THE

SAWYER'S COMPANION;

OR,

INSTRUCTIONS FOR USING AND CHOOSING

BOTH

LONG AND CIRCULAR SAWS.

BY

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WILKESBARRE,
LUZERNE COUNTY, PENNSYLVANIA.
1857.

TO

O. D. MUNN, ESQ.,

FOR HIS UNTIRING EFFORTS,

THROUGH THE COLUMNS OF THE SCIENTIFIC AMERICAN,

TO DISSEMINATE NEW AND USEFUL KNOWLEDGE, AS WELL AS

FOR HIS DEFENCE OF PATENTEES,

AND SYMPATHIES WITH THEM:

THIS BOOK IS RESPECTFULLY DEDICATED, BY

THE AUTHOR.

STEREOTYPED BY
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PREFACE.

To the Reader.—The Lumbering business has become one of great magnitude, involving the investment of millions of capital, and it is constantly on the increase.

Fortunes have been made by it, and fortunes lost; but oftener lost by the want of judicious management, and good machinery; but oftenest, by poor, and *badly dressed or badly fitted saws.*

A poor mill, with a well fitted saw, not unfrequently produces more net profit, than a good one with a badly fitted saw. The latter requires double power, and is therefore subjected to double wear and tear, besides making an inferior quality of lumber.

Sometimes a saw will bear double the feed that it will at other times, and will work with as much ease, as every Sawyer knows.

Now, how can the cause of this difference be known, and how remedied?

The design of the following pages is to furnish that information: and this is the only apology the author offers for the introduction of this book to the public.

The owner of a mill, who lacks experience, with this book in hand, can save himself from the imposition of inexperienced Sawyers; and such Sawyers may soon become expert workmen by the same means; thus rendering this laborious and toilsome occupation, comparatively pleasant and profitable.

Small and constant losses are more ruinous than large ones; for a failure in the former case, generally leaves a man without credit; but, with a failure in the latter case, it is easier to retain a character for honesty and capability, besides having the sympathies of his neighbors, and that is equal to a small capital.

There are a few weak points about saw mills, which, together, not unfrequently consume fifty per cent. of power; and this occurs from a want of knowledge, and not for the want of funds; for many times, the same money, properly laid out, would be more than sufficient to add the requisite strength, making a mill worth double its former value with these deficiencies.

Badly fitted saws, with defective and *badly used machinery*, are sufficient, either of them, to sink a handsome profit, and not unfrequently ruin a man; but combined, like the sting of a viper, they are, *sooner or later, sure to destroy.*

INDEX.

THE SAWYER'S COMPANION.

PART I. Choosing or Quality.

Section 1. soundness of teeth.—In selecting a saw, first examine the teeth, and reject all such as have any signs of splitting. These will be generally indicated by slight lines or seams along their tops and bottoms, which for this reason are worthless.

Sec. 2. a true plate.—It must be of an equal thickness throughout, and level on each side. If however, it be thinner on the back, and it taper truly, it will work with less set. Many saws are concave or hollowing one half their length, and the other half convex or rounding on the same side; others are concave their whole length on one side, and convex the other—a saw having these defects, cannot work as well as one that is true. To discover these defects apply a straight edge.

SEC. 3. GAUGE.—There is a gauge, below which all that is saved in timber, is lost in time, in consequence of a want of strength in the saw to perform what is required of it—and above which is a loss of timber in saw dust. The rule is—a gauge that will endure to give a firm cut. I have found that a saw of about 5-32 to 3-16 of an inch in thickness, or a gauge of No. 9, has sufficient strength to answer the demands of the rule; requiring only 1-32 of an inch set on each side, making about $\frac{1}{4}$ of an inch kerf, of which lumbermen seldom complain as wasteful; but less set will answer with a true plate.

SEC. 4. WINDING.—To ascertain this, take a couple of trying sticks (*t. t.* Fig. 1.) of equal width and with parallel edges, and between one and two feet in length, and lay one on each end of the saw, if their edges coincide throughout, that is right so far; then letting one remain, remove the other to different positions, and if their edges coincide at these different positions, of course it is true in this particular.

SEC. 5. GOOD TEMPER.—To ascertain this, stand the saw on the end and strike it with something; if it give out a dull heavy sound, it is too soft; if a high sharp sound, it indicates hardness. Again with the left hand hold of the top, let it lean the length of the arm—then press it somewhat sidewise with the other hand; if it spring back again

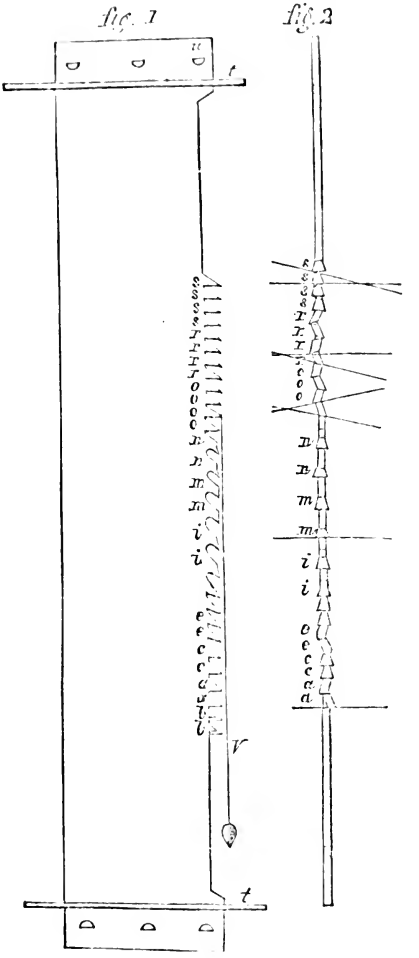
fig. 1
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straight, as a good hand saw would under similar circumstances, it is a sign of good temper. Then with a light hammer try the upper, middle, and lower tooth, by endeavouring to turn down their edges a very little; if these edges crumble off or break easily, the saw is too hard, or what is worse it is rotten; if they bend partly down before breaking, and do not fly like glass but tear off, it is very likely to be a good saw. But if these edges bend down somewhat as lead would without scarcely any fracture, the saw is too soft. Generally speaking, however, if a saw spring back again straight after having been pressed smartly sidewise, it is a sufficient test of firmness and good temper.

