
THE LIBRARY OF CONGRESS

# The Band Saw

## A GUIDE BOOK

*for*

Filers, Sawyers and Woodworkers


**Price $1.00**

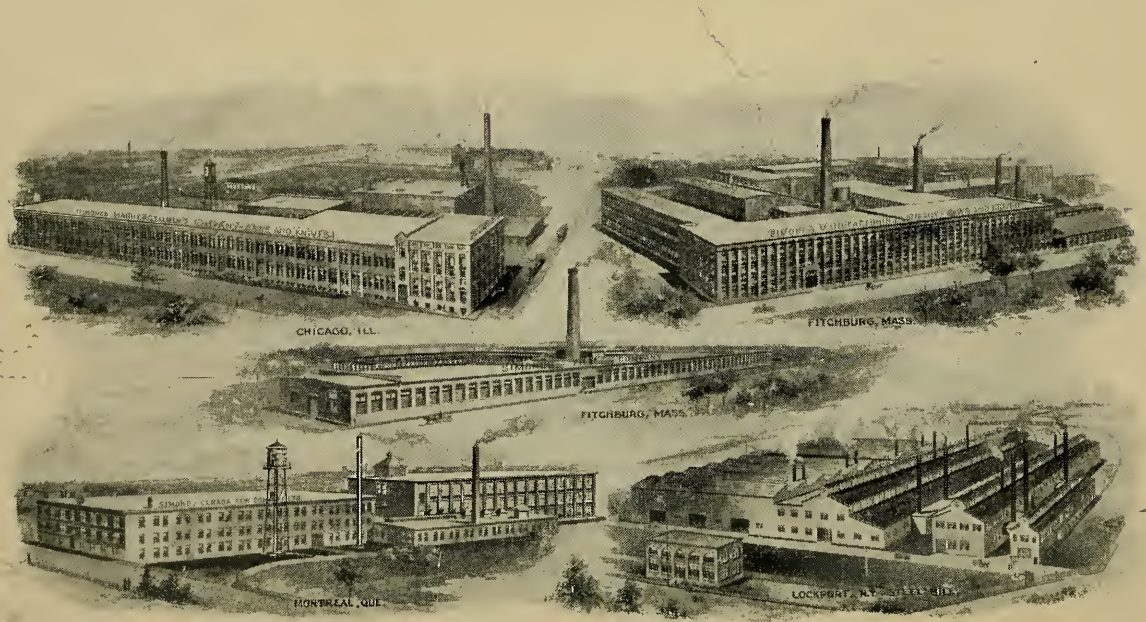
COMPILED BY

**Simonds Manufacturing Co.**

**"The Saw Makers"** **Established 1832**

**Fitchburg, Mass.**

**Five Factories** **Twelve Branches**




The four factories of the Simonds Manufacturing Company; two at Fitchburg, Mass, one at Chicago, Ill., one at Montreal, Que., and the Simonds Steel Plant at Lockport, N. Y.

# INTRODUCTION

AS a result of numerous inquiries and requests for information which have been received, the Simonds Manufacturing Company some time ago concluded to issue a series of booklets covering the manufacture, care and use of Circular Saws, Band Saws and Machine Knives. The first named book, *The Circular Saw* has been published. It met with popular favor and appears to be appreciated by users of circular saws. We hope *The Band Saw* which we herewith present for your consideration will prove as satisfactory as its companion work and that it may contain information which will be available for use in the great woodworking industry all over the world, where Simonds Saws hold such an enviable place.

In presenting *The Band Saw* it has been our endeavor to set forth accurate data, the greater part of which is founded on information which has been compiled and which we accumulated from our store of records and actual experience of eighty-nine years as makers of steel cutting edges.

While we do not wish to convey the impression that we are super-authority on the subject of handling saws, we do say that the information we herein offer is considered most authentic. We have avoided expression of opinions by individuals or organizations, and have grouped ideas from experienced sawyers, filers and millmen in every section, to which we have added our own expert knowledge gained as saw makers. It has been the endeavor of the Simonds Manufacturing Company, since it first commenced to make saws, to keep in constant touch with those who use saws, and as a result we have become familiar with many of the troubles incidental to their use.

We therefore offer *The Band Saw* for your approval in the belief that it may be of service to the sawyer, filer or millman, who is constantly seeking accurate information which will tend to improve his business.

# The Band Saw

CHAPTER I

# Superiority of the Band Saw

For years the problem which confronted sawmakers was how to reduce the time and power consumed, as well as the waste in sawdust, in converting logs into boards. Eventually the perfection of the band saw proved to be the solution.

**The Saw.** William Newberry of London, England, patented the first endless band saw in 1808, although his machine was never developed further than the model submitted to the Patent Office. The great difficulty in making a smooth, strong joint in the steel band was a stumbling-block which arrested practical development until Newberry's time.

The old difficulty in joining the blade so it would run over the wheels without breaking was not overcome until nearly forty years after Newberry gave this type of saw to the world.

**The Steel.** When one considers that the modern band saw travels at the speed of about one and one-half miles per minute—or faster than the fastest express train—that in connection with its width it is extraordinarily thin, one will have some idea of the strain to which it is subjected, and a better conception of the wonderful quality of the steel that has made the production of these saws possible.

The band saw which remains today in practically the same form as when invented is still the last word in saw efficiency. It is in the perfection of a suitable steel to withstand the successive bending and straightening while in operation, the making of a proper joint or "braze," and the improvement in the form of the teeth that modern advances have been made.

It is hardly safe to predict what may be developed in the way of improvements to the saws as at present manufactured, but it is difficult to conceive of anything which will surpass the material, construction, and operation of the band saw as now used.

**Widths.** Wide band saws which today range in size up to 18 inches in width, are familiar to almost everyone. They consist of an endless band, or ribbon of steel, usually toothed on one side. They are also made with both edges toothed. This is usually done in the case of large band saws, although double-edge band saws are sometimes made in width as narrow as 8 inches.

The early log machines used quite narrow saws, 3 inches to 5 inches wide, but owing to the fact that by using wider saws a faster rate of cutting could be obtained, and that there are a number of experienced men who understand their treatment, a very much wider saw than was formerly the case, has come into use.

**The Wheel.** The band saw is run over two wheels, or pulleys, which, in the case of perpendicular band saw machines, are set one above the other, and spaced some distance apart.

**Thin Blades.** The band saw has superseded the circular saw in several lines of work. It has many advantages over the circular saw—especially in that class of sawing where its very thin blade makes it desirable. Band saws from 2 to 8 inches in width, are extensively used for ripping and resawing, for, compared with the circular saw, they save kerf, time, and power.

This leads us to the consideration of the band saw as related to the sawmill. Before its introduction there was a limit in size of timber which could be sawn by circular saws, which could cut only logs of a size slightly less than half the diameter of the saw. The size of the saw itself was

also limited; difficulties of management and running arose as soon as the saw diameter was increased beyond a certain point.

**Double Mills.** Double mills were used to a great extent in regions where large timber was being cut. By this arrangement, which consisted of two circular saws, one above the other, logs of an ordinary size were sawn with the larger or "main" circular saw, while the smaller, or "Top Saw," was brought into action when a log exceeded the capacity of the main saw. The band saw obviated all this, for there is practically no limit to the size of logs which can be cut by band saws.

In large band mills, as a rule, the work is brought to the saw upon a carriage driven by feeding devices independent of the saw.

**Continuous Cutting.** Compared with the reciprocating saws formerly used in sawmills, such as mill, gang, etc., the band saw has the advantage of steady and continuous cutting action, no time being lost in return stroke. However, gangs of reciprocating saws, by reason of their ability to cut as many as 30 boards at one time, are still retained in numbers of large mills as an adjunct to the bands.

When one considers the value of every $\frac{1}{16}$ inch saved in kerf in the course of a day's sawing of several hundred thousand feet, the great economy in using the thin blade band saw can be more fully appreciated.

**Large Bands.** Large band saws for log sawing range from 8 to 18 inches in width. The general width for single-edged bands, i.e., toothed on one edge, is 12 inches, while double-edged band saws are made in a variety of sizes. The majority of these latter, however, are about 14 inches in width, although, as previously stated, some few are made as narrow as 8 inches.

The length of the standard log band saw varies, according to size and make of mill, from 40 to 60 feet.

Double-edged band saws are now used frequently and the log can be cut as it moves in both directions.

The swage set is principally used on log bands and resaws. Swaging the teeth consists of spreading or widening the cutting edge of each tooth so that it extends slightly beyond each side of the blade, giving clearance to the body of the saw while cutting. Sufficient clearance prevents friction and insures free running.

Then, too, with the swage tooth both corners of the tooth cut, consequently it will not only do twice as much work as a spring-set tooth, which merely cuts half a kerf, but in addition it will stand more feed, thus greatly increasing the capacity of the mill.

The band resaw which is now extensively used has been successfully operated in gangs. There are mills in the United States and Canada using gangs containing two or more machines.

**The Hand.** The experienced sawyer or mill man is familiar with the "hand" of a band saw, but for the benefit of the beginner it may be stated that a saw is either right or left hand. As you stand facing the mill with the teeth of the saw toward you, if the log passes on the right hand side, it is a right hand saw; if it passes on the left of the saw it is a left hand saw.

**Narrow Bands.** Band saws adapted for certain kinds of cutting are known as *Narrow* and *Wide*. Machines on which are working saws $\frac{1}{8}$ inch up to $1\frac{3}{4}$ inch are designated as narrow bands. These are used extensively in mills, cooperage shops, furniture factories and other woodworking establishments, for a great variety of purposes. They are employed to cut in addition to wood, slate, fiber-board, paper, bone, meat, hard rubber, ivory, asbestos

magnesia, horn, amber, cloth, bronze, brass, copper, aluminum, nickel, iron, steel, carbon, ice, celluloid, talc, camphor, mica, pearl, shell and cardboard.

In using small band saws, the work rests upon a table, through the center of which the saw passes, the work being fed by hand.

For general work, the blades are made as narrow as $\frac{1}{8}$ inch and from that are graduated up by eighths to $1\frac{3}{4}$ inches, saws up to this width being considered "Narrow Band Saws." The length is usually 18 feet, or longer according to the size of the machine on which they are used.

**Cutting Circles.** The fact that with a narrow band saw, circles or other curved lines can be cut in any desired direction, makes it available for use in cutting intricate and ornamental patterns. Where formerly scroll sawing was done entirely by the reciprocating type—web or scroll saws, working up and down, and compass saws—now the narrow band saw is being widely used with excellent and greater results. Its downward motion carries the sawdust away without the aid of a blower, leaving the lines drawn on the work perfectly clean to the operator.

It is understood, of course, that band saws can be used in this connection only in cases where the pattern is begun on the edge of the stock, for interior designs it is necessary to use a reciprocating saw (jig saw), the end of which can be passed through the interior of the pattern.

