

# **EQUIPMENT MANUAL**

**NO. 172 DEEP THROAT  
COMBINATION MACHINE  
FORM F-4**

# **NIAGARA**

**Niagara Machine & Tool Works**

General Offices, P.O. Box 475, Buffalo, New York 14240, U.S.A.

# **INSTRUCTIONS**

and

# **PARTS LIST**

## **NO. 172 DEEP THROAT COMBINATION MACHINE FORM F-4**

This manual has been written to instruct the operator in the operation and maintenance of the Niagara Combination Machine. When written, it was completely up-to-date. Because of later improvements in design, descriptions may vary slightly from the Combination Machine delivered to you.

Your Niagara Combination Machine is a precision-built, accurate, quality machine tool. Careful attention to the adjustment and maintenance of the Combination Machine should result in many years of trouble free service. Although your machine has been carefully inspected and tested in our plant, some of the adjustments may have been disturbed in transit. Therefore, it is recommended that your millwrights, maintenance men, and press operators carefully read these instructions before the Combination Machine is installed or operated. Additional copies of this manual will be furnished on request. We can assume no liability for unauthorized alterations or attachments to the Combination Machine.

# NIAGARA NO. 172 ELECTRIC COMBINATION

## ROTARY MACHINE

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## SETTING UP

This machine has been adjusted and fully tested before shipment, however the adjustments may have been disturbed in transit and should be checked before the machine is used.

The machine should be lagged to a solid floor. Pack between the floor and the base if necessary to firmly support the machine.

Clean off all dirt that may have accumulated in transit. The protective compound on all finished surfaces should be removed with a suitable solvent such as Sovasol, carbon tetrachloride, etc. Be sure that all oil holes are open and clean.

## LUBRICATION

Proper lubrication is of vital importance and gives the owner the opportunity to save maintenance and to increase the length of service.

The machine is provided with oil holes for proper lubrication which are obvious or stamped "OIL". For these lubrication points, we recommend Socony Vacuum Gargoyle Vactra BB. The rear motor bearing is easily reached. The front motor bearing and gearing are accessible by removing the plate marked "OIL" on the left side of the machine. For quieter operation, spread Socony Vacuum Gargoyle Dorcia No. 4 on gears once a week or as often as required by use. The Zerk Fittings for the bearings on the drive shaft (48) should be greased with Socony Vacuum Gargoyle Grease Sovarex L-1. An equivalent lubricant can be used in place of any of the above mentioned lubricants.

## ELECTRICAL INSTALLATION

The 172 Combination Machine is normally wired for 110 volts, 60 cycle current. When furnished with three phase motor, check the direction of roll rotation. The rolls should operate so that the material moves from left to right as you face the end of the roll shafts.

The clutch will not function properly in the reverse direction. However, on special orders, the direction of rotation can be reversed from right to left.

## ADJUSTMENTS

The adjustments of this machine are easily made. The lateral adjustment of the upper roll shaft is made by means of the two knurled screws (22) on the top of the machine. By tightening the front screw and loosening the back, the upper shaft is adjusted in; and by loosening the front screw and tightening the back, the shaft is adjusted forward. Be sure that both screws are tight before operating the machine.

Held by lock nuts, the spring (25) on the top elevates the upper shaft. If, upon releasing the upper roll treadle adjustment (4) the roll raises sluggishly, the nuts holding spring (25) can be tightened or some oil can be placed on the bearing surface between the rocking box (23) and the frame.

The upper roll can be lowered for work by either the treadle (4) or the crank handle (12). The crank handle should be used to ease the upper shaft into capacity work. The two jam nuts on the crank handle can be set so that the upper shaft will move down just enough to accommodate the thickness of work. Forcing the crankscrew with insufficient clearance between the rolls to accommodate the work will spring the shafts. The foot treadle (4) is usually used for quick action on light work.

The pivot screws (19), held by lock nuts on each side of the housing, provide a pivot for the rocking motion of the upper roll shaft. These pivots should not require adjustment.

## CLUTCH

The clutch is controlled by hand, by foot treadle (5) or may be locked in the engaged position by means of the thumb screw (15) which bears against a lug cast on the side of the housing.

## CHANGING THE ROLLS

1. Raise the upper roll with the crankscrew (12).
2. Using the wrench (67) provided, place the two prongs into the holes located at the front of the upper roll.
3. With the clutch engaged, loosen the upper roll lock nut (30) by turning it counter clockwise. Loosen the lower lock nut by turning it clockwise. If the rolls, which are fastened to the threaded shaft ends, become extremely tight, open the rolls by use of the crankscrew (12) and insert a block of wood between the shafts. Bring the upper shaft down so that the block of wood is clamped firmly between the two shafts. Holding the wrench (67) in place with left hand, strike the outer end of the wrench sharply with a hammer in the proper direction as described above.
4. Remove the upper roll by sliding it off the shaft.
5. Repeat the above operation for removal of the lower roll.
6. Place the desired rolls by installing the lower roll and then upper so that the keyway in the roll fits over the key on the shaft.
7. Check the alignment of the rolls by lowering the upper roll with the crankscrew (12) until it just touches the lower roll. The clearance on each side of the bead should be equal. If this is not the case adjust the upper shaft laterally as explained above under "Adjustments".

## OPERATION

Detailed instructions for performing all of the various operations possible on this machine are beyond the scope of this manual. The production of satisfactory sheet metal parts depends largely on the skill and training of the craftsmen performing the operation. To get the most out of the machine, it should be operated by skilled sheet metal workers. Training courses in the performance of the various operations that can be performed on this machine are generally available at trade

and technical institutions. Text book publications on the subject are available. One suggested source of text material is Delmar Publications, Inc. of Albany, New York. *For optimum result, use the gages designed specifically for the operation being performed.*

## MAKING A SINGLE OR O.G. BEAD

1. Install rolls as described above.
2. Set the gage for the desired distance from the bead. Measure from the center of the bead on the lower roll to gage.
3. Insert the work between the rolls with the edge pressed firmly against the gage.
4. Hold the work in a horizontal position with the left hand and lower the upper roll by means of the crankscrew (12), or the treadle (4) until the work is held quite firmly between the rolls.
5. While holding the work against the gage with the left hand, operate the clutch foot treadle (5) and turn the crankscrew (12) with the right hand to feed the upper roll into the work slowly. The bead should be made in several revolutions of work. More revolutions are necessary to make a bead on heavy metal. *NOTE:* The seam must not be passed between the rolls. Examples of single and O.G. beading rolls and work are shown on page 12.

