CANADIAN WOODWORKER

Vol. I.] SEPTEMBER 1908 [No. 7

PRINCIPAL CONTENTS

See Index to Advertisements, page 38.

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TORONTO CANADA

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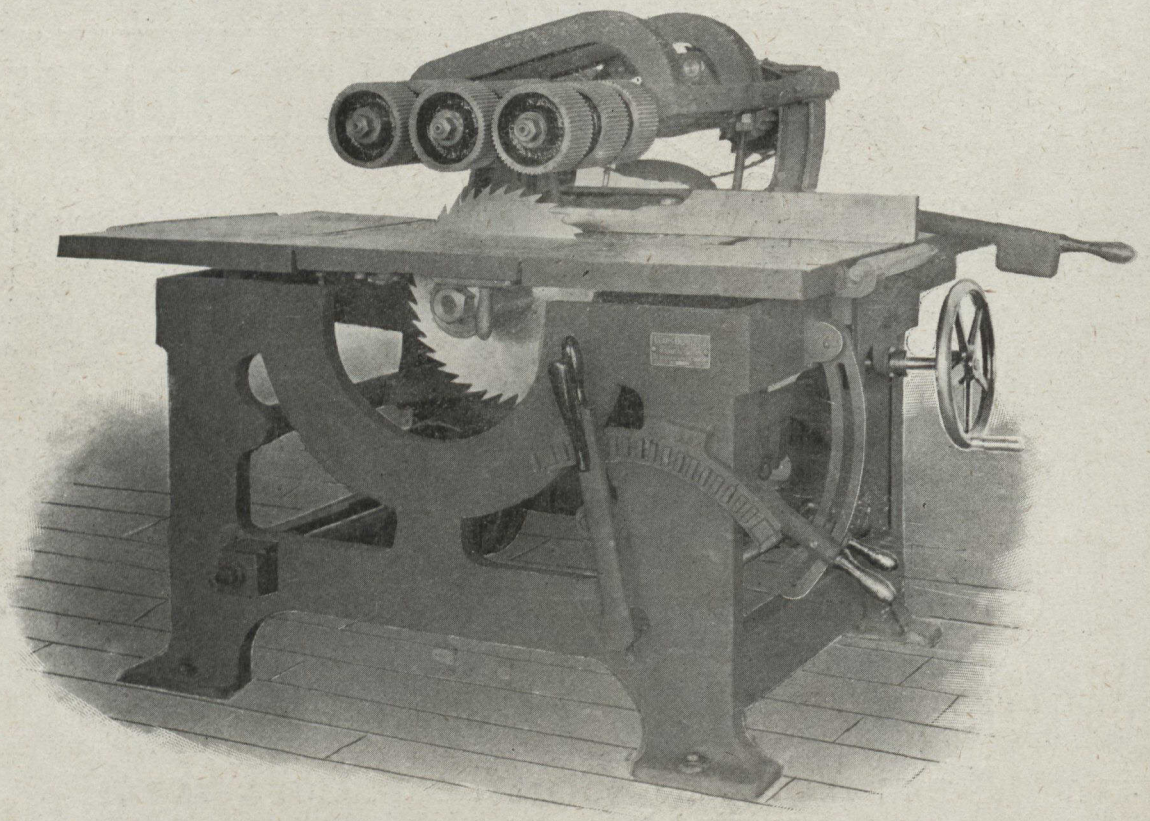

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Canadian Woodworker

A MONTHLY JOURNAL
FOR ALL CLASSES OF WOODWORKERS

Vol. 1 TORONTO, SEPTEMBER, 1908 No. 7

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.

"CHEAP" VERSUS GOOD MACHINERY.

Not which machine can be obtained for the least outlay of money, but which machine is the best adapted to carry on its work in the most efficient way and with the least expenditure for repairs is the true criterion in the selection of machinery for woodworking purposes. A thousand dollars saved in first cost represents but poor economy if the article purchased will not turn out as large a quantity of product as will another make, or if the finish or quality of that product is not equal. The most successful planing mill men recognize this fact already, and will not buy a "cheap" machine at any price, but there are a good many smaller mills, in the country districts or elsewhere, where this truth still remains to be brought home. In some lines of industry, notably in the metal trades, the manufacturers have pretty thoroughly learned the lesson of sacrificing first cost to the more essential principle of getting the BEST tools that money will buy, and they have found this policy to be cheaper in the end. A woodworking specialist has figured out that the difference in quality and quantity of output between a high-class machine at, say, $2,000 and one that will represent the lower grade at, say, $1,000 (a big difference here!) will show a comparison of earning power in absolute favor of the more expensive machine. He figures interest at five per cent. and depreciation, taxes and insurance even at the high figure of twenty per cent., and shows that the annual excess charges for the higher priced machine would only be $250. This amounts to only about 80 cents for each working day. Not only this, but the good machine is sure to be the most durable, and, therefore, prove the least costly in the matter of repairs.

Of course, this does not mean that a woodworker should in all cases select a high-cost machine rather than a cheaper. It simply means that the most value for one's money does not always, or generally, bear strict relation to first cost. Reputation of the manufacturer of the machine is generally a pretty sure guide.

TORONTO EXHIBITION.

The Canadian National Exhibition at Toronto, to be held from August 29th to September 12th, bids fair to prove the most successful, even in its long line of successes. To woodworkers, as to those engaged in every other line of industry, it should prove particularly interesting, as some of the best types of woodworking machinery will be well represented. The Processes of Manufactures Building alone should be sufficient to bring crowds to Toronto this year, but besides that there will be exhibits from every part of the Dominion and from many other sections of the globe, which will render this year's Fair a magnet to hundreds of thousands of people of every kind and taste imaginable.

The Executive of the Toronto Exhibition are certainly to be congratulated on the manner in which, year after year, they rise to the occasion. As each Fair makes its appearance, one is apt to think that now the summit, the acme of perfection, has been reached. Yet, in the result, the crowds go home after each year's display and say: "This is the best yet." There are sure signs that this will be the case in 1908.

—The terrible forest fires in British Columbia, which devastated a tract of country fifty miles long, destroyed several large sawmills as well as whole towns and villages, and rendered thousands of people homeless, are an object lesson in the results of negligence. The fires had been burning for weeks before the wind swept the conflagration over doomed Fernie. Yet, British Columbia's forest regulations were not sufficient to prevent the ruin and terror which ensued. In forest value alone at least $5,000,000 damage was done.

—In the new Australian tariff the duty on furniture made of wood in the general tariff remains unchanged but the preferential tariff has been increased from 25 to 30 per cent. Elm hubs with metal bands, known as Sarven hubs, are free but other prepared hubs are dutiable at 1s. each. Articles formerly classed as bent poles are now classed as poles for vehicles and are dutiable at 30 and 25 per cent.

Planing and Molding

VENEERS IN THE PLANING MILL.

In the average planing mill doing a house finishing business and more or less odd work, the field for the use of rotary cut veneers is rather limited. It is usually the practice to buy the required built-up panels from some firm making a business of panels, and in the case of veneers for doors, it is usually as cheap to resaw and dress them in the mill as to buy them already resawed and then run the risk of having them hold out thin at the planer.

The rotary cut veneer is usually of a more pronounced and handsome figure of grain than the sawed—always excepting the quarter-sawed woods as oak and sycamore—but it also has a wrong side which has been started into small checks in the cutting, and unless this is worked in the glue it will make a poor finishing veneer. Then again, if the veneer has to be planed down in thickness and the face side is carelessly planed off, the sheet will be bad all the way through. The sawed veneer will be solid enough, but the figure will be plainer and if the pieces are cross-grained it will require great care and skill to plane them down to ⅛-inch or less without tearing through and spoiling them.

Perhaps a word or two about resawing and planing veneers will not be amiss to the man who wishes to add this kind of work to his shop, or to his experience in another man's shop as the case may be.

In the first place, to be economical the stock should be selected in thickness so that it will make a certain number of veneers with as little waste as possible. If the veneers are for doors, the run of practice will call for ⅛-inch in thickness and it will usually be possible to get three thicknesses out of inch rough stock. The boards should be looked over carefully before being brought to the planer, and then planed two sides as thick as they will smooth up two sides. In any of the hardwoods, especially oak, the boards should be planed both sides before being cut to the required sizes as to length and width, for it is impossible to see nearly all the defects in the rough wood, and this is especially true of sap when the surfaces of the lumber have been darkened by dirt or time. It is very humiliating and also expensive to cut out a hundred or so pieces for ¼ oak veneer stock and then find that about 75 per cent. of them have defects which show up under the planer.

If the plant has a band resaw, the veneers can be sawed on that with as little waste as any way if the machine is in proper trim, and in case there is no such machine in the mill, the veneers can be sawed on a thin circular if it is wide enough to reach half way through. This is usually practicable for the stile veneers, but for wider rail veneers the pieces can be kerfed on a thin rip-saw and then finished on the common band-saw. In case there is but a very little to plane upon, it is best to rip off one veneer and then plane the stock again before splitting the last time, so that the unevenness of the middle piece will not come on both sides at once which requires so much more stock to even up both sides.

Every shop which has any wide veneer sawing to do should have a wide blade for the band-saw machine, say one inch wide at least, with points not less than 1¼-inch apart. The teeth of this saw should not be allowed to become long in the process of filing, and the set should not exceed 1-16 of an inch. If the teeth are too long and the set too wide, they are apt to catch in the hard wood and tear out by the roots, and if not so bad as that, will stretch the saw out of shape so that if there is no tension rolls in the mill the saw will soon be useless. Most plants having no band resaw also have no filing room machinery, so it should stand the band sawyer in hand to take the best care of his saws from the start. The writer has successfully resawed pine boards 18 inches wide on a little wood-rim bandsaw with a blade like the one described, and quite often cut 14-inch oak and birch veneers on the same machine.

The task of planing up thin veneers is one that many of the planer men would like to shift to someone else. Unless the stock is of the best quality in regard to grain, the percentage of ruined veneers is so high that the workman is discouraged if he has not made the special preparation necessary to handle the stock. Because the stock is cross-grained is no particular sign that it will be hard to plane up smooth, for if the grain slants one way all the length of the piece and it is fed into the machine with the grain, it is bound to come out all right even if it is very thin; but if the grain runs both ways in the same piece, or if the stock is curly, or has been sawed too close to a knot, the chances are in favor of its being picked up by the planer knives and split through or a piece entirely torn out.

There is one sure preventative for calamities of this kind and one which will insure the safe planing of the most curly and cross-grained woods. It is the simple expedient of giving the front edge of the knives a slight bevel, 1-16 of an inch across the face of this bevel will do, and while it takes more power to run the machine with this scraping cut, the saving in stock and in the quality of the stock will many times repay the outlay. In the event that there is any quantity of this work to be done, it would be more economical to have a separate pair of knives for this work, as it is quite a waste of metal to be compelled to grind off this bevel occasionally, for the knives will not stay sharp so long with the blunt edge, and for the general run of work are not just the right thing.

It is possible and quite practicable too, to make very thin veneers on the common cabinet or "pony" planer. Suppose it is required to make a veneer 6 inches wide, 4 feet long and 1-60 of an inch thick, the piece may be planed down to 1-16 in the ordinary manner if the machine is in good fix, and for the last cut which is to reduce it to the required thickness, it should be placed on top of a smooth straight board. The piece for the veneer should be gotten out at least 6 inches longer than the length of the finished piece, so that it can be fed into the machine far enough to reach the pressure-bar before the bed is raised to the required height. A trial should be made with a scrapp piece before the real work is commenced, so that when the desired thickness is obtained the planer bed can be let down a certain distance by the screw and then turned back to that place as the veneer piece is fed in. The object of turning the bed up after the piece has been seized by the pressure-bar is to prevent the knives lifting the thin piece and chopping it up as soon as it reaches them. With tough, close-grained woods like birch it is possible to plane a good veneer as thin as 1-100 of

an inch. These thin paper-like veneers are very handy in the way of veneering the face of brackets and in fact any uneven surface.

It is the practice of some factories to hand-surface all the veneers and cores for veneered doors before gluing them up, but if the machine work is well done it is usually a waste of time for a very acceptable quality of work can be turned out by the use of "machine joints" alone. Of course it is necessary to face up one side of the cores on the jointer or buzz planer before planing them to a thickness, and the latter machine should not leave any ridges or hollows in them on account of high feed rolls. In shops where there is but one planer and that one used for all the different kinds of planing done in the shop, it is necessary to change the height of the feed rollers quite often, for what is good for veneer work will utterly refuse to feed rough plank or timbers; and on the other hand if the fine work is attempted while the rolls are high, there will be the cross ridges 4 to 5 inches from each end. So the operator should be neither forgetful nor lazy about having the rolls in condition for his work.

USE AND ABUSE OF KNIVES.*

By W. E. Bonesteel.

Knives: their use—On this I do not need to say anything, as you all know for what purpose you want to use each one of them. If they will not cut as you have a right to expect, someone is to blame—either the knifemaker or the user—as knives can be made to meet almost any requirement, and if skilfully used will invariably give profitable results

Two things are very necessary to make veneer knives satisfactory. First, good steel must be used. It must be of a proper temper or carbon, and should be specially made for the purpose. Bar steel that is suitable to make a veneer knife would make as fine a razor as can be made. Second, and the most important element, is the proper temper.

It is very essential that the knife-maker should know for what work the knife is intended. Too much is taken for granted by the user of the knife. For instance, a knife tempered just right to cut gum veneers will not cut quartered oak so that you could make a reputation for good stock. A knife that would work successfully on a machine running from sixteen to thirty revolutions per minute would not do as good work or stand to the work if run at fifty to seventy revolutions. I never saw but one machine running seventy revolutions per minute—that was on butter-dish stock, and they are not running that fast to-day.

Now for the abuse. For over twenty-one years I have been "trouble man" for a Cleveland company. In that time I have had some very funny and some very trying experiences. I am going to tell you some things that you may not like to hear and may not believe, but they are plain truths. Over 90 per cent. of the trouble with veneer knives comes from their abuse, and most of the abuse is confined to the grinding room. There are so many ways that they are abused that I hardly know where to begin.

The better the knife, the easier it is spoiled in grinding. In cases where the temper is drawn in grinding, the evidence is nearly always hidden until the next time the emery wheel passes over the knife. That is as far as you can discover with the eye, but if you will try the knife with a file you will notice how soft it is. If you will take a hammer and strike the edge lightly, the edge will turn over completely, while a little farther along on the edge it will file hard and break out at the touch of the hammer.

Many veneer mills have the very latest and best veneer cutters that can be bought and everything first-class, all but the grinder—that is only to sharpen knives. They buy something that has an emery wheel that goes around, and the knife passes back and forth past the wheel or vice versa. Sometimes there is a water attachment. In fact, any old thing that will grind is good enough.

However, this would not be so bad if they would give you a good emery wheel with the grinder, but that is very apt to be as cheap as the machine. If the emery wheel is too hard it will either draw the temper or cause a number of fine cracks to appear in the face of the knife. Either the knife edge will turn over if the temper is drawn or break out of the cracks appear. It is not always the case that the knife breaks out the first time it is used after grinding. Sometimes it is weeks or months before the trouble begins.

Some grinding machines are fitted with a cast-iron box or tank to hold water, with a small pump to force water up to the emery wheel. This idea is all right so long as oil and grease do not get into the tank, but just as soon as oil gets into the tank and is pumped to the emery wheel, that wheel begins to glaze, heat and burn. After oil has once reached the emery wheel it is next to impossible to keep the face from glazing, and this is one of the ways to ruin a knife. Frequent use of the emery wheel dresser is the only remedy.

There are as many grades and qualities of emery wheels as you find grades and qualities of veneers. Emery wheels should be free-cutting, and free-cutting means that they wear out much faster than the wheels that are hard and will glaze and heat. You can run your emery wheel too fast—so fast, in fact, that it will not cut. It makes quite a difference if you are grinding brass, cast iron, or hardened steel, as to the speed you should run the emery wheel.

One veneer man I know ran his wheel about 650 revolutions, while his neighbor ran his 800 revolutions. The man running 650 ground his knife perfectly in three and one-half hours, while his neighbor ground seven and one-half hours and then stopped because he had cracked his knife and ruined it. Both knives were the same size, and same make of grinders.

Another veneer manufacturer who had one of the best grinding machines made placed it right in front of the windows where he had plenty of light, which came just where it was wanted. He also had a man who understood grinding and never had any trouble. Suddenly there was a change. He could not get knives fast enough to keep him running, and as usual in such cases the knife got the blame.

We investigated and found that the grinding machine had been removed into a dark engine room, where the grinder had a torch, such as foundrymen use, to get around the machine, and a common laborer at about $1.75 a day had been picked up to watch the grinding machine. The result was that it cost about $400 to replace the knives ruined, to say nothing of the time lost and veneers that were probably ruined.

We also found that they had bought an emery wheel that was everlasting, one so hard that it would never wear out. The knives were cracked so that pieces from four inches to ten inches long by three-quarters of an inch deep broke from them, and in some places the knives showed spots that were blued three-fourths of an inch to one inch deep. This is perhaps the worst case that ever came to our knowledge, but

*From a paper read at a meeting of the Veneer and Panel Manufacturers' Association.

there are similar cases where trouble comes for want of proper care in grinding.

NEW SURFACE PLANER.

The illustration shows the No. 320 Double Cylinder Endless Bed Surface Planer built by the Clark Demill Company, Limited, Hespeler, Ontario. It planes 26 inches wide by 12 inches thick, raises and lowers by hand or power, and will feed 22—34—45 and 59 running feet per minutes.

The No. 320 is a heavy, powerful machine, very simple and easily handled, fully up-to-date in design, simple in construction, material and workmanship of the best, with a complete system of numbering and lettering applied and available when repairs are necessary.

