

NIAGARA

MACHINE MANUAL

**NIAGARA POWER SQUARING
SHEARS**

SERIES ONE

Models 12 - 13 - 14 - 15 - 16 - 18 - 110

1R4 - 1R6 - 1R8 - 1R10

SN 62477

FORM C-2-G



NIAGARA MACHINE & TOOL WORKS
MACHINERY EXCHANGE www.SterlingMachinery.com
General Machinery Works, P.O. Box 475, Buffalo, New York 14240, U.S.A.



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INSTRUCTIONS and PARTS LIST

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

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

NEVER PLACE YOUR HANDS UNDER THE CROSSHEAD OR HOLDDOWN OR BETWEEN THE KNIVES UNLESS THE MOTOR IS OFF AND THE CROSSHEAD IS BLOCKED UP.



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NIAGARA POWER SQUARING SHEARS

SERIES ONE

Models 12 - 13 - 14 - 15 - 16 - 18 - 110
1R4 - 1R6 - 1R8 - 1R10

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RECEIVING

Immediately upon receiving shear, check it very carefully for damage or loss of parts in transit. Since all equipment is sold F.O.B., the Niagara plant, our responsibility for transit damage ceases when the transportation company signs the Bill of Lading indicating that it has received all of the listed items in good condition. Report any loss or damage to the delivering carrier promptly to insure proper handling of your claim.

Shortages not appearing on the Bill of Lading or discrepancies between equipment received and the order should be reported to us immediately.

INSTALLATION

If crane service is available, lift the shear onto the foundation. Protect the finished surfaces on the front of the bed with timber. CAUTION — do not attach sling around center of the shear because this may spring and distort the crosshead. If crane service is not available rig the shear into position on the foundation and lower with jacks under the bed at each end.

FOUNDATION

The Series One Shear does not require a special foundation other than a solid wood or concrete floor which will support the weight of the shear without sagging or settling. It must be firm enough to prevent the action of the shear or truck traffic from causing a springboard motion. It must be stable enough to keep the shear level and in proper alignment. The type and thickness of the foundation depends upon the weight of the shear and sub-soil conditions.

The holes, provided in the feet for attaching shipping skids, can be utilized also for bolting the shear to the foundation and thus prevent its moving during use. FOUNDATION BOLTS OR LAG SCREWS SHOULD NOT BE TIGHTENED BUT LEFT LOOSE TO PREVENT TWISTING OF THE SHEAR THROUGH POSSIBLE SETTLING OF THE FOUNDATION.

To aid in preparing the foundation, an outline drawing of the shear giving overall dimensions will be furnished upon request.

CLEANING

The shear is protected from rusting during shipment by a slushing compound. This compound should be washed off with a suitable solvent such as Sovasol, carbontetrachloride or other cleaning fluid. Wipe the knives clean and coat with light oil. Remove all dirt and cinders accumulated in transit. Inspect the oil cups to see that they are clean. If not, do not blow out but remove cup and wash in solvent. Periodic cleaning after the shear has been placed in operation is desirable.

LEVELING

Successful, accurate operation of the shear depends on careful leveling. When the shear is properly leveled, the crosshead and guide bearings carried by the left and right hand legs will be parallel and will guide the up and down movement of the crosshead without binding.

The simplest way to level the shear is to check the clearance of the crosshead guide bearings. Any misalignment will be readily apparent in the cross-corner binding of the crosshead bearing.

To level a shear by the feeler gage method, select a .002" (or preferably a .0015") feeler as a "Go" or "No Go" gage. If this feeler can be inserted into the bearing, the clearance can be considered open. If the feeler cannot be inserted, the clearance is considered closed.

The crosshead of a leveled shear will rest in the guide bearings tilted either forward or backward. If the crosshead is tilted backward, the bearing clearance in the top front and bottom rear bearings will be open to the feeler. If the crosshead is tilted forward, the top rear and bottom front bearings will be open.

To level the shear insert shims under the front or rear feet of the housing as required to make the cross-head bearing clearance relationship the same at each end of the shear. Note that the actual amount of bearing clearance is of no consequence when leveling. The feeler gage is used merely to determine which way the crosshead end bearing is resting in the guides.

The level of the machine should be checked periodically inasmuch as the foundation may settle.

SETTING UP

If the back gage has been removed for transit, attach the brackets to the underside of the crosshead with the bolts provided. Dowel pins in the back gage brackets properly locate them in relation to the crosshead. The single bracket back gage is attached with a single bolt in the center of the crosshead. Adjust the back gage in accordance with instructions under "BACK GAGE" (Pgs. 7 and 8).

The center support bearing for the treadle shaft should be secured to the floor so that it does not bind the shaft. Shimming between the support bearing and floor may be necessary.

Connect the motor to run in the direction indicated by the arrow cast on the gear box. (CAUTION — DO NOT ATTEMPT TO RUN THE SHEAR UNTIL IT IS LUBRICATED AND THE KNIFE CLEARANCE CHECKED IN ACCORDANCE WITH SUBSEQUENT INSTRUCTIONS.) Direction of motor rotation may be observed by looking through the louvers, by removing the outer bearing cover or by removing the motor from the gear box. If the shear is equipped with an axial air gap or so-called "pancake" motor, the motor cover may be removed. IF THE MOTOR RUNS BACKWARD THE CLUTCH WILL NOT DISENGAGE AND THE CROSSHEAD WILL RECIPROCATE AS LONG AS THE MOTOR RUNS. WHEN STARTING THE MOTOR WAIT A FEW SECONDS BEFORE TRIPPING THE CLUTCH TO LET THE FLYWHEEL REACH FULL SPEED. This will insure the crosshead stopping at top position where the detent will hold it until the treadle is again depressed.

To special order, certain shears are equipped with an electro-pneumatic or solenoid foot treadle. Unless otherwise tagged, connect the coil of the solenoid valve to a 110 volt single phase line. Connect the air inlet of the solenoid valve to the shop air line. Use clean air at a minimum pressure of 80 lbs. per square inch.

CHECK ALL BOLTS, NUTS, SCREWS, ETC., TO INSURE TIGHTNESS AS THEY MAY HAVE LOOSENED IN TRANSIT.



LUBRICATION

The shear is now ready for lubrication. A metal lubrication plate is permanently attached to the shear at the left hand end giving the catalogue number of the shear, the serial number, and the shearing capacity as well as the recommended lubricants. Also see lubrication chart (Pgs. 18 and 19).

Make certain that the oil is up to the oil level plug in the gear box and detent cam box.

Fill all oil cups to the top with the recommended oil; wait several minutes for the oil to fill the grooves and passages and again fill to the top.

The machine should be oiled by hand periodically in accordance with frequency of operation.

During the first hour of operation keep the oil cups filled to the top with the recommended oil to be sure that all passages are full and that the bearings will be flushed with fresh clean oil. A reasonably excessive amount of oil should be used for the first few weeks of operation.

CAUTION — Do not put waste or rags into oil cups to restrict the flow of oil.

Care should be taken to use only clean oil and clean oil cans as the least amount of dirt can damage bearings. Use the recommended specially compounded oils. *Common machine oil or engine oil is not satisfactory.*

Before starting a shear equipped with a centralized lubricator, fill the reservoir with the recommended oil and hand prime until the oil can be seen running out of the bearings. Periodically inspect the piping to see that it is not damaged. It is not practical to lubricate all parts, such as the holddown feet, with a centralized system. Therefore, these parts must be lubricated manually.

CAUTION — If an equivalent gear oil is used it must be non-gumming and must not exceed the viscosity or pour point of the gear oil recommended on the lubrication plate.

ADJUSTING KNIFE CLEARANCE

Before applying power to the shear or placing it in operation for the first time, the knife clearance should be carefully checked. During transit the shear is subject to conditions which may decrease the knife clearance and endanger the knives by rubbing or overriding.

Turn the shear over slowly by hand and observe very carefully to make certain that the knives are not rubbing or overriding. To make sure that the knives are not rubbing, try with very thin tissue paper. The paper should fold down between the knives and not be cut. A convenient method of turning the crosshead over by hand, when equipped with an axial air gap motor, is to remove the cover of the motor, step on the treadle, and slowly rotate the motor armature. If the clutch does not engage, release the clutch lock. Shears which do not have an axial air gap motor may be turned over by hand by removing the motor and using the splined motor coupling (27-A) on a piece of pipe formed into a crank or "T" wrench. Do not forget to rewire the splined motor coupling set screw after replacing it. An alternative to turning the shear over by hand is to slowly and carefully jog the motor a little bit at a time.

To adjust the knife clearance, the entire bed carrying the lower knife is moved toward or away from the upper knife so as to decrease or increase the clearance between the upper and lower knives.

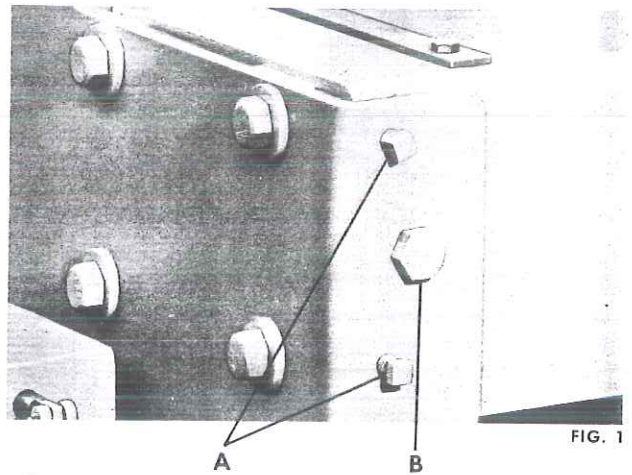


FIG. 1

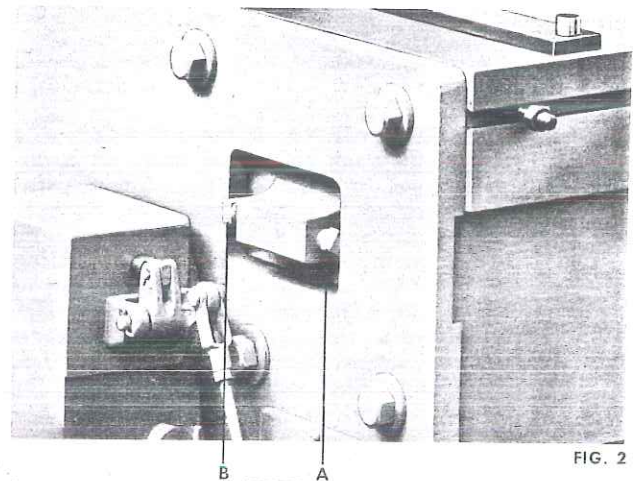


FIG. 2

To adjust the bed, slack off but do not loosen the nuts or bolts at each end that attach and clamp the bed to the legs. There are four nuts on the outside of each leg. Referring to Figs. 1 and 2, screws (A) move bed in to reduce knife clearance and screw (B) move bed out to increase knife clearance.

When adjusting screws (A) and (B), they should not be completely loosened but should oppose each other. For example: When moving the bed inward continue tightening screws (A) without loosening screw (B) until no further inward motion is observed and then slightly slack screw (B). Tighten screws (A) again and repeat until the bed is adjusted to the required setting.

The center knife clearance may be adjusted by means of the truss rod post at the rear of the crosshead. Series One Shears have crossheads equipped with a straight truss rod within the rear of the crosshead. Tightening the nut on this truss rod will reduce the clearance at the center of the knives and loosening will increase the clearance.

