INDEX

WOOD-MIZER® LT20

OWNER'S & OPERATOR'S MANUAL

MARCH 1986

This manual is to replace or to be used in conjunction with all previous information received on the Wood-Mizer® LT20. All future mailings will be an addition to or a revision to individual sections of this manual as we obtain new information.

We sincerely hope this manual will take care of any questions, and help increase productivity with your lumbermill.

If you have any questions, please write or call our Customer Service Department at (317) 271-1542.

In the event your manual is lost or destroyed, a replacement manual is available upon request to customers only at a cost of $25.00 each including shipping and handling.

The information and instructions given in this manual do not amend or extend the limited warranties for the equipment given at the time of purchase.

Ordering Parts

As our number of customers grow, so do the amount of orders processed by the Customer Service Department. Trying to maintain open accounts and net terms has only caused confusion and slowed down our service to you. In an attempt to give you the fastest service possible, we have adopted these four methods of payment: MasterCard, Visa, pre-payment, or COD.

Office Hours:

Monday	8:00 a.m. to 5:00 p.m.
Tuesday	8:00 a.m. to 5:00 p.m.
Wednesday	8:00 a.m. to 5:00 p.m.
Thursday	8:00 a.m. to 5:00 p.m.
Friday	8:00 a.m. to 5:00 p.m.
Saturday	8:00 a.m. to 4:00 p.m.

SECTION 1.1

WOOD-MIZER® MODEL LT20 LUMBERMILL WARRANTY

LASKOWSKI ENTERPRISES, INC., (Seller), an Indiana Corporation, with principal place of business at 8180 West 10th Street, Indianapolis, Indiana 46224, phone (317) 271-1542, hereby warrants the **WOOD-MIZER®** LT20 lumbermill to the original Buyer only.

15 DAY SALE OR RETURN MONEY BACK GUARANTEE

Within fifteen (15) days after delivery if Buyer is not completely satisfied with the **WOOD-MIZER®** LT20 lumbermill, Buyer may notify Seller for a full refund of the purchase price (used saw blades and damaged parts excepted) and re-transfer ownership to Seller upon return of the **WOOD-MIZER®**, shipping pre-paid by Buyer. Buyer retains risk of loss during such period and until re-delivered to Seller.

LIMITED WARRANTY

The warranty period commences with the date of delivery of the **WOOD-MIZER®** LT20 lumbermill to the original Buyer and expires ninety (90) days from that date for moving parts and one (1) year from that date for non-moving parts, except for main drive motor/engine (which exceptions are warranted by their respective manufacturers).

SELLER DISCLAIMS ANY WARRANTY WHATSOEVER, WHETHER EXPRESS OR IMPLIED, FOR BELTS AND SAW BLADES, AND BUYER PURCHASES ALL SAW BLADES "AS IS" AND "WITH ALL FAULTS", AND NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE ARE TO BE IMPLIED.

During such warranty period Seller warrants to the original Buyer that the **WOOD-MIZER®** LT20 lumbermill is manufactured and delivered in accordance with Seller's published specifications for the equipment at the time of sale and that the **WOOD-MIZER®** shall be free of defects in material and workmanship. The sole liability and responsibility of Seller shall be to replace or repair, at Seller's principal place of business in Indianapolis, Indiana, (or at such other location approved by Seller and at Seller's sole discretion) free of charge including related labor, any defective part, and repair of defective workmanship. Buyer shall pay shipping costs. Correction of any non-conforming part, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of Seller to Buyer, whether based on contract, negligence, or otherwise with respect to, or arising out of such equipment.

To obtain return shipping information or information on warranty performance, call Customer Service at Area Code 317/271-1542, charges reversed.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTIBILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT AS TO TITLE. Any description, photograph, sample or model of the equipment used as a sales aid shall not extend to create any warranty, the Seller's warranties being specifically restricted to the published specifications for the **WOOD-MIZER®** at any time of purchase. No Dealer or Agent has the authority to bind Seller other than to the published specifications for the **WOOD-MIZER®** at any time of purchase. No verbal statement or promise made by a Dealer or agent or by the Seller shall constitute or extend any warranty, except as herein provided. Neither Buyer nor Seller shall be liable to the other for special, indirect, or consequential damages. The remedies set forth herein are exclusive, and the liability of Seller with respect to any contract or sale or anything done in connection therewith, whether in contract, in tort, under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the equipment or part on which such liability is based. **SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU.**

Seller shall have no obligation under this warranty in the event the **WOOD-MIZER®** is damaged in transit by common carrier, is overloaded, is abused, is not used in conformity with the directions accompanying the equipment or if the equipment is modified.

SELLER SPECIFICALLY DOES NOT WARRANT THAT THE EQUIPMENT SHALL MEET OR COMPLY WITH THE REQUIREMENTS OF ANY PARTICULAR SAFETY CODE OR REGULATIONS OF ANY STATE, MUNICIPALITY, OR OTHER JURISDICTION.

This warranty gives the Buyer specific legal rights, and the Buyer may also have other rights which vary from state to state.

December, 1985

WOOD-MIZER® EXTENDED WARRANTY FOR PURCHASE OF TRADE-IN REPLACEMENT PARTS

Upon expiration of the stated Warranty periods for the Wood-Mizer® Lumbermill, owners thereof shall have the right to trade in worn or damaged parts and purchase replacement parts at 50% of the published retail price for such parts, on the following conditions:

1. Trade-in replacement parts shall be for Wood-Mizer® owner use only and shall not be re-sold or supplied to non-Wood-Mizer® owners.

2. The 50% replacement cost is based upon a trade-in value of worn or damaged parts. Upon request of Laskowski Enterprises, Inc., the worn or damaged parts shall be returned to the company. The company shall have the right to request trade-in parts to be returned to its plant in Indianapolis, Indiana prior to shipping out of new replacement parts. In the event the company does not request trade-in parts to be returned prior to shipping, such worn or damaged parts shall be retained for ninety (90) days by the owner prior to disposal. The company shall not be responsible for any storage charges for the storage of trade-in parts retained by the owner.

3. Shipping costs for return of trade-in parts shall be at the owner's sole expense.

4. The Company shall have the right to change the published retail price at any time without notice.

It is understood that the granting of this extended Warranty for purchase of replacement parts is not and does not extend or modify any other existing Warranty whatsoever, whether express or implied, for the Wood-Mizer® or any accessory products or replacement parts therefore.

Laskowski Enterprises, Inc.

By:_____

Oct. 1985 L

SECTION 1.2

SAFETY

The safety tips and warnings listed below should be observed at all times. **Read and understand ALL safety instructions before you operate the mill!**

Turn engine off and let wheels come to a stop:

1) Before removing any covers or guards.
2) Before adjusting the blade guides.
3) Before changing the blade.
4) Before refilling gas tank.
5) Before making any type of carriage adjustments.
6) Before rotating log.

Disengage clutch mechanism:

1) After each cut.
2) Before adjusting throat width.
3) Before returning the bandsaw carriage.

Always:

Wear eye protection and avoid wearing loose clothing while operating mill.

Raise side support braces when rolling log onto carriage.

Position mill on flat, level surface. Level mill before operating.

Disengage clutch after each cut is completed.

Adjust outer blade guide to a 1" clearance or less between the guides and the log.

When rolling a log onto carriage, keep the area behind the log clear of people.

Change the blade with one person only.

Clamp log firmly in place before cutting.

Keep all observers a safe distance from work areas.

Do not operate gasoline engines in confined spaces.

Store gasoline away from sawdust and other flammable materials.

SECTION 1.3

CUSTOM SAWING GUIDELINES

The most common question asked by new Wood-Mizer® owners concerns what you charge when sawing for someone. Although there is no single answer to this question, there are some guidelines to follow that may help. Each region is going to vary as to the going price to have wood sawn, size and species of available timber, and amount of sawing business available. The following guidelines aren't intended to cover all situations, but are offered to help in understanding some different pricing approaches.

PRICING BY THE HOUR OR DAY

Many owners use this method to charge for their sawing. The obvious advantage of this approach is that your income doesn't change with each type of cutting job. If you are cutting difficult wood or set up at a location that doesn't allow efficient handling of logs and finished lumber, the risk of low production rates is passed on to the customer. Your hourly rate remains fixed so the lower production won't effect your income. Many of the owners using this hourly method require their customer to supply the manpower to handle all logs and lumber. If the customer wants higher production, he simply supplies more manpower or equipment to increase output. The owner is simply there to operate the mill. This places most of the burden on the person having the wood cut. Rates vary in different areas from $15.00 to $35.00 per hour. Some charge a delivery fee based on miles to the site for mill set-up.

MILL RENTAL OR LEASE

Some Wood-Mizer® owners rent or lease their mills for people to do their own cutting. The advantage in this case, is that the mill can generate income without requiring any of the owner's time. Things to be cautious about are the competency of the person using the mill, possible legal liability if someone is injured using the mill, and possible damage to the mill when being used by inexperienced operators. Rental rates vary from $10.00 to $20.00 per hour. Blades can be sold in addition. We do not recommend this method.

PRICING BY THE BOARD FOOT OR VOLUME

This is the most common pricing approach in the logging industry. It's main advantage goes to the person wanting the lumber cut. His price is fixed no matter what the production rates are. Rates can vary from under $.10 per foot to over $.25 per foot. The equation for how much you earn is simple--the more you cut, the more you make. The actual amount you make can be affected by many factors which make that equation much more difficult. The type or species of the logs, the length of time they have been down, the condition of the logs, the cutting location, and the size of the logs and thickness of lumber the customer requests will affect your production rate. Each of these factors is important enough to consider individually.

The type of species of log will greatly affect your production rates. White oak, mosquite, and hard maple cut at a rate lower than that for poplar or pine. Although some regions won't accept it, you should try to establish a higher cutting fee for the more difficult species. Some people charge a $.05 premium per board foot for certain species. If your area won't accept this premium you may be better off not cutting certain wood types.

PRICING BY THE BOARD FOOT OR VOLUME - cont'd

The length of time the logs have been down will also affect the rate at which you can produce. Generally, the longer wood has been down, the harder it is to cut. Because of this, it is good to find out how long the timber has been down as well as the species before quoting. The condition of the logs can also affect the production rate. Logs that have been dragged over rocks and mud will require additional time to debark or clean. If you cut through the mud, your blade will dull in just a few minutes. A premium per board foot or an hourly rate should be charged to clean the logs. You could also refuse to cut mud-laden logs.

The cutting location is important. Your price should be based on a setup where you can simply roll or load logs onto the mill without moving the mill. If you are required to move the mill several times in a day, you should be able to charge a fixed amount per move. Some operators charge $5.00 per move.

The amount of wood to be cut should be considered when pricing. If a customer had only two logs, a premium should be expected. Some operators charge a premium of a few cents per foot for any job less than 1000 board feet. A minimum fee can be established on small jobs.

The size of the logs you plan to cut should be a factor in pricing. Large diameter logs can take extra time to handle by hand. Having to stop to trim side limbs or large flares at the butt can greatly reduce total output. Too small a log can involve too much handling for the total yield it produces.

The size of lumber the customer requests can cause you to more than triple the number of cuts you would need to get the same volume of wood. This is true with cutting 1x4s vs 2x12s. Some mill owners charge a certain price for 1" or 2" boards. Very wide boards require much more time to cut than narrower boards, even if you need to make more total cuts when cutting narrower widths. The feed rate for a cut of 24" is less than 5' per minute and takes more time and runs more risk of wavy cuts than cutting thru boards that are 8" wide at a feed rate of 20' or more per minute.

The Wood-Mizer® has several advantages over circular mills and when pricing your sawing, you should take advantage of them. Many Wood-Mizer® owners get premiums over the going rates in the area by selling these advantages. Recognize that a $4,000.00 mill can't compete in the area of output per day with a $100,000.00 mill operation. Where you can compete (and beat) the big mills is in transportability, lumber quality, versatility and total yield of usable lumber per log.

PORTABILITY

The money your customer can save in not having to haul his lumber to the mill can let you charge a few cents more per board foot than the large mills. Be sure that this savings is used to your advantage, either to secure a cutting job or to get a premium for saving the customer a hauling bill. In Indiana average hauling costs within 30-40 miles of the mill is $40.00/MBF ($.04 per board foot).

LUMBER QUALITY AND ACCURACY

The surface texture of a board cut on a Wood-Mizer® is far smoother than on a circular mill. A good sawyer can get finished framing lumber directly off the mill. The more accurately any mill cuts, the less you need to oversize your cuts to assure a given finished dimension.

LUMBER SIZE CAPABILITIES

The Wood-Mizer® lets you cut ½" lumber for paneling with less overall log waste than most mills cutting 2" lumber. The SLR option lets you cut wood shakes or shingles and lap siding or weatherboard. The Wood-Mizer® can also resaw large timbers into accurately-sized dimensional lumber. These capabilities are very significant advantages.

YIELD PER LOG

The Wood-Mizer®'s high yield of usable lumber per log is one of its most important and sometimes most overlooked advantages. This higher yield has an easy-to-calculate real cost savings for every log cut. A 14" to 18" diameter log measured by Doyle Scale when cutting with the Wood-Mizer® will consistently produce as much as 50% over scale. This can allow you to charge a much higher rate than a large mill and still have the same net cost as the larger mill per finished board foot. It is actually possible to charge twice the rate as some mills and still save a customer money. An equation to calculate the cutting rate you can charge so the net cost per board foot is the same as the different mills is:

$$(VL \times \frac{1}{1 + ERC}) + CR + HF - (VL \times \frac{1}{1 + ERW}) = WR$$

Where

VL =Value of the lumber in log form
ERC =Efficiency Rate of Competitor (Amount of usable lumber over scale the competitor's mill will cut)
CR =Competitors Rate (Rate that the competitor's mill charges)
HF =Hauling Fee to the mill
ERW =Efficiency Rate of Wood-Mizer® (Amount of usable lumber over scale the Wood-Mizer® will cut)
WR =Wood-Mizer® Rate (Rate that you can charge to have the same net cost per board foot as the competitor's mill)

YIELD PER LOG - cont'd

This equation looks quite involved but can be easily calculated when you fill in actual values. For example: A customer has some prime poplar logs valued at 25¢ per board foot ($250.00 per thousand). He can have lumber sawed at a circular mill at 10¢ per board foot that cuts approximately 10 to 15% over scale. (i.e., for every 1000 board foot by Doyle scale, the mill cuts 1100 to 1150 usable board foot of lumber). The hauling fee within 30 miles of the mill is 4¢ per board foot. Most Wood-Mizer® operations cut 50% over Doyle scale on logs under 20" in diameter. Given these figures, the equation will tell you what you could charge for cutting so the net cost per board foot is the same as the circular mills.

(.25 X .87) + .10 + .04 - (.25 X .67) = rate

.218 + .10 + .04 - .190 = rate

.168 rate = .168¢

This means that you can charge 16.8¢ per board foot for the lumber you cut and the customer's cost is no more than if he had it hauled into a circular mill and cut at 10¢ per board foot. The reason for this is that you can cut half again as much usable lumber as the scale volume compared to the 25% of the circular mill. For example, if he pays $250.00 for 1,000 scaled board foot in log form, you can give him 1,500 board foot of usable lumber from those logs. This essentially cuts the price he is paying for his lumber by 30-40%! Because of this difference in efficiency, you should easily be able to get a higher cutting rate than the larger mills.

It isn't our intention in this example to advise you to charge the 16.8¢ board foot fee for cutting. In this example you could possibly charge a rate of 15¢ and essentially pass on the difference of 1.8¢ per board foot to the customer. Even when cutting pine worth 10¢ a board foot, you can compete at over 15¢ per board foot versus 10¢ of a large mill, when you calculate the savings in efficiency and hauling costs. Anything less than the 15¢ board foot is money you are putting in the customer's pocket.

One thing to consider when looking at the efficiency of the Wood-Mizer® is that your advantages increase as the value of the logs increase. If you have poplar worth 20¢ per board foot, you cut the net cost of the lumber 30-40% by giving him 50% of the scaled volume in usable lumber when cut. This is essentially an 8¢ board foot savings. If the wood were oak valued at 50¢ per board foot, you could cut his cost by 20¢ a board foot; walnut valued at $1.00 per board foot would reduce cost by 40¢ and so on.

When cutting by volume or board foot, **always charge for the amount of usable wood produced, rather than scale volume.** If you charge by scale volume, every board foot you cut past scale you are cutting for free.

If you determine your volume by output, reduce risks of low-volume days by knowing what and when you cut, and **always** charge something for the additional factors that reduce your production, cutting by volume can be a profitable venture.

SAWING FOR A PERCENTAGE OF THE WOOD YOU CUT

This can be a good way to charge for your sawing, but it will not bring in money unless you have a ready market for the wood you cut.

Cutting this way essentially makes you a small-scale lumber yard. If you can sell your lumber at a good price, this can be a very profitable arrangement. Percentage you keep as a sawyer can range from 25-50% depending on species and region.

COMBINATION PRICING

One key to securing more cutting jobs is to be flexible in your pricing. A customer who owns a substantial amount of standing timber may not be concerned about the higher yields from the Wood-Mizer®. In this instance, he may be willing to let you cut at the current large mill rate and keep some of the over-run lumber.

There may be certain jobs or wood types that you may want to cut on an hourly rate instead of a board foot rate. You may also charge more or less per foot depending on how much labor the customer supplies. A combination of several pricing approaches may be what will work best in your operation.

A few points to remember:

If you price by the day, establish a rate that will leave you the income you want **after** expenses.

If you rent your mill, know the people who use it and be sure they are properly trained.

If you price by the board foot, use the high yield, portability, cutting versatility, and surface texture to get the highest rate possible for your region. (Be conscious of all factors that can reduce output and charge accordingly.)

SECTION 1.4

WOOD-MIZER® CUSTOM LUMBER CONTRACT

THIS AGREEMENT, by and between _____ (Sawyer), and _____ (Customer), with the Wood-Mizer® one-man sawmill as follows:

1. Sawyer agrees to cut customers log at: Customer's site _____ or Sawyer's property _____; for $_____per hundred board foot of lumber cut. Charges are based on actual lumber cut rather than scaled volume. (**Note:** net usable lumber will be greater than scale when cut with the Wood-Mizer®.) A board foot of lumber is defined as 12"x12"x1".

2. In addition to above, Customer shall pay Sawyer $ _____ for delivery and location setup of Wood-Mizer®. Also, if Sawyer is required to relocate Wood-Mizer® on site, there shall be an additional charge of $ _____ per move. In the event a saw blade is broken or damaged by foreign matter (nail, rock, metal, etc.) in Customer's log, there is a charge of $ _____ per damaged blade.

3. Sawyer will arrive at Customer's location at _____o'clock _____.M., on _____, 19_____ to start operation. Customer agrees to provide _____ men to assist in loading and unloading logs and lumber. All logs shall be stacked in location of mill so that there can be continuous loading of mill by rolling logs up the mill ramp without moving mill. Lumber shall be stacked at mill location to allow continuous cutting operation.

4. Other Charges: _____

5. Payment in full shall be made as follows: _____
   _____

6. It is understood by the Customer that log handling and cutting may be hazardous. Customer shall be responsible for conduct of helpers and observers and agrees to hold Sawyer and the Wood-Mizer® Lumbermill manufacturer harmless for any injury or damage whatsoever to helpers or observers arising out of operation of the mill and the handling of logs and lumber. It shall be Customer's duty and obligation to keep all children and observers out of the work area. Customer represents that he is the owner of the logs and/or has the authority to enter into this **Agreement** on behalf of all interested parties.

Dated this _____ day of _____, 19_____.

Sawyer:

_____

Customer:

_____

SECTION 1.5

LUMBER SCALE

THICKNESS AND WIDTH	LENGTH OF BOARD IN FEET					
	6	8	10	12	14	16
	CONTENTS IN BOARD FEET					
1 x 3	1.5	2	2.5	3	3.5	4
1 x 4	2	2.6	3.3	4	4.6	5.3
1 x 5	2.5	3.3	4	5	6	6.6
1 x 6	3	4	5	6	7	8
1 x 7	3.5	4.6	6	7	8	9.3
1 x 8	4	5.3	6.6	8	9.3	10.6
1 x 10	5	6.6	8.3	10	11.6	13.3
1 x 12	6	8	10	12	14	16
2 x 4	4	5.3	6.6	8	9.3	10.6
2 x 6	6	8	10	12	14	16
2 x 8	8	10.6	13.3	16	18.6	21.3
2 x 10	10	13.3	16.6	20	23.3	26.6
2 x 12	12	16	20	24	28	32
2 x 14	14	18.6	23.3	28	32.6	37.3
3 x 6	9	12	15	18	21	24
3 x 8	12	16	20	24	28	32
3 x 10	15	20	25	30	35	40
3 x 12	18	24	30	36	42	48
4 x 4	8	10.6	13.3	16	18.6	21.3
6 x 6	18	24	30	36	42	48

SECTION 1.5

LOG & LUMBER SCALE

INTERNATIONAL ¼ INCH LOG RULE

DIB* (small end)	BOARD FEET PER LENGTH BELOW					
	6'	8'	10'	12'	14'	16'
6	5	10	10	15	15	20
7	10	10	15	20	25	30
8	10	15	20	25	35	40
9	15	20	30	35	45	50
10	20	30	35	45	55	65
11	25	35	45	55	70	80
12	30	45	55	70	85	95
13	40	55	70	85	100	115
14	45	65	80	100	115	135
15	55	75	95	115	135	160
16	60	85	110	130	155	180
17	70	95	125	150	180	205
18	80	110	140	170	200	230
19	90	125	155	190	225	260
20	100	135	175	210	250	290
21	115	155	195	235	280	320
22	125	170	215	260	305	355
23	140	185	235	285	335	390
24	150	205	255	310	370	425
25	165	220	280	340	400	460
26	180	240	305	370	435	500
27	195	260	330	400	470	540
28	210	280	355	430	510	585
29	225	305	385	465	545	630
30	245	325	410	495	585	67

*DIAMETER INSIDE BARK

SECTION 1.5

LOG & LUMBER SCALE

DOYLE SCALE

DIB* (small end)	BOARD FEET PER LENGTH BELOW					
	6'	8'	10'	12'	14'	16'
6	2	2	3	3	4	4
7	3	5	6	7	8	9
8	6	8	10	12	14	16
9	9	13	16	19	22	25
10	14	18	23	27	32	36
11	18	25	31	37	43	49
12	24	32	40	48	56	64
13	30	41	51	61	71	81
14	38	50	63	75	88	100
15	45	61	76	91	106	121
16	54	72	90	108	126	144
17	63	85	106	127	148	169
18	74	98	123	147	172	196
19	84	113	141	169	197	225
20	96	128	160	192	224	256
21	108	145	181	217	253	289
22	122	162	203	243	284	324
23	135	181	226	271	316	361
24	150	200	250	300	350	400
25	165	221	276	331	386	441
26	182	242	303	363	424	484
27	198	265	331	397	463	529
28	216	288	360	432	504	576
29	234	313	391	469	547	625
30	254	338	423	507	592	676

* DIAMETER INSIDE BARK

SECTION 1.5

TREE SCALE

DOYLE LOG RULE

DAG*	NUMBER OF 16 FOOT LOGS IN TREE							
	½	1	1½	2	2½	3	3½	4
12	20	30	40	50	60	-	-	-
14	30	50	70	80	90	100	-	-
16	40	70	100	120	140	160	180	190
18	60	100	130	160	200	220	240	260
20	80	130	180	220	260	300	320	360
22	100	170	230	280	340	380	420	460
24	130	220	290	360	430	490	540	600
26	160	260	360	440	520	590	660	740
28	190	320	430	520	620	710	800	880
30	230	380	510	630	740	840	940	1040
32	270	440	590	730	860	990	1120	1220
34	300	510	680	850	1000	1140	1300	1440
36	350	580	780	970	1140	1310	1480	1640
38	390	660	880	1100	1290	1480	1680	1860
40	430	740	990	1230	1450	1660	1880	2080
42	470	830	1100	1370	1620	1860	2100	2320

* DIAMETER 4'-6" ABOVE GROUND

TO ESTIMATE TREE VOLUME

1. Determine tree diameter in inches at 4½ ft. above ground.
2. Determine usable length in feet from stump height to large branches.

SECTION 1.5

TREE SCALE

INTERNATIONAL ¼ INCH LOG RULE

DAG*	NUMBER OF 16 FOOT LOGS IN TREE							
	½	1	1½	2	2½	3	3½	4
12	30	60	80	100	120	-	-	-
14	40	80	110	140	160	180	-	-
16	60	100	150	180	210	250	280	310
18	70	140	190	240	280	320	360	400
20	90	170	240	300	350	400	450	500
22	110	210	290	360	430	490	560	610
24	130	250	350	430	510	590	660	740
26	160	300	410	510	600	700	790	880
28	190	350	480	600	700	810	920	1020
30	220	410	550	690	810	930	1060	1180
32	260	470	640	790	940	1080	1220	1360
34	290	530	730	900	1060	1220	1380	1540
36	330	600	820	1010	1200	1380	1560	1740
38	370	670	910	1130	1340	1560	1840	1940
40	420	740	1010	1250	1480	1700	1920	2160
42	460	820	1100	1360	1610	1870	2120	2360

* DIAMETER 4'-6" ABOVE GROUND

TO ESTIMATE TREE VOLUME

1. Determine tree diameter in inches at 4½ ft. above ground.
2. Determine usable length in feet from stump height to large branches.

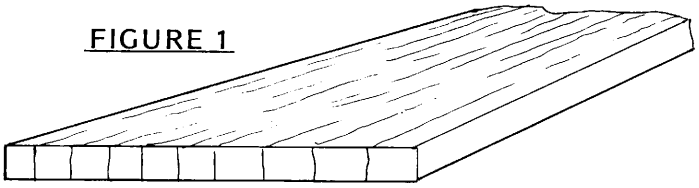
SECTION 1.6

LOG SAWING AND DRYING TIPS

Although most people know of the term, quartersawing, many do not know what it means. What is quartersawing? Why and when should you quartersaw? How do you quartersaw? These are questions we hope this article will answer.

The Society of American Foresters defines quartersawed as "timber converted so that the growth layers meet the face of any part at an angle ∢ 45° (not less than 45°). When the angle is ∢ 80° (not less than 80°) the timber is termed fully quartersawn". This technical definition is one reason that the term is confusing to many people new to sawing. In simpler terms this means that a fully quartersawn board has growth rings that are approximately perpendicular to the face of the board **See Figure 1.** The board is still considered quartersawn as long as the growth rings aren't less than 45° to the face of the board. **See Figure 2.**

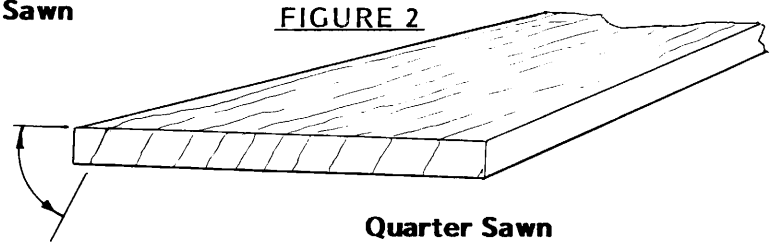
FIGURE 1



Fully Quarter Sawn or Rift Sawn

90° ± 10°

FIGURE 2



Quarter Sawn

45° – 80°

There are several reasons to consider quartersawing your lumber. In certain hardwoods the grain patterns found are in high demand. Quartersawn oak has a very distinct grain pattern and is more valuable than plainsawn oak. Quartersawn wood is also more dimensionally sound and will not cup or dish while drying, and will shrink less than plainsawn boards. For these reasons most cabinet makers, quality furniture shops, and craftsmen prefer quartersawn boards.

Not all lumber will increase in value when quartersawn. Because of this, the added handling and time involved should be weighed against the added value of the quartersawn lumber. Quartersawing framing lumber isn't normally suggested. Quartersawing furniture grade hardwoods is suggested.

We have found commercial quartersawing of logs to be simple and fast on the Wood-Mizer®. Judgment as to where the first cut should be made depends on the shape of the log (oval, square, or round), and as such, is arbitrary. Seeing that this method results in the best quality lumber, we felt you would be interested in the approach we use. It is important to keep the heart of the log parallel to the bed of the mill. It may be necessary to raise one end of the log to accomplish this and wedge a small piece of wood under it. Referring to the sketches below, **Figure 1** shows an end view of a log we will say is 17 inches in diameter. The first cut is made 11½ inches above the bed. The top cant (A) is laid to the side and six cuts of one inch (B) are made and those boards laid aside. The remaining cant (C) is rotated 90° **(See Figure 2)** and boards are cut starting 13 inches from the bed down to 3 inches (boards D). These boards are acceptable as commercial grade quartersawn lumber. The two boards above and below are plain sawn. The boards (D) are then placed in a vertical position and edged. Cant (A) is processed in like manner. Boards (B) are then mounted vertically, sliced through the center **(Figure 3,)** and edged. **(See Figure 4.)** Using this approach, 60 to 70 percent of a good log can be converted into the most valuable lumber rapidly and effectively.

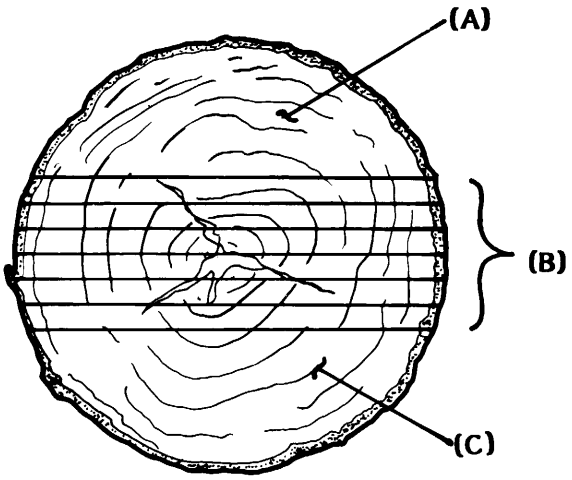


FIGURE 1

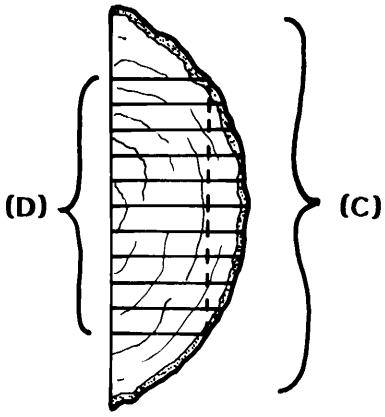


FIGURE 2

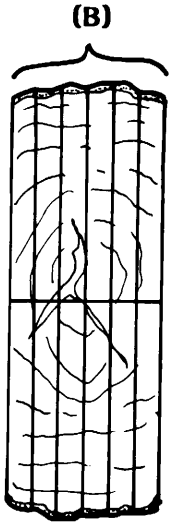


FIGURE 3

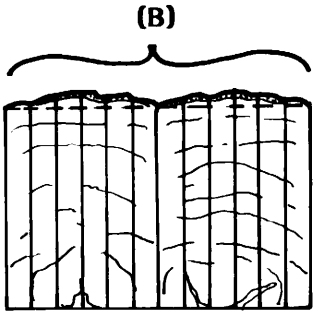


FIGURE 4

LUMBER VOLUME AND SIZING

An important step in cutting lumber is to determine the correct size. Lumber is normally sold according to **nominal** size, which indicates the dimensions of the rough lumber in inches (1x2, 2x4, etc.). The first dimension is the thickness of the board and the second its width. After a board has been surfaced with a planer on all sides and dried, it will then be the **actual** size. For instance, the actual size of a 2x4 is 1½ x 3½ inches.

When you are cutting framing lumber, you should be able to cut its actual size (1½ x 3½ for a 2 x 4) directly on the mill to avoid any planing to size. You may want to allow an overcut of approximately 10% for shrinkage when dried.

The chart below compares nominal and actual size of most common sizes.

Nominal and Actual Sizes of Lumber (In Inches)

Nominal Size	Actual Size
1 X 2	25/32 X 1 5/8
2 X 2	1 5/8 X 1 5/8
1 X 3	25/32 X 2 5/8
2 X 3	1 5/8 X 2 5/8
1 X 4	25/32 X 3 5/8
2 X 4	1 5/8 X 3 5/8
1 X 5	25/32 X 4 5/8
1 X 6	25/32 X 5 5/8
2 X 6	1 5/8 X 5 5/8
1 X 8	24/32 X 7 1/2
1 X 10	25/32 X 9 1/2
2 X 10	1 5/8 X 9 1/2
1 X 12	25/32 X 11 1/2
2 X 12	1 5/8 X 11 1/2

Circular mills cut 1 1/8" hardwoods to be planed to 3/4". You can cut 1 1/16" lumber by dropping the carriage 1 1/8" for each board (1 1/16" board and 1/16" saw kerf = 1 1/8" drop) and you should easily be able to get a planed 3/4" board. This is because surface texture and accuracy are better with the Wood-Mizer®.