All the adjustments are easily and quickly made from the operator's position at the working side, or end of machine.

The frame is very substantial. Sides heavily ribbed. Cross girts all planed to a seat and strongly bolted, and all the upper works constructed in a way to add strength and stability.

The cylinders are made of special high grade steel forgings, carry four knives and have extended lip chip breakers.

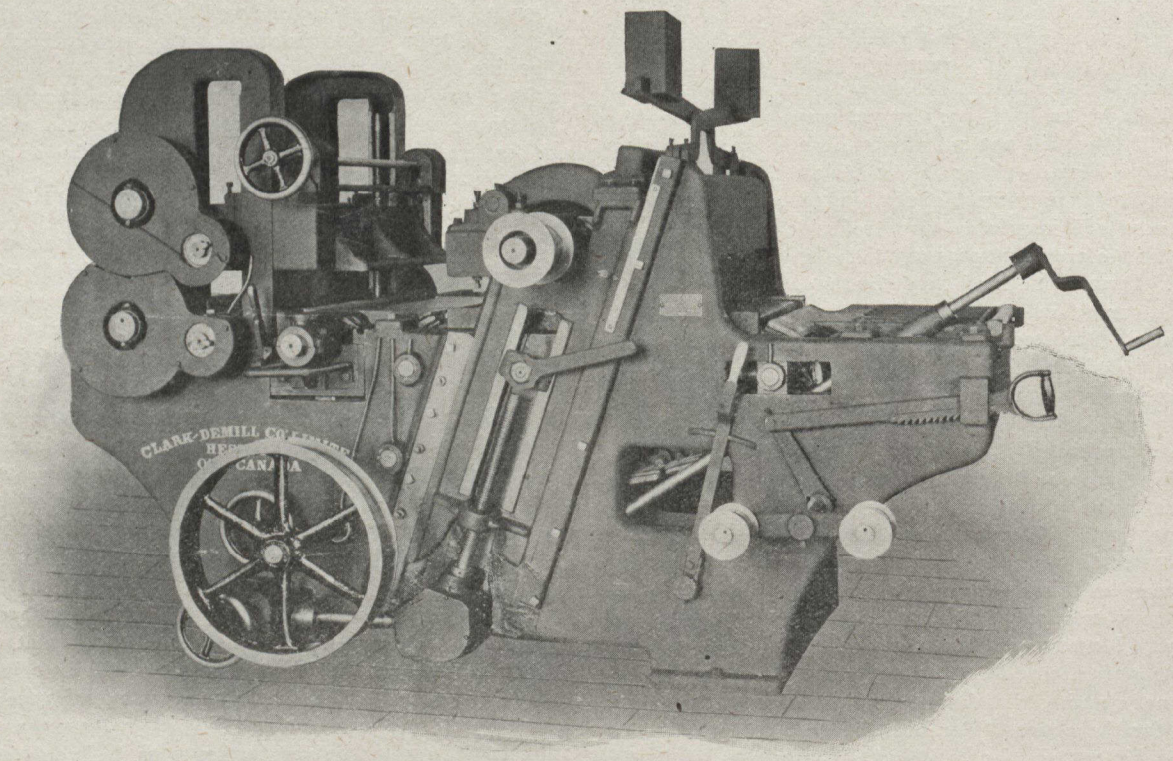
The pressure bar over the under cylinder has independent adjustment.

The line of the bed is a fixed position, the upper works are made to adjust simultaneously to the thickness of the lumber. They can be raised and lowered with the cylinder, requiring no separate adjustment, or can be adjusted independently when necessary. The revolving bed is of the most practical construction, having three bearings, one on each end, and one in the centre, connected with an improved patent link that has taken the highest awards at the Provincial, Dominion and Foreign Exhibitions.

The slats pass under a rib the full length of the bed, making it impossible for the slats to rise up into cylinder when planing thin material. They have heavy ribs on under side, making it impossible for them to warp, or sag. This bed is driven by our cut gears, which gives a smooth and even feed.

The delivery rolls are driven by heavy expansion cut gears, and placed after the under cylinder which feeds the lumber away from the machine, and helps to relieve the strain on the bed.

The speed of the cylinder is 4,000 revolutions per minute; seven to twelve horse-power required.



No. 320, Surface Planer.

The top cylinder bearings are 2-3/16-in. diameter by 10 in. long. The under cylinder bearings are 2-3/16-in. diameter by 10 in. and 16 in. long. Both cylinders are made exactly alike in detail, so that the knives are all interchangeable.

The under cylinder with the table after same, can be drawn out at the working side of the machine for sharpening and setting the knives, and is adjustable for light or heavy cut.

The top cylinder, together with the divided chipbreaker, or shoe, divided roll, pressure plates and after roll, are raised and lowered by power or crank handle. The long slides upon which they adjust are very long and gibbed in a very superior manner, with adjustment to take up any wear that may take place.

This machine is also made single cylinder and without delivery rolls, and is known as No. 321.

—Many lumbermen in Ontario, it is said, have decided to reduce their cut next winter by 50 per cent. owing to dullness in business and competition from the States.

—The Canadian Pacific Lumber Co.'s big sawmill at Port Moody, B.C., has begun operations again after a shutdown of some months. The company has received an order for lumber for the wooden pipe waterworks system to be installed at Calgary, which will necessitate the cutting of over 6,000,000 feet of lumber.

HARDWOODS FOR MOTOR BOATS.

From the very first men have been building boats with the idea of getting the maximum amount of both comfort and speed out of them. Of course, the two qualities are in a way contradictory, for if we emphasize the comfort we are liable to end with a houseboat; while if speed is all we want the birch bark canoe strongly appeals to us. A happy medium, however, is the motor boat, which is rapidly growing into popularity not only as a pleasure craft, but, like the automobile, many business men regard it as an absolute necessity, and having once tried it in connection with their business would not feel that they could well dispense with it, especially when their enterprises are spread over considerable ground and are more readily accessible by water than by land. This mode of transportation appeals strongly to lumbermen, and many lakes and streams near timber operations are "alive" with the little craft.

At first thought its construction might be considered somewhat intricate, but on closer observation we discover that although great care must be taken in each phase of the operation, yet the entire work is comparatively simple. This is due no doubt to the fact that the modern factory for the manufacture of motor boats is a wonder in precision and systematic development. And thereby hangs this tale.

First of all great care is taken in the choice of the lumber used, says Hardwood Record. In a motor boat every piece is not only called upon to bear its full share of wear and tear, but it is also quite conspicuous and so must be of the best grade. The lumber which is stacked at one end of the factory usually begins its trip through the plant by being split into narrower pieces by means of a buzz saw. It then passes through the planer, and if necessary its edges are smoothed off by the buzz planer. Next it is carefully guided through the shaper.

A notable fact in the well organized plant is that every board is made an exact duplicate of a numbered model, which has served the same purpose before. The advantages of such a scheme are apparent. Every board in the boat is fashioned after a standard which has already "made good." Every boat turned out is uniform and every part in it can be immediately and exactly replaced. Thus delay in securing repairs is reduced to a minimum and certainty of adjustment is assured.

The first step in the actual building of the motor boat is to place the keel on the form or model boat. This keel is made of two by three inch straight grained clear white oak, although the shaft-log which is attached to it is made of cypress, fastened between strips of oak. The transom or rear end of the boat is also fastened to the keel, and is made of oak usually in two pieces which meet in a broad "V."

In the meantime the ribs have been planed down to the exact shape of their model, and have been steamed so as to be easily bent. Some boats have been made in two sections, one rib running from the coaming on each side to the keel—or in other words, the boat is built in separate halves, which are then fastened together. It is not necessary, however, to build a boat in this way, for a single rib may run from one coaming to the other, being bent over the keel. It is true that although the first few ribs sometimes crack when they are bent at such a sharp angle, as they are fastened at both ends, this does not matter very much, for they are still stronger than two separate ribs.

With the exception of the two pieces of cypress used in the shaft-log all the wood employed in these parts is oak. However, all the planking is made of the best Louisiana red cypress. The planking process is perhaps the most difficult part of the whole operation. These planks must be fitted along the stem and keel so that each calking seam will be uniform throughout. This is absolutely necessary, for if the seam is such that in some places the calking will be driven through while in others there will be no room for it, the only possible result will be that the boat will leak, which is exactly what it must not do.

After the planks have been nailed in place, the boat is gently slid off the form, which is again used in building up the next one. The boat itself is now placed upon a stand, and all the nails are counter-sunk and clinched. As might be imagined, the craft at this time is in a very rough condition, but after the entire outside hull has been planed down, the counter-sunk nail holes plugged up with putty, and the whole boat thoroughly calked and sand-papered, it begins to assume a more seaworthy appearance.

The next step in the process is the finishing up of the interior, which has previously received its first coat of paint. Considerable remains to be done here for the clamps must be carefully fastened in place, the engine bed made safe and strong, the flooring securely laid, and the decks, covering boards, coamings, seats, ceiling and other parts fitted, bent and put into position. The lockers containing the batteries and other electrical equipment, and the paneled bulk-head in the forward end of the cock pit are also put in position. The entire interior, with the exception of the seats and flooring, is made of the best selected oak, which is hand-finished and receives three separate coats of spar varnish before being sent out.

It is now time to install the engine. The flooring around the engine bed has not been nailed down, so that the engine is soon in its fixed position, and the entire installation process complete.

By this time the boat has almost reached the far end of the factory, and it is here that it receives the finishing touches. Four coats of marine paint are applied to the outside hull, and as has been stated before, three coats of varnish add to the appearance of the interior.

The last step before shipment is the thorough testing of the completed boat. Of course it looks all right, but appearances count for little unless supplemented by results, and these can only be determined by placing the boat in a tank and actually operating it.

In glancing over the entire construction of the boat, one cannot help noting another phase of the systematic methods previously referred to. With very few exceptions the men work in pairs, and each pair has its own separate work to do. Thus two men fit the keel and ribs on the form, two others lay and fasten the planking, and still another planes down the hull after the nails have been counter-sunk. One man is kept busy puttying, while his partner is likewise engaged in calking. As can be readily seen the men soon become adept in their particular line of work, and so efficiency as well as speed is obtained.

The ordinary motor boat ranges from sixteen to twenty-four feet in length, the most popular being the "twenty-footer." In the average boat of this size 147 feet of cypress are employed and 165 feet of oak. In the ordinary factory one boat is turned out per day, although approximately ten days elapse from the time the first board is planed down to the time when the boat is crated for shipment.

A CONTINUOUS FEED GLUE JOINTER.

The J. A. Fay & Egan Company, 153-173 West Front St., Cincinnati, Ohio, after long and costly experiment, have produced a continuous feed glue jointer that has proven to be a wonder, because of its excellent work, ease and quickness of adjustment, rapid feed and large capacity.

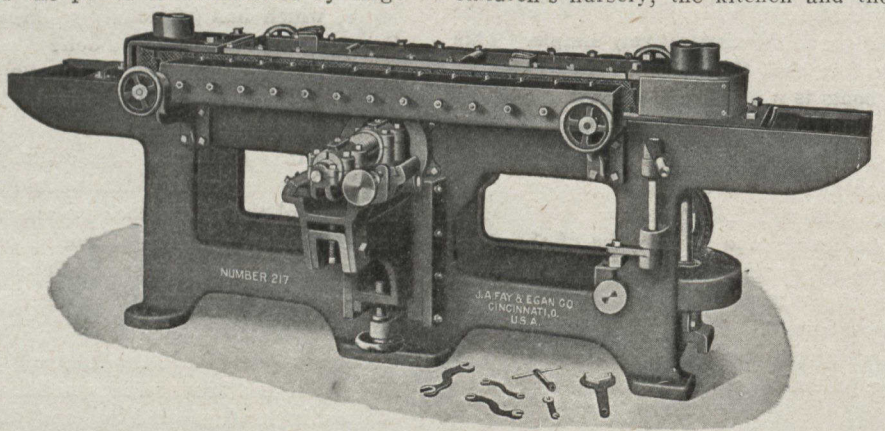
The frame is cast in one piece—absolutely rigid, and is constructed so that the entire mechanism is completely enclosed.

One of the important features in its construction is that all the bearings are oiled from the outside without stopping the machine.

The feed consists of a traveling chain, composed of detachable links, which is provided with a gib running full length, not part way only, insuring perfect alignment.

The chain runs over two octagon wheels, one at each end of the machine, with finished faces, and flanged at lower edge to support the chain.

The feed is driven by a 3-step clutch cone operated by a lever close at hand, and the power is transmitted by large



No. 217, Continuous Feed Glue Jointer.

bronze worm-wheel and steel worm running in oil, with ball-bearings at end thrust, absolutely noiseless.

On the machine illustrated herewith you will notice the two hand-wheels on each end. They adjust the housings to various thicknesses of stock. You will also notice on the housing, nuts the full length. These nuts hold in place as many steel rollers which give pressure to the stock being worked. The rollers are each mounted on independent housings and backed up by tempered springs, holding the stock firmly in place.

The cutter heads are located in the center of the machine lengthwise, one on either side. They are mounted in heavy housings, having vertical, horizontal and angular adjustments.

For further information, write the manufacturers.

Manufactured by J. A. Fay & Egan Co., Cincinnati, Ohio.

MANUFACTURING OF FOLDING SCREENS.

Since the use of folding screens began many carpenters, cabinetmakers and woodworkers in general have benefited by it. Busy millmen with large orders on hand for sash and door stock do not like to stop and dicker over the cost of making a few folding screens, but if a large store desires a hundred, or a hundred gross, the millman may turn in his estimate and bid for the contract. If there is a run of trade in folding screens, such as exists in some communities at the present time, the business-like carpenter or millman finds it to his advantage to so arrange matters that he may derive considerable profit from the work.

Screens can be made during slow times in the shop and there is a good margin of profit in them, although when only an occasional one is made the gain is slight, owing to the necessity of getting tools together and planning for the special article. In some shops this is overcome by making a dozen screens even on a single order, trusting that the other eleven will be bought up in time.

The sketches are presented with a view of elaborating on the designing and making of the modern types of screens. Formerly it was considered all right to attach the corners of the frames with nails. Sometimes screws were used. There were types of bolted and flanged joints. The requirements of the present time involve the uniting of the corners, as in Fig. 1 at a. Buyers abhor nail heads. Even screw heads are not wanted. Therefore a good joint with all wood parts is made. In Fig. 2 is shown a frame set up.

As to the timber employed, much depends upon the style of folding screen wanted. There are cheap lines for the children's nursery, the kitchen and the rear porch that can be manufactured from pine or other easily worked stock. Such timber is usually stained to imitate the hardwoods. Sometimes it is painted. The screen for the hall, the library or sitting room must be better.

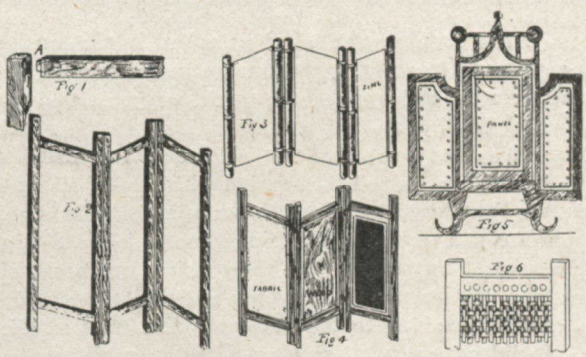
Weathered oak is the popular stock. The oak pieces are obtained about the right proportions and cut to match the parts of the frame. The filling in of the frame is not done at the shop, as a rule. The frames are almost always wanted free and open and hinged, ready for tacking on the burlap or other material. The hinges may be of the common one-way type or of the swinging variety, so that the folds may be turned in any direction. Polished brass or white-metal hinges set off dark colored woods to advantage.

While the average buyer of the folding screen wants the frame only, there are others who order the body part finished. Fig. 3 shows a zinc body frame, constructed with cylindrical pieces of oak, turned down to two and one-half inches diameter. The height is usually about five feet. The hinging is done with brass strapping which passes about the poles alternately, as shown, and is tacked at the tips. This makes it possible to turn the rolls very readily. The zinc sheets are cut out at the nearest tinner's and the metal hinge straps are soldered on or riveted on, as desired. The zinc surfaces are later decorated with colors. A very attractive folding screen results.

Fig. 4 shows some of the panels employed in the body work. Often the body is made by stretching a piece of common burlap, canvas, or fine silk across the frame and tacking

it, although some handsome wood panels are used. The middle frame of the screen shows such a panel. A leather design is represented by the black surface.

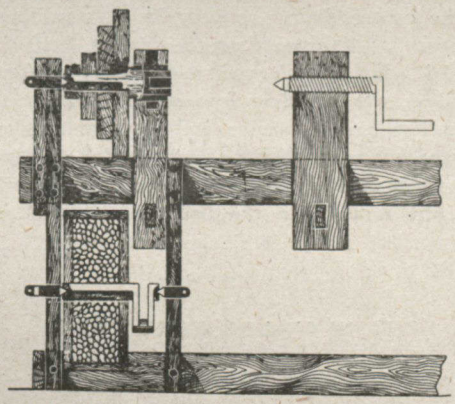
There are certain forms of folding screens that have a variety of woods in them, as in Fig. 5; these are usually turned out on special orders and are very valuable. Often



selected hardwoods are engraved and attached, while there are other screens containing considerable brass or metal work in the form of scrolls, angles, and general figures; there are opportunities for adjusting fret saw work to the screen of this nature. Then there are the chair-back styles, as shown in Fig. 6. The frame is bored with a series of holes along the sides, and through these holes material is pulled, making the braided or plaited effect. The variety of design possible in the folding screen line is unlimited, and there is a wide field for artizans.—Hardwood Record.

A HOME-MADE LATHE.

