DELTA Machine Tools
MILWAUKEE

PM-1529
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43-B: Shaper Instruction Manual

SASH AND CABINET CUTTERS

GENERAL MILL TERMS

SOLID MOULD OR STICKING—A moulding which is worked on and is a part of the article itself.

APPLIED MOULD—A separate moulding applied or attached to any part of an article.

FLUSH MOULD—An applied moulding which finishes flush or below the face of the article to which it is attached.

RAISED MOULD—An applied moulding which partly covers or which extends above the face or surface of the article to which it is attached.

FACE MEASURE—The face dimension of an article exclusive of any solid mould or rabbet.

FINISHED SIZE—The measurement of any article including the solid mould or rabbet.

RAIL—The cross or horizontal pieces of the framework of a sash, door or blind.

STILE—The upright or vertical outside pieces of a sash, door or blind.

COVE-AND-BEAD—A mould which is a combination of a cove and quarter-round with a small fillet between.

BEAD-AND-COVE—A mould which is a combination of a quarter-round and cove with a small fillet between and on each side.

OGEE or O-G—A mould which is a combination of a cove and quarter-round with no fillet between.

OVOLO—A mould which is a combination of a small fillet on either side of a quarter round.

MILL TERMS APPLYING TO DOORS

PANELED DOORS—Doors containing one or more panels of lighter wood inside a framework.

SASH DOORS—Doors containing one or more glass panels.

FLAT PANEL—A wood panel of the same thickness throughout, usually 1/4, 5/16 or 3/8-in.

RAISED PANEL—A panel which is heavy at the center and tapered to a smaller dimension on all four edges.

MULLIONS—Long vertical members of a door between panels.

LOCK RAIL—The central horizontal rail of a paneled door.

MILL TERMS APPLYING TO WINDOWS

SASH—A single wood frame to be filled with glass.

WINDOW—Two sash, upper and lower.

CASEMENT SASH—A sash or pair of sash which are hinged, generally at the sides, to swing.

FULL BOUND—Indicates same amount of wood in stiles and rails, often described as "same rail all around."

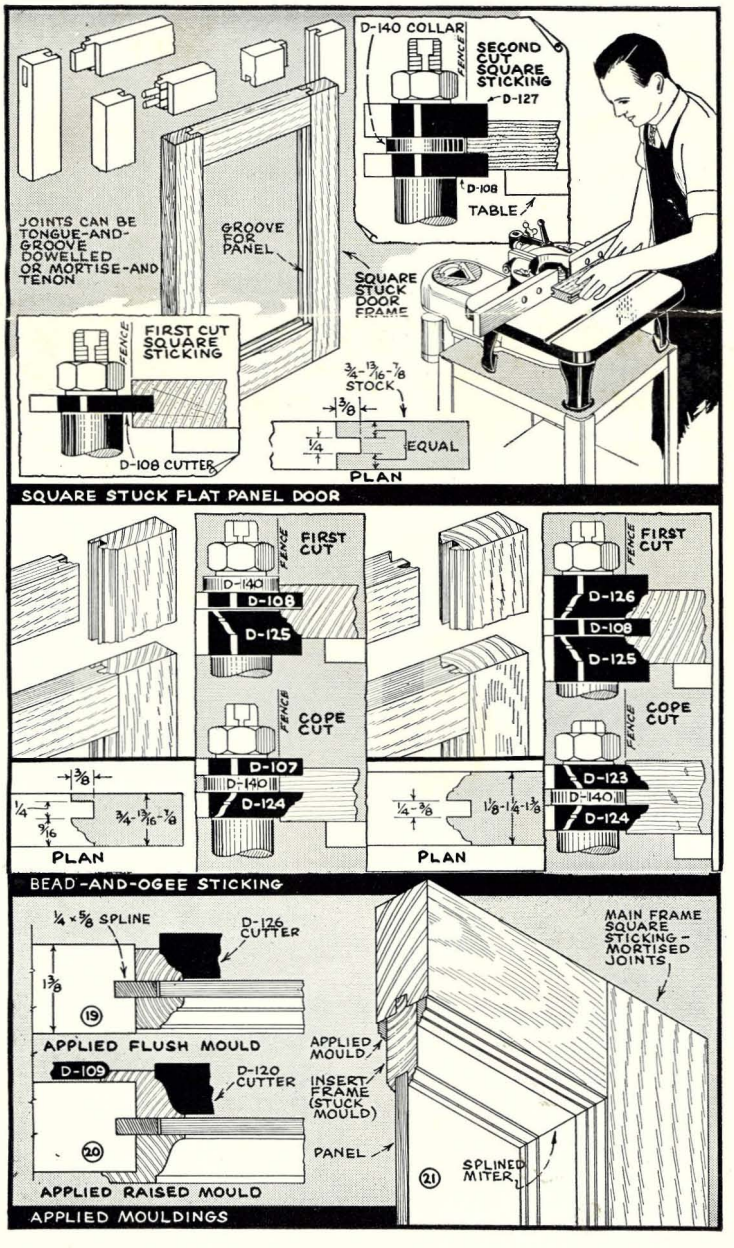
MEETING RAILS—The rails of a window which meet when the window is hung and closed.

PLAIN RAIL—Meeting rails of the same thickness as the rest of the frame.

CHECK RAILS—Meeting rails made thicker than the rest of the frame to fill the opening between the upper and lower sash made by the parting strip of the frame.

SASH BARS—Vertical members which separate the glass in a sash.

MUNTIN—Short or light horizontal bars in a sash, which do not extend the full width of the frame.



INTRODUCTION. Our sash and cabinet cutters are specially-designed shapes for cutting mouldings used in sash-and-door work and building trim. The complete set contains four basic forms. (1) A large ogee cutter, D-120, which is used extensively for different mouldings. (2) D-121 and D-128, ogee cutters used in sash work, but useful for many other operations. These two cutters are male and female, one being the counterpart of the other. (3) Cutters D-123 to D-126 inclusive comprise four matched cutters. The shape is a small ogee combined with a bead. The right and left-hand cutters are identical, except that one is just the reverse from the other, like a right and left shoe. One set of right and left cutters is used to cut both sides of the male portion of the joint, while the other set of right and left cutters is used to cut both sides of the female portion of the joint. (4) Straight cutters, 1/4, 3/8, and 3/4-in. wide complete the set.

The wood pieces cut with any of the various cutters or knives is said to be *moulded, shaped,* or *stuck,* stuck being the common mill term. The mould itself is called *sticking,* as, for example, ogee sticking, bead-and-cove sticking, etc. For other common terms used in millwork, consult the glossary above.

