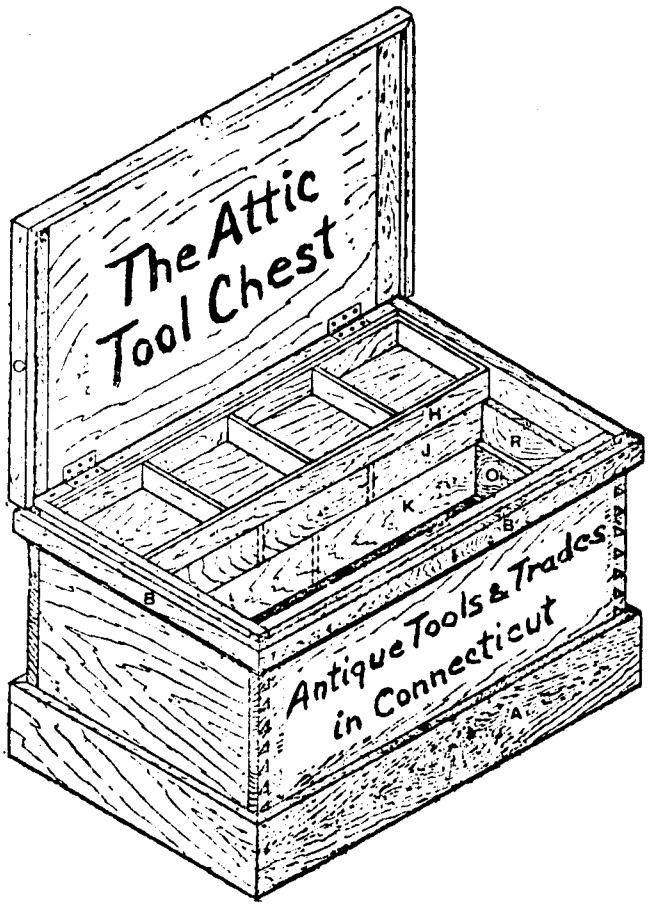
ISSUE 17 JANUARY 1979



ATTIC DUST

OCTOBER 1978 JOINT MEETING

At 8:30 on the morning of our October joint meeting we already had a line of people waiting to register and get their badges and auction cards. Fortunately, Harriet Murray was early too, and handled registrations splendidly till Carol Burritt Betty Downes, Judy Kebabian and Marsha Smith arrived to help out. By the end of the day, 255 people had registered. There were 117 on the ATTIC list, 53 on the ACTIVE list, 51 on TNT, and 34 on ETC. Of course there were some people who belonged to two or more of the societies. Dwight Burritt handed out 155 auction cards, and with wife Carol handled the money receipts all day.

Nobody had a problem in finding the tools; there were many, many tables of them. The previous monday, we had moved the tools to Mystic from the Carlson home at Deep River. Joe Link and Sherwood Chamberlain had guided the loading of the tools into the station wagons and trucks of George Campbell, Gus and Fred Carlson, Bill Downes, Tom Elliott and Bud Steere. Pete Coope had the tables ready at the Mystic Seaport Museum. Bud Steere was given the difficult job of deciding which tables the tools should go to for the tool sale. The rest of us subsequently changed a few locations on the basis of our opinions. Joe Link had already selected the items to be auctioned; and we added a few to that list, too. Paul Kebabian set the book prices for us.

By 10:00 a.m. on the meeting day everybody was ready to descend on the sales tables. For each table we had a clerk with a red badge to record sales. There were red badges on Gus, Eric, Fred and Ann Carlson; Pete and Ginny Coope; Harriet Gorlin; Phyllis Jeacock; Ann Link; Vera Steere; Jean MacRea; and Arthur Burritt. Everyone agrees that when the whistle blew there was a rush to the tables - but a well behaved rush. In no time at all people had made their choices and were ready for the next round. Prices were reduced twice; by that time little was left. The remains were divided into four lots and sold as the last items in the auction. The least popular sale table tools were the soldering irons - not surprising. Bob had said, "What other tool can you buy for 50 cents these days?" That partially accounts for the large number of irons on hand.

Frank Eppinger had brought 40 dozens of doughnuts. Monica Eppinger provided coffee and doughnuts until she had to go to a wedding, at which time Harriet Gorlin took over. After finishing giving out travel information, Betty Downes ended up with about 11 dozens to dispose of. Dick Dixon was the coffee hero. As the circuit breaker kept tripping, he kept restoring the power to the coffee makers; he also had to rush out for more coffee.

Shorly after 1:00 p.m. the auction began. Jack Kebabian was in great form as auctioneer. Eleanor Kebabian noted each sale, and Betty Buckley entered the sale on the proper person's card. Between the morning sales

and the auction sales, Betty entered 931 sales - a great job. Jack and Eleanor were a fine team at their jobs. As usual, Jack did very well in getting proper bids for the tools. Once or twice, Paul Kebabian made sure that he did. It was about 4:45 p.m. before things were over. Bidding held up well to the end. Everything was sold, even the big up and down saw machine . We weren't sure we should bring the big saw to the sale, but Tom Elliott persuaded us, and it came on top of George Campbell's station wagon. It seems that Lee Murray had seen the saw years ago, fallen in love with it, forgot where he saw it - and there it was at the auction. Of course it was Lee who bought it.

Late that night, Dwight Burritt made a special trip to the night deposit door of his bank and left behind all the cash and checks from the days sales. He and Bill Downes got together twice thereafter to check the entries on the auction cards against the many sales slips. As a result, Dwight was left with the task of making refunds to a few people and collecting additional amounts from others. After this time consuming work was done we were ready to transfer the proceeds to Cinnie Carlson. The total amount was a little over $12,000.

Cinnie is very grateful for our efforts, and wants us to be sure to realize that. She appreciates not only the money, but the fact that we picked out what should be sold, and then moved it out and sold it. And, of course, to have the tools go to so many of Bob's friends was a fine thing. Joe Link deserves the most credit for this very worthwhile enterprise. However, as you see from the above, many people pitched in and helped.

As a joint meeting of four societies, it was a success, if the large attendance is a good indicator. Presidents Paul Kebabian of ACTIVE, Bob Pomeroy of TNT, Bill Downes of ATTIC, and former president Larry Newmark of ETC were present. Many people arrived the day before or stayed another day and visited the attractions in the region. It was a real surprise to find who had come the greatest distance to the meeting. It was Sheila Lewis from the Red House, Horncastle, England. She was a guest of Win and Scotty Carter of Portsmouth, N.H. The meeting and auction were nicely written up by Alex Farnham; his article appeared in the Maine Antique Digest.