SEC. 6. WIDTH.—A saw of 14 inches in width is cheaper in the end than two seven inch saws, even if it cost as much as the other two. The reason is this: the wide one is stronger, and therefore may be thinner; besides after it is worn out, you have only one back to throw away instead of two. It is therefore cheaper by the first cost of one of the worn out saws, besides effecting a saving of timber and power.

SEC. 7. NUMBER OF TEETH.—A general rule is this—the finer the teeth the firmer the cut; therefore a thin saw with fine teeth, will work as well as a thick saw with coarse teeth; and of two saws of equal dimensions and quality, the one with fine

teeth, and the other with coarse; the one having fine teeth will make smoother lumber, bear heavier feed, and will be less troublesome to keep in order. It is true that it will require more filing at any one time, but then the gain in quality and quantity will more than offset that loss. From one inch to one and one quarter inches, is about the right distance between the points of the teeth, in a gauge of No. 9; a less gauge would require a less distance.

PART II. USING.

SEC. 8. HANGING SAWS.—A gate, frame, or sash saw requires four lug pins, half round and tapering; two at the top of the saw, and two at the bottom—the upper and lower front holes should be made in line with the roots of the teeth (*n. n.* Fig. 1. page 11). The back holes should be made within one and a half or two inches from the back of the saw, and another one midway between these—making six holes in all; the middle holes being used after the saw is partly worn.

SEC. 9. STIRRUPS.—Each stirrup should be furnished with four set screws, two in each jaw,

for the purpose of ranging and plumbing the saw. Afterwards drive wedges if deemed necessary.

SEC. 10. RAKE.—It is necessary that the saw should lean forward of a vertical line (v. Fig. 1, page 11), so as to give room for the log to move up to it when rising. This leaning of the saw is called *Rake* or *Overhang*.

SEC. 11. RAKE FOR ONE HAND FEED.—The rake must equal the greatest desired feed; which may be found by the following rule:

RULE 1. First set your crank up—then with your square or rule standing on the rabbet of the headblock, measure a distance up the saw equal to the *stroke* of your crank (which is always double its length), then hang a plumb and line (v. Fig. 1. page 11) from the edge of a tooth nearest to that distance, and bring that point of the saw forward, until the distance between the line and a bottom tooth, corresponding with the rabbet in height, or nearly so, equals your greatest desired feed; as at *b*. v. Fig. 1. page 11.

FOR EXAMPLE.—Suppose the length of your crank to be 12 inches; the *stroke* would be *double* that, which is 24 inches, and the greatest feed you desire, to be ½ an inch; then with your line hanging at the distance of 24 inches from the rabbet, bring the saw forward until the distance between it and the lower tooth, corresponding with the rab-

bet, equals a $\frac{1}{2}$ inch. Then fasten the saw in that position.

SEC. 12. UNNECESSARY TEETH.—It is desirable to cut out all the teeth below the rabbet; because it is a waste of time and files to dress them; and generally the upper two may be cut out to advantage, unless your logs run large.

SEC. 13. FOR DOUBLE HAND FEED, OR FOR ROTARY FEED.—Double hand feed means, when both hands push the ragwheel forward alternately. Rotary feed means, when the rag or feeding wheel has a continuous motion.

SEC. 14. RAKE FOR DOUBLE HAND, OR ROTARY FEED.—The rake must equal one half of the greatest desired feed; which must be ascertained by Rule 1, under Sec. 11; with this difference only, the distance between the plumb line and the lower tooth, is only *one half* of what that rule directs; because the log advances as much when the saw descends as when it rises.

SEC. 15. CHURNING THE SAW THROUGH.—When the diameter of the log is 5 or 6 inches or more, greater than the stroke of your crank or saw, sometimes it will clog with dust, it becomes necessary to churn the saw through; or in other words, let it make 3 or 4 cuts, and then let it strike as often without cutting, that will enable it to clear itself of dust, or it will clear itself, by feeding it *very* lightly.

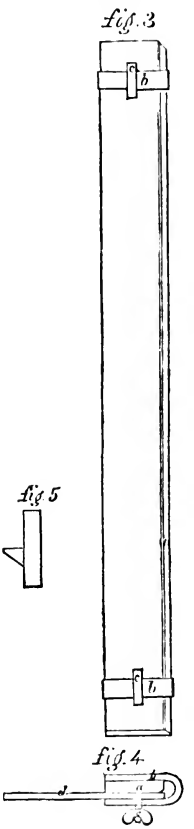
SEC. 16. MORE RAKE.—But if the average diameter of logs be much greater than your stroke; more rake must be given, than the rules require; so that it may clear itself. But with this extra rake a loss is sustained; as the saw would descend through a part of its stroke before it would begin to cut.

FOR EXAMPLE.—Your stroke of crank is 24 inches. The rake is a $\frac{1}{2}$ inch, and you are obliged to give it $\frac{1}{4}$ of an inch more extra, making $\frac{3}{4}$ of an inch in all. Now when the saw is up, the log has moved towards it a $\frac{1}{2}$ inch, and is still $\frac{1}{4}$ of an inch from it. Now in its descent it must pass one third of its stroke downward before it begins to cut; which is eight inches, making a loss of one third of the motion. It is a much better way to use a longer crank.

SEC. 17. JOINTING.—The tooth edge of a long saw should never be left crowning; as in that case it would be liable to run out of course. If one sixteenth of an inch hollowing the better, but not more than that. To insure perfection in jointing, use a rule made after the following dimensions:

Take a piece of hard wood board three fourths of an inch thick, four inches wide, and nearly equal in length to the distance between the stirrups. Then gauge $\frac{1}{4}$ of an inch each way from one corner, and dress it off to those lines; next, attach

to the side of this piece, opposite the bevel and near each end, a U, with two wood screws, taking care that the open end be placed opposite the bevel also; in the middle of the other side put a thumb screw, for the purpose of holding the rule tightly against the saw, in the proper position. This U, on the inside, is in length equal to the width of the body of the rule, and each side one half inch thick, and one inch wide, with the sides one inch apart—see the annexed Figures; in which Fig. 3, represents the body of the rule, *a*, is the beveled corner, *b*, *b*, are the Us, and *c*, *c*, the thumb screws. Fig. 4, is an end view with the rule attached to the saw, *d*, ready for the jointer.