DOOR CONSTRUCTION

SQUARE STUCK FLAT PANEL DOORS. This type of construction is generally used for cabinet and cupboard doors. The stock can be 3/4, 13/16, or 7/8-in. thick. Panels are 1/4 in. plywood. In making this type door, the stock is first cut to width and length. The top rail and stiles are generally 2 1/2 in. wide, bottom rail, 3 1/2 in., the dimensions being subject to considerable variation depending upon the size of the door. After cutting to size, the stock is placed in the position it will take when fitted together, and each piece is marked. The marked side is thenceforth known as the face side, and should always face up or out in machine operations. Using the shaper set-up shown in Fig. 5, groove the inside edge of all pieces. Ride the work against the fence to make the groove 3/8 in. or a little better in depth. On curved work use D-140 or D-141 collar to set depth. Use the set-up shown in Fig. 6 to cope both ends of both rails. Assemble the door as shown in Fig.

1. For light cabinet doors, the tongue-and-groove formed by sticking makes a sufficiently stiff joint when well glued. For sturdier construction, the joints can be doweled, Fig. 3, or tenoned, Fig. 4. If dowels are used, the holes should be drilled previous to sticking. If mortise-tenon joints are used, proper allowance must be made for tenons. Intermediate rails and mullions are made in the same manner, except that they are stuck on both sides, as shown in Fig. 7.

BEAD-AND-OGEE STICKING. Figs. 9 and 10 show the assembly of a cabinet door, bead-and-ogee stuck on one side. The operations are the same as before, using the set-up shown in Fig. 12 for the first cut to make the moulding or sticking, and the set-up in Fig. 13 to cope the ends of the rails. Panels are ¼ in. plywood. Figs 14 and 15 show the assembly of a door stuck on both sides. This sticking is standard for 1⅛ in. closet doors, cabinet doors, shutters, etc. It can also be used on heavier stock, but makes up better in standard door stock (1⅜ in.) if ⅜ in. panels are used. The joints should be dowelled. **Note that in this setup D-140 collar is used as a spacer only. The depth of the cut must be set from the fence; not against the collar.**

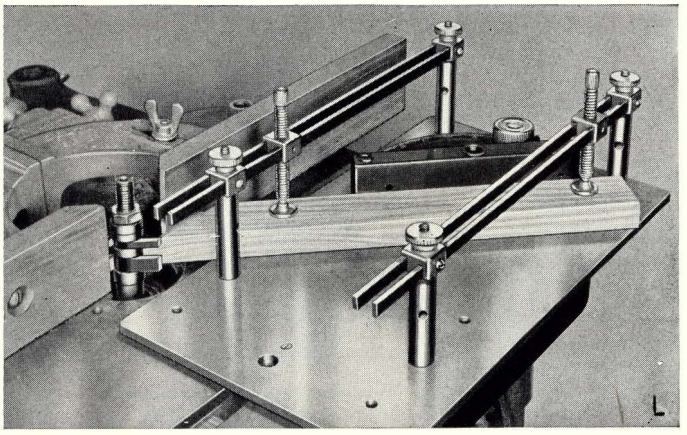


Fig. 22. Using the shaper sliding jig at 45 degrees to make the end cut in a mitered frame. The jig should always be used for end cutting.

APPLIED MOULDINGS. Doors are frequently made up with applied mouldings, as shown in Figs. 19 and 20. The main frame is square stuck, after which the panels and moulded strips are fitted in place. A somewhat similar form of construction is shown in Fig. 21, which shows a door with an insert frame. This construction is good for very heavy doors, the main frame being square stuck with tenoned joints, while the insert frame is stuck for ¼ in. panels.

In any form of construction, the end or cope cut on the rails should be done with the work held in the shaper sliding jig. Lacking this, the stock should be backed with a suitable piece of heavy wood. Where the corner joints are mitered, the same general procedure is followed, with the exception that the cope cut is then made with the jig set to the 45 degree position, as shown in Fig. 22. Standard 1⅜ in. doors will require ½ in. dowels, 5 in. long, about three dowels to each joint. Lighter doors will take smaller dowels proportionately. The average wood sizes for interior doors is 5 in. wide for the stiles, top rails and cross rails; 8 in. wide for lock rails, and 9½ in. wide for bottom rails.

MAKING SASH AND WINDOWS

GENERAL. Sash and windows are easily and quickly made after the worker has become familiar with the general features of construction. The work should not be attempted unless proper equipment is available—circular saw, drill press or mortising unit, and shaper. While the descriptive text and pictures deal specifically with the construction of double-hung, check-rail windows, the same general construction can be applied to casement sash and French windows or doors; also, with slight variations at the joints, the procedure is the same for circle, Gothic, and peak-head windows. In the construction of the last group, shaping, of course, would be done directly against collars instead of against the fence as used for straight work. Standard sash stock is 1⅜ in. thick white pine, and is readily procured surfaced two sides to net size.

CONSTRUCTION OF UPPER SASH. Fig 23 shows the construction of the upper sash of a double-hung, check-rail window. The top rail and stiles are 2 in. wide, face measure, which is a fair standard, while the check-rail is 1¾ in. wide by 1¼ in. thick. The first step in construction involves a careful layout of the wood stock. The size of the window must be determined, the basic dimensions being the glass size or the size of the opening into which the window must fit. All mortises and tenons should be carefully marked. Wood to be removed should be pencilled with a heavy "x." The name of each piece should be plainly written on the best side of the wood, this side to be known thereafter as face side.

The first machine operation after jointing and trimming the stock to size consists of cutting the mortises, as shown at 1. The rails are then taken to the circular saw and the shoulder cuts for the tenons are made, as at 2. Some form of stop should be used in order to keep the dimension uniform. The tenon cheek cuts are then made, using the two saws with a spacing collar, as shown in Operation No. 3, or one saw and making cuts on either side. The top rail and stiles are next conveyed to the shaper where they are stuck with the set-up shown, Operation No. 4. The check rail is not stuck, but is rabbeted only. The sticking on the lower end of the stiles for the length of the tenon is now cut away on the band saw, as at 6. Operation No. 7 consists of mortising the top rail in line with the tenon and in ¼ in. Finally, the top rail is coped at both ends, Operation No. 8, after which the assembly of the sash can be made. After checking the joints, the check rail is removed for beveling. The plowed groove for the cord is not run in until the sash is permanently fitted together. Similar operations in the construction of the lower sash are, of course, done at the same time as the upper sash.

