A BIBLIOGRAPHY ON
THE MACHINING OF WOOD

MAY 24, 1948 EDSON A. REEDER

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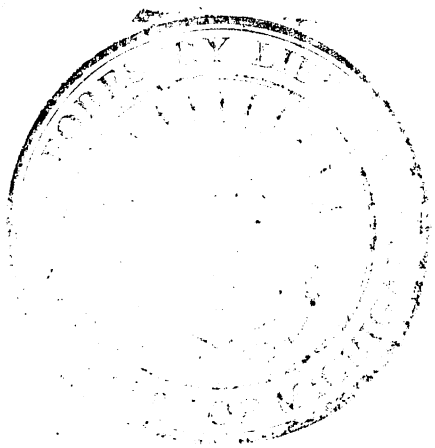

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May 24, 1948

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Dear Professor Patronsky:

This report, A Bibliography on The Machining of Wood, is being submitted in partial fulfillment of the requirements for the degree of Master of Forestry.

Very truly yours,

Edson A. Reeder.

A

BIBLIOGRAPHY

ON

THE MACHINING OF WOOD

By

Edson A. Reeder

This Report is Submitted
in Partial Fulfillment of the
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School of Forestry and Conservation
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INTRODUCTION

Increased competition with substitute materials for uses formerly allotted to wood, in addition to the usual invigorating effect of better methods of manufacturing needed by a healthy industry, has created the necessity of stimulating research dealing with the machining characteristics of the various woods, both native and foreign. The machinability of wood under various conditions, power requirements in machining, practical rates of feed, machine design, and production methods are a few of the factors connected with woodworking in which much research is needed in order to provide the wood using industries with a sound basis in turning out products that must compete with substitutes.

This bibliography was prepared with the hope that it can be of assistance in the investigation of problems in the machining of wood. The Engineering Index, in the Engineering Library at the University of Michigan, provided an excellent and reliable listing of articles concerning the machining of wood. This bibliography covers the period from the beginning of 1944 to the end of the first quarter of 1948. A Bibliography on The Machining of Wood, published by The American Society of Mechanical Engineers in 1939, covers the period from 1850 to 1939 and is without summaries. A copy of this ASME bibliography is available in the Forestry Library at the University of Michigan. A bibliography of Machining of Wood, covering the period from 1940 to 1944, has been compiled and may soon be available in the Forestry Library.

The large number of articles on British woodworking machinery will serve as good sources of information in comparing American made woodworking machinery with that of British design and manufacture. The articles listed in "Wood", the British periodical, are very descriptive of machining operations and machine design. All articles are very well

illustrated.

Very few foreign articles (except British) on the machining of wood have been written since the beginning of World War II. The various libraries at the University of Michigan are attempting at the present time to re-subscribe to foreign publications that were terminated during the war.

The method of citation and abbreviation in this bibliography is standard and easily interpreted. The name of the periodical is written in full. The first number following the name of the periodical is the volume number; the number in parenthesis is the issue number, and the numbers after the semicolon are inclusive page numbers. When an article is illustrated the abbreviation, "il.", is used following the page numbers. The date of the issue is next in line and this is followed by the abbreviation for the particular library on the University of Michigan campus in which the periodical is located. The following are abbreviations of designated libraries and the location of these libraries at the University of Michigan:

F. & C. - Forestry Library (Room 1045, Natural Science Bldg.).
Eng. - Engineering Library (Room 213, West Engr. Bldg.).
E. Eng. - East Engineering Library (Room 3035 East Engr. Bldg.).

Approximately 110 articles were read in the search for suitable articles for this bibliography. Half of the above number of articles were discarded after reading because of their non-technical nature or non-application to the subject of the machining of wood.

This bibliography may have some usefulness in the study of various courses in wood technology at the University of Michigan including: Tools of the Wood-Using Industries, Machinability of Wood, and possibly Factory Management.

1944

Ellis, H. J.

1. Results of Expansion in Woodworking Cutters.

The Wood-Worker, 63 (9): 58, 59, Nov. 1944, F. & C.

Expansion in a cutter takes place in proportion to heat build-up. Excessive heat buildup in dull saw-tooth points of a circular saw often causes the teeth to lose their temper and the heat gradually works into the center of the saw causing the rim to expand and the saw will dodge or snake in the cut. The band-saw blade expands after work begins and must be brought again to the proper tension, but if this tension is not released when the work is finished, the blade will shrink as it returns to room temperature and will stretch on the wheels, very likely leading to a fracture in the blade.

Graham, P. H.

2. Practical Power Belting Pointers.

The Wood-Worker, 63 (5): 42, 44, July 1944, F. & C.

63 (6): 30, 32, il., Aug. 1944.

Leather, rubber, balata, solid woven cotton and stitched canvas are the general classifications of belting. Pulley diameter and speeds are the factors which determine the thickness of the belt. The best grade of leather belting comes from the center of the hide which once laid over the animal's spine. If the belting (leather) wrinkles in the "piping" test (bending over a form), it should be rejected. A tensile strength test should average not less than 3000 lbs. per square inch. In the stretch test the elongation should not exceed 15% at 2500 lbs. pressure.

The endless method of belting joining has proved the most

satisfactory, as the joint has the same flexibility and the same frictional contact with the pulley as the belt itself. This is not true of the lacing and metallic fastening methods. A few of the defects caused in belting by improper installation, maintenance, or use are: burning, ply separation, edge abrasion, excessive stretch, excessive slip, and jamming.

Graham, P. H.

3. The Dust-collecting System.

The Wood-Worker, 63 (7): 32, 34, Sept. 1944, F. & C.

Efficient operation of a wood refuse exhaust system is a result of the use made of long used standards based on correct theory and practice. Figures 1 and 2 in this article give the correct connection pipe diameter for the desired suction (inches water gage) and for different sizes of various woodworking machines.

"Collector resistance can be figured by use of this formula:

$$R \text{ equals } C \frac{(V)^2}{(1000)}$$

where: R equals the collector resistance in inches of water.

V equals the air velocity in feet per minute at collector inlet.

C equals a constant whose value depends upon the type and construction of the collector, usually ranging from .10 to .20."

1944 (cont'd.)

Haycock, A. H.

4. Circular Rip Saws.

Wood (British) 9 (5): 114 - 116, il., May 1944, F. & C.
9 (6): 127 - 130, il., June 1944.

A saw that has been in use for a considerable length of time should be tested for tensioning by the use of a straight edge to show whether the center or the edges drop away or by giving the saw a blow when held in the hand to check the amount of vibration resulting, thus determining the need for re-tensioning. Packing has the function of generating heat to the body of smaller saws to compensate for partial loss of tension as well as the function of mechanical support.

