PREVENTION OF DECAY IN TIMBER.

The treatment of timber to secure it from rapid decay is a subject of great importance to shipbuilders, railway engineers, bridge-builders and all others who are interested in the preservation of wooden structures intended to be exposed to the winds, the waters and the weather. Iron is undoubtedly taking the place of timber with advantage for many purposes, but the latter material is so convenient and so capable of being shaped and combined in suitable forms, that it will always be used to a great extent. One of its chief defects is liability to rapid decay, depending upon its condition and the circumstances connected with its application. Every item of information, therefore, which will tend to promote its durability is of great value. On a former occasion—on page 390, Vol. VII. (new series) of the SCIENTIFIC AMERICAN—we briefly noticed some experiments which had been made in France in treating ship timber by M. Lapparent, director of the dockyard and inspector of timber for the navy. His printed report to the Government has lately been forwarded to us, and it contains a considerable amount of valuable information, some of which we shall present in a condensed form.

The sap of timber is composed of nitrogenous elements which are called *unstable*, because under certain circumstances they are so liable to change—producing rot. When timber is treated so as to alter the nature of the sap or to dry it completely by what is called *seasoning*, it resists decay more effectually than if used without being dried. Moisture and confined air tend to produce decay in timber, and on the other hand timber exposed to a free circulation of air and shielded from moisture will retain its strength almost unimpaired for centuries. The oak beams, rafters and other timbers of old churches and houses which were built before the plastering of walls was introduced, have remained sound for six and seven hundred years. Of course, ships cannot be kept dry, but if their timbers are well seasoned before they are exposed to the elements, it has been found by experience at the French naval dockyards that they will endure five times longer than timbers not thoroughly seasoned.

It is well known that when timber is steeped for a certain period in water, then exposed to the air to dry, it seasons more rapidly. It has been customary, therefore, to immerse ship timber in water prior to drying it. On this head M. Lapparent states that the practice of those shipbuilders who steep their timber in sea water is wrong, and that fresh water is the most suitable for this purpose. For oak planking, he states, it should be steeped one year in river water, two years in fresh water not so frequently changed; while in brackish water, continually changing, it requires three years' immersion.

In drying timber to season it, exposure to the air is the most simple method, but this requires a very long period of time for large ship-timber. Another method consists in drying it in large rooms exposed to currents of hot air driven in by fans. By this system the surface of the timber is liable to become dry and crack before the interior is seasoned, and for planking it is, therefore, objectionable. Another method has lately been tried near Cherbourgh, France, which consists in exposing it to the smoke, steam and gas of wood and coal under combustion. The small amount of moisture in the smoke prevents the timber from cracking, and M. Lapparent looks upon this mode with favor. But his favorite method in treating timber to prevent its decay is the charring of its surface. He states that this plan was once tried during the last century in the British royal dockyards; that the frigate *Royal William* was built of carbonized timber, and that it was one of the most remarkable cases of durability on record. This system has been revived in France with improved apparatus, and it is about to be extended to all the dockyards in the empire. The timber to be operated upon is secured upon an adjustable table and its surface is slightly charred by a flame of gas mingled with a jet of air. The consumption of gas is 200 gallons for 10 square feet of carbonized surface, and one man can carbonize 440 square feet in ten hours. Some timber is improved by giving its surface a very thin coat of tar before it is charred. It is stated that the whole surface of timber is carbonized with great uniformity by this method, and M. Lapparent says:—"It ought to be applied to every surface in contact with, or in general intended to be surrounded by, moist and stagnant air." It is also recommended for treating the beams and joints of house timber, intended to be embedded in the walls or surrounded with plaster. By carbonization a practical and economical means is also offered to railway companies of preserving, almost for ever, their sleepers, particularly those of oak. In France the annual cost for vine props amounts to no less than $24,000,000. By charring these this cost will be reduced two-thirds, and a relative saving will also be effected in thus treating hop poles. As the vine and the hop are extensively cultivated in America, this system also deserves the attention of our people who raise these agricultural products.

In building ships M. Lapparent suggests that horizontal holes should be bored through the ribs, at certain distances apart, and there should be spaces between the outer and inner planking to permit currents of air to be driven between the ribs, also that portions of the ribs should be smeared with a paint composed of flowers of sulphur, 200 parts; linseed oil, 135 parts; and manganese, 30 parts, to prevent the development of fungi. In conclusion M. Lapparent says:—"I have pointed out the means for preventing the rapid decay of timber; they are simple, logical, economical, easy of adoption and perfectly innocuous. By employing them we shall save that timber for building ships which is, in my opinion, far superior to iron for the same purpose."