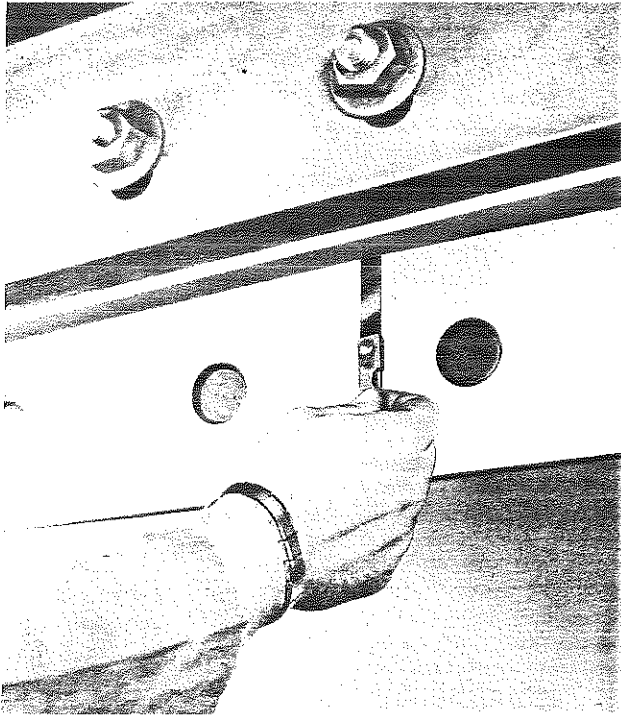


FIG. 3 Adjusting knife clearance

ADJUSTMENT PROCEDURE: — Adjust the bed away from the upper knife so as to make sure the knives will not override. Then, with the power disconnected turn the shear over by hand until the knives intersect at the right hand end. Insert feelers equal in thickness to the desired setting vertically between the knives at the intersection as shown in Fig. 3 and adjust the bed accordingly. Next, turn the crosshead so that the knives intersect at the left hand end and adjust the bed to the feelers. Recheck right hand end. When both ends of the bed are adjusted to the desired clearance *retighten the bed bolts and nuts*. Then turn crosshead so that knives intersect at center. If necessary, adjust center to the same clearance or slightly less than at the ends, as outlined in previous paragraph.

KNIFE CLEARANCE

Proper knife clearance is important to successful shearing; however, contrary to antiquated practice it is not necessary or desirable to use a different knife clearance for each different thickness of material.

It is important not to use too small a knife clearance in order to avoid rubbing or overriding of the knives. Rubbing or overriding will result in loss of cutting edge keenness, scoring of the knife faces, serrating of the cutting edge, and in extreme cases, breaking of the knives or damaging of the shear itself.

Too great a knife clearance is undesirable as it leaves heavy burrs on the material and in extreme cases may cause the material to fold between the knives rather than cutting. An optimum clearance between these two extremes will produce satisfactory results without affecting the load on the shear or the service life of the knives.

It is recommended that knife clearance be set between .002" and .003" (or at a point where the machine will cut wrapping paper full length).

When mild steel of the lighter gages (say 20 gage to 30 gage) predominates better results are sometimes obtained if the upper knife is ground to have an included angle of less than 90° (say 86°).

Shearing of copper, Monel metal, nickel, stainless steel, silicon transformer stock, aluminum, brass, lead, German silver, and many other metals and non-metallic materials may require closer knife settings. Some of these materials may also require special angles ground on the knives, or knives made of special alloys, and occasionally a reduced capacity rating of the shear. The factory will be pleased to make recommendations for your shearing problems.

REMOVAL OF HOLDDOWN

Before changing knives, the holddown should be removed.

Series One Models 12, 13, 14 and 16 are supplied with a one-piece reciprocating holddown which is removed in the following manner:

Before removing the holddown, the following precautions must be observed. As the holddown plunger is spring loaded and is under compression when retained by the lug on the leg, removing it from under the lug will cause the plunger to be ejected with force, and to prevent this, **IT IS IMPORTANT THAT THESE STEPS BE FOLLOWED**. Turn power off and open disconnect switch. Loosen locknuts on the holddown lifting adjustment screws (202). There is an upper and lower 9/32" hole in the holddown plunger (201). Insert a 1/4" pin in the upper hole and rotate the plunger until the pin is directly above the hole in the end block of the holddown. Back out the holddown lifting adjustment screw on one end of the holddown until the lower hole in the holddown plunger lines up with the hole in the end block of the holddown. Insert a 1/4" pin in this hole. Back out the holddown lifting adjustment screw until the holddown plunger is clear of the lug on the leg. Repeat this procedure at the opposite end of the shear. Remove the holddown from the guiding studs. Re-install holddown by reversing the order of procedure for removal. When assembling locknuts, (211) be sure to allow enough clearance to prevent binding.

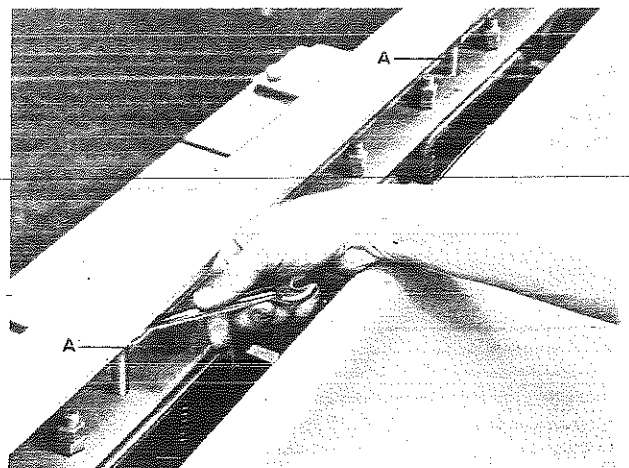


FIG. 4

The 18, 110, 112 and 1R models are equipped with a plunger type holddown assembly which is removed in the following manner:

Turn power off and open disconnect switch. Lower the crosshead to bottom of stroke by engaging the clutch and by turning the shear over by hand (see page 5). Install 1/2"-13 N.C. thread square head set screws 2" long (A) in holes on channel (207) as shown in Fig. 4. One set screw should be installed at each end of the channel. On 8, 10 and 12 foot shears, a set screw should be installed in the center of the channel also. Tighten the set screws until the holddown feet are lifted from the bed. The socket head screws (212) can now be removed and the entire holddown assembly taken from the machine to make the upper knife accessible.

Change knives as outlined in the following section. Re-install holddown by reversing order of procedure for removal.

When Series One Shears are assembled at the factory, the clearance between holddown feet and the bed is set at 1/4" on Models 18, 110, 112 and 3/8" on 1R Models.

NOTE: The socket head cap screws (A) must be removed from the channel before operating the shear.

CHANGING KNIVES

BEFORE proceeding to change knives be sure to TURN OFF power and OPEN the disconnect switch. To facilitate removal or attachment of the upper knife, remove the holddown as described above.

Remove the upper knife first. Before removing the plow bolts, block the upper knife in two or more places by inserting wood blocks between the knives and driving them slightly to the right so as to wedge the knives securely in position. When all the plow bolts have been removed, the upper knife may be lifted out from the front of the shear. Use great care in handling. If dropped, the cutting edges may be nicked or spoiled. Heavy leather gloves are recommended for protecting the hands. Boards may be placed on the bed perpendicular to the knife to protect the cutting edges from contacting the bed surface.

When removing the plow bolts from the lower knife be sure to hold or block the knife in place so that it cannot fall. Inspect all plow bolts to see that they are not damaged or worn. Periodic replacement of plow bolts is recommended.

Before proceeding to install new knives or changing to a new cutting edge, see that all faces of the knife seats are smooth and clean. Remove any burrs from the knife seats with a file. Also see that the knife surfaces are perfectly clean. Reassembly is a reversal of the disassembly procedure.

The distance from the cutting edge of the upper knife to the knife seat must be maintained as stamped on the center of the crosshead over the knife seat. Place a sheet metal shim between the knife seat and the top edge of the UPPER knife to maintain this distance after grinding.

The cutting edge of the LOWER knife must be even with the top of the bed. The height of the cutting edge is regulated by placing a shim UNDER, not behind, the knife.

Just before initially tightening the knives in position, replace the previously mentioned wood blocks and tap slightly to the right so as to flatten and clamp the upper and lower knife shims firmly in place on their respective seats.

Attach the knives loosely to the knife seats with full number of bolts. Care must be taken to seat the key of the bolt into the groove. When drawing the bolts home, start at the center and initially tighten these by working alternately right and left (of center) outward to the ends. As the plow bolts are tightened the bolt heads should be tapped with a heavy hammer and a large diameter drift or steel rod. This insures that the plow bolt heads will be properly seated in the knives.

After the shear has been in operation for a short time, inspect all bolts, making sure they are still properly set. Retighten as required.

SETTING AND ADJUSTING BACK GAGE

Single Bracket Type

The back gage bracket is pivotally mounted and secured to the rear of the crosshead by a king pin bolt (A). Removal of this bolt will facilitate quick removal of the entire gage.

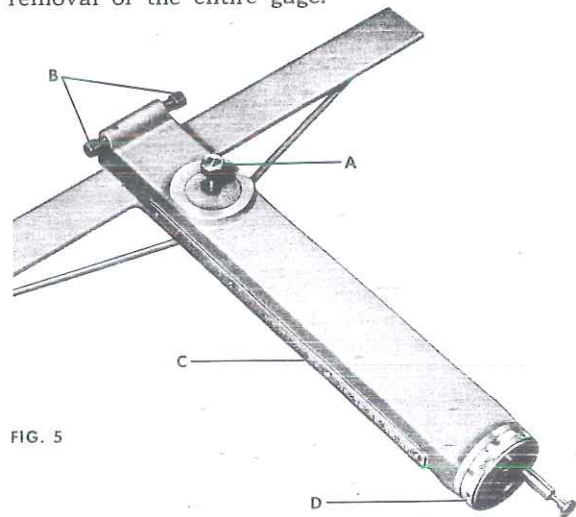


FIG. 5

The angularity of the bracket for parallel or taper cutting is adjusted by means of the two set screws (B) at the inner end of the bracket under the crosshead. These screws butt against two downwardly projecting lugs so that loosening the screw on one side and tightening the opposite screw will change the angularity of the bracket and gage.

The gage bar is pre-stressed for stiffness by a truss rod which also provides an adjustment for maintenance of straightness.

To adjust the gage for parallel cutting, a convenient method is to use a 1" square piece of cold rolled steel as a gage. Use this 1" gage block between the face of the gage bar and the lower knife. Adjust the bracket and gage bar so that the block just fits snugly at each end and slightly loose in the center. Then set the long scale (C) at the right hand side of the bracket to read 1" and the hand wheel scale (D) to read "O"

Positioning of the gage is accomplished by turning the hand wheel. Each full turn of the hand wheel moves the gage 1/4" and the plunger-type indexing handle engages locking holes at each 1/128" increment. When adjusting the gage, open it wider than the desired setting then make the final setting while moving the gage toward the bed.

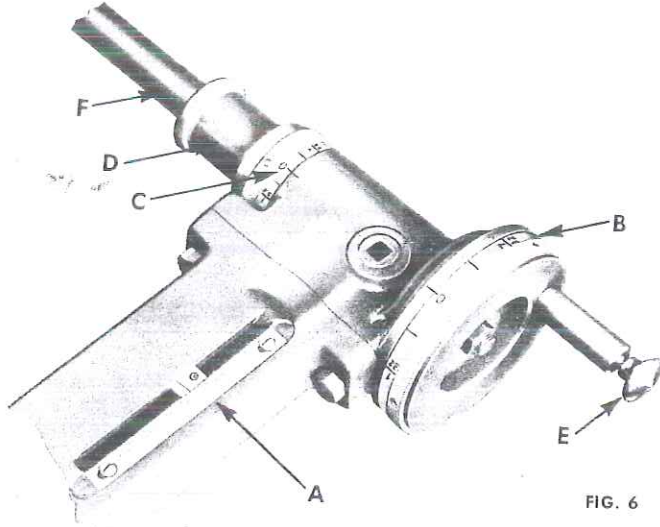


FIG. 6

Double Bracket Type

The double bracket type of back gage has two back gage brackets connected with a squaring shaft (Detail F, Fig. 6 which illustrates hand wheel end of the back gage operating mechanism).