SASH BARS AND MUNTINS. Very frequently, the sash, espeially the upper one, is divided into a number of smaller lights. Vertical uprights which separate the panes of glass are called *sash bars*, while the shorter horizontal strips are called *muntins*. All of the light wood inside a sash is often referred to as muntins or munts. The manner of fitting sash bars and muntins is shown at the top of Fig. 24. The necessary marking and cutting of the mortises in the main frame would be made at the same time as other previous operations. The muntins are 1⅜ in. thick to match the thickness of the sash, but vary somewhat in width, being narrower where the sash has many lights. Approximate average dimensions are given in the drawing and will be found suitable for most work. The stock for all of the sash bars necessary should be in block form. In this shape, it is cut to exact length and coped at the end which is to fit to the top rail. The end which fits to the check rail is simply square-cut to the tenon dimensions shown. After this cutting to length, the wood stock is ripped into pieces of the required width. Each piece is then stuck on both sides with the same set-up as used for the main frame.

Muntins are made in the same manner as sash bars, with the exception that the tenons are flush with the ends, as can be seen in the circle inset, Fig. 24. Mortises to receive the munts are thus the same depth as the glass rabbet, or ¼ in. The joint between muntin and sash bar is the same as muntin to stile, as shown in the detail drawing joint at "A." The wood stock should be cope-cut in block form before being ripped to width for sticking.

CONSTRUCTION OF LOWER SASH. With a few minor variations, the construction of the lower sash is the same as the upper sash, as shown at the bottom of Fig. 24. The bottom rail is fitted exactly the same as the top rail. The check rail shows two variations. One of these concerns the joint between the rail and stile, the rail being copecut to match the sticking on the stile. Variation number two is that the under edge of the rail is stuck, and is not left square as for the upper sash. A glass groove substitutes for the glass rabbet as shown at 5. The groove can be cut with D-108 cutter at the same time the edge is being shaped. This cutter makes a groove somewhat in excess of the thickness of the glass, the open space being filled with putty. If a close fit without putty is desired, the groove should be run in separately, using D-60 or D 61.

RABBETED CHECK RAILS. At the lower right in Fig. 24 is shown a section through check rails which have been rabbeted. This form of construction is generally conceded to be tighter against wind and weather than beveled check rails.

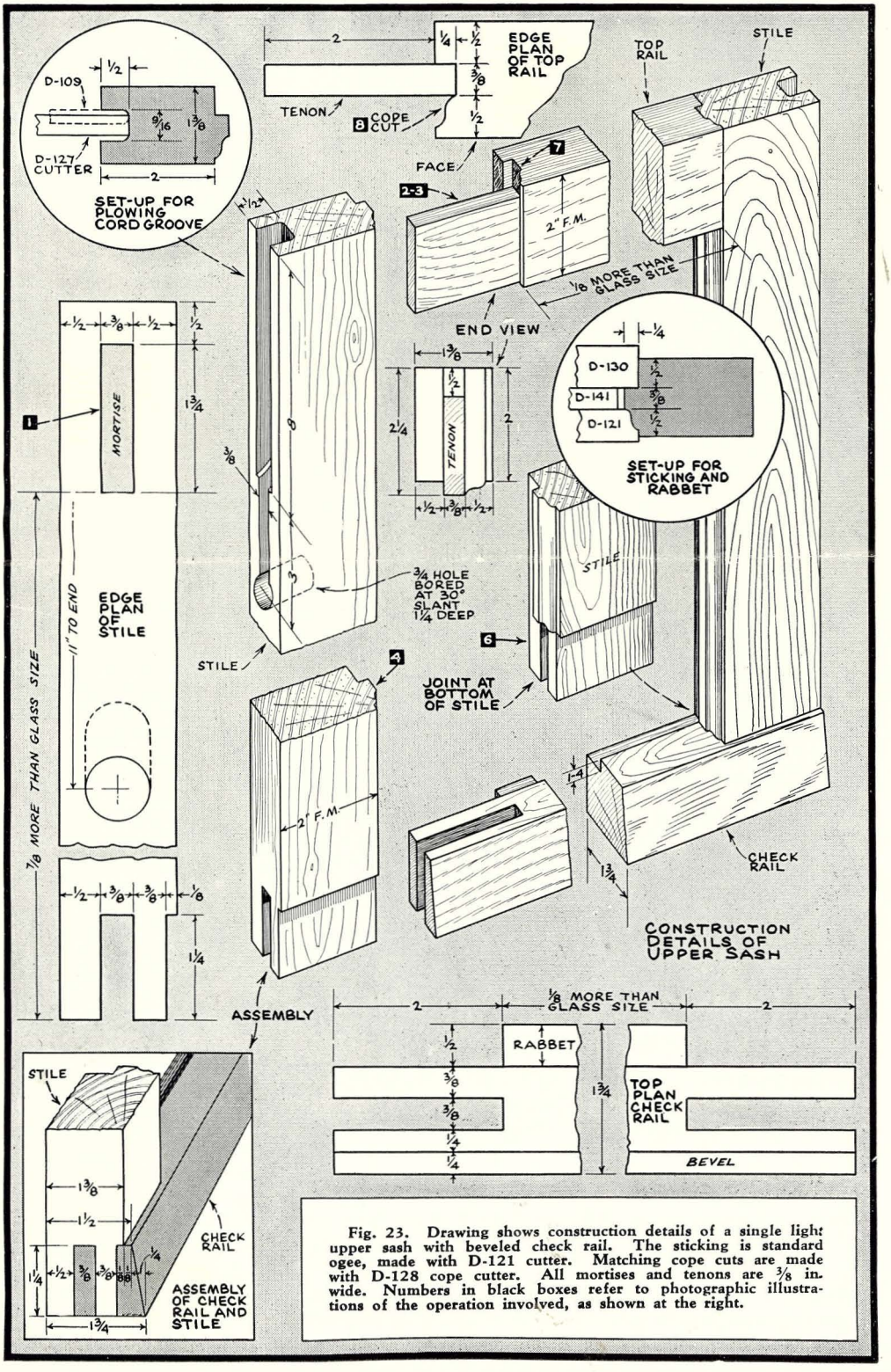
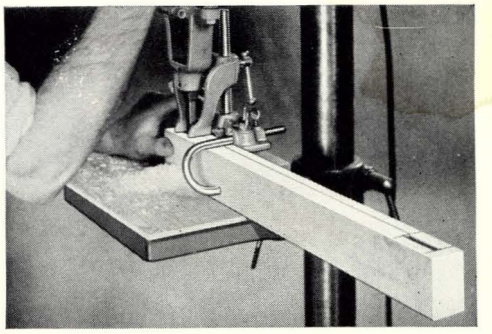
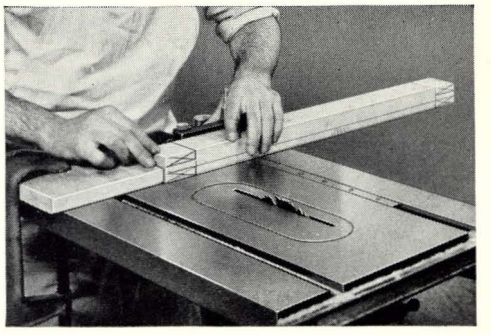