VOLUME

Lumber is commonly sold by the **board foot (bd. ft.).** This unit is actually a calculation of volume. To find the number of board feet in a board, multiply the nominal thickness times the nominal width times the actual length in feet. This product is then divided by 12. Thus, a one-foot-long 1x12 and a two-foot-long 1x6 would both be sold as one board foot.

SECTION 1.7

LUMBER DRYING

GENERAL WOOD CHARACTERISTICS

As with any sawmill, the ultimate value of your lumber depends greatly on what happens to the boards **after** they are cut. The amount of damage or "de-grade" the lumber will have is affected by many factors. By far the most important of these is drying.

The two most common methods of drying wood are **kiln-drying** and **air-drying.** The kiln-drying process involves drying lumber in a closed chamber. Wood is dried to a given level by a carefully controlled combination of heat, relative humidity and air circulation. Wood-Mizer® produces a 1,000 bd. ft. capacity kiln that allows the small business to dry wood quickly and practically through a unique method of drying wood.

Kiln-drying wood with the Model 1000 Dry Kiln is a new method that creates whole new approaches and options for the wood supplier. The following is a brief explanation of how the Model 1000 Dry Kiln works, stated as simply as possible.

First, picture yourself as a small, single molecule of water in vaporous (steam) form. Now picture yourself inside a cell of wood. You find yourself in what appears to be a tremendous cavern with huge tunnels interconnecting to other caverns. The walls of these caverns (which are the walls of the wood cells) appear as a sieve with large openings . . . large enough that you can crawl through them into the adjoining caverns.

This gives you an idea of the size of a single molecule of water in relationship to wood. This is important, as the principle for drying in the Model 1000 Dry Kiln is centered primarily around drying of moisture through vaporous form. Water is one of the few elements which will exist in this very tiny form when heated above its boiling point. Below its boiling point, it has an affinity (tremendous attraction) to other molecules of water (cohesion) and to other substances such as wood fibers, etc. (adhesion).

Once one recognizes that the cellular structure of wood is not a significant barrier to the flow of water in its vaporous (steam) form, the principle of this type of drying is simple to understand. This also explains why vacuum-drying is so much faster than air and conventional kiln drying (approximately 10 times faster than conventional means).

There is only one reason for using vacuum in our process -- reducing the boiling point of water. At sea level, water boils at 212°F. Denver, Colorado is a mile high (reduced atmosphere) and water boils there at about 180°F. As the atmospheric conditions get rarer and rarer and come closer and closer to a complete vacuum, the boiling point of water drops to lower and lower temperatures. In the Model 1000 Dry Kiln, the vacuum is capable of reducing atmosphere to a point that water will boil at about 90°F.

We believe it is desirable in wood-drying to keep the wood fibers at temperatures similar to those in which they grow. By reducing the boiling point of water to the range of 90°F, the Model 1000 allows the rapid drying process in vaporous form to occur with minimal damage to the wood fibers.

The drying process is accomplished by adding heat through layers of thin heating blankets between which layers of wood are stacked, bringing the temperature of the wood to a point higher than boiling, and then allowing the boiling vapors to escape from the wood. These vapors then condense back into liquid form on condensing coils attached to the interior of the kiln walls. The rate at which heat is added to the wood and the rate at which steam is boiled out of the wood are controlled by microprocessing circuitry. The microprocessor is completely field-programmable and allows the operator to rapidly schedule the drying rate required for the specific species and thickness of wood being dried.

This all adds up to a self-contained, 1000-board foot capacity, vacuum dry kiln designed to rapidly dry thick stock with low degrade levels. The drying time of the Model 1000 is 1/10th that of most conventional kilns. The unit dries 4/4 red oak from green to 7% in approximately 3 days, 8/4 in 6 days. This fast turnaround gives users the ability to handle specialty drying needs without tying up a high-volume conventional kiln for extended periods. It is also practical for the small user drying the more common 4/4 stock, especially when fast turnaround is critical.

Air-drying is the most common method of drying lumber for most small mill operators. The following paragraphs are quotes from the "How to Dry Small Quantities of Lumber" pamphlet prepared by the North Central Forest Experiment Station Forest Service, United States Department of Agriculture.

Before using freshly sawn hardwood lumber in your woodworking projects, you must dry it. These paragraphs will outline how you can dry short lengths of green boards inexpensively at home. Green lumber up to 2 inches thick can be dried for indoor use in 1 to 4 months, depending on the species and wood thickness. Moisture contents of the dried lumber range from 6 to 11 percent, depending on the conditions in the indoor room. However, when using this method of drying, you should expect a significant amount of defects to occur.

Freshly cut lumber contains up to 1 pound of water for each pound of dry wood. If used in the green condition, the lumber will dry while in use, leading to shrinkage, decay, paint failure, and loosening of joints. The lumber must be dried first to avoid these problems.

When warm dry air is moved over the surfaces of green wood, the wood absorbs heat from the air and this heat evaporates the water held in the wood. Stack the wood in rows or tiers separated from each other by a few crosslaid pieces of dry lumber about 3/4-inch square (called stickers) and support it well above the ground. Place heavy weights on top of the stack to keep the boards flat. Align the stickers vertically to prevent sagging.

Build the stack where warm, dry air can move through the tiers. Heated or dehumidified indoor space or an attic above heated space are good locations. However, unheated sheds can be used to accomplish most of the drying. If no shed or indoor space is available to handle all of the lumber, you can build the stack outdoors, but it must be protected with a slightly sloping roof of plywood or other panel-type material.

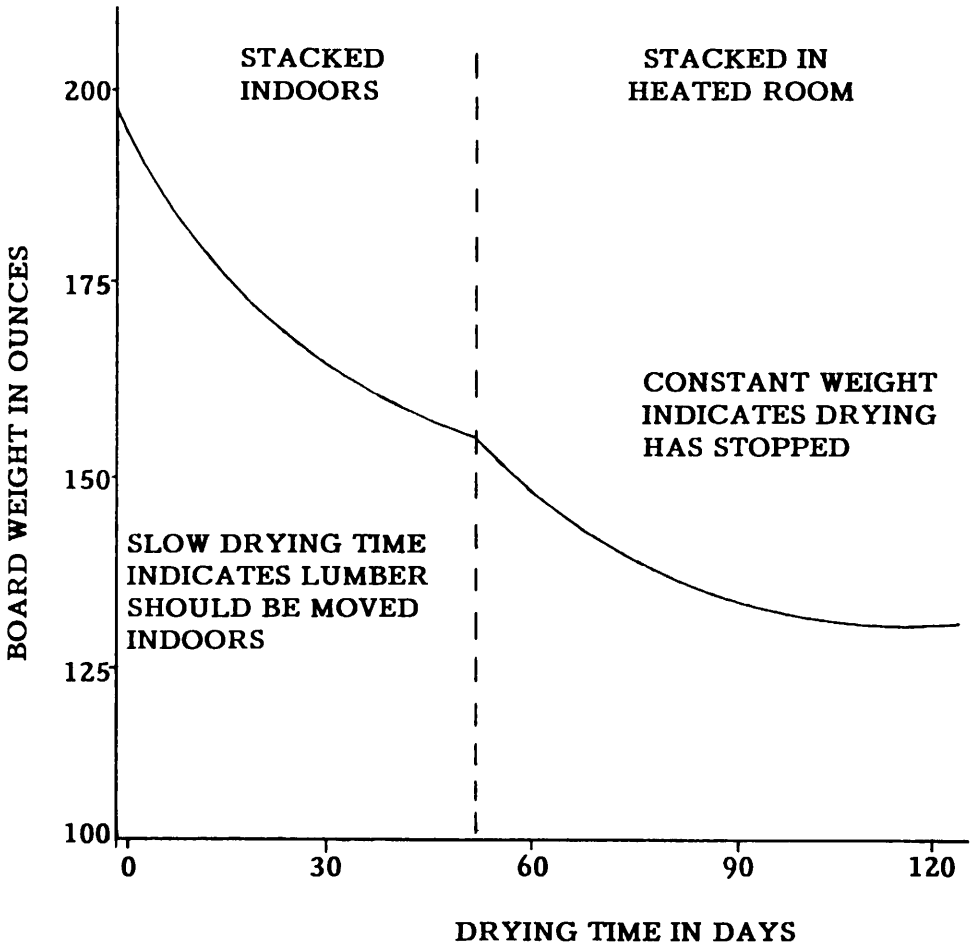
LUMBER DRYING - cont'd

Stacks built outdoors or in unheated sheds will dry well in the warm months, but much more slowly in cold winter months.

Outdoor conditions are not dry enough to remove enough moisture from the wood to reach the 6-10 percent moisture contents required for indoor use. Therefore, you will have to move the material in the stack into a heated or dehumidified interior space to complete the drying. The lumber should be stacked indoors in the same manner as described earlier.

HOW WILL I KNOW WHEN THE WOOD IS DRIED?

Weigh a few boards from the stack at least once a week. When their weight stops dropping, the boards have stopped drying. One easy way to keep track of the wood's progress is by graphing the board weight, such as in the graph below. The graph shows the weight loss of white oak, originally weighing 200 ounces, which was dried outdoors until the rate of weight loss was very low and then moved to a heated indoor space and dried until no further weight loss occurred. Although a hard-to-dry species such as white oak took 4 months to dry, easier drying species like yellow poplar and silver maple can be dried in less than 1 month.



LUMBER DRYING - cont'd

A FEW POINTERS

1. End coat your green logs and green lumber with beeswax or a commercial sealer to prevent excessive end checking.

2. Use light-colored wood for stickers.

3. Keep dried lumber indoors in a dry location until you're ready to make the final product.

4. Stickers should be located approximately 16" apart and at both ends of the boards.

LUMBER DRYING - cont'd

Approximate time in days to air-dry green 1-inch (2.54 cm.) lumber to 20 percent moisture content

SPECIES	TIME	SPECIES	TIME	SPECIES	TIME	SPECIES	TIME
Softwoods	**Days**	Sugar:		Beech, American	70-200	Sugar	50-200
Baldcypress	100-300	Light	15-90	Birch:		Oak:	
Douglas-fir:		Sinker	45-200	Paper	40-200	Northern red	70-200
Coast	20-200	Western white	15-150	Sweet	70-200	Northern white	80-250
Interior north	20-180	Redwood:		Yellow	70-200	Southern red	100-300
Interior south	10-100	Light	60-185	Butternut	60-200	Southern White	
Interior west	20-120	Sinker	200-365	Cherry, black	70-200	(chestnut)	120-320
Hemlock:		Spruce:		Cottonwood:		Pecan	60-200
Eastern	90-200	Engelmann	20-120	Black	60-150	Sweetgum:	
Western	60-200	Red	30-120	Eastern	50-150	Heartwood	70-300
Larch, western	60-120	Sitka	40-150	Elm:		Sapwood	60-200
Pine:		White	30-120	American	50-150	Sycamore:	
Eastern white	60-200	**Hardwoods**	**Days**	Rock	80-180	American	30-150
Jack	40-200	Alder, red	20-180	Hackberry	30-150	Tanoak	180-365
Lodgepole	15-150	Ash:		Hickory	60-200	Tupelo:	
Ponderosa	15-150	Black	60-200	Magnolia	40-150	Black	70-200
Red	40-200	Green	60-200	Maple:		Water	70-200
Southern:		White	60-200	Bigleaf	60-180	Walnut, black	70-200
Loblolly	30-150	Aspen:		Red	30-120	Willow, black	30-150
Longleaf	30-150	Bigtooth	50-150	Silver	30-120	Yellow-poplar	40-150
Shortleaf	30-150	Quaking	50-150				
Slash	30-150	Basswood	40-150				

SECTION 1.8

GRADING OF WESTERN PINE

Select Grades

B & BETTER SELECT (1 & 2 Clear). B & Better is the highest recognized grade of Pine . . . a practically perfect grade. Although graded from the better side, even the backs of pieces in B & Btr. are of extremely high quality. To all practical purposes, the grade is clear.

B & Btr. Ponderosa Pine is used for finishing work of the very highest order, including interior trim, siding, paneling and cabinet work. It is also used for special industrial purposes where practically clear lumber in fairly large pieces is desired.

C SELECT. C Select is the second grade of Pine finish lumber and is designed to provide a top grade paint finish wood. Many pieces have a B & Btr. face with backs of a slightly lower quality than are permitted in the higher grade. Other pieces have a clear appearance but contain small parts of slightly torn grain, fine checks or possibly light pitch.

C Select is suitable for the very highest uses where entirely clear lumber is not required.

D SELECT. D Select includes pieces showing a finished appearance on one side only, the back of the board at times containing knots, pitch, wane or a combination thereof. In such cases, the face is correspondingly high. A type often used is a high line piece requiring a cut to eliminate a defect too serious to go into finished work.

It is especially useful grade for the small planing mill and works up into various articles of woodwork with little waste.

MOLDING GRADE. This is a special grade exhibiting characteristics of both Select and Factory grades. As the name suggests, a high yield in long, clear but narrow cuttings suitable for producing moldings is the basis of the grade.

Price of molding Grade is intermediate between D Select and Third Clear, and the board will normally be found to be too good for Third Clear and not good enough for D Select. It is a sound value for the custom woodworker, because he can produce almost anything he needs from it at a relatively reasonable cost.

Common Grades

NUMBER 1 COMMON. Number 1 Common is the highest of five grades into which Pine Common is classified and contains pieces of the small knot variety. Knots are always sound, red or intergrown, smooth and are liminted in size to slightly more than 2" in diameter, depending upon the size of the piece. As a rule, the knots average very much smaller and are well distributed along the board.

Only pieces that show smooth dressing around knots are allowed in No. 1 Common. Knots in No. 1 Common are usually round or oval in shape and seldom occur on the edges of the board.

SECTION 1.8

GRADING LUMBER

STANDARD HARDWOOD GRADES

FIRSTS & SECONDS (FAS) GRADE

Use: For long, generally wide cuttings. As required for fixtures and interior trim.

Board Size: 6" and wider, 8' and longer.

Number of Clear Face Cuttings: Determined by Surface Measure (S.M.) of piece.

Size of Clear Face Cuttings: 4" or wider by 5' or longer and 3" or wider by 7' or longer.

Yield in Board of Clear Face Cuttings: 83 1/3% or more.

SELECT GRADES

Use: For long, medium to narrow width cuttings, where only one good face is required. As required for molding and wall paneling.

Board Size: 4" and wider, 6' and longer.

Clear Face Cuttings and Yield: Same as Firsts & Seconds (FAS) on better face. Poorer face to grade not below No. 1 Common.

NO. 1 COMMON

Use: For medium length, narrow to wide cutings. As required for furniture manufacture.

Board Size: 3" and wider, 4' and longer.

Number of Clear Face Cuttings: Determined by Surface Measure (S.M.) of piece.

Size of Clear Face Cuttings: 4" or wider by 2' or longer and 3" or wider by 3' or longer.

Yield in Board of Clear Face Cuttings: 66 2/3% or more.

IMPORTANT EXCEPTIONS

1. Walnut, butternut and all quarter-sawn woods are 5" and wider in Firsts & Seconds (FAS) grade.

2. Minimum size of clear face cuttings in walnut and butternut are:
   a. FAS: 4" or wider by 3' or longer and 3" or wider by 6' or longer.
   b. No. 1 Common: A clear face cutting shall not contain less than 144 sq. inches; minimum width 3", minimum length 2'. There is no limit to number of cuttings.

3. FAS Poplar 8" and wider must contain not less than 66 2/3% heartwood on one side and not less than 50% on the reverse side. Pieces 7" wide allow 1" aggregate sapwood on either or both faces; pieces 6" wide must be all heartwood. Clear stock with excessive sapwood is usually sold as "SAPS", or sometimes FAS (SND), meaning "sap-no-defect".

SECTION 1.8

GRADING OF WESTERN PINE

Select Grades

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Common Grades

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Only pieces that show smooth dressing around knots are allowed in No. 1 Common. Knots in No. 1 Common are usually round or oval in shape and seldom occur on the edges of the board.

Common Grades - cont'd

NUMBER 2 COMMON. Number 2 Common, a very popular grade, represents a large percentage of the total production of Ponderosa Pine lumber. An all-around utility grade, it is suitable for all uses where a good grade of Common is required. It contains the same type of defects as No. 1, but in greater degree.

Generally similar to No. 1 in appearance, No. 2 allows larger and more pronounced characteristics. In narrow widths, knots are usually limited to 2½" in diameter, and in wider widths to 3½", but the average is considerably less than the maximum.

NUMBER 3 COMMON. Number 3 Common comprises pieces of less uniform appearance than those in the two higher Common grades, varying from a piece of otherwise No. 1 or No. 2 quality with a single characteristic which causes it to be Grade No. 3, down to pieces showing numerous coarse knots, or boards with loose knots or an occasional knot hole. A piece containing a knot hole is generally of otherwise high quality.

A limited amount of heart shake and pitch may be found in low line pieces of No. 3, provided they do not occur in serious combination with other defects. A type frequently found is a piece with a No. 2 face, but showing several skips in dressing.

SECTION 1.9

DEFINITIONS

At one time or another, every Wood-Mizer® customer finds himself involved in conversation dealing with woodlot management or forestry concepts. Unfortunately, many aspects of woodlot management and professional forestry can only be explained or described in technical terms. Therefore, it is important for sawyers to become familiar with basic forestry concepts and terms if they are to communicate successfully with other professional foresters. The following is a selected list of definitions used when discussing forestry management concepts and practices.

Acre - An area of land which contains 43,560 square feet (about 208.7 feet square).

Afforestation - Establishing a forest on an area which has not previously had trees growing on it.

All-Aged Forest - A forest stand in which trees of all ages and usually all sizes are present. Seldom exists in nature.

Allowable Cut - The volume of wood or the amount of product which can be cut, under a particular management plan, during a given period of time.

Annual Ring (or Growth Ring) - The growth layer of one year as viewed on the cross section of a stem, branch, or root; composed of early and late wood.

Board Foot - A unit for measuring wood volumes, equalling 144 cubic inches, which is commonly used to measure and express the amount of wood in a tree, sawlog, veneer log, or individual piece of lumber. For example, a piece of wood 1 foot x 1 foot x 1 inch or one measuring 1 foot x 3 inches x 4 inches both contain 1 board foot of wood.

Bole - The main trunk of a tree.

Bolt - A short log or a squared timber cut from a log.

Buck - To saw felled trees into shorter lengths.

Butt - The base of a tree or the lower end of a log.

Catface - A well-defined healing or healed wound usually near the base of a tree bole.

Check - A lengthwise separation of the wood, which usually extends across the rings of annual growth, commonly due to mechanical stresses which occur during drying. It is not considered to be cull unless excessive.

Commercial Cutting - A cutting which yields a net income (receipts for the sale of products exceed the cost of the cutting).

Conifer - A tree belonging to the order **Coniferales,** which is usually evergreen; cone-bearing; and with needles, awl, or scalelike leaves, such as pine, spruces, firs, and cedars; often referred to as "softwoods" which does not necessarily refer to the hardness of the wood.

Conservation - The protection, improvement, and wise use of natural resources to assure the attainment of their highest economic and social values.

Cord - A standard cord is a stack of cut wood 4 feet high, 4 feet wide, and 8 feet long. The dimensions of a face cord are 4 feet by 8 feet but composed of sticks under 4 feet long (commonly 12, 18, or 24 inches).

Crop Tree - A tree identified to be grown to maturity and which is not removed from the forest before the final harvest cut. Usually selected on the basis of its value (quality and species) and its location with respect to other trees.

Crown - The leaves and branches of a tree.

Cubic Foot - A wood volume measurement containing 1,728 cubic inches, such as a piece of wood measuring 1 foot on a side. A cubic foot of wood contains approximately 5 to 7 usable board feet of wood.

Cull - (a) A tree or log of merchantable size but having no market value. (b) A tree or log which is unusable for the intended product and, therefore, not measured. Cull includes such things as rot, crookedness, cavities, and excessive limbiness.

Cutting Cycle - The planned time interval between major harvesting operations in the same stand. The term is usually applied to uneven-aged stands. For example, a cutting cycle of 10 years in a northern hardwood stand means that every 10 years a harvest would be carried out.

Deciduous Tree - A tree which loses all of its leaves at some time during the year (during the winter season in New York). May include some conifers, such as larch.

Defect - The portion of a tree or log which is unusable for the intended product and, therefore, not measured. Defects include such things as rot, crookedness, cavities, and excessive limbiness.

Dendrology - The study of the identification, habits, and distribution of trees.

Diameter Breast Height (DBH) - Tree diameter measured 4½ feet above ground level (the established standard place to measure tree diameter).

Environment - The prevailing conditions which reflect the combined influence of climatic, soil, topographic, and biological (plants and animals) factors present in an area. Environmental factors are extremely important in determining how well a particular species will grow in a given area.

Even-Aged Forest - A forest in which all of the trees present are essentially the same age (within 20 years). This is in contrast to an all-aged (uneven-aged) forest.

Forest (or Woodland or Woodlot) - A plant community in which the dominant vegetation is trees and other woody plants.

Forestry - The science, art, and practice of managing trees, forests, and their associated resources for human benefit.

Girdling (or Frilling) - Completely encircling the trunk of a tree with a cut that severs the bark and cambium (active growing layer of cells) and usually penetrates into the sapwood to kill the tree by preventing the movement of food materials. It is sometimes necessary to add oil, such as kerosene, or a chemical to deaden trees, especially beech trees.

Grading - Evaluating and sorting trees, logs, or lumber according to quality and value.

Harvesting - (a) In general use, removing all or portions of the trees on an area. (b) Technical definition: A harvest cut is the removal of trees on an area to obtain income, to develop the environment necessary to regenerate the forest, or to achieve some special objectives such as the development of special wildlife habitat needs. Harvesting is in contrast with intermediate cuttings.

Hardwood - A term used to describe broadleaf, usually deciduous, trees such as oaks, maples, ashes, and elms. It does not necessarily refer to the hardness of the wood.

Heartwood - The inner core of a woody stem, wholly composed of non-living cells and usually differentiated from the outer sapwood by its darker color.

High-Grading - The removal from the stand of only the most valuable trees; often confused with selection cutting. High-grading usually reduces stand quality seriously, and is not recommended.

Knot - That portion of a branch which has become incorporated in the body of a tree stem.

Log - (a) A piece of the woody stem of a tree. (b) The trunk portion of a tree. (c) A unit of measurement of a merchantable tree stem section 8, 16, or 32 feet in length.

Log Rule - A device, usually presented in tabular form, which expresses log volume content based on log diameter (inside the bark of the small end) and length.

Marking - Selection and indication, usually by blaze or paint spot, of trees to be cut or retained in a cutting operation.

Non-commercial Cutting - A cutting which does not yield a net income, usually because the trees cut are too small, poor quality, or not marketable.

Preservation - (a) As applied to wood, the treatment of wood products to prevent damage by insects or decay organisms. (b) With respect to land, the practice of attempting to maintain a natural environment undisturbed by the influence or activities of humans.

Pruning - The removal of live or dead branches from standing trees. With forest trees, pruning is generally done along the trunk to remove the side branches (which cause knots in the wood) to produce a higher quality wood (knot-free).

Pulpwood - Wood cut primarily to be converted into wood pulp for the manufacture of paper, fiberboard, or other wood fiber products.

Punky - A soft, weak, often spongy wood condition caused by advanced decay.

Release Cutting (or Cleaning) - A cutting operation carried out to release young trees (seedlings or saplings) from competition with other trees of the same size (termed a cleaning) or larger and overtopping trees (termed a liberation cutting).

Roots - That portion of the tree which is generally underground and which functions in nutrient absorption, anchorage, and storage of food products. There are several general types of roots including: (1) Tap Root - A strong central descending root with lateral roots branching off horizontally; typical of species such as black walnut, white oak, and some pines. (2) Heart-shaped Root - Consists of several large roots descending at various angles into the soil with smaller roots branching from these. Produces heart-shaped root mass which is broadest near the soil surface but which penetrates a considerable distance into the soil; typical of species such as beech and maple. (3) Flat Root - Consists of several large roots which extend out nearly horizontally with smaller roots branching from these. This produces broad, flat, shallow root systems typical of spruce, hemlock, and trees growing in poorly drained soils, or soils where the water table is close to the soil surface.

Rotation - The number of years required to establish and grow trees to a specified size, product, or condition of maturity.

Sapling - Small trees, often less than 20-30 feet tall.

Sapwood - The outer region of a woody stem containing some living cells and functioning primarily in water movement and food storage.

Sawtimber - Trees that will yield logs suitable in size and quality for the production of lumber. In New York, hardwoods must generally be over 16 inches in diameter at breast height in order to be considered sawtimber.

Scale Stick - A flat stick, similar to a yardstick, which is calibrated so log volumes can be read directly when the stick is placed on the small end of a log of known length.

Seasoning - The process of drying lumber or other forms of wood for better utilization by natural (air-dried) or artificial (kiln-dried) processes.

Slash - Residue left on the ground after logging, pruning, or other forest operations including tree tops, branches, and bark.

Snag - A standing dead tree without leaves and most branches, or a standing section of the stem of a broken off tree. Considered valuable to wildlife as either a perch or nesting site.

Sprout (or Sucker) - A tree that has grown from the base, stump, or root of another tree.

Stand - A grouping of trees occupying a given area and sufficiently uniform in composition, age, and condition so as to be distinguishable from the forest on adjoining areas. A forest stand is said to be pure if 80% or more of the trees present are of the same species. If less than 80% of all trees present are of the same species, the stand is said to be mixed.

Stumpage - The value of a tree or group of trees as they stand in the woods uncut (on-the-stump).

Urban Forestry - A new field, developed in 1970's, concerned with management of urban trees, parks, and green spaces for a better environment.

Veneer - A thin sheet of wood cut on a veneer machine and often used for plywood facing; requires big, high quality logs.

Volume Table - A table which estimates the volume of wood contained in a standing tree based on measurements of the tree, most commonly diameters measured at breast and merchantable heights.

Wilding - A seedling naturally reproduced outside of a nursery used in reforestation.

Windfall - A tree uprooted or broken off by wind.

Wolf Tree - A tree which occupies more space in the forest than its economic value justifies. Usually a tree which is older, larger or more branchy than other trees in the stand. These trees represent a positive value to a variety of wildlife.

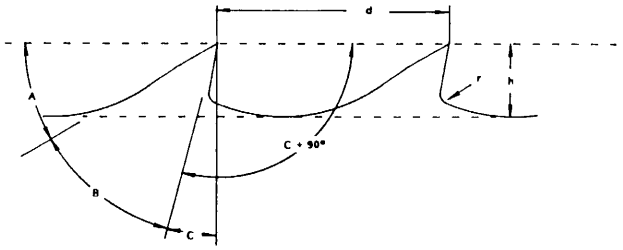
Wood Pulp - Mechanically-ground or chemically-digested wood (composed primarily of wood fiber) which is used in the manufacture of paper, fiberboard, and other products.

SECTION 2.1

BLADE THEORY AND TERMINOLOGY

If any one area of our sawmill can determine the success or failure of a cutting operation, it's the blade. Because of this, a clear understanding of both definition and theory about bands is essential. What we have found to be the most productive has not always matched what the textbooks say. For the most part, we believe this is due to the low horsepower and narrow width of our blades when compared to larger production band mills. Below is a summary of our best current understanding of blades used with the Wood-Mizer®.

Tooth shape characteristics



The shape of the tooth line is determined by the following characteristics:

d = Pitch (tooth space)
h = Depth of gullet (tooth height)
r = Root radius
A = Clearance angle (topping angle)
B = Tooth angle (tooth point angle, sharpness angle)
C = Hook angle (hook)
C + 90° = Breast angle
A + B + C = 90°

PITCH

The teeth per inch on a bandsaw blade is called its pitch. The pitch of the Wood-Mizer® blade is 1.33 (or 3/4" tooth spacing.) The smaller the pitch, the more stress or load on each tooth. A larger pitch results in a smoother sawn surface. The pitch is not part of the tooth geometry that is changed on the Wood-Mizer®.

DEPTH OF GULLET (TOOTH HEIGHT)

The area between teeth that carry sawdust out of the cut is called the gullet. The gullet of the standard Wood-Mizer® blade has proven to be adequate to carry enough sawdust under most cutting conditions. The gullet is determined by the shape, pitch, and height of the saw teeth and needs to be large enough to carry away all sawdust produced. If the space of the gullet is too small, the sawdust is forced out at the side of the blade into the kerf. This increases the friction between the blade and the wood, resulting in heat, sap build-up on blade and increased power consumption. If the blade is sharpened several times, the tooth height will decrease which will result in a gullet area too small to carry the sawdust. Too short a tooth will also result in the inability to set the teeth. To overcome this, the gullet should be ground slightly deeper when tooth height becomes less than 3/16".

CLEARANCE ANGLE

The clearance angle is the angle at the top of the tooth. This angle extends long enough down the standard Wood-Mizer® blade that it should not need to be ground during the normal life of our blades. It is generally understood that this angle should never be less than 5° and can be as large as 30°. If this back clearance is insufficient, the back of the tooth in the tip region will press against the wood, causing a rubbing action that will overheat and cause early dulling of the blade. The higher the feed rate, the higher the required clearance angle.

TOOTH ANGLE

The tooth angle determines the strength of the tooth. Using the standard clearance angle and recommended hook angle of 10° to 20°, the Wood-Mizer® blade is within the recommended 45° to 75° range.

HOOK ANGLE

The hook angle is the number of degrees that the tooth face leans forward of 90°. Hook angle and tooth set are the two most critical factors in cutting ability. Both will have a decisive effect on cutting quality and production capabilities. The proper hook angle is determined by the type of wood and the intended feed speed. The generally accepted rule is that softwoods require a greater hook angle than hardwoods. Generally, the smaller the hook angle is, the slower the cutting capacity of the mill will be.

The object of the hook angle is for the teeth to "hook" themselves into the timber to remove a certain amount of wood so that the blade feeds itself into the log. If the hook angle is too great in relation to the feed, the blade will "pluck" and attempt to move forward in the cut. This results in chatter, a coarse cut, and poor cut quality. This slow feed speed doesn't allow the teeth to fill their function and the tooth points will develop a rubbing action, resulting in premature dullness. If the hook angle is too small, the blade must be forced into the log in order to make the saw cut. This creates side deflections in the blade and will also cause a rubbing action that will wear the teeth faster.

Recommended hook angles are 15° to 20° on softwoods, 10° to 15° on hardwoods. In theory you should use less of a hook angle when cutting wider boards because of the slower feed rate.

FACE ANGLE

The face angle is the angle of the tooth face in relation to the body of the blade. This angle should remain at 90° for all teeth to pull sawdust forward out of the kerf. This is critical to getting a good cut and the primary reason for sharpening new blades. A new blade is sharpened before it is set, which turns the face angle out as much as 7°. Grinding a blade on a properly aligned sharpener will true all the teeth to 90°.

TOOTH SET

The tooth set is measured as the distance that a tooth is bent in relation to the body of the blade. The further a tooth is set, the wider the cutting path of the blade. Wider sets require higher horsepower. A nominal set of .075 + or - .015 is good for most woods. This translates to each tooth being set to .020 (.020 left + .020 right + .035 material thickness = .075 total set). Remember that as you sharpen your teeth, the set will decrease and require resetting as the tooth is ground shorter. Softwoods can require a wider set than hardwoods with total set not to exceed .090.

CRITICAL BLADE SHARPENING AREAS

-If the saw teeth require setting, always clean the blade, set, then equalize before sharpening.
-Be certain that the tip of the tooth has at least 1/8" flat face ground to a hook angle between 10° and 20°.
-Do not grind any more metal than required to regain a new, clean cutting face from tip of tooth to gullet radius.
-If you grind too little amount on a new blade, you'll notice black areas on face of tooth; never leave black on tip.
-If you grind too little on used blade, it's possible not to remove rounded or dull tip of tooth.

SECTION 2.2

TOOTH SETTER OPERATING INSTRUCTIONS

The optional tooth setter is a simple, hand-held tool. It is designed to quickly put a set on the teeth of a bandsaw blade. Proper use will allow you to set the teeth as accurately as a stationary setter costing hundreds of dollars.

The blade supplied with the sawmill has a raker style set in the teeth. If you would look down at a blade standing on edge, the teeth will be set in a repeating center, left-right sequence. **(See Figure 1.)** The teeth that are set left and right do the cutting. The straight tooth is a raker tooth that helps clear the cut of sawdust. The tooth setter will put a precise set or bend in the left-right teeth. The total width at these farthest two points should be .055 to .075 for most woods. Teeth will typically need to be set every second or third sharpening, but we suggest visually checking the blade between each sharpening. The blade should be reset before equalizing, and resharpening, not after.