The American Machinist illustrates, as per accompanying diagram, a backwoods lathe built fifty years ago by two Wisconsin pioneers, one of them handy with carpenters' tools,



the other originally a blacksmith. The balance wheel was a round box filled with stones. The tools were made from old mill files. With this lathe they made about 400 feet of well-drill rods in one winter.

BORING HOLES.

Not long since a number of staves were required to be drilled, 700 holes each, arranged in 10 rows. The holes were ¼-inch diameter and ⅜-inch between centres. The rows were also ⅜-inch apart and the holes were staggered so that only those in every other row came directly beneath each other.

These staves were a part of a special perforated drum and the job did not at first seem to present any special difficulty except the time required for drilling, but trouble soon developed.

The staves were of ⅞-inch soft baywood and it was planned to drill two at a time. A jig of maple about ½-inch thick was made for the job and the centres of the holes all carefully laid out in proper positions on their respective rows. Then the jig with the two staves planed to proper thickness, and a thin piece of cheap lumber for a backing to prevent the drill from breaking the fibre of the woods as it came through the second stave, were all clamped together with corrugated fasteners every few inches along the joints; the fasteners being only driven in slightly so they could be removed easily with pliers later on.

A twist drill with a central slender point and lips on the edges was procured. A reliable boring machine with vertical spindle and adjustable rest was at hand. The coast certainly appeared clear. The plan was to drill the jig itself together with two of the staves at the first operation and thus save time.

Quite a good many holes were drilled in this way and then the top of the jig and the bottom of the backing beneath the staves began to take on a decidedly swollen appearance. Something was certainly wrong, and the more holes drilled the worse things looked.

The parts had to be removed and examined, with the result that the work was found to be spoiled as far as live staves were concerned. Where the drill broke through each thickness, the fibres of the wood between the holes were crushed badly, partly owing to two reasons, one that the baywood was soft and rather spongy and the holes being so near each other that the congested chips forced the grain between adjacent holes, but principally owing to the fact that as the various parts could only be clamped together by the edges, and as the drill passed through one thickness into the next, it forced particles of chips to wedge between the layers and thus separate them, leaving no backing for the drill as it broke through each stave and the grain between the holes on the under side of pieces was badly broken and crushed as the result.

The next move was to finish boring the jig all by itself and discard the staves after experimenting a little with them in the circular saw and planer to see if the action of these machines would tear the fibre of the wood between the holes already bored.

New material for staves was gotten out, thicker than required, and the two stave pieces together with a thin backing all glued together, the jig only being separate and held with fasteners as before.

The problem was now solved, for the parts being glued together, the chips could not possibly force the pieces apart, and there could be no chips between the jig and the first stave. After the holes were all bored, the staves were separated by passing them through a very sharp circular saw at the glue joint, and then smoothing one side on the buzz planer, next bringing them to size on the thickness planer.

It was found in practice that a sharp saw and planer would not break the wood between the holes unless it had previously been crushed by the drill, even if they were so very near together and the grain so short between them.

—There is a growing tendency to leave off all ornamental finish on manufactured machinery. Thirty years ago woodworking tools were painted in bright and variegated colors; to-day practically but one color is seen, and that a color that, contrasted with the finished bright work of the moving parts, is much more pleasing to the eye and in use, than the coat of many colors.—Machinery.

Saw Mill Department

TAKING TWISTS OUT WITH THE ROLLS.

Can twists be taken out of saws with the use of the rolls alone? is a question frequently asked. I myself have removed line twists with the rolls alone, or at least have made the saw stand up on the floor as well as ever after it had had a line twist like a figure 8. I leveled my saw, made the back curve uniform and adjusted tension, put the saw back on the mill and did excellent work with it, and at that time (some six years ago, and for about two years after) I felt that I had found an ideal way of removing twists, and advised my brother filers accordingly. They, too, thanked me "many a time and oft," until one of them, who had been indulging rather freely in the "cup that cheers," got a 10-inch 14-gauge saw pulled off, he afterwards said, through cross-lining the saw. Anyway, it described a spiral stairway about as accurately as anything I can think of. There were no two men in that mill with sufficient strength to straighten out one coil of it, so the filer decided, as there was a large iron works near, he would have it straightened out on the heavy rolls used in straightening sheet iron. He, of course, knew that he could not, by any possibility of means, use his own saw stretcher.

Well, they rolled, and rolled, and re-rolled. All they hoped for was a partial straightening of the sudden curve, but, alas! when they were through with it all the change that had taken place was that it leaned like the Tower of Pisa. About this time I happened along that way and was invited to demonstrate how easily the twists could be taken out without having recourse to the old and (and as I claimed) antiquated hammering process. I got heavy timbers and pried in an effort to straighten it; but whether the iron works rolls had increased the tensile strength by taking out the tension, thereby making the saw stiffer, or whether the filer who was helping me was overcome by a strong weakness, the result was the same. Every bend we tried resisted us stubbornly.

Now, to go back to the use of the hammer would be to admit I had promised more than I could perform, and then, again, there did not seem any possible chance of getting solid blows even if I did try the old style. So, in desperation, I asked for a spirit lamp, and clamping the first bend (that is the end which would have described the highest point before the rolling mill operation) to a loose plank, 2 inches thick, I pushed it through the open stretcher until I had the first portion of the plate, which had defied the pry system, within 6 inches of the rolls. The saw, being still in coil, did not need holding up on the coil side of the stretcher. I then applied the torch and kept it on the bend until I had the steel hot enough to fry meat on (this by actual test). As soon as I got the desired heat, I had the filer move the coil until the heated portion was under a steel pry (a piece of 2-inch shafting), which I had set to an angle to correspond with the bend in the plate, and by this means managed to get the first coil fairly well straightened out.

Having accomplished so much, all that remained to be done was easy, so, after treating all the knotty kinks in this way, I had a saw that was sufficiently flat to allow of the ordinary tests being made as to back, tension, and leveling. We then squared off the ends, filed the lapse and made a braze. After dressing the braze we rolled in the tension at the braze, and after giving similar treatment to each of the places where we had applied the torch, we proceeded to get the back right—by which I mean, in this case, 1-32-inch in 12 feet. We then gave the saw a little more tension than usual; that is, we carried the tension within one inch of each edge. We then leveled up, and, after swaging and sharpening, put the saw on the mill again, when it did just as good work as ever. But every time the tension got back to 1½ inches from the toothed edge (which was where it had always been carried previous to the accident) that saw would lop over. It did not seem to interfere with the quality or quantity of the output, but the filer wanted that lop, as he put it, "out for keeps." He could get it out by going, as I had done, nearer to the toothed edge, but he had a decided objection to doing so, as he prided himself on having very few cracks in his saws, and while he had not been troubled with any since I had made the change, he still wanted that tension back to 1½ inches, giving me the old, old story of prevention being better than cure.

Finally I had him roll the tension back to 2 inches. I then examined the saw carefully with the short straightedge and found plenty of short twists, some long-face and some cross-face. All these places I marked carefully with blue pencil, giving emphasis to the marks on the extreme edges of the plate. I then rolled in the tension to within ½-inch of each edge, after which I used the cross-face hammer very lightly on the twist marks (on the edges only). My idea was that the centre, being so very loose, would respond to edge treatment. After getting the tension back where the filer wanted it, that saw showed no tendency whatever to lop over. And ever since that time when I have a twist to remove, I roll in lots of tension and then treat the edge with the cross-face hammer. I have had plenty of saws to treat which looked as bad as the one I have just described, but never had any more than the usual amount of trouble in getting them right except in this particular case.

CROWN IN LOG BAND SAWS.

There is no process in connection with the fitting of a band saw upon which opinions differ so much as upon the crown a saw should have in order to hold its position upon the wheels while in the cut. Filers are gradually learning that crown in the back of a single-cut band saw is as essential to the quality and quantity of lumber as any other process in the fitting of the saw.

Several years ago I was representing a saw manufacturing concern, and traveled from mill to mill adjusting any complaints that were from time to time made by its customers. I was instructed to do all in my power to assist filers and post them on any little points that would help to improve their work or save them time. At one mill in Pennsylvania the filer was a straight-backed man, and, of course, was in favor of the straight saw of another make than the one I was representing. I tried to sell his company a pair of saws, but it was no use that time. I saw that it was up to me to prove that I was right by backing up my goods by a test. A week after I wrote to the manager, asking permission to fit up two

of our company's saws in their file room, explaining that my company had made these two saws of different makes of steel and wished by practical tests to prove which was the better steel for band saw work, and that they wished me to make the test personally, before the one chosen was delivered to our customer. I receive permission, and immediately wired my people to make and send me two saws made of the same grade of steel and equal in temper, in fact, alike in every respect, except in the matter of crown. I ordered one to be straight-backed and the other crowned to 1/32-inch in 5 feet 6 inches.

Then the trouble commenced in our own shop; for they had no gauge 5 ft. 6 inches, but had one 11 ft. with 1/16-inch crown, and the head sawmaker informed my manager that the latter was just the same degree of curve as the one I had asked for. The manager, however, wrote to me, asking if this 11-foot gauge with a concave of 1/16-inch would give the same result as the 5-ft. 6-inch gauge with 1/32-inch concave I had asked for. I wrote saying this would not do, as there would not be half the crown in the saw that I had requested, and that I must have the saws made to my order if they expected me to win a new customer, even if they had to make this special gauge. The result was that the gauge was made, and one saw made straight as usual, and the other with a crown in the back of 1/32-inch in 5 feet 6 inches. Then more trouble came along in the shop, for when this saw was laid down alongside a saw made to the 11-foot gauge, 1/16-inch concave, the saw-maker noticed that my saw had a curve of 4 inches more in its length than the saw made to the 11-foot gauge. The manager wrote, assuring me that I must have made a mistake in my order, as the foreman of the shop said the saw would never run without breaking all to pieces, as the gauge I had ordered gave a saw more crown than any they had ever seen or heard of. I replied that I would bear the cost if the saw broke, and asked that the saws be shipped to me at once.

In a few days I received the two saws and got them to the mill where I had permission to put them up. I fitted up the straight-backed saw first, and then the crowned one, but without letting either the filer or manager of the mill know that one was straight and the other crowned. When I was through the manager and filer sat with me on a wooden bench, and in the course of conversation I mentioned that these two saws were made of different grades of steel and that my people would adopt the one which gave the better results from my test. I suggested to the manager that it would satisfy his curiosity and my own if he would permit me to make a preliminary test on his mill, and, as he agreed, the straight-backed saw was put on. As I expected, it did no better than the other saws used in the mill, but it made the usual run. When the other saw was put on, I stepped out to the mill and tilted the top wheel to run the saw off in the right position. The saw stood up so well and cut so nicely that the sawyer nearly covered up the men at the tail end of the mill with lumber, and he expressed the opinion to the manager that it was the best saw he had ever had on that mill. The manager was so satisfied with the work that he said if our company could furnish him with saws like that one he would place his orders with us, and asked if I could leave the saw on his mill. This, of course, I did willingly. When I told that filer that both saws were alike except that one was crowned and the other straight, he was the most surprised man you ever saw.

The average speed for the band saw blades in soft woods is generally given as from 9,000 to 10,000 feet per

cut band saws to have straight backs, does not stand, for the reasons I will try to make clear. A single-cut band saw works under entirely different conditions from a double-cut saw. First, a single-cut runs on a wheel whose fact is wider than the saw, and, as the cutting edge is always run off the wheels, the back of the saw must, consequently, be on the wheels, and as the saw is strained it will be tighter on the back than on the teeth; it is necessary, therefore, to crown the back of the single-cut to overcome this. Second, a double-cut saw is always wider than the wheels, therefore it is necessary that it be straight on both edges in order that it be strained evenly on both edges when on the mill.

Another point upon which I wish to touch is the cause of considerable trouble to many a good filer. How often we hear of a filer who has had good results with big mills, getting into trouble with his saws going back on the wheels. All the leveling, tensioning, back or hook he can get into his saw will not put the matter right; the saw will go back in the cut and forward out of the cut. I believe that in nine cases out of ten the following are the causes of this trouble. From some cause or other, one of the upright trunnions has been tightened so that it sticks and will not work up and down freely; if so, when the saw enters the cut, the weights do not take up the slack and the saw will go back and come forward at will. This trouble generally occurs with those mills which have a separate weight or straining device to strain each end of the top shaft. The method is as near a failure as anything I know of, but it is mostly used on resaw band mills.

THE CARE OF SAWING MACHINES.

Taking the larger machines first, and assuming that it is a band resaw, we may note a few essential points contributing to the success of its operation. Bear in mind, however, that the main purpose here is to discuss the machines and their care rather than that of saw filing, especially in relation to the band resaw, because saw filing is a special trade of itself.

The first step to take in the care of a resaw is to provide it with a good substantial foundation. There is probably nothing better for this than a concrete foundation, which may be cushioned with lumber to make the frame fit down smoothly, and should be bedded deep enough in the ground to ensure its standing absolutely rigid. With a foundation of this kind to start from one should be able to put up a band resaw so that there is absolutely no vibration, except that caused by the saw itself.

If there is any vibration in the machine the chances are that there is something out of balance that should be looked after. Occasionally one comes across a band resaw machine that will show a little vibration and a little jerk no matter how carefully it is gone over, but such cases are the exception rather than the rule. Every vibration has a cause, and most generally the cause is in unbalanced wheels, and careful testing and rebalancing will correct it. Sometimes there may be a sprung shaft that causes a jerk, and sometimes where the saw is driven with a belt from a line shaft the jerk may be caused from the belt or from the line shaft itself, especially if it has other machines attached to it which jerk or has belts which do not run smoothly.

The average speed for the band saw blades in softwood is generally given as from 9,000 to 10,000 feet per minute and from 8,000 to 9,000 for hardwood.

This is really a pretty high speed, and, while it is in keeping with our general tendency to rush things, it is generally better to run at a little lower speed than to exceed it any. Both saws and machines can be kept up better running 8,000 feet a minute than at 10,000. Also, it is better to run at a lower speed and maintain the speed regularly than it is to have a high speed and have the machine slow down, when it strikes a cut, and have to release the feed from time to time in going through a wide board. There is nothing like a steady gait for a resaw, and where the power is limited you can get more power on your saw by reducing the speed, and can frequently do more in a day running at 8,000 feet per minute than if you had the saw geared up to 10,000 feet and then couldn't maintain the speed through heavy cuts. It is not only the steadiness that counts in sawing, but it saves both the saw and the machine. They will last longer and be easier to keep in order.

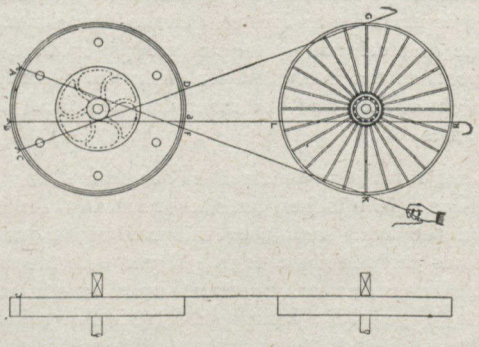
There is nothing like maintaining absolutely true and straight lines in connection with a band resaw. There are numerous temporary kinks resorted to at times to make a saw run right on the wheels and stand up to its work, such as tilting and cross lining. But these should only be made use of temporarily, and then only when circumstances absolutely demand it. The machine should be set level and the wheels absolutely true with each other, both in cross lining and in tilt, for this is the natural way to run them. Also, the faces of the wheels should be practically straight. Some crown them a little when they true up the face, but, in the opinion of the writer, straight lines are the best thing to work to.

With the wheels absolutely true on the face and the lines straight and square with each other, it is up to the filer to so hammer and fit his saws that they will run on the wheels, and then he will get the best results and the machine will run better. Of course, to maintain their position rigidly it is important that all the journals and bearings be properly fitted and closely adjusted so that there is no play in the journals to let the shaft of one or the other of the wheels pull out of line when the strain comes along. Generally resaw boxes are in fairly good proportion, and with proper care they can be adjusted so that there is practically no play in the journal, and yet not made tight enough to pinch and cause excessive heating.

To ensure safety against heating there should, of course, be proper facilities for oiling, for keeping the journals well lubricated throughout the day. It is not sufficient to pour a little oil on each of the journals at starting time and have it run through and work itself out in an hour and then have the journals run almost dry and get hot. There are numerous ways and devices for feeding and retaining oil in journal boxes, and from among the lot each man should be able to provide himself with satisfactory means. It is simply a matter of looking carefully after it and not neglecting these things. It is a mean job to have to take out and rebabbitt a resaw box, and lots of it that is being done could be avoided by just a little more attention to adjustment and to lubrication.

Not only when first setting a machine, but after it becomes necessary to rebabbit the box or overhaul the machine in any way, one should always go over resaw wheels thoroughly to make sure that they are properly aligned before putting on the saw and starting up. The accompanying illustration from "Packages" shows the proper alignment of resaw wheels. The saw should be strained on the wheels first, as this takes up all the lost motion, and your adjustments are then made under exact working conditions. Illustrating an easy manner of properly aligning wheels, it says:—

"A line should be stretched across the bottom and brought so it just touches the rim of the wheel on both sides as shown at 'A' and 'B.' It can be observed whether



it touches the top wheel at the points 'L' and 'H,' and if it does not, this can be corrected by tilting the wheel by means of the small hand-wheel provided for this purpose. In case it is necessary to move the top wheel forward or backward, the shaft will slide free in the boxes, and can be fastened to position with the set collars provided for that purpose.

"Now pass the line across the bottom wheel from 'C' to 'D,' and observe if it just touches the rim of the top wheel at 'G.' If it does not, the top wheel can be adjusted by means of the cross-line so that it will. After this result has been obtained, pass the line across the bottom wheel as shown in 'A' and 'F,' and see that it also touches the top wheel at 'K.' When all these points have been found to be in perfect alignment, the wheels are in correct position for actual operation."

