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Extension Circular 745 January, 1935

Fitting the Farm Saws

L. M. Roehl

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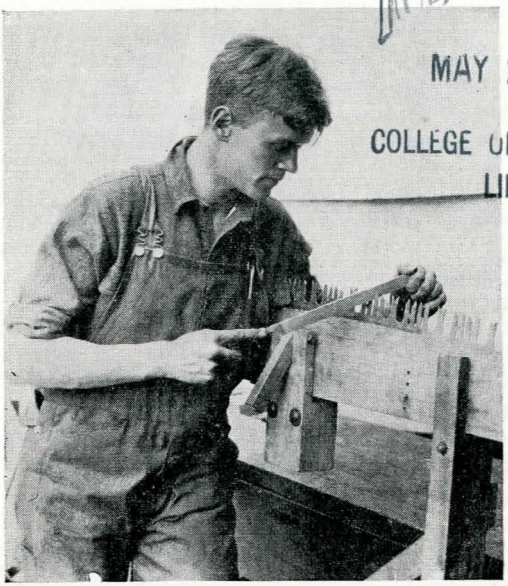

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FITTING THE FARM SAWS

L. M. Roehl

This bulletin is an effort to aid the farmer so that by his own handiwork he may enjoy the use of sharp saws on his farm.

HOW TO FIT A RIPSAW

Before one can expect to file any saw successfully, he must have clearly in mind the shape of the teeth he desires to file or make. The shape of ripsaw teeth is shown in figure 1. It will be noted that the front, or face, of each tooth is straight and at right angles to a line along the points, and that the cutting edge is square across the tooth. The shape of the teeth may also be seen in figures 2 and 11.

The action of a ripsaw is shown in figure 3. It will be noted that the teeth are a series of chisels, and, if all the teeth are alike, each will cut and force out an equal amount of wood.

In ripping wood, the saw should be held at an angle of about 45° to the material being sawed. This brings the cutting points at about the best angle to the fibre of the wood to make the saw cut well.

Saws are designated by the number of teeth to the inch. In measuring a saw, it will be noticed that in one inch of space there is one tooth less than there are points (figure 4). Ripsaws are made 4½, 5, 5½, 6, 6½, and 7 points to the inch. The 5½- and 6-point saws are used most extensively. A 26-inch length is best suited for general work.

Table of saw files

(Recommended by a well-known saw-manufacturing firm)

For 3-, 3½-, and 4-point crosscut, use 7-inch regular taper.

For 4½-, 5-, and 5½-point crosscut, use 6-inch regular taper.

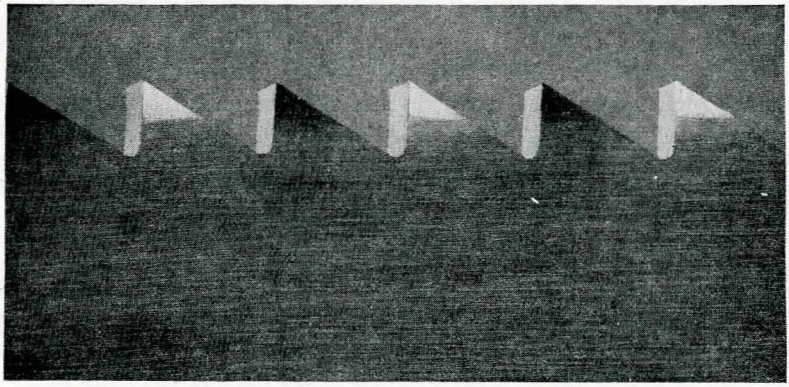

Figure 1. ripsaw teeth (magnified)

The straight front, or face, and the cutting edge square across the top

Author's acknowledgment. Acknowledgment is made to Henry Disston and Sons, Inc., Philadelphia, Pennsylvania, for use of figures 1, 3, 11, 13, 16, 17, 24, 25, 27, and 28, and to E. C. Stearns and Co., Syracuse, New York, for figures 6 and 33.

For 6-, 7-, 8-, and 9-point crosscut, use 4½-inch regular taper.
For 10-, 11-, and 12-point crosscut, use 5½-inch slim taper.
For 4½-, 5-, 5½-, and 6-point rip, use 4½- inch regular taper.
For 4-point rip and coarser, use 6-inch regular taper.

The author prefers to use a 6-inch slim taper file for 7-, 8-, and 9-point crosscut saws and a 6-inch extra slim taper file for all finer saws.

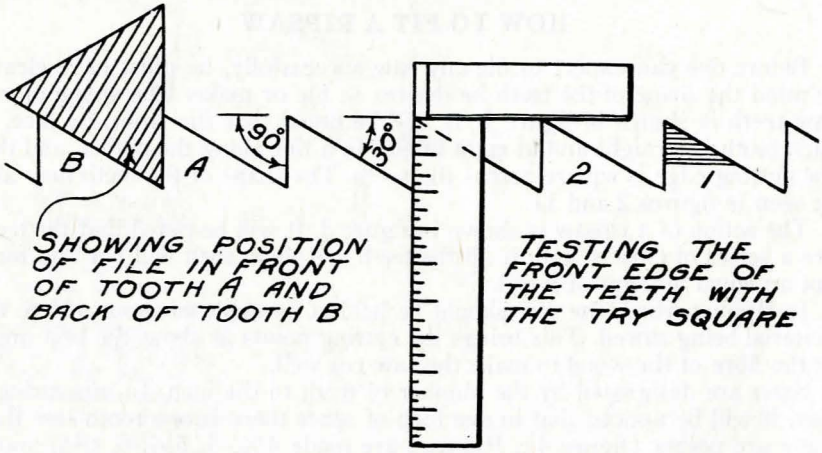

FIGURE 2. RIPSAW TEETH

Success in filing a saw depends very largely on the light. The saw must be held in such a position that the light shines on the points of the teeth, so that the filer can see when a tooth has been filed to a point.

Jointing the saw

The first operation in fitting a saw is that of jointing it (figure 7). This is done with a flat file without a handle. The saw is placed in the clamp so that the teeth are at least an inch and a half above the jaws, so as to allow plenty of room for the hands. The filer stands at the end of the saw, and holds the file in both hands with the handle end toward him. The thumbs are held on the file and the index fingers under the file and pointing toward the filer. By holding the file in this way, it is easy to keep it at right angles to the side of the saw. The file is pushed forward lightly over the saw lengthwise as many times as are necessary to file all the high points down to the level of the lowest tooth. By working in front of a window, so that light shines on the teeth, it will be observed that each point that has been touched with the file shows a bright, shiny surface. If some teeth do not show a bright point, it is an indication that they have not been touched by the file and that another stroke or two of the file is needed. If any tooth is below the line, it will not do any service when the saw is being drawn thru the wood, and might as well be out.

Filing the saw

The shape of ripsaw teeth is shown in figures 1 and 2. The front, or cutting, faces of the teeth are at right angles to a line along the points of

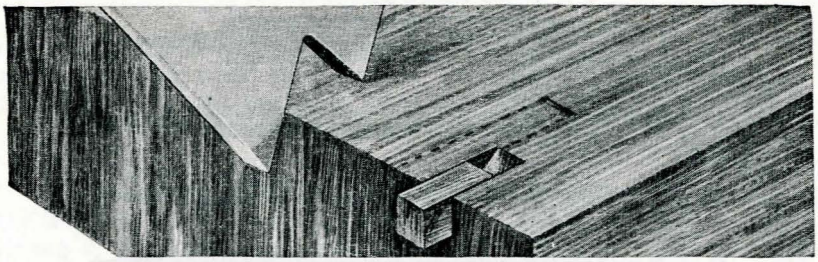

FIGURE 3. ENLARGED VIEW SHOWING THE ACTION OF RIPSAW TEETH

the teeth. This may be tested with a square, as shown in figures 2 and 8. A triangular file in the right position between two teeth is also shown in figure 2. It will be noted that the side of the file which is against the front of a tooth is held plumb. How to hold a try-square tight against the file to test whether it is being held plumb is shown in figure 8. By holding one side of the file plumb, as shown in figures 2 and 8, and by pressing the file down into the gullet, the back of the tooth will be at a 30° angle to a line along the points of the teeth.

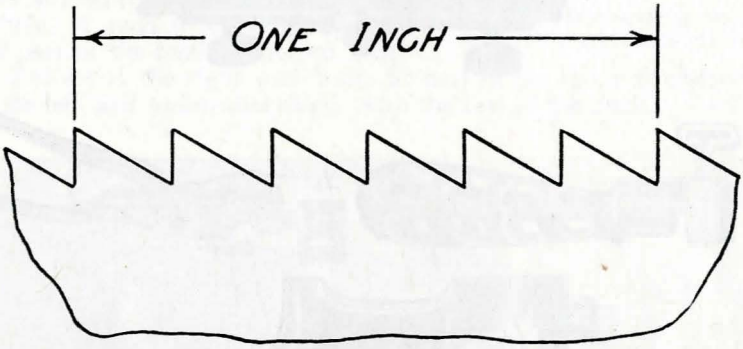

FIGURE 4. THE NUMBER OF TOOTH POINTS TO THE INCH

The position of the saw in the clamp and that of the file on the saw are shown in figure 9. It may be noted that, for filing, the saw is placed down in the clamp so that the teeeth are only about ¼ inch above the top edge of the clamp. Unless the saw is thus placed low, it will vibrate and the file will not cut well. It may also be noted that the file is held straight across the saw. A file cuts on the forward stroke only, and so should be raised from the saw each time it is brought back. Long, light, even strokes of the file are necessary for the best results. A desirable position of the hands is shown in figure 9. The right hand holds the handle end of the file firmly, and the point of the file is held lightly betweeen the thumb and the index finger of the left hand, with the palm of the left hand up. Every other tooth is filed from one side of the saw, and then the saw is placed in the clamp end for end, and the rest of the teeth are filed from the other side of the saw in the same way. At each stroke, the file is to cut the back of the tooth that projects away from the filer and the front of the adjoining