## STRAIGHT CRIMPING ROLLS

1. Install rolls as described in the paragraph "CHANGING THE ROLLS".
2. Set the gage to the desired width of crimp. Measure from the gage to the end of the lower crimping roll.
3. Proceed as previously outlined under "MAKING A SINGLE OR O. G. BEAD." *CAUTION:* For jobs with riveted or grooved seams, start and finish without crossing the seam. Crossing the seam would damage the corrugations on the rolls and may spring the shafts. Example of straight crimping roll and work is shown on page 12.

Other operations such as elbow edging, furnace collar edging, wiring and burring can be performed on the 172 Combination

Machine in a similar manner as described on Page 5 under "MAKING A SINGLE OR O.G. BEAD" and "STRAIGHT CRIMPING ROLLS." Examples of the type of work and rolls are shown on pages 12, 13, and 14.

### COMBINATION CRIMPING AND BEADING

Special rolls can be furnished for a specific combination crimping and beading operation. Special shafts are necessary with extensions to accommodate these rolls.

### SLITTING

1. Install cutters.
2. Adjust the clearance between the cutters by use of feeler gages to about one tenth the thickness of the metal to be slit. This adjustment is made by means of the knurled screws (22).
3. When slitting, the upper roll should be set down just enough to break through the metal. Check page 14, showing slitting cutters. (An extra set of cutters makes it possible to resharpen one set without interrupting work schedule).

### CIRCLE SHEAR ATTACHMENT

1. Attach horn bracket (84) to frame.
2. Adjust the cutters as described above.
3. Adjust the height of the lower clamping disc (91) so that the plane of its top surface is tangent to the cutting edge of the lower cutter.
4. The radius of circle to be cut can be controlled by moving the circle arm (78) in or out along the horn (80). Fasten securely after setting.
5. The center of square blank can be scribed off by crossing lines from the corners of the plate. The blank can be centered by use of the swing gage. The metal is butted up against the gage and the upper cutter. Shearing must always start from a flat edge of the blank. Therefore, the off cut piece is always curled and distorted as illustrated (Fig. 1). Do not attempt to shear circles by forcing the upper cutters down into the blank. This type of shearing must be done on a ring and circle shear made for the purpose where both

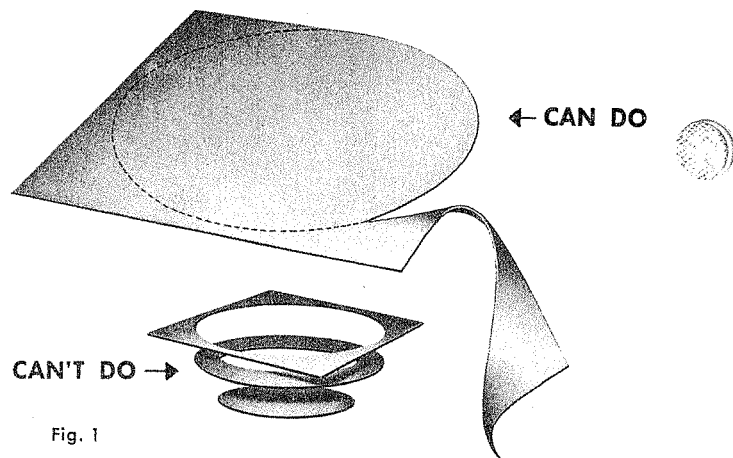


Fig. 1

inside and outside circles may be cut.

The circle arm pivots to permit throwing the center of the clamping discs off the center line of the shear. The thickness of the material to be cut and the setting of the cutters, particularly the amount of vertical overlap of the cutters, are factors affecting this lateral adjustment of the circle arm. Marks on the circle arm holder and base of the circle arm, when set in alignment, indicate approximately the proper lateral adjustment for the maximum thickness of material.

The lateral adjustment of the circle arm is extremely important. When properly adjusted, the sheet feeds freely and easily without strain on the clamping discs and a true circle is obtained. The center of the clamping discs when in correct position (with reference to blank rotation) is slightly ahead of the center of the lower cutter shaft: that is, toward the direction of feed.

If the center of the clamping discs is behind the correct position, the cutters will tend to draw away from the center of the disc and the following irregularities will occur:

1. While being cut, the sheet metal disc will jam against the upper cutter.
2. The metal cut off will clear the lower cutter.
3. The circle arm will tend to move away from the cutters.
4. The metal will tend to push into the clamp away from the cutters.
5. The finished disc will be large and will rub hard against the upper cutter.

If the center of the clamping discs is ahead of the correct position, the cutters will tend to draw toward the center of the disc and the following irregularities will occur:

1. While being cut, the sheet metal disc will clear the upper cutter.
2. The metal cut off will jam against the lower cutter.
3. The circle arm will tend to move toward the cutters.
4. The metal will tend to pull out of the clamp toward the cutters.
5. The finished disc will be small and will not touch the upper cutter.