JOINTER.—To make a jointer; take a piece of board one inch thick—four inches wide, and of the length of your file, shank and all; see *d*, Fig. 6, page 18,

and one piece one inch and five eighths wider than the file, and one inch thick, and of the same length of the other piece, as, Fig. 7, at *b*; next bed the file into one side of *b*, level with its surface, and flush with one of its edges. Then take another piece one inch square, of the same length, and fasten it on the edge of *b*, and against the edge of the file, with three wood screws to hold the file in place, as at *c*, Fig. 7. Then fasten *b*, Fig. 7, with the side opposite to *c* on the edge of Fig. 6, with three screws; taking care that the surface of the file stands at a right angle to the surface *d*, of Fig. 6, and it is ready for use. Fig. 8, is an end view showing the rule *k*, attached to the saw and with the jointer in position ready to be used. Having previously attached the rule to the saw, in such a position as you desire, place the surface *d*, Fig. 6, on the surface of the rule, and the file will come in front of the tooth edge; when a few strokes up and down will joint it straight. A good sawyer will joint once every twenty-four hours.

Fig. 6

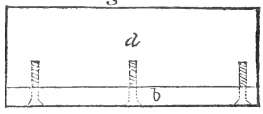


Fig. 7

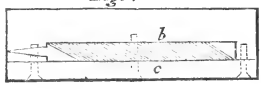
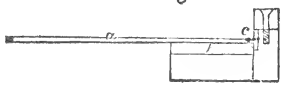


Fig. 8



OBSERVATION.—The jointer will naturally wear the edge of the rule hollowing, and thus the teeth will be dressed hollowing also, which was just before mentioned as being desirable.

The jointer may be used without the rule, by substituting a piece of board in the place of the rule.

SEC. 18. GUMMING.—There are two modes of gumming. The first with a file, and the second with a machine.

SEC. 19. GUMMING WITH A FILE is considered preferable, because it does not stretch the edge of the saw, and it should be done every twenty-four hours. It requires only three or four strokes more back with a file top and bottom, than is required in the middle, to keep it straight.

SEC. 20. IF GUMMING WITH A MACHINE be preferred, get one that is capable of gumming every alternate tooth from opposite sides; and always gum back an eighth of an inch afterwards with a file; as gumming with a machine is apt to stretch the edge, and gumming from one side only bends the saw one way, and bending it back again stretches it. But if your saw should have a loose or stretched edge after gumming with a machine, place it upon a smooth and true faced anvil and then with a light hammer give it an equal number of strokes on each side along its middle, this process will stretch the middle and tighten the edges.

SEC. 21. SETTING.—There are three ways of seting saw teeth, each of which is more or less in use among sawyers.

SEC. 22. BENT SET.—The first and most common way is to bend the teeth a little, back of their edges, outward enough to allow the saw a free passage through its kerf, without touching its sides (*a. a.* Fig. 2, page 11).

SEC. 23. BENT SET, NO. 2.—The second mode requires the tool or saw set, to take hold of the tooth about one third of its length back, and at the same time its end is bent outward; turn the bottom outward and upward also. The advocates of this mode claim that it holds set better, and cuts smoother than the first, because the tooth is wide where it is bent, and because it has a better side edge, being somewhat acute, and all saws having their teeth filed beveling on their bottoms possess the latter advantage.

SEC. 24. SWEDGED SET.—A third mode requires the teeth to be left without bent set, and to spread their edges wide enough for the set, with a tool called a swedge, which may be made thus, (see Fig. 13, page 22,) being about one half of an inch thick and one inch wide, and five or six inches long, and with a recess in one end, V shaped. It may be made of either one or two pieces, but in the latter case, it must be held together by a gripe or some kindred device.

But if made of one piece, the recess is mostly made with a three cornered file, and is farther finished with a knife-edged file, and fully so by a hard and well directed blow on a properly fitted cold chisel.

To use this tool, place its open end on the edge of the tooth, when a few strokes with a light hammer will spread it enough; giving the ends of the tooth somewhat the shape of a fish's tail as at *c. c.* Fig. 2, page 11. The edge must be wider than the whole set, and the surplus dressed off with the file gauge.

SEC. 25. WHEN a saw is too hard to receive bent set, it may be swedged in, if the steel be good.

SEC. 26. GAUGING SET.—In bent set the teeth are bent outward to a gauge or cross, which is made of some material and in such a way that it cannot spring; thus (Fig. 11, page 22) the screws 1, 2, 3, are placed on the side of the saw, back of the teeth, and the screw 4, is turned back of the plane of the other three screws; say 1-32 of an inch, or more or less, to correspond with the set desired as at Fig. 12, which is an edge view.

SEC. 27. SWEDGED SET.—For swedged set, a file gauge is best; as it leaves the outer side of the teeth both smooth and true.

SEC. 28. FILE GAUGE.—To make a file gauge; take one piece of board one inch thick, and four inches wide, and of the length of your file, shank

and all, as at *a*, Fig. 10, into the side of which, bed the file as much below its surface, as the set you require, with one of its edges flush with the edge of the board. Then take another piece *b*, three-fourths of an inch thick, and one inch and a half wide, and of the length of the other piece, and fasten it upon the edge of it, and against the edge of the file, to hold it in position, as seen in Fig. 10. Fig. 9, is an end view of the file gauge in position on the saw ready for use. To use this tool, apply it to the side of the saw with the file on that part of the teeth set out, when a few strokes will even the set. This tool will be found useful in correcting bent set, also, either in circular or long saws.

