CAUSES OF BOILER EXPLOSIONS.

Water, having the property, to a slight degree, of compression by mechanical means necessarily has the property of elasticity; hence, heavy bodies brought in sudden contact with water, or vice versa, the heavier will rebound. This is one of the fundamental principles involved in steam boilers, and which is worthy of lengthy discussion. Supposing the water to be pure *e. g.*, accurately proportioned as to the hydrogen, nitrogen, etc., in its combination, it requires a certain amount of heat to disturb its molecular make up, rendering them gaseous or volatile, the result being steam, but without perceptible color, until brought in contact with the atmosphere (if we examine boiling water in a glass retort or flask, no vapors can be seen); the water, however, like a majority of other bodies, expands by heat before this volatizing ensues; hence, when placed in the boiler it occupies much greater space when hot than before, inasmuch as the iron, or any metal, will not expand in like proportion. In addition to this, water pressing equally upon itself from all points, the boiler has to submit to the weight of the water before ebullition, with the combined pressure of the generating gases or vapor from above — the water being homogeneous throughout and possessing compressibility to such a slight degree, carries this combined pressure of the water with its accumulating weight or pressure of vapor from above—makes the pressure at the base of the boiler much greater than at the top, until boiling begins, when these forces are changed instantaneously, and the bubbles of air or gas, in their ascent carry with them increased force, besides which the water being in violent agitation makes the pressure vacillate from one point to another. hence, if any portion of the iron is weak, this unequal pressure is sure to find it, and will eventually burst.

Again, as the water boils and the pressure is constantly changing from one point to another, it is natural to suppose that when it is forced out of true in one place there must be a corresponding depression in another; hence the process of crystalization begins with the use of a boiler, and some morning the country is startled with the report of a violent explosion from causes unknown.

The liability of boilers to explode increases with unequal firing, together with the sudden turning the steam on or off, as the transition of pressure from one point to another is so instantaneous the iron eventually succumbs, and a rupture is the result; these explosions, however, are not so violent and the results as disastrous as when the explosion is the result of other causes, such as alkaline reactions of the water causing a calcareous deposit in certain portions of the boiler, and an acid reaction which causes another corrosive deposit above, the results of each of which are eventually the same.—*Midland Industrial Gazette.*

TIMBER SUPPIES OF GREAT BRITAIN.

In a paper on "The present and prospective sources of the timber supplies of Great Britain," read recently by Mr. P. L. Simmonds at a meeting of the Society of Arts, presided over by Sir Charles Tupper, the supply of foreign wood was broadly divided into four classes. These are:—"1. Ordinary soft woods of construction, consisting chiefly of pine and fir, obtained from North America and the North of Europe. 2. Shipbuilding woods, principally oak and teak, with small quantities of greenheart and mora from British Guiana, and a few Australian woods. 3. Hardwoods and furniture woods, which are at present very limited in number, though they might be largely increased by a little enterprise and judgment on the part of cabinet makers and dealers. 4. Dye woods. They are less important now than formerly, owing to the extensive employment of aniline dyes and the chemical improvements constantly making." Mr. Simmonds, added. ' There are ninety-five species of forest trees in Canada, of which Ontario, the most southerly of the provinces, has sixty-five British Columbia is amply supplied with lumber, and, as its facilities for export increase it must develop a large trade. The coast line of British Columbia, both on the island and mainland, is clothed with the finest lumber. The Douglas pine, with its straight, uniform trunks, often 200 feet high, and exceedingly tough and flexible, furnishes the finest masts and spars for the largest vessels." Mr. Simmonds spoke of the attention that had been given of late to the preservation and reproduction of forests in Canada and other colonies. The immense importance of the extraneous supply of wood to Great Britain was shown by the trade reports of the last two years which gave an excess in value of £18,000,000, while other forest products brought the total up to £31,500,000. The increase during the past forty years is shown by the fact that in 1884 the whole quantity of timber imported was under 1,500,000 loads, whereas in 1883 it exceeded 6,640,000 loads. Of that quantity only a little over 1,529,000 came from India and the other colonies. Sir Charles Tupper, in thanking the lecturer, expressed his satisfaction that, however great might be the demand of the country for wood production, England could obtain all needed supplies from one or other of her own dependencies.—*Montreal Gazette.*

ACCIDENTS IN PUTTING ON BELTS.

A writer in a mechanical paper discoursing of accidents from running machinery, makes the following pertinent remark as to a preventable class of accidents· "One great fault, and one that causes numerous accidents with many workmen, is the manner in which they attempt to put on belts while pulleys are under motion. More people get caught in belting by attempting to do this than in any other way. I have seen men on a ladder trying to put on a 10-inch belt running at high speed, crowding the belt against the pulley, and burning it as well as their hands, and finally having to give it up as a failure; then they had the speed decreased and the belt put on without any trouble. I think that they never calculated how fast they would have to move the belt to get it on easily. There is nothing that agitates my nervous system more than to see some one attempt to put on a belt standing on the wrong side of the pulley. He stands no chance of getting the belt on, and a good big chance of being caught and wound up around the shaft. The right place is to stand on the opposite side of the belt, putting it on as it travels toward you. Having a good foundation to stand on, take the belt in hand and lead on to the pulley, moving the hand as fast as the pulley travels. This is the whole secret. I have seen a little fellow who understood this principle go to a large that three men were tugging at, and easily put it on the pulley at first trial."

SAWS.