Small, narrow band saws are fitted with spring-set. With the spring-set the point of one tooth is bent to the right and the next to the left, and so on alternately throughout the length of the saw. This effects the necessary clearance.

CHAPTER II

# Making Band Saw Steel

**Strength.** When one considers that a band saw is subject to terrific strain, due to the high speed under which it is operated, it is not surprising that the steel which composes the band must be of exceptional quality. Otherwise the saw is of little value. A 50 foot band saw operating at the rate of 11,000 feet per minute bends 440 times. This is a severe test of steel. The molecules undergo a constant change, shifting and reshaping themselves as the saw goes on and off the wheel, and upon the ductility, uniformity and tensile strength of these molecules depends the life and power of the saw.

**Alloys.** In the manufacture of steel for Simonds band saws only high grade alloys are used. It requires a high prcentage of new iron together with such alloys as will give the greatest toughness and keenness to the cutting edge. Steel experts have proven that nickel gives to certain steel a toughness not obtained by any other alloy. It has been found by the makers of Simonds band saws that the resistance required in these saws can best be obtained by the liberal use of nickel alloy. While it adds to the cost per pound of the steel, the results obtained warrant the extra expenditure.

Band saw steel must be absolutely free from blow-holes, pipes, seams, splits and other defects, and that is why particular care must be taken in its making. It must be uniform in hardness. Because of the necessity for a special high-grade saw steel Simonds Manufacturing Company some years ago established its own steel mills which are now maintained at Lockport, N. Y.

**Care in Making.** In order that the reader may properly follow the numerous operations, and realize the

infinite care necessary in making a band saw it is necessary that one turn attention to the heart of the steel works. In the Simonds Steel Mills, under the most modern methods, the first step toward the finished product is taken.

**Crucible Steel.** The foundation of Simonds band saws being crucible steel, that means it is melted in earthen pots over furnaces in which care must be taken at all times to retain a certain degree of heat. When the "charge" or "mix" in several of these pots has been brought to the proper heat point, the pots are removed from the furnaces and all poured into one large ladle. This is to assure uniformity of steel. The large ladle containing the seething mass of metal is then poured into special moulds which form ingots of solid blocks, weighing from 200 to 800 pounds. These ingots are later subjected to a careful inspection. If there are surface flaws they are removed by chipping. The ingot is then reheated and hammered to the shape and dimensions required. It then goes to the mill to be rolled into plates. In this operation much care is necessary in the heating and working of the steel. The saw plate ingot must now be drawn into proper dimensions without injury to the quality of the steel. Careful supervision and skillful workmanship must be exercised to produce saw plates of uniformity, and also to prevent any weakening by injurious strains due to improper rolling and working.

**Heating the Plate.** The next operation is the heating of the plate to a uniform temperature. This is to soften the steel and bring it to a proper condition for working. The pressing operation to flatten the plate follows, after which the plate is trimmed and inspected. If found to conform with the standard for Simonds Nickel Steel Band Saws, it is passed and is ready for the necessary operations for making the saw.

CHAPTER III

# Making a Band Saw

**The Blade.** A band saw blade when received from the rolling mills has little resemblance to the finished saw. From the black, unfinished band of steel to the smooth polished, tempered, toothed and tensioned saw is the difference of many operations in which the skill of experienced saw-makers is shown to a high degree in the manufacture of Simonds band saws. Tempering in oil bath, grinding and smithing or hammering out the various forms of bends and twists and the final process of swaging, sidedressing and sharpening the teeth, are some of the important processes which the saw passes through. This requires men skilled in practice as well as in theoretical knowledge.

**Hardening and Tempering.** In the making of a Simonds band saw the first operation after the blank band is received in the saw factory from the steel mill is the work of hardening and tempering. For this furnaces and other equipment of special design are required in order that uniformity of temper may be secured throughout the entire length of the band. Upon being removed from the furnace the saw is given a special treatment used exclusively by Simonds, and then it is tested for temper by a scientific method, nothing being left for guesswork or chance. If the saw comes up to the established Simonds standard it is passed. In another department the ends of the band are cut off and the smithing done in the "black" to make it level. After being ground to the thickness required the saw is then sheared under a power press to the required width. This last operation leaves the solid edge for toothing. The grinding of the edges to obtain uniform width of the blade is then accomplished through the use of

special machines and the band is then ready for toothing. It is placed in a power press set with a die of the particular pattern of tooth desired. At each stroke of the press one tooth is cut. After toothing the band is put through the brazing operation. The ends of laps are beveled by machinery and dressed by hand-filing to assure a perfect joint. The ends are then joined by a strip of silver-solder and held in proper position by a clamp. Heated irons are placed on the part to be brazed and also under it. Heavy pressure is applied until the solder is thoroughly melted and the brazed part cooled off. The joint is then dressed and given the proper tension, the result being a strong uniform joint. The saw is now ready for polishing and after this has been accomplished it is rolled and tensioned by practically the same methods as are used in the saw mills.

**Grinding.** The endless band is next placed on an automatic grinding machine and the teeth ground, this machine being set for the particular size and shape of tooth to be ground. After this the teeth are swaged. On large band saws intended for mills or machines of great capacity the teeth are usually swage-set, the points of the teeth being spread to extend beyond the sides of the blade for clearance to prevent friction while cutting. Except in the case of narrow band saws the teeth are sharpened on automatic machines in a similar manner to that of grinding the teeth. This assures uniform work in cutting. In the case of narrow band saws with fine teeth, hand filing is frequently resorted to. Following the sharpening the saw is etched, and before being packed for shipment the operation known as "stiffening" to bring up the elasticity of the saw is applied.

CHAPTER IV

# Rolling and Tensioning Wide Band Saws

**New Saws.** In the manufacturing of wide band saws it is not possible to subject the saws to the same strains that they receive in mills. They are liable to change more in the first run than on any succeeding one, and should be gone over carefully the first time they come off. In fact, if the practice of running a saw only half an hour on its first run then taking it off and touching it up wherever necessary were more generally used, there would be fewer cracked band saws, and their life would be greatly increased.

**Care.** All first-class filers and millmen know that excessive speed, too much tension, case-hardening or glazing from the use of an unsuitable emery wheel, gum adhering to the face of the wheel, crystalization from too heavy hammering, cuts on the surface of the saw from sharp faced hammers, vibration of either machine or saw, sharp angles in the gullets, imperfectly adjusted guides, backs of saws being too long or too short, excessively cross aligned to make them "track," insufficient throat room and hook, crowding the saw against the back guard, will cause a saw to crack. Yet notwithstanding the fact that all band saws are more or less subject to these conditions, entirely too often the cause of fracture is attributed to the quality of the steel, or over-hardness.

**Toughness.** It may be said in justice to the saw manufacturer that due consideration should be given the fact that the saw is only one item, while each and every one of the above named causes is a large factor in producing cracks in band saws. If the saw will stand swaging, and the swage can be compressed without fracturing the steel, it is con-

clusive evidence that the steel is tough, and that the temper is not too high.

**A Few Points.** Many letters are received from band mill owners and operators asking advice as to the best method to fit, tension, and operate saws, in order to obtain the best results in capacity and quality of lumber made, and, at the same time, get the most wear out of the saws.

It is almost impossible to lay down rules that will fit all cases, or answer correctly any one of them, without knowing the exact conditions under which the saws are to run, but we will give a few of the most important points in connection with the care and management of band saws, which if followed out carefully, will aid those who have neglected any of these points.

Assuming that you have a good mill, built by a man who has learned by experience so to proportion and distribute the metal in the machine, that the saw can be strained up to the proper point without springing or distorting any part of the machine, and yet have ample margin of strength to properly stand the additional strain put on it by vibration—such a mill is the only one from which a man can expect to get best results.

**Vibration.** It is well known that vibration is one of the greatest causes of bad results in the use of band saws, and knowing this, great attention should be paid at all times to the wheels and their shafts, the journals, and boxes. The wheels must be round, plumb, and in perfect balance, and the shafts must run free in their boxes, with no lost motion.

**Cracking.** Sawyers frequently complain that their saws, which have been doing good work and giving perfect satisfaction, begin to crack. This is not so surprising when one considers the great tensile strain the saw is subjected to while running and the great number of times it is bent

and straightened in running over the wheels, all of which eventually cause crystallization of the steel, and tends to crack the saw.

**Less Crown.** None of the leading band mill owners are putting so much crown in their wheels as they were a few years ago, and some of them are making flat wheels. Each style has its advocates, and will give good satisfaction when properly handled. But, as some of the leading mill builders give $\frac{1}{64}$ inch in a 10 inch face wheel, it seems a question of education or preference on the part of a perfectly flat faced wheel. However, it is easy to see that the more crown there is to the wheels, the more tension will be required, which means that the saw will need more hammering and rolling, consequently it will not be so flat, and necessarily will need more kerf to clear the plate. Saws kept in this condition are more liable to crack.

**Uniform Tension.** Perfectly uniform tension is an important factor in the care of band saws, for, if the saw has fast and loose places in it, the tendency to crack is largely increased, the fast spots cracking from undue strain, and the loose spots from constant buckling of the surplus metal.

**Tools.** The tools required for the care of band saws are a roll, a cross-face hammer, and a round or dog-head

Fig. No. 1

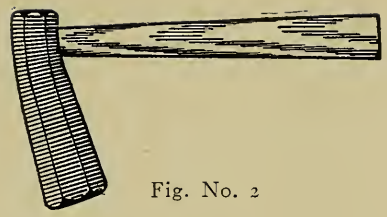


Fig. No. 2

hammer, each weighing about two and one-half pounds.

The face in line with the handle of the hammer is termed the long face; the face at right angles with the line of handle, is the cross face. A blow struck with this hammer, when held in the position as shown in Fig. 3 is a long-face

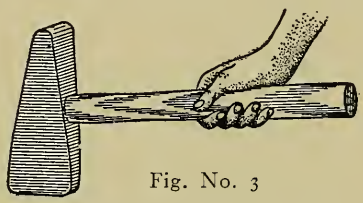


Fig. No. 3

blow, and, by turning the hammer over without altering the line of the handle, but reversing the position of the faces, cross-face blows can be struck with it.

The round-face or "dog-head" hammer has but one face, which, as its name indicates, is round. It is used chiefly for adjusting the tension. This face must be ground convex, of an even sweep, so as to strike a round blow exactly in the centre of the face, the mark of its blows to be about $\frac{7}{8}$ to $\frac{1}{2}$ inch in diameter.

By the use of the cross-face and long-face hammer, the operator can, without changing his position, make all the forms of blows shown in cuts.

To become accustomed to the use of the hammer, take each hammer in turn, grasping it firmly by the handle about two-thirds its length from the head.

Too much attention cannot be given to the matter of becoming proficient in the command of the hammer.

