THE OUTTHROW OF A PULLEY.

It does not seem possible that any two machanics should disagree on the outthrow of a pulley when being driven with a high speed. Every wheel that is out of balance has a heavy side, and one that is light, which are directly opposite to each other, and it is towards one or the other of these sides that the outthrow is claimed to be found by those who have made experimental study of this matter It would seem that in an unbalanced wheel that the centre of gravity would be off from the central line of the shaft, and bring the effects of the whole pulley like a stone in a sling, with a tendency to spring the shaft toward the heavy side and increase the distance between the centro of gravity and the line about which the wheel is turning. This very feature is noticed in lathe work, and a shaft that throws out hadly by its bulleys is not remedied by increasing its speed. But take the contrifugal switcher and notice how readily it will adjust itself with an unbalanced load. This hydro-extractor stands in a vertical position and can rock about in an elastic bearing at the foot, and if the sling stone principle could have its hold for an instant the whole machine would be thrown off its centre toward the heavy side.

There is another matter that must be taken into account in balancing the moving parts of any machine while driven with great velocity, and the advocates of high speed must give these forcus time to act, or the effects of any cause may likely be found acting in a different direc tion than the cause that produced it. Take the force of gravity, for instance, and notice its effect on any single atem in a revolving wheel. If the plane of rotation is level, this downward tendency that gives weight to a substance acts directly to one side or at right angles to the direction of motion, and neither assists at one instant in drawing the particle forward nor holding it backward at another. If the axis of the wheel is inclined from its vertical position, this particle not only rises and falls with the force of gravity but trave. in an elliptical path with reference to the former surface. Now if gravity required the least matant of time to act, this revolving atom would no longer balance the one directly opposite, and as far from the centre on the other side. Unless revolving in a level plane every particle of material, when they arrive on the descending side of an inclined wheal, would not have the downward effect on the pulley as they will on the similar portions of the ascending side, and the effects will be similar to those seen in the gyroscope, to bring the axes not toward the heavy nor to the light side, but around a vertical axis, leading the centre of gravity in a spiral shaped path till the wheel is steedy and level with the axis in upright position. If the contribugal force, or the out. throw of a pulley, should have a similar tardiness in its action, the speed of rotation could be such that the effects of the outthrow would be brought in a direction to bring the wheel into its central position instead of throwing it off its centre of rotation.

In balancing pulleys on the ball-and-socket joint, the tardiness of action is easily observed. A force applied to true the wheel has the effect of one that is taking place in some othe part of the pulley, and if the combined efforts the centrifugal force of every particle, or the outthrow of the whole wheel were to manifest themselves as the forces appeared on the hall joint, the mechanics would have reason to disagree, and it would be doubtful if the outthrow would be exactly to the heavy side or to the light .- Boston Journal of Commerce.

HEAVY AND LIGHT TOOLS.

There is a general demand at the present time from manufacturers and machinists, for strong, powerful tools, capable of taking as large cuts as the work will stand, and geared to the highest speeds that are practicable. Tool makers in all parts of the country are overhauling their patterns, increasing the weight of bedplates and frames, and adding to the stiffness in all directions, while at the same time feedmotions and driving gear are redesigned and made more powerful. In doing this, they are but complying with the strict requirement of is expended, before any force is actually others, that some would not at the heart while induced, radically cured. Address, World's the trade. Where such tools can be kept up to appned to the work intended to be performed, the outside was sound; that in deadening Dispensary Medical Association, Buffalo, N. Y.

their full capacity, doing the work for which which a tool of this class can but rarely be used to the full extent of its capacity. For many classes of work, however, such a tool is manifestly too clumsy and altogether unsuitable, us, for example, when an 18-inch lathe is needed for turning up a lot of light rings, or there is a large quantity of light work to be done. Light lathes for these purposes fill the bill both from the commercial and mechanical standpoint, Having strict regard for the character of the work to be done, the best tool makers have reached the conclusion that the should be about three different patterns for each size of tool. Of these, the first and most important is the machine which is capable of doing all that can be required of it, able, in fact, to do all that the work will stand. The second or intermediate tool should be one adapted to a variety of work and to be useful in a wide range. Lastly comes the light tool having the same capacity as the others, so far as size is concerned, but intended to do a class of work that could not be conveniently handled on either of the other styles of machine.

