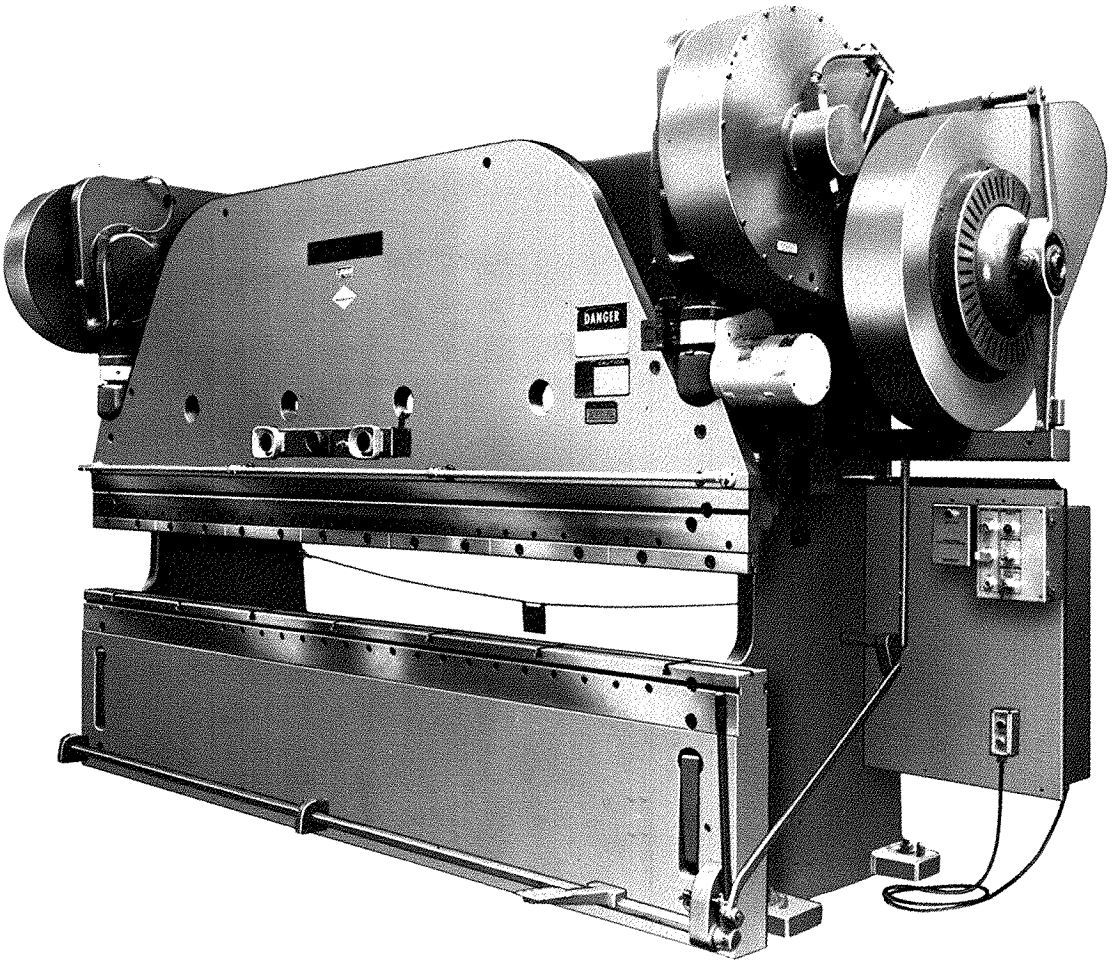
OPERATION, SAFETY AND MAINTENANCE MANUAL

CINCINNATI

4 SERIES THROUGH 50 SERIES MECHANICAL PRESS BRAKES

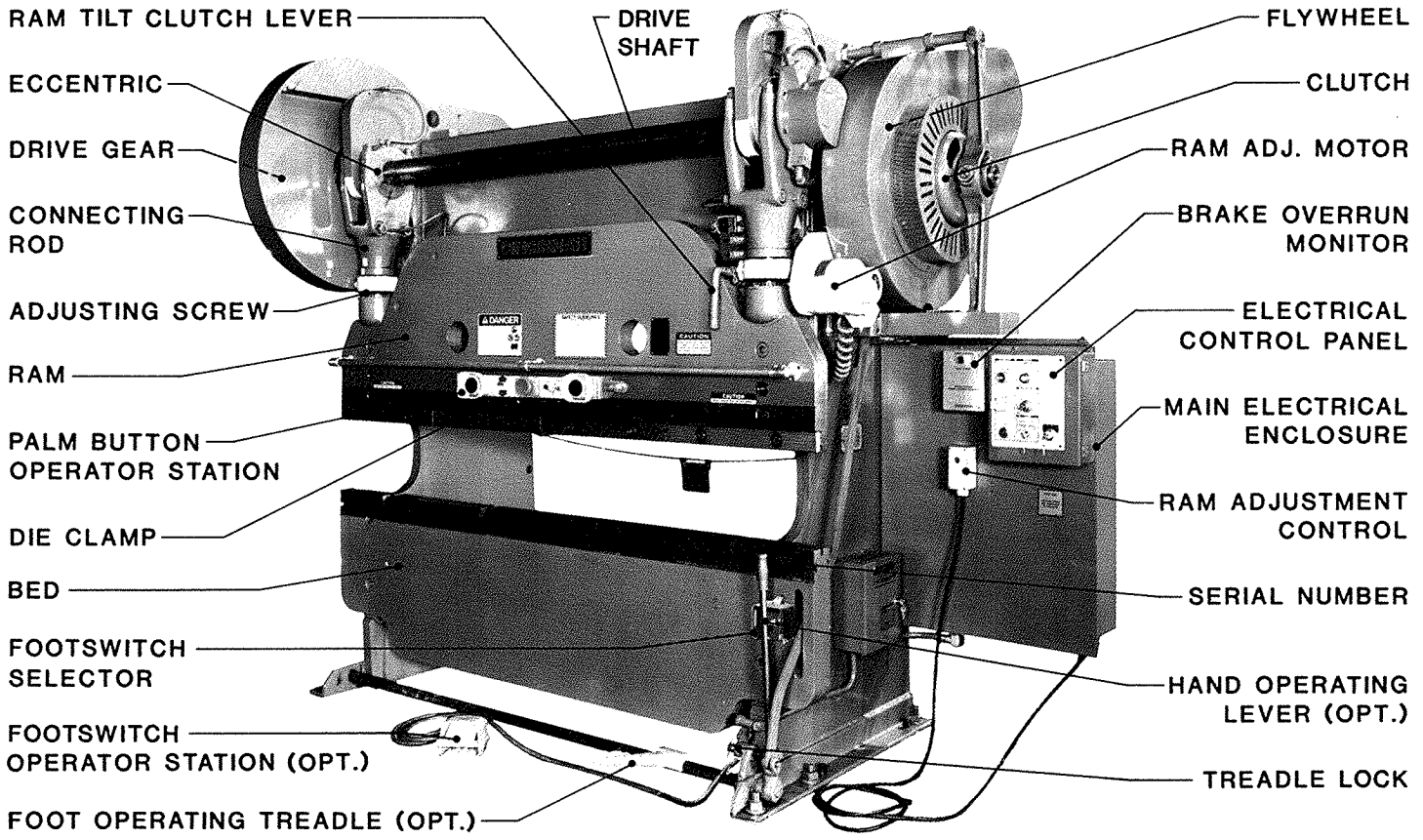


CINCINNATI

CINCINNATI INCORPORATED
CINCINNATI, OHIO 45211

EM-147 (FEB 93)

CINCINNATI 4-5 SERIES PRESS BRAKE



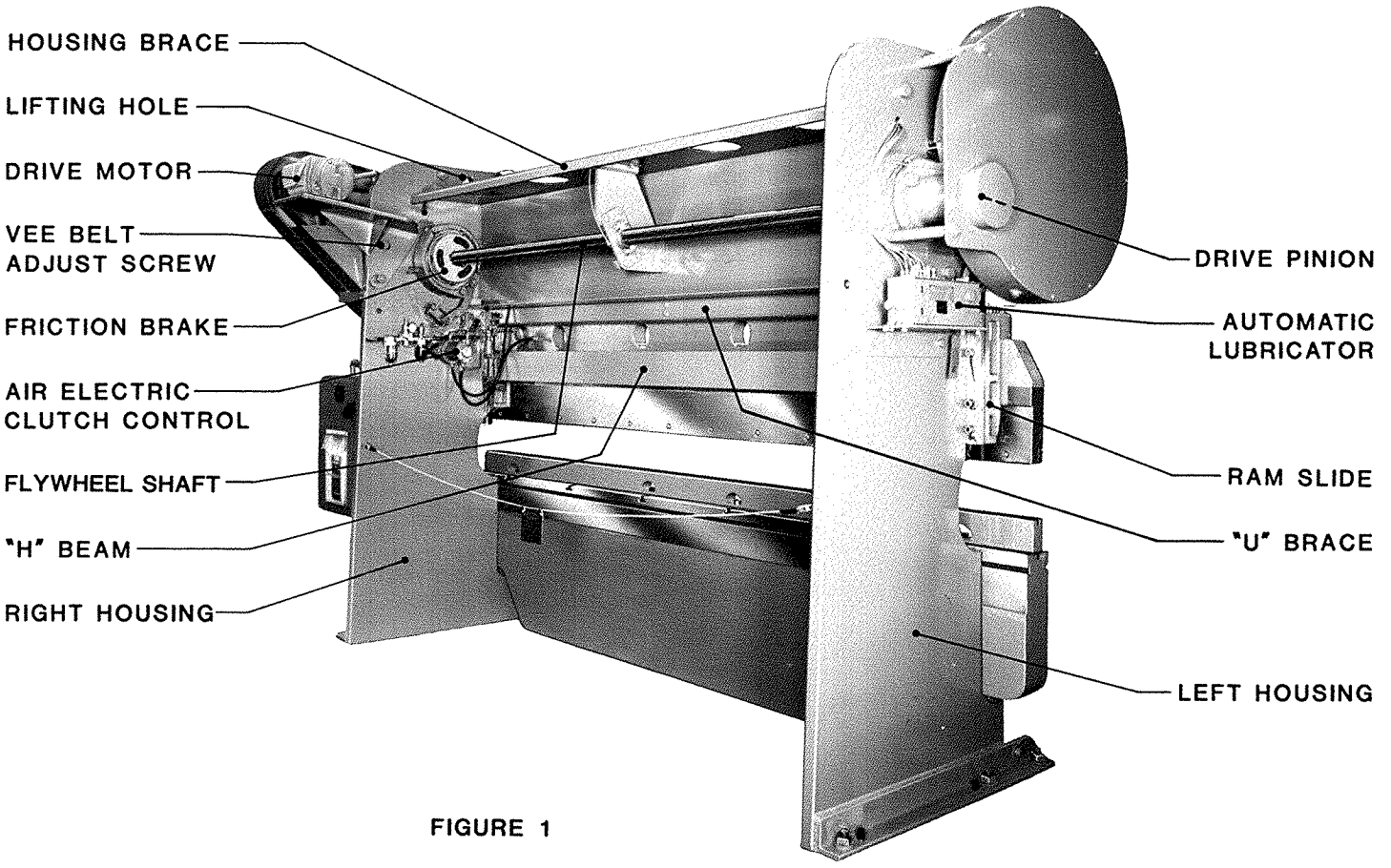
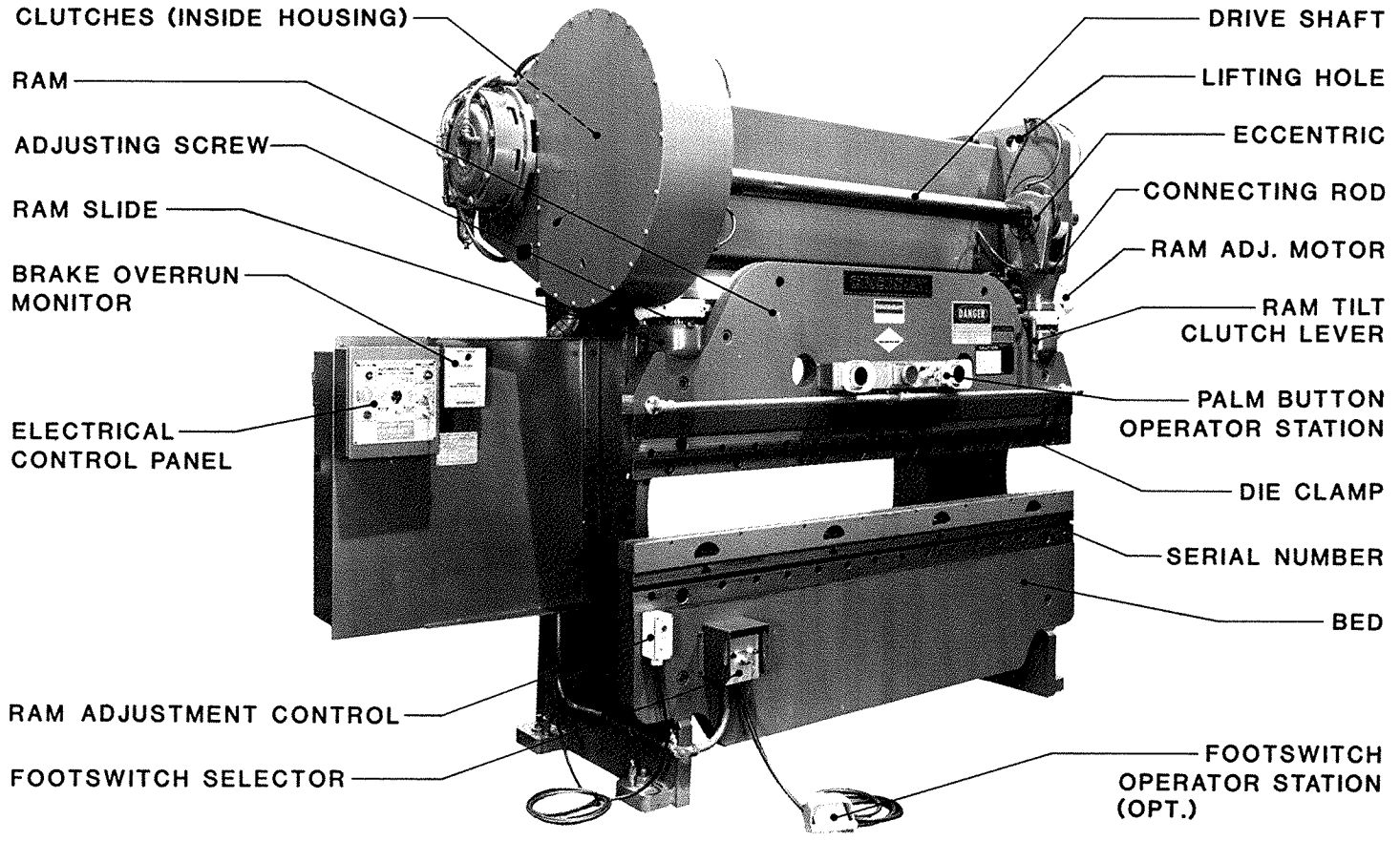


FIGURE 1

CINCINNATI 4-5 SERIES AUTOMATIC CYCLE PRESS BRAKE



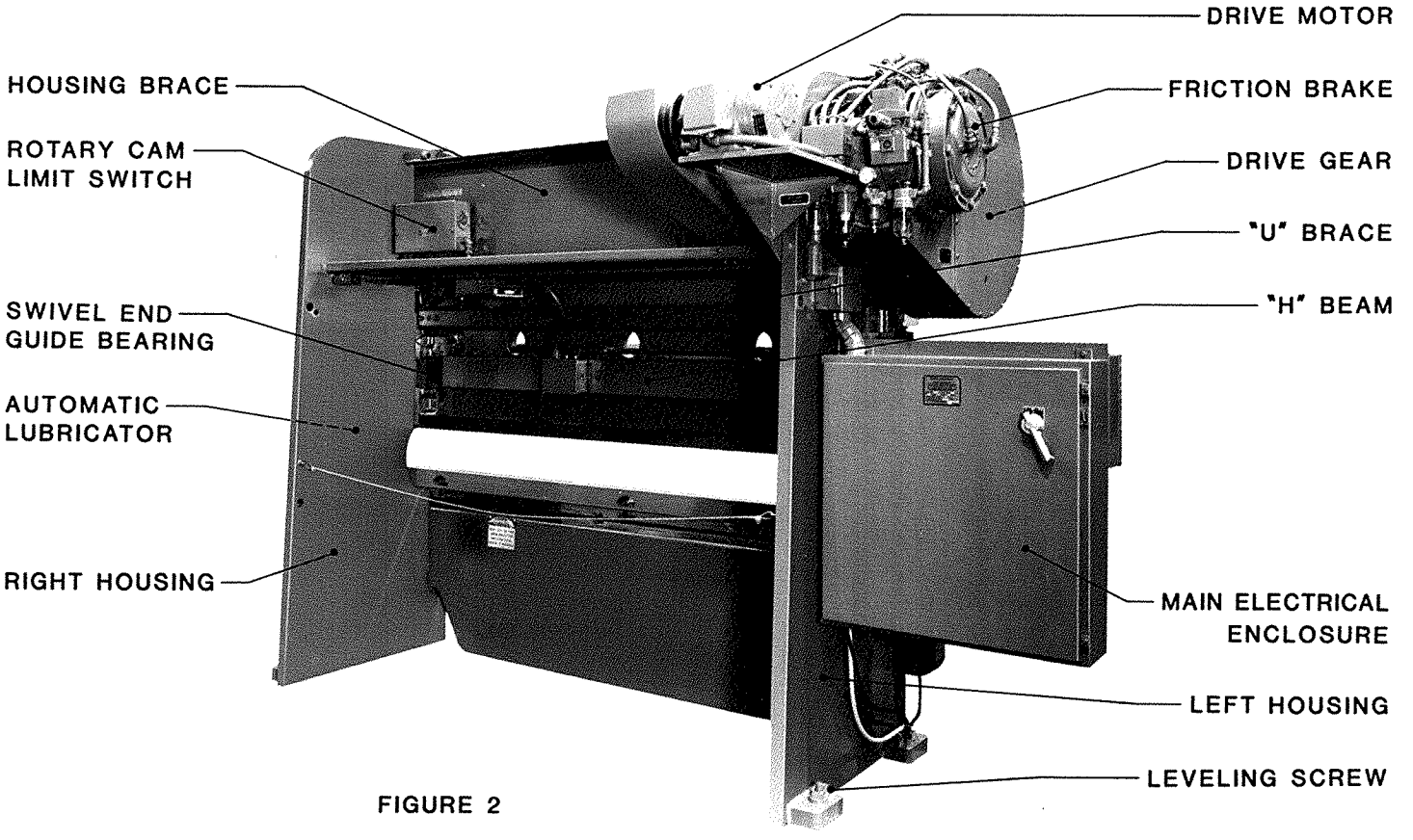
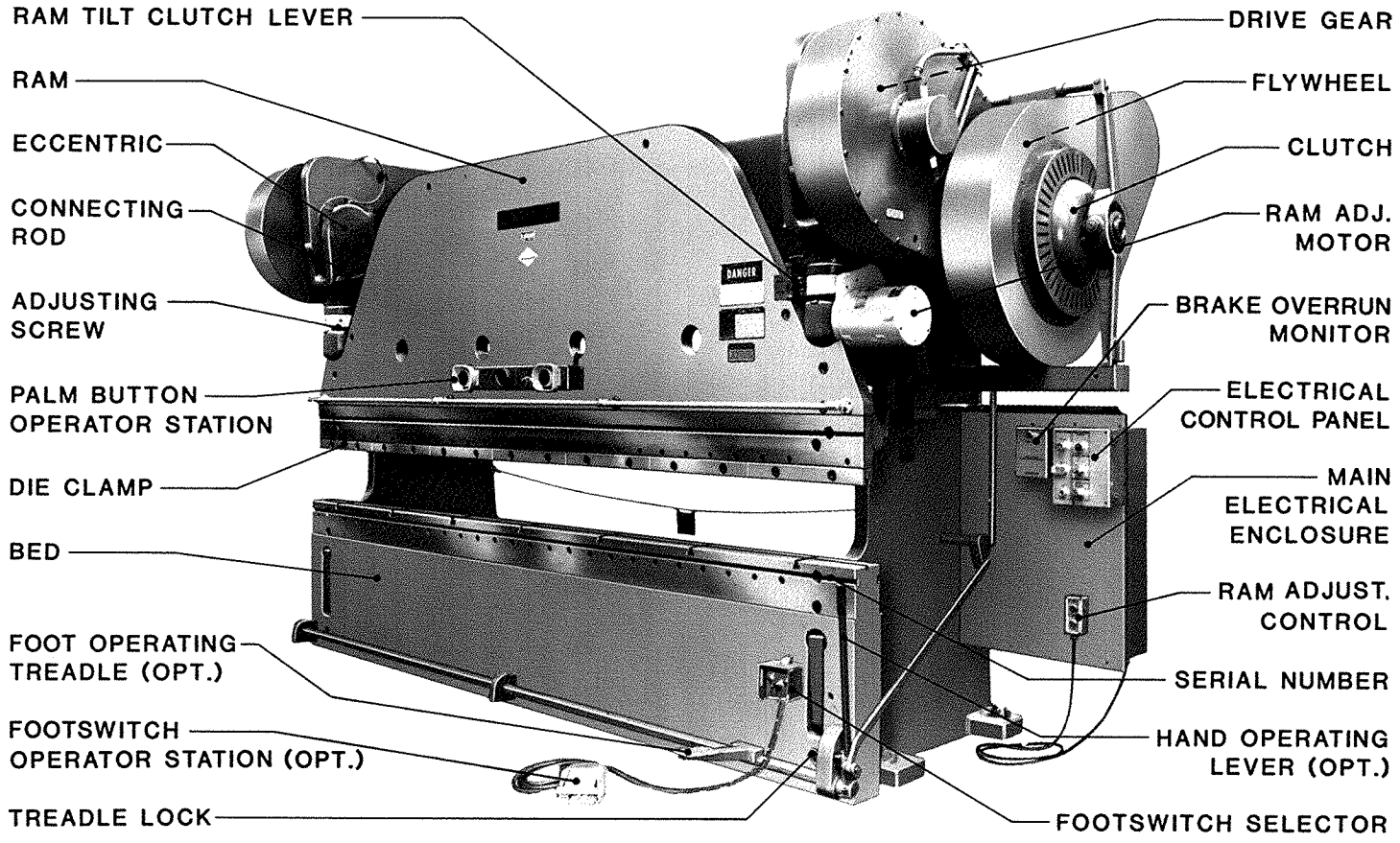


FIGURE 2

CINCINNATI 7-9 SERIES PRESS BRAKE



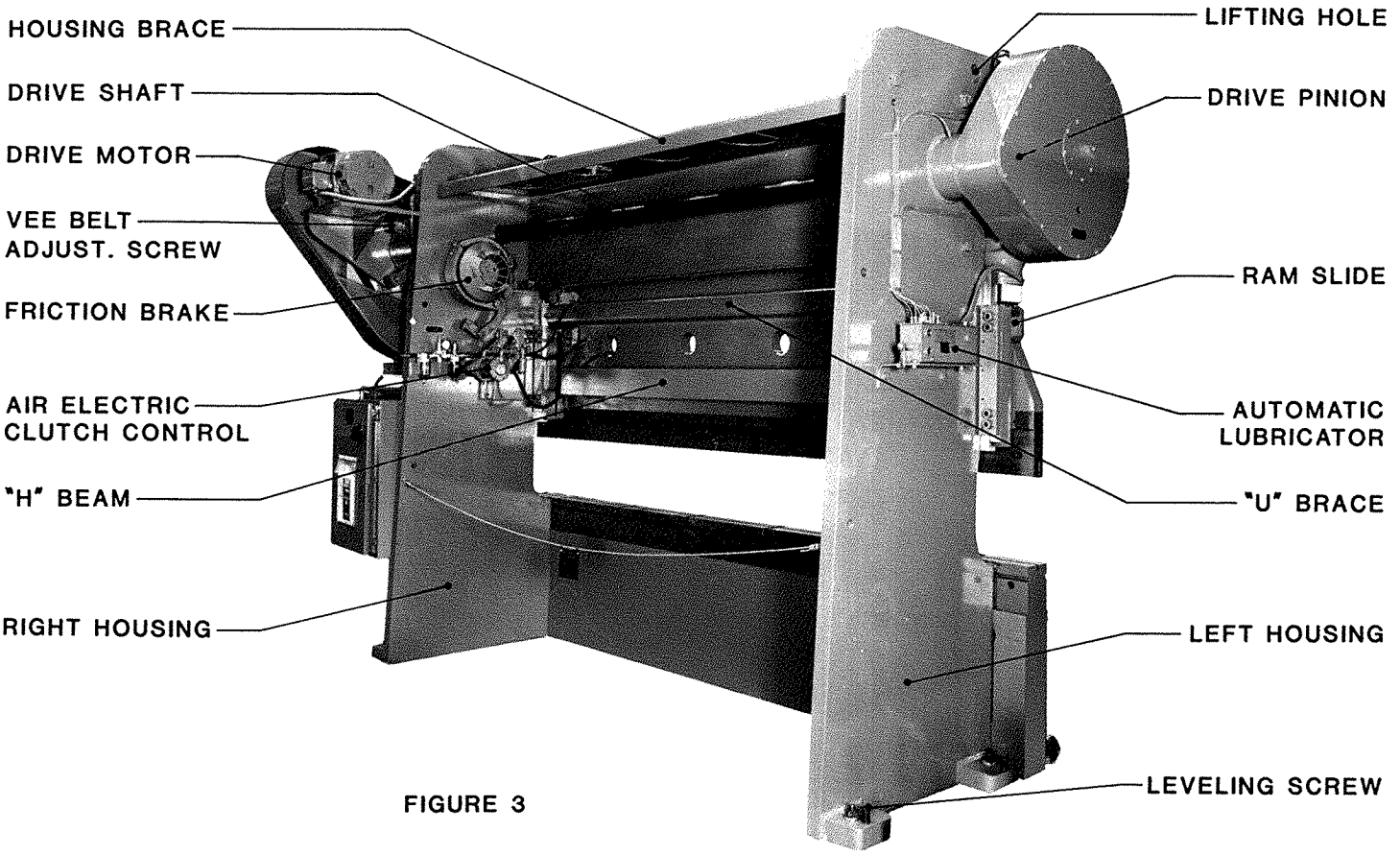
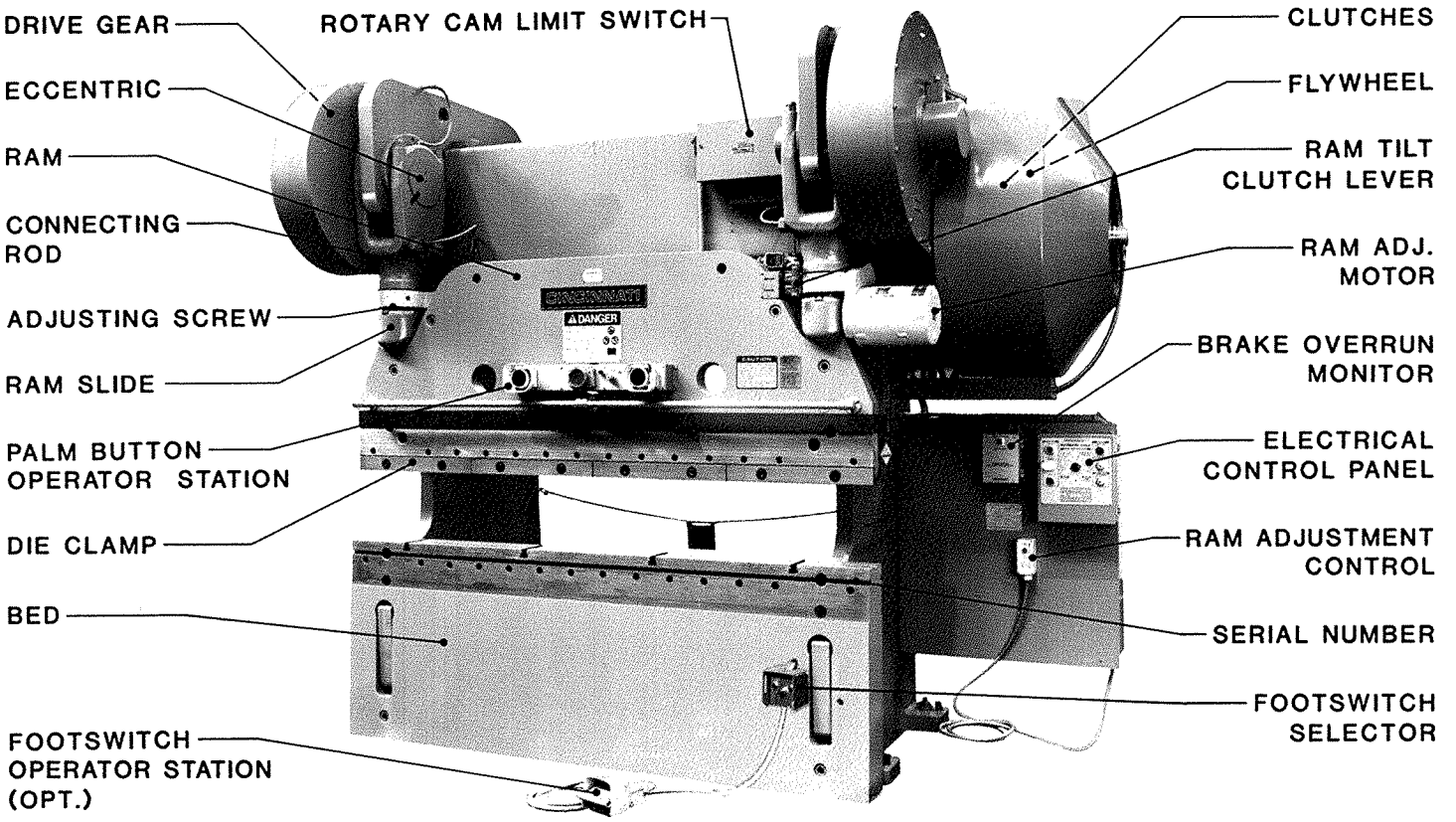


FIGURE 3

CINCINNATI 7-9 SERIES AUTOMATIC CYCLE PRESS BRAKE



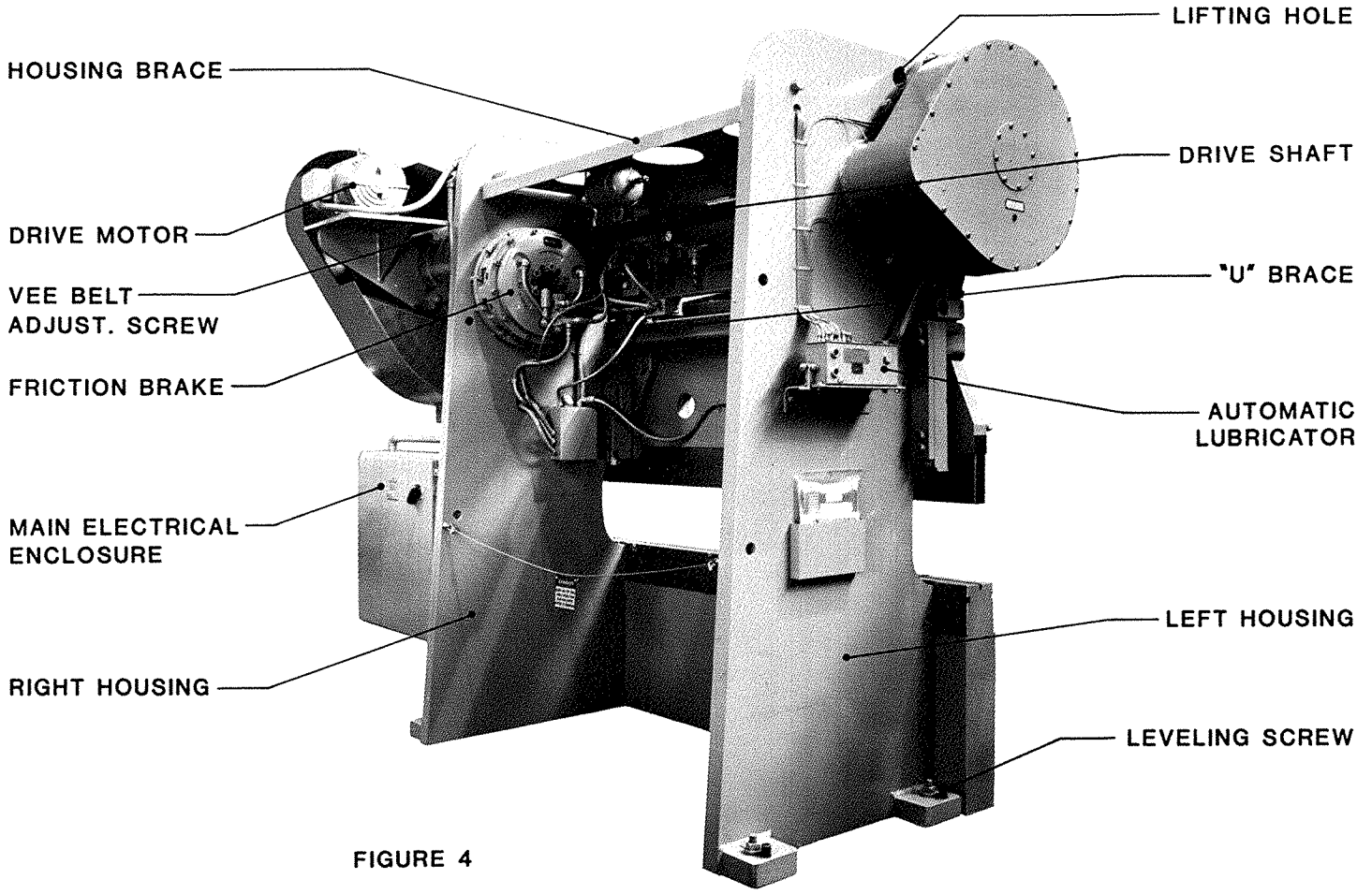
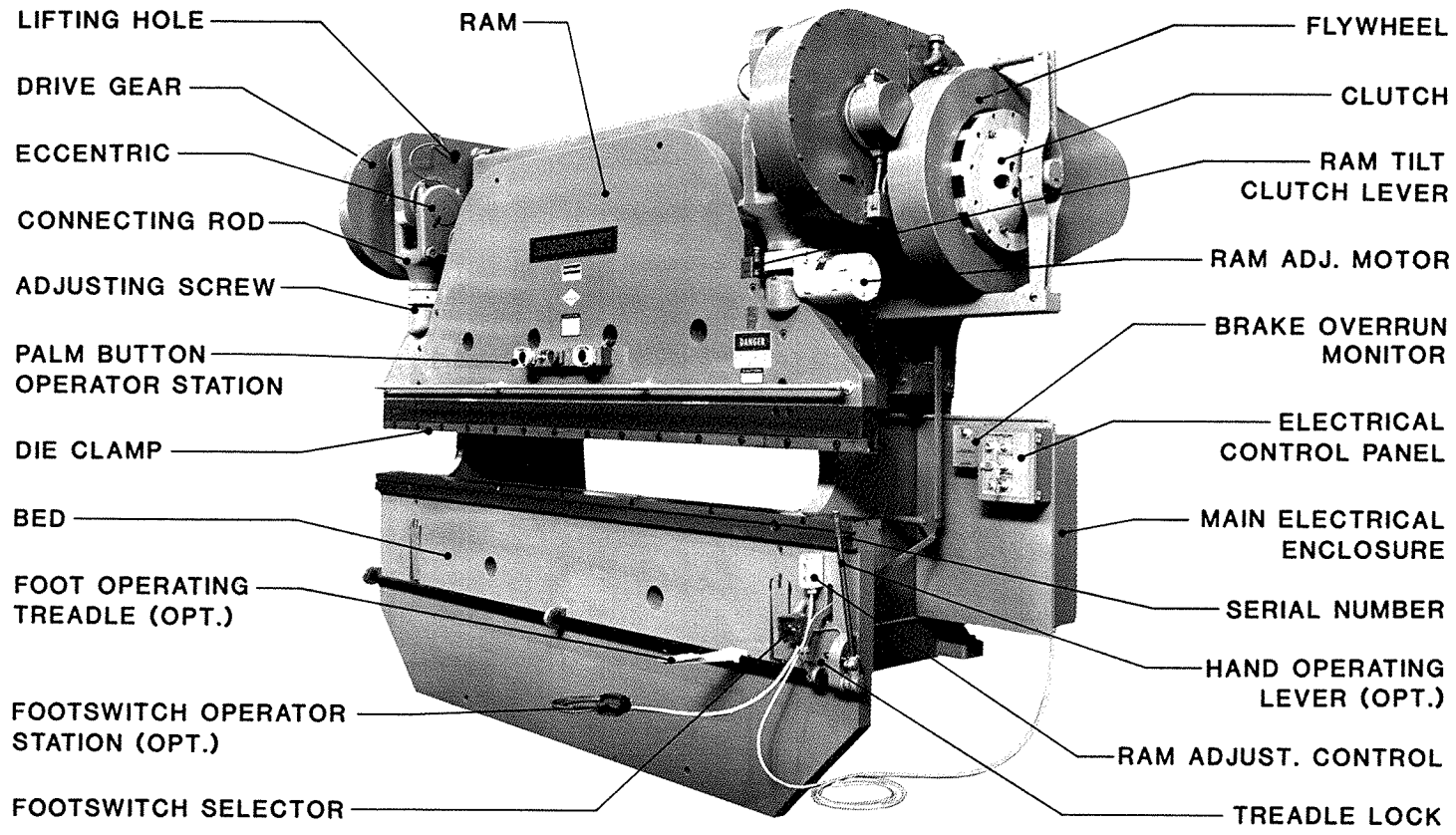


FIGURE 4

CINCINNATI 12-13 SERIES PRESS BRAKE



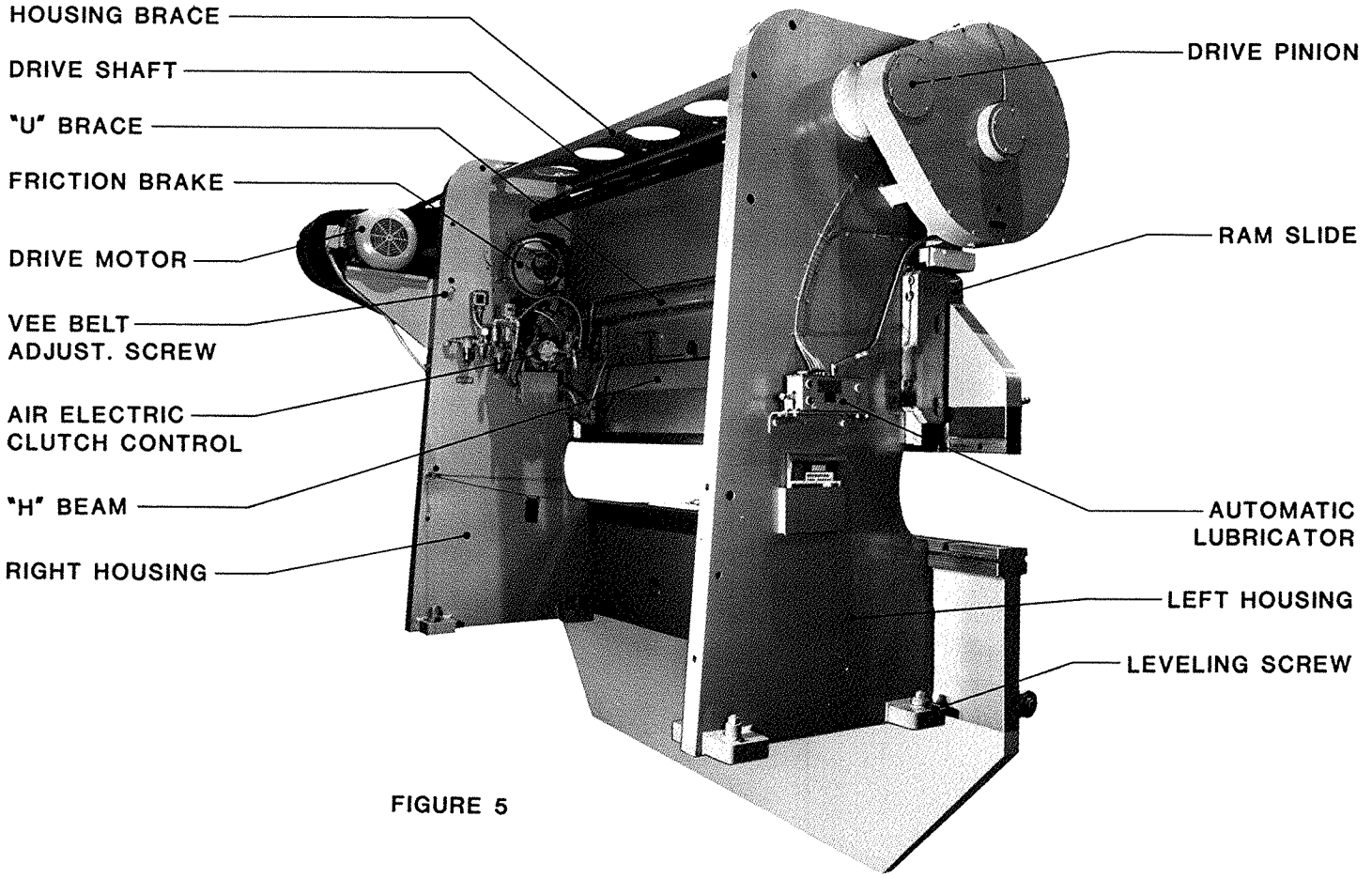
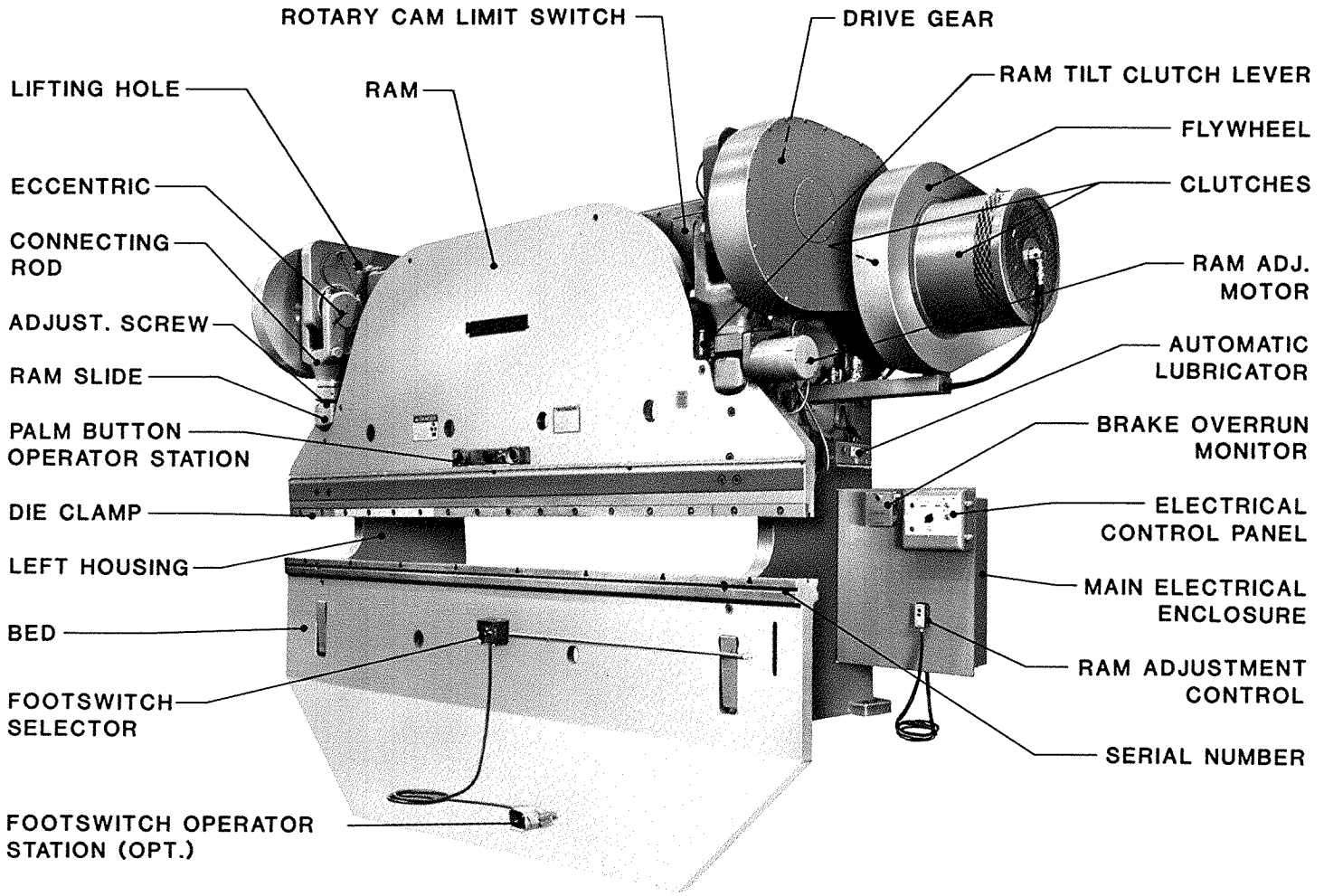


FIGURE 5


ROTARY CAM LIMIT SWITCH
DRIVE GEAR
LIFTING HOLE
RAM
RAM TILT CLUTCH LEVER
FLYWHEEL
ECCENTRIC
CLUTCHES
CONNECTING ROD
RAM ADJ. MOTOR
ADJUST. SCREW
AUTOMATIC LUBRICATOR
RAM SLIDE
BRAKE OVERRUN MONITOR
PALM BUTTON OPERATOR STATION
ELECTRICAL CONTROL PANEL
DIE CLAMP
MAIN ELECTRICAL ENCLOSURE
LEFT HOUSING
BED
RAM ADJUSTMENT CONTROL
FOOTSWITCH SELECTOR
SERIAL NUMBER
FOOTSWITCH OPERATOR STATION (OPT.)