The continuation of the face of the tooth (rip saw) falls halfway between the center of the saw and the gullets. This is the amount of hook advocated for softwoods. For hardwoods this line should fall about one-third the distance from the center to the gullets. The gulleting machine should be used to sharpen the fronts of the teeth at every sharpening instead of only after the teeth have been worn down. A good standard to set in the depth of the gullet is one-half the distance from one tooth to the next. There is a limit to the thickness of material which can be cut off by a saw, due to the heat generated by bearing against the bevel of the saw and also due to the wedging action of the saw splitting wood in front of the teeth.

Haycock, A. H.

5. Circular Cross-Cutting Saws.

Wood (British), 9 (7): 160 - 163, il., July 1944, F. & C.
9 (8): 181 - 183, il., Aug. 1944.

1944 (cont'd.)

Cross-cut saws with a negative hook on all teeth are very inefficient and have practically no power to remove sawdust from the cut. Teeth with neither negative or positive hook give much better results. A front bevel of 10 degrees for hardwoods and 20 degrees for softwoods is recommended. The smallest bevel possible consistent with smooth filing is advised for the backs of the teeth. Rounded gullets give better protection against cracking than do sharp corners in gullets.

The best cross-cutting saw has a combination of cross-cutting or peg teeth and ripping teeth or rakers. The peg teeth project slightly past the rakers and sever the fibers before the rakers remove the wood. Cross-cutting saws will run a longer time than ripping saws without losing their tension to the extent they need re-tensioning.

Haycock, A. H.

6. The Straight-Line Edger.

Wood (British), 9 (9): 203 - 206, il., Sept. 1944, F. & C.

The stresses released when a board is sawn lengthwise through its center often cause twisting and warping almost immediately. The straight-line edger is adapted much better to the cutting of wide material into several pieces than for the purpose for which it was designed, that of jointing. The feeding mechanism is horizontal and only one setting is required to cut the widest material.

It has been noted that the fewer the teeth in a saw the lower the power consumption up to a certain limit. A set of .015" on each

side of the saw is ample for most general ripping work.

Haycock, A. H.

7. The Narrow Band Saw.

Wood (British), 9 (10): 223 - 226, il., Oct. 1944, F. & C.

9 (11): 260 - 264, il., Nov. 1944.

Good results were obtained in an experiment where the points of two-thirds of the teeth in a narrow band saw were removed to prevent them from cutting and the remaining teeth had a five degree positive hook. This method is strongly recommended for deep cutting (more than 3" thick). Breakage in band saws is caused by too sudden starting or stopping of the saw, too much strain on the saw by the tensioning mechanism, and also fracture caused by the compressing of a thin skin of steel on the back of the saw due to heat of friction on the guide wheel allowing minute cracks to develop in the saw.

A good standard to use in setting the teeth of a narrow band saw is to put the amount of set on each side equivalent to one-third of the thickness of the saw.

It is advisable to lower the guide arm until the bottom edges of the guide blocks are not more than $\frac{1}{2}$" from the top of the work.

Haycock, A. H.

8. Dimension Saws.

Wood (British), 9 (12): 277 - 280, il., Dec. 1944, F. & C.

The wood is fed into the saw by means of a movable table on the dimension machine. A combination of two peg teeth to one raker on hollow ground saws produces extra smooth rip sawing. A good combina-

tion for crosscutting and angle sawing on both hard and soft woods is 20 sets of 4 peg teeth to one raker on both 16" and 18" saws.

The amount of loose fibers hanging to the bottom edges of a cut may be reduced by projecting the saw only a small amount above the work, thus bringing the thrust of the teeth nearer to the horizontal and allowing the wood following up to partly support that being cut.

Stebbins, F. H.

9. Design of Refuse Collecting Systems.

Sheet Metal Worker, 35: 40 - 42, il., July 1944, E. Eng.

35: 42 - 44, il., Aug. 1944.

Calculation, design, and installation are the principal divisions of work involved in constructing and installing a refuse collecting system. The various types of separators are, as follows: a cyclone separator where the refuse is separated from air by centrifugal force, a cloth screen dust arrester where the refuse is separated from air by filtration, a dust settling chamber where dust is separated from air by gravity by the use of baffles, a clarifier which takes out finer particles of dust from the air after dust has passed through another separator, and an air filter which separates dust from air by means of impingement. Illustrations in this article show a typical refuse collecting system for a woodworking plant. The main pipe should be so constructed so there is little difference in the suction obtained in it and a branch pipe. The U-tube test may be used in testing static suction. Tables given in this article list the carrying capacities of pipes, in cubic feet of air per minute, at various velocities.

1944 (cont'd.)

Van Ormer, W. K.

10. Modern Sanding Practice in Furniture Manufacturing.
The Wood-Worker, 63 (4): 42, 44, June 1944, F. & C.
63 (5): 30, 32, July 1944.
63 (6): 42, 44, Aug. 1944.
63 (8): 32, 34, Oct. 1944.
63 (9): 32, 34, Nov. 1944.
63 (10): 34, 36, Dec. 1944.
63 (12): 48, 50, Feb. 1945.
64 (1): 46, 48, Mar. 1945.
64 (2): 50, 52, April 1945.
64 (5): 44, 46, July 1945.

Garnet and aluminum oxide are the chief abrasives used in furniture making. The electrocoating process used in making aluminum oxide papers increases the speed in cutting, with proper operating speeds, and gives a uniform finish. Aluminum oxide paper is used chiefly on hard woods and where there is hard glue and possibly nails. In triple drum sanding, as a rule, No. ½ paper is used on the first drum, 1/0 on the second and 2/0 on the third. Spiral-wound drums appear to give better results than clamp drums, as clamp drums are likely to cause waves, washboards, and snake marks. According to experienced operators, there should be twice the thickness of felt on the last drum as on the first two in order to prevent the paper on the drum from having a tendency to "quit" too soon.

Rough belt sanding with 2/0 and polishing with 4/0 is considered the best practice following triple drum sanding with ½, 1/0 and 2/0. No. 3/0 is often used to remove tape and polish in the same operation.

1944 (cont'd.)

For best results in sanding straight-line moldings the pulleys should lie on their sides so the belt is in a vertical plane. Open-coated jeans cloth of the extreme degree of all-direction flexibility gives the best sanding job on straight-line molding. Belt speeds are below 3000 surface feet per minute on most molding sanding operations; therefore, garnet is usually superior to aluminum oxide which burns the wood more readily at low speeds.

Roll sanding is used to arrive at the approximate shape desired. Pneumatic drum sanding is very good on small rounded surfaces.

The method of sanding serpentine panel considered most successful is by means of an edge sander with the work table set 1-ft. out of line with the pulleys absolutely level and near the operator.

There is a tendency for furniture factories to use sanding belts that are too coarse in edge sanding operations. One reason for the use of coarser abrasives for edge sanding is the difficulty of sanding butt grain which burns easily because of its hardness if finer than 1/0 is used. It has been found that it pays to use 4/0 regular, full-coated jeans, non-flexible for edging.