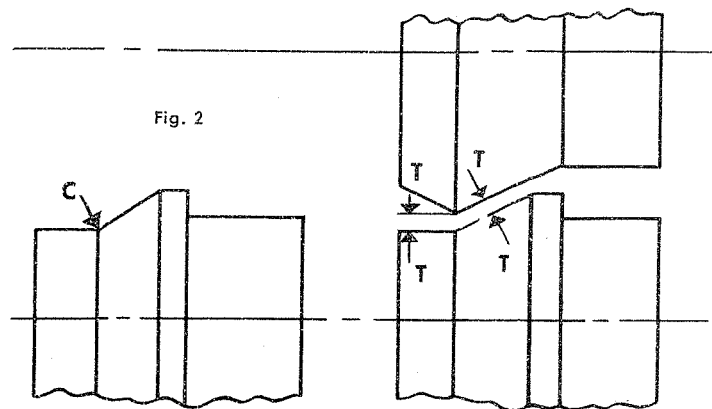
### REGROUNDING CUTTERS

For information on regrinding cutters, refer to Niagara instruction Form P-4.

### FLANGING ATTACHMENT

1. Attach bracket (100) to frame.
2. To insure that the side bracket (99) is properly located, remove the swivel studs (106). Obtain some plugs that will fit the stud holes. In the center of each plug, drill a small hole to allow the passage of a string. These plugs should then be inserted in the pivot holes of the side bracket (99) and a string drawn tightly through the center holes. A small weight can be tied on each end of the string to keep it taut. Now loosen the set screw on the bottom of the side bracket (99) and move the bracket in or out until the string becomes tangent to the lower roll at point "C", Fig. 2. Be sure the side bracket is at right angles to the shafts. Retighten the set screw and replace the pivot studs.
3. Loosen the thumb screws (101). This will enable the circle arm to be moved in and out for various diameter discs. The distance from the center of the clamping discs to point "C" (shown in Fig. 2) of the lower roll is equal to the radius of the bottom to be formed.
4. The top of the lower clamping discs must be in alignment with the gage rod (104) and point "C" of the lower roll when the support rods (105) are in a horizontal position.

5. Adjust the upper roll with the crank-screw (12), so that one thickness of material can be inserted between the flanging rolls as shown on sketch below. The two nuts on the crankscrew should be locked in place so as to prevent the upper flanging roll from being adjusted down closer than one thickness of material.



6. Adjust the upper shaft laterally by use of the knurled screws (22) so that the flanging area of the rolls is separated by just the thickness of material as shown by sketch above.
7. Lower the upper roll and at the same time raise the flanging attachment by pushing up on the yoke (94). This must be done gradually and should always take place at the same point of rotating disc. This can be accomplished easily by marking the starting point with chalk.
8. To release the work raise the upper roll and swing the yoke down. Then raise the upper clamping disc eccentric lever (98) and remove the flanged disc.

### THREE SPEED DRIVE

The normal operating speed of the rolls is 20 ft./min. This speed can be varied from 20, 30 and 40 ft./min. when a special three speed drive is used. By turning both pulleys on their shaft, end for end, speed of 10, 15, 20 ft./min. can be obtained. A 7/16" spacer must be used behind the pulley driven on the 1/2" shaft.

F-4

#172 Combo

# PARTS LIST

## FOR NIAGARA NO. 172 ELECTRIC COMBINATION ROTARY MACHINE

When ordering repair parts state the serial number of the machine. It is stamped on a boss on the left hand side of the machine. Be sure to use complete names of parts and part numbers listed on the following pages for positive identification.

- |     |  |     |  |
|-----|--|-----|--|
| 1   | Frame                                    | 58  | Sleeve Pinion                            |
| 2   | Clutch Treadle Rod                       | 59  | First Intermediate Gear                  |
| 3   | Upper Roll Adjustment Treadle Rod        | 60  | Sleeve Pinion Cap                        |
| 4   | Upper Roll Adjustment Treadle and Clevis | 61  | Gear Shaft Bushing                       |
| 5   | Clutch Treadle                           | 62  | Gear Shaft Pin                           |
| 6   | Treadle Studs                            | 63  | Motor Pinion                             |
| 7   | Upper Roll Adjusting Treadle Rod Clevis  | 64  | Motor                                    |
| 8   | Clevis Pin                               | 65  | Starting Switch                          |
| 9   | Upper Adjusting Roll Lever               | 66  | Electrical Cord                          |
| 10  | Upper Adjusting Roll Pinion Shaft        | 67  | Wrench for Rolls                         |
| 11  | Upper Adjusting Roll Rack                | 68  | Pedestal                                 |
| 12  | Crankscrew and Lock Nuts                 | 69  | Rear Cover                               |
| 13  | Hand Shifting Lever                      |     |  |
| 14  | Outer Clutch Lever                       |     | <b>SPECIAL 3-SPEED V-BELT DRIVE</b>      |
| 15  | Clutch Continuous Operation Set Screw    | 70  | Motor Pulley                             |
| 16  | Clutch Lever Pin                         | 71  | Driven Pulley                            |
| 17  | Clutch Treadle Rod Connection Pin        | 72  | Belt                                     |
| 18  | Outer Clutch Lever Stop Pin              | 73  | Motor Bracket                            |
| 19  | Pivot Screw for Adjusting Bracket        | 74  | Driven Pulley Shaft                      |
| 20  | Adjusting Bracket                        | 75  | Filler Plate                             |
| 21  | Adjusting Bracket Pin                    | *76 | Shaft Support                            |
| 22  | Upper Roll Adjusting Screws              | *77 | Pulley Shaft Bearings                    |
| 23  | Rocking Box                              |     | <b>SPECIAL CIRCLE CUTTING ATTACHMENT</b> |
| 24  | Counterbalance Spring Rod and Nut        | 78  | Circle Arm                               |
| 25  | Counterbalance Spring                    |     |  |
| 26  | Counterbalance Spring Retainer           | 80  | Horn                                     |
| 27  | Pin for Counterbalance Spring Rod        | 81  | Rotary Cutters                           |
| 28  | Upper O.G. Beading Roll                  | 82  | Upper Shaft Spacing Collar               |
| 29  | Lower O.G. Beading Roll                  | 83  | Lower Shaft Spacing Collar               |
| 30  | Roll Lock Nuts                           | 84  | Horn Bracket                             |
| 31  | Upper Shaft                              | 85  | Circle Arm holder                        |
| 32  | Upper Shaft Bushing                      | 86  | Circle Arm Holder Locking Handle         |
| 33  | Lower Shaft                              | 87  | Eccentric Lever                          |
| 34  | Lower Shaft Bushing                      | 88  | Clamping Lever                           |
| 35  | Upper Shaft Drive Gear                   | 89  | Clamping Spindle Adjustment Set Screw    |
| 36  | Lock Nut                                 | 90  | Upper Clamping Spindle Assembly          |
| 37  | Lower Shaft Drive Gear                   | 91  | Lower Clamping Spindle Assembly          |
| 38  | Clutch Gear                              |     | <b>SPECIAL FLANGING ATTACHMENT</b>       |
| 39  | Clutch Gear Wheel Face                   | 92  | Upper Flanging Roll                      |
| 40  | Outer Clutch Sleeve                      | 93  | Lower Flanging Roll                      |
| 41  | Lock Nuts and Oil Cup                    | 94  | Yoke                                     |
| *42 | Inner Clutch Sleeve                      | 95  | Right Hand Swivel                        |
| 43  | Inner Clutch Lever                       | 96  | Left Hand Swivel                         |
| *44 | Clutch Lever Blocks                      | 97  | Clamping Lever                           |
| 45  | Clutch Spring Pin                        | 98  | Eccentric Lever                          |
| 46  | Clutch Spring                            | 99  | Front Bracket                            |
| 47  | Pipe Plug                                | 100 | Flanging Attachment Bracket              |
| 48  | Drive Shaft                              | 101 | Thumbscrews                              |
| 49  | Drive Shaft End Nuts with Zerk Fitting   | 102 | Upper Clamping Spindle Assembly          |
| 50  | Filler Ring                              | 103 | Lower Clamping Spindle Assembly          |
| 51  | Locknut and Washer                       | 104 | Gauge Rod                                |
| 52  | Drive Shaft Bearings                     | 105 | Supports Rods                            |
| 53  | Second Intermediate Gear                 | 106 | Swivel Stud                              |
| 54  | Spacers                                  | 107 | Gauge Rod Links                          |
| 55  | Drive Pinion                             | 108 | Stop Pins                                |
| *56 | Gear Shaft                               | 109 | Circle Gauge                             |
| *57 | Gear Shaft Bearings                      | 110 | Gauge Arm                                |