Buyers are now very frequently carried away rith the fashion, and because it is the correct thing to take the heavy cuts with fast feeds, they select with a view to the number of pounds of iron which they get, and the strength and stiffness of the tool, rather than with reference to the character of the work they are doing and how it can be produced in the most economical manner. Practically, the price paid for the tool which will do the work in the best and cheapest manner is of no consequence. The difference between the lowest-priced machine tool to be found in the country and the best one which money can buy for a given purpose is so smill, compared with the difference in the the amount and quality of the product, as to make the first cost an entirely secondary consideration. - National Car Builder.

THE WHEEL WORK OF MILLS.

Mistaken attempts at economy have often prompted the use of wheels of too small diameter. This is an evil which ought carefully to be avoided. Knowing the pressure on the teeth, we cannot with propriety reduce the diameter of the wheel below a certain measure.

Suppose, for instance, a water wheel of 20horse-power, moving at the pitch line with a velocity of 31 feet per second. It is known that a pinion of 4 feet diameter might work into it with impropriety; but we also know that it would be exceedingly improper to substitute a pinion of only one foot diameter. although the pressure and velocity at the pitch lines, in both cases, would be, in a certain sense, the same. In the case of the small pinion, however, a much greater stress would be throw on the journeys (or journals) of the shaft. Not, indeed, on account of tortion or twist, but on account of transverse strain, arising as well from greater direct pressure as from the tendency which the oblique action of the teeth, particularly when somewhat worn, would have to produce great friction, and to force the pinion from the wheel, and make it bear harder on the journals. The small pinion is also evidently liable to wear much faster, on account of the more frequent recurrence of the friction of each particular tooth.

That these observations are not without foundation, is known to millwrights of experience. They have found a great saving of power by altering corn mills, for example, from the old plan of using only one wheel and pinion to the method of bringing up the motion by means of more wheels and pinions of larger diameter and finer pitches.

The increase of power has often, by these means, been nearly doubled, while the tear and wear have been much lessened, although it is evident the machinery thus altered was more complex.

The duo consideration of the proper commun ication of the original power is of great importance for the construction of mills on the best principles. It may easily be seen that in many cases a very great portion of the original power

Notwithstanding the modern improvements they were intended, they are undoubtedly the in this department, there is still much to be most economical, but there are many shops in done. In the usual modes of constructing mills, due attention is seldom given to scientific principles. It is certain, however, that were these principles better attended to, much power that is unnecessarily expended would be saved. In general, this might be in a great measure obtained by bringing on the desired motions in a gradual Lanner, beginning with the first very slow, and gradually bringing up the desired motions by wheels and pinions of larger diameters. This is a subject which should be well considered before we can determine in any particular case that ought to be the pitch of the wheels. In the case above alluded to, where the supposition is a pinion of 4 feet diameter, or of 1 foot diameter, it is obvious that the same pitch for both would be prudent; that for the small pinion ought to be much less than that which might be allowed in the case of the larger pinion. It is also equally obvious that the breadth of the teeth, in the case of the small finion, ought to be much greater than that in the case of the larger pinion.

It is evident, however, that although great advantage may often be derived from a fine pitch, there is a limit in this respect, as also with regard to the breadth.—Buchanan on Mill Work.

WOOD POLISHING WITH CHARCOAL

A Laris technical journal thus describes a method of polishing wood with charcoal the world now knows of those articles of furni ture of a dead black color, with sharp clear cut edges and a smooth surface, the wood of which has the density of ebony. Bringing them side by side with furniture rendered black by paint and varnish, the difference is so sensible that the considerable margin of price separating the two kinds explains itself. The operations are much longer and much more minute in this system of charcoal polishing, which respects every detail of the carving, while paint and varnish would clog up the holes and widen the ridges. In the first process they employ only carefully selected woods of a close and compact grain; they cover them with a coal of camphor dissolved in water, and almost immediately afterwards with another cost composed chiefly of sulphate of iron and nut gall. The two compositions in blending penetrate the wood and give it an indelible tinge, and at the same time render it impervious to the attacks of insects. When these two coats are sufficiently dry, rub the surface of the wood at first with a very hard brush of couch grass, and then with a substance as light as possible; because, if a single hard grain remained in the charcoal, this alone would scratch the surface, which on the contrary they wish to render perfectly smooth. The flat parts are rubbed with natural stick charcoal, the indented portions and crevices with powdered charcoal alternately with the The workman also rubs his piece of furniture with a piece of flannel soaked in linseed oil and the essence of turpentine. This process repeated several times causes the charcoal, powder, and oil to penetrate into the wood, giving the article of furniture a beautiful color and perfect polish, and which has none of the flaws of ordinary varnish."