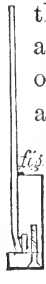


fig. 9

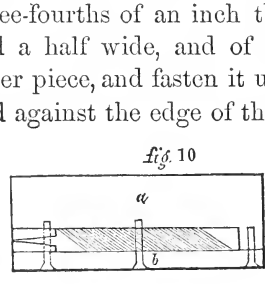


fig. 10

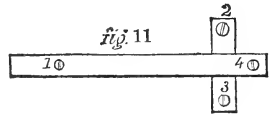


fig. 11

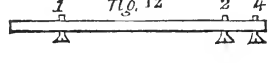


fig. 12

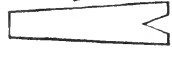


fig. 13

SEC. 29. WIDTH OF EDGE.—The outer corners of

the teeth naturally wear off faster than the other parts, but in sawing hard wood they wear very fast, causing them to become crowning, so that the distance across their crown is greater than the width of its cut, (see *e. e.* page 11, Fig. 2). In this case good filing and setting avail nothing; this shows the importance of keeping their edges swedged out fully. This defect is the grand reason why sawyers fail so often in making their saw work easily and strongly, but especially so in hard wood—for then they always require double the filing even if the teeth were never in so good shape.

PART III. On Filing.

Sec. 1. THERE are two general modes of filing, called, *square filing*, and *bevel filing*, each of which have their advantages, and disadvantages.

Sec. 2. SQUARE FILING teaches us to carry the file at a right angle to the side of the saw, or in other words, level, or square across, which makes it cut the timber square across the grain or at a right angle; the lines at *a*, and *m*. Fig. 2. page 11, show the direction of the file.

SEC. 3. FILING INSTEAD OF CUTTING.—As saws are commonly fitted, they are files on a large scale, scraping, or breaking, or filing out the dust, instead of cutting it out, as *a. a.* Fig. 1, page 11.

SEC. 4. AVOIDING THIS DEFECT.—Many ways have been devised for avoiding this scraping process, some of which have been patented, and all of them are more or less useful. Assuming what is true in this theory, that if the edge of the tooth can be so dressed as to make it *cut* instead of *scrape*, the defect is overcome; accordingly teeth have been filed more or less hooking, varying, from one degree to forty-five, as at *e. i. m.* and *n.* Fig. 1, page 11. With the latter angle, if the original shape of the point of the tooth be preserved, the top, or front of it will assume almost, if not quite, a vertical position, and especially so if the rake be taken into account; thus presenting the edges of the tooth to the grain of the wood in the desired or cutting position, as seen at *m. m.* Fig. 1, page 11.

SEC. 5. DIFFICULTIES.—But there are difficulties attending a saw, filed at any of these angles. The first of which is its inclination to draw forward into the log in its descent, imparting to it a vibratory or trembling cut, which renders its action uncertain and laborious.

SEC. 6. TO OVERCOME THIS DIFFICULTY a pat-

ent has been obtained for filing the top or front of every tooth to correspond with a vertical line, as at *m. m.* in Fig. 1, page 11, resembling a chisel edge with the face outward. But as soon as the edge is a little worn, it will make the saw frame labor on its slides.

SEC. 7. ANOTHER PATENT has been obtained for a heel or guide on the front of the tooth, and above its edge; as at *n. n.* Fig. 1; which avoids the first difficulty, and the defect in Sec. 6th, almost if not entirely. These heels or guides are dressed in line, the edge of the tooth projecting a little beyond its guide; this prevents its hauling into the log, and holds an edge longer.

SEC. 8. SECOND DIFFICULTY IS THIS; when a saw, dressed like either of those described in Sec. 6 and 7, strikes a knot which runs into a log horizontally, its action is like splitting, more than cutting; but one fourth of this splitting process may be overcome by filing every fifth pair of teeth fleam-pointed; as at *b. b.* Fig. 1, page 11; where both the fleams are shown on the same side.

SEC. 9. THE THIRD DIFFICULTY IS THIS; a saw or any other tool dulls much faster when cutting square across the grain, than it does when cutting at a beveled angle, as every one who ever cut a riding whip knows; notwithstanding a tool cutting at a bevel of forty-five degrees passes over a surface, as much greater as the diagonal of a square

is greater than its side, which is about as 10 to 7. We therefore resort to *Bevel Filing* to overcome the difficulties attending square filing.

SEC. 10. OF BEVEL FILING.—There are three modes, each of which may be varied to suit the mind of the sawyer.

SEC. 11. FIRST MODE requires both the top and bottom of the teeth to be filed beveling, and of the same bevel, or angle, making a fleam point or edge which cuts the grain of the timber, at two bevel angles, a horizontal and vertical, which is the easiest way of cutting; the cross lines at *o*, Fig. 2, page 11, represent the direction of the file.

SEC. 12. SECOND MODE requires that the bottom be filed at a right angle; as in square filing and the top beveling. This form cuts at one horizontal bevel angle, and cuts only half as easy as the first mode, and cuts as easy again as square filing, see cross lines at *s. s.* Fig. 2, page 11.

SEC. 13. THIRD MODE requires that the top be filed square, and the bottom beveling, which also cuts at two angles, as in the first; and is preferable to it, because it presents a better point, and is also as much better than the second as two angles are than one. Care, however, should be taken not to file too beveling, as in that case, if feed be crowded, the set of the teeth will spring wider as the saw descends, making your boards rough at

the bottom while the top is smooth. The angle should be such as will enable the saw to retain its set, which is about 25° or 30°. It does not require as much skill to file after this mode as the first and a little more than the second; see cross lines at *r. r.* Fig. 2, page 11. It may be said, finally, in reference to the best mode of filing for all kinds of timber, that for rough or knotty timber saw teeth should be filed but a *very little beveling;* but for fair timber it is better to file enough beveling to hold set good, as that secures the double advantage of holding set and cutting easily.

SEC. 14. HAMMERING.—In the first and third modes of bevel filing, hammering or turning down the edges of the teeth, (see *o. o. o. o.* Fig. 1, page 11,) is indispensable. In the second mode as well as in ordinary square filing, hammering will save near a quarter of the power. In the first and third modes of bevel filing, the splitting process in cutting knots is compounded with cutting (Sec. 8th, part 3) by hammering, which may be further overcome, by filing every fifth pair of teeth fleam-pointed; see Fig. 1, *b. b.* page 11.