Sanding with the vertical jig spindle is best on rough band-sawed stock and on contoured edges. The best average paper for furniture factories when taking into account average hardness of woods and average machine speed is regular full-coated garnet.

No. 2/0 is the paper now chiefly used for any type or grade of furniture. Anything from 3/0 to 8/0 is used for polishing. In the use of hand sanding no more than one grit size should be jumped in subsequent sandings.

In the finishing room high priced furniture requires the largest

number of operations including sanding. Flint paper and silicon carbide paper are abrasives used in the finishing room, but not in the machine or cabinet room. Electrocoated open-coat aluminum oxide finishing paper is very good on hard lacquer sealers used in the radio cabinet field.

Pumice and related materials are being replaced with waterproof paper in many plants. Waterproof paper can cut a hard lacquer in one-third to one-fifth of the time required by pumice.

1945

Brady, Lee

11. Welding Band and Circular Saw.

Industry and Welding, 18 (8): 76, 77,79, 80, 81, il.,Sept. 1945 Eng.

A piece of saw plate can be welded to the stub of a broken tooth in a band or circular saw and the correct shape of the tooth obtained by filing or grinding. In welding long cracks the welding should be started from both ends and alternated from one end to the other until the welds meet. In hard-facing saw teeth one of the carbides or stellite is fused into the surface of the teeth and built up to normal proportions after which a grinding machine is used to finish the job.

Bunnett, L. E.

12. Conversion Waste.

Wood (British), 10 (4): 85 - 86, il., April 1945, F. & C.

All forms of waste should be controlled and kept to a minimum. Cutting waste is directly related to: width of sawcut, depth of surfacing (planing) cut, and the cross section of the finished product.

From the formula:

Percentage wasted cutting boards = $\frac{100}{\frac{X}{W}} \neq 1$

where X is thickness of board in inches and W is width of saw cut plus twice the planing cut in inches, formulas can be derived for usable timber after cutting and the amount wasted. A chart has been developed from these formulas to determine the allowance for waste in converting timber to boards.

1945 (cont'd.)

Chamberland, H. J.

13. High-Speed Band Sawing.

Aero Digest, 48 (5): 114, 116, 118, il., Mar. 1945, E. Eng.

The high-speed band saw has maximum rigidity and remains vibrationless when operated at super-high velocities. A 10-horse power motor is adequate for saws with bands up to 1½ inches. The use of the buttress band which provides coarse-pitch tooth construction eliminates the deep wedge-shaped gullet and increases the rigidity of the tooth more than 100%. Saw pitch and velocity are dependent upon the composition of material and the type of finish desired. Velocities of 3000 to 4000 ft. per minute are used in cutting hardwoods and softwoods with saw pitch for work thicknesses of ½" to 6" ranging from 2 to 6.

Graham, P. H.

14. Wood Properties and Characteristics.

The Wood-Worker, 64 (3): 34, 36, 37, May 1945, F. & C.
64 (4): 55, 56, 57, June 1945.
64 (5): 48, 49, 50, July 1945.
64 (6): 54, 55, 56, Aug. 1945.

Shrinking of wood in seasoning and the type of sawing are the most important factors in the stability of wood.

This article contains a table, "General Grading of Commercial Woods", which should be useful to the wood-worker. Properties and characteristics of the following commercial woods are listed in this series of articles: ash, basswood, birch, beech, cherry, chestnut, cottonwood, cypress, elm, gum, pecan, magnolia, mahogany,

1945 (cont'd.)

maple, oak, white pine, poplar, sycamore, and black walnut. "The basis for the common factors are: Strength - Composite strength value, with weak rating strong enough for average work. Stability - Rated on unrestrained warp. Nailing - Rated on ability to take nails near end without splitting. Planing and Jointing - Rated on average runs at 15, 20, and 25-degree cuts. Turning - Rated on smooth cutting and ability to hold detail. Sanding - Rated on freedom from fuzz. Mortising - Rated on smoothness of cut, but work speed decreases due to hardness of wood must be considered also. Bending - Rated on fracture percentage as well as basic bending properties."

Haycock, A. H.

15. Surface Planing.

Wood (British), 10 (1): 14 - 17, il., Jan. 1945, F. & C.

In many cases the weight of the wood alone should be sufficient to hold it to the tables at the usual feeding speeds. Denser woods may require some vertical pressure to prevent "kickback". In order to secure good surfaces for glue jointing the surface planer should be of accurate construction, have sharp cutters, accurately set back table, and the proper number of knives to operate efficiently. A hardwood straight edge is usually used in setting knives, although a good gage has been made for this purpose.

The finger-feed planer feeds the wood over the knives by means of spring loaded steel fingers.

1945 (cont'd.)

Haycock, A. H.

16. Thickness Machines.

Wood (British), 10 (2): 47 - 50, il., Feb. 1945, F. & C.

In order for a panel planer to do the best work all the rollers together with the pressure bar must be set correctly, the anti-friction rollers with regard to the surface of the table and condition of the wood being planed, and the feed rollers and pressure bars in relation to the cutterblock or the lowest point of the knife tract. To avoid torn grain, pieces with a sloping grain should be fed into the machine with the open ends of the loops (growth rings) first if the heartside of the wood is uppermost, and with the closed ends of the loops first if the heartside is downward.

Haycock, A. H.

17. Planer Knife Technique.

Wood (British), 10 (3): 63 - 66, il., March 1945, F. & C.
10 (4): 89 - 92, il., April 1945.

Knives with a minimum clearance at the heels of the grinding bevels are to be preferred to those which have been ground to a more acute angle, because the cutting edge is thicker and stronger and can stand the strain of high feed speeds without chipping. Good results can be obtained under normal conditions with a bevel of 30 degrees on the knives.

The larger the cutting angle, the more efficient a knife is in regard to its wood removing action. The natural cutting angle is satisfactory for most hardwoods, but it is too large for others

and this results in rough work and torn grain. If the wood is crossgrained the wedging action of the knife splits the grain below the nominal planed surface. The faster the feed used the more this adverse grain is torn out because of the large size of the chips which do not break off easily. The use of dull knives also causes torn grain. A secondary bevel can be ground on the faces of the knives to improve the quality of planing of difficult woods.

The bearings of the cutter-block should be checked often to detect any wear that would certainly affect the quality of planing.

Haycock, A. H.

18. Tenoning.

Wood (British), 10 (5): 122 - 125, il., May 1945, F. & C.

A shearing cut from cutters which do not lie parallel with their axis of rotation gives much cleaner and smoother surfaces than a straight cut from cutters in parallel sided square blocks. The greater the angle which the cutter seats of the blocks make with the axis of rotation the greater the degree of shearing action. An excessive bevel of the cutter seats reduces the cutting angle proportionally, thus giving a loss in the efficiency of wood removal. Discarded flat files may be used for shoulder cutters. They are cut at an angle of about 40 degrees to form the cutting bevel and then serrations are cut on this bevel.

