545 DOUBLE END
TENONER MANUAL

GREENLEE

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THE FEED CONTROLS:

Operation of the feed chains are controlled by five push buttons and one selector switch. At the front end of the right hand chain beam there is a group of four control buttons, the feed jog, run selector switch, feed start button, master stop button, and the jog feed stop button..

To start the feed, the operator must turn and leave the selector switch in the run position; then the feed and master stop buttons can be used accordingly. When making machine set-ups its more desirable to use jog feed; in order to do so, the selector switch must be turned to its jog position then the jog feed stop button can be engaged the number of times needed for the machine set up. To further help the operator save set-up time there is a jog feed stop button at the rear of the machine located on the back end of the gear case. Also, in this same location there is another master stop button.

FEED GEAR CASE, FEED MOTOR AND VARIABLE DRIVE:

The feed gear case entirely encloses the gear mechanism which runs in oil. Regular machine oil is used in the back reservoir only and a level to the center of the oil sight glass near the bottom must be maintained. In the front reservoir where the worm and worm wheel are located, only a heavier oil like Mobil Compound EE oil or its equivalent should be used, with the level equal to the plug in the cover.

The feed drive mechanism provides a varaible range of feed speeds to cover practically all operating needs and care should be used to avoid faster feed rates than the cutters can handle to give satisfactory quality of work. The rates are regularly from 17 to 55 feed per minute (see Page 5 Key 5), but for special needs, slower feeds can be had by addition of a larger pulley ring to standard pulley, and faster rates by use of special gearing. The high speed is always about 3¼ times the slow feed rate.

The face of the taper disc pulley must be kept clean and free from grease. Also check daily and shift unit through its entire speed range by turning the hand crank for feed control from the slowest to the fastest feed. See that the vee belt runs level and true. If one side rides high, one disc may be sticking on the splined shaft because of improper lubrication or from the shaft getting gummed up. In such cases, remove the vee belt and clean the disc hubs and splined shaft thoroughly with kerosene until the discs move freely. Then re-lubricate the shaft and put the belt back on, but reverse the belt occasionally so it will run in the opposite direction than before.

Lubricate daily with soft ball bearing grease. The discs are held under spring tension which should be no greater than necessary to avoid belt slippage. The springs are set properly when machine is tested and should not be changed until necessary. The tension should be the same on both sides for proper belt performance.

A safety rattle clutch inside the driven pulley disengages the feed and sounds a warning to the operator when the chains are overloaded. The two springs which regulate the amount of load for the clutch are set at the factory but the tension can be increased or decreased as required. This is done by adjusting the hex jam nut on both springs to obtain the desired spring tension. These nuts should not be turned more than one-half of a turn between trials. Lock nuts hold the setting. Remember to make the same adjustment on both springs so as to maintain uniform tension. On older model machines the safety clutch is inside the gear box; therefore, a small cover on the left side of gear box must be removed before adjustments are made. Adjustment procedure is similar except there is only one spring instead of two.

The feed motor has a built-in disc brake for braking purposes, and requires no attention other than periodic inspection if feeding difficulties are not encountered. This feature provides practically an instant stoppage of the feed chain travel when stop button is engaged or if any motor protective relay opens up. Older model machines have a plugging switch built in the feed motor which served the same purpose. For servicing either style see the brake manufacture 's instructions on page - .

A hand crank can be inserted into the side of the gear case to give hand travel to the feed chains for backup up if necessary. The feed motor must be stopped when this hand feed crank is used, and as the automatic motor brake is then engaged, the two dust seal screws must be removed and studs inside be turned to release brake discs. Then screws must be replaced and brake will return to automatic operation when feed motor is started. On older model machines, the small spring latch on the end of brake housing must be pushed down to release the brake. Caution: Always remove hand crank from pulley shaft before running feed motor again.

CHAINS, TRACKS AND AUTOMATIC OILERS:

There are two types of chains--smooth and corrugated. The former is for the general run of work where dogs are used, and the latter is recommended where stock may at times be run without dogs, such as in sizing large panels with overhanging veneer. When feed chains are assembled on the machine, the front adjustable idlers should be so set that the sagging of chains at the center is about 8" below the chain beam casting directly above it. The travel of the feed chains is started and stopped by convenient push buttons, which also provide for jogging the chains when the 3-position selector switch is set for jogging.

The tracks, chains and sprockets should be cleaned daily (oftener in exceptionally dust operations) of all grit and dirt by blowing out with air. The felt wipers which are mounted below to clean the chain links before they reach the front idler sprockets, should be examined from time to time, and the felts be replaced when necessary. The operator should check, at least once a day, the automatic oilers at the front end of each chain beam to see that they are supplied with oil. Also occasionally remove the bleeder screw to determine the quantity of oil being pumped, and reset the adjusting screw on cover as necessary to secure the proper amount of lubrication and avoid excess oil that would get on the stock. Machine oil should be used for these automatic oilers which are filled to the top of the filler plug.

The right-hand chain on all machines is supplied with an adjusting device, in connection with the rear feed sprocket. This enables the operator to locate this chain ahead or behind the opposite chain, as necessary to position the feed dogs for angle cutting. When setting this device, the four cap screws holding the outer plate of the sprocket housing, must be loosened before the adjustment is made with a crank on the squared end of the worm shaft. When making an adjustment, always back up right hand chain beyond desired setting and then bring it forward to take up slack. These screws must be securely tightened for locking when the desired square or angle setting is obtained.

MAIN DRIVE SHAFT:

The bearings in the chain beams for the main feed shaft should be greased each 40 hours of operation. Feed shaft and keyways should be cleaned daily from accumulated dust. When necessary to remove the main shaft, the side cover plate of the gear case must be taken off to give access to the large nut on the end of the shaft. After this is removed, the key is withdrawn by turning a screw in the 3/8" tapped hole

in the end of the key. Then loosen the set screws on the key for the right-hand adjustable sprocket, and also loosen the cap screws in the cover of this adjustable sprocket housing. After the shaft sleeve bearing at the left end of the machine is loosened by removing the set screw and grease fitting, the shaft can then be moved toward the left enough to take off the large gear and ball bearing in the feed gear case, so that the shaft can then be completely withdrawn at the right end, as is necessary on standard machine. Never open and close movable end of machine while feed shaft is rotating as key way will be abused.

DIAL INDICATORS:

On all cutting units, one turn of handwheels or cranks gives 1/8" movement vertically or horizontally or 1 degree tilting. ~~Collar~~ type scales are calibrated in eight divisions, each equal to 1/64" or about .015", thus permitting fine adjustments to be made. After making final adjustments, the locking screws should be tightened.

The tenon carriages for each headstand are adjusted vertically by two octagon handwheels, ~~and one-eighth turn of a handwheel moves the carriage 1/64"~~. These handwheels will adjust separately for changing position of either unit or can be locked together and moved simultaneously to maintain the tenon thickness while changing its position above the chain level. All newer models have dials graduated in .001" increments to show adjustments of tenon units.

The dial arrangement that indicates the setting of the movable headstand in relation to the fixed headstand, for changes in length of stock handles, consists of one large and one small dial mounted horizontally for visibility. The large dial is marked in both feet and inches for the full range of the machine, and this has a large pointer pivoted at the center and locked with a hand knob. This pointer is moved by hand for a change in length to the marking for distance as indicated on the face of the dial. The pointer is then locked, and motor push button is depressed, which causes the movable headstand to travel to the indicated setting and then automatically stop. The small dial is graduated in 1/64", and this is connected to the large dial and also through spiral gears to the motor shaft, which operates the long adjusting screw for moving the headstand. The handwheel, which is held out of engagement by a spring, is used for the final accurate setting of the small dial and this setting should always be made by turning the handwheel toward the right so as to take up all slack.

The resetting of the dials is made by loosening the knob on the top of the small dial and revolving this dial until the reading on both the large and small dials

exactly corresponds to the distance between the selected cutting units. For the original dial setting, a piece of stock that has been fed through between the cutters should be measured for length and the small dial be set as above outlined to obtain the exact reading.