SEC. 15. IF THE EDGES that were turned down do not wear entirely off before filing, take a framing chisel or an equivalent, and with the handle in the left hand and placing the face of it about one or two inches from the cutting end, on the bottom of the tooth and on this edge, and holding it

level and crosswise, strike it upward with a hammer until it is leveled up.

SEC. 16. HAMMERING HARDENS and refines the steel, besides preserving the original width of edge; it will be necessary to use the file gauge to even the teeth which were spread by this process.

SEC. 17. A STRETCHED EDGE.—After a saw stands the foregoing tests, it may not work well, from two causes: either on account of a stretched edge which was done when its teeth were cut, or from a weak spot caused by bad treatment in making. The first may be overcome by gumming back an eighth of an inch at the first filing, and this ought to be done with every new saw, as a matter of precaution. The second may be overcome entirely by not using it, or hammering it (see Sec. 20, part 2); for a poor saw is dear at any price, and a good one cheap at any price.

SEC. 18. TO ALLOW A SAW TO GET HOLLOWING, from a fourth to a half inch, is generally equal to a breakdown, and a loss of from one eighth to one fourth of the work it would do when in good order.

SEC. 19. SAW TEETH should be equal in size, and depth, or the longer will spring inward or outward more than the shorter, according with the mode of filing. If beveled on the bottom, outward, if square, inward; they should be of the same angle

or hook on the bottom. To secure this result, make a bevel, with the stock equal in length to two or three spaces of teeth, and with a tongue, having the shape and depth required for the tooth. Then lay out, and file to it. Or make the tongue of the shape of the space between them which is more convenient, (Fig. 5. page 17.)

SEC. 20. DEFECTS.—A saw of the proper gauge or thickness, may give a trembling cut, either from having too *coarse teeth*, or uniform *uneven set*. If *set* be all on one side, or nearly so, it can be made to run straight, by filing to suit that set. The side without set should be filed beveling on the bottom, while the other should be square, and their tops must in this case, and all cases, be filed so that their edges will present the same breast or horizontal angle. A saw having too *coarse teeth* and with the same feed, will not work as well, nor as easily, as one with teeth to suit the thickness of the plate. Because in the first case, each tooth has more to do than its strength will bear, and if urged with feed it will tremble, and tear out its work, making rough lumber; and in both cases, a saw with the best temper, and perfect in every other respect, will not work with but little strength; with uniform uneven set, the centre of pressure is on one side of the centre of the plate, and therefore cannot work with its whole strength.

SEC. 21. SOMETIMES a saw, after starting into a log plumb, and straight, will come out at the other end winding, or out of plumb. If it lean toward the log, it is because there is more set in the top on that side, or that the teeth are longer on that side at the top, or that they are filed more beveling on that side at the same place, or it must be out of range at that place. If it lean from the log, the reverse is true.

SEC. 22. AGAIN, a saw may run straight with light feed, when with common it would sheer a little, or, in other words, saw in a curve. This may be caused by teeth being longer on the outer side of the curve, or by more set on that side, or by being filed more beveling or more hooking on the same side.

SEC. 23. ZIGZAG.—The course of a saw may be zigzag, or cut in short curves. This may be caused by unequal or zigzag set, or unequal filing; and if the board be ridged, there is too much set in the saw.

SEC. 24. TEARING OUT AT THE BOTTOM may be caused either by having too coarse teeth, or by the saw being too hollowing, or by too much rake or overhang. In this latter case it will make a pounding or jerking noise in its descent.

SEC. 25. CARRIAGE OUT OF LINE.—If the saw be in good order, and still saw curving, examine your carriage and its ways.

SEC. 26. DISHING.—If your saw make dishing or hollowing boards, it is because its teeth are filed more beveling on the side toward the hollow either on their tops or bottoms, providing, however, that the set is even, and teeth of an equal length; and it may be caused by the teeth being filed more hooking on that side than the other.

SEC. 27. IF YOUR SAW have equal set, and its teeth equal in length, and in range, and does not come out in line, it is either crowning on its tooth edge, or it is badly filed. In the latter case, it is much better to alter the filing on that side towards which it runs, than it is to alter the set; because altering set changes the centre of pressure to one side of the centre of your saw plate, thus reducing its strength. In the former case, it requires jointing *straight*.

SEC. 28. STRAINED TOO MUCH ON THE BACK.—When your saw is strained more at its back than its front, it will run out of course. This is the reason why the front lug pins in a mulay saw should be nearly in line with the roots of its teeth; and any saw with its back strained more than its edge will not work well, nor scarcely at all, however well it may be fitted in every other respect.

OF CIRCULAR SAWS.

PART IV.

SEC. 1. AS CIRCULAR SAWS DIFFER in action and circumstances from long saws, so they require somewhat different treatment in some respects. Though most of the rules applicable to long saws, are also applicable to them, as well as the tools.