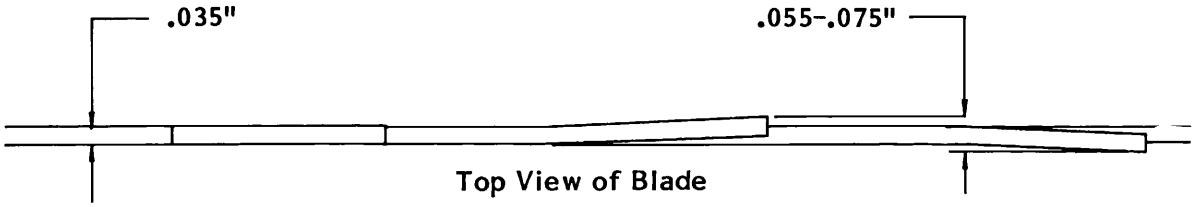


FIGURE 1

The amount of set in the teeth is determined by the adjusting screw of the setter. **(See Figure 2.)** The fine tuning of this adjustment is fairly simple to accomplish, even without a dial caliper. Each tooth will spring back when squeezed so they are actually deflected beyond their maximum set when clamped by the setter.

NOTE: When using equalizer, teeth should be set slightly more than half set to allow equalizer to flex the teeth back.

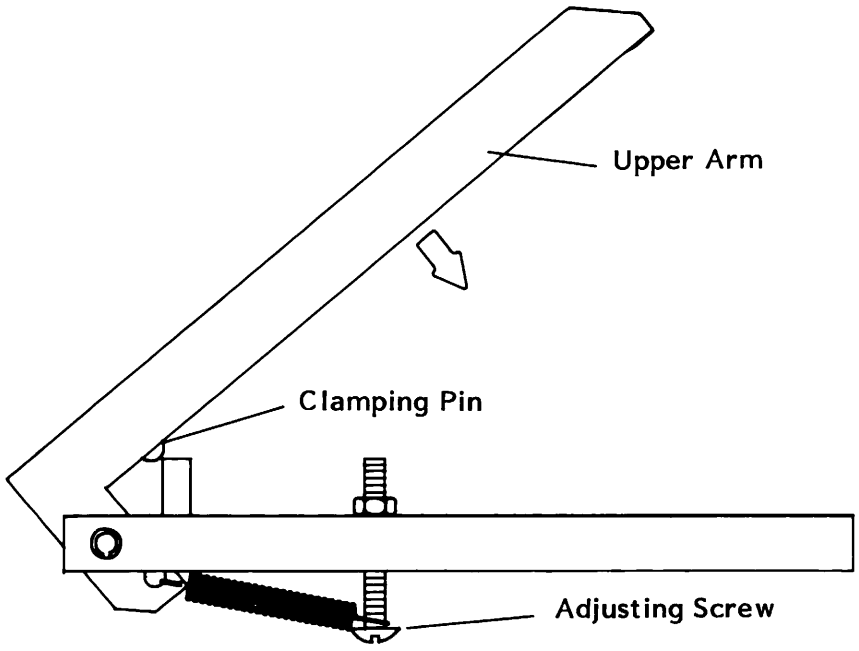


FIGURE 2

TO SET THE TEETH IN YOUR BLADE

Locate the weld in the blade. The weld is often a different color with grind marks on it. If you can't find the weld, mark the blade with tape or ink at one point.

Locate the first tooth from the weld or mark that is set in an upward direction with the blade setting flat on your lap. Lay that tooth across the horizontal hardened pin in the setter **(See Figure 3)** and squeeze. Before you set any additional teeth, fine-tune the adjustment of your setting tool. The tooth you set should look like the one in **Figure 4.** Approximately one-half of the tooth thickness (or slightly over half) should be extended over the side of the blade. The material of the blade is .035 thick, so if both left and right teeth extend over the side of the blade by 1/2 their thickness, the total width of the kerf would be .070. Certain woods with high sap content can cause a sap build-up on the side of the blade. In these instances, a wider set is required. A total kerf of more than .090 is not required or recommended in any instance. Once the tool has been fine-tuned, every third tooth will be set in the same direction. Stop when you get to your weld or mark. To set the teeth that are set in the other direction, turn the blade inside out and repeat.

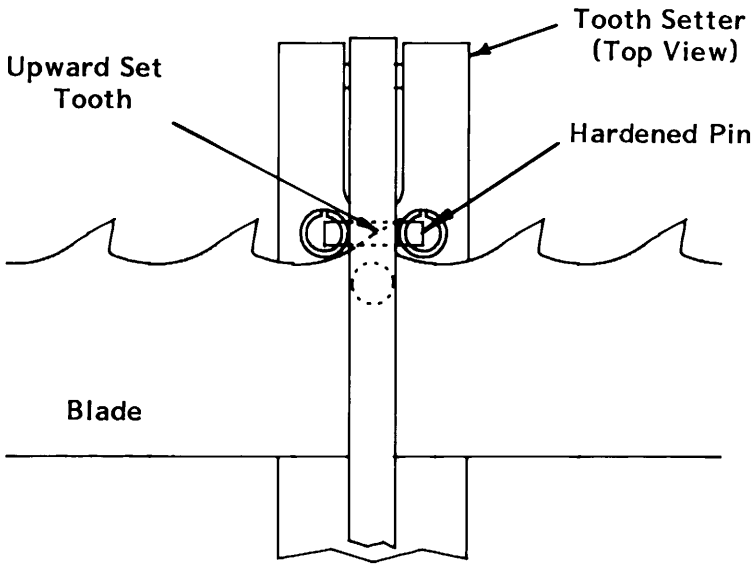


FIGURE 3

FIGURE 4

SECTION 2.3

LTEQ SET EQUALIZER INSTRUCTIONS

The LTEQ Set Equalizer is designed to be used after your blade has been set with the LTSF Toothsetter. The equalizer will press the teeth in to ensure an even set in each tooth. The equalizer can be hand-held or mounted to the LTADS Blade/Chain Sharpener as shown in the following instructions.

TO ASSEMBLE EQUALIZER TO SHARPENER:

1. Loosen the hand knob underneath the sharpener's swivel base. Slide the open slot in the equalizer handle around the hand knob stud until the stop fits against the front lip of the sharpener base as shown in **Figure 1.**

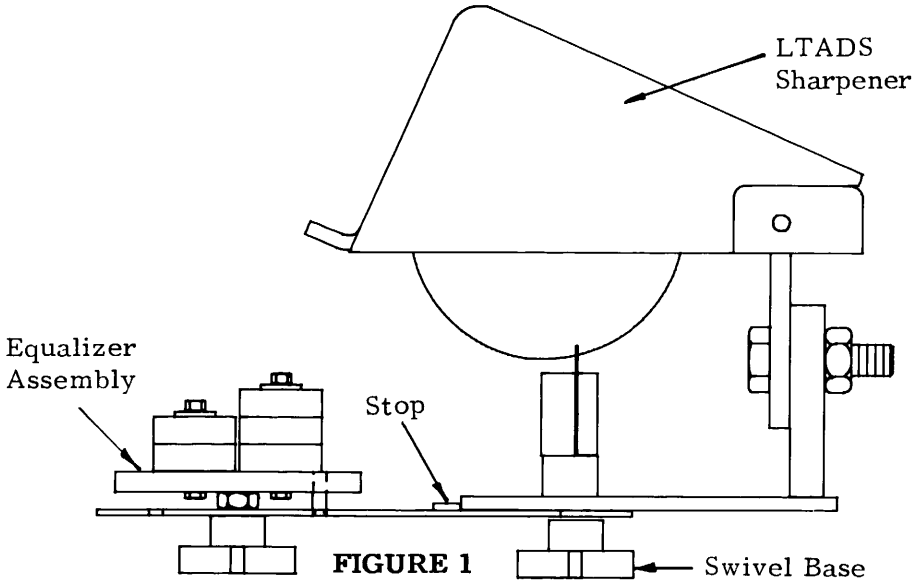


FIGURE 1

TO USE EQUALIZER:

NOTE: The set equalizer is to be used in conjunction with the tooth setter. The blade must be set heavier than the desired final kerf as the equalizer will press the teeth back approximately seven thousandths of an inch (.007) per side. In other words, if the desired final kerf is .075, then the blade should be set to .089 before equalizing. A .095 kerf is produced when the tooth is set roughly the thickness of the blade itself. Under normal cutting conditions, the set should be adequate for two or three sharpenings before it is necessary to re-set and re-equalize the blade.

The equalizer is pre-set and ready to use when received.

The blade **MUST BE CLEAN** or the equalizer **WILL NOT WORK.**

2. If it is necessary to set and sharpen the blade, always set the blade first, equalize second, and sharpen last.

3. Lay uncoiled blade on sharpener blade supports, teeth up.

LTEQ SET EQUALIZER INSTRUCTIONS - cont'd

4. Place the blade between the two stacks of rollers on the equalizer. Start with the weld as a reference. Pull the blade through the rollers so that the cutting face of the teeth enters the equalizer first as shown in **Figure 2.** Pull the blade through two complete revolutions.

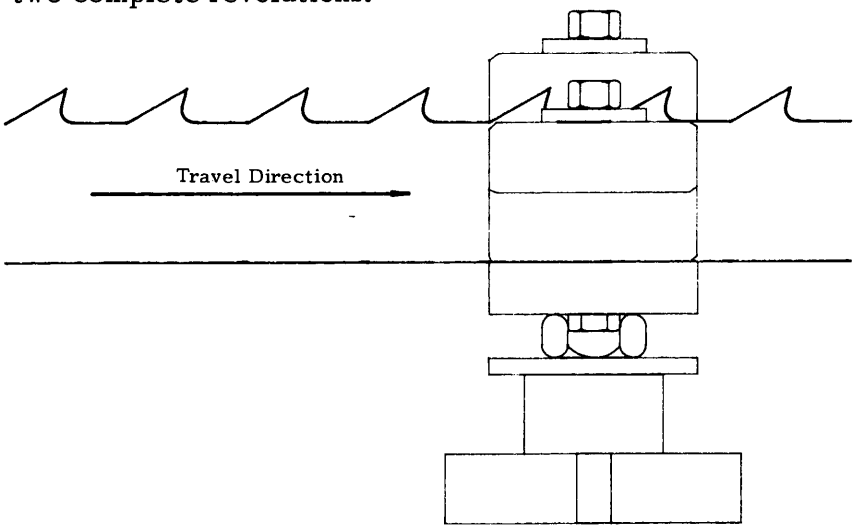


FIGURE 2

5. To equalize the other side of the blade, simply lift the blade out of the rollers and loosen the hand knob found on the underside of the equalizer. Lift the pin out of the hole it is currently sitting in and rotate around until it locates in the opposite hole **(See Figure 3).** Re-tighten hand knob and re-insert blade. Follow same steps as before to set second side of the blade.

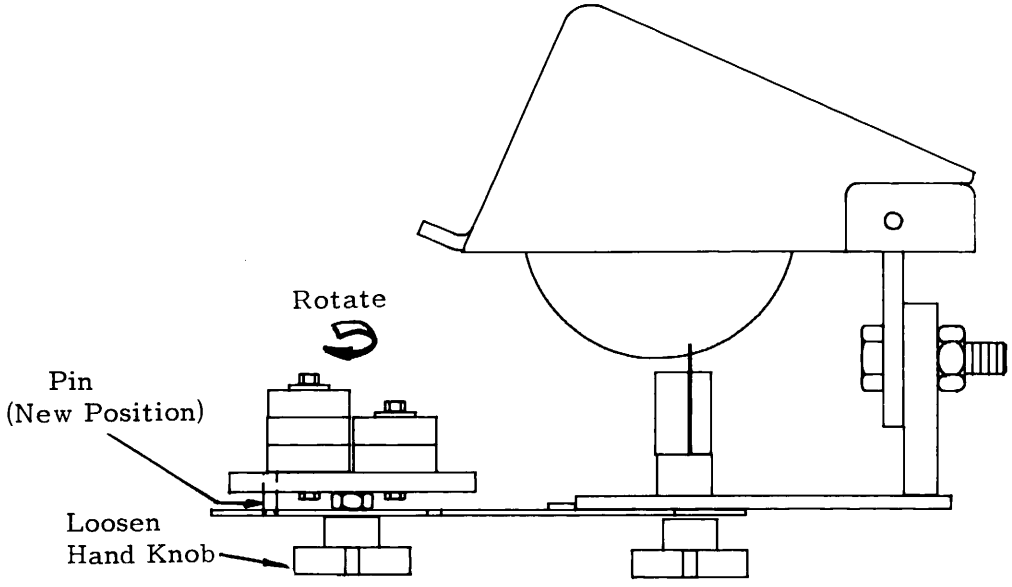


FIGURE 3

6. Remove the equalizer from the sharpener when equalizing is completed.

NOTE: If the gap between the two stacks of bearings changes from the factory pre-set adjustment, a minor change will be necessary. Proper adjustment is when the blade will run through easily yet the bearings rotate as the blade is pulled through.

SECTION 2.4

MODEL LTADS ASSEMBLY/OPERATING INSTRUCTIONS

The Model LTADS Blade/Chain Saw Sharpener is shipped completely assembled except for the grinding wheel installation and the blade support system.

ELECTRICAL HOOK-UP

The Model LTADS Sharpener can be powered in two different ways.

1. 115 VAC
2. 12 VDC (From Battery)

1. Using the AC/DC converter provided, plug the standard power cord into a grounded, 15 amp 115 volt receptacle protected by a fuse or circuit breaker. Mount the grinder per the mounting instructions. Plug the Model LTADS grinder into the pigtail socket of the AC/DC converter. The switch on the grinder will start and stop the motor.

2. When using the LTADS in the field with the Wood-Mizer® Model LT20, use the provided socketed pigtail with the battery clips. Attach the clips to the terminals of a car or truck battery per **Figure 1.** Plug the grinder lead into the pigtail socket. Check the grinding wheel rotation direction. Rotation of the grinding wheel should be counterclockwise when viewed from the shaft end of the motor. If direction is wrong, reverse the two clips on the battery.

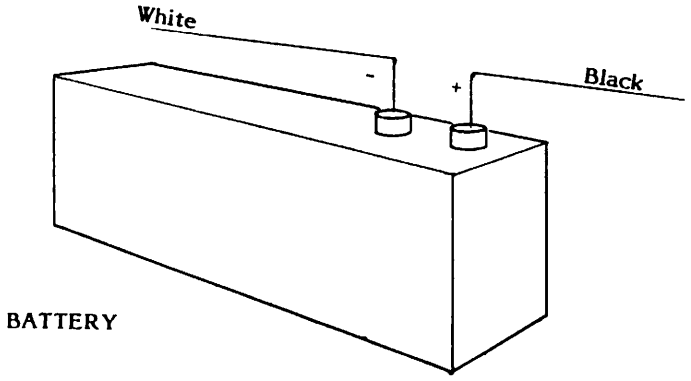


FIGURE 1

MOUNTING INSTRUCTIONS

To use your Model LTADS Sharpener, mount the grinder solidly on a bench or table, using the two mounting holes in the grinder base. **(See Figure 2.)** The two mounting holes should be no more than 1" back from the front edge of the bench to allow for clearance when sharpening a chain blade. The two "J" hooks, washers and wing nuts provided can be used or 3/8 bolts may be substituted. To use the grinder for Wood-Mizer® blade sharpening, mount the grinder so there is at least 32" clearance to the rear and to each side of the grinder to allow the blade to lay properly for grinding. Thread the three support tubes into the tapped holes located near the bottom of the vertical portion of the grinder base. Be sure the support tubes are seated against the base plate. Slide the blade supports onto the tubes as shown in **Figure 2A.** The blade supports should be 1" from the ends of the right and rear tube and 2½" from the end of the left tube. (Minor adjustments may be necessary for maximum freedom of circular travel of the bandsaw blade.)

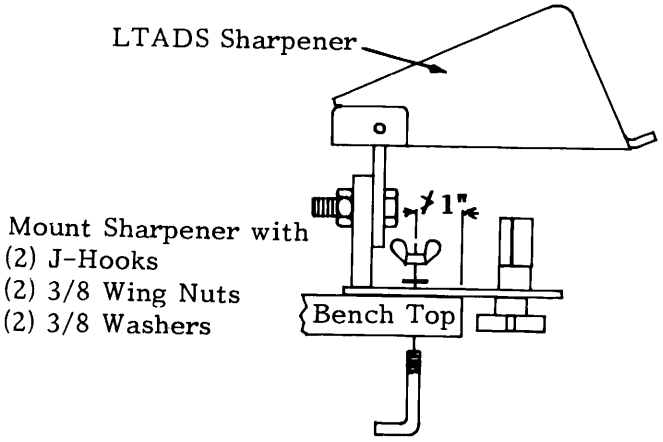


FIGURE 2

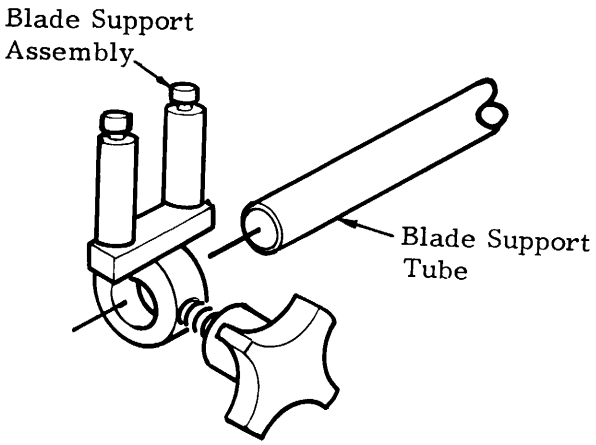


FIGURE 2a

Chainsaw blades can be sharpened in either of the above setups. If additional portability of the grinder is required, the grinder can be mounted by the user to suit his application.

GRINDING WHEEL INSTALLATION

Select the grinding wheel to be used. The proper size wheel is 5" in diameter by a 1/2" bore. (We recommend the 1/8" or 3/16" wide wheel for Wood-Mizer® blades and most chainsaw blades. The 1/4" wide wheel is used to deepen (gum out) the gullet, when required. **See Step 11** of the Sharpening Instructions for Bandsaw Blades.)

GRINDING WHEEL INSTALLATION - cont'd

CAUTION: Check the grinding wheel before using it for cracks or chips. If the wheel is cracked or chipped **DO NOT USE IT.** Do not use the wheel any further than the edge of the blotters. Removal of grinding wheel while transporting could prevent cracking or breakage due to jarring or bumping of unit.

Remove the right side cover from the grinder head by removing the wing nut. Remove the knurled knob from the motor shaft. Slide a wheel blotter on the shaft, then slide the selected wheel in place. Slide a second wheel blotter on the shaft and replace the knurled knob, flanged side towards the grinding wheel and hand tighten. Replace the cover and wing nut. Prior to grinding, check that the grinding wheel rotation is counter-clockwise when viewed from the shaft side.

SHARPENING INSTRUCTIONS FOR BANDSAW BLADES

ALWAYS WEAR EYE PROTECTION WHEN USING THIS EQUIPMENT

REFER TO SECTION 2.1 OF MANUAL FOR SPECIFIC INFORMATION ON BLADE TERMINOLOGY

1. Set the tooth face angle scale at 0. **(See Figure 3.)** The zero on the scale should also line up with the 0 mark that has been punched into the base plate. As the wheel wears, the blade clamping blocks may be moved away from the operator to keep the blade directly under the center of the grinding wheel. (The other marks are for grinding Micro or Super [Round File] Chisel type chain).

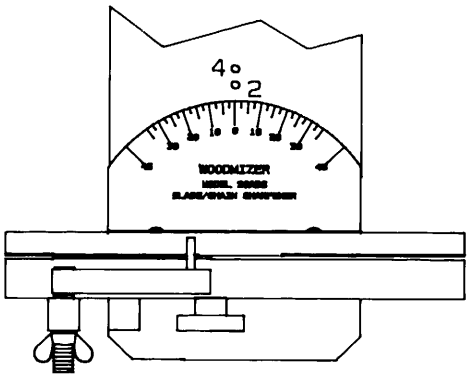


FIGURE 3

2. Set the hook angle by using the indicators at the back of the throat. **(See Figure 4.)** The numbers and hash-marks indicate how many degrees the grinding head is tilted for hook angle. Set the hook angle gauge with the same line on the base plate as the face angle gauge. (As a general rule, we use 10° hook angle and nominal set for hard woods and up to 15° hook angle and heavier set, up to .085 for the softer woods.) Make sure base rule and face angle gauge is set on 0°. **(See Figure 3.)**

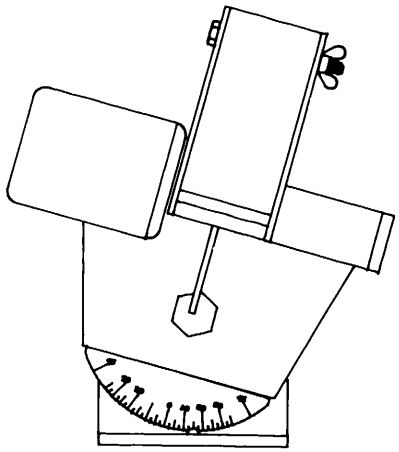
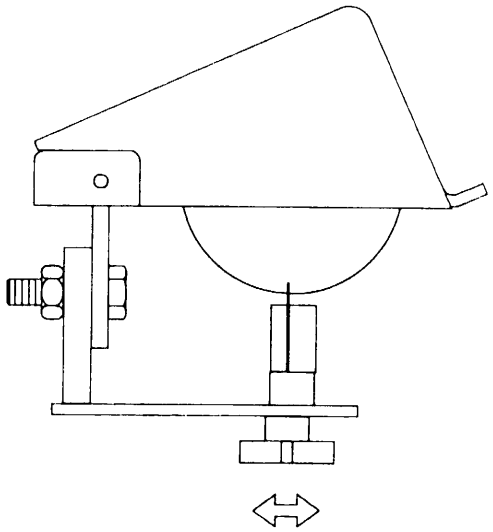


FIGURE 4

3. Remove 16 gauge shim from between clamping plates during setup steps. Set the blade into the clamping plates with the teeth of the blade facing to the right. Lay the blade in the roller supports. (Teeth should be pointing to the right.)

4. Position the blade so the first tooth right of the weld is positioned at the front of the machine. Position blade clamping plate so that wheel's lowest point contacts blade gullet. To make this adjustment, loosen the star screw knob under the unit. **(See Figure 4A.)**



CENTER WHEEL OVER BLADE

FIGURE 4A

5. Position the blade so the wheel can contact the flat of a tooth gullet and adjust the depth setting to that level. (Depth setting knob located on top of the machine.)

6. Set the clamping plate spacing at a point where the blade is held straight, yet still slides easily right to left.

7. Position the first tooth right of the weld so the wheel will lightly touch new metal on the length of the tooth face. Dress the profile of the grinding wheel to match the profile of the first tooth. **(See Figure 5.)** After dressing the stone, grind that tooth just enough to regain a point on the tooth, leaving the gullet the same or possibly a little deeper. **(See Figure 5A.)** If you are grinding your gullet deeper, the stone must be reshaped to keep from making an inconsistent gullet which will lead to premature breakage of the blades. (An inconsistent gullet is when the stone grinds below the level of the gullet.) This is a condition that will enhance premature blade breakage. A very sharp-cornered gullet will also lead to premature breakage. **(See Figure 5B and Step 11.)**

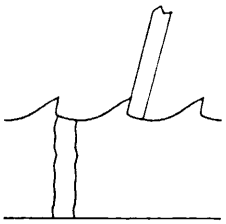


FIGURE 5

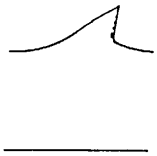


FIGURE 5A

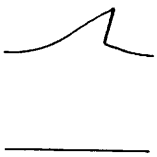


FIGURE 5B

8. Turn the machine off and flip the indexing pawl down and slide the blade to the left until the pin lays in front of the tooth that was just ground. (The bolt that the pawl pivots from should be in the lower pivot hole.) **(See Figure 6.)** The upper pivot hole is for sharpening chain saw blades. The pawl itself should be located such that the roll pin is pointing away from the operator and extending approximately 1/8" beyond the blade. Use the wing nut to

lock the pivot bolt in position. Using the thumb bolt adjusters (front left of the machine), set the alignment pawl so that when the blade is pulled to the right, the pin against the ground tooth locates the next tooth to be ground in its proper position. The proper position will be a point where you lightly contact metal across the face (like in the first tooth you ground), but enough to regain the tooth point. Taking too much of a grind will shorten the tooth height, burn the tooth and shorten overall blade life.

9. Replace the 16 gauge shim between clamping plates. This will allow you to completely tighten the fixture, yet still allow the blade to slide freely. Sharpen each tooth by sliding the blade to the left until the indexing pin falls in front of the tooth just ground, pull (or push) the blade to the right (until held against the pin) and grind the tooth by pulling down the head. Repeat. Grind each tooth face until the weld is again in the front, showing that you have gone completely around the blade. (Some blades have more than one weld. Never use index across weld, use the freehand method).

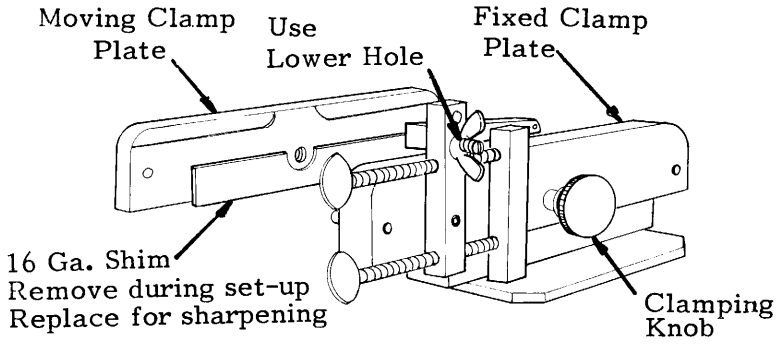


FIGURE 6

10. After a few blades have been ground, depending on how dull the blade is, the grinding face of the wheel may be worn away. **(See Figure 7.)** Rather than dress off large quantities of the wheel, the wheel may be reversed on the arbor and re-dressed, cutting away only a small amount of the wheel.

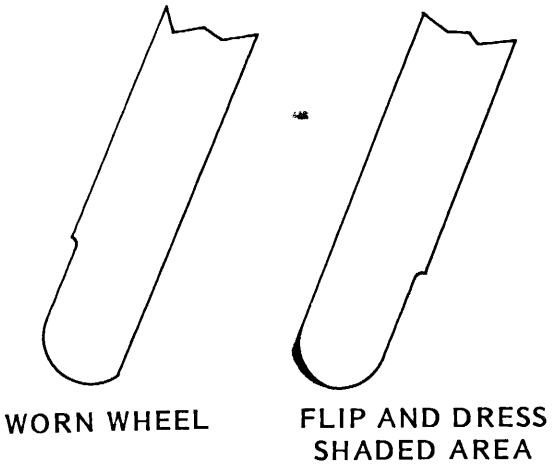


FIGURE 7

11. After a blade has been sharpened several times, the tooth gets too short to set properly. With this machine it is possible to "gum out" the blade to regain original tooth height (¼") by lowering the depth setting and grinding away material across the gullet, again making sure the wheel is dressed properly to avoid any inconsistency in the gullet. The ¼" wide grinding wheel should be used during the gumming process due to the heavy grinding being done.

12. The spring action of the grinder head may be made stiffer by tightening the nut on the back side of the machine, and vice versa.

NOTE: SOME BLADES DO NOT HAVE CONSISTENT TOOTH SPACING. If while grinding you notice the grind starting to become heavy, simply slide the blade slightly beyond the index pawl to re-establish a proper grind of the tooth. Then proceed as normal. Also, changing index too often will result in uneven pitch.

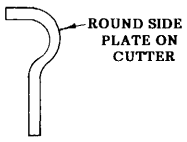
SECTION 2.4

MODEL LTADS ASSEMBLY/OPERATING INSTRUCTIONS - cont'd

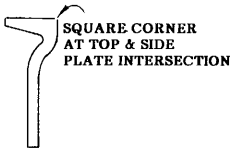
SHARPENING INSTRUCTIONS FOR SAW CHAIN

BEFORE GRINDING SAW CHAIN THERE ARE SEVERAL IMPORTANT POINTS THAT ARE OUTLINED IN THE FOLLOWING PAGES, PLEASE READ THEM BEFORE USING YOUR CHAIN GRINDER.

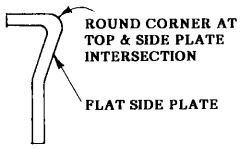
1. Saw Chain Types



A. Chipper Type Chain

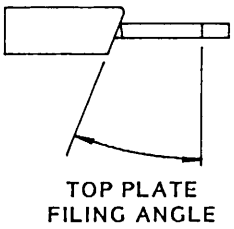


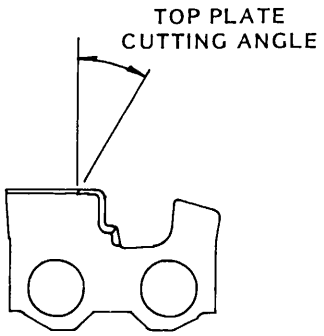
B. Chisel Type Chain

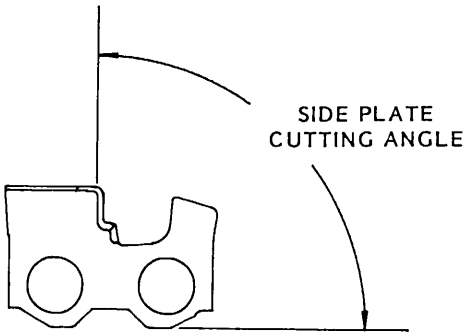


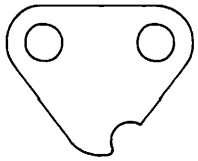
C. Semi-Chisel & Micro Chisel

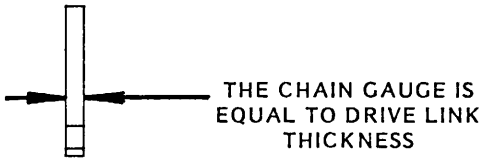
2. Saw Chain Terminology

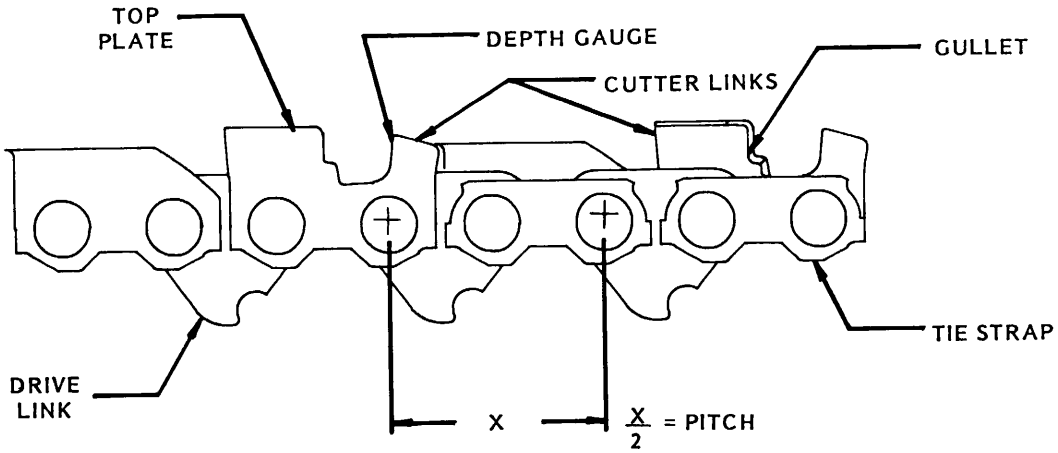












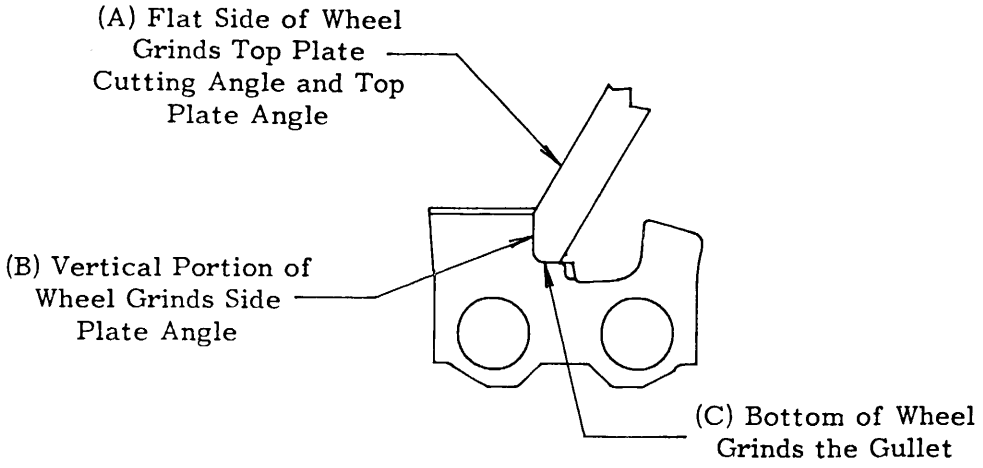
SHARPENING INSTRUCTIONS FOR SAW CHAIN - cont'd

3. Grinding Wheel Dressing (Shaping)

The importance of the grinding wheel form as dressed can only be appreciated when cutting with a saw chain that has been sharpened with a properly dressed grinding wheel versus a saw chain that has merely been ground with an improperly dressed grinding wheel.