**Saw Hammering.** Having now learned to control the hammer you may proceed to the practice of saw hammering, and the adjustment of saws. To experiment, take a piece of worn-out band saw, about five feet long, and lay it on the anvil. Take a straight-edge and place it edgewise across the saw. Beginning at the end farthest from you find the largest lumps first, drawing the level over the entire extent of each lump. Lay the bevel down and take the hammer, and, by a careful distribution of blows, proceed to knock down the lumps, using blows heavy or light as the case may require.

**Blows.** Repeat the operation until you have gone the entire length of the piece, turn it over and repeat the operation on the other side. The direction of blows is across the

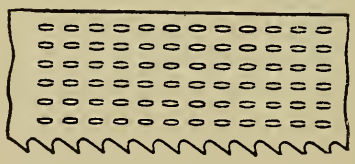


Fig. No. 4

line of the straight edge (see Fig. 8) and must always be so; hence, as your instructions were to place your straight edge square across the saw, the blows you have applied,

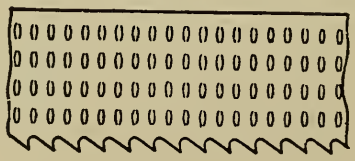


Fig. No. 5

which run lengthwise of the saw, are long-face blows, (See Fig. 4.). Whichever face of the hammer you use, the

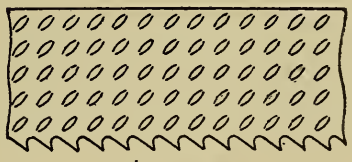


Fig. No. 6

name of the blow is determined by its direction. (See Figs 4, 5, 6 and 7).

Having taken out the long-face lumps (Fig. 4) go over the plate carefully a second time to see that the work has

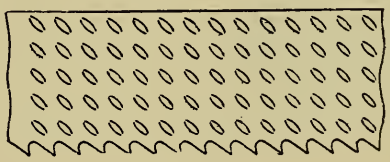


Fig. No. 7

been properly done, then proceed to take out the cross-face lumps. (See Fig. 5.)

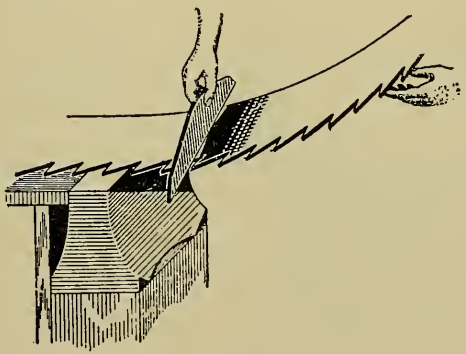


Fig. No. 8

**Tension.** To gain a knowledge of the tension as applied to the band saw, lay the piece you have already been working on, lengthwise, and take hold of one end, letting the farthest end rest on the plate back of the anvil. Grasp tightly, and bend to a curve by a pressure of the hand (Fig. 8 shows the manner of holding the plate). When the straight edge (Fig. 12) is placed across the saw the parts

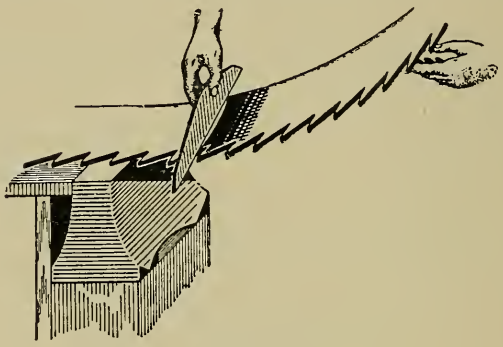


Fig. No. 9

drawn to the straight edge are "fast," and the parts that fall away from it are "loose," and the parts that neither

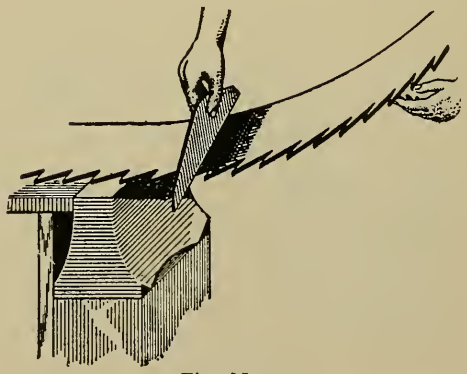


Fig. No. 10

draw to, nor fall away, are "stiff," that is, they show no tension (See Figs 8, 9 and 10.)

**Stiffening.** The effort you are now engaged in is to make this piece "stiff" or flat, without any tension. To this end, first find a "fast" place by bending in the manner before described. The "fast" place will show in the manner that a lump shows when the plate is lying flat (See Fig. 9.) Having located the "fast" places, and noting their extent, turn the plate over, and it will be found they show in exactly the same manner as on the other side of the plate. With the round hammer, hammer equally on either side, try with the straight edge, and proceed until you have taken out all the "fast."

**Fast or Loose.** The "loose" places are those that will drop away from the straight edge when the saw is bent. (See Fig. 8). These are removed by hammering on

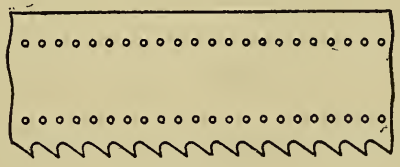


Fig. No. 11

either edge of the plate. (See Fig. 11). Hammer the piece until it shows neither "fast" nor "loose" places, but shows "stiff" throughout, as described above.

**Leveling Up.** Now proceed to "level up," that is, knock down any lumps you may have made in using the round-face hammer. When the blade is bent under the level as previously described and shown in Fig. 8, a "fast" place shows where the blows should be placed.

**For Beginners.** The foregoing illustrations and advice are for the beginner, to show how tension may be applied to the saw with the hammer, but we recommend

the rolls, which will do the same work, except in a few instances, for the reason that every blow of the hammer shortens the life of the saw by closing the molecules of the steel, robbing it of its elasticity, thereby causing brittleness and inviting cracks.

**Twists.** There are two kinds of twists, the long-face and the cross-face. The long-face is that which must be removed by the use of the long face of the cross-face hammer applied diagonally across the blade, as in Fig. 6. The cross-face twist is that which must be removed by the use of the cross face of the cross-face hammer applied diagonally across the blade, as in Fig. 7. Now, as the long-face produces a cross-face twist, the opposite blow (cross-face) will remove it or vice versa. The same rule applies to twists as to tension. Both sides of the blade must be equally hammered. Before removing either twist, place the straight edge diagonally across the blade, and you will find that it shows a lump at right angles to the straight edge. Changing the position of the straight edge to an exactly opposite diagonal direction, you will find a hollow. Without changing the position of the straight edge, turn the piece over, and you will find a hollow on either side, and, in like manner, with the straight edge in the opposite diagonal direction you will find a lump on both sides, showing that both sides must be hammered to remove the twist.

**Removing Twists.** In removing twists, care must be taken not to hammer too much, or an opposite twist to the one removed will be produced. Also note that when the piece is lying flat on the leveling block, the parts which do not lie flat are at opposite corners to the piece. Where there are no twists, and the hammering is done any other way than either parallel with the length of the blade, or squarely across it, a twist is produced.

It would be presumption to expect that one can take a saw and adjust it with any hope of success, without some practical knowledge, and this you cannot expect to obtain by working on new saws as they come from the manufacturer, or trying to adjust them in their first deviation or flatness. Try to master the above rudimentary instructions. The more practice, the better able one will be to keep the saw in working order.

**Sharp Saws.** A saw should never be run when extremely dull. Normal feed when the saw is dull, is the same as feeding a well sharpened saw beyond its capacity. Therefore, never neglect this important part of your labors. **Always keep saws sharp** and in good condition.

**Clearance.** Not having set or clearance enough the closing of the grain or fibre produces heat at the base of the teeth. This, if in undue degree, causes expansion at the edge of saws, which results in causing a wavy or vibrating motion likely at any time to start small cracks at the bottom of gullets.

When the set or swage is light, the lumps on the saw, even when passed over as of no consequence by the straight edge, will show bright and clean, while the hollow places are of a dull color. Watch your saw carefully, and, when these lumps appear, take the blocking hammer and straight edge and go over them carefully, removing them as before instructed.

By watching these indications, and by a careful use of the straight edge and hammer, you will, by a little practice, produce a flatter saw than by any other means available to the millman. In all saws, band, gang, and circular, the most essential quality is a steel and temper that will swage and hold the corners and at the same time be stiff enough to stand up to its work and hold its tension for a reasonable

length of time. We claim for Simonds Saws that in this respect they stand at the head of all makes.

**Double Cut Bands.** More care and frequent fitting is required to maintain the double-cut saws than single-cutting variety. The principle of tensioning and leveling is the same as that employed on the single-cut band saw, but it is necessary to be careful and have the log side present a true and even surface.

In fact filers should be careful to keep both edges straight and true, as a double cut band saw cannot run properly with one edge longer than the other.

If in running it should strike a little gravel or become dull on the log side it is necessary to change and refit the saw at once or bad lumber will result. Rules governing the rolling, straightening and dressing the teeth on single-cut saws apply as well on the double-cut band. The tools and machinery are the same except the grinder and clamp. For this purpose there are two different grinders, one being used to grind the saw on both sides at the same time and the other to grind but one side and repeat the operation on the other side.

Mill operators and filers agree that the band sharpener should be a type similar to the ordinary sharpener for single-cut bands designed to sharpen one side of the saw at a time, the saw being supported in the ordinary manner on post brackets and fed by front and back feed finger, the sharpener equipped as a right- and left-hand machine. For supporting these saws there are six special post brackets faced with hardened steel, over which the points of the saw slide. On the special feed pawl posts at front and rear of the sharpener, similar supports are provided, and this method of supporting the double-cutting band saw proves satisfactory in practice, making it easy to handle the saw without injury to the teeth.

For double-cutting band saws a special filing clamp is required. This is provided with one jaw that will swing so as to permit the insertion or removal of the saw without injury to the saw teeth. In most respects the machines such as the swage, shaper, stretcher, brazing clamp and lap grinder are suitable for either single- or double-cut band saws.

CHAPTER V

# Leveling a Band Saw

**The Bench.** To level a band saw lay it on a bench, inside resting on leveling block perfectly true. With the straight edge, about 10 inches to 12 inches, start at the braze or chalk mark on the saw, taking a portion about three feet long, or the length of your leveling block, and go over it very carefully, pounding down the high places only, or places where you may find small lumps. After going the entire length of the saw, should there be any places where daylight can be seen under straight edge, take saw and hang it over the rack which is above your filing bench, so as to have the outside of blade rest against the leveling block. Start again at the braze or chalk mark and go over the entire length of the saw the same as on the other side, being careful not to hammer too heavily, as it will cause extra work on the other side again.