There is a wrinkle for removing resin on a saw that will be appreciated by those who are resawing pine and other wood that gives trouble from gum or resin sticking to the saw. This wrinkle is a sawdust oiling box which is designed to keep pitch and other gummy substances from adhering to the saw by automatically applying a little kerosene. The box has a slot in both the top and bottom, with the lower edges of the wood slanted upward toward the saw. Strips of leather applied directly on the sides of the saw prevent the sawdust from being carried out and assist in keeping the blade clean. The box is filled one-half full of coarse sawdust, after having been thoroughly saturated with kerosene oil. The blade passes through the box, stirring up the sawdust, each particle tending to cleanse the saw thoroughly and continuously."

This idea of using sawdust in a box for keeping the saw cleaned may be used with varying details. Each millwright can exercise his own ingenuity. But the main idea is good and worth keeping in mind, that of applying automatically a slight amount of kerosene to keep the saw blades clean, and yet not wasting or messing up the machine with it. There are probably different shapes of boxes that could be made and different quantities of sawdust or even other material used, depending on the needs of the occasion, but, however the idea is carried out, there is many a man, who has been troubled in sawing yellow pine, who will appreciate this wrinkle and should be able to make good use of it.

Where two hundred or more barrels a day are being made in a cooper shop, it pays to install machinery to do the work, no matter whether they are slack or tight barrels.

THE RIP SAW IN THE YARD.

Among those lumber dealers who have no thought or intention of undertaking what might be classed as planing mill work there is more or less increasing use of the power-driven saw, generally a rip saw, where it is wanted for lumber yard purposes proper. Usually where it is available electric power is preferred for driving it, but even in country districts where there is no electric power plant such saws are found useful, as they are easily driven with a light gasoline engine, the whole equipment costing but very little.

"It is the handiest thing I ever had about the place," said one yardman, speaking of the iron frame table-saw that he had standing at one end of his lumber shed, and was driving with a small electric motor. "It enables me to fill almost any kind of an order without carrying so much diversified stock I can take a lot of common oak, 2-inch plank, for example, the kind used for bridge floors, and sometimes when a man comes along wanting a few clear pieces of 2-inch oak I can rip them out for him, as I have often done. Also, there are certain lengths of 2 x 8 and 2 x 4 yellow pine that are not called for regularly enough to carry full stock of each, so I can keep on hand some 2 x 8s and 2 x 10s, and then if I get an order for 2 x 4s or 2 x 6s in the same length I can rip the wide stock in a few minutes and make them.

"There is a whole lot more of the same kind of help," he said, "that I get out of having a rip saw handy which I can start up in a minute and stop again when I get through, but the place where it seems to come in handiest of all is in the matter of joists, because of knots and some defects near the centre that injure their strength. I get quite a lot of these accumulated, some of them 2 x 8, some 2 x 10 and some wider, and those that are thrown out because of knots weakening them in filling orders from time to time are practically useless for this purpose. I can take one, however, with a knot half way across it, and by ripping it get o good 2 x 4 of full length, and then get possibly two short pieces of 2 x 4 or 2 x 6, depending on the width of the joist and the location of the defect. It saves me a lot in this way, and has enabled me to turn to good use lumber that would otherwise have to be sacrified, and it puts me in a position that at all times I can fill every item of any kind of a bill, even though I may not have it all in stock. I can get some of it by ripping and some by cross cutting, and it is such a great help for all this that I wonder how we ever got along without this saw-table before, and it is surprising to me that every yard man doesn't have one."

This one instance conveys some idea of the convenience and advantages of a rip saw in yard, and there are probably many other experiences which could be given, furnishing ligt on the subject from other viewpoints, practically all of which will tend to show that some light power-driven rig of this kind is an advantage to any lumber yard.

There are sawing rigs of different types in some lumber yards in the timber districts where cordwood as well as kindling is a notable item. There are some who operate woodyards as a side issue to the lumber business, and these buy the wood in comparatively long lengths and saw it up into cordwood on the cross-cut. In the old days these were driven by horse-power, but in modern times there is no need for that. Where there is no electricity there is the gasoline engine, that may be had in any size wanted. Neither one eats anything while standing idle, and both can generally be put to work instantly when wanted and immediately discontinued when not wanted. It is, however, the power-driven rip saw that seems to be the great tool to help out in the lumber yard, and possibly in the near future it will become an almos inseparable par of every yard. There is a hint in this idea that may help machinery people to develop a fairly good trade among the lumber yards in light sawing rigs.—American Lumberman.

HIGH SPEED STEELS FOR WOODWORKING.

Builders of woodworking machinery assert that they have demonstrated to their complete satisfaction that the high speed steels are destined to bring about radical improvements in the woodworking industry, and some even go so far as to prophesy that it will be revolutionized in the near future. The steel has been in use for these purposes for some little time, but in a limited way. Its usefulness has been hampered by a lack of knowledge of its characteristics as applied to the machining of wood, and it was only recently that tests have been concluded which give to the mechanical engineers employed by the builders of woodworking machinery something approaching exact knowledge of how the steel will work under the various conditions of this industry where its real usefulness lies, the speeds and feeds which may be employed to best advantage, its wearing qualities and their application to cutting edges, and so on into minor details.

Tests made by large woodworking machine establishments brought out these general facts: The rate of feed may be nearly doubled; the cutting knives keep an edge from three to ten times as long as the old steels; the knives may be ground with a better edge, and the sharpening of knives may be done to advantage without removing them from the head; a slower speed of knife head is entirely practicable.

Most interesting, and probably most important of all, is the knowledge that the real value of the new steels in woodworking lies in the finish given the work. The advantage in roughing out heavy work, or in other heavy duty, is secondary to that of finish. The new steels will do more work than the old, according to these tests, but it is not for this that it will be especially valued or that it will act as a revolutionary agent, if so great a change in the industry is to be effected. These statements will sound somewhat paradoxical to those who employ the new steels in working metal, where they have been of little or no value in finishing work, though of exceedingly great importance in heavy or rapid reduction. But, according to these tests, in working wood the quality of the steel is such that, to take a tests of planing as an example, instead of a succession of knife marks there is a clean, unmarred surface, with a glossiness similar to that obtained in a sanding machine. Sample boards planed at the rate of 105 feet a minute showed this characteristic, and they included several varieties of both hard and soft woods. It should be noted that 60 feet a minute is a high rate of feed for planing with the carbon steels.

Probably the reason for this better finish lies in the durability of the steel, which renders it possible to give the knives a keener edge, in the knowledge that it will stand up to the work for a reasonably long time. One occasionally hears of an expert woodworker who, using the ordinary knives, has planed to a finished surface, free of knife marks, but this was under exceptional circumstances, at slow feed, and perhaps with knives especially ground for the purpose. Under the new conditions, according to those who have made the tests, finished surfaces should become the universal practice in planing machines, and this at very high rates of feed. However, it must be remembered that tests are usually made

under exceptional conditions, because the operators are working intelligently and even scientifically. The use of the new steel must be worked out into an accepted practice in its treatment of the steel as such, in methods of sharpening, the form of cutting edge, and in other ways that must become general in their acceptance before the steel can be applied successfully in a universal way. This will take some time, but nevertheless the development of the new practice will go on much more rapidly than formerly as soon as the manufacturers of woodworking machinery shall have adopted it as standard.

As to the use of the steel for heavy reduction purposes there should be an advantage in its use, as in metal, but not to such great extent. The faster feed and the better ability to maintain an edge will count for a great deal, but it should be stated that in the way of rapid reduction the old steels have been entirely satisfactory, and seldom has a task been found beyond the temper of the cutting blades. For special purposes, doubtless, the new steel will be valuable, as, for instance, in the machining of very hard woods. As for the form of the knives the tool holder is coming into vogue for the purpose, the blades consisting of thin, narrow strips securely clamped to the head.

RULES FOR SAW TEETH.

A considerable difference of opinion exists as to the best forms of teeth for different woods. Speaking generally, for ripping with a circular saw pine and soft woods, generally large, acute, and well-pitched and set teeth are necessary, whilst for hardwood more perpendicular teeth of less pitch and set are required. Powis Bale, in Saw Mill and Wood Converting Machinery, says: "If a line be drawn through the points of the teeth the angle formed by the face of the tooth with this line should be, for cutting soft woods, about 65 to 70 degrees, and for cutting hard woods about 80 to 85 degrees. The angle formed by the face and top of the tooth should be about 45 to 50 degrees for soft wood and 65 to 70 degrees for hard. It will thus be seen that the angle of the tooth found best for cutting soft wood is much more acute than for hard. For softwood the teeth should have large, well-rounded gullets to allow of the ready escape of the sawdust.

TENSIONING THE BAND SAW.

For tensioning a band saw, have the saw perfectly level before attempting to roll tension in it, for the roller will not perform its work if the saw is not level and free from lumps. Some filers adjust the tension in saws to suit the crown of the wheels. I would prefer to adjust the tension to suit the feed of the mill—not the speed of the mill, but the feed of the carriage. The speed of a band mill has nothing to do with the tensioning of the saws, as in the case of circular saws, although it has much to do with the work and life of the saws, as too much or not enough speed will have great influence in inducing cracks. In tensioning a 10-inch band saw I use a gage crowned on a segment of a 32-foot circle. Some may think this is a little too much tension for a 10-inch saw. As a rule, I give a saw all the tension the blade will stand and at the same time have it so it will lie flat on my leveling block.—A.B.

SAWS CRACKING.

It is impossible for saw-makers to guarantee their saws against cracking. A saw may be all right, but the mill on which the saw is run may be in such a shape that any saw would crack. Too much tension, uneven tension, crystallization from too heavy blows with the hammer, cutting the surface of the saw plate with a sharp-face hammer, sharp angles in the gullets, guides not being properly adjusted to the saw, casehardening the gullets of the teeth with the emery wheel, not having sufficient throat room to chamber the sawdust, or not having sufficient hook in the saws, all constitute causes whereby saws crack.

DOWELING AND HANDWORK.

It is not often that the improvements brought about by the use of machinery afford much aid and comfort to hand workers in the same line; but I recently saw a man use the dowel method very advantageously in making a screen door by hand.

He sawed his stock, clamped it up; then bored for and drove his dowels from the outside. The method was quick for hand work and it is probable that by slanting his dowels a trifle he got a stronger job than he would by boring them square with the work.

—What makes a band saw cut straight lumber? It is the uniform tension and the perfect fitting of the teeth. When a saw snakes or runs in or out of the log it is often due to the fact that it has not been perfectly tensioned, or the teeth not properly swaged and dressed. A band saw improperly tensioned, or teeth improperly fitted, will run in or out every time, therefore too much care cannot be taken when tensioning or when fitting the teeth. A poorly-tensioned saw will not strain up evenly on the wheels, and, if run very long that way will probably break.

On July 25th, the anniversary of the fire which wiped out the large Edwards sawmill at New Edinburgh, near Ottawa, the reconstructed mills started operations again. The new buildings are all of reinforced concrete, and when every detail has been completed will be the finest of the kind in either Canada or the United States. C. K. Plummer, constructing engineer, of Atlanta, Ga., had full charge of the work. The whole enclosure measures 600 by 400 feet, and within this are the main planing mill, 100 by 152 feet, and the sash factory, 70 by 300 feet, and two stories in height. Every machine within the buildings is driven by an individual motor, and the entire plant is operated by electricity developed from the Rideau River close by. From 300 to 350 men are employed.

—Musical instruments which come to the tropics are generally supposed to be constructed to suit the climate. One difference to be observed is in the manufacture of the keyboard. Instead of the ivory touch a celluloid one is substituted. The celluloid is put on in one piece and bent over the front without a lip, the edge is being slightly bevelled. When the celluloid touch is glued on, it is pinned with two brass pins at the bottom of the front, and one at the rear end of the touch. Ivory keys, it is said, put on in the usual way, are likely to come off owing to the heat and moisture of the climate.

Furniture and Cabinet Making

FINISHING OF WOOD FOR PIANOS, ETC.

The workman in the finishing-room of the piano factory has problems in his work that the man in the furniture finishing-room never meets. The number of experiments that are made in the piano finishing-room will bear out this statement. The chief difficulty arises from the fact that piano finishing is done on split veneer and not on sawed stock as formerly prevailed. The uneducated public are under the impression that the piano is solid wood, but the poor, distraught finisher knows much better than this.

The finisher in the piano finishing-room, in order to be able to cope with all the difficulties of his calling, must know something about the pecularities of the different woods that he comes in contact with. The principal ones that he uses are the three leading varieties of walnut, namely, Circassian, Blister and Italian. All these woods are walnut, of course, yet no two are alike, and each requires a different treatment. Each must have its own kind of filling and its own particular form of rubbing. And the same is true of the various sorts of mahogany. And there is quite a list of other woods, each of which has its individuality, and none used to any extent in any other trade. This leads to the thought that there is another source of trouble to the piano finisher, in the continual trying of new woods or veneers, in the effort to meet the popular demand for something new or striking in the wood and finish line. I regret to have to say that a piano is sold mostly upon its good looks. If it is a "good looker," it goes, regardless of its musical qualities. Hence the maker endeavors to make his instrument as attractive as possible, and this means more work for the finisher and more exacting work. His work must be flawless in every respect, the figuring of the wood must stand out clear and distinct, with just the exact light and shade shown. Now, this is one of the hardest things to accomplish. The effects are obtained from stains, and stains do not give the needed immediate effects nor reveal their true color or nature for hours or days, perhaps. The work demands patient labor and a high degree of skill upon the part of the finisher, such as is not required of the finisher in other branches. Some woods look best when their every feature is brought out by filler and stain without altering the entire surface; quartered oak is such an instance. To make the figuring show up well and not at the same time destroy or detract from the surrounding surface requires artistic skill of the highest order.

What is known as wood finishing is simply the process of applying to the surface of the wood after it has been properly prepared by planing and smoothing, a thin coating of varnish or similar suitable substance to render the surface wear-resisting or durable and to enhance the natural beauty of the wood. This may be accepted as an encyclopædic definition of the term or the art so familiar to finishers and in its completed state, familiar to the general public. There are many and varied methods of wood finishing, with a variety of materials or substances employed in the process of filling and finishing, the varnishes being the principal ones used. In their natural state all woods are more or less porous, and consist of hard fibers, whose interstices are filled with a softer substance. According to the arrangement of this cellular tissue, the wood is hard or soft, close or open-grained. It is the wood finisher's art to properly fill this cellular structure for a little distance from the surface with a suitable filler, so that when the varnish is applied it will not sink into the wood, but will be held up and allow of rubbing and polishing. I told in a previous article how formerly the wood was filled by successive applications of clear varnish, which was pressed into the wood, after drying, at least three coats being necessary to fill the wood. Then the surface was made smooth with sandpaper, after which the finishing coats of varnish were applied. This operation involved the use of a great deal of varnish, and at that time the varnish was of a good quality, as I well remember, for North Carolina copal had not been introduced to the attention of users of fine (?) varnish. Now, fillers are used, and some of these are of very poor quality, but suitable, however, for cheap work. For the finest grade of work it is undoubtedly better to use the best stock for filling, for rosin in the filler will not give the same wear as hard gum. Rosin is easily acted upon by water, alkali, etc.

Every finishing-room should have a brush cabinet in which to keep brushes safe from dust, etc. Instead of throwing a brush into a can or tub of water or other substance, as the case may be, there to remain until again needed for use, it should be cleaned out with benzine and be laid away in the cabinet. If cleaned properly by this method, the brush will not need to be put in any liquid, but will be clean and in good condition for the next job. A cabinet was invented some few years ago for this purpose. In the upper part of it there was a tin vessel with perforated bottom and resting in another vessel. Benzine being placed in the upper vessel high enough to allow of the washing out of a brush therein, the paint, etc., settling through the perforations in the upper can into the lower can, from which they could be removed and the clear liquid drawn off, the sediment being used for rough work of some kind. Thus there was no loss of material in the cleansing operation, and the brush came out perfectly clean, and was hung in the lower part of the cabinet, I think, or was laid down on a slatted frame in the upper part. This method has very much to commend its use to all finishers, and, as the cabinet is not to my knowledge being made and sold, for it did not seem to go through, as good a thing as it was, anybody might make something of the sort for shop use. When a brush is thus cleaned every night before quitting, it is in good condition next morning for service. It will wear longer, too. It is not a pleasure to work with a dirty, ill-kept brush, nor can good work be well accomplished with it.

Speaking of brushes and their keeping, let me say a word for the care of stock in general. Two important things are accomplished when you take care of materials and tools, namely, saving and keeping in better working condition. The first has to do with the profit and loss question, a vital one, and upon the healthy equilibrium of which depends your job. The more saving, the less loss and consequently the more profit. That means much to the employee. Secondly, when tools are in best condition you can do more work and better work in the same time. Therefore, keep the cans or barrels of liquid material covered. Volatile

liquid will under exposure evaporate a good share of the day's profits. Dirt and specks get into the uncovered can of varnish. Varnish, shellac and stain cups gather dirt when uncovered and not in use. Materials deteriorate when left uncovered, varnish particularly. In the well-ordered finishing-room such things do not, of course, occur. Another item worth calling attention to is the needless waste of tow in the filling department. Tow makes a very good cleaner for the filler, and when it is properly used and cared for it is quite economical, otherwise it is expensive. After the tow has been used it may be pulled apart when dry and the old filler material be shaken out of it; or pull it apart while it is wet with the filling and let it dry, after which shake out the loose material. The tow thus treated may be used again as a first-cleaner.