The grinding wheel thickness should be approximately the same as the chain manufacturer's recommended chain file diameter.

4. Dressed Grinding Wheel Functions



5. Prepare Saw Chain for Sharpening

A. Remove Saw Chain from bar.
B. Clean Saw Chain in solvent to remove pitch and resin.
C. Inspect Saw Chain for:

Abrasive damage to side plate and top plate cutting edges. The damaged cutting edges should be ground back to completely eliminate damaged portion.

Top plate angle excessively blunt or feathered.

High and low depth gauges and square leading edge of depth gauge.

Side plate angle excessively hooked or backsloped.

6. Select the grinding wheel to be used. The grinder uses a 5" diameter wheel by a 1/2" bore. As a general rule the grinding wheel thickness should be that thickness nearest to or less than the recommended file size.

7. The bolt that the pawl pivots from should be in the upper hole for sharpening saw chain. **(See Figure 8.)** The pawl should be located directly over the chain, and locked in place with the jam nut provided.

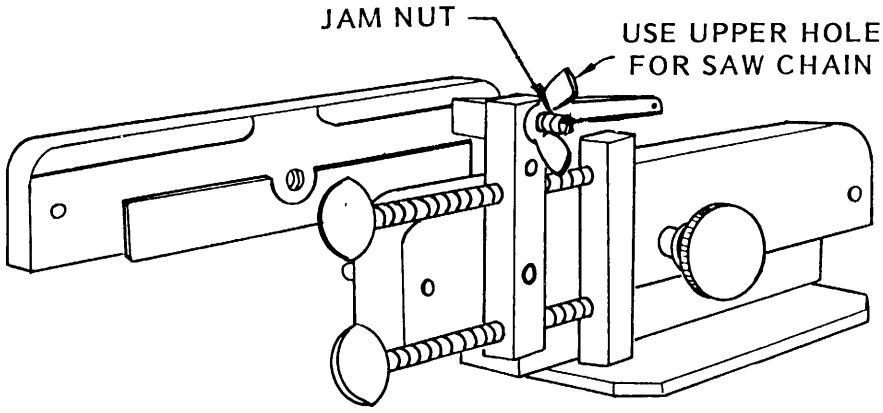


FIGURE 8

8. Make sure the 16 gauge shim is in place between the clamping plates. **(See Figure 8.)**

9. Place the saw chain in the clamping plates with the cutting edge facing to the right.

10. Set TOP PLATE ANGLE by setting the protractor of the clamping plate assembly to the desired angle. **(See Figure 9.)** (We will use 30° for an example.) The clamping plate assembly will be moved from front to back as the wheel wears, to keep the blade in proper placement with the wheel.

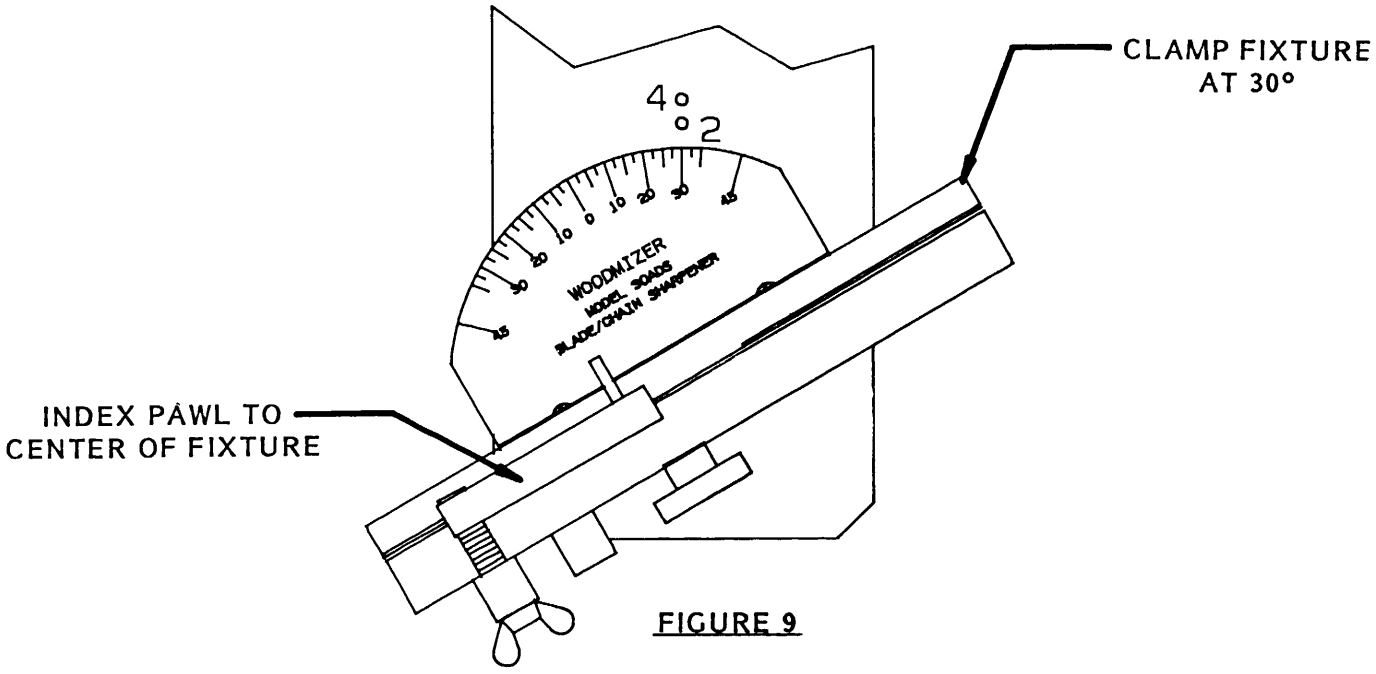


FIGURE 9

11. Set TOP PLATE CUTTING ANGLE by setting the scale on the back of the throat to desired angle. **(See Figure 10.)** (Again we will use 30° for an example.) Follow manufacturer's specifications for recommended angles. This represents degrees this angle tilts past 90°.

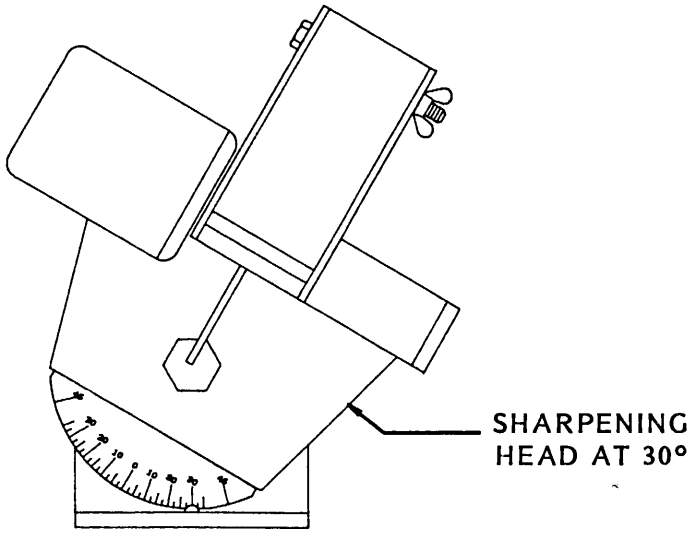


FIGURE 10

12. SETTING OFFSET. The offset allows for the proper Top Plate Cutting Angle to be ground across the full width of the Top Plate of a cutter link. To set offset, move the clamping plates so the cutter link will be located properly under the grinding wheel. (There are offset marks punched in the baseplate of the grinder to be used for reference purposes.) A properly placed cutter link under a grinding wheel is shown in **Figure 11.** (There will be final adjustments of the offset after the grinding wheel has been dressed.)

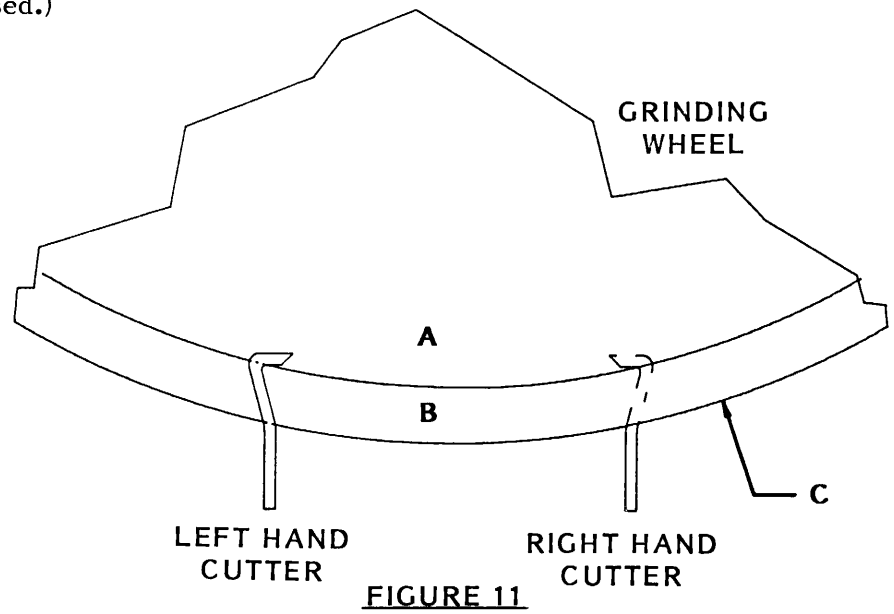


FIGURE 11

13. Set DEPTH OF GRIND. After setting the Top Plate Angle and Offset, set depth of grind. With the chain securely clamped and the motor turned off, pull the motor down until the grinding wheel sets down in the cutter link to the desired depth. Adjust the depth setting to that depth and lock in place with the jam nut. Depth setting knob located on top of the machine. (There will be final adjustments of the depth setting after the grinding wheel has been dressed.)

14. Dress the GRINDING WHEEL. This is one of the most important steps in chain grinding, as the form or shape of the grinding surface of the wheel determines the cutting angles of the chain. **(See Figure 12.) READ THIS ENTIRE STEP BEFORE DRESSING THE WHEEL!**

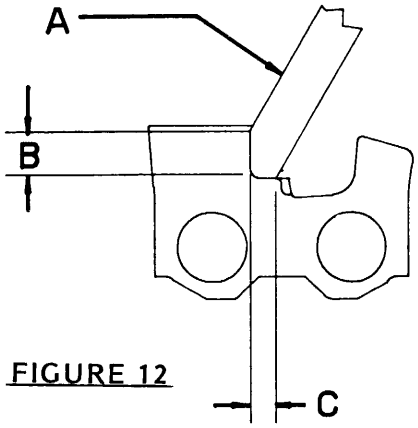


FIGURE 12

Portion "A" grinds the Top Plate Angle and Top Plate Cutting Angle.

Portion "B" grinds the Side Plate Angle.

Portion "C" is used to grind the gullet and to keep it smooth and flat.

To dress a grinding wheel properly, the results and remedies of improper wheel dressing must be known. Using the popular Chisel-type saw chain as an example, **Figure 13** shows the proper angles.

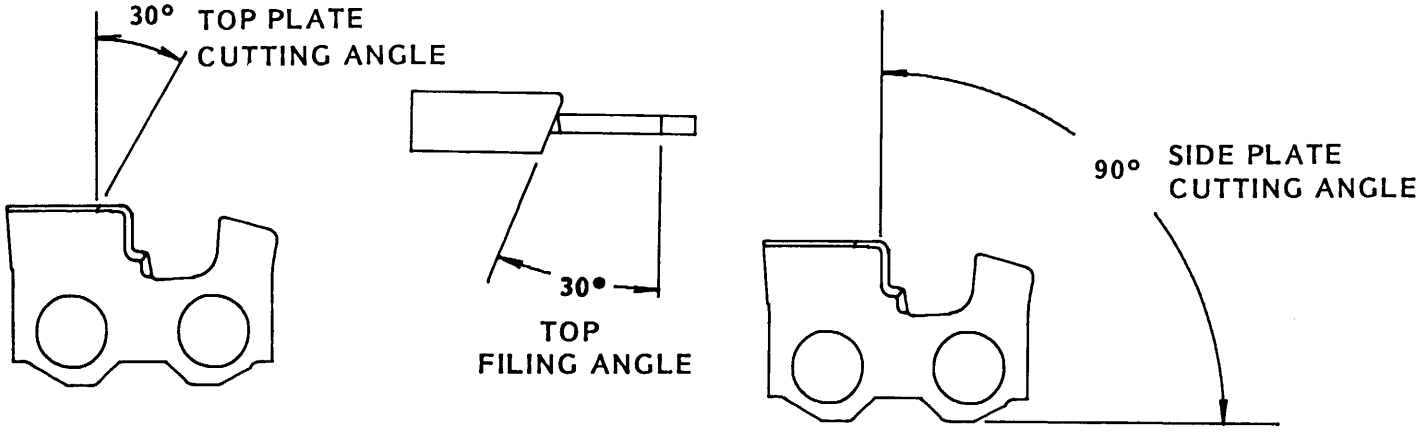


FIGURE 13

RECOMMENDED PROCEDURE FOR DRESSING THE WHEEL:

A. Tilt the cutting head to 30°.

B. Dress section "C" of the wheel by holding the dressing stone horizontal and dress a flat on the bottom of the grinding wheel. **(See Figure 14.)** This is the portion that will grind the gullet area.

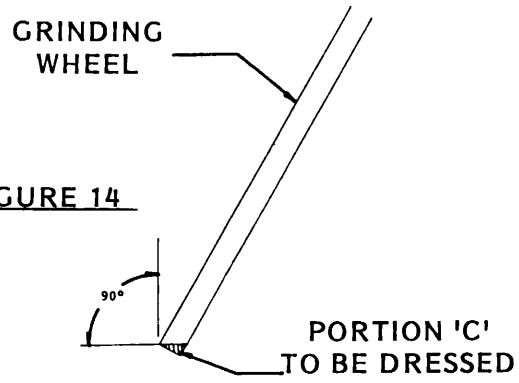


FIGURE 14

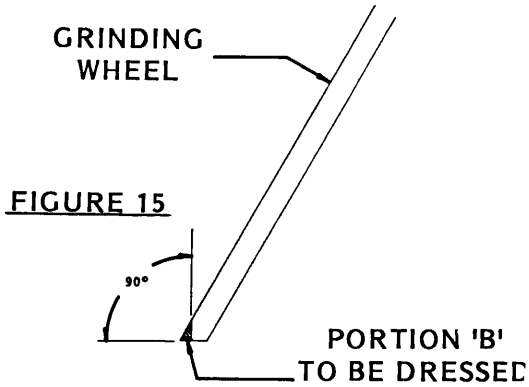


FIGURE 15

C. After obtaining the results shown in **Figure 14,** hold the dressing stone vertical and dress the vertical portion "B" which grinds the side plate angle of the cutter link. **(See Figure 15.)** If you dress the wheel too far at this point, the portion "B" will be too large and will cause the side plate angle to run into the portion "A" and "C" during the grinding process.

Figures 16 through **18** show results and remedies of improper wheel dressing.

Curved or blunt Top Plate Angle caused by worn wheel. **(See Figure 16.)** The radius of portion "B" has worn into the "A" region. To correct, redress the wheel to decrease the size of area "B" on the wheel.

Positive Hook on Side Plate Angle. **(See Figure 17.)** Make sure that portion "A" is grinding only the Top Plate Cutting Angle and not the Side Angle. Make sure portion "B" of the grinding wheel has been dressed vertically.

Negative Hook on Side Plate Angle **(See Figure 18),** caused by the portion "B" of the grinding wheel being dressed with a negative angle. Make sure portion "B" of the grinding wheel has been dressed vertically.

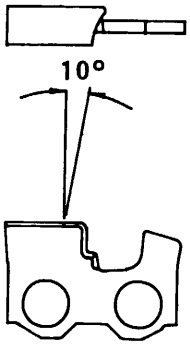


FIGURE 16

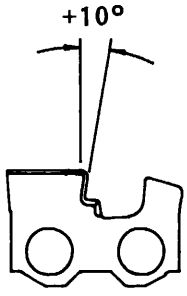


FIGURE 17

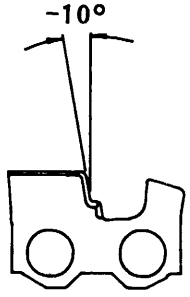


FIGURE 18

15. SET THE INDEXING PAWL. Using the thumb bolt adjuster (front left of the machine), set the indexing pawl to the back side of the cutter that is being sharpened **(See Figure 19),** to a position that will sharpen just enough cutter to regain a new, clean edge. After setting the indexing pawl, return to steps 12 and 13 and **Figure 11** to make the final offset setting and also the correct depth setting to leave a clean, flat gullet.

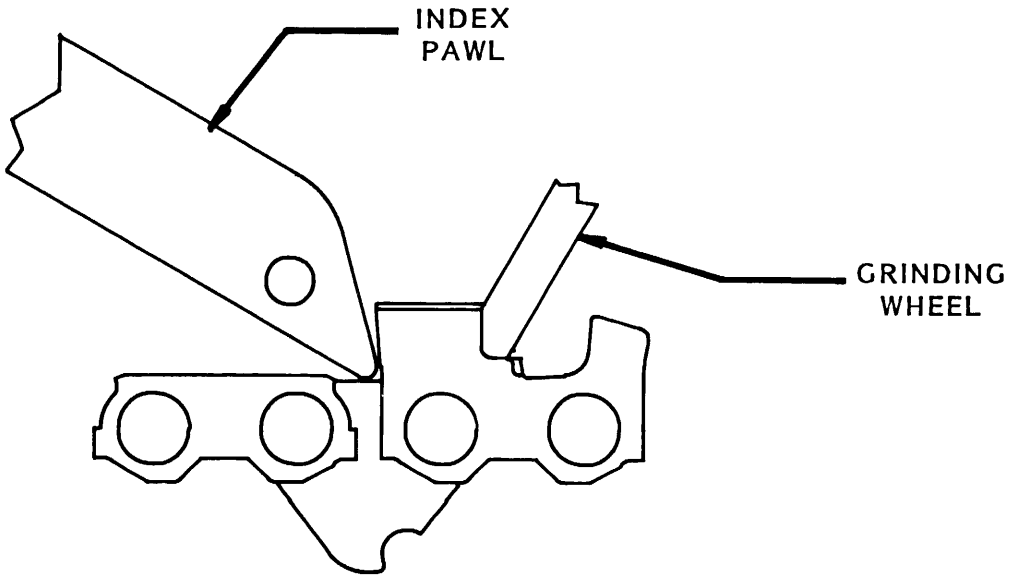


FIGURE 19

16. CLAMPING THE CHAIN. Make sure the shim between the clamping plates is in place. The chain should be clamped when grinding each tooth and released when indexing or when adjusting the indexing pawl.

17. INDEXING THE CHAIN. To index chain (move chain to next cutter to be sharpened), loosen the clamping knob about a 1/4 turn, pull chain to the right until the Index Pawl drops in back of the next similar cutter link to be sharpened. Then pull chain to the left to seat the back of the cutter link against edge of Index Pawl. Clamp the chain into position, grind and repeat until all the right (or left) hand cutters have been ground and then reset the clamping plate angle for the left (or right) hand cutters and repeat. (A small amount of adjustment of the index pawl may be necessary when changing from the right hand cutters to the left hand cutters.)

18. GRINDING THE DEPTH GAUGES. The depth gauges are the part of the chain that regulate how deep each tooth bites into the wood. If the depth gauge is not ground deep enough, the chain will cut slower than it should. If the depth gauges are ground too deep, the chain will become too aggressive. An aggressive blade will tend to get stuck in the cut and also overwork the engine. A blade with properly-ground depth gauges and properly sharpened teeth will actually self-feed into the wood.

SHARPENING INSTRUCTIONS FOR SAW CHAIN - cont'd

Depth gauges should be maintained at the saw chain manufacturer's recommended setting (X). Use a 1/4" grinding wheel with the bottom of the wheel ground flat. Position the clamping plate line directly under the center of the wheel and set the depth of grind to grind the depth gauge level to manufacturer's specifications. Position the depth gauge directly under the grinding wheel and then adjust the pawl to the back side of the tooth. Grind the depth gauges by clamping and indexing as you would during the sharpening process.

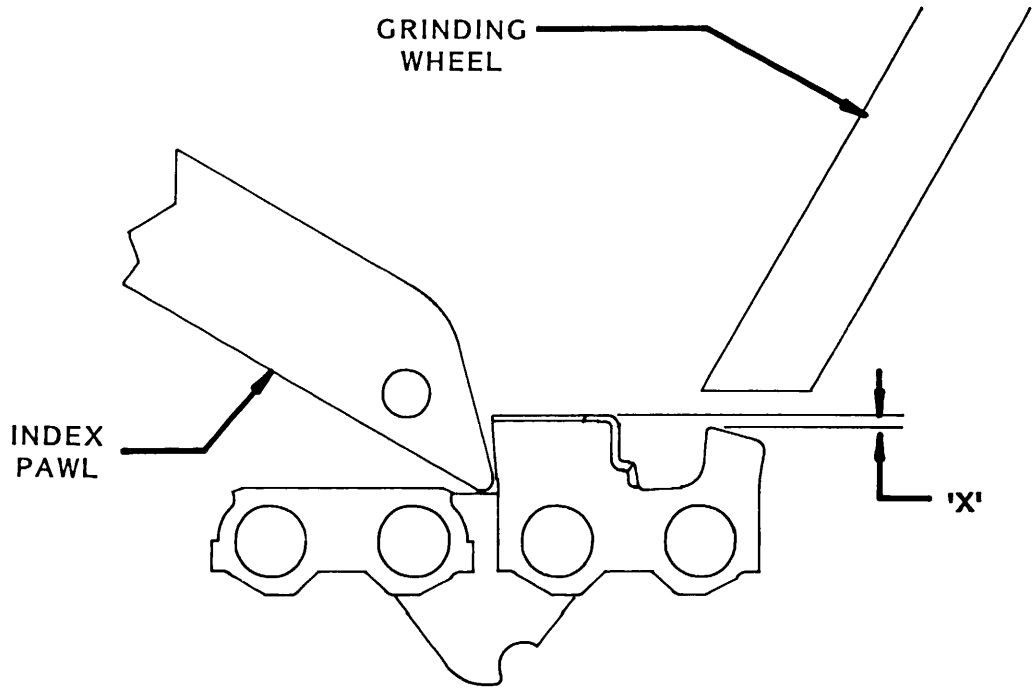


FIGURE 20

When grinding the depth gauge, there must be a radius on the right side of the gauge or the top of the gauge should be ground with a downward angle to the right to prevent the depth gauge from hanging up in the cut by a sharp leading corner.

NOTE: The procedure outlined in this chain saw sharpening manual is just one of many ways to sharpen a chain saw blade. Individual requirements may call for changes to some of the basics of this instruction.

SECTION 2.5

WET-GRINDING SYSTEM

The Wet-Grinding System is simply a system to cool the blade during the grinding process. Cooling the blade during grinding will assure you that the teeth will maintain the hardness that is so critical to cutting time between sharpenings.

Your Wet-Grinding System should include:

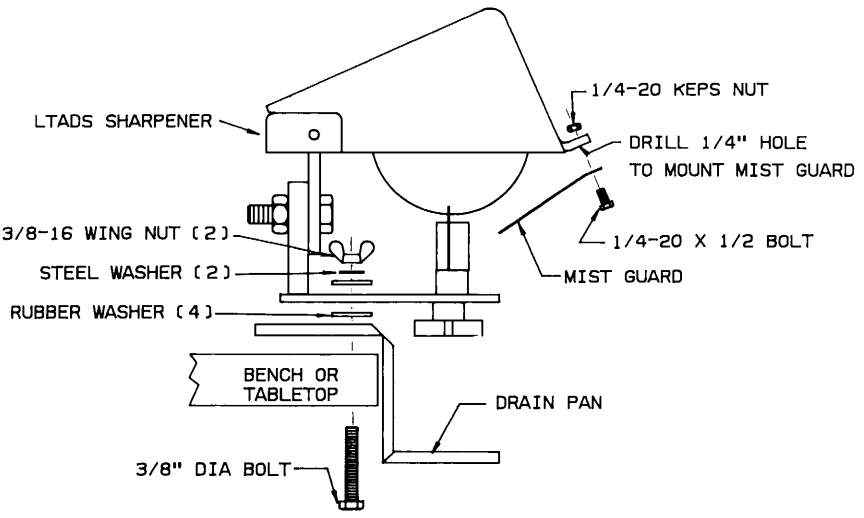
Five-Gallon Water Jug with Needle Valve
Coolant Hose Kit
Drain Pan Assembly
32 Oz. Coolant Concentrate
Bag Assembly:
- (4) rubber washers
- (2) 3/8 SAE washers
- (1) 1/4-20 x 1/2" HHCS
- (1) 1/4-20 Keps nut
- (1) Mist Guard

Assembly:

1. Choose the area where the grinder is to be set up. Set the drain pan over the edge of the bench and mark the bench where the mounting holes are. We recommend mounting the assembly to your bench or stand with 3/8" bolts.

2. Drill a 1/4" hole in the center of the "Handle" on the grinding head assembly, and assemble the mist guard as shown in **Figure 1.**

3. Bolt the grinding assembly to the bench as shown in **Figure 1.**



4. Apply silicon caulk to the eight corners, bends, and drain hole in the drain pan to stop any potential leaks. (Only small amounts of caulk are necessary at the exposed bends in the drain pan, as there is very little water that drains from the upper level of the drain pan.)

5. Assemble the 1/4" male pipe thread fitting on one end of the coolant hose, and the spout on the other end. After assembling the hose, fasten it to the water jug by screwing the 1/4" MPT into the female end of the needle valve of the jug. (A thread sealer may be necessary to prevent leakage.)

6. Coolant Mixture: Fill the five-gallon jug with approximately 4 gallons of water. Add to the water approximately 1/3 of a bottle of grinding coolant concentrate. Set the jug on its side (valve end down) just to the left of the grinding head assembly. (If you are not working on a bench where a jug could be set, lay a board(s) across the blade supports for the jug to set on.) Drain the used grinding fluid into a bucket as it can be reused several times.

7. Grinding: By using the needle valve to control the flow, direct a stream of coolant on the tip of the tooth to insure that the tooth will remain cool during the grinding process. This will ensure longer life between sharpenings. (As the water level in the jug drops, the water pressure will drop also. Open the needle valve as necessary to maintain a constant flow. Refill the bottle with used coolant when the water level reaches approximately one gallon.) Allow used coolant to stand for a period of time so that the residue can settle to the bottom. Pour off reusable fluid avoiding the sediment.

8. After the blade has been sharpened, let the grinding wheel spin freely for 15 seconds to dry any excess fluid from its surface.

NOTE: If circumstances require that plain water be used for the coolant, clean the grinding unit with a light oil (WD-40) to prevent the assembly from rusting when not in use.

SECTION 2.6

BLADE MAINTENANCE AND CARE

The Wood-Mizer® cuts with a 1 1/4" x 158" band with 3/4" tooth spacing. This band will give you 15 to 30 hours cutting life if properly used and maintained. Follow the guidelines below to get the most out of each blade.

The best indicator of blade condition is the quality of its cut. IF THE BLADE DIPS OR CLIMBS, IT IS CAUSED BY SOME FACTOR IN THE BLADE 99.9% OF THE TIME, NOT BY MACHINE ALIGNMENT. THE BLADE CAN LOOK SHARP, FEEL SHARP, AND STILL NOT CUT RIGHT.

As the blade gets dull, gets loaded with build-up between tooth set or loses set of the teeth, the quality of the cut will deteriorate. A dull blade will typically start to wave as it cuts and overload the engine. When this happens, you should:

Check to see if the blade is loaded with sap build-up. This problem is almost nonexistent with some woods but can ruin the quality of the cut when it occurs. The build-up fills the set of the teeth creating friction which causes the blade to burn its way through the wood. **(See Water Lube Instructions.)** (Water Lube System reduces or prevents sap build-up.)

Check the edge of the teeth to be sure that they are sharp. If not, remove the blade and sharpen with the optional sharpening fixture. **(See Sharpening Instructions.)**

Check the set of the teeth. Your best indication is the quality of cut you are getting. If cuts are wavy, chances are the blade is dull or the teeth need to be reset. If they need to be set, remove the blade and set the teeth with the optional setting fixture, then resharpen. **(See Tooth Setter Instructions.)**

Always keep a consistent gullet. **(See Figure Below.)**

SECTION 2.7

CHANGING THE BLADE

WEARING GLOVES IS RECOMMENDED WHENEVER HANDLING THESE BLADES

CHANGING BLADES IS SAFEST WHEN DONE BY ONE PERSON

DO NOT CHANGE THE BLADE WITH THE ENGINE RUNNING. Remove the main cover that covers the drive wheels. Release the blade tension by turning the tension control **(See Figure 1)** counterclockwise until the wheel is pulled in and the blade is lying loose in its track. Lift the blade out of the C-Frame.