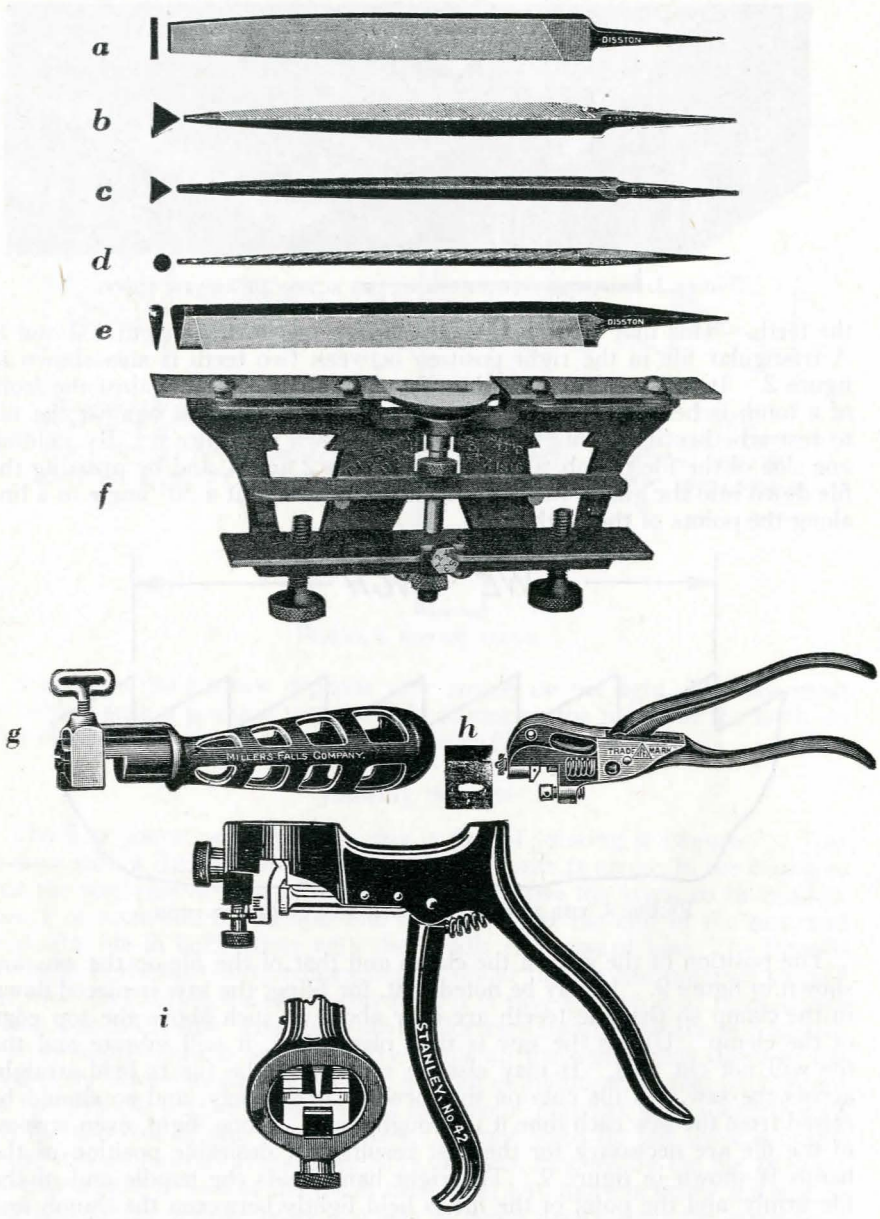

FIGURE 5. HAND TOOLS FOR FITTING SAWS

a, flat file; *b*, regular-taper triangular file; *c*, slim-taper triangular file; *d*, round file; *e*, great American crosscut-saw file; *f*, crosscut-saw tool; *g*, universal file handle; *h*, timber-saw set; *i*, pistol-grip hand-saw set

tooth. If the teeth are uneven, they should be gradually equalized in size by pressing the file against the larger tooth.

Setting the saw

The last step in fitting a ripsaw is that of setting it. The purpose of the set is to make a saw kerf wider than the thickness of the blade of the saw. Saws for wet and green woods require more set than do saws for dry wood, and the amount of set to give a saw is determined by the work it is to do. Every other tooth is set to the right, and the rest to the left. The saw set which you have should be so regulated that not more than half of each tooth is set, or, in other words, that only the point, not the whole, of each tooth is bent. The shaded part of the tooth numbered *1* in figure *2* is set to the right, and a similar part of the tooth numbered *2* is set to the left, and so on, alternately, with the rest of the teeth.

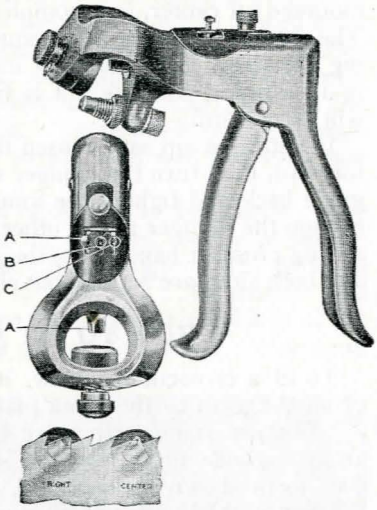

FIGURE 6. PISTOL-GRIP HAND-SAW SET WITH OSCILLATING PLUNGER

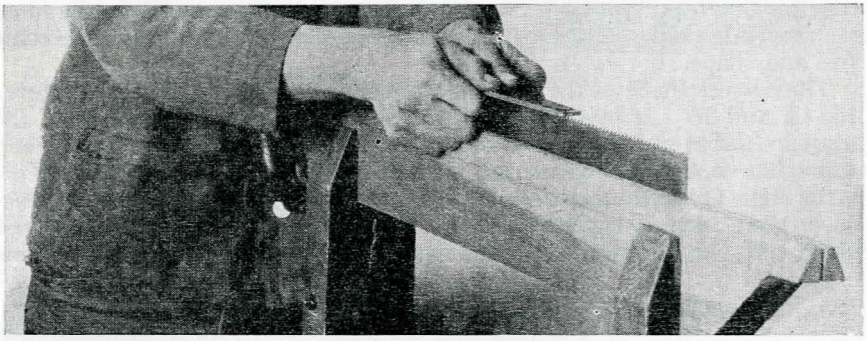

FIGURE 7. JOINTING THE SAW

An enlarged view of the teeth of a ripsaw is shown in figure 11. It will be noted that the cutting edge of each tooth is square to the saw blade, and that every alternate tooth is set to the right and the others to the left.

A modern saw set that has a pistol grip, thus making it easy to operate, and an oscillating plunger, which enables the user to set the plunger to the pitch of the tooth, is shown in figure 6. When setting the saw, the plunger comes in contact with the tooth at the proper angle and does not interfere with the tooth either ahead or back of the one being set.

To regulate the set, turn the arrow to the number corresponding to the number of teeth per inch on the saw. This turns the anvil, which is

mounted off center, to accomplish the right length of set down on the tooth. The amount of set is determined by the screw below the plunger. Turning the screw in to the right increases the set. When the desired amount is determined, the lock nut is tightened against the casting so that the set will be uniform.

In setting a rip saw, loosen the knurled screw at the top, slide the guide forward, then turn the plunger to one side, as at *A,* figure 6, then slide the guide back and tighten the knurled screw. Set the saw on one side, then change the plunger to the other side, as at *C,* and set the other side. For setting crosscut hand saws, the plunger is set in a vertical position, as in *B,* and both sides are set without changing.

HOW TO FIT A CROSSCUT HANDSAW

To fit a crosscut handsaw, it should first be jointed, to bring the tips of all the teeth to the same plane, or line, as shown for the saw in figure 7. Because some teeth were longer than others, the saw is apt to have an appearance, after jointing, similar to that shown in figure 12. Of the four teeth shown in figure 12, the point of tooth number *1* has just been touched with the file; tooth number *2* was considerably longer, and much of the tip has been filed away, leaving a large, flat surface; number *3,* due to poor previous filing, is smaller than the others; and number *4* is larger than any of the others. To file these teeth properly, number *1* is left as it is; number *2* is brought to a point by filing against the front edge only; the back of number *3* is filed with the same strokes of the file as used for the front of number *2;* and number *4* is brought to a point by filing the front edge only. By such procedure the teeth are brought to the same size and shape.

The correct shape of the teeth of a crosscut handsaw is shown in figures 13, 14, and 16. It may be noted that the front, or cutting, edges of the teeth are not at right angles, or square, to the line of the points of the teeth, as are the teeth of a ripsaw, but are 12° more than a right angle. This is the angle at which saws are filed at the factories. If the front, or cutting, edges were filed at right angles, the saw would draw into the wood too much. It would work hard, and would not make a smooth cut. This

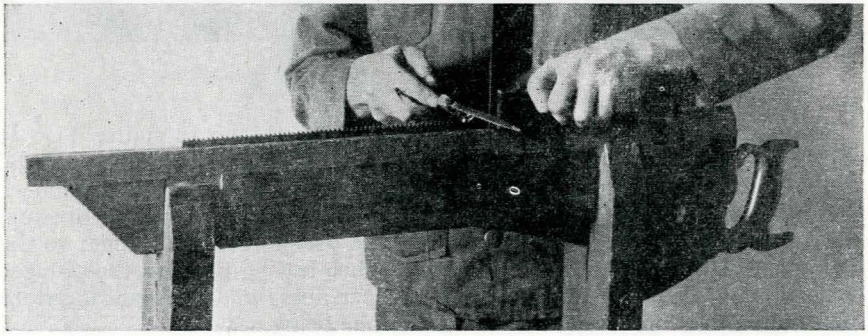

FIGURE 8. USING THE TRY-SQUARE TO SEE THAT ONE SIDE OF THE FILE IS AT A RIGHT ANGLE TO THE LINE OF THE TEETH

angle is often spoken of as the "hook" of the saw. The amount of hook of the teeth is controlled by the extent to which the file is tilted, or tipped sidewise, toward the point of the saw, as indicated at *B,* figure 15. In this figure a file is shown at the proper angle in the gullet between two teeth. If the file were so held as to have its top side horizontal, the front and the back of each tooth would have the same angle. There would not be enough hook to the front of the teeth to cause them to take hold well. Such a saw is spoken of as a *peg-tooth saw.*

The crosscut handsaw is not filed straight across, as is the ripsaw. The file is held as shown at *A,* figure 15, so that the point of the file points toward the handle of the saw, and so that there is an angle of 45° between the handle end of the file and the tip end of the saw. The smaller this angle, that is, the closer the handle end of the file is held to the blade of the saw, the keener will be the resulting cutting edges of the teeth. Not more

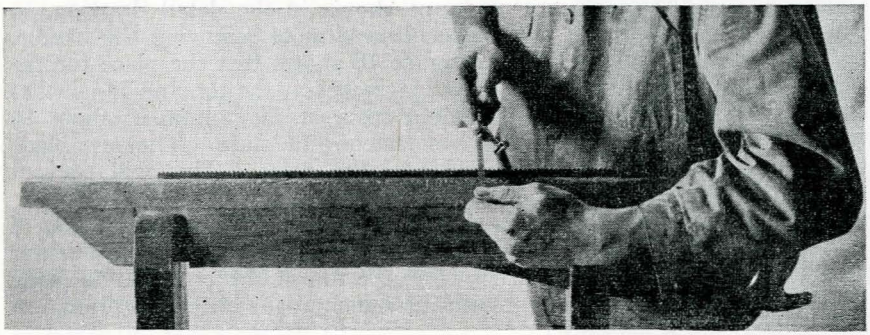

FIGURE 9. THE POSITION OF THE SAW IN THE CLAMP AND OF THE FILE ON THE SAW

than 60° nor less than 45° will give good results. Opinions differ in regard to the way to hold the file. Some men file as indicated in the drawing, filing against the cutting edges of the teeth. Others point the file toward the tip of the saw and maintain that the saw takes hold better and makes a smoother cut. The method illustrated is the one used more frequently.