Fig. 23. Drawing shows construction details of a single light upper sash with beveled check rail. The sticking is standard ogee, made with D-121 cutter. Matching cope cuts are made with D-128 cope cutter. All mortises and tenons are 3/8 in. wide. Numbers in black boxes refer to photographic illustrations of the operation involved, as shown at the right.

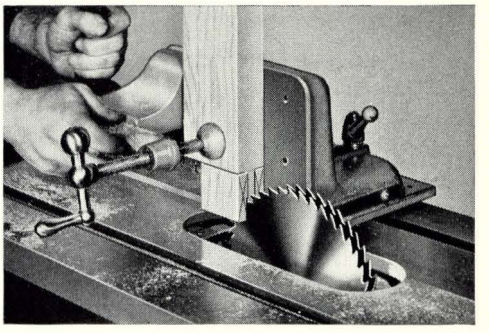
MACHINE OPERATIONS IN MAKING SASH



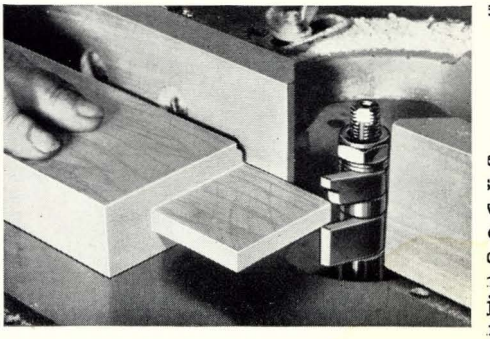
1 Cutting the mortises in one of the stiles. The wood area to be removed should be carefully marked, centering the cut 1/2 in. from each edge of the 1 3/8 in. stock. The face side of the wood should be towards the operator.



2 Making the shoulder cuts on the ends of the top rail. Notice the stop block to accurately set each cut to the required length. Set the saw blade shallow, cleaning out the corner of the shoulder with the cheek cut shown at 3.

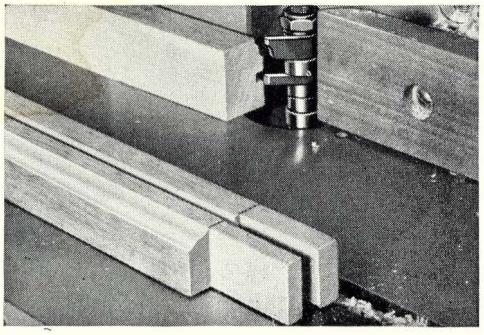


3 A double saw with 3/8 in. spacing collar is used to make the tenon cheek cuts. The cut should be carefully centered, and the thickness of the tenon checked for a snug fit in a 3/8 in. mortise. A single saw can be used if desired.

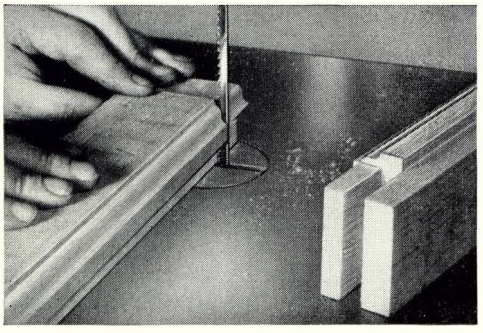


4 Sticking the edges of the stiles and rails, using D-121 cutter. The rabbet is cut at the same time. The fence should be set to cut a rabbet 1/4 in. deep. The ogee cutter will then take a corresponding bite. Use D-141 collar.

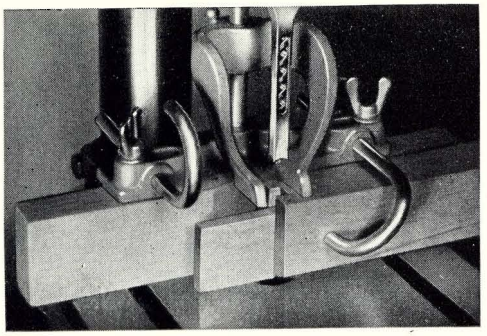
MACHINE OPERATIONS IN MAKING SASH



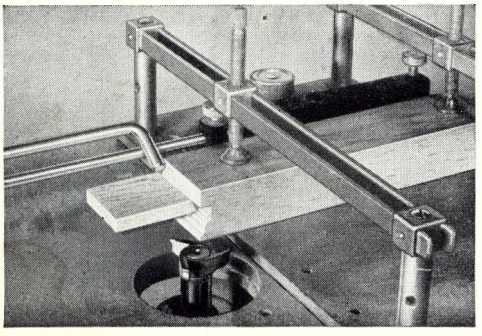
5 Sticking the bottom edge of the lower sash check rail. The glass groove is cut at the same time or can be made in a separate operation (see text). The appearance of the cut when finished is as shown in the foreground.