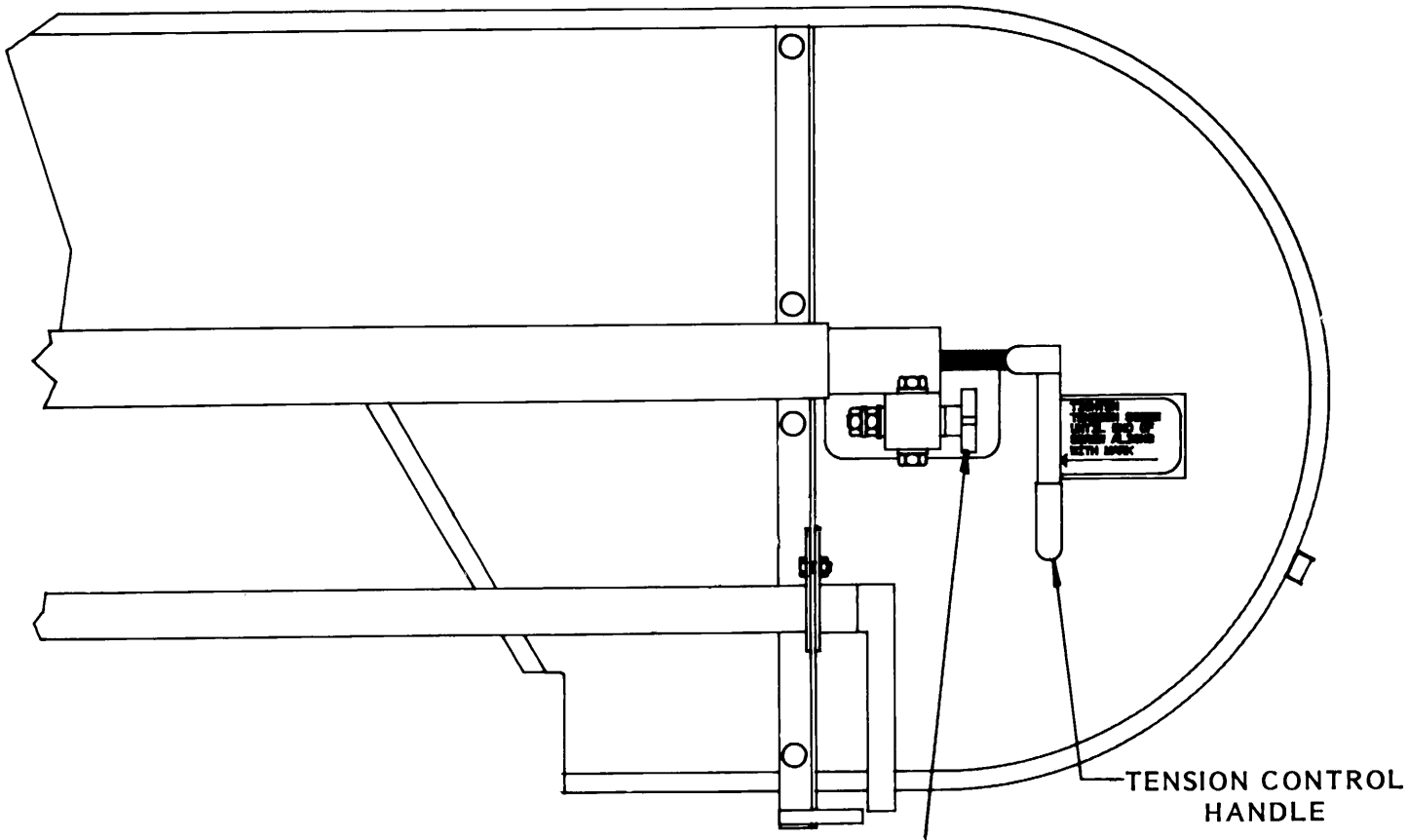


FIGURE 1

When installing a sharp blade, make sure the teeth are pointing the correct direction. (The teeth should be pointing toward the operator side of the sawmill.) Install so the blade is roughly centered on the wheels. The next step is to tension the blade by turning the tension handle clockwise until it is even with the tension gauge. **(See Figure 1.)**

CHANGING THE BLADE - cont'd

The blade should run **roughly** centered on the wheels. A good rule of thumb is to align back edge of blade with back side of wheel. Do not let the teeth ride on wheels and do not let the back edge of the blade ride any farther forward than back side of wheel. **(See Figure 2.)**

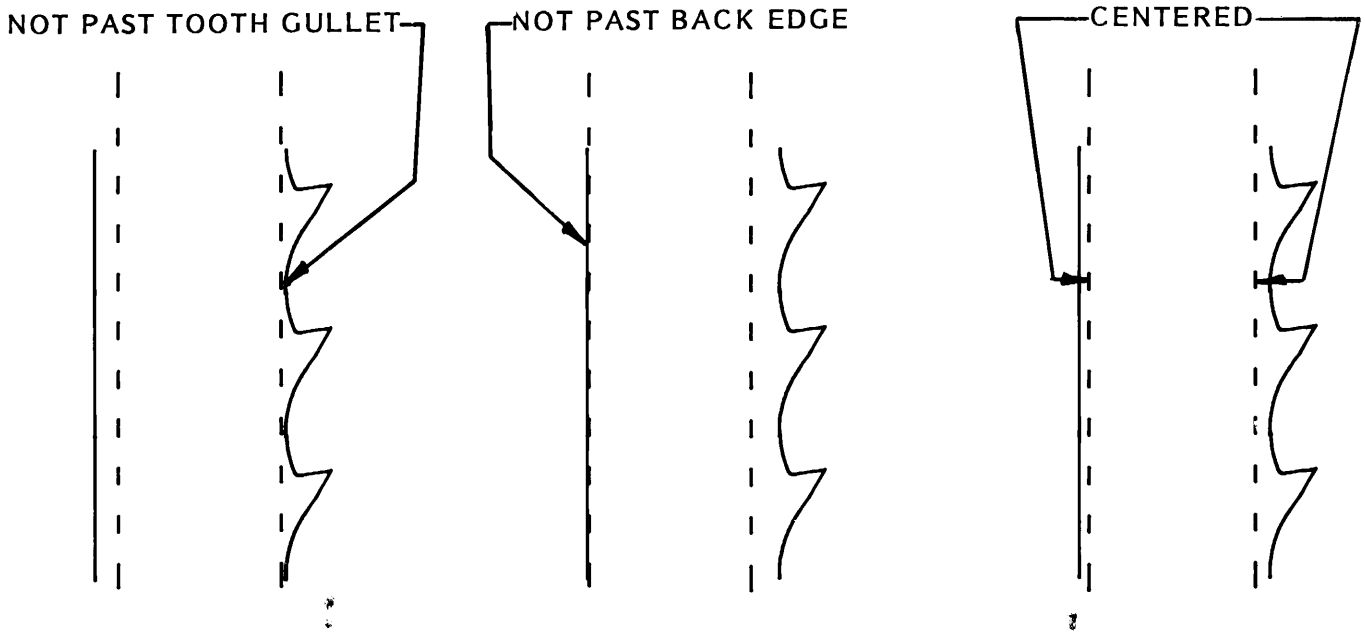


FIGURE 2

Adjustment of the free-running wheel is made with the cant control. **(See Figure 1.)** Start engine and pull lightly on the clutch handle, rotating blade until blade locates itself. If blade is too far forward on wheel, loosen the cant control; if the blade is too far back, tighten the cant control. SOME ADJUSTMENT IN SPRING TENSION WILL BE NECESSARY TO COMPENSATE FOR ANY ADJUSTMENT IN THE CANT CONTROL. Replace cover.

IMPORTANT: After lining the blade on the wheels always double-check the blade guide spacing and location. **(See Section 5.3.)**

SECTION 3.1

SETUP AND OPERATION

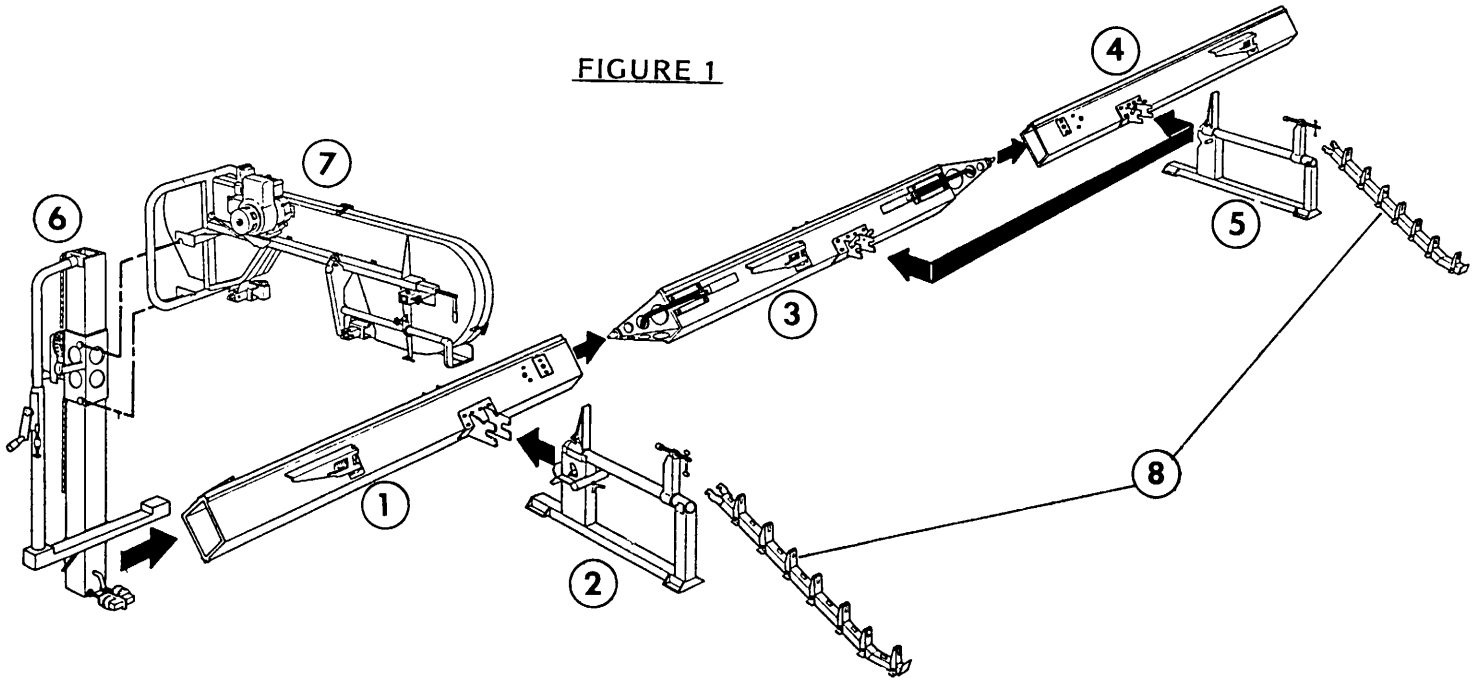
1. READ ENTIRE OPERATING MANUAL BEFORE OPERATING YOUR WOOD-MIZER® MODEL LT20 LUMBERMILL.

2. Set up mill on level, relatively firm ground. If you are setting up in long grass, either cut a path or lay down a ground cover beneath the main track assembly and the ground as the grass will get tangled in the lower rollers. If you are setting up on soft ground, it will help to set planks or boards under the front and rear log beds to keep the machine from settling down into the ground causing misalignment.

3. For assembly purposes, each of the seven main components have been given the following number: **(Refer to Figure 1.)**

    1. Front Track Assembly
    2. Front Log Deck
    3. Middle Track Assembly
    4. Rear Track Assembly
    5. Rear Log Deck
    6. Carriage Assembly
    7. Cutting Head
    8. Loading Ramps (Optional Equipment)

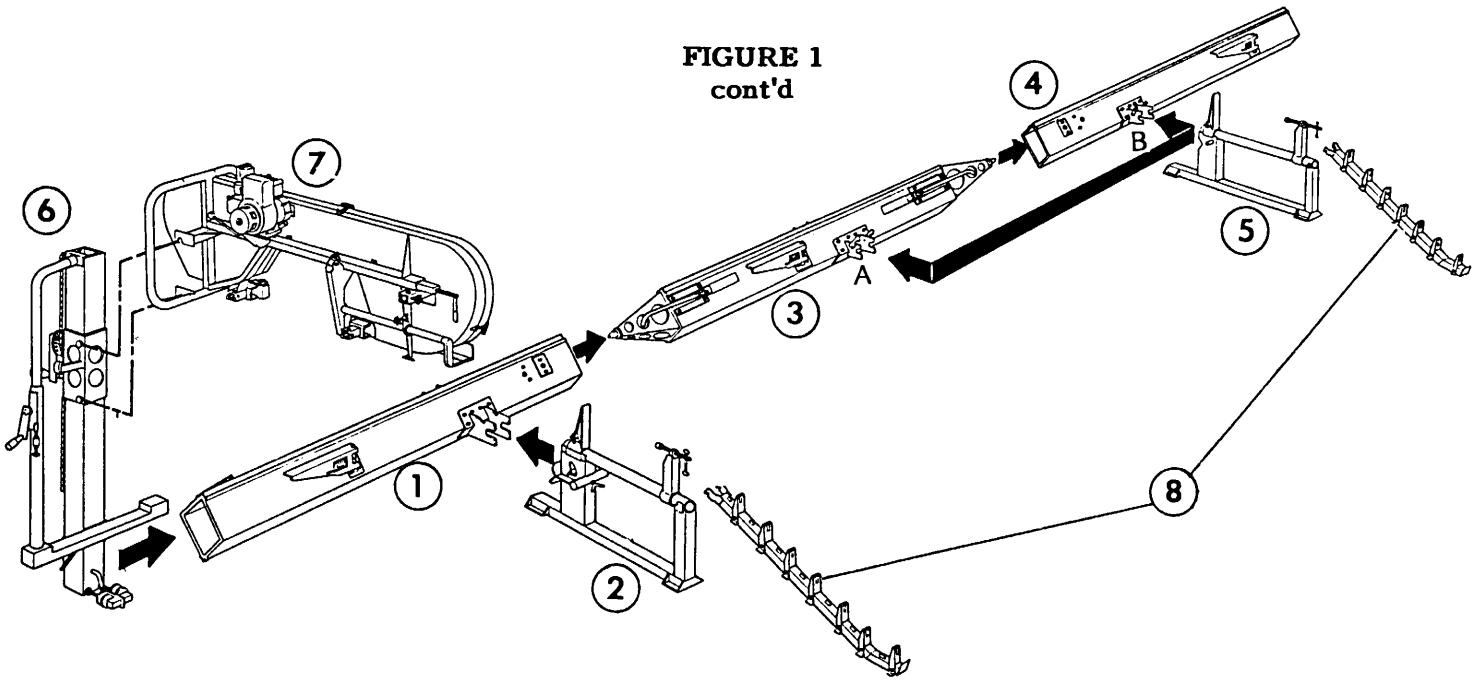
FIGURE 1



4. Assemble (#1) to (#2) as shown in **Figure 1.** Turn the T-Handle located in the body of the Front Log Deck clockwise until the Log Deck is clamped firmly to the Track Tube. (Make sure there is no sawdust in the junction between any of the pieces.)

5. Assemble (#3) to pieces (#1) and (#2) as shown in **Figure 1.** Clamp into place with the quick clamp.

FIGURE 1
cont'd



6. Assemble (#4) to piece (#3) as shown in **Figure 1.** Fasten in place with the quick clamp.

7. Before assembling the Rear Log Deck (#5), notice that there are two places it can be attached to the main track. If you are sawing logs eight (8) feet or less, use position (A). **(See Figure 1.)** If you are sawing logs longer than eight (8) feet, use position (B).

8. Assemble the Carriage Assembly (#6) to the track assembly by simply lifting it onto the track so the upper and lower rollers will run on the replaceable stainless steel upper and lower tracks. **(See Figure 1.)**

9. Assemble the Cutting Head (#7) to the Carriage (#6) as shown in **Figure 1.** There are four "Hooks" on the Cutting Head that will slide over the four "Posts" on the Carriage Assembly. (The cutting head weighs approximately 150 pounds and it is awkward for one person to carry it alone. It is **not** recommended that the Cutting Head be mounted on the Carriage Assembly by one person. **NEVER** assemble or disassemble the Cutting Head with a blade installed.)

10. When installing the optional loading ramps, simply set in place over the pins on the front and rear log decks. **(See Figure 1.)**

11. Every time the LT20 is moved you must double-check the alignment. **(See Alignment Section 5.2.)**

12. Move the carriage to the front of the mill with the hand crank or by simply pushing or pulling the Carriage Assembly along the track.

13. Load log onto the log deck.

When loading logs, always have the side supports at their highest position to

keep the log from rolling off the operator side of the lumbermill. Also slide the clamping dogs completely to the outside edge of the log decks so they will not be pinned underneath the log once it is rolled into position. The auxiliary log supports **(See Figure 2)** are not designed to be used when squaring up the log. The auxiliary log supports are designed to be used under cants that have a tendency to sag and should be folded out of the way when squaring a log.

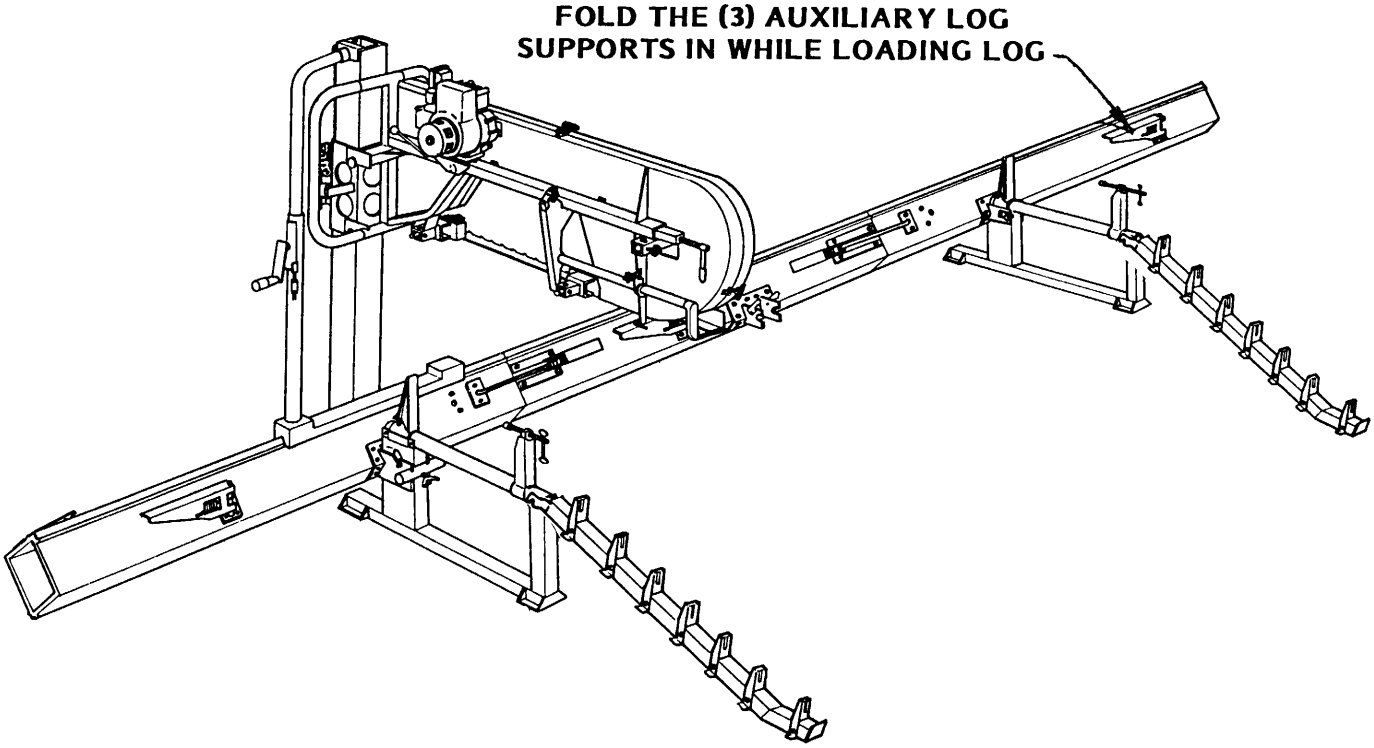


FIGURE 2

When using the optional loading ramps, it is recommended the log be rolled up the ramps by two people, each with a cant hook or peavey.

To avoid injury, neither person should stand directly behind the log in case it rolls back down the ramp. These ramps are equipped with special flip-up stops that are designed to assist in the loading of the log. (The loading ramps will have to be removed during the actual cutting of the log, or the ramps will interfere with the cutting head.)

14. Rotate log to desired angular position by spinning it against side supports.

15. Secure log to desired angular position by clamping it in place with one or both of the clamping dogs located on the log decks. **(See Figure 3.)** The clamping dogs are typically required only when the log is resting on a rounded portion.

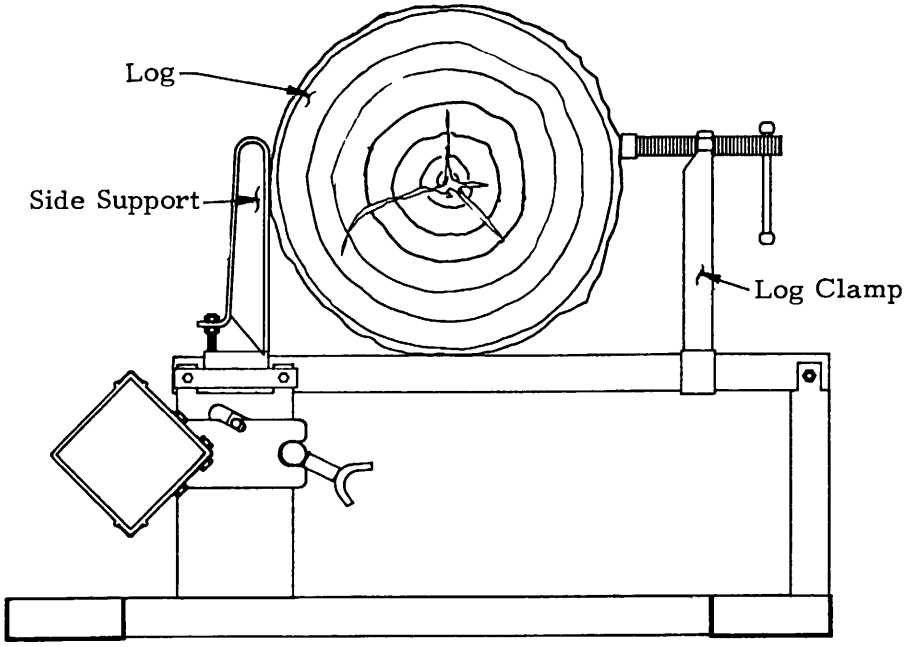


FIGURE 3

16. Check the tension gauge for proper blade tension. **(See Section 2.7.)**

17. Set the Cutting Head to desired height. The ruled gauge and indicator represents the distance between the log bed and the bottom of the blade.

    The cutting head is raised and lowered by the hand crank on the front of the carriage assembly. **(See Figure 4.)** There are 16 holes in the face plate of the up/down crank assembly. Each hole represents an adjustment in the blade height of 1/16 of an inch. One full turn of the crank is one (1) inch.

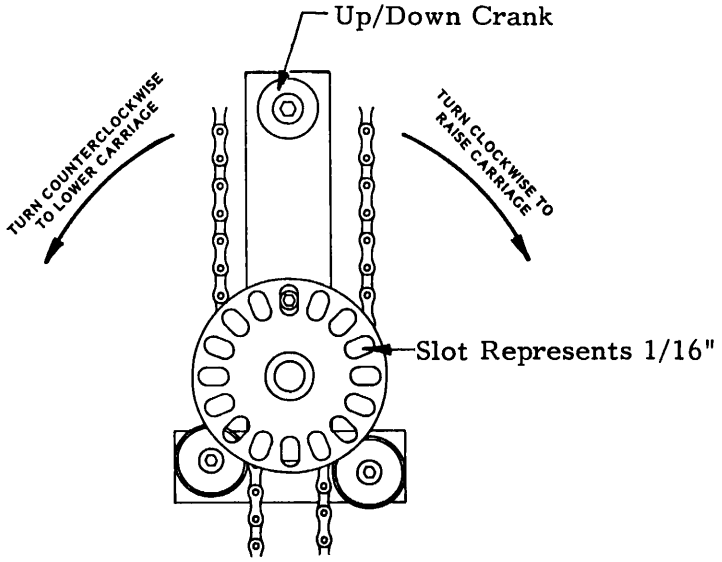


FIGURE 4

18. Adjust the width of the throat by sighting down the log to determine its maximum width. The movable blade guide should be adjusted to clear the widest section of the log by less than one (1) inch. This is done by loosening the clamping knob and sliding the movable blade guide horizontally in or out as necessary. **(See Figure 5.)** (**NEVER** adjust the throat width while the blade is moving.)

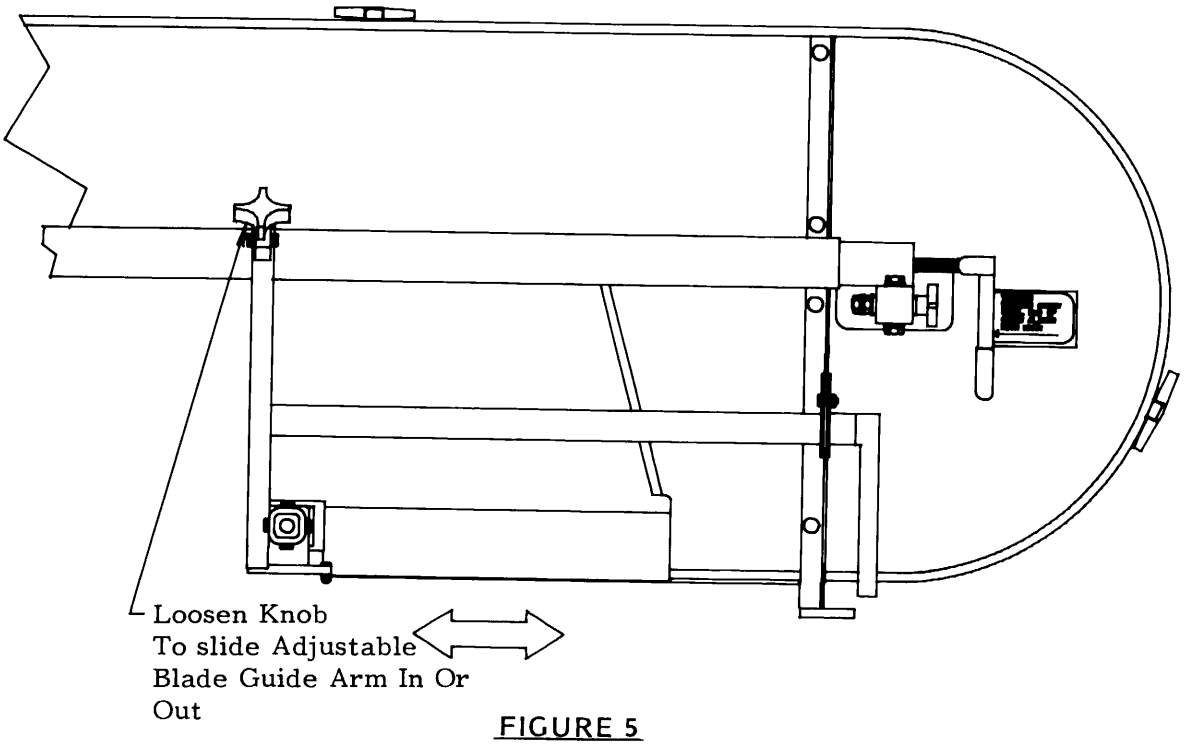


FIGURE 5

19. Make sure clamping dogs and side braces are adjusted below the cutting plane of the blade.

20. Start engine per instructions found in engine manual. (**See Section 4.5** for throttle adjustment.)

21. Pull down slowly on clutch/brake lever found below the engine until it locks into the run position.

22. Feed the carriage into the wood at a slow speed. Let the blade contact the wood slowly and then feed at a rate that will not overload the engine or force the blade to wander. Maximum feed rate will vary with width, hardness of wood, and sharpness of the blade. Overfeeding will result in excessive engine and band wear and will produce a wavy cut.

23. Stop the carriage at the end of the cut. (If you stop the carriage while the back of the blade is still on the log, you will not have to worry about the blade catching on the log when you pull the carriage back for another cut.)

24. Lift clutch/brake lever to stop blade and drop engine to idle. Failure to stop

blade can cause blade to be pulled off (while traveling in reverse) by a wood sliver and the blade could be ruined. Stopping the blade also increases its life.

25. Remove board from top of log.

26. Return the carriage back to the front of the machine while making sure that the blade does not catch on the end of the log, **(See Step 23),** or the carriage can be raised slightly to ensure that the blade clears the log when returned. The carriage is most easily pulled back to the front of the machine. (Be careful that the crank handle does not spin into your arm when pulling the carriage back.)

27. Rotate log if you wish to square it after this first cut. Move the side supports to an upright position before rotating the log. We recommend that you use cant hooks to rotate the logs. Typically, the log would be rotated 180° to set the first flat of the log on the bed. If log is rotated 90°, use the clamping dogs to clamp the first flat against the side supports.

28. Set cut depth per **Step 17.** Remember that the blade cuts a 1/16" wide kerf, so if you want 1" thick boards, the carriage should be lowered 1 1/16" for each board.

29. Repeat Steps 17 through 28 until log is cut as desired.

SECTION 4.1

MAINTENANCE SCHEDULE

The procedures listed in this schedule are essential to trouble-free operation of the Wood-Mizer®. The small amount of time required by these procedures is the best time investment in a successful sawing operation.

EVERY FOUR TO EIGHT HOURS OF OPERATION:

1. Grease the two blade guides. **(See Figure 1.)** Do not lubricate until grease is oozing out of the gaps. The purpose of greasing every four hours is to purge the sawdust out of the bearings.

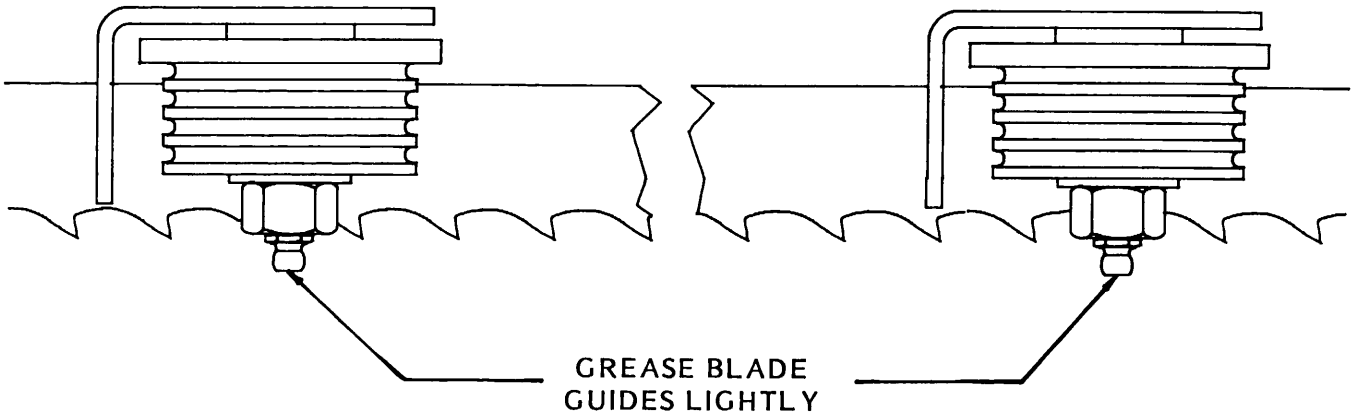


FIGURE 1

2. Check to see that the blade guide bearings are clean and free-spinning. If not free-running, disassemble, clean with diesel fuel or equivalent, and re-pack with grease. **(See Section 4.2.)** If the bearings need to be replaced, notice that one of the shields on each bearing has been pulled off and notches ground in the inner race to allow grease to get to the ball bearings. These bearings are standard R-8 bearings available at most places that sell bearings.

3. Grease the side supports. **(See Figure 2.)** Certain woods have high levels of acid in the sawdust that will react with steel, causing excessive wear. The grease is primarily for purging any sawdust out of the critical areas.