**Using Straight Edge.** After having the saw perfectly level on both sides, lay it down again on the bench in the former position, take straight edge six feet long and lay it against the back of saw. Should the straight edge rock on the saw, mark the places where the straight edge rocked going over the entire length of saw in this manner. Should it be an even convex or crown on the back the full distance of the blade, and not be too great a crown, it would be advisable to fit the saw in this manner. We should not recommend a greater crown than $\frac{1}{64}$ to $\frac{1}{32}$ inch in six feet. Should a low place be found on the back, which will fall away from your straight edge, mark the low place for the full distance. Then start with roll, beginning at one end of chalk mark in the centre of blade, and roll one deep roll through centre of saw the full distance of chalk mark, then go 1 inch or 1½ inch to the side next chalk mark also

1 inch to the other side, but go very lightly. Again, go 1 inch farther at the edge where chalk mark is and take another roll. Continue this onto the edge, rolling evenly. By the time the last roll is taken along the edge where the chalk mark is, the hollow places will become straight and lie close to the straight edge. Should the straight edge rock too much, or the back be too high at points, continue a like performance on the side of plate opposite the high places.

**Uneven Brazes.** In straightening uneven brazes in saws, it is always best to first place the roll in centre and work to the edge, rather than start at the edge and go to the centre, for, in working from the centre to the edge of the blade the filer can follow much closer with the tension gauge the exact amount of tension he has in the blade, whereas, in working from the edge to the centre, it is very difficult to keep track of the tension being put in.

**Straight Edge.** The straight edge should be a piece of steel from 10 inches to 12 inches long, about 15 or 16 gauge, and about 1½ inch wide. It can be made the same width all the way along, or it can be made wider in the centre and taper at each end, which is much more convenient to handle. The filer should always have what is known as a "try gauge," so as to be able to fit the straight edge as it wears, which it naturally will, being drawn over the saw many times a day. For dressing the straight edge, it is advisable to use a mill file, and draw it very carefully along the full length of the steel so as not to make lumps and hollows.

**Tension Gauge.** The tension gauge is made in somewhat the same manner as a straight edge, with the exception of the edges, which are convexed and concaved. A tension gauge should be from 40 to 45 degrees convex on one side, and concave on the other in like manner, so that when the

saw is raised with the left hand to position which is customary in trying tension gauge on a saw, the convex side of the gauge should fit the proper tension in the blade.

**Even Tension.** In like manner to concave a saw, when saw is bent down by tight hand to about the same angle as it was raised up, the saw will also fit the concave side of the straight edge, thus giving the filer absolute assurance that the blade is tensioned perfectly even on both sides.

In tension gauges, the same as in straight edges, the filer should always have a try gauge, and be very careful to see that the tension gauge is kept perfectly true with the same circle on both ends, so as not to have more tension on one side of the saw than on the other. If this is followed up carefully, it is much easier for a filer to test his tension and to see when he has the proper amount in the saw, for many filers make hard work for themselves in having improper tension gauges.

**Adjusting Automatic Grinder.** An automatic grinder should be set so that the saw when on the machine is parallel with the bench. If there is plenty of room in the filing room, it would be wise to set the grinder some 10 or 12 feet from the bench so as to allow plenty of room for turning the saw. It is always preferable to set the grinder so that it will be inside of the saw when grinding. In this manner there may be considerable room saved.

When the saw is hung on the wheels, have the wheels high enough so that saw will just rest lightly on the guard and one standard. If the saw rests on both the standards and guard bad work will result, so there should be a little clearance between the front standard and the guard. This will permit the saw to lie on the guard and the standard opposite the machine when the saw is passing through. Saw should run through the automatic grinder easy enough so as not to bind, at the same time

being tight and stiff enough so that when the finger releases the teeth it will not slip back, therefore overcoming any danger of spoiling the teeth.

**Cams.** Grinders have a variety of cams for different shaped teeth, and if a filer is careful in selecting the proper cam, it will enable him to keep the proper shape of tooth on his saw with little difficulty. There are a number of filers who have considerable trouble keeping the proper shape of tooth on saw, and it is principally due to not having the proper cam on the grinder.

The finger should always be carefully watched so as to press the teeth at the same point all the time, thereby making an equal and uniform back on teeth.

**Use of Grinder.** With little practice and close observation, filers will get to use a grinder with a great deal of satisfaction. The improper use of a grinder will soon make an uneven breast on the saw, while, on the other hand, if a grinder is working perfectly, a saw may be kept perfectly straight and sharp without the use of a file, which is preferable. No matter how accurate a filer may be in filing a saw by hand, there is nothing so accurate as a machine, and if a saw can be finished up on a grinder to go on the mill, it is bound to be more perfect than when it is fitted up by hand.

**Filing Clamp.** The filing clamp should be set either on the side the grinder is on, or the opposite side, as the hand of the saw may require. It is always preferable to work on the outside of the saw, this giving more room. However, it depends wholly on the light in the filing room as to what position to work at filing clamp. Filing clamps are used principally to clamp the saw while swaging and shaping.

**Swaging and Shaping.** In swaging a saw, start as far back on one side as possible where the saw is straight.

Mark a tooth to start on, and after the saw is clamped tightly in vise, swage the distance of the saw as far as possible without swaging over a wheel, or where a saw is bent out of a straight line. After going this distance take the shaper and follow up the swaging. See to it that the shaper is held down tight to the teeth all the time, so as to go over every tooth the same way. In swaging and shaping band saws great care should be taken that the dies of swages and shapers are kept in perfect shape all the time so as to fit the teeth without springing the steel in any one way, as there are a lot of corners and points of saws broken off by improperly shaped dies and anvils of swages.

CHAPTER VI

# Brazing a Band Saw

**The Braze.** For brazing, band saws should first be lapped about $\frac{3}{8}$ inch on each end for 19 gauge saws. Lap should be increased in length about $\frac{1}{16}$ inch for each gauge heavier. Laps should be ground accurate in width and taper and should be a straight bevel running to nearly a sharp edge.

The lap should be well cleaned of oil and grease. "Brazine" a preparation sold by Simonds Manufacturing Co., is recommended for this purpose.

**Position.** Be careful in placing the saw in position in the clamps, so when the final pressure is applied with the hot irons the laps will come together in proper position.

In brazing, the saw is placed between the clamps. A piece of silver solder cut to the same size as the laps, is placed between the laps. The silver solder should also be cleaned in "Brazine" before being used. Heat the irons to a good cherry red, scrape off all scale, and place them on either side of the laps. Then, pull the clamps tight. Three-eights inch irons are used for gauges lighter than 19 gauge; $\frac{1}{2}$ inch irons for 19 to 16 gauge; $\frac{5}{8}$ inch irons for heavier than 16 gauge.

**Heavy Irons.** The heavier irons for the heavier saws are such that the extra volume of heat contained in them is sufficient to prevent the heavier saws from cooling too quickly.

In our observation in mills, we find frequently that saws crack in close proximity to the joint. On examination we find that part "fast" at or near the location of the crack.

**Pressing Joint.** Pressing the joint properly is the most difficult part to learn of the entire task. The method to follow in this is hard to describe. During the process of

brazing, the hot irons hold the saw so tightly that there is no room for expansion under their pressure. Outside the irons (as far as the heat extends) expansion has free play, and shows in lumps on either side of the joint, which is now the contracted or fast part. Therefore, after brazing, roll the braze from centre to edges until saw lies flat or nearly so.

**Tensioning Braze.** Tension the brazes with a roll as much as possible and only use the hammer to level down the lumps and to take out cross lumps as the roll is much easier on the braze. Then dress both sides with file, being careful not to file too much and make the saw thin at the braze.

Avoid unnecessary work. Have a reason for every blow. Try to put it in the right place every time. The joint is now an integral part of the saw, and will stand as much as any other portion. This is a test for the quality of your work—let it be good or bad.

**Thickness.** The joint having been perfectly flat trim it to even thickness. Great care should be taken in filing the lap, not to make it too thin, as this is the cause of a great deal of trouble regarding brazes cracking. Then adjust the tension and breast according to instructions already given.

Be a close observer, and let each joint, straightened and adjusted, be an object lesson in the tensibility of the steel.

CHAPTER VII

# How to Tension a Band Saw

**Tension.** The tensioning of band saws is an important matter. The longer the experience and practice one has, the more perfect he becomes. In starting in, one should always begin right and in doing so it will be much easier to follow the right course.

In beginning the operation of tensioning a band saw, lay the saw on the bench. Take a straight edge and go over the saw the entire length, and see that there are no small lumps, also have saw perfectly level. Then place saw in rolls, starting at the braze. Roll directly in the centre the entire length of the saw. When this is accomplished shift the roll 1 inch to one side and go around the entire length of the saw as described. Then place the roll 1 inch the other side of the centre going the entire length of the saw, and so on working from the centre to the edges, not going any closer to the edge than 1¼ inch, leaving what is commonly known as the tire or strain line on the toothed edge. On resaws 16, 17 and 18 gauge the tire strain line should be about 1 inch and when the gauge is 19, 20 and 21 a ¾ inch tire is sufficient.

**Uneven Tension.** Should the tension be uneven in the saw, it is not advisable to go all the length of the saw with the roll but just over the fast places. Roll very lightly at first until perfectly acquainted with the hardness of the plate, as the tension is much more difficult to take out then to put in. Should there be too much tension in saw, run the roll lightly around each edge of the saw about 1 or 1½ inch from the edge. This should be done very carefully though, as one is liable to take out too much of the tension and make the strain line of the saw too loose.

**Use of Roll.** If proper care is used in handling the roll, it will save the filer considerable work on the block with the hammer, as the saw can be very easily dished one way or another with the roll, thereby causing considerable leveling that could otherwise be avoided.

**Circle.** The circle of the tension in an ordinary band saw should conform to a 40 or 45 foot circle; that is, a tension gauge, convexed to a 40 or 45 foot circle, should fit to conform to the declension or "drop" of the blade, when tested as shown in Fig. 10. This is about the average tension used in all mills with flat wheels. Any more tension than this is liable to give great trouble by cracking as the tensile is too great on the strain or tire line therefore cracking while running over the wheel.

**Flat on Wheels.** The saw when strained on the band wheels, should be nearly flat all across the wheel, but strained a little heavier on the toothed edge than at any other part. Saws that rest too heavily on each side, and rise up in the centre from the wheel, do not do as good work as a saw that is nearly flat, as the body of the saw is not stiff enough to hold the teeth in a straight line, thereby allowing them to lead one way or the other. This strain is not secured by adjustment of the wheels, but through lenghtening the back of the saw $\frac{1}{64}$ or $\frac{1}{32}$ of an inch in 6 feet. This is the reason the average filer runs a long back saw.

**Unequal Tension.** Unequal tension is the cause of much trouble and breakage, but, as one gains in experience, it is easily remedied. The saw may work well at first, and yet every time it is used or filed, its tension may be altered, perhaps not to any great extent while the saw is at work, but the inequalities can be very easily detected by the use of the tension gauge. Constant care and watchfulness will teach the need of a little "touching up" here

and there, as the case may require. It is in this way, line upon line, that one gradually becomes master of his work.

**Use of Tension Gauge.** For the benefit of the few who are not acquainted with the use of the tension gauge, a brief explanation of its use in connection with the adjustment of band saws is timely and important.