MAIN BED AND HEADSTANDS:

Heavy sectional steel cover plates enclose the top of the bed to keep it free from dirt and shavings and protect the conduits leading to the magnetic switches that are enclosed in steel cabinet mounted on the end of the bed. These cover plates are held by screws and should be kept tight. A large conduit that carries the wires for the motor units on the movable headstand, rests on top of these covers, and flexes as the column is adjusted on the bed for required settings for length of stock handled. Convenient disconnect boxes are provided for the spliced wires that permit removing any motor unit without disturbing the wires in the large conduits.

Before moving the left-hand sliding headstand, the ways should be inspected and oiled after being wiped free from dirt. The large adjusting screw and nut should also be cleaned and oiled. When adjusting the left-hand column, to secure the desired shoulder distance between tenons, or distance between saws, the operator should first move the unit by power to a point beyond the desired distance and then hand crank it back to the correct position. This takes up any slack in lead screw and the final exact setting is then made by turning the adjusting handwheel to the right until the dials show the exact location required.

HOLD DOWN BEAMS:

The hold-down beams are hinged from a pivot at the outfeed end to enable the operator to swing them out far enough to step onto the bed cover plates and have complete access to the top and bottom tenon heads and scoring saws for knife whetting or any necessary changes. These swinging beams when brought back in place, are supported in a horizontal position by an extension fitting into a machined pocket and the beams are then securely locked with two clamp screws. Be sure this pocket is cleaned before locking the screws.

For the general run of work, the pressure beams should be set so that the rubber blocks compress about 1/16" Page Key 6). More pressure is required for heavy work. This is accomplished by turning handwheel 1/2 turn after setting hold-downs on stock to point where stock can be removed by some effort. The hold-up

shoe unit at the front of each pressure beam is adjustably mounted and provided with spring tension and it acts to hold the stock back against the dogs and avoid any tendency of the rubber blocks to move the stock. This unit should be set about 1/8" below the rubber blocks and its pivotal mounting permits setting to suit flat stock handled singly, or narrow pieces on edge handled in multiples.

The bearings on the front and rear of the beams should be inspected every 40 hours for adequate lubrication. The felts on top of the beam should be removed when they become hard. Pertaining to machines prior to about mid-year 1943, the drip oilers should also be shut off when the machine is idle. Later machines have sight feed oilers that do not require attention other than care should be taken to see that oil shows in the glass at all times. If beams should become lower in front than in back, adjust jib tak-up screws on back of slides. For adjusting procedure see page .

FEED DOGS:

Various patterns of dogs can be supplied, the more common ones are plain, wood-faced dogs and drop dogs. The plain dogs are standard and most generally used and these are squared up at the factory. Each dog is numbered with the corresponding chain link so that when replaced after being taken off, they will be in square relation with their mates on the opposite chain. The dogs are located by an accurately fitted cross slot in the chain link, and each dog is securely held by one screw so it can be easily and quickly taken off and put on. In case of breakage requiring replacement of a dog or if there is wear on the front face of any dog to throw it out of alignment with its mate on the opposite chain, the face of the forward dog should be touched up lightly with a file to put it in square relation. The method of checking is to use a precision square against the or 50 core gauge with the chains set about 12" apart.

The wood-faced dogs are used to back up the stock to prevent its tearing out at the back side. Wooden blocks of proper size are screwed to the front face of these dogs and allowed to pass through the cutter which properly forms it to act as a chipbreaker. These wooden blocks can be renewed to suit different shaping jobs, but they are seldom required except when the shaping cut is made across the grain on the last pass through the machine. Wooden blocks can be replaced with soft aluminum blocks if required.

The drop dogs require specially machined main chain links which are recessed at the sides to keep the dog within the standard chain width yet be so located that any chips fall away to the side and do not interfere with its operation. These dogs are spring operated and can be readily removed so that plain dogs can be used on the same link when desired.

LUMBER AND CORE GAUGE:

A combination core and lumber gauge is standard equipment on all machines and is regularly mounted on the left-hand chain beam. When handling material having overhanging veneers, the blade edge of the guage is set for height to engage the core stock. The angle iron gauge itself can be reversed in position so as to present a wide face as necessary to serve as an ordinary lumber gauge. It is necessary that this gauge be set square with the chain beams so that it stays parallel with the travel of the feed chains. Accurate machining of gauge makes this possible. If core gauge is dropped, it can be thrown out of alignment.

CUT-OFF SAW UNIT

The cut-off saw unit is primarily used for sizing the stock to accurate lengths or width prior to further machining, although special uses, such as grooving, jointing or coping are not uncommon.

MOUNTING OF UNITS:

The saw units are mounted on the unit slides to give a permanent back clearance on the saw blades of .008" to .010" per foot. This back clearance prevents the trailing edge of the saw from dragging, thus giving smoother cuts.

SAW ARBORS AND ROTATION:

The standard arbor size is 1-15/16" and is reduced to 1-1/4" for saw blade mounting, although other diameters for blade mounting can be furnished on order. The arbor rotation in most cases is against the feed. THREADED ARBORS ARE MADE ONLY TO ROTATE IN ONE DIRECTION. IF THE ARBOR ROTATION IS REVERSED, NUTS COULD WORK LOOSE. When it is necessary to change the arbor rotation, special arbors with mounting sleeves should be obtained or the left hand rotating arbor assembly should be put in the right hand unit and vice versa. Saw collars should be pinned when arbor rotation is reversed, or made reversible.

SAW BLADE SIZES:

A 12" diameter saw blade is generally used for stock up to 4-1/2" thick, with standard saw collars. The regular cut-off units will also permit the use of 14" or 16" diameter blades for stock up to 6-1/2" thick, while either the 6" or 9" extended type units will take blades up to 18" diameter although the 6" extended units are preferred as they allow more hold-down ahead of the cut.

STIFFENING COLLARS:

Standard 2-7/16" diameter saw collars are furnished with the machine. Six inch diameter stiffening collars are recommended for use with 12" or 14" diameter hollow-ground blades, carbide-tipped blades or miter saw blades to minimize vibration and saw run-out.

MOUNTING OF SAW BLADES:

1. Saw blades, arbors and collars should be thoroughly cleaned and the arbor holder engaged before positioning the saw blade.

2. The nuts on threaded arbors should not be tightened with force. It is only necessary to snug up the nuts with the arbor wrench, since the arbor rotation will have a tightening effect.

3. Arbor sleeves, when used, should be placed at the ends of the arbors and the brass tipped Allen set screws tightened. The sleeve nuts should be tightened with the spanner wrenches furnished, and excessive tightening is not necessary as threads are furnished so rotation tends to tighten the nuts.

OPERATIONAL SET-UP:

1. Adjustments

   A. Horizontal adjustment of the cut-off saw unit is obtained by using handwheel (See Page 5 Key 1). Six inches of adjustment is possible with the saws adjusting back to trim stock 12 inches longer (6 inches per side) than the maximum rating of the tenon shoulders. This handwheel is rotated clockwise to move the unit in and counterclockwise to move the unit out. Approximate horizontal settings can be made by using the horizontal scale, which indicates the distance from the saw blade to the outside edge of the chain.

B. Vertical adjustment of the cut-off saw unit is obtained by using handwheel (See Page 5 Key 2). Eight-inch vertical adjustment is possible, with the unit adjusting above and below chain level. The handwheel is rotated clockwise to move the unit up and counterclockwise to move the unit down. Locating the saw in the vertical plane is not too critical, since in most cases the unit is used for trimming operations and the vertical setting need only be made by sight.

C. Tilting adjustment is accomplished with handwheel (See Page 5 Key 3). Clockwise rotation of the handwheel moves the motor end of the unit up 45° and counterclockwise rotation moves the motor end down 45°. A protractor scale is provided so that the proper tilt setting can be made. Locking screw is then tightened to hold the setting (Page 5 Key 4).