Each full turn of the hand wheel moves the gage bar 1/4". The locking type plunger (E) must be pulled out against its spring to turn the hand wheel. The position of the hand wheel is maintained by letting the plunger drop into one of a series of holes circumferentially spaced around the hand wheel. The spacing of the holes is such that the movement of the gage is 1/128" between the adjacent holes for the hand wheel plunger.

Positions of the gage bar are read to the nearest 1/4" on the adjustable scale (A). Scale (B) is calibrated to read the gage bar position to the nearest 1/64" while the locking plunger may be set between the 1/64th graduations.

For accurate adjustment always open the gage beyond the point desired and make the final setting, moving the gage inward, to take up lost motion should any be present. If the shear is equipped with a Power Operated Back Gage always open the gage wider than the desired setting and make final adjustment with "Narrow" button.

Taper setting of the gage is easily accomplished. Slacken the cap screw at each end of the gage bar which attaches it to the bracket slides. Move the adjustment sleeve (D) away from the hand wheel bracket by gripping the sleeve with the left hand and pulling against retaining spring until the splined connection is exposed and disconnected. With the sleeve disconnected, the hand wheel will then actuate only one end of the gage bar. Do not forget to re-tighten the cap screws.

To set back gage parallel, select a steel block exactly 1" thick and place between the gage bar and the lower knife at each end of gage bar. Adjust until gage is parallel then check by actually doing work and adjust until a parallel cut is obtained. Then set dials (B) and (C) to 0 with gage (A) on an even inch mark.

The gage bar is equipped with an adjustable truss rod to stiffen it and permit an adjustment to concave or straight condition. Gage bar should be straight or slightly concave on its working face so that the sheet gaged against it cannot rock, thus causing inaccurate work. A good procedure is to trim a broad sheet taking a trim cut in width about equal 1 1/2 times the thickness of material. Then push the trimmed sheet against the back gage pressing on one end and then the other to see if any rocking can be detected. If rocking is noted, slack off on the center strut that hold the back gage brace rod, but not so much that an excessive hollow occurs.

FRONT GAGE

The front gaging may be obtained by bolting front gage stops to the top of the bed, using the dovetail slots. Adjustable steel scales at each end of the bed will aid in lining up the stops.

For gaging beyond the bed width, the stops may be bolted to the front brackets.

EXTENSION SQUARING GAGE

An extension squaring gage, as shown in Fig. 7 can be furnished as special equipment for squaring large sheets. It is recommended for use at the left hand side of the shear. The extension squaring gage is furnished with one adjustable stop and an inlaid scale adjustable to compensate for knife wear.

To install the extension squaring gage remove the side gage from the shear bed. The side gage of the extension arm fits over the top of the bed and is fastened with the bolts provided. Extension squaring gages furnished after the shear has been shipped may require a certain amount of fitting by the purchaser to line up the bed holes properly. To accomplish this, loosen all of the bolts at the under side of the channel that attach the side gage. Move the side gage toward or away from the shear bed until the bed holes are in line, then re-tighten the attaching bolts. If there is not sufficient clearance for attaching bolts to line up the bed holes, remove the side gage and elongate the channel holes with a round file in the required direction.

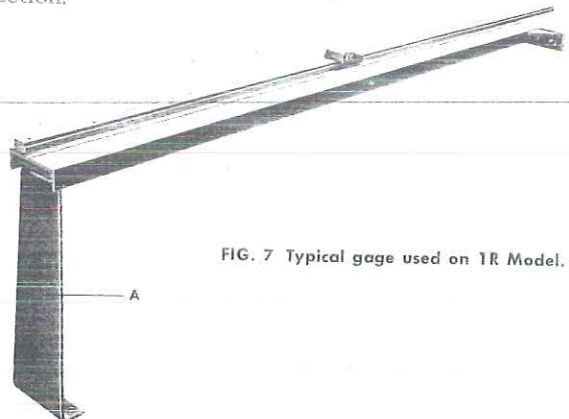


FIG. 7 Typical gage used on 1R Model.

Pack or shim between the outer gage support (A) and the floor until the gage arm is level. The gage arm may be tried for squareness by using a square against the lower knife or by checking the actual cut produced with the gage. When using an extension squaring gage it is extremely important that the shear is firmly positioned by use of angle brackets lagged to the foundation. Movement of the shear will have a tendency to throw the extension squaring gage out of line.

CLUTCH

The famous NIAGARA sleeve clutch is enclosed in the gear housing where it is protected from dirt and damage. The clutch operates in a bath of oil to promote long life.

The sleeve clutch applies the power or torque to the driveshaft concentrically because the fourteen jaws form a complete circle on the sleeve. The sleeve transmits the torque to the main shaft through splines machined circumferentially in the shaft.

Due to the fourteen engaging jaws, the load is divided, thus making wear on the driving surfaces of the engagement points negligible.

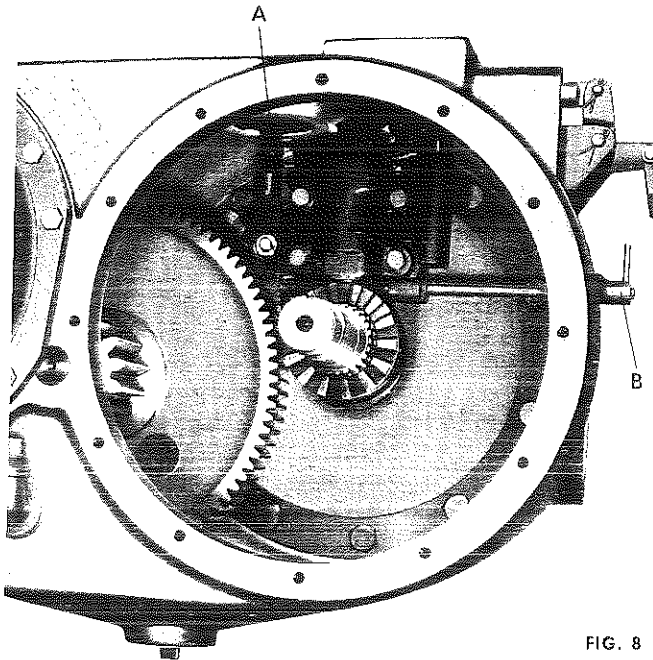


FIG. 8

The clutch gear, which rotates constantly, carries a driving member or clutch plate with matching clutch jaws. Both clutch sleeve and clutch plate are made of hardened alloy steel. The clutch sleeve is held in disengagement by the throwout shaft until the treadle is depressed momentarily. The throwout then releases the sleeve which, sliding on splines of the shaft, engages with the rotating clutch member on the gear. To effect disengagement, the throwout is permitted to come into contact with the throwout cam on the clutch sleeve where it rolls until the sleeve is disengaged from the clutch wheel face on the clutch gear.

The clutch gear or main drive gear is mounted on anti-friction bearings.

Single Stroke Selector

The shear may run continuously by keeping the treadle depressed or be made to come to a stop at the top of the stroke regardless of treadle position by merely suitably positioning the single stroke selector (Detail A, Fig. 8).

The selector knob is reached through the large pipe plug at the top of the gear box. By pulling up and turning this knurled selector knob, one-half turn, the shear may be set for either single stroke or continuous operation. The selector knob is round with a flat on one side. When the flat side is toward the sliding pin (167) the single stroke cam (140) is rendered ineffective. Turning the flat side away from the pin will make single stroke operation effective. Be sure the knob snaps back into place when adjustment is made so that it will not turn without lifting.

The single stroke feature reduces the possibility of accidents that may be caused by the operator failing to remove his foot from the treadle in time to prevent a second stroke. It functions by unhooking the treadle mechanism by means of a specially timed, cam operated device.

Clutch Lock

A clutch lock (Detail B, Fig. 8) is provided for locking the clutch out of engagement. To lock clutch, pull out slightly on locking lever, and turn pointer to position marked "LOCK". Make it a habit to always lock the clutch in addition to shutting off the power when making adjustments to the shear.

WHERE TO CUT

When shearing against a side gage it is well to use the gage at the left hand end of the shear. Shearing of short width sheets of heavier material at the center of the bed should be avoided. *Never exceed the capacity of the shear even in short widths, as short widths are as difficult to cut as wider sheets.*

Shearing of two sheets, one on top of the other, requires more pressure than a single sheet of equivalent thickness. If pack cutting is desired a reduced capacity is called for. The factory will be pleased to offer assistance in such cases.

Never attempt to shear material that is not securely gripped by the holddown. Small pieces not gripped by the holddown may tip and fold between the knives.

SHEARING TO A LINE

It may be desirable to cut sheets to a scribed line rather than to a gage. This is accomplished by looking down behind the holddown bar and lining up the scribed work with the cutting edge. To facilitate better vision the front of the crosshead is sloped to the rear.

A light beam shearing gage, available as extra equipment, will aid in shearing to a line by illuminating the work area and casting a shadow of the upper knife on the work.



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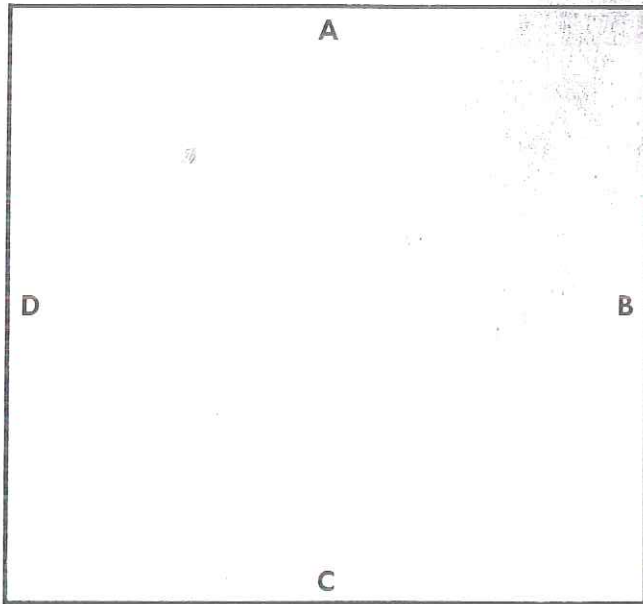


FIG. 9

SQUARE CUTTING

Square cutting with the extension squaring gage by the following method will produce the least amount of irregularity: Refer to the sketch (Fig. 9). Trim edge A. With edge A against side gage, trim edge B; with edge A against front gage, trim edge C. With edge C against same side gage used in the second cut, trim edge D.

ACCURATE SHEARING

Keeness of the cutting edges, kind and thickness of material, proper use of gages, and size of cut are among the many factors that affect accurate shearing.

Accurate shearing results cannot be expected with stress-filled stock. The release of these strains by cutting cause distortion of the sheared edges and a straight cut is not obtained. Stress-filled stock should always be cut enough oversize to permit a second, narrow (trim) cut. This trim cut will improve the straightness of the sheared edge. Stretcher-leveled or stress-relieved stock should be used if utmost shearing accuracy is required. Cold rolled annealed stock can usually be cut with greater accuracy than ordinary black stock or blue annealed stock. Sheets produced in a modern strip mill are generally better than those made in old fashioned merchant mills.

For accurate shearing against the back gage, the operator should feed the sheet against the back gage holding it there firmly, but not necessarily with excessive pressure, until the cut is in process. However, there is no objection to maintaining this pressure for as soon as the cut is finished, the off-fall will drop to the floor and the sheet can be automatically fed in to strike the back gage preparatory for the next cut.

