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Canadian Woodworker

A MONTHLY JOURNAL
FOR ALL CLASSES OF WOODWORKERS

Vol. 1 TORONTO, AUGUST, 1908 No. 6

CANADIAN WOODWORKER

A Monthly Journal for all classes of Woodworkers.

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Practical men are invited to send to the Editor signed articles or paragraphs upon any subject of interest to their fellow woodworkers.

PROSPECTS FOR EXPORT.

There can be no doubt that the future holds in store many opportunities for profitable export of Canadian articles in the woodworking line, both in respect to goods manufactured of wood and in respect to machinery for making the same. In New Zealand some close observers believe a profitable trade might be developed in sawmill outfits. One or two large mills are to be erected shortly in various parts of the Islands, says the Canadian trade agent there, but as a rule the mills being erected there are small, owing to the restrictions imposed by the Government on the amount of timber land that can be taken up for lumbering purposes.

There seems to be in parts of England a fairly large demand for piano parts. One large London firm expresses a desire to be placed in communication and contract with parties in Canada for a supply of not less at a time than 5,000 white bass keyboards.

Reference has already been made to the large number of applications received from British firms for several different classes of woodenware articles. Harrison Watson, the trade agent for the Dominion in London, speaks of a firm who would gladly do business in Canada in such lines as tools, broom, mop and pick handles, shovel trees, dowels, mouldings, skewers, closet seats, wood door knobs, electric bell pushes, square wood blocks, chair seats and legs, sash pull handles, blind rollers and ends, cornice pole ends, sieve hoops, taps, towel rollers, hat racks, dairy accessories, bread platters, washboards and laundry appliances, wheelbarrows and trucks, spindles, legs and balusters, pedestals, shelves and brackets, tables and various kinds of furniture; in fact, almost anything that can be made of wood. In many cases no doubt the margin of profit would be small, but these articles are required regularly in such large quantities that the business might easily prove a profitable one to a manufacturer with facilities for producing on a large scale and with good transportation facilities.

UNITED STATES AND CANADA—A LUMBER CONTRAST.

At Ottawa last month took place a meeting of manufacturers, limit-holders, and wholesale dealers in lumber, which resulted in the formation of an important organization under the name of the Canadian Lumberman's Association. The objects of this body will be very similar in scope to those of the National Wholesale Lumbermen's Association in the United States. That is, it will keep a close watch on any proposed legislation affecting the lumber interests, will keep its members posted on all developments, both commercial and political, etc. The first move of the Association after its inauguration was to send a deputation to the Dominion Government to urge them to place a protective duty on southern pine and hemlock coming in from the United States. On a basis of fair dealing for all there is, of course, a good deal to be said in favor of such a step, because Canadian lumber cannot enter the United States on an equal basis. From a practical woodworker's point of view, however, something can be said on the other side. There is no doubt that the United States is rapidly exhausting her lumber supplies. At the present time, owing to the trade depression there and the fact that they need all the ready money they can get, the lumbermen are sending over to this country surplus stocks of wood at a low price, which is some benefit to Canadian consumers of that article. This all helps in the impoverishment of the United States of its forest resources and, incidentally, in the prevention to that extent of a similar impoverishment of our own.

This will bring still nearer the day when the centre of the whole woodworking industry of the continent will be within its northern half. Canada already has great natural advantages in this direction, but they will be increased immeasurably when the exhaustion of the United States supplies is more nearly completed. This is a selfish aspect of the question, but nationally and from a Canadian standpoint it is a very important one.

Planing and Molding

SOLID STOCK OR VENEER?

It seldom makes any very material difference to the builder whether some of the work is veneered or solid, so long as the face work shows the proper wood and the construction is such that the various members will stay in place when completed and placed in their permanent positions. The primary idea in facing up jambs, casings and mouldings with the finish wood is to save material, but this is often accomplished at a positive financial loss when the important item of labor is figured in. If there are a great many pieces of the same size so that the clamps may be filled to advantage as well as an economical run on the cores and veneers beforehand, it may pay even to veneer ⅞-inch stock. It sometimes occurs that the stock of the finishing wood is so low that veneering is the only way out of the dilemma; but, of course, this has nothing to do with the general run of planing mill economics, and it is for general results that we are constantly striving. It is the habit of work that tells if we allow ourselves to form one, which I maintain we should not, but rather conduct every separate job so as o require the least material and labor to turn out a first-class product.

One class of details often furnished by architects call for the veneering of one side of a solid piece of lumber, such as panels, jambs, wide casings, base-boards and the like. To the operator of little or no experience in this kind of work the construction is liable to prove an expensive and exceedingly annoying experiment, for it is only with the greatest care and precaution that a good job can be turned off in this manner. In the first place it is very difficult to get the cores and veneers of the same condition of dryness, and even if they are, it is nearly always true that one or the other will absorb more water from the glue than the other, and so warp the piece out of flat.

The most common trouble is that the expensive woods are nearly always bone dry, while the cores are usually brought in from the yard a short time before the job is to be put up, and if they show dampness are put through the kiln, if the mill has one. If the job is to be put up with the one veneer, the stock should be stacked up with the veneers in place between the cores and the pile weighted down and left for a time sufficient to distribute the moisture equally between the veneers and cores, a time usually not less than three days, depending upon the thickness of the veneers, which in this class of work is usually not less than ¼-inch. Then, after gluing, if it is convenient to let them stay in the press for a considerable time, the stack should be taken out as soon as the glue will permit and a caul or piece of common board placed on each side and the whole bunch held with hand-screws until the moisture from the glue has been diffused throughout the cores and veneers alike. In case the stock is good and dry to start with, the small amount of water in the glue will not make the pieces very damp, so that the subsequent drying will not spring the pieces if they are kept on edge until it has been effected.

Work of this kind should be coated on each side as soon as possible after coming out of the clamps, and if there is a suspicion that the cores are not as dry as they should be, at least two coats of lead and oil should be given the backs wherever the subsequent work will permit.

Some foremen will allow enough thickness on this class of work to permit of straightening after the warping has stopped, but there is no question but that it is an expensive practice, and it is cheapest even in mahogany finish to make the work solid.

It is pleasing to note that there is a better way if we have the temerity to use some of our own judgment in the matter—let the architect take a hint if he will—for it is a simple thing to put a cheap hardwood veneer on the back of the work. It is also easy to have both front and back veneers of the same humidity, and so insure a straight piece, whether thick or thin.

Some other workmen do not know that staving up a core will not insure it staying straight when veneered only on one side, but that it will act very much the same as a solid piece of wood; so that in counter tops, for instance, where they are long and two feet or more in width, it is folly to try and stave up the backing and glue a veneer on the top. If it is impossible to get these tops already plied up from a panel factory, by all means make them solid if the lumber can be procured in one-inch stuff.

However, a contingency might arise under which it would be impossible to buy a plied-up top, and at the same time the kind of wood required could be had only in veneers. Then the workman would be confronted by a condition and not a theory. The former suggestion of veneering both sides of the core with woods as nearly similar in texture as possible will apply here, and the top can then be put together the same as in the case of solid lumber.

It is a common sight in details to find interior sash and transoms to be veneered, and this is usually a senseless and puttering job, for which there is no call outside of the architect's habit. They are exactly as good made solid, and the details will not permit the use of very thin veneers on account of the sticking, while if they have to be different woods on each side it is an easy matter to glue them up two ply.

The veneering of outside sash and windows should be of one detail, and that should bring the joint inside of the glass, and even then it is better to make the bottom rails solid, if such a thing is possible, for the sweat or frost will sometimes run down the best-kept windows, and the glue joints which are perfectly covered when the house is first painted will not always remain so; therefore, knowing as we do what water does to glue, the only permanently safe method is to not have any glue joints in the lower check or the bottom rail.

The making of wide, flat panels is a proposition of another character entirely, and whether or not they should be made solid depends more upon the character of the wood texture than upon its cost, for it is frequently more expensive to ply up panels from cheap woods than to make them solid from the more expensive ones. Take red gum, for instance, where a selected figure is to imitate the interwoven grain of mahogany. It would be impossible to put up a solid panel so that it would stay straight unless it was quite narrow; that is 12 inches or less. So that, while the wood itself is comparatively cheap, the cost of plying up is

such that it will make an expensive panel, although it is possible for any mill equipped with a cabinet-planer, band-saw and plenty of handscrews to put up this kind of work as cheaply as it can be bought from a panel concern, in case the proper skill can be brought to bear in the prerara-tion of the veneers. If the shop has no one capable of resawing and planing thin or cross-grained veneers without spoiling a large per cent. of the stock, it would be much cheaper to buy the panels all ready to put in the job. If the mill has a good drum sander, veneers that are too wide or too curly to put through the planer can be brought to a surfaced thickness with practically no loss from spoiled stock, although the power bill is necessarily higher in reducing stock with sandpaper.

Generally speaking, it is not necessary to make panels more than three ply, and this is especially true when all the stuff is got out in the mill where it is easy to make the middle member or core as thick as is necessary to bring the whole panel to size, regardless of what the veneers may be. In panel works, where all the core stock is made up of cheap-cut veneers, the plies may be any number in thick-ness, and, of course, the more, the better the panel will hold its flatness.

Where veneers are gotten out in the mill and have to be glued up in two or more pieces to make up width, it is best to resaw the pieces to about ¼ inch in thickness and then glue up in the clamps, being careful the pieces match the way the grain runs, as well as the face for appearance, and if the stock can be brought to thickness on the planer so much the better.

In the planing mill very little is known of the taping machines, and the quantity of thin veneer work done would not warrant the purchase of one, so that when it becomes necessary to join the edges of thin veneers, the workman must tack his veneer on top of a board, letting the edge come about even with the edge of the board, so that it can be jointed off. In case the veneer is quite thin, the edge may be placed so as to slightly protrude between the edges of two pieces of board , and in this position may be brought to a straight edge, either by hand or by running over the jointer. But in this last operation it is necessary to see that the two pieces of board are clamped up tight against the veneer of the latter will be torn at the edge by the jointer knives. The work of gluing the edges of this thin stock is accomplished by placing the veneers on a wide board or bench and holding them in place by strips, which are bradded through the veneers into the table, and after the edges have been glued cover the joint with a piece of tough paper glued fast to the wood, and held down flat by another strip. which should be left in place until the mois-ture from the glue has passed out of the veneers. This strip of paper should be placed on the face side of the stock, so that it will not interfere with the subsequent gluing, and will also protect the joint until the panel is ready to clean up.

Usually it is not considered necessary to glue up the core or middle ply for panel work, but it suffices that the pieces are of an even thickness and joined on the edges so that they will fit up closely together. Some glue men do not take the trouble to glue both of the contact faces, but it is safer to do this, and by so doing the glue can be spread thinner on each piece, with the assurance of having all the surfaces covered.

Perhaps nothing has more to do with a successful job of this kind than to be entirely ready to despatch the work before beginning to spread the glue. In such wide sur-faces, if the glue chills before the pressure is applied it will be impossible to squeeze out the surplus, and so the result is an inferior job, which will require a great deal more time to dry sufficiently to be taken out.

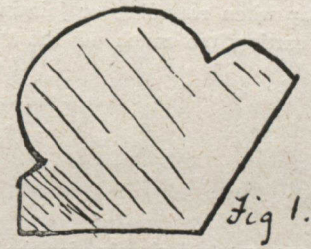
If the job has been done where there are no clamps or presses large enough to take in the work, two cauls should be provided which are slightly wider and longer than the desired panel, between which the veneers may be clamped. As it is unusual to find wide boards perfectly flat, care must be taken that the crowning side of the cauls are placed next the panels and a number of pairs of cross pieces should be provided by which to clamp the whole together. These last pieces should be slightly crowning at the middle also in order that the pressure may come upon the middle of the panel first, and so force out the surplus glue. One of the precautionary measures that should not be overlooked is the fastening of the veneers and cores together with small brads very close to the ends, so that they will not move in handling or slide at the beginning of the clamping pro-cess. If the room and the cauls are warm and there is plenty of fast help it will be economy to put in two panels at once; more than this can hardly be handled successfully with handscrews, and then they must be left in the clamps long enough to thoroughly set before opening up. It should be remembered, also, that the thinner the plies of the panel the longer it should be left in the clamp on account of there being more moisture in proportion to the amount of wood to take it up.

Wide, solid panels may be made with a matched joint if there is a liability of the joint taking moisture. The wood should be selected with reference to the lay of the grain so that if there is a tendency to warp it will not warp in a reverse curve. Two pieces should be joined so that if they warp at all it will be in the same direction, and may be corrected by proper application of heat and moisture.

In all glue work, whether solid or veneered, be sure that everything that can be done beforehand is ready, for in the ordinary mill without a separate glue-room, the element of time is more important even than the quality of the glue.

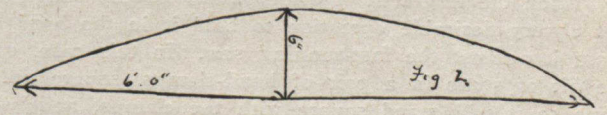
RUNNING MOULDING ON STICKER.

A subscriber writes to ask the most modern method of running this moulding on sticker. Fig. 1 is exact size of a rough end sketch of it. It is to be run in segment form



to mitre into moulding of same design in straight lengths. The segment is six feet long, with a six-inch rise.

Suggestions are invited from readers of the "Canadian



Woodworker" as to the best methods of running this moulding. To do so is not impossible, because the writer did it not long ago on a four-sided machine.

FIXING TEETH FOR SMOOTH WORK.

Woodworking machines are kept in use in shops for the reason that they pay a profit upon the amount invested in their purchase. Every machine, in order to earn the largest possible dividend upon the investment, must at all times be kept in the best condition, and worked at the very limit of its capacity without the loss of a minute of time. The output must be of the highest possible quality; therefore it is absolutely necessary that each machine is in A1 condition for work. This means that every saw, planer, moulder, and every cutting tool, belt and nut must be in perfect condition and ready for long and continual use. It means that the saws must be kept sharp and the shape of the teeth perfect. There is a certain shape of tooth which will cut the best in each particular kind of work which is to be done. This shape must be found, and once found, it must be maintained or the machine is not working at its full capacity and the profits fall off.

Jointing.

Take, for instance, a bench cutting-off saw. This tool can be kept in such condition that varnished and finished boards can be cut to length without in the least marring the boards or without splintering the ends in the least. To

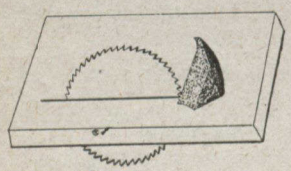


Fig. 1.

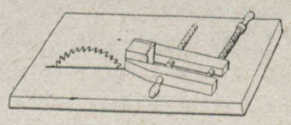


Fig. 2.

put a saw into condition to do this work, and to keep the saw so, requires a little skill and a good deal of patience on the part of the workman in charge of the saw. To put a circular saw in perfect condition, it must first be "jointed," or made perfectly round. All manner of methods are in use for this purpose, from holding a file against the saw to using a diamond. The writer prefers an old emery wheel, or a piece of wheel for jointing any saw, either circular or hand.

A good method of jointing a saw, particularly a large one, is shown by Fig. 1, in which a piece of emery wheel is shown standing on the saw-table. To use the stone, grasp it firmly with both hands, and tip the top edge toward the saw until the stone barely touches the teeth. Watch very closely when the fire begins to fly, for that is the guide to go by when rounding or jointing saws. There is no danger of cutting too much off the teeth of the saw

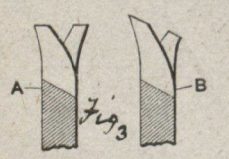


Fig. 3

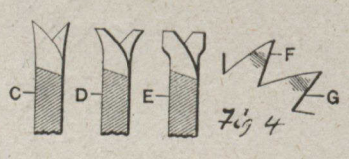


Fig. 4

when the sparks are watched closely, for the jointing should be stopped the instant all the teeth are brought to an even length, and when the fire flies from all the teeth they must be all the same diameter, and the emery should be removed.

When the fragment of emery wheel is very small, it is not a very desirable operation to hold it in the hand and press it against the fast-running saw. In this case, catch the bit of stone in a pair of hand-clamps, square up the stone so it will stand square with the clamps, and when they are laid on the saw-table the stone must necessarily stand "square with the world." With the clamps the stone can be fed against the saw in a manner perfectly under control, and the method is preferable to the first method of holding the stone in the fingers.

Great care must be taken to make the teeth of equal length on both sides of the saw. Fig. 3 gives two examples of saw jointing, two teeth being shown in sections, that is, looking at the edge of the saw. At A, there is shown an example of correct jointing, the teeth on both sides of the saw being of equal length, and both are cut square across the saw. At B, however, something altogether different is shown. In rounding this saw, the stone was evidently allowed to turn from its proper position, and the result is seen in the condition of the teeth, those on one side of the saw being much longer than those on the other side. A good deal of care should be taken to prevent this action when rounding or jointing saws, for one in the condition shown by B can never be made to do satisfactory work.

Saw Setting.

All saws, except those doing very fine, nice work in the driest of material, must have the teeth "set" or spread alternately to one side and the other in order to cut a kerf wider than the body of the saw, in order that the saw may pass through the kerf without undue friction against the sides of the divided material. All saws designed for the finest class of work, and to run without being set, are so ground that they are the thickest at the rim, thus allowing the body of the saw to pass anywhere that the thicker teeth have made a passage.