2. Cutting Position

A. The recommended cutting position is from above the chain, with the saw projecting approximately 1/2" below chain level. Offal, in this case, will not interfere with the motor unit and dust collection is simplified.

B. The saw blades are generally set about 1" away from the feed chain, but this is often dependent on the final shape of the stock. For example, the tenon unit normally should cut about 1/2" away from the feed chain and if the tenon is to be 3/8" long, the cut-off saw unit should be set at 1/2" plus 3/8" or 7/8" away from the chain. Cope unit cutters should be run about 1/8" from the chain to minimize tearout. It can readily be

seen that a cope cut will have a direct bearing on the distance that the cut-off saw blade is placed from the chain.

IN SUMMARY:

THE SHAPE OF THE END PRODUCT AND THE CUTTING UNITS USED TO ACCOMPLISH THE JOB DETERMINE THE FINAL HORIZONTAL PLACEMENT OF THE CUT-OFF SAW BLADE. POSITION THE BLADE AS CLOSE AS POSSIBLE TO THE CHAIN.

TENON UNITS

Tenon units, normally used for cutting tenons, are versatile inasmuch as they can, with special cutterheads, be made to cut a variety of jobs such as special grooving, shaping cuts and dado cuts.

MOUNTING OF UNITS:

A permanent back clearance of about .015" per foot is machined into the tenon slide to prevent the trailing edge of the cutter from back-cutting. In addition, a 1/16" taper per foot is similarly provided in the vertical plane so that a slight undercut is obtained to insure a nice fit on tenon joints.

No vertical taper is applied to the tilting tenon units since they can be vertically tilted; however, the back clearance is maintained.

TENON ARBORS AND ROTATION:

The standard arbor size is 1-15/16" diameter. The arbor rotation is most always against the feed for both the upper and lower horizontal as well as tilting tenon units. However, when shaping cuts are being made or when veneered stock is being dadoed, the arbors are run with the feed.

CUTTERHEAD SIZES:

Standard heads are of an 8" diameter and a 1-3/4" or 3-3/4" width. Two 3-3/4" wide tenon heads can be placed on the tenon arbor to obtain a 7-1/2" wide cut. An 8-1/2" diameter head can be used when tenon motors are a 10 horsepower size.

MOUNTING OF CUTTERHEADS:

1. Cutterheads, arbors and any sleeves or collars should be thoroughly cleaned before positioning.

2. The standard tenon heads have one set screw which clamps a feather key on the arbor, thus insuring a positively locked head.

3. Arbor sleeves, when used with special cutters, should be placed at the ends of the arbor and the brass-tipped Allen set screws tightened. The sleeve nuts should be tightened with the spanner wrench furnished and excessive tightening is not necessary as threads are furnished so rotation tends to tighten the nuts.

OPERATIONAL SET-UP:

1. Adjustments

A. Horizontal adjustment of 7" from the edge of the chain is possible for both the upper and lower tenon units by means of handwheels (Page 5 Key 7 and Key 8). The handwheels are rotated clockwise to move the units in and counterclockwise to move the units out.

B. Vertical upward adjustment of 5-1/2" for the top tenon units and 4-1/2" for the lower tenon unit is possible by means of handwheels (Page 5 Key 9 and Key 10). The scales for the vertical adjustment indicate the distance that the outside diameter of the cutterheads are away from the top of the chain level. When locking screw (Key 11) is tightened, both handwheels (Key 9 and Key 10) are locked permitting simultaneous vertical adjustment of both units. This is done so that the units can be vertically adjusted without disturbing the relationship between the tenon heads.

C. The tilting tenon carriages in addition to the above adjustments can be tilted 8 degrees with the motor ends down and 22-1/2 degrees with the motor ends up. The tilt is accomplished by a rack segment and pinion and is adjusted by means of a removable crank. A protractor scale is provided so that the proper tilt can be made.

2. Cutting Position

A. The vertical placement of tenon cutters is naturally dependent on the depth of tenon cut desired.

B. The minimum distance between the right and left hand tenon shoulders is 5". However, if definitely required, the machine can be arranged to have 4-1/2" or even 4" between tenon shoulders. Tenon cutters should normally cut about 1/2" away from the feed chain. In many cases the placement of the tenon units determines the final placement of other units. (See operational set-up of Cut-off Saw)

C. When tilted 22-1/2 degrees, an 8" head on a 5 or 7-1/2 horsepower carriage will clear 4" above chain level; and an 8-1/2" head with 10 horsepower carriage will clear 3-1/4". Slightly increased tilting is possible on thin stock, but would involve modifications. Overhang of stock on the feed chain in this case is dependent on the amount of tilt required for the job and should be kept to a minimum.

COPE UNIT

Use:

Standard bottom tilting cope units are primarily used for shaping or forming the ends of work, although they are frequently used for jointing. It is also not uncommon to use them for finger jointing and slotting.

Mounting of Units:

The cope units, unlike the horizontal cut-off saw or tenon units, are mounted in an upright vertical position. They are set parallel to the columns and perpendicular to the feed chains.

Cope Arbors and Rotation:

The standard cope arbor size is 2" and is reduced to 1-1/4" for head mounting. Five inches of space is provided underneath the nut. With each arbor there are varying thickness filling collars so other size heads can be run. Arbor rotation is regularly against the feed, but if arbor rotation is reversed, split or double nuts will be required so cutterheads will not work loose.

Cutterhead Size:

Our standard shaper collar type heads are of a 9" diameter and can be furnished to accommodate 1-1/2" or 2" wide knives.

Mounting of Cutterheads:

1. Cutterheads, arbors and spacing collars should be thoroughly cleaned and the arbor holder engaged before positioning the cutterhead.
2. The nuts on the arbors should not be tightened with force. It is only necessary to snug up the nuts with the arbor wrench, since the arbor rotation will have a tightening effect.

Operational Set-up:

1. Adjustments

   A. Horizontal adjustment of the cope unit is obtained by using handwheel. (See Page 5 Key 15) Eight inches of horizontal adjustment from the edge of the chain is possible by use of this handwheel. The handwheel is rotated clockwise to move the unit in and counterclockwise to move the unit out. A locking screw is provided to hold the setting.

   B. Vertical adjustment of the cope unit is obtained by using handwheel. (See Page 5 Key 16) Seven and three-quarters inch vertical adjustment is possible, with the unit adjusting five inches below and two and three-quarters inches above chains with shoulder of arbor. The handwheel is rotated clockwise to move the unit up and counterclockwise to move the unit down.

   C. Tilting is accomplished by rack segment and pinion and the adjustment by means of a removable ratchet wrench located near the top of the motor housing. These units can be tilted 45° motor end away from chain beam and 15° motor end toward beams. A protractor scale is provided so the desired tilt setting can be made. To hold the setting, a tee wrench type locking screw is located at the very bottom of each unit.

2. Cutting Position

   A. To insure good cope cuts and minimize tearout, the cope heads should be run close as possible to feed chains, preferably 1/8" from chain. The cope heads are usually

the key in setting the preceding cutting units such as the tenons and saws.

RELISHING ATTACHMENT

Use:

Relishing attachments are primarily used to clip off the ends of tenons at two or all four corners. Sometimes they are used for producing blind dado grooves on ends of work.

Mounting of Units:

In order to mount the relishing attachment on top of the cope carriage the cope hood bracket must be removed. The unit takes its drive from the cope spindle through which it passes and to which it is locked with the regular cope spindle nut. Be sure to clean bottom of the relishing attachment and the top of the cover before mounting.

Arbor and Rotation:

The standard arbor size is 5/8" diameter. It is ground to the exact size with a possible maximum variation of .0005" undersize. There is a 1-1/4" space under the nut. Furnished with each arbor is an assortment of spacing collars so as to allow cutters to be positioned at varying heights depending upon the work. Arbor rotation is against the feed.