The back gage is planed perpendicular and its contact with the work remains unchanged until after the hold-down feet have clamped the sheet. From this point on, as the crosshead descends further the back gage is planed with a relief angle providing necessary clearance.

SHEARING OF NARROW STRIPS

A certain amount of difficulty may be experienced in the accurate shearing of narrow strips. The three major difficulties encountered in shearing of narrow strips are: camber, curl, and bow. The tendency for these conditions is usually greater in the softer and more ductile materials.

CAMBER is the tendency for a strip to distort in such a way that the edges are no longer straight but become bowed to form a long curve. Camber is influenced by the slope of the upper knife, the material being cut, and the width of the strip in proportion to its thickness. The low slope of these shears reduces camber to a minimum. Stress-filled stock will camber to a greater degree than will stress-relieved stock. The narrower the strip in proportion to its thickness, the greater the camber.

CURL is the tendency of a narrow strip to twist around itself or to cork-screw. Curl is influenced by the slope of the upper knife, the width of the strip, and the thickness and kind of material. The narrower and heavier the strip, the greater the amount of curl. Dull knives may increase the amount of curl.

BOW is the tendency for a strip to change from a flat condition. Bow usually accompanies camber and curl but is reduced by the low slope of the upper knife, a feature common to Niagara Shears.

MAINTENANCE

Under normal operating conditions the shear should require very little maintenance, other than that of good care in keeping it clean and well lubricated. The knives should be kept sharp and properly adjusted. Periodic inspections should do much to prevent minor conditions from developing into costly repairs and possible consequential loss of productive operating time.

When the main drive gear or clutch require attention, drain the oil from the gear box. On 1 and 1R Models, the gear box bearing is locked into the cover plate (25) by either one or three eccentric head bolts (24) depending on the particular model involved. Before the cover can be removed, the bearing must be released as follows: The locknuts on the outside of the cover are loosened while the bolt is held firm by inserting a screwdriver in its slotted end. Then, the screwdriver is used to rotate each bolt a one-half turn.

WHEN REASSEMBLING THE COVER, MAKE SURE THAT BOLTS ARE ROTATED ONE-HALF TURN TO LOCK THE BEARING AND THAT THE LOCK NUTS ARE DRAWN UP TIGHT. IMPROPER INSTALLATION OR TAMPERING WITH THESE BOLTS MAY CAUSE IMPROPER CLUTCH OPERATION.

Cover plate fits over the outer support bearing of the main shaft. Care must be taken to see that the cover is backed off evenly by inserting set-screws in the holes provided.

Removal of the spanner lock nut (143) and lock washer (143A) from the end of the shaft releases the outer support bearing (31), clutch gear (30), clutch sleeve (141), spring (144), and single stroke cam (140). These parts may be removed from the shaft in this order.

Before the latch bracket assembly can be removed, it will be necessary to remove the locking bar (135)



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and treadle connection link (33A). The locking bar end collar (137) is placed on the locking bar next to the inside wall of the housing where it retains the locking bar spring. The locking bar end collar may be removed by knocking out the standard taper pin. This will permit withdrawal of the locking bar from the gear box.

When reinstalling the latch bracket assembly, before the throwout housing cap screws (133) are tightened, the locking bar should be replaced and the housing moved so that there is clearance between the recessed portion of the locking bar and the shoulder of the clutch sleeve when in the unlocked position.

Replace the clutch sleeve and single stroke cam correctly by observing that it slides on with the "O-O" on the internal spline straddling the "O" on the external spline. Compress the clutch sleeve spring by hand and turn the locking bar handle one-half turn to hold the sleeve in position while mounting the clutch gear. When tightening the clutch gear on the shaft, pull the locknut (143) tight and lock. The clearance for free running of the bearings has been provided for in the machining. Be sure the through bolts holding the clutch gear face plate are tight.

Gearing

The entire flywheel and pinion shaft can be removed as a unit by unbolting the motor adaptor flange and withdrawing it.

For servicing the intermediate gear and pinion assembly, the gear box should be removed from the shear. The motor and all parts on the eccentric shaft and the latch bracket must be removed as previously outlined. When the gear box has been removed the intermediate shaft can be driven from the gear box by tapping the outer end of the shaft. This shaft is stepped and cannot be removed by driving it in the opposite direction. The intermediate shaft does not revolve but is held in the walls of the gear box. The intermediate gear and pinion cluster rotate on this shaft.

Removal of Gear Box

After removal of the clutch gear, clutch sleeve, spring, single stroke cam and clutch bracket, the gear box can be removed by unbolting the cap screws which fasten the gear box to the housing. Those cap screws lying behind the intermediate gear can be reached with a socket wrench and extension handle through a cored hole in the web of the intermediate gear.

When replacing the gear box, follow the procedure outlined below so that it will not become loose in operation.

1. Clean mating surfaces and remove any burrs with a file.
2. Replace all cap screws.
3. Tighten screws, finger tight.
4. Raise up rear end of gear box with jack to take up backlash in bolt circle clearance.
5. Pull up cap screws as tightly as possible, using a sturdy socket wrench with good leverage.

Brake

A patented detent device controls the stopping of the shear.

The detent device consists of a cam and spring loaded cam roller mounted on anti-friction bearings. The detent is located in the housing at the end of the shear opposite the gear box.

To remove the detent cam housing, first remove the large pipe plug at the bottom of the spring pot and drain the oil. Then remove the round cover plate from the side of the cam box. Insert a cap screw and washer in the tapped hole at the bottom of the spring plunger. Tightening this cap screw will release the spring pressure from the cam roller so that the cam can be removed from the end of the shaft. Either the spring pot or the entire cam housing can then be removed.

On shears of 10 foot and greater cutting lengths, a drag brake is incorporated with the detent to supplement its action. The brake strap and brake collar are stamped with matching marks to show the correct stopping point of the brake. Should the mark on the brake collar be either to the right or the left of the brake strap, adjustment is necessary. If the mark on the brake collar is to the left of the mark on the brake strap, it indicates that the adjustment is tight. Tightness can also be detected by a clicking of the clutch. If the mark on the brake collar is to the right of the mark in the brake strap, it indicates the adjustment is too loose. The clutch will disengage but the machine will over-ride top stroke and the throw-out will strike the positive stop on the clutch sleeve. A resounding thud or clank will be heard.

Counterbalance

The 18, 110 and 1R Models are equipped with a counterbalance. The counterbalance spring adjustment is properly set at the factory and should not be disturbed. Should counterbalance have to be removed consult factory for correct installation.

REPAIR PARTS

When ordering repair parts, state the serial number of the shear. It is stamped on or near the front left-hand corner of the bed. Be sure to use complete names of parts (not numbers) listed on the following pages for positive identification.

It is recommended that knives be returned to the factory for regrinding. A fast regrinding service is available. Due to the hazards of improper regrinding, claims against knives reground outside our plant cannot be considered.

Reordering Knives

In ordering knives you will enable us to expedite delivery by sending the following information with your order: —

1. The part numbers stamped on the knives.
2. Type and size of shear.
3. Serial number of shear.
4. Type of knife required. (Refer to catalog)

NEVER PLACE YOUR HANDS UNDER THE CROSSHEAD OR HOLDDOWN OR BETWEEN THE KNIVES UNLESS THE POWER IS OFF AND THE CROSSHEAD IS BLOCKED UP.



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Illustrations in this manual do not show each machine model in exact detail. Niagara reserves the right to discontinue or change specifications, design or prices at any time, without notice and without incurring any obligation.



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PARTS LIST

MODELS 12, 13, 14, 15, 16

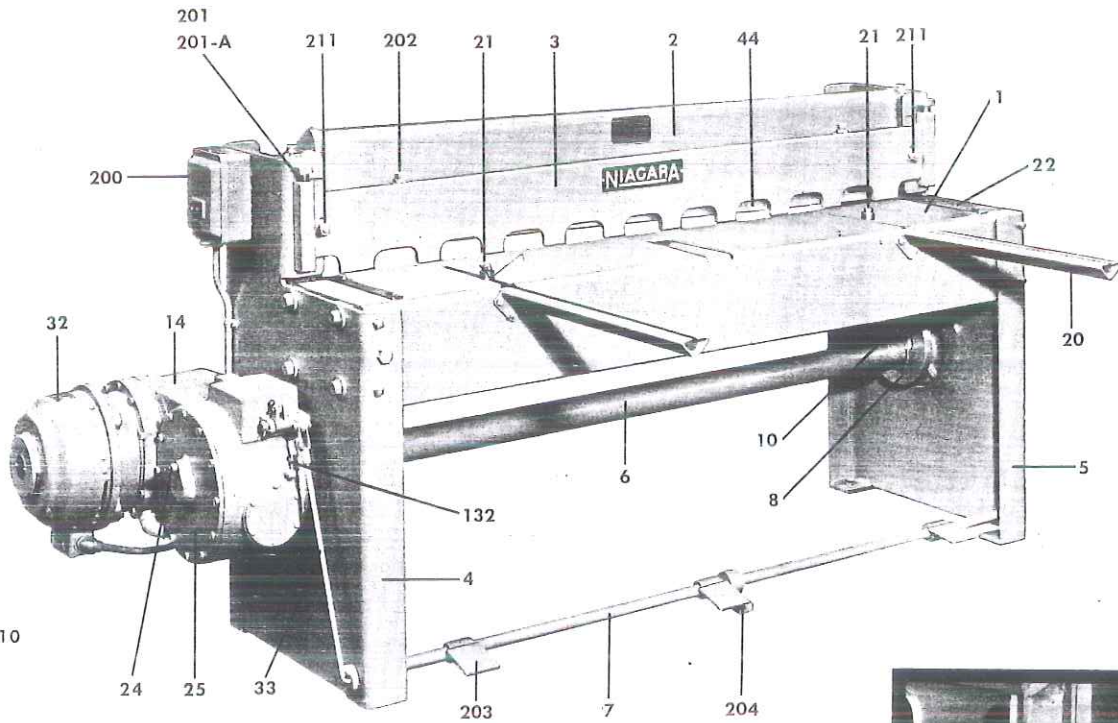


FIG. 10

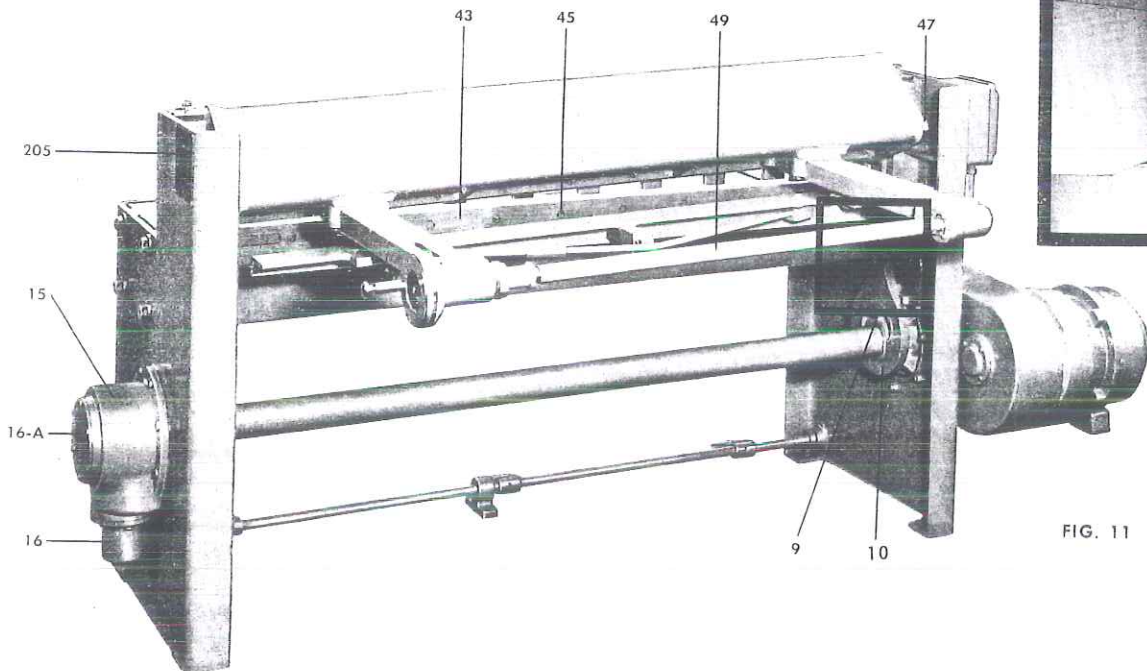
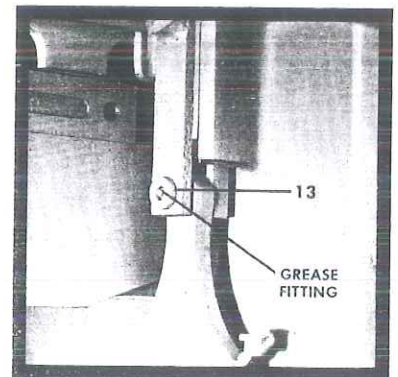