Saws are ordinarily set before they are filed, but saws poorly filed may appear as in figure 12 when they have been jointed. There is so little gullet between teeth *2* and *3* that they cannot be set. As with the ripsaw, only half of the tooth is set on a crosscut handsaw. The shaded part of the tooth numbered *1,* in figure 14, shows the part that is to be bent over. This is also shown in figures 13 and 17. Every alternate tooth is set to the right and the others to the left, as shown in figure 13, and the clearance which is obtained for the saw blade by the set is shown in figure 17, *C.* The set makes a cut, or kerf, wider than the thickness of the blade of the saw. The amount of set depends largely on the kind of work required of the saw. Green or wet wood requires more set than dry wood. Saws which are used for general purposes on farms require more set than those used by carpenters. The set is held as shown in figure 10.

FIGURE 10. SETTING A HANDSAW

A HANDSAW CLAMP

A good clamp is necessary for success in filing handsaws. The one shown in figure 18 is portable yet rigid. A portable clamp provides an advantage over a fixed clamp in that it makes possible placing the clamp and saw in front of a window or other place where the light is suitable for the work. The saw can be placed in the clamp quickly, and it is held rigidly thruout its entire length so that it can be filed without shifting the blade.

The ends of the clamp are made, as shown in the detail drawing, to provide a way to hold the saw while filing without removing the handle.

The detail sketch at the right in figure 18 shows that the place for the jaws at the upper ends of the post is 1¾ inches at the top and 1⅞ inches at the lower end. This is to provide a space at the bottom of about ⅛ inch between the jaws when they are fastened in place. The saw blade will then be clamped at the top edge of the clamp. This will prevent vibration.

The same detail drawing also shows the pocket for holding an end of the lock stick. A pocket is made on the inside of each post, on a center line. The upper end is 11 inches from the top of the post. It is made by boring holes 1⅛ inches deep with the 1-inch auger bit and cleaning out the wood with a wood chisel.

The dimensions for making the lower ends of the levers are shown in the detail sketch at the bottom of the drawing. The upper ends of the levers are fastened to the front jaw of the clamp with two wood screws and a flat head stove bolt for each lever. The heads of the bolts are countersunk on the inside of the clamp. The levers are fastened to the clamp before the clamp is attached to the posts.

When the saw is placed between the jaws of the clamp and the round stick is pushed down the slanting triangular blocks, it locks or holds the saw. The saw is released by merely lifting the stick.

HOW TO FIT A TIMBER SAW

The tools required for fitting a timber saw are a crosscut-saw tool (figure 24), which includes the anvil set (figure 27) and the set gauge (figure 28); a flat file, file handle, and saw set (figure 5).

Before one can sharpen a timber saw well, he must have in mind the desired shape of the teeth he is filing, so as to get them the same shape as made at the factory or some other shape definitely suited to the kind of work the saw is to do.

The work done by the cutting teeth and the rakers of a timber saw is illustrated in figure 19, which shows four cutting teeth between two rakers, or drag teeth. Two of the teeth, *A* and *B*, are filed so that the points of the teeth make a cut like a knife cut at the right side of the saw kerf, and

the other two, *C* and *D*, at the left. Each raker has two square points, like a wood chisel. One point draws the sawdust, or "worms," out in one direction, and the other in the opposite direction.

Three styles of teeth, filed for general use, are shown in figures 19, 20, and 21. A style called *lance tooth*, that has four cutting teeth between each pair of rakers, is shown in figure 19. A style called *regular tooth* is shown in figure 20. This has no rakers, each tooth doing its share of the clearing. A style called *champion tooth*, which has two cutting teeth between each pair of rakers, is shown in figure 21.

To cut well, a saw must meet the following requirements:

1. All cutting teeth must be the same length, so that each tooth will do its share of the cutting.

2. Each cutting tooth must be filed to a point.

3. All rakers must be of a uniform length.

4. The rakers must all be shorter than the cutting teeth by an amount suited to the kind of wood the saw is to cut.

5. The gullets, or spaces between teeth and rakers, must be deep enough to carry the wood in the saw kerf which is loosened by one stroke of the saw.

Gumming the saw

If the gullets are too small to carry out all the "worms" loosened by one stroke, the first operation in fitting the saw is to make larger gullets between the teeth and the rakers. This process is called *gumming the saw*. It may be accomplisheed by using a round, or a round-back, file (figure 5), which, however, is a slow and laborious method. A better way is to grind out the gullets with a high-speed grinder or saw gummer. A round-face gummer ⅜-inch thick and 6 inches in diameter is suited for most farm saws. A platform must be provided, so that the saw can be placed flat in front of the grinder and fed against the approximate center of the grinder (figure 22).

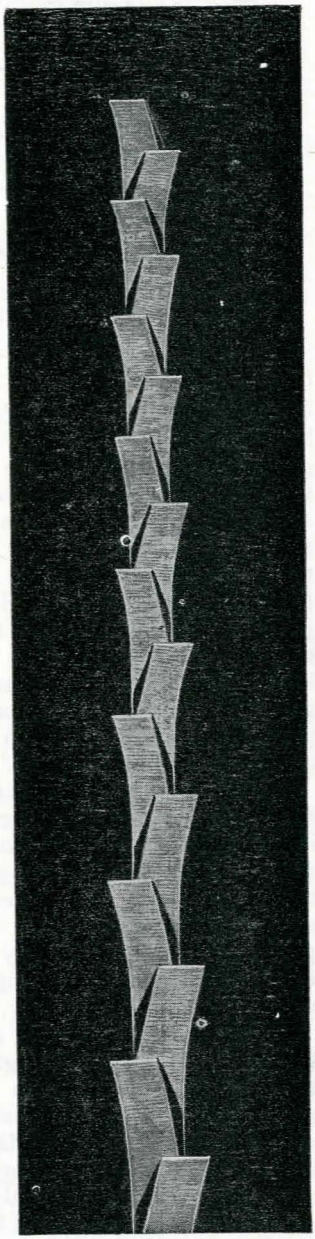

FIGURE 11. AN ENLARGED VIEW OF THE CUTTING EDGE OF A RIPSAW

FIGURE 12. THE SHAPE OF THE TEETH OF A POORLY FILED SAW AFTER JOINTING, AND WHERE TO FILE TO RETURN THE TEETH TO CORRECT SHAPE

The saw should be fed against the stone very lightly, because forcing it may break the grinder or heat the blade of the saw, which will then become so hard that a file won't cut it. A good way is to grind a little in one gullet and then to move the saw on to the next and the next and then to go back to finish the first gullet. If a little filing is done in the gullets with a round or a round-back file each time the saw is filed, the teeth can easily be kept at their proper length without much gumming at any one time. This is a good practice for those who do not have access to an emery grinder.

In saw factories, a punch gummer is used for gumming timber and circular saws. This is the most satisfactory way, but the price of such a machine makes it too expensive for a farmer to own. It is often advisable to send saws which are badly in need of being gummed to a saw factory to have the work done. The cost of having it done does not make it prohibitive.

The actual shape of a saw, just as it had been used, is shown in figure 23, *A*. It may be noted that drag tooth number *1* is more than 1/16 inch shorter than the cutting teeth, and that drag tooth number *2* is about 1/32 inch longer than the cutting teeth. The points of the teeth and of the rakers have been filed many times, but the gullets have been neglected, so that not enough space remains in the gullets to hold and to carry out the sawdust. In fitting the saw, it was gummed, as shown in figure 23, *B*, with a 3/8-inch emery grinder.

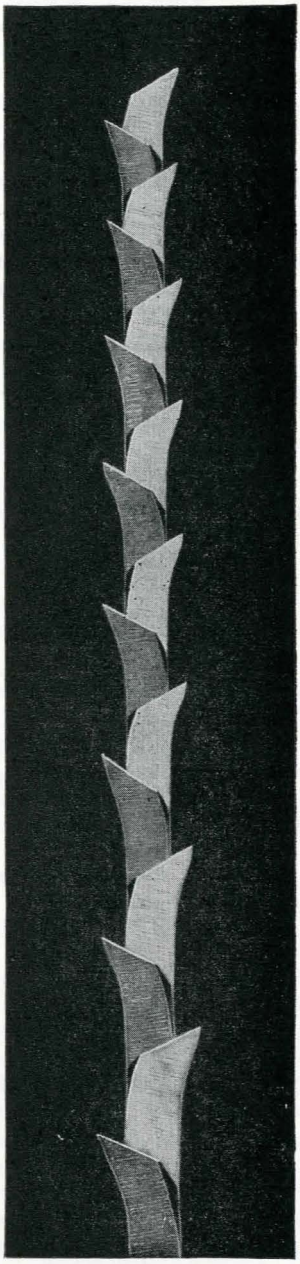

FIGURE 13. CROSSCUT-SAW TEETH (MAGNIFIED)

This shows the shape, the bevel, and the manner of filing

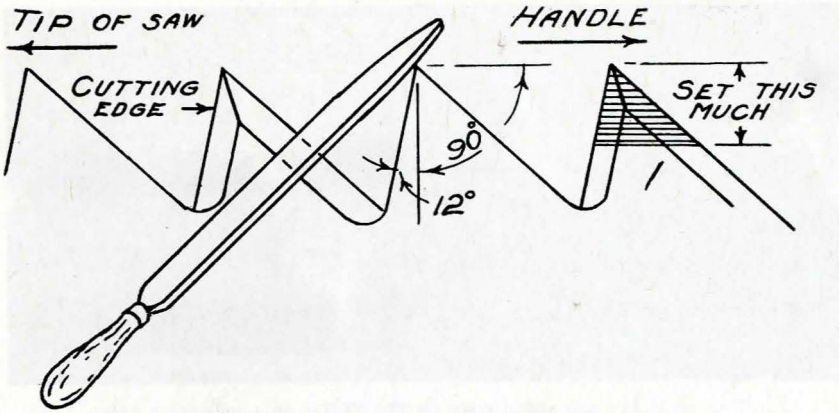

FIGURE 14. HAND CROSSCUT-SAW TEETH

This shows the shape of the teeth and the position of the file

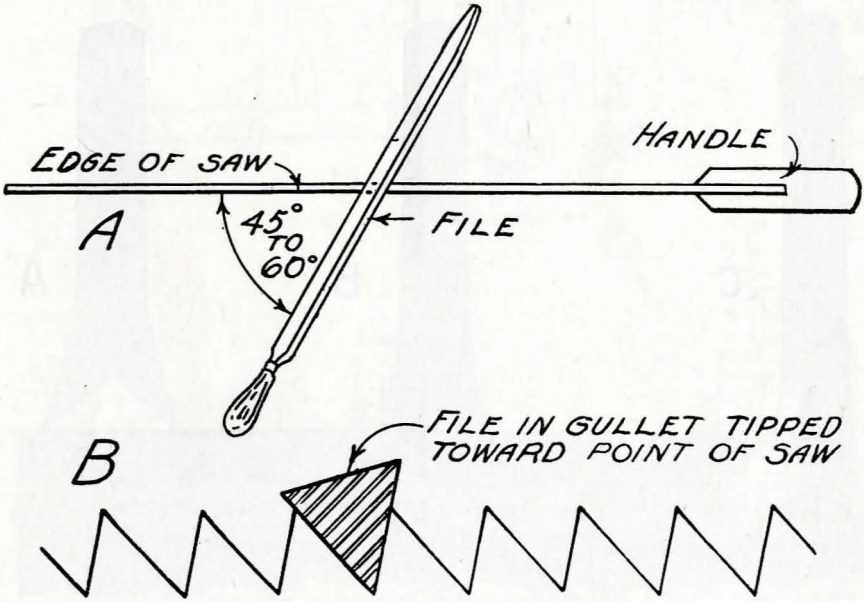

FIGURE 15. FILING A CROSSCUT SAW

A, the position of the file across the saw; *B*, the position of the file in the gullet