Cutterhead Size:

The standard relishing cutter is 6" diameter, 10 tooth, 1/2" wide, common tooth groover. Other diameter and width cutters can be furnished when required.

Mounting of Cutterheads:

Same as for cope heads. Please refer to Page

Operational Set-up:

Horizontal and vertical adjustments same as copes. Refer to Page

Cutting Position:

Positioning of the relishing cutters is directly dependent upon the tenons.

SCORING SAW UNIT

USE:

Scoring saw units are primarily used for scoring veneers prior to tenoning to eliminate the possibility of the tenon heads tearing the work. They are also used for light grooving, rabbeting and for making shoulder cuts on solid stock to minimize tear-out prior to further machining.

MOUNTING OF UNITS:

The tenon unit slides are machined with a permanent back clearance of about .005" per 8" diameter scoring saw blade and when the scoring units are mounted on the tenon motors, the trailing edge of the scoring saw blade will not bind in the cut, thus producing a smooth cut. In addition, a 1/16" taper per foot is similarly provided in the vertical plane, so that a slight undercut is obtained when cutting shoulders.

Only a permanent back clearance is provided on the independently mounted tilting or horizontal scoring saw units.

SAW ARBOR AND ROTATION:

The standard arbor size is 1-7/16" diameter. Arbor rotation for both the upper and lower scoring saw unit is in most cases with the feed, thus insuring a minimum amount of tear-out.

Arbors should be run against the feed when using the units for special grooving purposes. A reversing switch can be furnished, if ordered, to reverse arbor rotation.

SAW BLADE SIZE:

An 8" diameter, 16 gauge, 3-1/4" bore scoring saw blade with about 100 teeth is generally recommended for this operation. Since they are always sleeve mounted, they have a 3-1/4" bore which is the nominal size of the sleeves.

MOUNTING OF SAW BLADES:

1. Saw blades, arbors and sleeves should be thoroughly cleaned before positioning the saw blade.
2. Arbor sleeves should be placed at the ends of the arbors and the brass-tipped Allen set screws tightened. The sleeve nuts should be tightened with spanner wrenches furnished, and excessive tightening is not necessary as threads are furnished so rotation tends to tighten the nuts, if properly positioned.

OPERATIONAL SET-UP:

1. Adjustments

A. Horizontal adjustment of the scoring saw units can be accomplished by the use of the tenon units horizontal adjusting screws marked Key 7 & 8 so that the scoring saw blades will maintain their horizontal relationship with the tenon heads. Seven inches of horizontal adjustment from the edge of the chain is possible by use of this handwheel. The scoring saw units also have independent horizontal adjustment of 5" (See handwheels Key 12). In either case the handwheels are rotated clockwise to move the unit in and counter-clockwise to move the unit out. Approximate horizontal settings are made by scaling the distance from the edge of the chain to the end of the saw blade.

B. Vertical adjustment of the scoring saw units can be accomplished by using the tenon units vertical adjusting screws marked Key 9 and 10, Page , so that the scoring saw blades will maintain their vertical relationship with the tenon heads. When locking screw(Page 5) is tightened, both handwheels (Key 9 and 10) are locked permitting simultaneous vertical adjustment of both the upper and lower scoring saw units. Releasing locking screw allows the carriages to be adjusted independently. Handwheel 9 is used for adjusting the upper tenon carriage and handwheel 10 is for the lower tenon carriage. The handwheels are rotated clockwise to move the units up and counterclockwise to move the units down. The scales for the tenon carriage's vertical adjustment indicate the distance that the 8" outside diameter of the cutterheads is away from the top of the chain level. There is about 5-1/2" of upward vertical adjustment on the top tenon units and 4-1/2" upward vertical adjustment on the lower tenon units.

In addition to the vertical adjustment of the scoring saw units by means of the tenon adjusting screws, independent vertical adjustment of 1-1/2" is also possible (See handwheels Key 13). Handwheels are rotated in the same direction as the tenon unit adjusting screws to obtain the desired movement.

C. The standard scoring units when mounted on the standard tilting tenon carriages can be tilted 8° with the motor ends down and $22\text{-}1/2^{\circ}$ with the motor ends up. The tilt in this case is accomplished by a rack segment and pinion and pinion and is adjusted by means of a removable crank. A protractor scale is provided so that the proper tilt can be made.

2. Cutting Position

A. The scoring saw blades are generally set to cut through the thickness of face veneers in plywood or about 1/8" deep. When scoring solid stock the maximum depth of cut that should be made is about 3/8", depending on HP.

B. The horizontal placement of the scoring saw blades is dictated by the nature of the work and the cutters that will be used to perform the succeeding cuts. For example, when tenon heads are cutting about 1/2" away from the chain edge, the scoring saw blades will also be placed at this distance to cut the shoulder.

DADO UNIT

USE:

The dado unit is primarily used for performing single and multiple, straight and blind dado groove cuts. In addition, the dado attachment can be used for certain shaping operation, single or multiple splitting of panels as well as actual trimming operations.

MOUNTING OF UNITS:

No back clearance is provided on the dado arbor, since the variation in taper on the extremities of the arbor would be too great and therefore the width of grooves along the length of the arbor would vary. Back cutting or binding of the blade is eliminated when using the unit for splitting by means of a splitter mounted on the lower stock support which parts the stock after it has been cut.

Where dado cuts are made in long stock, an overhead support with steady bearing for the dado arbor is needed and for extreme requirements, two supports and two steady bearings can be obtained. Where a long dado arbor is used and it is necessary to operate the machine with the chain beams close together, the overhead tubing that carries the center bearing can be moved in the opposite direction to support the outer end of the arbor and prevent it from whipping.

DADO ARBORS:

The standard dado arbor diameter is 2-3/16" and should be the minimum length possible for work to be handled. Arbors are available for the full length capacity of the machine or any special intermediate length.

All arbors are ground to their nominal size of 2-3/16" and the maximum variation allowed is .0015" undersize. These arbors are never oversize, thus permitting fine fits between the arbor and sleeves.

Dado head sleeves, when furnished, are regularly 3-1/4" outside diameter and are never oversize. The maximum variation allowed in grinding is 0005" to .001" undersize and for best results, cutters should be ordered to the exact bore with an allowance of perhaps .0005" to .0008" oversize.

ROTATION OF ARBORS:

The arbor rotation is generally run with the feed particularly when dadoing veneered stock or when using a lathe-type head for performing certain shaping operations. However, when running solid lumber the arbor rotation is against the feed.

CUTTERHEAD SIZES:

Twelve-inch diameter heads are usual and will cut 1-1/2" deep with standard rubber-block type hold-downs; however, an 18" diameter cutter can be used and will clear the work.

MOUNTING OF CUTTERHEADS:

1. Standard mounting sleeve and arbor
   - A. Cutterheads, arbor, sleeves and collars should be thoroughly cleaned before positioning.
   - B. Coupling on dado arbor shaft should be loosened and the dado arbor partially removed to permit passage of mounting sleeves with cutters on the arbor.
   - C. The arbor coupling should then be securely fastened and after cutters are properly located in the horizontal plane, the brass-tipped Allen set screws should be tightened in position.
2. Split-type mounting sleeve
   - A. The dado shaft need not be removed for mounting the split-type mounting sleeves and cutters.

B. The split cutterhead is first mounted and aligned on the split sleeves and bolted securely. After positioning this assembly on the arbor, the clamping screws are fastened and the brass-tipped Allen set screws tightened in place.

OPERATIONAL SET-UP:

1. Stationary Dado Unit

A. Adjustments

a. Vertical adjustment of 4" is possible and is accomplished by rotating handwheel labeled 14. Clockwise rotation of the handwheel produces upward movement and counterclockwise rotation produces downward movement of the dado unit. A scale is provided that indicates the distance that the bottom of a saw blade is above the feed chain level. The final vertical setting can then be made since the adjusting screws are such that one revolution of the handwheel is equal to 1/8". A calibrated collar is furnished to aid the operator in adjusting the unit to within .015" of the desired cut.

b. Horizontal placement of the cutters is easily accomplished by loosening the set screws on the collars and sliding the cutting units to the desired position on the dado arbor.