The improvements made in saws form one of the most important steps in modern progress. It is now practicable to run circular end band saws with a capacity of 4,000 feet per minute. Circular saws have even been run in soft wood with a circumferential velocity of 9,000 feet (nearly two miles) per minute; but the difficulties of any higher rate than that we have indicated as the ordinary maximum are due to heating and trembling, especially if the parts are dull and unbalanced. Band saw dodge; they can be made to bear a great number of the moderate flexures required by sufficiently large wheels and can be guided very successfully at the points of entering and emerging, but no practicable amount of skill can make them saw in absolute planes through thick and knotty wood. Circular saws heat and buckle in working, unless just enough distorted when cold to allow it. Reciprocating saws cannot work with a speed satisfactory for modern progress. The teeth of the power saws may hook, and draw the wood indifinitely. Hand-saws cannot be so shaped, for unless the cut is gauged they will take hold too rank. The saws made of three layers, each side cast steel, and the inner layer tough iron, are very serviceable. For woods of a wooly fibre, such as poplar, the teeth of the saw should be of coarse space and set, to effect a clearance and overcome its clinging property. For cutting the harder and close grained woods, such as oak, beech, etc., the saw should be increased one gauge, the teeth should be more upright and space finer, and the set also should be reduced. A cross-cut saw must be sharpened with reference to the wood. whether hard or soft. If not properly set it is evident it will take more power to drive it. For sharpening cross-cut saws for hard wood the file should be at an angle of 45°, for medium wood at an angle of 35°, and for soft wood at 12½. So much for position. There is no difference in the angle of a large or small file. Difference of action in working depends on the fine or coarse cut of the file. We prefer for the purpose of sharpening a good sized file, not less than 4½ or 5 inches, if it is cut equally fine and sharp on the corners. The cutting angles and the tops and faces of the teeth should be beveled exactly alike, and the cuttings should be of even depth, the saw working freer and with less power if the teeth are allowed to get short and stumpy. In clamping a saw for sharpening the jaws of the vise should be covered with sheet lead, about ¼ inch thick. If not so covered the saw will vibrate in sharpening and most probably strip the file. In setting saws with a hammer, the best plan is to fit the saws horizontally on a stud fitted in a wooden frame, having a transverse movement. A small steel anvil with a beveled face should be placed at one end of the frame, and the saw traversed backward or forward for the teeth to overlap the anvil centre, the distance of the set required. A series of short, sharp blows should be given to the hammer in preference to a heavy one.

For setting saws, several different machines have been patented by which the teeth may be set to a uniform level, one of which is made in the form of pliers. The object of setting saws is to lessen friction. The reason of greater power being requisite for cross cutting than for ripping is that the former is not parallel to the grain. In filing, the edges are, of course, beveled opposite ways. The sharp beveled edge will be outward on the side to which the tooth is bent.

In sawing a large amount of lumber, the thickness of the saw, as effecting the wood, is a matter of consideration; the thinner the saw, too, the less is the power required to drive it. An objection, however, against thin saws worked in tension, is that from their pliability, the cuts are apt to diverge from a straight line. On the other hand with a thick saw blade, the thrust tends to bend it, while the pull on the thin saw straightens the blade. The thin blade in tension must be considered as preferable for hand and machine frame saws as well as band saws. In scroll bands, the thickness and narrowness of the band permit the saw to cut out corners, and segments of circles of extremely sharp curvatures.

A great improvement in the circular saw is the application of inserted teeth, this allowing of ready renewal in the case of any being broken, and that thorough renewals, the diameter of the saw is not permanently reduced by the process of sharpening. In the use of saws care must be taken that the teeth are on the same general level; if the opposite be the case, proper action of all the teeth cannot be secured; they will become more readily blunted, and through the longer teeth being drawn more deeply into the timber than the others, they will be apt to be broken off; power, too, will be lost in driving the saw.—*London Timber Trades Gazette.*

VIBRATION IN BUILDINGS.

An exchange, in speaking on this matter, says: "At one of the print works at North Adams, Mass., a new and unoccupied building was found to vibrate in consequence of the puffing of a small steam engine sixty feet away, At Centerdale, R. I., it has been necessary to change the height of the column of water flowing over the dam, to prevent the excessive vibration of the adjacent mill. At Amesbury, Mass., out of eleven mills that are near the river, two vibrate when water in certain quantities flows over the dam, but the tremor can be wholly stopped by changing the flow of water. The most frequent cause of vibration is due to the running of machinery, and it has repeatedly happened that a complete cessation has been obtained by increasing or lessening the speed at which the machinery is run. This is not always profitable or possible, and the fact that this vibration results in a loss of power, variously estimated from 10 to 20 per cent., is a strong argument in favor of the construction of one-story mills, which would necessarily vibrate much less than factories having a height of six or eight stories. But it is not alone the loss of power that has to be considered, for in addition there is the straining of the building and machinery, and in the manufacture of textile fabrics this unsteadiness causes a great breakage in the threads, and a consequent damage to the material."

Oiling Machinery.

An old machinist of nearly 50 years' experience stated in his shop recently that he had run a counter shaft, which he pointed out, on five drops daily of oil, the shaft being 1½ inches in diameter and having three bearings in hangers. "Yet," he said, "that shaft has never squeaked." The shaft carried pulleys which drove a drilling lathe, a polishing and wood turning lathe, a small screw cutting lathe and a grind stone. Most of the weight of the pulleys was between the two hangers, on which he lavished two drops of oil a day. He kept his shaft level and in line. The belts pulled almost equally. The boxes were babbited. The shaft made about 300 turns. The experimenter said that he had tested oils as well as quantity. He believed in clear animal oil—whale or lard. He felt assured that good oil was wasted wherever drip pans were used, and he never used them. There is a text here for establishments to sermonize over, where the shaft bearings drip oil and the floors are soaked with it.—*Industrial World.*