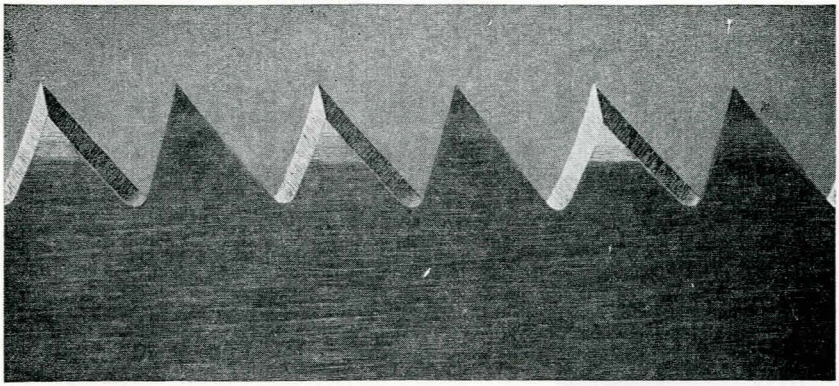

FIGURE 16. AN ENLARGED VIEW OF THE TEETH OF A CROSSCUT SAW

Jointing the saw

The second operation in fitting a timber saw is that of jointing it. This consists in running the side of a flat file lengthwise over the points of the saw teeth enough times to bring the tops of all the teeth to a line. When the point is filed from a tooth, a small, smooth, shiny surface is left, which may be readily seen by placing the saw in front of a window or in some other place where the light will shine on the tip of the tooth.

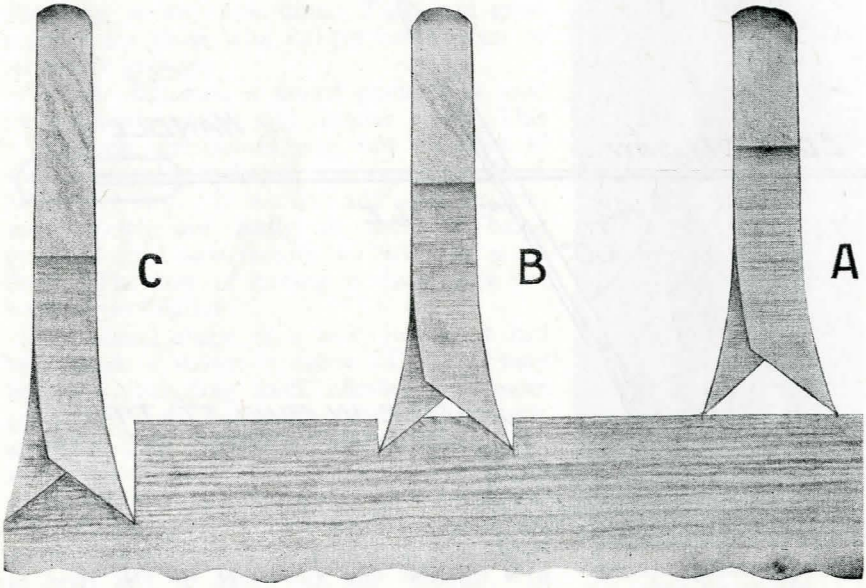

FIGURE 17. AN ENLARGED SECTIONAL VIEW SHOWING THE ACTION OF A CROSSCUT-SAW TOOTH

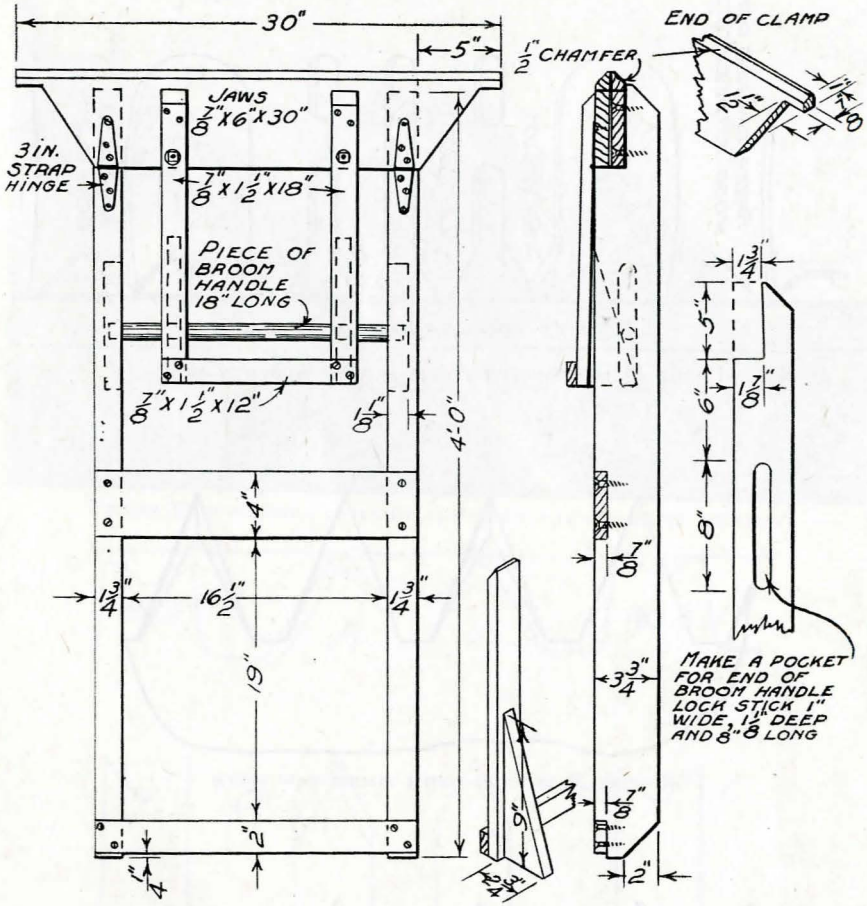

FIGURE 18. A HANDSAW CLAMP

Lumber:

Pieces	Dimensions	Use
Two	1¾" x 3¾" x 4'	Posts
One	⅞" x 2" x 20"	Bottom brace
One	⅞" x 4" x 20"	Middle brace
Two	⅞" x 6" x 30"	Jaws
Two	⅞" x 1½" x 18"	Levers
One	⅞" x 1½" x 12"	Brace for lever
Two	⅞" x 2¾" x 9"	Lock

One piece of broomstick 18¾ inches long, for lock bar

Hardware:

Two 3-inch strap hinges
Eight 1½-inch No. 9 flathead wood screws, to assemble lever and triangular lock pieces to levers
Twelve 1¾-inch No. 9 or No. 10 flathead wood screws, to fasten middle and bottom braces and back jaws to posts
Two 1½-inch No. 9 flathead wood screws and two ¼-by-2-inch flathead stove bolts, to fasten levers to jaw