CARLSON AUGER COLLECTION

As many of you know, Bob Carlson was probably the worlds expert on augers. Any concern over possibly breaking up his collection of augers need bother us no longer. Cinnie Carlson has given the collection and the papers that go with it to Mystic Seaport Museum. Joe Link and George Campbell made the arrangements and did the moving of the tools. The Seaport personnel are already at work familiarizing themselves with the tools and the papers. The intent is to make the collection available for further studies connected with augers.

ATTIC DIRECTORS MEETING, Dec. 3, 1978

After we had seen Frank Dorion's tools,and greatly admired his excellent craftsmanship as a cabinet maker and tool maker, Carol Dorion served us lunch. After that beginning, we had a Directors Meeting. While we were at the Dorions, a snowstorm started and ended; fortunately, the snow snow on the roads went before we left.

We first reviewed our joint meeting for lessons to be learned.We then agreed that we would offer to do the same sort of tning for Elsie Bawden, if she should want us to do so. Subsequently she was informed of our readiness to do this, but there are no plans to report at this time.

Next, we discussed plans for the Spring meeting, which are discussed below. The Fall meeting will include election of officers and some directors. A flea market among ourselves will be part of the program, so start setting things aside to take to the flea market.

SPRING MEETING, MAY 5, 1979

Doug Hayes has arranged for us to use the facilities of the Talcot-

ville Congregational Church in Vernon, Conn. for our Spring meeting. The main feature of the meeting will be a morning session on identification of the various woods we encounter in furniture and in collecting tools. Bob Sutter is working on this and expects to provide effective means for improving our abilities to recognize woods. Hopefully, we'll have other people present to add their own methods, and help identify those samples of wood that you bring in for identification. After noon, we expect to have a what'sit sessiom , followed by a showing of slides taken at the 45th E.A.I.A. meeting at Albany. The slides show the many displays and demonstrations that were the special feature of the anniversary meeting.

LIFE MEMBER JACK KEBABIAN

Your officers and directors are very grateful to Jack Kebabian for being our auctioneer once again. In recognition of his most effective and voluntary efforts, we elected him to life membership in Antique Tools and Trades in Connecticut.

NEW MEMBERS

Our October joint meeting encouraged a number of people to either join or rejoin ATTIC. We welcome them and the others who have joined us:
Larry Newmark, 15 Alma Lane, E.Northport, N.Y.11731
John Roundtree, 96 Maplewood Ave., Maplewood, N.J. 07040
Louise Kilcourse, 3 Vista Road, Wilbraham, Ma.01095
Harry W. Rapp, 21 Claire Rd., Vernon, Conn. 06066
George Gochis, 36 Centerview Dr., Shelton, Conn. 06484
Elliot Sayward, 60 Harvest Lane, Levittown, N.Y. 11756
Theodore D. Bennett, 6469 Main St., Stratford, Conn. 06497
Jim Waite, 656 Wheeler Road, Monroe, Conn. 06468
William Norton, Col. Stephen Ford House, Durham, Conn. 06422
Rod Hagenbuckle, Box 376, E.Orleans, Ma. 02643

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SOME THOUGHT ON CLEANING TOOLS

Harvey Jeacock, Brookfield, Ct.

I am aware of the controversy that exists among collectors concerning the subject of cleaning tools. I am also a collector motivated, as are others, by a sense of urgency as regards the subject of preservation. When I see metals covered with corrosion, or wood whose natural oils are so depleted that they are sponglike, the preservationist in me takes over. Or when I see a tool so long deprived of the care of the craftsman who once needed it for his or her livelihood, then I am moved to action. The corrosion will not cease until it is cleaned away and the metal protected. And wood so dry and checking can only deteriorate further when subjected to the Sahara-like atmosphere of our modern central heating.

Whatever your motivation, the cleaning should be done with measured care. First, analyze each tool and determine how far you wish to go. In haste, I have been guilty of overcleaning. For those who wish to put the tool back in workable condition, there are some excellent pointers in a recent book by Michael Dunbar, "Antique Woodworking Tools".

For myself, when I come upon the usual "grungy" plane with years of encrusted dirt and moderate rust (maybe even some scale) on the iron, the first step is to disassemble it. Next, I will scrub the wooden parts with Brillo soap pads and water, wiping all parts and allowing them to dry thoroughly. Paint splotches or varnish that resist the first attack are subjected to paint remover. Do not bear down in the scrubbing, let the medium do its work. When thoroughly dry, buff with the finest grade of steel wool available. Now soak the wooden parts in a mixture of equal parts turpentine and boiled linseed oil. You can do this by repeatedly brushing until the wood will no longer absorb, or you can immerse the object and

let stand for 24 to 36 hours. Then wipe dry and allow to dry for 2 or 3 days. Buff with a soft cloth and you will find that you have the patina which undoubtedly delighted the craftsman who last used the tool. If you are wondering, there is ample justification for this oiling on page 98 of Percy Blandford's book "Country Craft Tools".

As for the metal parts, or in the instance of a plane its iron. I usually use a bench mounted fine wire wheel. Go easy, but get rid of the rust. If there is some scaling, break through it with chemicals or by a light hammering, being careful not to dent or distort softer metals. Your fine wire wheel may only buff the surface of the scale, and the rust will still be there, destroying your tool. Now, on the treasured relic or museum piece, you may want to think twice before going this far. A deeply pitted piece will look very strange indeed with all of its scale removed. Going back to what I said in the beginning, analyze the tool and decide how far you want to go. Having cleaned the tool, and perhaps even honed the cutting edge, protect it with Butchers wax or something like Mitchell's satin glow. I have not used hard finishes like lacquer on metals or wood.

Reassemble your tool and enjoy it or use it. I feel that by restoring the tool to the condition that a true craftsman would have valued, I gain some insight into his or her pride of accomplishment. Those of you who do not like to clean up the tool for reasons of authenticity will never know what you are missing. From my own experience, I have uncovered more about who made the tool or how it was made, or even how it was used, only after careful cleaning. Those of you who have seen my collection can judge for yourselves.