When the speed of the band saw was increased to 10,000 feet per minute, together with the increased feed, it was found that in order to have the saw stand the increased tensile strain, it was necessary to have a deep,well regulated tension. Loose tension beyond a certain degree will carry down the "fast" places so they cannot be detected by the straight edge. With the tension gauge, which is convex to fit the amount of tension in saw, the most minute portions of "fast" can be located. By using the tension gauge under pressure it will show up the loose and fast places much more distinctly than by holding it loosely.

**Tension Gauge.** The form of a tension gauge may be seen by reference to Fig. 12. The edge "B" is convex, by

Fig. No. 12 "B"

the use of which is secured a uniform tension. The sweep of the convex edge, fitting the declension, is governed by the amount of tension the saw is found to need. The convex side should always fit the depth the saw dishes or drops when bent to test the tension, as shown in Fig. 8.

**To Level Saw.** To level, place the saw in position for rolling, mark the saw and begin by knocking down the lumps, both "long-face" and "short-face." This done, take the tension level in your right hand, place your left

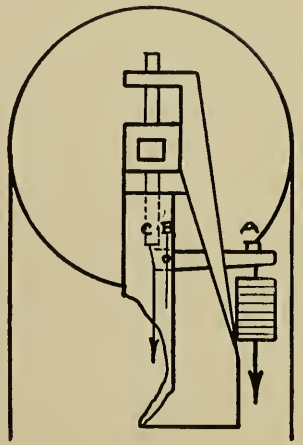
under the blade, raising it to nearly the height of your shoulder, and place the tension level squarely across the blade at arms' length, as shown in Fig. 8. The "fast" portions will lie closely to the gauge, and show in about the same manner as a lump shows under the straight edge when the saw is lying flat. Now proceed according to instructions on page 18. You cannot turn the saw over as you would a short piece, therefore be careful and not hammer too much so as to drive the saw through.

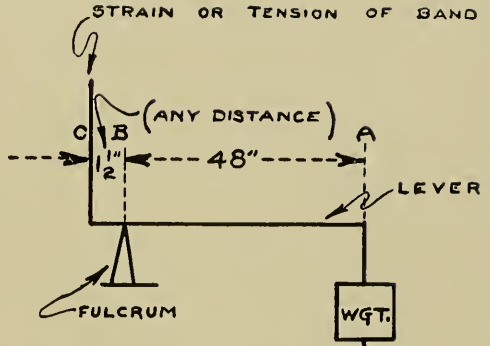
**Hammer Short Lumps.** This is the time to exercise qualities of perception and memory, for when you have gone around the saw on one side, take the other, and again using the straight edge begin at the joint or chalk mark and hammer down all the short lumps and high places as nearly as you can in like amount on the other side.

**Rolling.** To make the tension less or stiffer, roll gently on the extreme edges of the saw, wherever this is needed. To put in more tension (to "open up") roll on the inner portions of the blade. (See instructions on tension, page 33.)

**Breast.** Uneven breast is indicated by hollow and high places—not by uneven width. Blades may have parallel edges, but, not being in a straight line, cause a lateral movement when the saw is in motion, thus presenting an uneven and everchanging cutting front. To draw these places out straight, take a long straight edge, six feet long (this is a convenient—one shorter than this would be too short) or we would recommend a concave back level, the same length, $\frac{1}{64}$ or $\frac{1}{32}$ of an inch hollow as desired;—place it against the back edge of the saw, locate the point most out of line, making a chalk mark on the opposite side to where the straight edge rocks. After marking the entire length of the saw, you may find that it has one continuous bend. This is a condition necessary in a great many cases. That

is, the back edge should be a trifle longer than the toothed edge, but it should be uniformly so throughout the entire length of the blade, and our experience teaches us that the crown of the back should not exceed $\frac{1}{32}$ (we would recommend about $\frac{1}{64}$) of an inch in six feet. If you find it does exceed this amount, or the amount which your mill seems to require, roll fom one end of the blade to the other, working carefully no matter which course you take. Begin at the edge on the hollow side of the plate, rolling gently from edge to centre. By this means, with care, altering the tension may be avoided.




$$\frac{\text{WGT.} \times 48''}{1\frac{1}{2}''} = \text{STRAIN WHEN LEVER IS HORIZONTAL OR BALANCED}$$

$$\frac{\text{STRAIN} \times 1\frac{1}{2}''}{48} = \text{WEIGHT ON LEVER WHEN HORIZONTAL OR BALANCED}$$

N.V.C.-17

CHAPTER VIII

# Band Saw Speed and Strain

**Speed.** The speed at which a band saw should run depends on the kind of timber to be sawed and the amount of work it is required to do. When a band saw has to deal with both soft and hard woods it is an advantage if means are provided to vary the speed at which it runs. For cutting the softest materials, such as unseasoned pine, bass wood, etc., a maximum speed of 10,000 feet per minute is considered reasonable. For seasoned softwood, and unseasoned comparatively hard wood, such as oak, gum, etc., a speed of 10,000 feet per minute is recommended by many experts. For maple, hickory or other comparatively seasoned hardwood a speed of 8,000 feet per minute has been considered sufficient. In cutting seasoned hardwood and unseasoned exceedingly hard wood, a saw speed of 7,000 feet per minute is adopted by many mills.

**Strain.** When the strain of a band saw is required or it is desired to know how much weight to put on the lever when the strain is known, the accompanying sketch and table will be found useful. The illustration shows the weights hung on the lever of a typical mill and these are designed as A. The point B is known as the fulcrum, and C the point where the end of the lever acts upon the vertical shaft supporting the saw, wheels and bearings. The diagram is used for easy solution of the problem as follows: the distance A-B is, we will assume 48 inches, and the distance B-C is 1¼ inch. Thus as in the simple leverage formula, weight times 48 is equal to the unknown resistance (or strain) at C times 1½ inch. In other words they must balance which means the lever must be horizontal. If 48 times weight equals 1½ times the resistance or strain, then this strain is equal to the weight times 48, divided by the distance 1½.

# REVISED TABLE OF STRAINS

## SUITED TO DIFFERENT WIDTHS & GAUGES OF BAND SAW BLADES

| THICKNESS | | WIDTH | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2½" | 3" | 3½" | 4" | 4½" | 5" | 6" | 7" | 8" | 10" | 12" |
| | | LBS. | LBS. | LBS | LBS | LBS. | LBS. | LBS. | LBS. | LBS. | LBS. | LBS. |
| 21 GAUGE & LESS | 18/1000 TO 32/1000 | 800 | 950 | 1050 | 1200 | 1300 | 1400 | 1600 | | | | |
| 19 & 20 GAUGE | 35/1000 TO 42/1000 | 1000 | 1200 | 1400 | 1500 | 1700 | 1900 | 2200 | 2500 | | | |
| 19 TIGHT & 18 GAUGE | 45/1000 TO 49/1000 | | | 1700 | 1900 | 2100 | 2300 | 2600 | 3000 | 3300 | | |
| 17 GAUGE | 58/1000 | | | | 2300 | 2500 | 2700 | 3200 | 3600 | 4000 | 4800 | |
| 16 GAUGE | 65/1000 | | | | | | 3000 | 3500 | 4000 | 4500 | 5200 | |
| 15 GAUGE | 72/1000 | | | | | | | 4000 | 4500 | 5000 | 6000 | 7500 |
| 14 GAUGE | 83/1000 | | | | | | | | 5500 | 6000 | 7500 | 9000 |

**Number Pounds.** The table is used when it is required to know the number of pounds to put on a lever, assuming that there is but one lever or two that merge into one, and also that the weight of boxes and wheel is counterbalanced.

From the table it will be seen that 6,000 lbs. is required for a 10 inch, 15 gauge saw. We have, using the simple leverage formula again, 6,000 times 1½ is equal to 48 times the weights. Then the weights are equal to 6,000 times 1½, divided by 48, or 9,000 divided by 48 or 187½ lbs. the weight required to give the necessary strain on the saw.

CHAPTER IX

# The Band Saw Mill

**Wheel Face.** The face of band mill wheels for single- or double-cut mills should be perfectly flat, or as nearly so as possible, as this is a very essential thing in the accuracy of saws running, and in the life of band saws, there should be especial attention paid to this to see that the wheels are kept in perfect condition. It is advisable to turn the face of band wheels at least once a year, and, if possible, twice. There is not much to grind off of them in that time, and they can always be kept true, for a band wheel will sometimes get out of true with ordinary use. If great care is taken in this, it will save the filer a lot of extra work on saws, and also save a great many dollars' worth of saws.

**Adjustment.** The adjustment of a band mill is another very essential thing. If a mill is not in good plumb, or in true line, no matter how good a mill, or how well it is built, it is impossible to do good work.

In setting up a band mill, it should be set plumb, or as nearly so as it is possible, with the V carriage track, so that when the mill is complete and the saw put on, it will hang perfectly parallel with the track. Unless this is the case, it is impossible for a band saw to cut true lumber as you cannot lead a band saw with the guides. The head blocks on a carriage should be set perfectly true, and parallel with both track and saw. It is advisable in lining head blocks, to measure the distance from the teeth of the saw to each head block, as the carriage may be run slowly along the track. In doing this, the head blocks will all be the same distance from the saw as when passing.

**Steel Faced Pulleys.** Crystallization of a band saw is caused in various ways. Saws running on and off steel face pulleys at a rapid rate will have a tendency to crystal-

lize the blade. Saws running through guides have a tendency to crystallize. Slivers, sawdust, or any fibre of that kind getting between the saw and the side of the log, also have a tendency to crystallize the steel to some extent. Band saws are more frequently crystallized by the use of improper metal in the guides, or by the guides being improperly set.

Great care should be taken when a band saw is strained on the mill and running, that it runs perfectly free, does not oscillate or vibrate, and is perfectly parallel with the carriage track. This being closely watched, and the mill, saws, and carriage kept in perfect line, it will relieve the filer or operator of a lot of unnecessary work. Get your two wheels in line and keep them in line. Then use your tilt to adjust your saw and not your crossline.

**Care in Handling.** We trust that this will be of helpful assistance to mill owners and operators, as we feel it has been to us. We would suggest in conclusion that band saw operators take great care, and exercise patience, in the handling and manipulation of band saws, as we have always found it is much better to go very slowly at the start until one knows perfectly the surrounding conditions, and we believe it is better to go slowly in experimenting in new ideas, until fully accomplished in the care of saw.

**Guides.** The guides through which the saw runs, should be of frictionless material, such as Babbitt metal, or something of this kind. We would recommend a very hard wood such as lignum vitae, which contains lubricating properties, and should not rest tightly against the saw when strained, but should have clearance enough to hold the saw from running in or out of the cut, but not to bind it, as this would be the means of case-hardening or crystallizing the steel more quickly than by any other possible means.