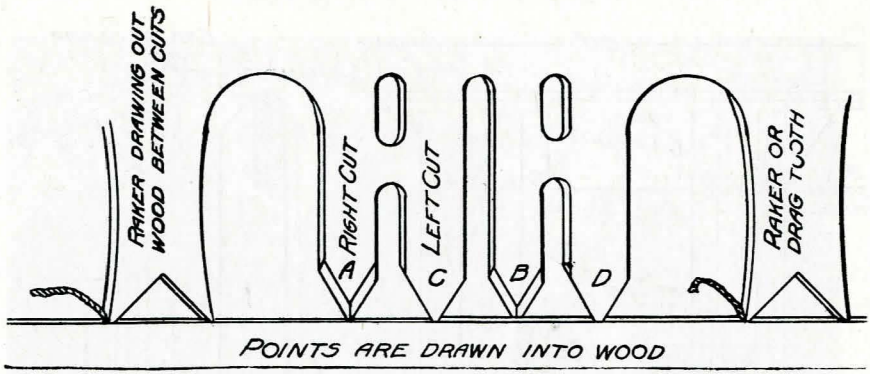

FIGURE 19. LANCE-TOOTH TIMBER-SAW TEETH WHEN NEW

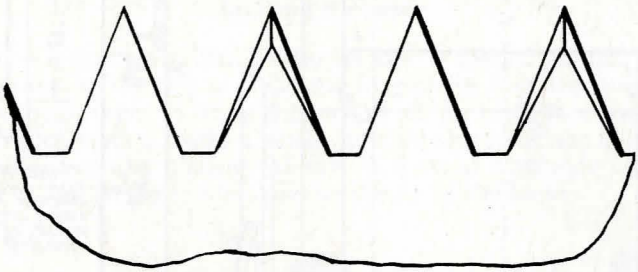

FIGURE 20. REGULAR-TOOTH TIMBER-SAW TEETH

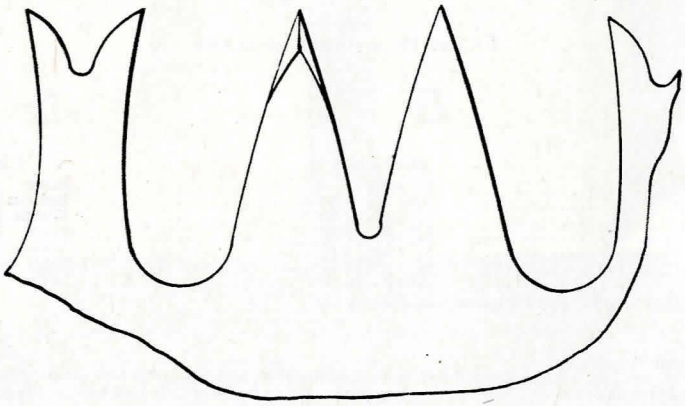

FIGURE 21. CHAMPION-TOOTH TIMBER-SAW TEETH

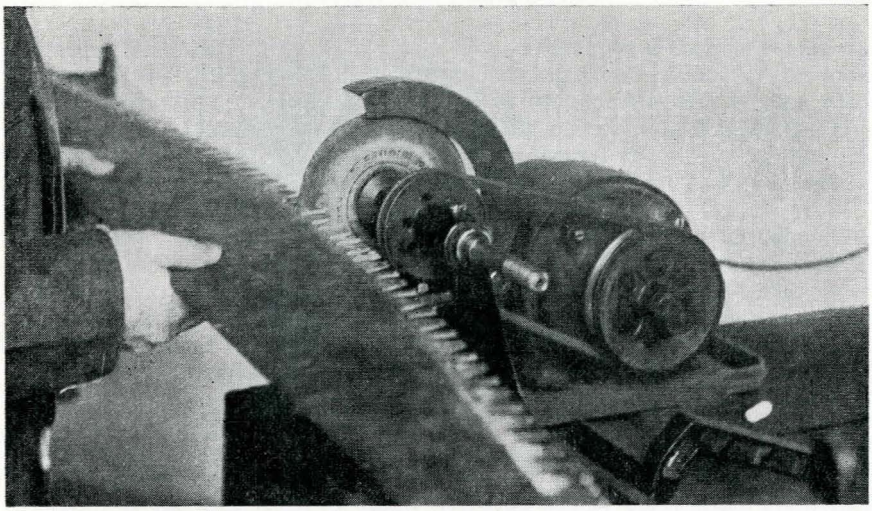

FIGURE 22. GUMMING A CROSSCUT SAW WITH A POWER-DRIVEN GUMMER

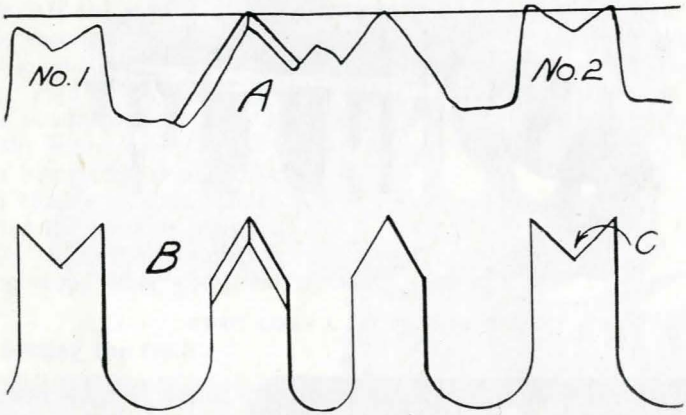

FIGURE 23. EFFECTS OF FITTING A SAW

A, the actual shapes of the teeth before fitting; *B*, the same teeth after fitting

A tool called a *saw jointer,* or *crosscut-saw fitting tool,* is very desirable and almost necessary for jointing the saw and for filing down the rakers. The use of such a tool in jointing a saw is shown in figure 24. A flat file is held in the tool at a right angle to the side of the saw and run over the teeth with forward strokes of the file until all the teeth have beeen touched. The teeth, being large, make it difficult to hold a file in the hands, as is done in fitting handsaws.

Filing down the rakers

The next step after the saw is jointed, that is, when all the teeth have been filed down to the level of the lowest tooth, is to file down the rakers. This

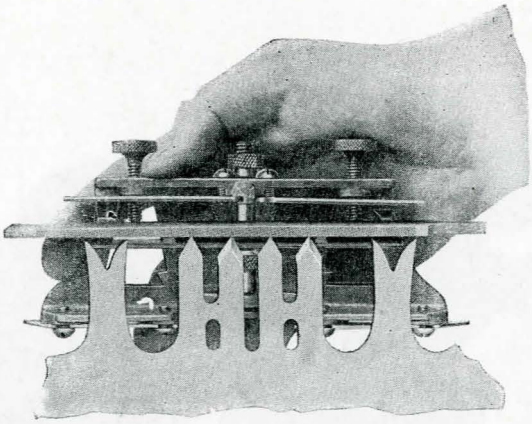

FIGURE 24. JOINTING THE SAW

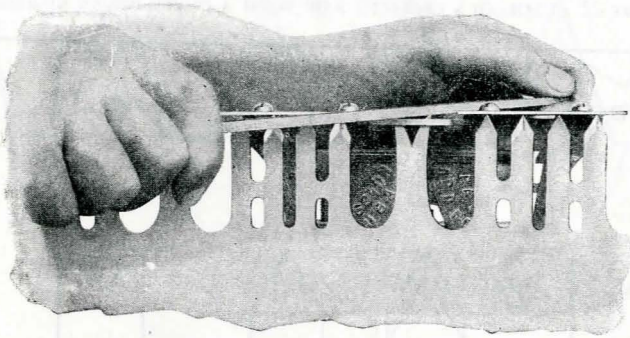

FIGURE 25. FILING A RAKER TOOTH

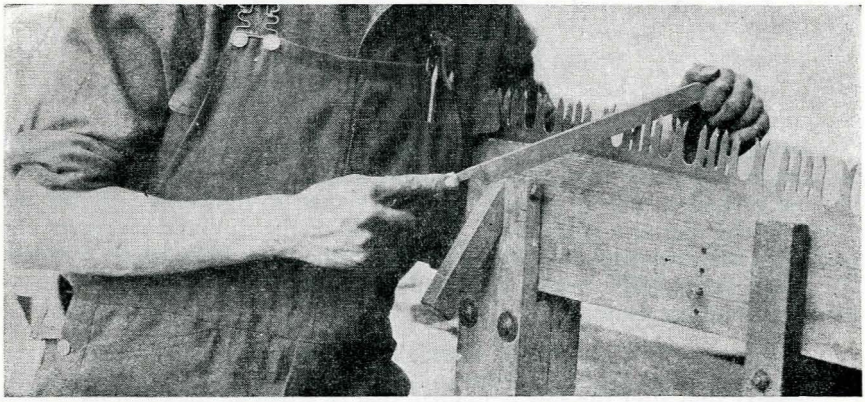

FIGURE 26. FILING THE CUTTING TEETH OF A TIMBER SAW

operation is illustrated in figure 25. The crosscut-saw tool is placed on the saw so that the points of a raker project up thru the slot in the tool, and all of the point of the raker that sticks up thru the slot is then filed off. Softwood requires more clearance for the rakers than hardwood. For cutting hardwood, the rakers are filed down from 1/64 inch to 1/40 inch shorter than the cutting teeth. A hacksaw blade is about 1/40 inch thick. For softwood, from 1/40 inch to 1/32 inch is satisfactory.

When the rakers have been filed down to the right distance below the cutting teeth, they must be filed to a point. The filing is done on the inside of the notch on the end of the raker, straight across the saw. A flat file is most satisfactory for this work. Each raker should be filed so as to have a square corner at the center, as shown at *C* in figure 23, *B*.

Filing the teeth

The next step in fitting the saw is that of filing the teeth. This operation is illustrated in figure 26. Every other tooth is filed from one side. The position to hold the file depends on the shape and on the length of point desired. If the saw is to be used in frozen timber containing numerous knots, so that strength is required in the teeth, a rather blunt point is desirable. If the saw is to be used in softwood, where strength of teeth is not so essential, a longer point may be filed. To obtain a long point, the handle end of the file is held low and to the right or left, depending on which side of the tooth is being filed. Full light strokes of the file are most satisfactory for the work. A file cuts on the forward stroke only, and so the file is raised from the saw at each return stroke. The tooth which is being filed needs to be watched closely at each stroke, to see that the point is made at the center of the tooth, and that the filing stops when the point is sharp.

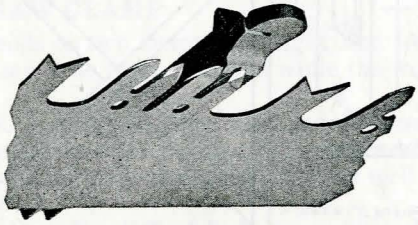

FIGURE 27. A SETTING BLOCK IN POSITION

Setting the teeth

The next step in fitting the saw is that of setting the teeth. The purpose of the set is to make a saw kerf in the wood which is wider than the thickness of the blade of the saw, so that the blade will not bind in the wood. Wet and green wood requires more set than hard or dry wood. Not more than ¼ inch of the point of each tooth is set. Some practical saw filers set less than 3/16 inch of the points, maintaining that the saws draw easier and cut better after the keen points have been slightly worn off.

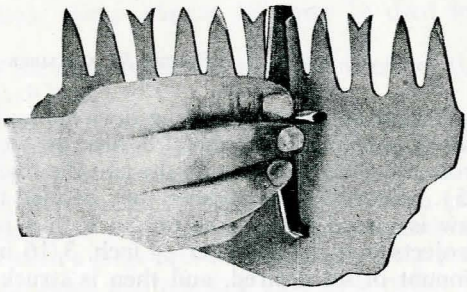

FIGURE 28. A SET GAUGE IN USE

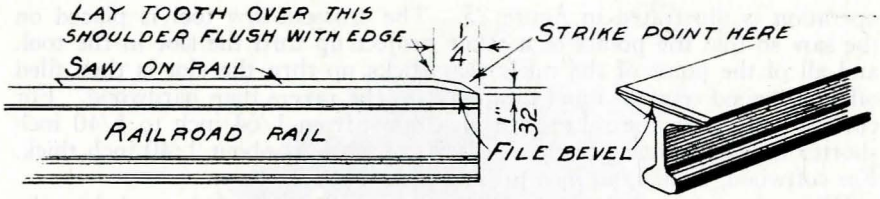

FIGURE 29. A PIECE OF RAILROAD RAIL AS A SETTING BLOCK

Success in setting timber saws depends largely on the kind of tools one has for the work. Best results are obtained with a hammer set or a hammer and a setting block, as illustrated in figure 27. The saw is placed on the setting block so that the point of the tooth projects over the beveled surface as far as desired, and the point of the tooth is then struck firmly with a light hammer. A set gauge in place on the saw is shown in figure 28. By its use, it is easy to see the amount of set given to a tooth, and all teeth may be set alike.

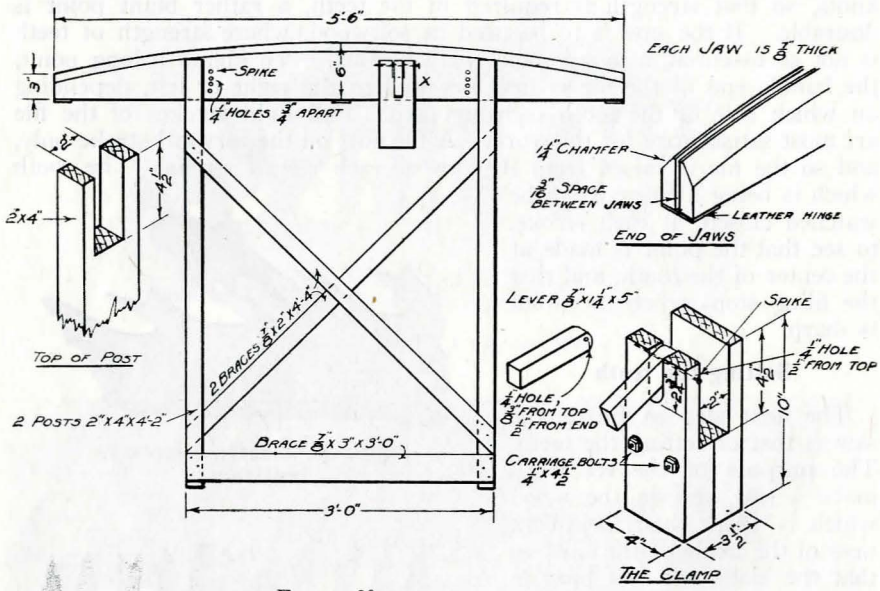

FIGURE 30. A TIMBER-SAW CLAMP

A very satisfactory setting device may be made with a piece of railroad rail (figure 29). The metal is filed off to make a bevel about 1/4 inch back from the end and down on the end the thickness of a hack saw blade (figure 35). Several sizes of bevel may be filed to provide a variety of sets. The saw is placed flat on the rail in such a position that the point of a tooth projects past the shoulder 1/8 inch, 3/16 inch, or 1/4 inch, depending on the amount of set desired, and then is struck firmly with a heavy hammer at the point indicated in the drawing (figure 29).