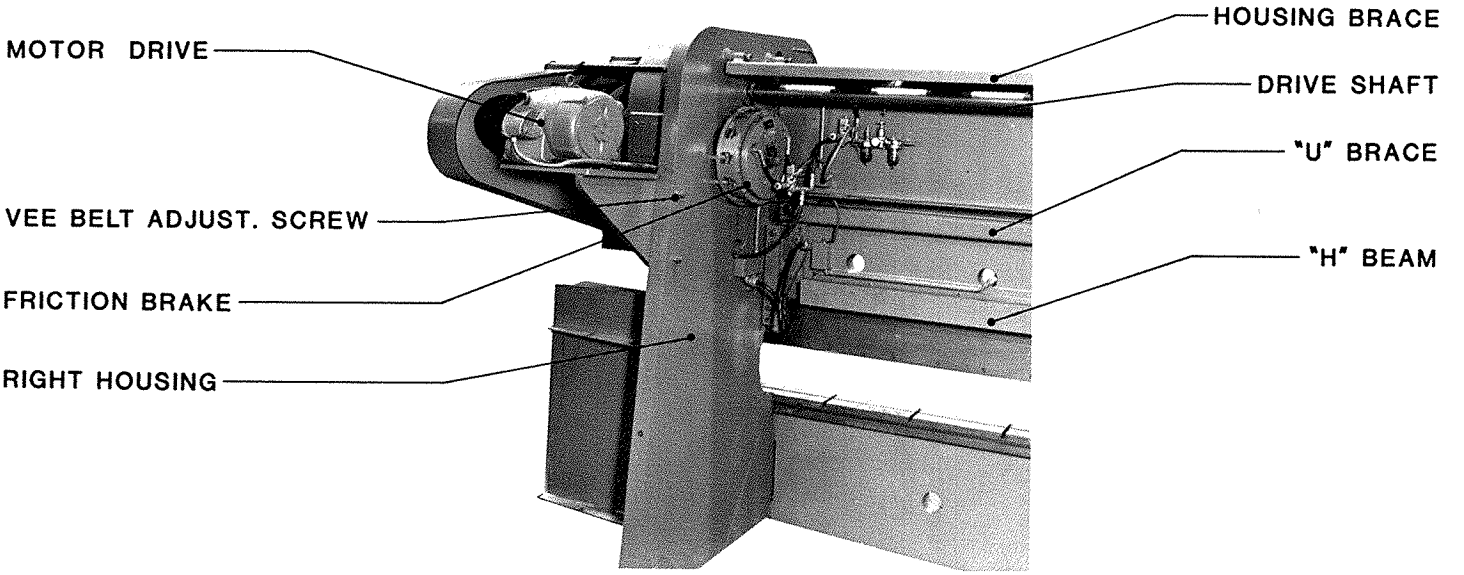
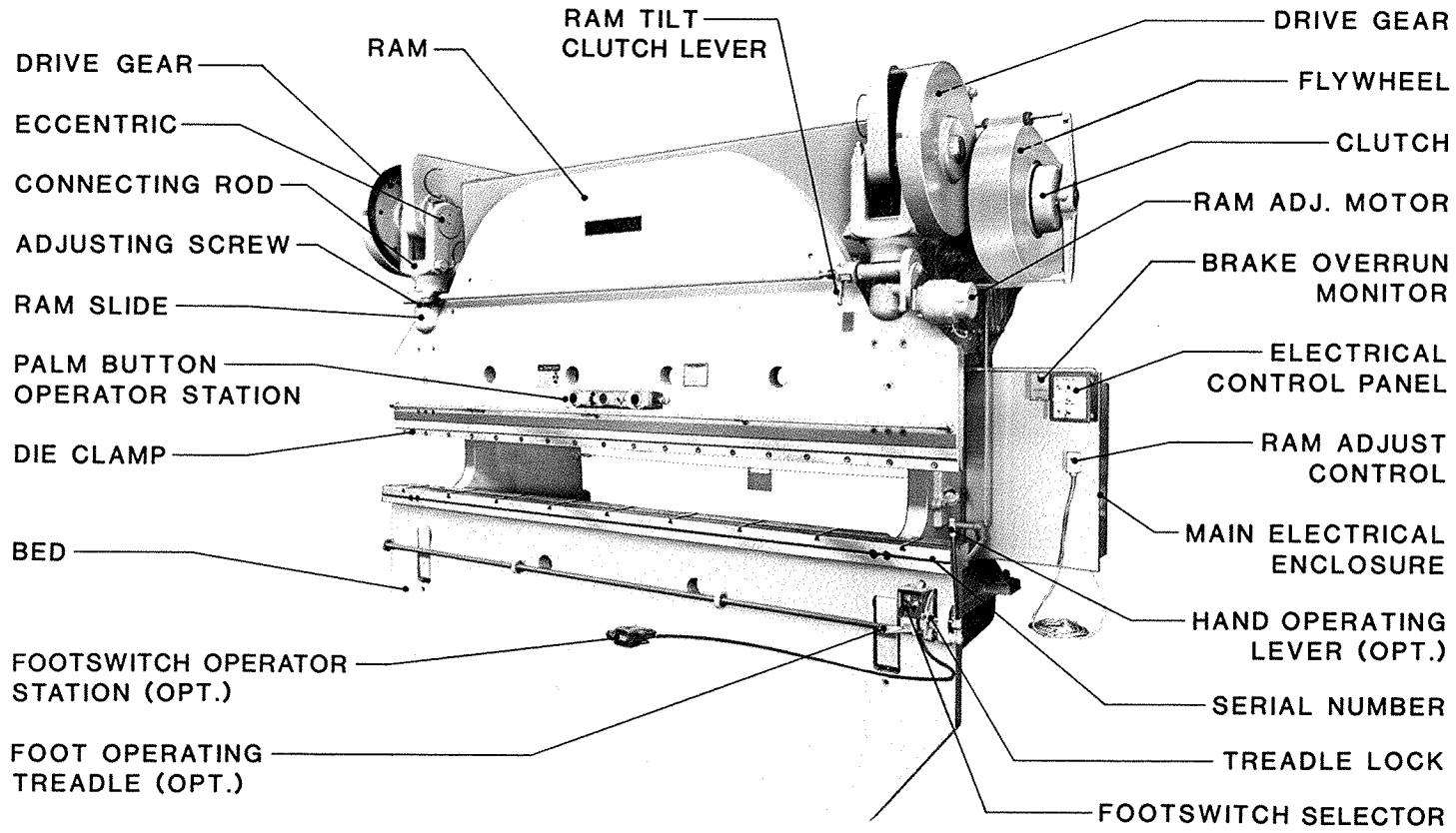

HOUSING BRACE
MOTOR DRIVE
DRIVE SHAFT
"U" BRACE
VEE BELT ADJUST. SCREW
"H" BEAM
FRICTION BRAKE
RIGHT HOUSING

FIGURE 6

CINCINNATI 19-21-34 SERIES PRESS BRAKE



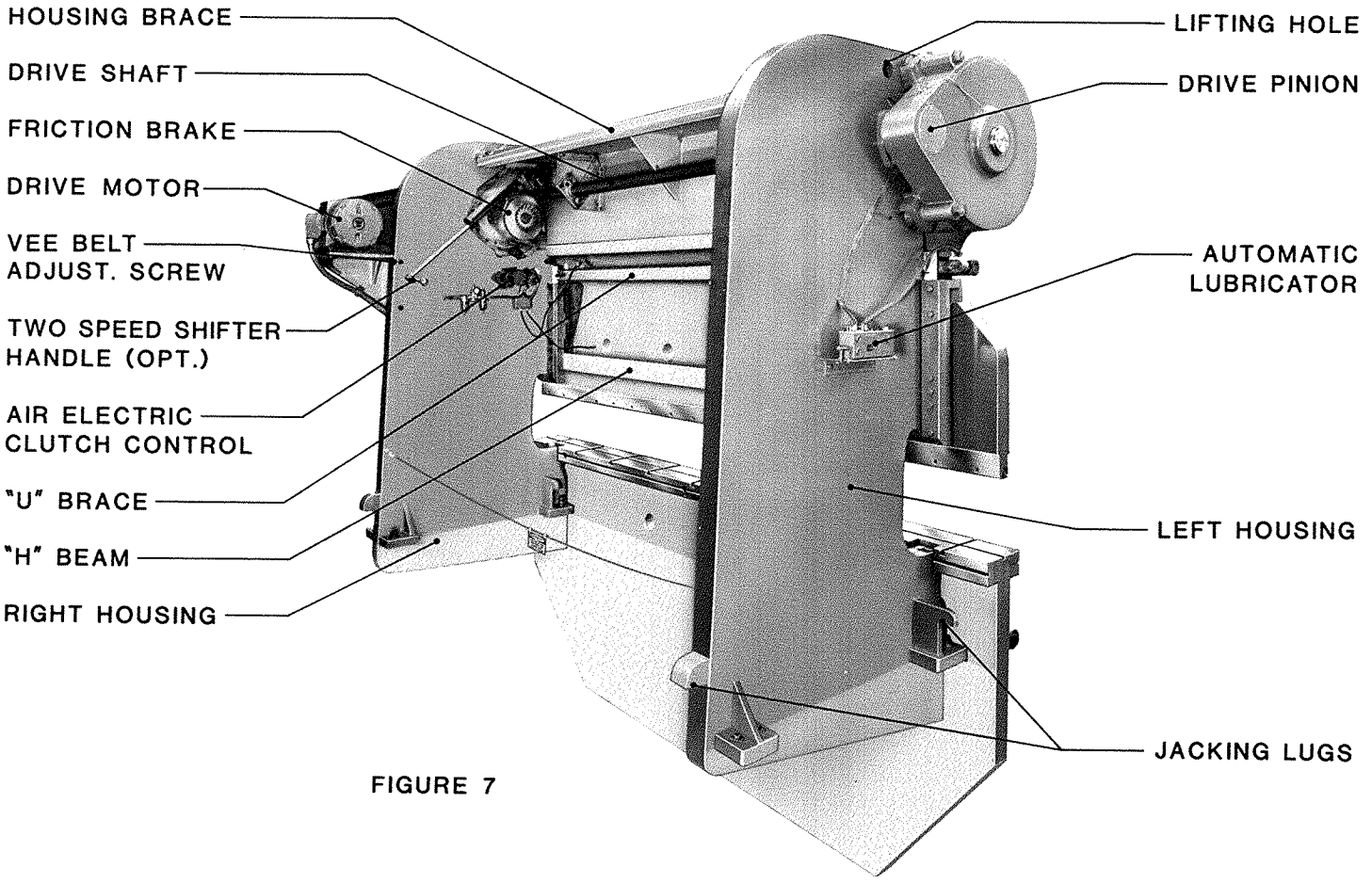
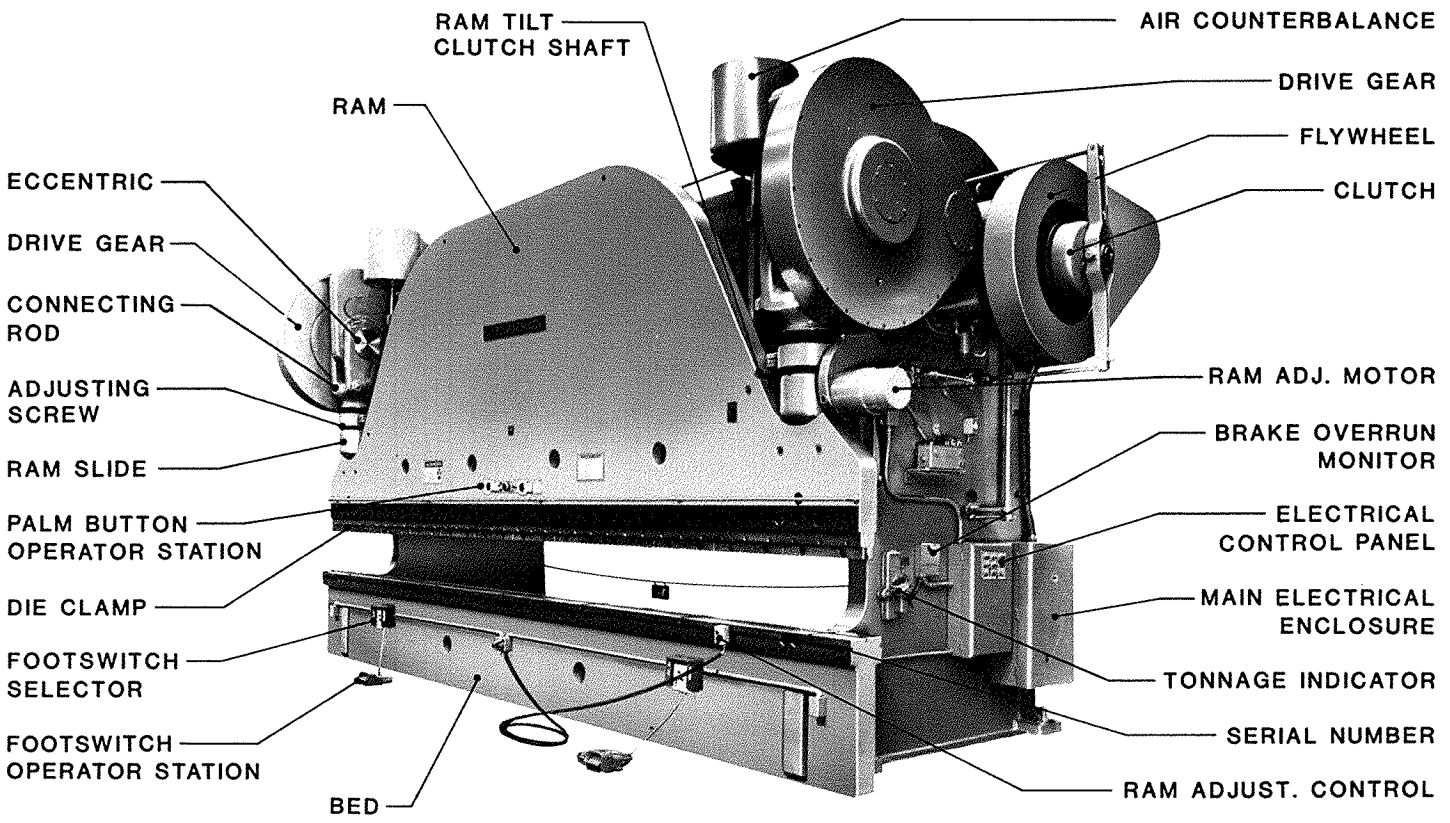


FIGURE 7


RAM TILT CLUTCH SHAFT
AIR COUNTERBALANCE
RAM
DRIVE GEAR
FLYWHEEL
ECCENTRIC
CLUTCH
DRIVE GEAR
CONNECTING ROD
RAM ADJ. MOTOR
ADJUSTING SCREW
BRAKE OVERRUN MONITOR
RAM SLIDE
ELECTRICAL CONTROL PANEL
PALM BUTTON OPERATOR STATION
MAIN ELECTRICAL ENCLOSURE
DIE CLAMP
TONNAGE INDICATOR
FOOTSWITCH SELECTOR
SERIAL NUMBER
FOOTSWITCH OPERATOR STATION
RAM ADJUST. CONTROL
BED

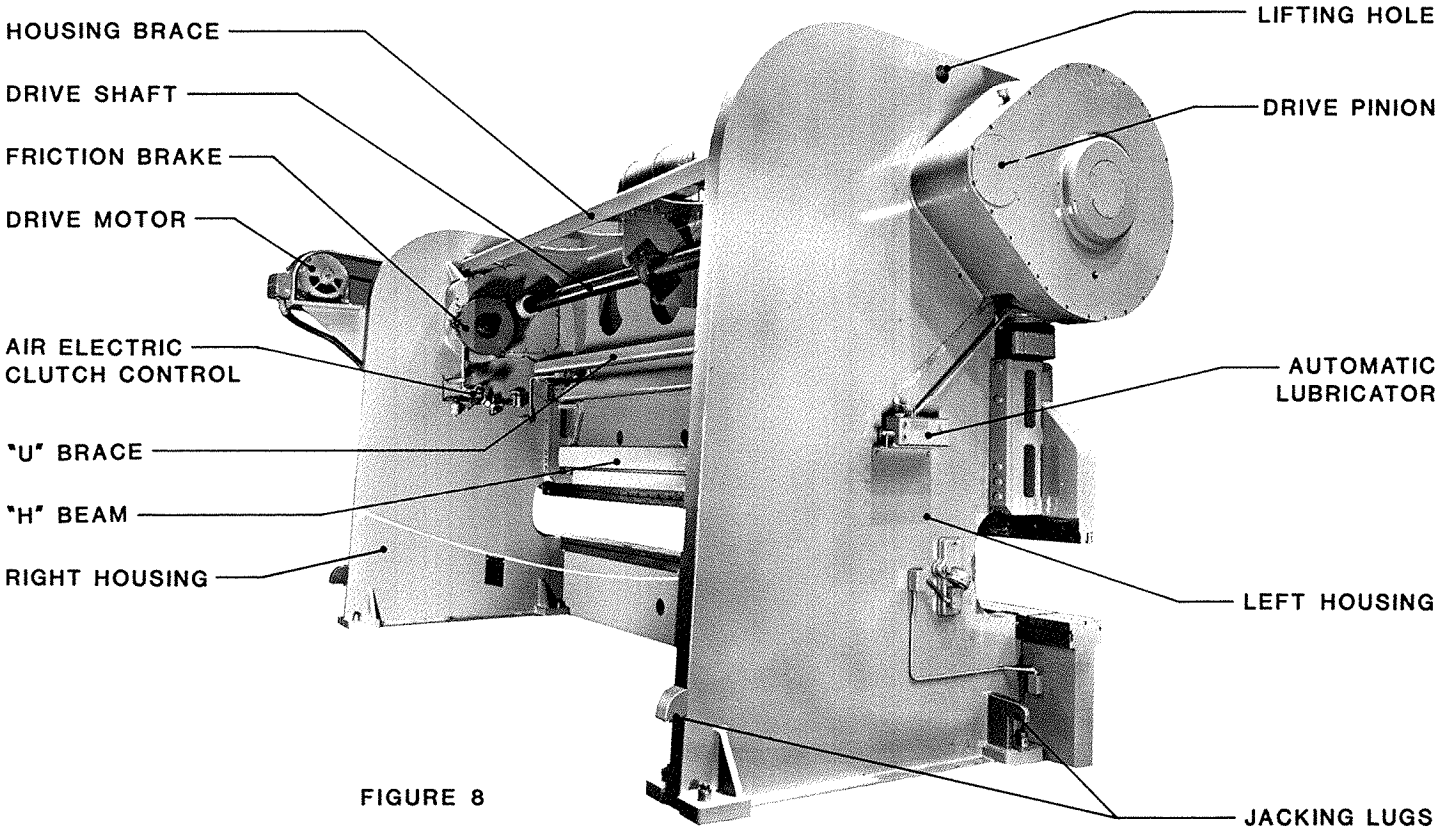

HOUSING BRACE
LIFTING HOLE
DRIVE SHAFT
DRIVE PINION
FRICTION BRAKE
DRIVE MOTOR
AIR ELECTRIC CLUTCH CONTROL
AUTOMATIC LUBRICATOR
"U" BRACE
"H" BEAM
RIGHT HOUSING
LEFT HOUSING
JACKING LUGS

FIGURE 8

UNLOADING

Upon receipt of your CINCINNATI Press Brake carefully remove the contents of the one or more tool boxes shipped with the machine. All of the machine options and loose parts, such as bolts, gears and wrenches, will be in these boxes. Check all of the parts received with the packing list. Claims for shortages or damaged parts should be made within ten days. Remove all shipping paper from the wrapped parts of the Press Brake. Leave the shipping skids attached to the machine or machine components until they are moved to the final location.

The 5 and 9 Series Press Brakes are shipped completely assembled on skids. The 12 Series through 34 Series x 12' machines are shipped assembled on skids with the bed mounted on the back of the housings. Some machines having special housings may be shipped dismantled. The 34 Series x 14' and larger Press Brakes will be shipped dismantled on two flat cars. One car carries the L.H. housing, bed and tool box attached to the bed. This car should be unloaded first since the L.H. housing is always the first main member to be erected. The other car carries the R.H. housing, ram, housing brace, drive motor and motor bracket.

LIFTING AND MOVING

The shipping weight of the assembled machine or of the main members of disassembled machines are shown on the Bill of Lading which accompanies the machine. Check these weights carefully before lifting or handling. Provisions for safety will prevent damage to the machine and injury to personnel.

Machines shipped assembled are readily handled by cranes with chains or cables of sufficient capacity (refer to ANSI standard B30.9-1984) adjusted to proper length for even lifting. The chains or cables should be long enough to minimize side loading on the housings. A typical hitch is shown in Figure 9.

Where crane facilities are insufficient, or not available, rig the machine into final location. When rigging assembled machines into position leave the bed mounted on the back of the housings if they were shipped in that manner.

> **CAUTION:** Machine is front heavy. Be extremely careful to keep the machine supported evenly and to guard against tipping.

CINCINNATI INCORPORATED recommends that professional riggers be employed to handle the machine to insure against damage or injury to your personnel.

If jacks are used to lower the machine onto the foundation bolts, care should be taken to prevent twisting of the machine.

Disasembled machines can be lifted directly from the cars if crane facilities are sufficient. The R.H. and L.H. housings should be lifted by using the lifter hole as shown in Figure 10. If a clevis, as illustrated, is not available, an adequate cable should be used in the same housing hole. The bed and ram should be lifted with a cable. Large diameter lifting holes are provided in some beds. Beds having permanently widened tops have lifting holes in the supporting gussets. Where no lifting holes are provided, sling the cable around the bed. Do not put the cables through the two machined slots for the housings. The ram has two lifting holes located near the top. Be sure to protect finished surfaces from damage.

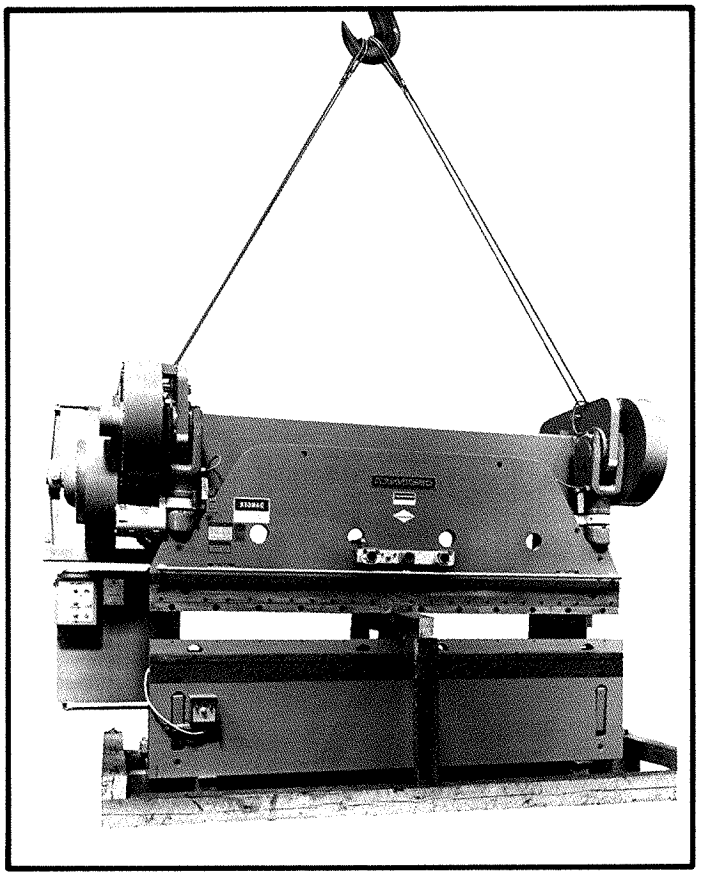


FIGURE 9

Where crane facilities are insufficient, the handling of four main parts is done by jacking, rolling and mobile crane. Care should be exercised to prevent damage to finished surfaces and parts attached to the main members.

EXPORT MACHINES ONLY: Once the main parts have been moved to the area where the Press Brake will be located, remove the skids from bed and ram before assembling to housings. Leave skids on the housings until they are erected.

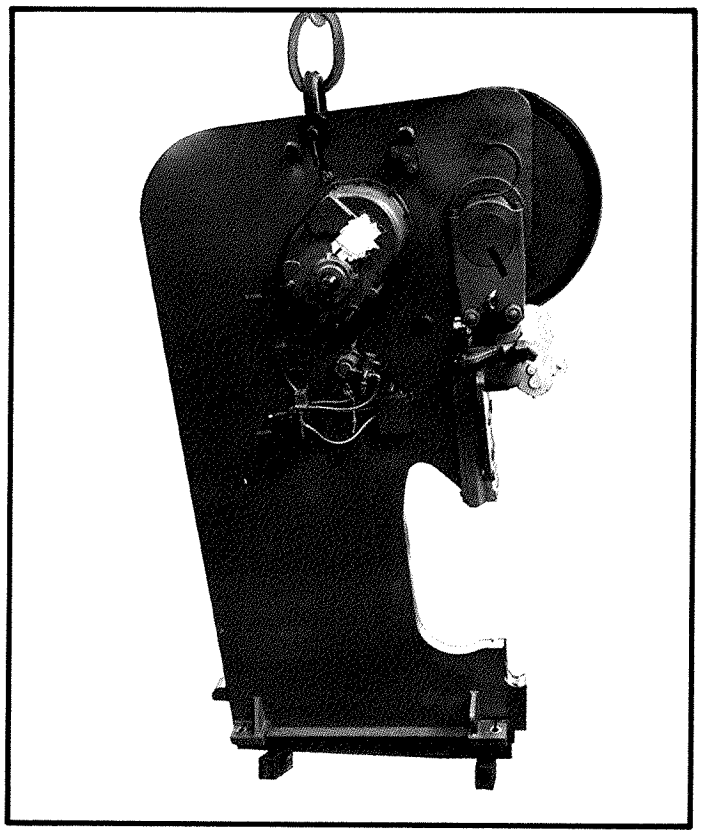


FIGURE 10

FOUNDATION

A CINCINNATI Mechanical Press Brake is not a self-contained machine; that is, the machine must be provided with a rigid foundation to insure preservation of alignment of the housings and cross framing members. The foundation must support the weight of the machine without cracking or settling out of level.

For details of the foundation recommended for your Press Brake refer to the certified Foundation Plan drawing. It is advisable, particularly in localities where unusual soil conditions may exist, to have a local registered civil engineer specify the actual dimensions of the foundation.

As a final check, before locating the Press Brake on the foundation, see that the anchor bolts in your foundation coincide with the bolt hole spacing in the housing feet. Check the width of the bed pit and the distance from the centerline of the front foundation bolts to the rear edge of the bed pit with the dimensions shown on certified foundation plan.

INSTALLATION - ALL MACHINES

Open the shim packs shipped with the machine, remove the thickest shim from each pack. Place one shim at each foundation bolt location. The top surfaces of the shims must be approximately level. Thinner shims can be used to obtain this level condition. Then place a 1/4" to 1/2" thick shim at the four front feet locations to deliberately make the front of the machine high. It is then much easier to raise the rear housing feet to obtain final leveling when the machine is in position. As an option we recommend using a transit to establish that all four front and rear pads are in the same plane.

INSTALLATION - ASSEMBLED MACHINES

Lift the machine with a crane to remove skids. If no crane is available, secure against tipping as soon as the skidded machine is placed on the foundation and before skids are removed. To secure against tipping use a block and tackle. Run one from the housing lifting hole to the rear of the machine and secure to a solid anchor in the building. Run another block and tackle from the other housing lifting hole to the front and secure. To remove skids, raise the machine in two inch steps with the aid of blocking and jacks of sufficient capacity. The jacks should be placed under the front and rear of housings. Use the leveling screws in the angles or housing feet for inserting and removing the jacks. Block up the housings two inches at a time until there is enough clearance to remove skids. Lower machine by removing the blocking about two inches at a time from alternate housings. Temporarily bolt the machine on the foundation.

INSTALLATION - ASSEMBLED MACHINES WITH BED REMOVED

The 12 Series through the 34 Series x 12' (with standard housings) are usually shipped with the bed bolted on the rear of the housings. After the machine has been placed on the foundation as described above, remove the "X" type shipping braces bolted to front of housings. Thoroughly clean the protective grease from front vertical faces of the housings. Go over the grease with a rag soaked in an aliphatic solvent, such as Stoddards solvent or mineral spirits. (Any further references to cleaning solvent will mean this material). Allow solvent to soak. Wipe off grease with clean rags - do not use waste. A stiff brush will get into the corners. Do not use an air hose because the pressure will drive grit and dirt into the bearing surfaces.

The front vertical faces of the housings must be plumb. This can be checked with the level in squaring head of an ordinary machinists square or any level that can be used on a vertical surface. If the housings are not plumb, loosen the foundation bolt nuts. Use leveling screws in the housing angles or feet on 5 through 13 Series to raise or lower the Press Brake. Do not let machine permanently rest on these screws. On larger machines drive a wedge under the housing foot to raise housing. See Figure 11. Insert flat steel shims under the housing feet as required. Lower housings and retighten foundation bolt nuts. Recheck the plumb on housing faces and repeat above procedure if necessary until the housings are plumb.

Remove the bed from rear of housings using a cable of adequate capacity. Remove the bed shoes and bed bolts from tool box. Clean the bearing surfaces of the housings and matching bed slot surfaces, and the bed shoes and bolts. Carefully lubricate all finished surfaces of the housings where the bed fits. Also lubricate top and bottom surfaces of bed shoes. Use EP #2 Lithium grease (C.I. grease H-2EP). Place bed shoes into position on the housings. Match the markings on housings and bed shoes. Place the bed into position on the housing. Insert bed bolts into bed. Loosen all foundation bolt nuts and tighten bed bolts securely. Use a six foot piece of pipe on the wrench. Retighten the foundation bolt nuts securely. Use a three foot length of pipe on the wrench. Check your work with feeler gages. There should be no clearance between the vertical bearing surfaces of the housings and bed. If there is clearance, either the bed bolts are not tight or there is grit between the bearing

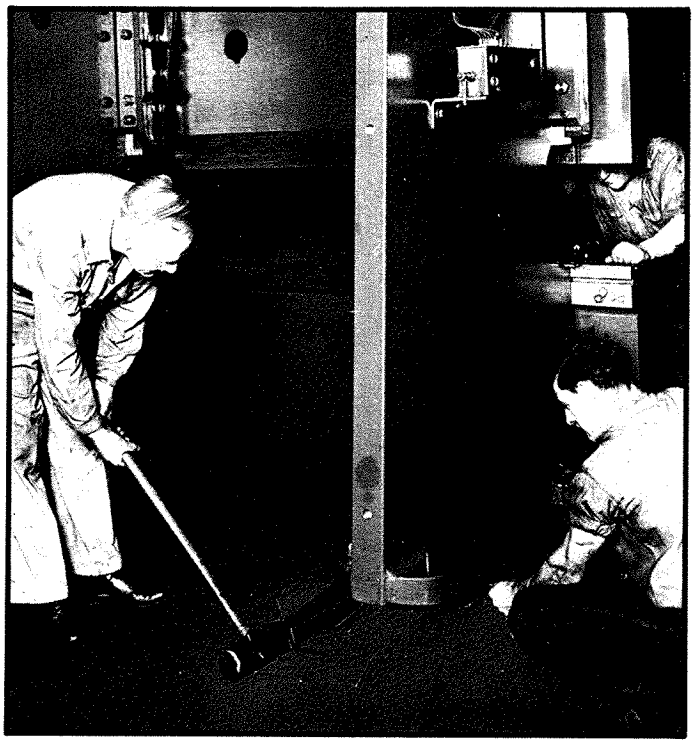


FIGURE 11

surfaces. There should be no clearance between the bed shoes and the bed. If there is clearance, remove the bed. Determine and correct the cause of clearance. Replace bed as previously described. Recheck clearance. Tighten "lock down" screws between the housings and bed. They are located at the bottom of each housing where the housing fits through the bed.

ERECTION - DISASSEMBLED MACHINES

The 34 Series x 14' and larger press brakes, and some smaller machines having special housings, are shipped disassembled. These assembly instructions apply to 19 Series and larger press brakes. When 13 Series or smaller machines are shipped disassembled, separate erection instructions will be furnished. Place the shims at foundation bolt locations as described in INSTALLATION - ALL MACHINES. The left housing is always erected first. By placing this housing first and then erecting the right housing, all the lifting equipment is still on the heavier right housing for final spacing of the housings. The lighter left housing is moved into final position with wedges and crowbars.

Lift the left housing as described in LIFTING AND MOVING.

> EXPORT MACHINES ONLY: Rest housing on two blocks as shown in Figure 10 to provide clearance to remove the skids. Once the housing is vertical, remove the eight nuts holding the long skids. Pull the skids from the bolts using a suitable lifting device. Next take off the two cross timbers.

Place the left housing over the foundation bolts and on top of shims. Place flat washers on each bolt and start nuts. To ease later assembly of bed, plumb this housing at front and side. This can be done with the level in squaring head of an ordinary machinist's combination square, or with any level that can be used on vertical surfaces. Tighten the foundation bolt nuts with a wrench. Remove the lifting device.

Erect the right housing using the same procedure as for the left housing. Place flat washers on each foundation bolt and start nuts, but do not tighten. Position and shim the right housing to achieve distance and plumb in relation to the left housing. Carefully check the distance between housings. This is measured from the inside finished surface where the bed is attached.

EXAMPLE: For a 34 Series x 14'. This measurement is 14'6". The measurement can be taken from the machined slots in rear of bed.

Tighten foundation bolt nuts with a wrench. Wedge a 4" x 4" oak timber under the flywheel shaft bearing casting immediately before releasing the lifting device. See Figure 12. Remove the lifting device. Stretch a line across both housings against the vertical front faces as shown in Figure 12. Set vertical faces to the line by shifting the housings as required. A straight steel bar or wooden straight edge can be used instead of the line.

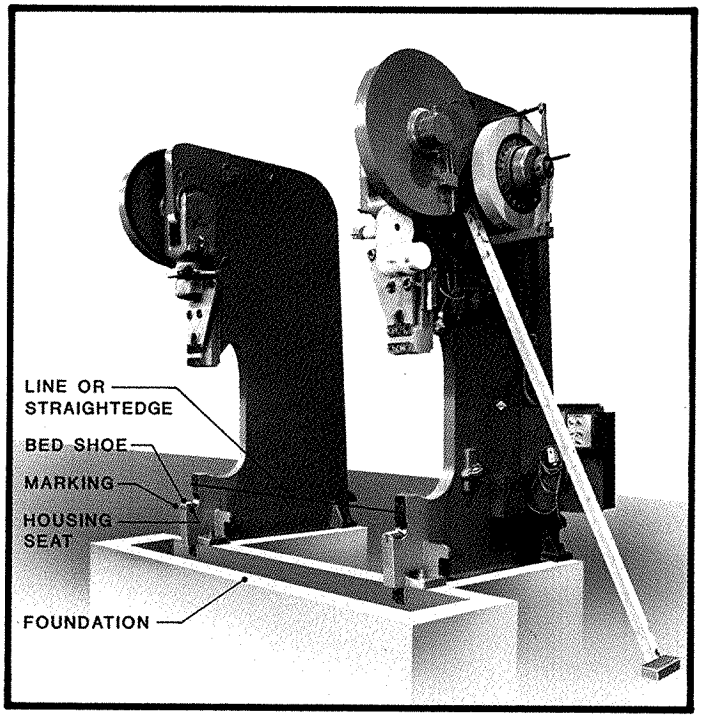


FIGURE 12

Thoroughly clean the protective grease from front vertical faces of the housings. Go over the grease with a rag soaked in an aliphatic solvent, such as Stoddards solvent or mineral spirits. (Any further references to cleaning solvents will mean this material.) Allow solvent to soak. Wipe off grease with clean rags - do not use waste. A stiff brush will get into the corners. Do not use an air hose because the pressure will drive grit and dirt into the bearing surfaces.

Remove the bed shoes and bed bolts from tool box. Clean the bearing surfaces of the housings, matching bed slot surfaces, bed shoes and bed bolts. Carefully lubricate all finished surfaces of the housings where the bed fits. Also lubricate top and bottom surfaces of bed shoes. Use EP #2 Lithium grease (C.I. grease H-2EP). Place bed shoes into position on the housings. Match the markings on the housings and bed shoes. Place the bed into position on the housings. Insert bed bolts into bed. Loosen all foundation bolt nuts and tighten bed bolts securely. Use a six foot piece of pipe on the wrench. Retighten the foundation bolt nuts securely. Use a three foot length of pipe on the wrench. Check your work

with feeler gages. There should be no clearance between the vertical bearing surfaces of the housings and bed. If there is clearance, either the bed bolts are not tight or there is grit between the bearing surfaces. There should be no clearance between the bed shoes and the bed. If there is clearance, remove the bed. Determine and correct the cause of clearance. Replace bed as previously described. Recheck clearance. Tighten "lock down" screws between the housings and bed. They are located at the bottom of each housing where the housing fits through the bed.

Clean ram slides and guides, remove shipping strips and clean machine as described in "CLEANING" in this Section.

TRANSMISSION ASSEMBLY - 21 AND 34 SERIES

With the eccentrics down, insert long drive shaft through left housing.

NOTE: Drive shaft for 18' and longer Press Brakes are larger in diameter and stepped down to standard diameter on both ends. For installation of this size shaft, the left drive gear cover, drive gear and housing bearing must be removed. The housing bearing has tapped holes for pulling. Use a stud of sufficient length to pull this bearing. After shaft is through both housings, replace all of these parts.

On these longer machines a center bearing is used to support the center of drive shaft. Install the center bearing on drive shaft after it has passed through the left housing. The pads should be toward the right housing. Slide the bearing toward left housing for positioning when housing brace is installed.

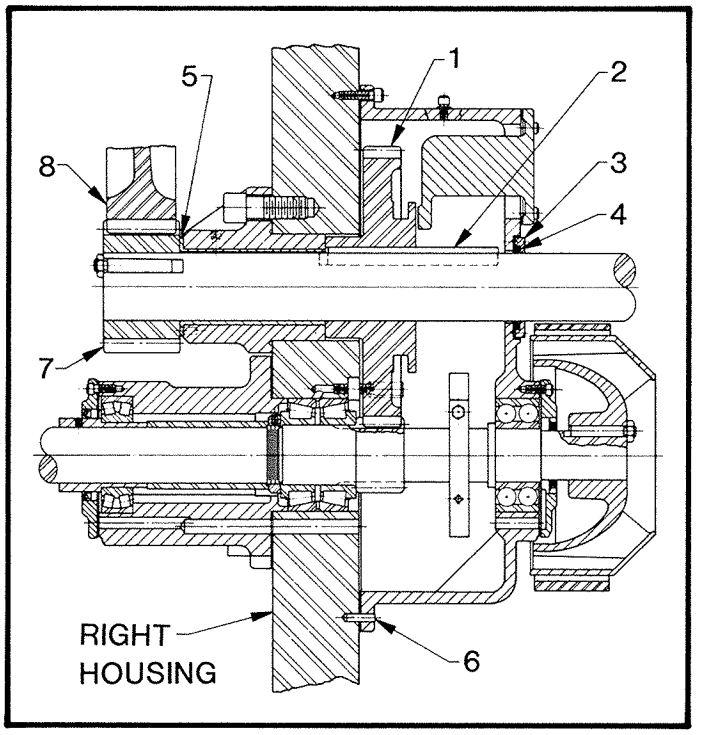


FIGURE 13

Refer to Figure 13. Remove oil seal (No. 4) and retainer (No. 3) from gear case on inside of right housing. Remove the friction brake assembly and brake drum from the flywheel shaft. Remove bolts holding gear case to right housing and remove gear case.

CAUTION: Lifting equipment is required to remove these parts.

Install in the following order on drive shaft. Retainer (No. 3) with oil seal (No. 4) and the gear case. Slide all of these past the long keyway for the intermediate gear key (No. 2). Remove the intermediate gear (No. 1) and key from the tool box and clean with solvent. Oil and install this key. It is a drive fit into the drive shaft and is marked as to the direction of placement into the drive shaft. Lubricate the bore of the intermediate gear (No. 1) with Molycote or equivalent. Try the intermediate gear on the shaft to see that it slides easily on the shaft and key. Shifter slot is towards center of machine. Remove intermediate gear and place it in position in the right housing. See Figure 13. Slide the shaft through this intermediate gear and into the right bronze shaft bearing (No. 5).

Remove the right drive pinion (No. 7) from the tool box. Clean the bore thoroughly and lubricate. Position the pinion in mesh with the right drive gear (No. 8). Make sure the timing marks are aligned. See Figure 14. Hold in position while the drive shaft is being installed. The left pinion also has timing marks that must be aligned. These timing marks "O" are stamped on pinion and drive gears. They are also painted with a red line. Install the keys in the right pinion.

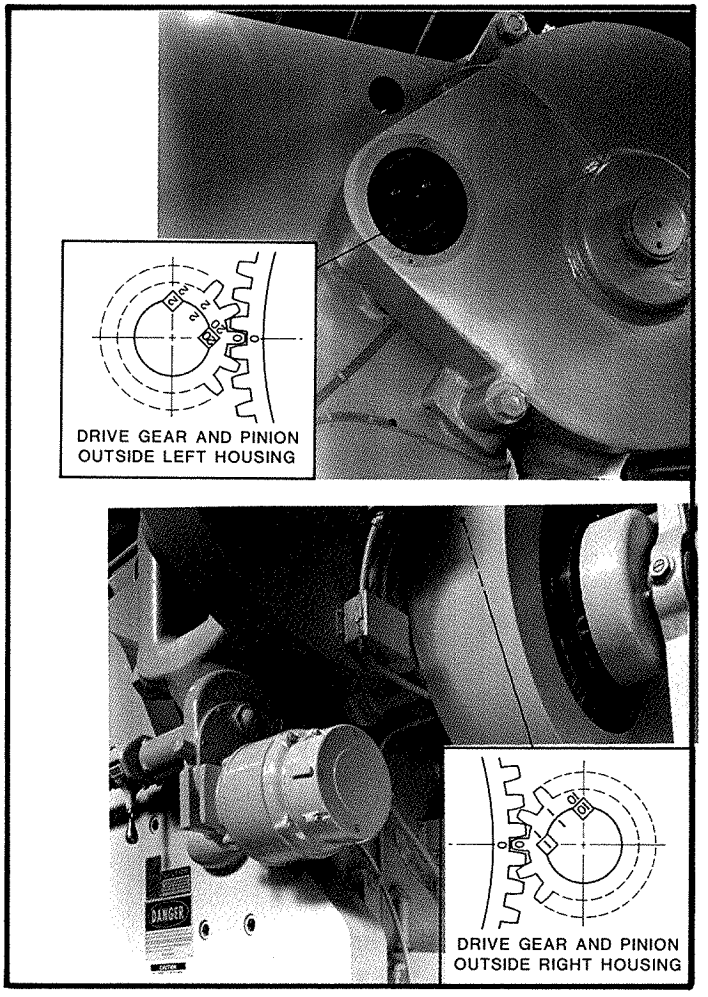


FIGURE 14

NOTE: On 18' and longer machines, both pinions will have to be installed and keyed. Assemble pinions so that stamped numbers correspond.

Do not drive keys tight. Place keys into keyways loose so drive shaft end play can be set after installing housing brace.

Slide the gear case to the right housing. Align the two locating pins (No. 6). Bolt the gear case to housing, making sure the gasket is in good condition. If the machine has two speed mechanism, install the shifting lever.

Install the brake drum and tapered key. Install the oil seal (No. 4) and retainer (No. 3). Fill the gear box with the proper oil. See Lubrication instructions in this Section.

Bring the eccentrics to the front quarter position by turning the brake drum with a bar. This will provide clearance for installing the housing brace. Block the bottom of the ram slides to hold the eccentrics in this position. The housing brace acts as a spacer between the upper portions of the two housings. Carefully install the housing brace. This brace is a close fit between the two housings. Install housing brace bolts and tighten securely.

Remove the blocks from bottom of ram slides. Turn the eccentrics to bottom of the stroke position. Install friction brake assembly with all necessary linkage.

Install four 3/4" x 2-1/4" hex head bolts, lockwashers and nuts (shipped in tool box) between the drive shaft bearing and the support. Do not tighten. Level the shaft by bracing with a two-by-four and jack from the floor on each side of the bearing. When shaft is level push bearing against bottom of shaft. Then draw up bolts to secure bearing to support. Connect oil line to bearing. Remove bracing from the drive shaft.

Position drive shaft pinions (No. 7) with .050" to .060" total clearance. Measure this clearance between the right pinion and the bronze bushing (No. 5). Then drive the tapered keys. Tack weld all key nuts to shaft, including key for brake drum. Tack weld head of the housing brace bolts to the tubular spacers.

CAUTION: Place welder ground next to or on part to be tack welded, not on machine housing.

TRANSMISSION ASSEMBLY - 36,40,50 SERIES

REFER TO FIGURE 15 (36 SERIES) AND FIGURE 16 (40-50 SERIES)

In preparation for installation of the drive shaft, remove screws from covers (No. 6 and No. 7) on both gear guard covers. It will be necessary to lower the oil trough mounted on the inside of left gear guard cover. Attach a soft wire through hole in upper corner of trough. Remove three of the socket head screws and only loosen the fourth screw. This is the screw furthest away and diagonally across from the hole with the inserted wire. This allows the trough to swing down out of the way. After the drive shaft is in place this trough must be repositioned, screws replaced and tightened.

With the eccentrics down, insert the drive shaft through the left drive shaft bearing.

NOTE: Drive shafts for 18' and longer Press Brakes are larger in diameter and stepped down to standard diameter on both ends. For installation of this size shaft, the left drive gear cover, drive gear and housing bearing must be removed. The housing bearing has tapped holes for pulling. Use a stud of sufficient length to pull this bearing.

CAUTION: Lifting equipment is required to remove these parts.

On these longer machines a center bearing is used to support the center of the drive shaft. Install the center bearing on drive shaft after it has passed through the left housing. The pads should be toward the right housing. Slide the bearing toward the left housing for later positioning when the housing brace is installed. After the drive shaft has been installed, the housing bearing, drive gear and drive gear cover should be reassembled.

The eight hex head screws that hold the retainer between the eccentrics and drive gear must be safety wired after installation. The heads of these screws are drilled for the wire.

Remove the oil seal (No. 4) and retainer (No. 3) from gear box cover on inside of the right housing. Place this seal and retainer on the drive shaft past the set of keyways for the intermediate gear. Lubricate the bore of intermediate gear (No. 1) and the drive shaft with "Molykote" grease (or an equivalent). Slide the drive shaft through the intermediate gear and start it into drive shaft bearing (No. 5).

Remove the six 1/2" studs threaded through gear case cover, located where the oil seal (No. 4) and retainer (No. 3) were bolted. These studs hold the intermediate gear (No. 1) in place for shipping. Raise the right pinion (No. 8) with a small pry bar to line up with drive shaft. This pinion was left in gear box for shipping. Align timing marks located on the pinion and the drive gear. They are stamped with "O" and painted with red lines. These marks are on both the right and left drive gears and pinions. The marks must line up. Push drive shaft through the pinion (No. 8).

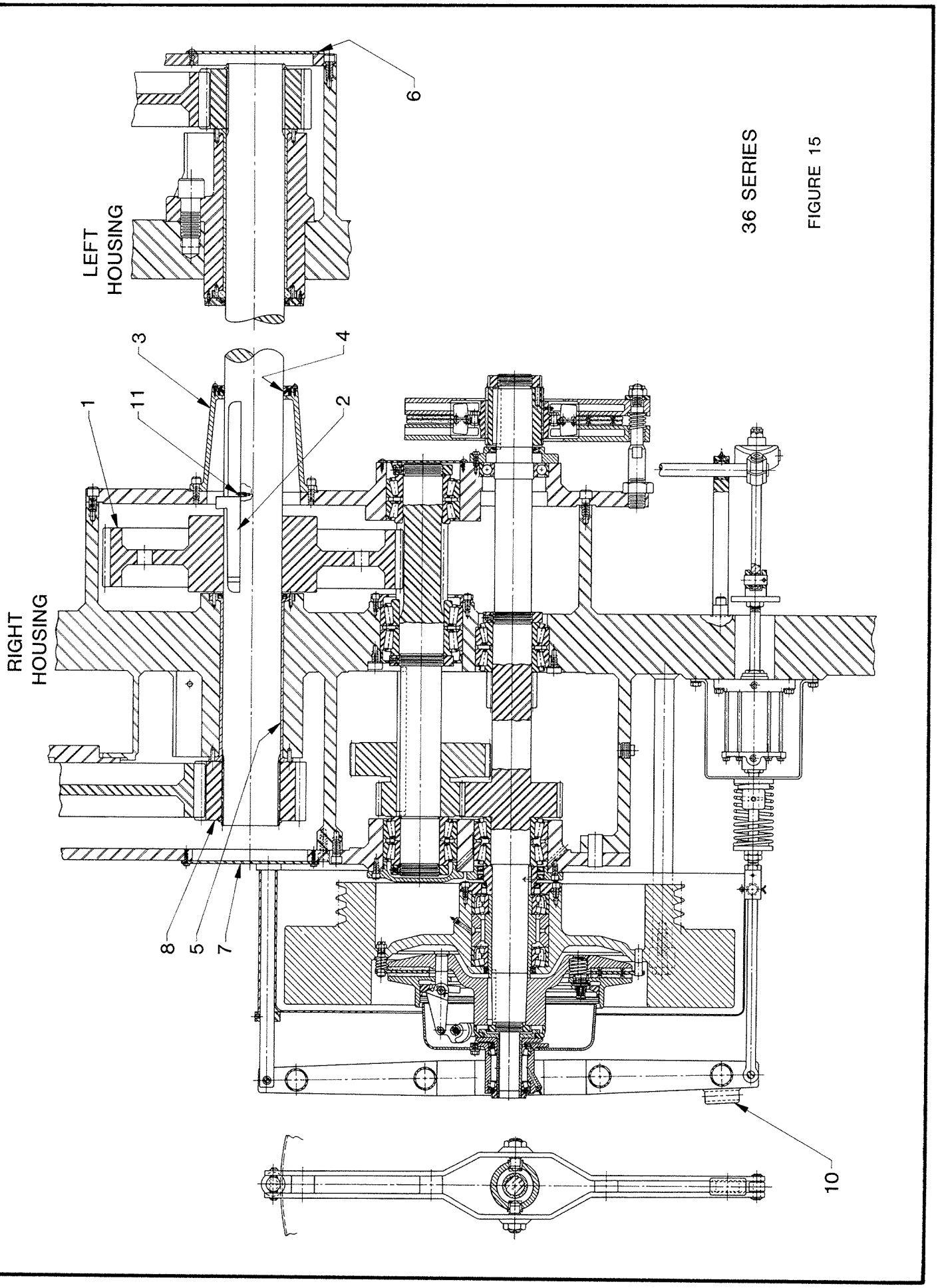
40-50 SERIES: Install the tapered keys (No. 9) in the right pinion.

Install tapered keys (No. 2) in the intermediate gear (No. 1). All keys are marked for installation. They have numbers stamped on them with corresponding numbers on the gear. Do not drive keys tight. Place keys into keyways loose so drive shaft end play can be set after installing housing brace.

36 SERIES: The drive pinions are splined to the shaft. The pinion is held captive with a snap ring. This snap ring can be installed after the pinion is in position. However, the intermediate gear keys (No. 2) must not be driven tight as described above.

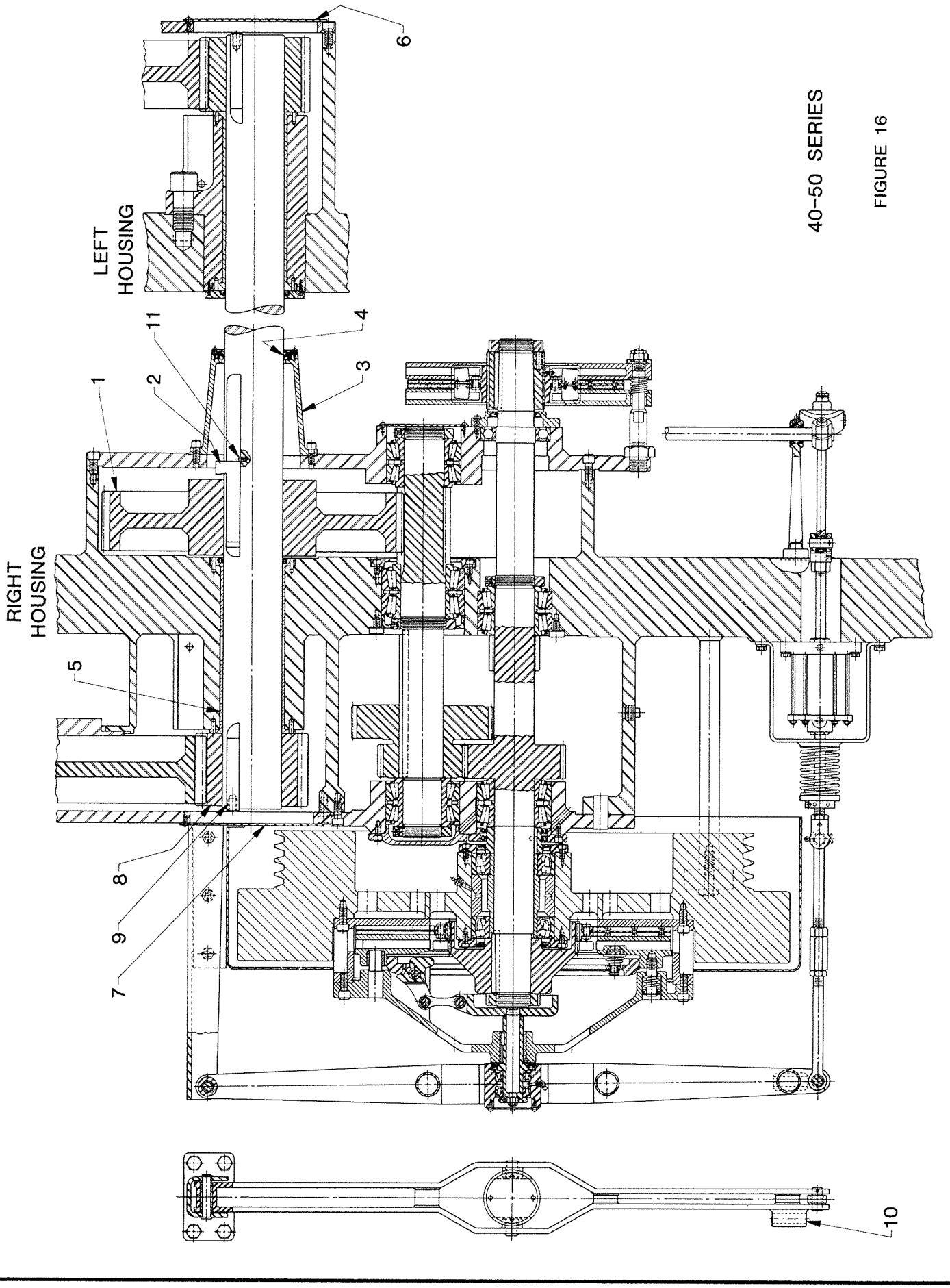
Move the eccentrics to the front quarter position by turning the flywheel by hand. Manually engage the clutch by placing a bar in lug (No. 10) and push toward right housing. When the front quarter position is reached, disengage the clutch. This will set the brake. Block between the ram slides and bed to hold eccentrics in this position.

Carefully install the housing brace. This brace acts as a spacer between the upper portions of the two housings. It is a close fit between the housings. Install housing brace bolts and tighten securely.



36 SERIES

FIGURE 15



40-50 SERIES

FIGURE 16

Remove blocks from between the slides and bed. Bring the eccentrics down to bottom of the stroke by using method previously described. 40-50 SERIES ONLY: Position the drive shaft pinions with .050" to .060" total clearance. Measure this clearance between the right pinion (No. 8) and bronze bushing (No. 5). Then drive the tapered keys tight.

> 36 SERIES: Drive shaft clearance is preset at factory. Install retaining rings on drive shaft.

Position the intermediate gear (No. 1) to the scribed line on drive shaft. Drive the tapered keys (No. 2) tight. Install the set screws (No. 11) behind these keys. Install the oil seal (No. 4) and retainer (No. 3) to the inside gear box cover. Install the pinion covers (No. 6 and No. 7) on the left and right gear guard covers. Fill the gear box with proper oil. See Lubrication instructions in this Section.

Tack weld head of housing brace bolts to the tubular spacers of the housing brace.

On the longer machines having a drive shaft center support bearing, slide the bearing into position with bracket on housing brace. Fasten with four bolts, shipped in tool box. Do not tighten bolts. Level the drive shaft by bracing it with a two-by-four and jack from the floor on each side of the bearing. When the drive shaft is level push the bearing against the bottom of the shaft. Then draw up the bolts to secure bearing to the bracket. Connect the oil line to the support bearing. Remove bracing from drive shaft.

Install ram elevating cross shaft in rear of ram location. Also install U-Brace between ram elevating worm boxes. Do not tighten the lock nuts. This will be done after the ram is installed.

FINAL ASSEMBLY - DISASSEMBLED MACHINES

Thoroughly clean the finished surfaces of both ram slides and matching surfaces on rear of ram. Grease both machined saddles of ram with No. 2 EP Lithium grease (C.I. grease H-2EP). Remove ram bolts and dowel pins from tool box and thoroughly clean. We recommend cooling the dowel pins in dry ice for at least two hours to make assembly easier.

> **CAUTION:** Do not touch dry ice or cooled pins with bare hands. Use gloves or other protective device.

Lift the ram with a cable of sufficient capacity. Position ram against front surfaces of ram slides. Line up ram bolt holes and dowel pin holes. Place a jack between bed and ram nose in front of each housing. Protect the finished surfaces with wood or soft metal. Apply pressure to seat the ram saddles to slide trunnions. Install ram bolts, but do not tighten securely. Remove the dowel pins from dry ice. Use caution when handling cooled pins. Severe frostbite could result. Drive in dowel pins. Make sure pins are driven in hole with stamped word "UP" to the top. Tighten the ram bolts securely. Use a six foot length of pipe on the wrench. Remove the jacks. Remove the lifting device and cable.

Remove die clamps from ram nose and clean all surfaces. Discard wood shipping spacers. Replace die clamps on ram nose.

Adjust swivel end guide bearing located on right ram slide. See Figure 17. Tighten both hex nuts equally, then back-off 1/4 turn. This will give .002" to .003" clearance.

19 THRU 34 SERIES ONLY: Install ram elevating cross shaft in front of ram. Also install U-Brace at the rear of ram between ram elevating worm boxes. Lock nuts for U-Brace must be tightened, then back-off 1/8 to 1/4 turn. This allows for tilt adjustment of the ram.

36, 40 AND 50 SERIES: Tighten and adjust locknuts at this time as described above.