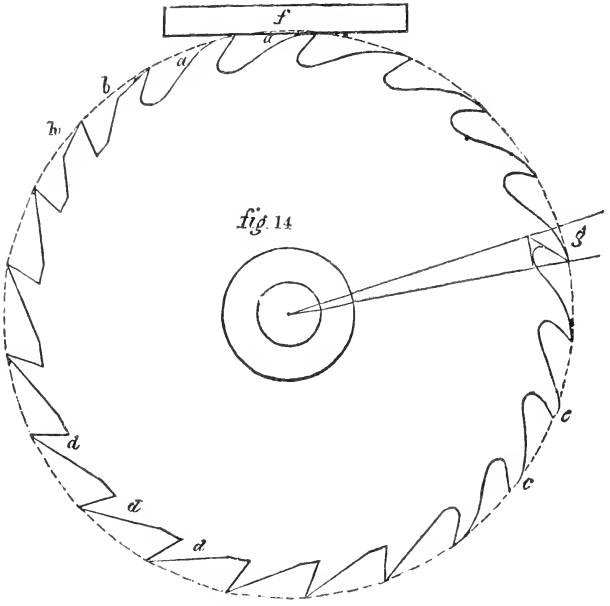


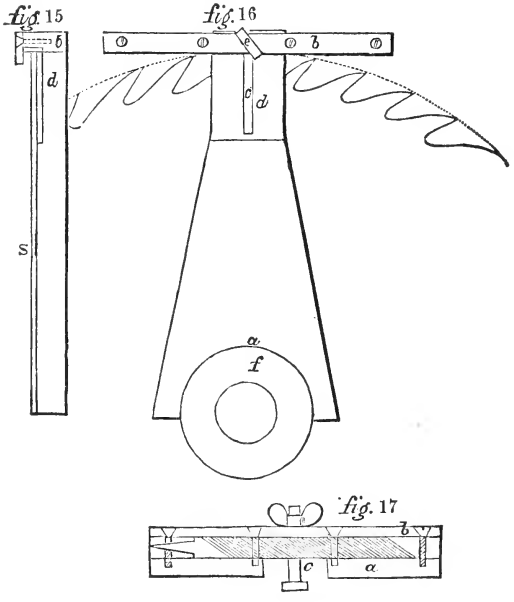
fig. 14

SEC. 2. GAUGE.—The gauge depends upon their quality of steel, their number of teeth, and their diameter. The larger their diameter, the thicker they must be in order to work with firmness. Good temper and finer teeth may reduce the gauge somewhat.

SEC. 3. JOINTING.—The extremities or edges of the teeth must be kept at an equal distance from their centre of motion, which in all well made arbors is the centre of the arbor.

SEC. 4. TO MAKE A JOINTER.—Take one piece of hard wood board, (*d*, Fig. 16,) one and one fourth of an inch thick, and three inches longer than the radius or half diameter of your saw, make one end two inches wider than the diameter of its collar; then cut a gap, *a*, out of this end, of sufficient size to allow it to sit astride of this collar, and three inches below its centre. Then make a slot or mortise, *c*, through the other end, five inches or more or less in length, according with the size of the saw, and a half inch wide. Then dress this slot end down to one inch in thickness, and in length to three fourths of an inch below the lower end of the slot. Then take another piece of board, (*a*, Fig. 17,) one inch wider than your file, and one inch thick, and as long as the file and shank. Then bed your file into one side of it flush with one of its edges, (taking care that the file, when attached to this shank piece, stands at a right angle

with it,) and then take another piece, (*b*, Fig. 17,) of the same length and one and a half inch wide, and one half inch thick, and fasten it with four wood screws on the edge of the other piece, and against the edge of the file, to hold it in position. Then cut out of *a*, a gap, *c*, full equal to the width of the slot end of the shank piece. Then place it transversely across this slot end on the side reduced, and fasten it with a thumb screw in a position to suit the size of saw. Fig. 15, is an edge view of the



same tool in position on the saw. To use this tool, place the open end astride the collar, and bring the file down to the shortest tooth, or to the edge of the one which is at the least distance from the centre of the saw, and screw it fast; then pressing it down on the collar, and against the side of the saw, move the file forward until the edges of the teeth are at the same distance from the saw centre.

SEC. 5. FILING CIRCULAR SAWS.—There is but little objection to filing them square, because the portion of timber cut at a right angle is so small, that but little loss is sustained in dulling fast, or cutting harder on that account, providing the teeth are filed hooking enough.

SEC. 6. BEVEL FILING.—The chief advantage in filing beveling, on the bottom of the teeth, arises from their holding set better.

SEC. 7. SHAPE OF TEETH.—Teeth with circular tops, (*a*, *a*, Fig. 14,) present their edges to the timber in a cutting position, thus avoiding the scraping process attending triangular teeth, (*d*, *d*, *d*,) but do it more perfectly, when their tops, as at *a*, *a*, near their edges, nearly coincide with their line of motion (*b*, same Fig.), thus avoiding the necessity of hammering. *h*, *b*, are square topped teeth: one with a curved root, and the other with an angular. The curved root is best.

SEC. 8. TRIANGULAR TEETH.—But it is necessary

to hammer triangular teeth to make them cut easily and to give them the same advantage of the circular teeth.

SEC. 9. BUT THERE IS DANGER in dressing circular teeth, or in hammering triangular ones, of bringing their edges within their line of motion, as at *c*, *c*, Fig. 14.

SEC. 10. TO DISCOVER THIS DEFECT, apply a straight edge as at *f*.

SEC. 11. THE PROPER HOOK OR ANGLE, for the bottom of the teeth in a circular saw, is the diagonal of a square, or, which is the same thing, an angle of forty-five degrees. To ascertain this, draw a line from the centre of the saw to the edge of a tooth. From this edge, measure the depth of the tooth desired toward the centre, and let that distance or depth form one side of a square. Then draw a line from corner to corner, and this is the desired angle, (Fig. 14, at *g*.)

To secure this angle easily, make a bevel with the stock equal in length to one and a half spaces between the edges of the teeth, and with a tongue set in the middle, and equal in length to the depth of tooth, then set it at that angle; then with a slate pencil or lead mark it out. The top of the tooth may be dressed of the shape desired, or the depth may be marked by striking a circle with a pencil at their roots. This bevel differs from Fig. 10, page 22, only in the shape of its tongue.

SEC. 12. FOR CROSS CUTTING.—Teeth must be filed fleam-pointed, with the exception of every fifth pair, which should be filed square for the purpose of taking out the core or chip left by their "ILLUSTRIOUS PREDECESSORS," and for cutting knots; see *b*, *b*, Fig. 1, page 11.

SEC. 13. THE REASON OF THIS IS, that the teeth being fleam-pointed, they cut the chip wedging of necessity, and therefore crowd it from them instead of drawing it toward them, as is the case with long saws; and for this reason cross cutting circulars do not require a high motion in order to make them work the fastest. But filing a part of the teeth square as in Sec. 12, will allow an increase of motion; under other circumstances its edge should move about seventy-five feet per second, and that of long cutting circulars should be three times that number of feet per second.

SEC. 14. DEFECTS.—The greatest difficulty attending the use of circular saws, is their tendency to heat when out of order, causing them to *waver* or *stagger*. This may be caused by badly constructed machinery, as well as bad dressing; and, first, when the teeth are more hooking on one side than the other, the hooking teeth cut easier, and the others dull faster, and consequently tend to heat that side.