\* NOT SHOWN



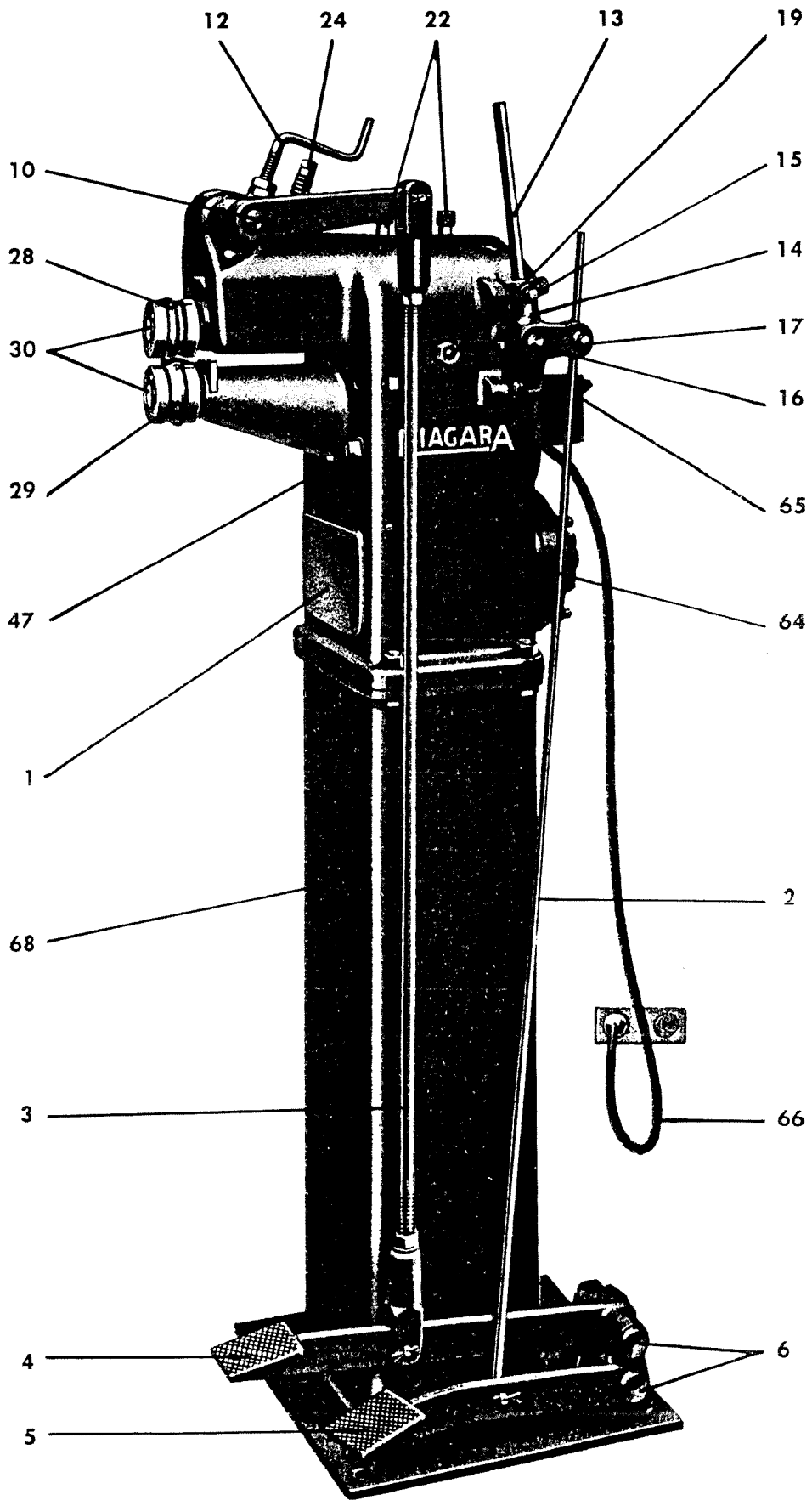


Fig. 3

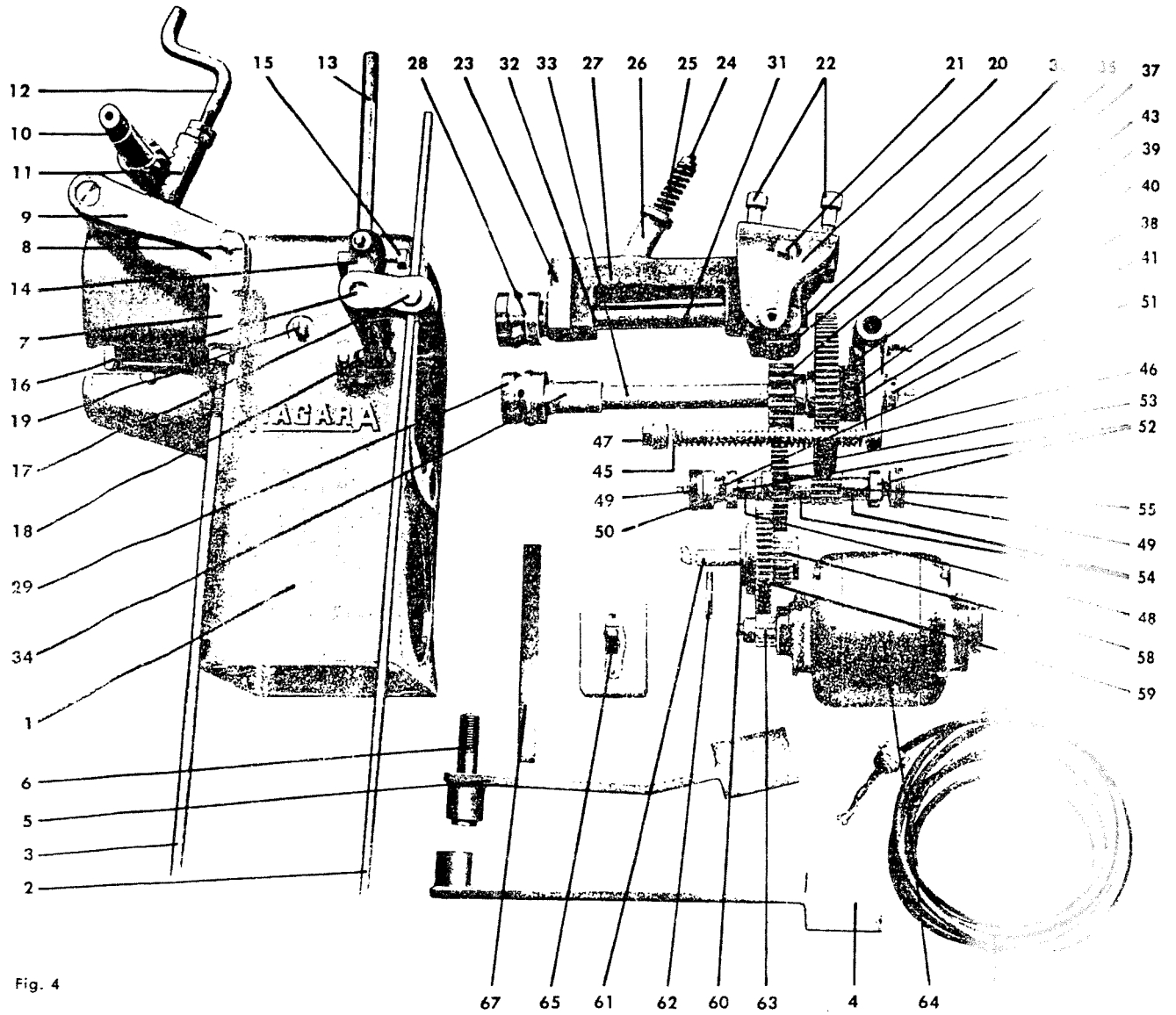


Fig. 4

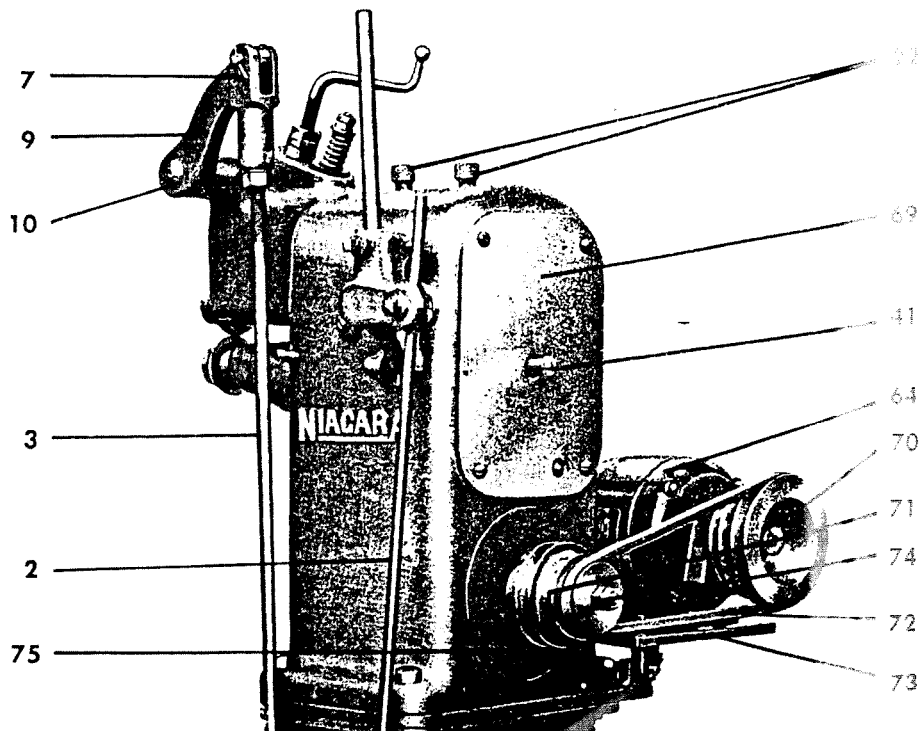


Fig. 5

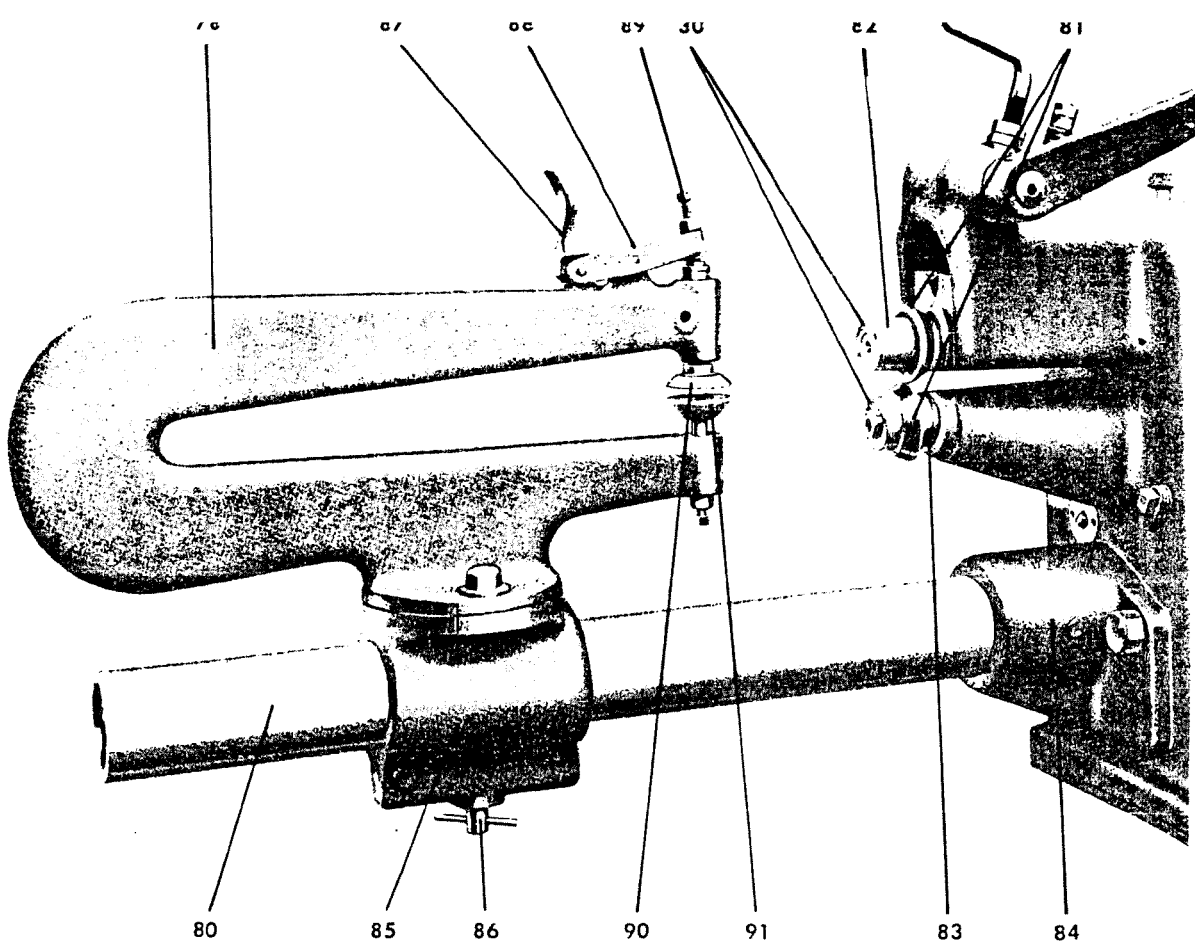


Fig. 6

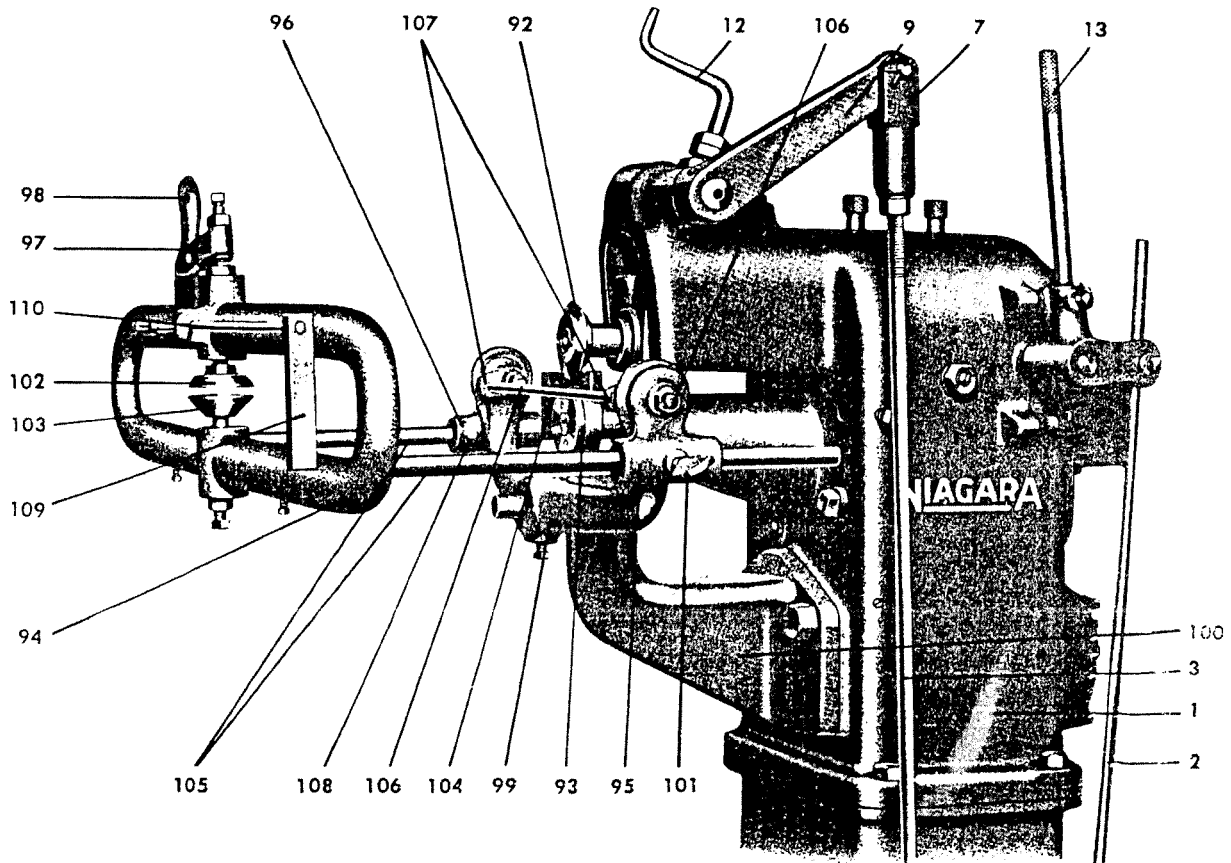


Fig. 7

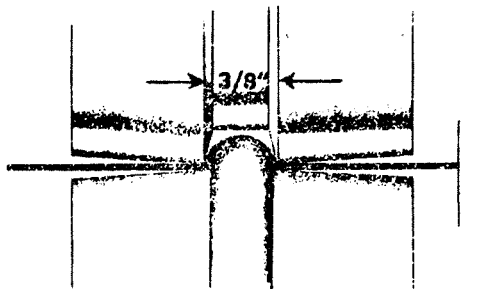
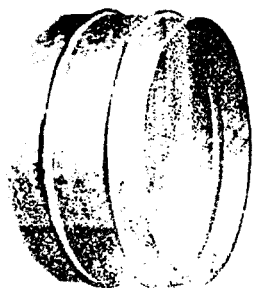
# STANDARD NIAGARA ROLLS

(CARRIED IN STOCK)