In Fig. 4, the sketch C represents an example of good setting. The teeth are spread sidewise, slightly and evenly, a small distance beyond the sides of the saw. This saw is for cutting off material, and the teeth are filed "fleaming" or pointed. The set in saws of this kind must not be too close to the points of the teeth, or a condition will be met with which prevents the saw from working long after it has been filed and set. It will be noted that in sketch D the points of the teeth are turned out a good deal, and that the point only has been bent out. A saw set in this manner will soon have the points of the teeth worn off by the action of cutting, then the saw will be dull, the teeth do not project much beyond the sides of the saw, the setting is worn off with the sharpness, and the saw is entirely out of business. Never set a saw in this manner.

In direct contrast with the "point setting" shown by D is the manner illustrated at E, where seemingly the whole point of the tooth has been carried bodily out beyond the case of the saw. In other words, the tooth is offset, and the edge of each tooth is almost parallel with the face of the saw. Here, there is less likelihood of wear, because there is considerable body to back up the point of the tooth, and this saw will wear many times as long before needing filing and setting than will the tooth represented at D.

The saw shown at E is arranged for ripping, and the tooth is filed nearly square across, instead of being made fleaming as is the case with examples C and D. But this makes no difference, and the setting may be the same for both cut-off and rip saws. The effect on the sides of the teeth is shown at F and G, where both sides of the teeth are shown respectively. A blow or a heavy squeeze at F forces over the entire end of the tooth, as if it had been placed over a bit of sheet iron and offset. This effect is also shown on the other side of the tooth at G, and is the correct thing—when you can get it. Usually, however, the sawyer has to be satisfied with that shown at C, Fig. 4, which is a good average setting.

There are many appliances for putting set into a saw, some of them very crude, while others are refined to such an extent that they almost need an engineer to take care of

them. Whatever method of setting a saw may be employed, bear in mind just one thing and the desired result will be obtained—and that one point is this: The only way to set a saw is to bend the teeth outward the distance necessary to cut a kerf of the required width. That is the cause and the effect, and it matters nothing how the teeth are bent.

One man may do a fine job at saw setting with no tools but a hammer and a punch, the saw being laid flat on the smooth end of a block and the teeth bent outward by hitting them with the hammer through the medium of the punch. Another man bends the teeth by means of a monkey wrench, or a special tool, consisting of a notch the thickness of the saw blade, cut in the side of a bit of steel. Each tooth is bent over with this tool, and a gauge is used to make sure that each tooth projects just far enough, but not too far.

The familiar hammer saw-set is in evidence in every mill and in the woodworker's tool chest. This is a refine-

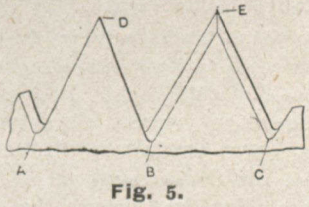


Fig. 5.

ment of the crude punch and hammer method, but the result is the same. Then there is the elaborate spring set of various kinds, improvements on the monkey wrench business, but bending the tooth in exactly the same way. It matters not which way the saws are set, but it does matter a good deal how they are set, for if the set is not exact in every tooth, then that saw can never cut smooth, no matter how much time is spent on it.

Balance, Lost Motion and Filing.

Sometimes it is impossible to round a saw perfectly for the reason that either the saw, or the mandrel, or the pulley, is out of balance. There may be a little lost motion in the bearings, and then, if there is the least lack of balance in the running gear, the saw will shake and flutter so badly that it is impossible to either round the saw, or do good, smooth work after it has been set and filed. Therefore, see that the saw is in perfect running balance, taking saw and arbor, all together, ready to run, before attempting to round the saw. Of course, if there is no tendency to wobble or run untrue, the balance business is probably all

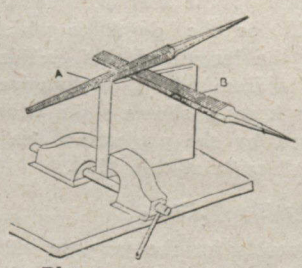


Fig. 6.

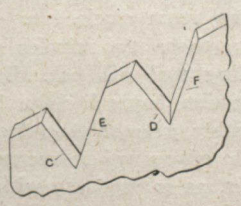


Fig. 7.

right, and may be neglected until it is found necessary to look for some unknown cause of trouble. When that time comes, it is well to look to the balance and the fit of the boxes.

While filing is one of the most important factors in doing smooth work with saws, it is not the only thing which causes good or bad work, for, no matter how well a saw is filed, it will not do the best work unless it is well rounded, evenly set, and well balanced in close-fitting bearings. Thus, while filing is not all, no good work can be done without it, and, everything else being well done, good filing will insure smoothness of cut. Therefore, learn to file correctly, then take the necessary time and patience to do a perfect job.

To file a saw to the best advantage for smooth cutting, it must be known exactly what service is required of the saw. If it is to cut pine or some other soft wood, then the teeth must be made slim and filed with a flatter bevel—more "fleaming"—than if the saw is to cut mahogany, oak, or any other hard wood. If a saw is to cut brown ash, the teeth must be given much less "rake" than if other woods are to be sawn, for there is so much grit in that kind of wood it is almost impossible to keep the saw sharp unless it is filed like a hack-saw for cutting metal.

If a saw is to do rough work and lots of it, then the teeth may be filed more nearly square across than is proper for comparatively slow, smooth cutting. Fig. 5 shows a tooth in three positions, front, edgewise, and looking straight at the point of the tooth. This tooth is designed for very smooth cutting of medium soft wood, and, if properly used and kept sharp, it will cut as smooth as if the surface had been filed.

The tooth shown by Fig. 5 is several times as large as the actual tooth, and is made to a large scale in order to more fully show the method of filing. A large three-cornered file was used, about eight inches long, and the cuts A and C were made from the front side of the saw, while cut B was made from the back side. Two sides of a tooth are filed at the same time. For instance, the sides B, D and B, E are cut at the same time by the strokes of the file, as may be judged by an inspection of the corners A and C, which show that the file was dropped, handle low, in front of the saw while making the cuts A and C, and that the file was held handle low on the back side of the saw while making cut B.

In any case, the point of the file should be pointed ahead in the direction in which the saw is to revolve. In no case should the file be pointed backward when filing. If a file is pushed over a piece of metal as shown by A, Fig. 6, the file will squeal and squeak so loud that it can be heard all over the shop, and good filing is impossible, no matter whether on a saw or a cutter. The reason for this noise and bad filing is that the file is working against the spring of the thin metal which is being worked. Were the saw so thick that it did not spring under the pressure of the file, then the squealing and chattering would cease at once. To prove this, hold the file as at B, Fig. 6, and the tool at once begins to cut in a noiseless and most satisfactory manner.

Referring again to Fig. 5, it will be noted that in filing the cut A, the file is pushed against the edge of thin metal, just as it is at A, Fig. 6, where the squeaking is so fierce. Still, there is no squeaking when filing tooth A, Fig. 5, even when pushing the file against the metal from A to D. To find the reason for this seeming contradiction, look at Fig. 7 and try the experiments there shown. Run the file into the thin metal as at C, and as long as the file is pushed square across, there is no squeaking. But try to turn the shank of the file either to the right or to the left, so as to cut fleaming as in filing a saw, and the concert commences at once.

How, then, is the filing to be done "against the metal" and a good job done? No file will cut well or fast while it is "screeching"; therefore, hold the file in some manner to render it noiseless, save for the regular cut of the teeth. Never file when the tool squeals, for you are doing little except spoiling the file—and one's ears. The solution of

this problem is found at D, Fig. 7. It is by holding the file at the same angle with the sheet metal, as shown at C, and then lowering the near end of the file, that the noise is stopped.

The side F shows how the lowering of the file handle changes the cut from "against the metal" to one which is noiseless and smooth-cutting. It is in this manner that the file must be moved in order to make it cut smooth and noiseless. It is evident that the more the file is moved toward being parallel with the metal horizontally, the more the file handle will have to be depressed in order to make the file cut noiselessly. It must also be kept in mind that the more the file is moved in either direction, from a position "square" with the metal, the more fleaming the tooth will be, the smoother it will cut, and the quicker it will get dull.

Here is the guide to making all sorts of saws and cutters do good, smooth work. They must all be sharpened so they run true and without the least vibration, then they must be filed or ground as above described, and there can be dependence put upon their doing good work. And just one more word in regard to filing or grinding saws for smooth cutting. Do it the moment it is found that the saws or cutters show signs of getting dull. Never try to see how much work you can get out of a saw with once filing. That does not pay. Just as soon as the points of a saw can be seen, then it is time to file it. The above is a most excellent rule, and if carefully followed will result in keeping all the saws and cutting tools in perfect condition for doing perfect work.

MACHINE TROUBLES AND THEIR REMEDIES.

A double surface planer, after a long period of excellent service, developed an occasional and very annoying peculiarity on the part of the lower head, of once in a while cutting too deep for a revolution or so. Sometimes the deeply-cut chip would appear with astonishing regularity for the entire length of a board. Then, again. two or three boards in succession would be finished with the washboard cut, while at other times the planer would run for days with only an occasional roughly-cut board in its total product.

Indeed, the planer had become so much of a puzzle that no one knew whether it would cut 10,000 feet of surface without a mark, or if there would be from one to a dozen boards in each thousand that would be marked with occasional or frequent deeply-cut knife marks, while the rest of the boards would be perfect.

At last it was observed that the sunken tool marks were more apt to be in evidence just after the planer-knives had been ground Then, it was soon noticed that after the belt had been tightened, there would be very few of the knife marks in evidence. With a tight belt and dull knives there would never be a low cut in any of the boards.

With the above noted peculiarities in view, the repair man began a quiet still-hunt for the cause of the occasional high cutting of the lower knives. After quite a long period of observation, during which a number of things were found which should be and were changed, and a number of theories run into the ground as worthless, the real cause of the trouble was located, and, as is usual in such cases, the remedy at once became apparent and the cure was rapid and complete.

It was found that the lower head bearings had become somewhat worn in their bearings, and that a certain amount of lost motion had there developed, which caused the head shaft to be loose under certain conditions—or to become troublesome under those conditions, for the journals were, of course, loose all the time.

When the belt got a bit slack, the journal would flop up a bit under a heavy cut, and the knives would dig into the under side of the board, making a high cut, which appeared as a low cut when the board was turned over to be looked at. When the planer-knives were newly ground and very sharp, the angle of the knife was such that the knife possessed a tendency to drawn into the cut. This tendency was evidently much greater when a heavy cut was being taken, hence the manifestations noted above, where the lower cutter-head would only occasionally take a high (low) cut and dig into the board, the trouble being greater with a sharp knife, a loose belt and a heavy cut. A little babbitt metal poured into each box, and some careful scraping thereof, cured the trouble quickly and thoroughly.

It often happens, particularly in the job shop, that a bead of some kind of a light moulding shape is required near the middle of a wide board. It is quite a task to set up a four-side machine just for a one-inch strip down the middle of ten or eleven ten-foot boards, and if the job could only be done on the double surfacer, it would be a very great convenience. For this purpose the writer at one time designed the little affair for this purpose which is shown by Fig. 1. Briefly stated, it consists of a cutter of the required shape to do the work, an adjustable chip-breaker placed underneath the little cutter, and a bolt for holding the cutter in place. The chip-breaker is shown at **a,** the

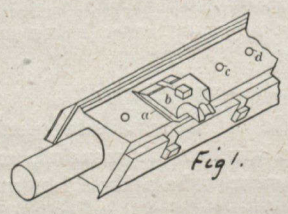


Fig 1.

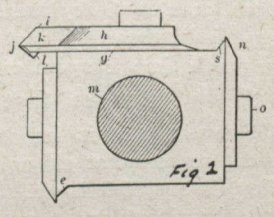


Fig 2

cutter at **b,** and several holes along the head are provided as at **c** and **d** for fastening the beader in place anywhere along the length of the cutter-head.

The proper arrangement of beader cutter and its chip-breaker is more plainly shown by Fig. 2, in which an end of sectional view of the cutter-head is presented. In this engraving the cutting portion of the tool **i** is shown projecting from circle **l** to circle **j**; the distance radially between those two circles will be the depth to which the beading tool will cut. But the length of this tool in this projection beyond circle **k** is from **l** to **j**, a distance considerably greater than from **k** to **j,** showing the decreased depth of cut when measured by the projecting length of cutter, as is the case with all tools of this kind.

Setting Up the Cutters.

Thus, in setting up all tools for the purpose indicated above, it is necessary to measure the projection of the tool on the line **j l,** radial to the cutter-head, the line or circle **k l** being the line followed by the plain cutter-knives located on the chip-breakers **e and f.**

It is sometimes difficult to locate the circle **l** sufficiently accurate to permit the measurement from it of the circle **j,** but the planer man will find several ways in which it can be done. One way is to measure the radial distance between the cutting edge of the plain knives and the shaft. This distance being known, a straight-edge may be placed lengthwise of the cutter-head, bearing across **j,** parallel with the shaft, and the distance measured at either end of the

cutter-head. It is obvious that the distance from shaft **m** to cutter **j** must be equal to the sum of the distances **m l** and **j l**, or **j m**.

Another way of determining the distance of circle **l** is to run the cutter-head into a board, which is left in the planer when that machine is stopped with the knives in the cut. Take measurements from shaft **m** to the edge of the curve in the plank. Add to this distance, as shown by the calipers, the distance it is desired that the bead-cutter projects, and set that cutter the distance from the shaft as found in the manner described. If carefully done, this is a most excellent way of setting supplementary cutters as shown by Figs. 1 and 2.

An inspection of Fig. 2 will reveal some things to which the planer man should pay very close attention. Among these little things is the manner in which the planer-knife is ground as shown at **n**. It will be noted that there is very little clearance between the heel of the knife and the circle in which the cutting edge revolves. After the knife has been whet or filed a number of times, the heel will be drawn closer toward the cutting circle, and, particularly if the knife is ground a little too "stunt" to begin with, the heel of the knife may strike the wood, and then there will be the mischief to pay. The cutter-head will rattle and jump; the surface of a board cannot be planed smooth, no matter how sharp may be the knives or slow the feed per minute.

Another and similar trouble which is frequently met with is the use of a bolt at **d**, one which was too thick a head and touches the wood back of the cutters. This sometimes causes a great deal of trouble before it is detected. It is often caused by stretching of the knife bolts. These bolts stretch under the strain of planing and of the wedging of chips under the cutter-knife. The stretched bolt touches the bottom of the hole, and to make that bolt screw up tight, the planer man sometimes puts a washer or two under the bolt head. This raises the head so far that it strikes the wood the same as the heel of the knife struck, and with the same results—poor planing, and little of it at that.

Still another trouble—and an exasperating one, too—that of a new cutter-knife which proves so wide that the back edge strikes the cutting circle. Sometimes this can be cured by setting the knife out a trifle more than is otherwise really desirable beyond the chip-breakers. The cut will not be quite as smooth on cross-grained lumber, but as the knife speedily wears narrower, it will not be long before the knife can be set in its proper place again.

The planer man should beware of imperfect bolts in the cutter-head. Many a good planer-knife has been ruined by being thrown out of the machine when the bolts break. The amount of centrifugal force developed by a high-speed cutter-knife is very great. When the bolts are unduly strained by tightening up with a large wrench, there is liable to be trouble when the knives strike a heavy cut. Do not tighten the knife bolts too much. A ten-inch wrench is plenty large enough for tightening planer-knife bolts instead of the fourteen-inch wrench often used for that purpose.

Planer-knife bolts should be made of very soft mild steel or Norway iron. The latter is preferable, but hard to get. In fact, there is very little iron manufactured at the present time. About all the so-called "iron" which the dealer sells or the blacksmith uses is Bessemer steel instead of wrought iron.

Planer-knife bolt should never be made of tool steel. At first sight, that material would seem to be just the thing for the purpose because bolts made from that metal would never give trouble by stretching. But, although that trouble is effectively cured, another and worse defect soon becomes manifest to the user of tool steel planer-knife bolts; they will break short off under a heavy strain instead of stretching a little and then holding fast under the strain.

Tool steel will not stand up under strain when it carries any sharp corners or angles, and, as the presence of threads makes angles and corners a necessity, "snap" goes the bolt under strain, and it is found to be worse and more dangerous than the softest iron bolts that soon stretch all out of shape.

Just compute the strain put upon a ½-inch planer bolt when a man pulls 100 pounds on a 14-inch wrench placed upon the head of the bolt, which has twelve threads to the inch. A man turning a nut or a bolt with a 14-inch wrench will probably apply his power about twelve inches from the centre of the bolt, the remaining two inches of the wrench being used for obtaining a proper hold. This makes the power applied, 100 pounds, move in a circle 24 inches in diameter. As the power moves around the circumference of a 24-inch circle, its travel will be 75,138 inches; while the weight or load on the screw is advancing 1-12 inch. Thus the leverage is 7.38 to 1-12, or 904.6 to 1. When 100 pounds pull is applied to the leverage, the power exerted to screw up the bolt is 904.6 × 100, or 90,460 pounds. Allowing one-half of this amount to be used up in friction of the screw, there remains the very tidy sum of 45,300 pounds pull on that bolt-head. This is more than enough to break any ½-inch bolts ever put into a planer head.

Bolt Strength.