**Guard.** The guard, or what is known as the back guide, for a band mill, should be used only as a safeguard against running the saw off the back of the wheel but it never should be set up so that the saw will run against it. If in any way the saw may run back against the back guide and crystallize or case-harden, it is advisable to take an old piece of emery wheel, while the saw is in motion, and hold it tightly on the back for some minutes, turning it around to make the back of the blade perfectly round and true, and at the same time taking out the case-hardening or crystallization that may have been put in by running heavily on the back guide. This will be found to prevent cracks.

CHAPTER X

# Fitting and Running Small Band Saws

**Small Bands.** The breakage of small bands in woodworking plants is the source of much annoyance to the operators of such plants. Among the most frequent causes of breakage we name the following: the use of saws unsuitable gauge for the work; the use of an improper arrangement for giving the saw the required strain on the wheel; not slacking saw after use, thus preventing the free contraction of saw blades on cooling down (they should always be left a trifle slack when not in motion); the joint not being the same thickness as the rest of the blade; the back guide being too close, so that the saw is constantly rubbing against it, consequently case-hardening the back of saw, and cracking it. The back guide should never be so close that the saw will come in contact with it. It is only placed there as a matter of precaution, and when the saw will not stay on the wheel without being held there with the back guide, there is trouble somewhere, which should be located and corrected.

Saws should never be filed to sharp corners at gullets; they should always be rounded out with a round file or emery wheel.

Working dull saws, feeding work onto the saw beyond its cutting capacity, allowing the sawdust to collect on the face of wheel, thus causing it to become lumpy and uneven, stopping or starting a machine too suddenly—especially when using a light blade—will almost certainly snap a saw in two.

**Wheel Covering.** When a covered wheel is used, it should be frequently examined to see that it is perfectly true on the face, as a covered wheel is much more liable

to get out of true than a solid one. We think leather is preferable to rubber, as it can be trued very easily by turning.

Saws should be frequently breasted to keep them perfectly true on the toothed edge, and the teeth of uniform depth. For ripping, the teeth should be filed perfectly straight across; but where rip and cut-off work are both done on the same saw, it is well to file the teeth a trifle flemming. Run as narrow a set as possible, but always have enough to clear the plate and prevent it from binding in the cut, as this would surely cause the saw to crack. Soft or pithy timber requires more set than timber that is free from pitch. Hard wood requires the least of any.

**Full Swage.** All band saws having teeth of sufficient size to admit of swaging, should be fitted full swage. There are many kinds of swages used for this class of saw fitting, and with due care any of them can be used with very good results. The bar and hammer, and the upset have, however, almost entirely gone out of use in the swaging of band saws, except where the upset is used in connection with other swages of the roller style. We think every band saw filer should have one, as they are very useful in case the saw runs onto a stone or gravel, and a little more spread is needed than can be obtained by one operation of the roller swage. In a case of this kind the upset can be used to good advantage by placing it on the point of tooth, when, with a few light blows of a hammer, the point of tooth can be spread a little, and, at the same time made thicker. Thus one application of the roller swage will draw the point of the tooth out sufficiently to give a good full swage. The saw should be kept perfectly true on the cutting edge, and the points of uniform width throughout. To regulate the width of points, we recommend the use of a "shaper," as it gives a better and more uniform shape to the teeth. (See cuts of section of band saw teeth).

H. I. J. K.

Referring to the sketches H, I, J, and K, which illustrate full swage, the tooth marked "H" represents the ideal shape, both in swaging and side-dressing. The cutting edge of the tooth only should come in contact with the wood, and this cutting edge should have clearance both downward and backward from the point. This double clearance can be more properly secured by using a swage shaper.

Tooth "J" represents a point improperly side-dressed, the swage running too far down the face of the tooth, and not having the necessary amount of clearance.

Tooth "K" represents tooth "J" after striking gravel or some hard substance, by which part of the corner was knocked off, leaving the swage widest below the cutting point. In fact, it bulges out in such a manner as to constantly rub and crowd against the side of the cut, raking the timber and leaving bad ridges upon it. This also causes the saw to be crowded out of line.

**Side Dressed.** An examination of cuts "H" and "I" illustrating a tooth properly side-dressed and before and after striking gravel, will show that, although part of the clearance has been removed, there is yet enough left to prevent the body of swage from rubbing. This demonstrates that the points of teeth at all times should have ample clearance, so that nothing but the extreme point can possibly come in contact with the wood. On the other hand, they should be sufficiently stout so as not to crumble off in striking a hard knot.

This cut illustrates some forms of teeth used in band, gang and band re-saws. Any of the up-to-date saw sharpeners can be readily adapted to produce them.

**Band Re-Saws.** Factories and wood working shops use small band saws for resawing boards or plank, and these saws require the same treatment as large band saws except in cases where they are less than 3 inches in width. Then they will require little if any tension. A full swage should be used on all rip saws, but saws for cross-cut work should be spring set. Care should be taken to spring the teeth very close to the point and keep the outside corner full and sharp. When dressing, bevel a little to the outside.

It is evident that the band resaw is a saw well worth the consideration of any millman. The advantage of band resaws in saw mills result from the fact that the modern saw mill machinery must be adapted to saw lumber to the best advantage. Gangs have been used extensively, but as now all grades of logs are sawed at once it is evident that a mode of sawing which would be suitable for one would ruin another. The log band saw is extensively used because it has a large advantage over the circular saw in the saving of saw kerf, and in a like manner the band resaw effects a saving as compared to all other methods. For saw mill use the band resaw is usually placed behind the log mill or between it and the edge, and as the large mill saws two or three inch planks, the resaw converts them into inch boards. A band resaw should handle the stock before it is edged, so that in sawing stock from the side of the log each board may be edged as wide as possible. Blades as thin as 20 to 24 gauge are being used on resaw mills for certain kinds of work. This results in a saving of power necessary to drive the saw. High temper and tough steel is necessary in band resaws and skillful workmanship is essential in fitting them. Methods for fitting log bands saws apply in general to the resaw.

**Repairing Cracks.** There are various methods used for punching band saw cracks to prevent them going through the saw, but one plan which appears to be used with success is the use of a chisel that makes a straight cut in the saw. In order to avoid the crystallized steel, which is always at the bottom the cut or punch should be made about $\frac{3}{32}$ inch below the crack.

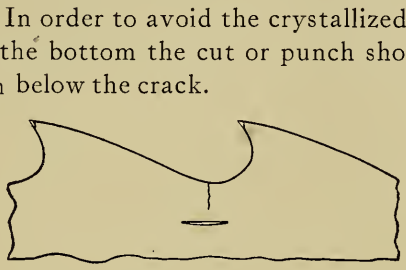


Fig. No. 13

The idea is to form a new front edge on the saw, instead of the cracked edge (See Fig. 13). Naturally, a straight front edge will hold better than any other kind. Grind the little chisel straight first, then round the corners off afterwards. The incision should be from $\frac{1}{4}$ to $\frac{3}{8}$ inch long. Be sure to punch through from both sides, to separate the crystallized steel and the crack from the new front edge, then finish by punching lightly from the outside, to make the cut show clear. Then treat this new edge the same as the bottom of the throats on all the rest of the front edge of the saw.

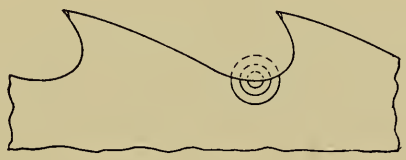


Fig. No. 14

Cracks in band resaws may be prevented to a great extent by compressing the steel at the bottom of each

throat, all the way around the saw, with the sharp clamp screws of a large band or circular swage. Remove the die and anvil and fit a suitably-shaped piece of steel into the slot of the swage block, to cause the clamp screws to strike every throat, as shown in Fig. 14. Now go all around the saw, compressing the steel enough to take out some of the tension, then retension and readjust the back of the saw. You will find this will make a saw hold tension much better and there will be very few cracks, unless there is something seriously wrong in the conditions the saw has to contend with.

When half of the compressed spot has been ground away, repeat the operation again, otherwise the saw may start losing tension too fast again, and crack. With this method the filer can carry the tension closer to the front edge, more tension, and more crown on the back, if desired, without cracks.

When the tension is down in a saw it is always well to compress the throats before tensioning. It stands to reason that if the strain is relieved on the extreme front edge the steel is better able to stand it a little farther back. Some have tried to do this work by striking the bottom of each gullet with a hammer, but failed because the semi-circular grooves pressed into the steel by the sharp clamp screws are essential to success.

A small resaw swage is entirely too weak. A large swage or a specially constructed tool, must be used. The rings at the ends of the screws should be nearly sharp, to make a good impression. Work the live screw on the outside of the saw, oiling the saw first. A saw is not so apt to crack from case-hardening in the throats while the half rings are there. Old cracks are also held much better by this compression method.

CHAPTER XI

# Safety First with Small Band Saws

**Kinking.** Accidents most common on band saws are those resulting where the stock is not securely held, with a consequent kinking and breaking of the saw. Severe injury often results from accidents brought about by the operator trying to remove waste pieces near the saw with the hand, or attempting to stop the wheel with hand, foot or stick when the power is shut off; attempting to adjust the gauge when the saw is running or the band flying off unprotected wheels in case of breakage. Other accidents are due to workmen's clothing becoming caught in the spokes or on the band of an unprotected wheel. Accidents are frequent through the carelessness of the operator getting his hand against the saw at the rear of the table, or sometimes getting the hands and head above the portion of the saw over the gauge.

**Prevention.** Safety engineers agree that practically all of these accidents can be prevented by enclosing the upper and lower wheels with either a wire mesh guard or a solid enclosure; also the cutting edge of the saw above the table at the rear, as well as that part above the guide. Guards should be provided for every kind of saw in the mill, as well as belting, gearing, set screws, shafting and drums. A blower system for the removal of dust and odors from the mill should be provided and emery wheels and tool grinders should be protected by guards. Automatic shifters for throwing belts on and off are also safety devices which should be considered.

**Danger.** Any saw regardless of size is dangerous. The numerous small saws of different kinds used in the average woodworking plant are often a greater menace than are the larger saws in the mills. Every precaution possible

should be taken by the operator of small saws to prevent injury to the careless or reckless, of whom there are many in factories and mills of all kinds. In many states factory inspection laws require certain safeguards on woodworking appliances.

# SIMONDS

## Saw Steel Products

It will be of interest to know that we manufacture a complete line of—

Wide Band Saws
Narrow Band Saws
Circular Saws
Inserted Tooth Saws
Gang Saws
Drag Saws
Metal Cutting Cold Saws
Hack Saw Blades
Files
Cross-Cut Saws
Hand Saws
Planer Knives
High Speed Steel Knives
Flat Steel Special Plates

Details regarding any of the above or our complete catalog sent free on request to any of our offices—see addresses on page 64.

# Styles of Teeth in Wide Band Saws

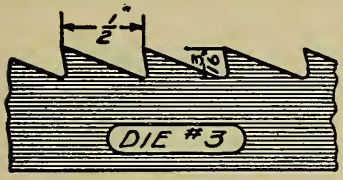
On the three following pages are shown our standard shapes of teeth for Wide Band Saws, and the table below shows the die numbers which we use for saws of different widths and gauges.