For No. 172 Electric Combination Rotary Machine

## BEADING AND CRIMPING

Fig. 8

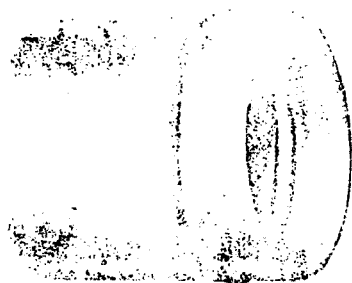


Single Peering Rolls

18 GAUGE CAPACITY

PART NOS.	
Upper Roll	P-17549
Lower Roll	P-17550

Fig. 9

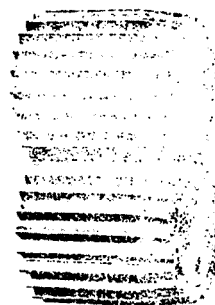


O.G. Bonding Rolls

18 GAUGE CAPACITY

PART NOS.	
Upper Roll	P-17548
Lower Roll	P-17548-A

Fig. 10



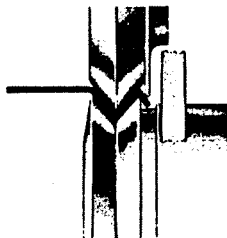
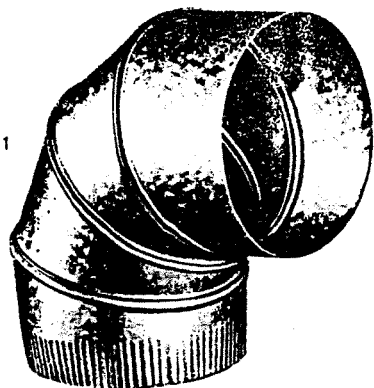
Straight Crimping Rolls

20 GAUGE CAPACITY

PART NO.	
P-19685	
Approx. 3 Crimps per in.	

## ELBOW EDGING

Fig. 11



Elbow Edging  
First and Second Parts

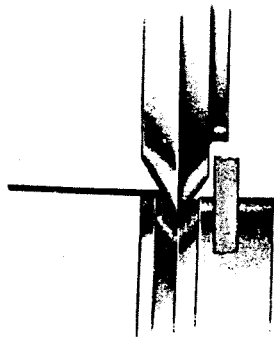
NO. 4 ELBOW



Join Parts  
and Rivet

18 GAUGE CAPACITY

PART NOS.	
Upper Roll	P-19450
Lower Roll	P-19451



Elbow Edging over Lower and Upper Rolls

**NO. 10 ELBOW**



Join Parts and Rivet

**18 GAUGE CAPACITY**

PART NOS.	
Upper Roll	P-19095
Lower Roll	P-19096

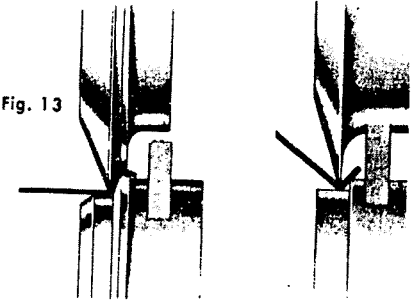


Fig. 13

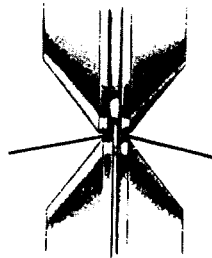
Elbow Edging

Burring

**NO. 1 ELBOW**



Join Parts



Close Seam With Elbow Seaming Machine

**18 GAUGE CAPACITY**

PART NOS.	
ELBOW	
Upper Roll	P-19448
Lower Roll	P-19449
BURRING	
Upper Roll	P-17523
Lower Roll	P-17524