The strength of any bolt may be easily calculated. A ½-inch bolt has a diameter at the bottom of the thread of about ⅜ inch, and the cross section of the metal at the bottom of the thread is ⅜ × ⅜ × .7854, or about .1104 square inch of metal. Iron breaks under about 45,000 pounds pull to the square inch. Soft steel breaks at about 60,000 pounds. For planer bolts there should be allowed a factor of safety of five, thus bringing the safe strain down between 9,000 pounds for iron bolts and 12,000 pounds strain for steel to each square inch of cross section.

As there can be but .1104 square inch of iron in the bolt, it can, of course, be expected to carry only .1104 × 9,000, or .1104 × 12,000, amounting to between 9,936 and 13,248 pounds, according to the material from which the bolt is made. Allowing an equal amount of "would-be pressure" to be expended in friction of the bolt and its head in the thread and on the planer-knife, and calculating the larger strain of the soft steel only, it is found that the power exerted by the screw should equal about 26,496 pounds. Dividing this amount by 12, the length of the short arm of the screw lever (multiplying by 1-12), it is found that the quotient is 2,208, which represents the product of the power applied and the long arm of the lever. As the power supposed to be exerted is 100 pounds, the long arm of the lever, the distance through which the power travels, must be 22.08 inches. This represents the circumference of a circle of about 7 inches in diameter. Therefore, the necessary power can be applied only 3½ inches from the centre of the bolt and the necessary pressure given with 100 pounds pull. This means that a 6-inch wrench is ample for tightening ½-inch planer bolts. Imagine the damage done when a big man pulls for all he is worth on the end of a 14-inch wrench when tightening planer-knife bolts. Is it any wonder that these bolts break as often as they do, or is it not to be wondered at that planer-bolts stand the trouble as long as they do?

A GUARD FOR THE JOINTER.

A Protective Device of Automatic Type—Operated by the Moving Lumber as it Passes Over the Tables.

A Belgian paper has a description of a jointer guard that appears to possess certain novel features among the many and ingenious devices designed for the better protection of operators of machines having rotating cutter-heads.

However, Figs. 1 and 2 are vertical sections of a machine duly equipped with this protective piece of apparatus, the illustrations exhibiting the guard in two different positions. Fig. 3 shows a plan of the machine with a modified form of the guard.

The invention is characterized by a shield which closes or opens the gap between the tables in such a manner that the workmen cannot come in contact with the knives, at least that is the intention, and by a study of the following particulars it will be seen how the inventor proposes to carry his ideas into effect.

The cutter-head C has a shield K which is a segment of a circle and slides up and down in suitable curved guides located at each inner side of the machine. In the upper

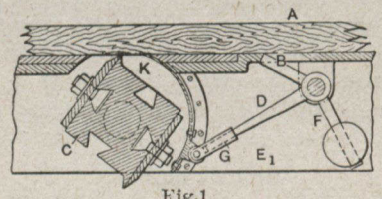


Fig.1

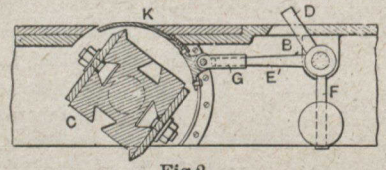


Fig.2

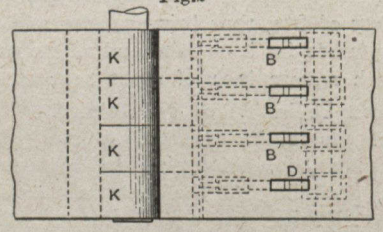


Fig.3

position as illustrated in Fig. 2, the guard or protecting shield is over the knives and the gap in the machine is closed. The guard K is operated through a bell crank, one arm E of the bell crank fitting loosely in a socket at G on the shield. The other member of the bell crank at D projects through an opening in the table at B.

A weighted lever at F actuates the combined arms D and E and is heavy enough to carry the guard K upward and over the cutter-head C and thus bridge the gap between the tables. It will be noted that when the knives are thus guarded by the encircling shield K, the arm D projects through the opening in the table at B.

The latter position of the device is a key to Fig 1 where the machine is illustrated when at work. The board A passes over the opening B and in moving from right to left, presses down the lever D and thus moves the guard out of the way. It would seem that the inventor depends upon the work A to hold back the shield when the opening B is uncovered by the moving board or whatever stock is in hand. But it is not quite clear how the guard K can be prevented from coming in contact with the work A as soon as the lever D is free, and then the guard and work moving in the same direction are the more surely interfering with the knives and before the end of the work is reached.

Fig. 3 illustrates the division of the guard K into adjoining sections. The several sections have their individual complements of levers and when narrow work is being done on the machine only so much of the guard moves out of the path of the stock as will allow the respective width of the knives to take effect.

RUNNING THE STICKER.

By W. C. Carlisle.

To run a sticker, a man should, in the first place, have a thorough training and a perfect knowledge of the machine. In the second place he must be competent in the making, seting and tempering of knives. In short, he should serve a sufficient time as apprentice with a capable man over him to guide him in his efforts to master the machine and correct his mistakes.

The running of a sticker is, in fact, of such vital importance in the woodworking line that it may well be considered a trade in itself; and to learn a trade, as we all know, requires time.

The writer worked eleven years in a shop in Cleveland, Ohio, and for twenty-seven years in various localities in the North, in the West, and on the Pacific Coast, and in all these places he found a great variety of opinion as to how to set up and make the required changes to a sticker. Some shops and mills still cling to the old ways in this respect, while in others they use the more modern methods.

In some shops, for instance, they use samples or patterns in the setting up of a machine, but as in the course of time these samples become twisted and very hard, it is very difficult to place them properly, especially where the machine stands in a dark place. In other shops the men running the sticking machine very seldom use the patterns; they are evidently a thing of the past in most mills.

Some men saw off a piece of moulding which is to be run, make the knives to match, and then fasten the pattern to a short stick to hold it under the head, and by this means set the knives. Other men will set knives by the use of the common rule, as near as possible, trying perhaps several times and refitting the knives until they arrive at just what is wanted.

Some sticker men, after they get the knives for stock moulding in proper working order, mark the profiles of their knife simply on a piece of board, and file it away; and generally when a man quits the shop he destroys all such patterns and his successor, the new man, will have to do the same work over again. This, however, occurs more often in the West than in the East.

To my knowledge there is no uniform system adopted by sticker men in this work, but as regards the setting of knives I believe that the rule will universally be adopted for that purpose, and all old methods will be eliminated. What would you think of a carpenter keeping a pattern of every rafter or brace he cuts out? Wouldn't you say: "What is the matter with his square; can't he lay out two alike?"

This is exactly the idea I wish to convey to the sticker men. The "up-to-date" sticker man uses the sticker man's rule or gauge; this tool will show you just where to set a

knife, on a head or the perfect slope, it will show you where the knife requires grinding, and will guide you otherwise. To stick a detail moulding on top or all four heads is, by the use of this rule, very simple. Simply square up the pattern and find out the amount of wood to be cut away; or transfer the shape of the moulding or a rule, apply rule on head, set knives, and the machine is ready to start up.

This is the quickest and most accurate method of setting up a sticking machine; it does away with all old makeshifts. By the application of this method a mechanic will set up a machine while a man using the old method may be looking for patterns; and the rule is used on all four heads of any machine, large or small.

VARIABLE SELF-FEEDING RIP-SAW.

The illustration represents a No. 316 Special Variable Self-Feed Ripping Saw, with feeding gear and delivery roll, built by the Clark-Demill Company, Limited, Hespeler, Ont. It is specially designed to meet the requirements of furniture, organ, piano, buggy and chair factories, planing mills, and any place where there is a lot of ripping to be done, and will save its cost over an inferior machine in a short time.

This machine is built with a bearing outside of the drive pulley on the saw spindle.

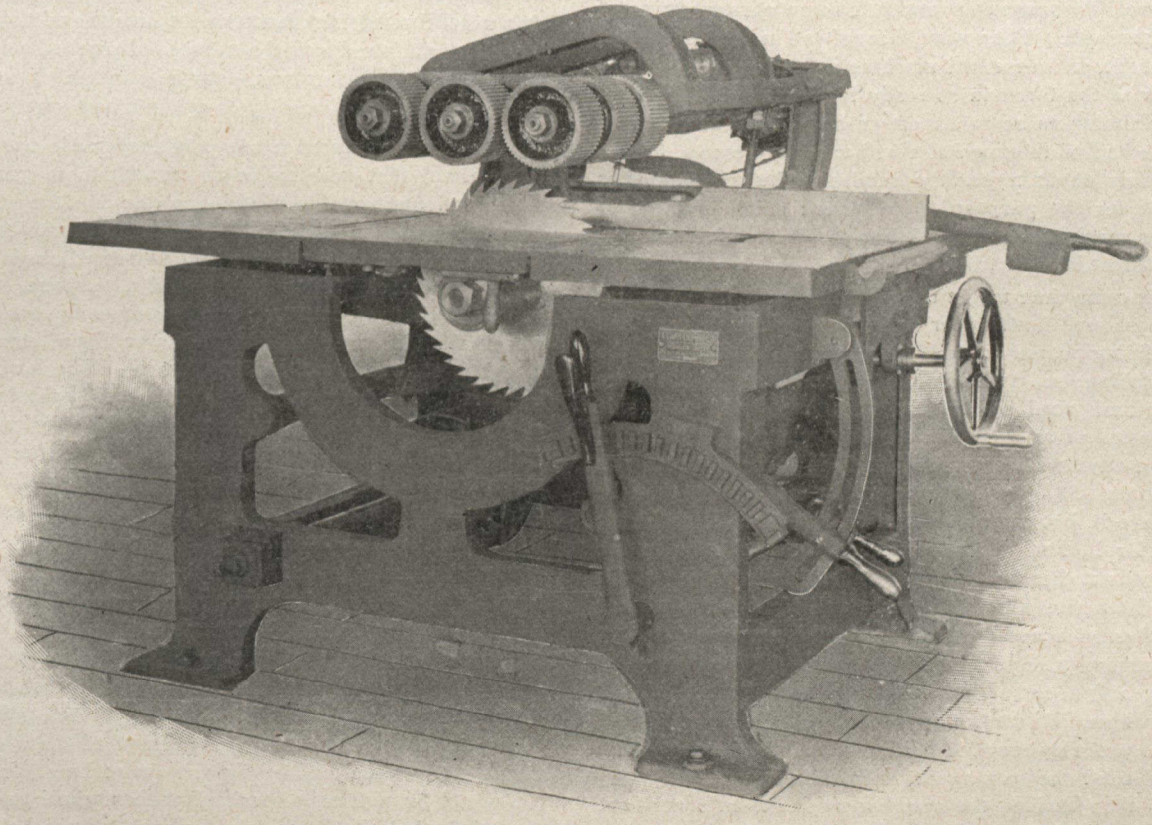
The frame is of substantial construction, with ample length and width to form a rigid support for the table and working parts.

The table is made of iron, planed true, and is well braced on under side, both length and cross ways, and has four anti-friction rollers, two before and two after the saw, for carrying the lumber. Size of table is 5 ft. long and 3 ft. 4 in. wide.

The saw spindle is very heavy, running in self-oiling bearings, namely, 1 15-16 in. x 8 in. Where saws go on the spindle is turned down to 1½ in. It is also provided with multiple collars, permitting a number of saws to be placed at any desired distance from each other. Will rip 18 in. wide with the first saw and 2⅜ in. wide with last saw, and is adjustable by sixteenths. Saws up to 16 in. in diameter can be used; cutting material as short as 6 in.

The variable feed can be instantly changed by the operator from nothing to 200 feet per minute, simply by moving the lever on side of machine and regulating the feed just as desired, so that the cut of the saw can work up to its full capacity, either on the thinnest or the thickest material, on hard or soft wood, without stopping the saw or even the feed of the lumber being sawed, and has feed shaft with toothed steel disc for feeding and plain delivery roller with splitter for discharging material. Feed is driven with chain and sprocket. It can also be lifted out of the way and saw used as hand rip. The device for raising and lowering the heavy iron table, as well as the device for moving and locking the fence are pronounced by mill men to be simply perfect.

The main table has a sliding section which can be instantly withdrawn to allow for use of more than one saw. No screwing of the table up and down, but by one movement of the handles shown, the table or the self-feeding attachment can be raised or lowered to their full capacity.



Special Self-feed Rip Saw for very short material.

AN ENQUIRY FROM ENGLAND.

A large firm in Liverpool, England, who regularly import ash and hickory handles, maple flooring, dowels, office furniture, turned wood, joinery and three-ply wood, write to the "Canadian Woodworker," informing it that they would like to be put into communication with any shippers of these goods in Canada.

Saw Mill Department

TROUBLES OF THE BAND RESAWYER.

Some articles in the "Woodworker" on band sawing have brought to mind an instance that occurred some time ago. The machine in question was supposed to be practically new, but had been used some. The purchaser was a man supposed to be a practical machine man who understood about all there was to know about woodworking machines. When the machine, a combination 42-inch wheel, arrived, the practical man assembled the parts, figured his speed, placed his pulleys and put on a saw which came with it, but which had been plenteously brazed and showed hard usage.

After placing the saw on the wheels and straining (this being a spring tension) to what he thought the right thing, and tilting the upper wheel to make the saw teeth clear the face of wheel, he started up and fed some narrow strips of soft wood through. They went through all right, of course, and that meant, of course, the machine was all right, so it was turned over to the foreman as ready for business. The foreman, not claiming to be an expert on such machines, having at that time had more experience with circular resaws, felt no special anxiety about trying the band saw, but considered it rather light for the purpose. He wasn't much in favor of combination machines in general, but decided to give this machine the fairest kind of trial.

When it came time to get the machine ready for work, investigation showed both upper and lower guides in very bad condition, being scored to such an extent as to endanger the saw by catching and twisting the blade. The guides were taken out and trued up lightly, then replaced, and side guides adjusted so as to relieve the chattering; then the back guides were adjusted so the saw, while in motion, would run clear and free. Still the saw was rather more noisy than he cared to have it, but after a careful examination he could see no reason for it, and finally concluded the fault was in the saw, as it was rather badly brazed. He finally let it go. It would go through 2 or 3-inch fairly well if not crowded too fast, but after an hour or two it was found necessary to stop and braze several places, the cracks coming on the front edge of the saw, and not usually at the roots of the teeth, but all along, anywhere. He looked again to the back guides, thinking the saw probably crowded back, but found them all right; brazed and tried the saw again, with the same result.

It was then decided the saw was at fault, so a new one was ordered, 2-inch blade, 20-gauge. When this came they again went over guides and bearings to see that all were tight and guides free, put on the new saw and started up—but there, again, was that everlasting clackety-clack and noise as bad as before. After trying in various ways to stop the racket, the stock was fed to it and fairly good work done with stock from 2 to 12 inches wide, on a slow feed. After a couple of hours' run the machine was stopped, and in looking over the saw it was found to have nearly a dozen cracks on the front edge, just as the other had done, some of them requiring a braze; others were simply touched with cold-chisel—a light blow at the root of the crack.

They had others examine the saw, and all told them the back guide was at fault—the saw ran too hard on it, stretching the front edge—but they went over these parts and were satisfied the trouble was elsewhere. They finally concluded the saw might be too hard, and to make another trial of a new saw, using the other meanwhile, but were obliged to braze several places after every run, and finally the saw was even beyond brazing, and useless, unless cut down to 1-inch. When the new saw arrived it was looked over and found slightly crooked from brazing, which was remedied, and the saw placed on the wheels. The guides were all right, but when the machine started the saw made a great racket and seemed to flop on the wheels. They then concluded to look after the speed a little, and found it rather faster than the general run of saws of that size, so changed the pulleys, reducing the speed about half the excess, then started the machine again, with somewhat better results, making a fairly good run. There were not as many cracks as usual and not as far back, so they concluded to reduce the speed to what was usual for that size machine, hoping to end their troubles; but although it reduced the number of cracks somewhat, they still appeared, and it was only a question of a short time when it would be necessary to order a new saw.

When they ordered a new saw they made up their minds to overhaul that machine from foundation to garret, if possible, and find out the trouble, so one day they took off the saw, swung the feed clear, and taking a plumb-bob, dropped it from the top of the top wheel to see where it stood with the lower wheel. Then they found a surprise. They had supposed that, of course, when the machine was set up the wheels were lined up, and so had never given them a thought. The bob showed a sad state of affairs. The lower wheel set back full ¾-inch from the line of the top wheel, which was as far back as it was possible to get. The lower wheel was full ⅜-inch too low at that end of the countershaft, which made the saw run on a quarter-twist nearly, and all the strain on the front edge. No wonder it cracked! It couldn't very well do anything else.

They expected that would be an easy job, as all saws have an adjustment for raising and lowering one end of the countershaft, but when they came to look this up they found it had been used to the limit, and still was a long way from being in line. After looking the thing over a while, they took the shaft out, cut the babbit from the bottom of the box next the wheel, then replaced the shaft, blocked the wheel up level with the top wheel and brought it out to line with the face of top wheel by putting a washer between wheel and box, then poured the babbit. It took considerable more babbit to raise it to where it belonged, but it answered the purpose. They then fitted the cap and found that the bob showed the wheels in line, so were ready to give it a trial when the saw came. When the saw was placed on the wheels, strained up and the machine started, the racket had disappeared and the saw hugged the wheels in good shape. This looked quite encouraging, and when the stock was presented it simply walked right through it in a straight line, and has been doing that for some time, without cracks or kinks, and seems able to do business at the old stand for some time.