FIG. 11



Part Nos. for Figs. 10, 11, 12 and 13

- | | | |
|-----------------------|--------------------------------|--------------------------------|
| 1. Bed | 9. L.H. Eccentric | 20. Front Brackets |
| 2. Crosshead | 10. Crosshead Eccentric Straps | 21. Front Gage Bolts |
| 3. Holddown | 13. Crosshead Wrist Pins | 22. Side Gage |
| 4. Left Hand Housing | 14. Gear Box | 24. Eccentric Head Cover Bolts |
| 5. Right Hand Housing | 15. Detent Cam Box | (one on Models 12-16, three on |
| 6. Eccentric Shaft | 16. Detent Spring Pot | 110 & 1R Models) |
| 7. Treadle Shaft | 16-A. Detent Cam Box Cover | 25. Gear Box Cover |
| 8. R.H. Eccentric | | 32. Motor |



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When ordering parts always give the catalog and serial number of the shear. The serial number is stamped at or near the front left corner of the bed and also on the metal lubrication plate. Be sure to use complete names of parts listed for positive identification.

MODELS 18, 110, 1R4 TO 1R10

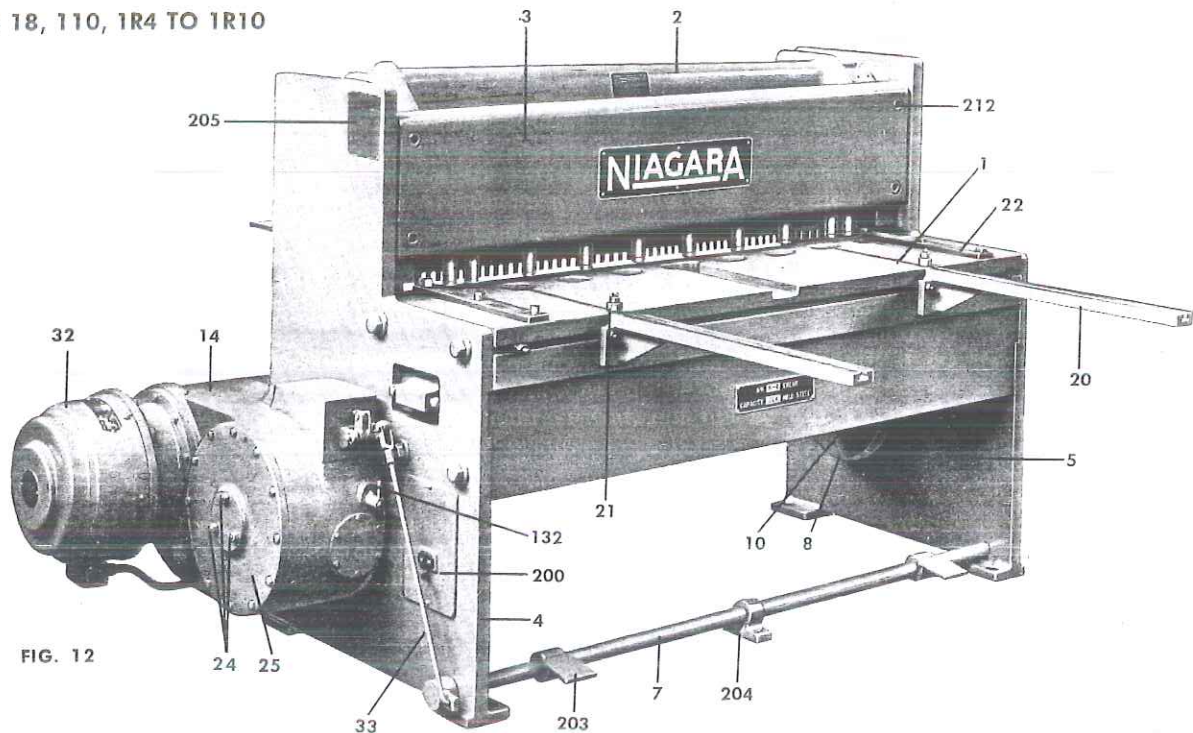


FIG. 12

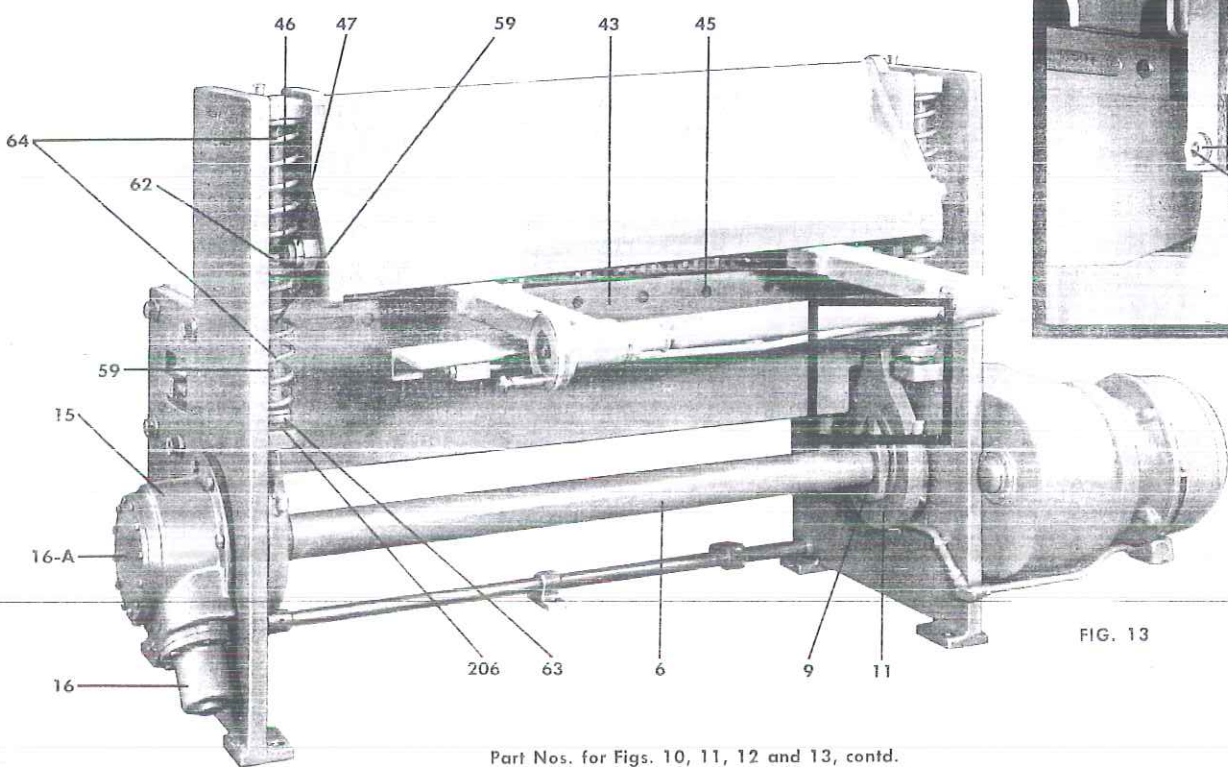


FIG. 13

Part Nos. for Figs. 10, 11, 12 and 13, contd.

- | | | |
|--|---|-------------------------------|
| 33. Treadle Connection | 62. Center Counterbalance Spring Washer | 203. Treadle Foot |
| 43. Lower Knife | 63. Lower Counterbalance Washer | 204. Treadle Rod Support |
| 44. Upper Knife | 64. Counterbalance Springs | 205. Lubrication Plate |
| 45. Knife Plow Bolts | 132. Locking Bar Handle | 211. Holddown Locknuts |
| 46. Crosshead Brace Rod | 200. Starter | 212. Holddown Retainer Screws |
| 47. Crosshead Brace Rod Adjustment Nut | 201. Holddown Plunger | 206. Jam Nut |
| 49. Back Gage Squaring Shank | 201-A. Holddown Plunger Spring | |
| 59. Counterbalance Springs Box | 202. Holddown Lifting Adjustment Screws | |

* Not Illustrated

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QV F700N

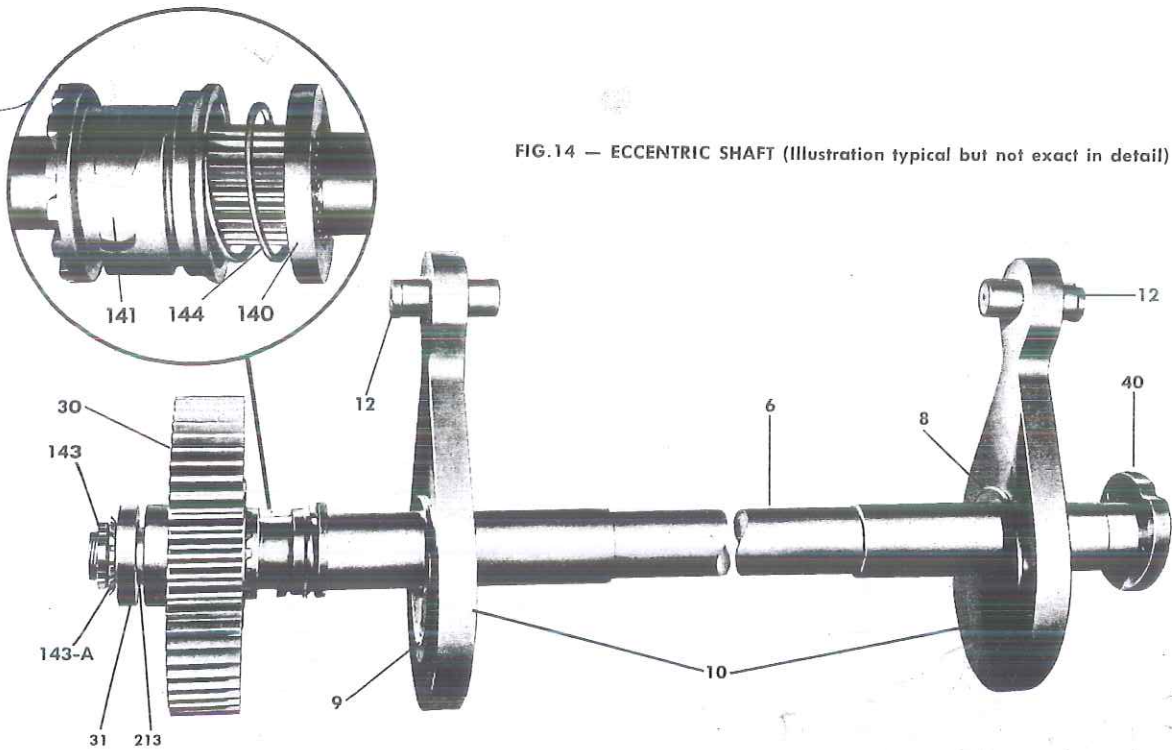


FIG. 14 — ECCENTRIC SHAFT (Illustration typical but not exact in detail)