**FURNACE COLLAR EDGING, TURNING AND WIRING**

**FURNACE COLLAR EDGING**

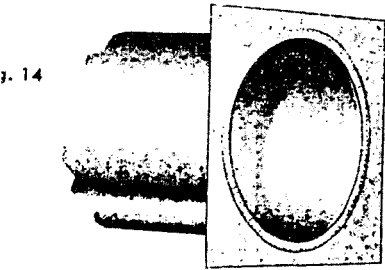
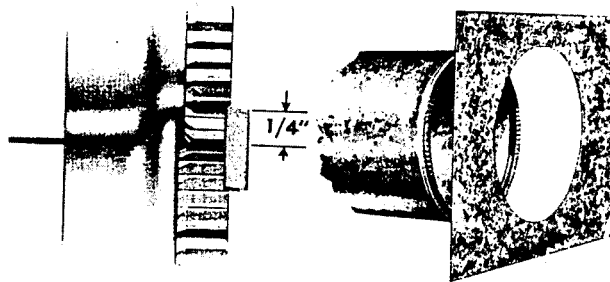


Fig. 14



Edge and Crimp

Insert Pipe and Hammer Flange Flat

**20 GAUGE CAPACITY**

PART NOS.	
Upper Roll	P-43633
Lower Roll	P-43634

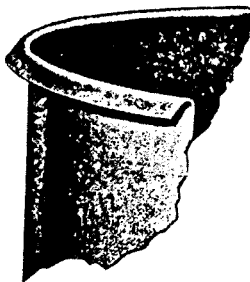
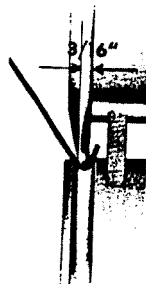


Fig. 15

**TURNING**



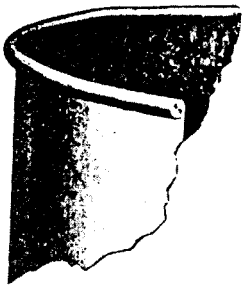
Turning Rolls

**18 GAUGE CAPACITY**

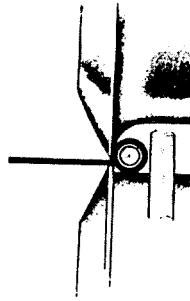
PART NOS.	
Upper Roll	P-17525
Lower Roll	P-17526

**WIRING**

Fig. 16



First Operation



Second Operation

**18 GAUGE CAPACITY**

Max. Wire Dia. 5/16

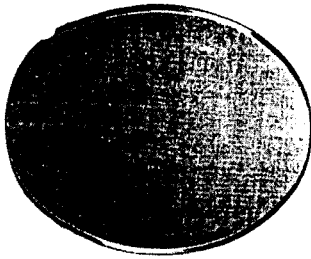
PART NOS.

Upper Roll	P-17527
Lower Roll	P-17528

**BURRING, FLANGING, SLITTING AND TRIMMING**

**NARROW FLANGE HEADS**

Fig. 17



Burring  
Rolls

**18 GAUGE CAPACITY**

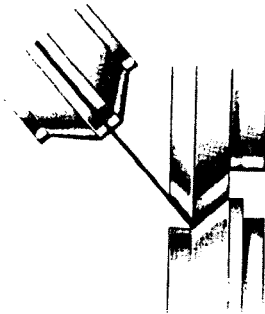
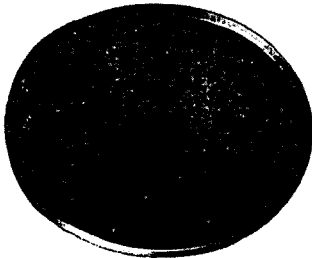
PART NOS.

Upper Roll	P-17523
Lower Roll	P-17524

Approx. flange  
height 3/16" max.

**WIDE FLANGE HEADS**

Fig. 18



Circle  
Flanging Rolls

**18 GAUGE CAPACITY**

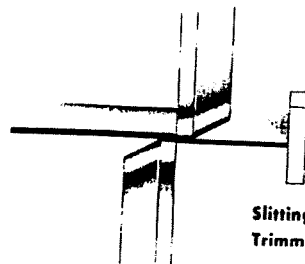
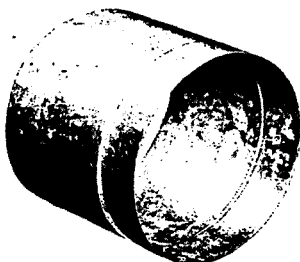
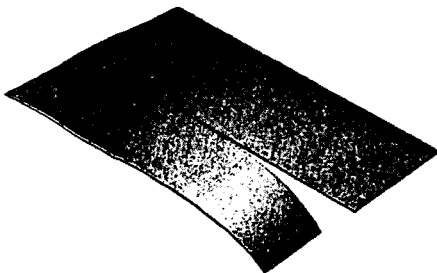
PART NOS.

Upper Roll	P-21803
Lower Roll	P-21804

Approx. flange  
height 5/16" max.

**SLITTING AND TRIMMING**

Fig. 19



Slitting and  
Trimming Rolls

**16 GAUGE CAPACITY**

PART NOS.

Upper Roll	P-17551
Lower Roll	P-17551