1945 (cont'd.)

Haycock, A. H.

19. Setting-up the Tenoner.

Wood (British), 10 (6): 149 - 151, il., June 1945, F. & C.

Best results are obtained when the edges of the cutters conform exactly to the cutting circle, although the method used most is that of making the edges form a smaller curve than that of the cutting circle. The bottom blocks may be put on the top spindle in order to set the cutters easily. If one of the heads is found to be too high after testing, it should be lowered a little more than the amount found to be necessary so that it must be lifted a fraction to set it to the correct height to take up backlash of the nuts and screws. A scale should be engraved around the bosses of the adjusting handwheels as on metal turning lathes.

Haycock, A. H.

20. Scribing on the Tenoner.

Wood (British), 10 (7): 174 - 176, il., July 1945, F. & C.

The operation usually meant by this term (scribing) is the cutting away of the shoulders of the tenons to enable them to fit over moulded work. In making door rails and stiles the upper tenoning block completes the top part of the work entirely while the lower one cuts the bottom surfaces of the tenons together with the shoulders, and all that the scribing cutters do is remove the small amount of wood from the bottom shoulders so they will fit over the mould. Cutters may be set to a previously work piece or they may be set by using the marked stick method where the exact profile of the mould is marked on the stick and then the cutter is lined up

to conform with the outline on the stick.

Haycock, A. H.

21. Aids to Efficient Tenoning.

Wood (British), 10 (8): 198 - 201, il., Aug. 1945, F. & C.

In gang tenoning on a single end tenoner a special clamping devise may be used which makes use of a row of small rubber pads which give a positive action without undue effort on the part of the operator and take care of any slight inaccuracy in the thickness of the pieces due to the resilience of the pads.

Extra fences may be used to support the whole length of the tenons right up to the cutters as well as supporting the whole length of the pieces. This gives cleaner outside edges on the tenons. The back-cutting method is sometimes used with single end tenoners. It consists of drawing the carriage backward past the cutters.

Haycock, A. H.

22. Trenching on the Tenoner.

Wood (British), 10 (9): 224 - 227, il., Sept. 1945, F. & C.

There is a possibility of warping when some time elapses between the planing of wide pieces and subsequent trenching. The use of the tenoner in trenching is the best means of solving the problem as the clamps are powerful enough to press the pieces down flat on the carriage while they are worked. The dado head is recommended for cutting the narrower grooves up to 3/4" wide. An adjustable trenching head is used for cutting wider trenches. A simple gage can be devised to check on the difference in size of the cutters so they may be all maintained to exactly the same size.

1945 (cont'd.)

Shims may be used between the inside cutters to extend the variability of the head.

Haycock, A. H.

23. The Double-End Tenoner.

Wood (British), 10 (10): 245 - 248, il., Oct. 1945, F. & C.

On most double-end tenoners the dogs are fixed on the chains so as to be directly under the top pressures. Where the work is less in depth than the height of the dogs, they must be replaced with shorter dogs. With stock with its greatest dimension vertical it is imperative to have the dogs project at least up to 75% of the depth of the work above the chains. Deep narrow pieces tend to tilt when the dogs are not deep enough in relation to the height of the work. "Chattering" may be caused by dull cutters, insufficient pressure on the work, or burrs on the top edges of the rails. Fixing adjustable spikes through the faces of the dogs is a method of preventing "creeping" endways.

Haycock, A. H.

24. Scribing on the Double-end Tenoner.

Wood (British), 10 (11): 281 - 284, il., Nov. 1945, F. & C.

A setting stand should be used to pre-set cutters in the tenoning blocks. The marked stick method used with single-end tenoners can also be used to set scribing cutter blocks of the double-end tenoner. The larger the block the larger the cutting angle for a given projection of the cutters from its faces. Great care should be taken in balancing the cutters and in determining the amount of cutter necessary to cut a given depth.

1945 (cont'd.)

Haycock, A. H.

25. Mortising Machines.

Wood (British), 10 (12): 314 - 317, il., Dec. 1945, F. & C.

In using the reciprocating chisel mortiser where the mortises are tapered from the back in order to give wedge room, a much better glue bond is made between the wedges and the edges of the tenons than between the wedges and the ends of the mortises. A core driver may be used to force the severed material out of the mortise. Self coring chisels have flanges on their bevelled sides between which the material wedges as it is cut and is withdrawn with the chisel, the next stroke forcing this out. The hand reciprocating chisel mortiser is still in use and gives fairly good results. Mitreing of small mouldings can be accomplished on the hand operated mortiser by use of a tool made from a standard hand chisel and an ordinary chisel.

Hyler, J. E.

26. The Use of Air Compressors in the Woodworking Plants.

The Wood-Worker, 64 (8): 62, 63, Oct. 1945, F. & C.

When in doubt, a check can be made to determine whether an air compressor is delivering air at its rated capacity by using a tank of given capacity fitted with a pressure gage. The volumetric ratio between air at atmospheric pressure and that at the test pressure is multiplied by the test tank capacity and this volume of air is divided by the rated capacity of the compressor to arrive at the time necessary to deliver this volume. If it takes longer than this time, the compressor should be overhauled.

1945 (cont'd.)

Trowbridge, Thomas

27. Use of Modern Coated Abrasives in Woodworking Industries. Mechanical Engineering, 67 (6): 387 - 391, il., June 1945, Eng.

Modern coated abrasives can be efficient high speed cutting tools if the proper abrasive is used for the job and the sanding equipment is maintained properly. The improvements in aluminum-oxide mineral to take higher speeds, improvement in paper construction resulting in nearly 50% savings to the user, development of various degrees of cloth flexibility, the heat treatment of garnet to give longer abrasive wear, the development of the "Openkote" and "Closekote" principle of distribution of abrasive particles over the backing and the invention of the electrostatic method of coating are important developments in the manufacture of coated abrasives. Correct storage conditions insure higher efficiency in using the abrasive. At high belt speeds electrocoated aluminum oxide gives longer belt life than garnet on practically all woods.

1946

Gallaher, E. B.

28. Sandpaper That Gives More Work Value.

Industrial Finishing, 23 (1): 70, 72, 74, 76, 78, 80, 84, il., Nov. 1946, F. & C.

The relative humidity of the surrounding atmosphere produces a direct ratio with moisture conditions in the glue which bonds the abrasive. A relative humidity of 50% allows coated abrasives to give their maximum work value. Abrasive paper should never be stored with the rolls on end, but should be laid on their sides to provide circulation. Too low or too high moisture content in the storage room will make the sandpaper lose its working power. Too low moisture content ruins the abrasive paper permanently by causing dehydration of the glue holding the abrasive and the abrasive tends to shed. A change in relative humidity makes a change in sanding production for the day. Excessive moisture in the belt, in the wood being sanded, or in the atmosphere may cause "filling" of the belt. A higher belt speed may be needed to reduce "filling" of the belt or to eliminate "burning" of the work. Belt speed for sanding wood surfaces should be between 4000 and 10000 ft. per minute.