A correspondent of the London *Builder* states that the Belgian Government now require all the wood sleepers used on the state railways to be creosoted, and the Government of Holland has adopted a similar resolution. The creosote used is simply what is called the "dead oil" of coal tar. M. Crepin, a Belgian engineer, has also made a series of experiments with creosoted timber in harbors and docks, and in his report, lately published, he states that timber so treated was found successful in resisting the attacks of marine worms. Timber is used to a greater extent in America than in any country of an equal population in the world. If by any mode of treatment our ship, bridge, railway, house, fence and other timber can be rendered twice or three times more durable, a saving to that extent may not only be effected in material but in the labor required for preparing and applying it. All the processes, therefore, which have been set forth for preventing the rapid decay of timber deserve careful and general attention, because they relate to interests which affect every class in the community.

SCREW-PROPELLERS—TECHNICAL TERMS.

The following definitions of the principal technical terms used in connection with screw-propellers may be found useful to some young engineers in enabling them to understand conversations or printed articles on that subject:—

The "axis of the screw" is the imaginary line drawn through its center in a fore and aft direction. The "radius of the screw" is the imaginary line drawn at right angles to the axis and extending to the most remote part of the blade, and it is technically called the "directrix;" twice this radius is the "diameter of the screw."

The "length of the screw" is its length on a line parallel with its axis; the "length of the hub" and the "length of the blades" are measured on the same parallel line.

The outer edge of a blade is called the "periphery;" the forward edge is called the "leading edge;" the after edge is called the "following edge." The "radial length" of a blade is its length measured from the outside of the hub to the periphery in the direction of the radius.

The "pitch of a screw" is the distance (measured in a line parallel with the axis) which a screw would move in one revolution if revolved in a solid nut. A "true screw" has the pitch uniform for every part of it. When the forward part of the screw has less pitch than the after-part, the screw is said to have "a varying or expanding pitch longitudinally;" and when the outer part of the blade has a different pitch from the inner part, the screw is said to have "a varying pitch radially." The "fraction of the pitch used" is the comparison of the aggregate lengths of the blades with the entire pitch.

The after-face of the blades is called "the driving surface," and the forward face "the drag surface." The "angle of a screw" is the acute angle included by a plane at right angles to the axis and the driving surface of the plane. This angle varies at each point of the radius.

The "effective area of a screw" is the projection of the screw-blades drawn on a plane at right angles to the axis. The "oblique area" is the actual area of the driving surface measured obliquely. The "disk area" is the area of the circle described by the radius of the screw.

The "center of pressure" is that position on the blade around which the forces exerted by the blade will counterbalance each other.

A screw is said to be "right-handed" when the upper blade turns from port to starboard, while propelling the vessel ahead; the reverse of this describes a "left-handed" screw.

The "cohesive attraction of the water" is the resistance which the water offers to the blade passing through it, in contradistinction to the direct resistance which the water presents to the screw, when being driven away from it.

The spiral line described by any one part of a screw, as it progresses through space, is called the "helix."

The difference between the speed of the vessel and the speed of the screw, in a line parallel with its axis if it were screwing into a solid nut, is called the "slip." This difference is generally expressed as the "per-centage of the speed of the vessel." When the speed of the vessel exceeds the speed of the screw (as it sometimes does when the vessel is being propelled principally by sails), this excess is called the "negative slip."

VALUABLE RECEIPTS.

NEW CHROME GREEN.—The London *Chemical News* gives the following receipt for manufacturing a beautiful new chrome green color adapted for painting and topical printing:—Take 10 ounces of boiling water and dissolve in it one ounce of the bichromate of potash, and to this add 6 pints of the biphosphate of lime and 3 ounces of brown sugar. When these substances are mixed a disengagement of gas takes place and the liquid fumes. It is allowed to stand until this action ceases, then it is decanted and left to stand for about ten hours when a beautiful green color is deposited. It is washed with cold water and dried in a warm room. The green color thus obtained is stated to be fixed on cloth in printing by mixing it with albumen. It may be used both as a water color and as an oil paint.

TO CLEAN BRASS.—Rub the surface of the metal with rotten-stone and sweet oil, then rub off with a piece of cotton flannel and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass with a cotton rag soon removes the tarnish, rendering the metal bright. The acid must be washed off with water and the brass rubbed with whitening in powder and soft leather. When acids are employed for removing the oxide from brass, the metal must be thoroughly washed afterwards or it will tarnish in a few minutes after being exposed to the air. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

CLEANING TINWARE.—Acids should never be employed to clean tinware, because they attack the metal and remove it from the iron of which it forms a thin coat. We refer to articles made of tin plate, which consists of iron covered with tin. Rub the article first with rotten-stone and sweet oil, the same as recommended for brass, then finish with whitening and a piece of soft leather. Articles made wholly of tin should be cleaned in the same manner. In a dry atmosphere planished tinware will remain bright for a long period, but they soon become tarnished in moist air.

CLEANING SILVER PLATED ARTICLES.—White metal articles electro-plated with silver are now very common and great care is required in cleaning them when tarnished. No powder must be used for this purpose which has the least grit in it, or the silver will be scratched and soon worn off. The finest impalpable whitening should be employed with a little soft water in removing the tarnish. They are next washed with rain water, dried and polished with a piece of soft leather, some rouge powder or fine