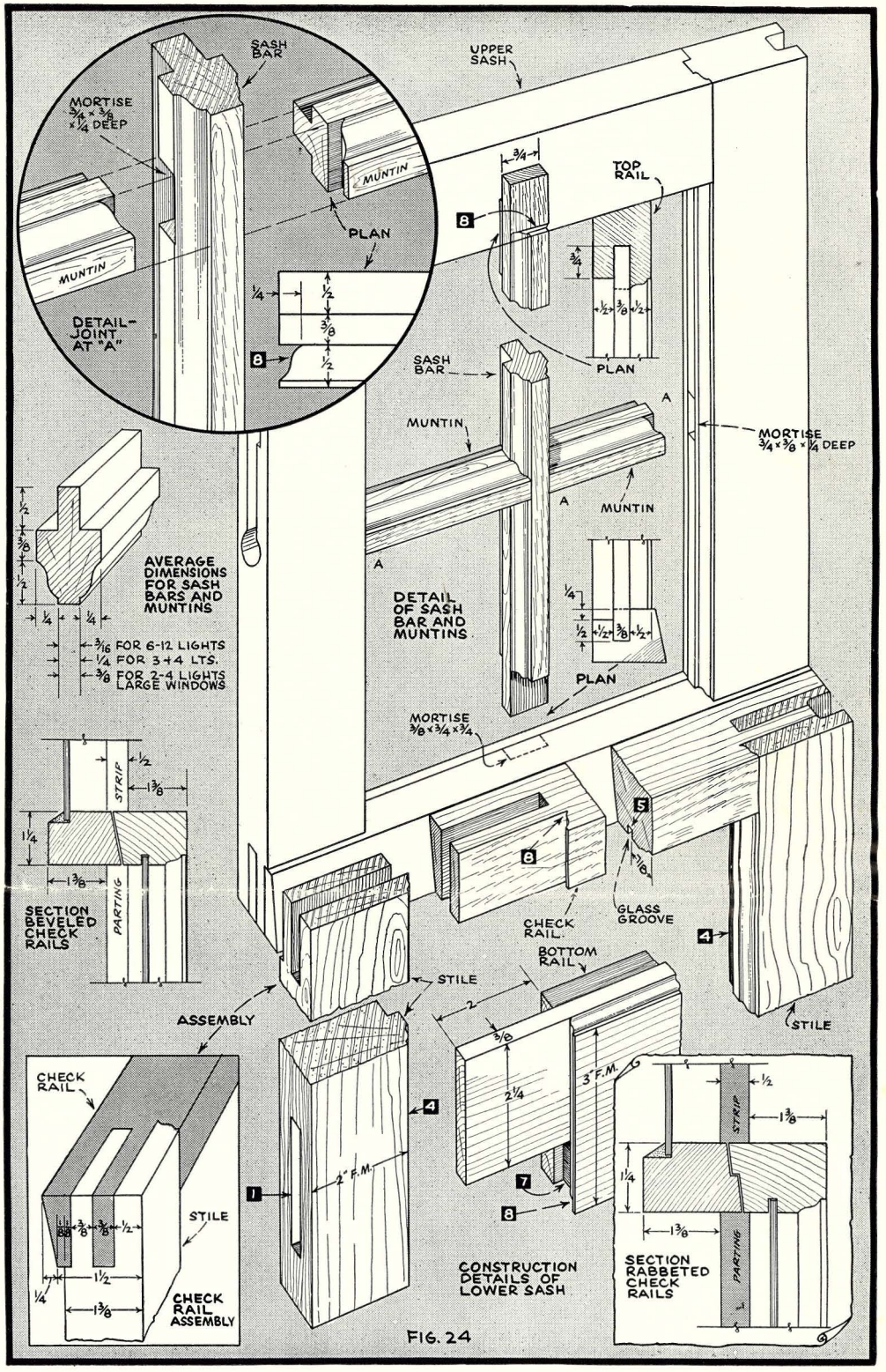
6 Trimming the ogee mould at the bottom of the upper sash stiles to permit a neat joint with the check rail. The operation is done on the band saw. Piece in foreground shows finished appearance.



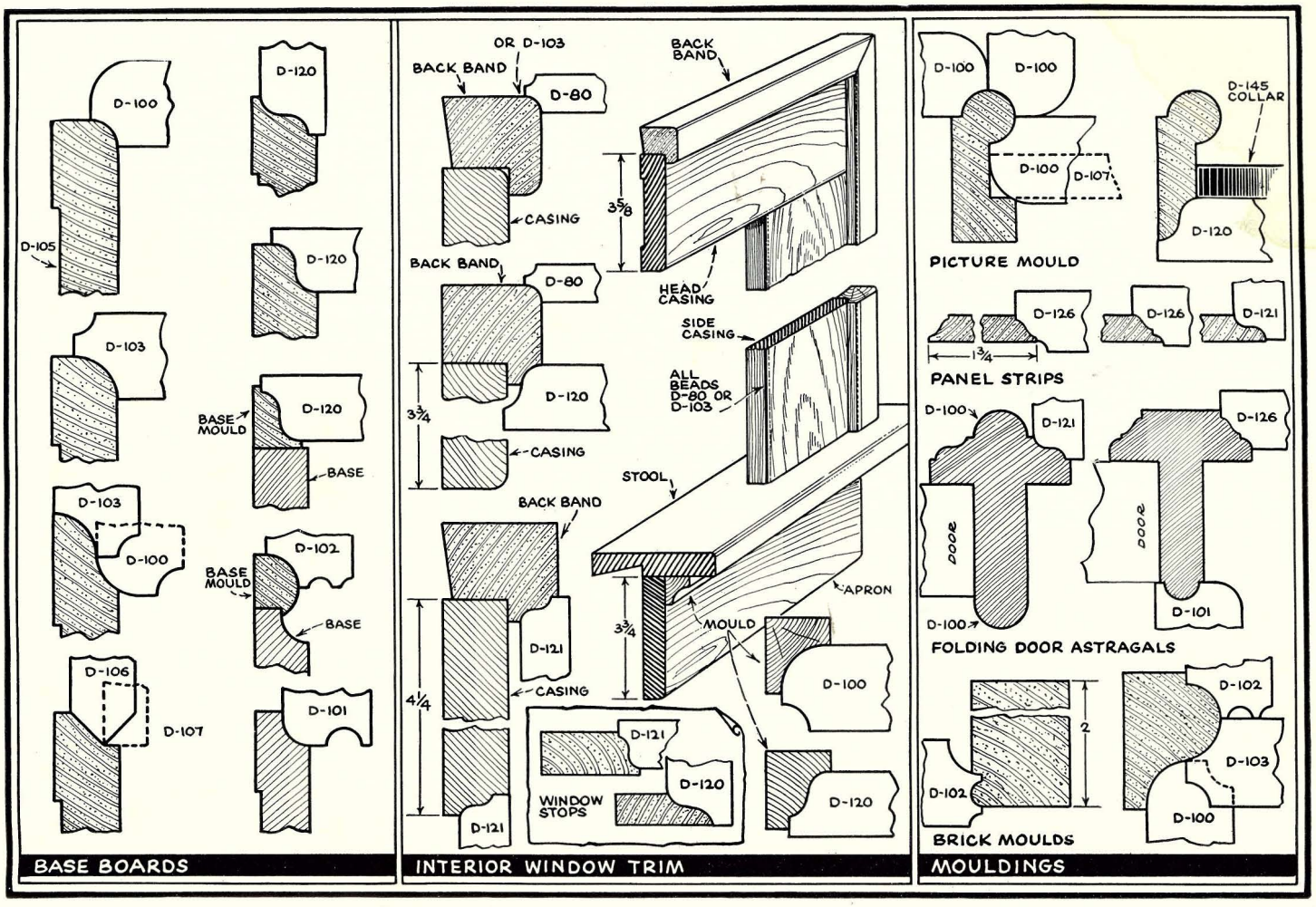
7 Mortising the upper rail so that it will fit the corresponding shoulder on the stile. The cut should be in line with the tenon, and should extend in 1/4 in. The same operation is necessary on the underside of the bottom rail.



