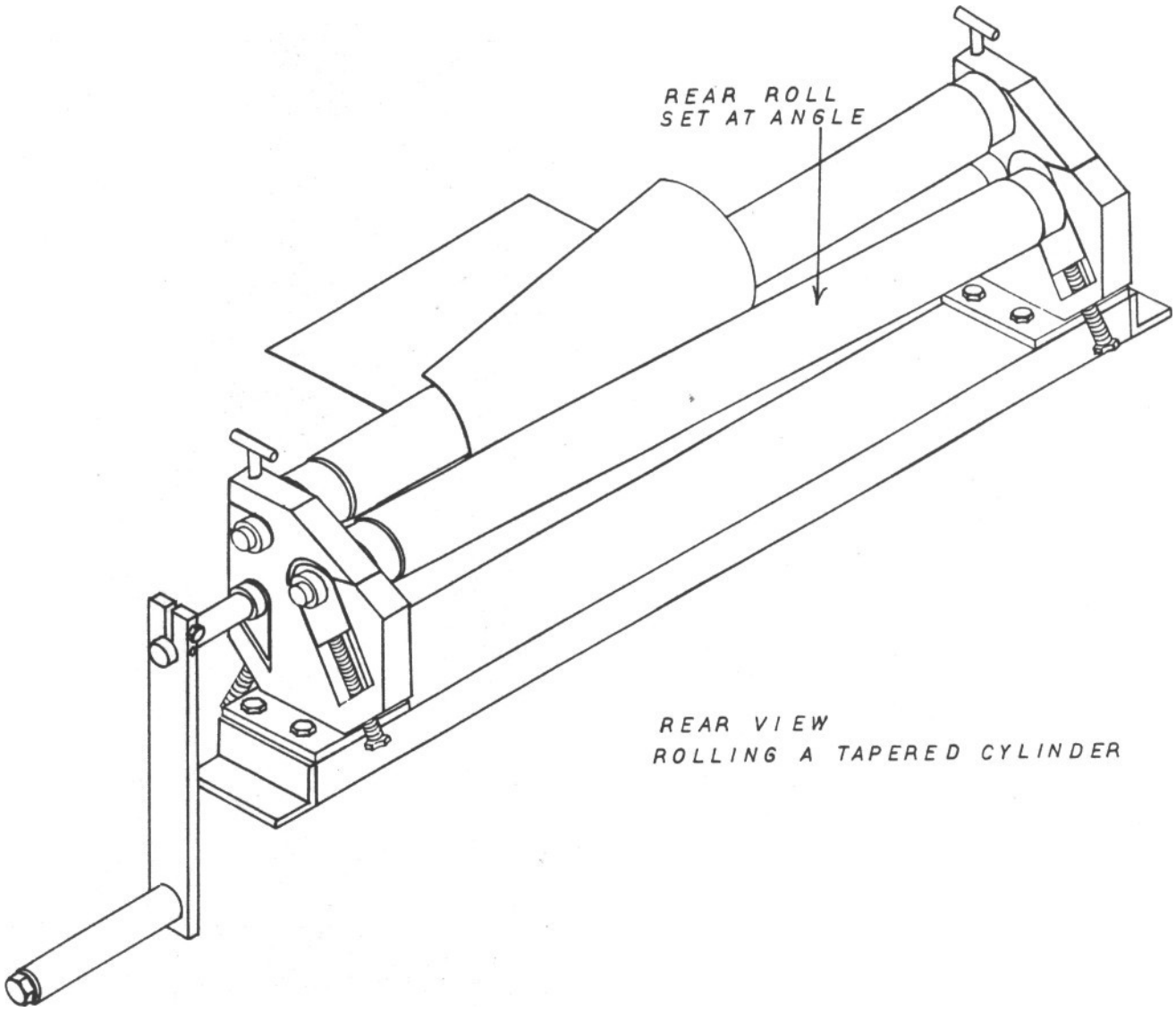
DETAIL 45

pass forms a small curve. The rear roll is then raised a little and the metal is passed through the roll again. This process is continued until the cylinder is completely formed. With a little practice you will be able to determine just how high the rear roll can be raised for each pass to form a desired cylinder.

To reduce the flat spot on the starting edge of heavier material it is common practice to reverse the metal after the first pass. That is to say feed the edge of the metal that passed through the rolls last through the gripping rolls first on the next pass.

To reduce the number of rear roll adjustments when forming small cylinders of light weight material, insert the edge of the sheet in the two front gripping rolls and bend the sheet slightly upward around the top gripping roll as you turn the crank and pass the material through the machine.

Tapered cylinders can be formed by adjusting one end of the rear roll higher or lower than the other. See detail 46 on page 40.



DETA I L 46