

THE ADHESION OF A BELT.

Air and atmospheric pressure must have quite an influence on the driving capacity of a belt if a pulley must be turned perfectly true and left smooth for no other purpose than to allow the pressure of the atmosphere to hold the belt on the face of the wheel with all the crushing force of vacuum, but this idea doesn't seem to agree with the practice of cutting holes, or stripping up the belt to make air spacing to ventilate the belt and let out the cushion of air that is drawn under the belt while in motion. This cushion of air is observed when a surface plate is placed on another; the air between them holds them apart and they move on each other with ease. The clinging of a belt is observed when a piece of leather is moistened and pressed on a flat surface, and if a string is attached in the centre the pressure of the atmosphere is made apparent, but it is doubtful if any such manifestations of aerial lubrication, or vacuum adhesion are to be seen with a driving belt. The surface plates that have such a treacherous movement while there is a thin layer of air between them, assume a different attitude when one of the plates is slid on to the other while in contact. The air is driven off from each plate by the other. The belt when at work meets the pulley, not by coming in contact with the whole arc of the wheel at once, but by rolling over its surface from one end to the other, driving out the air before it. The disk of leather that will rise so many pounds with ease when attachment is made in its centre, is drawn off with the slightest force when the pull is taken from its edges. On these two principles a belt can be made to cling with all the weight of the atmosphere, or held apart with an air cushion that the greatest tension will not expel, but these two elements cannot work together. If an inclosure is about to explode there is not much danger of a collapse. The air that is drawn under a belt is no doubt seeking for a means of escape so long as the layer is compressed, but when extended the reverse takes place and the influence of the atmospheric pressure becomes known. To follow these elements through one turn of the belt it will be easily seen that along the driving stretch both sides of the belt are affected alike by the air and meets with the same resistance from the atmosphere, but when it comes in contact with the driving wheel, the layer of air on the inside of the belt, which is moving nearly as fast as the wheel, is no doubt making every attempt to pass between the belt and pulley, but has only its inertia and surface friction for assistance with the tension of the belt to work against. The belt in passing from the tight to the slack side is relieved of a portion of its tension and is not inclined to lie as closely to the face of the wheel as it did at the beginning of the arc of contact, which must now feel the effects of the atmosphere, as there is a tendency for the air to find its way beneath the belt to fill the space that had become partially rarefied. A smooth-faced wheel has all advantages of coming in contact with the belt without entrapping a layer of air in every imperfection on the surface, and if there are any benefits to be derived from the atmosphere by resting with its whole weight on the outer surface of the belt it has the liberty to do so, but from experiments with belting under pressure, and in a vacuum, it is evident that not the difference that is shown by the surface plates or seen with the disk of leather, is manifested in the adhesion of a belt.—*Boston Journal of Commerce.*

THE MANUFACTURING SITUATION

The general manufacturing situation is what might naturally be expected toward the close of the year, although in many respects it is an improvement on the condition of things a year ago. Most manufacturers, in view of the fact that prices of their goods were close down to the cost of production, have pursued a very cautious and conservative policy during the last twelve months, not only in studying the economies of their business, but also in avoiding any large and unwieldy accumulations. Hence their stocks are now in better shape than for many years past, and they are not under the necessity of forcing immediate sales, or of resorting to the loan market, in order to bridge

over to the new year. Of course there is a little tendency to an accumulation in some lines of fabrics, as is always the case at this season; but it is so slight, and the demand from the trade for the spring business is so near at hand that it has no weakening effect upon the views of holders.

Many millowners are taking advantage of this dull, between-seasons period, in the way of putting in new machinery and making needed repairs, so as to be fully prepared for the next season's work. Not a few of them are introducing long-delayed improvements which were sadly needed in their business, and the effect of which must be to cheapen and facilitate processes as well as to widen their margin of profit. They have strong confidence in the future of values, from the fact that supply and demand have at length been brought to an equilibrium and that consumers are generally in better condition than for many years past. The large cotton, corn and hog crops give them assurance that our agricultural population will be able to take and pay for more than an average supply of manufactured goods.

They are also encouraged by the fact that but few goods will be carried over by the distributors, and that buyers will be early in the market to supply their immediate wants. Moreover, they see signs of returning confidence and increased business activity in the steady improvement of the stock market and the increased earnings of our railroad corporations, which are usually regarded as unfailing indications of a corresponding improvement in all branches of trade and industry.