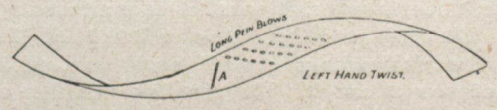
The foreman still thinks the machine too light for the work, and thinks a size larger single machine, for just resawing, would make more money for the concern, but can make this answer the purpose. He still claims this machine

was not right when it left the shop, as it could not be lined as it was. This should have been discovered by the practical man in the first place, of course. This foreman has found that it isn't always best to take much for granted, but to make a thorough job by starting at the foundation of things.

TWISTS IN SAWS.

Hit the high places in the direction they run, is my rule for taking out twists from a band or any other long saw. This would seem to be an easy task, and is comparatively so to the skilled mechanic, but appears to be quite a mystery to some. It is easy after you know, however.

The blade of a band saw, being joined ends together, is calculated to puzzle the apprentice, but if taken apart and straightened out full length, the twist, if any, will show very plainly which way the blows should be placed. Take a long strip of thick writing paper, hold the ends between thumbs and fingers, and twist it until it sets, or stays in a twist when laid on a flat surface, and it will appear as shown in Fig. 1 or Fig. 2, according to which way—right or left—you have twisted it. I will say here, for the benefit of the man who always turns the nut of a bolt the wrong way first to find which way is right, that a right-hand thread runs "with the sun" and a left-hand thread "against the sun"—that is, as the sun, apparently, moves from east to south and back to west, so the right-hand threaded nut must turn to screw down. In Fig. 1



I have tried to show a left-hand twist. To take it out with the hammer, the blows should be placed as shown by the oval marks, with the long-pein end of the hammer, for a right-handed man; A shows how the straightedge is held to find the ridge. If the level is held parallel with the lines of blows, the blade will show hollow, if the tension has been pulled out, as is usually the case when a saw is twisted. In fact, I suppose that is why they twist; the edges are longer than the centre and must go somewhere, so they form a spiral to get room.

Fig. 2 shows a right-hand twist, and a right-handed man will naturally use the cross-pein end of the hammer—the long-pein is parallel with the handle and the cross-pein is at right angles with same. A left-handed man will use the hammer the reverse of a right-handed man. The

operator, whether right or left-handed, must place the blows in lines parallel with the ridge, or get into more trouble.

I do not advise the use of the pein hammer except in extreme cases, as the same result can be attained with the dog-head, placing the blows in lines as shown, and with less sharp lumps. If a saw is only slightly twisted, rolling in tension and leveling will take it about all out for a time, but as the blade loses tension the twist will come back, and I have found that the only way to take it out to stay is to hammer it out.

One writer on the subject says he does "not pay much attention to the twist," but rolls in the tension, straightens the back, levels the blade, and the twist appears. I have tried this method, but have never yet succeeded in getting all the twist to stay out. A saw treated in this way will always have a tendency to "lie over" and "figure 8" more or less. I will not say, however, that others have not been entirely successful by this method. I once thought a left-hand thread could not be cut with a right-hand tap, but I was mistaken, for it can be done.—Woodworker.

INSTRUCTIONS FOR YOUNG FILERS.

It is a well-known fact that it is almost impossible for any filer to write instructions to fit all cases, but the instructions here given, if carefully followed out, will benefit those who may have heretofore neglected any of these points which I mention. It is known among practical band saw filers that no matter how well the saws are fitted, if the machine on which the saws are run is not properly operated, the saws cannot be made to do good work, therefore particular attention should be given to the machine.

The first thing to do in tensioning is to level the saw on the hardwood block or on a cast-iron block, if you have one, removing all lumps and bends that you may find. The next thing, examine your saw with the tension gauge for fast and loose places. "Fast" places are without tension; in other words, the saw is perfectly flat; "loose" places are open.

Have the saw perfectly level, free from lumps and bends; examine the back edge of saw with the long straightedge. This straightedge should have a curve of about 1-16-inch, and should be about five feet long. After you get the back of saw fitted to the long straightedge, apply for tension with tension gauge. In testing for tension you will find it best to mark off a section about 18 inches long. Take your gauge in either hand, this, of course, depending on whether you work right or left-handed—it does not make a particle of difference. If you use the gauge in your left hand, put the right hand under the saw, about three feet from the left hand, and raise and lower saw with the right hand. Examine this section very carefully. If the gauge shows no light, roll the section lightly, repeating this until the saw conforms to the gauge from one edge to the other. After you get this section to fit the gauge, examine the same section on the levelling block with the short straightedge to see that the part which you have just rolled has not been dished. If you find that it has, level it again, using, of course, the cross-face hammer for this work. After you get it properly tensioned and levelled, it is best to test this section with the long straightedge before going any farther, to make sure that you have not stretched either edge while rolling.

In removing loose places it is always best to test the back edge of the saw first. If found straight, apply the rolls to both edges of the saw. To remove loose places with the back edge of saw hollow, apply the rolls to the back edge only. It requires but a slight pressure of the rolls to remove a loose place. A saw-stretcher will not remove lumps or short bends; therefore, it is necessary that the saw lie perfectly flat on the levelling block, otherwise the stretcher will not perform its duty of tensioning. If you have too much tension in saw, so that it tends to assume a wavy outline, the saw-stretcher, unless properly used, will get you in a lot of trouble; therefore I would call particular attention to the fact that the necessary pressure of the rolls depends upon the degree of the fast and loose places, which must be learned by results from actual use of the machine. I have heard filers complain of the stretcher leaving saws convex on one side and dished on the other. When this occurs, the trouble lies either in the rolls not tracking or

the machine has not been properly set up. A stretcher properly set up, with the bottom roll exactly in line with the surface of the bench, will not dish the saw one way or the other, but will leave it perfectly flat; in other words, level. If the bottom roll is lower than the surface of the bench, the roll will dish the saw; if the roll is higher than the surface of the bench, it will punch the saw through and leave the blade convex, and the saw will require quite a bit of levelling.

The cause of saws snaking is because they either need more tension or an equalized tension. A saw not open enough, or one will fast and loose places, will snake. A saw will also snake if the teeth are spaced too far apart, or if the teeth are too long or too slim, unless run with extreme tension.

The cracking of band saws is one of the worst things a filer has to contend with. Various conditions cause cracks, and one must be on his guard at all times. If the machine on which the saws are run is in good order—that is, properly in line—the cause of the cracking must be either in the tempering of the saws at the factory or in the fitting of the saws at the mill, but cracks are most frequently due to the fact that some portion of the blade has been expanded too much. Cracks are often caused by the swage of the teeth being in such form that it crowds the saw against the guides. Cracks are also caused by overstraining the saw on the wheels, or from vibration. Vibration is caused by the wheels being out of balance. Saws also crack from insufficient strain, and it is necessary that as nearly even strain be carried as possible. It is better to have a little too much strain than not enough, for if you do not have sufficient strain the saw is very apt to slip on the wheels and become crystallized, which will result in cracks.

Before going further, I will tell of a case that happened a few days ago, as it may possibly interest beginners and others. I was called to a mill where the foreman and filer were having trouble with a band resawing machine. They had successfully operated this machine for the past two years and never had any trouble to speak of. When anything went wrong they had always been able to locate the trouble, but this time they failed, and I was called on to help them out. The foreman had an idea that it was in the fitting of the saws, so the first thing he had me do was to examine the saw they had on the machine. The filer took the saw off the machine and put it on the hammering bench. I examined the saw very carefully, but failed to find anything wrong with it. The saw was put back on the machine and started up, so I could see how it acted. They had some 5-4 box lumber to saw that run from 3 inches up to 14 inches wide. The first board they put in was about 4 inches wide, and the saw cut it exactly in the centre. The foreman said: "You see how nicely that is sawed; now watch the next board." The next board was 12 inches wide. The saw cut it straight, but off on one side; it lacked about ⅛-inch of being in the centre of the board. We put another 12-inch board in the machine, and set the rolls so it would cut the wide board in the centre. Then we put a 3-inch piece in, and it cut this piece the same as it cut the first wide one—lacked about ⅛-inch of being in the centre.

At first I thought the rolls were out of line. I stopped the machine, took the guides off and examined the rolls, but found them exactly in line with the saw. It occurred to me to examine the column that the guide works on, to see if it was in line with the saw. I calipered from the side of the column next the saw to the outside of the saw, and found that the top of the column was out from the saw over ⅛-inch. I loosened up the bolts that hold the column to the frame of the machine, got a piece of pasteboard, raised the column and put it under the low side, then tightened down the bolts and tried the calipers again. Finding that I hadn't quite enough pasteboard under the column, I loosened the bolts again, took out the pasteboard and got a piece of 20-gauge band saw, cut it the right length and put it in under the column, tightened down the bolts and tried the calipers again. This time the column was as near in line with the saw as anyone could get it. I then put the guides back, got them nicely adjusted, started the machine—and there was no more trouble in sawing wide and narrow boards in the centre. Just before I left their mill the foreman made the remark that a man never got too old to learn. If your saws ever get so they won't saw wide and narrow boards the same, examine the guides, rollers and the column, and see if they are in perfect line with saw.

The next thing I would call attention to is a bottom hammer. This is one of the most useful tools about the filing-room, and my advice to beginners is that if you have no saw-stretcher, don't delay a minute in getting a bottom hammer, for it will save you a lot of work. I feel safe in saying that the majority of filers know nothing about this tool; even the saw and tool manufacturers seem to know little or nothing about it, at least I have never seen this tool advertised by any of them. I called on a man about a month ago who is right up to date on saw-fitting. He has been fitting bands for over twenty years, and has been all over the country. When I called he was hammering a saw, as he didn't have a roller. I asked if he ever used a bottom hammer. His reply was that he never heard tell of such a hammer. I explained as nearly as I could what the hammer is like and how to use it. The next day this filer came to my filing-room to see a bottom hammer. When he saw how easily a saw could be tensioned with it, he said it was the finest thing he had ever seen, and that he was going to get one right away. That same day he wrote to a saw and tool factory to send him a bottom hammer. In a few days he got a reply, stating that the concern never heard tell of such a hammer, and thought possibly he had made a mistake in the name of the hammer wanted. A catalogue showing all the different shapes of hammers that factory made for hammering saws showed nothing that looked anything like a bottom hammer. He wrote to several concerns that make all kinds of saw tools, and he received the same kind of reply. They told him that they could make any kind of hammer wanted, and if he would send a sketch they would make it and send it to him within a few days. He did so, and soon had his bottom hammer. He also received a letter stating that they had been manufacturing all kinds of hammers used in band saw fitting for over thirty years, that this was the first order they ever had for such a hammer, and asking if he would please tell them what the hammer was used for.

Now, as to the use of a bottom hammer. It is used in tensioning saws where there is no saw-stretcher for that work. We will say, for instance, that you are tensioning a saw and have no stretcher. You come to a place in the saw that is level, but does not show the proper tension. What is to be done in a case of this kind? You evidently must drive this place through on your anvil; then have your saw up over the brackets above the bench and drive it back again, in order to get tension. If this place does not show the proper tension yet, you are obliged to drive it through again; then put saw down on the bench again and level this place, in order to get the tension required.

This way of tensioning a band saw certainly makes a lot of work for a filer, especially one who is young at the

business. When testing the saw for tension and you come to a place that has not the proper tension, take the bottom hammer and place it under the saw, on the anvil, the flat end of the hammer next to the face of the anvil. Now, take the round-face hammer, or the hammer you use for tensioning, and commence placing the blows the same as you would if hammering right on the face of the anvil. All there is to do in using the bottom hammer is to keep moving it with your left hand wherever the blows are to be placed. The blows, of course, must be placed directly on the round face of the bottom hammer. By using the bottom hammer in this manner you never have to put your saw up over the brackets above the bench in order to level the inside of the saw in tensioning, as the bottom hammer punches the saw through from the inside; all there is to do is to level the outside of this section, and if it still doesn't show the proper tension, use the bottom hammer again in the same manner.

After one uses the bottom hammer once or twice it will be found a much easier way of tensioning than the old way of lifting the saw up and down off the hammering bench four or five times before one gets the proper tension. I wish it understood that I am not saying that by the use of the bottom hammer you will never have to level the saw on the inside, because you will. After you get the proper tension in the saw all the way round, put the saw up over the brackets above the bench and level the inside all the way round, then put the saw down on the bench and level the outside. The bottom hammer is also used for stretching the back or tooth edge of saw. In stretching either edge with this hammer, place the blows the same as when hammering on the face of the anvil.—The Woodworker.

"TELESCOPE" BAND SAWS.

Some people claim that the telescoping band mill is the only one on which perfectly sawed lumber can be made by a double-cutting saw; that saws on the telescoping patterns of band mill will stand much more feed, and that the feature of the top wheel being lowered right down to the cut is much better than a guide. All of these statements are absurd.

Double-cutting saws can be run on any make of band mill just as well as on the telescoping type, the running of the saws being a matter entirely in the hands of the filer—allowing that the filer has charge of the band he is filing for. Any make of band, with wheels correctly ground and properly lined up, will do as much work under similar conditions as a telescoping band. In fact, I know of a band, running with a double-cutting saw, which has dropped thirty-two boards 16 feet long in a minute, and each and every board was perfectly manufactured. As far as that is concerned, only a saw running under perfect conditions could make such a cut, so it follows that the boards were each perfectly sawed. Now, there is no telescoping band running on the Pacific Coast that can come within sight of this cut.

The idea that a telescoping mill will stand any more feed than any other type of band is based entirely upon an argument strictly fallacious. The manufacturers claim that the saw is like a belt—harder to push off or back on the wheels near the point of running off, on the tight side, than it would be anywhere else. If any scientific man connected with the manufacture of telescoping mills will explain why a saw running under a strain of say 8,000 pounds is any tighter near the upper wheel than it is a foot lower, and this, too, with the wheels as close together as they will run, he will be doing a good work.

To compare the running of a saw under the above conditions, with a belt running under one-tenth the strain, and on pulleys ten times as far apart, is absurd on the face of it. Let some of these wise people attempt to run a belt off the pulleys when said belt is running up to a strain of 600 pounds to an inch in width, and on pulleys so close together that the belt is only some 9 feet long between contacts, and he will find it just as difficult to push the belt off on one side as on the other.

If the lowering of the top wheel down near the cut is as good as a guide, why do the manufacturers of the telescoping mill use a top guide? Any band mill will run and do good work without a top guide, provided it is in first-class condition throughout. But the use of a top guide is universal, and the reason for this is that the saws will not remain in the condition they are when first put on without it.

SOME ENGLISH COMPARISONS.

A writer in the London Timber News has an interesting article on the differences between the various woodworking machines used in different countries. For converting, resawing, and planing each has methods peculiarly its own. Still there is less difference among European machines than among Canadian and American. It seems as though the development of the machines has followed different lines, and the results at present are striking in their dissimilarity.

English methods of sawing timber and of resawing goods are too well known to be mentioned. Scandinavian and Russian too are very similar, but we, in our haste, cannot wait for the moss to grow on the log while it is being sawn, so use means which sacrifice smoothness to rapidity.

The circular and frame cut fast enough for the European (the log band is not yet in universal use on this side, but across the Atlantic it has practically superseded the circular, not only in converting, but also for resawing purposes). Log mills are built with 9-foot wheels and band saws 14 inches wide, and, these are often discarded when they are less than 11 inches in width. The 6-inch or 7-inch saws on band mills on this side seem quite miniatures in comparison.

For the resaw band mills 21 and 22-gauge, 6 or 7 inches wide are used, these doing work commonly allotted to the ground-off. When circulars are used for resawing purposes they are huge machines, with feed rollers at the end. They are all live ones—two act as the fence, the others receive pressure to propel the wood. In most mills the transportation of timber is reduced to a fine art. Steam niggers and steam feed accelerate the work; trucks, conveying belts, or rollers lessen the number of employees required to continue the process of manufacturing. There are many mills in England that for years have employed men to carry deals from the yard to the machine; in some cases the distance is such that the work of supplying the saws with planks has required quite a large staff of men.

English mills are suffering from want, and ofttimes from being a continual growth from a small concern. Where a mill is deliberately planned, and there is a fair amount of money to buy equipment, it is then simply a question of whether the owners are up to the times, whether they have appliances that lessen the wage bill and add to the efficiency of the mill.

Most of English sawing can be compared favorably with that of any country. Occasionally, it is true, one may see rough boards in a case, but when the total is compared with those of other nationalities there is very little room for complaint.

Furniture and Cabinet Making

DRYING LUMBER AND VENEER.

The drying of lumber is one of the difficult problems that come up before each and every mill man or furniture manufacturer as well as those who are making interior trim and others along the line.

It would seem that the business had been entered into so extensively that there was nothing new to propose and that every idea along the whole range connected therewith had been thoroughly covered and exhausted.

It further appears that there are as many systems of kiln-drying as there are makers of kilns. And still the cry goes up for satisfactory processes. No doubt there are many mistakes made with the systems at hand, when if they were more carefully handled they would prove more satisfactory. In some of them the steam is allowed to go too high in temperature for the stock when it is first put in, and then the drying is crowded too fast, which has a bad effect on the lumber, often causing it to honeycomb, thereby becoming almost worthless.

Not long ago the system of steaming or moist air drying was patented, or at least certain patents taken out in connection therewith.

This system has proven to dry the lumber much quicker and in better shape than the old hot method as often used.

The former dries oak from the log in a satisfactory condition in about eight days' time, and as this is the timber usually used in furniture one can readily appreciate what this fact means.

Formerly oak was cut and held on sticks for about nine months before most concerns would accept it. Then some of them held it a year or more before they would use it. This because they had so much trouble with it honey-combing and in getting out the acids contained therein until the lumber would shrink no more.