Haycock, A. H.

29. Chain Mortising.

Wood (British), 11 (1): 24 - 27, il., Jan. 1946, F. & C.
11 (2): 54 - 56, il., Feb. 1946.

Mortising chains are obtainable in three different sizes of links which give pitches of .89 in., .62 in., and .54 in., the pitch being the distance between the centers of the outside rivet

holes of one outside and one inside link. Chain breakage may be due to excessive feed-speed and jerky movements on the part of the operator. Another cause of breakage is the grinding of too much hook on the faces of the teeth. This tends to draw the teeth into the wood, stretching the chain away from the guide bar and causing excessive wear to the guide bar and roller. Ten to fifteen degrees of positive hook on the teeth are considered the maximum that can be safely used.

Chains should be sharpened when needed and should not be worked for extra long periods if maximum working life is to be attained. When the guide bar wears the roller on the end of the bar tilts over to one side when pressure comes on it due to wear on the sides of the bar and the roller and also on the bearings in the roller. As a result, the chain tilts at the bottom giving a slightly curved mortise. When a chain is too slack while cutting, the slackness will be all on the side that is moving into the wood and this causes the mortise to be rounded over the top on that side. Slack in a chain should not be greater than a pull without effort of 1/8" away from the side of the bar. Chains should be kept immersed in oil when not in use.

Haycock, A. H.

30. The Hollow Chisel.

Wood (British), 11 (3): 83 - 85, il., March 1946, F. & C.

Care should be taken to file the edges of a hollow chisel so as to retain the hollow shape on each of the four faces of the chisel. This enables the auger to be set high enough to come almost level with the corners of the chisel. The working portions

1946 (cont'd.)

of the chisel are slightly tapered from the cutting end to the top to facilitate withdrawal from the cut. Care must be taken in filing the lips of augers. The filing should be done on the end faces and this should be done to give each one about 10 degrees of clearance on their inside bevels. A method of reducing clogging of sawdust chips in the chisel while cutting softwoods is to put a little paraffin in the opening of the chisel while it is revolving. This dissolves the resin.

Haycock, A. H.

31. Mortising Methods.

Wood (British), 11 (4): 111 - 113, il., April 1946, F. & C.
11 (5): 144 - 146, il., May 1946.

For cabinet making the hollow chisel is generally used because of the need for high quality mortises and for high production, the chain mortiser is the logical machine because of its ability to cut a mortise in a single stroke regulated, of course, by the size of the guide bar and chain. A combination of chain and chisel mortisers may be combined in the same machine. This is sometimes used when two different sized mortises are made in the same piece. A swing stop may be devised to be used when blind mortising to various depths in the same piece. In order to prevent "whiskering", a chipbreaker is very helpful.

The mortises in a jig for both hollow chisel and chain mortising should be made about 1/8" larger than the mortises in the work so the chisel does not foul the sides of the mortises in the jig. The adjustment for back-lash in the table of a chain mortiser should be

made in the opposite direction to that in which the chain moves at the bottom of the guide bar. A tilting board on which the work is mounted is sometimes used in producing tapered mortises. Tapered mortises are often produced on gang-mortising machines by using guide bars with tapered sides. A drawback to this method is the heavy strain and wear on the guide bar, as all of the chain below the surface of the wood must be cutting at the same time which is not true with the standard guide.

Haycock, A. H.

32. Standard Boring Tools.

Wood (British), 11 (6): 170 - 172, il., June 1946, F. & C.

The size of the holes required and whether the holes are to be bored in the end grain or face of the timber are two factors to consider in choosing a boring bit. The three winged bit is useful in slot mortising, but is not efficient purely as a boring tool because the end cutting edges possess no cutting angle as the flutes are parallel to the axis of the bit. Leadbeater and Gilpin pattern bits are very good for end grain boring as the close spiral flutes eject chips automatically from very deep holes and the bits have an efficient cutting angle. In sharpening these bits the filing must all be done on the insides of the edges.

Haycock, A. H.

33. Special Boring Tools.

Wood (British), 11 (7): 205 - 207, il., July 1946, F. & C.

For the boring of larger holes, from 3/8" up, in addition to

1946 (cont'd.)

the Jennings and lip and spur types of bits the multi-spur bit is frequently used for boring shallow holes. Its fiber severing action is enhanced due to the great number of spurs. The Jennings bit makes a cleaner cut than the multi-spur bit because the fibers are pressed downward at the same time they are severed leaving the top edges of the hole clean. An ordinary engineer's twist drill, manufactured for metal cutting, may be used for boring shallow holes, but has the disadvantage of being able to penetrate only so far at a single stroke due to the smallness of the flutes which do not eject the chips efficiently.

Haycock, A. H.

34. Boring Machines and Methods.

Wood (British), 11 (8): 234 - 237, il., Aug. 1946, F. & C.

More machines, used in the woodworking industries, are made for the purpose of boring than for any other operation. An alternate method in using a fence on a horizontal borer is to reverse it so the fence faces the operator eliminating the danger of the bit drawing the work away from the fence. The cluster type boring machine ensures spacing of holes to a greater degree of accuracy than usually obtainable with a single spindle. The table rises to a predetermined height as a foot pedal is depressed and then sinks to its original level after the holes are bored. Special jigs and clamps should be made to allow boring a number of holes in short order.

1946 (cont'd.)

Haycock, A. H.

35. The Slow-Speed Router.

Wood (British), 11 (9): 264 - 267, il., Sept. 1946, F. & C.

The slow-speed router has a maximum spindle speed of about 6000 r.p.m. and its primary purpose is grooving and recessing of various kinds on the face of relatively large stock. Lips on the side edges of cutters give an efficient cutting angle to the edges. Lipped cutters can be sharpened several times between grindings without being removed from the holder or machine. Flat cutters are useful for short runs, but are not very efficient as they have a scraping action instead of a cutting action. A ground clearance of 30 degrees on flat cutters is preferable. A secondary bevel giving 15 degrees clearance behind the edges makes it possible to sharpen the cutters a number of times before regrinding.

Haycock, A. H.

36. The High-Speed Router.

Wood (British), 11 (10): 294 - 297, il., Oct. 1946, F. & C.

The size of the waves made by a router cutter or bit may be made so small as to be imperceptible by: having a number of cutting edges on the cutter; by using a low rate of feed; and, by increasing the r.p.m. of the cutter. A sufficient amount of gullet room to accommodate the chips removed is essential to the efficient working of any cutter. It is recommended that bits up to and including ½ inch in diameter should have one cutting edge only. Because of vibration set up by the unbalanced condition of single edged bits, those larger than ½ inch should be the double-edged type. Care should be taken in grinding to remove the same amount of metal from each cutting edge.

1946 (cont'd.)

Haycock, A. H.