WHEN TO OUT TIMBER.

The fact is becoming fully recognized, says the Lumberman's Gazette, that the durability of timber depends very materially on the time of year in which it is cut, and there is no little diversity of opinion in relation thereto. arises, probably from the fact that very few men engaged in getting out timber are enabled to follow it to the point of consumption, and thereby draw rational and practical conclusions regarding it. A gentleman named John H. Moore, at Arkansas Post, who has been long engaged in the business has made it in subject of study, and gives his conclusions to the Cincinati Artizan in quite a lengthy letter, wherein he states his experiments and conclusions as follows:

"I have been getting out timber for forty years, and long ago noticed that of the same kind of wood some lasted much longer than timber on land to be cleared some would rot all the san off while the heart remained sound while other trees would rot in the heart and fall while the san was sound.

In looking for the cause of this, I concluded these effects were produced by the presence of sap. I find that after the fall of the leaf, the sap goes into the body of the tree, and that the only time when there is no sap in the body of the tree is after the leaf is fully grown and the sap is making new wood. I once supposed that this state of things continued until the leaf is ready to fall, but from an examination of oak wood, cut last September for steam purposes, I am induced to believe that it lasts but a few months-with us, probably from the 1st of June to the 15th of August, possibly until the 1st of September.

I have here some examples which I will give to your readers: In August, 1858, I cut some fence posts from post oak saplings about six inches in diameter. Some of these posts are still sound. Rails made from the same kind of timber cut in winter will not last over five years. In 1860, in August, I got some logs for a house; these logs are still sound, although they remained in the woods, after being cut, until 1868. In the winter of the same year (1860) I got out square timber of the same kind of eak to build a gin. They were not used, but were piled up, with slats between each layer, until, in 1866, they were found to be all rotten in the heart while the outside was sound. I am now using a piece of post oak as a bed for my engine, that was cut in the winter of 1868; it has been under cover, but the heart is rotten, while the outside is sound.

This proves to me that the cause of rot is not by exposure to the weather, but on account of the presence of sap. This is the conclusion that I have come to; timber lasts best when cut after the full leaf has grown, and before the san returns to the body of the tree."

FOREST FIRES.

The year before last was especially noteworthy or the sudden growth of public opinion favorfble to the preservation of our forests. convention in blontreal was participated in so heartily by men of science, by statesmen, by farmers and by merchants, that there seemed good ground for the belief that the day of apathy had gone by and that a new area of conservative wisdom had been inaugurated in which our diminished forest wealth would be secured the protection and fostering care which had been denied it in the past. And, undoubtedly, the interest in the subject of which the Montreal gathering was so encouraging an indication did not prove evanescent. All over this continent, in the United States, North and South, and in every province of the Dominion -there has been an earnest desire to omit no measure or effort which would directly or indirectly contribute to the great end in viewthe preservation and renovation, as far as possible, of our own bountiful timber supplies. During the last two years some admirabl. manuels for the instruction and guidance of the public have been issued by governments and individuals. The people can no longer, therefore, be said to perish for lack of knowledge Still more practical steps have been taken in the enactment and enforcement of certain regulations tending to secure the forests of the country from fire and other forms of waste.-Montreal Gazette.

Chimney Stack Tops.

The tops of chimney-stacks need careful arrangement because the exit of smoke from them is very liable to be disturbed and hindered by gusts of wind; particularly when beneath other high objects in the neighborhood. There should be at the top of every flue an expanded space, within which most down draughts of air will rotate, and, expend their force, without invading the flue below; and there should be louvred openings, so arranged as to direct the wind upward, and make it assist, instead of interfering with, or retard the exit of smoke. - The Architect.