How many factories have had trouble with their furniture showing open joints, simply because the acids and moisture were not all out of the stock before it was worked.

These openings usually show most at the center of the lumber. The ends of the boards generally dry the fastest and contract to the last extreme, while the center of the board contains moisture and is expanded.

Now when it is jointed up in this condition and glued together the moisture still continues to evaporate and the stock to contract at all points not thoroughly shrunken, causing open joints in the furniture.

I know of cases where this fact alone caused the loss of several hundreds of dollars worth of furniture before the condition was fully realized and remedied.

Others may still be bumping up against the same conditions, as these things are met by all who pass this way or become experienced in handling lumber.

What condition should lumber be in before working it into furniture?

Well seasoned and thoroughly dry.

But what is the small factory going to do when not able to carry a year's supply of lumber ahead?

Buy stock of a thoroughly reliable dealer who will guarantee to deliver only well seasoned stock, or better still to have a moist air kiln where the lumber is sure to come out right if cared for as directed by the makers of these kilns. Or if the small factory is located in one of the large cities they can have this drying done for them.

This will further produce a saving, inasmuch as thirty-day stock is usually sold cheaper than nine months' old stock.

And then the final results in well-built funiture; a satisfied customer is a business getter and goes a long way in attaining the coveted results.

Veneers, like lumber, should be thoroughly dried before gluing to insure good work. Especially is this true where one joints them to make large panels.

Generally speaking veneer is not thoroughly dry when shipped and often gets exposed to moisture in transit or in storage. It is preferable to have it redried before gluing. And this can be done with a plate-dryer very satisfactorily. Several of which are on the market. But where one hasn't this means it may be piled on sticks in a fairly warm room for a few days or until needed for use.

However never take chances of its being shipped to you dry enough to glue, for this is seldom the case and is very apt to cause bad work.

I saw some veneered doors a few days since where the joints had opened up, showing that the veneer was not thoroughly dry when used.

This stock was quarter-sawed oak and ⅛-inch in thickness, which together with 3-16-inch and ¼-inch stock are the thicknesses which are liable to be slighted in drying.

One can imagine what loss there is when a door is returned to the manufacturers with the veneer joints open.

To re-veneer it is not practical, and to patch it up makes a rather unsatisfactory job of it. So the next course is to set it to one side and wait for the fellow looking for some cheap stock and sell it to him for what one can get rather than to work it over. However, one doesn't care to take this course very often or the wrong side of the ledger may look bad.

Veneers should be kept in stock far enough ahead of the orders to allow for plenty of time to dry and not force the mill to use stock before it is in shape to use.

And now seems to be the opportune time to lay in a stock of veneers as well as lumber. All indications are that prices will soon soar up, as business is bound to advance, and one can hardly expect that they will ever come down to the level where they are to-day. As timber is becoming more scarce each year and the demand for veneers is becoming greater the price will certainly go up, where it will stay. Even if another dull time should come later the price of veneers will hardly drop back to the present rate.

"Observer."

HARMONIOUS FURNITURE DESIGN.

When one enters on a subject that is as vast as furniture design he is treading on somewhat precarious ground; design has so many meanings and so many interpretations that it becomes at once a maze. I hear the term "pure design," and am told that the so-called "mission" idea is its only exemplification, and, at the same moment, others

affirm that when any one will not admit that the Louis XIV. period is not all that it should be he is an atheist.

I am going to define, as they appear to me, a few phases of pure design. First: Fitness to purpose, and, in fact, if everyone would stick to that idea the whole problem would be solved. Spindle-legged chairs, meant only to look at and not to sit on, or, on the other hand, massive oak furniture, so heavy that the housewife must call in all the neighbors to help her when she wishes to move a chair about, may have a fitness to its purpose, but that purpose is biased and does not fulfil an ideal in the line of furniture design. Originality is not claimed for the sketches here shown.

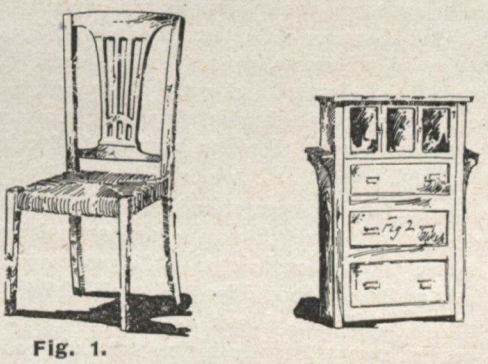


Fig. 1.

Let us analyze fitness to purpose. What is the purpose of furniture? First, articles made for our use in the simplest and most direct way, giving service, comfort and ease to the daily life. Second, to accord with the democratic ideal of modern life—man first, his fittings second. Third, to be so decorative as to be able to please in the highest artistic sense, yet to be so decorated as not to spoil the first object, the use. To be explicit, let us take the chair. What is the excuse for its being? To sit on. Then build it strong enough to bear the weight of a man. Running over the pages of any furniture periodical, many a chair is seen pictured that will not hold 180 pounds and have a two per cent. "factor of safety"; then, on the other hand, while having it strong enough, do not make it uselessly massive

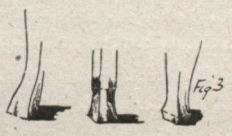


Fig. 4.

—it may have to be moved sometime. It does not matter if the legs be square, round or otherwise if they be well placed, strong, and have good, clear lines. The seat may be rattan, wood or cloth if it be ample and serves the purpose for which it was intended. Think of all the various chairs upon which you have sat, formed seats, the sit-still kind, plush seats and tidies, buttoned seats, with a button off, et cetera. The back is also full of opportunities for study. I honestly think all chair builders should take a course in anatomy, or else be obliged to sit in some of their own chairs in the future.

The wood itself is nearly enough decoration; the form may be made graceful yet substantial. Very heavy carving has no place in true furniture design. Use carving sparingly, a touch here and there to add beauty of line. I wish I could remember which magazine contained an article on a certain Morris chair. I should like to quote it in full. Morris stood for all that was simple, graceful and clean in art, and what a desecration to call a heavy, over-carved and gaudily upholstered affair a "Morris chair." To sit in it one had to grasp lions by the manes, and after one was seated lions stood on either side as guards against the intrusion of good cheer and comradeship.

Much more desirable is a quiet piece of furniture, with simple lines, curved if you will if they do not destroy the sense of support, finished at the foot possibly as sketched in Fig. 3, having a simple adjusting device that will not pinch the fingers—a rod across the extended arms is a good one; upholstered in a quiet tapestry for preference. What is the first requisite of a chair? That it be strong enough to hold anybody; and second, that it be simple, easy to clean and to dust; third, quiet in tone and design, and, lastly, comfortable. What is the pleasure of a good appetite, a good digestion and the wherewithal, without the comfort to thoroughly enjoy the combination?

Having decided upon the idea of a perfect chair, go ahead; build the chair of mahogany if you wish, but if it be of chestnut, be honest about it and finish it chestnut. What lies and truth a piece of furniture can tell!

How beautiful is a mahogany chair with the legs slightly modeled, an entire seat of rush, the back a little inclined, and giving support to one's body exactly as Nature intended; no complicated carvings to be filled with grime by careless maids.

It is not against good design to make the construction evident—it rather helps, but do not overdo it and make unnecessary tenons and keys to catch and hold clothing. The use of screws is good, provided they hold and are useful for that purpose, that is, if the chair be well designed for the use of screws. I have in mind a rocker screwed together, and on outside inspection good. Soon it was found that the centre of gravity was too far to the rear, too much strain came on the back. After a little use the front legs, screws and all, parted from the rocker. The back legs gave way at the seat, and so on. A slight study of the construction disclosed the fundamental fault—a lack of knowledge of the elements of physics in the design of that chair, wrecking the value of an otherwise well decorated and designed piece of furniture.

One of the chief faults in the design of furniture is the lack of harmony in proportion. It is impossible to give a rule regarding space relations, as each piece calls for individual treatment. Notice how well Nature takes care of the problem in an elm tree. The trunk soon divides into two limbs, each one-half the weight of the parent, each to divide again, and so on. It is easily seen that the weight of all the topmost twigs is just equal that of the trunk at the root, a true harmony of proportion and balance.

I have before me a cut, as in Fig. 4, of a chair that may be analyzed thus: At the feet very slender and given a deep carving. The weight there may be about 1 to 50 as proportioned to the back, which is solid and combined with solid arms, flanking a stuffed cretonne seat.

VENEERING COLUMNS.

Veneering ordinary columns is work that can be made very tedious, yet is also capable of being done very simply and easily.

The first start toward the column, of course, is to make up the body or core. This is always built up, preferably hollow, but in any case always built up out of two or more pieces of wood. To turn columns out of solid wood is to invite trouble through swelling and shrinking. To avoid this and get a better job generally, the lighter columns are built up with strips of common lumber of any kind and then turned to the exact size wanted. If columns are 4-in. and over in

diameter, the usual practice is to build them in box form, leaving them hollow in the center and just getting enough wood around the outside to make them substantial. Often they are made of staves matched together edgewise, sometimes one way and sometimes another, and occasionally one cannot help but think that cores from the veneer machines could be used in a lot of this work by boring out the center. Of course, there is a little more danger from swelling and shrinking than when a column is built up with several pieces, but still it looks like one might make a pretty fair column out of veneer cores by boring and then thoroughly drying them.

But this is aside from the main question of veneering the columns. The columns for veneer are all turned just as if they were going to be used without further facing. Then they are taken to the glue room and the veneer is gotten out to the right dimensions for the columns to be faced. If it is a small column, anything from 4-in. down, it is comparatively easy to get the veneer for each column in a single piece so that there is no matching up at all. For larger columns, of course, the veneer must be matched up and jointed and fastened together with tape, just the same as in panel work, after which it is used as one sheet. Then two men usually do the work, one doing the gluing, the other clamping the veneer.

Before spreading the veneer with glue it is usually moistened on the face or outside with a cloth or sponge dipped in water, to make it bend easily and prevent cracking; and sometimes, after being moistened, it is held over a steam jet for a minute, or heated up in some way, to further prepare it for ease and safety in bending around the column. The outside surface of the column and the inside surface of the veneer are then carefully spread with glue, not too thick, because there is not as good a chance to squeeze surplus glue out of a joint of this kind as in making flat work, but carefully spread all over and rather thinly mixed, so that the glue body may not be too heavy. After the glue is spread, the man who does this work at the table or work bench rolls the veneer around the column, first tacking one edge at each end, then drawing the other around, and laps it over something like an inch and puts a tack in it at each end to hold it in place, after which he passes the column to the other man, who does what would be termed press work.

The press work on an ordinary column, however, does not involve the use of a press at all, but may be most easily done by using the irons—that is, the head and tailstock of two simple turning lathes. The explanation of this comes from the fact that the veneer is drawn tight to the column and held in place by winding with a strip of heavy canvas about 2-in. wide, would spirally from end to end, and drawn tight enough in the process of winding to hold the veneer firmly up to the column. To start the winding, one end of this strip is tacked to the column at one end, and then the lathe is started on slow speed, and by holding the strip in the hand the man can put as much tension or pressure on it as he thinks is required, and run it on spirally, coming out at the other end and lapping back a few times, then tacking the canvas down again. No clamps or presses are used at all, but there is a sort of sleeve in which the column may be run at the head end to hold the veneer down a little during the wrapping.

It may seem from this that one lathe would be all that the work would call for, but really the use of two helps out considerably. The two are mounted practically on the same bench, one just back of the other, the back one being just an idle or holding lathe. The advantage and usefulness of this combination comes from the fact that those columns which have been laid aside and on which the glue has set must, of course, have the tape or canvas strip unwound from them, and by putting these columns in the back lathe two birds may be killed with one stone, so to speak; the canvas from one is wound off onto the fresh one, being put in the driven lathe. It is started off by hand, and the end brought across and nailed to the freshly-glued column in the lathe, then the lathe is started, and the strip of canvas, being wound spirally on the first one, naturally in unwinding winds itself spirally on the other one; the tension or tightness of the winding may be regulated by tightening the one that is being unwound in the lathe, so that it pulls as heavily as may be necessary. When the canvas is wound off it onto the fresh one, the last end is tacked and both are ready to come out of the lathe, the operation to be repeated on two others. It's a very simple matter, and only takes about a minute to unwind an ordinary column The exact speed, of course, depends on the skill of the workmen, but it is so simple and easy compared to the old, laborious manner of clamping in a tin form that the old way is hardly to be thought of where numbers of columns are made regularly.

The veneer, as has been stated incidentally before, does not joint together, but laps over to make the joint, and the outside veneer is chamfered down in the process of finishing, so that it is really a lapped joint. Naturally, too, in making a joint of this kind there is not much room for the surface glue to get out except that which runs out endwise in front of the winding, so care should be exercised so as not to get the glue too thick, and at the same time it should be thick enough to insure a good joint.

This method of jointing veneer on columns by lapping it over answers for most general purposes, because columns used in mantel work, and frequently in mill work, have the back close to some other work, so that this joint can be turned behind and is not visible. Where it is desired to make a neater job, the edge of the under veneer in this lap is cut into the core, so that the top piece, when lapped over and finished down, does not leave a hump. Another method is to carefully joint the veneer together, but this is a little hard to do when wound with canvas as described above. Where the old form is used there is generally an open space at the top where the lap can be gotten at and trimmed to a joint and carefully matched down. This method, however, takes so much time and work that the usual practice is to lap over, and where the lower or starting edge of the veneer is carefully notched into the core, a very neat job can be made.

Veneer used for columns is practically always 1/20 stock, either sawed or cut. The cut veneer is less expensive, and when the cutting is properly done and put on with the right side out, it is difficult for even an expert to tell, after it is finished, whether it is cut or sawed. Sometimes, however, in matching up on large work it is desired to turn one sheet of veneer with one side out and one with the other out, to get an exact match of figure. This can be done with sawed veneer, but not with cut. However, in column work this is not as important as in panels, because the main point is to get a figure that harmonizes and runs in the same general direction, and this can usually be gotten out of cut veneer. Matching up crotches and things of that kind are not called for in column work like they are in panels, so cut veneer can be used very nicely.

—A practical woodworker writes as follows: "I think we woodworkers of Toronto should give our best support to a magazine of the kind you are publishing." And there are many others think the same.

Boxes and Cooperage

DRY KILNS FOR COOPERAGE STOCK.

By E. H. Vitalius.

The dry kiln has been, and probably still is, one of the most troublesome factors arising from the development of the timber industry. In the earlier days, before power machinery for the working up of timber products came into general use, dry kilns were unheard of. Air drying, or seasoning, was then relied upon solely to furnish the craftsman with dry stock from which to work up his product. Even after machinery had made rapid and startling strides on its way to perfection, the dry kiln remained practically an unknown quantity, but gradually, as the industry developed and demand for dry stock increased, the necessity of some more rapid and positive method of seasoning became apparent and the subject of artificial drying began to receive the serious attention of the more progressive and energetic members of the craft.

The first efforts in the way of artificial drying were confined to the aiding or hastening nature in the seasoning process by exposing the lumber, or timber, to the direct heat from fires built in pits, over which the lumber was piled or hacked in a way to expose it to the heat rays of the fire below. This, of course, was a primitive, hazardous and very unsatisfactory method, to say the least, but it marked the first step in the evolution of the present dry kiln and in that particular only is it deserving of mention.

In addition to marking the first step in artificial drying, it illustrated also, in the simplest manner possible, the underlying principle governing all drying problems, viz., the application of heat to evaporate or volatilize the water contained in the material with sufficient air in circulation to carry away in suspension the vapor thus liberated. It matters not what type of kiln is used, source or application of heating medium, this underlying principle remains the same and must be the first thing considered in the design or selection of the equipment necessary for producing the two required elements—heat and circulation.

Although this principle constitutes the basis of all drying problems and must, therefore, be continually carried in mind in the consideration of them, it is equally necessary to have a comprehensive understanding of the characteristics of the material to be dried and its action during the drying process. All failures in the past, in the drying of timber products, can be directly attributed to either the kiln designer's ignorance of these things, or his failure to carry them fully in mind in the consideration of his problems.

Wood has characteristics very much different than those of other materials, and what little knowledge we have of it and its properties has been taken from the accumulated records of experience. The reason for this imperfect knowledge lies in the fact that wood is not a homogeneous material, like the metals, but a complicated structure, and so variable that one stick will behave widely different from another stick, although it may have been cut from the same tree. The great variety of woods often make the mere distinction of the kind or species of the tree most difficult. It is not uncommon to find men of long experience disagree as to the kind of tree a certain piece of timber was cut from, and, in some cases, there is even a wide difference in the appearance and evidently the structure of timber cut from the same tree.

It is not the intent of this paper to go into a discussion of the characteristics and properties of wood, except as they affect the drying problem, and it must also be perfectly obvious, considering the limited time allowed for this paper, that even this phase of the problem can be handled only in a general way.

The rapidity with which water can be evaporated, that is, the rate of drying, depends on the size and shape of the piece and on the structure of the wood. Thin stock can be dried much faster than thick, under the same conditions of temperature and humidity. Pine can be dried, as a general thing, in about one-third of the time that would be required for oak of the same thickness, although the former contains the more water of the two. While it is true that a higher temperature can be carried in the kiln for drying pine and similar woods, this does not altogether account for the difference in drying time, as experience has taught us that even when both woods are dried in the same kiln, under the same conditions, pine will still dry much faster, proving thereby that the structure of the wood itself affects the drying.