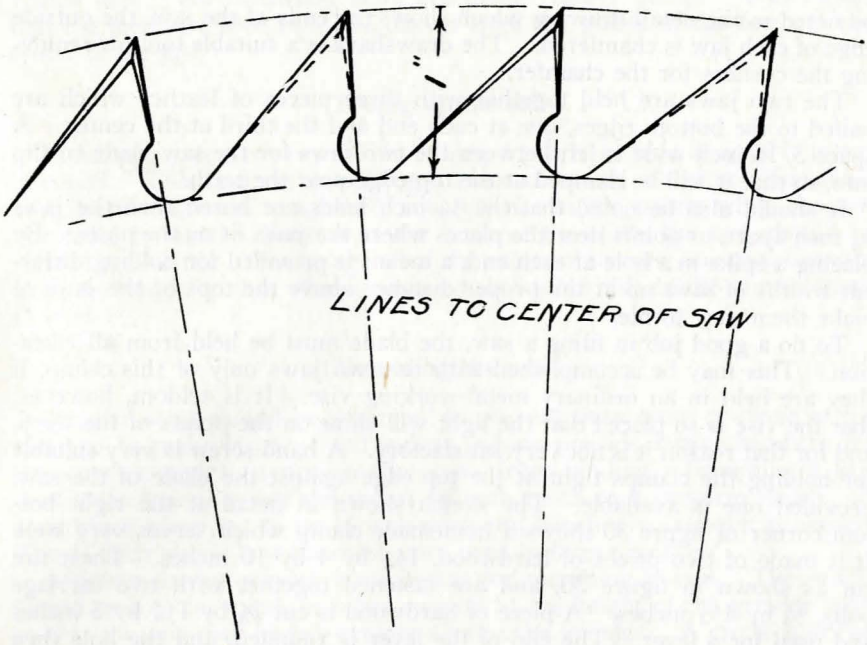

FIGURE 31. THE ACTUAL SIZE AND SHAPE OF THE TEETH OF A NEW SAW FOR CORD-WOOD, POLES, AND LOGS

TIMBER-SAW CLAMP

Success in filing a timber saw depends on two factors: the light, and some clamping device which will hold the saw free from vibration while the work is being done.

The saw clamp shown in figure 30 is designed to be used independently of a metal-working vice and may be taken wherever the light is good for the work. It may be taken to the woodlot and used as needed, as well as in the farm shop.

The framework of the clamp consists of two 2by4-inch pieces 50 inches long, a brace at the bottom, and two braces which are placed diagonally. Any scrap material will do for the braces. The sizes shown are suggested because they are sufficiently strong to hold the clamp rigid and also are rather light. The handsaw clamp (figure 18) may be used for timber saws.

The detail sketch at the left on the drawing shows the dimensions of the notch which is cut in the top of each post.

The jaws are made of two pieces of 7/8-inch lumber, 6 inches wide and 5 feet 6 inches long. Hardwood is the most suitable. The shape to cut the jaws depends on the saws to be fitted. If the blade of the saw is straight, the top edge of the clamp may be left straight; but if it is an arc, the tops of the jaws are cut as shown in the drawing, the arc conforming to the arc of the saw. To lay out such a large arc, the board may be placed on a barn floor or other large open space and a string used as a radius to swing the pencil. In this way, a regular curve may be obtained. As may

be noted in the detail drawing which shows the ends of the jaw, the outside edge of each jaw is chamfered. The drawshave is a suitable tool for removing the corners for the chamfer.

The two jaws are held together with three pieces of leather which are nailed to the bottom edges, one at each end and the third at the center. A space 3/16 inch wide is left between the two jaws for the saw blade to slip into, so that it will be clamped at the top edge near the teeth.

It should also be noted that the ¼-inch holes are bored thru the jaws ¾ inch apart, at points near the places where the jaws fit on the posts. By placing a spike in a hole at each end, a means is provided for holding different widths of saws up at the proper distance above the tops of the jaws to make them easy to file.

To do a good job in filing a saw, the blade must be held from all vibration. This may be accomplished with the two jaws only of this clamp, if they are held in an ordinary metal-working vise. It is seldom, however, that the vise is so placed that the light will shine on the points of the teeth, and for that reason it is not very satisfactory. A hand screw is very suitable for holding the clamps tight at the top edge against the blade of the saw, provided one is available. The sketch shown in detail at the right bottom corner of figure 30 shows a homemade clamp which serves very well. It is made of two pieces of hardwood, 1¾ by 4 by 10 inches. These are cut as shown in figure 30, and are fastened together with two carriage bolts, ¼ by 4½ inches. A piece of hardwood is cut ⅞ by 1¼ by 5 inches and used for a lever. The end of the lever is rounded, and the hole thru which a spike or a 1¼-inch bolt is placed is bored off center, so that the lever will work as an eccentric and clamp the two jaws when in place, as shown in figure 30 at *X*. The clamp is moved along to the point where the filing is being done.

HOW TO FIT A CIRCULAR SAW FOR CORDWOOD, POLES, AND LOGS

The directions given in this section refer only to what are known in the trade as cordwood saws.

TABLE 1. SIZES OF CORDWOOD SAWS

Diameter (inches)	Gauge	Teeth in saw (number)	Size of hole in center (inches)				
20	13	60	$1\frac{1}{4}$	$1\frac{5}{16}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
24	11	60	$1\frac{1}{4}$	$1\frac{5}{16}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
26	11	64	$1\frac{1}{4}$	$1\frac{3}{16}$	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
28	10	64	....	.....	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
30	10	72	....	.....	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$
34	9	72	....	.....	$1\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{5}{8}$

Shape of teeth

The shape of cordwood-saw teeth on a 26-inch saw, as they are made at the factories, is shown in figure 31. It will be noted that the teeth are

1 inch long. All cordwood saws are made "center pitch." This means that the teeth are filed to a line drawn from the points of the teeth to the center of the saw.

Truing up the saw

In fitting a circular saw, the first thing to do is to true it up if it is out of round. This is done by holding a piece of emery wheel or grindstone, or a flat file fastened to a board, squarely across the points while the saw is rotated by hand. Because of the hook of the teeth, the saw should be rotated backward. This brings all of the points of the saw on equal distance from the center, so that when sharpened each tooth will do the same amount of work.

Gumming the saw

Circular saws should be gummed, to prevent them from cracking at the rim and to make large, round gullets, which provide large chambers for the sawdust and thus prevent the saws from binding. Gumming a saw consists in grinding out the throat of each tooth to a uniform depth. A round-face wheel ¼, ⅜, or ½ inch thick and 6 inches in diameter is needed. The ⅜-inch size is best for most saws used in farm practice.

A power-driven grinder is necessary for gumming a saw. The saw is placed on a table, stand, or other support at the height of the grinder shaft so that the saw may be fed straight against the grinder. A circle is drawn on the side of the saw a third of the distance from the rim to the center, as shown in figure 32. The gummer is then aimed tangent to the circle, as shown by the straight lines. If continuous grinding is done at one time at one gullet, the saw blade will become heated, which stretches the rim and will soon make it out of true. The heating also case-hardens the steel, and the file will not take hold. This is overcome by going around the saw several times and doing only a little of the grinding in one gullet at one

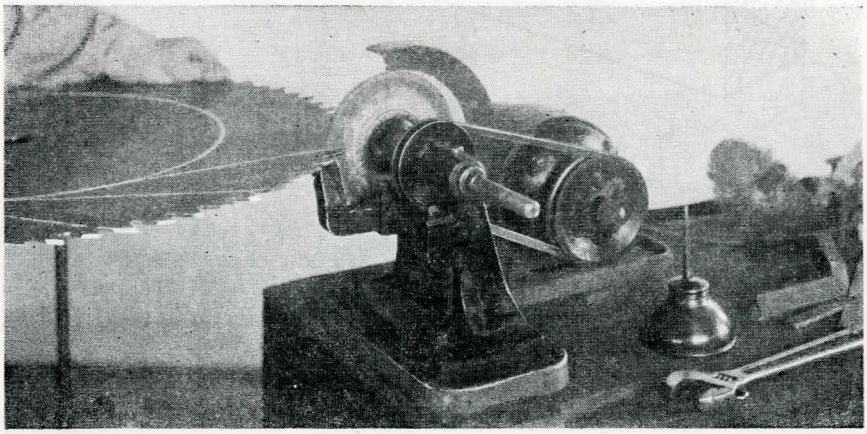

FIGURE 32. GUMMING A CIRCULAR SAW WITH A POWER GRINDER

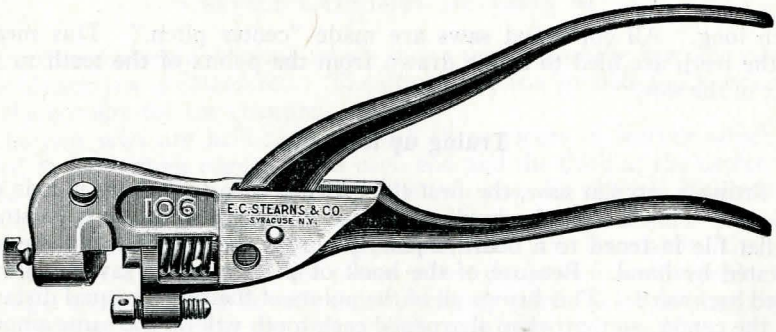

FIGURE 33. A CIRCULAR SAW SET

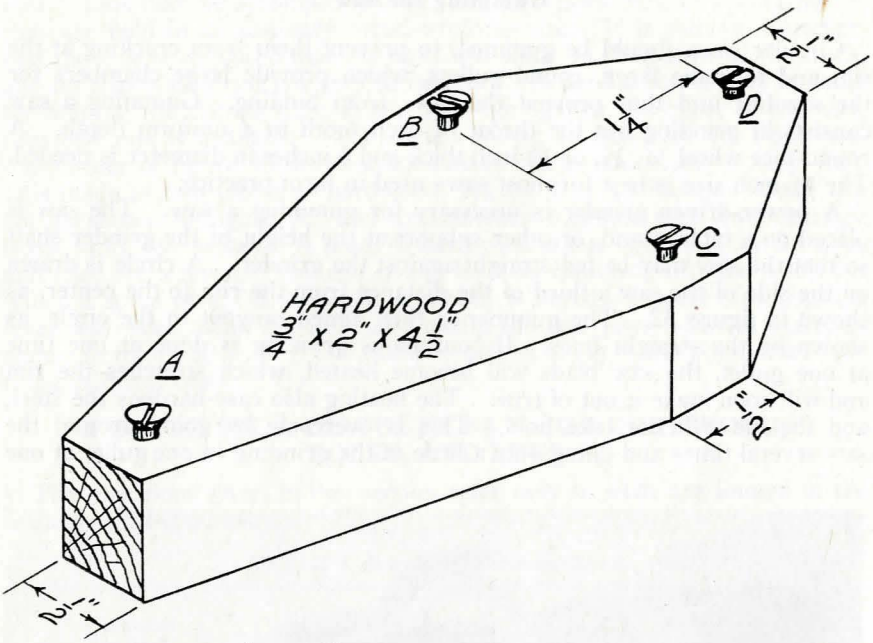

FIGURE 34. A CIRCULAR-SAW-SET GAUGE

Screws *A*, *B*, and *C* project ¼ inch, and screw *D*, 1/64 inch to 1/32 inch less

time. The saw should not be crowded against the grinder so as to heat the saw and make it blue. The face of the gummer needs to be dressed frequently, as it becomes coated with metal. This heats the blade, and the gummer will not cut well.