- | | |
|--------------------------------|---------------------------|
| 6. Eccentric Shaft | 40. Detent Cam |
| 8. R.H. Eccentric | 140. Single Stroke Cam |
| 9. L.H. Eccentric | 141. Clutch Sleeve |
| 10. Crosshead Eccentric Straps | 143. Locknut |
| 12. Crosshead Wrist Pins | 143-A. Lockwasher |
| 30. Clutch Gear | 144. Clutch Sleeve Spring |
| 31. Cover Bearing | 213. Spacer |

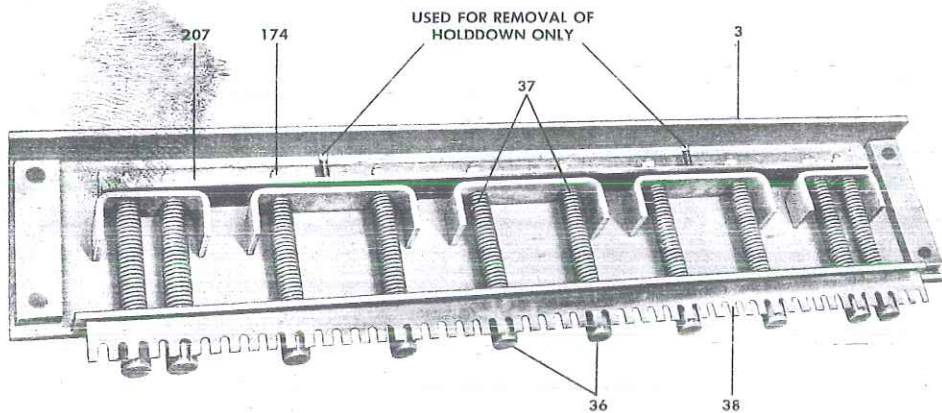


FIG. 15 HOLDDOWN

for models 18, 110, 1R4 to 1R10 (rear view)

- | | |
|---------------------|----------------------------------|
| 3. Holddown | 38. Knife Guard |
| 36. Holddown Foot | 174. Holddown Foot Retaining Nut |
| 37. Holddown Spring | 207. Holddown Lifting Bar |

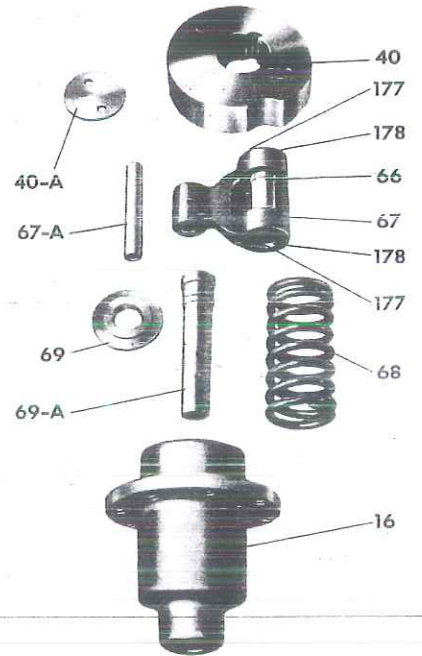


FIG. 16 —DETENT BRAKE

- | |
|-----------------------------------|
| 16. Detent Spring Pot |
| 40. Detent Cam |
| 40-A. Detent Cam Housing Washer |
| 66. Detent Cam Roller |
| 67. Detent Cam Lever |
| 67-A. Detent Lever Pin |
| 68. Detent Spring |
| 69. Detent Spring Plunger |
| 69-A. Detent Plunger Stem |
| 177. Detent Cam Roller Bearings |
| 178. Detent Cam Roller Snap Rings |

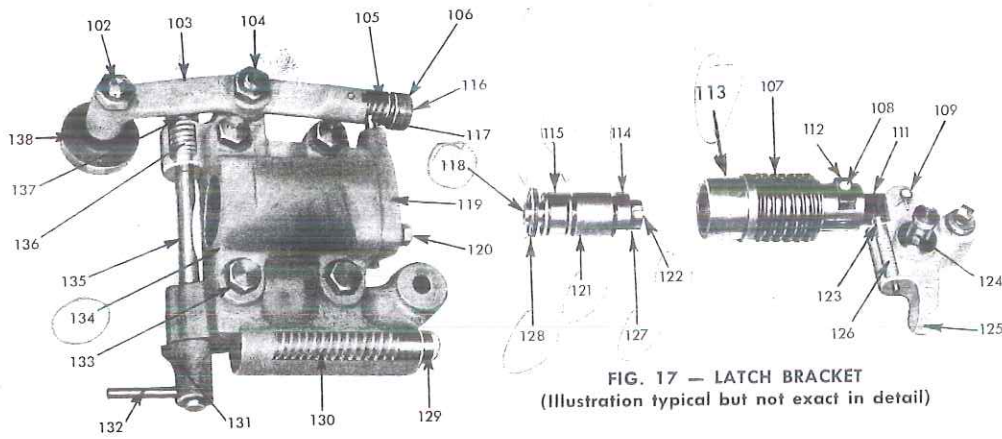


FIG. 17 — LATCH BRACKET
(Illustration typical but not exact in detail)

- | | | | |
|----------------------------------|---------------------------------|---------------------------------|---------------------------------|
| 102. Cam Roller Shaft | 112. Throwout Key | 121. Spacing Collar | 130. Treadle Spring |
| 103. Cam Lever | 113. Throwout | 122. Throwout Shaft Lock Nut | 131. Locking Bar Indicator |
| 104. Cam Lever Pin | 114. Throwout Bearing Ball | 123. Latch Spring Pin | 132. Locking Bar Handle |
| 105. Selector Knob Spring | 115. Throwout Bearing Needle | 124. Bell Crank Pin | 133. Throwout Housing Cap Screw |
| 106. Single Stroke Selector Knob | 116. Selector Knob Pin | 125. Bell Crank | 134. Throwout Housing |
| 107. Throwout Spring | 117. Sliding Pin | 126. Latch Spring | 135. Locking Bar |
| 108. Throwout Pin | 118. Throwout Shaft | 127. Lock Washer | 136. Locking Bar Spring |
| 109. Latch Hinge Pin | 119. Throwout Housing End Cover | 128. Throwout Shaft Collar Nuts | 137. Locking Bar End Collar |
| 111. Latch | 120. End Cover Cap Screw | 129. Treadle Spring Plunger | 138. Cam Roller |

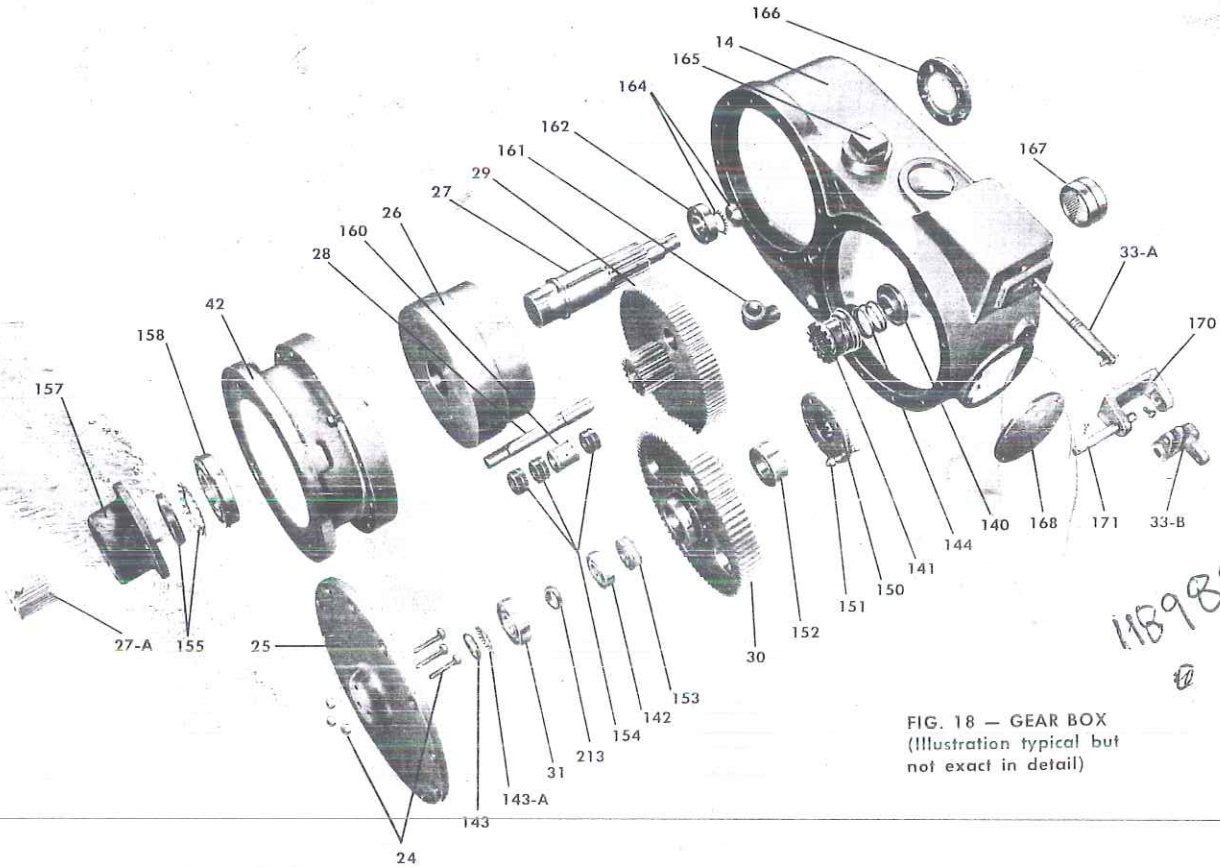
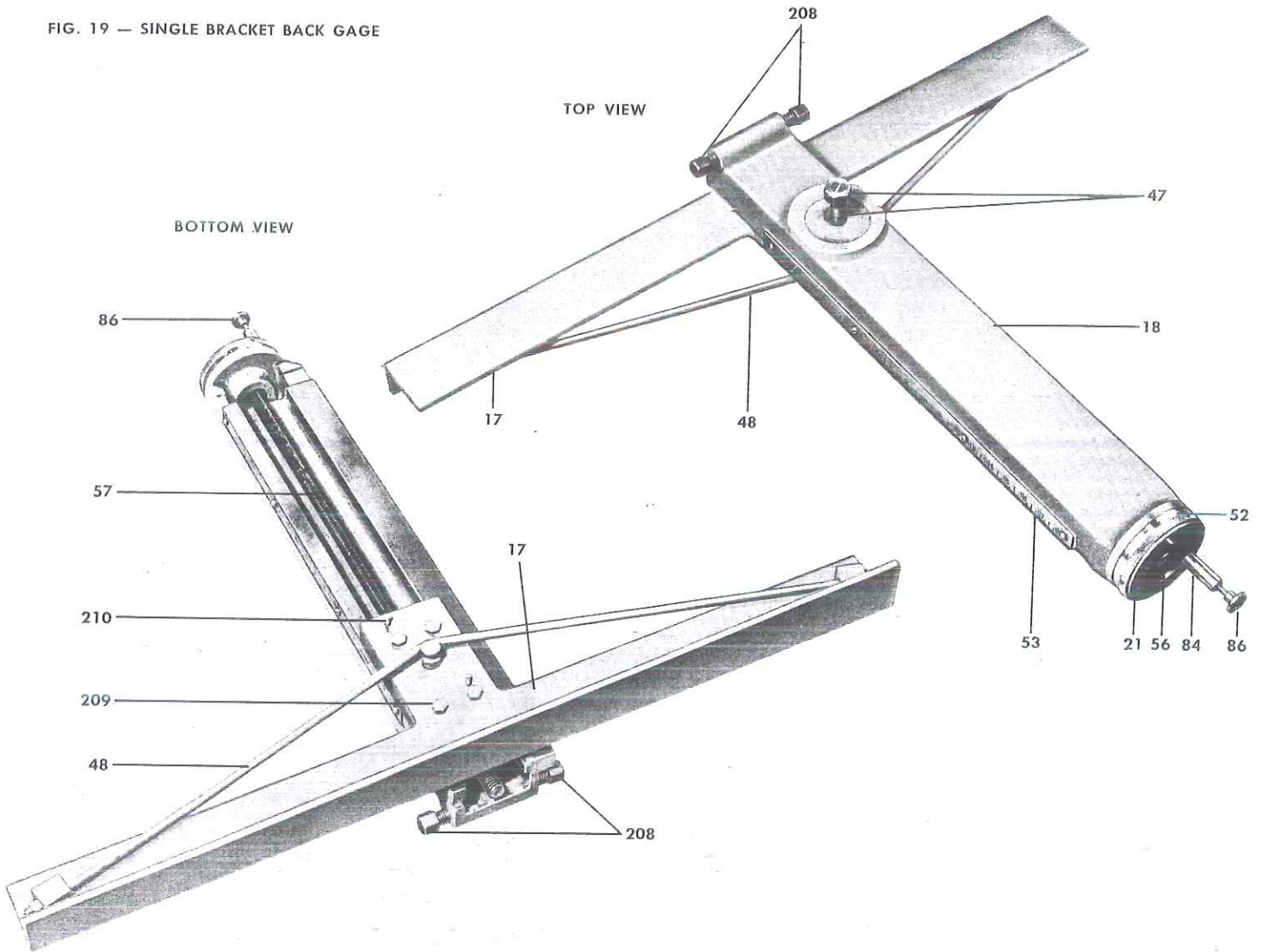