2. Crowding feed on a dull saw, will make it heat and stagger.

3. If your saw be out of round, the teeth farthest from the centre must do the most work, and will therefore heat sooner than if the labor were equally divided.

4. Unequal or zigzag set, will cause it to heat.

5. Or anything that drives it out of course, will cause it to heat more or less, by making the plate rub against the log; besides the arbor is crowded endwise against its end or its shoulder, thus heating it and causing the centre of the saw to expand also.

6. When the top of the teeth, just back of their edges, project beyond their line of motion, as at *c*, *c*, Fig. 14, page 32, or, which is the same thing, strike the timber before their edges, this will cause it to heat in spite of all the filing and setting in the world. Apply a straight edge to ascertain this as at *f*, Fig. 14, page 32.

7. Another cause is, that the saw may not be in line with the carriage, or the saw may be in a correct position, and the carriage not run in line with the saw.

8. To tight a belt or band will cause the arbor to heat, which of course extends to the saw.

9. Short belts are apt to run tightly from the manner in which they are stressed, and if not stressed at all they are worse still. This may be remedied by giving length of belt enough

to allow it to wrap the saw pulley nearly all around, and it can be made to work in that position, by placing the stress pulley as near the saw pulley as possible, which wrapping the pulley more, requires less stressing, and therefore a looser belt.

10. Poor brasses, or brasses not suited to the temper of the arbor, will cause it to heat.

11. If your saw arbor is not level, it crowds endwise when cutting, producing the same effect.

12. If your arbor is *level*, and at a right angle to the motion of your carriage, and the next shaft is not in line with it, or its centre parallel every way, it will throw the arbor either one way or the other, which will cause it to heat.

13. If your arbor crowds against its shoulders, it will heat, there must therefore be a little freedom or play, say 1-16 or $\frac{1}{8}$ of an inch altogether.

SEC. 15. SCRATCHING.—If your saw run out of course, and from the log, it will scratch on its return.

SEC. 16. IF YOUR SAW RUN in course, and scratch on its return, it is because that either its arbor is not level, or the next shaft draws it endwise from the log when working; or from a warped edge, which when cutting, works truly or nearly so, but as soon as free assumes its warping or staggering edge, caused by previous heating, and therefore cannot work truly.

Or if the carriage is not parallel with the plane of the saw, the saw will crowd its arbor endwise, toward the side, its arbor is farthest from the tail block, or stock; on its return, it will assume its original position and scratch. Again, if it scratch at either end, and not in the middle, the carriage or blocks are out of order. If it scratch when cutting forward, it is because a tooth has more set than its fellows.

SEC. 17. WHEN a circular saw is in perfect order, and its machinery all right, it may not work up to its capacity, in consequence of having too high a motion. In this case its power is consumed by friction.

SEC. 18. SKILL.—The only remaining difficulty is a want of skill to file perfectly. If this be not supplied by experience, it must be done by machinery.

When there are many saws to file, as in a gang mill, a power filer is advisable and economical.

But for single saws, where there is a lack of skill, a hand filer is advisable, or some device which will direct the motion of the file. There are a number of good hand filers, but I have found that any filer that must be attached to the saw with the screw or wedge, is soon laid aside by sawyers in consequence of its apparent unnecessary consumption of time; besides, it is humiliat-

ing to acknowledge a want of skill by their use, although that would teach them how to file very fast. I am of the opinion, that a common sawyer, who saws by the thousand, would be vastly a gainer by using one. The author is the inventor of four different filers, the last of which is the most simple of all, being held in the hand with full command of the file, and in such a way that in two or three weeks' use, it will confirm the sawyer in the habit of carrying his file correctly, and is the readiest way to learn, being a correct teacher, combining its instructions with the effort to file. On the receipt of one dollar, I will send one by express, or send a drawing by which one can be made cheaper than the express charges would be; with this, a saw may be filed a hundred times in succession, so that it will not vary from a true line half the thickness of the saw, so far as filing is concerned.

SEC. 19. FILES.—The best files with which I am acquainted, are *the double-cut-single* files. They make a fine smooth edge and last well.

SEC. 20. CIRCULAR SAW teeth should be filed concave at their roots with a half round file, and it should be combined with a convex line which forms the top of the next one, for the purpose of cleaning itself of dust easily and strengthening the tooth at its base, and with the convex top so that its edge will be presented to the timber in a cutting position, as seen at Fig. 14, page 32.

SEC. 21. IF ANY SAW cut *ridged* or *rough*, it is because it has more set than its strength will allow, or too coarse teeth which, when crowded with feed, causes each tooth to do more than it can bear, and therefore has a tremulous motion caused by its springing to obey its mode of filing. A circular may cut ridged in consequence of a warped edge.

SEC. 22. RANGING SAW.—Hang your saw in the desired position. Then move the carriage forward until the tail block strikes its edge; mark that spot, and stick an awl there; then run the carriage back ten or twelve feet, attaching the end of a line to the awl. Then carry the line forward and back of the saw, bringing it at the same time against the side of the saw; if the line touch back and front when stretched it must be right.

SEC. 23. A CIRCULAR SAW requires more power to make a cut through a log of a given diameter than a long saw does with equal feed and quality of timber. In a log of two feet in diameter, the length or depth of kerf of a long saw would be only two feet, while it would require a circular saw to be at least four feet six inches in diameter to cut a board of the same width. The most of the circular in cutting contact at once is one fourth of its circumference, *minus* that proportional part belonging to its collar, which is 3.5343 feet *minus* .3927 feet, equal to 3.1416 feet, the length of the circular

kerf; and 3.1416 feet *minus* 2 feet, equal to 1.1416 feet, the difference between the two kerfs. Now if the long saw had equal leverage, and a continuous motion, it would require equal power. But the leverage of this circular is two feet three inches, and that of the long saw is ordinarily one foot; consequently the former requires more than double the power. Again, the latter cuts only half of the time, while the former cuts all the time, and therefore requires still more power. If you file your long saw beveling, the circular has no advantage in cutting easier, otherwise it would have this advantage. The circular requires at *least* double power.