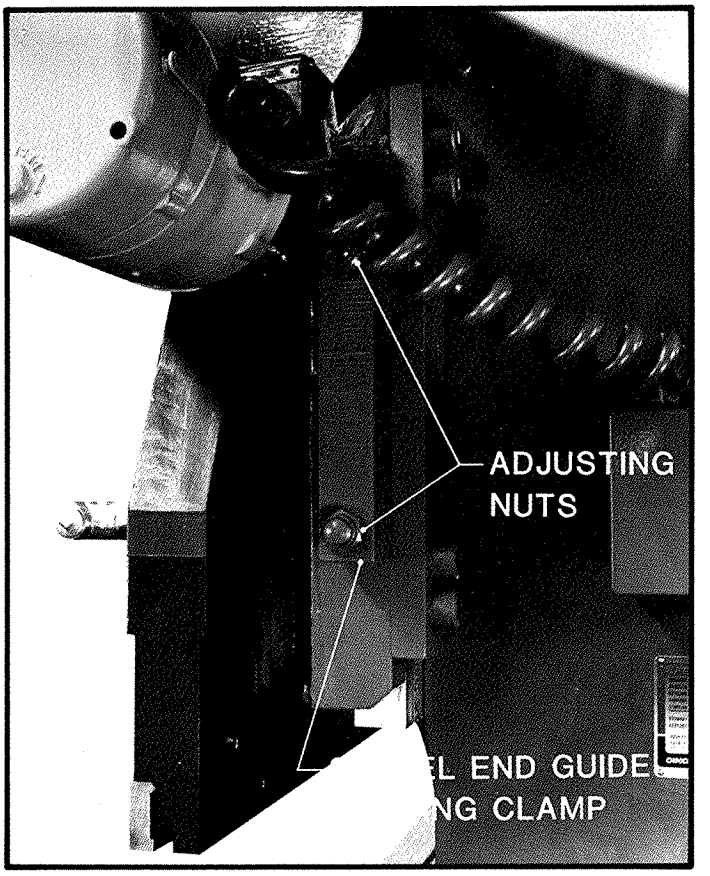


FIGURE 17

Install ram adjustment limit switch on the bracket at right end of U-Brace. Secure limit switch cam rod by bolting the clamp to inside of the right connecting rod tie bolt. Do not change the setting of the two factory set cams on this rod.

Install the main drive motor bracket on rear outside surface of the right housing. Use bolts shipped in tool box. Tighten bolts with the motor bracket in maximum up position. Lift the main drive motor on to the motor bracket. Secure with four hex head bolts shipped in the tool box. The motor drive vee belts were shipped in the flywheel grooves. Install the vee belts one at a time, starting with the belt closest to the housing.

> **CAUTION:** Do not get any portion of your body between the vee belts and the grooves. Serious injury could result if you are caught by the vee belts.

34-36 SERIES: Refer to Figure 18 to install the flywheel and belt guard. Remove retaining ring from upper pivot pin (No. 2) and the lower pivot pin (No. 3). Remove both pins. The lower clutch lever rod (No. 4) will drop down slightly. Disengage clutch lever (No. 1) from the upper clutch lever rod (No. 5) and rotate clutch lever (No. 1) to a horizontal position. Attach a lifting device to clutch lever. Loosen both hex nuts (No. 6) located at center of clutch lever. Disengage both pivot screws (No. 7) and remove

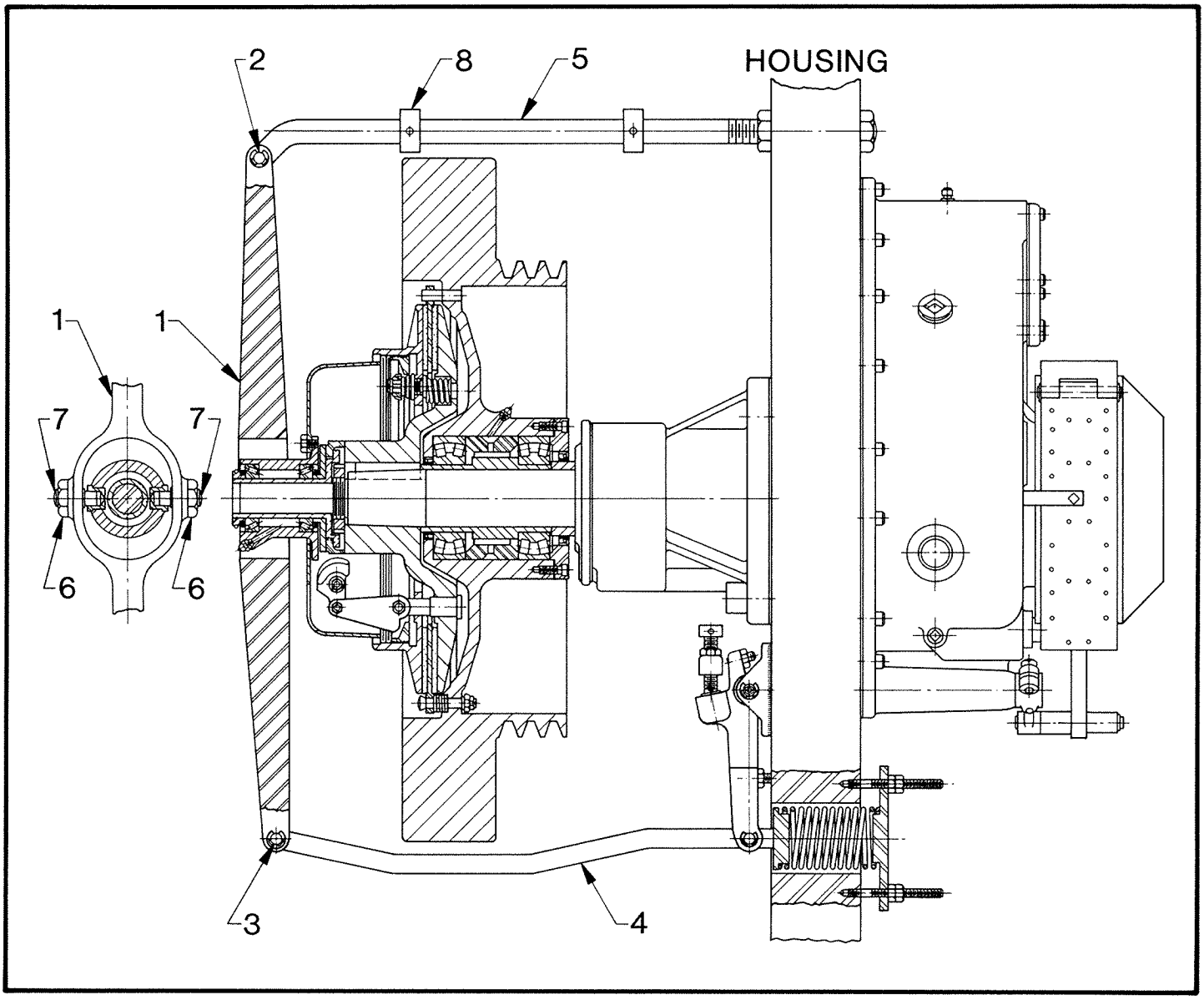


FIGURE 18

clutch lever. Remove outer spacing collar (No. 8) from the upper clutch lever rod (No. 5). This collar is positioned with a set screw. Install the flywheel and belt guard by sliding the loop on top of guard over the upper clutch lever rod (No. 5). On 34 Series the loop is bolted to the guard and must be removed for assembly.

40-50 SERIES: Refer to Figure 19 to install the flywheel and belt guard. Remove clutch lever (No. 4) by removing retaining ring from pin (No. 1) and cotter key from pin (No. 3). Attach clutch lever to a crane or other lifting device with a suitable rope or nylon sling. Raise lifting device to take slack out of sling. Remove pin (No. 3). (The end of pin which has hole for cotter key is a tap fit in the clutch lever. Tap pin out from opposite side.) Remove pin (No. 1). (The head of this pin is a tap fit in clutch lever support No. 2). Lower clutch lever (No. 4) with lifting device until rollers (No. 6) disengage from machined slots in sleeve assembly (No. 5). Remove rollers (No. 6) from the pins welded in the clutch lever. Set clutch lever and rollers on the floor.

Lift the flywheel and belt guard into position and bolt to the machine. To replace clutch lever (No. 4) attach top to lifting device with the sling. Turn sleeve assembly (No. 5) so that machined slots for rollers (No. 6) are vertical. Lightly lubricate the pins for rollers (No. 6) with grease (C.I. grease H-2). Lift the clutch lever and move it into position for assembly. The pins for rollers (No. 6) should be directly below the machined slots in sleeve assembly (No. 5). Assemble rollers (No. 6) on their pins. Lift clutch lever with the lifting device so that rollers enter bottom of slots in sleeve assembly (No. 5). Lubricate pin (No. 1) and (No. 3) with grease (C.I. grease H-2). Lift clutch lever (No. 4) and install pin (No. 1). This pin must be tapped into position for the last 1/2" of its length. Install retaining ring on pin. Remove sling and lifting device. Lift lower clutch rod into position and install pin (No. 3). Start pin in the side of clutch lever (No. 4) which has hole for cotter key. When tap fit diameter just starts into hole in clutch lever, rotate pin to line up the cotter key holes. Tap pin into position and install cotter key. NOTE: Use a new cotter key, do not reuse old cotter key. Cotter key should be tapped firmly into position before bending tabs.

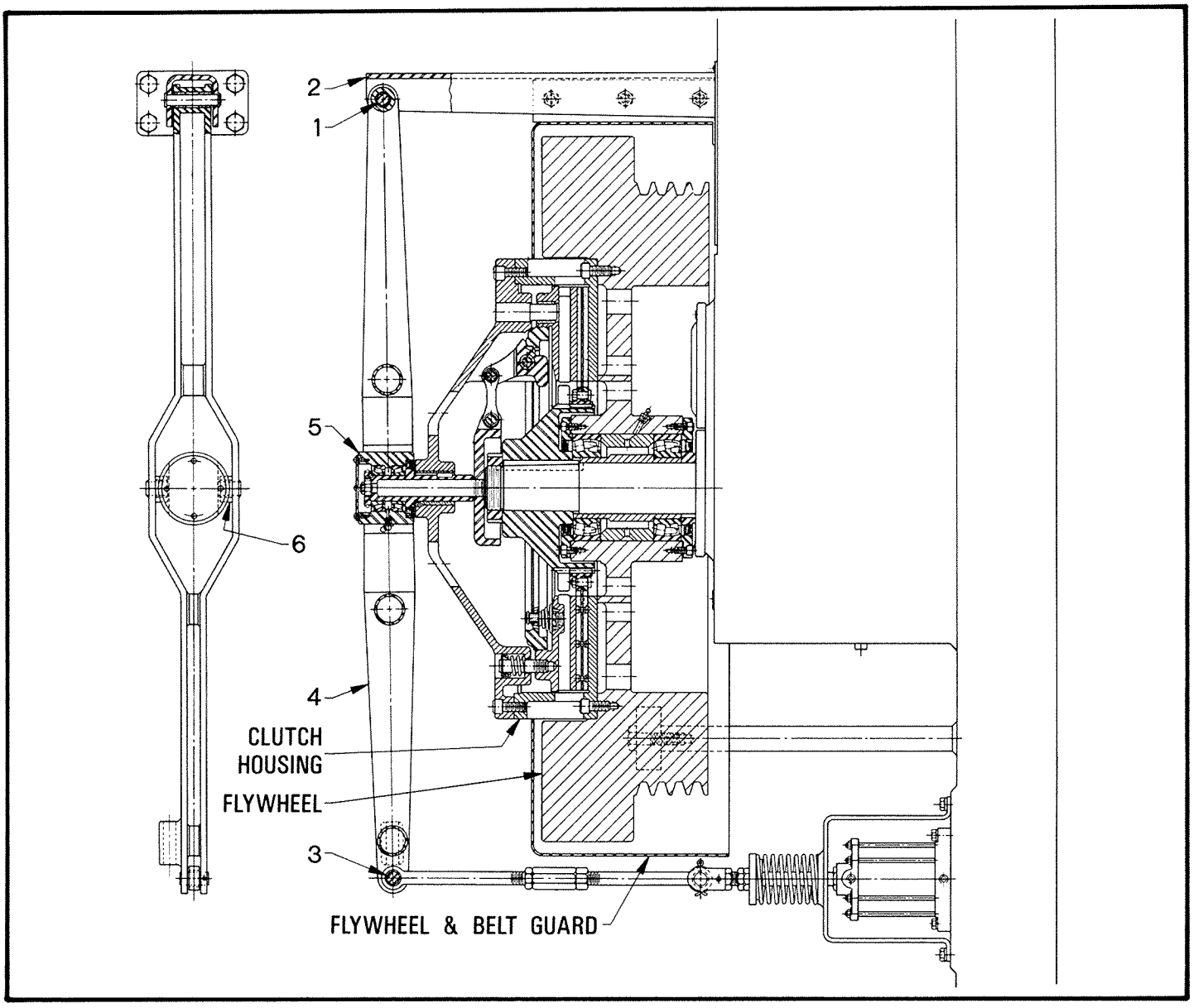


FIGURE 19

CLEANING

Remove the long operating links from lubricators to pitmans. Remove the ram slide clamps. Loosen the two nuts on the swivel end guide clamp (Figure 17) on right ram slide. Remove the end guide bearings. Swing the ram (ram slides) outward.

> **CAUTION:** Keep fingers and hands from between slide and guide surfaces to prevent injury.

Remove the laminated plastic strips from between the slides and guides. These strips are used for shipping and must be removed before running the machine. Use an aliphatic solvent, such as Stoddards solvent or mineral spirits, to flush protective grease from between slides and guides. Allow surfaces to dry and then lubricate with oil. Thoroughly clean protective grease from all other parts of the machine. Go over the grease with a rag wet with solvent and allow to soak. Wipe off grease with clean rags, not waste. A stiff brush will get into corners. Do not use an air hose. The pressure will drive grit and dirt into bearing surfaces. After cleaning the machine thoroughly, wipe dry, and oil lightly. A periodic cleaning of the machine after installation is recommended.

Swing the ram slides back against the ram guides. Install the swivel end guide bearings on the right ram slide. Replace the ram slide clamps on both ram slides and tighten. For machines shipped disassembled, leave the end guide bearing adjustment loose until after ram is installed. For other machines, tighten both hex nuts equally. Then back-off 1/4 turn. This will give .002" to .003" clearance. Re-install the operating links to the lubricators and connecting rods.

LEVELING

CINCINNATI Press Brakes are leveled by placing flat steel shims of proper thickness under the housing feet as required. Use a precision level graduated in .005" per foot - not a carpenter's or machinist's level. Always wipe the level and bed surface clean before placing the level on the bed. See Figure 20. Give the bubble of precision level a full half minute to come to absolute rest.

The 5 Series through 13 Series machines can be raised or lowered by using leveling screws in the housing angles or feet. Use at least a two foot length of pipe on the wrench. See Figure 21. On 21 Series and larger machines drive a wedge under

the housing foot to raise the housing. See Figure 11. The foundation bolt nuts must be loosened, not removed, before raising the machine. Before checking the level of the machine, the foundation bolts must be securely retightened.

FIGURE 20

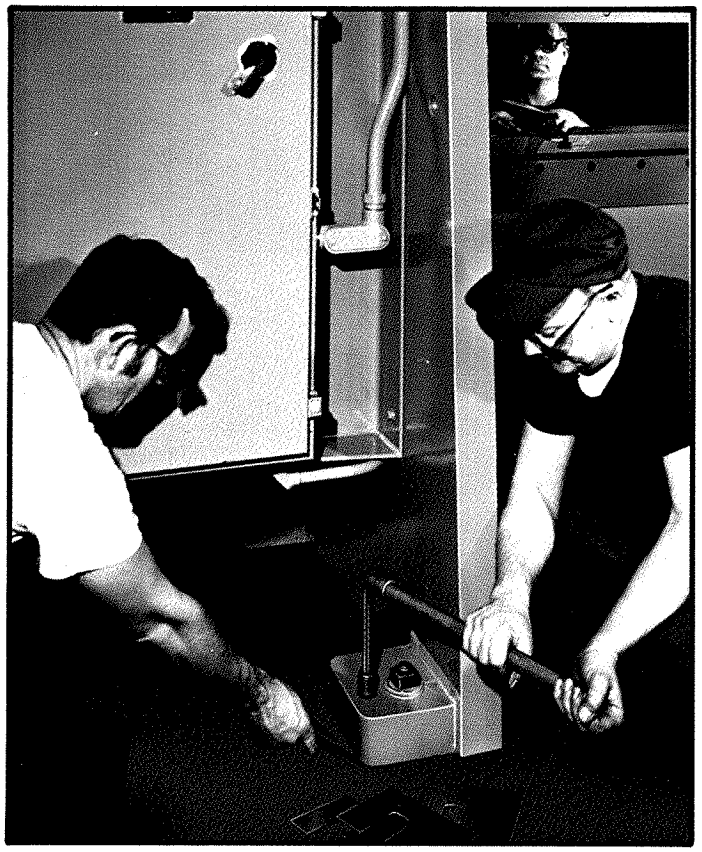


FIGURE 21

Start leveling by checking the setting of machine lengthwise. Place the level in center of bed parallel to edges of bed. Level the machine lengthwise by placing the required metal shims under the low housing feet, both front and back. Let the Press Brake down, tighten foundation bolts and recheck level. Repeat until machine is level lengthwise.

IMPORTANT

The housing feet must be resting on the shims and not on the screws or wedges when reading the level. Foundation bolt nuts must be tight.

Level the Press Brake front-to-back with the level placed crosswise on bed. See Figure 20. Check first with the level at right end of machine and then at left end. Add or remove shims under the front or back housing feet as required. Level readings on both ends of bed must be alike within .001". Recheck lengthwise level and repeat above procedure until machine is level in all directions. The nuts on 1" foundation bolts should be torqued to about 454 ft. lbs., 1-1/4" nuts torqued to 815 ft. lbs. and 1-1/2" nuts torqued to about 1350 ft. lbs.

Check the ram slide clearance with feeler gages as shown in Figure 22. This is to make sure there is no twist in the machine due to being out of line. If all the clearance (.006" to .008") is at TOP FRONT and BOTTOM REAR on one slide and the reverse condition, all clearance at TOP REAR and BOTTOM FRONT on the other slide, there is twist in the ram. Regardless of level of the bed, if this condition is not corrected the slides may score. Raise or lower the rear of either housing to relieve twist in the machine. Some clearance must appear at the points which have been tight. Clearance must not vary more than .001" across face of guides.

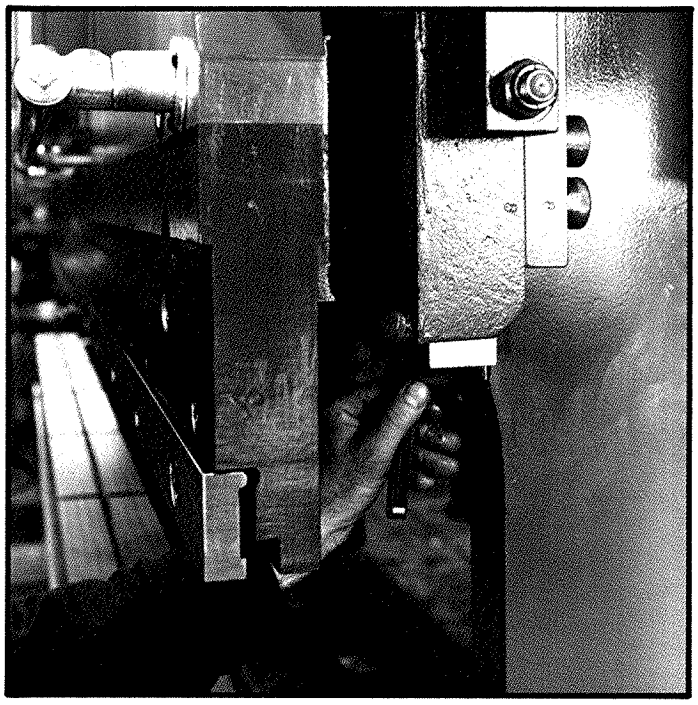


FIGURE 22

These slide clearances are considered to be the final and most important check on the level of the machine since they are actual running clearances.

After the machine is level retighten foundation bolt nuts to torque previously specified. Recheck slide clearances. Do not remove shims. Alignment may not be permanent. Recheck level in a few weeks. Do not use any grouting around machine. Leave bed pit (if any) empty and cover with steel plate.

ELECTRICAL CONNECTIONS

For machines shipped disassembled, connect all electrical leads which were disconnected for shipment. Refer to the electrical wiring diagram in the main electrical enclosure or at the rear of this manual.

Suitable electrical leads must be brought to the machine as shown on the certified foundation drawing. These leads are connected to incoming side of electrical disconnect switch in the main electrical enclosure. Be certain that the leads are of sufficient capacity and that proper voltage is supplied to the machine.

Turn power ON at the factory power supply disconnect switch and at the machine disconnect switch. Press the main drive motor START and STOP buttons to jog the main drive motor. Check the rotation of the flywheel. It should be turning in the same direction as indicated by arrow on flywheel guard. If rotation is not correct, turn OFF power at factory disconnect switch and lock switch. Reverse any two of the incoming leads to disconnect switch in machine electrical enclosure. Do not change any leads beyond disconnect switch. Restore power and recheck direction of flywheel rotation.

RAM TILT ADJUSTMENT

Place a hard wood block in the center of bed and ram. The grain should be vertical. Turn ON the disconnect switch. Lower the ram by means of the ram adjusting mechanism. Press the "DOWN" button on the moveable magnetic base control (Figure 48) until the ram jams against the block. Measure the distance between the ram nose and bed top in front of each housing. If the measurements are not equal, adjust ram tilt by disengaging clutch with clutch lever (Figure 47). Run the right screw up or down with the ram adjusting motor as required. Use a dial indicator when checking the ram for parallelism. After the ram is parallel to bed, set the direct reading counters to read alike if necessary. To set counters, remove the left counter and turn by hand.

LUBRICATION

Proper lubrication is of extreme importance if any piece of equipment is to have long life and troublefree operation. Strict observance of all lubrication instructions contained in this manual will pay dividends in lower maintenance costs for your Press Brake.

The following lubrication points should be checked before start-up and at regular intervals thereafter to assure proper lubrication. See Figure 24 through 32.

AUTOMATIC LUBRICATOR

This lubricator supplies oil under pressure to the guides and bearings of the Press Brake. It should be refilled when the oil level gets down to the lower window. Use a good grade hydraulic oil with a viscosity of 300 seconds at 100° F (C.I. oil B-315). Refer to the Recommended Lubricants chart after manual. The capacity is one gallon.

The lubricator automatically feeds oil when the machine is operating. When the machine is started up after standing idle for 48 hours, turn the hand crank until oil appears at the ram guide farthest away from the lubricator. We recommend at least 40 turns of the hand crank. Eight turns of the hand crank supplies oil through each of its lines. The sight feeds should be set so that it feeds 3 to 4 drops of oil at a time. The oil feed will be seen in the window during one turn of the hand crank and then not for seven turns.

GEAR BOX

All machines, except the standard 4-5 Series, have one or more gear boxes. Check the oil level weekly and refill if necessary. Use a good grade non-foaming extreme pressure gear oil of the sulphur-phosphorus type. Viscosity of 700-1000 seconds at 100° F (C.I. oil G-850). Refer to the Recommended Lubricants after manual. For the location of the gear boxes and their capacities refer to the Lubrication Points illustrated in Figure 24 through Figure 32 for the appropriate series Press Brake. Change the oil after 2000 hours of operation or once a year, whichever occurs first.

FLYWHEEL SHAFT BEARING & CLUTCH SHIFTER

All machines, except Automatic Cycle Press Brakes, have a grease fitting on the clutch lever and the rear side of the flywheel to provide lubrication for the flywheel shaft bearings. Apply a No. 2 lithium soap base grease (C.I. grease H-2) with a grease gun every six months. Do not over lubricate.

Press brakes shipped prior to April, 1968 were lubricated with a sodium base grease (Whitmore's was recommended), which was entirely satisfactory. However, this type of grease may no longer be readily available. To change to the lithium base grease the flywheel bearings and all adjacent parts must be disassembled and thoroughly cleaned with solvent. After reassembly, repack with lithium soap base grease. Under no circumstances, should the sodium grease and the lithium grease be mixed, as a chemical breakdown occurs which results in a loss of lubricating qualities and a considerably shortened bearing life.

FLYWHEEL

The 4-5 Series and 12-13 Series Automatic Cycle flywheels contain an oil reservoir. Rotate the flywheel to position shown in Figure 23 and remove filler plug "A" and oil level plug "B". Fill with oil until level reaches the drain hole. Use the same gear oil, and check and change frequency as specified for the gear box.

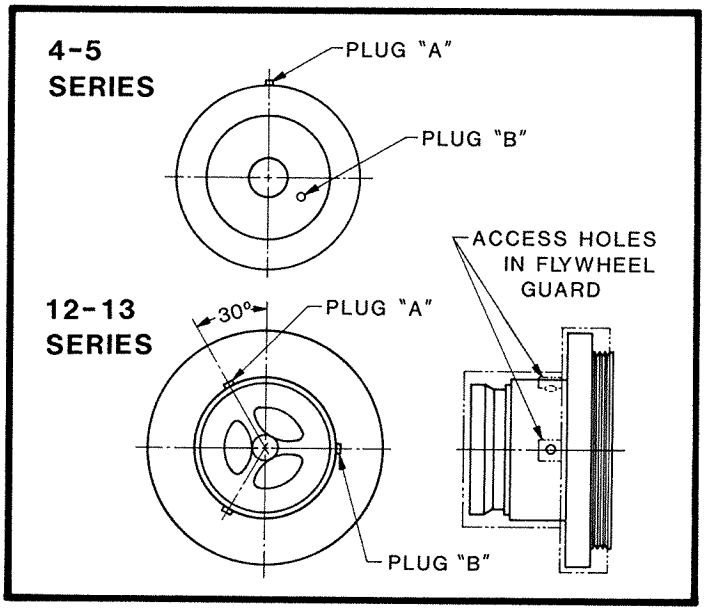


FIGURE 23

RAM ADJUSTMENT WORM GEAR BOXES

The 4 Series through 13 Series Press Brakes have a grease fitting on each of the two gear boxes. Apply a No. 2 lithium soap base grease (C.I. grease H-2) with a grease gun every 6 months.

The 36, 40 and 50 Series Press Brake has an oil filler plug in the top of each worm box. Remove the plug and fill to bottom of the opening with a worm gear oil, viscosity of 2150 seconds at 100° F with 5% - 7% acidless tallow (C.I. oil F-2150). Check oil level every three months.

Worm gear boxes for the 19, 21 and 34 Series are lubricated at manufacture and the level is maintained by the automatic lubricators.

RAM ELEVATING GEAR BOX

The 4 thru 13 Series and 34 Series Press Brakes are greased at manufacture. To repack the gear box, remove the ram elevating motor and the gear box cover plate. Use No. 2 lithium soap base grease (C.I. grease H-2). Check and repack every three years.

The 19-21 Series elevating gear box has two pipe plugs on the lower left side. Remove the upper plug to check and refill oil. Use medium heavy hydraulic oil with viscosity of 315 seconds at 100° F (C.I. oil B-315). Check oil level every six months. In addition, there is a grease fitting on the left side of the gear box. Apply a No. 2 lithium soap base grease (C.I. grease H-2) every six months.

The 36, 40 and 50 Series has an oil level gage in the front of the elevating gear box. Maintain oil level with a sulphur-phosphorus extreme pressure gear oil with a viscosity of 700-1000 seconds at 100° F (C.I. oil G-850). Change oil annually by removing drain plug in bottom of gear box.

OPEN DRIVE GEARS

The standard type 4-5 Series drive gear can be lubricated at the guard opening at the pinion or by removing the gear guard. Apply a heavy open gear grease with an adhering fiber (C.I. grease H-8) with a brush or spray every twelve months.

The above grease can be applied to the 19, 21 and 34 Series drive gears by warming the lubricant and pouring it through a hole in the gear guard. Grease every twelve months.

AIR LINE LUBRICATORS

Air line lubricators are used on all air clutch and automatic cycle Press Brakes, as well as for other optional pneumatic control devices. Keep lubricator filled with medium hydraulic oil with a viscosity of 215 seconds at 100° F (C.I. oil B-215).

FOOT TREADLE BRACKET

The standard type 4-5 Series Press Brakes having the optional manual foot control has a grease fitting on the treadle bracket. Use No. 2 lithium soap base grease (C.I. grease H-2) every six months.

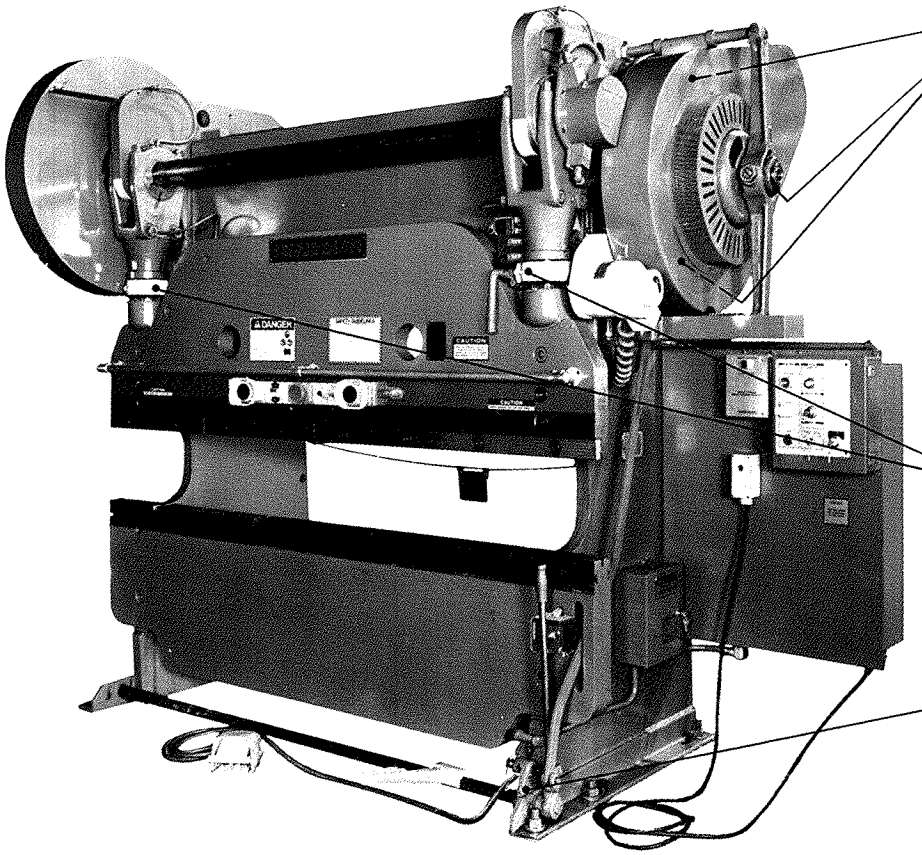
MISCELLANEOUS GREASE FITTINGS

Some machines having grease fittings not mentioned above should be lubricated with a No. 2 lithium soap base grease (C.I. grease H-2) every six months.

DRIVE MOTORS

Lubricate the motors according to the manufacturer's recommendations or at least once a year. Do not over lubricate.

LUBRICATION POINTS - 4-5 SERIES PRESS BRAKE

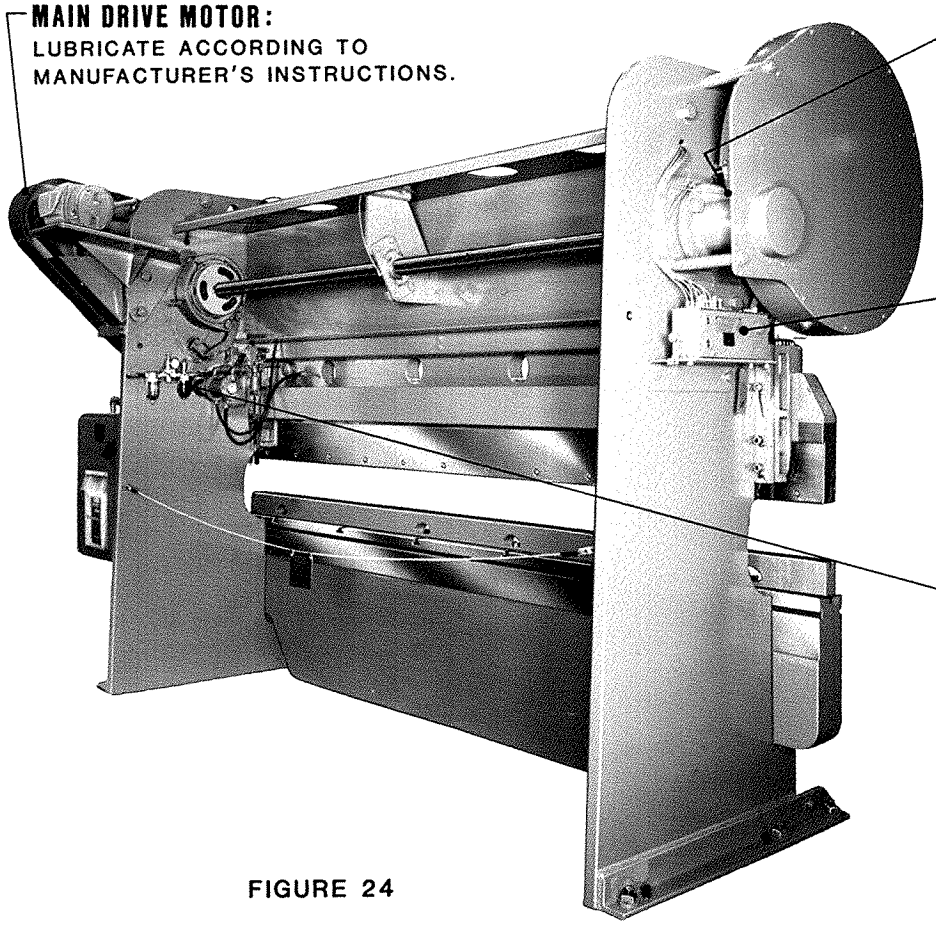


FLYWHEEL BEARINGS, CLUTCH SHIFTER & BELLCRANK PIVOT PIN:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTINGS WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

TREADLE BRACKET (Optional):
SERVICE GREASE FITTING WITH #2 GREASE AS SPECIFIED ABOVE.

MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.



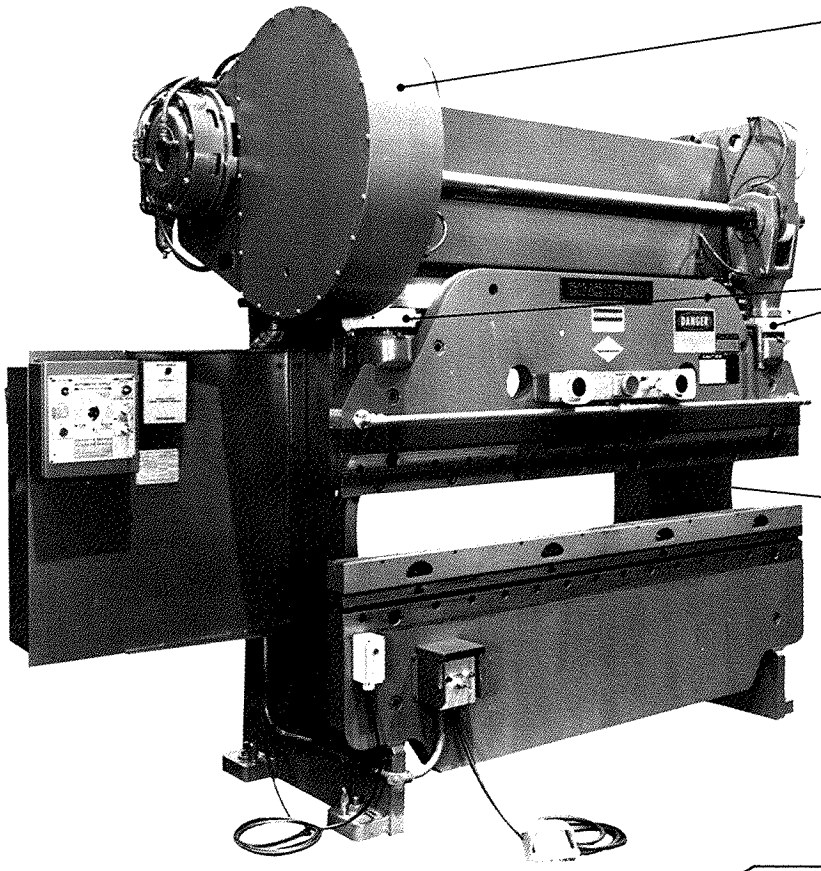
DRIVE GEAR:
APPLY HEAVY OPEN GEAR GREASE CONTAINING ADHERING FIBER (C.I. GREASE H-8) TO GEAR TEETH. REMOVE SMALL GUARD ABOVE PINION FOR NEWER MACHINES. LUBRICATE EVERY 12 MONTHS.

AUTOMATIC PRESSURE LUBRICATOR:
KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON. GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. CAPACITY: 1/2 PINT.

FIGURE 24

LUBRICATION POINTS - 4-5 SERIES AUTOMATIC CYCLE PRESS BRAKE



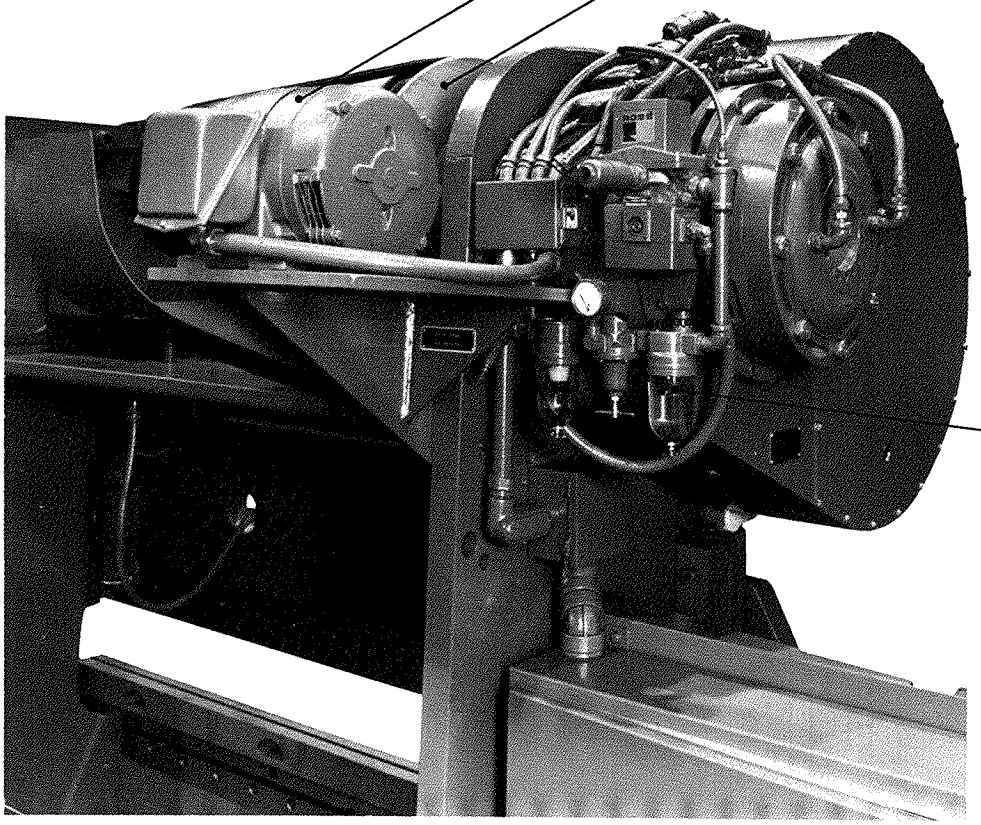
GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 4 GALLONS.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTINGS WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

AUTOMATIC PRESSURE LUBRICATOR:
KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

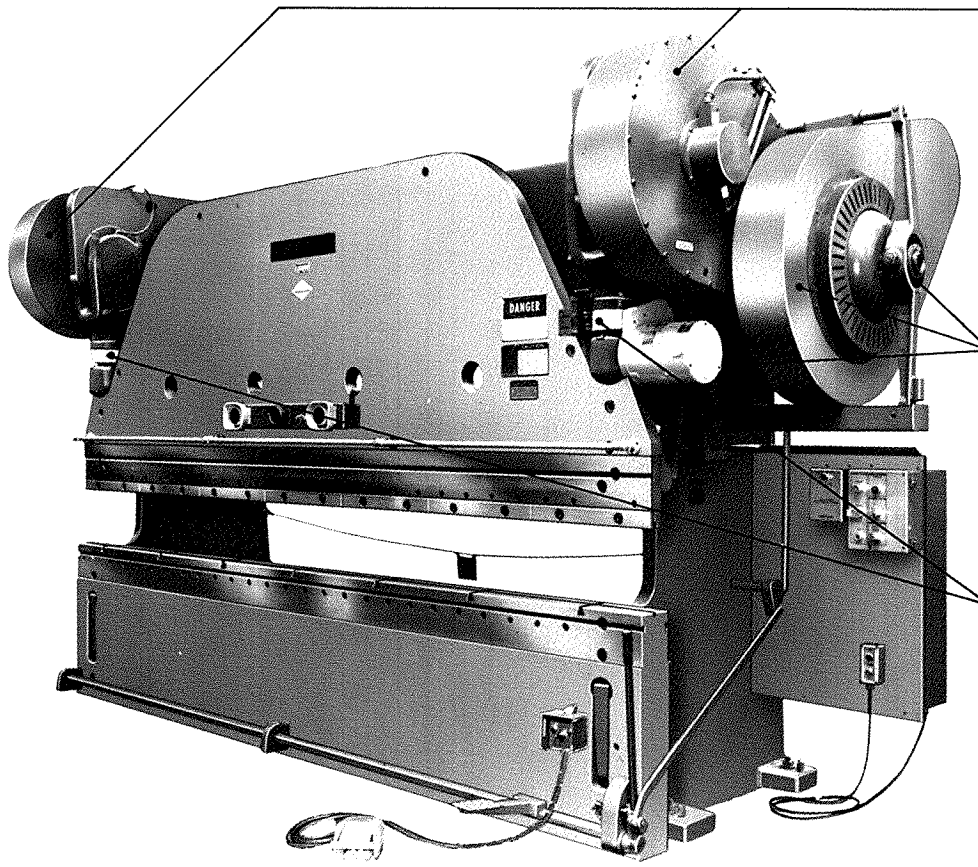
FLYWHEEL:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). WITH FILLER HOLE IN VERTICAL POSITION, FILL UNTIL OIL RUNS OUT VENT HOLE. CHECK EVERY MONTH. CAPACITY: 5 QUARTS.



AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY 1/2 PINT.

FIGURE 25

LUBRICATION POINTS - 7-9 SERIES PRESS BRAKE

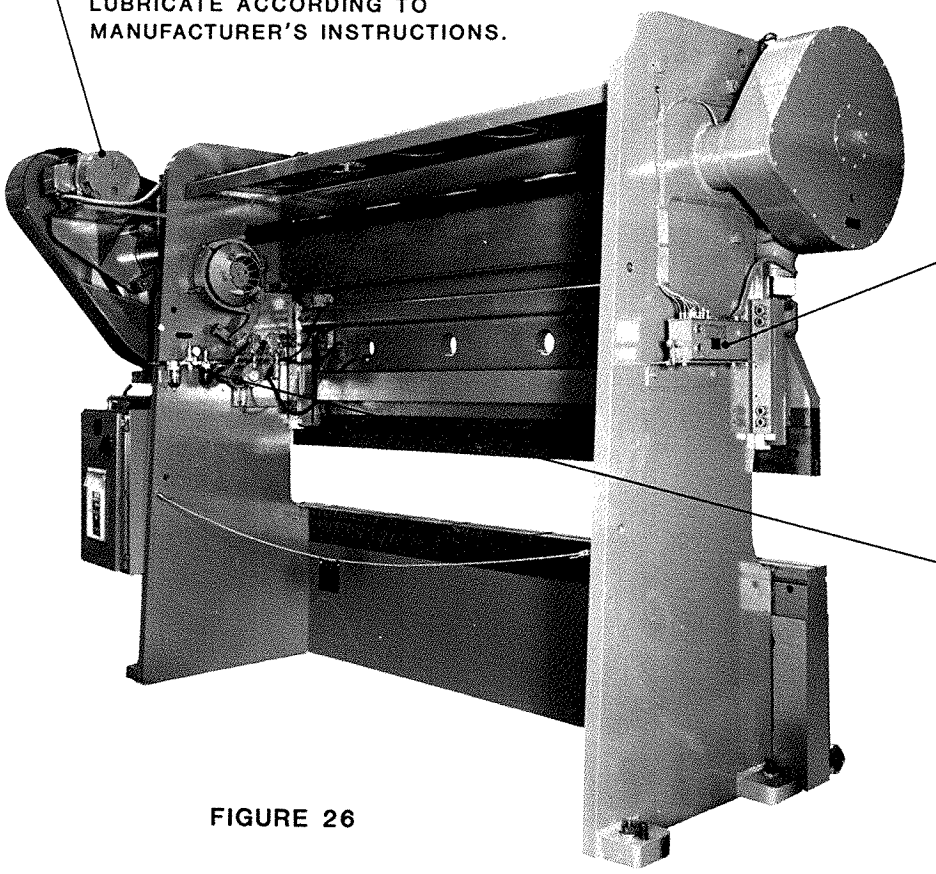


GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 3 GALLONS IN LEFT GEAR BOX, 4 GALLONS IN RIGHT GEAR BOX.

FLYWHEEL BEARINGS, CLUTCH SHIFTER AND BELLCRANK PIVOT PIN:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTINGS WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

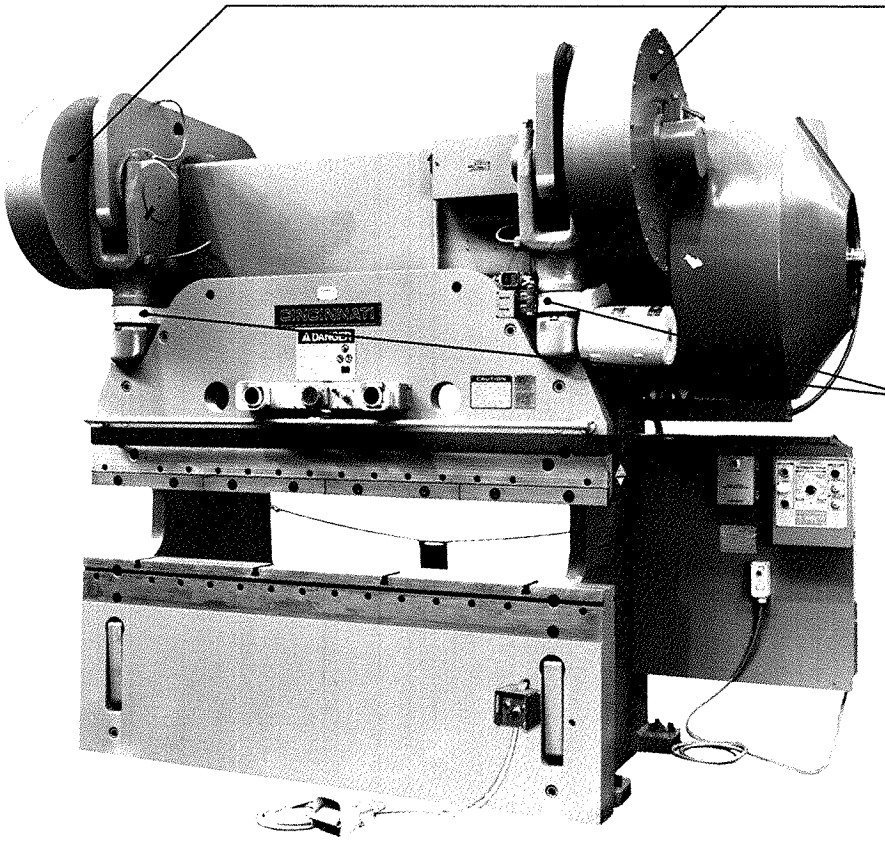


AUTOMATIC PRESSURE LUBRICATOR:
KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100°F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

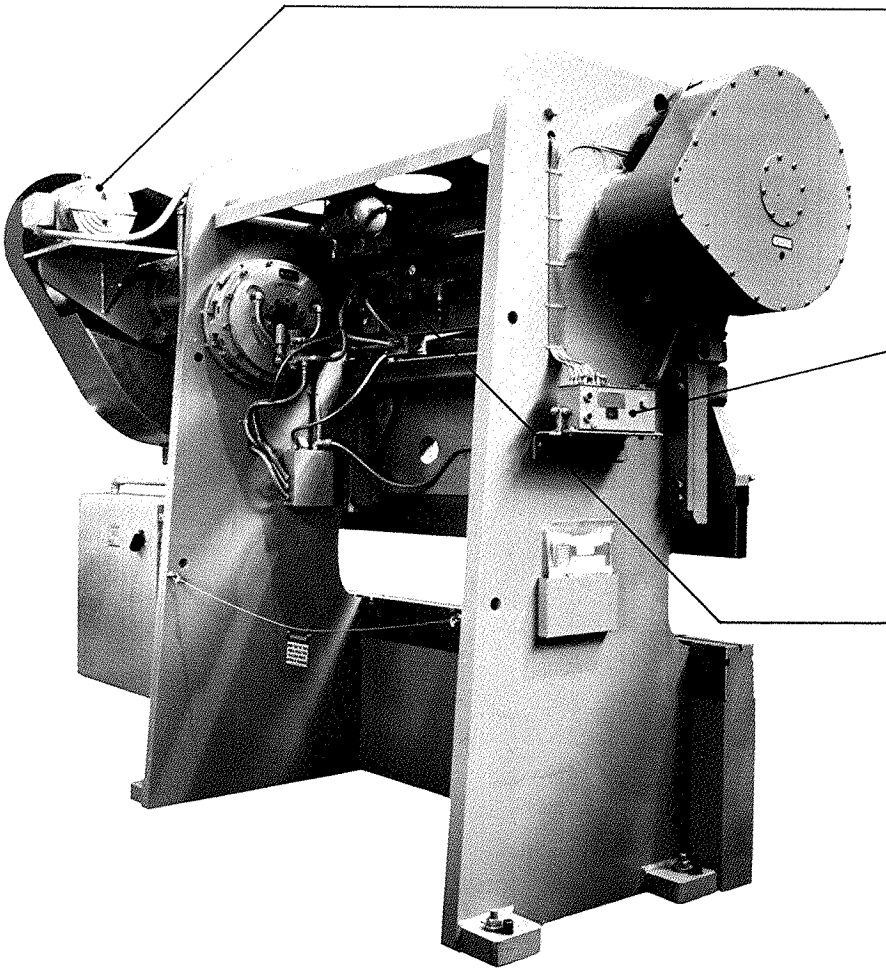
FIGURE 26

LUBRICATION POINTS - 7-9 SERIES AUTOMATIC CYCLE PRESS BRAKE



GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 3 GALLONS IN LEFT GEAR BOX & 4 GALLONS IN RIGHT GEAR BOX.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTINGS WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.