FIG. 18 — GEAR BOX
(Illustration typical but not exact in detail)

- | | | |
|--|----------------------------------|--|
| 14. Gear Box | 42. Motor Adapter Flange | 157. Oil Catcher and Bearing Retainer |
| 24. Cover Bolts and Nuts | 140. Single Stroke Cam | 158. Pinion Shaft Flywheel Bearing |
| 25. Gear Box Cover | 141. Clutch Sleeve | 160. Intermediate Shaft Bearing Spacer |
| 26. Flywheel | 142. Outer Clutch Gear Bearings | 161. Oil Level Elbow |
| 27. Drive Shaft | 143. Locknut | 162. Pinion Shaft Bearing |
| 27-A. Splined Motor Coupling | 143-A. Lockwasher | 164. Locknut and Washer |
| 28. Intermediate Shaft | 144. Clutch Sleeve Spring | 165. Single Stroke Cam Cover |
| 29. Intermediate Gear and Pinion Cluster | 150. Clutch Wheel Face | 166. Pinion Shaft Bearing Cover |
| 30. Clutch Gear | 151. Clutch Face Bolt and Nut | 167. Eccentric Shaft Bearing |
| 31. Cover Bearing | 152. Inner Clutch Gear Bearing | 168. Inspection Cover |
| 33-A. Treadle Connecting Link | 154. Clutch Gear Bearing Spacer | 170. Treadle Lever Bracket |
| 33-B. Upper Treadle Lever | 155. Intermediate Shaft Bearings | 171. Treadle Lever Pin |
| | 155. Locknut and Washer | 213. Spacer |

FIG. 19 — SINGLE BRACKET BACK GAGE



- 17. Back Gage Bar
- 18. Single Bracket
- 21. Back Gage Handwheel
- 47. King Pin Bolt and Nut
- 48. Back Gage Brace Rod
- 52. Handwheel Scale
- 53. Bracket Scale
- 56. Handwheel Nut
- 57. Single Bracket Back Gage Adjusting Screw
- * 58. Single Bracket Back Gage Slide
- 84. Handle
- 86. Knob
- 208. Set Screws
- 209. Mounting Screws
- 210. Dowel

* Not Illustrated

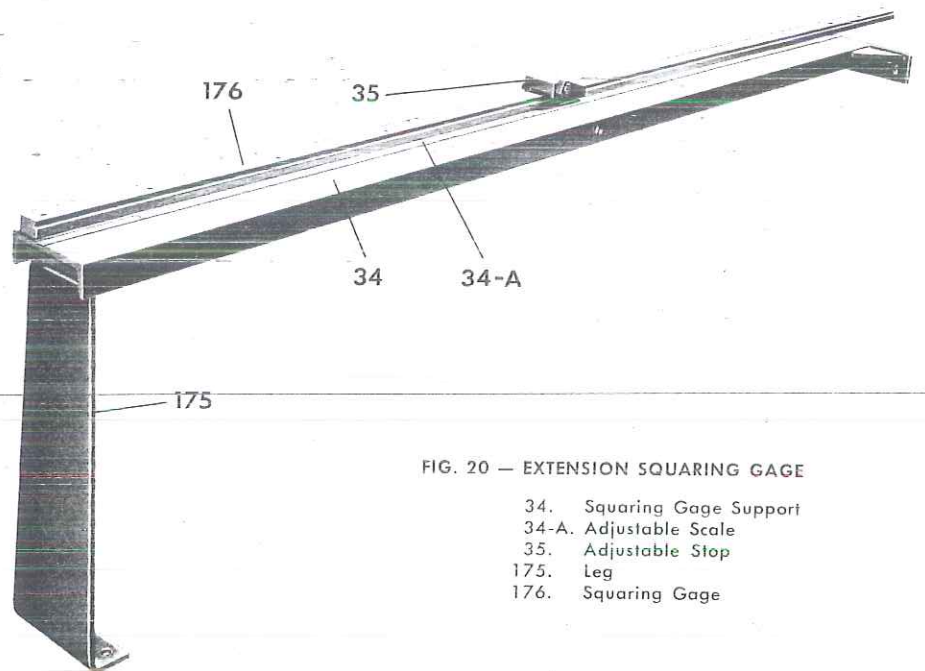


FIG. 20 — EXTENSION SQUARING GAGE

- 34. Squaring Gage Support
- 34-A. Adjustable Scale
- 35. Adjustable Stop
- 175. Leg
- 176. Squaring Gage

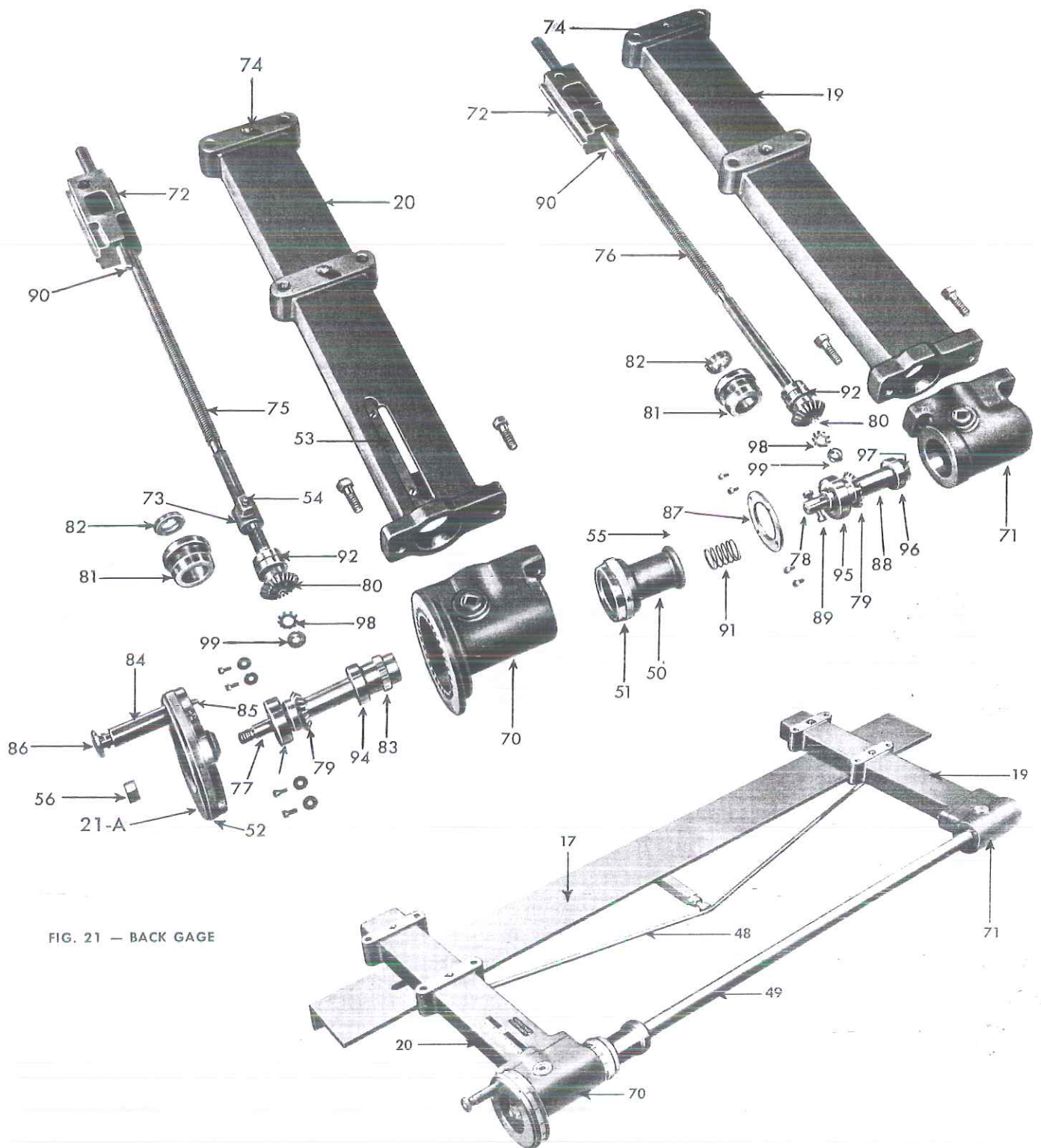


FIG. 21 — BACK GAGE

- | | | |
|-------------------------------------|--------------------------------------|--|
| 17. Back Gage Bar | 71. Left Hand Gear Case | 86. Knob |
| 19. Left Hand Back Gage Bracket | 72. Slides | 87. Ring for Left Hand Gear Case |
| 20. Right Hand Back Gage Bracket | 73. Indicator Nut | 88. Spacing Collar for Left Hand Shaft |
| 21-A. Back Gage Handwheel | 74. Bracket Dowels | 89. Bolt for Connecting Shaft |
| 48. Back Gage Brace Rod | 75. Right Hand Adjusting Screw | 90. Stop Pins |
| 49. Back Gage Squaring Shaft | 76. Left Hand Adjusting Screw | 91. Spring for Coupling Sleeve |
| 50. Back Gage Sleeve | 77. Shaft for Right Hand Gear Case | 92. Double Bearings for Adjusting Screws |
| 51. Locking Sleeve Scale | 78. Shaft for Left Hand Gear Case | 93. R.H. Bearing for R.H. Shaft |
| 52. Handwheel Scale | 79. Bevel Gears for Gear Case | 94. L.H. Bearing for R.H. Shaft |
| 53. Bracket Scale | 80. Bevel Gears for Adjusting Screws | 95. R.H. Bearing for L.H. Shaft |
| 54. Back Gage Adjusting Screw | 81. Retainer Bushings | 96. L.H. Bearing for L.H. Shaft |
| Indicator Nut | 82. Nuts for Retainer Bushings | 97. Nut for Left Hand Shaft |
| 55. Woodruff Key for Locking Sleeve | 83. Coupling Gear | 98. Lockwashers for Adjusting Screws |
| 56. Handwheel Handle | 84. Handle | 99. Locknuts for Adjusting Screws |
| 70. Right Hand Gear Case | 85. Locking Pin | 100. Handle Spring |