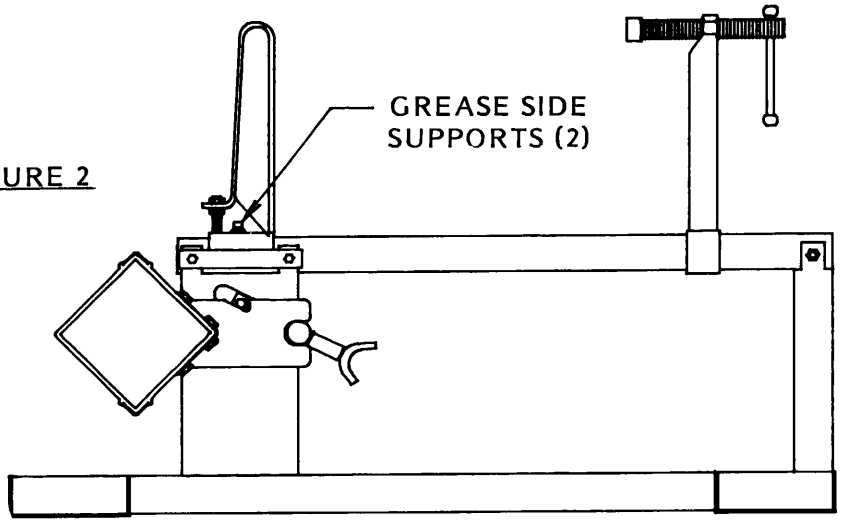


FIGURE 2

4. Clean any excess sawdust build-up in blade wheel housings.

5. Clean the gas engine air filter daily.

EVERY FORTY HOURS OF OPERATION:

1. Lubricate the chain.

2. Check for any excessive belt wear and set the drive belt tension by loosening the jam nut and adjusting the roller assembly outward as needed to obtain proper tension. **(See Figure 3.)**

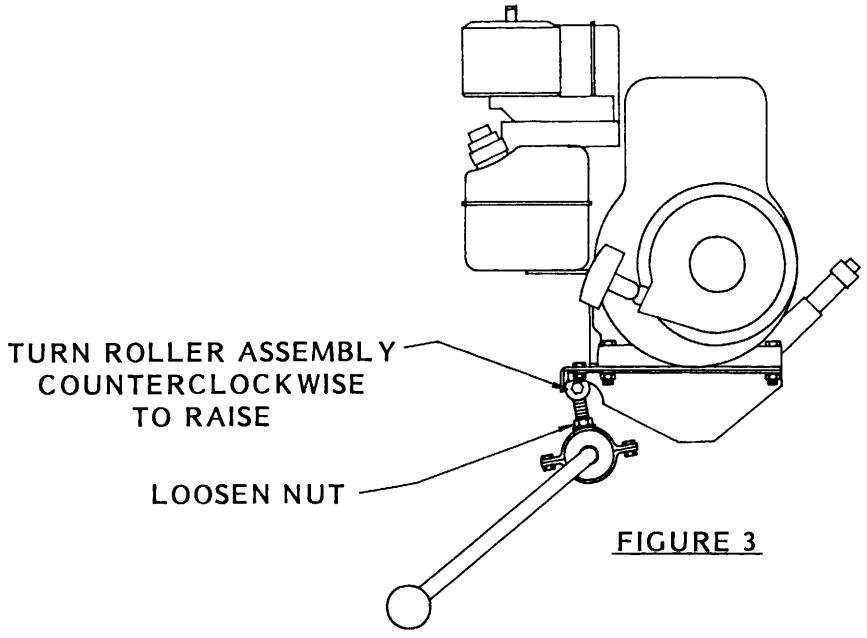


FIGURE 3

MAINTENANCE SCHEDULE - cont'd

3. Oil all pivot points, chains and bearings. Rebuild or replace bearings as needed.

4. If the blade is not coming to a stop rapidly, the brake shoe is probably worn and needs to be adjusted or replaced. **(See Section 4.6.)**

5. Adjust the wear pads on the vertical mast if there becomes noticeable side-to-side movement of the cutting head. **(See Figure 4.)**

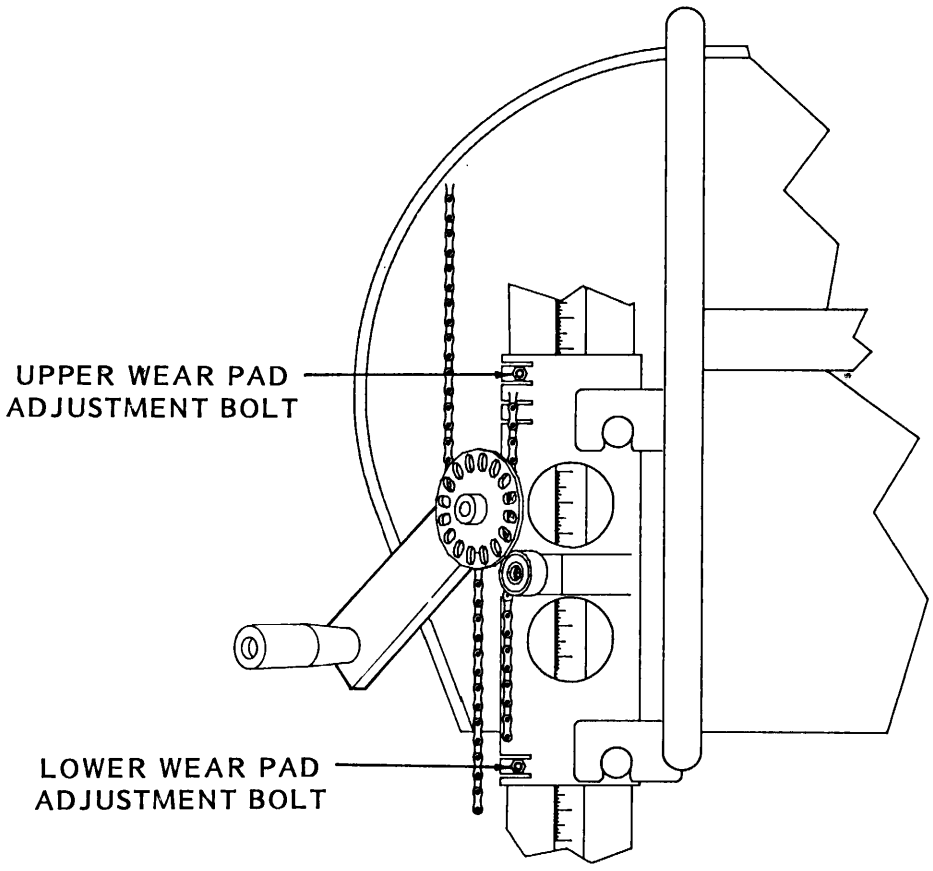


FIGURE 4

6. Check and adjust the main track rollers on the bottom of the main track.

MISCELLANEOUS MAINTENANCE

Go through alignment procedures per alignment section of manual as often as necessary. Maintain engine or motor per manufacturer's schedules.

SECTION 4.2

BLADE GUIDES AND CARE

The blade guides of the Wood-Mizer® are designed to give hundreds of hours of use before needing any servicing.

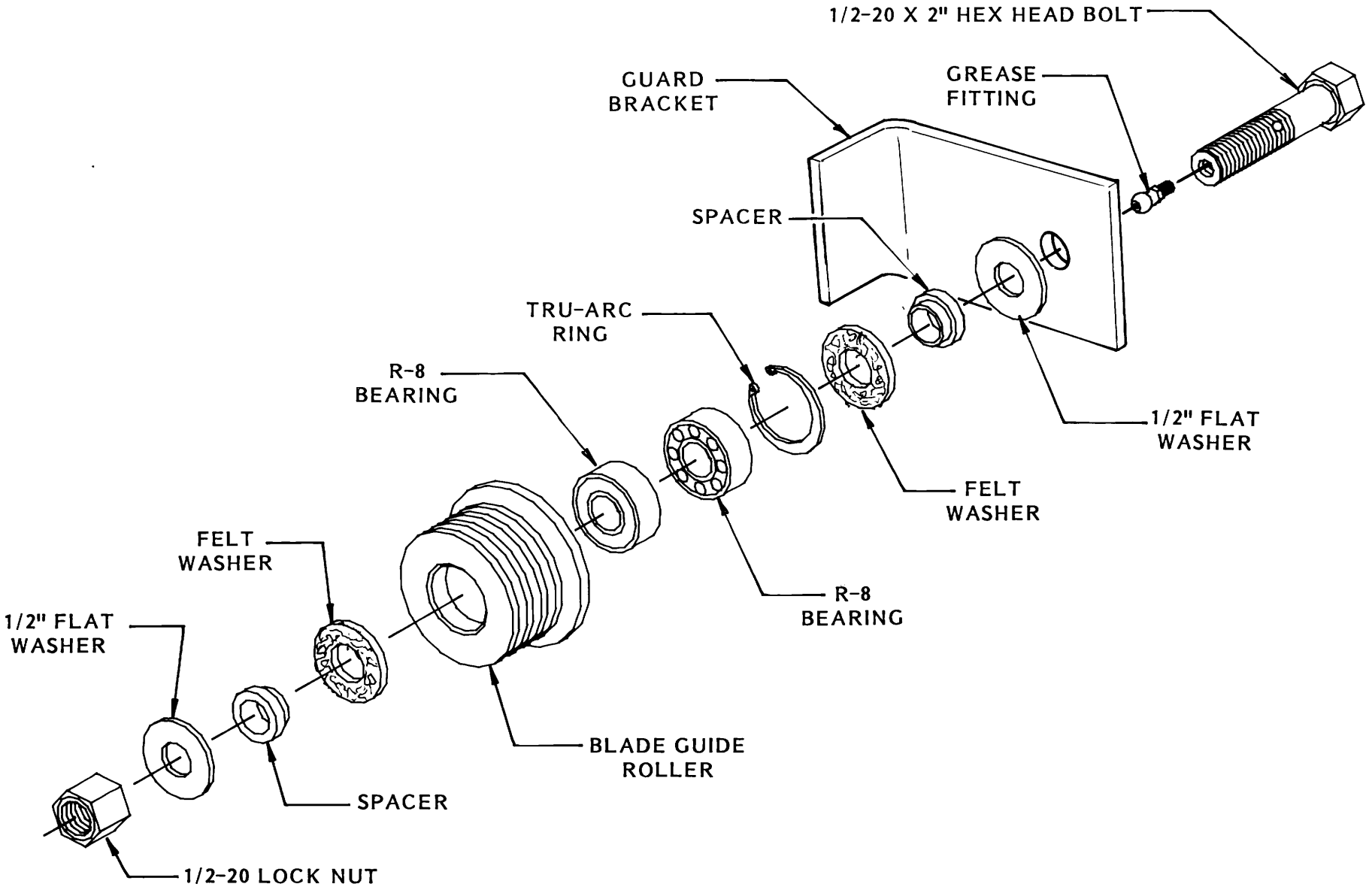
1. The only maintenance the Blade Guides require is greasing every 4 hours. Failure to keep the guides well-greased will cause premature failure. The frequent greasing of these blade guides is primarily to purge the sawdust out of the blade guides that may have worked its way into the bearing assembly.

2. One condition that causes early failure is pre-loading of the guides. Pre-loading occurs when the blade is riding too far back on the drive wheels which causes the blade to ride the flange of the blade guide. There should be a 1/16" to 1/8" gap between the back edge of the blade and the flange when in the free-running mode. When actually cutting with the mill, the back edge of the blade will most likely run against the back flange.

SEE EXPLODED VIEW ON NEXT PAGE

SECTION 4.2

EXPLODED VIEW OF BLADE GUIDES



SECTION 4.3

CHAIN TENSION ADJUSTMENTS

The mechanism for raising and lowering the cutting head incorporates a chain that will require periodic adjustments. The chain should be lubricated to prevent rust.

To adjust the raising and lowering chain, move the idler bearing up or down as necessary. The idler bearing is located at the bottom of the 4" mast tube. **(See Figure 1.)**

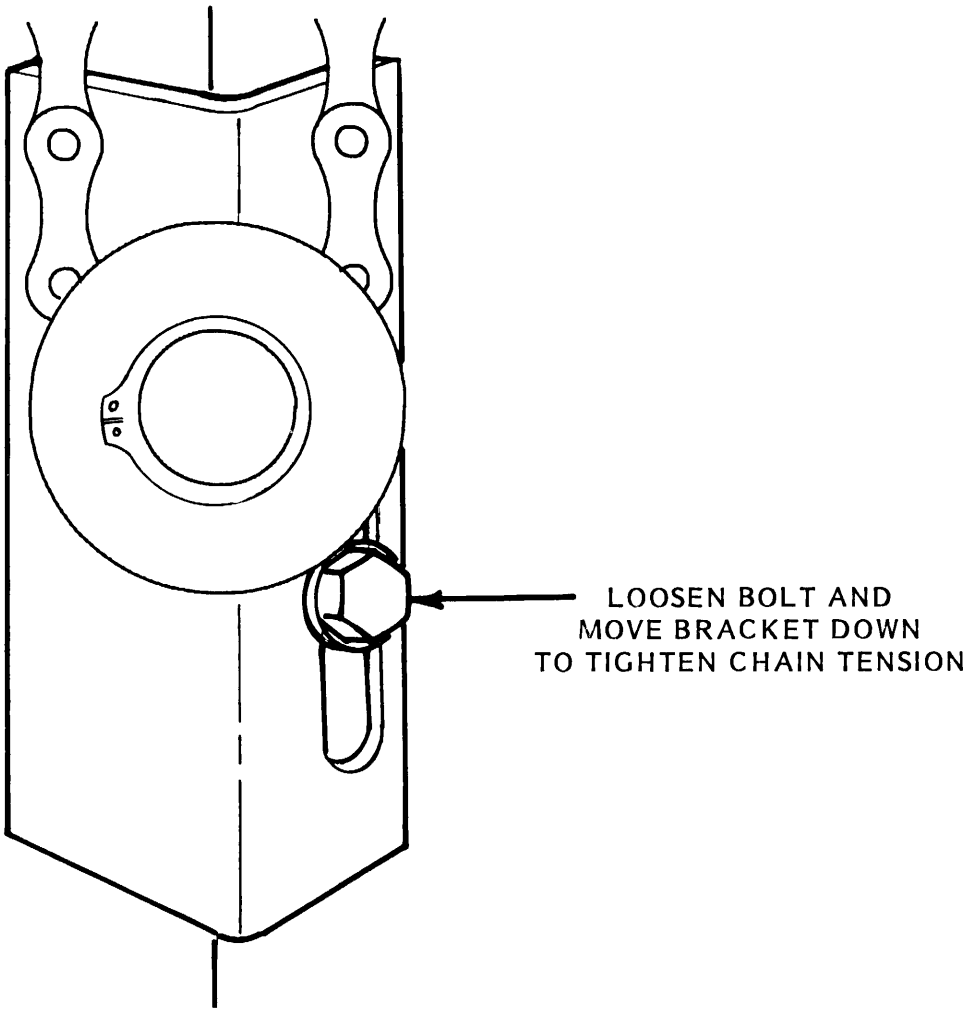


FIGURE 1

SECTION 4.4

DRIVE BELT ADJUSTMENT

If the drive belt becomes too loose to move the carriage, loosen the two bolts shown in **Figure 1** and then raise the adjusting bolt just enough to regain a positive drive from the hand-crank assembly. If the belt is tensioned too much it will be difficult to move the carriage with the hand-crank assembly.

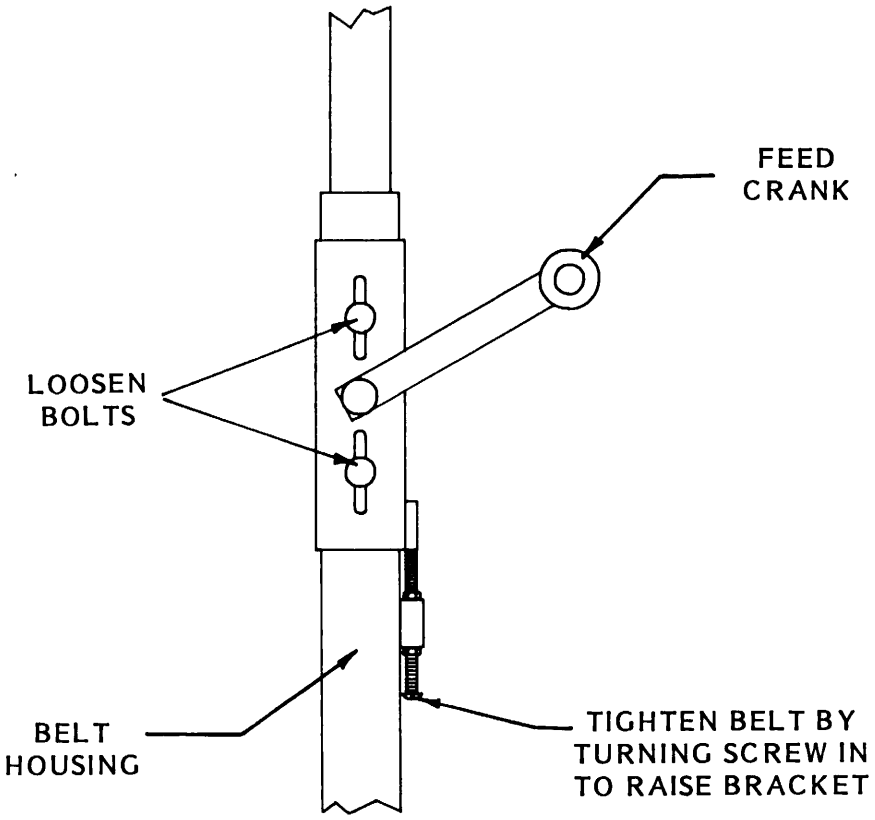


FIGURE 1

SECTION 4.5

THROTTLE ADJUSTMENT

Adjust the throttle at idle to approximately 1800-2000 RPM. This is done by adjusting the eye-bolt up or down until the desired RPM is obtained **(See Figure 1.)** By adjusting the throttle to this setting, the engine will pick up in speed before the blade begins to spin. If the blade begins to spin before the engine speeds up, there will be a good chance that the governor of the engine will choke the engine and cause it to stop.

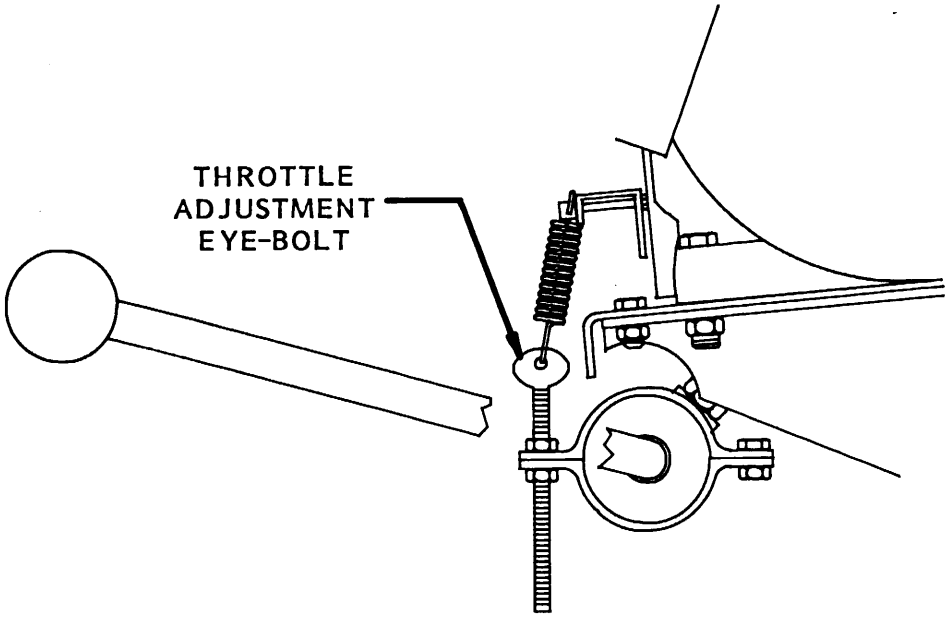


FIGURE 1

SECTION 4.6

BRAKE SHOE ADJUSTMENT

Adjust the brake so that the leather shoe fully contacts the drive wheel when engaged but make sure the metal bracket is no closer to the wheel than 1/8" at the nearest point. When disengaged, the brake shoe should not contact the drive wheel at all.

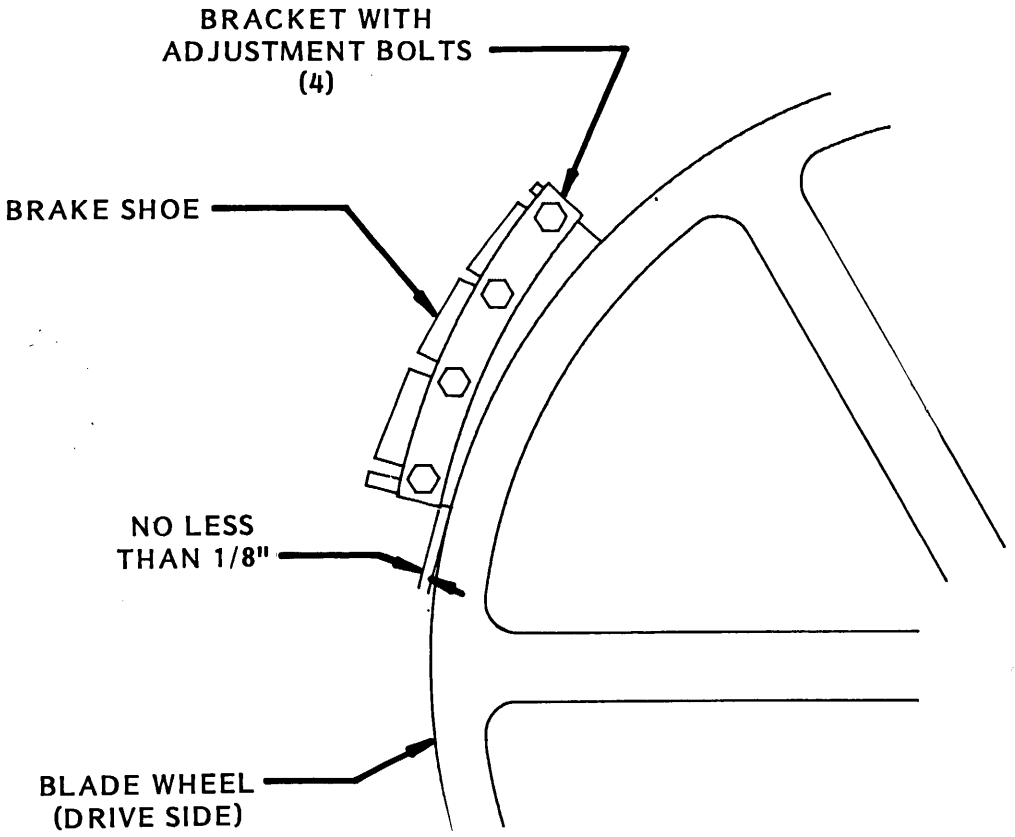


FIGURE 1

SECTION 5

ALIGNMENT

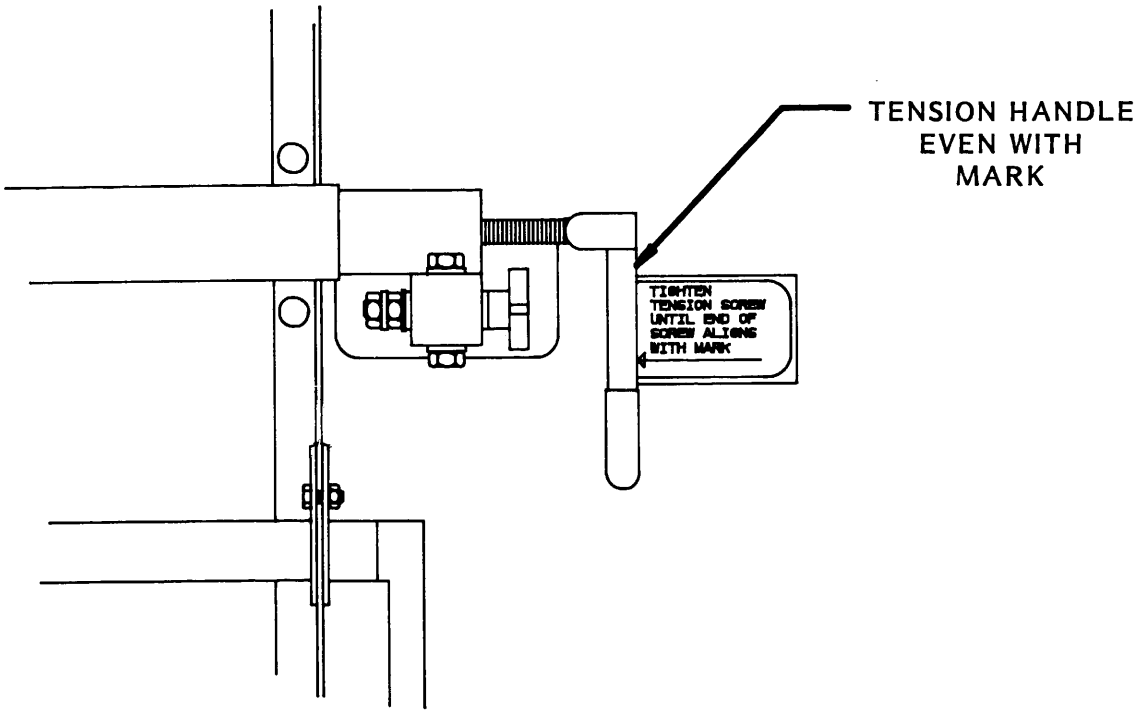
Portions of the Wood-Mizer® Model LT20 are pre-aligned. This section will show you how to align the entire mill. Alignment is extremely important. Care should be taken in these steps as they will determine how accurate and square your lumber is cut. The areas to be aligned are:

1. Blade centered on the wheels.
2. Blade parallel to the deck.
3. Blade guide adjustment.
4. Side supports square to the decks.

The Wood-Mizer® LT20 should either be on firm ground or on some sort of platform (planks) while aligning the mill on soft ground. (Every time the mill is moved, the alignment will need to be checked.)

In the following steps the blade should be properly tensioned. **(See Section 2.7 Figure 1.)** Spring tension is adjusted with the tension control, right handle in **Figure 1.** Blade guides should either be removed or adjusted so they will not contact the blade causing improper alignment.

FIGURE 1



SECTION 5.1

BLADE ALIGNMENT ON WHEELS

The blade should run roughly centered on the wheels. A good rule of thumb is to align the back edge of the blade with back side of the wheel. Do not let the teeth ride on wheels or let back edge of blade ride forward any farther than back side of wheel. **(See Figure 2.)**

Adjustment of the free-running wheel is made with the cant control, middle knob in **Figure 1.** Start engine and pull lightly on the clutch handle, rotating blade, until blade locates itself on the wheels. If blade is too far forward on wheel, turn the cant control knob counterclockwise; if the blade is too far back, turn the cant control knob clockwise until the blade is positioned where it should be.

The drive wheel will typically not have to be adjusted; however, the adjustment is available. As you look at the drive shaft from the engine side, you will see four set-screws that locate the axis of the drive shaft. If you move the drive shaft to the right, the blade will ride farther back on the wheel, or vice versa.

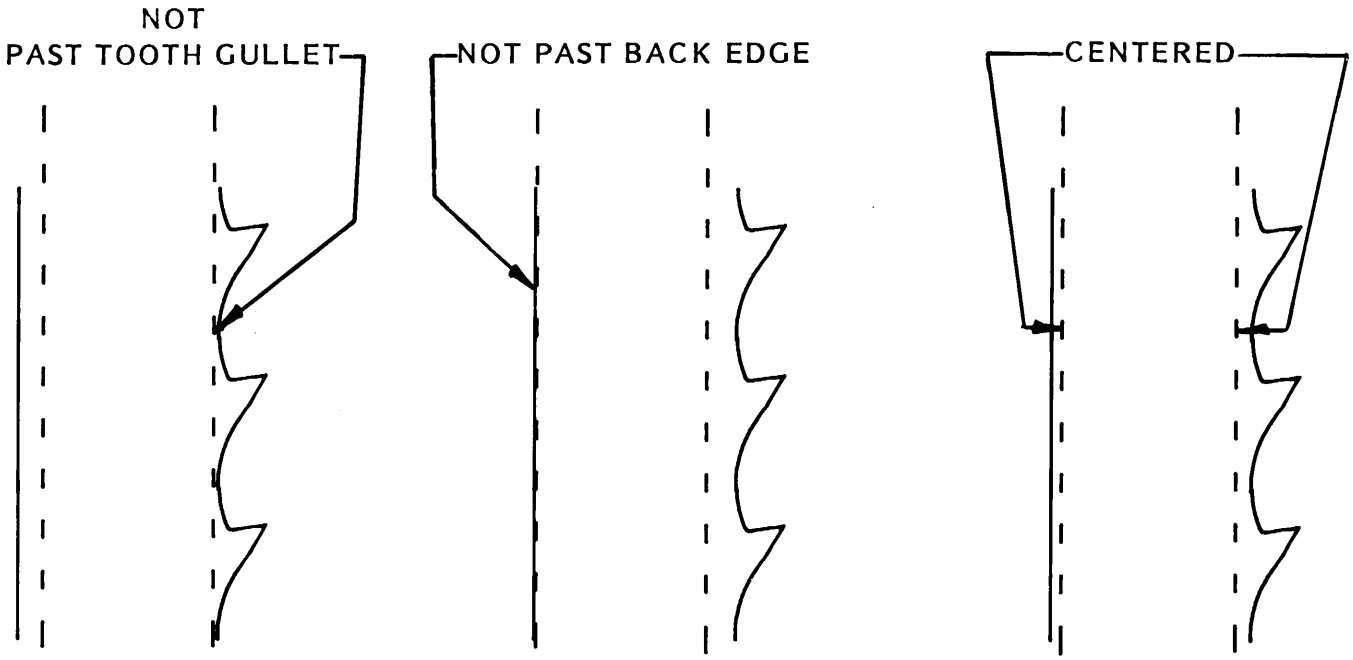


FIGURE 2

SECTION 5.2

BLADE PARALLEL WITH BED

This step will assure you of square cuts and accurate dimensions across the width of your boards. With blade guides removed or adjusted so they do not contact the blade, move the blade directly over the front log deck and open the movable blade guide arm to within 1" of its full open position. Measure from the blade to log deck on both the right and left hand side to see if the blade is parallel to the deck. **(See Figure 3.)** The blade will be parallel to the deck when the distance between the blade and the log deck is the same on both the right and left side.

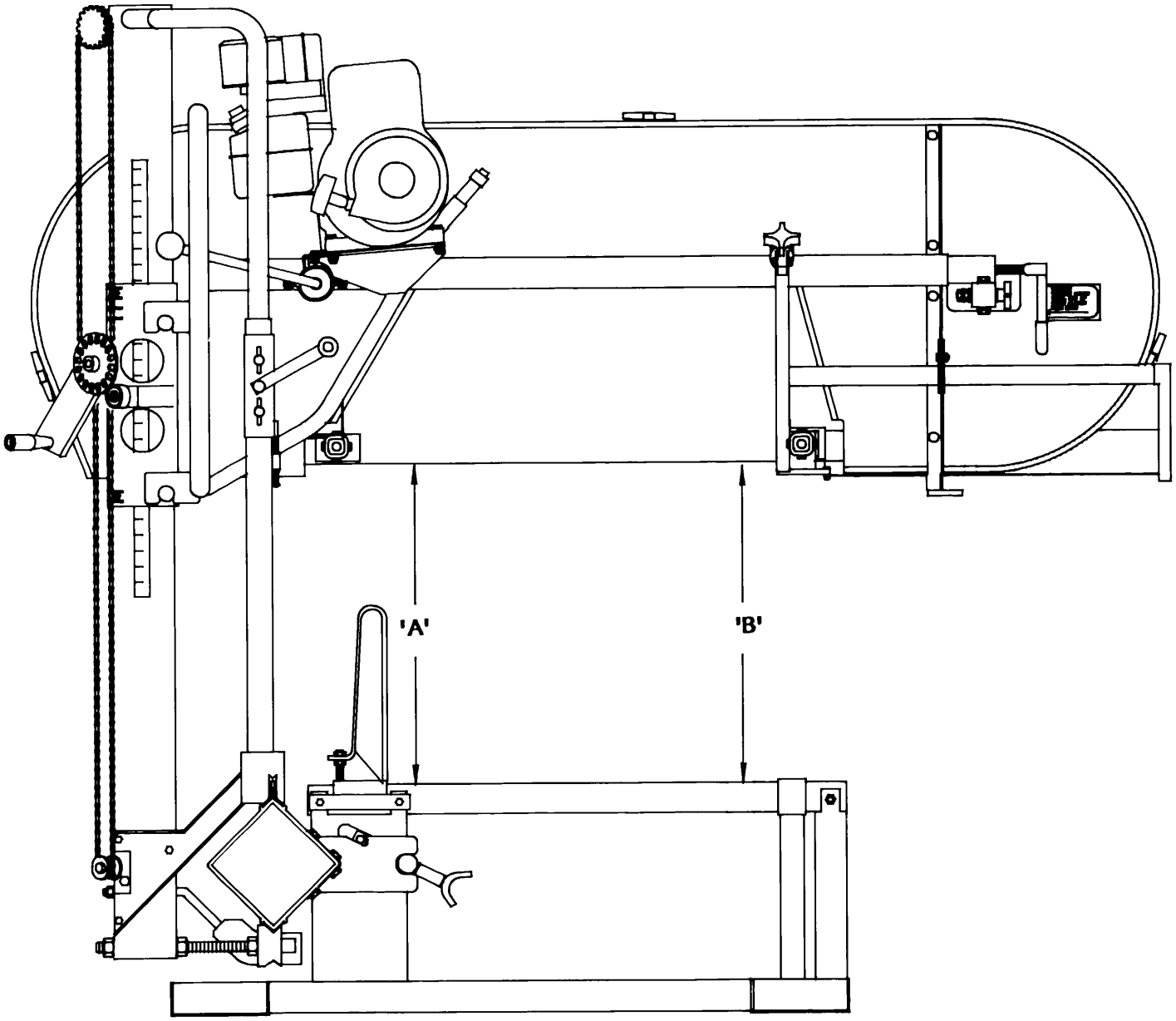


FIGURE 3

SECTION 5.2

BLADE PARALLEL WITH BED - cont'd

The three bolts shown in **Figure 4** will be used to align the blade parallel to the log deck. **Figure 5** shows the result you are looking for after making this adjustment. There should only be a 1/32" to 1/16" gap between the lower track and the lower rollers.

Example: If the blade is too low on the right side **(Figure 6),** the two lower sets of nuts need to be adjusted toward the lower rollers. After adjusting the lower nuts, an adjustment of the upper bolt will be necessary to maintain the proper gap between the lower rollers and track. Measure the distance between the blade and bed again and readjust as necessary to obtain the results shown in **Figure 5.**

After the blade has been adjusted parallel to the front deck, move the carriage towards the back end of the mill and position the blade over the rear log deck. Measure the distance between the blade and the log deck at both the right and left side. If the gap is larger to the right side of the log deck, shim the log deck up under the right hand side of the log deck until the measurement between blade and log deck is the same. If the blade is closer to the log deck on the right side, then shim the **front** log deck up under the right side of the log deck until the distance between the blade and rear log deck is the same at both the right and left sides.

NOTE: Once the blade has been adjusted parallel to the front log deck, usually the only adjustment necessary when the mill is moved will be to shim the front or rear log deck depending on which way the log decks are resting.