SEC. 24. THE AUTHOR IS the inventor of a *filer* for circular saws also, which is very simple in its construction, with which any angle, square or beveling, can be filed with uniformity and truth. This filer, together with that mentioned in SEC. 18, would furnish any sawyer with the means of dressing both circular and long saws successfully, so far as filing is concerned; and in connection with the other tools he would be competent, under any circumstances, to make a saw work well or condemn itself.

OVER FIVE HUNDRED MILLS IN MOTION.

Thirty three per cent. saved in the Manufacture of Lumber

BY USING

S. E. PARSONS'

IMPROVEMENTS IN SAW MILLS.

Parsons' Self-Straining Stationary Saw Frames

Hold the Saw in its proper position, stretching or straining it enough to make it run straight and do the best of work, and make a saving of one-third of the power commonly used in the old mills. *This IMPROVEMENT for Mills on small streams is of great advantage, enabling them to double their work during the year.*

CERTIFICATES.

LOCKPORT, 8th Mo. 13, 1852.

Friend Parsons:—I have got my mill speeded up to 300, and a neater running saw than the one thee put up was never seen. it beats every thing of the saw kind, the lumber is very smooth and it cuts fast too, and does it with ease. I have not spent six cents in repairs in nine months.

Yours truly, L. A. SPALDING.

I hereby certify that I have had in use one of Parsons' self-straining Saws for the last nine months, and I am satisfied that it is the best I have ever seen, it will cut ¼ more lumber than a Gate mill with the same power, and make it most merchantable. I also recommend his Friction Feed Works as one of the best in use. If any one doubts the above they can have their doubts removed by giving me a trial. STEPHEN LEE.

Wright Township, Luzerne Co., Pa., Feb. 3, 1853.

I have sawed with one of Mr. Parsons' self-straining Saws for the last nine months, and find that it will bear ½ inch feed in oak and will run from 100 to 500 motions per minute with safety, and with ¼ less power than the Gate mill; it cuts lumber the fastest of any up and down saw that I have ever seen, his Friction Feed Works can't be too highly recommended. I have cut 3,500 feet of inch boards on a tour of 12 hours. HORACE STEBBINS, Sawyer.

Luzerne Co., Pa., March 22, 1854.

This certifies that I have used one of S. E. Parsons' self-straining Saws in use for some time past, and that I saw as much lumber now with 60 lb. of steam as I ever did with 100 lb. when I used the Gate. My average tours of 12 hours are 3,000 feet, but I have sawed 5,500 feet on a tour, and I take pleasure in recommending it to be the best of anything I have seen for sawing lumber. LEONARD DAVIS.

Hebron, Potter Co., Pa., July 7, 1854.

I hereby certify that I have had one of Parsons' self-straining Saws in use for the last four months, and it does not require so much power by one-third, to do as much as the Gate did, and makes the lumber smoother and is not difficult to keep in order. STEPHEN SLYKER.

Rockport, July 19, 1854.

I hereby certify that I have had one of Parsons' self straining Saws for nine months past in use, and I can recommend it to all who are building new mills. It does its work well and will cut as much again as a Gate mill with the same power, and we have never spoiled a board since we commenced using it, and we were the first saw down to 2½ inches in width. THOS. R. BOYD.
Rockport, July 18th, 1854.

This is to certify that I have tested S. E. Parsons' self-straining Saw with a mercury pressure gauge, and found that 60 lb. of steam gave as good motion with the same feed and depth of cut as 90 lb. did with the Gate.
Binghampton, Nov. 19, 1853. DONALD GRANT, Millwright.

Parsons' Iron Rotary Friction Feeding Works

FOR COMMON, CIRCULAR OR PORTABLE SAW MILLS

Are superior to every other, as they give over 100 changes of feed, without any loss in changing, and thus enable the saw to cut all it can bear, and require only one Belt to drive them, which for perfect action and durability have never been beaten. The Feeding Works in common use are attended with an almost constant loss. For instance, suppose your Saw will bear 2¾ changes of feed, it would have to fall back to 2 changes, thus losing ¾ of a change every cut of the saw, which will amount to a great many feet in the course of a year, *besides they are very liable to get out of order.* The CARRIAGE IRONS are perfect and simple, and enable the carriage to move so easily, that it saves from one to three horse power. These, with the Feeding Works, have only to be seen to be approved. The IMPROVED MILL DOGS will hold a 2 inch plank firmly until sawed, or a 3 feet log without spotting,

PARSONS' DOUBLE ACTION IRON WATER WHEEL,

Which for simplicity and durability, strength and economy, is very desirable.

Reuben Riches' Center Vent Iron Wheels and Iron Scrolls,

Which can be used with equal advantage with the shaft vertical or horizontal, with direct action or geared, and suitable for all heads, *giving out seventy per cent. of useful effect and so WARRANTED.*

PARSONS' IMPROVED CIRCULAR SAW MILLS

Will cut a board twice as wide as is commonly done with the same sized saw. A 40 inch Saw will cut a board 30 inches wide, and costs only $33.00, while in the old way it would require an 80 inch Saw to cut a board as wide, costing $700.00. The small Saw needs to be only 3-16 of an inch thick, while the larger would require to be ⅜ of an inch, thus wasting every fifth board, requiring four times the power, and three times the trouble to keep it in order.

Parsons' Portable Saw Mill, for Farmers,

Gives employ for their idle teams in winter, enabling them to saw their own lumber, at less expense than hauling their logs to neighboring mills, besides saving their slabs for fences.

☞ The Subscriber is prepared to furnish any of the above improvements at short notice, besides Steam Engines of the very best kinds for Saw Mills, either geared or direct attachment, and he is ready to contract for building Mills, from $500.00 to $10,000.00, that will be warranted to do one-third more work than any old fashioned Mill costing the same amount. Having traveled the last four years among Saw Mills, he feels prepared to build a better Mill with his improvements, than any other man. All enquiries respecting his business will be promptly and cheerfully answered, and drafts of Mills furnished to order. Having attended the Crystal Palace, in 1853, for a number of weeks, he is prepared to furnish valuable information of the best machinery there. *Ample security* given for the performance of all contracts. Address the Subscriber at Wilkes-Barre, Luzerne Co., Pa. SANFORD E. PARSONS.