* Not Illustrated

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LUBRICATION CHART

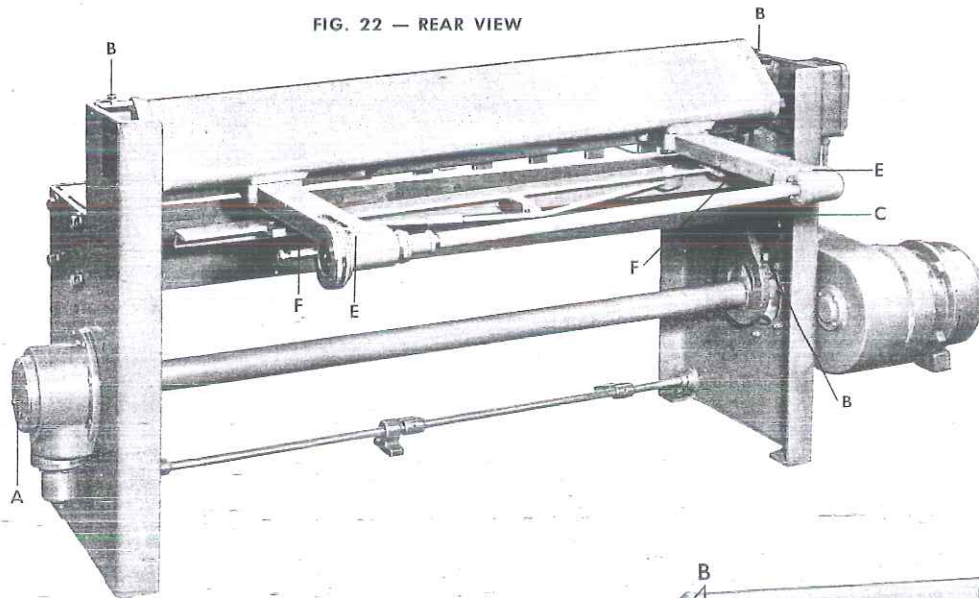
Socony Mobil Oil Company Engineers cooperating with our own staff recommended the following or equivalent lubricants.

Thoroughly oil bearings after each shutdown *before* starting shear and frequently thereafter. Keep bearings and oil clean and free from dirt or grit. The plain bearings of this shear are not designed to accommodate any type of grease. The oil has a special compounding for the purpose and its use is highly advocated. ORDINARY AUTOMOTIVE AND MACHINE OILS ARE NOT CONSIDERED SATISFACTORY.

| MODELS | 12, 13, 14, 15, 16, 18, 110 | 1R4, 1R6, 1R8, 1R10 |
|--------------------------------|-----------------------------|---------------------|
| Gear Box Capacities Gal. | 1½ | 6 Qts. |
| Defent Capacities Gal. | ½ | 3 Pts. |

| POINTS OF LUBRICATION | PARTS | LUBRICANT |
|-----------------------|--|------------------------------|
| A | Gear Box & Detent | Mobil Compound Oil BB |
| B | Gibs, Holddowns, Counterbalance & Eccentric Straps | Mobil Vactra Oil Extra Heavy |
| C | Wrist Pins | Mobilplex EP-1 |
| D | Eccentric Shaft Bearings | Mobilplex EP-1 |
| E | Backgage Gearbox | Mobilplex EP-1 |
| F | Backgage Screws & Slide | Mobilplex EP-1 |
| G | Motor | |

FIG. 22 — REAR VIEW



MODELS 12, 13, 14, 15, 16

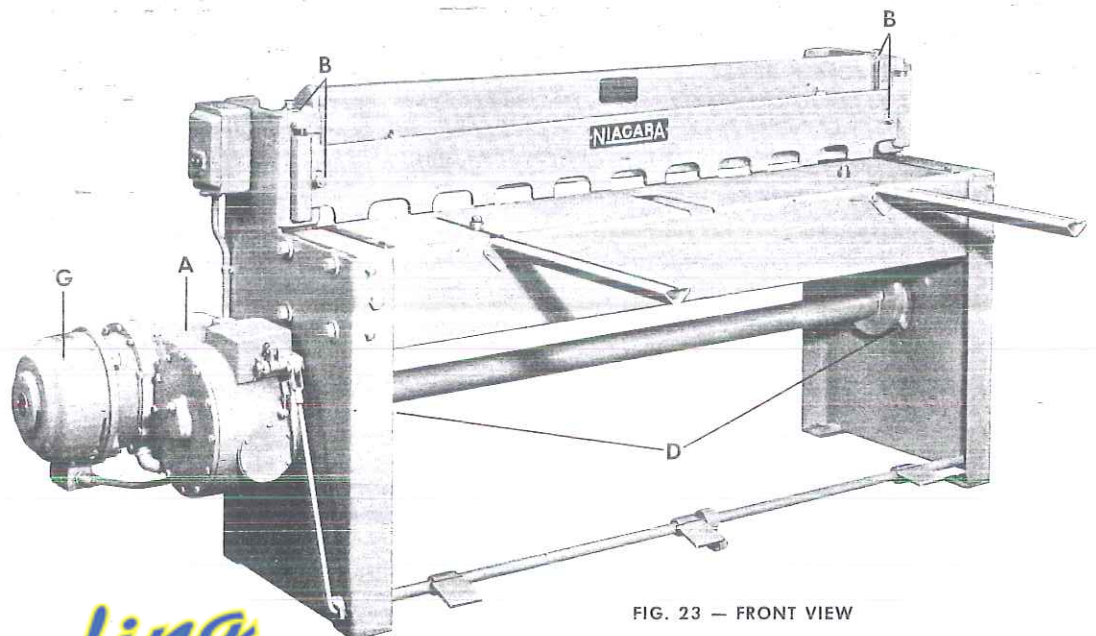


FIG. 23 — FRONT VIEW

POINTS OF LUBRICATION

| METHOD OF APPLYING | REMARKS |
|--|---|
| Fill through plug or cover, top of gear box | Drain and refill after first three months; thereafter, change oil every six months. Maintain oil level. |
| Oil cups or Centralized Pressure Lubrication | Fill oil cups until full before starting shear. After each shutdown, refill cups several times during each shift. Put a few drops of oil on top of each holddown foot. Fill reservoir on automatic lubrication as required. |
| Grease gun | Fill until grease shows on both sides of connection. <i>Keep well lubricated.</i> |
| Grease gun | Fill until grease shows on side of eccentric cam. |
| Fill through plug by spooning | Check every six months. |
| Spread liberally on screws and slideways | Check every three months. |

Follow motor manufacturer's recommendations.

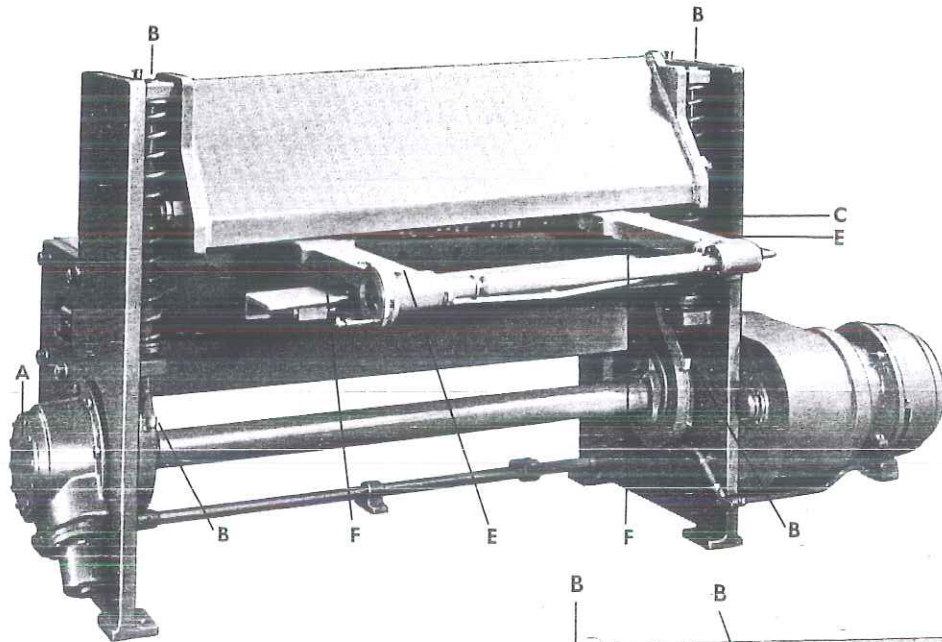


FIG. 24 — REAR VIEW

MODELS 18, 110, 1R4 TO 1R10

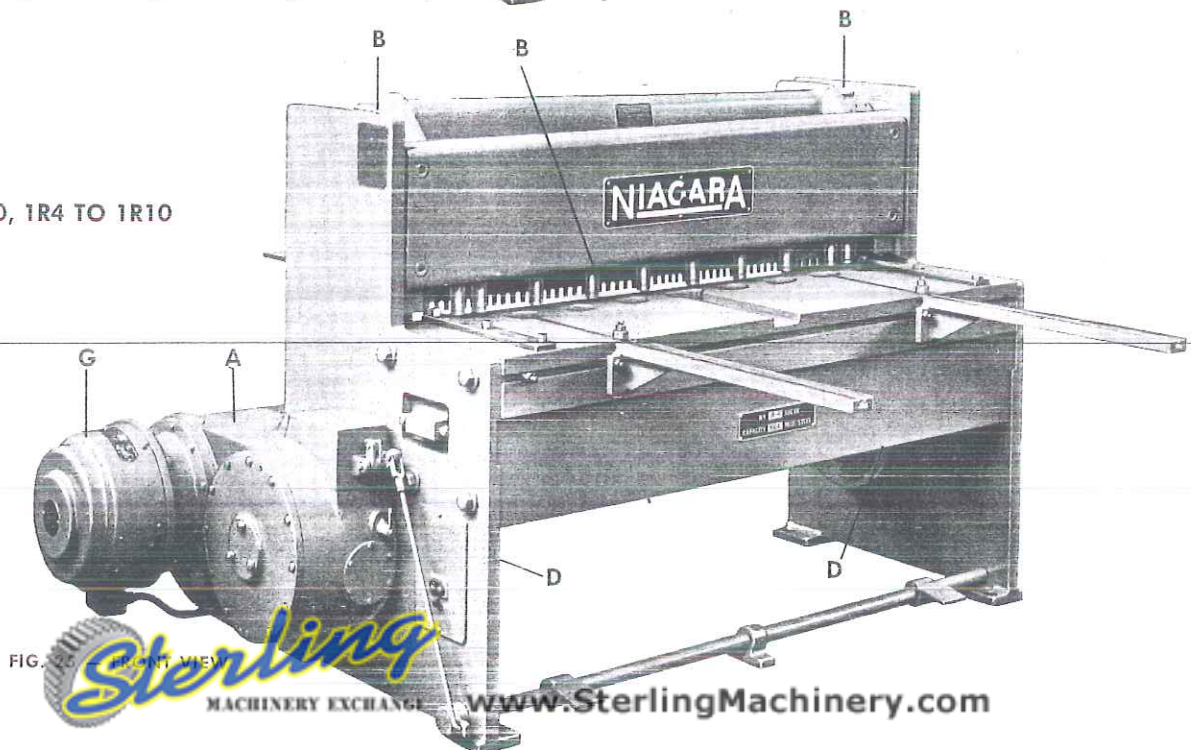


FIG. 25

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