FIGURE 4

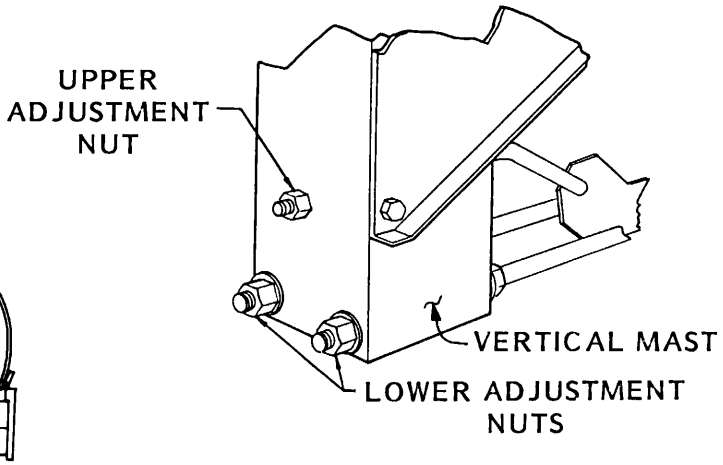


FIGURE 6

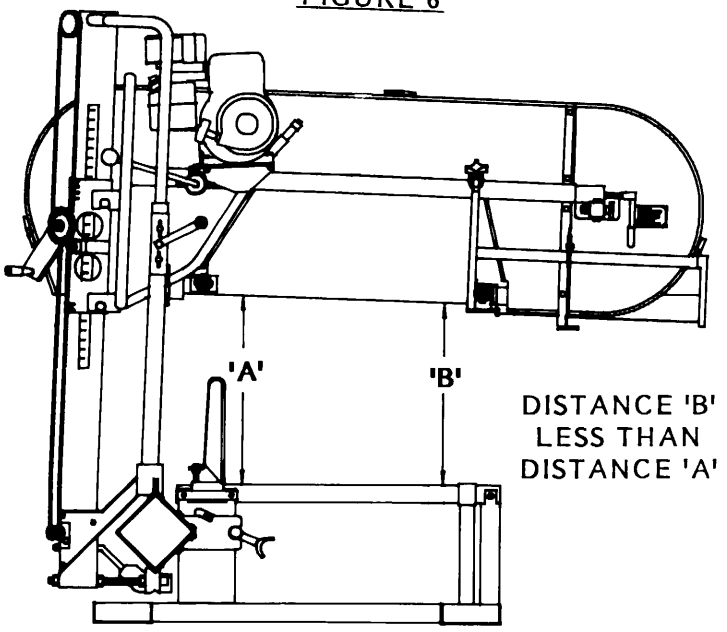
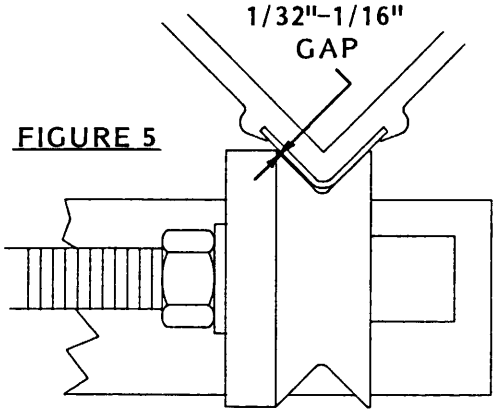


FIGURE 5



SECTION 5.3

BLADE GUIDE ADJUSTMENT

Once the blade has been centered on the wheels and adjusted parallel to the front log deck, the blade guides must be adjusted horizontally to allow a gap of 1/16" to 1/8" between the back-up collar of the blade guides and the back side of the blade. Failure to make this adjustment will decrease the life of the blade and blade guides substantially. **(See Figure 7.)**

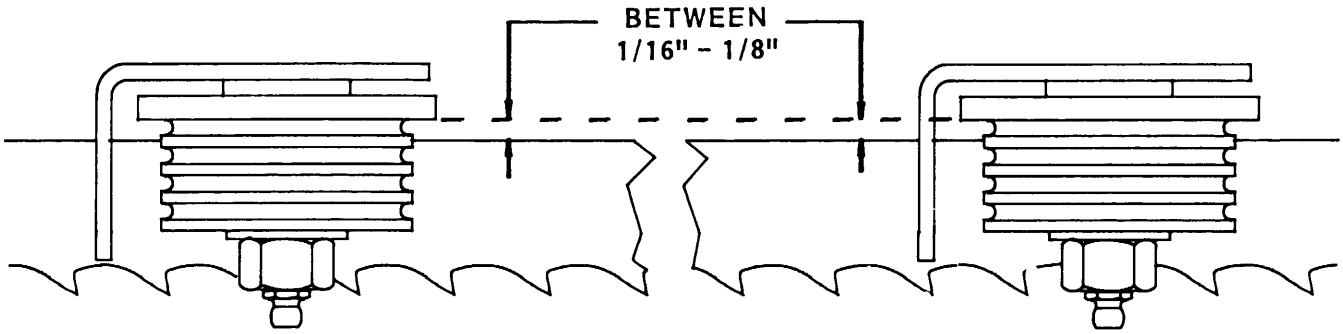


FIGURE 7

SECTION 5.3

BLADE GUIDE ADJUSTMENT - cont'd

The blade guides are to be adjusted to put a 3/16" downward deflection in the blade.

Example: Before deflecting the blade in any way with the blade guides, set the distance between the blade and log deck at 10 3/16" by actual measurement with a tape measure. Now insert the blade guides and adjust them downward until they hold the blade at 10" from the log deck. The upward and downward adjustment of the blade guides is done with the vertical bolt shown in **Figure 8.** Loosen the set screw and nut at the top and then turn the bolt counterclockwise to lower the blade guide and vice versa. Adjust the depth scale on the vertical mast to read 10", if necessary.

After making the 3/16" deflection adjustment, you **must** be sure that the blade guides are tilted at the correct angle. If the blade guides are tilted up, the blade will tend to rise in the cut. If it is tilted down, the blade will tend to dive in the cut. One good indication of how the blade guides are tilted is what the blade does as it moves off the end of the log after a cut. If the blade falls off the end of the log, the blade guides are tilted up. If the blade guides are tilted up, adjust the upper and lower set-screws upward. **(See Figure 9.)** If there is a gap between the blade and the cant when you bring the carriage back, the blade guides are tilted down and need to be adjusted accordingly.

NOTE: Once the blade guides have been tilted to the correct angle, any cutting variances are most likely being caused by the blade itself and may be solved by proper blade maintenance procedures. **(See Section 2.3.)**

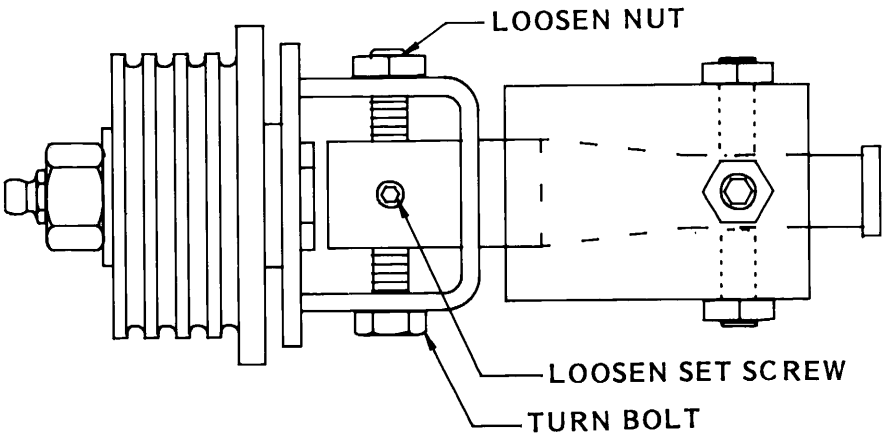


FIGURE 8

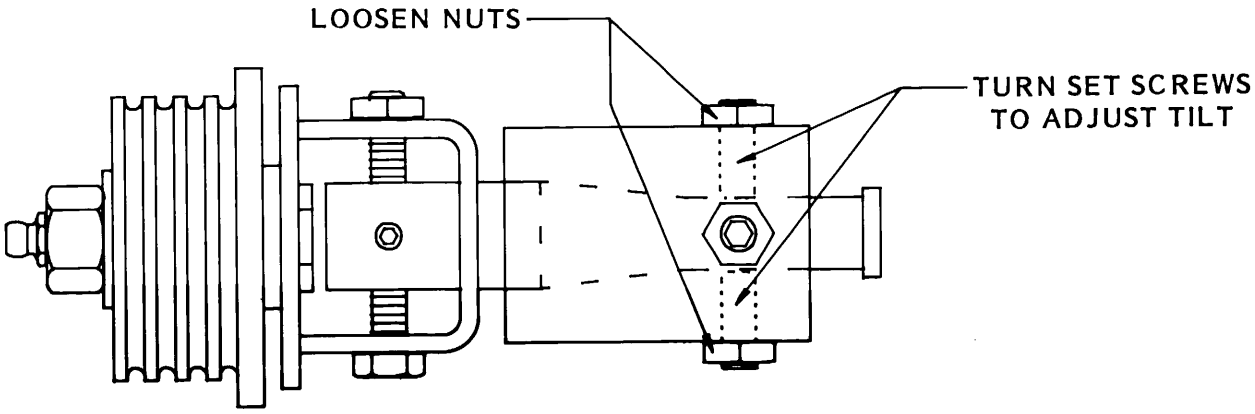


FIGURE 9

SECTION 5.4

SIDE SUPPORTS SQUARE TO BED

The side supports are used to clamp flats on a log to set the squareness of the next cut. The cut will be only as square as the supports. Swing the side supports to an upright position and check the angle with a square. Adjust with nuts shown in **Figure 10** as necessary to bring the side supports to a 90° angle.

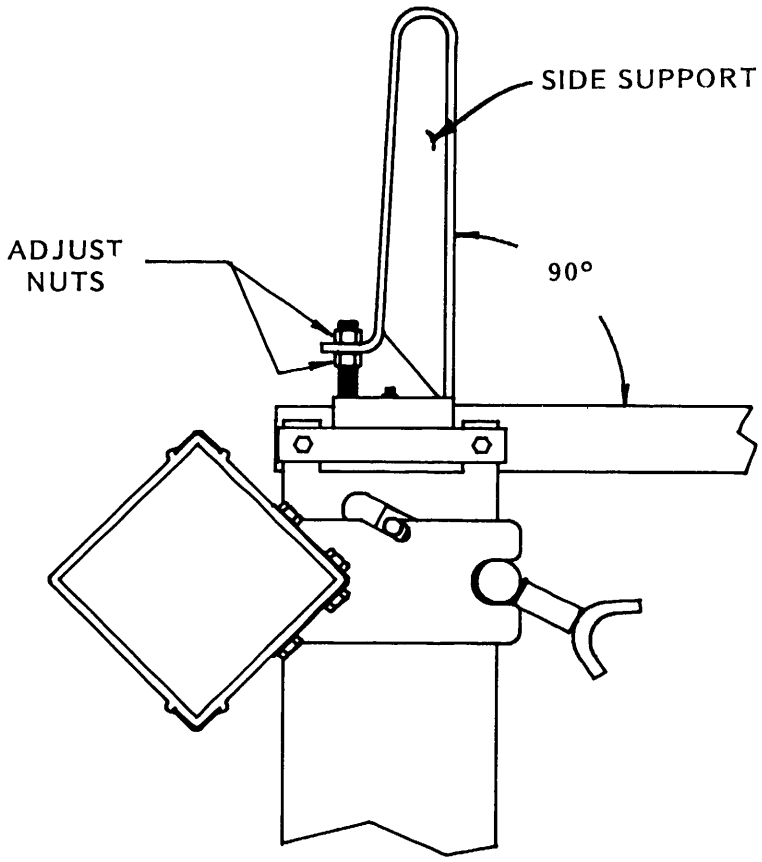


FIGURE 10

SECTION 5.5

MAIN TRACK TUBE ALIGNMENT

If alignment of the main tube ever becomes necessary, follow these steps:

Assemble the mill per Operating Instructions, steps 4 through 7.

Using two equal height blocks (approximately 1/2"), and some string, (fishing line or heavy thread), clamp the blocks and string on top of either end of the upper track assembly. **(See Figure 11.)** Make sure the string is pulled tight to avoid any sag in the string which will cause inaccurate measurements.

Sight down the tube and you should be able to see any variances in the straightness of upper track of the tube. You can also measure the difference between the string and the track to determine the variances.

If alignment is necessary, you will find four holes around the four sides in the front track assembly (piece #1), and four holes in the rear track assembly (piece #4), near the quick clamps. **(See Figure 12.)** If there is a sag in the main tube at the junction between the front track assembly and the middle track assembly, loosen the two upper set screws about 1/2" by turning counterclockwise, and tighten the lower two set screws clockwise until they are tight. Resight or remeasure the tube and adjust as necessary to bring the tube into a straight line.

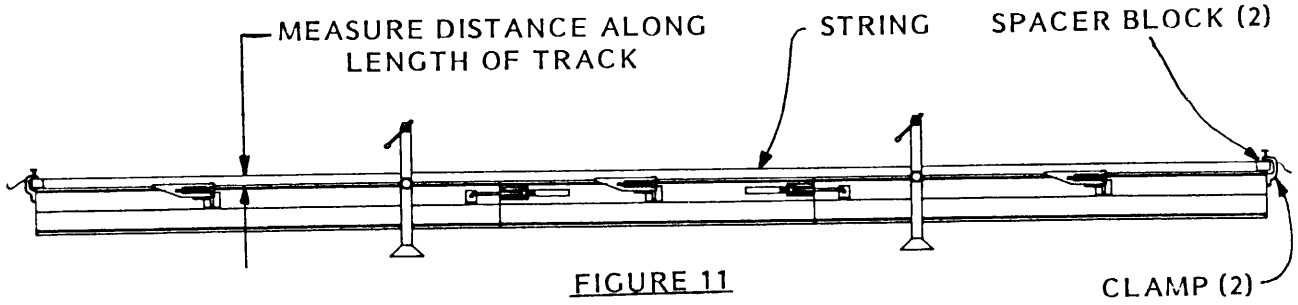
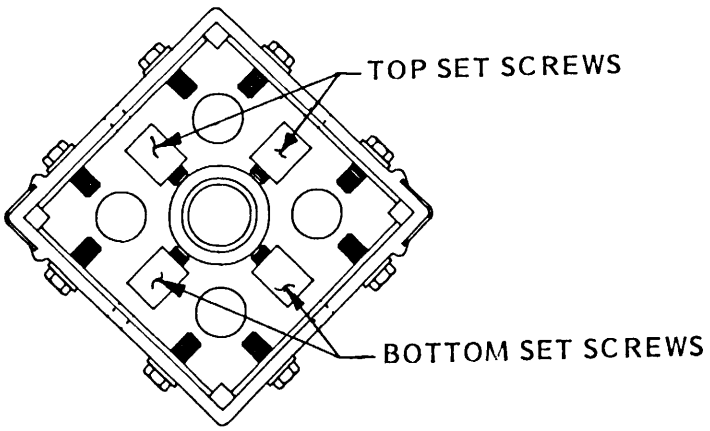


FIGURE 11

FIGURE 12



MAIN TRACK TUBE ALIGNMENT - cont'd

NOTE: In the event that the male ends of the middle track assembly show wear, thus causing a loose fit when assembled, the posts on either end of the middle track assembly can be adjusted outward to take up the slack. Loosen the jam nut **(See Figure 13),** and turn the posts counterclockwise a small amount to make the junction tight when assembled. Be sure to tighten the jam nut.