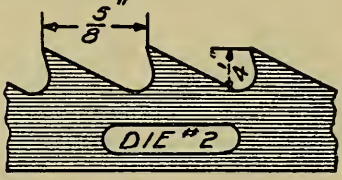
| Width | Gauge | Distance from Point to Point of Teeth. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ⅝, ¾, ⅞ | 1 in. | 1¼ in. | 1½ in. | 1¾ in. | 2 in. | 2¼ in. | 2½ in. | 2¾ in. | 3 in. | 3½ in. |
| 2 | 18–21 | 2 | *13 or 16 | *13 or 16 | 15 | .. | .. | .. | .. | .. | .. | .. |
| 2½ | 18–21 | 2 | *13 or 16 | *13 or 16 | 15 | .. | .. | .. | .. | .. | .. | .. |
| 3 | 18–21 | 2 | *13 or 16 | *13 or 16 | 15 | .. | .. | .. | .. | .. | .. | .. |
| 3½ | 18–21 | 2 | *13 or 16 | *13 or 16 | 15 | .. | .. | .. | .. | .. | .. | .. |
| 4 | 17–21 | .. | . . . | *13 or 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 4½ | 17–21 | .. | . . . | *13 or 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 5 | 17–21 | .. | . . . | *13 or 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 5½ | 17–21 | .. | . . . | *13 or 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 6 | 17–21 | .. | . . . | *13 or 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 6 | 17–18 | .. | . . . | 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 7 | 17–18 | .. | . . . | 16 | 15 | 15 | .. | .. | .. | .. | .. | .. |
| 7 | 16 | .. | . . . | 15 | 48 | 47 | .. | .. | .. | .. | .. | .. |
| 8 | 15 | .. | . . . | . . . | 48 | 49 | .. | .. | .. | .. | .. | .. |
| 8 | 16 | .. | . . . | . . . | 48 | 47 | .. | .. | .. | .. | .. | .. |
| 9 | 17–18 | .. | . . . | . . . | 47 | 47 | .. | .. | .. | .. | .. | .. |
| 9 | 14–15 | .. | . . . | . . . | 48 | 49 | 50 | 50 | .. | .. | .. | .. |
| 9 | 16–17 | .. | . . . | . . . | 48 | 47 | .. | .. | .. | .. | .. | .. |
| 10 | 14–15 | .. | . . . | . . . | 48 | 49 | 50 | 50 | .. | .. | .. | .. |
| 10 | 16–17 | .. | . . . | . . . | 48 | 47 | .. | .. | .. | .. | .. | .. |
| 11 | 14–15 | .. | . . . | . . . | 48 | 49 | 50 | 50 | .. | .. | .. | .. |
| 11 | 16 | .. | . . . | . . . | 48 | 47 | .. | .. | .. | .. | .. | .. |
| 12 | 13–14 | .. | . . . | . . . | 48 | 49 | 50 | 50 | 55 | .. | .. | .. |
| 12 | 15–16 | .. | . . . | . . . | 48 | 49 | .. | .. | .. | .. | .. | .. |
| 13 | 12–14 | .. | . . . | . . . | 48 | 49 | 50 | 50 | 55 | .. | .. | .. |
| 14 | 12–14 | .. | . . . | . . . | 48 | 49 | 50 | 50 | 55 | .. | .. | .. |
| 15 | 12–13 | .. | . . . | . . . | .. | .. | 50 | 50 | 55 | 57 | 61 | 60 |
| 16 | 12–13 | .. | . . . | . . . | .. | .. | 50 | 50 | 55 | 57 | 61 | 60 |
| 17 | 12–13 | .. | . . . | . . . | .. | .. | 50 | 50 | 55 | 57 | 61 | 60 |
| 18 | 12–13 | .. | . . . | . . . | .. | .. | 50 | 50 | 55 | 57 | 61 | 60 |

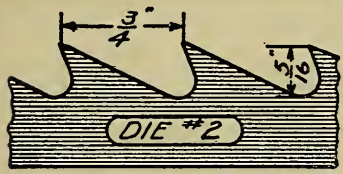
*Die No. 13 is for Spring Set and Die No. 16 is for Swage Set.

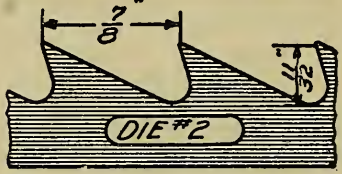
# Simonds Band Saws

The illustrations herewith show spacing and depth of teeth, also patterns or die numbers commonly used. When ordering please refer to style tooth wanted.

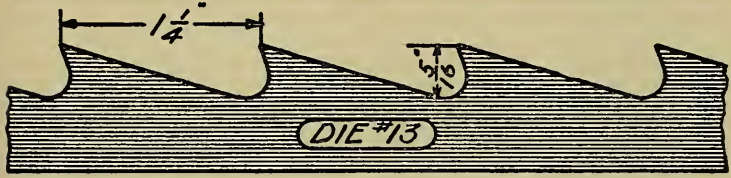


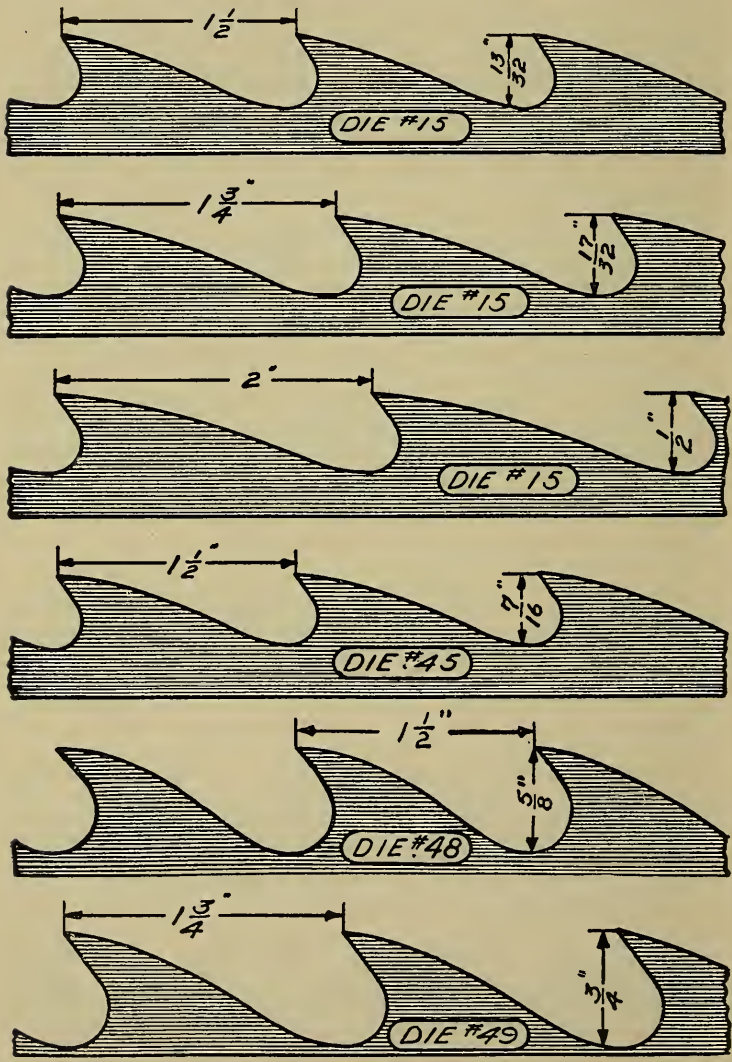






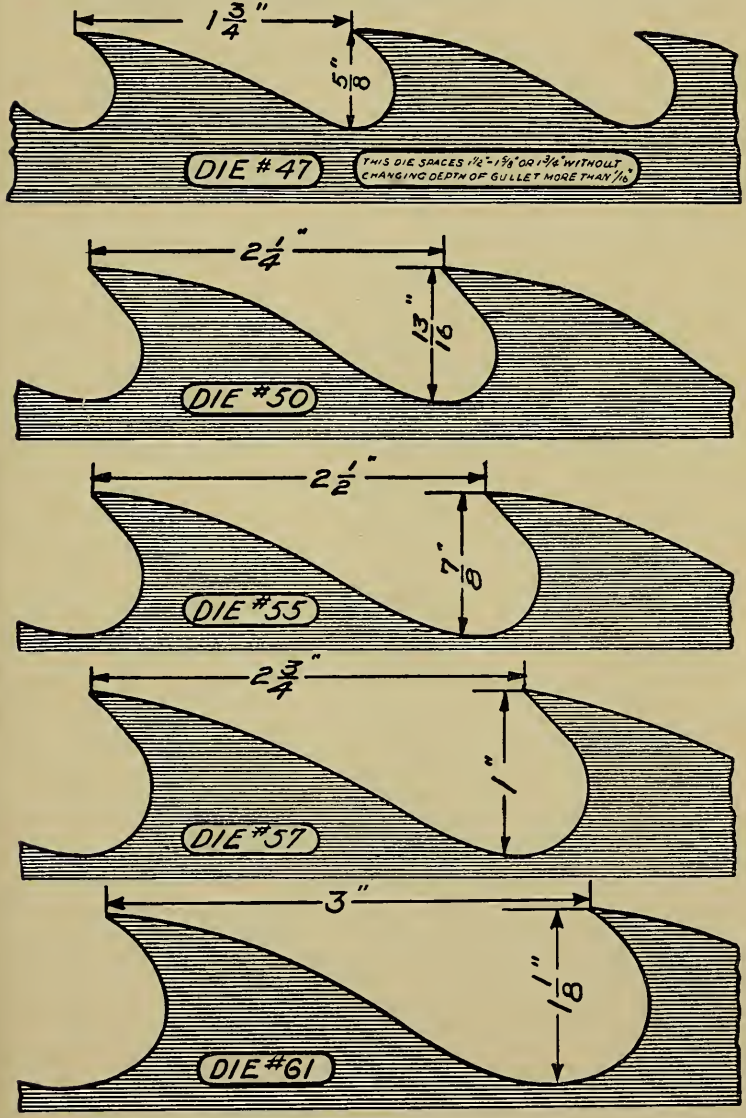
# Simonds Band Saws

The illustrations herewith show spacing and depth of teeth, also patterns or die numbers commonly used. When ordering please refer to style tooth wanted.

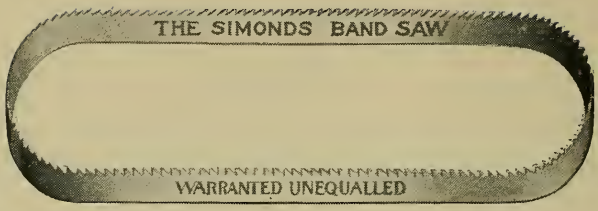


# Simonds Band Saws

The illustrations herewith show spacing and depth of teeth, also patterns or die numbers commonly used. When ordering please refer to style tooth wanted.