37. Router Forms.

Wood (British), 11 (11): 324 - 327, il., Nov. 1946, F. & C.
11 (12): 351 - 354, il., Dec. 1946.
12 (1): 23 - 27, il., Jan. 1947.

With the addition of a guide pin to the table a slow speed router is enabled to do the same work as high speed routers, although possibly not of such high quality. For production of small quantities a plywood templet may be used, made from a close grained species such as maple or birch. The wear on a templet should be easily detected and the templet and guide pin should be arranged to make detection as easy as possible. Guide pins should be as large as possible.

A substantial base should be used for the templet. A laminated wood base is suitable. As work often tends to lift because of the type cutter used, a top clamp must be used. An eccentric clamp is suitable for this purpose. Wooden wedges are often used for edge clamping.

Routers do exterior cutting around the outside of a piece, as well as interior cutting, and the clamps and templets used should fit the job. Stock should be clamped securely enough to withstand the strain of cutting without moving. Provision must be made for accurate locating of pieces regardless of the type cut to be made. In some work clamps may have to be moved to complete the cut. Projecting spikes upon which the work is impaled are used where the holes do not mar the finished article. Lifting tools and handles on the templet are useful in creating more ease in extracting stock from the spikes and in handling the templet in cutting.

1946 (cont'd.)

Hermann, C. C.

38. Theory and Design of Shavings Exhaust System.

The Wood-Worker, 65 (3): 36, 38, 39, il., May 1946, F. & C.

65 (4): 26, 28, 29, il., June 1946.

The hoods used on woodworking machines in connection with the shavings exhaust system should have sufficient inlet of air capacity and outlet air velocity to carry shavings away from the cutterheads and into the duct system. "The following table gives the conveying velocities usually used:"

Material	Velocity ft. per min.	Material	Velocity ft. per min.
Sawdust, dry	3000	Shavings, heavy	4000
Sawdust, heavy, green	4000	Lathe refuse	3500
Hog waste	4000	Sanding	4000
Grinding	4500	Bakelite dust	4000

The above velocities are those that should be maintained in the branch pipe connecting to the hood. "The main pipe velocity may be 500 ft. per minute lower than the branch pipe velocity." Figure 2 in this article gives the diameter of any pipe up to and including 30 inches for any given velocity and volume. Figure 3 in this article lists the data taken from the diagram in Figure 1 so as to determine the resistance of the system so that the proper size fan and electric motor may be obtained.

1946 (cont'd.)

Hyler, J. E.

39. Woodworking Planer Practice.

National Hardwood Magazine, 20 (2-9), il., Mar. 1946 - Nov. 1946, F.& C.

(Nine chapters in bound copy)

Proper planing practice requires good knife and roll adjustments regardless of the job to be undertaken. The lower rolls should be adjusted only to sufficient height to feed the stock through the plane efficiently. Stock which is of low density should be lined up properly under the top sectional infeed roll in order to prevent crushed corners. Chips from cross grained boards often cause trouble by lodging between a lower roll and the platen and thus marring boards as they pass through.

Where operating conditions permit boards may be cut in two pieces in order to plane them with the grain. In planing thin stock a "stiffener" board must sometimes be used to give "spine" to the thin material and prevent tearing and buckling. A great loss in thickness may be prevented when planing cupped stock if it is first ripped lengthwise (if the operation permits).

A feed speed of higher than 60 ft. per minute is needed when using four jointed cutters in order to prevent a high degree of heat being generated. The use of jointed planer knives requires an exhaust system for shavings of a much greater capacity than that required where unjointed knives are used.

It is possible to dress stock edges on a planer by placing a fence through the planer on a 10 to 20 degree oblique line to prevent the stock from tilting sidewise.

Stock put through a planer should never be shorter than the

1946 (cont'd.)

width of the "throat" or gap between the chipbreaker and the pressure bar. For a high degree of accuracy the roll elevation should be only from .015" to .025" above the platen. A hardwood block can be used to check the parallelism of the platen and rolls with the cutterhead.

The outfeed rolls and the pressure bar adjustments may be made with the planer in operation. Planing on alternate sides of the bed plate can be practiced to prevent too great wear in the center portion.

When feeding trouble is encountered it is best to use means other than changing the machine settingsto get the board through. The "coaxer" method is useful in forcing a stalled board through the planer.

A lumber gage may be used to check thickness of stock. Proper moisture content of the lumber is important in getting a good planing job. "Bone" lumber tends to tear easily.

In making a tapering cut on the planer not more than ¼ inch to 3/8 inch should be removed at one cut. Taper-ripping and taper-swelling are useful in certain types of work.

A number of different beveling cuts can be made on the planer without too much set-up time.

Hyler, J. E.

40. Safety in Woodworking.

The Wood-Worker, 65 (8): 52, 54, il., Oct. 1946, F. & C.

Changes in design have made woodworking machines much safer for the operator, but on many operations it is imperative that the operator use good judgment in handling the stock to avoid any

chance of personal injury. In order to avoid running small or short pieces in dangerous operations it may be necessary to perform these operations on stock in longer lengths after which it can be cut to shorter lengths. Extra machining time may be the only remedy for the elimination of dangerous operations.

McDermid, H. B.

41. Machine Bearing Maintenance.

The Wood-Worker, 65 (5): 56, 58, July 1946, F. & C.

When new babbitt bearings must be made to replace old ones on the old type machines an oversized mandrel on which to pour the babbitt should be used to allow for shrinkage of the babbitt.

On the modern machines using ball bearings the bearing should never be filled to over one-third to one-half its capacity because too much grease causes the ball bearings to heat violently due to high speeds and the centrifugal "pumping" action of the grease.

Sawyer, M. B.

42. Are High Speeds Required?

Investigate High Cycle Motors!

Machine Design, 18 (4): 121 - 126, il., April 1946, Eng.

Direct high frequency drives can assure optimum machining conditions. The outstanding merits of the standard polyphase motor are, as follows: (1) Constant torque under full load, (2) Nearly constant speed under full load, (3) Various set speeds according to the frequency and number of poles of the design,

and (4) The absence of all moving electrical contacts, brushes and commutator. The increase in speed, voltage, and horsepower is proportional to frequency, the torque remaining constant. As the frequency of the circuit to a standard polyphase motor is changed this power unit becomes a high or varying frequency drive and is limited in increased speed and horsepower only by its bearings and the structural strength of its rotating members. The frequency changer is an induction motor which is driven in a direction opposite to normal rotation and becomes a frequency multiplier picking up the incoming line frequency and increasing it in proportion to the number of poles with which it is wound and multiplied by the number of revolutions at which it is driven, plus input frequency.

Tiemann, H. D.

43. Measurement of Moisture in Wood.
Electric Moisture Meters.
Southern Lumberman, 172 (2155): 65, 66, Jan. 15, 1946, F. & C.