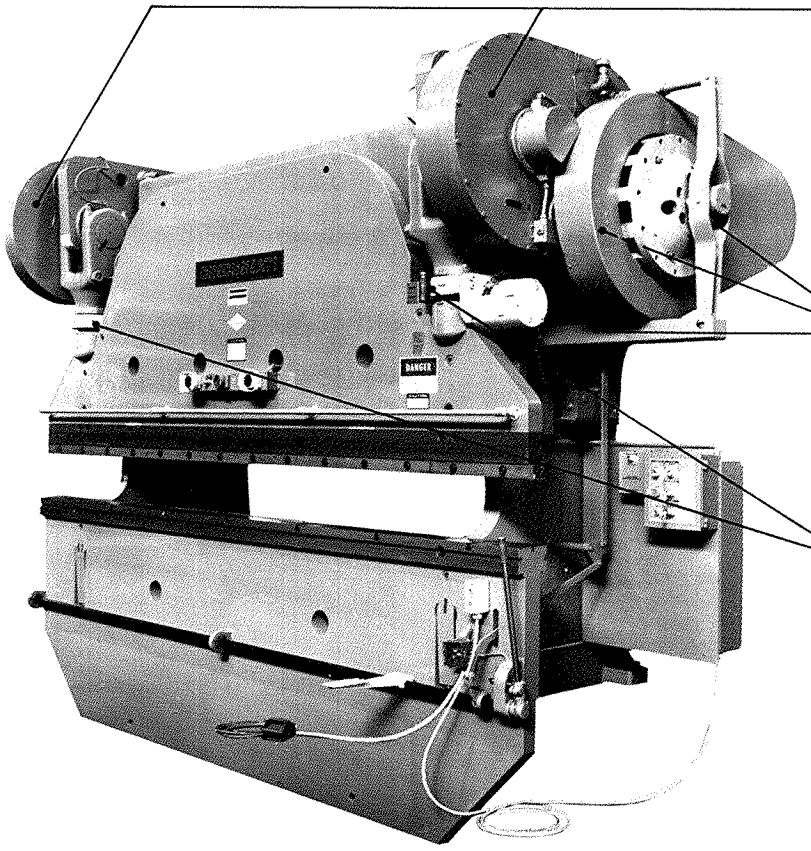
MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

AUTOMATIC PRESSURE LUBRICATOR:
KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

FIGURE 27

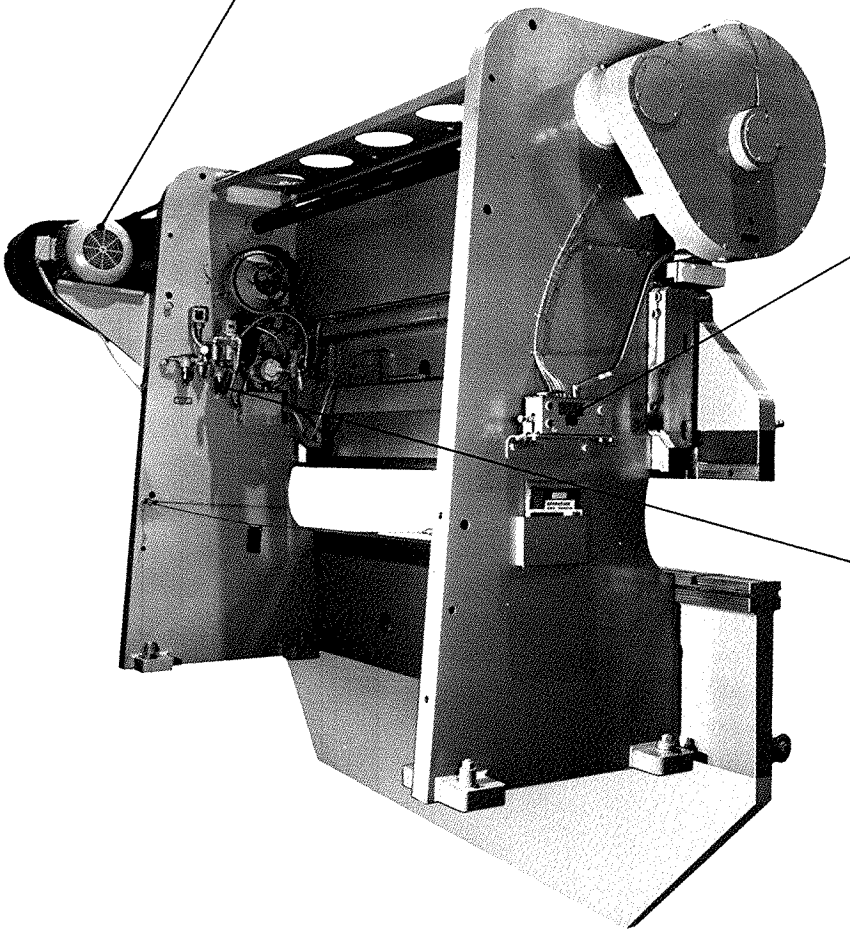
LUBRICATION POINTS - 12-13 SERIES PRESS BRAKE



GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 1-1/4 GALLONS IN LEFT GEAR BOX, 8 GALLONS IN RIGHT GEAR BOX.

FLYWHEEL BEARINGS, CLUTCH SHIFTER AND BELLCRANK PIVOT PIN:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.



MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

AUTOMATIC PRESSURE LUBRICATOR:
(ONE LUBRICATOR ON EACH HOUSING) KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS. CAPACITY: 1 GALLON.

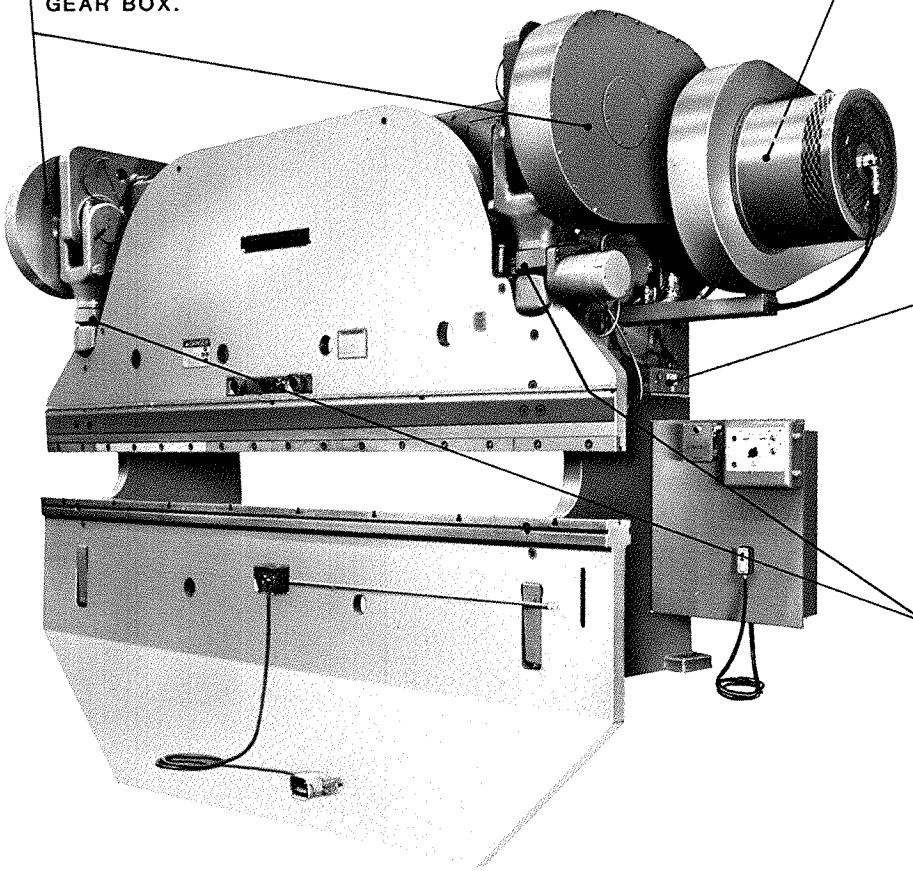
AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

FIGURE 28

LUBRICATION POINTS - 12-13 SERIES AUTOMATIC CYCLE PRESS BRAKE

GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 1-1/4 GALLONS IN LEFT GEAR BOX, 8 GALLONS IN RIGHT GEAR BOX.

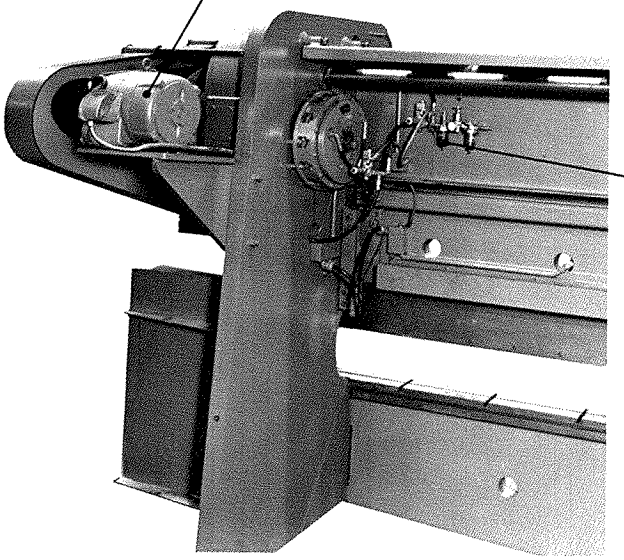
PLANETARY GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). REMOVE PLUGS IN FLYWHEEL THROUGH OPENINGS IN GUARD. WITH VENT HOLE IN REAR IN HORIZONTAL POSITION AND FILLER HOLE 30° FROM TOP TOWARDS FRONT, FILL UNTIL OIL REACHES LEVEL OF VENT HOLE. CHECK WEEKLY AND MAINTAIN LEVEL.
CAPACITY: 2-1/2 GALLONS.



AUTOMATIC PRESSURE LUBRICATOR:
(ONE LUBRICATOR ON EACH HOUSING). KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315).
CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

RAM ADJUSTMENT WORM BOXES:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2).
LUBRICATE EVERY 6 MONTHS.

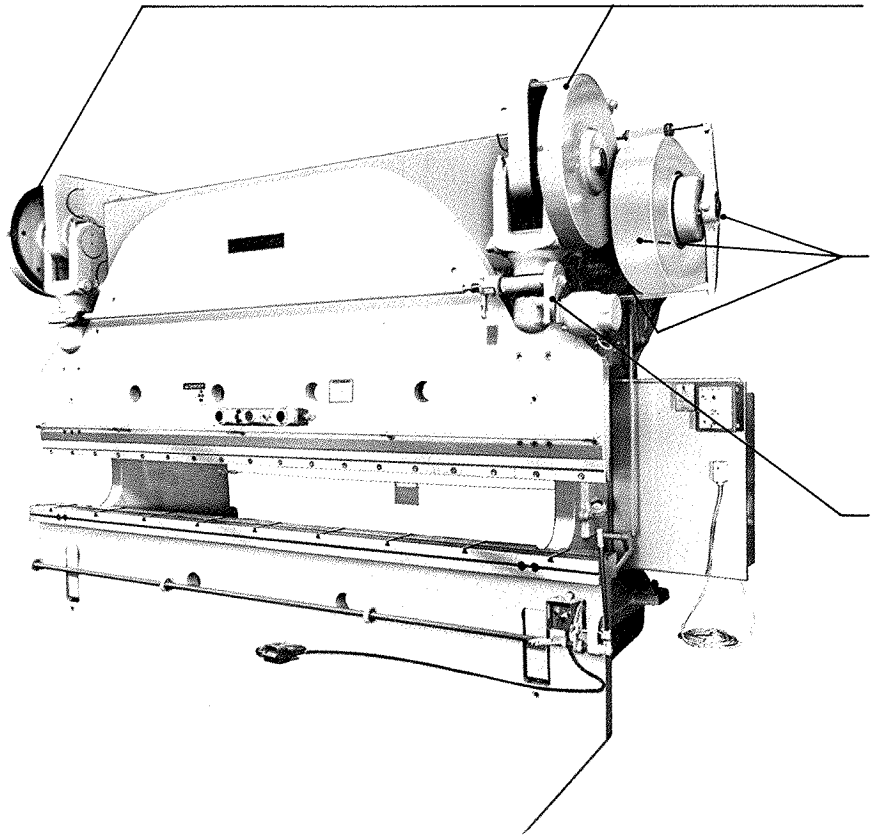
MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.



AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215).
CAPACITY: 1/2 PINT.

FIGURE 29

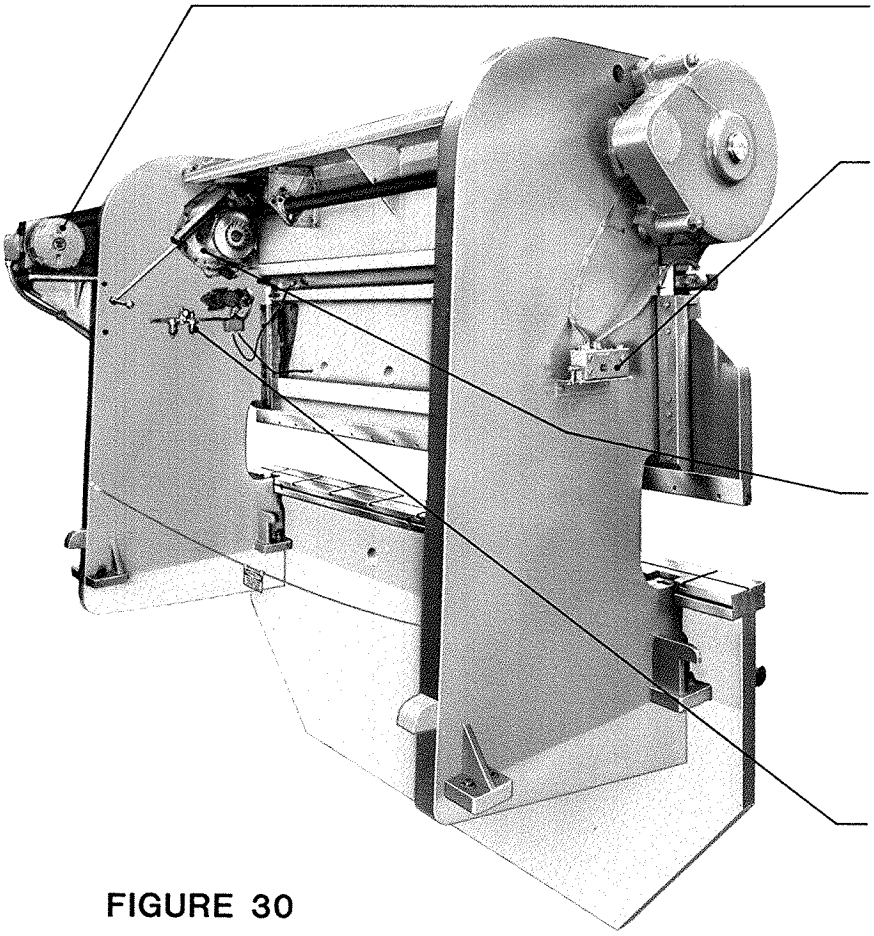
LUBRICATION POINTS - 19-21 SERIES PRESS BRAKE



DRIVE GEAR:
APPLY HEAVY OPEN GEAR GREASE WITH ADHERING FIBER (C.I. GREASE H-8) TO GEAR TEETH. WARM LUBRICANT FOR POURING THROUGH HOLE IN GUARD. LUBRICATE EVERY 12 MONTHS.

FLYWHEEL BEARINGS, CLUTCH SHIFTER AND BELLCRANK PIVOT PIN:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

RAM ELEVATING GEAR BOX:
USE MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). KEEP FILLED TO BOTTOM OF UPPER PIPE PLUG HOLE. CHECK EVERY 6 MONTHS. CAPACITY: 1 PINT.



MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

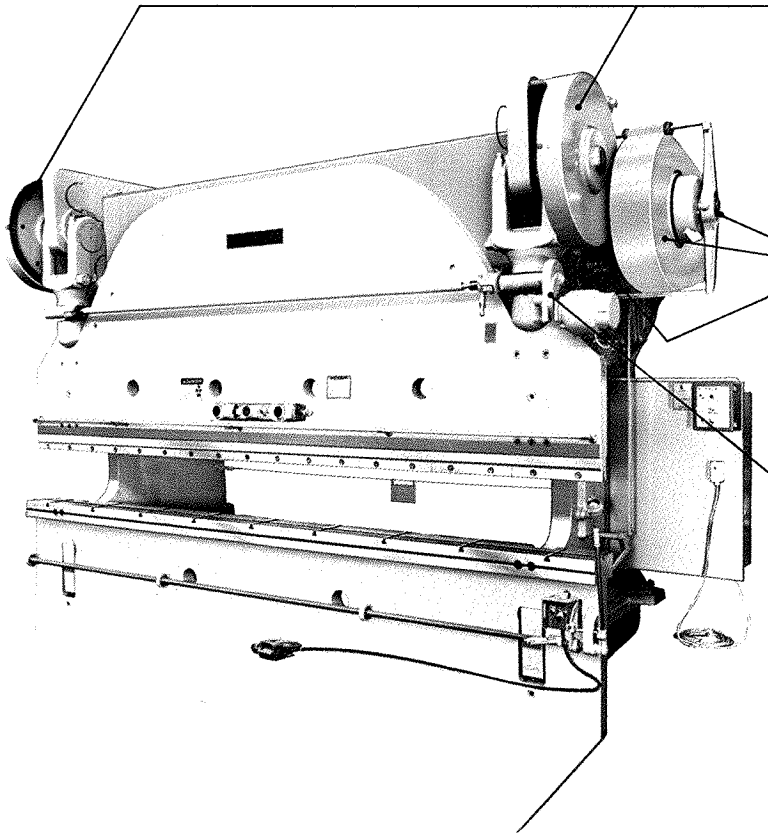
AUTOMATIC PRESSURE LUBRICATOR:
(ONE LUBRICATOR ON EACH HOUSING). KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

GEAR BOX:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 3 GALLONS FOR SINGLE SPEED, 3-1/2 GALLONS FOR TWO SPEED.

AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

FIGURE 30

LUBRICATION POINTS - 34 SERIES PRESS BRAKE



DRIVE GEAR:

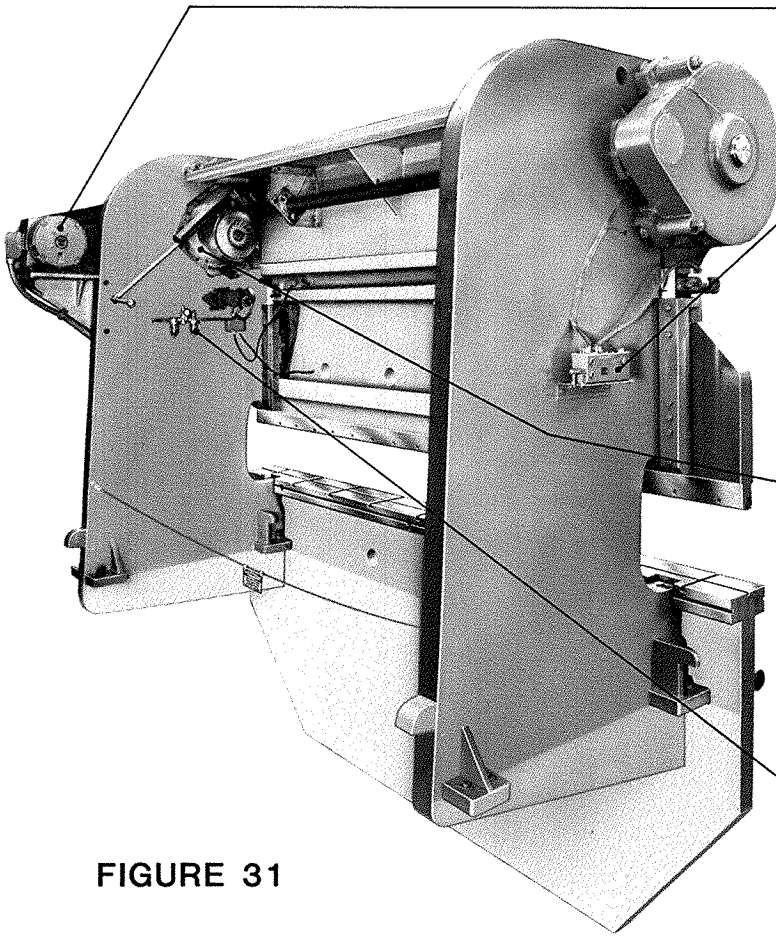
APPLY HEAVY OPEN GEAR GREASE WITH ADHERING FIBER (C.I. GREASE H-8) TO GEAR TEETH. WARM LUBRICANT FOR POURING THROUGH HOLE IN GUARD. LUBRICATE EVERY 12 MONTHS.

FLYWHEEL BEARINGS, CLUTCH SHIFTER AND BELLCRANK PIVOT PIN:

SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

RAM ELEVATING GEAR BOX:

APPLY GREASE TO GEAR TEETH IN GEAR BOX. USE #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 3 YEARS.



MAIN DRIVE MOTOR:

LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

AUTOMATIC PRESSURE LUBRICATOR:

(ONE LUBRICATOR ON EACH HOUSING). KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

GEAR BOX:

USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 3 GALLONS FOR SINGLE SPEED, 3-1/2 GALLONS FOR TWO SPEED.

AIR LINE LUBRICATOR:

KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

FIGURE 31

LUBRICATION POINTS - 36-40-50 SERIES PRESS BRAKE

BALL SOCKET:
USE SAME OIL AS OUTSIDE GEAR BOX. APPLY OIL BETWEEN ADJUSTING SCREW AND ADJUSTING SCREW NUT. LUBRICATE EVERY 3 MONTHS.

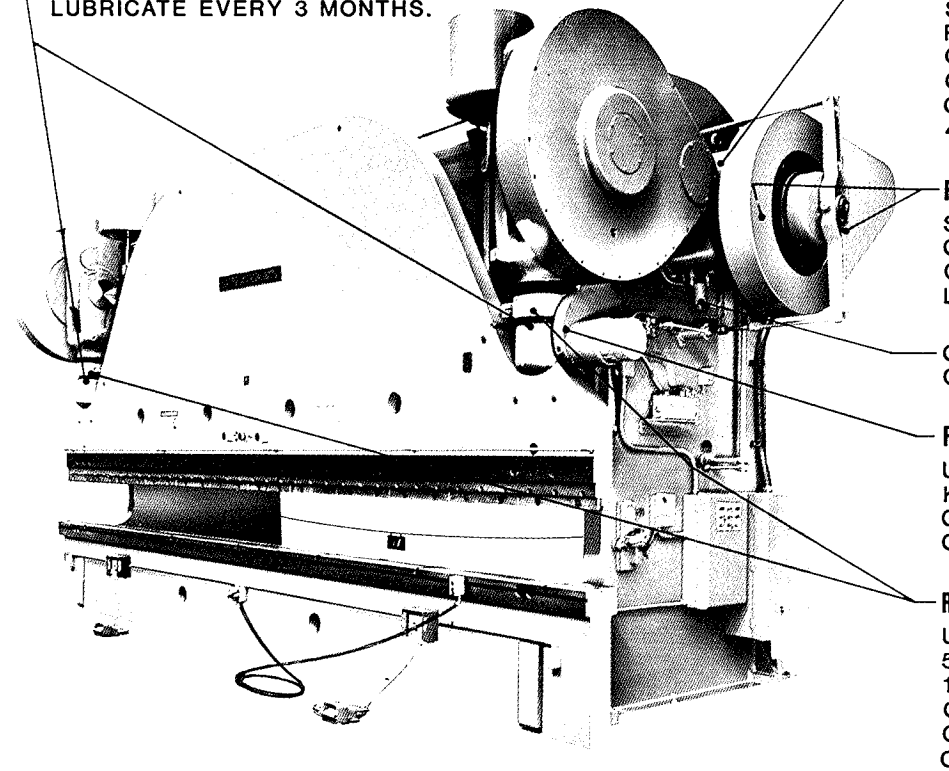
OUTSIDE AND INTERMEDIATE GEAR BOXES:
USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). REMOVE PIPE PLUG IN TOP OF OUTSIDE GEAR BOX TO FILL. CHANGE EVERY 12 MONTHS. CAPACITY: 36 SERIES - 12 GALLONS, 40-50 SERIES - 11 GALLONS.

FLYWHEEL BEARINGS AND CLUTCH SHIFTER:
SERVICE GREASE FITTING WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

CLEAN FERRO OIL FILTER WHEN CHANGING OIL.

RAM ELEVATING GEAR BOX:
USE SAME OIL AS OUTSIDE GEAR BOX. KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 1 PINT.

RAM ADJUSTMENT WORM BOX:
USE WORM GEAR OIL CONTAINING 5-7% ACIDLESS TALLOW, VISCOSITY 1935-2365 SECONDS AT 100° F. (C.I. OIL F-2150). REMOVE SCREW TO FILL. CHECK EVERY 3 MONTHS . CAPACITY: 36 SERIES - 1 QUART, 40-50 SERIES - 3 PINTS.



MAIN DRIVE MOTOR:
LUBRICATE ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

DRIVE GEAR BOX:
(ONE GEAR BOX ON EACH HOUSING) USE SULPHUR PHOSPHOROUS TYPE, MEDIUM-HEAVY EXTREME PRESSURE GEAR OIL, VISCOSITY 700 TO 1000 SECONDS AT 100° F. (C.I. OIL G-850). KEEP FILLED TO VISUAL OIL LEVEL GAGE. CHANGE EVERY 12 MONTHS. CAPACITY: 6 GALLONS.

AUTOMATIC PRESSURE LUBRICATOR:
(ONE LUBRICATOR ON EACH HOUSING) KEEP FILLED WITH MEDIUM-HEAVY HYDRAULIC OIL, VISCOSITY 300 SECONDS AT 100° F. (C.I. OIL B-315). CAPACITY: 1 GALLON.
GIVE HAND CRANK AT LEAST 40 TURNS BEFORE STARTING MACHINE AFTER AN IDLE PERIOD OF 48 HOURS.

AIR LINE LUBRICATOR:
KEEP FILLED WITH MEDIUM HYDRAULIC OIL, VISCOSITY 200 SECONDS AT 100° F. (C.I. OIL B-215). CAPACITY: 1/2 PINT.

BRAKE PIVOT POINTS:
SERVICE GREASE FITTINGS WITH #2 CONSISTENCY LITHIUM SOAP BASE GREASE (C.I. GREASE H-2). LUBRICATE EVERY 6 MONTHS.

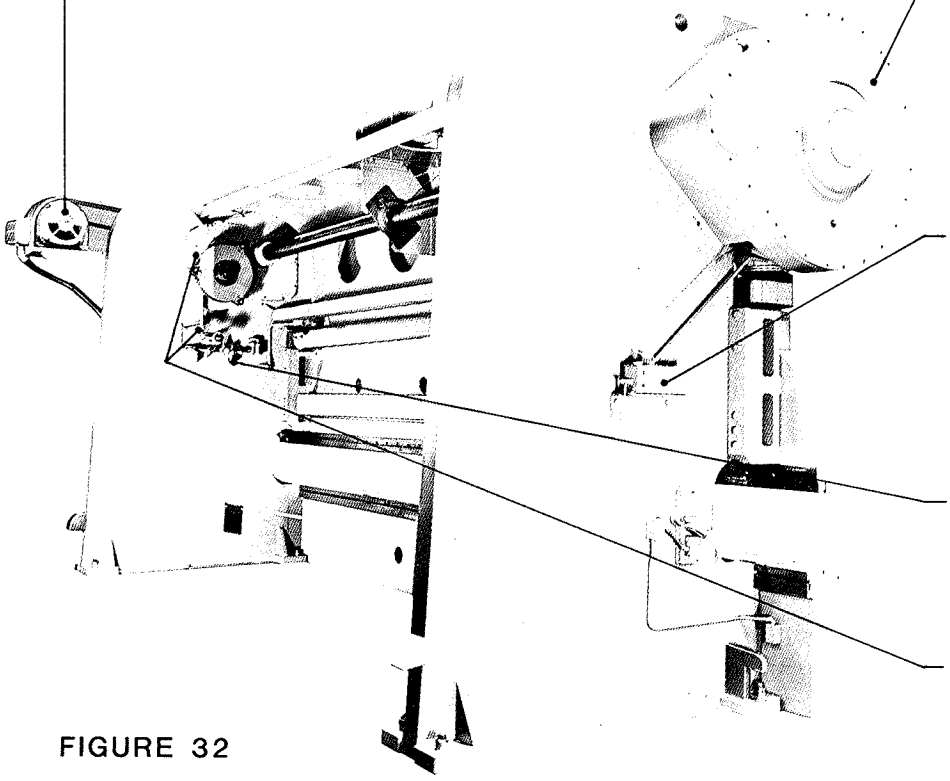


FIGURE 32

SAFETY RECOMMENDATIONS FOR MECHANICAL PRESS BRAKE OPERATION:

Press brakes manufactured by CINCINNATI INCORPORATED comply with the construction requirements of the Occupational Safety and Health Act and the National Safety Standards of the American National Standards Institute. CINCINNATI INCORPORATED also offers update packages for older press brakes to assist you in your compliance and safety programs.

The press brake is a versatile and multi-purpose machine. We recommend you evaluate each press brake operation in order to determine the method of point-of-operation safeguarding which best meets that operation. The press brake, tooling, piece part and method of feed and removal must be evaluated for each job before deciding on the safeguarding to be used.

CINCINNATI INCORPORATED recommends you read and understand the safeguarding, use and care requirements of the American National Standard for Press Brakes, ANSI B11.3. This is available from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036 and is included with this manual.

For additional safety information we recommend:

- Securing applicable safety data sheets from the National Safety Council, 1121 Spring Lake Drive, Itasca, Illinois 60143-3201.
- Determining your responsibilities under your state and local safety codes
- Requesting assistance from the loss prevention department of your workmen's compensation carrier

Personnel responsible for your press brake operator training program, tooling set-up, maintenance, and operations must read and understand this Operation, Safety and Maintenance manual. No one should set-up, operate or maintain this press brake until they thoroughly understand it and know how to do their job safely. This safety information is not intended as a substitute for the Operation and Maintenance sections of this manual.

FOR SAFE OPERATION OF YOUR CINCINNATI PRESS BRAKE

KEEP CLEAR OF THE POINT-OF-OPERATION

The purpose of a press brake is to bend metal and it is obvious that this same capacity will sever arms, hands, fingers or any other part of the body that is in the point-of-operation when the ram is activated.

During operation, all parts of your body must be completely clear of the work area. **NEVER PLACE ANY PART OF YOUR BODY IN THE POINT-OF-OPERATION (Die area).**

If operation by more than one person is required, operator controls must be furnished for each person. If foot controls are used, and your evaluation of that specific operation indicates safeguarding is necessary, provide the necessary safeguarding before any work is performed. (See ANSI B11.3.)

If you use two-hand operator control station(s) as point-of-operation safeguarding, be certain that they comply with ANSI B11.3.

If operation by more than one person is required, one person should be responsible to see that not only his own body is clear of the point-of-operation and all moving parts, but also that his co-workers are clear and entirely visible in a safe location, before the press is operated.

During set-up, maintenance or other work on the machine which necessitates manipulation within the point-of-operation, either the ram should be at the bottom of the stroke or it should be blocked so the dies cannot close. The power supply should be entirely disconnected.

CONCENTRATE ON YOUR JOB

Daydreaming, worrying about other problems or other improper operation of a machine could cripple you for life. Operating a press brake requires your complete attention. Talking, joking or participating in or watching horseplay could result in physical injury to you . . . and that is nothing to joke about. So watch what you are doing and concentrate on your job.

NEATNESS IS IMPORTANT

Keep the floor of your work area clear of scrap and trash that could cause you to stumble. Put scrap in the proper containers and keep stock and finished

work neatly arranged. Be sure slippery surfaces are cleaned up properly. Stumbling and slipping can result in painful and perhaps even fatal injuries.

Put all tools and equipment away when you are not using them. Only the part you are working with should be on the machine when it is operating. Even a screwdriver can be deadly if left on the press brake or lower die.

PROPER TOOLS ARE IMPORTANT

Use the proper tools when working on the press brake. An improper tool might slip and cause lacerations. When making repairs on the machine, disconnect the power source and be sure the ram is at the bottom of the stroke or blocked in place.

ELIMINATE LOOSE AND FLOWING CLOTHING

Loose or flowing clothes may be comfortable, but if they are caught on the machine, it could result in an injury to you. Keep jewelry to a minimum. That link I.D. bracelet you got for Christmas could cost you your hand or finger.

LOOK THINGS OVER CAREFULLY

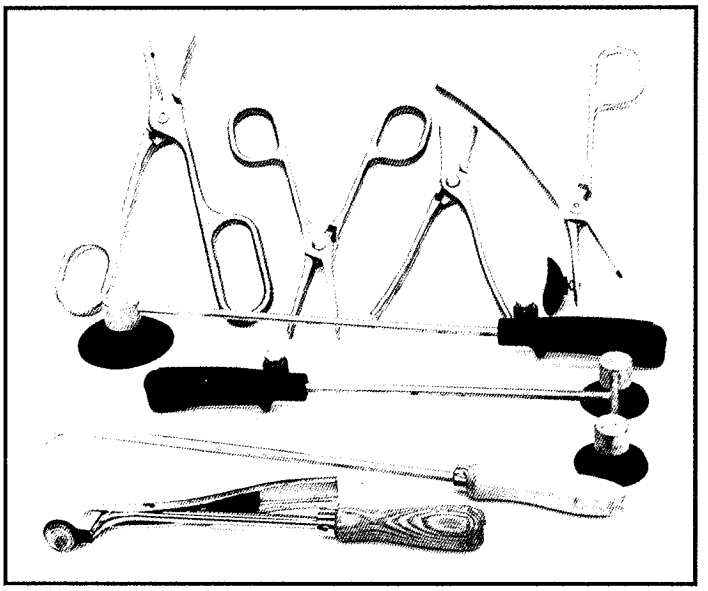
Before operating your CINCINNATI Mechanical Press Brake, look to see if your machine is in proper condition. Are the dies worn? Are the machine's covers and guards securely in place? Is the machine securely anchored to the floor? Are all nuts, bolts and screws tight? Is everything in proper operating condition? If not, report any unsafe condition or needed repair to your supervisor and be sure the problem is corrected before beginning operations.

KNOW YOUR MACHINE'S CAPACITY

The CINCINNATI Press Brake you are operating has a maximum rated machine capacity shown on the capacity plate. Check the charts in KNOWING YOUR PRESS BRAKE, Section 4 of this manual for the tonnage required to bend the material you are forming. By applying too much force you can damage the tooling, drive mechanism or the bed and ram of the machine. When using short or small area dies, the force must be reduced to avoid damage to the tooling or the bed and ram. Too much tonnage may also cause a die to rupture and cause injury. Also refer to the *Press Brake Capacities* bulletin for the load required to do the job.

FOR THE SAFE OPERATION OF YOUR CINCINNATI PRESS BRAKE FOLLOW THESE RULES:

1. **Never place any part of your body in the point-of-operation (Die area).** Placing your hands or any part of your body in the point-of-operation may result in serious injury or amputation.
2. Evaluate each operation to determine the point-of-operation safeguarding to be used.
3. Use the point-of-operation safeguarding selected, or method of operation selected to minimize the exposure to potential hazards at the point-of-operation.
4. For small part insertion and removal, use a hand tool. **DO NOT** place your hands in the point-of-operation.



5. Know how to safely operate and adjust your CINCINNATI Press Brake. Review the Operation and Maintenance sections of this manual.
6. Maintain proper lighting levels and eliminate light glare to prevent eye strain and eye fatigue.
7. Protect your eyes from flying pieces of metal by always wearing your safety glasses.
8. Always wear safety shoes. A heavy or pointed piece of stock could fall and cause serious injury to your foot.
9. Wear snug fitting hand and arm protection when handling rough or sharp edged stock.
10. Keep die area free of loose tools and materials. When placing stock in the machine for forming, be certain the gages and stops are correctly set and the edge of the stock is against the gages.
11. Stand clear of the workpiece with thumbs and fingers beneath the workpiece and arms slightly extended to avoid being hit in the face if the stock whips up as the bend is made. With some dies the whip is down. Be sure you know how the workpiece will react to the bend being made.

12. When material weight is such that the operator cannot fully control the workpiece, use front gage brackets shown in Figure 63 to support material. This will prevent the material from falling, causing injury to the operator or striking the foot treadle and cycling the machine.

13. Releasing the electrical palmbuttons or the foot treadle (or electrical footswitch, if so equipped) will stop downward travel of the ram in case of emergency.

14. When you leave the machine, place the ram at bottom of the stroke or place safety blocks in position under the ram. Also, engage the treadle lock or turn the operator control switch OFF or shut the power OFF, even if you will be away for only a few minutes.

15. Have the routine scheduled maintenance and adjustments performed as shown on the Maintenance Checklist in Section 6.

16. Check alignment of the dies before operating the machine after the dies have been changed or if the machine has been idle overnight. Improper alignment could cause chipping and flying chips can cause lacerations and eye injuries.

17. Report any cuts, bruises and all other injuries to your supervisor or the medical department immediately. They are the best judges of how serious or minor the nature of your injury is.

GENERAL GUIDELINES FOR INSTALLING, REMOVING AND TRANSFERRING TOOLING (DIES)

Installing, removing and transferring tooling is hazardous and should be done with proper supervision by experienced set-up men. Improper handling techniques can cause muscle strains, hernias or serious disabling injuries.

1. Transfer dies using the proper techniques for the weight of the die(s) being handled:

   a. Very light dies (up to 50 pounds) can be carried manually or transferred on a die truck.

   b. Dies weighing over 50 pounds or those that are awkward to move should be handled by a hoist.

CAUTION

STAY CLEAR OF DIES WHILE THEY ARE BEING TRANSFERRED, PARTICULARLY WHEN THEY ARE BEING LIFTED. IF A DIE SHOULD SLIP, SERIOUS INJURY, INCLUDING LOSS OF HAND, A FOOT OR EVEN YOUR LIFE, COULD RESULT.

If the punch or die has tapped holes for lifting attachments, be sure the proper size bolts are used. A bolt smaller in diameter than the tapped hole will slip out and cause serious injury. If no lifting attachments are provided, use only approved rope slings so the dies will not be nicked or scratched.

Lift the dies high enough to clear any obstructions, but no higher.

2. When installing and setting-up dies:

   a. Clean the machine and filler block surfaces to which the dies will be fastened. Always position the ram at the bottom of the stroke and turn power OFF when working in this area.

   b. Inspect the dies for chips, cracks or other hazardous conditions. Wipe them off with a clean cloth.

   c. With the ram at the bottom of the stroke and the filler block in place but not bolted tight, place the lower die on the filler block in such a way that the load will be centered between the side frames if possible. Tighten the die clamping set screws in the filler block. The die should sit firmly on its supporting shoulders. Locate the filler block so the die vee is centered above the slot in the bed and temporarily tighten the clamp bolts. Use the material supports front and/or back whenever practical.

   d. Adjust the ram by means of the ram adjusting motor so that just enough space remains for the upper die. Slide the upper die into place and tighten the die clamp bolts securely so that the upper die will not fall out. Adjust the ram upward to free it from the lower die and place safety blocks on the lower die. Recenter the lower die by sight. Now remove the safety blocks and adjust the ram downward to seat the die in the die clamps and complete the final tightening of the upper die clamp bolts.

   e. Adjust the ram upward to metal thickness clearance at the slopes of the die. Adjust the alignment of the filler block until the clearances are alike when the filler block is bolted securely to the bed. Check at both ends of the die with feeler gages or strips of metal of proper thickness. This completes the alignment set-up.

   f. The ram must now be adjusted to produce an acceptable part. This may require a different setting at one end from the other to compensate for errors in dies and differences that

may occur in wear on dies. Some jobs will require shimming of dies to correct for machine deflections. If the load is too light to deflect the the bed and ram to a parallel condition, shims may be required.

g. A definite change in the angle of the bend will be noted if the ram adjustment or shimming is changed only a few thousandths of an inch. In like manner, shims may be only a few thousandths of an inch in thickness. The "tapering " procedure is important in obtaining a satisfactory result.

h. When using back gages provide a material stop of sufficient height and size to minimize the possibility of the workpiece passing beyond the back gage, which would allow your hand to enter the point-of-operation.

i. Select the appropriate point of safeguarding for your set-up and activate it. Turn ON the machine and test your set-up and the safeguarding. (See ANSI B11.3 standard for point-of-operation safeguarding information.)

j. Make test bends using the same thickness and type of material that will be used on the job. Adjust the ram setting until a satisfactory bend is made.

k. When a satisfactory set-up has been made, all information, such as dies used, filler block used, ram adjustment reading, ram tilt readings, gage setting dimensions, shims (if any) and other notes that would help to repeat the job with a minimum of set-up time should be recorded.

l. Review the proper operating procedure with all employees working at the machine and make sure they understand it and the safeguarding method being used.

CAUTION
NEVER REACH INTO OR THROUGH THE DIE AREA WHEN ALIGNING THE DIES OR SETTING GAGING.

3. When removing dies from the press brake:

   a. Clear the work areas of all stock, containers, tools and other equipment.

   b. After placing safety blocks between the dies and turning OFF the machine, clean both upper and lower dies using a bench brush and finally wipe clean with a cloth. Inspect dies for chips, cracks or other hazardous conditions. Remove safety blocks after all work in the die area is finished and jog the ram to the bottom of the stroke. Shut OFF the machine and wait until flywheel stops.

   c. Jog the ram adjusting motor until the upper and lower dies are completely closed. Loosen the ram clamp bolts to release the upper die.

   d. Jog the ram adjusting motor up to release any pressure between the dies (about 1/8").

   e. Slide the upper die out of the machine slightly more than half way.

   f. Attach a lifting sling at the middle of the upper die.

   g. Now remove the upper die from the machine with a lift and transfer it to the tool storage area, making sure that the working surfaces are protected from nicks and scratches. Be sure that dies which are top heavy are blocked to prevent tipping.

   h. Loosen the bolts holding the lower die to the filler block.

   i. Slide the lower die out of the machine. Lift in the same manner as used for the upper die and transfer this to the tool storage area.

Detailed step-by-step instructions for installing and removing tooling are provided under SET-UP AND USE in the OPERATION section of this manual. These instructions should be followed for safe installation and removal of tooling from your CINCINNATI Press Brake.

Also included in the OPERATION section are instructions for making bends, gaging, blank development and use of the machine controls.

SAFETY SIGNS

In order that press brake operators and maintenance personnel may be warned of certain potential hazards that may exist - unless specified procedures are followed – a number of warning signs are attached to CINCINNATI Mechanical Press Brakes. Warning signs are not intended to be a substitute for reading and understanding this Safety section and the machine Operation and Maintenance manual.

The warning signs are placed at strategic points on the press brake for the most effective use. It is intended that they become a permanent part of the equipment and, therefore, must not be removed, covered, hidden or defaced. All signs installed on the machine by CINCINNATI INCORPORATED are identified by a small six digit part number in the lower right corner. If any of these plates become damaged

or defaced, new ones should be ordered by contacting the factory or the nearest CINCINNATI Sales and Service Office.

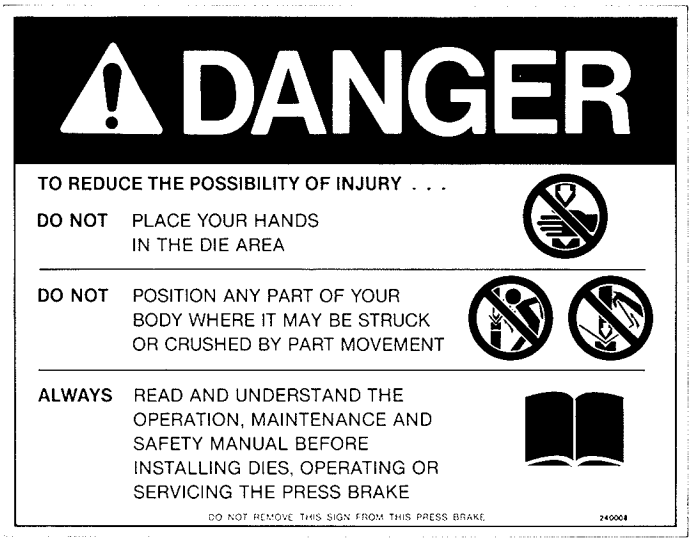
The following illustrations are of the warning signs most commonly used on mechanical press brakes. Some other signs may be furnished to cover possible hazards due to special equipment or machine features. The user management should also include additional warning signs to cover any hazards that may be presented by customer-added auxiliary equipment.

DIE AREA

This DANGER sign warns the operator to keep his hands out of the die area (point-of-operation). Usually the sign is attached to one end of CINCINNATI dies, and not on the press brake. These adhesive backed signs have been furnished in safety update packages and are available from CINCINNATI INCORPORATED.

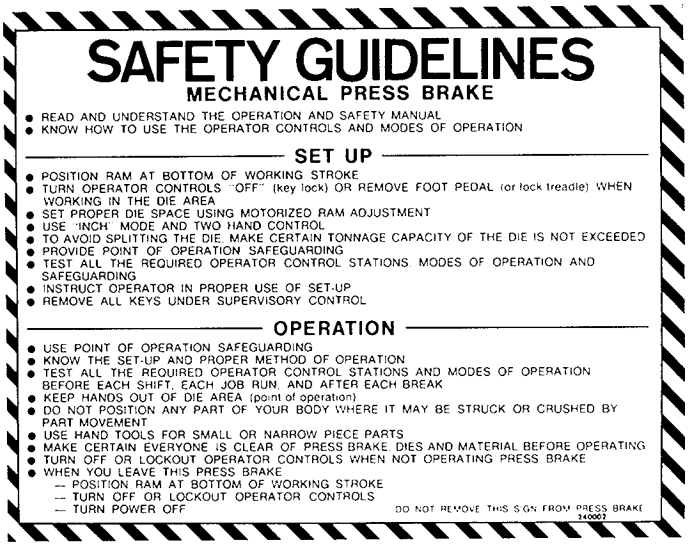
DANGER

This warning sign is attached to the press brake ram, which is the most visible location on the machine. The sign is a reminder to operators or maintenance personnel that certain procedures must be followed to prevent serious bodily injury.



SAFETY GUIDELINES

This sign is also attached to the ram adjacent to the DANGER sign. It provides a checklist of safety considerations which should be observed before, during and after operation of the press brake.

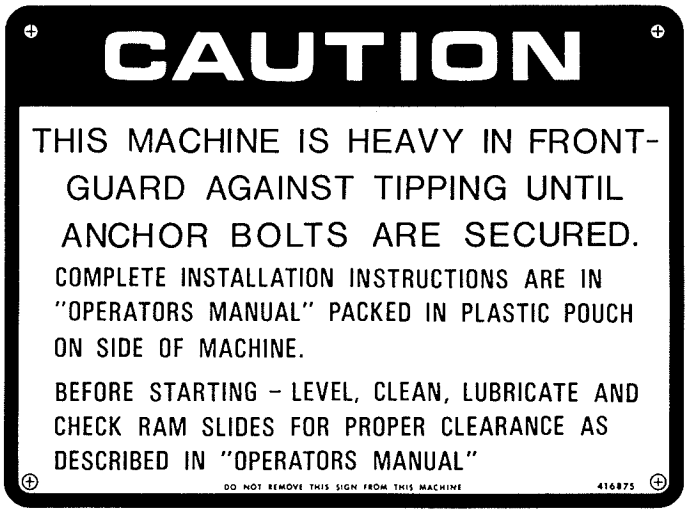


HAZARDOUS AREA

This sign warns of a hazardous area between the machine housings at the rear of the press brake. The sign is attached to a steel restraining cable which spans the space between the housings. No one should enter this area while the machine drive motor is running or the control is energized.

GUARD AGAINST TIPPING

The design of mechanical press brakes is such that much of the weight is concentrated to the front of the machine. This sign cautions that the machine should be guarded against tipping when moving or installing until it is anchored to the floor. The sign refers to the Operator's manual for complete installation instructions.



PRESS BRAKE OPERATOR SAFETY GUIDELINES

- Be sure you know your press brake - capacity, controls, operating modes, safeguarding
- Know and understand the job you are about to perform - material placement, feeding, movement of material being formed
- Never place your hands in the die area
- Make sure no one is in backgage area at rear of machine
- Tooling, press brake and gaging properly set for the job
- Always cycle the press brake at least twice without a part in dies before each shift and each job
- Keep die area free of all unnecessary material and tools
- Do not hang tools on the ram
- Adequate safeguarding available and used
- Keep your body clear of workpiece
- Keep work area clean and orderly
- Keep alert - Keep your mind on the job
- Hand tools - personal protective devices available and used
- Make certain all persons are clear of machine and material before operating
- When you leave your press brake:
  - Place ram at bottom of stroke or block under ram
  - Turn controls OFF
  - Turn power OFF

FAILURE TO FOLLOW SAFE PRESS BRAKE OPERATING PROCEDURES MAY RESULT IN SERIOUS INJURY TO YOU OR ANOTHER EMPLOYEE

SAFETY MAINTENANCE CHECK

- SAFEGUARDING at point-of-operation in proper adjustment and operating properly
- PINCH POINT guarding properly installed
- OPERATOR CONTROLS working O.K.
- OPERATING MODES functioning properly
- RAM starting and stopping properly
- WARNING PLATES clean and easily read
- ELECTRICAL WIRING in good condition
- CAUTION PAINTING in good condition
- AUXILIARY EQUIPMENT checked - working properly
- HAND TOOLS and personal protective equipment in good order - readily available
- SAFETY MANUALS and OPERATOR MANUALS attached to machine
- SCHEDULED NORMAL MAINTENANCE work completed

SAFETY IS PART OF YOUR JOB . . . THE MORE ATTENTION YOU PAY TO DEVELOPING SAFE HABITS, THE LESS THE CHANCES OF INJURY TO YOU AND YOUR FELLOW EMPLOYEES

The following charts and illustrations emphasize the most important performance capabilities and limitations of the CINCINNATI standard clutch and automatic cycle mechanical Press Brakes. They are important aids for safe and effective use of these machines.

PERFORMANCE AND RATINGS

SERIES	NOMINAL LENGTH (FT.)	CLEAR DISTANCE BETWEEN HOUSINGS	TOTAL OVERALL DIE SURFACE (FEET)	APPROXIMATE SHIPPING WEIGHT, DOMESTIC		BENDING CAPACITY WITH STANDARD STROKES **		TONNAGE CAPACITY *		STANDARD STROKE (IN.)	RAM ADJUSTMENT (IN.)	THROAT CLEARANCE (FROM CENTER OF DIES)	DIE SPACE (STROKE DOWN, ADJUSTMENT UP)	STANDARD SPEED (STROKES PER MINUTE)		H.P. OF MOTOR	
				STANDARD CLUTCH	AUTOMATIC CYCLE	STANDARD CLUTCH	AUTOMATIC CYCLE	NEAR BOTTOM OF STROKE	AT MID-STROKE					STANDARD CLUTCH	AUTOMATIC CYCLE	STANDARD CLUTCH	AUTOMATIC CYCLE
5	4	4'- 5-3/4"	6	11,800	13,500	5/16" x 4' 1/4" x 6' 3/16"x11' 10ga. x 14' 12ga. x 19'	5/16" x 5' 1/4" x 8' 3/16"x12' 10ga. x14' 12ga. x 19'	135	90	3	5	8	12	35	35 AND 4	7-1/2 or 10	10
	6	6'- 5-3/4"	8	13,400	15,100												
	8	8'- 5-3/4"	10	16,200	17,900												
	10	10'- 5-3/4"	12	20,700	22,400												
	12	12'- 5-3/4"	14	25,300	27,000												
9	4	4'- 6"	6	24,850	26,100	3/8" x 6' 5/16" x 9' 1/4" x 13' 3/16"x 19'	3/8" x 7'6" 5/16" x 9' 1/4" x 14' 3/16"x19'	225	150	3	5	8	12	30	33 AND 7	10 or 15	15
	6	6'- 6"	8	27,500	28,700												
	8	8'- 6"	10	30,810	32,000												
	10	10'- 6"	12	34,210	35,400												
	12	12'- 6"	14	40,310	41,500												
	14	14'- 6"	16	48,140	49,400												
12	6	6'- 6"	8	32,320	35,300	5/8" x 4' 1/2" x 6' 3/8" x 11' 5/16" x 14' 1/4" x 18' 3/16"x 25'	5/8" x 4' 1/2" x 6' 3/8" x 11' 5/16"x14' 1/4" x 18' 3/16"x25'	300	200	4	6	10	12	30	30 AND 4.3	15	20
	8	8'- 6"	10	35,610	38,600												
	10	10'- 6"	12	39,810	42,800												
	12	12'- 6"	14	44,260	47,300												
	14	14'- 6"	16	49,450	52,500												
	16	16'- 6"	18	58,660	61,700												
13	6	6'- 6"	10	37,810	40,800	5/8" x 4' 1/2" x 8' 3/8" x 13' 5/16"x 18' 1/4" x 24'	5/8" x 4' 1/2" x 8' 3/8" x 14' 5/16"x 18' 1/4" x 24'	400	260	4	6	10	12	30	30 AND 4.3	20	25
	8	8'- 6"	12	42,240	45,300												
	10	10'- 6"	14	47,690	50,700												
	12	12'- 6"	16	53,510	56,500												
	14	14'- 6"	18	60,640	63,700												
	16	16'- 6"	20	69,290	72,300												
21	6	6'- 6"	10	64,210		3/4" x 5' 5/8" x 8' 1/2" x 12' 3/8" x 21' 5/16"x 27'		600	400	4	6	14	14	30		30	
	8	8'- 6"	12	69,500													
	10	10'- 6"	14	76,110													
	12	12'- 6"	16	83,430													
	14	14'- 6"	18	92,180													
	16	16'- 6"	20	102,700													
	18	18'- 6"	22	111,950													
	20	20'- 6"	24	125,920													
34	6	6'- 6"	10	75,600		3/4" x 10' 5/8" x 13' 1/2" x 18' 3/8" x 28' 5/16"x 30'		750	520	4	6	14	14	23		40	
	8	8'- 6"	12	82,200													
	10	10'- 6"	14	89,700													
	12	12'- 6"	16	98,200													
	14	14'- 6"	18	108,500													
	16	16'- 6"	20	123,600													
	18	18'- 6"	22	137,300													
	20	20'- 6"	24	150,300													
36	6	6'- 5-3/4"	10	94,040		1" x 6' 3/4" x 12' 5/8" x 17' 1/2" x 24' 3/8" x 36'		1000	650	5	6	14	14	23 AND 6		40	
	8	8'- 5-3/4"	12	100,880													
	10	10'- 5-3/4"	14	108,990													
	12	12'- 5-3/4"	16	118,020													
	14	14'- 5-3/4"	18	128,750													
	16	16'- 5-3/4"	20	140,230													
	18	18'- 5-3/4"	22	153,860													
	20	20'- 5-3/4"	24	166,820													
50	8	8'- 5-3/4"	12	147,100		1" x 12' 3/4" x 21' 5/8" x 28'		1500	1000	6	6	16	16	20 AND 5		50	
	10	10'- 5-3/4"	14	157,100													
	12	12'- 5-3/4"	16	164,600													
	14	14'- 5-3/4"	18	183,800													
		16'- 5-3/4"	20	196,300													
	18	18'- 5-3/4"	22	214,100													
	20	20'- 5-3/4"	24	229,100													

* Tonnage is reduced at mid-stroke when greater than standard stroke is furnished. It remains unchanged near bottom of stroke.