# Wide Band Saws




BRAZED AND FITTED

| Width | Usual Gauge | Price per Foot |
|---|---|---|
| 2 inch | 18 to 20 | $1.00 |
| 2½ " | 18 to 20 | 1.20 |
| 3 " | 18 to 20 | 1.40 |
| 3½ " | 18 to 20 | 1.60 |
| 4 " | 17 to 19 | 2.00 |
| 4½ " | 17 to 19 | 2.20 |
| 5 " | 17 to 19 | 2.40 |
| 5½ " | 17 to 19 | 2.70 |
| 6 " | 17 to 19 | 3.00 |
| 7 " | 16 to 18 | 3.40 |
| 8 " | 14 to 16 | 3.80 |
| 9 " | 14 to 16 | 4.30 |
| 10 " | 14 to 16 | 4.80 |
| 11 " | 14 to 16 | 5.40 |
| 12 " | 13 to 15 | 6.00 |
| 13 " | 13 to 15 | 7.20 |
| 14 " | 13 to 15 | 8.40 |
| 15 " | 12 to 14 | 10.20 |
| 16 " | 12 to 14 | 12.00 |
| 17 " | 12 to 14 | 16.80 |
| 18 " | 12 to 14 | 21.60 |

Saws of odd widths, not listed, take price of next wider size listed.

For saws of heavier gauge than listed add 5 per cent to list for each gauge heavier.

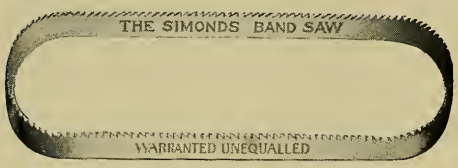
No extra charge for saws one or two gauges thinner than list; when more than two gauges thinner, add 5 per cent to list for each gauge.

**Double Edge Band Saws.** List price per foot, all widths, advance 10 per cent over list prices of single edge saws as above.

**Toothed Blanks.** Same price as finished saws.

**Band Saw Blanks.** Bright, of any width, furnished to order, but not warranted.

# Simonds Narrow Band Saws

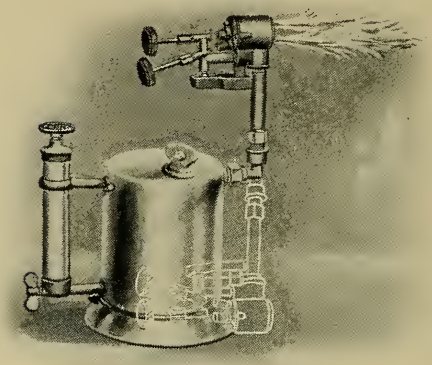



**SPECIAL NOTICE.**—Narrow Band Saws are furnished *Set* and *Filed*, but not Brazed.

| Width, Inches | Usual Gauge | Number of Teeth to Inch | Price per Foot |
|---|---|---|---|
| $\frac{1}{8}$ | 22 or 23 | 6 or 7 | $0.13 |
| $\frac{3}{16}$ | 21 or 22 | 6 | .13 |
| $\frac{1}{4}$ | 21 or 22 | 5 or 6 | .13 |
| $\frac{3}{8}$ | 21 or 22 | 4 or 5 | .14 |
| $\frac{1}{2}$ | 21 or 22 | $3\frac{1}{2}$ or 4 | .15 |
| $\frac{5}{8}$ | 20 or 21 | 3-$3\frac{1}{2}$ or 4 | .16 |
| $\frac{3}{4}$ | 20 or 21 | $2\frac{1}{2}$ or 3 | .18 |
| $\frac{7}{8}$ | 20 or 21 | $2\frac{1}{2}$ or 3 | .20 |
| 1 | 20 or 21 | $\frac{1}{2}$″ or $\frac{5}{8}$″ pt. to pt. | .22 |
| $1\frac{1}{8}$ | 19 or 20 | $\frac{1}{2}$″ or $\frac{5}{8}$″ pt. to pt. | .24 |
| $1\frac{1}{4}$ | 19 or 20 | $\frac{1}{2}$″ $\frac{5}{8}$″ or $\frac{3}{4}$″ pt. to pt. | .26 |
| $1\frac{3}{8}$ | 19 or 20 | $\frac{1}{2}$″ $\frac{5}{8}$″ or $\frac{3}{4}$″ pt. to pt. | .28 |
| $1\frac{1}{2}$ | 19 or 20 | 1″ or $1\frac{1}{4}$″ pt. to pt. | .32 |
| $1\frac{5}{4}$ | 19 or 20 | 1″ or $1\frac{1}{4}$″ pt. to pt. | .38 |

Above prices cover Saws Set and Filed but not Brazed.
If not Filed and Set, deduct 4 cents per foot.
Brazing — $\frac{1}{4}$ to $\frac{1}{2}$ in., 50 cents each; $\frac{5}{8}$ to $\frac{7}{8}$ in., 60 cents; 1 to $1\frac{1}{4}$ in., 70 cents; $1\frac{3}{8}$ to $1\frac{3}{4}$ in., 80 cents.

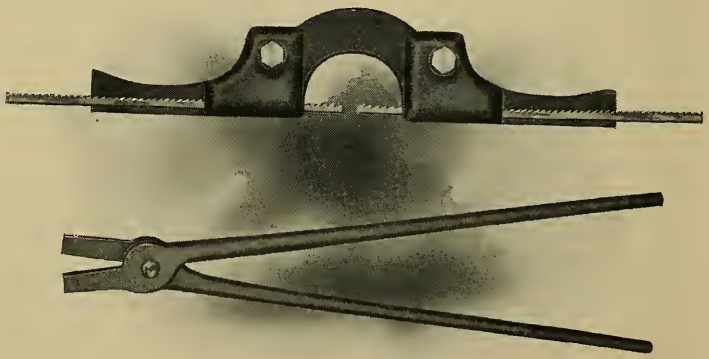
# Brazing Lamp



A popular lamp with saw fitters. Produces a hot pointed flame. Excellent for brazing and other work for which a common blow torch is used.

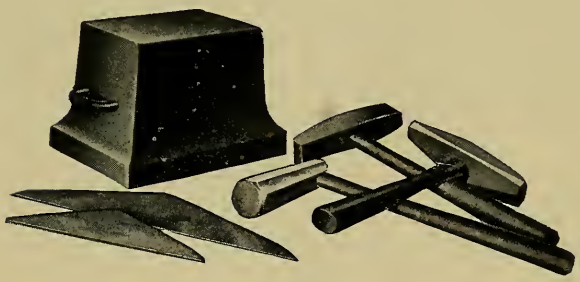
# Band Saw Brazing Clamp and Tongs

This design of Clamp and Tongs is generally used on narrow band saw work.



# Saw Makers' Tools

## Anvil, Hammers and Straight Edges



Circular and Band Saw Anvils made with cast steel face, hardened and polished. Saw Makers' Hammers of fine steel. Straight Edges of popular design.

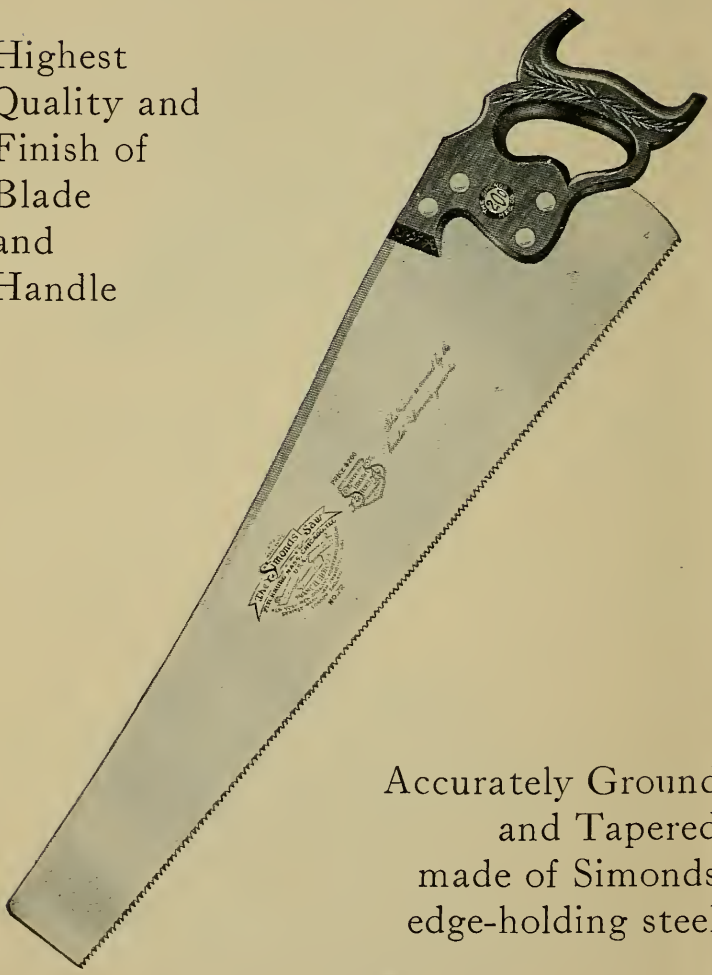
---

# Saw Swages


Simonds Swages are correctly constructed and used extensively. They are designed for shaping the point of the tooth, squaring up the cutting edge, and giving body to the swage point. Prices furnished on request.

# Simonds Blue Ribbon Hand Saws

Highest
Quality and
Finish of
Blade
and
Handle




Accurately Ground
and Tapered
made of Simonds
edge-holding steel

**Ask your Hardware Dealer**

# Simonds Hack Saws


Simonds Hard Edge Hack Saw Blades are the most economical because they cut fast, remove less metal and outwear other makes. When properly used they do not break. The steel in these blades is toughened by a special Simonds process.

---

# Simonds Files

These are high grade files for use around the mill. They are subjected to rigid tests. The Simonds Cross-cut File is especially designed for filing cross-cut saws.

## Simonds Manufacturing Company

**Fitchburg, Mass.**

17th Street and Western Avenue
Chicago, Ill.

90 West Broadway
New York City

402 Occidental Avenue
Seattle, Wash.

85 First Street
Portland, Oregon

239 Court Avenue
Memphis, Tenn.

420 Canal Street
New Orleans, La.

12-14 Natoma Street
San Francisco, California

## Simonds Canada Saw Company, Ltd.

554 Beatty Street
Vancouver, B. C.

55 Water Street
St John, N. B.

St. Remi Street and Acorn Avenue
Montreal, Quebec

## Simonds Saws, Ltd.

53A Bayham Street, Camden Town
London, N. W., England

## Simonds File Company

**Fitchburg, Mass.**



## Simonds Steel Mill

**Lockport, N. Y.**

PRINTED IN THE U. S. A.
THE DAVIS PRESS WORCESTER