The aim of all kiln designers is to dry in the shortest possible time, without injury to the stock. Experience has demonstrated that high temperatures are very effective in evaporating water, regardless of the degree of humidity. A fresh piece of sap wood will lose weight in boiling water and can also be dried to quite an extent in steam. This proves conclusively that a high degree of humidity does not have the detrimental effect on drying that is commonly attributed to it. In fact, a proper degree of space humidity, especially in the loading and receiving end of a kiln, is just as necessary to good results in drying as getting the proper temperature. Experiments have also demonstrated that injury to stock in the way of checking, warping and hollow-horning always develops immediately after the stock is taken into the kiln, due to the degree of humidity being too low.

The receiving end of a kiln should always be kept moist, where the stock has not been steamed before being put into the kiln. The reason for this is simple enough. When the air is too dry it tends to dry the outside of the board first and in so doing shrinks and closes up the pores. As the stock is moved down the kiln, it absorbs a continually increasing amount of heat, which tends to drive off the moisture still present in the center of the board. The pores on the outside having been closed up, there is no exit for the vapor or steam that is being rapidly formed in the center of the board. It must find its way out some way and in doing so, sets up strains, which result either in checking, warping or hollow-horning. If the humidity had been kept higher, the outside of the board would not have dried so quickly, and the pores would have remained open for the exit of moisture from the interior of the board, and this trouble would have been avoided.

Where the humidity is kept at a high point in the receiving end of the kiln, we also find that higher temperatures can be safely carried and in that way the drying process hastened with comparative safety. While thin stock, such as cooper-

age and box stuff, is less inclined to give trouble in this respect, than 1-inch and thicker, we find that the kiln will give more uniform results and, at the same time, be more economical in the use of steam, when these conditions are maintained.

Cooperage stock is now universally dried in the progressive type of kiln. In a kiln of this type, the material is piled on trucks, which are pushed down through the kiln on tracks, progressing through the kiln slowly as the demands for dry stock determine. One of the main advantages in a kiln of this type is the small expense of handling and it also has advantages from the drying standpoint, which cannot be duplicated in other types of kilns.

The progressive type of kiln is divided into two classes—the pipe kiln, in which natural draft is relied upon for circulation, and the blower kiln, in which the circulation is produced by fans or blowers. The blower kiln is the older of the two and has been used for drying this stock for nearly 25 years, during which time, of course, it has undergone steady improvement, not only in the apparatus and equipment used, but also in the general design of the kiln, method of introducing air and provision for controlling the temperature and humidity.

The pipe kiln first became known about 15 years ago, and while it has been used to some little extent for the drying of cooperage stock, the results obtained from it have not been so uniformly good as from the blower type of kiln.

Cooperage stock essentially requires positive and uniform circulation to insure good results. With a natural draft of pipe dryer, we find that the varying atmospheric conditions affect the circulation, in some cases to such an extent that good results cannot be obtained, while with the blower kiln, the circulation is always under control and can be adjusted to suit the conditions arising from the operation of a dry kiln, which necessarily vary with the condition of the stock going into the kiln and the amount of output that is expected.

In either type of kiln, however, it is absolutely essential, in order to secure good results, both as to rapidity in drying and good quality of stock, that the kiln be so designed that the temperature and humidity, together with the circulation, are always under convenient control. Any kiln, where this has not been carefully considered and allowed for, is sure to give trouble. In the pipe, or natural draft kiln, we find that while the temperature and humidity can be controlled to a satisfactory degree, the trouble has been in the circulation. In the old blower kiln, the trouble was, while the circulation and temperature were very largely under control, it was next to impossible to produce conditions in the receiving end of the kiln so that the humidity could be kept at the proper point. In fact, this was one reason why the natural draft, or so-called moist air kiln, was developed and it succeeded very well in overcoming this trouble, but, as usually is the case, it developed the other defect, which was just about as detrimental to good results.

The advent of the pipe, or moist air kiln, served as an education to kiln designers, in that it has shown conclusively the value of a proper degree of humidity in the receiving end of the kiln and it has been of special benefit to us in that it gave us our first idea of how to improve the design of our blower kilns to overcome the difficulty above referred to. This has been remedied and in a decidedly simple manner, as is usually the case with all things that possess any merit. We find by returning from one-third to one-half of the air used in a kiln back to the fan room, and mixing it with fresh air, that we can produce ideal conditions for drying work.

The amount of air that can be returned from the kiln depends on three things—first, the condition of the stock on going into the kiln; just how hard the kiln is being worked; and the condition of the outside atmosphere. In the winter time, we find that a larger proportion of air can be returned than in the summer time. This is rather a fortunate coincidence, as, when the kiln is being operated in this way, it is also much more economical in steam consumption, as must be perfectly obvious. In the summer time, when the outside atmosphere is saturated to a much greater extent, we find that it is not possible to return as large an amount of air from the kiln, although we have some kilns in operation in which all of the air is returned and no fresh air whatever taken. This is an unusual thing, however, and can only be accounted for by the peculiar conditions surrounding the installation, which we will not go into at this time and explain.

It is not generally understood that the length of a kiln has any effect upon the work that can be gotten from it, but it is a fact, nevertheless, that long kilns produce a better quality of stock and in a shorter time. Our experience has shown us that for cooperage stock a kiln from 75 feet to 90 feet long will produce the best results, and it is our practice in every case, where possible, to keep within these figures. The reason for this is that in a long kiln there is a greater drop in temperature between the discharging end and the green or receiving end. As we have outlined in the foregoing, it is very essential that the condition in the receiving end of the kiln, as far as temperature and humidity are concerned, must go hand in hand. We find in a long kiln, we can produce the desired conditions with higher temperatures than with short kilns, consequently we can carry much higher temperatures in the discharging end of the kiln on this account and on account of the length of the kiln as well. It is nothing unusual to find that a temperature of 200 degrees and over can be carried in the hot end of the kiln safely, without, in any way, injuring the quality of the material, although perhaps a better average would be placed at 180 degrees in the hot end and about 120 to 130 degrees in the receiving end.

With the positive circulation that can be maintained, with a blower kiln, and the conditions of temperature and humidity under absolute control, we have the elements most necessary to produce good drying results in the fastest possible time.

As may be gathered from the above, that in spite of the fact that we manufacture what is pretty generally recognized as the best moist air, or natural draft, kiln on the market, we find, from our experience, that the "ABC" blower kiln is better adapted for the purpose of drying cooperage stock and we have no hesitancy whatever in recommending its use for this purpose.

It must not be inferred from this, however, that this type of kiln can be installed and good results obtained regardless of how the kiln is handled. A great deal of the success of any kiln depends on intelligent handling. Although there have been any number of kilns exploited in the last 10 or 15 years, for which extravagat claims have been made, both as to efficiency, rapidity in drying, freedom from attention, etc., most of these have been of the type that might be classed as "freaks" and have died a natural death. Every year we are approached by would-be inventors with ideas to sell, and as we are continually seeking improvements in the art, which possess real value, we investigate all of them carefully. Invariably, we are sorry to say, we have had to reject them for one reason or another. Usually they are not based on sound principles, or comprise features which would make their use uncommercial.

CARE OF BOX MACHINERY.

There is quite a variety of planers in use among the different box manufacturers that, aside from their individual peculiarities and differences in detail, are conveniently divided by machinery manufacturers according to their sizes and shape into several general classes. There is the big double surfacer, which is found in both the endless belt style and the roller feed type, there is the big single surfacer, and then there are numbers of pony planers and panel planers of a more compact type, calculated generally to make a smooth finish and not dress as much lumber in a day as the larger machines.

Among all the different types, however, there are certain general principles to be followed in fitting up and operating the machines to get the best results. Generally, it is either ignorance or neglect of some of these, probably not in the main essential, but in many of the details, which result in poor work at the planer and in the box factory. You can find plenty of evidence of this from the fact that sometimes the shops which have the most expensive and up-to-date planers do the poorest work. Not that the best work can always be done with the poorer machine, for it is really difficult to do good work with a poor machine, but the point that it is desired to bring out for the purpose of emphasizing the imporance of looking after the many details in the care of a machine is, that the quality of the product depends more on the handling of the machine than on the machine itself. This is considering, of course, that all the machines are of the kind that can be made to give good service. So without regard to the specific make let us consider in some detail the different faults that can be found with planer work in a box factory and the things that it is necessary to look after and adjust about the planer to get better results.

There was found one day in a progressive box facory, says "Packages," a big new double surfacer, of which the owner was somewhat proud, and it was dressing lumber to beat the band, shooting it through so that both the feeder and the man taking it away had to hustle. But the lumber didn't look good, and close examination of it showed that it not only had some washboard effect, common to lumber dressed rapidly, but the face was marred up considerably by chips and shavings sticking to the surface of the lumber and passing under the pressure-bar. This fact was so prominent that attention was called to it, and the proprietor said that he noticed it, and had made some effort to cure the fault, but somehow he had not been able to do so.

Now, do you know what this little fault means? It means two things: First, that there was a deficiency in the blow piping system, and it tells us, in the second place, that one of the first essentials to good work with a planer is to have all the heads well hooded and a good fan for taking away the shavings, so that they may not stick to the lumber and pass through under the pressure-bars.

It is about as bad a mistake as a man can make to buy a good planer, for which he necessarily has to pay a good price, and then put up a cheap rig to take away the shavings. It is like buying a pair of good horses, and then hitching them to an old, rickety wagon that won't carry a load. You couldn't get the service out of the horses in that case, and neither can you get the proper service out of a planer until it is well hooded and has a good fan to take away the shavings. The best thing to do with a job of this kind, unless you have some man in the factory who is a known expert at it, is to let the job of piping the planers and other machines to people who make a specialty of this class of work. There are several of them advertising right along, and generally you can find some that are near enough to you to have them come and attend to your work, and even if it is quite a distance away it is better to pay the extra cost and have the job well done. You may not be able to see from a glance enough difference in the appearance of a piping system put up by experts and one put up by some clodhopper, and for this reason it may be hard for you to realize that there is so much difference in the value. Yet, it is there just the same, and if you want to see the difference, just visit awhile and make a study of the different plants and note how much more satisfactory those are which had their blow piping system and fans well put up by people who are experts at the work.

Among the simpler defects found in planer work is the tearing out of the wood in splinters or slivers, the eating in of wood as some call it, or digging into the grain where the grain runs against the cut.

Where this occurs in the finished product it is most commonly caused by dressing lumber before it is thoroughly dry. This is not the only cause, however, but it is one, and it is one that should be looked after. No man can get smooth work out of a planer, that is work that will remain smooth and look nicely after it is finished, if the lumber is dressed green. Most box factories are provided with dry kilns, which make it unnecessary to dress green stock ordinarily, but here and there are some factories which have no dry kilns, and these quite frequently get stock into the planer that is not dry enough for proper dressing. Factories of this kind should really buy all their stock kiln-dried, or else they should carry their lumber on the yard for two or three years.

The better plan, however, is to equip a kiln of some kind, even though you don't need it all the time, for it is worth the investment to have a small kiln or hot room of some kind where you can thoroughly dry cut lumber before dressing it, if you want to get a smooth job. In fact, for any kind of job and on any kind of lumber it should be dry before it is worked on the planer. If it is rough crate stock it doesn't hurt it, but makes it look better to have it well dried, and if you can't do the dressing properly you might about as well use the lumber rough. Of course, you can make a bluff at fulfilling some specifications on rough boxes that call for one side surfaced, or both sides, by shoving rough green stock through the planer, but it is a poor makeshift, and in the end gets the shop a bad reputation for quality of work. In short, it is better to dress the stock right or not dress it at all, no matter even if it is going into cheap packages. It doesn't cost much more, and is well worth the additional expense.

When lumber is thoroughly dry and still there is this rank cutting or eating into the grain of the face, it is time to examine the knives, chip-breaker and pressure-bar for the source of trouble. If knives are set too rank they will sometimes cause this effect. Sometimes it may be caused from the knives being dull, but generally when knives are dull this fact becomes apparent from the noise and hard pulling of the machine; it pounds or "hollers," and pulls heavy and don't cut clean. Sometimes, too, when the chip-breaker is not close enough to the knives or isn't properly adjusted, there may be a little tearing of the grain. It is more than likely, however, that the cause is from having the knives set too rank; that is, the edges extending too far beyond the lip of the cutter-head. It is pretty hard at times to get some people to understand the theory or the result of setting the knife so that the edge extends beyond the lip of the cutter-head certain distances. It is, however, a very simple matter, one that practically every carpenter

understands, and the theory and its application to the machinery planer is the same as applied to the carpenter's plane.

For a roughing-off plane, or jack plane, the carpenter takes the cap that goes on top of his plane bit and sets it back from the edge probably an eighth of an inch or nearly a quarter. He knows that this will give him easy cutting and a free clearance for the shavings, but that it won't give him a smooth finish. To get the smooth finish he takes another plane, called the smoother, and sets the cap on this bit close down to the edge, down to as close as one-sixteenth or one-thirty-second of an inch, so that it will keep the shavings from stringing and the bit from eating in, and insure smooth work, even where the grain is against the cutting of the knife at times. On the machine planer the lip of the cutter-head performs exactly the same mission for the knife that the cap on the hand plane performs for the plane bit. If the planer man will keep this religiously in mind when he comes to setting the planer knives he needn't have any difficulty about getting smooth work, or understanding why it is that when the knife edge is set back close it will do smoother work.

In some woodworking institutions they use planing machines considerably like the carpenter uses his plane. They have a roughing-off planer, which takes the place of the jack plane, through which the rough lumber from the yard is run to surface it down to a given thickness and remove the dirt and the saw marks, and get it as smooth as is consistent with this class of planing. This machine, therefore, is the jack plane of the factory, and the knives are set out probably an eighth of an inch, and even more at times, and no effort is made to get finished work with it. Later, however, the stock goes to a smoothing planer, where the knives are set very close and kept ground and whetted keen for doing smooth work. This practice is particularly noticeable in a furniture factory, and it would be a good thing if we had a little more of it in the box factory, because then stock for the finer grade of boxes on which fancy printing is being done could, by being run through the second planer, be made much nicer than is possible at one time running through a big surfacer. Where box factories haven't equipment for doing this, however, the next best thing is to keep the one machine in the best possible order, have your knives set in close enough so that they will dress smoothly and keep them as sharp as possible.

Keeping sharp knives on a planer that has to take rough stock from the yard, especially if it is a city yard, where lots of soot and cinders fall, is a pretty tough job, and at times one is inclined to feel rather sorry for the planer man who has to work dirty lumber, and at the same time gets jacked up every time the stock isn't as smoothly finished as the proprietors would like to see it. One good way to do is to have the lumber as well protected as possible while in the pile and not allow any yard hands to throw it down in the dirt and walk over it And then, after taking every possible precaution for the care of the lumber, grind the knives on the big planer a little concave, so that you can file and whet without taking them off for quite a while, and thus from time to time freshen up the edges. They have to go to the grinder more often, of course, than if the planer were simply doing the rough work and there was another planer to do the finishing afterwards. But it is either that or put in another planer. Some day some box men will probably realize that there is an advantage, even though it seems an additional expense in running stock through a second planer to get it smoothly surfaced, and using the first planer to simply clean off the dirt and knock off the saw marks and the high places.

Where stock comes from the resaw and is then to be surfaced on the resawed side it is not so hard on the planer as taking off the outside surface from lumber that has been standing on the yard.

There may be some variation of thickness, but the lumber is fresh and clean, and, as the knives can be set close and can be kept sharp for a reasonable length of time, they should do excellent work if the machine is properly adjusted. Where lumber is surfaced on both sides and then resawed and resurfaced on the resawed face one should be able to get at least one excellent face for printing or for any other purpose. And, of course, if there are no defects in the lumber to make it imperative to turn the other side it is this resawed face that should be turned out, that is, provided the planer has done its work properly. If it hasn't if this resawed face after going through a single surfacer isn't better dressed than the original surfacing at the big machine before resawing them, it is time to take a working on that single surfacer, because it is not doing its duty.

Also, where lumber is resawed before dressing and the thin boards go through a double surfacer, one should get the best results out of the head dressing the resawed side. And where practical, use one head only for this process; that is, keep the boards turned one way all the time so that the head doing the facing on the clean side will not have to be dulled by taking off the old surface of the outside. This is given more as a suggestion than as a rule, because sometimes there are other things besides the freshness of the face that determine which side of the board to turn down in dressing. Still, it is well to keep all such points in mind because they do a lot to help keep the planer work up to the right standard, and there is plenty for the man to do who keeps planers in order, even when he is favored by proper attention to these things.

CANADIAN COOPERAGE STOCK MARKET.

July 27th, 1908

There has been quite a brisk demand for apple barrel stock during the past month, and the demand has steadily increased. There is a general crop of apples throughout the country, not quite as large as was anticipated, but the packers report the apples are all of very good quality, and with the favorable rains we have had during the month, they will undoubtedly turn out a very large proportion of apples suitable for export.

The general demand for stock throughout the country has not been quite as heavy during July as in the previous month, but now, when the new wheat is coming in in Ontario, the mills expect a heavy run during August, and will use a large amount of stock.

The sugar refineries are using if anything a little more barrel stock than a year ago, and a great many concerns are going back to this package on account of it being the most sanitary package for sugar.

A great many of the mills are now closed down for lack of raw material and on account of the state of the woods from the recent rains are not likely to be able to start up to any extent until September, when there will be a light run.