Setting the saw

After the saw has been trued up and gummed, it should be set. The two ways of setting a cordwood saw are the spring set (figure 33) and

the hammer-and-anvil set. Since most setting of cut-off saws is done while the saw is on the arbor, the spring set is most extensively used. The distance down in the tooth is regulated by setting the anvil at the desired position and locking it in place with the thumb bolt. The amount or angle of set is regulated with the screw below the plunger. Turning the screw in decreases the set and turning it out increases it. The set is accomplished by merely closing the handles. Every alternate tooth is set to one side, as in hand and timber saws, and the other teeth to the opposite side.

A piece of railroad rail 30 to 36 inches long may be used to make a good setting anvil. A saw being set in this way is shown in figure 36. Bevels of several dimensions are filed as directed in figure 29 and illustrated in figure 35. The setting can be done better by two men than by one man. A piece of cardboard or thin wood is placed on the rail under the saw opposite the setting hammer to keep the sharp points from striking the anvil. A heavy hammer is used. The tooth is struck firmly with the face of the hammer parallel to the beveled surface.

A piece of railroad rail, a post maul, or a heavy sledge may have similar bevels filed on an end and then used as a setting block while the saw is on the shaft. The operator needs to be careful and so hold the iron that all teeth are given the same set when struck with the hammer.

A homemade circular-saw-set gauge used extensively by lumbermen is shown in figure 34. It is merely a hardwood block ¾ by 2 by 4½ inches, with the corners cut off to be out of the way. Four flat-head wood screws are placed as indicated. The three screws, *A, B,* and *C,* project exactly ¼ inch out of the wood, and screw *D* as much less as the set desired in the saw. This depends on the kind of wood in which the saw is to be used. Somewhere between 1/64 inch and 1/32 inch is suggested. A hack-saw blade is 1/40-inch thick. If the gauge is placed on a smooth surface, such as the saw blade, with the screws *A, B,* and *C,* resting on the surface and a clearance between the end of screw *D* and the blade sufficient to allow the blade of a hack saw to slip between them freely, a saw which is set as determined by this gauge will work well in almost any wood.

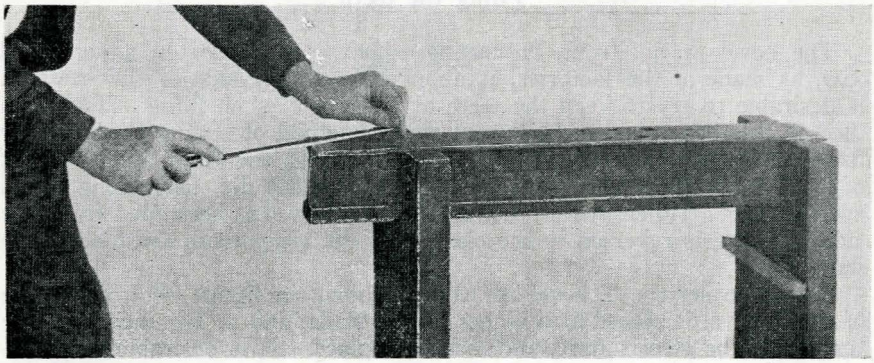

FIGURE 35. FILING A BEVEL ON A RAILROAD RAIL FOR A SETTING BLOCK

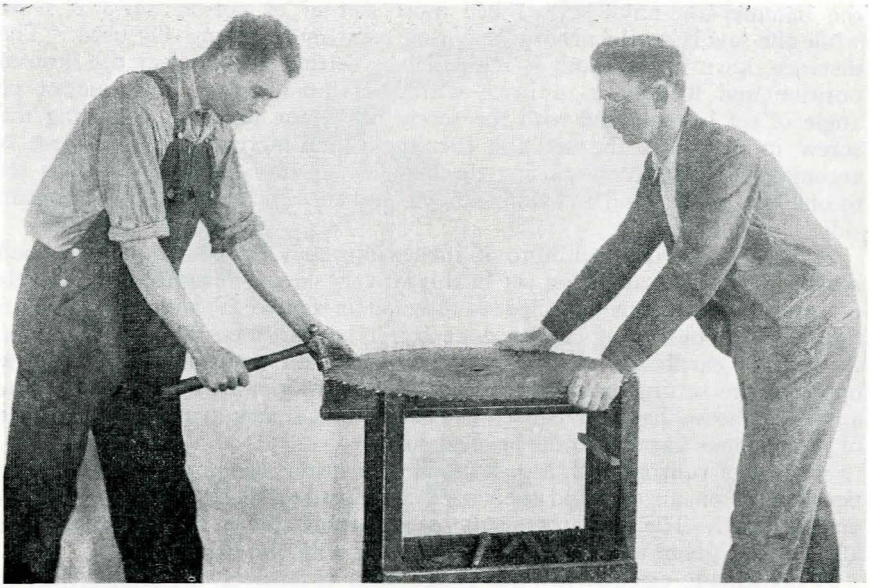

FIGURE 36. USING A PIECE OF RAILROAD RAIL AS A SETTING BLOCK

To test the amount of set given a tooth, the gauge is placed on the side of the saw with the screws *A, B,* and *C,* resting against the blade of the saw and the screw *D* against the point of the tooth. If all the teeth have been sprung, or bent over, far enough just to touch screw *D,* the set will be uniform. If the point of any tooth does not touch the screw, the set needs to be applied again; and if a tooth has been set past the clearance indicated by the screw, it needs to be bent back. The gauge may be regulated to any desired set by driving screw *D* in or drawing it out, as may be desired.

Filing the teeth

The bevel at the front, or cutting edge, of the teeth on a cordwood saw, as made at the factories, is about 105° to the side of the saw. It is desirable to try to keep the teeth at this angle when filing. The teeth filed at this bevel, set at 105°, and also a method of testing the bevel by use of a T bevel, are shown in figure 37. Both the front and the back of a tooth are filed from the same side with a flat file, using long, light, even strokes. When every other tooth of the saw has been filed from one side, the saw is reversed in the clamp and the other teeth are filed in the same way.

A way to set the T bevel at 105° is shown in figure 38. The blade of the T bevel is placed at 6 inches on the blade, and at 1¾ inches on the tongue, of the steel square, and locked in place. It is desirable for a beginner to use this method of checking his work, so as to make it uniform.

Speed of saws

The speed of a saw is indicated by the number of revolutions per minute made by the saw, and also by the number of feet traveled by the rim per minute (table 2).

TABLE 2. AVERAGE SPEED OF CIRCULAR SAWS, BASED ON A RIM SPEED OF 10,000 FEET PER MINUTE

Diameter in inches	Revolutions per minute
8	4,600
10	3,920
12	3,260
16	2,450
20	1,960
24	1,630
28	1,400
32	1,225
36	1,080
40	980
44	890
48	815
50	750
56	700
60	640
64	600
68	560
72	530

Rules for calculating the revolutions of the pulleys

$$\frac{\text{Revolutions of driver} \times \text{Diameter of driver}}{\text{Diameter of driven}} = \text{Revolutions of driven.}$$

$$\frac{\text{Revolutions of driver} \times \text{Diameter of driver}}{\text{Revolutions of driven}} = \text{Diameter of driven.}$$

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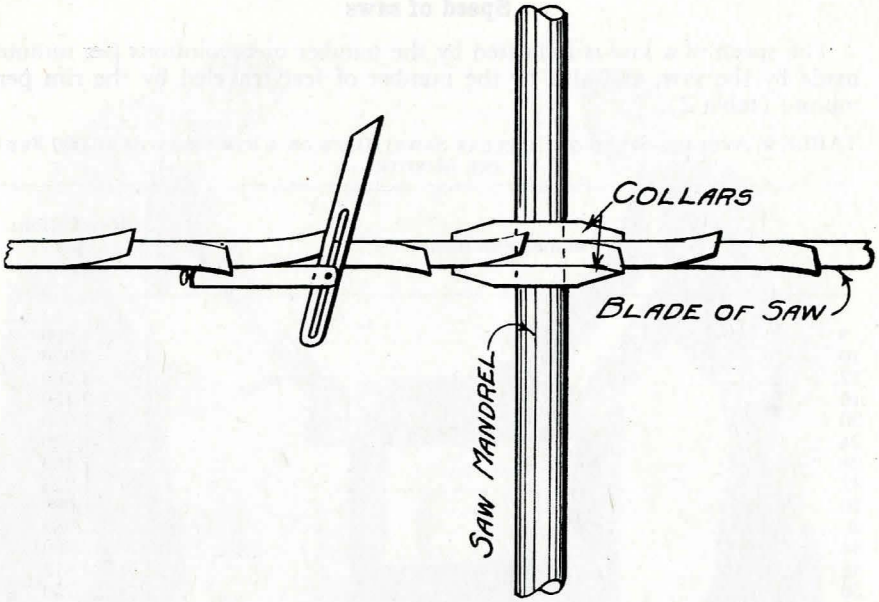

