watertight. Iron cars having wheels of small diameter fitting the track on the bottom, the end of the cylinder being closed by strong iron doors, are provided to carry the timber or ties while under treatment. A steam boiler with a vacuum and force pumps, and reservoirs fitted with steam coils, for containing and heating the preservative substance, are also provided. The operation may be briefly described as follows:

After the cars loaded with timber for treatment are run into the cylinder, and the doors closed, steam at about 100 lbs. pressure is injected into the cylinder, and the supply continued for a length of time, depending upon the nature of the wood and its dryness. The steam is then shut off, and the vacuum pump started, and kept at work as long as any liquids or vapours are obtained. The vacuum pumps are then stopped, and the hot preserving liquid allowed to flow from the reservoir into the cylinder until it is filled. After this the force pumps are started, and their action maintained until the pressure in the interior of the cylinder rises to about 100 lbs. per square inch, the pressure being maintained at this point until a sufficient quantity of creosote oil or other preservative liquid is forced into the cells of the wood. The force pumps are then shut off, and the creosote oil or other liquid contained in the cylinder discharged into a suitable cistern, after which the doors at the ends of the cylinder are opened and the car carrying the timber or ties run out.

When wood has been creosoted in the manner described, paying proper attention to the complete removal of water and juices previous to the injection of the creosote, the density of the wood will be found to have considerably increased, and that its tenacity for holding spikes, etc., as well as its ability to resist mechanical wear, has also increased to a noticeable extent.

The principal item in the cost of preserving is the quantity and the cost of preserving substance. In the case of ties, three gallons of dead oil or of wood tar will be required, while for bridge timbers a smaller quantity will suffice.

The cost of treatment, aside from the cost of the preserving agent, will not in the case of ties vary much from 5 cents. per tie. The cost of dead oil ranges from 7 to 10 cents. per gallon.

Ties for creosoting should be carefully selected, as it is manifestly poor economy to creosote a tie in which decay has already commenced.

The necessity of a most thorough preliminary treatment of the ties for the removal of fermentable substances cannot be too strongly insisted upon, as the value of the subsequent preserving process depends almost wholly upon its proper performance, and its neglect has been the cause of frequent failures in wood preserving operations.

Complaints have been made that creosoted beech wood ties become rotten in the middle of the tie, while the outside for an inch or two in depth remained perfectly sound. The reason for this condition of the tie seems clearly traceable to the neglect of a proper preliminary treatment of the tie; water and juice had been removed from the surface of the tie, but not from the interior. Consequently, the creosote oil was unable to penetrate that portion of the tie on account of the cells being already filled with water.

We do not wish to be understood in this article as advocating the immediate adoption in all cases of wood preserving processes, for this will depend largely upon the cost of the ties. In many localities their cost is still so low as to preclude any treatment of this kind, but there are many others in which their cost has already increased beyond the point where creosoting may be profitably employed; the area of such localities is continually increasing, and it needs no prophetic vision to foresee that in the near future the adoption of some preservative process for wood will become universal.—*Builders' Reporter and Engineering Times.*

HOW COMMON CIRCULAR SAWS ARE MADE.

Ordinary circular saws are of all sizes, from six inches to six feet in diameter. The plates from which they are shaped come from steel-mills in circular form, almost round, if not perfectly so. The first thing to be done is to see that each plate is made a perfect circle. A hole is then cut in the centre, and the teeth are marked around the rim. The plate is then taken to a machine on which the teeth are to be cut. It is placed upon a pin at such a distance from the machine that the edge becomes beneath the die, and the operation of teeth-cutting begins. The steel is cut cold, each tooth being made by one blow. All sizes and descriptions of dies are necessary, as the style of saw and saw-teeth are many. After the teeth have been cut the next operation is that of tempering, which is the most difficult and important process in the making of a saw. Several saws are placed in the furnace at a time, and allowed to remain until they have reached the proper temperature, a light cherry red, when the plates must be taken from the oven and plunged into a vat of whale oil, heated by pieces of red-hot iron or steel, which are placed in the vat one after another until its contents are properly heated. As each piece is dropped in, a brilliant flame leaps from the surface of the oil and continues to burn until extinguished by stirring the liquid with a long iron rod. The large, glowing plates are then cautiously slid into the vat. Leaving the tempering department, the saw goes back to the main shop to be hammered and straightened ready for grinding. This work is done by hand. After the plate, which has been more or less warped in the tempering process, has been made perfectly straight again, it is placed in the grinding machine, which is a carriage between two wheels, which turn it, and at the same time press its sides against a rapidly revolving grindstone. The carriage is fixed in automatic bearings, and is moved back and forth at the will of the operator. It usually takes about two hours to grind a large five-foot circular saw, though the time varies according to the kind of saw that is being made. The next operation is that of polishing, which is done with emery-wheels. To polish a large circular saw the plate is secured to a large wheel or flange, which turns, carrying the saw with it, the workman meanwhile pressing an emery ball (attached to a handle) against the side.

The saw must then be "rounded," that is, care must be taken to prevent one tooth projecting farther than the others. For this purpose the saw is placed in a bearing and made to turn slowly. It is then gradually brought in contact with an emery-wheel, the latter turning very swiftly, until the edge of every tooth touches the wheel. The saw is next sharpened and submitted to further hammering for the purpose of "truing" and straightening, and is then cased ready for shipment.

One important part of the sawmaker's business is the renovation of old saws injured in fires. It is straightened up, tempered over again, and provided with a new set of teeth.

This article has dealt only with common circular saws, the teeth of which are not separate from the plate. Other saws, however, supplied with inserted teeth of various kinds, are made in large numbers. These are all patent saws, and can be supplied with new sets of false teeth as often as necessary. —*Mining and Scientific Press.*