I have received some very beautifully finished samples of hard and soft woods from the foreman of a Baltimore finishing-room, and have been given the method of producing the same, some of which follow here. The finisher tells me that he has produced at least five hundred different colors or shades for wood finishing.

Malachite Green.—Water stain with aniline green crystals or strong green oil stain; green paint will not answer, not being transparent enough to show the figure of the wood. Next coat with white shellac tinted with green to the proper shade, one or two coats, according to the body required. When quite dry, finish with wax in the usual way.

Flemish.—There are many ways of producing this finish. Some stain manufacturers send out a stain that will do the work with one or two coats, and, it being a spirit stain, it dries hard enough to ship in a few hours. The sample sent was treated with a coat of ebony water stain and then oiled with a dark oil stain containing ivory drop black, after which it was given a coat of dark shellac. Finish with wax. By holding the work in a certain light the Flemish green may the more readily be noticed.

Antwerp Oak.—Stain with Antwerp stain in oil and apply one coat of shellac, then wax.

Green Oak.—Apply golden oak stain first, then when it is dry give a coat of orange shellac tinted with green aniline crystals. Then wax finish.

Forest Green.—Make the oil stain as follows: Take one pound of chrome green; half pound chrome yellow, medium shade; three pints of turpentine; one pint raw linseed oil, and a few drops of good white japan. Stain the wood with this, then apply a coat of orange shellac, colored with turmeric and a few crystals of green aniline; then finish with wax.

Weathered Oak.—There are many shades and many ways of making weathered oak. The sample furnished was finished with a chemical stain made thus: Take two ounces of dry tannin, same of copperas, and dissolve separately in a quart of water, then mix them together. This will give the natural weathered oak color with the bluish slate cast. It should then be oiled and shellacked, then waxed. A very good weathered oak stain may be made with a mixture of lampblack and lemon yellow chrome, using very little of the chrome. Or stain with copperas and bluestone in solution, then oil stain it, using a stain with a little burnt umber in it. Then shellac and wax.

Primrose Oak.—This is same as green oak, except that the yellow cast is more pronounced in primrose. Use no green in the shellac. but add instead a few grains of aurimine yellow.

Marine Oak.—The peculiar effect shown in this specimen was produced as the result of the accidental spilling of a bottle of Carter's writing fluid on some raw oak wood; noticing the effect, he applied the ink to a slat of oak, and after it had dried he applied a light copperas solution; next gave it a coat of black shellac, then waxed it. The shellac was made black with nigrosine.

Bog Oak.—This effect is obtained by the use of the regular bog oak stain, coated with orange shellac and waxed.

Gray Weathered Oak.—This can be obtained by the use of the regular commercial weathered oak stain, shellacked and waxed.

Royal Oak.—This is a fumed oak effect obtained by the use of a stain composed of ammonia, bichromate of potash and Vandyke brown.

Fumed Brown Oak.—This effect is obtained with the same stain as indicated for royal oak, only making the stain stronger. Then oil, shellac and wax.

Mottled Oak.—This color it whatever one may choose to call it. It is something entirely new, and I doubt if many finishers would know how to produce it. It is something that one does not get up against every day. I quote the finisher's words. The wood is first treated to a strong copperas stain, which is allowed to dry hard, then fill with a good shade of antique filler. After the filler has been wiped off, make a medium strength solution of oxalic acid, dip a sponge in this, wring out the sponge and dab over the filled surface of the wood carelessly, until you have mottled the same to your satisfaction. If the wood is much quartered, take the tip of the sponge and mottle the flakes separately; allow this to dry perfectly, then dust off the acid crystals that have formed. When quite dry and dusted off, apply a light coat of stain, then shellac and wax, or shellac and two coats of varnish, after which rub and polish.

There are many colors that may be employed in staining oak. since the advent of aniline dyes particularly, so that as I have said in the beginning of this article, the finisher may effect 500 at least; the writer has seen at least 200 shades or colors on oak alone, some of which are very beautiful, the crimson or ox blood, for example. However, there is no great demand for so many colors, and where some of the most beautiful ones are used it is in the case of special pieces of furniture. Nobody would probably care for a set of furniture done in ox blood or vivid crimson stain, and yet a chair or other single piece would look very fine thus decorated.

If asked whether wood stains derived from vegetable sources make upon the whole more satisfactory stains than those derived from coal-tar products, I should not hesitate to say that they do. And yet wood stains derived from vegetable sources have a weak point in their liability to fade on exposure to sunlight, just as the aniline stains do, though not in every case in the same proportion. It will be interesting in this connection to have a few formulæ for making stains from vegetable sources.

Mahogany.—Stain with a 10 per cent. solution of dragon's blood in alcohol. Don't brush this stain on to the wood, use a soft cloth.

Mahogany.—Madder root, 500 parts; yellow wood, 250 parts; boil an hour in 2,500 parts water. Let it be noted here that stains containing turmeric are unsatisfactory, this coloring matter being exceedingly fugitive.

Leather Red Stain.—Red Brazil wood, 250 parts; vinegar, 1,000 parts; soak for eight days; then dissolve 30 parts of alum in 250 parts of water and pour the wood extract into this.

Black Stain.—Brazil wood, 500 parts; water, 2,500 parts; boil, then add 15 per cent. of alum. For a very deep black use a weak solution of iron mordant; brush the wood over with the first, then apply the stain.

Yellow Stain.—Yellow stains vary greatly in composition, and most are somewhat fugitive. A fairly stable one consists of 500 parts of barberry wood in 1,000 parts of water, adding a little alum to the extract.—A. A. Kelly.

THE HANDLING OF GLUE.*

By H. A. Reinkensmeier.

It is a fact that very little attention is given by most glue manufacturers to the mechanical condition of glue; that is to say, glues made from the same grade of glue stock and of identically the same glue test, according to the glue manufacturers' method of testing, do at the same time work differently when put in use, owing to the fact that the mechanical condition in the case of flake glue is not the same, for one may have dried out thicker or thinner than the other, as the case may be; or the breaking may have been coarser, that is to say, a greater number of medium-sized or large pieces. Again, a variation in the cut, say thin, medium and thick cut; these three, as you will note, would bring about quite a difference in the measurement of flake glue. In ground glues these mechanical variations are not so great. However, there can be an abundance of fine ground with the coarser, or approximately equal parts of thin and coarse, or there may be an unusual quantity of thin and coarse, or there may be an unusual quantity of coarse ground. The latter condition, however, is seldom, if ever, found in ground glue.

With these variations in mechanical conditions in cases where glue in measured instead of weighed, uniform results in a solution can hardly be obtained by the user. I, of course, understand that the hydrometer is employed by quite a number, but this instrument is simply to prove the condition of the solution of glue, and is of little service after such solution is made up. Then again, the hydrometer readings are changed by variations of temperature, and with the general run of factory help very few can figure same to a correct basis. In fact, many of them look upon an instrument of this kind as a "fussy" proposition in their work. Personally, I do not disregard the use of the hydrometer for gaging the consistency of solution where ground glue is used, but owing to the inconsistency of flake glues, believe it to be less practical. Mechanical conditions should be a necessary quality stipulated by the user in purchasing this glue, that is to say, the user should specify a standard weight for a given volume of dry glue, such standard measure, if so selected, could be, for example, cubic foot or bushel measure. If this one point is demanded by the user he is certain of at least one uniform condition, and it affords a basis for determining results from any glue he handles; also for establishing a method of using his works.

It is, of course, possible to enlarge on this point by repeating what I have in the past casually observed, but believe the point has been made clear to you. If, then, a mechanical condition has been decided upon as above outlined, a further point in standardizing the use of glue could be brought about by establishing a standard for the measurement of water to be used in the solution. This can be accomplished by simply providing a rod graduated to show say one-fourth, one-half, three-fourths and an entire day's requirements of glue. This is merely offered as an illustration, its application to your work depending, of course, upon the capacity of your glue-handling equipment.

To me a method of this kind would offer a means of obtaining an absolutely uniform solution of glue throughout the entire day and every day, which would be left to your practical workers entirely.

If a further check is thought desirable, such a check could be entrusted to someone higher in authority, and could be made by using an accurately standardizing hydometer and thermometer. This, then, would provide an accurate gaging, and would, no doubt, enable you to check, any waste that might otherwise obtain, as well as give you the assurance that glue is being used in strict conformity with your instructions, which instructions, of course, will have been based on a scale of cost per square foot of surface glued, such scale obtained when deciding on the glue in use.

In this connection permit it to be said that should, for any reason, glue solution remain at the close of the day's work, draw it off in a stock receptacle, such as shallow pans, which will permit of it cooling off and allow same to be utilized next day, without in any way hazarding the quality of fresh glue made for the new day. Where this was not done we have known it to happen, and not infrequently, that a leaky valve permitted enough steam to enter the jacket to sour the glue contained therein, and when you add to this really decomposed substance good fresh glue the next morning, you do not and cannot hope to obtain the same desired satisfactory results that will be realized if the unused glue is drawn off as before mentioned.

Too much importance cannot be attached to this particular point, and I believe a good many of the manufacturers of glue appreciate this to be the prime cause of many complaints where all the blame is laid to the inferior quality of the glue

Perhaps someone would suggest the introduction of a preservative. This, however, will positively deteriorate the adhesive properties of the solution, as well as encourage a tendency to foam or cause a chemical reaction even more damaging.

Let it be understood that manipulation on the part of the glue manufacturer to give extreme weight in a given volume, in order to meet the requirements, is impracticable, if not indeed impossible, where maximum body and adhesiveness and other working properties enter into consideration, as they of course must be adapted to veneer laying purposes.

It would, perhaps, not be amiss to mention at this point that there is positively no known standard system affecting scientific tests of glue for any purpose, and while we may have been placed in touch with many so-called glue scientists, we have yet to find one whose statements are not in themselves probably self-contradictory. It is the practical application of glue to a specific class of work that brings out both the good and the bad properties in the various glues, and the larger the number of the great faults eliminated and minor faults minimized is, in our opinion, the glue for the user to choose. And to decide these requirements no expert with greater capacities than those permitting of quick development in any one of you is necessary.

Temperature, too, is an important consideration that should be regulated, but must be done in conformity with conditions obtaining in each particular plant, for in each factory conditions prevail peculiar to itself. For a glue manufacturer to prescribe at what temperature his glue is to be

* Read at the meeting of the Veneer and Panel Manufacturers' Association, Chicago, Ill.

used is, I believe, erroneous, and this practice should be avoided. As all will readily see, the Southern manufacturer, who experiences warmer and more humid temperatures, will require less heat in his glue solution than will a manufacturer located in a northerly climate, in whose plant the temperature is naturally cooler and less humid; and where, as a consequence, the heat emanating from the glue is much more quickly absorbed, due to the greater difference in temperature between the glue and the atmosphere surrounding it.

My observation leads me to say that if I were personally interested in the use of glue in the manufacture of any one article I would make my standard of temperature 130 degrees Fahr. This degree of temperature, however, approaches the danger point in using glue, and I would not advocate using it at this temperature without some personal study and observation. However, if time and study are devoted to the subject it will be found that less glue is required and less glue shows through than where same reaches the veneers at a higher temperature.

Of course, the temperature of cauls must also be taken into account. As a matter of fact, I believe they are often the cause of glue showing through where the thinness of glue solution is given as the fault. While dwelling on the subject of temperature, let us note that the matter of draft in the glue room is often responsible for glue troubles, for once a skin has formed on glue all the hot cauls you apply will not give you what you have lost in allowing the glue to set.

Getting back to the mechanical conditions of flake vs. ground glue, much can be said on this point, and the few remarks given to the latter would illustrate what seems to me affords considerable advantage in the use of same in this the ground form.

Inasmuch as uniformity of mechanical condition plays so important a part in the successful use of this substance, the best possible reason would perhaps be the one that glue-makers, without exception, can maintain uniformity in ground glues to a greater degree than otherwise, for it permits of their overcoming mechanical defects which really do not affect any of the essential working properties of the glue. Of course, you are too practical and considerate to allow the thought to suggest itself that in ground glue you are more liable to be taken advantage of. For no doubt you appreciate that even though possessed of no higher motive, with the great number of competitors we glue-makers encounter, there are not any of us who could successfully and profitably manipulate ground glues, for it is the manner in which the article does your work and continues to do it that interests you; our every aim, then, is to maintain a uniform working quality throughout. Unfortunately there are some who know not how, but these same unfortunates are as disadvantageously situated on the flake or the broken glues.

A further advantage in the use of ground glue is the time required to soak it, which many of you appreciate is not 10 per cent. of that required for flake glue, and to such of you who have not been soaking flake glue, ground glue offers even added advantage. In other words, the advantage of ground glue is brought about by the fact that a given quantity of any ground glue will absorb water more readily than the same quantity of the same quality of flake glue, due to the fact that a much greater area of surface of ground glue is exposed to the action of the water than is possible in flake glue, no matter how much longer flake glue is allowed to soak.

MAKING OF MATCHES.

Of the manufacture of matches, whether of those which are traditionally said to be made in heaven or those which by their sulphurous odor seem as if originating in the other place, there is apparently no end. It seems in this modern day and generation a far cry from the time when there were no such means for ready production of fire as now exist and when coals were carefully covered with ashes at night to preserve them alive or fire was carried from one house to another, or, in lieu of these methods, resort was had to flint and steel. Yet it is less than the span of two lifetimes, for persons not yet old have heard their parents and grandparents talk of the days antecedent to the general use of matches.

That such a necessary article to modern civilization should have been lacking to the world for more than eighteen hundred years after the Christian era began appears almost incredible, and yet it was not until 1827 that the lucifer match, the pioneer of friction matches, was produced by human ingenuity. Fire was first made known to man by its direct descent from heaven, doubtless, in the form of lightning, which caused dry leaves or timber to burn. How to produce it artificially was a problem in savage days, and this was solved by the laborious method of friction, by rubbing two sticks together until they burst into flame, and later by the bow-drill, by which the process was shortened. With the advance of civilization began the use of flint and steel to strike sparks, which were caught in tinder and ignited it. From this grew up the first form of a match. This was a thin strip of wood, one end of which was dipped in melted sulphur. When this was presented to the spark caused by striking flint and steel together it burst into flame. But this process was cumbrous and costly.

The first improvement, about a century ago, was the construction of what was called an instantaneous light box. The device consisted of a bottle with sulphuric acid, into which were dipped splinters of wood, one end of which had been covered with sulphur and over this a paste spread made of chlorate of potash, loaf sugar powdered, gum arabic and a little coloring matter, so that the end to dip could be extinguished. While they ignited instantly there was danger in the use of so powerful a poison as sulphuric acid, and it absorbed moisture so as soon to lose its usefulness unless carefully corked. Out of this grew the lucifers, made with an inflammable mixture of chlorate of potash and sulphuret of antimony placed over the sulphur, and which would ignite on sandpaper. They were first made by John Walker in England.

The fact that sulphur and phosphorus would ignite by friction was dicovered in 1680 by a German chemist, but no practical use of the fact was made until a century and a half later, when phosphorus friction matches were made in Vienna. About the same time Walker began to use phosphorus in his matches. The first improved friction matches were made in this country, at Springfield, Mass., by Alonzo Phillips in 1836. A score of years later the so-called safety matches were devised to obviate the difficulty caused by the use of the ordinary lucifer match, part of the compound, the phosphorus, being left off the match head and put with the sand on the outside of the box, on which the match must be rubbed for ignition. The detestable odor of the ordinary sulphur match was obviated by the discovery of the so-called parlor match, in which no sulphur is used. But the danger in its use, from the readiness of ignition by stepping on or friction in one's pocket, has led in a large degree to the substitution of the safety match, also free from the odor of sulphur, but which cannot be ignited on any ordinary surface. Besides the prepared surface of the box on which safety matches may be struck it is also possible to strike them on a pane of glass or other smooth, highly-polished surface.

Match-making may be classed among the great industries of the world, for so many are made and the variety of machines employed is so great that the labor of many hands and minds is employed. An estimate of the use of matches in the United States places it at five a day on an average for each of the 90,000,000 people, or a total of about 165,000,000,000 a year. But as one machine has been known to turn out 177,026,400 matches in a single day, all boxed, ready for use, there is little danger of a lack in the supply. In some countries match-making is a government monopoly, but in this country it is largely in the nature of a private monopoly, one company doing most of the manufacturing.

The amount of wood consumed in making matches is something enormous, as it must be straight grained pine in order to be used. But the portions of the lumber not used for matches find other uses. An almost infinite variety of machines make the different sorts of matches. Each company has its own patented devices and special secrets of manufacture. Round matches, those most in use, are made in that shape by softening the wood by steam and forcing it through dies. The making of match boxes is also an important branch of the paper industry, 2,000,000 being used in this country every day. In Japan matches are made from paper, but as this is made from wood the match material is the same. But with the exhaustion of the supply of power timber it will be left to the inventive genius of the future to discover a substitute for wood in matches. The general introduction of electric lighting should reduce the consumption of matches perceptibly.

LOOK AFTER YOUR MACHINES.

Don't expect machines to do good work if they are not properly cared for. This is not new, but it cannot be repeated too often. Several years ago a mill changed hands, and the new owners, having been accustomed to turning out a cheap grade of work, immediately commenced operations that way. In a short time their customers began kicking about the quality and finish of the product. The former owner and proprietor had taken pride in the quality of his work, which was always first-class. Upon a refusal of a customer to accept some inside finish from the new firm, the superintendent stated that he did not see anything the matter with it, and that it was run on the same machine Blank had used, and his work had always had a reputation for being good. "Yes," said the customer, "it was good. The fault is not with the machine as much as with you and the operator. If you'll put the machine in order it will turn out as good work as ever." It was a case where a few months' neglect of a good machine caused it to do poor work Incompetency, lack of pride in product, and all-round carelessness have caused this mill to run at a loss a large part of the time when it should have been making money.