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DUES FOR 1979

The $5.00 dues for 1979 are due, (unless you joined at the October meeting or later). Please send them to our Treasurer, Dwight Burritt, 229 Olde Stage Road, Glastonbury, Ct. 06033.

ATTIC

President/Editor, William A. Downes; Vice-President, Harvey Jeacock; Secretary, Peter Coope; Treasurer, Dwight Burritt.

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SAWS

As his contribution to the Attic Tool Chest, Frank Eppinger provided a whole file on saws. Part of the file was a Xerox copy of "The Saw in History" , an early 20th century publication of the Henry Disston & Sons Company. Frank had written to the Company, and in the absence of a copy, they Xeroxed one for him. Within a couple of months of getting the file, E.A.I.A. and Midwest Tool Collectors brought out a reprint. E.A.I.A. members may order a copy from Mrs. Paul Kebabian, 11 Scotsdale Road, So. Burlington, Vt. 05401. Enclose $2.00 and your mailing address for use on the return envelope.

Some of the material in "The Saw in History" appears to have come from Knight's "American Mechanical Dictionary" of 1884. The pages from Knights is part of the attached material.

The rest of the material is from Eppinger's copy of "Concerning Saws" produced by Spear & Jackson, the prominent English saw manufacturer.

Handsaws

FROM: "Concerning Saws"

Produced by Spear & Jackson (Tools) Ltd. St. Pauls Road, Staffordshire, England WS10 9RA

Wood consist of a mass of closely packed fibres all lying in one direction; along the grain. To cut, the saw teeth must sever these fibres, either across or along the grain.

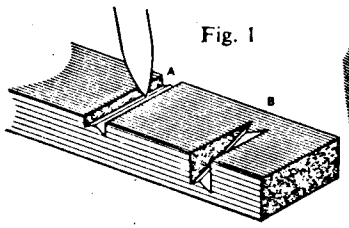


Fig. 1

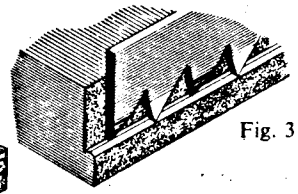


Fig. 3


Fig. 2

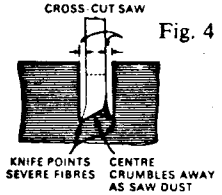


Fig. 4

The action of a **cross-cut** saw can be seen in slow motion when a knife is used to make two cuts about $\frac{1}{16}$ inch apart across the grain of a piece of wood (Fig. 1). The fibres left between the cuts are very short, and crumble away as the cuts are deepened. The teeth of a cross-cut saw are so arranged that they cut two knife lines close together in this way. The fibres crumble and are carried away as sawdust in the gullets between the saw teeth (Fig. 4). Cross-cut teeth have an angle on the leading edge of approximately 14° from the perpendicular. The teeth of top quality saws are also "bevel sharpened" into knife-like points and are even better equipped to carry out the severing action (Figs. 2 and 3).

For cutting **along** the grain a rip saw is required. The saw teeth work with a chiselling action to make cuts at right angles to the blade (Fig. 5). Rip saw teeth are not bevelled, but filed square and arranged like a series of chisels, one behind the other to approach the wood at the most efficient angle (Figs. 6 and 7). Rip saw teeth are upright, the leading edge being only about 3° from the perpendicular.

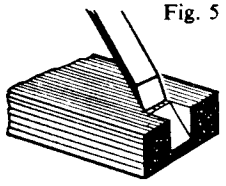


Fig. 5

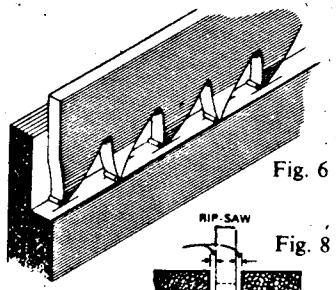


Fig. 6


Fig. 7

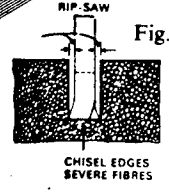


Fig. 8

The teeth of both cross-cut and rip saws are "set" to prevent the saw jamming in the cut. Alternate teeth are bent slightly outwards to make a kerf or cut just wide enough to give clearance for the blade (Fig. 8). To improve this clearance, best quality saws are taper-ground. This process gives a uniform thickness along the toothed edge and near the handle, but reduces the thickness towards the back edge and from the handle towards the point.

SELECTION

To cut soft wood choose a saw with large teeth and gullets. Soft timber offers little resistance to the saw and so allows each tooth to bite deeply. The large gullet is needed to carry the sawdust out of the kerf.

Hardwood offers more resistance and accordingly more, and smaller teeth are required to cut it. Since each tooth bites less deeply, less sawdust is produced and so a smaller gullet is adequate. In both cases, teeth should be sharp, uniform, and evenly set.

The stipulated length of a handsaw is the length of the blade only; it does not include the handle. Tooth size is measured as the number of points per inch, including both outside points.

MAINTENANCE

A saw in bad condition will need the following operations:

1st: Topping
2nd: Shaping
3rd: Setting
4th: Sharpening

But, just as a chisel may be honed many times before regrinding becomes necessary, so a saw can be re-sharpened several times before the set is worn away. A good rule when sharpening a saw is "little and often".

1. Topping or Jointing When the teeth of the saw are worn to different heights (Fig. 9), or the edge worn hollow (Fig. 10) the saw must be "topped" to level off unevenness. Use a second-cut, mill file, 10" long, or any well worn flat file. Fix the saw in a saw-vice, hold the file flat and run it along the whole length of the saw. If the saw has a very uneven edge it is unwise to top it completely. With more than about a third removed from the tops of the most prominent teeth, it is difficult to retain the original spacing when performing the next operation of shaping. In this case, top lightly so as to file only the highest teeth. Shape these and top again, and continue shaping and topping alternately until all the teeth are reached.