** Each machine listed in a particular Series group can make any bend given for this Series Machine, providing it has sufficient die surface, i.e., a 12 Series x 6' machine which has a standard die surface of 8' can bend 3/8" x 10' of mild steel if the machine has 24" bed and ram extensions.

The above bending capacities allow for a 15% reserve of rated tonnage to cover possible increases in material thickness, tensile and yield strength. When determining tonnage required from the Bending Load chart, multiply calculated bending force by 1.15.

PRINCIPLES OF OPERATION

RAM STROKE: The drive motor turns the flywheel which produces the energy to operate the ram. This energy is transmitted through the drive train into the eccentrics. The eccentrics have a fixed crank length. When the eccentrics turn, they provide a fixed stroke of the ram. Standard stroke lengths range from 3" to 6", varying as to size of the machine.

TONNAGE CAPACITY: As the ram moves from mid-stroke toward the bottom of stroke, the available force stays the same, but the eccentric moment arm is changing constantly. This results in a higher available tonnage near the bottom of the stroke. The maximum tonnage limits are a combination of transmitted flywheel energy and the actual limits of the frame design of each size mechanical press brake. The machine's capacity plate and the chart on Page 37 show the tonnage capacities. Also see Press Brake Capacities included with this manual.

DIE SPACE: Each size machine has a fixed amount of die space (or shut height) to accomodate the dies or tooling. The maximum die space available is the distance from the bed top to the ram nose when the ram is adjusted to its maximum up position and the ram is at the bottom of the stroke. The minimum die space is that distance when the ram is adjusted fully down and is at the bottom of the stroke. See Figure 33.

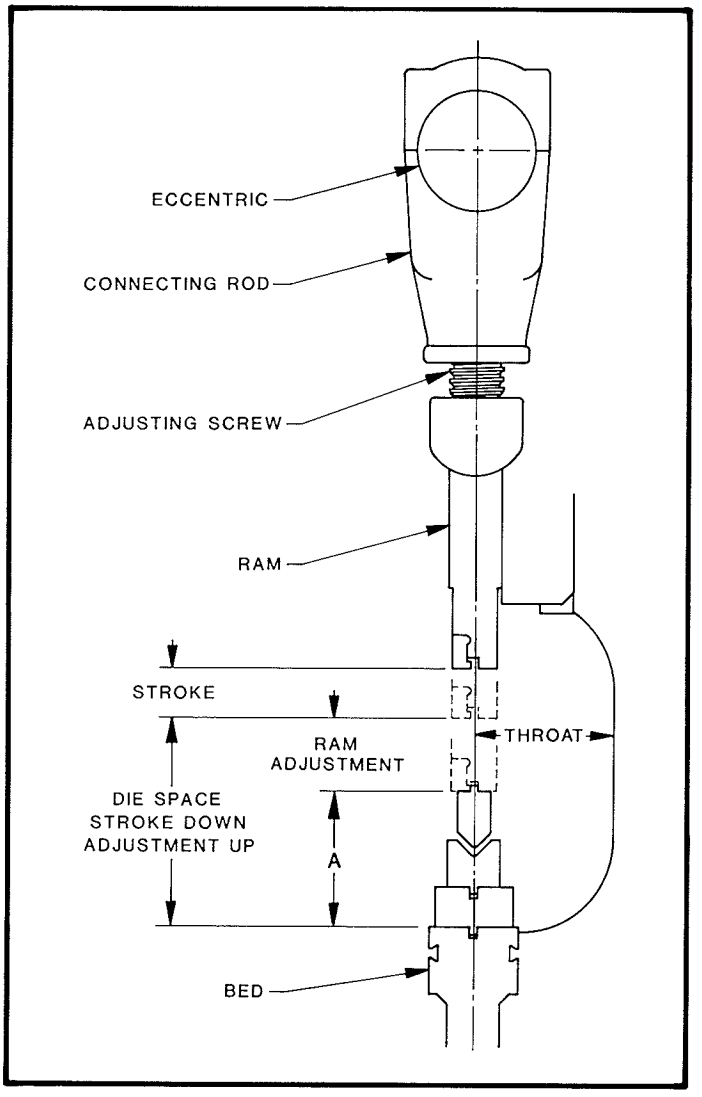


FIGURE 33

THROAT: Normally most forming on press brakes is done between the housing. However, when long materials or forming at one end of the machine is required, the housing throat provides space for the material. Forming at the housing is limited by the depth of throat.

CLOSED POSITION: This is the overall height of the dies when ram is at the bottom of the stroke and is adjusted to make the proper bend. See Figure 34.

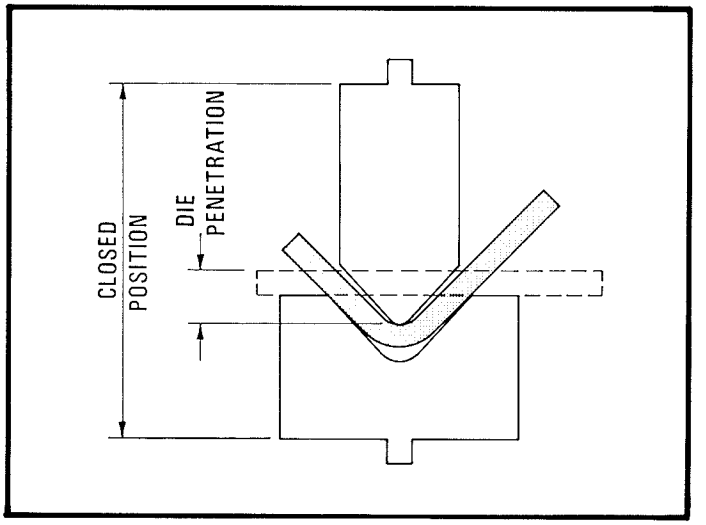


FIGURE 34

DIE PENETRATION: This is the distance the upper die penetrates the lower die. For a 90° air bend the die penetration is about 0.4 of the lower die opening.

The combined height of the dies when in the closed position plus the height of the filler block (if used) must be more than dimension "A" in Figure 33, but equal to or less than the "die space" dimension.

FILLER BLOCKS: Various types of filler blocks are available to hold the lower die. They provide a means of adjusting and clamping the lower die in position. Filler blocks also increase the height of dies to fill the die space. This means that the ram is adjusted upward, which reduces the amount of unsupported adjusting screw to a minimum.

MICROCROWNING: A carefully engineered crown is machined into the bed and ram of each CINCINNATI Press Brake. It is designed so the bed and ram will be approximately parallel at mid-stroke capacity of the machine with a uniformly distributed load. This feature improves bend accuracy under normal forming loads and minimizes shimming of dies.

TYPES OF DIES:

AIR BEND DIES - These dies are made with sharper angles than the angle to be formed. The metal being formed contacts only the point of the upper die and the two edges of the lower vee die opening. See Figure 35. Thus, all of the ram pressure is used in forming and none in squeezing the metal. Any greater angle than the die angle can be formed by adjusting the Press Brake ram upward as required. See the Press Brake Capacities booklet with this manual for further air bending information.

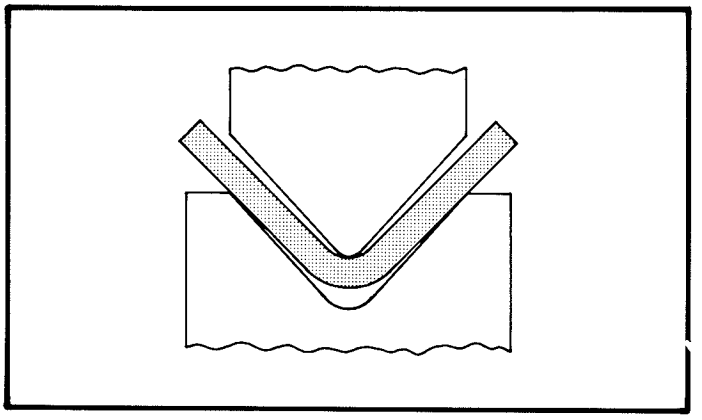


FIGURE 35

BOTTOMING DIES - The primary purpose of bottoming dies is to provide greater accuracy than air bend dies. They can also be used to obtain a relatively sharp inside corner. They are made in matched pairs, according to the thickness of the stock to be formed and radius required. See Figure 36. These dies require three to ten times as much pressure as air bend dies. Care should be taken not to exceed the capacity of the Press Brake. Other types of bottoming dies are coining dies, used to obtain a sharp inside radius, multiple bend and channel dies, and radius bend dies.

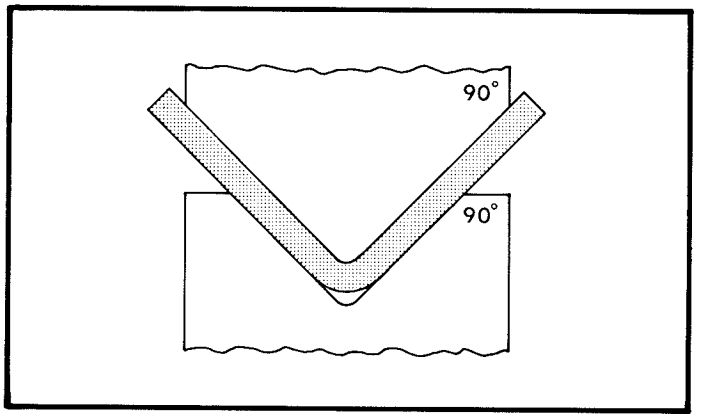


FIGURE 36

MINIMUM DIE AREA

Care must be taken to provide enough area under the upper and lower dies to prevent them from sinking into the ram nose and bed top due to highly concentrated loads. This is the shaded area in Figure 37. The minimum area (sq. in.) for each die to prevent sinking may be calculated by this formula:

$$\text{DIE AREA} = \frac{\text{Maximum Tonnage}}{15}$$

EXAMPLE: A 13 Series Press Brake has a 400 ton capacity near the bottom of stroke. The minimum die area is 400 divided by 15, or 26.67 square inches.

PUNCHING CAPACITY (Mild Steel)

For smooth machine operation the maximum punching tonnage (each level) should not exceed 66% of the total forming capacity (Figure 38). Additional punching capacity can be obtained by stepping the punches (Figure 39) on multiple levels. If material is other than mild steel, see Press Brake Capacities, included with this manual.

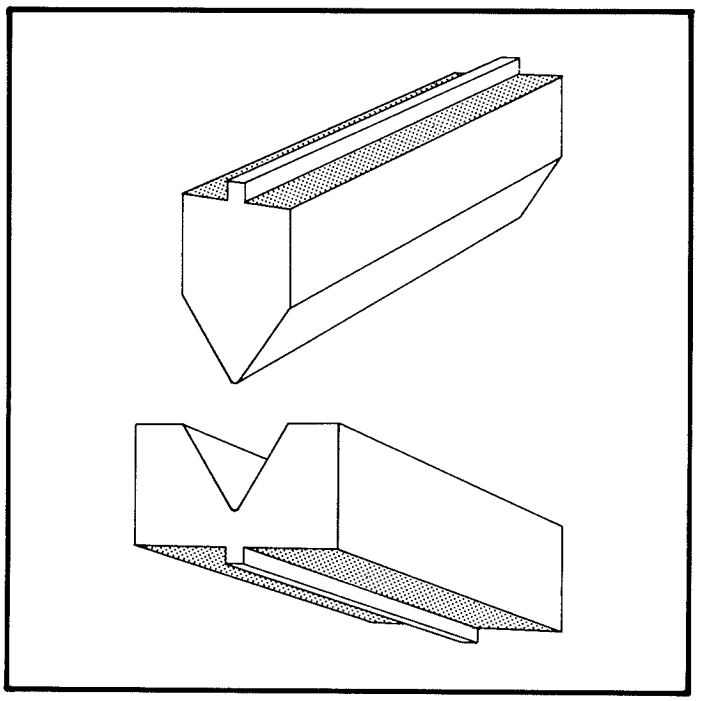


FIGURE 37

MACHINE SERIES	MAXIMUM PUNCHING CAPACITY (EACH LEVEL-TONS)
4	65
5	90
7	115
9	150
12	200
13	265
19	330
21	400
34	500
36	665
40	830 *
50	1000 *
* MACHINES SHIPPED AFTER 1 JANUARY 1961	

FIGURE 38

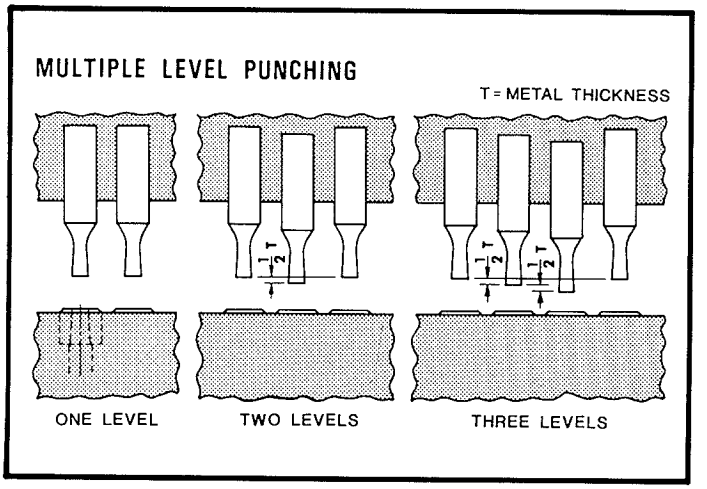


FIGURE 39

STRIPPING CAPACITY

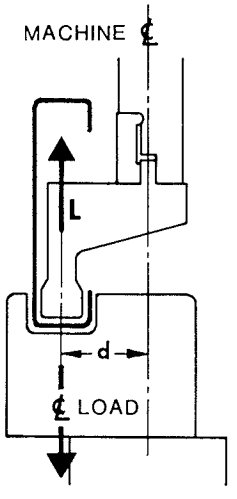
A stripping load is a force which occurs on the up stroke of the ram. The direction of this type of load is down on the ram and up on the bed (the reverse of forming and punching loads). (See Figure 40)

MACHINE SERIES	MAXIMUM STRIPPING LOAD (TONS)
4	6.5
5	9
7	11.5
9	15
12	20
13	27
19	33
21	40
34	50
36	67
40	83
50	100

FIGURE 40

OFF CENTER LOAD CAPACITY (FRONT TO BACK)

Occasionally special forming or punching setups are made which do not have their load centers located on the bed and ram centerlines. When this condition exists, care must be taken not to exceed the maximum eccentric (front to back) load capacity of the press brake. Exceeding the eccentric load capacity could damage the slides and guides, sink the upper bed bolts into their counterbores causing the bed to become loose, or overstress the upper bed and die clamp bolts causing them to shatter and possibly causing injury to personnel. Maximum eccentric load capacities with standard slides and guides are shown in Figure 41.



℄ - CENTERLINE

L - LOAD (FORMING OR PUNCHING) - TONS

d - DISTANCE BETWEEN MACHINE ℄ & LOAD ℄ - INCHES

MACHINE SERIES	MAXIMUM ECCENTRIC LOAD CAP. (INCH-TON)
4-5	100
7-9	200
12-13	230
19-21	500
34	500
36	520
40-50	840

d x L MUST BE EQUAL TO OR LESS THAN MAXIMUM ECCENTRIC LOAD CAPACITY

FIGURE 41

OFF CENTER LOAD CAPACITY (LEFT OR RIGHT)

Most forming and punching jobs are located on the centerline of the machine where the full rated machine capacity is available. When the load is not located at the center of the machine only a portion of the total capacity is available as shown in Figure 42.

For example, a 13 Series Press Brake has 100% (400 tons) of its rating near the bottom of the stroke available for bending at the centerline of the machine. At either housing, regardless of length, only 50% of the tonnage (200 tons) is available. To determine the available tonnage at a point between the centerline and either housing, the ratios shown in Figure 42 can be used. For example, a 13 Series x 12' Press Brake is 12'-10-1/4" from housing to housings (L). A point .3 of this length is 46-1/4" (.3 x 12'-10-1/4"). Then at 46-1/4" on either side of the centerline of the machine 62% of the tonnage is available, or 248 tons (.62 x 400 tons).

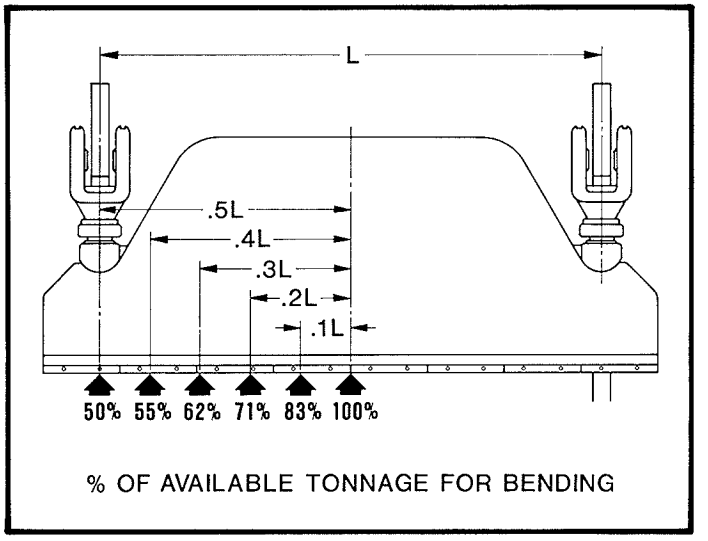


FIGURE 42

MACHINE CONTROLS

Before starting your CINCINNATI Press Brake, the following controls and their functions should be thoroughly understood.

STANDARD CONTROLS

1. ELECTRICAL CONTROL PANEL - STANDARD CLUTCH MACHINES (FIGURE 43)

The electrical control panel for Press Brakes with air-electric clutch control or electric-air disc clutch and brake is located on the main electrical enclosure. This enclosure is on the housing or on a metal bracket attached to the housing. The standard controls are shown in Figure 43:

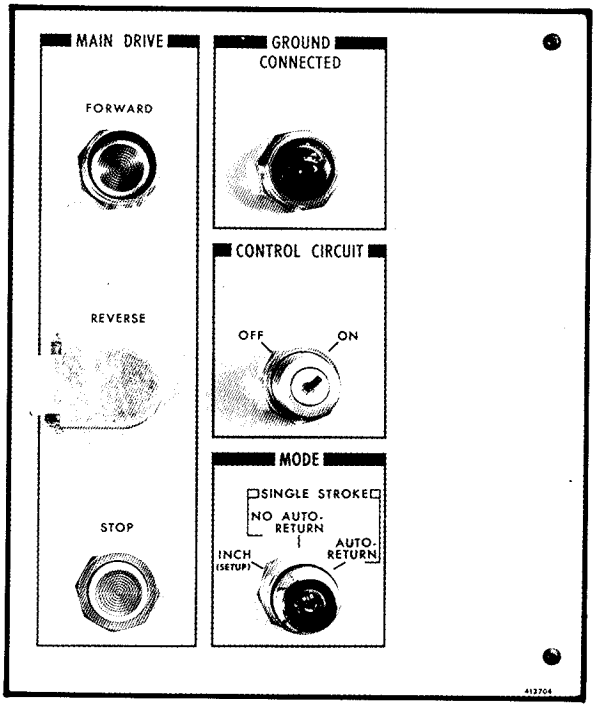


FIGURE 43

MAIN DRIVE - FORWARD: The guarded green push-button is depressed to start the main drive motor running in the forward direction and to energize the machine's electrical control circuits. Forward rotation of the drive motor is used for normal operation of the Press Brake.

MAIN DRIVE - REVERSE: This control is only used to run the ram upward when an overload has occurred and the ram has stopped before reaching the bottom of the stroke. The main drive motor must be OFF and the flywheel stopped before raising the cover and depressing the black "REVERSE" button.

MAIN DRIVE - STOP: When this red pushbutton is depressed the main motor is turned OFF. The clutch is disengaged and the brake is engaged. The ram elevating and brake monitor circuits are still active.

> **CAUTION:** The flywheel will coast to a stop and therefore is capable of cycling the ram if the manual foot treadle is depressed.

GROUND CONNECTED LIGHT: The illuminated green light indicates that the low voltage control circuit is properly grounded. If the light does not turn ON, push the lens to check. If the light then turns ON, the control circuit is not grounded and maintenance personnel should check the machine before starting operation. If the light does not turn ON when the lens is pressed the light bulb is burned out. Operation can be started but the bulb should be replaced at once.

CONTROL CIRCUIT Selector Switch: In the "ON" position this keylock selector switch activates the control circuits to the palm buttons on Operator Station and to the optional foot switch. In the "OFF" position these controls will not operate, even though their selector switch is turned "ON". Therefore, the ram cannot be cycled. We recommend that the operator lock the Control Circuit selector in the "OFF" position when he is away from the controls to perform maintenance, adjustments, moving material, etc. to prevent anyone from cycling the ram.

MODE Selector Switch: Three modes of operation are provided on Press Brakes with either type of electrically controlled clutch. The switch can be keylocked at any position.

> INCH: This is a set-up mode that can only be operated by the palm buttons on Operator Station. The ram will move when palm buttons are depressed and will stop on either the DOWN or UP stroke when they are released. By rapidly pressing and releasing the palm buttons, the ram can be inched to a desired position. If the controls are held depressed, the ram will continue to cycle until they are released.
>
> SINGLE STROKE - NO AUTO RETURN: A production mode that can be operated by palm buttons or by the foot switch, but not a combination of both. The ram will move when the control is depressed, and will stop at any point on the DOWN or UP stroke when the control is released. The ram will automatically stop at the top of the stroke, even if the control is held depressed. To start another cycle the control must be released and depressed again.
>
> SINGLE STROKE - AUTO RETURN: Also a production mode that can be operated by the palm buttons or foot switch, but not by a combination of both. The ram will move when the control is depressed, and will stop at any point only on the DOWN stroke when the control is released. After the ram passes stroke reversal position it will automatically return to the top of the stroke and stop, regardless if the control is held depressed or is released. To start another cycle the control must be released and depressed again.

2. ELECTRICAL CONTROL PANEL - AUTOMATIC CYCLE MACHINES (FIGURE 44)

Automatic Cycle Press Brakes provide two ram down stroke speeds and a fast up stroke speed. Either a high or low down speed, or a high down speed which shifts to the low speed at a predetermined point may be selected. This speed change feature minimizes the "whip-up"

and "back bending" which occurs when parts are formed at high speed. In addition, Stroke Stop can be selected to stop the ram on the down stroke at the speed change position.

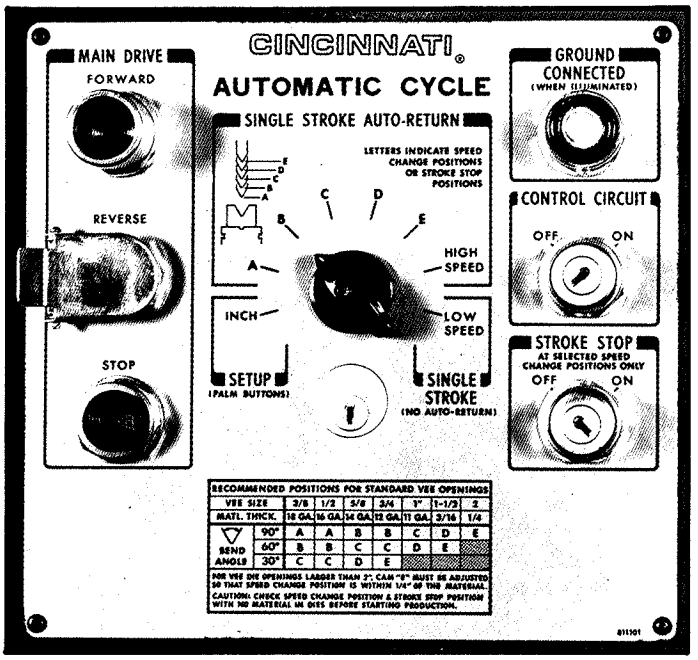


FIGURE 44

MAIN DRIVE, GROUND CONNECTED light and CONTROL CIRCUIT selector controls operate as described above for Standard Clutch Machines.

AUTOMATIC CYCLE Selector: This is an eight position selector switch which controls the mode of ram operation. The selector can be keylocked at any position. The function and operation of these selector positions are:

SETUP - INCH: This is a set-up mode that can only be operated by the palm buttons on Operator's Station. The ram will move in low speed when the palm buttons are depressed and will stop on either the DOWN or UP stroke when they are released. By rapidly pressing and releasing the palm buttons the ram can be inched to a desired position. If the palm buttons are held depressed the ram will continue to cycle until it reaches the top of stroke, where it automatically stops.

SINGLE STROKE AUTO-RETURN: Automatic Cycle Press Brakes have two down speeds (see chart on Page 37) and one up stroke speed. Selector positions "A" through "E" selects the point on the down stroke where the ram speed changes automatically from high to slow speed. The position is determined at set-up so that ram changes to low speed just above the workpiece. By forming in low speed the "whip-up" and "back bending" of the material is minimized. After reaching stroke reversal position (bottom of the stroke), the ram automatically shifts to high speed for the UP stroke. The ram returns to top of the stroke and it automatically stops.

In the HIGH SPEED position the ram runs only in high speed on both the down and up stroke. It automatically stops at the top of the stroke. Usually this mode is used with tooling designed for high speed operation. The operator should be cautious of material "whip-up" when forming in high speed.

The ram can be stopped at any point or jogged on the down stroke. However, after passing stroke reversal position the ram will return to the top of the stroke and stop regardless if the hand or foot control is held depressed or released.

To cycle the ram depress either the palm buttons simultaneously or the foot switch, but not a combination of both controls. Releasing the control will stop the ram.

SINGLE STROKE - LOW SPEED: A production mode where the ram runs in low speed on the DOWN and UP stroke. The ram will run when the operator's control is depressed, and will stop on either the down or up stroke when it is released. The ram will automatically stop at top of the stroke.

STROKE STOP Switch: Automatic Cycle Press Brakes have an electrical control circuit which automatically stops the ram on down stroke at the selected speed change position ("A" thru "E" on Automatic Cycle Selector). The Stroke Stop will only operate in the SINGLE STROKE AUTO-RETURN mode at positions "A" thru "E". It will not operate at the HIGH SPEED position. This control is operative when the switch is turned ON.

The stroke stop feature is used when the operator must align the material prior to bending, such as bending to a scribed line on the material. It allows the operator time to align the material just prior to bending without concern for the approaching ram. When the operator control is again depressed the ram will continue down to bottom of the stroke in the low forming speed.

3. BRAKE OVERRUN MONITOR (FIGURE 45)

This control monitors the stopping position of the ram at the top of stroke. A properly adjusted brake will stop the ram at the top of stroke, which is the top dead center of the eccentric. Should the ram pass this position and start on the down stroke, a microswitch is tripped. This switch is located on the eccentric shaft for standard clutch machines and is in the cam box on Automatic Cycle machines. When the switch is tripped the main drive motor is turned OFF, the clutch disengaged, the friction brake engaged, and the BRAKE OVERRUN light is illuminated.

FIGURE 45

The Brake Overrun Monitor operates in all modes for standard clutch machines except "INCH" and "RUN". It will not function for standard clutch machines with manual control when the machine is operated in manual mode. The monitor operates in all modes for Automatic Cycle machines, including "INCH".

Before restarting the Press Brake, your maintenance personnel should investigate and correct the condition causing the overrun. Usually adjusting the brake will correct the problem. To restart the machine press the BRAKE OVERRUN light/pushbutton to reset the circuit. Then press the MAIN DRIVE - FORWARD button on the Control Station.

4. PALM BUTTON OPERATOR'S STATION (FIGURE 46)

The Operator Station is the standard control to start or stop ram movement. It is usually located on the center of the ram, however Press Brakes may be furnished with one or more Operator's Stations located at other positions.

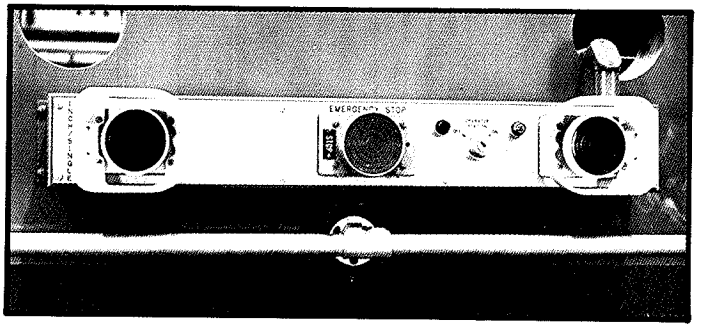


FIGURE 46

PALM BUTTON Switches: Two guarded palm buttons are located on the Operator Station, one at each end. Both palm buttons must be depressed the same time to start ram movement. If the machine is equipped with two Operator Stations, and both are turned "ON", then all four palm buttons must be depressed at the same time. This is a safety feature designed to keep the operator's hands clear of the point of operation.

Releasing any one of the palm buttons will stop the ram on the down stroke. Releasing any one of the palm buttons on the up stroke will either stop the ram at that point or at top of the stroke, depending upon mode of operation. To restart ram motion, all palm buttons must be released and then reactivated.

OPERATOR STATION Switch: This keylock switch must be turned "ON" to make the palm buttons active. In the "OFF" position the palm buttons are inoperative and the ram cannot be cycled. The switch can be locked "OFF" to prevent the ram being cycled. When the optional foot switch is being used to operate the Press Brake, the OPERATOR STATION switch must be locked "OFF". A red indicator light indicates the switch is turned "OFF" and an amber light indicates it is turned "ON".

EMERGENCY STOP Button: Depressing the red button will de-energize the clutch, set the friction brake and turn OFF the main drive motor.

5. RAM ADJUSTING AND TILT ADJUSTMENT (FIGURE 47 AND 48)

The ram can be raised or lowered with respect to the bed by the ram adjusting mechanism. This is used when setting up the tooling. By adjusting the ram bottom of the stroke position in relation to the tooling, a minimum die opening is set. This opening between the dies is equal to the fixed stroke of the ram. The relative position of the ram nose is shown on two indicators located near the right connecting rod (Figure 47). The lower indicator shows the position of the right end of ram, and the upper indicator shows the left end. When both indicators read 0.000 the ram nose is parallel and is at its lowest possible position - maximum down ram adjustment and ram at the bottom of the stroke. The distance from the ram nose to bed top at this position is shown on machine's capacity plate, located on the ram.

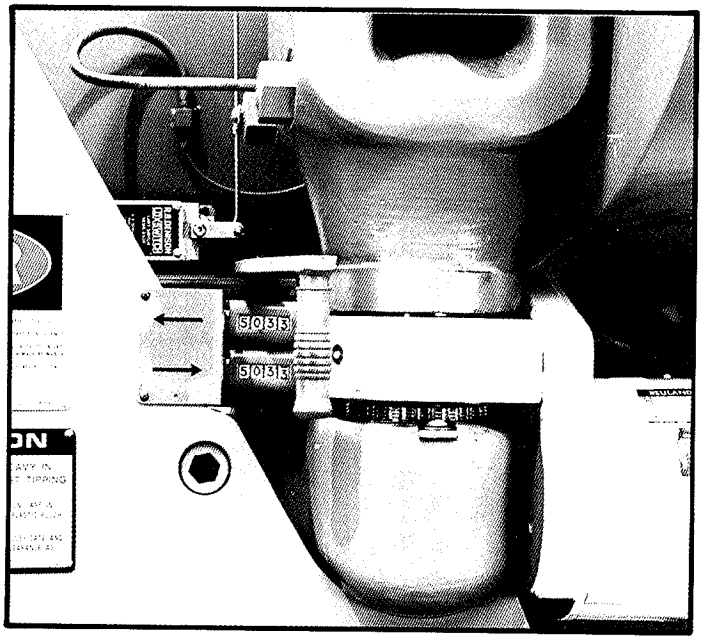


FIGURE 47

The ram adjusting mechanism is driven by a separate motor. It is operated by UP and DOWN pushbuttons, located on a moveable magnetic base control (Figure 48). The control can be hand held when making an adjustment and then placed in an out of the way location on the Press Brake when not in use. A double-acting limit switch limits the upward and downward adjustment of the ram. When operating ram in an extreme tilted position, R.H. low, care should be taken so not to bottom out L.H. wormwheel and connecting rod at maximum up position.

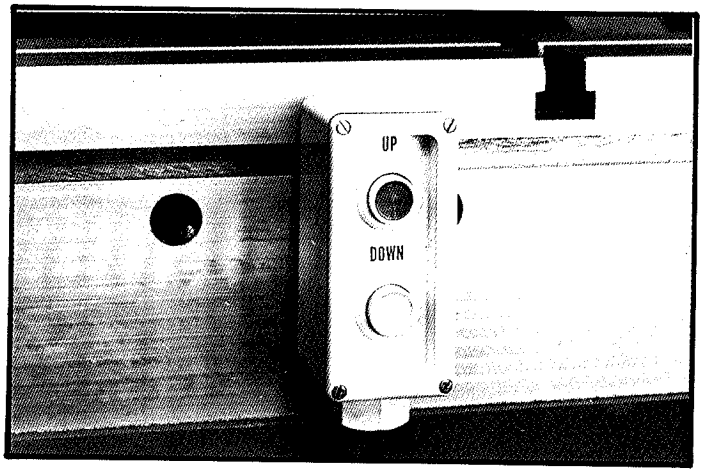


FIGURE 48

When the two indicators read exactly alike the ram is parallel to the bed. However, tilting the ram may be necessary to compensate for material variations, off-center loading, or inaccurate tooling in order to produce acceptable parts. The right end of the ram can be raised or lowered by disengaging the clutch with the tilt adjustment lever (Figure 47) and pressing the "UP" or "DOWN" pushbutton on the magnetic base control. The amount of tilt is the difference in the reading on the two indicators. In most cases the amount of tilt is set by trial and error, making sample bends until the desired bend is attained. The indicator readings should be recorded for future use if this set-up will be used again.

OPTIONAL CONTROLS

1. ELECTRICAL CONTROL PANEL - STANDARD CLUTCH MACHINES

STROKE STOP Selector: This device will stop the ram at a preselected position on the lower half of the down stroke. Manual clutch machines can also be stopped at the top of stroke with this device. Stroke Stop will function in all operating modes and is made active by turning "ON" the STROKE STOP selector switch on the control panel (Figure 49).

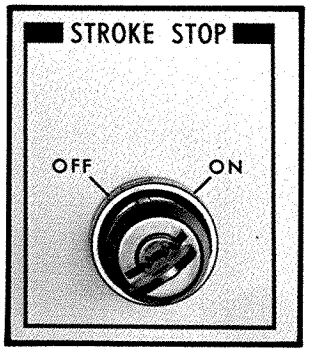


FIGURE 49

The stroke stop mechanism (Figure 50) consists of a limit switch (A) mounted on the right housing, an adjustable cam (B) and cam rod (C) mounted on the right ram slide. The cam is positioned so that when the ram moves down (the rod moving with the ram) the cam will trip the stationary limit switch and stop the ram just above the workpiece. This permits the operator to position the workpiece in the tooling. The operator control is then depressed or jogged to complete the forming operation and the ram returns to top of the stroke and stops.

NOTE: Clutch must be fully engaged from top of the stroke down to the stroke stop position. Jogging the ram on the down stroke before reaching the stroke stop position will cause erratic stopping of the ram.

RUN: This is a special production mode of operation where the ram will continue to cycle as long as the operator control(s) is held depressed. Either the palm buttons or the foot switch can be used to cycle the ram. The RUN mode is selected by a four position keylock switch located on a special control panel (Figure 51). The automatic return and stop at top of the stroke control of the ram is not operative in this mode. However, the STROKE STOP control as described above can be used in the RUN mode.

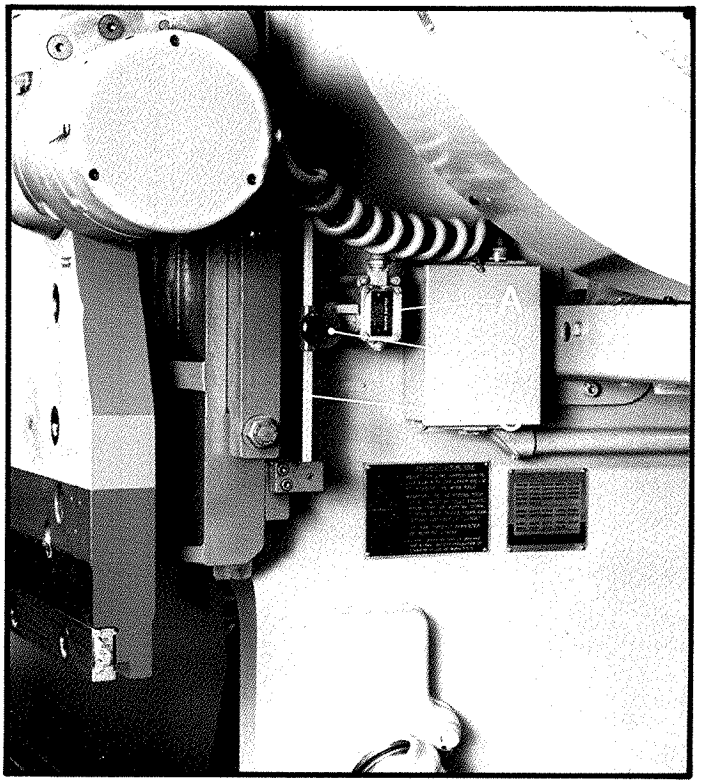


FIGURE 50

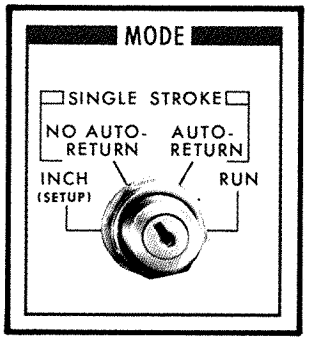


FIGURE 51

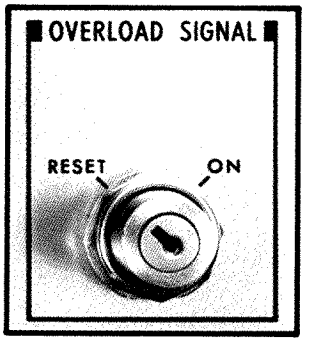


FIGURE 52

2. ELECTRICAL CONTROL PANEL - STANDARD CLUTCH AND AUTOMATIC CYCLE MACHINES

OVERLOAD SIGNAL: This device, used in conjunction with the Tonnage Indicator, indicates that an overload has occurred. It does not prevent an overload. When an overload occurs the clutch will disengage and the friction brake will engage. The ram may stop on the down stroke, at the exact bottom of the stroke or on the up stroke. The spring loaded switch (Figure 52) is always in the "ON" position, therefore the Overload Signal device is always active.

To remove an overload and restore operation see SECTION 6 - MAINTENANCE AND ADJUSTMENTS. Do not restart operation until the overload on the machine has been removed and the reason for the overload corrected.

3. ELECTRICAL CONTROL PANEL - MANUAL CLUTCH CONTROL IN ADDITION TO AIR-ELECTRIC CONTROL (OPTIONAL 5 THRU 21 SERIES)

The control panel and its electrically operated controls are identical to those described for the standard clutch machine (see Page 41). The optional manual control is not available for

electric-air disc clutch and brake machines. When the Press Brake is operated by the manual control, the electrical controls are made inoperative. This occurs when the locking pin (Figure 53) for the manual control is pulled out, allowing the control to move. A safety interlock switch is tripped by the locking pin, causing the electrical palm buttons and/or foot switch controls to become inoperative.

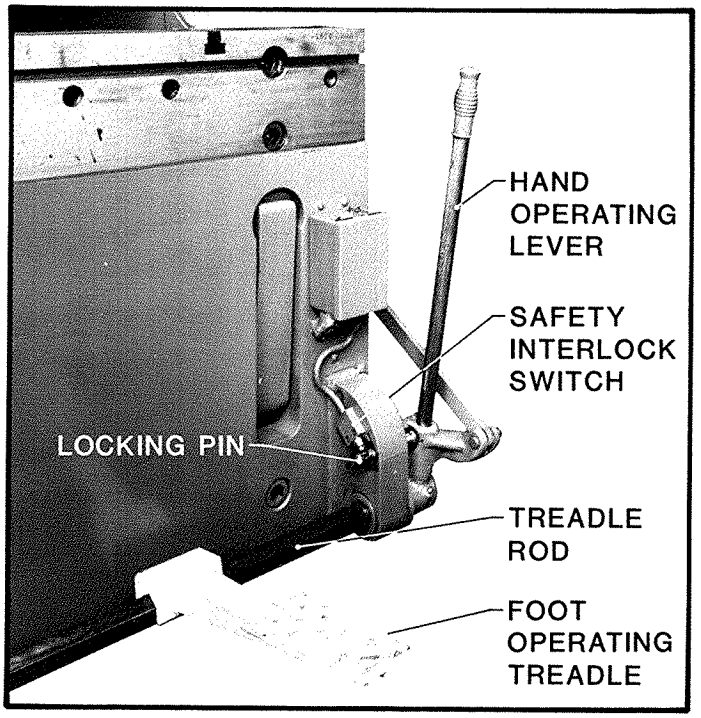


FIGURE 53

To cycle the ram either fully depress the foot treadle or pull the hand lever. To stop the ram at any point on the DOWN or UP stroke, release the foot treadle or hand lever. These manual controls are spring loaded with the clutch normally disengaged. The controls can be jogged to slowly bring the ram down near the workpiece so it can be aligned before forming.

The foot treadle can be moved along the hex treadle shaft to the most convenient position to operate the machine. Before cycling the ram make sure all persons are clear of the point of operation and be careful of material "whip-up". If the operator leaves the control area with the motor running, the locking pin should be engaged and the foot treadle removed to prevent the ram being cycled.

Another option available for manual clutch control is the pneumatic treadle rod assembly. This unit provides an air cylinder connecting the linkage between the foot treadle mechanism and the clutch and brake. A similar device is used in the Stroke Stop for manual control machines described below.

STROKE STOP: This device is available on air-electric clutch machines equipped with manual control in two versions. One will operate only with the electric or normal controls. In the electrical mode the Stroke Stop operates as previously described (Page 44). For machines having air-electric and manual operation there are two stroke stop cams (Figure 54). In electric operation the UP stroke stop cam "C" should be moved to maximum down position to prevent operation, since the automatic stop at top of stroke already occurs in the electrical mode.

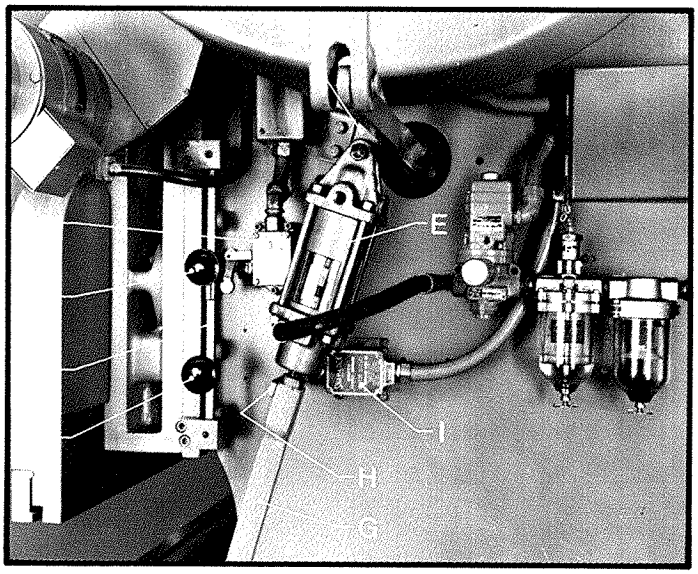


FIGURE 54

In manual operation stroke stop cam "B" is adjusted on cam holder bracket "D" so that ram will stop on the DOWN stroke just above the workpiece when it trips limit switch "A". Cam "C" is positioned so the ram will stop on the UP stroke at top of the stroke.

When the main drive motor is running in the manual mode of operation, air pressure against the piston in cylinder "E" creates a rigid connection between the upper treadle lever rod "F" and the lower treadle lever rod "G". This linkage between the foot treadle/hand lever and the air-electric clutch causes the ram to move when the manual control is actuated. When the cam "B" trips the limit switch "A" on the DOWN stroke, air pressure is removed from the cylinder "E", which breaks the rigid linkage connection. This causes the clutch to disengage and the brake to engage, stopping the ram. Fully releasing the foot treadle or hand lever causes the safety limit switch trip bar "H" to trip the safety limit switch "I", restoring air pressure to the cylinder and reconnecting the treadle linkage.

Again actuating the foot treadle or hand lever will restart ram motion. When the up stroke cam "C" trips the limit switch "A" the ram will stop at top of the stroke due to the control sequence described above.

For consistant performance the clutch must be fully engaged at the start of the DOWN stroke. The friction brake will then have a rapid closing action to stop the ram at the stroke stop position.

Safety features in the Stroke Stop device provides for electrical or air supply failure. If a failure occurs the air pressure to the cylinder "E is stopped, "disconnecting" the operating linkage and stopping the ram. However, if the operating valve malfunctions the ram will not stop at the Stroke Stop positions causing the dies to close unexpectedly on the workpiece or any portion of the operator's body between the dies. We recommend the operator keeps clear of the point of operation and the workpiece.

4. FOOTSWITCH (FIGURE 55): This optional operator station is a guarded, two position switch. It can be used instead of the palm button operator controls, but not in combination with them. Depressing the footswitch causes the ram to

move and releasing it will stop the ram (at a position determined by the mode of operation). The footswitch operator station is made active by a keylock OFF-ON selector switch. This switch may be located on a small electrical box on the front of bed or side of the housing, or on the main electrical enclosure. A red indicator light indicates it is turned "OFF" and an amber indicator light indicates it is turned "ON".

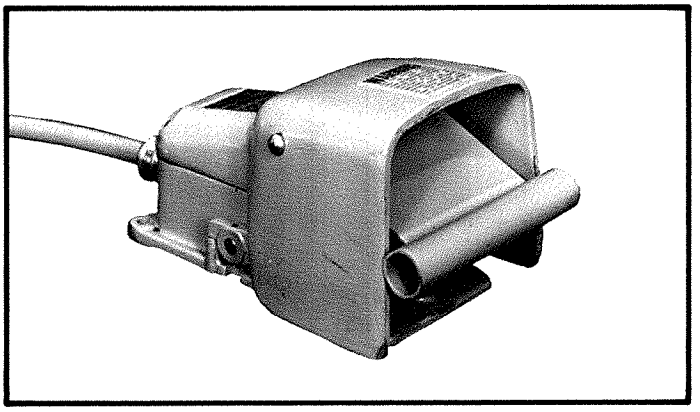


FIGURE 55

When the footswitch is used, the selector switch for the palm buttons must be turned "OFF". If two or more footswitch controls are used, they all must be depressed at about the same time. However, if any footswitch is released the ram will stop. To restart ram motion, all footswitches must be released and re-depressed. These are safety features for the operator(s).

5. TONNAGE INDICATOR (FIGURE 56): The dial indicator located on the Press Brake housing shows the load in tons which occurs on a forming stroke. This is accurate for loads centered between the housings. The black hand registers the load and will remain at that tonnage until released by pressing pin "A". Press this pin after each reading. The tonnage should be noted particularly at set-up and at times during normal operations. Excessive tonnage can damage the part, tooling or machine. Do not continue to operate the machine until the cause for the overload has been corrected.

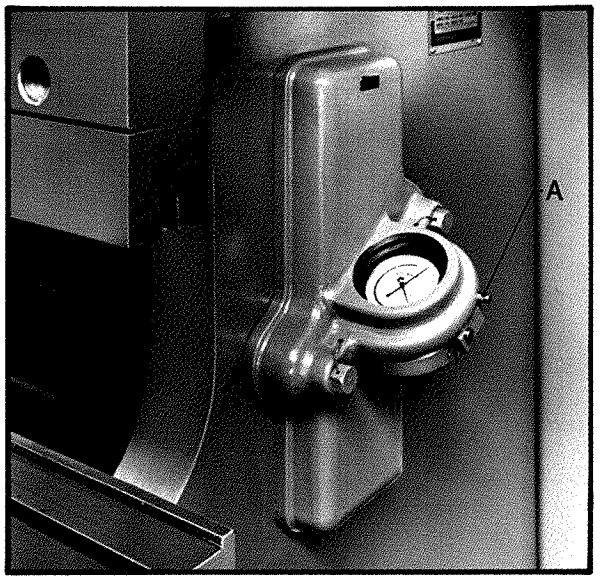


FIGURE 56

The red hand is set for the normal capacity of your machine at the factory and sealed. When an overload occurs, the red hand is pushed by the black hand to a higher tonnage, where it will remain. The black hand can be released by pushing pin "A", but it may not return to zero.

The red hand may require resetting due to an overload. The black hand may require resetting due to an overload, vibration during shipping or to changes in temperature. See Section 6 for the resetting and adjustment procedure.

6. TWO SPEED TRANSMISSION: This optional transmission for standard clutch machines provides FAST speed for normal production forming and SLOW speed to prevent "whip-up" of the part. The usual SLOW speed is approximately one fourth of the FAST speed. This transmission is available on all Press Brakes up through 34 Series. It is the standard transmission on 36, 40 and 50 Series machines.

On 4-5 Series Press Brakes and 7-9 Series Press Brakes shipped prior to 1 January 1956 the Two-Speed shifter handle is located in the rear of the machine at inside of the left housing. The shifter handle is also located in the rear of machine for other Press Brakes. On the 7-9, 12-13, 36 and 40-50 Series it is outside the right housing, and on 19, 21 and 34 Series it is inside the right housing. See Figure 57. Instructions for changing speeds are on the metal instruction plate. This plate is located near the shifter handle.

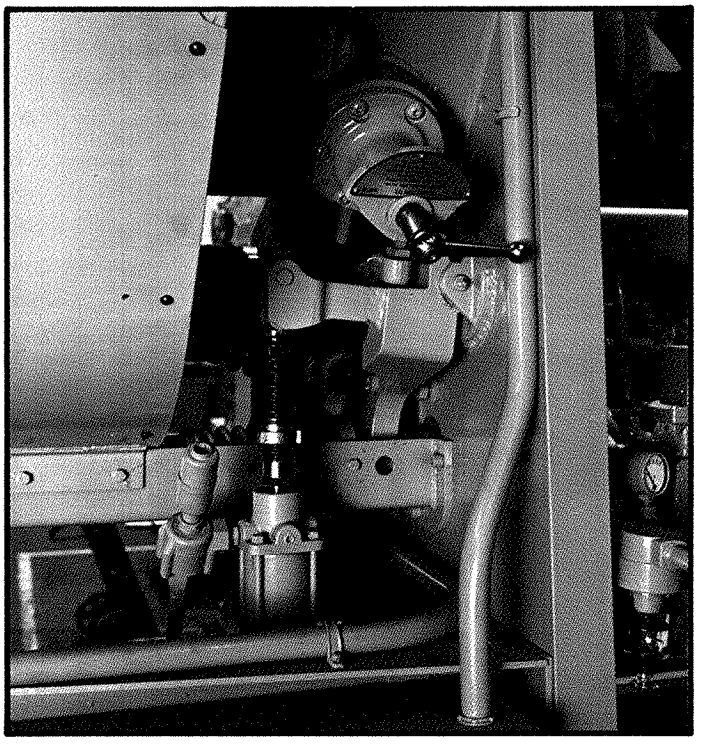


FIGURE 57

STARTING MACHINE

Before starting your Press Brake read and thoroughly understand the complete manual. Special attention should be given to the following cautions. Failure to do so could result in serious injury.