To some people a certain mystery surrounds the successful operation of a machine. Some men run one for years without actually understanding it thoroughly. These men never will make successful operators; they cannot use their brains. The good machine man knows his machine from end to end and top to bottom; every nut and bolt and oilhole in it. He knows the oilholes, every one, and he puts oil in them, too. His ear is accustomed to every sound about the machine, and at the least discordant note in the music when it is singing, his ear catches it instantly and he looks for the cause. Sometimes it takes quite a while to locate it, too, but he finds it in the end, and remedies the trouble.

I know one mill where shafting is true, loose pulleys are kept filled with oil, belts are true and smooth-running, and when the machines are all stopped, but engine going and belts running on loose pulleys, you may stand across the street and hardly know the wheels are turning—just a smooth, even hum. I know another mill which, running under the same conditions, can be heard two blocks away—loose pulleys rattling, belt lacing pounding on pulleys, and all sorts and kinds of noises. One of these mills gets daily attention to see that things are in order; the other gets none, until something gives way and goes to smash. We sometimes see parents who ought never to be such, and we pity their children. Whenever I see a good machine in the hands of a poor operator, I pity the machine. Many a cheap and really inferior machine is to-day turning out excellent work because it has proper care and attention.

In reference to fast feeds, I believe one should always consider the material to be worked, the amount of cut to be taken and the finish desired, then use a feed as fast as consistent with these. A feed of, say, 60 feet, which may do very well for 1 x 6 d.4.s. for yellow pine, would be entirely too fast for 4/4 oak, if one wants a nice surface, unless he had one of the very best machines, with four knives jointed off to all cut alike. We are not blessed with one of these machines as yet in our mill; therefore, we run two knives on each cylinder, and endeavor to have them both cut alike. All our small stock, such as 1 x 2, 3 and 4-inch, we put through our 7-inch outside moulder on a 56-feet feed. This does the work equally as well or better than can be done on a heavy 24-inch machine, besides saving a lot of power. This moulder came equipped with sectional top infeed rolls, with sharp-pointed teeth, which surely take hold of yellow pine and drive it through in great shape. But in working soft wood, such as cypress, these teeth leave an impression, which the top knives do not always remove, unless the cut is heavy, so we got a set of smooth rolls for such work, and it is only two or three minutes' work to slip off one set and put on the other.

If you are using a wet grinder to sharpen planer knives, put a small quantity of washing soda in the water and you'll not be troubled with rust on your knives. It also helps keep the machine from getting rusty. H.

The trade press has no other reason in the world for its existence except to work for the man who cuts the timber, the man who makes the staves, hoops, heading, etc., the man who buys and sells the stock and the man who makes the barrels. The function of the trade press is to bring all these factors together in such a way as to make it easier for all to do business. And not only to do business, but to do it on a profitable basis. While the trade press may have had its shortcomings, in the main it has performed these functions well.

—The English and German manufacturers of pianos have had for many years a monopoly of the West Indian trade, says E. H. S. Flood, Canadian Trade Agent in Bridgetown, Barbadoes. But United States manufacturers have recently given this matter more attention and are beginning to obtain a share of the business. The United States pianos are from a medium to cheaper grade, whereas the foreign makes are rather a higher grade. Pianos made by Broadwood and Bechstein are seen in many of the best houses, and are used generally by the musician. As so many excellent pianos are now being made in Canada, the Canadian manufacturers should make an effort to establish agencies here, and have their pianos introduced.

Boxes and Cooperage

THE WASTE QUESTION.

Waste, to the beginner, presents a problem of doubt and difficulty, and this is not to be wondered at so much when we consider that, however great the experience of those who do not belong to the "beginner" class, much time and thought is given by them to the study of this waste problem.

Beginner or veteran alike buy at per M ft. measure, whether board or surface contents are paid for and every foot of this material which is lost in the manufacturing process represents a definite loss, in dollars and cents, of the manufacturer's money that is as real and tangible as anything can be in this business life of ours.

Seeing, therefore, that waste is a condition of loss, and not a theory, it behooves every beginner to give the cutting up of his lumber his earnest and constant attention, for in no other direction can he make or save money so quickly as by reducing the waste feetage.

To look over a modern box factory, says J. M. Leaver, in Packages, and observe the speedy manipulation of the lumber into box and crate parts, is to wonder, no matter how great your experience may be, if there is not some leakage in the direction of unnecessary waste, and the expert would probably see, even in some of the prominent factories, some little point missed, either for lack of proper cutting combination or deficiency if intelligence on the part of some employes, etc., which would not be apparent in some other plant where these things obtain closer attention.

In a very great measure the success or failure of any box business depends on the manner of dealing with the waste problem, because it is the largest item of expenditure in the business, overshadowing very materially labor or fixed expense cost, i.e., under present conditions as to cost of raw material, in most localities, anyhow.

If we assume that the average value of stock as now used costs $15 per M ft. at factory, and waste 20 per cent. of this, then the loss is $3 per M ft., and the labor cost would not amount to that sum except in instances where an unusual amount of manipulation is required to produce thin stock. Nor would the fixed expense item reach the figure that waste would cost.

I am not to be understood as saying that waste is actually 20 per cent. This may be the figure for some plants. Other factories may get off with a much lower per cent., but I do honestly think and believe that a beginner may, and sometimes does, make as much as 25 per cent. or 30 per cent. waste.

There are many reasons for this belief of mine, the main one being that the beginner may be one to whom the business is entirely new, and, therefore, he has everything to learn; what information he may get will be mostly from employees who know nothing of the business end, and whose notions of cost and per cent. are very crude. They may mean well, yet their experience has been in the line of operation only, which usually means cutting up a great deal of lumber at as low a cost as possible, a commendable and necessary thing, yet often accomplished by a reckless use of stock.

No fixed rules can be laid down, for all plants, with regard to manipulation of stock. This is purely a question of internal economy. The problem for each plant is one to be solved for that plant alone, and it is in solving this waste problem correctly that the beginner gets the real start to success.

It seems to me, however, that the true way to approach the problem is, first, to consider very carefully the nature of the stock, and the endeavor to get orders, which will fit the stock with the least amount of waste, which involves variety of orders as to grades, lengths of cuts and widths, besides the thickness of parts which have more or less effect on the output.

I am constrained to put the matter in this light, for the beginner, because of some very large contracts that have been made recently, in regard to which my personal knowledge tells me that the stock available does not fit the contracts either as to quality, or availability of cuts and rips, or the requisite manipulation of thickness, due weight being given to other products necessary from the stock in question.

Rarely, if at all, do we find that the beginner who plunges into big things has been careful to weigh the pros and cons involved in furnishing proper stock for these big contracts; or if, by chance, he is supplied with material, it frequently happens this very same stock would bring more money in some product other than boxes. In either case the beginner has let himself in on a losing proposition, the extent of which is determined by the volume taken and the period of time covered.

To go into the factory and watch the men cross-cutting and find, that, owing to defects, a 10-ft. board lost, say, one foot, and, possibly, in order to make the proper lengths, for specifications being worked, another half foot of length of this board was lost, there would be a waste of 15 per cent. in cross-cutting alone, and the thought that should suggest itself to the amateur would be, how to get business as to quality that would reduce the foot of wastage for stock not good enough for the orders in hand, and if more lengths for cutting were available, would the half foot of wastage, made on the cutting lengths then being worked, disappear partially or entirely with a greater variety as to quality and lengths; and, again, in studying this out, the relative values of qualities must be considered.

Cross-cutting waste of one and a half feet on a 10-ft. board and the same amount of length on a 16-ft. board are different percentages; in the latter case the loss is below 10 per cent. So that it will not do to rush to conclusions and by so doing adopt a plan of averages that may be misleading. Better far for the beginner, I think, to watch closely the operation of cutting the larger items in the orders and note how they compare with the preconceived ideas of waste on them, and then, if the practice does not agree with the theory, set about applying a remedy in the line of combinations, etc., and if this won't furnish the needed assistance, then let him make up his mind to get better prices, or, if he is tied up on a contract, take his medicine and make a vow not to repeat the dose.

A little figuring will show the novice what the loss is on different length boards: in percentage, whether the waste is one inch or twenty inches; and a little table of this sort is instructive reading, whether it is considered theoretical or

not. Some theory is necessary in order to arouse interest. Nothing, however, beats practice. Yet theory leads to practice, and that is the thing to strive for; in fact, go at it any way that will bring the knowledge home to you and success will eventually be yours.

Ripping waste will depend very much upon the nature of the specifications, and the widths of the stock available; one-piece parts that fit in nicely with the stock are usually quick-working propositions, and a wide run of stock is very helpful on style No. 1 boxes, i.e., where it fits the ends and sides closely, or being so very wide admits of ripping into tops and bottoms without waste. This is quite a factor in the execution of large contracts where the specifications are rigid; but where specifications are elastic enough to admit of two pieces in sides and ends, little waste need be made for these parts, or for cleated boxes, provided, always, that when T. & G. becomes a condition of manufacture then the width of stock absorbed in making these must be figured in, otherwise it will swell the waste per cent., and the effect of a strip of waste, say, one inch wide on a top or bottom 12 inches wide as compared with such strip on a part 30 inches wide, is a very different proposition.

Kindling wood has a value, depending on location, yet no boxman is anxious to furnish this on a basis of $2 or less per M ft.; it is also a good thing under boilers and still no one is desirous to cut up lumber with the idea of shoveling it into the furnace; chips and sawdust have their uses for fuel and the surplus is frequently available as a source of income. The latter, however, may be said to cut no figure in regard to the waste problem.

Percentages all the way from 10 to 20 are named as the average for waste, and I find by correspondence that many beginners want an expression of opinion as to the proper waste on certain grades of stock. I am quite unable to give this information for the reasons heretofore given, and also because it depends so much on the method of figuring contents. Those who figure contents closely to cutting sizes are apt to have a larger average waste than those who figure fuller sizes in the estimate; hence, it's a good deal of "every man for himself," etc.

It has been said, there is no royal road to learning, meaning thereby, I presume, that there is no way by which knowledge can be accumulated other than by study, and this is true of the waste question in the box business, as well as of the other problems arising in that trade. It's a case of get in and dig in order to have the facts before you in such shape that they will guide you on your way to success. A little digging will create the desire to dig deeper, and it won't be long until facility in digging will come. A man may handle a spade awkwardly on the first attempt, but, like everything else that has to be learned, "practice makes perfect."

One thing is certain, the beginner in the box business must understand how waste is made before he figures on any large amounts of business. If he neglects this, his capital, whether it be money or energy, or both, will rapidly be impaired. It won't do to assume a percentage and then call his competitor names because some business is not forthcoming on his bid. He may feel reasonably sure that he was wrong in his point of view, and he ought to take such rebuff as an incentive to locate the cause.

PIECEWORK IN THE BOX MILL.

Piecework is not all faults and no favors any more than it is all favors and no faults. There are good things to be said for it as well as bad things about it. We have already had some of its faults pointed out, wherein it has been shown that it has a tendency to concentrate attention on speed frequently to the sacrifice of quality. Also, it is said to lead to unnecessary waste of material, which is quite a serious objection. These are faults that it develops in different degrees, depending on circumstances and how the work is handled, but there is another side, and so let us look at that for a while and see how the favors balance up with the faults.

Piecework encourages not only physical effort, but also more thinking and planning on the part of those doing the work to devise ways and means of doing it more rapidly. This of itself is quite an item in the development, because people who are actually doing the work can frequently develop ideas and discover means by which the work may be facilitated that are not practical to the superintendent or proprietor, who is not so familiar with all the details. A specific instance of this kind is related by a man in charge of a cigar box factory, where the piecework system is the only satisfactory basis on which to do the work. The girls were paid so much each for doing the work of putting on hinges and pasting the labels on the boxes, and finishing them off. They discovered by-and-by that the pasting of the hinges made quite a break in the work for each one, and finally they evolved a scheme of employing someone to do the hinge pasting only. They figured out a piecework basis for this, and arranged means to pay for the work, each a certain proportion, and found it worked out advantageously, because the hinge pasting being done separately allowed them to work better, make better time, and more money and work uninterruptedly.

Piecework in the factory is in some respects similar to the commission basis for travelling salesmen. The good ones, those who can make quite a record, like it because it gives them the chance to get all they earn instead of being paid according to the average earnings of all. Not only that, but it stimulates both the good and indifferent ones to greater effort, and to harder thinking about how to get orders. Take the average salesman on the road, and if he is getting a straight salary he may do his work conscientiously and not run his expense account abnormally high, but put the same salesman on a commission basis and he very likely will reduce his expense account materially, and increase his sales. He will work harder and think harder because he feels that he is working for himself as well as the company, and he can see where he gets direct benefit for the increased effort.

The same thing is true in the box factory where men are working at piecework. The good ones not only like it, but it sets all of them to thinking of ways and means to increase their output and enlarge their income. There is an old story illustrating this point about a man who had a contract to nail up boxes of large size and special design, which couldn't very well be handled with a nailing machine. The proprietor figured out a piecework system of pay that would enable a swift worker to make fair wages, and by-and-by it was found that one old man, who was not very swift and hadn't at first made fair wages, was making more than anybody else. Investigation developed the fact that he had brought his boy with him, his boy had induced some of his chums to come, and in the end he had three or four boys for help. The boys were very quick, and after he got them trained in each of the boys did practically as much nailing as he could do. He paid the boys from $3 to $4 a week, and, as his own wages had been figured so he could make about $10 a week, it was easy to understand how by paying these boys he had more than doubled the

amount coming to him that he would have had by nailing the boxes by himself altogether. Now, there are really two points to this incident. One is the stimulating of men to devise ways and means of reducing the cost of work, and the other is that in a certain measure it solves the problem of employing boys in the factory. If the proprietor had employed the boys to do the nailing, there would have been lots of protest on the part of the men, but having arranged it on a piecework system so the men themselves get the benefit for training the boys, and looking after them, the men, instead of objecting to the boys, sought to have them help at the work.

There are many other things of this kind, many instances that could be related, if the different manufacturers would take the trouble to tell of their efforts. Of course, there are some on the other side in which there are cases of what might be termed abuse of employees working the piecework system, slighting their work, etc., but where this occurs to any great extent it is due in some measure at least to lack of attention and proper supervision. It doesn't matter whether you are doing piecework or having day labor, to get the best results and the best quality of work there must be rigid supervision—there must be competent superintendents and foremen, and they must attend to their duties diligently. If they do this they will get good results either way, day labor or piecework. If they don't they may expect poor results, no matter how the work is arranged; so really a lot of it depends in the end on the foreman as well as on the management and methods.

SAWS FOR CUTTING STAVES.

Saws are being made and advertised to saw slack staves, and I am glad to note the change, especially if in sawing the staves we are not compelled to consult the grain of the wood, as in cut staves. I know that in practice a large amount of the best of timber is wasted in trimming bolts by the stave-cutter, quite enough, I believe, to make up for the saw kerf that would be wasted in sawing. To cut staves successfully the grain of the wood must be consulted and the bolt trimmed so that the stave knife will cross the grain going through the bolt in such a way that it will come out nearer the heart of the tree than where it started into that cut, but not exactly toward the heart. It should be remembered that when the knife, in cutting, approaches the heart, it must leave the heart below the direction of the cut, because if the cut goes exactly toward the heart, or leaving the heart above the direction of the cut, it makes the staves rough at first, and they warp and cup after they are made into a barrel. The saw will not make staves quite as smooth as the cutter will when the wood is perfect, but if the wood is defective, knotty or cross-grained, the saw will do the smoother work.

Then the matter of cooking the bolts must be considered as of great importance, especially when you cut more staves than the waste steam of the place will cook conveniently. I believe a good way to solve the problem would be to have the factory fitted with a cutter and a saw, too, then select the first-class bolts, such as will make flour barrel staves, and cook and cut them, letting the waste steam do the cooking, while the inferior bolts are sawed into staves without cooking. Thus the waste steam could cook the flour barrel stock alone, and the inferior stock for potatoes, salt, sugar, lime, cement and all second and third-class stock could be sawed without steaming and with very little, if any, more waste in kerf than would be made in trimming the bolts. A stave-cutter must have a full crew of men all the time, else they let the bolts get cold after they have been steamed and must be steamed again, whereas a saw can do good and profitable work with a few hands and never a cent of extra expense for resteaming. The space occupied by steam boxes is great when bolts must be steamed for 40,000 or 50,000 staves a day.

The stave-cutter and the stave saw are like all other machines in that they must be kept in order to do passable work. If one is kept in order and the other is out of order, the one that is in order will take the prize every time. To learn to keep a machine in first-rate shape one must possess two qualifications—he must be anxious to know and willing to do the work. Then all he has to do is to read how it is done and go at it and do it the best he can, then read it again and do it again the best he can, keeping up reading and doing until it is fixed on his brain and his hands become accustomed to it.

A stave saw requires very little adjustment by the operator. The carriage must lead off a little, just enough to require very little, if any, set on the block side. This acts as a guide to steady the saw, and it makes smooth stock if the teeth are all sharp, of equal reach and in perfect joint. The throats must be round and of sufficient capacity that the centrifugal force will discharge the sawdust. All, or nearly all, the set must be inside the saw; just enough to give clearance is all that is needed.

To keep a stave-cutting machine adjusted properly the operator must understand and consider all its parts. The cutter consists of only five parts besides the knife—the two ends, which make the legs on which the machine stands, the knife-back, the hornback and the tumbler. The knife works stationary, while the tumbler vibrates down and up, bringing the bolt against the solid knife. The stave bolt drops by its own weight against the hornback, which constitutes the gage for thickness of the staves; the hornback is fastened to the ends by a bolt in the middle at each end, and at each side of each end is a setscrew, these center screws and setscrews enabling the operator to adjust the thickness of the staves as desired. The knifeback is provided with a center screwbolt and two setscrews at each end, exactly like the hornback, which enables the operator to set the edge of the knife forward or backward to the most delicate adjustment, to cause the knife to draw to the wood according to requirements. When a man understands the adjustment of the hornback and the knife-back, then learns to properly trim his bolts and hold them to the gage, he can properly call himself a stave-cutter. Of course, it will be presumed that he will have learned to grind his knife.