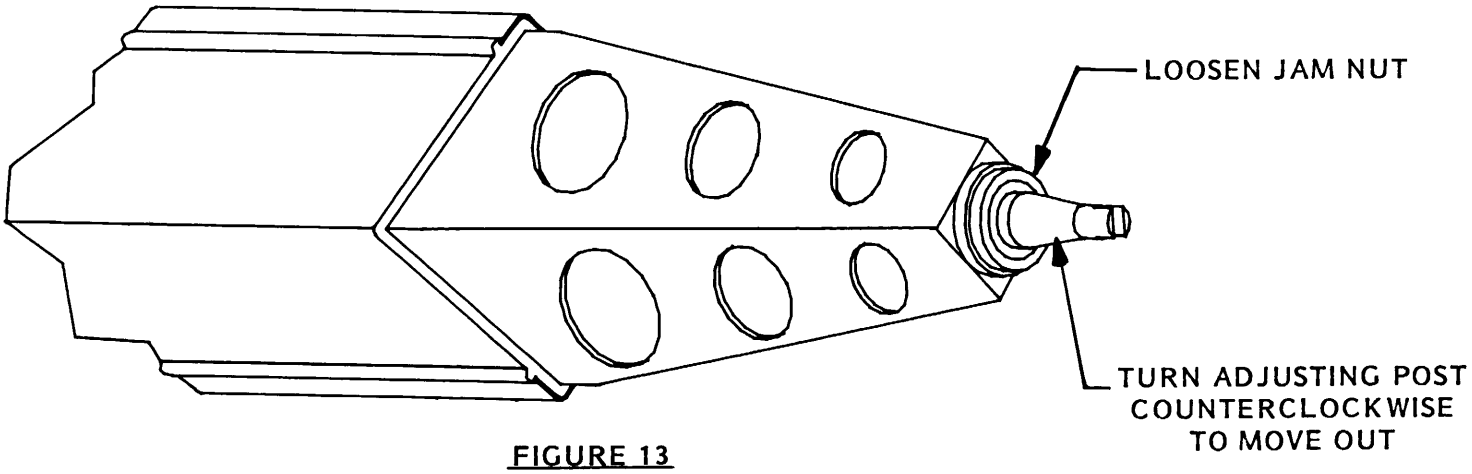


FIGURE 13

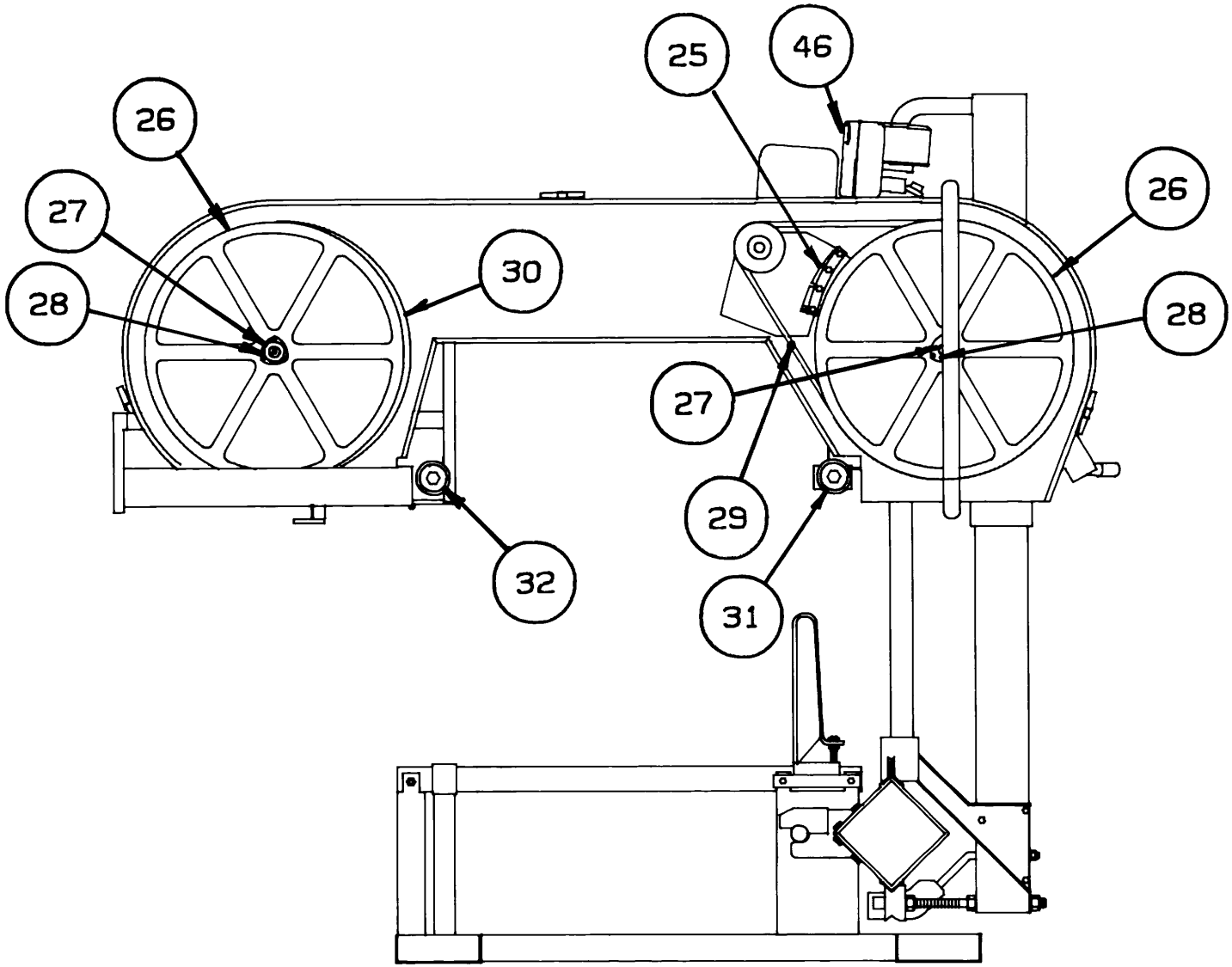


FIGURE 3

REAR END VIEW

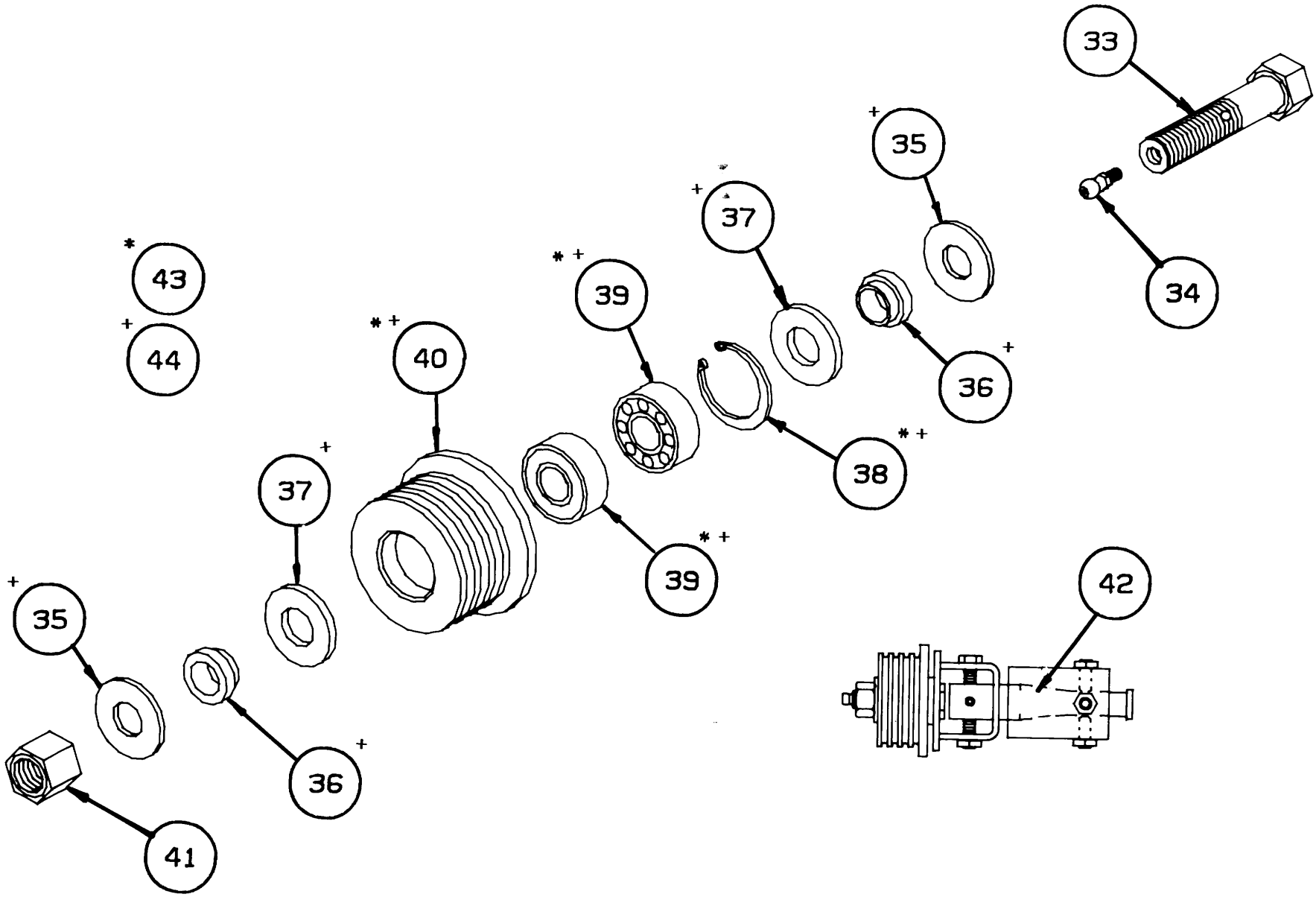


FIGURE 4

BLADE GUIDE ASSEMBLY

SECTION 6.1
PARTS ILLUSTRATIONS

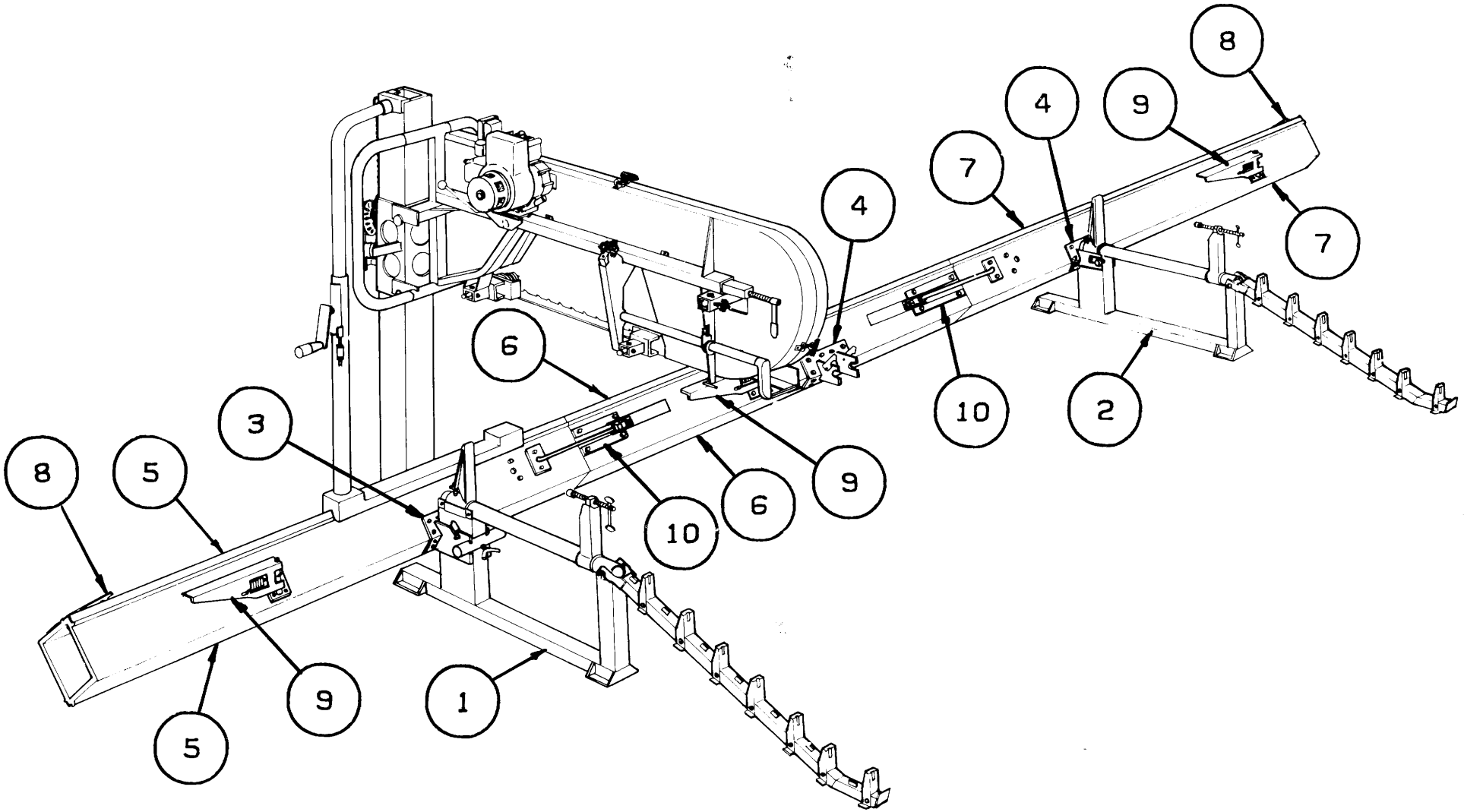


FIGURE 1

ASSEMBLED LT20

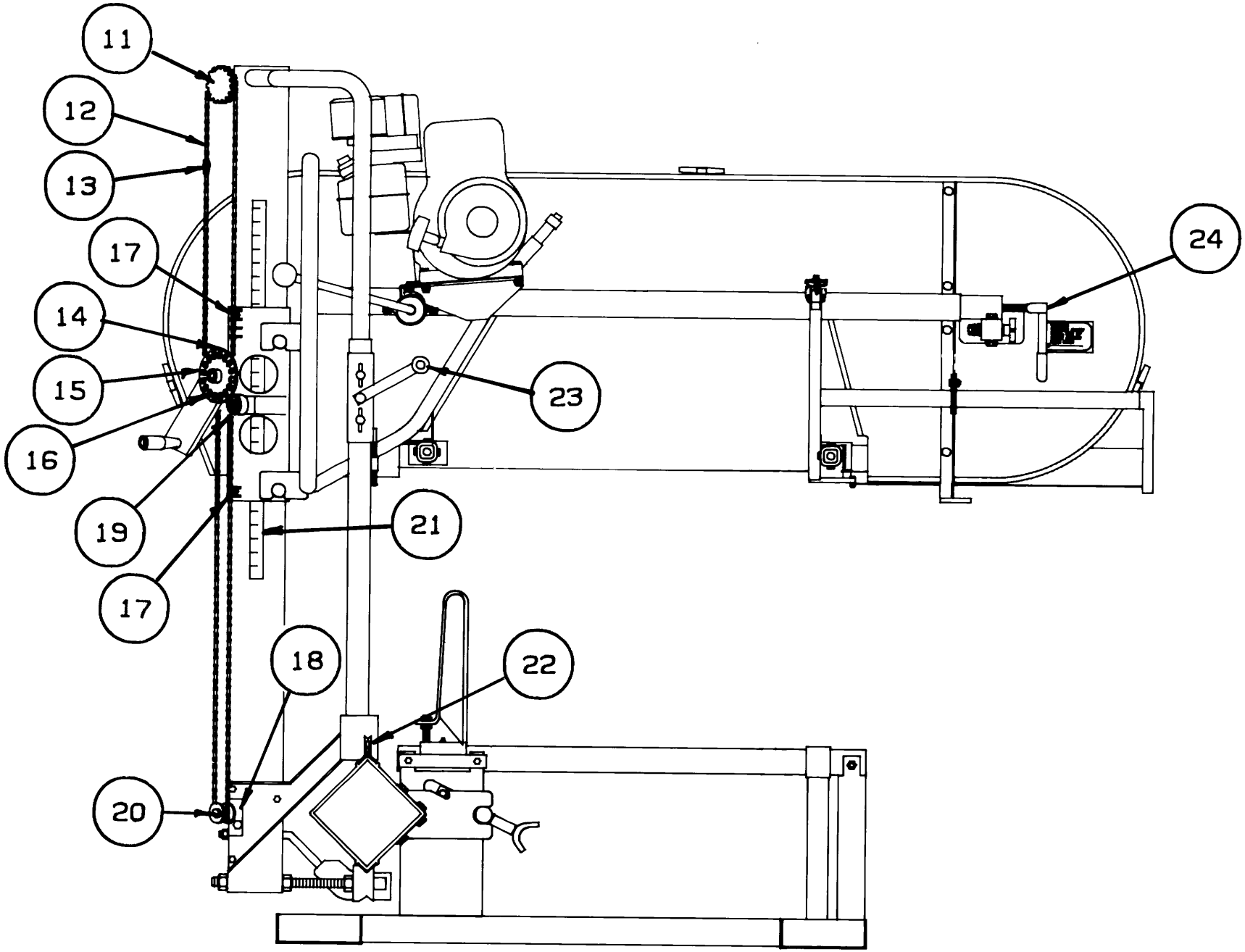


FIGURE 2

FRONT END VIEW

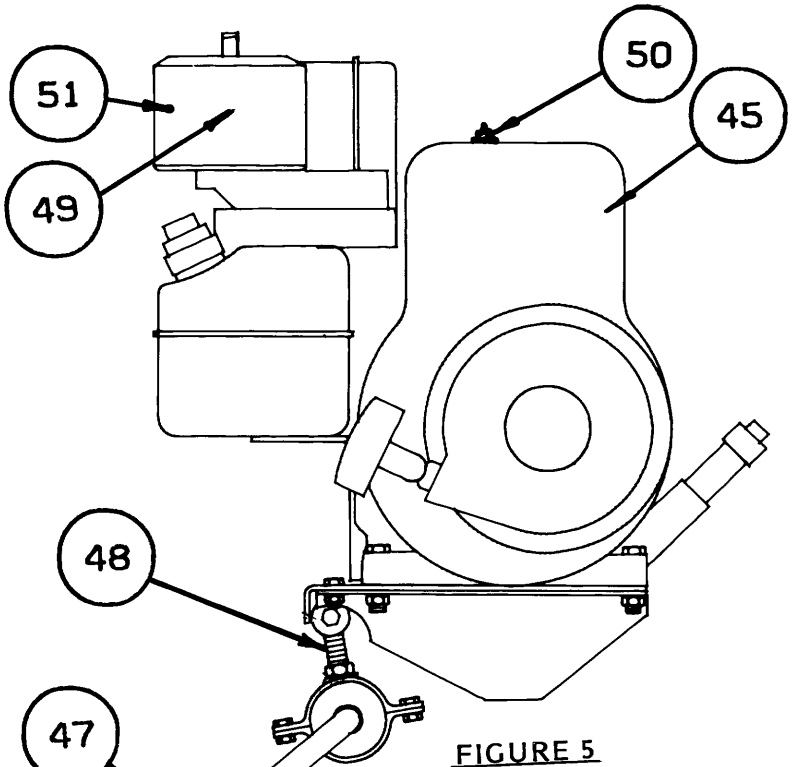


FIGURE 5

ENGINE/THROTTLE ASSEMBLY

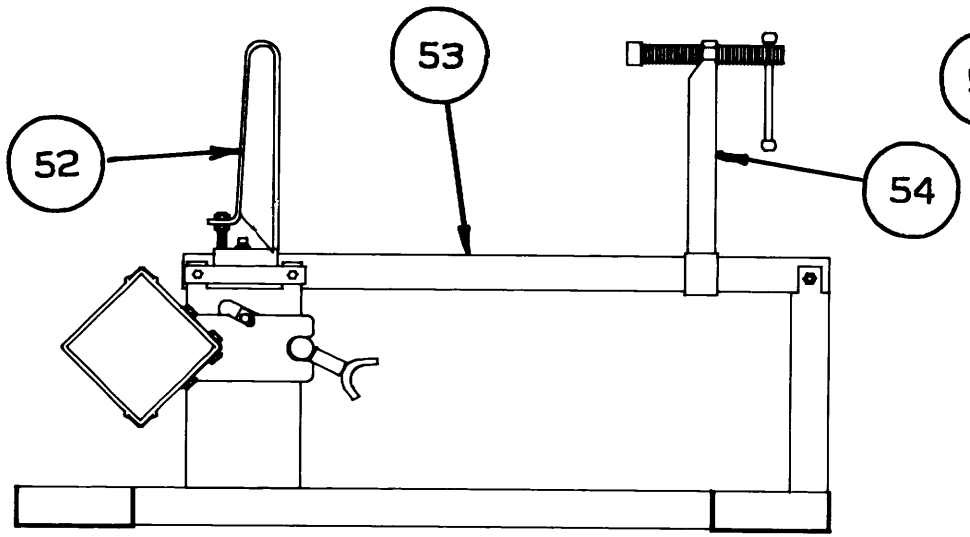


FIGURE 6

LOG DECK ASSEMBLY

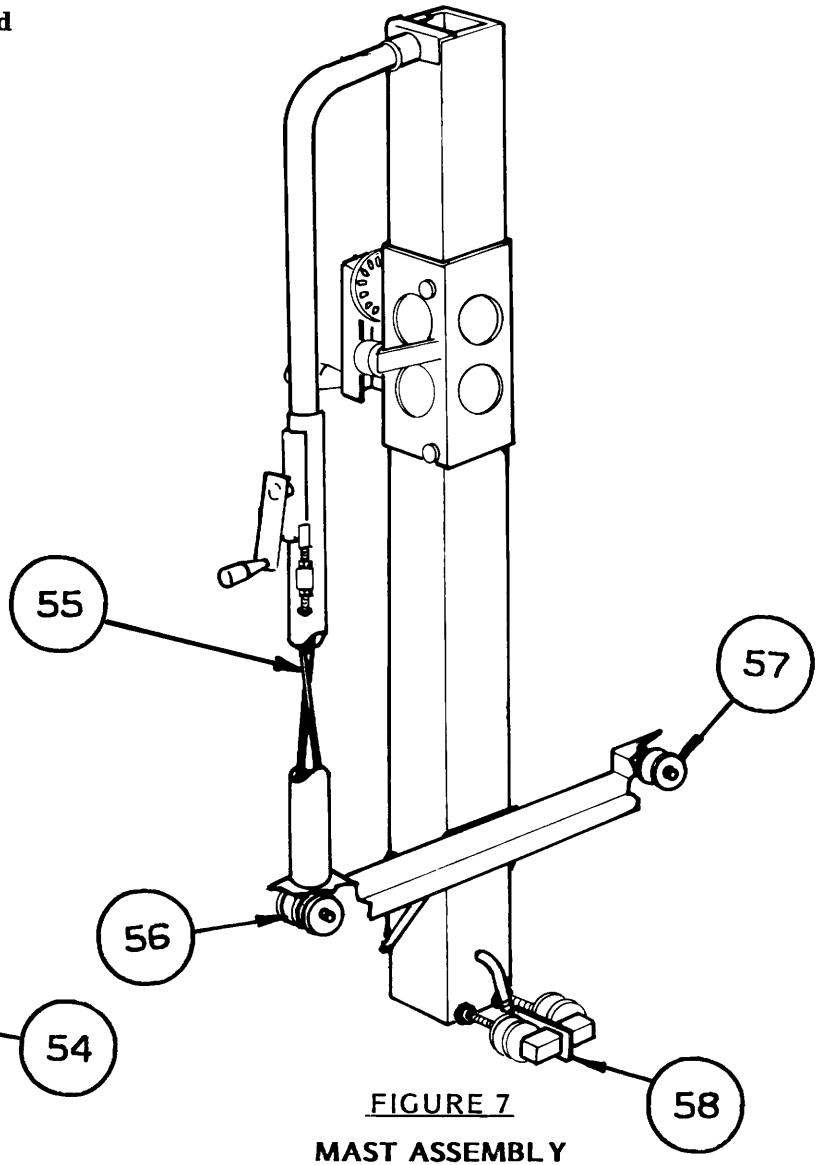


FIGURE 7

MAST ASSEMBLY

SECTION 6.2
PARTS LIST

Ref. No.	Description	Part No.
1.	Fixed Log Deck	A08006
2.	Floating Log Deck	A08007
3.	Fixed Log Deck Mount	W08111
4.	Floating Log Deck Mount	W08114
5.	Front Stainless Steel Track	S08343
6.	Middle Stainless Steel Track	S08102
7.	Rear Stainless Steel Track	S08101
8.	Spring Stop	S08103
9.	Auxiliary Supports	A08104
10.	Track Clamping Assembly	A08383
11.	Upper Idler Sprocket	P08068
12.	Up/Down Chain	P08126
13.	Up/Down Chain Master Link	P08076
14.	Up/Down Sprocket Assembly	A08390
15.	Up/Down Dial Weldment	W08346
16.	Socket Head Bolt w/Locknut	A08477
17.	Slide Pad	P08028
18.	Chain Tensioner Assembly	A08295
19.	6203-10 Up/Down Bearings	P06030-1
20.	Chain Tensioner Roller w/Snap Ring	A08476
21.	LT20 Inch Rule	M08454
22.	Track Wiper	M08270
23.	Feed Crank w/Handle	A08388
24.	Blade Tension Assembly	A08165
25.	Brake Pad	M08205
26.	19" Blade Wheel	M08125
27.	Wheel Bearing	P08066
28.	Bearing Retainer Plate	S08221
29.	B-67 Drive Belt	P08063
30.	B-57 Idle Belt	P04185
31.	Blade Guide Assembly (Drive)	A08197
32.	Blade Guide Assembly (Idle)	A08191
33.	Blade Guide Bolt	S08192
34.	1/4-28 Grease Fitting	P05060
35.	1/2 SAE Washer	F05011-2
36.	Blade Guide Spacer	P04253
37.	5/8 Felt Washer	P04252
38.	Tru-Arc Ring	F05254-1
39.	R-8 Bearing	M04902
40.	Upper Blade Guide Roller	A04925
41.	1/2-20 Lock Nut	F05010-12
42.	Blade Guide Shaft	S08196
43.	Upper Blade Guide w/Bearings	A04925
44.	Blade Guide Rebuild Kit	K07079
45.	5HP Briggs & Stratton Gas Engine	P08075
46.	Spark Arrestor Screen	P08402
47.	Clutch Handle Assembly	A08354
48.	Belt Adjustment Screw Assembly	A08216
49.	Air Filter	P07933

SECTION 6.2
PARTS LIST - cont'd

Ref. No.	Description	Part No.
50.	Spark Plug	P08474
51.	Air Pre-cleaner	P08475
52.	Side Support	W08079
53.	Bed Rail	S08048
54.	Log Clamp Assembly	A08282
55.	Hand Feed Belt 3L560	P08064
56.	Upper Track Roller (Drive)	S08255-1
57.	Upper Track Roller (Idle)	S08255-2
58.	Lower Roller Assembly	A08248

SECTION 7.1

WATER LUBRICATION OPTION INSTRUCTIONS

The Water Lube System is primarily a system to keep the blade clean. Water is routed from a 4-gallon bottle to a blade guide bracket. The water flow is controlled from a valve on the side of the bottle.

To install the water system, simply fill the bottle with water, then hang the bottle from the hanging bracket. **(See Figure 1.)** The water bottle must be vented for the water to flow.

Route the hose from the valve between the cutting head and the mast of the carriage assembly, then down to the tube that is welded to the blade guide bracket. **(See Figure 2.)**

Not all types of wood require the use of the Water Lube System, but when it is necessary, use only enough water to keep the blade clean. This conserves water and reduces the risk of water staining the boards.

Average flow rate will be one to two gallons per hour.

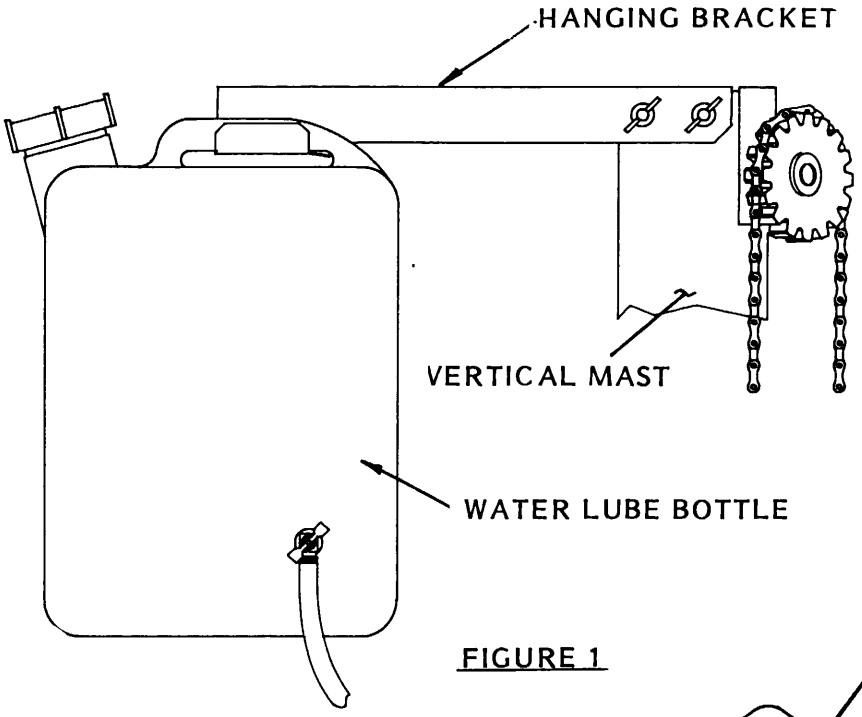


FIGURE 1

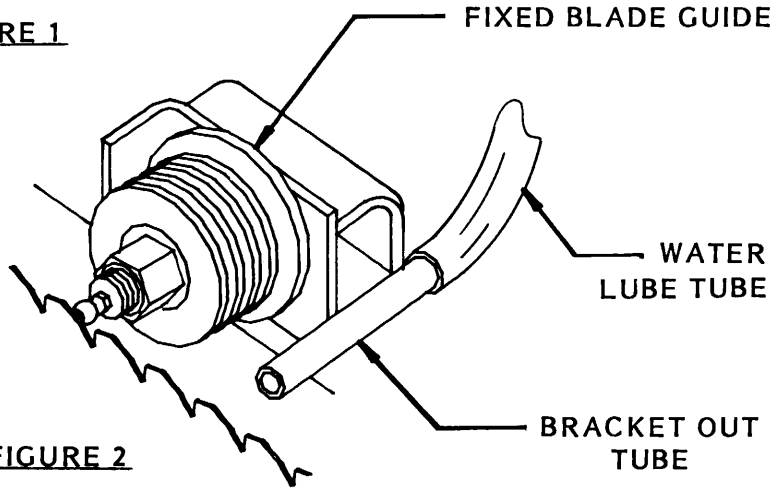


FIGURE 2

SECTION 7.2

LOG-LOADING RAMPS

The loading ramps come completely assembled and need only to be put in place over the loading ramp pins located on each of the log decks. **(See Figure 1.)**

It is recommended that two people, using cant hooks or peaveys, roll the log onto the mill with the optional loading ramps. To avoid injury, neither person should stand directly behind the log in case it rolls back down the ramp. These ramps are equipped with special flip-up stops that are designed to assist in the loading of the log. The loading ramps should be removed when sawing to avoid interference.

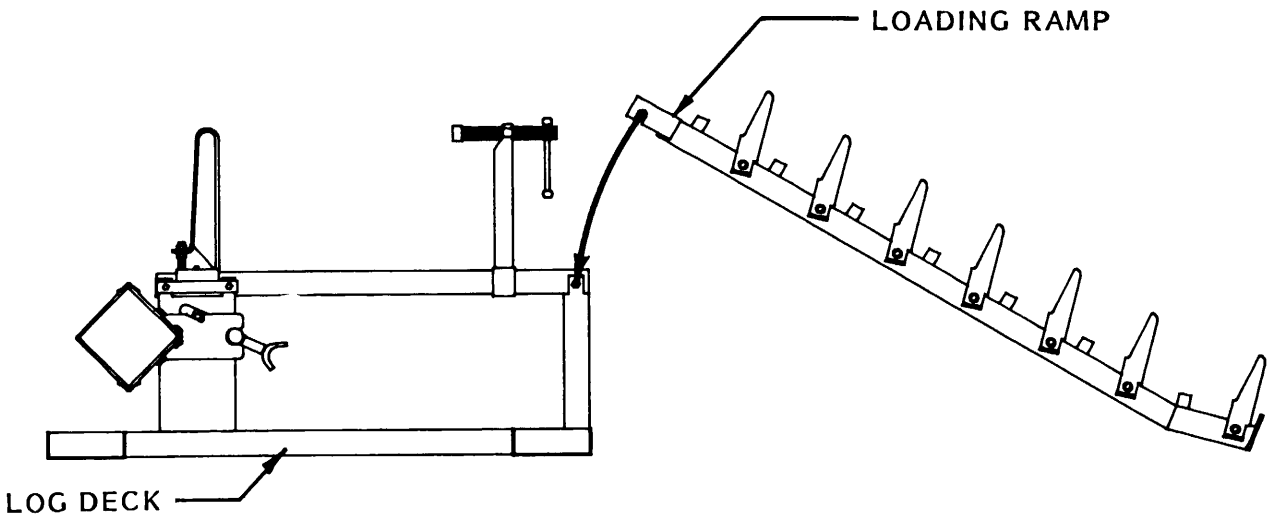


FIGURE 1

SECTION 8

TROUBLE-SHOOTING

PROBLEM	CAUSE	SOLUTION
Blades Dull Quickly	Dirty logs	Clean or debark logs, especially on the entry side of the cut
	When grinding teeth, taking too much metal will heat up the tooth and cause them to soften.	Grind just enough metal to restore sharpness to the teeth. See Section 2.5
	Poor sharpening techniques	Make sure the tip is being sharpened completely See Section 2.4
Blades Break Prematurely	Rubber tires on drive wheels worn to the point blade contacts metal wheel - look for shiny spots on edge of wheels	Change Belts (B-57 & B-67 Eaton V Belts)
	Poor sharpening techniques	See Section 2.4
	Tension too tight	See Section 2.7
Blade Doesn't Track Properly On Drive Wheel	Cant adjustment is not correct	Re-adjust - See Section 2.7
	Flat belts	Replace belts (B-57 & B-67 Eaton)
Blade Guides Don't Spin While Cutting	Frozen bearings	Replace bearings
	Stiff bearings	Grease bearings
Blade Doesn't Stop Immediately After Disengaging	Brake shoe too loose or worn	Adjust brake or replace shoe - See Section 4.6
Boards Thick or Thin on Ends or Middle of Board	Stress in the log, which causes the log to not lay flat in the bed	After the log has been squared, take equal cuts off opposing sides. i.e., Take a board off the top, then turn the log 180° and take a board off. Repeat, keeping the heart in the middle of the cant, and making it your last cut.
	Set in teeth	Re-set, equalize and sharpen

SECTION 8

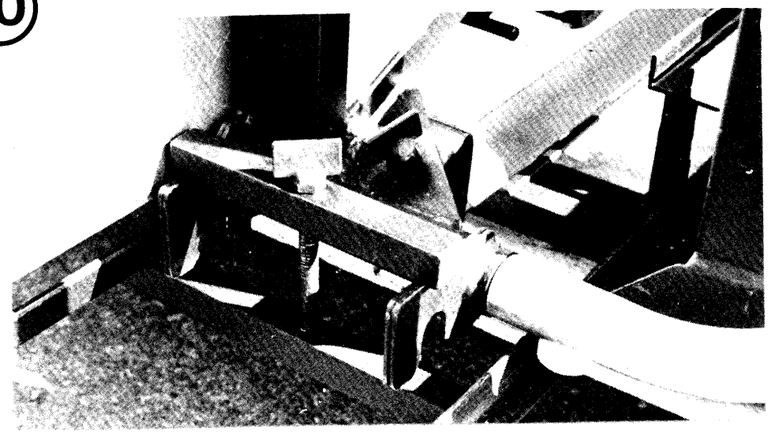
TROUBLE-SHOOTING - cont'd

PROBLEM	CAUSE	SOLUTION
Lumber is Not Square	Vertical side supports not square	Adjust vertical side supports. See Section 5.4
	Blade is not parallel to bed	Adjust blade to parallel - See Section 5.2
	Sawdust or bark between log and log decks	Remove particles
	Tooth set problem	Re-set, equalize and sharpen
Sawdust Builds Up On Track	Excessive oiling	Track does not need any lubrication
	Rail wipers worn	Adjust wipers to the point where they firmly come in contact with the track
	Track is sticky	Clean track with solvent, apply a coat of standard automotive wax and buff to a hard surface
Wavy Cuts	Excessive feed	Slow feed rate
	Improperly sharpened blade - **This will be the problem 99% of the time**!	Resharpen blade - See Section 2 - Read **entire** section
	Blade guides improperly adjusted	Adjust guides - See Section 5.3
	Sap build-up	Water-lube
	Set problem	Re-set,equalize and sharpen

LT20 Crating Instructions

10

10. Place T-bar over hook brackets and thread into tapped hole until carriage is secured.



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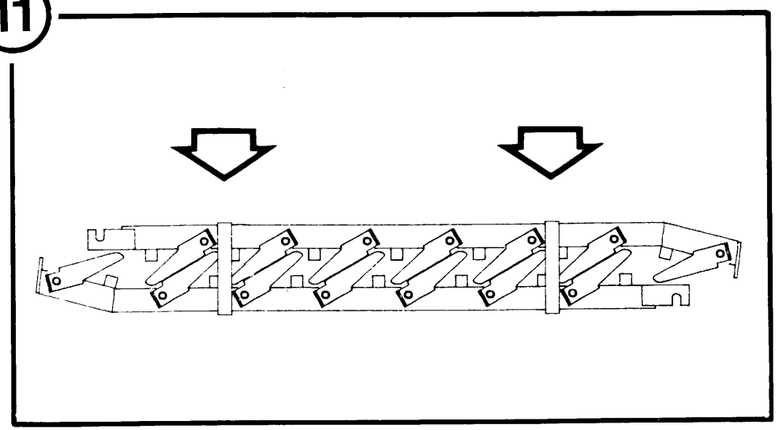
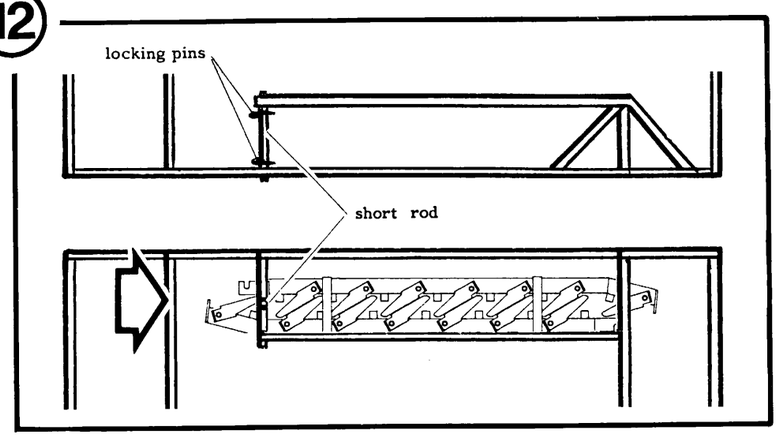


11. Clamp two ramps (optional) together by placing one on top of the other as shown and press together until you are able to place the two clamps around both ramps.

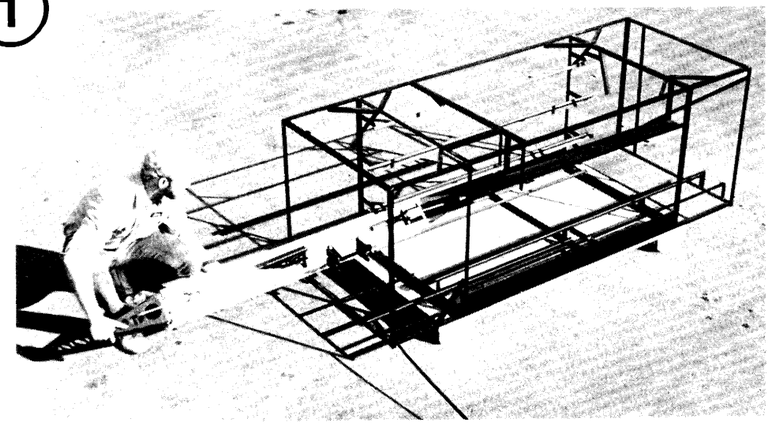
12



12. Slide ramps into shelf at top right of crate. Slide until ramps are approximately centered on shelf and use short rod with two locking pins to hold in position.

1

1. Load middle track section into lowest guide on left hand side of crate. Slide in all the way to rear of crate.



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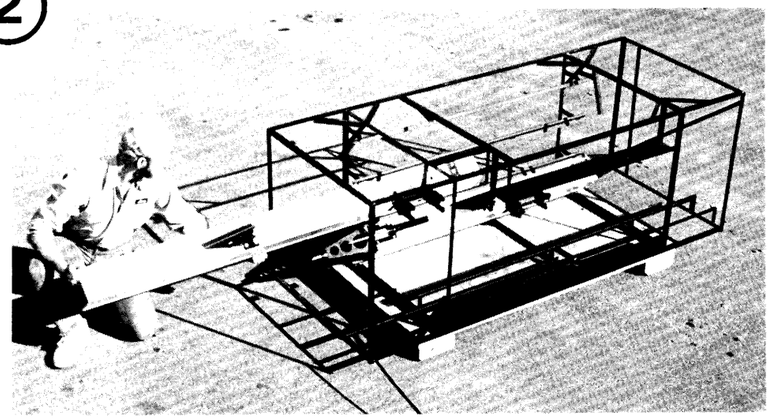
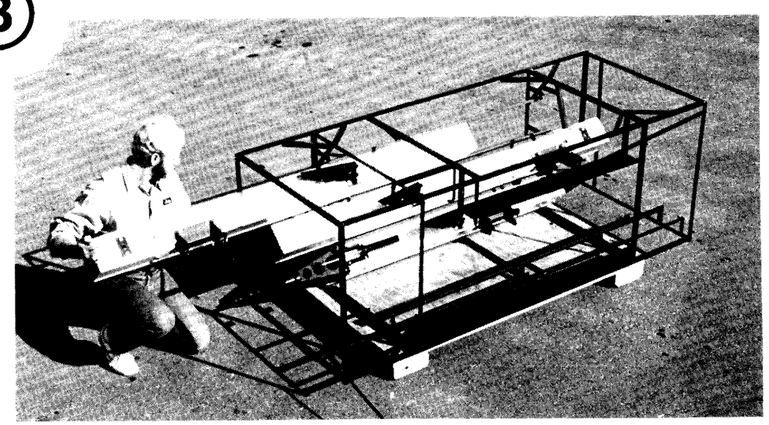


2. Slide front track assembly (clamp fixture first) into middle guide above the track just loaded. Again, push all the way to the back of the crate.

3

3. Slide rear track assembly (clamp fixture last) in top guide all the way to rear of crate.



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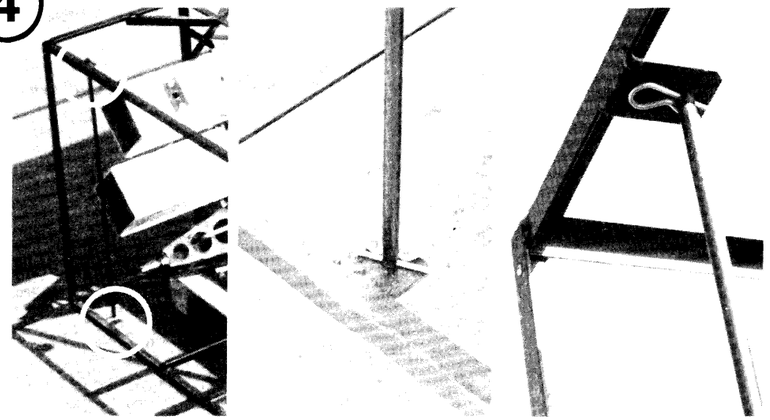
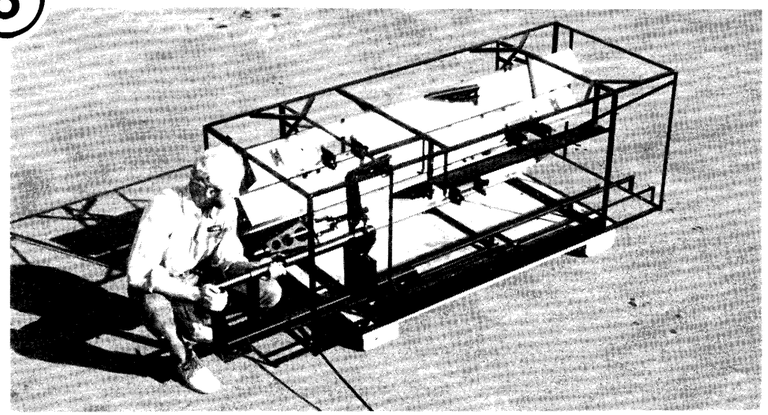


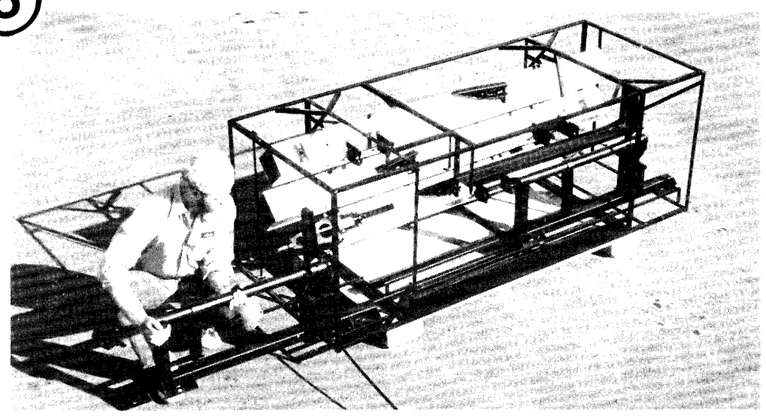
4. Replace stop bar with lock pins above bottom bracket and below top bracket as shown.

5



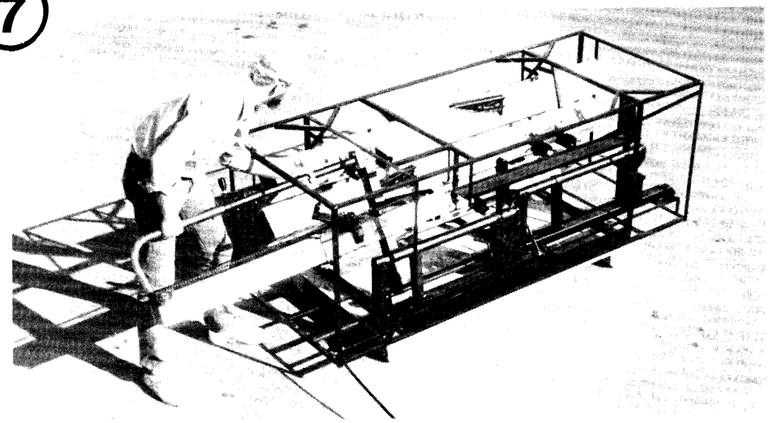
5. Load one of the log decks in the top guide on the far right hand side of the crate (side support end first). Slide all the way to rear of crate. You will have to tilt deck to allow side supports to miss support angles of the crate.

6



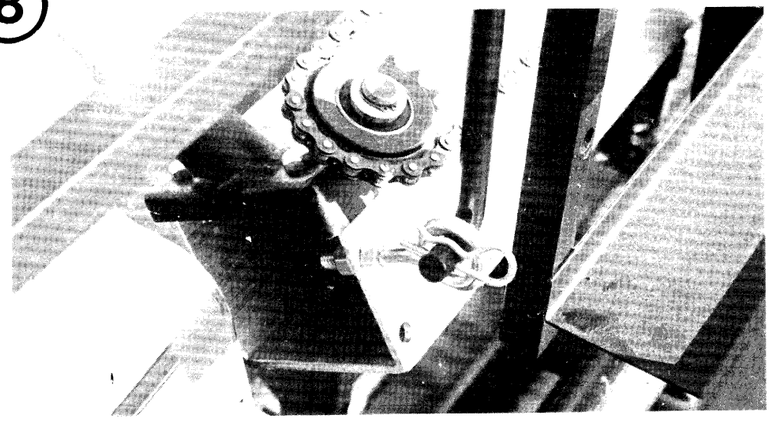
6. Place the other log deck in the lower guide at the far right side of the crate (side support end first) and slide till it butts against the first log deck.

7



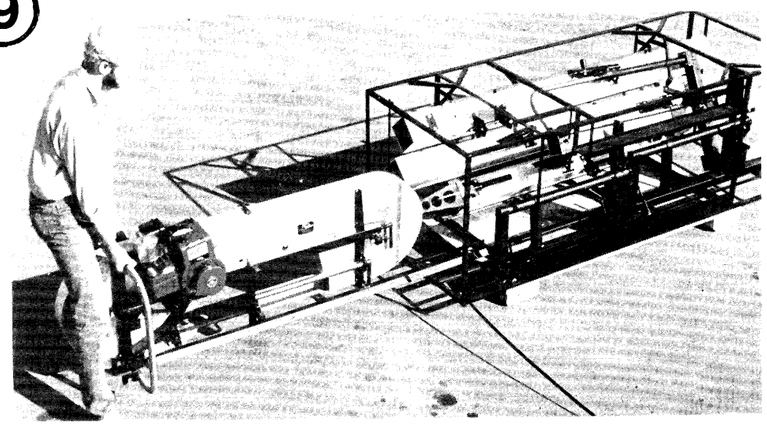
7. Load mast by placing pin located on idle upper track pulley housing in guide found just left of the log deck guides. Slide mast in crate until pin at end of guide locates inside the pulley housing.

8



8. Hang eye-bolt at top of mast on crate hook and lock with pin.

9



9. Attach guide handle to carriage head and load into crate (idle side first) on guide just left of mast pin guide. Slide carriage in crate until hook brackets rest over cross support with tapped hole.