- When machine is not in use, always run ram to bottom of the stroke or block the ram.

- **Whenever leaving the Press Brake, always turn the CONTROL CIRCUIT selector switch to "OFF" position. Engage treadle lock and remove foot treadle (optional manual clutch control).**
- **Never place any part of your body in the die area.**

INITIAL START-UP

A CINCINNATI INCORPORATED Service Representative should be present during the initial start-up of your Press Brake. Before starting the drive motor the following checks should be made:

1. Installation has been completed as determined by a CINCINNATI INCORPORATED Service Representative, including:
   a. Foundation
   b. Cleaning
   c. Leveling
   d. Lubrication
   e. Electrical and air connections
2. All machine options have been installed on the Press Brake.
3. The ram tilt mechanism has been properly adjusted with the ram parallel to the bed.
4. Flywheel rotates in proper direction (see arrow on guard).
5. A complete visual inspection of the machine has been made.

Press the MAIN DRIVE "START" button and allow the flywheel to reach full speed. Set the machine controls as follows:

1. Electrical Control Panel (Figure 43)

   MODE selector switch ....."INCH"
   CONTROL CIRCUIT switch ..... "ON"

   NOTE: If machine has optional manual clutch control, the treadle lock must be engaged.

2. Palm Button Operator's Station (Figure 46)

   OPERATOR STATION switch ---------- "ON"

   NOTE: If machine has optional foot switches, their control switch must be "OFF".

Run the ram through a number of strokes. All controls, electrical functions and safety features of the Press Brake should be checked for proper operation.

DAILY START-UP

Each time the machine is started after an extended off period (several hours or longer), the following procedure is recommended:

1. Check oil level in automatic lubricator(s). If machine has been idle for 48 hours, turn the hand crank until oil appears at the ram guide farthest away from the lubricator. We recommend 40 turns.
2. Drain air-line filters and surge tank of condensation. Check air-line air pressure and lubricator oil level.
3. Check controls for proper operation.
4. Check clutch and friction brake for proper operation. Adjust if necessary.
5. Check that all controls are correctly positioned for the set-up or job to be run.
6. Check the ram adjustment indicators to insure the ram is located properly for the set-up.
7. Check the machine for loose fasteners. Tighten if necessary.
8. Check that all required safety devices are operating properly and all safety procedures are being used.

SET-UP AND USE

A mechanical Press Brake is a very versatile bending machine. It is capable of exerting high forces between its bed and ram. These forces are applied and directed into the material to be formed by the use of tooling (dies).

The type and shape of dies are the principle factors in establishing the shape of the part to be formed. There are many different types and shapes of press brake dies. Some have a very special and unique shape. However, most dies are members of a family of tooling called Vee Dies. See Figure 58. These dies, being the most common, will be referred to in the following instructions.

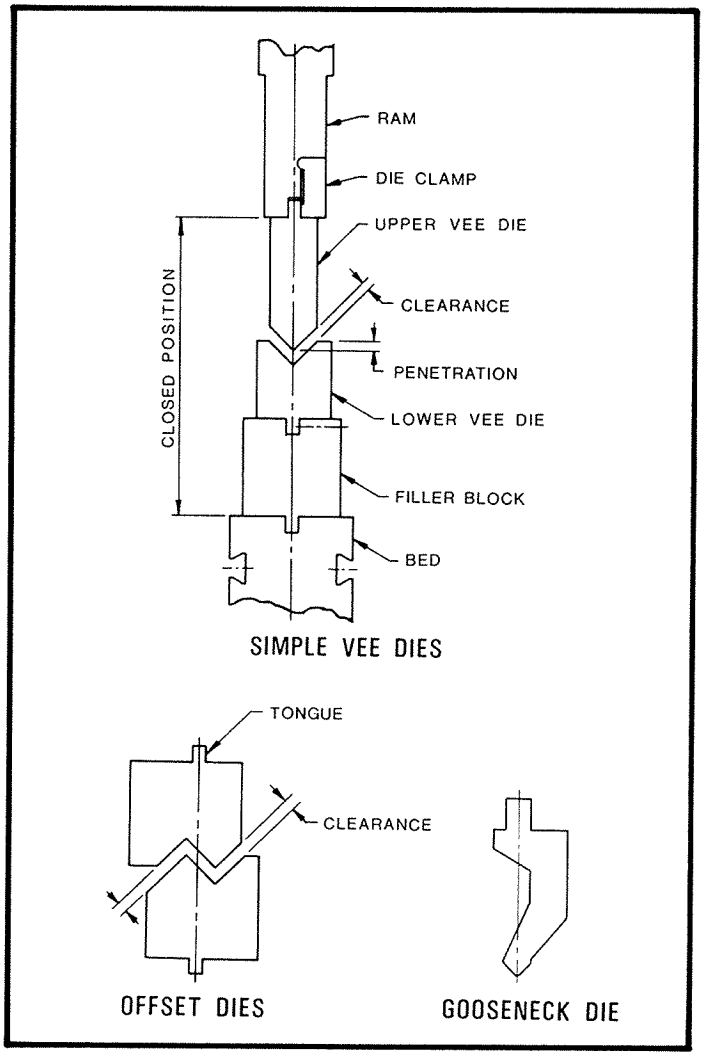


FIGURE 58

PRELIMINARIES - Before installing tooling in the Press Brake.

1. Know the machine. Thoroughly read this manual and become familiar with all of the controls and how they affect ram motion. Run the machine without tooling installed and become familiar with its "feel".

2. Be safety conscious. Always follow the safety precautions.

3. Select proper tooling for the job. Make sure the dies are in good condition.

4. Whenever installing or removing tooling always place the MODE selector switch in the "INCH" position. When in this mode the ram can only be cycled by use of the dual palm buttons.

5. Whenever installing or removing tooling always position the ram at the bottom of the stroke. Then, if the ram was cycled, its first movement would be UP.

6. Whenever installing or removing tooling always turn OFF the main drive motor and let the flywheel stop turning.

7. Whenever installing or removing tooling always lock the palm button OPERATOR STATION switch in the "OFF" position or lock the foot treadle so the ram cannot be cycled.

8. Change the die clearance only with the motor driven ram adjustment mechanism.

9. Be sure the dies have metal "clearance" as shown in Figure 58.

10. Never place any part of your body in the die area.

INSERTING AND SETTING-UP TOOLING (VEE DIES)

1. Set the machine controls:

CONTROL CIRCUIT switch	"ON"
MODE selector switch	"INCH"
OPERATOR STATION switch	"ON"
FOOT SWITCH selector	"OFF"
Manual foot treadle (optional)	LOCKED

2. Start the machine and run the ram to the bottom of the stroke. A broad red stripe painted on the eccentric and connecting rod, when lined up, indicates this position. See Figure 59. Turn OFF the main drive motor and lock the palm button OPERATOR STATION switch in the "OFF" position. Let the flywheel come to a complete stop.

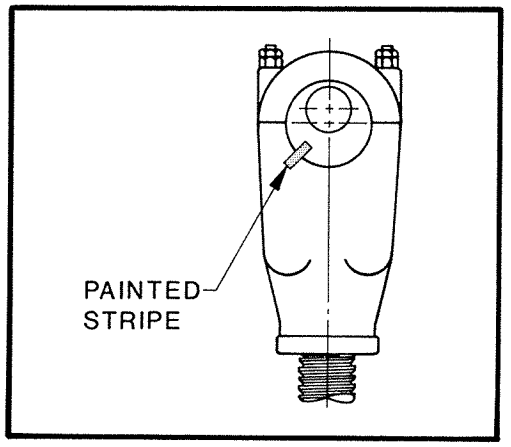


FIGURE 59

3. Deburr, clean and lightly oil bed top. Put tee nuts for filler block screws in the proper bed cross tee slots. Place filler block (die holder) on bed and lightly bolt into place. In some cases a filler block may not be required and the lower die may be placed directly on the bed. Deburr, clean and lightly oil the top of filler block. Loosen all of the filler block set screws.

4. Insert lower die on the filler block. Leave it extended past end of the bed several inches. Visually center filler block front to back so that lower die is aligned with slot in the ram nose.

   CAUTION: See Section 3 - SAFETY for proper handling of dies.

5. Loosen all ram die clamps about 1/8". Move the ram upward using the ram adjusting mechanism so that there is just enough space for working height of upper die.

6. Rest the upper die on extended portion of lower die. Make sure tongue of upper die is in the ram nose slot. See Figure 60. Then slide upper die into lengthwise position with the lower die. Slide the set of dies into a centered position on the filler block. Tighten the filler block set screws to secure lower die.

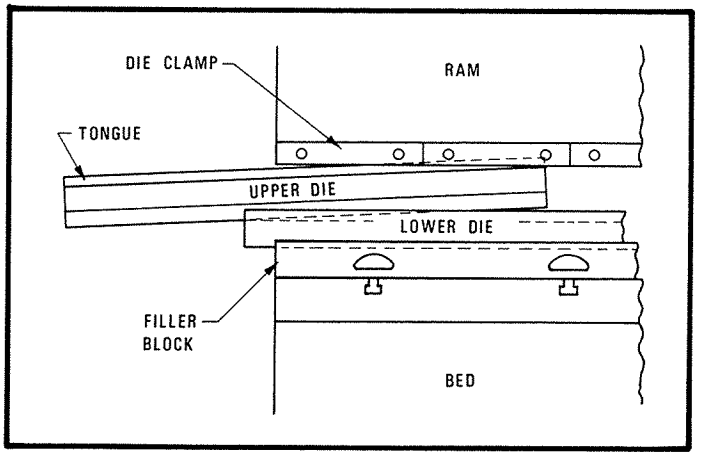


FIGURE 60

7. Moderately tighten the ram die clamps to prevent the upper die from falling when the ram is raised. Move the ram upward (or downward) using the ram adjusting mechanism to obtain 1/8" to 1/4" clearance between the dies. Visually align the upper and lower dies. Shift the filler block (holding the lower die) to obtain alignment. CINCINNATI recommends die aligners to adjust the filler block.

8. Move the ram down using the ram adjusting mechanism to tightly close the dies. This will seat the upper die against the ram nose. Fully tighten the die clamp nuts. Check the shoulders of the die with a .0015" feeler gage to make sure the die is seated properly.

9. Again adjust the ram upward to obtain clearance at the slopes of the dies. This clearance should be equal to the thickness of the material to be formed. See Figure 61. Adjust the alignment of filler block until the clearance is alike. Tighten the filler block (or lower die) to the bed. Check the alignment at both ends of the dies with feeler gages or strips of metal of proper thickness. Realign if necessary.

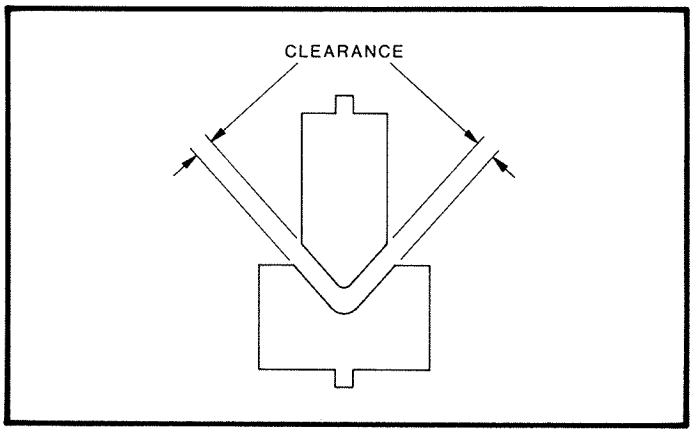


FIGURE 61

10. The ram must now be adjusted to produce acceptable parts. Start the Press Brake and make several test bends. Adjust the ram up or down until the desired bend is obtained. It may also be necessary to tilt the ram to compensate for variations in the dies, machine, material or die wear.

    CAUTION: Keep all parts of your body out of the die area.

11. Some forming jobs may require shimming under the dies to correct for machine deflection or die wear. The dies will need thicker shims in the center for capacity bends. This is usually done by using thin metal or paper .002" to .004" thick. Start with a long strip and then center successively shorter strips on top. For light loads the opposite method may be necessary. Place the shims at each end of the die. This "tapering" procedure can be used to produce very accurate bends.

12. When a satisfactory set-up has been made, carefully record all information so that repeat jobs can be set-up again in minimum time. Record the dies and filler block used, ram indicator reading (at both ends if they are not alike), gage setting dimensions and shims under the dies.

    CAUTION: Before making bends make sure that all safety devices are operating properly and are being used. Evaluate each job for proper safeguarding. See ANSI B11.3-1982 - Safety requirements for the construction, care and use of power press brakes.

    Always cycle the machine several times at the start of a new job or at the beginning of a new shift to check that the controls are set and operating properly.

    When making a bend, know how the part will react on the forming and return stroke.

REMOVING TOOLING

1. Set the machine controls:

   CONTROL CIRCUIT switch ..... "ON"
   MODE selector switch ..... "INCH"
   OPERATOR STATION switch ..... "ON"
   FOOTSWITCH selector ..... "OFF"
   Manual foot treadle (optional) ..... Locked

2. Start the machine and run ram to bottom of the stroke. Stop the main drive motor and lock the OPERATOR STATION switch in the "OFF" position. Let the flywheel come to a complete stop.

3. Use the ram adjusting mechanism to lower the ram until the nose of upper die is approximately 1/32" above the bottom of vee in the lower die.

4. Loosen the ram die clamp nuts. Use the ram adjusting mechanism to raise the ram 1/16" to 1/8". This will keep the upper die trapped in the ram nose and the lower die. See Figure 62.

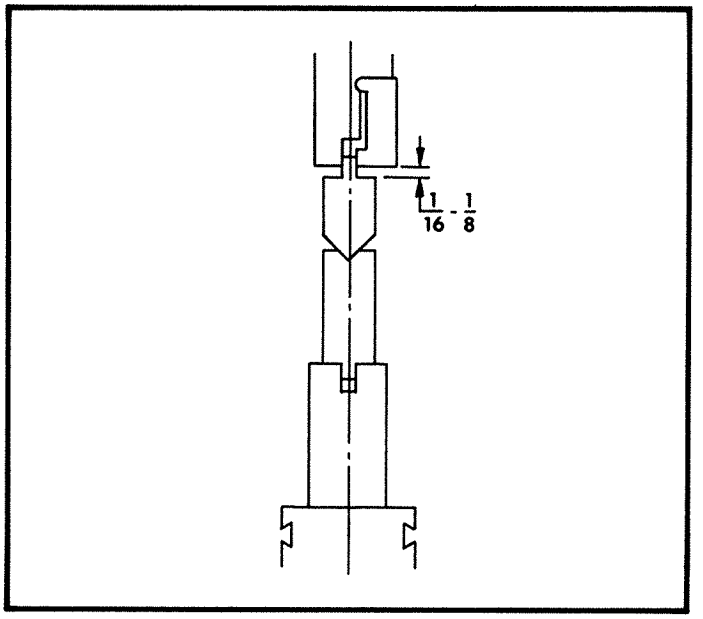


FIGURE 62

5. Loosen the filler block set screws holding the lower die.

6. The dies can now be removed from the end of machine. They may be removed either together or individually.

   CAUTION: See Section 3 - SAFETY for proper removal of dies.

BENDING TIPS

Making good bends is an art. The following suggestions will help in making the best possible bend.

Refer to the Press Brake Capacities in booklet to determine what tonnage is required to air bend the part. Check the machine's capacity plate on the ram to make sure the Press Brake can make the bend.

Whenever possible locate the tooling and bend load on the front to back and left to right machine centerlines.

Some jobs may require shimming of the dies to correct for machine deflection or die wear. This is usually done by using thin metal or paper .002" to .004" thick. Start with a long strip and then center successively shorter strips on top. This "tapering" procedure can be used to produce very accurate bends. Shimming should be done under the filler block or lower die.

Always make sure that the die shoulders are seated tightly against the ram nose and filler block. Check for burrs and dirt when installing tooling.

A bend difference between two ends of the part usually indicates worn dies or die errors. This problem can easily be corrected by tilting the ram.

Front to back die alignment is critical in producing uniform bends and in eliminating damaging thrust loads.

Selecting tooling which is correct for the job and compatible with the machine capacity is essential for making good bends.

Always inspect the tooling before starting a new job. It may be impossible to compensate for badly worn dies and damaged dies could create a safety hazard.

Two additional considerations for making good bends are gaging and blank development.

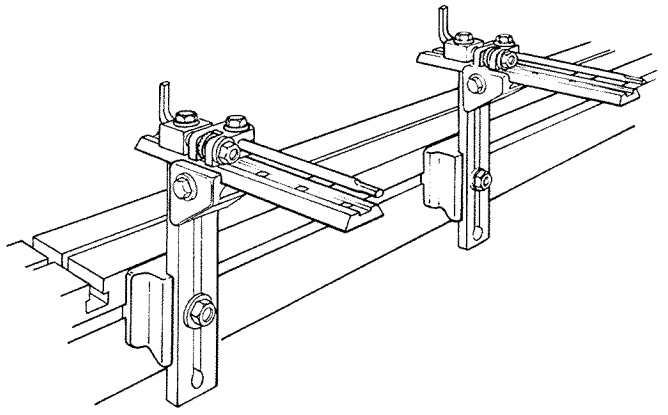
GAGING

Proper gaging is just as important as tooling and the Press Brake when attempting to make good parts. Each part should be individually analyzed for the best bend sequence and gaging method.

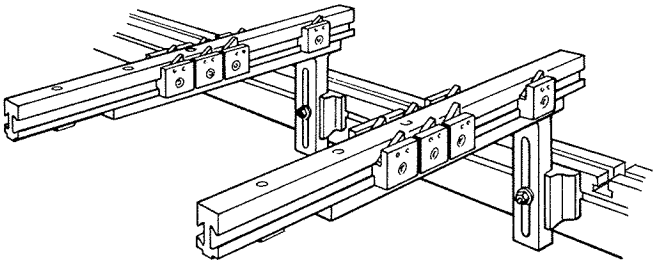
Selecting the proper gage:

1. Make a simple sketch showing the operation sequence of the bends.
2. Determine the gage locations using the part edge or the previous bend to hold the best accuracy and part tolerance. Sometimes holes are used for gaging.
3. When using backgages provide a material stop of sufficient height and size to minimize the possibility of the workpiece passing beyond the backgage, which would allow your hands to enter the point of operation.
4. Lot sizes, production requirements, shop methods and available funds also have a bearing on the selection of gages.
5. PT sheets 601, 602, 603, 604, 605, 606, 608, and 609 give many examples of methods of gaging using CINCINNATI gages.

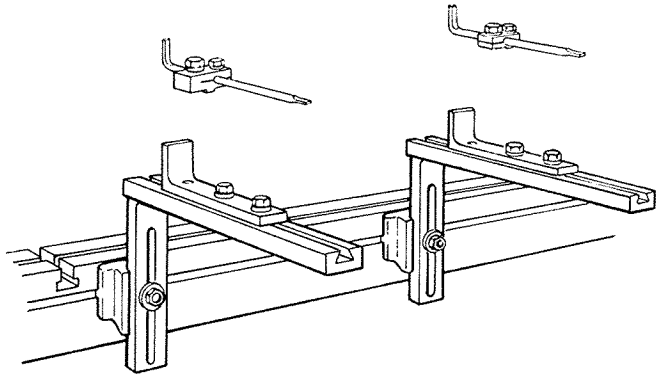
Figure 63 shows some examples of standard CINCINNATI gaging. These gages are normally fastened to dovetail slots in the front or rear of the bed.



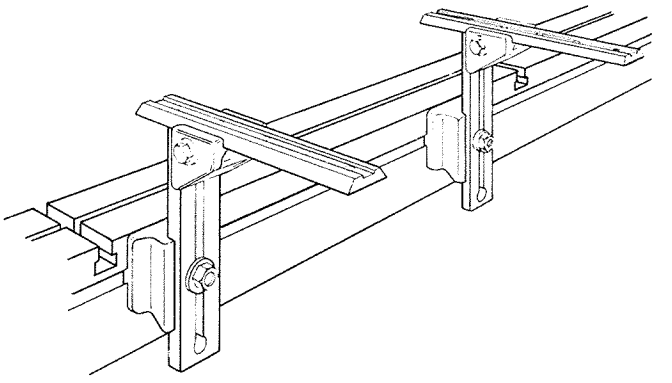
CINCINNATI Standard Gage with micrometer adjustment.



Adjustable Disappearing Gages provide multiple gaging positions with complete flexibility in vertical and horizontal positioning. These gages are easy to set up, are accurate, and save many hours of work handling. Disappearing gage stop assemblies are located on either side of heavy duty gage bars. Any number of stops may be used.

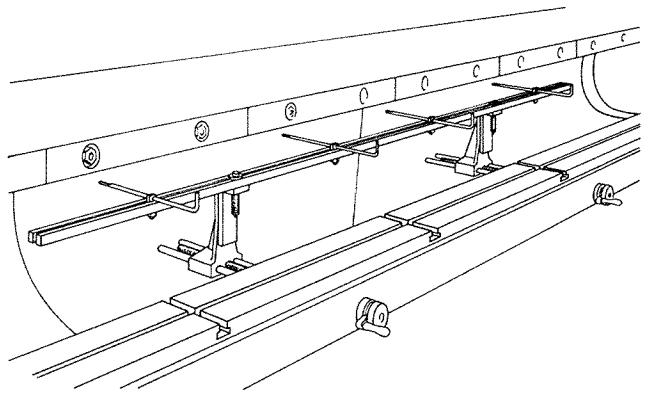


CINCINNATI Heavy Duty Gages are particularly recommended for use in plate shops, where very rugged construction is necessary. Gages equipped with heavy duty stops are shown.



CINCINNATI Standard Gage brackets without stops can be used for work supports.

FIGURE 63



CINCINNATI Front-operated, Dual Control Back Gage is used for gaging light sheets. They are manually operated and have a 24" range.

FIGURE 63 (continued)

BLANK DEVELOPMENT

This is not a gaging item but it is a necessary function to determine the gage location. Many users have developed their own methods and calculations. Information on blank development can be found in various handbooks.

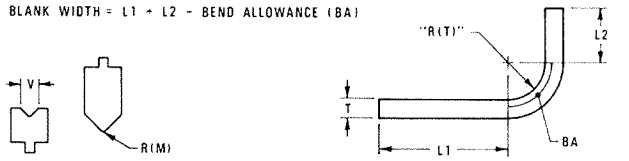
Figures 64 and 65 show the bend allowances commonly used for air bending mild steel. Also see booklet for Press Brake bending capacities.

Until formulas, charts and bending operations are verified, it is always best to make up an actual part before cutting a lot of blanks.

Changing material, die opening, upper die radii, tonnage (hitting harder or lighter), and the sequence of bending are some of the things that affect blank calculations.

BEND ALLOWANCES FOR SHEET METAL AIR BENDS - MILD STEEL

BLANK WIDTH = L1 + L2 - BEND ALLOWANCE (BA)



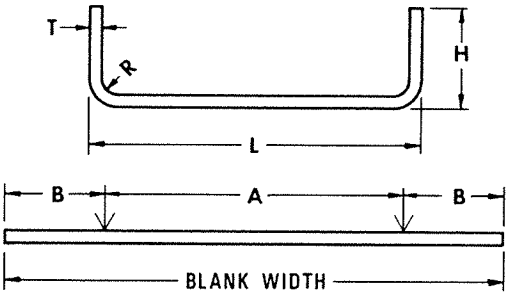
MATERIAL THICKNESS "T"	RECOMMENDED DIE WIDTH "V"	RECOMMENDED UPPER DIE RADIUS "R(M)"	THEORETICAL BEND RADIUS R(T)=5/32 X "V"	ALLOWANCE FOR 90° BEND "BA"	BASIS OF FORMULA FOR CALCULATIONS
3/16 (.1875)	1-1/2	3/16	.2344	.4857	BA = 1.57(R + .4T)
10 GA. (.1345)	1-1/8	1/8	.1757	.3605	
11 GA. (.1196)	1	1/8	.1562	.3203	
12 GA. (.1046)	7/8	1/8	.1367	.2803	
13 GA. (.0897)	3/4	1/16	.1172	.2403	
14 GA. (.0747)	5/8	1/16	.0976	.2001	
15 GA. (.0673)	1/2	1/16	.0781	.1649	BA = 1.57(R + 1/3T)
16 GA. (.0598)	1/2	1/16	.0781	.1539	
18 GA. (.0500)	3/8	1/32	.0586	.1181	
20 GA. (.0359)	1/4	1/32	.0390	.0802	
21 GA. (.0329)	1/4	1/32	.0390	.0786	
22 GA. (.0299)	1/4	1/32	.0390	.0770	
23 GA. (.0269)	1/4	1/32	.0390	.0754	

Calculated bend allowances are approximate, not exact. Actual dimensions can only be found by making the bend and measuring the results.

The above formula is for right angle bends only. For gaging, remember to use only one leg and one half of the bend allowance to approximate the distance.

FIGURE 64

BEND ALLOWANCES FOR PLATE AIR BENDS - MILD STEEL



SIZE DIE	BEND RADIUS	PLATE THICKNESS T	TO FIND: A	TO FIND: B
2	5/16	1/4	L - 1/2	H - 1/4
		3/8	L - 3/4	H - 3/8
4	5/8	3/8	L - 7/8	H - 7/16
		1/2	L - 1	H - 1/2
6	15/16	3/8	L - 1-1/8	H - 9/16
		1/2	L - 1-1/4	H - 5/8
8	1-1/4	5/8	L - 1-3/4	H - 7/8
		3/4	L - 1-7/8	H - 15/16

FIGURE 65

To maintain the accurate performance of your CINCINNATI Mechanical Press Brake there are maintenance practices that should be followed. This section deals with the maintenance and adjustments for the Press Brake.

RAM SLIDE AND GUIDE CLEARANCE

A .006" to .008" running clearance is required between the slides and guides. Insufficient clearance or uneven clearance may cause damage to the machine.

Check the ram slide clearance with feeler gages as shown in Figure 66. This is to make sure there is no twist in the machine due to being out of line.

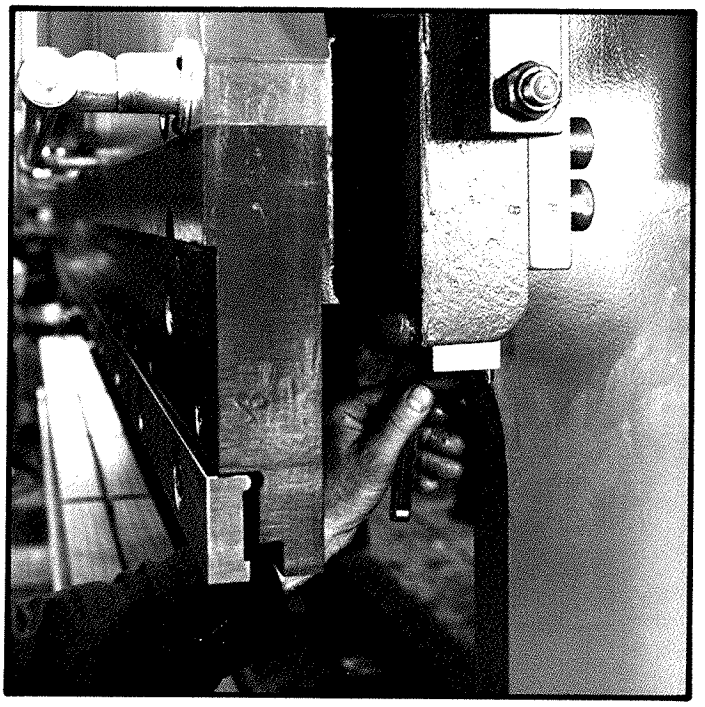


FIGURE 66

If all of the clearance (.006" to .008") is at TOP FRONT and BOTTOM REAR on one slide and the reverse condition, all clearance at TOP REAR and BOTTOM FRONT on the other slide, there is twist in the ram. Regardless of level of the bed, if this condition is not corrected the slides may score. Raise or lower either housing, adding or removing shims as required, to relieve twist in the machine. Some clearance must appear at the points which have been tight. Clearance must not vary more than .001" across face of the guides. If clearance exceeds .001" recheck to see that there is no clearance between the bed slots and the vertical surfaces of housings at top and bottom. Also check that housing brace lugs are tight against the housing brace nut or housing. After proper clearance is obtained, tighten foundation bolt nuts and recheck the clearances.

If the clearance between the slides and guides is either excessive or insufficient, contact CINCINNATI INCORPORATED Service Department.

SWIVEL END GUIDE BEARING

The swivel end guide bearing, located on the right ram slide, provides the adjustment for side clearance of the slides and guides. To adjust the end guide clearance:

1. Adjust swivel end guide bearing clamp by tightening the two hex adjusting nuts evenly until they are snug. See Figure 67.

2. Back-off both nuts one quarter turn. This will allow about .002" to .003" running clearance.

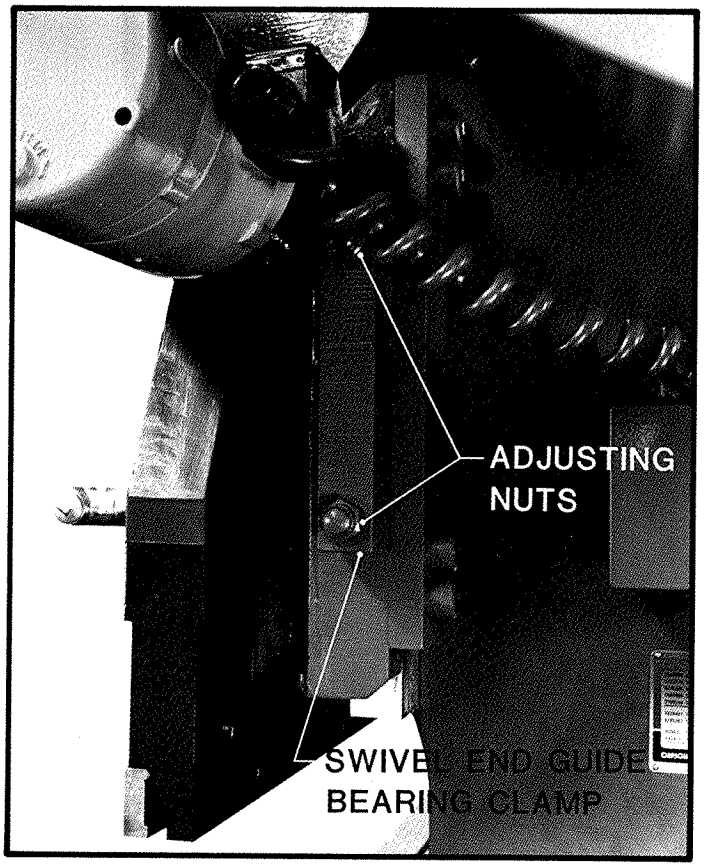


FIGURE 67

BALL SEAT ADJUSTMENT

To adjust for wear in the adjusting screw ball seat:

1. Start machine and cycle ram to bottom of the stroke.

2. Place a block of wood between center of bed and ram. The grain should be vertical.

3. Lower the ram with the ram adjusting mechanism. Press the DOWN button until ram jams against the wood block. Turn OFF main drive motor and main disconnect switch and lock disconnect switch. Let the flywheel come to a complete stop.

4. Loosen lock screw and pry lock plate away from adjusting nut. See Figure 68.

5. Turn adjusting nut clockwise by tapping with a brass rod until it is tight. Then back off one notch. Tap lock plate into the notch and tighten lock screw.

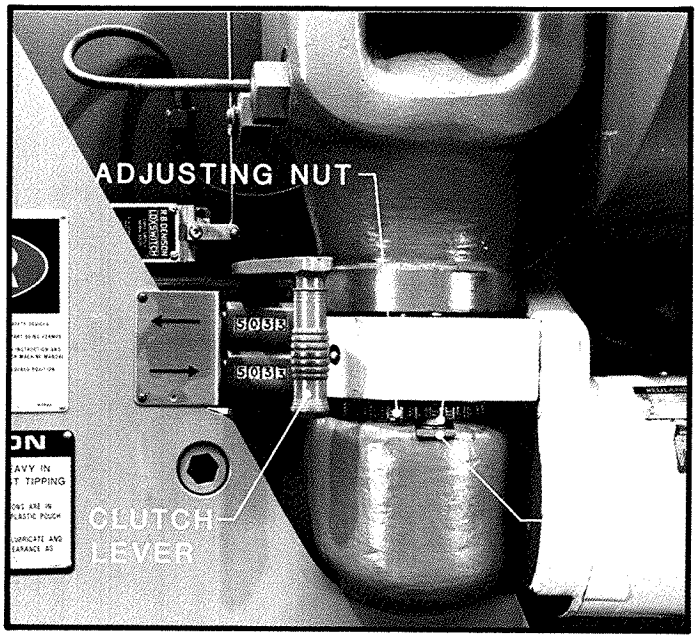


FIGURE 68

6. Check the ram for parallelism to the bed. Use a dial indicator.

7. If the measurements are not equal, adjust the ram tilt. Turn ON main disconnect switch (do not start drive motor). Disengage ram adjustment clutch lever and run the right adjusting screw up or down with ram adjusting mechanism as required.

8. After ram is parallel to the bed, set the direct reading counters to read alike. This is done by removing the left counter and turning it by hand. Then replace the counter.

UPPER CONNECTION BEARINGS

The eccentric is supported by two bearings at each housing. The eccentric fits through the eccentric bearings in the housing. The connecting rod is assembled to the eccentric by two caps, with a bronze bearing in each side of the connecting rod and cap. The outboard end of eccentric shaft is supported by a bearing in the gearbox cover on 7 Series and larger Press Brakes. (See Figure 69).

Wear in the upper connection bearings can be noticed if the upper part of the connecting rod moves (kicks) to the right or left under load. A small amount of "kick" is normal. This may be caused by the bearing bore on one side of connecting rod(s) being worn larger (probably egg shaped) than the other side. Check with feeler gages at point "A", Figure 69, with ram stopped at bottom of the stroke. Drive motor must be turned OFF and the flywheel stopped. The proper clearance is .005"-.007" (4-5 Series) and .006"-.008" (7 Series and larger). If the larger bore is within the maximum clearance, the "kicking" can be corrected by removing material from the connecting rod cap of the oversize bore on one or both connecting rods. Before removing the cap, run ram to bottom of the stroke. Stop main drive motor and let flywheel come to a complete stop. Block between bed and ram nose at each housing. Remove the cap from the connecting rod. Remove from the cap the amount of metal required to make clearance the same as for other bearing bore. See Figure 70. Replace the cap.

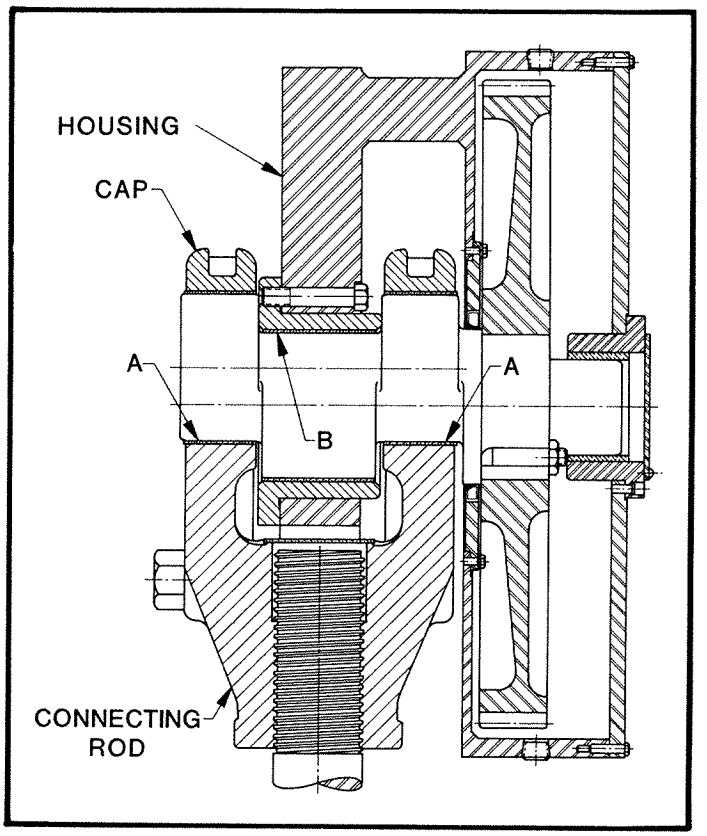


FIGURE 69

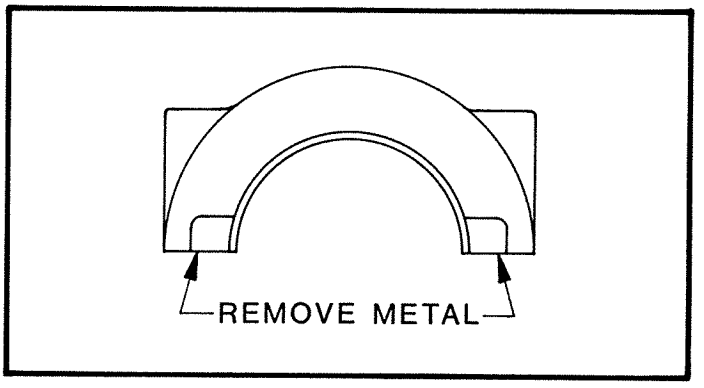


FIGURE 70

If wear on connecting rod bearings is greater than maximum clearance, the bearings must be replaced. Also check the eccentric bearings in housing (point B) by removing the inner connecting rod cap and checking with feeler gage. The same clearances apply as for the connecting rod bearings. Contact CINCINNATI INCORPORATED Service Department for further information.

AUTOMATIC LUBRICATOR

Check the operation of the lubricator by observing the sight feed glass. An impulse of oil is delivered for every revolution of the lubricator shaft. The lubricator makes one revolution for every eight strokes of the machine. Check for an oil feed when the Press Brake is being cycled or by manually turning the hand crank. See Figure 71. If a bind is noted when turning the hand crank the feed rate may be set too high. Also check for a stopped, damaged or kinked feed line. Oil should appear at the far end of each oil feed line. To clean or repair the lubricator, see the Madison-Kipp bulletin included with this manual.

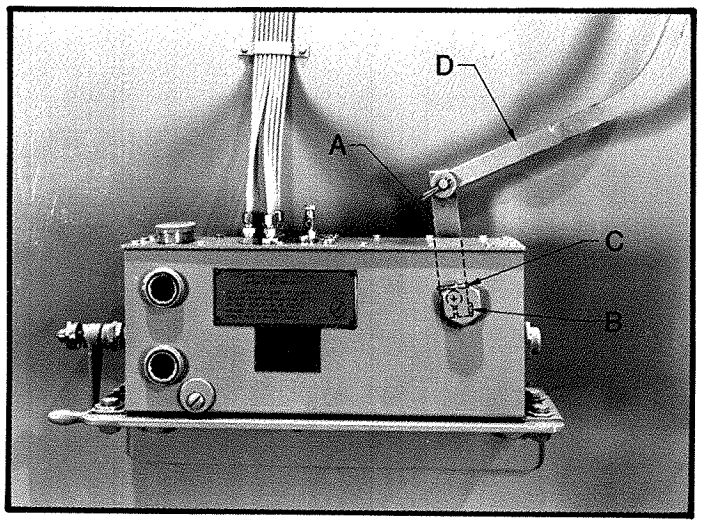


FIGURE 71

TO CHECK AND ADJUST OIL FEED RATE

A lubricator may have one or more pumping units, each capable of feeding eight oil lines. Each pumping unit has a sight gage, test spout and a slotted adjusting button. To check the feed rate, open the screw on top of test spout. Slowly turn the hand crank one revolution and count the number of drops from the test spout. We recommend four drops per turn of the crank. To adjust the feed rate, turn the adjusting button clockwise to decrease and counterclockwise to increase. Make sure the test spout is fully tightened after check is completed.

AIR LINE FILTERS, LUBRICATORS AND PRESSURE REGULATORS

These devices are used in the system for air operated clutches, stroke stop, overload signal and air counterbalances on CINCINNATI Press Brakes.

The air line filter collects both solid and liquid impurities from the air system. Open the drain cock once a week to blow the collected material out of the bowl.

The air line lubricator atomizes oil into an air-borne oil fog. This will lubricate components in the system and prevent rust and corrosion. Check the oil level weekly. Add oil (C.I. oil B-215) through the filler port. The oil feed adjustment on top of the lubricator controls the rate of oil feed through the sight feed glass. Adjust the knob to obtain one drop of oil per 35 to 40 clutch engagements.

The air pressure regulator reduces the factory air supply to the pressure required by the Press Brake's air system. A metal instruction plate, located on the machine near the presure regulator(s), indicates the proper air pressure setting. Generally this setting will not change, but it should be checked weekly. Adjust if necessary by turning handle on top of the regulator. Press Brakes equipped with air counterbalances may require air pressure adjustment to compensate for the weight of dies. See instruction tag on the machine for this adjustment.

Some air systems also have a surge tank. Open the drain cock once a day to remove water condensation from the tank.

TONNAGE INDICATOR

If an overload occurs, both hands of the indicator will move to a higher tonnage. The red hand, indicating normal capacity of the Press Brake, will remain at the higher tonnage. The black hand may not return to zero when the reset button is pressed. Before further operation of the Press Brake or resetting the Tonnage Indicator, the cause of the overload must be determined and corrected.

To reset the Tonnage Indicator (See Figure 72):

1. Remove the lead seal and wire (or cotter key) from pin "E".
2. Remove pin "E".
3. Using a hex socket key, turn screw "D" clockwise until the stop is reached.
4. Press the release button "F". This will cause the black hand to rotate counterclockwise, striking the red hand and also rotating it counterclockwise.

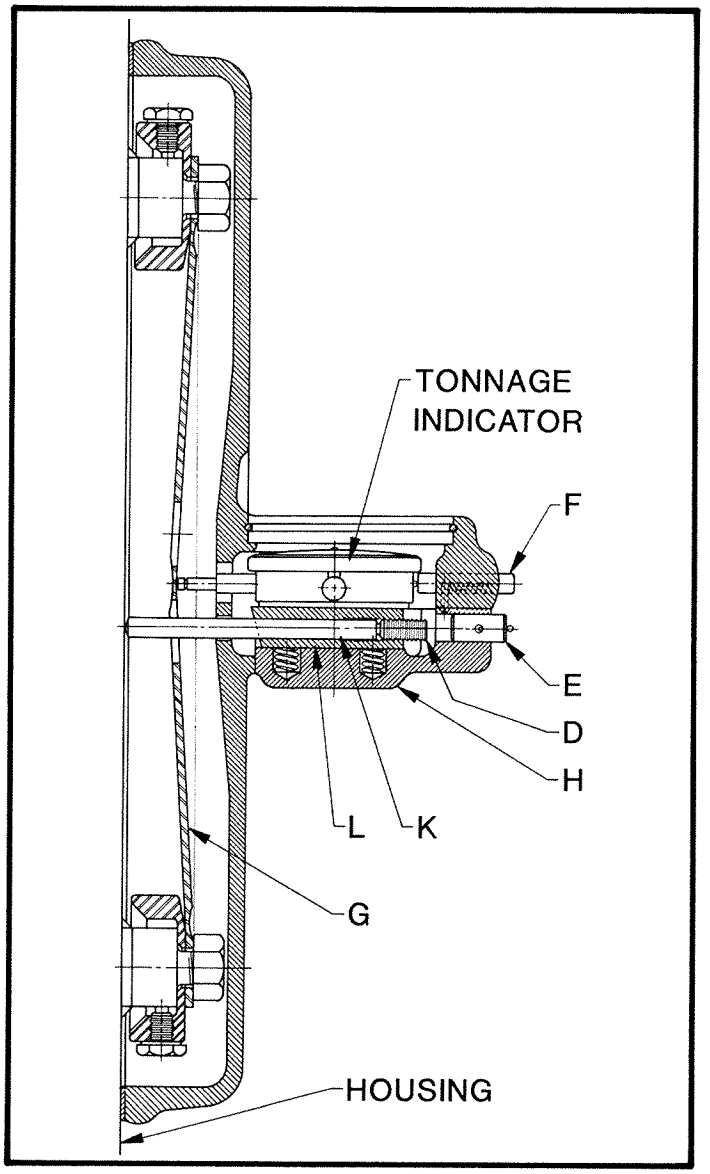


FIGURE 72

5. Back out screw "D" counterclockwise. This will cause the black hand to rotate clockwise, pushing the red hand clockwise. Continue to back out screw "D" until the red hand is at the proper setting. This is when the red hand is at the beginning of the red segment on the indicator dial. Turn screw "D" clockwise 1/4 turn and return the black hand to zero by pressing the reset button "F".

6. Replace pin "E" and cotter key (wire and seal is not reusable).

If the dial indicator is not working properly, it can be removed for replacement: Refer to Figure 73.

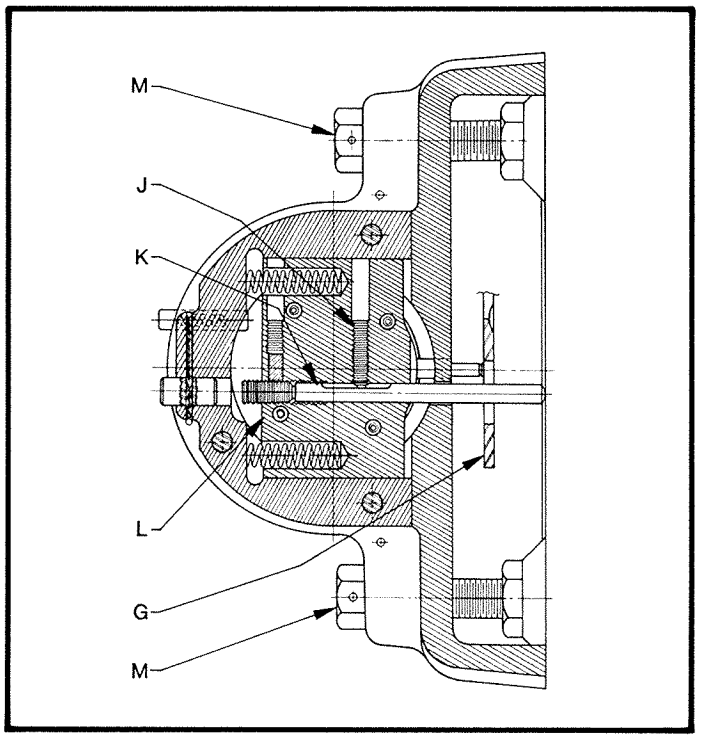


FIGURE 73

1. Remove the two hex head screws "M" and remove the entire load indicator unit.

   CAUTION: Do not disturb the fulcrum "G" or its adjusting screws on the housing.

2. Remove the three socket head screws in the back cover "H" (Figure 72) and remove the cover.

3. Carefully remove block "L", with the dial indicator attached, from the indicator housing.

4. Remove the four small screws holding the dial indicator to block "L".

To replace the dial indicator:

1. Pull the spindle of the dial indicator out as far as it will go.

2. Attach the indicator to the block "L". Insert it in the indicator housing and reassemble the springs, pin "K", set screw "J" and back cover "H".

3. Pin "K" should project 1/4" beyond the bottom of the indicator housing before attaching to the machine housing.

4. Attach the whole unit to the side of the Press Brake housing. As you retighten the hex head screws "M" the black hand should not move.

5. Reset the red and black hands as previously described.

STALLING

Any eccentric operated press can be stalled. When stalled at the bottom of the stroke, or at dead center, great overload may occur. To free a CINCINNATI Press Brake from such a stalled condition see Overload Signal.

OVERLOAD SIGNAL

When an overload occurs on the forming stroke the Overload Signal will cause the clutch to disengage and the brake to engage. If the ram is stalled near or at the exact bottom of the stroke, severe overload may occur. Observe the position of red painted stripe on inside of left connecting rod and eccentric (Figure 74). When the stripes exactly line up the ram is at the bottom of stroke. If stripe on eccentric is to the left of stripe on connecting rod, the ram is on the down stroke.

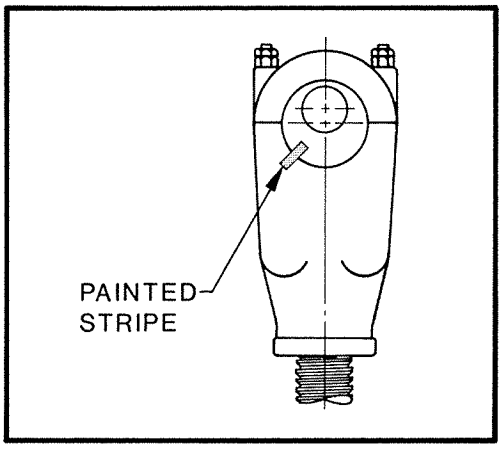


FIGURE 74

To free the ram and return it to top of the stroke, do one or more of the following steps:

1. Turn OFF drive motor and allow flywheel to stop.

2. Tighten the clutch as much as possible. Do not tighten so much that toggles will not pass "over center". See CLUTCH ADJUSTMENT in this Section. Check and tighten vee belts if necessary. On machines with air operated clutches, increase air pressure to the cylinder to a maximum of 100 PSI by adjusting the pressure regulator. Also replace the metering nipple between the solenoid valve and the cylinder with a pipe nipple. On Automatic Cycle machines, turn the pressure regulator to a maximum of 100 PSI on machines with Wichita clutch and 150 PSI on machines with Industrial clutch.

   If the ram is stalled on the down stroke or at bottom of the stroke, start the main drive motor in REVERSE. If the ram is on the up stroke, start motor in FORWARD. Turn the OVERLOAD SIGNAL selector switch to "RESET". Automatic Cycle or air clutch machines should be in "INCH" mode of operation. Allow the flywheel to reach full speed. Engage the clutch (manual clutch control should be

engaged quickly and firmly). If the flywheel speed slows down, release clutch and allow flywheel to reach full speed again. Repeat procedure until ram backs-off.

NOTE: Do not attempt to raise the ram with the ram adjusting mechanism. The connecting rod threads will be jammed tight and attempts to turn them will damage the ram adjusting mechanism and motor.

3. If the method described in paragraph No. 2 fails to move the ram, pack exposed portions of both connecting rods and the dies with dry ice. About 200 pounds of dry ice is required. This may cause these parts to shrink enough to allow movement. After about three hours again attempt to raise ram as described above.

   CAUTION: Do not touch dry ice or cooled parts with bare hands. Use gloves or other protective devices.

4. If all attempts to raise the ram fail, the dies must then be cut apart with a cutting torch. When enough material is removed to relieve pressure on the ram, raise the ram as described in paragraph No. 2.

   CAUTION: When raising ram, die components may fall out of machine.

   After the ram is raised to the top position the machine must be readjusted for normal operation. Readjust the clutch, air pressure, tonnage indicator and replace the metering nipple (if required). Before again operating the press brake, the reason for the overload must be determined and corrected.

TO ADJUST OVERLOAD SIGNAL

This adjustment should be made whenever the Tonnage Indicator is readjusted. It is not required every time an overload occurs.

1. Remove the limit switch cover (Figure 75).

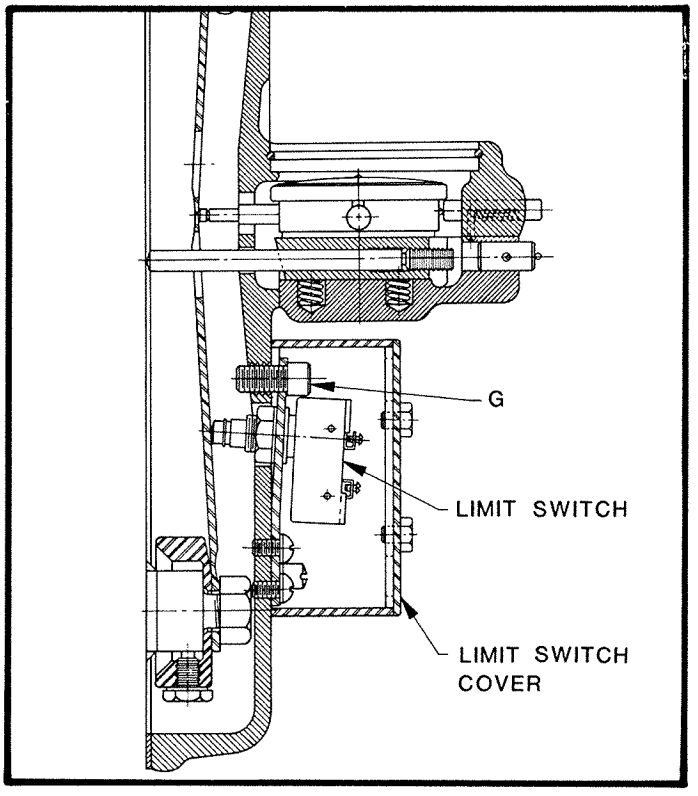


FIGURE 75

2. Adjust the limit switch by tightening or loosening screw "G". Adjust the limit switch so that the overload signal will operate at the bottom stroke capacity of the press brake (at the beginning of red segment on indicator dial).