Fig. 9

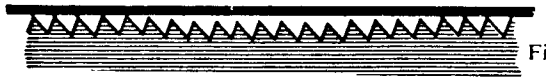


Fig. 10

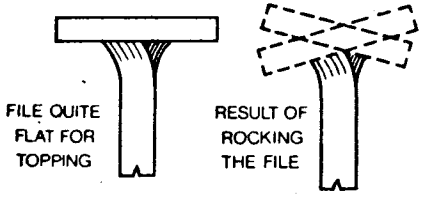


Fig. 11

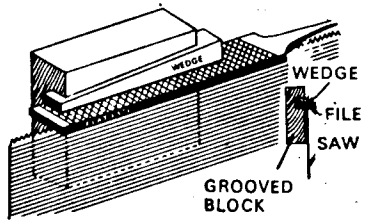


Fig. 12

When topping, care should be taken to keep the file quite flat (Fig. 11) otherwise the edges of the teeth will become rounded and difficult to sharpen correctly. If it is difficult to hold the file flat and square with the saw blade it is advisable to use a "topping clamp" (Fig. 12).

2. Shaping In shaping, the teeth of the saw are filed to a uniform shape and size with a taper or slim taper saw file, in one of the following sizes, as appropriate:

Saw points per inch:	5 (Rip)	6	7-8	10-12
Taper saw file, length:	8″	7″	6″	6″ (slim taper)

For best results the width of the file face should be just over twice the depth of the saw teeth (Fig. 13A). If the file is too narrow (Fig. 13B), two of its faces may become completely worn, so that when the file is turned over only one new face is brought into action, the other being already worn.

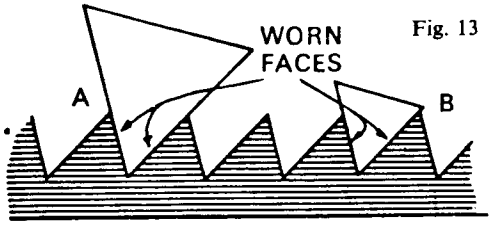


Fig. 13

To shape, first fix the saw in a saw-vice so that not more than ¼″ of the saw projects above the cheeks of the vice. Place the file in the gullet between two teeth and press it down firmly with the left hand so that it assumes the correct pitch of the teeth. (Pitch is the angle at which the leading edge of the tooth leans forward (Fig. 14) This is as much as 14° for a cross-cut saw, only 3° for a rip saw.) Grip the file handle in the right hand with the thumb on top and finger alongside and maintain this grip until the shape is complete. The same pitch will then be given to each tooth.

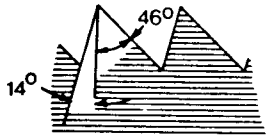


Fig. 14

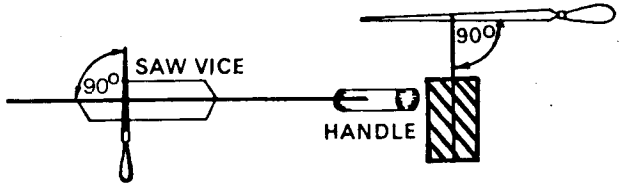


Fig. 15 Fig. 16

Shaping is now carried out by filing straight across the saw at right angles, with the file held horizontally (Figs. 15 and 16). File each gullet carefully and accurately with slow steady strokes of the file. Teeth should be shaped as uniformly as possible so that each tooth will play its proper part in the cutting action, leading to easy efficient sawing. When shaping is completed all flats formed on the tips of teeth during topping will have just been removed and each tooth brought to a point. The teeth should now all be quite even in height, all the same shape, with the front and back of each tooth sloping at the correct angle (Fig. 14). Do not bevel the teeth at this stage. This is done during the final sharpening process after the teeth have been "set".

3. Setting The most common mistake in reconditioning saws is to give the teeth too much "set". Most home-maintained saws returned to Spear & Jackson for expert reconditioning have been over-set. Well-set teeth will cut a kerf just wide enough to give clearance for the blade—and no more. Rarely will the kerf need to be more than 1½ times the thickness of the blade. Too much set reduces saw efficiency; more effort has to be expended in producing an unnecessarily wide kerf and more wood is wasted as sawdust. Teeth should not be set down more than half their depth (Fig. 17). Deeper setting can cause distortion of the blade at the roots of the teeth, cracking of the blade at the bottom of the gullets, and breaking out of some teeth. Undoubtedly the best method of setting is that used by the manufacturers. This process employs a fine cross pean hammer, a saw anvil consisting of a piece of steel with a rounded edge, and some form of guide or stop which ensures the teeth overhang the bevel on the anvil by the correct amount, i.e. no more than half the depth of the tooth (Fig. 18). With the saw blade resting on the anvil, the first tooth is set with two or three light blows (never one heavy blow) of the hammer. Alternate teeth along the whole length of the saw are then set in the same way. The blade is then turned over for the remaining teeth to be set. Care must be taken to set the teeth to their original sides. Bending teeth first one way and then the other causes breakage.

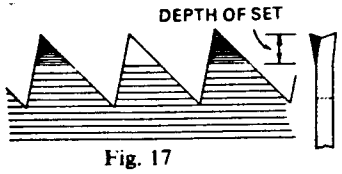


Fig. 17

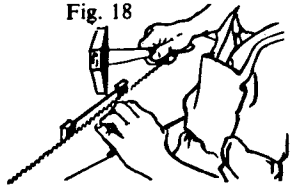


Fig. 18

The plier type of saw set (Figs. 19 and 20), if properly adjusted and carefully used, will also set saws satisfactorily. The pliers are placed over a tooth and the handles compressed. A plunger then pushes the tooth over against an anvil. To suit the pitch of each particular saw the amount and depth of set are controlled by the adjustment of the anvil and depth stop.

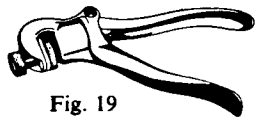


Fig. 19

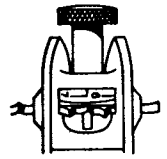


Fig. 20

Whatever method is used a uniform set must be produced along the whole length and on each side of the blade, each tooth being bent by exactly the same amount. A saw will not work true to a line unless the teeth on both sides do the same amount of work. Slight irregularities of set are removed by side dressing. Lay the saw flat on the bench and then run an oilstone slip lightly over the teeth to reduce any that are too prominent. Turn the saw over and repeat the operation.

4. Sharpening The method of final sharpening depends on whether the saw is to be used for cutting across or along the grain.

Cross-cut saws Here the teeth must be bevelled with a file to produce knife-edges which will sever the fibres of the wood. If this bevel is made too long a very thin edge is produced on the tooth (Fig. 21). Though this cuts well it will quickly wear away, particularly on hardwoods. A shorter bevel is better for general use (Fig. 22).