B. Cutting Position

a. The nature of the stock to be run naturally determines the final location of the dado cutters along the length of the shaft. However, when intermediate hold-downs are used as when grooving or splitting long stock the intermediate hold-downs should be positioned as close as possible to the cutters.

b. When grooves are to be cut close to the ends of the stock, such as when rabbeting or trimming, cutters can be placed between the pressure beams and their supporting brackets so as to make cuts on the outside edge of the feed chain.

c. Minimum centers between cutters are controlled by the length of the arbor sleeves. A minimum 4" center distance is available when using our standard sleeves. However, if RH and LH sleeves are purchased, the distance between cutters can be reduced to 5/8", or the thickness of the sleeve flanges. Spacers are used on sleeves to obtain close centers between cutters when necessary.

C. Feed Rates

With the number and variety of widths and depths of cuts that can be performed on the dado attachment unit plus the variations in motor horsepower sizes, it is difficult to apply any definite rule of thumb to determine the feed rates that should be used when considering the dado unit. Given a set of conditions, it is more a matter of starting with the lowest feed rate and gradually increasing it until an optimum operating range is reached, consistent with satisfactory cuts.

2. Jump Dado Unit

A. Adjustments:

a. (See section on adjustment of stationary dado unit.)

B. Cam Setting

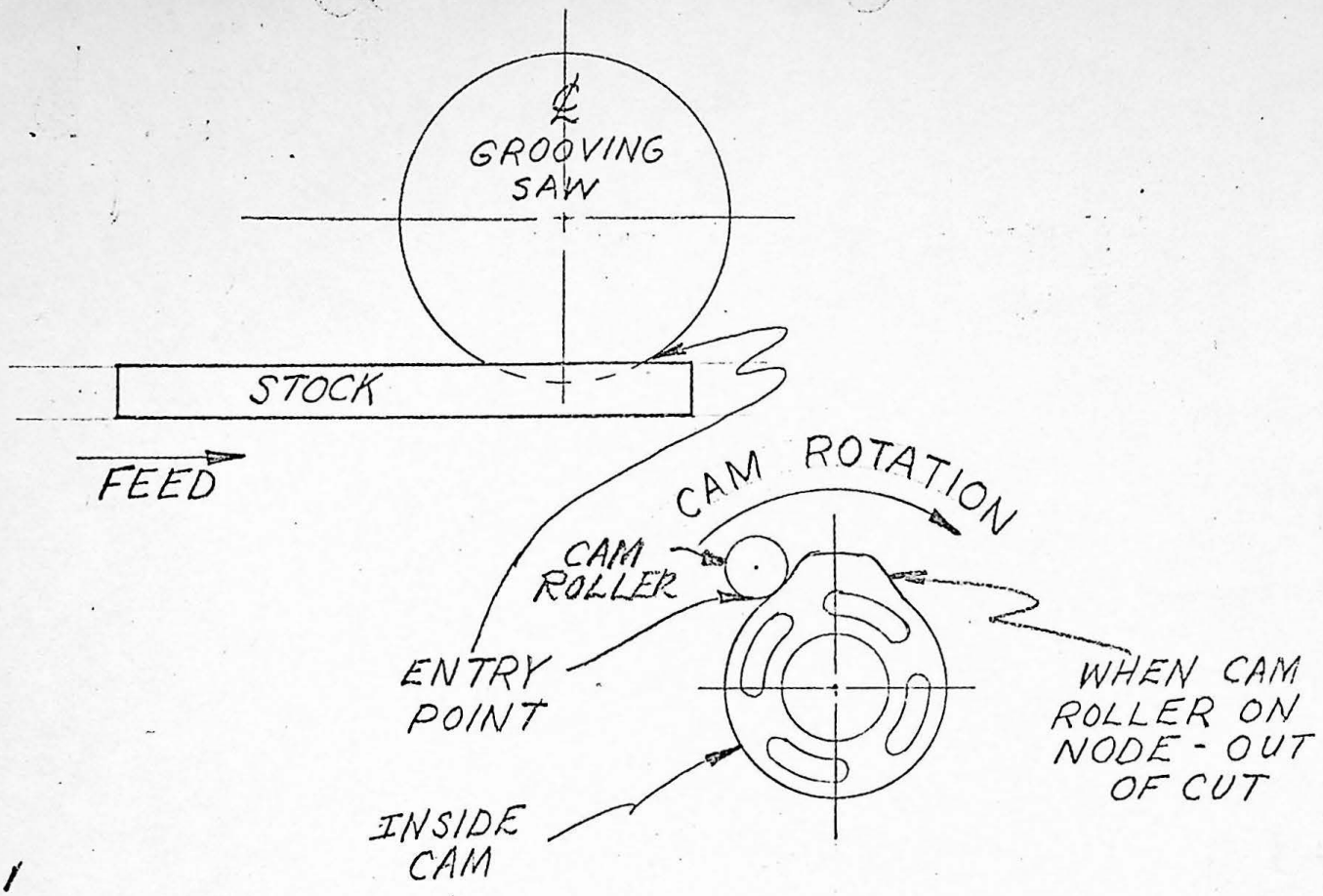
a. The jump feature of the dado attachment can be disengaged to permit straight-through dado cuts same as with the stationary dado unit. This is accomplished by moving the

cam roller out of the cam path by adjusting the screw located on the gear case housing.

b. The jump dado cams, driven by the feed drive shaft, are designed so that they permit a 3/4" jump for every 16" or 32" of chain travel. The standard cams are made in two sections, each having one node, and when these are in line the jump action occurs every 32" of chain travel. The cam sections can be adjusted with reference to each other and when the nodes are opposite, the jump is every 16". Special cams can be obtained to suit unusual requirements and for short odd jobs, wooden cams can be made for temporary use.

c. For intermediate settings, that is, setting of special cams for cutting special length blind grooves, the set-up procedure is as follows:

1. Mark stock for length of cut.
2. Raise dado attachment above chain level so cutters will not interfere with stock passage.
3. Run stock through the machine, jogging it up to the dado cutter position and stop the feed.
4. Lower the rotating cutterheads to the specified depth (using dado scale) at the desired entry position in the stock and set the inside cam so that the cam roller is entering the cut. (See Fig.1) The set screw on the graduated cam ring is loosened and the ring rotated until the zero point is opposite the node on the inside cam.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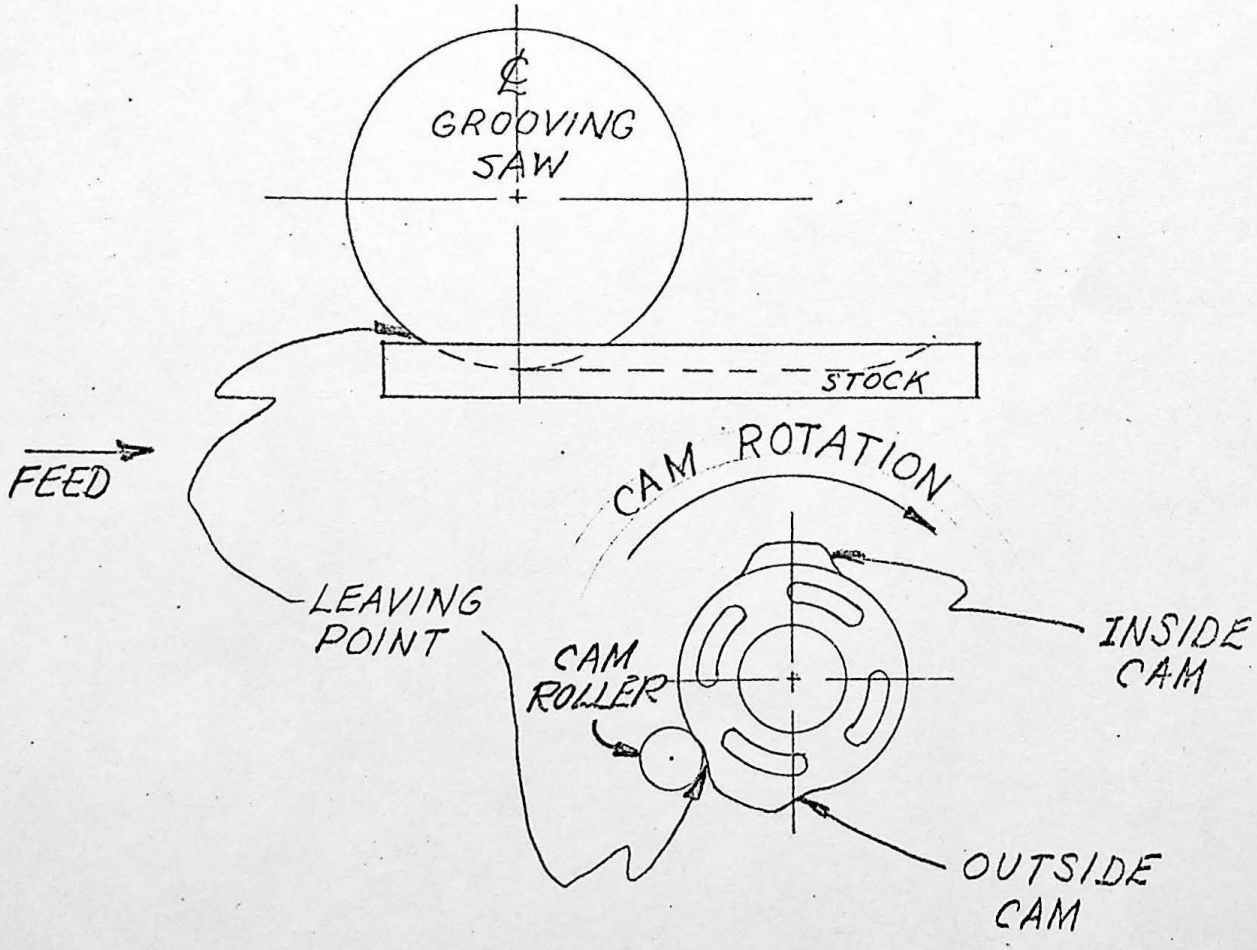
GROOVING
SAW
STOCK
FEED
CAM ROTATION
CAM
ROLLER
ENTRY
POINT
INSIDE
CAM
WHEN CAM
ROLLER ON
NODE - OUT
OF CUT

Fig. 1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GROOVING
SAW
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CAM ROTATION
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CAM

Fig. 2

5. Continue jogging the stock through the machine until the cutters reach the leaving point and stop the feed. It is then a matter of setting the outside cam until the cam roller is at the leaving point. SEE FIGURE 2

6. If the desired length of cut is obtained, but is not in the proper location in relation to the stock, measure the distance that the cut is mislocated and revolve both the inside and outside cam simultaneously to that distance. If the distance was 3/8", the cams need only to be rotated to 3/8" since the cam ring has already been zeroed in to the marking on the cam node.

   Rotating the cams clockwise any given distance will shift the cut toward the outfeed end of the machine, and rotating it counterclockwise will shift the cut toward the infeed end of the machine.

7. Once a setup has been made, the cams should be marked off for proper position, in the event that the setup will be re-used. Four graduations are provided on each cam for this purpose.

C. Cutting Position

   a. (See cutting position section of stationary dado unit.)

D. Feed Rates

With the number and variety of widths and depths of cuts that can be performed on the dado attachment unit plus the variations in horsepower sizes, it is difficult to apply any definite rule of thumb to determine the feed rates that should be used when considering the jump dado unit.

However, in most cases, the maximum feed rates should not exceed 35 to 40 feet per minute for best performance.

ELECTRICALS

Control Cabinet

The control cabinet is assembled complete with magnetic switches and thermal relays for the interlocked wiring to the various units. The bus bar is stamped to show which unit each switch controls. The failure of any motor cuts off all of the current and stops all of the motors and an examination of the switches will show which relay has opened up. The cabinet is arranged to take in the three wires from the supply line, but it is recommended that a disconnect line switch be located close to the machine so that the power can be cut off there when any electrical work is being done on the machine, or when the regular operator is away from the machine so as to prevent others from starting it.

Master Stops

A master stop station is fitted in the push button panel and also at the rear of the machine convenient to the off-bearer. Another stop device is applied to the front of the top pressure beam in connection with an adjustable latch which can be set for the thickness of stock handled and thus avoid jams from misplaced or oversize material. This device has a master lock lever which engages the stop button and prevents the accidental starting up of any cutting unit.

Electric Brake

Keep the brake in good adjustment so as to eliminate any excessive coasting of the feed chains. On the inside of the brake cover there are detailed instructions indicating the proper procedures for adjustment.

USE OF KNIFE SETTING STAND

Two arbor sizes, one of a 1-15/16" dia. arbor and one of a 1-1/4" dia. are provided for setting knives for the tenon heads and cope heads respectively on our standard knife setting stand. Other diameters can be obtained to suit special cutterhead bores.

Tenon Knife Setting:

All tenon knives are set at the factory so that the cutting circle is actually cone-shaped. For best results when setting the head at a future date, an aligning block should be cut upon receipt of the machine from our factory. The cut obtained on the aligning block will insure that the knives are set correctly when resetting them becomes a necessity.

The following procedure is used for setting knives on the tenon heads:

1. Before grinding knives, place tenon head on knife setting stand arbor to set aligning block in proper relationship to tenon head. Clamp aligning block in clamp bracket and adjust slide so that top of block is even with cutting circle.
2. After grinding knives to form of template furnished, place knives on tenon heads and fasten screws so that knives are clamped but can be shifted. Place head on arbor with spurs toward outside of stand.
3. Rotate head past aligning block and adjust knives to suit. Tighten knife screws as follows:

   Heads with 1/2" bolts to max. 175 ft./lbs. tightness

   Heads with 5/8" bolts to max. 200 to 250 ft./lbs. tightness

When using two 3-3/4" wide tenon heads in tandem to form a 7-1/2" long tenon or rabbet cut, the following procedure is ued for setting the knives:

1. Clamp special furnished tapered aligning block in clamping bracket and adjust slide so that top of block is 4" away from center line of arbor.
2. Place spacer provided on arbor.
3. Place knives on tenon head and fasten screws so that knives are clamped but can be shifted. Place outside tenon head on arbor with spurs toward outside of stand.
4. Rotate head past aligning block and adjust knives to suit. Tighten knife screws as previously noted above.
5. Remove outside head and spacer from arbor. Place inside tenon head against finished surface on stand and set knives as above.

Cope Knife Setting:

Setting of knives in the shaper collar type heads is very similar to setting of tenon knives with the exception that cope knives are generally contoured and must be set to a contoured block for alignment.

On each new pattern to be employed the contoured block must be cut before the knives could be set. In this case, one knife is placed in the shaper collar type head and a piece of stock is cut to the desired shape. The knife should be set so its lowest point on the contoured shape projects about 1/8" beyond the collar diameter. This aligning block can now be used for knife setting.

The following procedure is used for setting knives in cope heads:

1. Select the right dovetail slots since there are two sets furnished in the shaper collars to accommodate both shaper steel and milled-to-pattern bits. The slots around the edge of the collars are for milled-to-pattern bits while the slots around the bore are for ground-to-pattern bits.
2. Insert the bits and screws in the collars. Only three screws should be used, each one being adjacent to each bit. Snug the screws tight enough to hold the bits from falling out.
3. Place cope head on arbor. Rotate it past aligning block and adjust the bits to suit the contoured shape.