Hence manufacturers are naturally looking for a good spring trade, as well as a gradual advance in prices of their products to a fairly remunerative point. Yet they do not propose to abandon their cautious policy, or to pile up goods in anticipation of the demand for them. Just now they are in the attitude of watching and waiting, watching the signs of the times as a basis for future business calculations, and waiting for orders for goods from early buyers, some of whom, from remote points of distribution, have already made their appearance, and bring favorable reports of the trade prospects in their respective localities. On the whole the business outlook for our skilled industries, if not entirely satisfactory, points in the right direction, and shows that matters on the mending hand.—*Manufacturers' Gazette.*

THICK AND THIN SAWS—SOLID V. INSERTED TEETH.

"F. McG" contributes the following remarks to an American contemporary:—

I have had experience with saws for the past ten years, saws thick and thin, with both solid and inserted teeth, and have learned that the first and most important point to attend to is to have the saw adapted to the mill. In fact the mill has as much to do with making the saw work successfully as the saw has with making the mill a good one.

With a large, solid mill, with ample and steady power, a thin saw can be run with excellent results. The teeth should be regulated by the amount of feed to be used to the revolution, with more teeth than would be necessary for a thicker one; but for a light mill, in which the power is apt to be unsteady, with slow feed, the saw should be thicker, with less teeth and hammered stiffer, and in every case the maker should know just what kind of a mill he is making the saw for, whether heavy or light power is required, and what the speed of mandrel and the feed is to be. Then if the mill is in proper shape, and the maker understands his business, the saw will give satisfaction.

The mill is often to blame. A poor mill will spoil a good saw very quickly, and then the blame is too frequently laid to the saw.

My experience is that each tooth should cut away one-sixteenth of an inch of timber to work easily. I believe that a tooth will cut one-sixteenth just as easily as, if not easier than, it would cut half of it.

With regard to solid and inserted tooth saws, the latter surely have the advantage. Still I am a friend to a solid tooth when it is in good order, but it is hard to keep the teeth regular and in proper shape and, as it is worn away,

the strain of the saw is being changed, which makes it necessary to have it hammered quite often. If an accident happens to a saw, if it has solid teeth, the operator has to go to work and modify the whole saw as well as the teeth that have been damaged, but if it has inserted teeth he probably puts in new teeth, increasing the size of his saw rather than making it less.

I have had experience in sawing iron. I ran a lumberman's clipper into a road spike full speed with 3 in. feed. It took every tooth out or off and the plate came in contact next; it bent nearly all the shoulders behind the teeth, and I don't know what would have happened if I had not reversed the carriage. I thought my saw was ruined, but I hammered it up as well as I knew how and on starting it it worked as well as, if not better, than ever. I have got in several other scrapes almost as bad with the same saw, and yet it is just as good and big now as ever. If it had been a solid-toothed saw it would have been worn and torn all to pieces. The inserted tooth, without doubt, runs easiest, as the tooth can be made sharper or more pointed, so as to cut into the wood like a chisel instead of scraping or scratching their way.

ROTATION SPEED OF MACHINERY.

The method of arranging this so that it will not produce vibrations has been explained to some extent in an article recently published in an American paper. As a vibration has a tendency to communicate itself to the objects to which the machines are attached or to the buildings in which they are placed, the importance of understanding this subject will be apparent. Whenever such vibrations are communicated there is a loss of power, and the quality of the work done is liable to be reduced. A few common cases of the methods of preventing injury from vibration to other structures besides the mill in which the machines are placed will make this the better understood. Railway trains are required to stop before going under the bridges built across large streams. By this means the vibrating motion that is often apparent in a train moving at full speed, is allowed to cease, otherwise it would be communicated to the bridge, and, increasing as the train proceeds onward, commence a process that must eventually terminate in its destruction.