3. To check the point of clutch release, use a set of flattening dies that can be used without damage to the dies or machine. Carefully apply load to the machine, gradually building up the tonnage to the overload setting.

VEE BELTS

To replace or check the condition and tension of vee belts the flywheel and belt guard must be removed.

CAUTION: Before removing guards the disconnect switch must be turned "OFF", locked, and the flywheel must be stationary.

Place a straightedge across belt from flywheel to motor sheave. The vee belt, when pushed down by hand, must not deflect more than 1/2" at the center of span. To adjust the vee belt tension:

1. Loosen the motor base pivot screw and clamp screws. Generally the weight of motor will take up slack to provide adequate tension. On 19 Series Press Brakes and larger there is a screw in the front of motor base. This screw is threaded against the (upper) clamp screw to insure the motor base does not pivot. Loosen this screw until the correct tension is obtained.

2. Tighten the pivot screw and clamp screw.

3. Replace flywheel and belt guard.

TO REPLACE THE VEE BELTS

1. Loosen the motor base pivot and clamp screws.

2. Use a crane or a jack and 4" x 4" beam to raise rear of motor base. This will pivot motor toward the flywheel to provide the maximum belt slack. Tighten the motor base pivot and clamp screws.

3. Work the vee belts out of the sheave, starting with the outside belt.

   CAUTION: Be careful not to get hands or fingers caught between vee belts and grooves. Serious injury could result.

4. Work new belts on sheave and flywheel. The inside belt should be installed first. Do not replace an individual belt. Always replace a matched set.

5. Loosen the pivot and clamp screws. Lower the crane or jack to lower the motor base.

6. Adjust the belt tension as described above.

CLUTCH OPERATION AND ADJUSTMENT (4 through 36 Series)

The toggle type clutches on 4 through 36 Series CINCINNATI Press Brakes are designed to go "over center" to transmit the torque required for the rated bending loads. Figure 81 shows the clutch in the disengaged position. The clutch is "on center" when bolt "G" moves to position G' and bolt "J" moves to position J'. Bolt positions G', J' and "L" form a 90° angle. Bolt "G" then moves .007" to .012" beyond position G' to go "over center".

BELL CRANK ADJUSTMENT - AIR ELECTRIC CLUTCH MACHINES

4-5 Series Press Brakes equipped with inner flywheel guard: Remove screws fastening inner flywheel guard to flywheel guard and housing. Slide inner guard into flywheel guard so that bell crank is visible and accessible from rear of right housing.

Bell cranks pivoted on inside of right housing: Figure 76 shows location of stop screws for current design machines and Figure 77 is for earlier design machines.

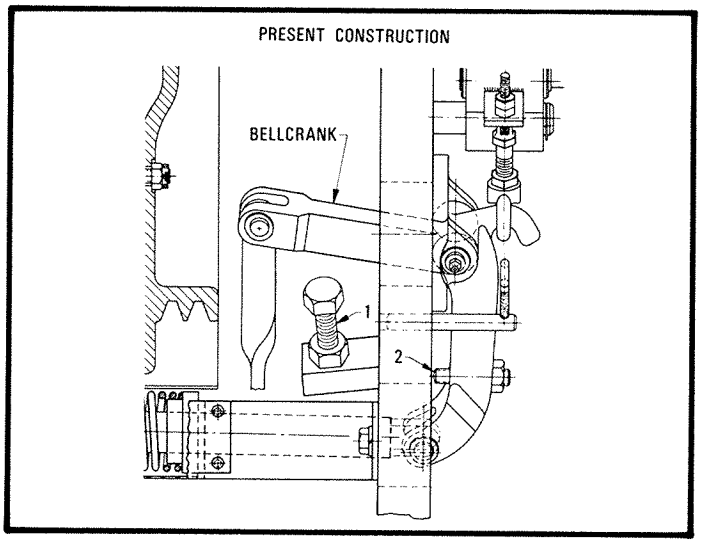


FIGURE 76

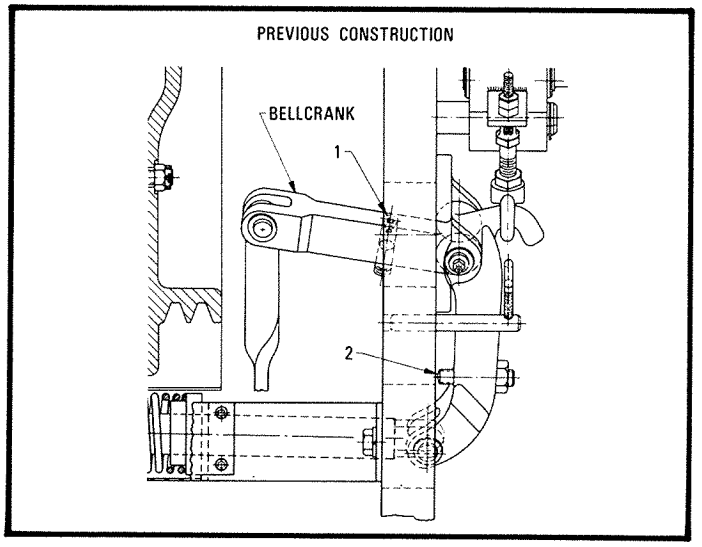


FIGURE 77

Bell cranks pivoted on outside of right housing: Figure 78 shows the location of stop screws for current design machines and Figure 79 is for earlier design machines.

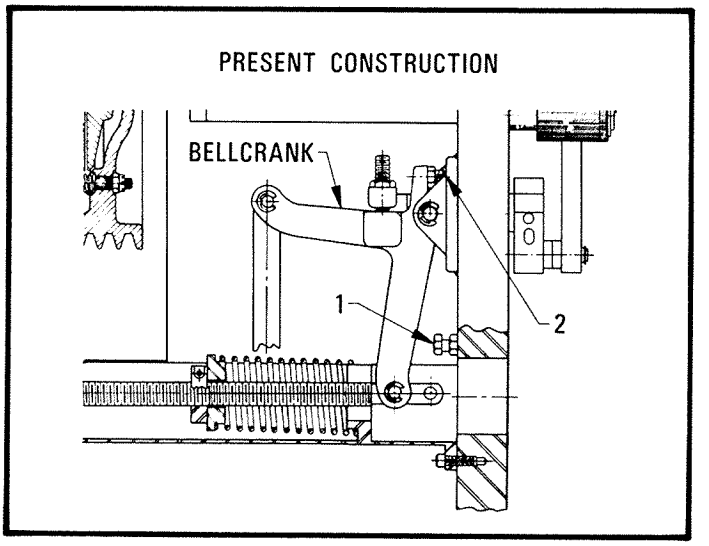


FIGURE 78

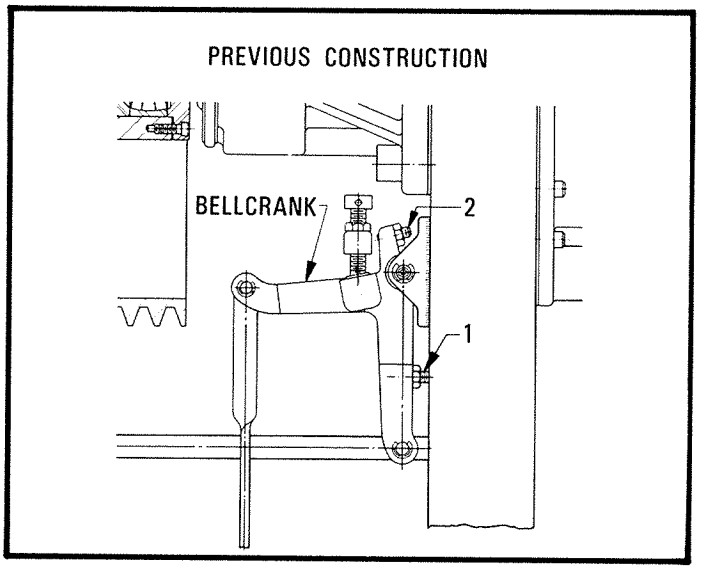


FIGURE 79

Screw No. 1 is used to limit the travel of the clutch linkage as the clutch is engaged. Screw No. 2 is used to limit travel of clutch linkage as the friction brake is engaged.

NOTE: Stop screw No. 1 is also used to remove the thrust force of engaging the clutch from the clutch assembly, flywheel shaft bearings and the left end flywheel shaft thrust bearing (4-5 Series - also 70-90 Series shipped prior to January 1, 1956). Stop screw must be kept in proper adjustment to avoid reducing normal life of these components.

Engage the clutch with palm buttons or footswitch. Another person should hold lower end of clutch lever "M" (Figure 81) and shake it in front to rear direction of press brake. The adjustment of stop screw No. 1 is correct if the lever moves freely when the screw contacts either the housing or the ball crank.

If the lever does not move freely in this direction, the relationship of stop screw No. 1 to its mating surface is incorrect. If the screw

does not contact its mating surface, the clutch adjustment is too tight. Loosen the clutch adjustment in small increments until the screw contacts its mating surface. See clutch adjustment procedures in this section of the manual.

If the screw does contact its mating surface, the screw must be readjusted to compensate for the yielding of its mating surface.

To adjust screw No. 1, disengage the clutch and back the screw away from its mating surface. Engage the clutch and advance screw No. 1 until it contacts its mating surface. Disengage the clutch and advance the screw 1/8 to 1/4 turn. Check the adjustment of stop screw No. 1 as previously described. Repeat procedure until clutch lever "M" moves freely. Lock adjustment of screw No. 1 with the lock nut.

12-13 Series Press Brakes shipped after 1 January, 1966: (See Figure 80)

The clearance, between the thrust surface of sleeve assembly and the spacer attached to the clutch head, is the final check on the adjustment of stop screw No. 1. This clearance should be .004" - .006" with the clutch engaged. If the clearance is not in this range, either advance or retract screw No. 1, as previously explained, until the clearance is correct.

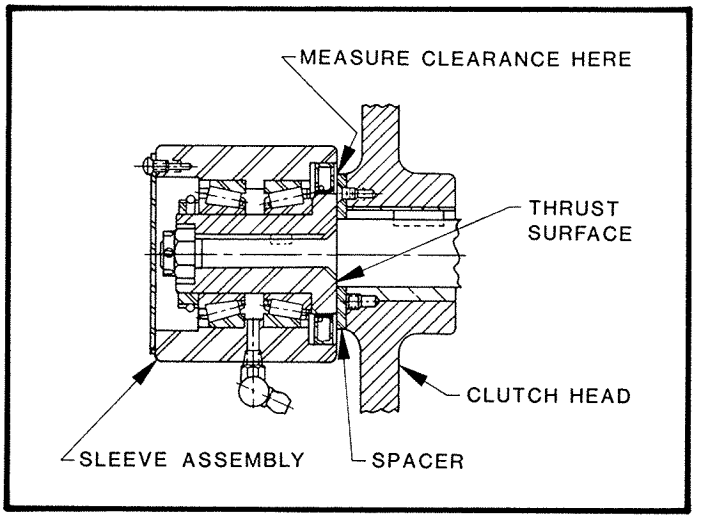


FIGURE 80

CLUTCH ADJUSTMENT

1. Stop the ram at the bottom of the stroke. Turn OFF main drive motor and allow flywheel to completely stop.

   NOTE: A safety type ladder or platform will be necessary for the following adjustments.

2. Stud "E" and lock gear "F" (Figure 81) must be visible and accessible through the circular slot in the front face of cast iron guard. See Figure 82. If they are not accessible, jog the drive motor with the "START" and "STOP" buttons to slowly rotate the flywheel. Then jog the clutch to line-up the stud and lock gear with the circular opening.

   NOTE: This step is not necessary for 12-13 Series shipped after 1 January, 1966.

3. Turn the disconnect switch on the electrical control enclosure to OFF.

FIGURE 82

4. Place the geared end of the clutch adjustment wrench (Figure 82) through the circular slot so that stud "E" enters the pilot hole in end of the wrench. With a 1/2" diameter rod in end of wrench, push the lock gear "F" towards the flywheel (Figure 83). This will disengage it from the internal gear teeth on adjusting nut "B" (Figure 81). The external gear teeth

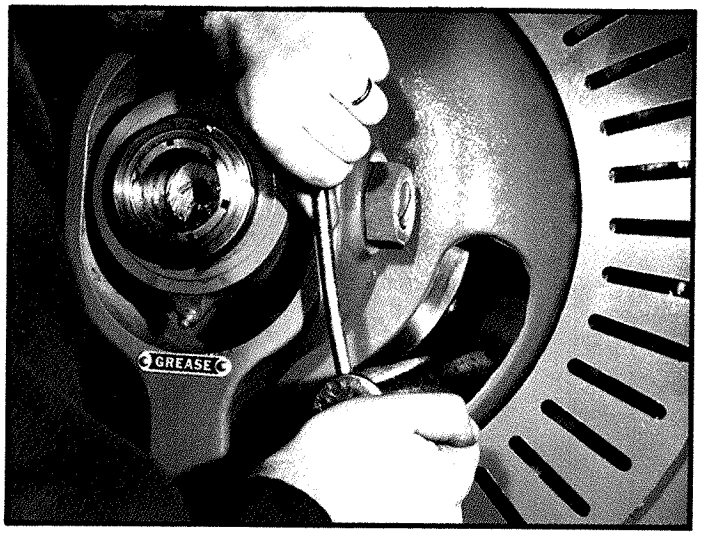


FIGURE 83

on the clutch adjustment wrench must engage the internal teeth on the adjusting nut.

5. Turn the wrench in the direction indicated on the end to tighten or loosen the clutch adjustment. Observe the teeth and adjust the clutch 3 or 4 teeth. Remove the clutch adjustment wrench.

   NOTE: Lock gear "F" must engage internal gear teeth on the adjusting nut. It may be necessary to slightly turn the wrench clockwise and counterclockwise to line-up teeth for the lock gear.

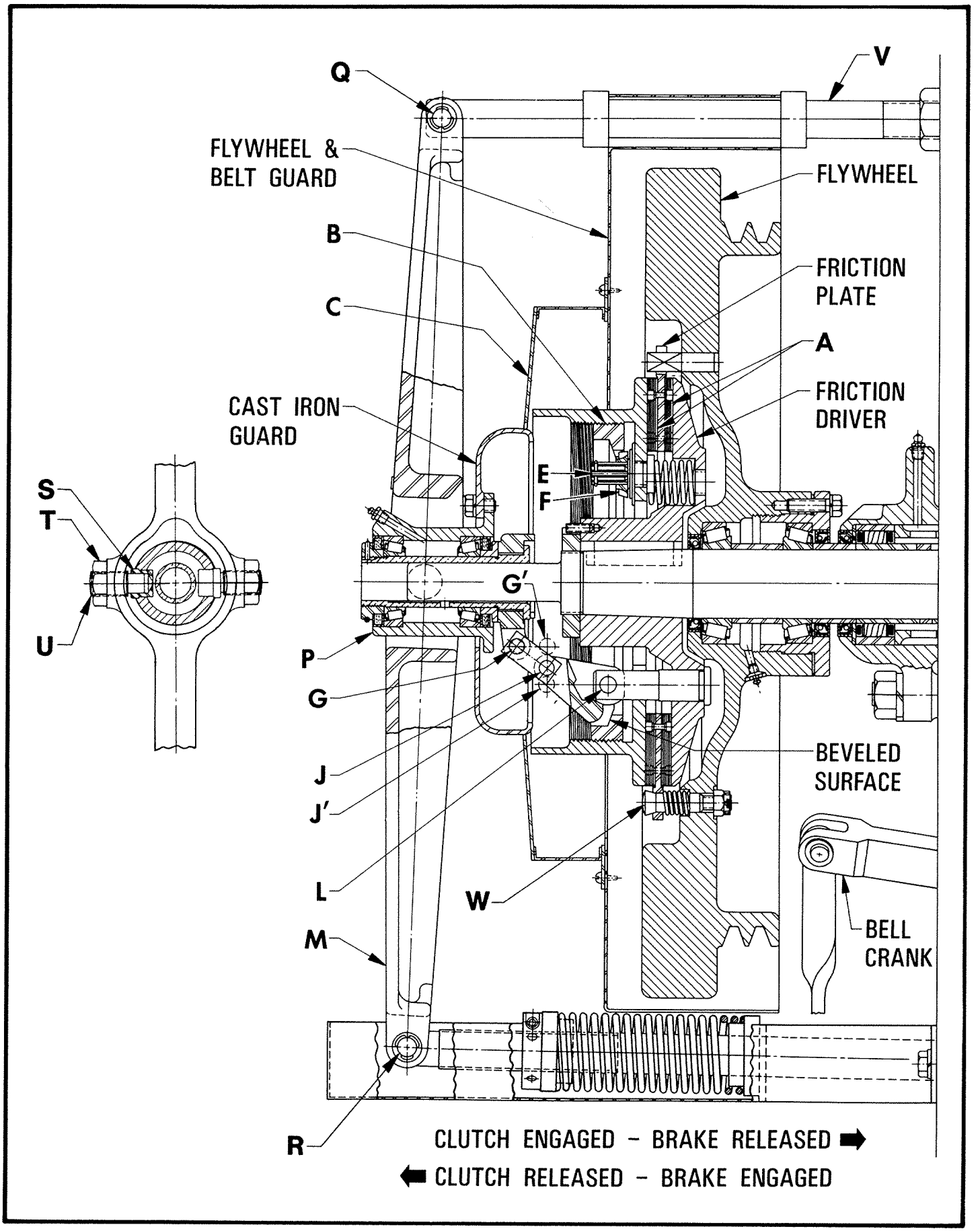

Q
V
FLYWHEEL &
BELT GUARD
FLYWHEEL
B
FRICTION
PLATE
C
A
CAST IRON
GUARD
FRICTION
DRIVER
E
F
S
T
U
G'
P
G
J
J'
BEVELED
SURFACE
L
W
M
BELL
CRANK
R
CLUTCH ENGAGED - BRAKE RELEASED
CLUTCH RELEASED - BRAKE ENGAGED

FIGURE 81

CHECKING CLUTCH ADJUSTMENT - AIR ELECTRIC CLUTCHES (4 through 34 Series)

1. Adjust the air pressure to the smallest value shown in Figure 84 using the air pressure regulator.

SERIES	AIR PRESSURE (P.S.I.)	
	TOGGLES WILL NOT GO "OVER-CENTER"	TOGGLES WILL GO "OVER-CENTER"
4-5	20	25
7-9	35	40
12-13	35	40
19-21-34	42	48
AIR PRESSURE REQUIRED TO FULLY ENGAGE CLUTCH ADJUSTED TO NEW MACHINE SPECIFICATIONS. PRESSURES LISTED APPLY TO CINCINNATI'S STANDARD 4" BORE, 3" STROKE AIR CYLINDER.		

FIGURE 84

2. Turn ON disconnect switch on electrical control enclosure. This will energize electrical control circuit for air cylinder on most machines built prior to January 1, 1971. For machines built after this date, also start main drive motor.

   CAUTION: On these machines the ram will cycle when the clutch is engaged. Press Brake ram should be at the bottom of the stroke. If necessary raise ram with the ram elevating mechanism to prevent damage to the tooling. Make sure that no one will be injured when the ram is cycled.

3. Depress the operator control (palm buttons or footswitch). With air pressure at this setting the clutch should not fully engage (the toggles should not go "over center"). This is when stop screw No. 1 in Figures 76 to 79 does not contact is mating surface. If the toggles do go "over center" the clutch adjustment is too loose and must be tightened. Release the operator control (palm button or footswitch).

4. Adjust air pressure to the largest value shown in Figure 84.

5. Depress the operator control. The clutch should now fully engage (the toggles should go "over center"). This is when stop screw No. 1 contacts its mating surface. If the clutch does not go "over center" the clutch adjustment is too tight and should be loosened. Release the operator control and turn OFF main drive motor and disconnect switch.

   NOTE: The values shown in Figure 84 are for new machines, adjusted at the factory for a rated capacity bend. They are intended as a guide to check clutch adjustment. Some customers may prefer a tighter or looser clutch adjustment.

CHECKING CLUTCH ADJUSTMENT (36 Series)

Check to verify that the cylinder air pressure is set at the recommended 65 pounds per square inch.

Turn the main disconnect switch on the electrical control enclosure to the "ON" position. On most machines shipped prior to 1 January 1971, this will energize the electrical control circuitry for the air cylinder. On all other machines, the drive motor must be started.

CAUTION: On machines where drive motor is started the ram will cycle when the clutch is engaged. The ram should be at the bottom of the stroke. If necessary, raise ram with the ram elevating mechanism to prevent damage to the tooling. Make sure that no one will be injured when the ram is cycled.

We recommend that the clutch be intentionally "over-tightened" so that the stop collar (Figure 85) will not contact its mating surface when the clutch is engaged. Using the procedures previously explained, loosen the clutch adjustment one tooth at a time until the stop collar will contact its mating surface when the clutch is engaged.

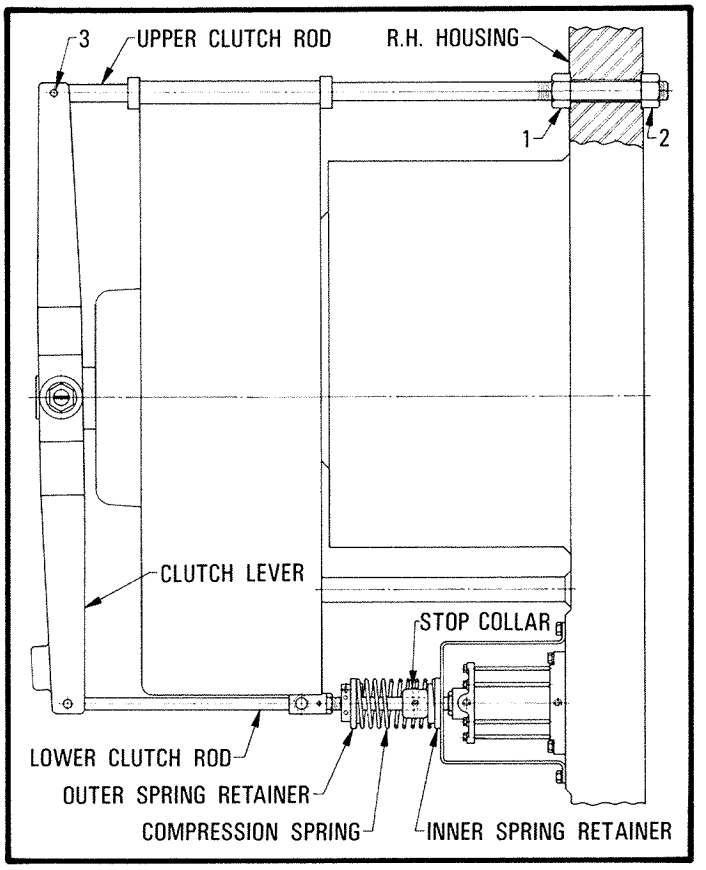


FIGURE 85

CHECKING CLUTCH ADJUSTMENT - MANUAL CLUTCH CONTROL (4 through 34 Series)

1. With the power OFF, slowly engage the clutch by depressing foot treadle. There should be an increase in force required as the clutch

mechanism comes to the "on-center" position. When the clutch goes "over center" considerably less force is required to hold it in this position. If there is no reduction in force, the toggles are not going "over center" and the clutch adjustment is too tight.

2. Clutch adjustment is also checked by using a spring scale and a 1" diameter bar. See Figure 86. Insert bar in hole of casting on right end of the treadle shaft. Attach spring scale to the bar 24" above the centerline of treadle shaft.

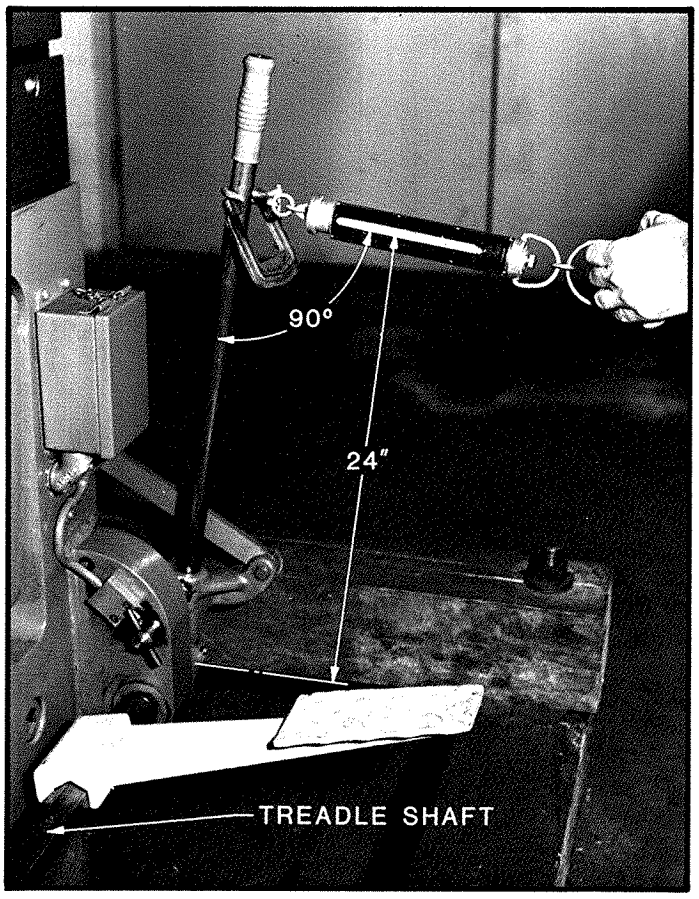


FIGURE 86

3. Pull on the free end of scale to engage the clutch. The spring scale must be held perpendicular to the 1" diameter bar. Read the force required to pull the clutch "over center. See Figure 87 for scale readings made on new machines. Your press brake may require a slightly different force.

NOTE: Foot treadle should not touch the floor. If this does occur, the pin holding the casting on right end of treadle shaft may be sheared.

CLUTCH ENGAGEMENT FORCE	
SERIES	FORCE REQUIRED (POUNDS)
4-5	67
7-9	125
12-13	125
19-21-34	150

FIGURE 87

CHECKING CLUTCH DISENGAGEMENT (4 through 34 Series)

1. Adjust air pressure to recommended pressure shown on tag near the regulator.

2. With the flywheel stationary, engage the clutch (toggles go "over center"):

   a. Air Electric Clutch Machines: On Press Brakes where turning ON disconnect switch energizes electrical control circuit, use the operator hand or foot control to engage the clutch. For all other machines have another person manually operate the air valves to engage the clutch.

   b. Manual Clutch Machines: Fully depress the foot treadle.

3. Slowly release the force (or method) used to engage the clutch. Observe the movement of clutch lever "M" (Figure 81). The clutch lever and the clutch should snap-out to the disengaged position.

If the clutch stays in the engaged position or hesitates before disengaging, the friction brake return spring may require adjustment. See instructions for adjusting this spring in this section of the manual. If adjusting this spring does not make the clutch release properly, consult your CINCINNATI INCORPORATED Service Representative for further information.

CHECKING CLUTCH DISENGAGEMENT (36 Series)

The flywheel must be stationary.

Position yourself where you can observe the movement of the clutch lever (Figure 85).

Another person will be required to manually operate the air valves to engage the clutch and disengage the friction brake. Engage the clutch to the "over-center" position. Release the clutch valve but do not release the brake valve. (The brake valve controls the flow of air into the cylinder port next to the housing.) The clutch lever and clutch should snap-out to the disengaged position. If they stay in the engaged position or want to "hang-up" before disengaging, the compression spring on the lower clutch rod (Figure 85) may need adjustment. See instructions for adjusting this spring in this section of the manual. If re-adjustment of this spring does not make the clutch snap-out to the disengaged position, consult your local CINCINNATI INCORPORATED Service Representative.

CLUTCH OPERATION AND ADJUSTMENTS (40-50 Series)

The toggle type clutch on CINCINNATI 40-50 Series Press Brakes is designed to transmit the torque required for the rated capacity bending loads without going "over-center".

Figure 88 shows the clutch in the engaged position. The clutch is engaged by moving the lower clutch rod "Q" towards the flywheel, which also moves the clutch lever "P", sleeve assembly "K" and toggle ring "L" in the same direction. The pin "J" which connects toggle link "H" and toggle ring "L", moves in a plane parallel to the centerline of flywheel shaft "M". The movement of pin "J" causes pin "G", which connects toggle link "H" and toggle lever "D", to rotate around pivot pin "C". The round nose of toggle lever "D" moves to contact the surface of adjusting nut "B",

threaded into outer pressure plate "O". The continued movement of toggle lever "D" pushes the outer pressure plate "O" towards the flywheel until friction material "A" on each side of the friction plate is clamped between the outer pressure plate "O" and the clutch housing "N".

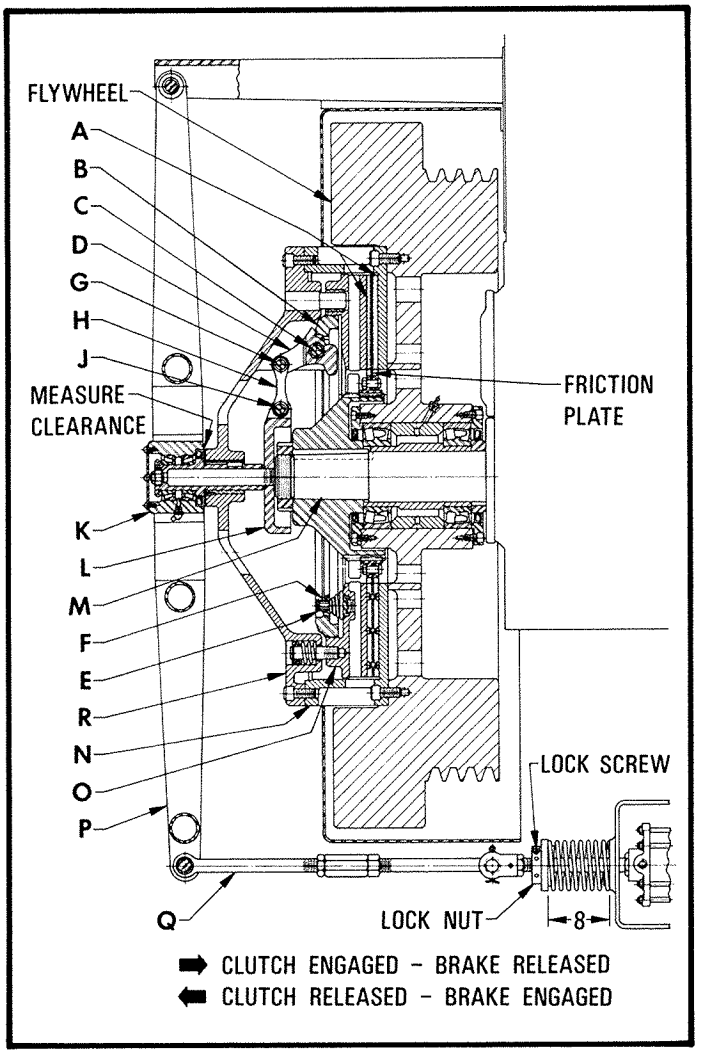


FIGURE 88

CLUTCH ADJUSTMENT (40-50 Series)

Stop the press brake with the ram at the bottom of the stroke. Turn "OFF" the main drive motor and let the flywheel come to a complete stop. Turn the disconnect switch on the electrical control enclosure to the "OFF" position.

A safety ladder or a safety platform should be used when the clutch is adjusted.

Stud "E" and lock gear "F" will be visible and accessible through the 2-1/2" diameter cored hole in the front face of clutch head "R". This cored hole is located 10-5/16" from the centerline of the clutch head.

Place the geared end of the clutch adjustment wrench (Figure 82) through the cored hole so that stud "E" enters the pilot hole in that end of the wrench.

Push the lock gear "F" towards the flywheel to disengage it from the internal gear teeth on adjusting nut "B". The external gear teeth on the clutch adjusting wrench must engage the internal gear teeth on the adjusting nut.

Use a piece of 1/2" diameter bar stock through the hole in the outer end of the wrench. Turn the wrench in the direction indicated on the outer end of the wrench to tighten or loosen the clutch adjustment.

Adjust the clutch three (3) or four (4) teeth and remove the clutch adjustment wrench.

NOTE: The lock gear "F" must engage the internal gear teeth on the adjusting nut. It may be necessary to slightly turn the wrench clockwise and counterclockwise to line up the internal gear teeth with the lock gear "F".

CHECKING CLUTCH ADJUSTMENT (40-50 Series)

Check to verify that the cylinder air pressure is set at the recommended 70 pounds per square inch.

The flywheel must be stationary.

Another person is required to manually operate the air valves to engage the clutch and disengage the friction brake. The clutch is correctly adjusted when the clearance between sleeve assembly "K" and the hub of clutch head "R" is 1/16" to 1/8". If the clearance is less than 1/16", the clutch adjustment is too loose and it must be tightened as previously explained. If the clearance is greater than 1/8", the clutch adjustment is too tight and must be loosened as previously explained.

FRICTION BRAKE RETURN SPRING ADJUSTMENT

Extension Springs: This type of spring is not approved by current safety standards. Extension type friction brake return spring should be replaced by a compression type spring. Consult CINCINNATI INCORPORATED Parts Department for replacement spring. The extension spring setting is 13-5/8" for 4-5 Series and 15" for larger press brakes, measured from inside to inside of the loops on each end of the spring. The clutch should be disengaged and the friction brake engaged.

Compression Springs: This type of return spring is preloaded with the clutch disengaged and the friction brake engaged. Figure 89 shows the preload dimension for 4-5 Series and Figure 90 for the current design 7 Series and larger press brakes.

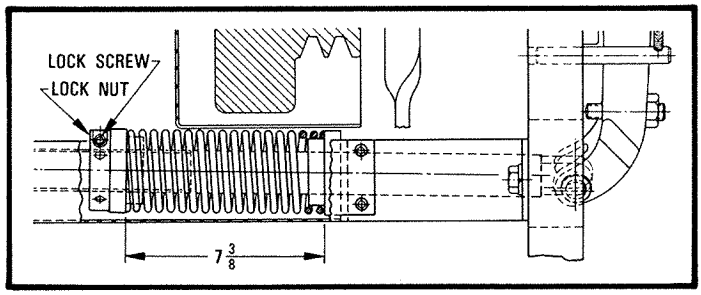


FIGURE 89

To adjust the preload on the spring, loosen the lock screw. Turn the lock nut to obtain the proper measurement. Securely tighten the lock screw.

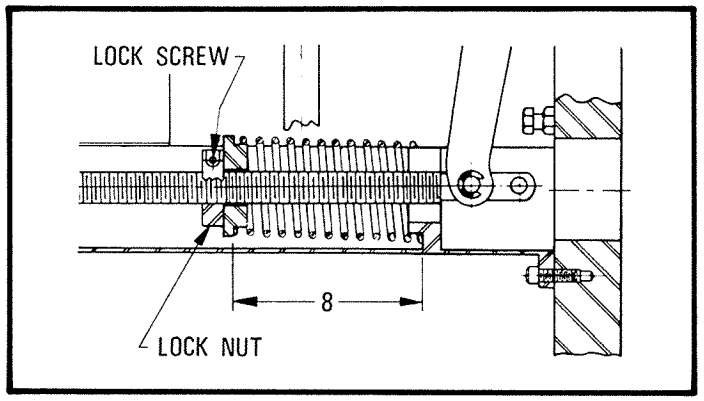


FIGURE 90

Figure 91 and Figure 92 show two earlier design friction brake return spring designs for 7 Series and larger press brakes.

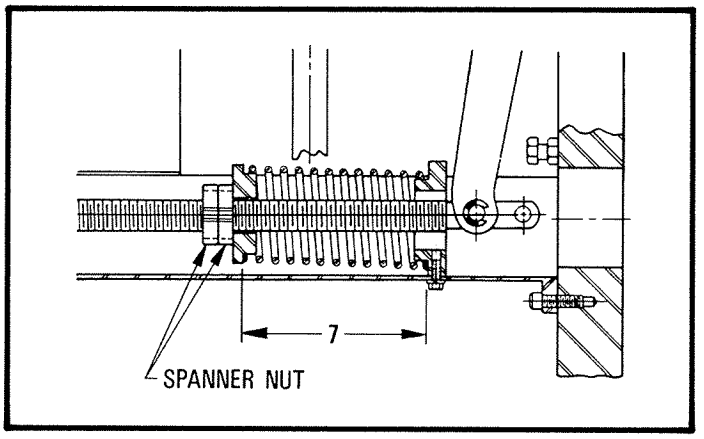


FIGURE 91

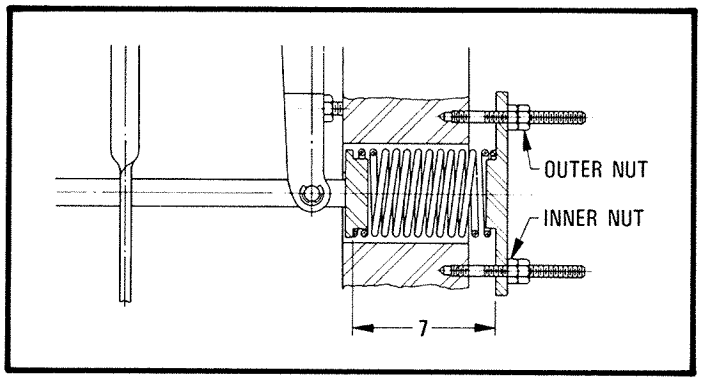


FIGURE 92

To adjust spring preload in Figure 91, use two wrenches to loosen the two spanner nuts. Adjust the inner spanner nut to obtain proper measurement. Use two wrenches to securely lock spanner nuts together to retain spring adjustment. The spring adjustment in Figure 92 is done in a similar manner. Loosen the outer and inner hex nuts with two wrenches. Adjust the spring preload with the inner nuts. Use two wrenches to lock the two nuts together to retain spring adjustment.

FRICTION BRAKE ADJUSTMENT (4 thru 34 Series)

Figure 93 is for press brakes with the bell crank pivoted on the inside of right housing, and Figure 94 for bell cranks pivoted on the outside of right housing.

1. The flywheel must be stationary.

2. Loosen lock nut "D" (Figure 93) or "B" (Figure 94). Turn stud "G" (Figure 93) or screw "G" (Figure 94) to tighten the brake. There should be some clearance between the brake drum and the linings on the brake band. Tighten lock nut "D" or "B".

   NOTE: Do not overtighten friction brake. This would reduce clutch clearance and may cause the clutch to drag. On press brakes with manual clutch control, an over tightened brake may prevent the treadle latch from moving into the engaged position.

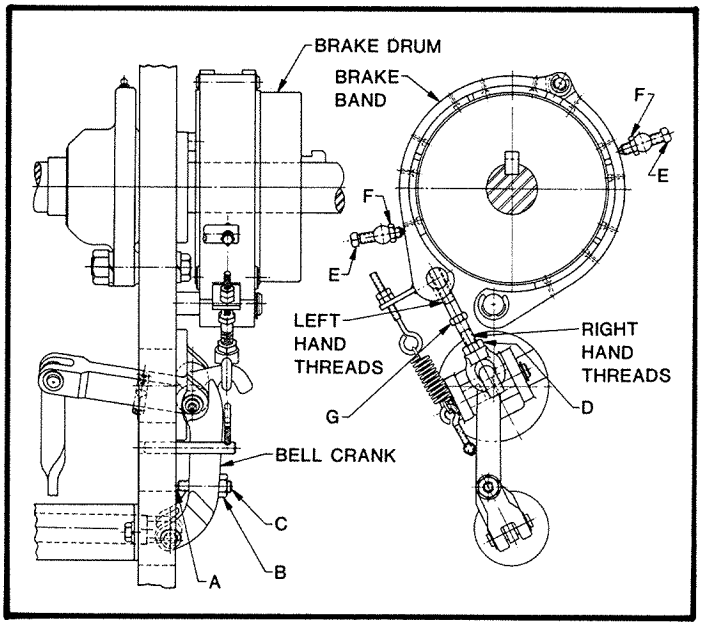


FIGURE 93

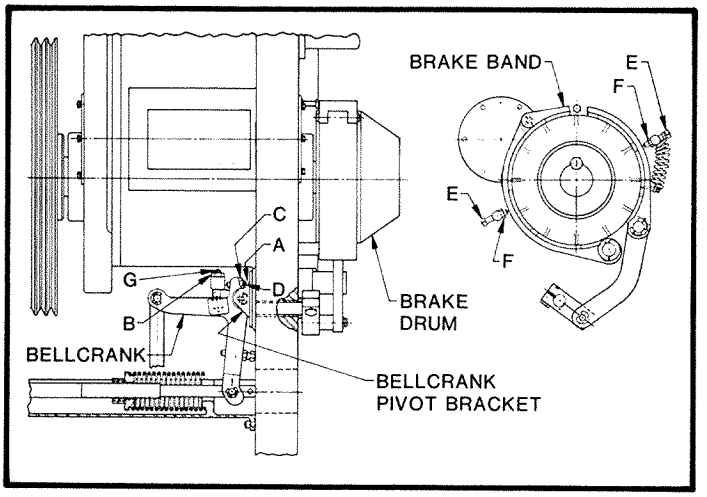


FIGURE 94

3. Turn ON the main drive motor. Air electric clutch machines should be set to INCH mode of operation. Stand in front of press brake so painted stripe on inside of left connecting rod and eccentric is visible.

4. To check brake adjustment, cycle the ram and disengage the clutch when ram is approximately half way on the down stroke. The friction brake is adjusted properly when the ram stops very quickly at this portion of the stroke. If the ram does not stop quickly, the friction

brake should be tightened (repeat steps No. 1 and No. 2).

5. Turn OFF main drive motor and allow flywheel to stop.

6. Engage the clutch (use procedure in "Checking Clutch Disengagement", step No. 2). Loosen lock nuts "F". Adjust screws "E" to obtain an approximately uniform clearance between the outside diameter of brake drum and the lining face of the brake band. There should be .006"-.010" minimum clearance at the tightest point.

7. Disengage the clutch, which engages the brake. There should be 1/16" to 1/8" clearance "A" between screw "C" (Figure 93) and the inside of right housing, or between screw "D" (Figure 94) and the bellcrank pivot bracket.

   If necessary to adjust clearance, loosen lock nut "B" (Figure 93) or "C" (Figure 94). Adjust screw "C" (Figure 93) or "D" (Figure 94) to obtain clearance and then tighten the lock nut.

8. On 4-5 Series Press Brakes, replace the inner flywheel guard if it was moved into the flywheel/belt guard.

FRICTION BRAKE ADJUSTMENT (36, 40 AND 50 Series)

The flywheel must be stationary.

REFER TO FIGURES 95 & 96

Clean the dirt and grease off of the surface of the outer pressure plate and the three adjusting nuts and graduated collars. If necessary, use mineral spirits to clean these components.

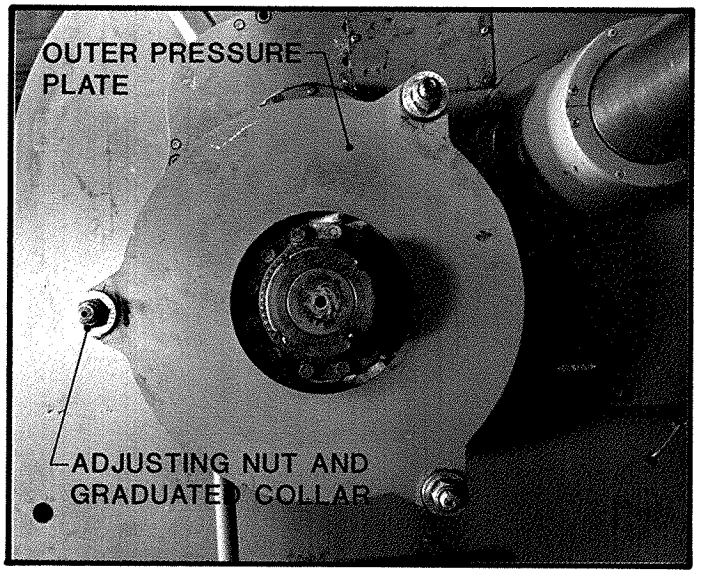


FIGURE 95

Check to determine that same number on the three graduated collars is lined-up with their respective zero marks. If the numbers are not the same, retain the adjusting nut and try to turn the graduated collars.

If a graduated collar turns while the nut is being held, the welded connection between these two parts has failed. Consult the Service Department of CINCINNATI INCORPORATED for instructions for repairing and calibrating the graduated collars.

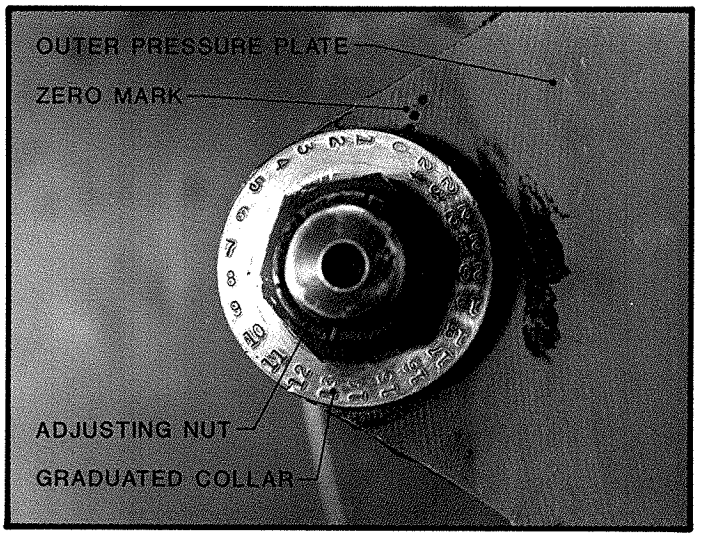


FIGURE 96

If the graduated collars do not turn while the nut is being held, turn the adjusting nut(s) clockwise to match the highest number lined-up with its zero mark on any collar(s).

Turn all three adjusting nuts clockwise to increase the number opposite the zero mark by two numbers. All three dial readings must be equal.

Another person is required to manually operate the air valves to engage the clutch and disengage the friction brake. Measure the clearance between the inner surface of the outer pressure plate and the friction disc (See Figure 97). This clearance should be 3/32" plus or minus 1/64". If the clearance is greater than 3/32", turn the adjusting nuts clockwise until the proper clearance is obtained. All three dial readings must be equal. The friction disc is worn out and should be replaced or relined when the adjusting nuts bottom on the threads of the studs and the clearance is still greater than 3/32". The thickness of the friction disc is 7/8" when new and 17/32" when worn out (rivets are ready to contact the pressure plates). Contact the Parts Department of CINCINNATI INCORPORATED for a new friction disc or friction material and instructions for relining and/or assembly.

If the clearance is less than 3/32", turn the adjusting nuts counterclockwise until the proper clearance is obtained. All three dial readings must be equal.

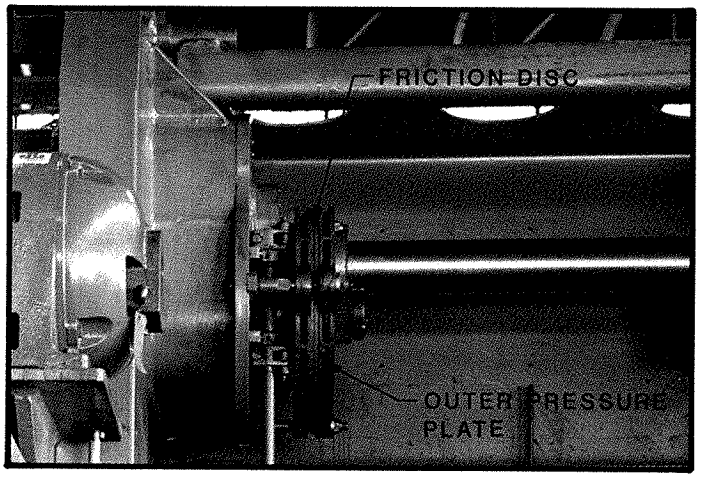


FIGURE 97

CAUTION: Do not overtighten the friction brake. Over tightening will cause a rapid heat "build-up" in the friction brake assembly and rapid deterioration of the brake assembly. Over tightening will also reduce clutch clearance and may cause the clutch to drag.

CHECKING FRICTION BRAKE ADJUSTMENT - ALL MACHINES

Turn "ON" the main drive motor.

Select the "INCH" mode of operation.

Stand in front of the press brake so that the red stripes on the inside of the left connecting rod are visible.

Cycle the ram and disengage the clutch and engage the friction brake when the ram is approximately half way on the down stroke. The friction brake is adjusted correctly when the ram stops very quickly at this portion of the stroke. If the ram does not stop quickly, the friction brake should be tightened as previously explained.

FRICTION PLATE ADJUSTMENT (4 thru 36 Series)

NOTE: Does not apply to 12-13 Series shipped after 1 January 1966. These machines and 40-50 Series do not require adjustment.

A clicking sound in the clutch assembly when the flywheel is running indicates adjustment of the friction plate is required.

1. The electrical disconnect must be OFF and the flywheel stopped.

2. Remove the retaining device (cotter key or retaining ring) from one end of pin "Q" and "R". See Figure 81.

3. Loosen lock nut "T" on both sides of clutch lever "M".

   Machines without clutch rod guards, and machines with clutch rod guard and separate spring support (see Figure 81):

   a. Remove clutch rod guard by removing four screws.

   b. Remove pins "Q" and "R". Rotate clutch lever "M" to a horizontal position (parallel to floor).

   c. Attach clutch lever "M" to crane or other lifting device using a rope or cable sling. Remove pivot screw "U" from plug "S" on side of clutch lever facing the floor. Then remove pivot screw "U" from other side of clutch lever. Remove clutch lever "M".

   Machines with clutch rod guard and integral spring retainer. See Figure 98:

   a. Remove pivot screw "U" from plug "S" on both sides of clutch lever "M".

   b. Remove pin "R" from the bottom hole of clutch lever "M".

   c. Support the clutch lever "M" and remove pin "Q" from the top hole of clutch lever. Lower the clutch lever slowly until it is supported by sleeve assembly "P".

   d. Disengage top of clutch lever "M" from rod "V". Insert a 1/2" diameter rod about 10" long through top hole of the clutch lever. Attach rope or cable to this rod and to a lifting device. Remove clutch lever "M".

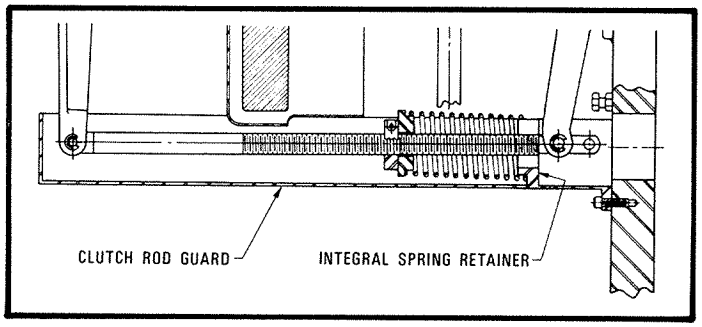


FIGURE 98

4. Remove self tapping screws holding friction ring guard "C" to the flywheel and belt guard (4-5 Series - also 7-9 Series shipped after April 1, 1972). Remove friction ring guard "C".

5. Check the clearance between friction material "A" and the flange of friction driver. Use feeler gages at silencer bolts "W". This clearance should be 1/32". If the clearance is larger than 1/32", adjust the silencer bolts "W" to obtain proper clearance.

   Tap bolts "W" towards the flywheel until proper clearance is obtained. Then remove cotter keys from nuts on bolts "W". Adjust the nuts against the finished surface of the flywheel. Insert a new cotter key through slot in nut and hole in bolts "W". If cotter key slot in nut does not line up with hole in silencer bolt, remove nut. File bottom surface of nut, check alignment and repeat until slot and hole lines up. Tap cotter keys firmly into position before bending tabs.