Fix the saw in the vice, with the handle to the right, so that not more than ¼″ of the blade projects above the vice cheeks. Next "top" the saw very lightly. This ensures all the teeth are the same height and puts a "shiner" on the tips of the teeth to help in the sharpening

process. Position the file to work on the front edge of the first tooth set towards you (A1, Fig. 24). The file will then also be working on the back edge of the tooth to its left, this tooth being set away from you.

Move the file handle over to the left until the file makes an angle of 65 -75° with the line of the saw blade (Fig. 23). This angle must be maintained throughout. Keeping the file perfectly horizontal, give each tooth two or three steady strokes of the file. When half of the "shiner" is filed away the file is transferred to the next gullet but one.

Fig. 21

Fig. 22

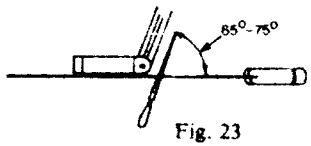


Fig. 23

The front edge of the tooth set towards you is being filed each time (A2, Fig. 24). Continue to the end of the saw, filing in each alternate gullet.

When you reach the end of the blade, reverse the saw in the saw-vice. The handle is now on the left of the vice (Fig. 25). Repeat the filing on the front edge of the teeth set towards you, i.e. in the gullets which were missed the first time (B1 and B2, Fig. 24). The file handle must be swung round to the right so that the filing is again done towards the saw handle. Maintain the original angle of 65 -75° (Fig. 25), and keep the file perfectly horizontal. Sharpening

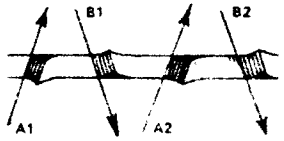


Fig. 24

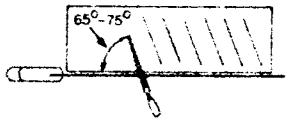


Fig. 25

is completed when the other half of the "shiner" on each tooth just disappears.

Rip saws The teeth of a rip saw must be filed to produce the chisel edges which sever along the fibres of the wood (Fig. 26). Again, fix the saw in the saw-vice, with the handle to the right, and give the teeth a very light topping to produce the shiners. The sharpening procedure is the same as for the cross-cut saw except that now the filing must be done at right angles across the saw (Figs. 27 and 29). The file must be quite horizontal at all times. File each alternate gullet (Fig. 28), then reverse the saw in the vice so that the handle is to the left. Then file the intermediate teeth which were missed on the first operation.

Fig. 26

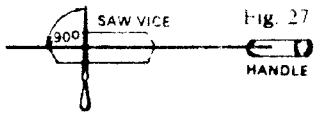


Fig. 27

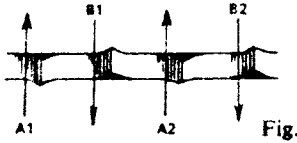


Fig. 28

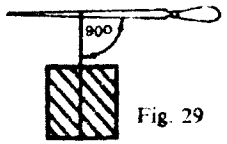


Fig. 29

After sharpening, side-dress the saw very lightly with an oilstone slip to remove any burr caused by the file.

Tenon Saws

The tenon saw is made for fine, accurate work, and has blade and teeth much finer than those of a handsaw. Its main identifying feature is the heavy steel or brass "back" which grips the thin blade along its whole length to keep it rigid. Sawmakers traditionally gave their better quality saws brass backs, and many craftsmen still believe these to be superior.

What is important, is the quality of the steel and correct tempering. As with handsaws, this cannot be tested in the shop. The only real safeguard for the purchaser is to choose a saw by a well-established maker.

The cutting edge should be perfectly straight. The teeth, which are usually pitched at an angle of 16° (Fig. 30), should be evenly set, and sharp. The blade should be perfectly flat and free from twist, with no "crimping" at the roots of the teeth. Both the back and the blade should be securely fitted into the handle.

Because the tenon saw is used for general work on the bench, it needs to cut both with and across the grain. Its teeth are, therefore, sharpened with a bevel, like cross-cut teeth, because these will rip—whereas rip teeth will not cross-cut cleanly.

SELECTION

For general carpentry:	14 inches long with 13 points per inch
or	12 inches long with 15 points per inch
For cabinet work:	10 inches long with 15 points per inch
or	8 inches long with 15 points per inch
For dovetailing:	8 inches long with 20 points per inch.

The dovetail saw is a small version of the tenon saw, with an even thinner blade and smaller teeth, 20 points per inch. It is used for cutting dovetail joints and for other very fine and accurate work.

MAINTENANCE

The tenon saw is sharpened exactly as a cross-cut handsaw, but because the teeth are smaller, greater care is needed to keep them

Fig. 30

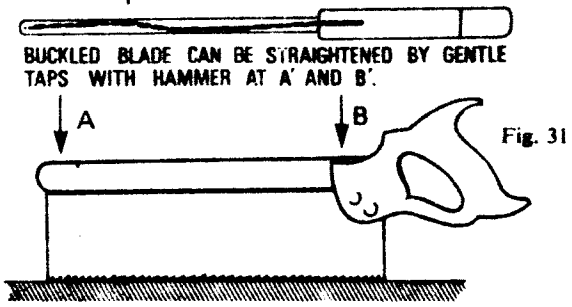


Fig. 31

perfectly even in size. For 13 points per inch, use a 5 inch slim taper file. For 15 points per inch, use a 4 or 4½ inch slim taper file.

It is essential that the teeth of a tenon saw be kept sharp and in good condition so that there is never any need to force the blade thus causing distortion.

Distortion can often be corrected by supporting the blade vertically on a piece of wood, and striking the back gently with a hammer, first at one end, then the other (Fig. 31). This procedure pushes the blade further into the back restoring it to its original state, and springing the blade back into its true line. If this is not successful, the back or the blade, or possibly both, have been twisted, and the saw should be returned to the makers for treatment.

FROM: "Knight"s American Mechanical Dictionary" By: Edward H. Knight, 1884

Saw. An instrument with a serrated blade, the teeth of which rasp or cut away the wood or other material, making a groove known as a *kerf*.

The wasp was perhaps the first sawyer.