8 Cope cutting the rails, using D-128 cutter. The wood is held in the shaper sliding jig, the depth of the cut being controlled by the stop rod. This cut should be checked carefully for proper height and depth setting.



ASSEMBLING THE WINDOW. After the various parts of the window have been completed and machined, the permanent assembly can be made. A single light sash is easily put together, the first fitting being made between upper or lower rail to stiles followed by the check rail. In assembling a divided light window, the stiles are loosely fitted into the bottom rail, and the check rail is fitted over the bars and stiles. The muntins are then slipped in place. All joints are sent home with blows from a rubber mallet. Clamps are then applied. It is important when clamping that some provisions be made to force and keep the sash *squared*. After the sash is in its final shape, steel dowels or headless nails are driven into each corner to hold the parts firmly together. The fastenings should be driven slightly below the surface of the wood. Glue is ordinarily unnecessary, but may be used if desired. Glazing is done in the usual manner, the putty being applied neatly and smoothly to line up with the finished surface of the wood.



BUILDING TRIM

GENERAL. Building trim comprises the various mouldings which are used to give interior and exterior woodwork and other surfaces a finished appearance. Practically all of the standard mouldings, and countless others which may be made up for special jobs, can be cut with our shaper cutters. It is, of course, impossible to show the thousands of shapes which are in everyday use, but a sufficient number are pictured and described on this page to give the worker a fair idea of the shapes involved. All mouldings shown are one-half full size.

BASEBOARDS. Stock sizes of one-piece baseboards are from 5 to 8 in. high by ¾ in. thick. The most common types are the bead and the ogee, as shown in the first three examples. Several other styles are shown, including two bases with applied mouldings. Bases are usually fitted with a quarter-round strip at the floor line, this piece being called the *base shoe* or *carpet strip*. The base shoe generally measures ¾ in. in height by ½ in. thick, and can be readily cut with D-103 cutter.

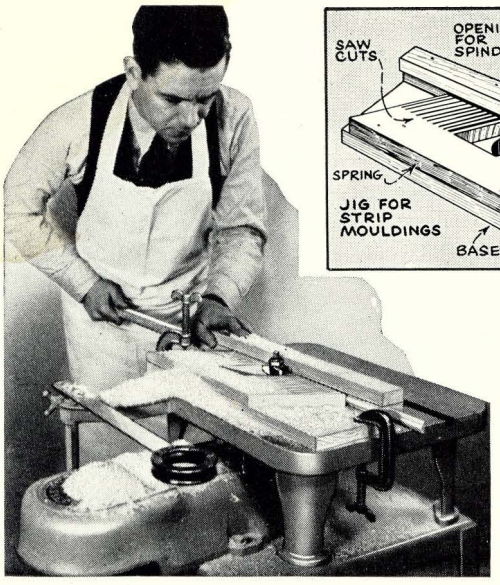
INTERIOR WINDOW TRIM. *Casings* are used as finish trim around doors and windows. The stock size is ¾ in. thick by from 3½ to 5 in. in width. *Back bands* are mouldings which are added to the edge of the casing to enhance its appearance. Three common types of back band casings are shown in the drawing. *Stools* are used in finishing the inside of the window sill. The usual stock is ¾ or 1⅛ in. The inside upper corner of the stool is usually rounded, while the underside is rabbeted to fit over the window sill. *Aprons* are placed under the stools in window trims, and measure ¾ in. thick by about 3⅝ in. wide. A moulding is generally used at the joint between the stool and the apron, two common types being the cove and the ogee, as shown at the bottom of the center drawing. *Stops* for windows are shown in the small box in the center drawing. Stops are used as interior trim while also serving to guide and hold the window in place.

MOULDINGS. Various other mouldings used as building trim are shown in the right-hand sketch. At the top is a *picture mould*, which, as its name implies, is used as a support for pictures. Many different styles are used, the distinguishing feature being the rounded top part that holds the picture hook in place. *Panel strips* are used in forming panels on plaster or board walls, etc. *Astragal* moulds or strips are used as a finish and as a stop on double folding doors. The mould is fastened to one of the doors and forms a rabbet to receive the other door. The two styles shown are called T-astragals because of their shape. *Brick moulds* are used to fill the corners formed by the outside casing of a door or window and the brick facing. The two styles shown are also useful as moulds around other styles of window and door frames.

Other examples of mouldings and building trim are best studied at first-hand. If you wish to duplicate any particular mould, draw the shape full-size on a piece of paper, and then compare the drawing with the cutters at your disposal. You will invariably find cutters which will duplicate or closely approximate the various curves in the required mould.

OTHER APPLICATIONS OF SHAPER CUTTERS

STRIP MOULDINGS. This name is given to any moulding of light body, and more especially to mouldings cut from rectangular stock. A typical example is the strip moulding used on screen doors and windows, examples of which are shown on the following page. Because such mouldings are run off in quantity and also because of the light body of wood stock, it is advisable to use the shaper hold-downs when working, or better, a simple strip jig such as shown in Fig. 25. The jig should be made to take the work snugly, the height being governed by the spacing strip, as shown in the sketch. The width of the opening through which the stock must pass, as indicated at W, should be a little less than the width of the stock so that the wood spring will sufficiently bind the work



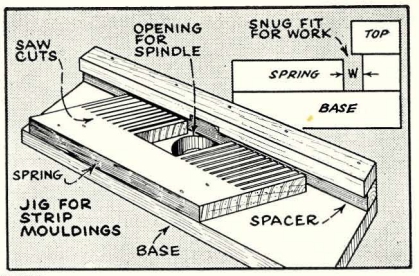


Fig. 25—Photo above shows strip jig in use; diagram shows construction. Screen mouldings and construction are shown at right.

to prevent backlash. Various styles of strip mouldings which can be easily cut with a jig of this kind are shown in Fig. 26, A, B, C, and D. The mould shown at D can be varied considerably in size, as can be seen in diagram E. This is the moulding which is being cut in the photo—a style suitable for screen doors.