However, from present indications there is going to be no stock carried over until next year. Prices are practically unchanged for prompt shipment, but manufacturers and dealers are asking an advance for shipments during September and October; prices are likely to be very much higher during these two months than they are at the present time.

MAKING CIGAR BOXES.

While some cigar boxes are made of cedar, a great number are made of poplar, veneered on one side with cedar, while still others are made of poplar without any veneer. In the latter case the wood is printed in imitation of cedar by the use of ink of the proper color and a machine which carries a printing roller on which are the lines to resemble the graining of cedar wood.

The bottom and top of a cigar box of standard grade are 5-32 of an inch in thickness, while the ends are 7-32 of an inch. Despite the very small amount of wood needed, it is cheaper, however, to use the veneered poplar than the cedar, and still cheaper to print the poplar. Solid cedar boxes to hold 100 cigars now cost about ten cents, and the half boxes, or those for fifty cigars, about eight cents. The corresponding prices for veneer are about one cent less, while for the printed poplar the prices are three to four cents.

Such prices are only made possible by the use of intricate machinery and subdivision of labor, and it is also important to waste as little of the material as possible. To this end the wood of the proper thickness is not sawed from the log, but sliced or split by a special machine. The immense pressure used in veneering wood for the manufacture of furniture is not used, and the veneered sides, which are pretty well warped and twisted at first, are straightened out and dried simply by passing through rollers.

Then the slabs are taken to the sawing table, where they are ripped and cross-sawed—from five to ten in one cut—into pieces of proper dimensions for the single boxes which are being made. Thence the pieces are sent to the inspector, who, besides examining each and sorting out those which are imperfect, makes separate piles, containing the same number in each of ends, sides, bottoms and tops.

The ends and sides are nailed together into a frame by one machine, and the bottoms and tops are nailed on by another. These machines are fed with nails by an automatic arrangement, which presents the required number of them at each stroke. One stroke does the business of nailing at each corner, and one stroke also suffices for the bottoms and tops, the nails being pushed in rather than driven. One of these machines will frame 5,000 boxes a day, and two machines, working together, will turn out 10,000 boxes, except for the labels.

The lid of the cigar box is held in place by nailing only along the front edge, and generally by one nail. The hinge at the back is made by one strip of cheese-cloth glued upon the outside and subsequently covered by the labels and paper trimmings. When the hinge is dry the pasting of the labels is begun. Tiny metal hinges are sometimes put upon cigar boxes, but these are comparatively rare. So are dovetailed boxes, which can, however, be had on order.

Generally speaking, the entire interior surface of the boxes is lined with paper flaps, and in large factories the label printing, and sometimes even the designing of the labels, constitute an important branch of the work. Such printing is of an unusually varied character, requiring several kinds of presses, including those for embossing.

TEST FOR LUBRICATING OIL.

To test the body take a strip of glass 3 feet long, 2 or 3 inches wide; fasten a scale to it (any old ruler will do), and bring it to an inclined position. From perhaps two different sorts of oil pour a drop on the highest point of this strip; oil No. 1 may run 18 inches in an hour and oil No. 2 perhaps 2 feet, which shows you that the latter has less body.

In order to make a comparison with your next lot make a note of this, and you can come nearer telling what you get for your money.

To test the oil for acid, which it should not contain at all, take a medicine glass, put in warm water, some oil and litmus fluid. If the oil turns red, and especially the litmus fluid, then it is allied with acid; but if the litmus remains blue, the oil is a good one, and, therefore, free from acid.

To make the third or gum test. let the oil used in first test stand an hour and then rub off; if easily removed the oil is pracically free from any gum; but if it feels sticky the oil is mixed with plant oil, or even with gum oil, which is extremely cheap.

SAW MILLING IN CANADA.

A writer in the Liverpool Daily Post and Mercury sets forth the English view of a Canadian sawmill in the following article:

"At a rough estimate there are 1,000 sawmills in Ontario. We contented ourselves with the sight of one—a big concern at Blind River, in the district of Algoma; and so having seen one of them, we consented to forego the other 999 with perfectly cheerful resignation. Blind River was our sole object lesson in the lumber trade of Ontario. Of the romantic open air life of the woodsmen who fell trees in the forest, the teamsters who haul the logs to the waterside, and the famous drivers who float the logs down the flooded streams, we saw nothing, for the end of September is not the time of the year when these things are to be seen. But the operations at the sawmill served to show us the extent of the season's activities, and helped us to realize more effectively than stacks of statistics the enormous volume and value of the lumber industry in Northern Ontario. Huge piles of sawn timber were ranged for half a mile along the side of the river ready for shipment. Thousands of logs caught up in booms were lying in the river waiting their turn for the mill, and the mill itself was working furiously at its maximum capacity to get rid of the accumulations of lumber before the winter set in. No work which can be done by machinery is done by hand in an up-to-date sawmill such as this was and all others are in Ontario. From the moment the big logs enter the workshop at one end by way of the endless chain carrier, which hauls them up from the river, until they are slid out at the other end in the shape of planks of varying length and thickness, they are never once actually handled by the workmen. The men are concerned solely with the direction of the machinery which does the work for them. Finally as the boards pass out, they are reviewed by an expert with a blue pencil, who makes marks on them which indicate their dimensions, and serve as directions to the men who are engaged in the piling. Add to all this the incessant screeching din of the whizzing saws, the jarring rattle of the engines, the whirring of the carriers, the vicious kicking of the "nigger," and the thud of the plunging logs, and you will have as faithful an impression of the interior of a Canadian sawmill as I am able to give you. And when you consider that this mill, like all its thousand fellows, works day and night without a break, throughout the summer, you will begin to appreciate what a big part the lumber trade plays in the industrial life in Ontario. In the light of the estimates I have mentioned, it cannot be denied that in its timber trade, positive and potential, Ontario possesses a prodigious golden egg; nor can it be denied that the Government has shown sufficient foresight in the adoption of means to prevent the killing of the goose.

Machinery and Mill Equipment

UNIVERSAL BORING MACHINE.

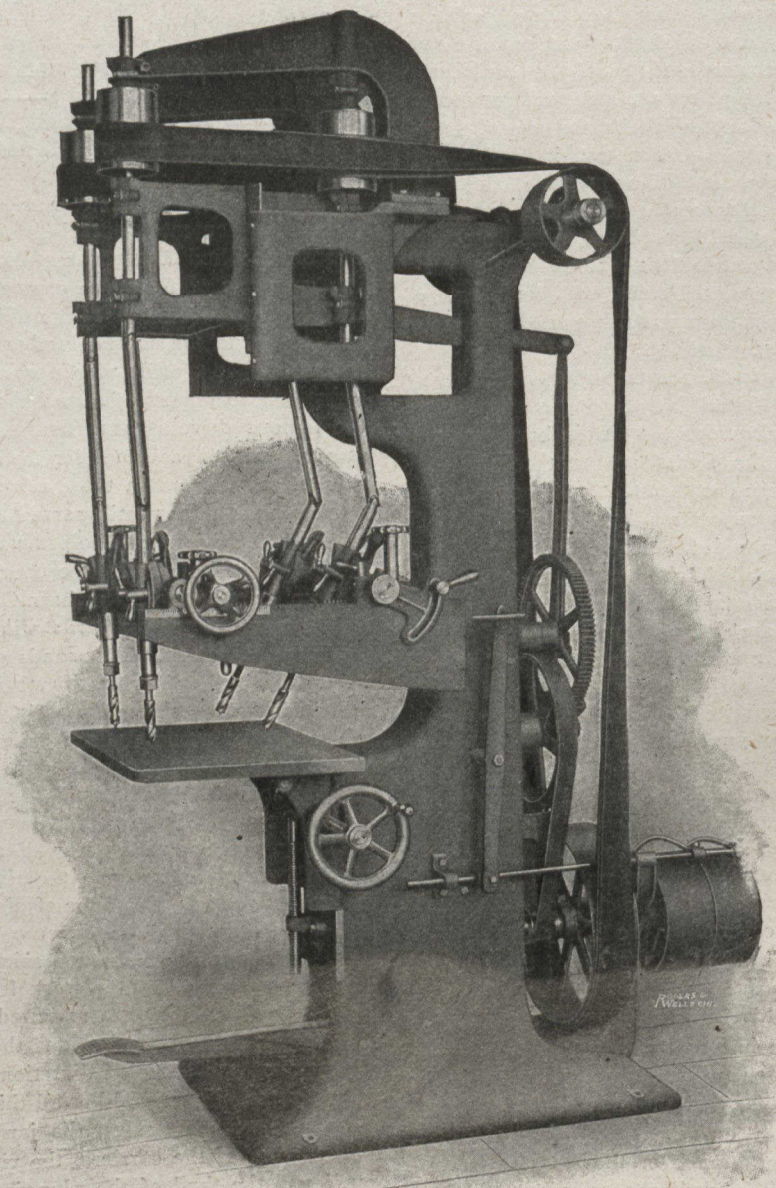
The illustration represents a four-spindle power-feed boring machine manufactured by J. M. Nash, of Milwaukee, Wis. This machine is especially adapted for the boring of the four leg holes in chair seats all at one operation, insuring perfect uniformity in the distances apart and angles of holes, making the machine not only a wonderful labor saver, but giving a greatly improved quality of work as well. A great variety of other work may be done on this machine even where only one, two or three holes are required to do the work.

The cut presents a view of the right-hand side, showing the arrangement for belt shifter and hand wheel and screw for raising and lowering the table. On this side of the machine there is a vertical scale with figures to indicate height of table.

The table can be set at various angles if desired, a positive gauge being arranged and numbered to determine the angle.

Two belts are used, working over extremely large pulleys, which give the four-bit spindles a very strong drive. These belts can be made endless and proper tension can be maintained by tighteners which are conveniently arranged for take-up with a hand wheel.

Graduations are used as a guide on every part of the machine where movements are required to obtain angles and distances apart of the boring spindles. Each of these is



Universal Boring Machine.

designated by a certain alphabetical letter. When the machine is set to proper angles and distances for a certain kind of work a record can readily be taken, printed blanks for which are furnished with the machine. In setting the machine for this particular work at any future time, it will only be necessary to refer to this record in order to get exactly the same distances and angles previously had. This renders it wholly unnecessary to have a lot of cumbersome patterns for marking. The seats can be bored in the same time that it requires to mark the seat for boring when the single bit boring machine is used.

All parts where adjustments are to be made are held firmly in place by bolts with hand nuts, no wrenches being required. The boring bit used in this machine has a straight 5/16-inch shank, and is held in place by a very simple device which holds the bit perfectly central and very firm, will never mar the shank of the bit, and can be tightened or loosened instantly.

No skilled labor is required, as the machine is very simple to adjust and operate, the various parts being constructed so strong and perfect in every detail that very little attention from the operator is required.

It has power feed, which makes it an exceedingly easy machine to operate. This feed is under complete control of the operator at all times. It can be stopped at any part of the stroke desired. A heavy coil spring inside of column gives the boring spindles a very quick return, which makes it possible for the operator to handle the work very rapidly.

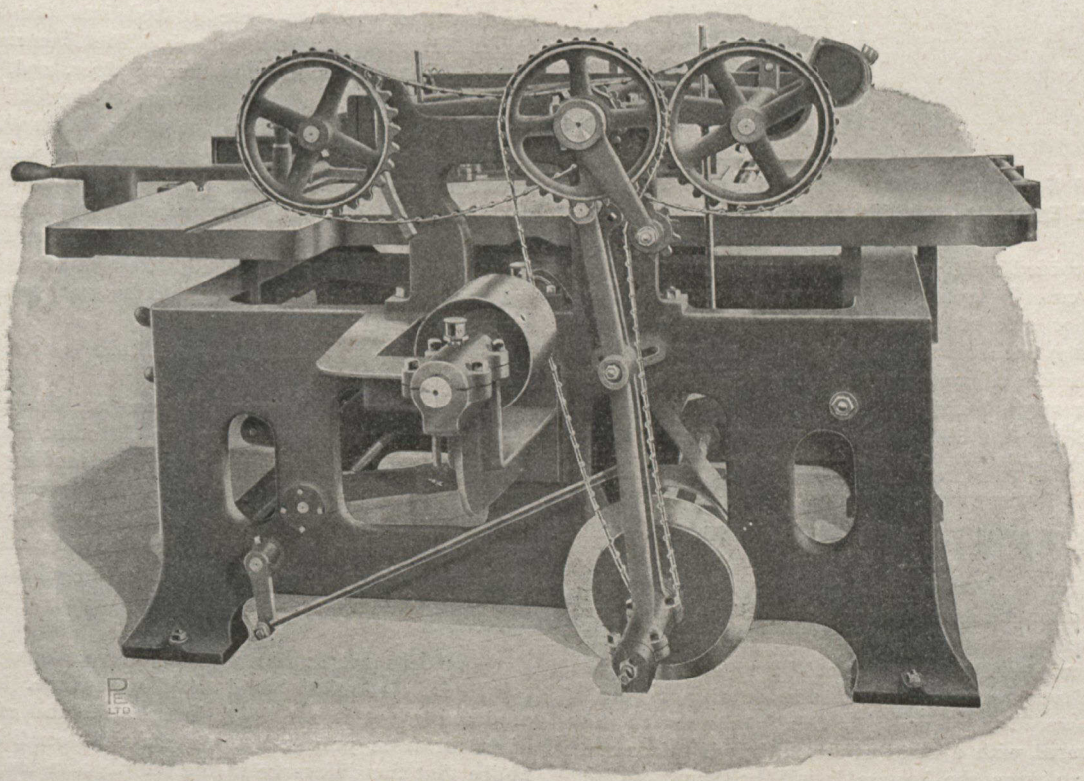
It has capacity to bore the four leg holes in 900 to 1,000 chair seats per hour. Tight and loose pulleys are 12 x 5 inches, and should run at 500 revolutions per minute. Floor space required for the machine is 4 x 6 feet. Weight of machine, 2,400 pounds.

NEW HEAVY SELF-FEEDING RIP SAW.

The new and improved No. 1 Heavy Self-feeding Rip Saw, built by the Goldie & McCulloch Company, Limited, of Galt, Ontario, embodies a number of improvements which go to make it one of the best machines of its kind now on the market.

It is cast in one piece strongly designed, insuring rigid alignment under all conditions.

The feed consists of one spur feeding in roll, one corrugated and one plain delivery roll with splitter. The rolls are driven with chain gear and any desired feed can be instantly obtained by adjustment of lever in front. The entire feed works is raised or lowered by lever in front and locked in any position. It can also be lifted out of the way and saw used as a hand rip. An adjustable spring is attached to feed



Goldie-McCulloch New Heavy Self-feeding Rip-saw.

The table is strongly ribbed and is provided with adjustable rollers running with the cut and returning material to saw. It is provided with an iron throat plate so that two or more saws can be used at the same time.

The fence has an improved self-locking device; by raising the handle it can be moved to any desired point on the scale where it is securely held by weight on lever.

roll bracket to prevent short pieces being thrown back from saw.

One saw is sent with machine. The arbor is steel and runs in self-oiling bearings.

The machine will rip 24-inch. or 29-inch. wide, will cut 9-inch. thick and will feed up to 200 feet per minute.

See page 12 for illustration of opposite side of machine.

A VARIETY SAW.

The machine shown herewith is manufactured by the J. A. Fay & Egan Co., 153-173 W. Front Street, Cincinnati, Ohio. It will be found a most valuable tool for any woodworking shop, as it will do a variety of work that usually requires several different machines, and at the same time it does the work much better, quicker and cheaper.

The manufacturers claim special merit for this machine because of its accurate work in ripping, cross-cutting, boring, bevel sawing, cropping, grooving, mitering, etc.

The table is 30 x 48 inches, and angles 45 degrees, and has a vertical adjustment of 5 inches. It has wooden throat-plate so as to enable the use of gaining heads or grooving

No. 3 Improved Variety Saw, manufactured by J. A. Fay & Egan Co., Cincinnati, Ohio.

saws, and is provided with an adjustable ripping fence and two mitre or cut-off fences, which can be used in the grooves on either side of blade. The boring table is 19 inches long and 9 inches wide; has vertical adjustment of 9 inches, and horizontal movement of 7 inches. The fence is adjustable for angle boring.

For detailed information, write the manufacturers, who will be pleased to send you full description by return mail.

BURNING SAWDUST AND MILL REFUSE.

When starting a sawdust fire, shavings or wood are necessary, and after it is well under way and the walls are heated up, green sawdust can be made to produce a good fire. I have seen sawdust burned that the water could be squeezed out of very readily. Sawdust most always burns from the top down. What I mean by this is, the top of the pile will be covered with a mass of flame, but if this same pile is stirred up from the bottom it will be found to be green sawdust.

Care must be taken that too much draft is not used for the purpose of conveying the sawdust to the fire. If too strong a blast is used it will blow out at the fire door or over the bridgewall, and thus in a very short time will fill up the rear combustion chamber with ashes, making frequent cleanings-out necessary. It is also liable to burn out the blow-off pipe.

There is great virtue in sawdust, 140 cubic feet of which approximately equal a cord of wood. Grates having ¼-inch air spaces are the best to use, as by using a wider grate the sawdust is liable to fill the ash-pit, and in a very short time, if not attended to, will burn out the grates.