It is possible to interpret accurately the reading of the moisture meter in terms of moisture present only if the relation of moisture to the electrical properties of the material is known. Slight changes in moisture content below the fiber saturation point greatly affect the electrical resistance of wood. Capacity meters can range down to near-zero moisture content while resistance meters are not reliable below 8% moisture content due to current leakage caused by the extremely high resistance of dry wood. Density variations affect the readings of capacity meters to a marked degree.

1947

Corti, M. A.

44. Tungsten Carbide Use in The Woodworking Industry.
National Hardwood Magazine, 21 (11): 110, 150, 157, Dec. 1947, F.& C.

The use of tungsten carbide cutting tools makes possible efficient cutterhead speeds of 20,000 to 50,000 r.p.m. The deficiency in the transverse rupture strength because of the brittleness of tungsten carbide is compensated for by reducing the elements of hardness to the increment of those promoting greater strength or toughness in the processing of tungsten carbide or by increasing the strength of the cutting tool proper by engineering and construction without sacrificing the hardness values. The supporting steel should be three times the thickness of the carbide insert. Tipping shaper steel knives is not a sound application because the steel section supporting the carbide is not sufficient. The cutterhead should be of such construction as to accommodate milled-to-pattern removable knives. Greater speeds are very desirable for tungsten carbide knives. The attributes of tungsten carbide are:

(1) Increased production is possible through greater feeds and speeds.

(2) Down-time on machines for maintenance of knives is decreased.

(3) More uniform and better quality products are produced and in some instances subsequent sanding operations are eliminated.

(4) Certain woods can be used which otherwise could not be worked economically.

1947 (cont'd.)

Harris, Philip

45. Circular Saws.

Wood (British), 12 (6): 159 - 163, il., June 1947, F. & C.

The cutting action of a saw can be studied by following the path of the teeth through the wood. It is possible to determine the minimum size of gullet for efficient operation at a particular feed speed that can be safely used with any type of tooth. The design of circular saw teeth has been standardized by the devising of a system whereby the various dimensions of a tooth are directly related to the pitch. The size of saw to be used as a rule depends on the diameter of the log to be cut, but if the short pitch used for small diameter saws is used on larger saws there would be insufficient gullet space to contain the extra sawdust. Sawing with the top portion of the saw involves a greater number of teeth being in the wood at any moment and each tooth engaging with the wood over a longer distance for the same amount of feeding. Power consumption increases with depth of penetration of a tooth but not in direct proportion. The amount of blunting of a tooth is determined by the distance travelled by the tooth in the wood.

Haycock, A. H.

46. Alternative Routing Methods.

Wood (British), 12 (2): 54-57, il., Feb. 1947, F. & C.

12 (3): 84-87, il., Mar. 1947.

Where final cuts have to be made at two or more different depths it is not necessary to make a number of entirely separate forms for this work. A number of different templets may be

necessary, but these can be made of metal, thinner than that normally used, and superimposed on one form. The best method of cutting at different depths is to cut the deeper recess first, if it is the smaller, and then cut the larger recess. Multiple-depth jobs are greatly expedited and simplified when only one cutter is needed.

When making only a few parts the use of forms is not always economical. Edge-moulding with the router may make use of a guide pin on the table, a combination of a guide pin and wooden fence, or a special cutter fitted with a pilot. Simple flat-knife cutters are used on small jobs. Work must be fed slowly to these knives as they are set radially and merely scrape the wood away. These flat knife cutters can be shaped for various cutting including striking out and boring small wheels in one operation. High speed routers can be used for some classes of boring work, but only very strong bits should be used as centrifugal force often causes breakage.

Haycock, A. H.

47. Special Routing Machines.

Wood (British), 12 (4): 115 - 118, il., April 1947, F. & C.

One modification of the standard router is the use of a compound table in place of the fixed one, the work being clamped directly to the table thus eliminating forms and jigs. The table is manipulated by handwheels moving it longitudinally and laterally against stops. This modification is used for rectangular work. The usual type of radial-arm router has a routing head carried on one end of a sliding ram which is mounted on a revolving turret.

1947 (cont'd.)

The pantograph router is similar to the radial-arm router in that the cutter is movable while the work remains stationary. Two or more tables on rails are advised for the radial-arm router.

Hyler, J. E.

48. A Discussion of the Workability of Thin Wood.
Wood Products, 52 (4): 20, 22, April 1947, F. & C.

The demand for lumber thinner than 4/4 is not great enough to justify woodworking plants to keep it in stock, but occasional orders have to be filled and thin stock may have to be processed. Rejects are often resawn to make thin stock. Plants having veneer sawing equipment can easily produce thin stock. Thin wood is often used in making bent laminated stock. Care should be taken in planing and jointing thin stock as tearing easily occurs. Heavier boards may be used as supports on both sides of thin stock when edge jointing to get a true edge.

Hyler, J. E.

49. Shaper Feeding Methods and Equipment.
National Hardwood Magazine, 21 (3): 26, 27, 30, il., Apr. 1947, F.& C.
21 (4): 30, 31, 32, 36, il., May 1947.
Installments 1-4 not available at this writing.

Where a double spindle shaper is used a guide can be devised to fit obliquely between the spindles and material can be machined on opposite edges at one pass between the two shaper spindles.

1947 (cont'd.)

In shaping irregular pieces across the entire edge of the stock a special form is made to run against the shaper collar and the same outline is cut on the stock which is fastened to the form. The work is held to the form by means of inverted screws whose points are filed sharp. A special jig may be made for turning round pieces. It is a shuttle affair which moves in a retaining slideway and makes the job of turning post caps, column bases, etc. much easier.

Hyler, J. E.

50. Balance in Woodworking Machinery.

The Wood-Worker, 66 (3): 46, 48, May 1947, F. & C.

Both dynamic and static balance are important in high speed woodworking machinery. A worn pulley or a repaired belt is usually badly out of balance and the resultant work is not the best.

Dynamic balancing machines should be used to insure proper balancing at each and every cross-sectional cutterhead plane. Knives in each set should be ground to the same weight and the two opposed ends of each knife should be of equal weight.

Hyler, J. E.

51. Methods of Avoiding Torn Grain.

National Hardwood Magazine, 21 (5): 34, 35, 38, il., June 1947, F.& C.
21 (6): 20-22, il., July 1947.
21 (7): 24-26, il., Aug. 1947.
21 (8): 28, 29, 33, 40, il., Sept. 1947.
21 (9): 30, 31, 36, 45, il., Oct. 1947.

1947 (cont'd.)

The amount of torn grain which occurs varies with different species of wood, machines and methods of woodworking procedure. In processing cross grained slender stock in the planer torn grain causes chunks of fiber to lodge behind the planer rolls where they disfigure the material. The use of stops and very small moldings help to avoid torn grain when using the moulder. Some tearing will result when processing material through a moulder if the cross grain runs either thickness-wise or width-wise because one side or the other (the same for edges) will run strongly against the grain. Stock with a large amount of cross grain should not be processed through the double surfacer. Some species of wood tear more easily than others and boards should be graded with this in mind. A shearing cut is progressive and the tearing leverage is at a minimum, giving less tearing on curved contours.