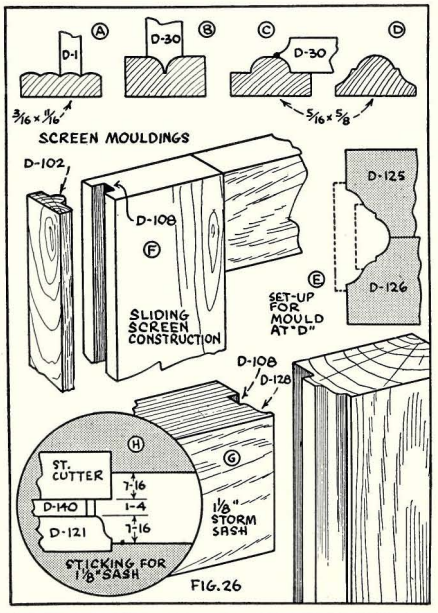
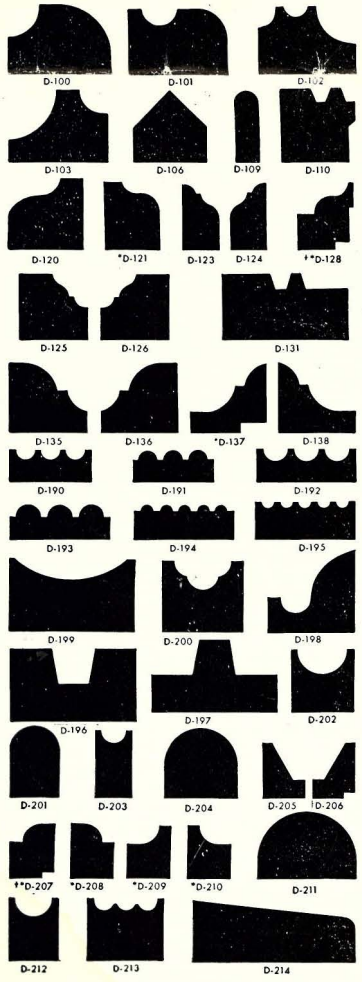


FIG. 26

SCREENS. Full or half window screens are easily made up from square stock without any special mouldings other than the strip mould which binds the edge of the wire mesh. Stock should be 3/4 in. thick for half screens and 1 1/8 for full screens. The top rail and the stiles are generally 1 3/4 in. wide, while the bottom rail is 2 3/4 in. wide. Joints can be butted, mitered, mortise-and-tenon, slot-and-tenon, etc. Half screens are generally fitted with a slide so that they can be moved up or down to cover either half of the window, the construction being as shown at F, Fig. 26. The slide extends the full length of the window; the screen is one-half the full length of the window. Screen doors are made on the same order as window screens. Joints should be dowelled or mortise-tenon. Panels, if used, can be held in place with applied moulding on either side.

STORM SASH. Storm sash are 1 1/8 in. thick, glazed the same as regular window sash and of the same general construction. They are often simplified by using applied mouldings on one or both sides as glass stops. Where the frame is to be stuck and rabbeted, the set-up shown at H is used. The cope cut on the rails is made in the same manner as window sash. Joints are best mortised-and-tenoned, but dowel construction can be used. In this case, straight cutter, D-108, would be used to make the end cut to fit the stile shoulder instead of running in with the mortising bit, as previously described in sash construction.

CASEWORK. General casework, such as kitchen cabinets, medicine cabinets, etc.,



SHAPED CUTTERS

(As shown in illustration)

SHAPED CUTTERS — 1/2" HOLE

1/2" Spindle No. 1347 needed with these cutters

D-100	1/2" Cove, 5/16" Quarter Round
D-101	5/16" Cove, 3/8" Bead
D-102	1/8" and 3/8" Quarter Round, 1/4" Bead
D-103	1/4" and 1/2" Quarter Round
D-106	90° Flute
D-109	1/4" Flute
D-110	Drawer Joint
D-120	Ogee
D-121*	Female Sash
D-123	Cab. R. H. Male
D-124	Cab. L. H. Male
D-125	Cab. R. H. Female
D-126	Cab. L. H. Female
D-128†*	Male Sash
D-131	Glue Joint
D-135	Cove and Bead Moulding L. H.
D-136	Cove and Bead Moulding R. H.
D-137†	Cove and Bead Cope R. H.
D-138	Cove and Bead Cope L. H.
D-190	3-Bead (5/16" Bead)
D-191	3-Flute (5/16" Flute)
D-192	3-Bead (1/4" Bead)
D-193	3-Flute (1/4" Flute)
D-194	5-Flute (1/8" Flute)
D-195	5-Bead (1/8" Bead)
D-196	Wedge Tongue
D-197	Wedge Groove
D-198	Ogee and Bead Table Edge
D-199	1" Convex Edge
D-200	Clover Leaf Screen Mldg. (9/32" x 5/16")
D-201	1/2" Flute
D-202	1/2" Bead
D-203	1/4" Bead
D-204	3/4" Flute
D-205	Pgee R. H.
D-206†	Pgee L. H.
D-207†*	Cove Sash L. H.
D-208*	Cove Sash R. H.
D-209*	Bead Sash L. H.
D-210*	Bead Sash R. H.
D-211	1" Flute
D-212	3/8" Bead
D-213	Beaded Screen Moulding
D-214	Panel Raising

STRAIGHT CUTTERS — 1/2" HOLE

D-104	1" x 1 7/8" Diameter
D-105	1 1/2" x 1 7/8" Diameter
D-107	1/2" x 1 7/8" Diameter
D-108	1/4" x 1 15/16" Diameter
D-127	3/8" x 1 15/16" Diameter
D-129	3/8" x 2 7/32" Diameter
D-130*	3/4" x 1 7/8" Diameter
D-139	1/4" x 2 7/32" Diameter

*For Sash work.

†Counterbored to fit stub spindle No. 1345.