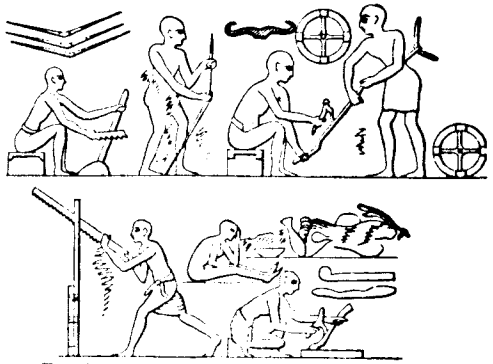
The Grecian myth of the invention of the saw (by Dædalus, *Pliny:* Talus, nephew of Dædalus, *Apollodorus*) is that the inventor once found the jawbone of a snake, and used it to cut through a piece of wood; he then imitated it by jagging an iron plate, and thus made a saw. It is said that the uncle, jealous of the discovery, killed Talus. It may have been a case of interference between two inventors, with irregular process and short shrift. Researches in Egypt upset some of the tattle of Pliny and others of his day. We owe them a great debt of gratitude, however.

Other writers say that Perdix, nephew of Dædalus, employed the backbone of a fish, and was thus led to the invention. Perdix raised the jealousy of somebody, and was changed into a partridge. Ovid mentions this, without assigning the name of the inventor.

Saws of the bronze age have been discovered in Germany and Denmark, but not in Great Britain. (LUBBOCK.) The metal was cast thin, and probably was serrated by chipping and grinding.

Saws of the stone age were made by setting flakes of flint in wooden handles and securing with bitumen. Obsidian was used in Mexico. Saws and knives of obsidian have been disinterred in the alluvial ground of New Jersey beneath the recent gravel. They are held to prove the existence of extensive coastwise trade, as no obsidian is found nearer than Mexico. The saws of the South Sea islanders in 1768, when Captain Cook went to Otaheite to observe a transit of Venus, were made of sharks' teeth lashed to a back-piece. The saws of the Lacustrians and other early inhabitants of Europe were of jagged flint; those of the Caribs, of notched shells. The saw is a very old device, as old as a knife with a ragged edge.

Fig. 4590.



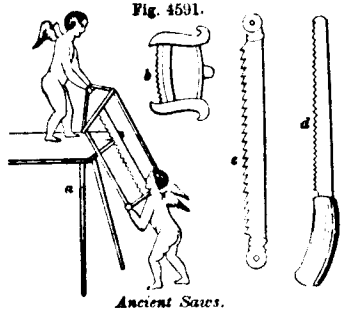
Egyptian Sawyer and other Mechanics (from Thebes).

Fig. 4590 is from a group of persons represented in an ancient painting at Thebes, who are making poles or carriage-tongues.

In dividing a beam of moderate length into planks, it seems to have been usual with the ancient Egyptians to set it upright between posts, to which it was lashed. Wilkinson failed to find any saw adapted for use by two persons, like the pit-saw.

g, Fig. 3032, page 1379, represents a saw discovered by Mr. Burton at Thebes, and now placed in the British Museum. The owner had probably been dead several hundred years before Pythagoras, Solon, or Plato visited Egypt to study science. The ancient saws were *hand* and *frame*.

Fig. 4591.



Ancient Saws.

a. From a painting at Herculaneum. Two genii working a frame-saw.

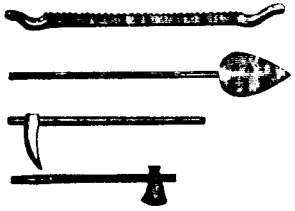
b. A frame-saw from a funeral monument.

c. A frame-saw blade detached; from a monument.

d. An Egyptian saw in the British Museum.

The implements of labor of the Assyrians are not so fully represented on the monuments as those of warfare. The cross-cut saw was two-handled, but not cross-handled, apparently. The shovels were heart-shaped, as at present used in Asia Minor. The picks had single heads. The hatchets had a poll.

Fig. 4592.



Tools of Babylon.

The modern Oriental saw is used with a *drag* rather than a *drive* motion, and the teeth are suitably inclined, raking toward the handle rather than away from it. The ancient Egyptian blade was of bronze, attached to the handles by leathern thongs, and was single-handled. Some of the blades, however, as in the instances of some of the Egyptian saws in the British Museum, are set into the handles with tangs, like our case-knives. The Egyptian saws were operated by the thrust movement, the edge curved or straight. Such are shown in the paintings of ancient Egypt.

St. Jerome is understood to have alluded to circular saws, but the point is not clear.

A double-handled iron saw has been discovered at Nimroud.

Sesorthus was called Aslepius by the Egyptians on account of his mechanical skill. The Greeks derived from him the name and attributes of Æsculapius. He introduced into Egypt the art of building with hewn stone, and, it has been supposed, used saws upon his blocks of stone. This is by no means certain, but we are told distinctly in the Hebrew history that the Phœnician architects of Solomon's temple built it of stone squared with the saw. The marble facing of the palace of Mausolus, king of Caria, described by Vitruvius, is believed by Pliny to have been faced with sawn slabs. This was erected 350 B. C.

Samuel (1033 B. C.) and Isaiah (742 B. C.) refer to saws.

The stone saws were commonly used, and the respective actions of the metal and sand were fully understood, in the time of Pliny. See STONE-SAW.

For *machines*, see SAWING-MACHINE; SAW-MILL; and list *infra*.

Japanese saws are shaped like butchers' cleavers. The handle is flattish, as if whittled out of a piece of inch board; the shank of the saw is driven into the handle, and the whole is secured by being wrapped with fine split cane. The metal of the saw is about the substance of our saws, but the teeth are narrower, giving more of them to an inch, and much longer. The teeth are pointed toward the handle. When a Japanese wants to rip a plank, he places it across anything which will elevate the end a few inches, then stands on the wood and cuts it by seizing the cleaver-looking saw in both hands, and pulling it toward him, working it by short, quick up-strokes.

The very distinguished place occupied by General Sir Samuel Bentham in the history of the invention and manufacture of wood-working machines is evinced by the list of sawing-machines invented and manufactured by him for the British Admiralty previous to 1800.

Circular saw.	Bevel saw.
Segmental circular saw.	Curvilinear saw.
Crown and cylinder saws.	Saw-blade grinding-machine.
Segment sawing-machine with radius arm.	Taper-gage for sawing-machines.
Saw for irregular forms with tracer-guide.	Double-grooving saws.

The circular saw is well described in Miller's English patent, No. 1,152, of 1777.

The band-saw is described in Newberry's English patent, 1808.

See also WOOD-WORKING MACHINES and list under SAW, *infra*.