It is for the same purpose that teams are not allowed to travel faster than a walk, and that soldiers marching in a body must break their ranks when crossing long bridges. Whenever two or more steam-engines, or any number of machines that have their power applied, in part at least, by means of a reciprocating motion, are located in the same building, their tendency to communicate vibrating motions to it may be counteracted by giving them rotation speeds that vary so that they cannot keep step. The principle by which this could be accomplished was fairly presented in the article referred to, but the mechanical calculation or the purpose of applying it practically in arranging their speed under different conditions was hardly made plain. Take, for illustration, the first example: "Thus 96 and 100 would not do, for each is equally divisible 4, and two would come together on a stroke every 96x100 divided by 4 = 2,400 turns." This is one of the processes for obtaining the least common multiple of the two numbers that represent their rotation speeds. But one travels faster than the other, and it cannot give the correct answer. Where two or more engines or machines are in use, and running at different speeds, the number of turns each will make from the time they start together on a stroke till they come together again may be ascertained by dividing the rotation speed of each by their greatest common divisor. In this way the 96 divided by 4 and the 100 by 4 gives 24 and 25 turns respectively. Where the engines or machines have rotation speeds which are "prime" to each other, that is neither of which are evenly divisible by any part of the other, they will when started on a stroke come together as often as each completes the number of strokes that represents its rotation speed, or with that at 99 and 100 they will come together when each has completed 99 and 100 turns respectively.

In arranging for the number of cogs in the cast gearing so commonly used for transmitting power, a factor should be taken into the account that bears some relation to the principle of running machines at different rotation speeds for the purpose of preventing the vibration that might result from allowing them to keep step.

That is the desirability of making their numbers "prime" to each other, whenever that is practicable, for the purpose of securing greater uniformity in the wearing away of the faces of the cogs, and of transmitting a steadier motion to the machinery driven. The relative speeds of wheels geared together are in proportion to the diameters to their pitch circles, and the calculations in regard to them are made from the number of their cogs. The common multiple of these, or the least common multiple, if they are not "prime," gives the number in each that will pass a given point between the time that two certain cogs starting together will come together again, and not the number of turns. That is ascertained for each wheel by dividing this result by the number of cogs. In the case given where one wheel has 288 and the other 256 cogs; the 288x256 divided by 32 = 2,304, the least common multiple. Dividing this by the number of cogs in each gives eight and nine turns respectively. Where these numbers are used, each cog in the large wheel engages with eight in the small one, and each cog in the small one with nine in the large wheel, and these eight and nine cogs come together in some way at every turn, and never engage with any of the other cogs in either wheel. Where their numbers are "prime," like 99 and 100, 99 and 75, or 287 and 288, each cog in one wheel will engage with every cog in the other before it will come around to the one from which it started, and the number of turns made by each wheel in doing it will be equal to the least number of cogs in the other. By applying the same principle the number of turns each of three wheels geared together will make from the time they start together till they come to time together again may be ascertained. Take, for example, three wheels having 99, 100 and 101 cogs. Multiplying these numbers together, and dividing their product by the number in each wheel, gives 10,100, 9,999, and 9,900 for the number of turns each will make.

Unless we can make our technical education capable of practical application, we might as well continue to do our work by the old rule of "thumb."—*Timber Trades Journal.*

Lloyd's.

Application is intended to be made by the corporation of Lloyd's in the ensuing session of Parliament for an Act to extend and enlarge their powers as regards the "collection, publication, and diffusion of intelligence," and to provide that the publication and diffusion of any such intelligence shall be deemed to be a privileged communication from them. By other clauses power will be sought for to authorize them to establish signal stations and to erect signal houses, with all requisite telegraph and telephone wires, appurtenances, &c., "at such places on the coast of Great Britain and Ireland and the islands appertaining or belonging thereto as they shall think fit, and to maintain and work the same," such powers, however, together with the taking of lands or houses for the purpose, to be exercised only with the approval of the Board of Trade.

How to Test Leather Belting.

We believe a considerable quantity of so-called "cheap" German belting is sent into this country and sold under various names. As regards testing leather belting the best test, of course, is that of wear, but to find out if it has been properly tanned the following method is recommended by M. Eitner.—Cut a small piece of leather out of the belt and put it in vinegar. If the leather has been perfectly tanned, and is therefore of good quality, it will remain moist without any other change than becoming a little darker colour. If, on the contrary, it is not well impregnated with tannin, the fibre will promptly swell, and after a short time become converted into a gelatinous mass. *Timber Trades Journal.*