RECOMMENDED PROCEDURE FOR TROUBLE SHOOTING OUT-OF-SQUARE CONDITION ON A GREENLEE #545 DOUBLE-END CUT-OFF SAW AND A GREENLEE #545 DOUBLE-END TENONER

The procedure described below starting with the third statement is the method used to initially align a machine. If it is apparent that major checking is in order, the steps as outlined below should be followed. On the other hand, if there is no drastic misalignment problem, it is suggested that Step Numbers 1, 2, 6, 7 and 10 be followed before any attempt is made to follow through on the major check points.

1. Make sure that all chains and sprockets are clean and free from any accumulated refuse. At the same time check to see that the tracks and chains are not excessively worn or scored. If they are, replacement is necessary.

2. All cutting units should be checked to see that they are not loose in the slides and that pivot screws are snug. If units are loose in slide parts, check tightness of gibs by procedure described in Step #3.

3. Check gibs on sliding base to see that they are tight, by the following procedure:

   a. Loosen the five 1/2" gib take-up screws

   b. Remove take-up gib and clean. Check take-up gib for possible scoring and flatness. Flatness can be checked by placing the gib on a known truly flat surface and running feeler gauges between the gib and the flat surface. A slight amount of grinding or hand scraping of the gib might be necessary to insure flatness.

c. Replace gibs and tighten take-up gib screws using wrench. Then loosen same screws and tighten with fingers for proper adjustment. Tighten lock nuts on gib take-up screws.

4. Check to be sure that the base of the machine is level and not twisted. (Regardless of the machine having been originally installed correctly, some misalignment may later occur over a period of time, particularly when the machine is located on something other than a concrete bed.) Place a true spirits level, graduated in thousandths, lengthwise on the base ways and if required, level the base by adjusting leveling screws at the necessary positions. Place the level lengthwise across the front and rear base ways to level the machine widthwise. The base should be flat to within .002".

If difficult to level because of wooden floor, thick steel strips should be placed under the leveling plates on each side, extending the full length of the machine base. Special bracing may be required under some floors.

After leveling, the sliding base should be moved to various positions and the levelness of the machine rechecked at these positions. If the base is not level at any one position, it is a good indication that the floor is sagging.

5. Check for worn link pins. If specific pair of dogs does not repeat; that is, if a pair of dogs is square once, but out of square on subsequent revolutions of the chain, it indicates that chain link pins are worn. This usually requires replacement of chains.

6. Close the machine down to about 12" and check one pair of dogs with a precision steel square. This should be done with stock in machine so there is pressure on chain. (One leg of the square against the stock

fence and the other leg against the pair of dogs.) Continue to check all the dogs on the machine in this manner. Each pair of dogs should be the same as every other pair. When new dogs have been purchased, a pair may not line up properly to each other. If this is the case, hand file to make corrections. Further checking of the dogs can be done by running short stock through the machine and trimming the ends. The stock should be numbered to correspond to a pair of dogs. Check the stock for squareness and file the face of the dogs that do not line up.

7. If, after checking the dog lineup with a precision square, it was found that none of the dogs line up with each other by the same amount of offset and the same relationship, this may be due to a worn keyway in the feed shaft or an entire chain has gone out of alignment. To check for a worn keyway, move the movable headstand to various positions on the base and check dog alignment at these positions. If all dogs are in alignment when the sliding base is in certain positions and not in others, this is a good indication that the keyway is worn. This can be corrected by rotating the drive shaft 180° and utilizing this keyway for driving. If the shaft does not have a keyway at this position, as is the case on some older machines, or this keyway is also worn, re-cutting of the keyway may be a necessity.

If the feed shaft keyway being used is found in good condition and total misalignment of the dogs is still apparent, the chain staggering device should be adjusted to make the correction. To adjust the staggering device, first loosen the four hex head screws found on the cover. Use crank square furnished to make the adjustment. One full revolution of the device moves the R.H. chain 1/2". The dial is graduated in 40 divisions and therefore corrections can be made to within .0125".

When advancing the chain forward, the staggering device is merely rotated to the right. However, if the chain is to be retarded, the staggering device should first be retarded beyond the required amount to take the backlash out of the gearing and then finally positioned. Broken castings or worn worm and worm gear will also allow R.H. chain to fluctuate.

8. The left hand chain beam should now be checked for straightness. This can be done by placing two pieces of key stock of the same thickness, one at each end of the chain beam on the finished surface found immediately beneath the track or remove the track and use vertical finished surface. Then a piece of string is placed on the key stock and drawn taut. Another piece of key stock is then inserted between the string and the finish at various points to check for any misalignment. Any corrections are then made by adjusting the tie rod on the infeed end of the machine.

The right hand chain beam must now be aligned to be perfectly parallel with the left hand chain beam. The base of a precision dial indicator is slid across the finish on the left hand chain beam which has been corrected, with the spindle of the indicator riding the same finish on the right hand beam. Any apparent variation must be corrected by adjusting the tie rod at the infeed end of the machine.

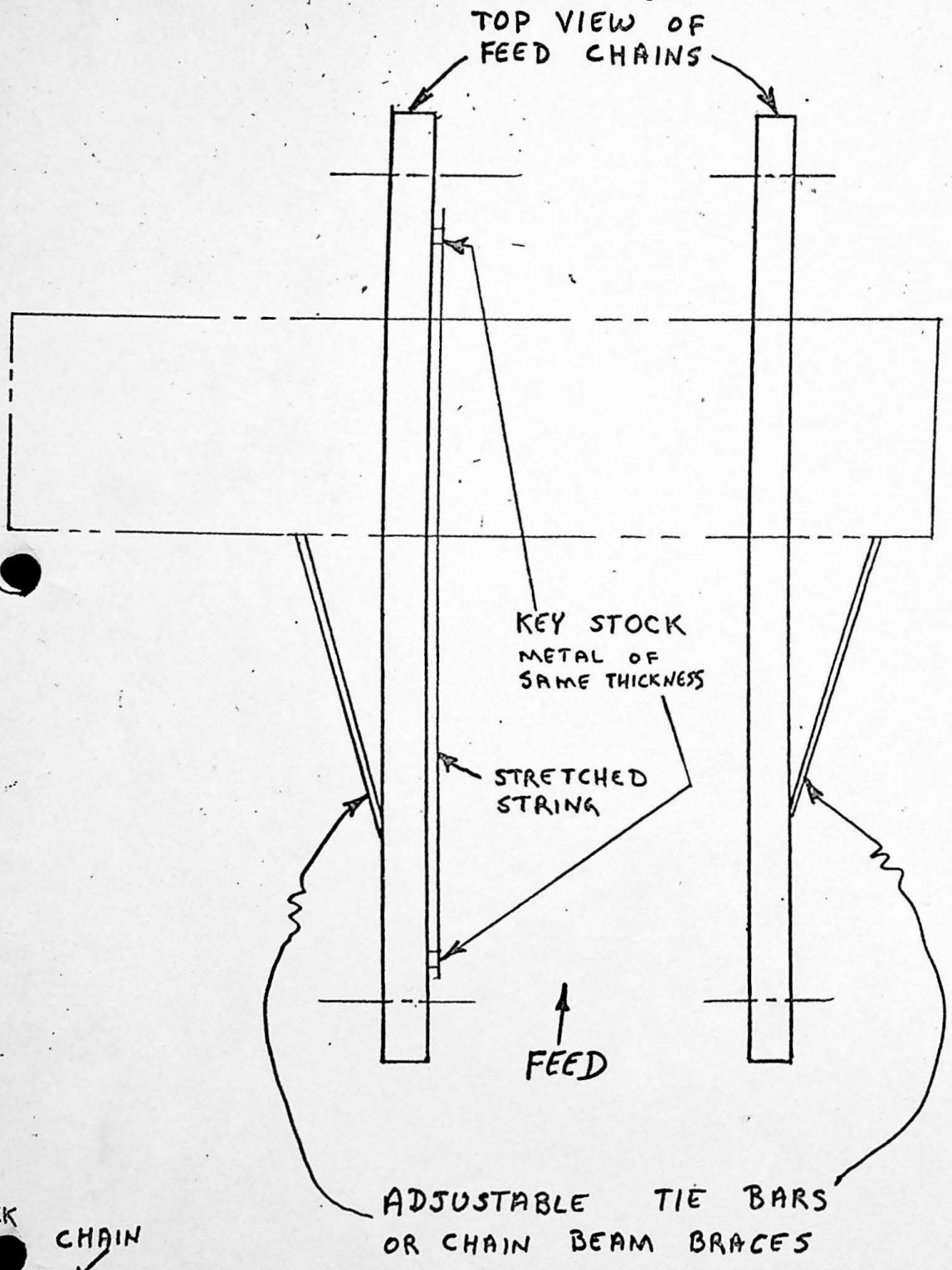
9. Check holddown beams for alignment with lower chain beams. On a #545 Double-End Tenoner, clean any dirt accumulation that may be found at the clamping bracket used for holding the front end of the pivoting holddown beam, as this condition could cause misalignment.