A circular saw was made with blacksmiths' tools by Benjamin Cummins, at Bentonsville, N. Y., about 1814. This is supposed to have been the first made in this country.

Making a saw involves the following processes: —

1. Cutting out the blade from the sheet.
2. Toothing with a press and appropriately formed dies.
3. Hardening, by plunging while heated in an oil-bath. In this state the metal is extremely brittle.
4. Tempering and straightening; the latter is effected by hammering on an anvil or by compressing several blades, while hot, between two dies worked by a hydraulic press.
5. Grinding and polishing with emery-powder.
6. Filing and setting the teeth.
7. Reheating to restore the elasticity lost in tempering.
8. Removing the scale by immersion, first in dilute acid, and afterward in alkali to remove the acid.
9. The handle is attached and the blade tested.

The plates for saws are made of ingots of steel, carefully prepared to secure uniformity, and reduced to the proper thickness by rolling. Formerly, the larger portion came from Sheffield, England, but Philadelphia, Pittsburg, Cincinnati, and other places make them of the best quality, and from American steel of American iron. Circular saws were employed by Brunel in his block-making machine, and afterward came into general use. The plates for these vary in thickness from $\frac{1}{72}$ to $\frac{1}{4}$ inch, according to purpose, and the diameter from 8 to 72 inches; though sometimes they are made 88 or even 100 inches in diameter. The materials employed are steel and iron scraps of the best quality, melted together, and after casting reduced by repeated rollings. The hole in the center is drilled out, and the teeth roughly cut out by dies under a powerful press, after which the plate is firmly secured upon a heated table and the teeth pointed and sharpened by an emery-wheel; a farther grinding and polishing operation then ensues, a second and narrower wheel finishing the gullets. They are then tempered by heating until the film of oxide on their surface indicates that the proper temperature is attained, when they are immersed for about five minutes in an oil-bath. The oil is next removed by saw-dust, and the temper let down by reheating and gradually cooling. These processes tend to warp the plate, which must, therefore, be straightened by hammering upon an anvil, their

accuracy being tested by a level. This operation requires great care and judgment. The saw is then fastened centrally upon a shaft and caused to rotate rapidly against a large grindstone moving in an opposite direction, which dresses off one side to a perfectly uniform surface, when the saw is turned and the other side similarly treated, making the blade slightly thinner toward the center than at the circumference. They are again tested as to planeness, the straightening process repeated if necessary, and afterward polished by being caused to rotate in contact with wooden blocks coated with a composition of glue and emery.

Straight saws are made in a similar manner, regard being had to the difference in shape. The edge intended for the teeth is trimmed true, the teeth punched by a fly-press, filed, tempered, wiped, heated until any remaining oil *blazes off*, hammered on an anvil or *smithed*, ground to a gradually decreasing thickness from front to back (this is now done on both sides at once), re-hammered, again ground or *drawn*, *glazed* or polished, again straightened on the anvil, grained with emery, the teeth set, the blade stiffened by a heating process, any discoloration thus occasioned removed by acids, and, finally, oiled.

For correctly spacing the teeth of fine saws, a double chisel (Fig. 4593) is sometimes employed.

For still more delicate saws, a small piece of steel, hooked rectangularly at one end, is used. Its end is hardened, and serves as a guide for the file.

Piercing and inlaying saws for wood, metal, and ivory are made from pieces of watch-spring; the teeth are laid off and

Fig. 4593.

Spacing Teeth of Saws.

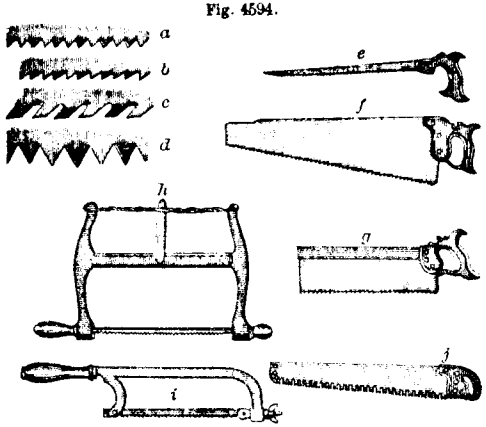
filed by laying the saw stretched in its frame flat in a grooved brass plate imbedded in a wooden block; as each tooth is formed the file is shifted angularly and returned to its former position, thus stepping off the interval of one tooth, the spacing being determined by the judgment and skill of the operator.

The French method is about as follows: The blades, after being rolled cold several times, in order to render the grain close and the metal homogeneous, are heated in special furnaces, from which the air is carefully excluded, and when at the proper temperature are plunged in a bath of colza oil; this is done in a dark chamber. The tempering is effected with the aid of machines which cause the blades to pass between cast-iron plates heated to a fixed temperature, according to the nature of the article to be produced. The tooth cutting, planishing, and grinding are done by machinery, as is also the reducing of joints of ribbon-saws, which is effected longitudinally, instead of across the blade.

Saw-teeth are known, according to shape, rake, interval, set, or other peculiarity, as *peg*, *fleam*, *gullet*, *briar-tooth*, *hawk's-bill*, *skip*, *insertable tooth*, etc.

Fig. 4594 shows varieties of saws and saw-teeth.

Fig. 4594.



Saws.

a d, cross-cut tooth.
b, hand-saw tooth.
c, gullet-tooth.
e, compass saw.
f, hand-saw.
g, tenon-saw.
h, frame-saw for wood.
i, smith's frame-saw for metal.
j, Boynton's "lightning" saw. See *a a' a''*, Fig. 4642.

The following table shows the dimensions of the generally used varieties of the rectilinear saws, arranged in three groups.

1. Taper Saws, mostly without Frames.

The thickness is that given by the Birmingham wire-gage.

With a Handle at each End.

	Length of Blade.	Width at Wide End.	Width at Narrow End.	Form of Tooth (Fig. 4641).	Space of Tooth.	Thickness of Metal. Gage No.
	Feet.	Inch.	Inch.		Inch.	
Cross-cut saw	4 - 10	6 - 12	3 - 7	*a - d*	¼ - 1	12 - 15
Long, pit, or whip saw	6 - 8	9 - 12	3½ - 5	*k l*	½ - 1	12 - 16
Pit-frame saw	4 - 6	7 - 11	3 - 4½	.....	½ - ¾	15 - 18
Felly or pit-turning saw	4 - 6	3 - 4	2 - 3	.....	½ - ¾	13 - 15

With Handle at one End.