In matching pieces for glued-up stock the grain should be turned in the same direction and a mark put across all the pieces so they may be glued as they lay. lie.

The lifting action of the knives on the chips in the machining of wood causes tearing. The more refractory a wood tends to be the more the cutting angle should approach a scraping cut in order to avoid tearing. This can be accomplished by back-beveling the knives. "Breaking up a cut" by using a number of smaller knives in spikes is a method of preventing tearing when using the moulder.

Light cuts tend to tear less than heavy cuts when using knife type machines. Chipbreakers are used to prevent or limit tearing by breaking off the chips as they are lifted by the knives.

Light cuts are favored on a jointer due to the fact that the

lip of the infeed table acts as a chipbreaker and is closer to the cutting circle on light cuts. Sectional chipbreakers are used on modern machinery to allow for rough stock thickness.

A shearing cut helps to avoid torn grain and for this reason knife seats on tenoner and lathe cutterheads are oblique to the cutterhead axis. A divided cut between the top and side heads on a moulder (with one handling of the material) avoids tearing of the wood to a great extent when making heavy cuts.

A slower feed speed in relation to the number of knives and cutterhead r.p.m. gives thinner chips and thus lessens tearing leverage of the chips. In lathe work the cut should follow the partial helical grain in order to avoid torn grain.

A face mark determining the grain of a piece of stock should be turned to the fence in a sticker or flat down on a tenoner or shaper. Short grained corners of stock should always be in the advance position of the tenoning or shaper cut or else the corners will be torn. Back-cutting may be advisable when tenoning or dadoing very delicate cuts on stock showing an extraordinary tendency to tear. Only very light back-cuts should be taken. In back-cutting the knife action is compressive and not a lifting action.

Mackenzie, H. R.

52. Planning a Shop.

Wood (British), 12 (7): 201-203, il., July 1947, F. & C.
12 (8): 230-232, il., Aug. 1947.
12 (9): 263-265, il., Sept. 1947.
12 (10): 291-293, il., Oct. 1947.

1947 (cont'd.)

The importance of position, the handling of material, specialized production, and the set-up of a medium sized cabinet shop are discussed in this series. Space should be conserved in the shop because of the rising cost of material and labor. Machinery should be in position for production line operation using a minimum of space for handling material. Equipment of the proper size for the job should be used. Material should move from one machine to the next with proper timing. Conveyors (roller, belt, etc.) should be used to keep the stock flowing avoiding stacking and wasted energy on the part of the operator. Self feed machines should be used to eliminate "bottlenecks" where possible. The spring loaded "finger" arrangement on the self feed jointer starts the stock toward other operations at a fast smooth clip.

The positioning of machines depends on three things: the type of work, the target of output, and the choice of machines. The value of a machine is determined by what it will do while at work. The double end tenoner, being chain fed, eliminates idle operations. The use of the dowel instead of mortise and tenon saves a great deal of wood and the use of dowels calls for a different set of machines. A lumber lift should be used where production warrants it. A shop plan should be flexible making alterations possible. Cross paths should be kept to an absolute minimum. Feeds, feed speeds, and clamps are important in determining types of machines to use.

1947 (cont'd.)

Parina, J., Jr.

53. Control of Vibration Can Increase Production Efficiency.
Steel, 120 (7): 94-96, 98, 118, 121, 122, 124, il., Feb. 17, 1947, E. Eng.
120 (8): 76-79, 120, 122, 124, 126, il., Feb. 24, 1947.
120 (9): 116-120, 122, 156, 159, 160, 162, 165, il., March 3, 1947.

It is essential for efficiency of operation to provide methods of control and isolation of vibration generated by high speed industrial machinery. Vibration may be controlled by eliminating the causes by improved design of the origin points or it may be controlled by isolating by use of antivibration materials reducing the transmission of vibration. Vibrations can be divided into two categories, namely: free damped vibrations and forced vibrations. Forced vibrations are the most familiar, as they are the result of a periodic disturbing force acting on the vibrating body and exist wherever there are moving parts in machines. These forces created by moving parts have definite frequencies.

Static load of the machine, estimated distribution of load, estimated impact, allowable or desired deflection, and a diagram of the machine base to show size and location of bolt holes are important considerations before installing vibration isolators. Uniformity of load distribution is essential to prevent overloading of some mountings, to insure more complete vibration isolation, to prevent sagging and to keep the machine in proper horizontal position.

Good vibration control depends upon the proper selection of mountings which are accurately related to the load and to the

1947 (cont'd.)

vibration forces and frequencies encountered. A mounting must have a high degree of softness (low spring rate) and must provide reasonable stability in order to be efficient.

If the isolation system is underloaded it can not be resilient and will transmit vibration. Overloading brings fatigue results which break down the resiliency.

1948

Campbell, C. C.

54. Shop Measurements and Mathematics.

The Wood-Worker, 67 (1): 26, 28, March 1948, F. & C.

"Measurements from a rule are from center to center of the lines, or to include one line and exclude one, and not to be read as between any two lines or to include both lines at the end of a measurement." A thickness gage, made properly, is much more accurate than a rule for planer work. A short cut in figuring board feet is the casting out of a 12. This stems from the rule in arithmetic stating that every factor in straight multiplication may be multiplied in any order without changing the result.

Crawford, A. E.

55. Electronic Stroboscopes.

Aircraft Production, 10 (113): 101, 102, March 1948, E. Eng.

The electronic stroboscope provides a direct visual method of analysis of rotating or recurrent phenomena. A commutator unit, which is friction-coupled to the moving part can be used to synchronize the stroboscope with the rotating part and this is useful in the detection of vibration and side play in shafts and "slip" in belt driven machinery. Flash tubes have been developed that provide a supplementary source of light where the light output of a stroboscope is not sufficient and where additional light is needed for photography. This article explains very well the basic operating principles of electronic stroboscopes and gives the circuit diagram of the industrial type electric stroboscope and also of the high power flash equipment.

1948 (cont'd.)

Hyler, J. E.

56. Ripsaw Blades.

National Hardwood Magazine, 22 (2): 34-37, 55, March 1948, F. & C.

In cutting with the grain ripsaw teeth act as little chisels. Factors affecting the efficiency of ripsaw teeth are: shape, strength, clearance, and the size of the gullets. A sufficient amount of positive hook makes ripsaw teeth cut more cleanly and with the application of less power. By using the same mounting point on the arbor and saw the periphery of the saw will always be concentric with the arbor. Tungsten carbide tipped saws are almost essential in cutting difficult materials. More power is required for removing a given amount of wood with a saw than with a knife type machine, as a number of teeth are cutting at the same time and also there is side friction.

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