The bridgewall should not be more than nine inches from the shell of the boiler, and I have found it to be an improvement to have a long bridgewall. This method conducts the heat and flames along close to the shell and keeps it where it is necessary to do the most good. I have seen boilers rigged up in a positively criminal way for burning sawdust and shavings, one firm in particular having installed a battery of four boilers exactly the same as if coal were to be used. In this case all the sawdust and shavings had to be shovelled in, and, notwithstanding that the fireman had a wooden shovel nearly as large as the grate, it was one continual session of shoveling. Added to this was the inability to produce steam on account of so much cold air being admitted to the fire. Fireman after fireman was hired, but all to no purpose. As a last resort a blower was installed in the mill to pick up the dust and feed the fire. Even this was a failure, as it was conducted into the furnace over the furnace door. This gave the chute an angle that delivered the sawdust at the base of the bridgewall at the back end of the grates, and after a short time it filled up to a certain extent, and most of the dust went into the combustion chamber, filling this and burning out the blow-off pipe.

It is also essential that a good draft be obtained. This was evidenced by an accident that occurred in a plant of which the writer had charge. In this particular case the sawdust and shavings were pushed into the furnace, the grates being level with the floor. The fireman gathered a large pile of fuel in front of the fire door, and, opening the door, pushed it into the furnace, filling it. Volumes of smoke and gas arose from the pile, but no flame. This state of affairs existed for a few minutes, when there was a violent explosion, the fire door being thrown open and a mass of flame bursting forth, severely burning the fireman and shaking the whole battery. The combustion chamber, tubes, etc., had become filled with gas and the moment the fire began to blaze it ignited the gas, resulting in the explosion.

—The Norton Company, Worcester, Mass., for whom the agents in this country are the Canadian Fairbanks Co., Limited, Montreal, Toronto, etc., are sending out a little booklet called "Helps-Don'ts for All Who Grind." It contains a wealth of suggestions as to the selection of wheels, mounting, trueing, speed, etc. It refers also to some of the good features of alundum, which is the abrasive used by the Norton Company.

—It does not appear wise to all people to trust a feed belt to draw a broken board out of a machine. The principle of drawing out is all right, but the method of doing it is often far from practicable. In the first condition we must notice that the difference in the length of a twist belt and a straight one is quite considerable, and if the straight belt is moderately tight, unless it is in perfect condition, the chances are that the instant it is tried on that same instant it will be a broken belt. Generally speaking, belts that have passed their usefulness as cylinder or side-cutter belts are put on as feed belts. The reasoning is that they are out of first-class condition, hence it is safe to say changing from a straight to cross belt would break them. The only proper way is to have a three-pulley motion, so the belt will either pull or push.

Woodworking News from all Canada

Readers of the "Canadian Woodworker" are cordially invited to forward to the Editor items of interest to the trade, particularly those relating to the erection or extension of woodworking establishments.

A. Todd, of Walkerton, Ont., will erect a sawmill in Guelph.

* * * *

C. J Moore, of Victoria, will build a sawmill at Prince Rupert.

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A. G. Chew's sawmill at Tannersville, Ont., has been burned.

* * * *

M. W. White & Co. will erect a planing mill at Beaver Cove, N.S.

* * * *

The St. Lawrence Lumber Co. will build a sawmill at Dalhousie, N.B.

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The Adolphe lumber mill at Baynes' Lake, Elko, B.C., was destroyed by fire.

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Devey & Owen's sawmill at New Westminster, B.C., has been destroyed by fire.

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McAllister's stave and heading factory at Hawkesville, Ont., has been burned down.

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Willis & Co., Limited, Montreal, will build a piano factory at Ste. Therése, Que.

* * * *

L. A. Brien & Co., Montreal, will carry on business as sash and door manufacturers.

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H. Crate's sawmill at Lombardy, Ont., has been burned, with a good deal of machinery.

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Taylor & Jamieson will rebuild their sawmill at Scotstown, Que., recently burned down.

* * * *

Waugh Brothers' sawmill at New Liskeard has been burned down at a loss of $7,000.

* * * *

W. L. Clark will operate a planing mill at Wetaskiwin, Alta., in connection with his foundry.

* * * *

The planing branch of the Selkirk, Ont., saw and planing mills is just about to start up.

* * * *

W. Roberts & Son's shingle mill at Vanessa, Ont., has been destroyed by fire at a loss of $1,500.

* * * *

The Czerwinski Box Co., Limited, who have a large factory in Winnipeg, are very busy just now.

* * * *

The Stanley Railway and Manufacturing Co. will build a woodworking factory at Ryan's Brook, N.B.

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Geo. Tennant has bought the Bracebridge, Ont., furniture factory and will convert it into a woodworking plant.

* * * *

Beckler & Company's sawmill at Sombra, Ont., was burned to the ground on the 13th July. Loss, $6,000; partly covered by insurance.

Duffy & Stewart's saw and planing mill at Bluevale, Ont., has been destroyed by fire. Loss, $3,000; insurance, $1,200.

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The Wm. Currie & Co., of Charlo, N.B., are adding two new shingle machines to their new mill, which began work about June 1st last.

* * * *

John Culligan's new sawmill at Jacquet River, N.B., began work July 1st with rotary saws, turning out 35,000 feet of lumber daily.

* * * *

W. H Phillips, of Seattle, and E. F. Mitchell, of Vancouver, are erecting a sawmill near Aberdeen, B.C., with a capacity of 50,000 feet.

* * * *

G. J. Brumwell's sawmill at Lindsay, Ont., has been burned down, presumably the result of incendiarism. Loss, $5,000; insurance, $2,500.

* * * *

The Phillip Manufacturing Co., Limited, Toronto, moulding and picture frame manufacturers, have moved from Lake and Lorne Streets to Carlaw Avenue.

* * * *

The Nicola Valley Lumber Co. have started work at their large sawmill at Petit Creek. The mill is equipped with the best modern machinery.

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Wm. Dauphinee's sawmill at St. Margaret's Bay, Nova Scotia, has been burned down. Only the engine and boiler and some lumber stock were saved.

* * * *

The Dokis Indian Reserve, situate near French River and Lake Nipissing, and containing, it is said, 100,000,000 feet of timber, was sold at auction for $871,000.

* * * *

The Wm. Smith Company, manufacturers of church and lodge furniture and mantels, etc., at Chesley, Ont., have been granted by that municipality free water and exemption from taxation.

* * * *

E. J. Skeans, of Vancouver, will shortly erect a large sawmill on the Alberni Canal, B.C., with a capacity at the beginning of 75,000 feet per day. It is estimated to cost about $75,000.

* * * *

Willow River Timber Company, Limited, Vancouver, capital $250,000, has been incorporated to manufacture and deal in lumber. J. H. Spence, 46 King Street West, Toronto, is a charter member.

* * * *

C. W. Gibbs' planing mill in Winnipeg was badly damaged by fire last month to the extent of about $4,000. A good deal of valuable machinery was injured, but the boiler and engine escaped.

* * * *

The Canadian Steel Specialty Co., Gravenhurst, Ont., who now make a specialty of bent steel furniture, counter stools, etc., contemplate going into the business of making wooden chairs as well.

D. McKechnie, while removing a splinter from a circular saw at his sawmill, near Tara, Ont., was caught by the sleeve and thrown on his back in front of the saw, which cut him almost completely in two.

* * * *

The Dalhousie Lumber Co., Limited, Dalhousie, N.B., have just completed the erection of an up-to-date sawmill, equipped with band saws, etc., capable of turning out 40,000 feet of lumber daily, besides pulp-wood.

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Huntingdon, Que., council has awarded the tender for a new white pine tank to the Canadian Fairbanks Co., Montreal. The tank will have a capacity of 50,000 gallons, and will be erected on a steel tower fifty feet high.

* * * *

John Carew's sawmill at Lindsay, Ont., which was burned down last month with a heavy loss, will be re-built at once on an extended scale, and with a large quantity of up-to-date machinery. Mr. Carew is now making preparations to go ahead.

* * * *

Ha Ha Lumber Company, Limited, St. Alexis, Que., has been granted a charter to operate sawmills. Bernard J. Kaine, contractor, Quebec City; T. D. Pontbriand, of Sorel, and M. H. De Witt, engineer, of Millinocket, Me., are charter members.

* * * *

The Canada Tool Co., Niagara Falls, Ont., capital $200,000, has been granted a charter to make and deal in machinery and tools and other articles of metal and wood. P. J. Creedon, C. W. Davenport, jr., and E. A. Nelson, of Niagara Falls, Ont., are provisional directors.

* * * *

The Louison Lumber Co., Limited, of Jacquet River, N.B., have nearly completed the erection of a modern sawmill, capable of turning out 125,000 feet daily. It will be in operation by September 1st. Their shingle mill at Nash's Creek, after being under repairs, has now started operations.

* * * *

The W. A. Moore Company, Limited, Meaford, Ont., has been granted a charter authorizing it to manufacture and deal in mantels and other high-class woodwork, and to operate sawmills, etc. Capital, $40,000. Among the charter members are: W. A. Moore, W. J. Johnston, L. H. Wood, H. R. Cleland, and H. Helstrom, all of Meaford, Ont.

* * * *

W. Routlee has erected a tie mill in South Vancouver, B.C., which is operated by electricity, obtained from the transmission lines of the British Columbia Railway Co. A set of oil-cooled, step-down transformers have been set up along the route, and from this a pole line has been built to the mill, on which wires of 2,000 volts have been strung.

* * * *

The Bathurst Lumber Co., of Bathurst, N.B., are building a modern sawmill, capable of turning out 125,000 feet of lumber daily. This mill is one of the few built in America built almost entirely of cement and steel. Main floors and lower part are of cement and rest of building built of steel, with separated engine-house of brick.

* * * *

A despatch from Winnipeg says the lumber dealers of the three prairie Provinces are facing the worst lumber famine in their history, as the result of the plan of the Canadian railways to devote all available rolling stock to moving the grain crop, estimated at 125,000,000 bushels. The lumbermen are unable to get enough lumber to supply the demand, and prices have risen alarmingly.

* * * *

Chicago capitalists have secured an option on a tract of timber limits comprising 198,000 acres in East Kootenay, and representing a portion of the land grant to the Nelson and Fort Sheppard railway, a link in the Great Northern system. This large area contains, it is estimated, about eight billion feet of timber. The deal is being negotiated by John McEwan, of Vancouver, and involves the payment of $750,000.

TRADE INQUIRIES.

The following inquiries relating to Canadian trade have been received at Ottawa. The names of the firms making these inquiries, with their addresses, can be obtained upon application to Superintendent of Commercial Agencies, Department of Trade and Commerce, Ottawa, or publishers "Canadian Woodworker," Toronto:—

612. **Plywood.**—A firm of timber importers, making a specialty of three-ply wood, wish to hear from Canadian shippers, with samples, full particulars and prices, c.i.f. Hull.

615. **Furniture.**—A South African firm of manufacturers' agents desire to be placed in communication with Canadian manufacturers of furniture, especially the cheap fancy class, such as tables, writing desks, whatnots, chairs, etc. Prices to be quoted f.o.b. at Canadian ports and also c.i.f. Durban, Natal, for direct shipment per steamer.

616. **Veneer Seats and Backs.**—A South African firm of general merchants desire to be placed in communication with Canadian manufacturers of perforated veneer seats and backs for chairs.

620. **Timber Specialties.**—An English firm of timber importers wish to get into communication with Canadian firms exporting any specialties in the timber line with a view to possibly taking up their agency.

650. **Veneer.**—A Manchester firm asks for samples and prices of three-ply alder veneer, 3-16 and ¼-inch, from Canadian manufacturers.

667. **Pine Sidings.**—A Lancashire firm now buying in United States wishes to obtain c.i.f. prices of pine sidings, sizes 1-inch, 1¼-inch, 1½-inch and 2-inch, unassorted best seconds and thirds, from Canadian manufacturers.

670. **Squares.**—A Manchester firm wishes to obtain prices of maple and birch squares from Canadian manufacturers.

761. **Birch Flooring.**—A South African firm of timber merchants and contractors desire to be placed in communication with Canadian manufacturers of birch flooring, tongued and grooved, ready for use. Samples of the flooring requested.

816. **Leather Board.**—A Manchester firm asks for prices of leather board from Canadian exporters.

817. **Pine Deals.**—A Lancashire firm asks for prices of three-inch pine deals, best seconds and thirds, c.i.f. Manchester, from Canadian exporters.

818. **Laths.**—A Lancashire firm asks for prices of plasterers' laths, 1 x 3-16-inch and 1 x ¼-inch, from Canadian exporters.

891. **Furniture, etc.**—A firm in the Midlands asks for catalogues from Canadian manufacturers of furniture and fittings suitable for churches, schools, colleges, theatres, hotels, etc.

Condensed Advertising

Advertisements under this head 10 cents per count line for single issue, contract rates on application Black face headings and names in caps count 2 lines each. Advertisements for "Help Wanted" or "Positions Wanted" given two free insertions for any subscriber to the paper and replies may be addressed to a box care "Canadian Woodworker."

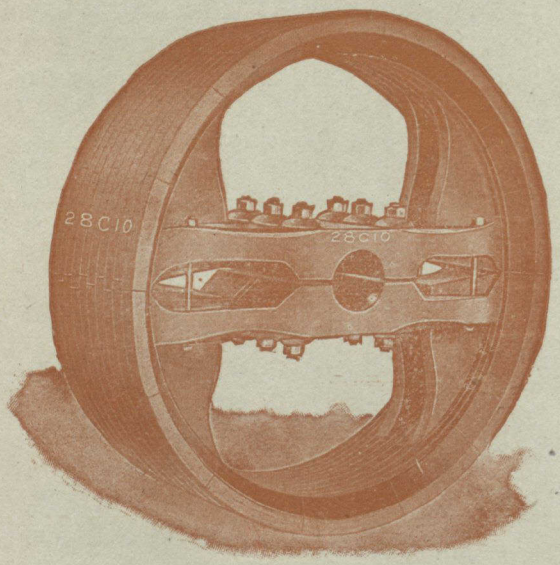
SIMPLER STYLES IN ORNAMENTATION.

The last few years have wrought radical changes in the ornamental features of woodworking, changes in the style and method of production. The main changes in style consist in getting away from the maize of intricate scroll lines of one kind and another, which formerly occupied a conspicuous place in practically all efforts at ornamentation in woodworking. To-day, in the place of this, no matter whether it is in mill work, furniture or cabinet work, there is a decided breaking away from these intricate lines, either in carving or scroll work, and the general tendency is to use plain finishes, straight lines and square corners so far as is practicable without becoming too extreme in the matter. There are, however, certain classic carvings and scrolls that are persistently adhered to more or less through all changes, and we have them with us yet; but even here there is a decided change in the manner of production. Much of the ornamental woodwork, especially in standard designs of carving, is now done in composition, molding and shaping them in wooden molds so as to get the grain, then attaching to the outside wood with which it goes, so that when finished an expert cannot tell from the outside appearance whether it was carved out of wood or is a composition product.

It must not be thought from all this that there is an end to wood-carving, for there is not. Right along with these ornamental products in composition there are to be seen both hand-carvings and machine-carvings. The hand-carving is now mostly of special and massive design, on some of the more expensive mantels and house trimmings and cabinet work. Most of the regular patterns now carved, such as egg and dart moldings, and, in fact, almost any pattern that is frequently repeated, is now done by machinery, for which purpose there seems to be a variety of machines, some of them working on one plan and some on another, and all of them producing carved work at a much smaller cost, and frequently more delicately done, than if cut by hand. The most striking thing about it all, however, is that most of the ornamental products are not formed and made at woodworking institutions, but are now purchased outside.

ADVERTISERS' INDEX

TRANSMISSION APPLIANCES



FAIRBANKS WOOD SPLIT PULLEYS

are built of well-seasoned timber. Rims are of Basswood. Each segment is glued and nailed to the next one.

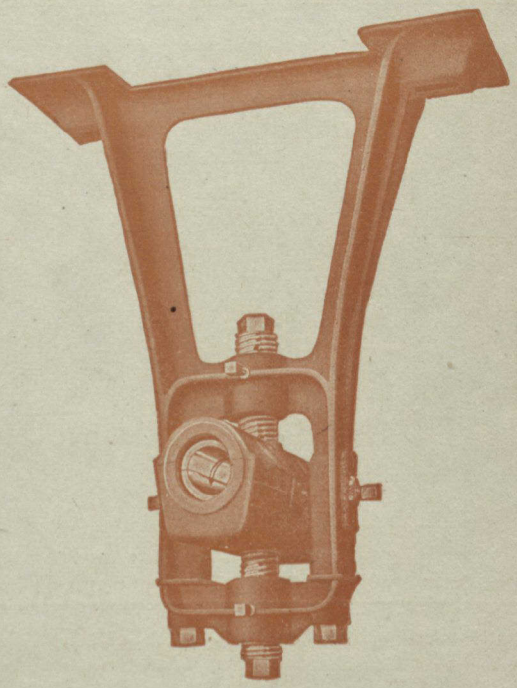
The Webb Construction of the arm, built into the rim strengthens it and makes it impossible for the rim to work loose at the arm.

Complete Power Transmission Equipment—
BELTING, SHAFTING, COLLARS, COUPLINGS, FRICTION CLUTCHES, ROPE DRIVES DESIGNED AND INSTALLED

UNIVERSAL GIANT HANGER
RING OILING TYPE

Reduces friction to a minimum.

Symmetrical in design, and has unusual strength which make the requirements of a perfect hanger.



SMALL TOOLS AND MILL SUPPLIES

The CANADIAN FAIRBANKS CO., Limited
MONTREAL

TORONTO ST. JOHN WINNIPEG VANCOUVER CALGARY