TWO SPEED TRANSMISSION

The friction slip clutch for slow speed requires adjustment when the clutch slips on a capacity bend. This clutch is found only on 12-13 Series machines built prior to 1966, and on 19, 21 and 34 Series machines. Two speed transmissions for other series machines do not require any adjustment.

To adjust the friction slip clutch: See Figure 99.

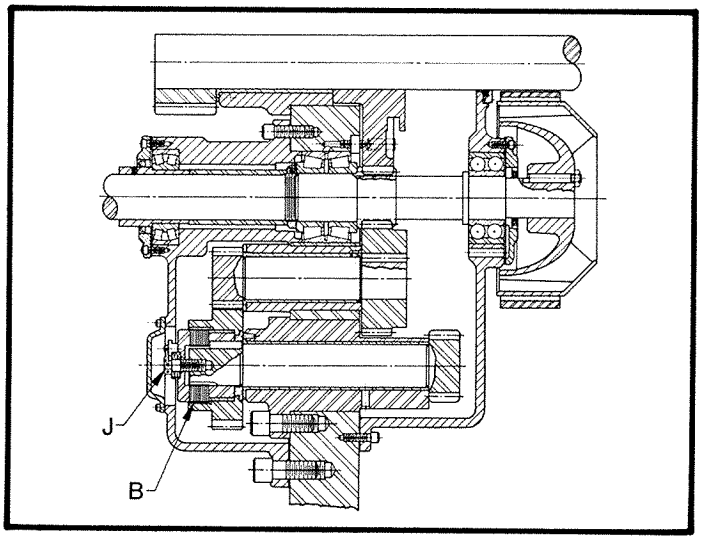


FIGURE 99

1. Remove inspection plate on outside gear cover. Remove wire and plate which lock screw "J".

2. Turn screw "J" 1/12 of a turn clockwise to tighten friction discs "B".

3. Replace wire and plate to lock screw "J". Replace inspection plate.

MAINTENANCE OF AIR DISC CLUTCHES & BRAKE - 4-5 & 12-13 SERIES AUTOMATIC CYCLE PRESS BRAKES (Industrial Clutch Corp. type "L-K")

NOTE: High speed clutch and the brake are also used on electric-air disc clutch and brake machines.

To maintain the rated torque capacity of the clutches and the brake, the air pressure must be set to 60 PSI. This pressure is set by an air pressure regulator located on the housing brace. Check air system for leaks, which can cause reduced air pressure.

For proper lubrication of the clutches and brake, the air line lubricator should be set to feed about one drop of oil for every 30 to 40 clutch engagements. Measure drops through the sight glass. Use a medium hydraulic oil with a viscosity of 194 to 236 seconds at 100° F (C.I. oil B-215).

CHECKING FOR FRICTION DISC WEAR

To check for wear on clutch or brake disc facings, look through the openings in their housing. If the facing on each side of the disc have worn down to less than 1/8" thick or are contaminated with oil, the disc(s) should be replaced. Regardless of wear on the facings, we recommend the high speed clutch and the brake friction discs be inspected for cracks or wear in the splines once a year. (This time period is based on an 8 hour day, 5 day week operation. Usage greater than this will require more frequent inspections). The friction disc in the low speed clutch is subjected to much smaller loading. Therefore, we recommend inspecting these discs only when the flywheel is removed for repair or other maintenance procedures. See RELINING FRICTION BRAKE OR CLUTCH DISCS (Form EP-146) for this detailed inspection information.

CLUTCHES

They are an air operated, friction disc type clutch. There is a high speed and a low speed clutch on the Automatic Cycle Press Brake. The 4-5 Series has single disc clutches and the 12-13 has double disc clutches. No adjustment of the clutches is required.

REPLACING HIGH SPEED CLUTCH DISC - 4-5 SERIES AUTOMATIC CYCLE (See Figure 100)

1. Remove the flywheel guard.

2. Disconnect air hose from rotary union at end of clutch assembly.

3. Remove the eight hex nuts "J" and washers from studs around face of air cylinder "C".

4. Slide air cylinder "C" and piston "E" out on studs until a sling can be passed through the bore and attached to a lifting device. Take up slack and remove air cylinder and piston.

   CAUTION: Make sure air cylinder does not come off studs until it is attached to lifting device. Damage to the parts and personal injury could occur.

5. Check inner and outer piston seal "O" rings and replace if worn or damaged. To check piston rings, insert bolts into tapped holes in piston "E" and pull piston from cylinder. Do not attempt to blow piston out with air pressure. Make sure mating surfaces of cylinder is smooth and polished. If necessary, these surfaces can be turned or ground up to .015" oversize, but they must be polished to 10-15 microinch surface finish. The cylinder must be replaced if these surfaces are badly scored or worn. Replace piston in air cylinder.

6. Remove pressure plate "D".

7. Remove old clutch friction disc "A".

8. Clean and lightly oil splines of new clutch disc and hub "H". Slide new clutch disc on hub.

9. Replace pressure plate "D" on studs. Center springs in counterbore of pressure plate and push it against friction disc.

10. Replace air cylinder "C" and hex nuts "J" on studs. All cylinder stud nuts must be pulled up snug and equally torqued.

11. If the low speed clutch is not to be disassembled, replace the air hose to high speed clutch and the flywheel guard.

REPLACING LOW SPEED CLUTCH DISC - 4-5 SERIES AUTOMATIC CYCLE (See Figure 100)

1. Disconnect air hose and flywheel guard if not removed in Step 11 above.

2. Attach lifting device to high speed clutch assembly with a sling and take out slack. Remove socket head screws "F" holding clutch to flywheel adapter "G". Slide clutch assembly from hub "H", being careful not to damage splines in hub or clutch plate.

3. Rotate flywheel so drain pipe plug is at bottom and drain oil from flywheel.

4. Attach a lifting device to rear of drive motor base and take out slack. Loosen the motor base pivot screw and adjustment screw. Raise motor base to take tension off the vee belts. Tighten the motor base screws to hold it in this position. Remove the lifting device. Remove the vee belts from flywheel grooves and hang them on the low speed clutch. (Inspect vee belts and replace if necesary.)

   CAUTION: Do not get any part of your body between the vee belts and vee grooves. Serious injury can occur from pinching action of the belts and grooves.

5. Remove set screw in hub "H" and remove spanner nut "K". Remove splined hub "H" and key for hub in flywheel shaft.

6. Screw a 3/4"-10 UNC eye bolt into one of the tapped lifting holes in outside diameter of flywheel "L". Attach eyebolt to a lifting device and take out slack. Slide flywheel assembly from flywheel shaft, being careful not to damage needle bearings in sleeve "M".

7. Disconnect air hose to air cylinder "N" of low speed clutch.

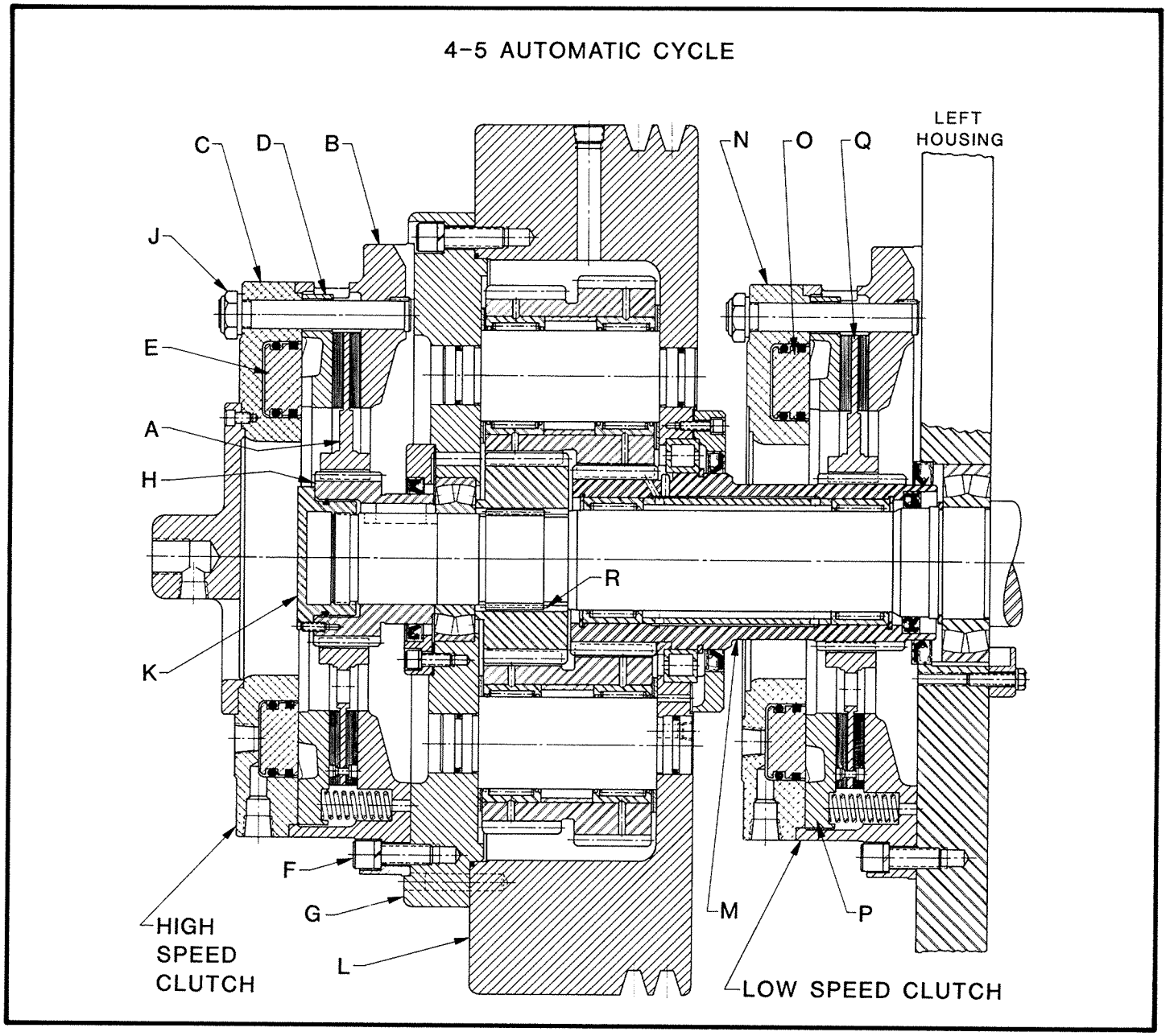


FIGURE 100

8. Remove the eight hex nuts and washers on studs around face of air cylinder "N". Slide air cylinder and piston "O" out on studs and carefully remove.

9. Check piston seal "O" rings using the same procedure as for high speed clutch (Step 5).

10. Remove pressure plate "P".

11. Remove old clutch friction disc "Q".

12. Clean and lightly oil splines of new clutch disc. Place clutch disc in clutch housing.

13. Replace pressure plate "P" on studs. Center springs in counterbore of pressure plate and push it against the clutch disc.

14. Replace air cylinder "N", lockwashers and hex nuts on the eight studs. All nuts must be pulled up tight and equally torqued.

15. Clean and lightly lubricate the splines on sleeve "M" which extends from the flywheel assembly. Clean and lightly lubricate the flywheel shaft.

16. Set the clutch air pressure regulator to 10 PSI. Connect the air supply hose to air cylinder "N". Center the clutch disc "Q" and apply air pressure to hold in position.

17. Lift flywheel assembly "L" into position and slide sleeve onto flywheel shaft. Be careful not to damage needle bearings on shoulders of flywheel shaft. Move sleeve toward clutch disc "Q" to engage splines. The clutch disc can be positioned with a tool (not hands) through the openings in clutch housing. It may be necessary to turn off the air pressure. Push flywheel toward housing of machine and line-up splines on flywheel shaft and gear "R". Continue pushing flywheel until it is in approximate position shown in Figure 100. Remove the lifting device.

18. Replace key for hub in flywheel shaft. Slide hub "H" on flywheel shaft and through oil seal in adapter "G". Inspect "O" ring seal in

outside diameter of spanner nut "K" and replace if necessary. Align "O" ring in seat, lubricate and insure that it is not twisted. Replace spanner nut on flywheel shaft and tighten up to original position. Replace set screw in end of hub "H" to lock spanner nut.

19. Lift high speed clutch assembly in position, centering it on flywheel shaft. Carefully slide assembly on shaft, aligning splines on hub with those of clutch disc "A". Replace lockwashers and socket head screws "F" and fully tighten.

20. Rotate flywheel so oil filler pipe plug is at top. Remove 1/4 NPT pipe plug in side of flywheel next to low speed clutch. Fill with oil until level reaches opening of 1/4" opening in side of flywheel. Replace both pipe plugs. Use extreme pressure gear oil with sulphur phosphorus additive, viscosity 700 to 1000 seconds at 100° F (C.I. oil G-850).

21. Replace vee belts in grooves of flywheel. CAUTION: KEEP hands from between vee belts and grooves. Attach a lifting device to rear of motor base and take out slack. Loosen motor base screws and lower base until proper tension of belts is obtained. Tighten the motor base pivot screw and adjustment screw. Remove the lifting device.

22. Replace air hose to high speed clutch. Readjust air pressure for clutch to 60 PSI.

23. Replace flywheel guard.

REPLACING HIGH SPEED CLUTCH DISC - 12-13 SERIES AUTOMATIC CYCLE (See Figure 101)

1. Remove the flywheel guard.

2. Disconnect the air hose at end of clutch assembly.

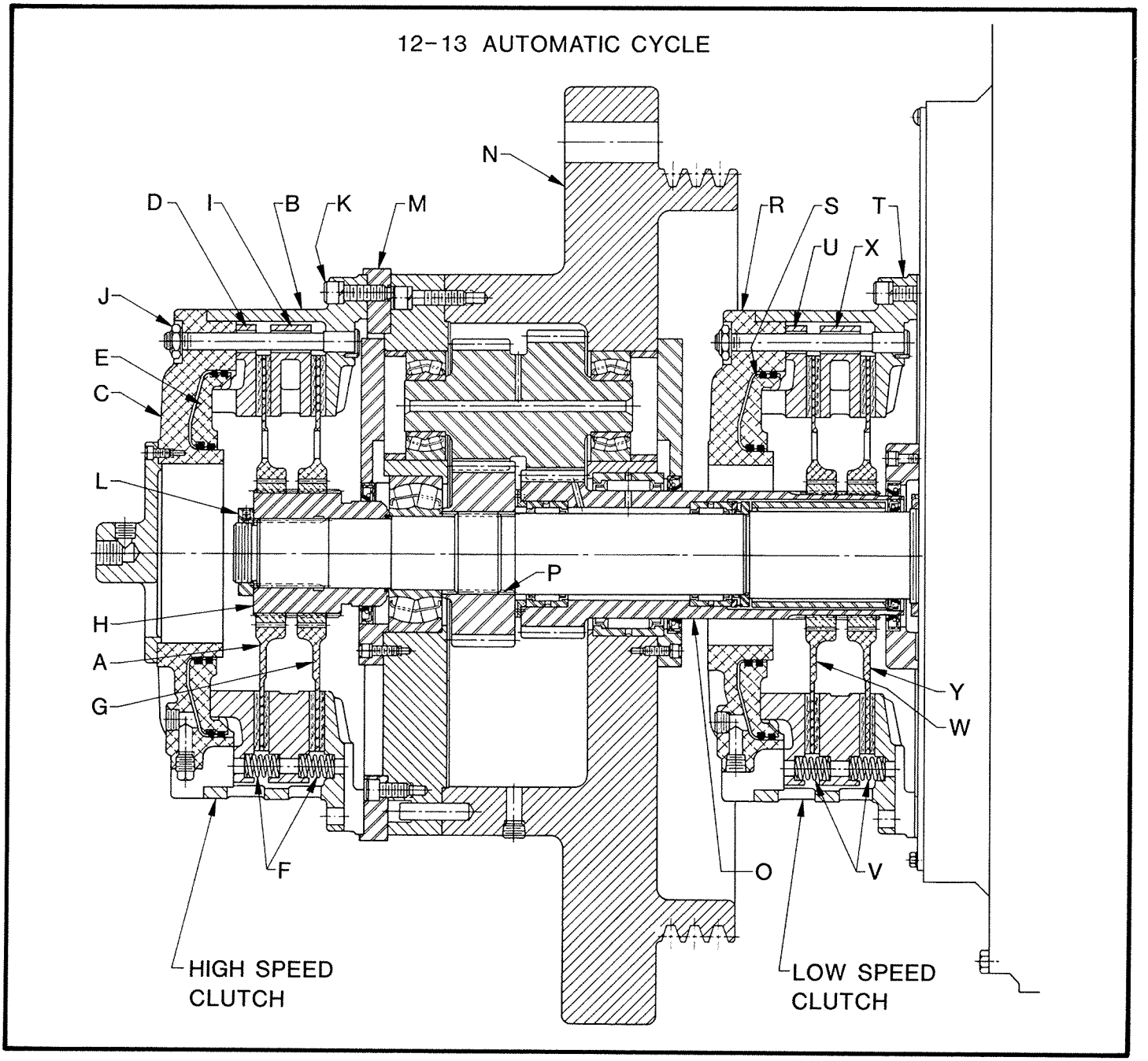


FIGURE 101

3. Remove the twelve hex nuts "J" and washers on studs around face of air cylinder "C".

4. Slide air cylinder "C" and piston "E" out on studs until a sling can be passed through the bore and connected to a lifting device. Take up slack and remove air cylinder and piston.

   CAUTION: Make sure air cylinder does not come off studs until it is attached to lifting device. Damage to the parts and personnel injury could occur.

5. Check piston rings (neoprene "O" rings) and replace if worn or damaged. The piston rings can be checked by inserting bolts into tapped holes in piston to pull piston from air cylinder. Do not attempt to blow piston out with air pressure. Make sure inner surface of cylinder is smooth and polished. If necessary, this surface can be turned or ground up to .015 oversize, but it must be polished to 10-15 microinch surface finish. The cylinder must be replaced if bore is badly scored or worn. Replace piston in air cylinder.

6. Remove pressure plate "D".

7. Remove outer clutch discs "A".

8. Remove springs "F" from center plate "I" and remove center plate.

9. Remove springs "F" from clutch housing "B". Remove inner clutch disc "G".

10. Clean splines of both new clutch discs and hub "H" and lightly oil.

11. Cut twelve 5/8" diameter x 7" long wood or metal dowel pins. Insert dowel pin into hole in each spring counterbore seat in housing "B". Slide a spring "F" on dowel into counterbore.

12. Replace new inner clutch disc "G" on splined hub "H. Make sure wider part of hub on inner clutch disc faces away from housing of machine.

13. Replace center plate "I". Slide springs "F" on dowel pins into seat in center plate.

14. Replace new outer clutch disc "A" on splined hub "H". Make sure wider part of hub on outer clutch disc faces toward the housing of machine.

15. Replace pressure plate "D" on the studs. Remove the dowel pins used to retain the springs.

16. Replace air cylinder "C" and piston "E", and the twelve nuts "J" on the studs. All cylinder stud nuts must be pulled up snug and equally torqued. This is to insure each stud will carry its equal share of the total load of the air pressure in the cylinder.

17. If low speed clutch is not to be disassembled, replace air hose to high speed clutch and the flywheel guard.

REPLACING LOW SPEED CLUTCH DISCS - 12-13 SERIES AUTOMATIC CYCLE (See Figure 101)

1. Disconnect air hose to high speed clutch. Remove flywheel guard.

2. Attach a lifting device to high speed clutch assembly and take out slack. Remove socket head screws "K" and lockwashers holding clutch to flywheel adapter "M". Slide clutch assembly from hub "H", being careful not to damage splines on hub or clutch discs "A" and "G".

3. Remove pipe plug from flywheel "N" and drain oil. Remove spanner nut "L" from flywheel shaft. Slide hub "H" from flywheel shaft.

4. Attach a lifting device to rear of drive motor base and take out slack. Loosen the motor base pivot screw and adjustment screw. Raise the motor base to take tension off the vee belts. Tighten the motor base screws to hold it in this position. Remove the lifting device. Remove the vee belts from the flywheel vee grooves and hang them on the low speed clutch. Inspect vee belts and replace if necessary.

   CAUTION: Do not get any part of your body between the vee belts and vee grooves. Serious injury can occur from the pinching action of the belts and grooves.

5. Insert rope or cable of sufficient capacity through hole in outer portion of flywheel "N". Attach to lifting device and take out slack. Slide flywheel assembly "N" from flywheel shaft, being careful not to damage needle bearings in sleeve "O".

6. Disconnect air hose to air cylinder "R".

7. Remove the twelve hex nuts and washers on studs around face of low speed clutch air cylinder "R". Slide air cylinder and piston "S" out on studs. Insert rope through bore and up between space of air cylinder "R" and clutch housing "T". Attach rope to lifting device and remove slack. Remove air cylinder and piston.

   CAUTION: Make sure air cylinder does not come off studs until it is attached to lifting device. Damage to the parts and personnel injury could occur.

8. Check piston (neoprene "O" rings) ring and replace if worn or damaged. The piston rings can be checked by inserting bolts into tapped holes in piston to pull piston from air cylinder. Do not attempt to blow piston out with air pressure. Make sure inner surface of cylinder is smooth and polished. If necessary, this surface can be turned or ground up to .015" oversize, but it must be polished to 10-15 microinch surface finish. The cylinder must be replaced if bore is badly scored or worn. Replace piston in cylinder.

9. Remove pressure plate "U", springs "V", outer clutch disc "W", center plate "X", springs "V" and inner clutch disc "Y".

10. Cut twelve 5/8 diameter x 7" wood or metal dowel pins. Insert dowel pin into hole in each spring counterbore seat in housing "T". Slide a spring "V" on each pin into counterbore.

11. Clean splines of both new clutch discs and lightly oil. Replace new inner clutch disc "Y" in clutch housing. The wider part of clutch disc hub should be facing away from the housing of machine.

12. Slide center plate "X" on studs against inner clutch disc. Place a spring "V" on each dowel pin into counterbore in center plate.

13. Replace new outer clutch disc "W" in housing

against center plate. The wider part of clutch disc hub should be facing towards the housing of machine.

14. Replace pressure plate "U" on studs and push all parts together towards housing of machine. Remove the dowel pins used to hold springs in position.

15. Replace air cylinder "R" and the lockwashers and nuts on the twelve studs. All stud nuts must be pulled up tight and torqued evenly.

16. Clean the splines on sleeve "O" extending from the flywheel assembly. Lightly lubricate the splines with oil. Clean and lightly lubricate flywheel shaft.

17. Set the clutch air pressure regulator to 10 PSI. Connect the air supply hose to air cylinder "R". Center both clutch discs "W" and "Y" and apply air pressure to hold in position.

18. Lift flywheel assembly into position and slide sleeve onto flywheel shaft. Be careful not to damage needle bearings on shoulders of flywheel shaft. Move sleeve toward clutch discs to engage splines. The clutch discs can be positioned with a tool (not hands) through the openings in clutch housing "T". It may be necessary to turn off the air pressure. Push flywheel toward housing of machine and line-up splines on flywheel shaft and gear "P". Then fully seat flywheel with rear needle bearing in sleeve "O" bearing against collar on flywheel shaft.

19. Inspect "O" ring in hub "H" and replace if damaged. Align "O" ring in seat and insure that it is not twisted. Slide hub on flywheel shaft. Replace spanner nut "L" on shaft and fully tighten. If shaft was "spotted" for set screw, align nut to this position and tighten set screw.

20. Lift high speed clutch assembly in position, centering it on flywheel shaft. Slide assembly on shaft, aligning splines on hub with those of both clutch discs. Replace lockwashers and socket head screws "K" and fully tighten.

21. Rotate flywheel so pipe plugs are in position shown in Figure 102. Remove both plugs and fill with oil until level reaches opening at plug "A". Use extreme pressure gear oil with sulphur phosphorus additive, viscosity 700 to 1000 seconds at 100° F (C.I. oil G-850).

22. Replace vee belts in grooves of flywheel. **CAUTION:** Keep hands from between vee belts and grooves. Attach a lifting device to rear of motor base and take out slack. Loosen motor base screws and lower base until proper tension of belts is obtained. Tighten the motor base pivot screw and adjustment screw. Remove the lifting device.

23. Replace air hose to high speed clutch. Readjust air pressure for clutch to 60 PSI.

24. Replace flywheel guard.

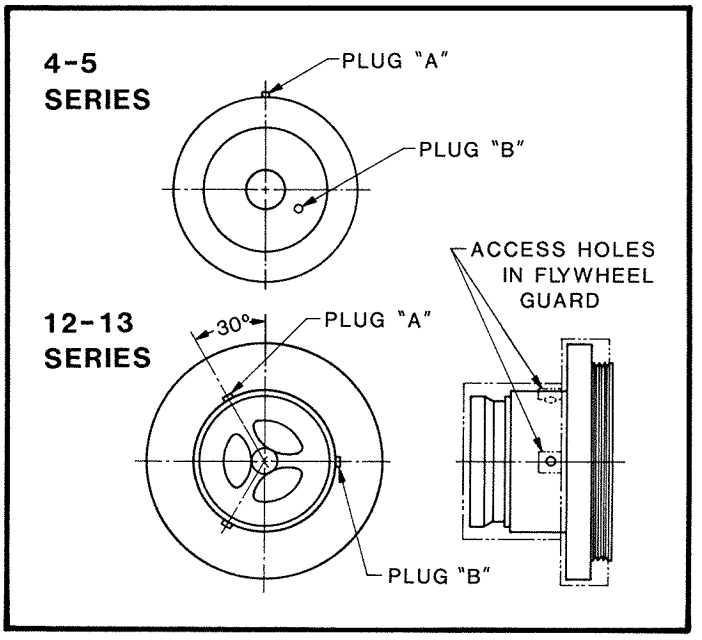


FIGURE 102

FRICTION BRAKE

It is a spring set, air released single disc type brake. No adjustment of the brake is required. Air pressure and lubrication are provided by the same system as for the clutch. The brake for the 4-5 A/C and 12-13 A/C are identical in construction and only differ in size and number of fasteners to assemble the unit. The following instructions apply to both brakes.

REPLACING BRAKE FRICTION DISC (See Figure 103)

1. Disconnect air hose to top of piston "AA".

2. The air cylinder "Z", piston "AA" and front plate "BB" can be removed as one bolted together assembly. Remove the twelve nuts from the studs near outer edge of piston. Slide the assembly out on the studs, attach a lifting device, and remove the assembly.

   NOTE: Do not remove socket head screws near bore of air cylinder "Z", which would release spring pressure. Then re-assembly will be more difficult.

3. Slide friction disc "CC" off splines on hub. Clean splines of hub and new disc and lubricate. Slide new discs on hub. The wider part of hub on friction disc must face away from the housing of machine.

4. Install the air cylinder assembly and hex nuts. All cylinder stud nuts must be pulled up snug and equally torqued. Replace air hose to top of piston.

REPLACING PISTON SEALS

1. Remove the twelve socket head screws near bore of air cylinder "Z". Remove the air cylinder.

   NOTE: Do not remove stud nuts on piston, which would release pressure on springs.

2. Remove both "O" rings. Carefully clean grooves and new "O" rings. Install new "O" rings. Make sure "O" rings are not twisted.

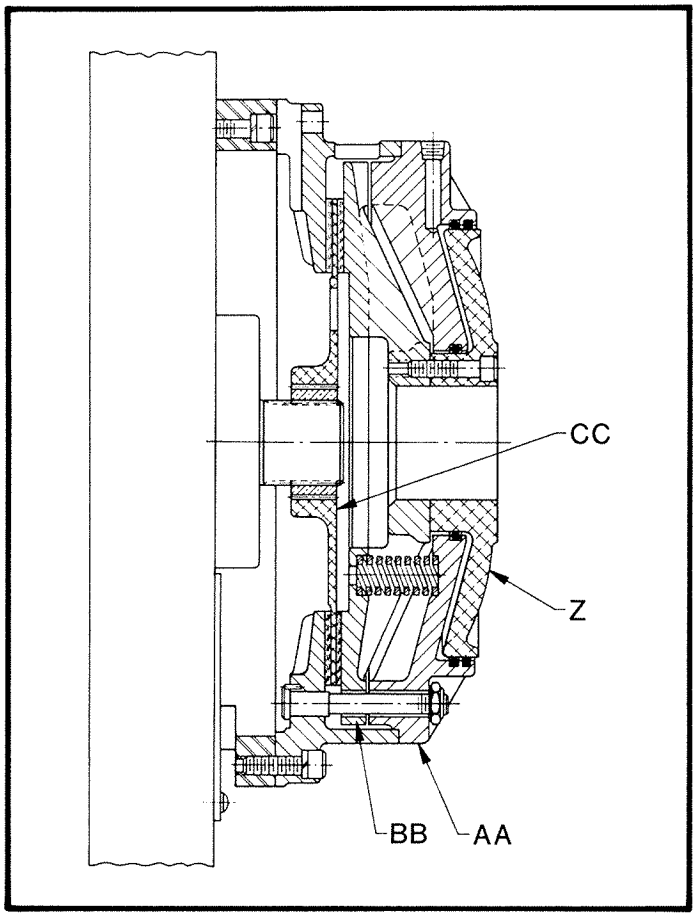


FIGURE 103

3. Replace air cylinder. Be careful not to nick or pinch the new "O" rings. Replace the twelve socket head screws and torque evenly.

MAINTENANCE OF AIR DISC CLUTCHES & BRAKE - 7-9 SERIES AUTOMATIC CYCLE PRESS BRAKE (Wichita Clutch Co. type "ATD")

NOTE: High speed clutch and the brake are also used on electric-air disc clutch and brake machines.

To maintain the rated torque capacity of the clutches and the brake, the air pressure must be set to 50 PSI. This pressure is set by an air pressure regulator located on the housing brace. Check air system for leaks, which can cause reduced air pressure.

For proper lubrication of the clutches and brake the air line lubricator should be set to feed about one drop of oil for every 35-40 clutch engagements. Measure drops through the sight glass. Use a medium hydraulic oil with a viscosity of 194 to 236 seconds at 100° F (C.I. oil B-215).

CHECKING FOR FRICTION DISC WEAR

To check for wear on friction disc facings, look through openings in clutch or brake housing. If the total width of the disc is less than 3/8", the friction disc should be replaced. The disc should also be replaced if the friction material is contaminated with oil. Regardless of wear on the facings, we recommend the high speed clutch and the brake friction discs be inspected for cracks or wear in the splines once a year. (This time period is based on an 8 hour day, 5 day week operation. Usage greater than this will require more frequent inspections). The friction disc in the low speed clutch is subjected to much smaller loading. Therefore, we recommend inspecting these discs only when the flywheel is removed for repairs or other maintenance procedures. See RELINING FRICTION BRAKE OR CLUTCH DISCS (Form EP-146) for detailed inspection information.

CLUTCH

It is an air operated, single friction disc type clutch. The 7-9 Series Automatic Cycle has a high speed and a low speed clutch. Air pressure expands the airtube in the clutch, squeezing the cast iron pressure plates and the friction discs together, which creates torque when the plates are turning. No adjustment of the clutches is required.

REPLACING HIGH SPEED CLUTCH DISC - 7-9 AUTOMATIC CYCLE (See Figure 104)

1. Disconnect both air supply hoses at rotary union. Remove flywheel guard. Disconnect air hose "D" to low speed clutch. Center punch an aligning mark on spring plate "E" and ring "K".

2. Remove hex nuts "H" from studs around face of spring plate "E". Attach sling around pipe fittings on face of spring plate, take up slack and remove spring plate assembly.

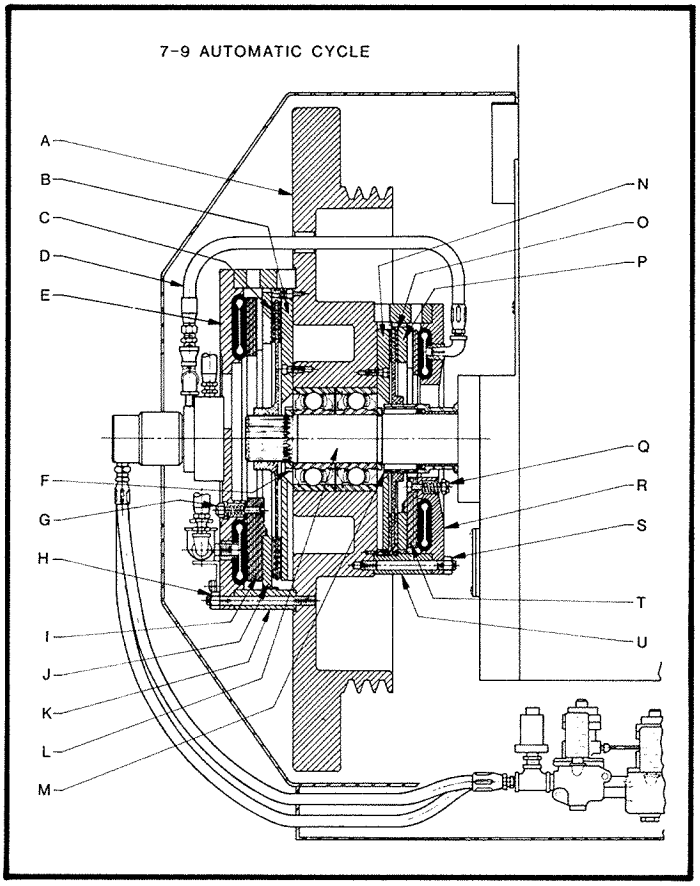


FIGURE 104

3. Place spring plate assembly on blocks with pressure plate "J" facing up. Remove cotter keys in screws for four hex nuts "G" and remove the nuts and springs. Remove pressure disc "I" and pressure plate "J". Inspect airtubes for excessive wear, damage or soft

spots. Replace if necessary. Reassemble pressure disc "I" and pressure plate "J" to spring plate "E". Make sure all four hex nuts "G" are tightened equally and to their original position. Replace cotter keys with new keys - do not reuse old cotter keys. Cotter key should be tapped firmly in position before bending tabs.

4. Remove old clutch disc "C".

5. Clean and lightly oil splines of new clutch disc and splines on flywheel shaft "L". Slide new clutch disc on flywheel shaft with the wide part of hub facing away from housing of the machine.

6. Replace spring plate assembly "E" and hex nuts "H" on studs. All stud nuts must be pulled up tight and equally torqued.

7. Check clearance with feeler gage between pressure plate "J" and clutch disc "C", with clutch disc against wear plate "B". There must be a minimum of .030" to .050" clearance. Proper clearance can be obtained by adding or removing circular shims between the spring plate "E" and ring "K". This clearance insures that the clutch is fully released with no air pressure to the airtubes and helps prevent overlap of clutches and brake.

8. If the low speed clutch is not to be disassembled, reconnect air hoses "D" for low speed clutch, replace flywheel guard and reconnect the two air supply hoses to the rotary union.

REPLACING LOW SPEED CLUTCH DISC - 7-9 AUTOMATIC CYCLE (See Figure 104)

1. Disconnect both air hoses to rotary union. Remove flywheel guard. Disconnect air hose "D" to low speed clutch.

2. Remove spring plate assembly "E" and clutch disc "C" (see high speed clutch procedure, steps No. 2 and 4).

3. Attach lifting device to rear of drive motor base and take out slack. Loosen motor base pivot screw and adjustment screw. Raise motor base to take tension off the vee belts. Tighten the motor base screws to hold it in this position. Remove the lifting device. Remove the vee belts and hang them on back gear housing. (Inspect vee belts and replace if necessary).

   CAUTION: Do not get any part of your body between the vee belts and vee grooves. Serious injury can occur from pinching action of the belts and grooves.

4. Attach sling around both clutch housings on either side of flywheel "A" and take out slack. Remove spanner nut "F" from flywheel shaft. Slide flywheel and clutch assemblies from flywheel shaft, being careful not to damage bearings or spline on shaft. Place flywheel on blocks or stands with low speed clutch facing up. If flywheel cannot be removed from flywheel shaft, consult your local CINCINNATI Service Representative.

5. Disconnect air hose "D" from pipe elbow in low speed clutch.

6. Remove the eight hex nuts "S" from studs around face of spring plate "R". Remove spring plate assembly and set on blocks with pressure plate "P" facing up.

7. To check airtubes, remove cotter keys in screws for four hex nuts "Q" and remove nuts and springs. Remove pressure disc "T" and pressure plate "P". Inspect airtubes for excessive wear, damage or soft spots. Replace if necessary. Reassemble pressure disc and pressure plate to spring plate. Make sure all four hex nuts "Q" are tightened equally and to their original position. Replace cotter keys with new keys - do not reuse old keys. Cotter keys should be tapped firmly in position before bending tabs.

8. Remove old clutch disc "O".

9. Clean and lightly oil splines of new clutch disc and splines on low speed pinion "M". Place new clutch disc "O" in low speed clutch against wear plate "N". The wider part of hub on the disc must be facing up.

10. Replace spring plate assembly "R" and hex nuts "S" on studs. All stud nuts must be pulled up tight and equally torqued.

11. Check clearance with feeler gage between pressure plate "P" and clutch disc "O" with clutch disc against wear plate "N". There must be a minimum of .030" to .050" clearance. Proper clearance can be obtained by adding or removing circular shims between the spring plate "R" and the ring "U". This clearance insures that the clutch is fully released with no air pressure to the airtubes and helps prevent overlap of clutches and brake.

12. Reconnect air hose "D" to pipe elbow in low speed clutch. Clean and lightly lubricate flywheel shaft.

13. Lift flywheel and clutch assemblies in position, centering it on flywheel shaft. Slide flywheel on flywheel shaft until splines in low speed clutch disc "O" are near splines on low speed pinion "M". Be careful not to damage roller bearings in flywheel on splines on end of flywheel shaft. Position the clutch disc with a tool (not your hands) through the openings in the low speed clutch ring "U". See Figure 105. When the splines are aligned, carefully push the flywheel towards the housing until the ball bearing is seated against the washer on flywheel shaft. Remove the lifting device.

14. Replace spanner nut "F" on flywheel shaft and fully tighten.

15. Replace vee belts in grooves of flywheel. **CAUTION:** Keep hands from between vee belts and grooves. Attach a lifting device to rear of motor base and take out slack. Loosen motor base screws and lower motor base until proper tension on belts is obtained. Tighten the motor base pivot screw and adjustment screw. Remove the lifting device.

16. Slide high speed clutch disc "C" on splines of flywheel shaft. The wide part of clutch disc hub must face away from housing of the machine.

17. Replace spring plate assembly "E" and hex nuts "H" on studs. All stud nuts must be pulled up tight and equally torqued.

18. Reconnect air hose "D" from low speed clutch. Replace flywheel guard. Reconnect two air hoses to rotary union.

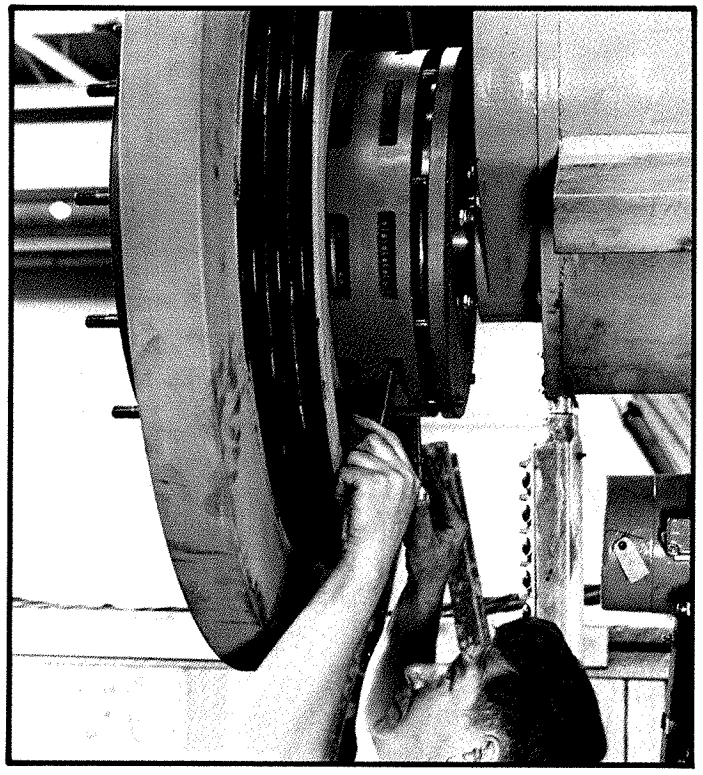


FIGURE 105

FRICTION BRAKE

It is a spring set, air released single disc type brake. The friction disc is normally held clamped by spring pressure on the pressure plate. When the clutch is engaged, air pressure is applied to the brake airtubes pulling the pressure plate away from the friction disc. For proper brake operation the clearance between the pressure plate and friction material must be maintained at .030" to .050".

FRICTION BRAKE CLEARANCE ADJUSTMENT (See Figure 106)

1. Manually energize the brake valve to release friction brake.

2. Check clearance with feeler gage between pressure plate "A" and friction material on brake disc "B" with the brake disc back against the brake housing "J". There must be a maximum clearance of .030" to .050". Excessive clearance will cause the brake to lose capacity.

3. Proper clearance can be obtained by adding or removing circular shims "H" between spring retainer "G" and the brake housing "J".

REPLACING BRAKE FRICTION DISC (See Figure 106)

1. Disconnect the four air hoses at the solenoid valve attached to the friction brake.

2. Remove the socket head screws "F" from spring retainer "G". Remove airtube plate assembly "D" and set on bench with airtube plate facing up.

3. To check airtubes, remove the six socket head screws "C" in face of airtube "D". Lift air tube plate off and turn over to inspect airtubes for excessive wear, damage or soft spots. Replace if necessary. Place airtube plate "D" on spring retainer "G" and replace the socket head screws "C". Make sure all brake application springs "E" are properly seated in the counterbores.

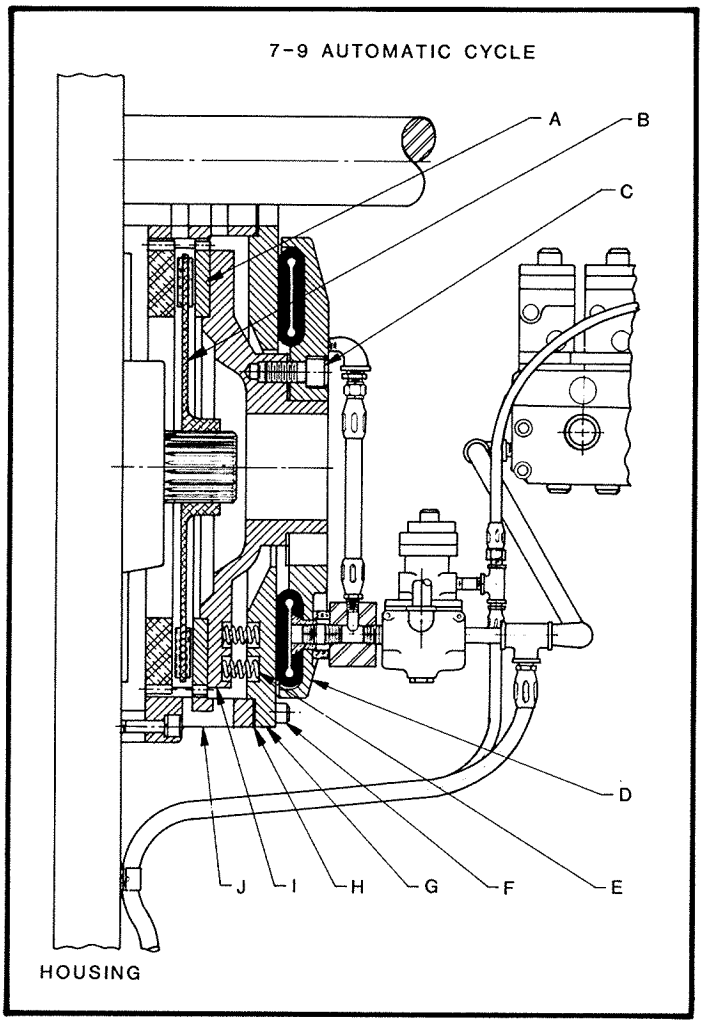


FIGURE 106

4. Remove pressure plate "A" and old brake friction disc "B".

5. Clean and lightly oil splines of new brake disc and splines on flywheel shaft. Slide new brake disc "B" on flywheel shaft. The wider part of the brake disc hub must be facing out (away from housing of machine). Push disc against back of brake housing "J".

6. Replace pressure plate "A". Locate it on splines with respect to springs on pins.

7. Replace air tube plate assembly "D", pushing it in position until pressure ring "I" seats against pressure plate "A". Replace the socket head screws "F" and tighten securely.

8. Reconnect the four air hoses to the solenoid valve.

9. Check friction brake clearance between pressure plate and friction material as previously described.

MAINTENANCE CHECK LIST - MECHANICAL PRESS BRAKES

	CHECK OR ADJUSTMENT	DAILY	WEEKLY	MONTHLY	3 MONTHS	6 MONTHS	YEARLY
1	Check clutch for proper operation - adjust if necessary	X					
2	Drain surge tank of condensate (IF SO EQUIPPED)	X					
3	Check entire machine for loose fasteners - tighten if necessary	X					
4	Check air pressure on regulator & drain air-line filter (IF SO EQUIPPED)		X				
5	Check ram stopping point at top of stroke - adjust brake if necessary			X			
6	Check silencer bolts in clutch - tighten if necessary (MACHINES WITH TOGGLE CLUTCHES)			X			
7	Check operation of air counterbalances - adjust air pressure if necessary			X			
8	Check clutch/brake linkage - tighten if necessary (MACHINES WITH TOGGLE CLUTCHES)			X			
9	Check ball seat clearance - adjust if necessary				X		
10	Check ram guide clearance - relevel machine if necessary				X		
11	Check tightness of main drive vee belts				X		
12	Inspect clutch and brake discs (AUTOMATIC CYCLE & MACHINES WITH AIR DISC CLUTCH/BRAKE)						X
	LUBRICATION SCHEDULE						
1	Check automatic lubricator oil level and turn crank 40 turns - add oil if necessary	X					
2	Check air-line lubricator oil level (IF SO EQUIPPED)		X				
3	Check drive gear box oil level - add oil if necessary		X				
4	Lubricate flywheel bearing and bellcrank pivot pin					X	
5	Grease treadle bracket and clutch shifter (IF SO EQUIPPED)					X	
6	Lubricate ram adjustment worm boxes					X	
7	Grease drive gear teeth (4-5 SERIES AND 19 SERIES & LARGER).						X
8	Lubricate main drive motor						X
9	Drain, clean and refill drive gear box						X

A PERIODIC MAINTENANCE SHOULD BE MADE ON THE PRESS BRAKE AS INDICATED ABOVE. INTERVALS ARE BASED ON ONE SHIFT AND NORMAL PRESS OPERATION. DETAIL INSTRUCTIONS FOR SERVICING THE MACHINE CAN BE FOUND IN THE OPERATOR'S MANUAL.

TROUBLE SHOOTING

Effective troubleshooting is usually acquired with experience and by a thorough knowledge of your machine and its operation. The assembly drawings, including hydraulic and electrical schematics located in Section 9 of this manual, should be used as troubleshooting aids. The following chart has been developed to present typical effects which indicate trouble spots in the machine system.

TROUBLE	PROBABLE CAUSE	WHAT TO DO
Drive motor will not start.	1. No power to machine.	1. If green GROUND CONNECTED light is OFF, check factory power source.
	2. Blown fuse(s).	2. Check fuses and replace if necessary.
	3. Electrical or air supply failure to operating valves for clutch or brake.	3. Check supply and correct.
	4. Electrical or air supply failure to STROKE STOP (optional).	4. Check supply and correct.
	5. BRAKE OVERRUN MONITOR has been activated.	5. Adjust friction brake and reset MONITOR.
Drive motor and flywheel running but ram cannot be cycled.	1. CONTROL CIRCUIT switch is in OFF position.	1. Turn to ON position.
	2. Operator control switch (palmbutton or footswitch) is in OFF position.	2. Turn to ON position.
	3. Damage to operator control or to their electrical connection.	3. Check and repair.
Ram runs backwards when operator control is actuated.	1. Main drive motor is running backwards.	1. Stop drive motor. Wait until flywheel stops and then press FORWARD button.
Drive motor stops after ram complete cycle.	1. BRAKE OVERRUN MONITOR was tripped.	1. Check brake adjustment and adjust if necessary. See Page 63.
Ram stops on down stroke before completing bend.	1. An overload has occurred.	1. Find cause of overload. See page 55.
	2. An overload has occurred and OVERLOAD has released clutch and engaged brake.	2. Find cause of overload and correct. Reset OVERLOAD SIGNAL. See Page 55.
	3. Improper clutch adjustment.	3. Adjust clutch.
Ram stops (anywhere on stroke).	1. Air supply failure, which stops drive motor.	1. Check supply and correct.
	2. Dual parallel flow air valve has tripped.	2. Push RESET button for valve and carefully make one cycle. If problem occurs again, check valve and replace if necessary.
Ram does not automatically stop at top of stoke.	1. MODE selector switch is in INCH or RUN position.	1. Select one of the production modes.
Ram automatically stops at top of stroke and will not make another cycle.	1. Failure of electrical reset circuitry.	1. Check circuitry and repair. (DO NOT INSTALL JUMPERS).
Machine squeals at flywheel when starting and/or at near capacity bends.	1. Vee belts are loose.	1. Adjust belts. See Page 56 .
Clicking sound in clutch with flywheel running, machine idle.	1. Friction plate is loose.	1. Adjust silencer bolts. See Page 65.
Clicking noise at adjusting screw and ram slide when ram reverses direction.	1. Ball seat(s) loose.	1. Adjust ball seats. See Page 52.

TROUBLE	PROBABLE CAUSE	WHAT TO DO
Connecting rod(s) kicks excessively to left or right.	1. Bearings worn in upper connection.	1. Check clearances and remove metal from cap(s) if required. See page 53.
Machine will not make capacity bend.	1. Clutch slipping.	1. Adjust clutch. See Page 58 and 62.
	2. Clutch not fully engaged.	2.1 Check clutch adjustment. See Page 58 and 62.
		2.2 Check air pressure. See Page 60 and 62.
	3. Brake not fully released.	3. Check linkage. See Page 63.
	4. Attempting to make "over capacity" bend.	4.1 Tensile and yield strength is too high. Check material.
		4.2 Improper tooling for material and/or bend. Check tooling application.
		4.3 Load not centered left to right. Center the load.
	5. Two speed transmission (optional 12-13 & 19-21-34 Series) slipping in LOW speed	5. Adjust friction slip clutch. See Page 65.
	6. Air pressure to Automatic Cycle clutches is too low.	6. Adjust air pressure. Check for leaks in air system. See Page 66 and 71.
	7. Vee belts are loose.	7. Adjust belts. See Page 56.
Inconsistent bends.	1. Material variations.	1. Check material thickness, tensile strength and yield strength.
	2. Ram not parallel to bed under load at housings.	2. Check ball sock adjustment.
Non-uniform bends (end to end).	1. Off-center machine loading.	1.1 Center load on machine centerline.
		1.2 Tilt ram to compensate.
	2. Worn dies.	2. Inspect and replace
	3. Machine and/or die deflection	3. Shim dies. See Page 49.

ORDERING REPAIR PARTS

When ordering repair parts be sure to give this information:

1. Serial number of the Press Brake. This is located on the machine's capacity plate and on the right end of the bed.

2. The part number and part name, obtained from the assembly drawings included with this manual.

3. As complete a description of the part as possible.

4. Delivery required.

5. It is sometimes necessary to furnish sub-assemblies instead of single parts. In such cases, we reserve the right to ship and to invoice accordingly.

RETURNING PARTS FOR CREDIT

1. No item is to be returned without prior authorization. Please write or call (513-367-7100) the Parts Department for instructions and the returned goods authorization number.

2. Returned goods authorization number must be shown on the outside of the package being returned. Unauthorized shipments will be returned to the sender freight collect.

SERVICE

CINCINNATI INCORPORATED Service includes:

1. Established field service having numerous local offices for prompt service assistance. Factory trained servicemen are available to assist you with any service problems you might be having. This includes service ranging from minor repairs and adjustments to major reconditioning jobs.

2. Planned Maintenance Service (PMS). This is a program designed to give you comprehensive inspections and recommendations concerning the condition of your equipment. PMS is specifically tailored to your needs to give you timely inspections, qualified recomendations and expert field assistance with repairs to your equipment.