FIGURE 37. TESTING THE BEVEL AT THE FRONT OF A TOOTH WITH A T BEVEL SET AT 105°

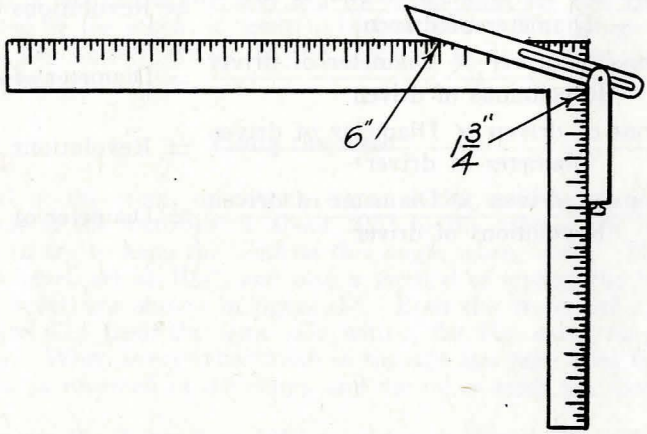

FIGURE 38. SHOWING HOW TO SET THE T BEVEL AT 105° TO USE AS A GUIDE FOR THE BEVEL ON THE TEETH OF A CORDWOOD SAW

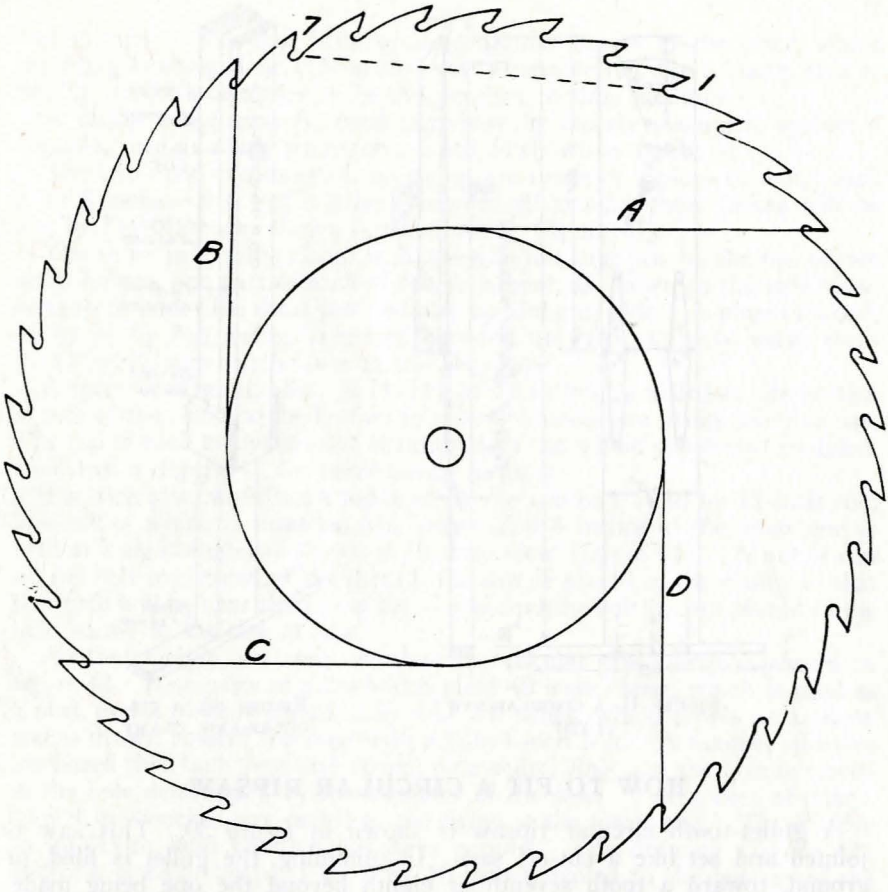

FIGURE 39. A GULLET-TOOTH CIRCULAR RIPSAW

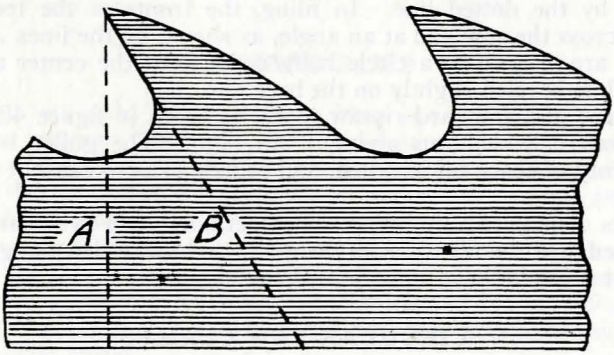

FIGURE 40. STANDARD RIPSAW TEETH

Line *A* goes to the center of the saw; line *B* goes half-way between the center and the rim

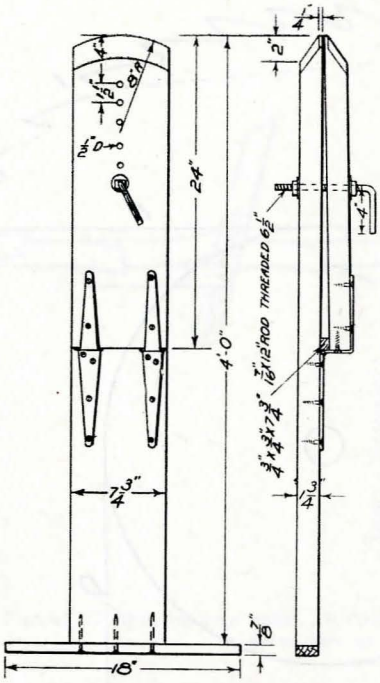

FIGURE 41. A CIRCULAR-SAW CLAMP

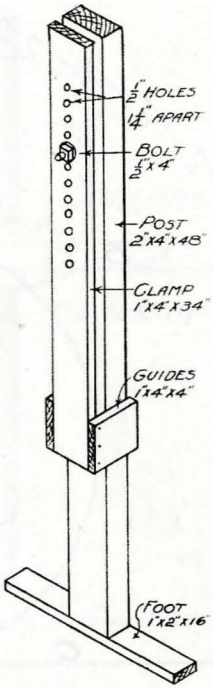

FIGURE 42. A CIRCULAR-SAW CLAMP

HOW TO FIT A CIRCULAR RIPSAW

A gullet-tooth circular ripsaw is shown in figure 39. This saw is jointed and set like a cut-off saw. In gumming, the gullet is filed, or ground, toward a tooth seventh or eighth beyond the one being made. Gullet number *1* in figure 39, is gummed toward the one numbered *7*, as indicated by the dotted line. In filing, the fronts of the teeth are filed straight across the saw and at an angle, as shown by the lines *A, B, C,* and *D,* which are tangent to a circle halfway between the center and the rim. Each tooth is beveled slightly on the back.

The shape of a standard ripsaw tooth is shown in figure 40. The base of the tooth is wide, thus giving it strength. The gullet is large, thus giving plenty of space for sawdust, and round, so as to cause it to discharge freely.

Filing is done with a mill file. The operator needs to be careful and not allow the edge of the file to touch the gullet and make sharp angles or edges. The gullet must be kept smooth and round.

CIRCULAR-SAW CLAMPS

If circular saws are to be filed off the machine, it is very desirable to have a clamp that will hold the saw at a height convenient for the worker

and in such a way that little or no vibration occurs at the point where the filing is being done. It is also very desirable to have a clamp that is readily portable, in order to be independent of shop facilities.

A clamp which may be used anywhere by merely placing it against a support, such as a saw frame or a fence, is shown in figure 41.

The two main members of the clamp are made of a piece of wood each 2 by 8 inches by 6 feet. When surfaced all around, these pieces will be 1¾ by 7¾ inches, as shown in the drawing (figure 41).

The short jaw of the clamp is fastened to the long jaw by the use of two strap hinges, one part of each of which is bent, as shown in the side view, so as to fit under the short jaw and also up along its side. A piece of wood, ¾ by ¾ by 7¾ inches, is placed between the jaws, so as to make them press tightly against the saw at the very top.

A piece of scrap lumber, ⅞ by 1¾ by 18 inches, is nailed to the bottom or side of the clamp at the bottom to make it stand more firmly while in use. The top of each of the jaws is chamfered on the outside, and also rounded, as shown in figure 41, for convenience in filing.

The two jaws are drawn together by the use of a 7/16 by 12-inch rod, one end of which is threaded 6½ inches, and 4 inches of the other end is bent at a right angle, as shown in the side view (figure 41). A nut is run on the bolt to the end of the thread, the saw is placed in the clamp so that the teeth will be near the top of the clamp, and the bolt is then placed in the hole suited to the size of saw.

Another simple, yet very satisfactory, circular-saw clamp is shown in figure 42. It consists of a 2by4-inch piece 48 inches long, which is used as a post, and a piece of board, 1 by 4 by 34 inches, which serves as a clamp and is drawn against the post with a ½by4-inch bolt. A number of holes are bored thru both post and clamp, on a center line, and the bolt is placed in the hole determined by the diameter of the saw. Two pieces of board, 1 by 4 by 4 inches, are nailed to the clamp at the lower end. These serve as guides to hold the two members parallel. The drawing (figure 42) shows a piece of board, 1 by 2 by 16 inches, nailed to the bottom of the post as a foot piece. This piece may be nailed to either side at the lower end.

CLEANING SAWS

Saws which are used on farms very often unavoidably get wet, and a wet saw soon becomes rusty. If it is cleaned soon after the rust begins to appear on the blade, it may be brought to as smooth a surface as a new saw. If, however, the saw is neglected, the blade becomes rust pitted, and the pits cannot be removed, because they are depressions in the metal.

Sandpaper, emery cloth, or any other substance which would leave marks on the blade should not be used in cleaning a saw. Lump pumice stone and water are very satisfactory materials for cleaning saw blades. Four or five 3- or 4-inch lumps weigh about a pound and cost approximately twenty-five cents at drug stores.

To clean a saw, place it flat on a bench or some other solid support. Put a small quantity of water on the blade, rub the blade with the pumice stone until all the rust is worn off, and then rinse off the rust and wipe the blade

clean with a rag. All saws, drawshaves, and other smooth tools may be cleaned in this way. A crosscut saw being cleaned with pumice stone and water is shown in figure 43.

If saws are to be left unused for any length of time, they should be covered with a light coat of machine oil.

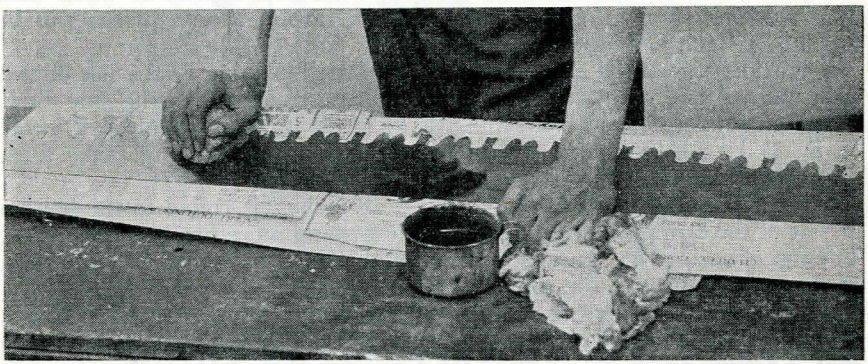

FIGURE 43. CLEANING A CROSSCUT SAW WITH PUMICE STONE AND WATER

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