Spacing Collars for Shaper Cutters

No.	Thick	Out. Dia.	Hole
D-132	3/8"	1 5/32"	1/2"
D-134	1/4"	1 5/32"	1/2"
D-140	1/4"	1 3/16"	1/2"
D-141	3/8"	1 3/16"	1/2"
D-142	3/8"	3/4"	1/2"
D-143	3/8"	7/8"	1/2"
D-144	3/8"	1"	1/2"
D-145	3/8"	1 1/8"	1/2"
D-146	3/8"	1 1/4"	1/2"
D-147	3/8"	1 3/8"	1/2"
D-148	3/8"	1 1/2"	1/2"
D-149	3/8"	1 3/4"	1/2"
D-150	3/16"	1 3/8"	1/2"
D-151	1/4"	1 7/8"	1/2"
D-155	1/4"	3/4"	1/2"
D-171	3/8"	13/16"	1/2"
D-172	3/8"	15/16"	1/2"
D-173	3/8"	1 1/16"	1/2"
D-174	3/8"	1 5/16"	1/2"
D-175	3/8"	1 7/16"	1/2"
D-176	3/8"	1 9/16"	1/2"
D-177	3/8"	1 5/8"	1/2"
D-178	3/8"	1 11/16"	1/2"
D-179	3/8"	1 13/16"	1/2"
D-180	3/8"	1 7/8"	1/2"
D-215	1/4"	1 15/32"	1/2"
D-217	1/4"	1 5/32"	1/2"

involves the shaper to the extent of general trim and door and drawer construction. Cabinet doors and general trim have been previously described. The various straight cutters can be used to advantage in grooving drawer sides for bottom panels, and making various other housed joints which are generally considered as dado work, but which can often be done better and quicker with straight shaper cutters.

SHAPER COLLARS. Collars designed for use with our sash and cabinet cutters are made to three different diameters to accommodate the full shape of the various cutters as used when riding curved work directly against the collar. D-140 and D-141 collars are 1-5/32 in. diameter, permitting a 1⅞ in. diameter cutter to cut to a depth of 23/64. This takes the full shape of cutters D-123 to D-126 inclusive; also, the full shape of the large ogee cutter. D-150 collar allows the cutting of the full shape of D-121 and D-128 cutters. It also limits the depth of D-125 and D-126 cutters to the small ogee portion of the full shape. D-151 collar is of the same diameter as the cutters. It is frequently used to ride the inner edge of a rabbet to permit a shaped cutter to cut to the same depth. It is also useful when shaping work with an outline pattern. Other collars of various diameters are useful in controlling the depth of cut when using cutters for making mouldings or doing special work.

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DELTA POWER TOOL DIVISION

Rockwell MANUFACTURING COMPANY MILWAUKEE 1, WISCONSIN

*T.M. Reg. U. S. Pat. Off.

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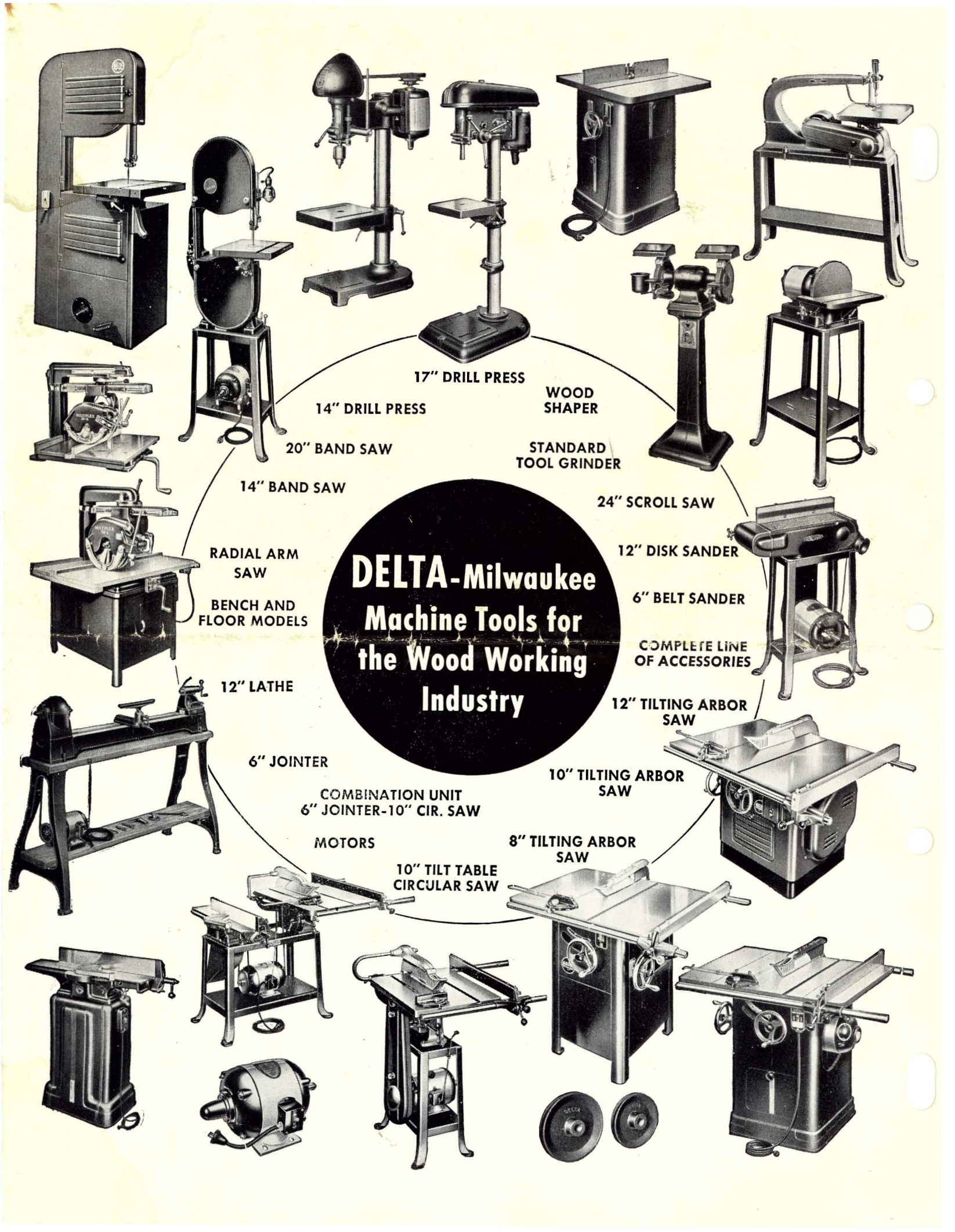
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OF ACCESSORIES
12" LATHE
12" TILTING ARBOR
SAW
6" JOINTER
10" TILTING ARBOR
SAW
COMBINATION UNIT
6" JOINTER-10" CIR. SAW
MOTORS
8" TILTING ARBOR
SAW
10" TILT TABLE
CIRCULAR SAW