	Length of Blade.	Width at Wide End.	Width at Narrow End.	Form of Tooth (Fig. 4641).	Points per Inch.	Thickness of Metal. Gage No.
	Inch.	Inch.	Inch.			
Rip-saw	28 - 30	7 - 9	3 - 4	*e f*	8½	18
Half-rip saw	26 - 28	6 - 8	3 - 3½	.....	4	18 - 19
Hand-saw	22 - 26	5 - 7½	2½ - 3	.....	5	18 - 19
Broken space or fine hand	22 - 26	5 - 7½	2½ - 3	.....	6	18 - 19
Panel-saw	20 - 24	4½ - 7½	2 - 2½	.....	7	19
Fine panel-saw	20 - 24	4 - 6	2 - 2½	.....	8	19 - 20
Chest-saw (for tool-chests)	10 - 20	2½ - 3½	1½ - 2	.....	6 - 8	18 - 21
Table-saw	18 - 26	1½ - 2½	1 - 1½	.....	7 - 8	16 - 19
Compass or lock saw	8 - 18	1 - 1½	½ - ¾	.....	8 - 9	18 - 19
Keyhole or fret saw	6 - 12	½ - ¾	¼ - ½	.....	9 - 10	19 - 20
Pruning-saw	10 - 24	2 - 3½	½ - 1¼	*c*	4 - 7	13 - 16

2. Parallel Saws with Backs.

With a Handle at each End.

	Length of Blade.	Width of Blade.	Form of Tooth.	Points per Inch.	Thickness of Metal. Gage No.
	Inch.	Inch.			
Tenon-saw	16 - 20	3¼ - 4	*e f*	10	21
Sash-saw	14 - 16	2½ - 3½	.....	11	22
Carcass-saw	10 - 14	2 - 2½	.....	12	23
Dovetail-saw	6 - 10	1½ - 2	.....	14 - 18	24
Smith's screw-head saw	3 - 8	½ - 1	.....	12 - 16	15 - 22

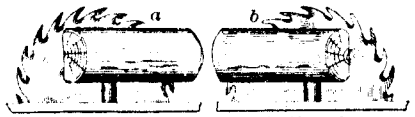
3. Parallel Saws used in Frames.

Stretched Lengthways.

	Length of Blade.	Width of Blade.	Form of Tooth.	Points per Inch.	Thickness of Metal. Gage No.
	Feet.	Inch.		Inch.	
Mill-saw	4 - 8	4 - 5	*i l*	¼ - 1	10 - 14
Mill-saw web	4 - 6	3 - 4	....	¼ - 1	17 - 20
Veneer-saw	4 - 5	4 - 5	*f*	2 - 4	19 - 21
	Inch.				
Chair-maker's saw	20 - 30	1½ - 2½	....	3 - 4	19 - 22
Wood-cutter's saw	24 - 36	2 - 3½	*e*	3 - 4	19 - 22
Continental frame-saw	15 - 36	1 - 3	*f*	4 - 12	19 - 24
Turning or sweep saw	6 - 22	$\frac{1}{10}$ - ½	....	10 - 20	19 - 24
Ivory-saw	15 - 30	1½ - 3	*e*	4 - 6	22 - 24
Smith's frame-saw	3 - 12	½ - ¾	*g*	10 - 14	20 - 26
Piercing-saw	3 - 5	$\frac{1}{30}$ - $\frac{1}{40}$	*f*	40 - 60	$\frac{1}{100}$ in.
Inlaying or buhl saw	3 - 5	$\frac{1}{25}$ - $\frac{1}{30}$	....	15 - 40	$\frac{1}{70}$ - $\frac{1}{100}$

Fig. 4595, *a*, left-hand circular-saw; *i. e.* the direction of rotation is from left to right.

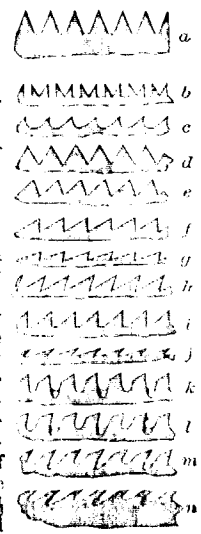
Fig. 4595.



Saws: Left-Hand Saw; Right-Hand Saw.

Saw-tooth. Saw-teeth are generally cut out by the fly-press. Those of the forms *d* to *h* (Fig. 4641) require but one punch, the sides of which meet at an angle of 60°. Two studs are used to direct the edge of the saw-blade to the punch, the required angle depending on the pitch or inclination of the teeth; and an adjustable stop determines the *space* or interval from tooth to tooth by catching against the side of the last tooth previously made. Gullet-teeth and the other kinds shown require punches corresponding to their peculiar shapes and sizes.

Fig. 4641.



Teeth of Saws.

After the formation of the teeth, the blade is ground upon a grindstone of considerable diameter, and (in the case of straight saws) principally cross-ways, so that it may be thicker at front than at back.

When, by means of hammering, the blade has acquired a uniform elasticity, the teeth are sharpened with a file and *set*, that is, bent to the right and left alternately.

The word *pitch* (preferably *rake*) is employed to designate the inclination of the face of the tooth, and not the distance from tooth to tooth, as in gearing. The distance between the teeth is expressed in narrow-spaced saws by the number of *points to the inch*; when the distance between them is ¼ inch or more, the saw is said to be of ¼-inch, ½-inch, etc., *space*.

Fig. 4641 shows various forms of saw-teeth: —

a, peg-tooth or fleam-tooth.
b, M-tooth.
c, half-moon tooth.
d, cross-cutting tooth.
e, *slight pitch* or cross-cutting tooth, generally used in small saws; the pitch exceeds that of the former by about 15°.
f, hand-saw, or *ordinary pitch* tooth.
g, tooth having the cutting-face *set forward* at an angle of 15°, used in mill-saws for soft wood.
h, tooth used in some circular saws; also occasionally for pit-saws, cross-cut saws, and saws for cutting soft stone.
i, shouldered tooth, employed in some rectilinear saws.
j, a similar tooth, having greater pitch; used in circular saws.
k l m n, gullet or brier teeth: the first is better adapted for cross-cutting and for hard woods, such as mahogany; the two next for pit and mill saws; and the last for ripping and for soft woods.