LITTLE WOODEN BARRELS.

Among the all but endless variety of things of wood are little wooden barrels. They are turned out of white birch, and come in many sizes, from tiny affairs an inch and a half high up to barrels ten inches high.

The biggest of them are turned with a hand manipulated tool, but those ranging from six inches downward are turned each with a cutting tool having an edge so formed that it turns the barrel all at once. They set a block of wood in the lathe and adjust the cutting tool and it turns the barrel into shape complete as quickly as a man turning with a hand tool could have turned one of the hoops on it; and on the smallest barrels one man can run three or four machines.

These little barrels are sold in the aggegate in great numbers, millions of them yearly. A single tack manufacturing concern buys them in car load lots of 2,000 gross, or 288,000 barrels at a time. Great numbers are used by confectioners who fill them with candy, and they are used to contain bottles, etc.

Machinery and Mill Equipment

MOTOR DRIVES FOR WOODWORKING MACHINERY.*

By Fred M. Kimball.

The electric motor, of itself, is not a source of energy in any respect. It affords, however, one of the most economical, flexible, and reliable means for the transformation and distribution of mechanical energy known to modern engineers. A motor without a supply of electricity is as useless a machine as a steam engine without steam.

A consideration of the advantages to be gained from the use of electric motors and the electric drive must, consequently, presuppose that a supply of electricity, obtained either from a central station or from a private plant, is available at all times when the use of power is required. The first matter to be considered, in connection with the adoption of the electric drive, therefore, is the source of electricity.

Due to the improvements in generating apparatus and transmission lines, with their accessories, which have been achieved during the past few years, it has become possible for central stations to generate and distribute current at prices so low that it may frequently become a very close question in any given case whether it is more desirable for a manufacturer to obtain his current supply from the central station or to attempt to install an isolated plant and furnish electricity for himself.

In the case of a factory requiring a large amount of power, located at a considerable distance from an electric station and making considerable waste, it is often found advantageous to install an isolated generating plant. On the contrary, if the amount of power required is moderate; if the power company is located near by and will make a low rate for current, it is frequently the case, especially when the needs of the smaller factories are considered, that it is advisable to purchase the current supply, and thus avoid the expense of installing a generating plant, with its consequent cost of operation and maintenance.

Assuming an average factory requiring 100 horse-power or less, it is, as a general statement, probably more advisable, from every standpoint, to buy current, if it can be bought at about two cents per kilowatt hour, than to attempt to make it. In purchasing current from an electric lighting company, there are marked advantages to be derived from the fact that there is usually duplicate and reserve apparatus in the central station, and that, at all times, the station is in charge of very competent and resourceful men, thereby reducing to a minimum the possibility of loss or damage from a shut-down due to failure of current supply. Very few isolated plants are provided with duplicate apparatus, and in case of damage to either boiler, engine, or the dynamo, a shut-down, involving very considerable losses, is easily possible.

The principal reasons, stated without regard to their importance, which will govern any manufacturer in deciding to adopt the electric drive in preference to the mechanical are: Elimination of waste in power transmission. Increase in production. Improvement in quality of product. Safety to operatives and machinery. Improvement in fire hazard, especially as to open flames and hot boxes. Elimination of belts and shafts, which not only interfere with the proper distribution of light and air, but, as well, limit the location of machinery, and thus frequently prevent that sequence of manufacturing operation which is so necessary to avoid rehandling of work with attendant expense, damage, and congestion. Ability to operate any section of a factory or any individual machine overtime or at unusual hours without putting the whole power equipment of the plant into operation.

In equipping a woodworking factory with motors, and assuming that either direct or alternating current supply may be made available at choice, the first point to be considered is the proportion of tools and machines which require large variation in speed. If the work is of such nature that variable speed tools are not required, then it will be wise to consider the use of alternating current motors, for these motors are somewhat simpler in structural detail than direct current motors, and, furthermore, they are somewhat better adapted to the requirements of manufacturing where dust and flyings are present.

If, then, there are no severe requirements for variable speed work, alternating current motors may be used to advantage, but if there is necessity for considerable variation of speed on the different machines, then direct current motors must usually be chosen, as speed changes are more easily effected over a wider range with the direct current motor than with the alternating current motor. If the required speed changes can be obtained by the use of two or three-step cone pulleys, either motor may be employed. It is hardly considered first-class engineering at the present day to use cone pulleys to effect speed changes, though the writer looks favorably on their use in many cases as providing the cheapest form of speed change, and one that is perfectly simple and has stood the test of time.

Having decided on the type of motor which will be employed, it next remains to determine whether the machinery shall be driven by so-called "group" drive or by individual drive. As the cost of electricity and motors becomes lower, and as the advantages of the individual drive become better known, the tendency to employ a separate motor for each tool is more and more marked. A group drive may be most advantageously employed when a number of similar machines, each requiring a comparatively small amount of power, are kept in continuous operation on the same class of work. The disadvantages of the group drive are found in the necessity for retaining considerable quantities of shafting and belting, all of which are constantly absorbing power wastefully; the variation of speed between the different machine units due to slipping of belts, and consequent loss of production of those that run slowly; the difficulty of arranging the driven machines to the best advantage, so far as the supply of light, air, and their relative positions in regard to the sequence of operations are concerned; the dependence of all machines in the group on one source of power, so that if the driving unit of the group fails, all the machines in the group will be shut down, with consequent loss of production; and the longer time needed

*Read at the meeting of the National Association of Box Manufacturers.

for repairs, in case repairs are necessary. It is usual, in establishments employing the individual drive, to keep on hand one or two extra motors of the various sizes employed, and, in case of any breakdown, the motor is immediately taken off the machine and replaced by another, the displaced motor being repaired at convenience and where repairs can be effected advantageously. Manufacturers using the group drive hardly ever feel justified in purchasing spare motors of large sizes, and, consequently, if repairs are necessary, they must be performed in a hurry and under very disadvantageous conditions, in respect to the location of the motor and its accessibility for working at it.

It has become a well-settled rule of conduct with nearly all progressive manufacturers to make liberal investments for machinery and power wherewith to push the rate of production per hour to the limit, and thus reduce the pro rata labor charge all that is possible. One of the most prominent objects to be kept in view by a manufacturer is maximum production from a given investment in plant and machinery, and this end is most frequently achieved by the use of the individual drive. The use of the individual drive provides a separate motor for each machine, and, therefore, the speed of the machine can be brought up to and maintained at the highest productive capacity without regard to the speed of adjacent machines. Its operation will also be continuous, irrespective of any accident that may happen to the adjacent machine or its motive power. The use of overhead belts and heavy distributing shafting will be eliminated, thereby improving the ventilation and light in the room in which the work is carried on and eliminating a large element of fire risk.

Further, the machines may be located, when individually driven, in most advantageous position relative to each other and for receiving the work which is to be wrough on them, and, finally, if it is desired to move a machine to a new location, temporarily or permanently, it is only a matter of running wires, which can be accomplished far more cheaply and quickly than when shafting has to be extended or a new line of shaft installed.

And when the individual drive is used, a plant may be extended and added to at a minimum cost, for the changing of the electrical circuits is cheaply and quickly accomplished, whereas the rearrangement of the mechanical drive is frequently very expensive and often entails great delays.

Until within a few years, manufacturers contended that the adoption of the individual drive necessitated much greater charges to capital account than when the group drive was used. With the reduction in cost of motors during recent years, however, and the improvement in their output, the difference between the cost of the group drive with its expensive shafting and belting and frequent inefficiency of operation, and the individual drive with its wire supply circuits and capabilities of maximum production is rapidly vanishing, and at present the difference is very frequently so small that it can be ignored in favor of the large advantages usually secured by the somewhat elaborate initial installation.

Both alternating and direct current motors and controllers are now made of such design as to enable them to be mounted on a great variety of machines and machine tools with little difficulty. It is no longer necessary to have special motors built for such work, and, consequently, the extra charges for direct connection have been largely eliminated in electric power installations.

It is advantageous in mounting a motor to keep it slightly up from the floor, where it will be free from sweepings and dirt, and when possible it should be directly and securely fastened to the frame of the machine which it drives. Gear, chain, belt, and direct drive are all available, the choice lying with the character of service and the speed requirements of the driven machine. The so-called silent chains are very efficient and satisfactory when transmission involving chain speeds of 1,200 revolutions per minute or less are involved. Gears, or chains, however, are rarely used in connection with woodworking machinery, for the reason that the speeds of the cutter-heads are very high, and under these circumstances the use of moderately short belts or direct connected motors is favored. It has been pretty well demonstrated that in equipping machines like stickers and planers the use of two or more motors is desirable. It is advantageous to carry the cutting head at a uniformly high rate with a constant speed motor, and to obtain the necessary variations of total cut largely by means of the feed, which can well be controlled by a variable speed motor.

In case the group drive is selected, it is advisable to use moderately large and light pulleys, moderately high shaft, speeds, and thin, light belts, and the use of an approved form of roller or ball-bearing for supporting the line and distributing shafts is advocated.

Among the minor advantages of the electric drive must not be overlooked the ease with which a check may be kept on the condition in which the producing tools or machines are maintained. Woodworking tools, when out of alignment or carrying dull cutters, may easily absorb 200 per cent. more power than they normally require, and this excess power is not only wasted, but absorbed in friction and strains which are very damaging to the machinery.

Under such conditions, the operating niceties of adjustment and smooth running are speedily deranged and the machine permanenly damaged. By placing an indicating watt meter in circuit with the motor and observing its reading when the driven tool is known to be in perfect adjustment and alignment with the cutters in good order and comparing that reading with subsequent readings taken from time to time, an abnormal use of power is immediately made known and corrective measures may be applied before serious damage has been done or much power uselessly wasted.

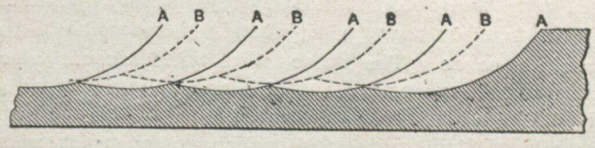
No fixed rules for the laying out of the electric drive in a box or other woodworking shop can be annunciated. There is one method better than any other for every shop and every combination of circumstances, and this method can only be determined upon after a survey of the establishment to be equipped and a careful study of the imposed conditions. The metal working industries have employed motors in the past much more freely than the woodworking industry, and this seems rather remarkable for the reason that the woodworking industries as a rule require high speeds, and it is for high-speed work that motors are particularly adaptable and relatively cheap, whereas the metal working industries, as a rule, require slow-speed motors, which are more expensive to build and install. Within the past two years, however, manufacturers of woodwork have begun to appreciate the advantages of the electric drive, and a number of notable and satisfactory installations have been effected, with more constantly coming under contract.

ADJUSTING MACHINE KNIVES.

As, in machine construction, we are pretty rigidly confined to rotary motion for high-speed and continuous action,

it follows that most machine wood work is done by rotating cutters. At first blush the idea of using such cutters, as they are now used, for making plane surfaces, doubtless seemed out of the question. The best that we can do, however, is to appproximate perfection; and it has been found that a surface composed of a series of short curves is about as near plane as we can get it. Modern woodworking machinery is run at such high speeds that, even with the fastest feed the curves are so short as to be barely perceptible. Not only plane surfaces, but surfaces curved in the opposite direction to that of the cut are so perfectly made that light sanding removes all traces of the cutter. This is as much as can be said of the best hand work; but good workmen are always—though, perhaps, silently—questioning present methods and seeking to do better. It is a mooted question, the answer to which depends largely on the skill of the operator, whether the two knives customarily used on planers and moulders do the work they are supposed to do, in shortening the curves of which the finished surface is made up.

While the making of machines has gone entirely from the realm of the woodworker, there are many niceties of adjustment to which he must attend if he is to produce good work, says "Woodworker." High speeds call for perfect balance, exact radial adjustment of the cutting edges and accurately fitting journals, as well as rigid frames and



bearings. Our brother craftsmen of the machine shop usually attend to the latter item—if we are not too niggardly as to paying the price—but the other conditions must be looked to by the operator. Of course, cutting edges must be kept keen, and as thin as the nature of the work will allow.

As to the other matters, the oldest of us are apt to be occasionally at loss. Even if we were to work wood for eons beyond this life (which, for most of us, would be climatically impossible), we would still have something to learn. In the case of saws, if they are kept reasonably near round and the teeth are kept moderately symmetrical, they are not apt to get sufficiently out of balance to attract attention; nor does a slight lack of balance bear materially on the quality of the work done by them. With planers, moulders and the like, the case is different, as any imperfection in the running balance is pretty sure to show its effects on the work.

Roughly estimated, the outward pull of each ounce in weight of a planer knife, when running, is something like five hundred pounds. This is a fact well worthy of careful consideration; though we are too apt to consider it lightly, if at all, till we have listened to the song of a flying knife or nut as it grazes our ear. Let us consider, for a moment, the result of having an ounce more of weight on one side of a cutter-head than on the other, and of having a consequent pull of five hundred pounds toward that side.

As a first consideration, this pull, except in so far as it is opposed by the pull of the belt and the working strain, tends to wear the journals all on one side. Certainly, combined as it may be in practice, it tends to wear them out of round. While the direction of this pull is constant, relatively to the head, it changes, relatively to the machine frame, through a whole circle, some 4,000 times a minute. It requires no argument to prove that a machine frame must be very heavy and rigid to resist such a pull, or even one of one hundred pounds, without appreciable shaking. We must bear in mind, in this connection, that "standing balance" is not necessarily "running balance." If one knife is heavy at one end, while the other is heavy at the opposite end, they may be of exactly the same weight and still make your cutter-head very badly out of running balance. Perfect running balance is attained, if attained at all, only when, if the cutter-head were sliced up into infinitely thin sections, each section would balance; and running balance is what counts.

Again, all bearings, in order to run at all, must float in an oil film of appreciable thickness. Direct running contact of metal to metal would be quickly disastrous, and the principal value of oil lies in the fact that it prevents such contact. To arrive at a just appreciation of the existence and thickness of this oil film, adjust a bearing so that it runs properly with ordinary machine oil; then flush this oil out thoroughly with kerosene and gasoline, and lubricate with a fine grade of sperm oil. You will find that the fit is appreciably less close.

This oil film is liquid; and, with the heat resultant from rapid motion, becomes more so. Hence, it will be seen that a constant strain toward one side, even of much less than five hundred pounds, will cause the oil to flow away from this side and toward the other, so that the journal will run concentrically with the box. In a properly adjusted and lubricated box this movement of the journal from the centre, i.e., the difference between the mechanical centre of the head and its running centre, is very slight; but let us note how slight a movement of this kind is required in order to make a difference in results.

Referring to the accompanying sketch, the shaded portion represents a section of a board, being planed. The cut of the knife extending farthest from the running centre is shown by the heavy lines, A, A, A; while that of the other is shown by the dotted lines, B, B, B. The feed per revolution, greatly exaggerated for the sake of clearness, is the distance between the points A, A.

Even in this exaggerated diagram the difference in the radii of the curves described by the cutting edges is very slight; yet it will be seen that the shorter one does not reach the finished surface at all, though it removes nearly its half of the surplus material.

In practice, where the feed rarely exceeds an eighth of an inch per revolution, the displacement due to the flow of a very thin oil film would cause the heavier knife to do all the work which shows on the finished surface. If, now, the heavier knife is set out a trifle more than the other, a still smaller displacement would be required. When the feed is an eighth of an inch per revolution of the head, there need be a difference of only about one one-hundredth of an inch in the radii of the circles described by the cutting edges in order that the cut of one of them may not show on the job. We are all prone, especially while young, to assume that we can make exact measurements and adjustments; but we learn, with years, that it is easy to err a hundredth part of an inch. An absolutely perfect running balance is practically impossible; and, with ordinary lubricants, it is very doubtful if the oil film is ever less than one one-hundredth of an inch thick. Taking all these facts into consideration, the man who can show the trace of more than one knife on a job of finished machine work has just cause for pride.

The probability that the desired result will be attained only once or twice in a lifetime doesn't make it any the less worth trying for; but it seems vain to deny some foundation

to the claim that, in ordinary practice, one knife will do as good work as two. Further basis is given to this claim by the fact that less power is required to remove all the material between A and A at one cut, with the momentum of a whole revolution to help, than would be required to remove it in two cuts with only the momentum of half a revolution behind each. Can you not remove twice as large a chip, with an axe, when you have room to give it a full swing, as when the length of your stroke is limited by one half? Very few, indeed, are the planers or moulders on the work of which any difference could be detected if one knife were set back a quarter of an inch. This is not equivalent to saying, however, that, with ordinarily careful adjustment, the knives may not be made to do approximately the same amount of work.

Probably the nearest approach to an absolutely equal cut by two knives is attained in the use of solid knives on a shaper. In such case the knives are set and balanced with as high a degree of accuracy as is humanly attainable; while the head is steadied, relatively to the work, by the bearing of the guide collar. In these conditions lies most of the reason for the high quality of work usually done by these machines.

It is probable that, even though two knives may not be set with sufficient accuracy to leave evidence of their work, the lighter cut involves less tearing up of the fibre, and so, in many cases, gives better results. Other than this, it is the belief of the writer that as good work may be done, while twice as much wear may be had from the knives, by setting one well back till the other is dull; then setting the sharp one ahead and the dull one back.