On both #542 and #545 Machines, the gibs on holddown adjusting slides should be tightened to take up any apparent looseness, as done in Step #3. Next remove the inside brass guide strips on the holddown beams so that their alignment could be checked with the chain beams.

The base of a precision dial indicator is placed on one of the finished chain beam surfaces that has been corrected for alignment. As the dial indicator base is slid along this surface, the indicator spindle rides the finish on the holddown beam to check for any inaccuracies. If a point is found that indicates that the beam is bent, peen the holddown beams on an unmachined surface at this area on the concave side of the bend, stopping at intervals to check straightness. The small end of a ball peen hammer or a hammer and a round-nose chisel can be used for striking the surface.

10. With a precision dial indicator, check the parallelism of the stock fence against the finish on the chain beam. Replacement of the fence will be necessary if it is bent, as it is very difficult to straighten. At no time should front end of fence be closer to chain than rear end.

CHART FOR REALIGNING CHAIN BEAMS



ROSS SECTION OF
HAIN AND TRACK

ALIGNMENT PROCEDURE

1. STRETCH A STRING ACROSS TWO PIECES OF KEY STOCK ON EITHER END OF BEAM.
2. WHILE STRING IS HELD A THIRD PIECE OF KEY STOCK OF IDENTICAL THICKNESS SHOULD BE INSERTED BETWEEN STRING AND TRACK AT VARIOUS POSITIONS BETWEEN THE FRONT SPROCKET AREA AND THE APPROX. FRONT SAW POSITION.
3. IF THERE'S A GAP BETWEEN THE FEELER PIECE OF KEY STOCK AND THE STRING, THE FRONT TIE BAR SHOULD BE TIGHTENED, HOWEVER, IF THERE'S A TIGHT CONDITION, THE TIE BAR SHOULD BE LOOSENED.
4. CARE SHOULD BE EXERCISED WHEN ADJUSTING TIE BARS.

CUTTING IMPERFECTIONS

Tenon Units

1. Arbor should be running true. Any amount of run-out will be greatly magnified at the rim of the cutterhead and cause rough cutting. This run-out can be due to any shock loads imposed on on the arbor or worn bearings.
2. Tearout on a shoulder would indicate that spurs or scribing saws are dull and should be reworked.
3. Tearout on a tenon would naturally be noticeable, if the knives are dull.
4. If too large a depth of dado cut is made, burning of the cutters may result since vertical taper is provided on the tenon units.
5. Noticeable drag on the cutters may indicate that the unit is hanging and therefore the take-up gibs have to be adjusted to account for wear.

Cut-off Saw Units

1. The arbor must run true, as any amount of run-out will be greatly magnified at the rim of the blade and cause rough cutting. Using a hammer on the wrench for removing the nut can cause run-out.
2. To minimize normal saw blade run-out and saw vibrations, particularly when using a hollow-ground blade, carbide tipped blade or miter blade, stiffening collars should be installed. Six-inch diameter collars are generally recommended for 12" or 14" diameter saws, and the maximum thickness that can be cut in this case is naturally reduced.

Cut-Off Saw Units (Continued)

3. Darkening of the saw blade teeth due to excessive heating indicates that teeth are dull or improperly set, causing cutting imperfections. In this case, the blade should be replaced or reworked.
4. Any burning of the stock or noticeable drag on the saw unit indicates that the saw blade is dull, not properly filed or set, or that the unit is hanging, in which case the take-up gibs have to be adjusted to account for wear.
5. If the stock is cut out of square after the feed dogs have been squared up and the take-up gibs have been adjusted, this may indicate that the front bevel on the saw blade is not filed uniformly on all teeth and, therefore, it would have a tendency to drag even though the arbor is set at proper clearance. All saw blades, except carbide tipped blades, should be jointed about every third filing to keep the blade round and running true.
6. Tearout on plywood caused by the saw as it cuts through the board can be minimized by using a chipbreaker which acts as a backing plate. This can either be on top of the stock when cutting from above and against the feed or on the bottom when cutting from below and against the feed.

Scoring Saw Units

1. Arbor should be running true. Any amount of run-out, which can be due to shock loads will be greatly magnified at the rim of the blade and cause rough cutting.
2. Darkening of saw blade teeth due to excessive heating indicates that the teeth are dull or improperly sharpened or set and

Scoring Saw Units (Continued)

should be reworked or replaced. Dulling will be more readily noticeable when cutting veneers because of the hand glue line.

3. Any burning of the stock or noticeable drag on the scoring saw unit may indicate that the saw blade is dull, not properly filed or that the unit is hanging and the take-up gibs have to be adjusted for wear.
4. Tearout of stock is greatly minimized since arbor is cutting with the feed. If tearout is noticeable, sharpness of saw blade should be checked or take-up gibs should be adjusted.

Dado Unit

1. Dado arbor should be running true as any amount of runout will be greatly magnified at the rim of the cutters. Dropping the arbor when removing it from the motor unit can spring it and cause it to whip, in which case it should be checked for straightness. Worn bearings can also prevent arbor from running true.
2. Inaccuracy in the depth of a dado cut can be due to the fact that a long span of stock or thin stock is unsupported between the feed chains. One or more lower center stock supports can be used, depending on the length of span and number of cutters, for added rigidity and to maintain the accuracy of a cut when grooving.
3. Intermediate hold-downs ride the stock which straightens it out and holds it steady while splitting or dadoing, thus preventing any inaccuracies in the cut.

Dado Unit (Continued)

4. Backcutting and binding of a splitting saw when in the cut can be eliminated by the use of splitter, which is generally mounted from the stock support and parts the stock after it has been cut.
5. Rough cutting will result if cross cutting teeth on dado cutters are not filed correctly.

Cope Units

1. The arbor must run true.
2. Keep knives sharp. Dull knives produce inferior work.
3. Make sure all knives in head are set properly so each one is cutting. This will minimize revolution marks.
4. For tear-out problems, use wood faced back-up dogs.

SAFETY CHECKS

1. Engage master stop on holddown beam when working in or on the machine, and/or setting cutterheads.
2. After cutterheads are positioned and set, rotate arbor by hand making sure there isn't any interference.
3. Be sure all cutting units that are in working position are running before stock is fed through the machine.
4. Always set the master stop bar slightly higher than the stock being run. This will allow the machine to be shut off if something thicker than the stock reaches the holddowns.
5. Never attempt to re-align or adjust the work while in motion under the holddown beams. Make sure power is off before corrections are made.
6. Use the dust hoods on cutting units since they serve a dual purpose as a collector and guard.
7. Be sure and turn off disconnect switch before doing any electrical work.
8. Check bed ways, columns, beams and shafts for interference in opening and closing machine.
9. For your safety, wear short sleeves, and use protective equipment such as good safety eye wear. Never wear loose clothing, ties or jewelry.
10. Last but most important, observe and develop good safe working habits for your own protection as well as your follow worker.