SAFEGUARDING MACHINERY.

In Great Britain, and probably still more in Germany, the care of the workman is apt to be more rigid on the part of the Government than it is in perhaps any other countries. In the opinion of many people who have watched the statistics of accidents, the effect of this care has been largely nullified in Great Britain by the countervailing influence of the Employers' Liability Act, which provides compensation for a workman, irrespective of whether the accident was due to his own wilful disobedience of safety rules or not. It may seem curious that personal injuries should increase as a result of certain compensation. It can scarcely be believed that any man would wilfully injure himself, and one can only attribute such increase of injuries to the unconscious effects of the acts for compensation.

But it is certain that workmen do take extraordinary risks without being called on to do so. Often one may hear an employer blamed because some poor fellow has gone home crippled, in order to put gold into his employer's pocket, but, careless as some employers may be, it is true that the workers are more often to blame than their employer. Men will dip under a suspended weight to save an extra yard in going round it. They will risk their own lives and their employer's solvency for the sake of a trivial economy of time.

The writer was once forced to lower a weight with tackle not safe for half the load put upon it. All hands were called clear, and the extreme danger pointed out, and yet men would pass beneath the load in this dangerous condition, and it was useless to attempt to stop them. If every one were to detail his experiences of carelessness, it would seem that some men cannot be trusted to care for their own lives or for those of others. They do not mean to be hurt; they simply think it will be all right this time, and probably say to themselves "for the last time," resolving not to do it again, and they do this once too often.

Among the inspectors of the Home Office, which is the department of the English Government that cares for these things, nothing is left to chance. Often more is enforced than ought to be, for one is sometimes compelled to place fences so that they add to the danger, as when placed too near to a small gas-engine flywheel, so that it is difficult to start the engine by the usual method for small engines, namely, by turning of the flywheel. Probably, in time, no gas-engine will be allowed to be started except by an accumulated air pressure. Wheels are guarded very completely. A pair guarded only on their top or in-running sides were ordered to be fully cased in because "some time it might happen" that in some extraordinary way they would turn the other way round.

Machinery fencing is of two sorts. There is the guard over the pair of wheels or other detail, and there is the general guard or fence or cage which contains the whole machine and prevents all access to it except by key. Some things cannot be guarded, such as the cutters of certain woodworking machinery, and these are perhaps the worst things for accident producing, for they are almost invisible when most dangerous. A circular saw might often be better caged than guarded, but a saw may be very considerably protected by a distance guard, when it is impossible to guard by a close cover. The Home Office takes account also of child labor, of overtime for women and young persons generally, of heating, lighting, ventilation and sanitation, and especially of the precautions to be adopted when persons are employed, as in the glazing of pottery. All pottery people are on the qui vive to find a leadless glaze. One hears of leadless glaze, but investigation generally reveals a hidden source of lead. The trouble comes in the putting on of the glaze in solution, and all the evils of lead-poisoning accrue, so that a strict watch is kept on all who are employed in respect of medical examination for detecting the first symptoms. Yet people who know they have symptoms will endeavor to hide them, and pass the doctor. Fans for removal of dust, and all manner of respirators and other safeguards, are more or less attended to by Home Office inspectors.

Every industry has its own peculiar crop of accidents, from unexpected directions and least suspected causes. It almost seems necessary for accidents to happen in order that weak points in design may be shown up, just as the true stresses in machinery and structural work only show up in actual work, though this is less the case now than formerly, when the failure of bridge details began to teach men that they could not allow the same nominal unit stresses in all details, but must take account of the manner of approach of the stress-producing agent or load.

Familiarity may lead to accident. It may also serve to prevent accident. Thus, if the people of England began to-morrow to walk upon the tracks of a railroad in the way usual in America, many thousands would be killed. In a week's time very few would be even hurt. So it is with ordinary machinery. The worker does not get hurt so often as might be thought likely, but nevertheless he does sometimes suffer from lack of guards to the more dangerous parts. The knowledge of what to guard, and how to guard it, is quite a special knowledge, demanding acquaintance with the machine and the method of its operation, and a general acquaintance with machinery and with accidents of all kinds.

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. D. Burrows has erected a new planing mill at Eden Mills, Ont.,

* * * *

The Louis A. Fisher Company, of Dryden, Ont., will erect a large sawmill there.

* * * *

Mahon, McFarlane & Mahon are putting up an up-to-date sawmill in Capilano Valley, B.C.

* * * *

Seattle and Vancouver capitalists will build a sawmill of 50,000 ft. capacity at Skeena, B.C.

* * * *

T. G. McGee, a millwright at the J. G. MacLaren Company's mill at Buckingham, Que., was accidentally killed.

* * * *

Abernethy & Lougheed's large sawmill at Port Haney, B.C., is now running full capacity with many orders ahead.

* * * *

Anderson's furniture factory, Newcastle, N.B., has been destroyed by fire. Estimated loss, $100,000, partly insured.

* * * *

The Crown Lumber Company, Vancouver, B.C., has been authorized to manufacture and deal in lumber and woodenware.

* * * *

R. & T. Ritchie, Limited, Aylmer, Que., have been incorporated with a capital of $100,000 to manufacture and deal in lumber.

* * * *

The Globe Lumber Company, Limited, Vancouver B.C., has been granted a charter to erect sawmills and manufacture woodenware.

* * * *

Forest fires have done much damage in the Lake St. John district of Quebec Province. The Kennedy sawmills near Berthier narrowly escaped.

* * * *

Peter Groskey, an employee at A. Prentice's lumber mill at Kashaboiwe near Port Arthur Ont., fell on a revolving saw and was killed.

* * * *

The Hunting Lumber Company's sawmill at Vancouver is resuming operations, extensive improvements and additions having recently been made.

* * * *

Samuel Wharton was accidentally killed while working on the chimney being built at the new saw and planing mill of the Dalhousie Lumber Co., Chatham, N.B.

* * * *

Prince Bros. are now putting in machinery, including steam engine, edging and butting saws and several planing machines at their new mill at Battleford, Sask.

* * * *

The Elmira Furniture Company, Elmira, Ont., are building a large addition to their factory. This has made it necessary for them to stop their machinery for two weeks.

* * * *

T. W. Oke, of Ashburnham, Ont., owner of the Peterborough Furniture Company, has purchased new premises on which he will erect an additional large factory. The contract for building has been let and the factory is expected to be ready for operations by October 1st.

* * * *

Woods & Spicer's shingle mill at Vancouver was damaged by fire. The dry kiln was destroyed with 1,000,000 shingles. Loss, $10,000, with only partial insurance.

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The Sackville Woodworkers' Co., Sackville, N.B., have started work on their new factory at Sackville, N.B. They will make mantels, chairs, showcases, sash and doors, etc.

* * * *

The Nimpkish Lake Logging Company, Limited, Vancouver has been authorized to take over the saw mill and wood manufacturing business of Stracey and Garland Ltd.

* * * *

The Malcolm Lumber Company, Fairview, B.C., have taken over the business of the Telford Lumber Company, and are fitting up a modern sawmill of 50,000 ft. capacity per day.

* * * *

The Trail Lumber Company, Limited, Vancouver, has been incorporated with a capital of $60,000 to operate saw and planing mills and manufacture shingles, doors and sashes, etc.

* * * *

The Kelowna Sawmill Company, Limited, capital $100,000, has been chartered to take over the business carried on under that name in Kelowna, B.C., and to manufacture wooden products.

* * * *

The Humber River Pulp & Lumber Company's timber limits and sawmills near Deer Lake, Newfoundland, have been sold to a syndicate headed by H. G. Bykhouse, of Grand Rapids, Mich.

* * * *

A heavy boiler in the Parrsboro' Lumber Company's sawmill at Canoe Lake, near Windsor, N.S., exploded last month, and E. Keith, the engineer, was instantly killed, and three other workmen badly hurt.

* * * *

Hercules Boxes Limited, Toronto, has been granted a charter to manufacture wooden and paper boxes etc. Capital, $40,000. Among the provisional directors are G. U. Stiff, 2 Leader Lane, Toronto.

* * * *

The Graham Island Lumber Company, in which two of the prominent members are C. H. Shannon, of Los Angeles, and J. C. Slean, of Pittsburg, will build a large sawmill at Massett on Graham Island, B.C.

* * * *

The chair factory belonging to the Canada Furniture Manufacturers at Wingham, Ont., has shut down, and, it is said, is not likely to resume operations again, as a large part of the machinery has been removed.

* * * *

A war in lumber prices is said to be under way in the North-West. Cuts have already been made by some of the principal coast mills owing to the termination of the arrange-

ment with the mountain lumbermen. The general price on the prairies is said to have come down 20 to 30 per cent., with further reductions anticipated.

* * * *

Miller's sawmill at Pokiok, N.B., has resumed operations after a close-down of some weeks. This is due not so much to any present improvement in the lumber industry as to the hopes held out for better conditions in the fall.

* * * *

The Monarch Lumber Company, Winnipeg, authorized capital $1,000,000, has been granted a Dominion charter to carry on business as timber merchants, sawmill proprietors and manufacture wood products. W. H. McWilliams, Winnipeg, and W. D. Douglas, Minneapolis, are members.

* * * *

C. O. Opdahl has bought the old Thomson-Emery planing mill at Fort Frances, Ont., and will erect a new woodworking factory with all the latest appliances for making doors, frames, moldings, shop fixtures, designs, and other classes of woodwork. * * * *

Owing to the stagnant state of the export lumber market Stetson & Cutler's sawmills in St. John, N.B., have closed down indefinitely until times improve. Several of the mills in that district, we are informed by a "Canadian Woodworker" correspondent, however, continue in operation.

* * * *

Among the sawmills which suffered from the terrible forest fires two or three weeks ago in Southeastern British Columbia were the Elk Lumber Company, the Fernie Lumber Company, North American Land & Lumber Company, the Wood-McNab Lumber Company, and Alex. McDougall's mill at Fernie, the Hosmer Lumber Company of Hosmer, the North Star Lumber Company of Elks, the Sparwood Lumber Company of Sparwood. * * * *

A fire originating in an oil tank in the tempering-room broke out one day last week in the factory of Shurly & Dietrich. the well-known saw manufacturers in Galt, Ont. The employees of the firm, however, headed by Mr. F. Shurly, worked with their own hose to such good advantage that when the fire engines arrived, which they did in quick time, the fire had been practically extinguished without much damage having been done.

MECHANICS OF THE FAN BLOWER.

By S. Walter.

Few among the common mechanical devices present more complicated problems regarding performance than does the fan blower. Simple as it is, and simple as are the physical laws which control its operation, the great variations in the conditions under which it may operate render accurate determination exceedingly difficult.

Aside from the differences between fans of various types and sizes, there is variety enough in the operating conditions of a single fan. They may be simply placed in two classes: those related to the freedom of discharge, as measured by area of outlet and by resistance, and those related to the speed of rotation and the velocity of discharge. The functions affected thereby are represented by the volume, the velocity, the pressure, and the power. Air temperature and humidity must also be taken into account for refined work. The efficiency, which is a function of the power, varies both with freedom of discharge and the speed of rotation.

This range of values and flexibility of conditions present difficulties in the way of accurate calculation that appear almost insuperable. Not but that they may be overcome if all the conditions are known, but such is usually the fact after the fan is installed, not before it has been put in operation.

Relative values are not difficult to determine, for fundamentally, with a given area of discharge, the volume and the velocity vary directly upon the speed of rotation, while the pressure produced varies as the square, and the power required as the cube of the revolutions. From these relations it is evident that a slight change in speed must result in considerable alteration in pressure, and still greater change in the power.

Were the fan rigid in its construction, and distinctly limited in its field of operation, the difficulties in the way of its application would be far greater. But fortunately it readily adjusts itself to conditions, its flexibility is brought into play, to a degree it becomes automatic in its adjustment. Let the resistance be more than can be overcome at given velocity and pressure, then the velocity slackens, while the volume, pressure and power readjust themselves to the conditions, and the fan still continues to operate.

The great mistake is made, however, when a fan is driven at a speed higher than is absolutely necessary to accomplish the desired result, whatever it may be. Then the power leaps up; it is practically doubled when the fan speed and the delivery is increased only 25 per cent. In other words, the power per unit of volume is increased about $2 \div 1.25 = 1.6$ times. Certainly this is an expensive method of increasing capacity. Far better as a rule is it to substitute a new and larger fan even at higher cost. Almost without fail it will show a handsome profit on the investment as evidenced in the saving of power.

THE MANTEL BUSINESS.

An interesting branch of the veneer using trade, says "Veneers," is the manufacturing of modern mantels, where quartered oak enters quite extensively,also plain oak, mahogany, birch, and occasionally some of the lighter woods. The general tendency of modern mantel-making is toward massiveness; therefore the heavier woods, especially oak, are quite a factor. Practically all modern mantels use a fair amount of veneer. A few years back there was more carving and moulding, and solid wood was used more extensively, but now the demand for heavy columns and massive effects generally calls for the use of quite a lot of veneer. It is a peculiar fact, too, that with the passing of the old-time fireplace and the general tendency to give way to the modern idea of economy in heating houses, the mantel idea is still retained. The mantel is one of the earmarks of home that it seems impossible to dispense with, and even though a modern house may be heated in the main with steam or hot air, mantels and fireplaces are still quite a feature. It looks like it always will be, too, because a lot of ancestral sentiment clings to it that brings the mantel idea back with renewed force every time it thinks of disappearing. There are new mantel manufacturing concerns going up all the time, and apparently they all find plenty to do, even though they have their dull season like other industries. Taking the mantel trade as a whole, it furnishes quite a market for quartered oak veneer, and also uses a fair amount of mahogany, birch and other woods.

Situations Vacant

Wanted—Firstclass carpenters; must have tools; wages twenty to twenty-five cents per hour;. Apply John S. Metcalfe Co., Midland, Ont.

Bandsmen wanted, who are cabinetmakers, finishers and machine men; state experience and salary expected to A. Winn, secretary, Southampton, Ont.

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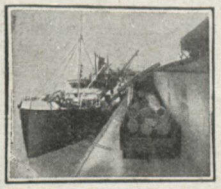
Advertisements under this head 10 cents per count line for single issue, contract rates on application Black face headings and names in caps count 2 lines each. Advertisements for "Help Wanted" or "Positions Wanted" given two free insertions for any subscriber to the paper and replies may be addressed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

The Talge Mahogany Co.



Tabasco Mahogany

Indianapolis, Indiana, U.S.A.

For Sale—Lumber and Veneers

225,000 ft. Bird's Eye Veneers.
430,000 ft, Mahogany Veneers.
73,000 ft. Mahogany Crotch Veneers
24,000 ft. Cedar Crotch Veneers
60,000 ft, Long Figd. Walnut Veneers.
38,000 ft. Figd. Walnut Butt Veneers.
87,000 ft. Curly Birch Veneers.
312,000 ft Qtd. Sawn Oak Veneers.
71,000 ft. Qtd. Sliced Oak Veneers.
93,000 ft. Circassian Walnut Veneers.
138,000 ft. Cuban Mahogany 1 in. to 4 in.
286,000 ft. Afr. & Mex. Mahog. 1 in. to 4 in.
23,000 ft. Circassian Walnut 1 in. to 3 in.

RICE VENEER & LUMBER CO.
Grand Rapids, Mich.

MAPLE LEAF
STITCHED COTTON DUCK
BELTING
DOMINION BELTING CO. LTD.
HAMILTON CANADA

WANTED

One all round machine and bench hand for planing mill. Apply
GEO S. EDDY & CO.,
Bathurst, N.B.

WANTED

One first class filer on gang saws apply
THE SNOWBALL LUMBER CO.,
Chatham, N.B.

WANTED

By end of August one band sawyer and one band saw filer, stating experience and wages expected. Apply
The DALHOUSIE LUMBER CO., Ltd.,
Dalhousie, N.B.

POSITION WANTED

A First Class Spindle Carver wants position at once. Has had six years experience and is capable of doing any kind of work on the spindle Machine.
ORSON GASHMEIER,
Box 5. Bridgeport, Ont.

POSITION WANTED

First class mill foreman wants position. Competent in all classes of work in the woodworking line. First class on new work and detail work, and thoroughly understands the handling of help. Box 252 Canadian Woodworker, Toronto.

Positions Vacant

Carriage Woodworkers wanted. The Baynes Carriage Co., Ltd., Hamilton, Ont.

That "No Admittance" sign is a back number and ought to be abolished. In refusing admittance to those who might want to come in you shut off the chance for information that might come in handy some time or other.

* * * *

Why do so many manufacturers put such small pulleys on their exhaust fans? They are continually giving trouble in many ways, such as hot bearings caused by tight belts, which are necessary in order to keep the fan up to the required speed in order to retain the air velocity. Also, with a small pulley, the belt has to be tight to keep from slipping. Soon as it becomes a little slack it commences to slip, then lost power takes a hand and the belt is soon burned.

* * * *

Don't hesitate to ask an expert in your line why he does things a certain way. There may be some little point about it which you have not caught on to yet, and, while you may think yourself one of the way-high-ups, there may yet be something left for you to learn. We are never too old to learn. There are lots of new things under the sun, especially in woodworking machinery. Never be afraid to ask questions for fear some man may think you don't know quite as much as he.

* * * *

—What makes a hand saw cut straight lumber? It is the uniform tension and the perfect fitting of the teeth. When a saw snakes or runs in or out of the log it is often due to the fact that it has not been perfectly tensioned, or the teeth not properly swaged and dressed. A band saw improperly tensioned, or teeth improperly fitted, will run in or out every time, therefore too much care cannot be taken when tensioning or when fitting the teeth. A poorly-tensioned saw will not strain up evenly on the wheels, and, if run very long that way will probably break.

ADVERTISERS' INDEX

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