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 whitening, then finally rubbed down with the hand, which forms a most excellent polisher.

Construction of Piers in Deep Water without Coffer-dams.

The construction of common coffer-dams in deep water, for the purpose of building piers and sea walls, is a very tedious and expensive undertaking. The London *Artisan* contains an article on this subject, in which a method is described of constructing sea walls in deep water without coffer-dams or diving-bells. This system has been carried out at the new harbor at Greenock (Scotland), by D. Miller and H. Bell, engineers-in-chief of the harbor works. These works had been projected almost entirely beyond the high water line into the sea. The outer pier would ultimately be upwards of 3,000 feet in length and about 60 feet wide at the top, with quays on both sides. Within this there would be space for two harbors, each 1,000 feet in length, 15 feet deep at low water, and 25 feet at high water, with entrances 100 feet wide, and ample room for the construction of graving docks, for the storage of timber, and for the erection of sheds. At present it was only proposed to erect about one-half of the sea pier, and to form one harbor or tidal dock. In the design of these works it was suggested that the walls under low water should consist of a combination of cast-iron guide piles in the front, with a continuous stone facing, slid down over and enclosing these piles; timber bearing piles being used in the body of the walls where required, and concrete backing being deposited in a soft state; and that the upper part of the walls should be built of masonry in the usual manner. The first operation, when the water was not sufficiently deep, was to dredge two parallel trenches to the required depth, 17 feet below low water, for the foundations. A staging of timber piles was afterwards erected in the line of the pier over its whole breadth, for carrying the tramways, traveling cranes, and piling engines. The cast-iron guide piles were then driven from the staging with great precision, 7 feet apart in the line of the face of each quay wall. These piles were driven until their heads were near to the low water line, by pile engines, furnished with long arms projecting downwards, strongly stayed by diagonals, and forming a trough, into which the pile was placed, and from which it was shot, like an arrow from a cross-bow. The piles were connected at the top transversely by wrought-iron tie-rods stretching through the pier. When the piling was driven, a bed of hydraulic concrete, 3 feet thick and 20 feet wide, was deposited in the trenches to form a base for the wall, and to give a large bearing surface. Into the grooves formed by the flanches of the iron piles, large granite slabs, from 18 inches to 2 feet thick, were slipped, the bottom one resting on the concrete base and on a projecting web cast on the piles. This constituted the face of the wall, and in each compartment between the piles, 16 feet in height and 7 feet in width, there were only three stones. Behind this facing, hydraulic concrete was lowered, under low water, in large boxes having movable bottoms, and was discharged in mass to form the body of the wall. To confine this at the back before it had set, loose rubble stones were deposited. The hearting of the pier consisted of hard till stones and granite up to the level of low water. When the whole of this mass was consolidated, the heads of the iron piles and the granite facing blocks were capped by a granite blocking or string-course, and the upper portion of the walls was built in freestone, ashlar, and rubble. The remainder of the hearting between the walls was then filled in, and the whole finished with a granite coping and causeway. The walls were 33 feet in height from the foundations, 11½ feet thick at the concrete base, diminished by 5 feet at the top. In the part of the work already executed, the outer flanch of the iron piles was exposed to the action of the salt water. In future it was intended to reverse this plan, and to make grooves in the stone facing, so that it should overlap the iron piles, filling in the grooves from the top with cement. When the whole extent of the seaward pier was completed, the interior operations for the harbor would be proceeded with; this pier serving as the principal coffer-dam, and a short dam, about 100 feet in length, closing the entrance. It was stated that this method of constructing walls in deep water, without coffer-dams, had been most successful, and that a sea-pier of great solidity and durability had been formed in deep water at a comparatively moderate cost.

The Proper Form for an Ax.

Almost every article, from a steam engine to a penny whistle, has been improved and patented so that it requires an inventive mind to suggest any want in that direction unsupplied. The plow has been subjected to change, till scarce a spot is left to attach an improvement; the stove has a multitude of forms, more numerous than the thousand and one kinds of fuel; the shovel retains nearly its ancient form, though made of a better material; hay and manure forks will pay the inventive expenditure lavished upon them, and so on through a long list too numerous to mention. But who ever saw a good ax? Who ever applied for a patent on the ax? Who suspects, even at this late day, that any improvement can be made in its formation? Where is the man, or association of men, that dare offer a premium for the best ax? The cutting quality of the ax is right, but the form is objectionable. The writer, after using the ax nearly fifty years, has found but one that is right. That one was made to order. The ax-maker should advise with the wood-chopper as to the form and size. But the wood-cutters, like doctors, may disagree. What shall be done? Let premiums be offered for the best ax—also for the best specimens of wood-cutting, and in two years it will be known what is the best form for an ax.—*Massachusetts Plowman.*

[We think our contemporary has omitted the real cause of the difficulty some individuals have in suiting themselves with an ax, and that is the "hang" of it. It is a remarkable fact that a mechanic cannot use his comrade's hammer with any degree of ease, because the handle does not suit his hand; either it is too long or too short, or something of this kind interferes with a skillful use of the tool. So it is with the ax; a man may not use his neighbor's as easily as his own, because he does not get the hang of the handle, and not for any radical fault in the form, weight, or shape of the head. These features have of course some bearing but not so much as the other cause we have mentioned, which is so notorious as to have passed into a bye-word.—Eds.

Railways.

An elaborate statistical article on railways appears in a late number of the London *Engineer*, from which we select a few results. The actual extent of railway now open throughout the world is probably about 70,000 miles, and the capital expenditure nearly one billion one hundred and seventy millions sterling. This vast sum has almost wholly been raised and expended within twenty-five years. The share of this immense capital which Great Britain and its colonies have expended appears to be upwards of four hundred and seventeen millions sterling, and the miles of open railway on which it has been expended amount to 14,277. On the continental railways, four hundred and seventy-six millions and a half sterling have been expended on 22,692 miles of open railway. On the North and South American continents, exclusive of British possessions, about two hundred and fifty-seven millions and a quarter sterling have been laid out on 32,102 miles of open railway. India is included, of course, with the British possessions. Thirty-four millions and nearly a half sterling have been expended in India on 1,408 miles of open railway, and upwards of twenty millions and a half in Canada, on 1,826 miles of open railway. Nearly ten millions have been already expended in Victoria on 183 miles of open railway; but in such cases as those of Victoria and India, works in progress are included in the expenditure named. France has expended upwards of one hundred and eighty-four millions and a half on 6,147 miles of open railway; Prussia, forty-four millions and upwards on 9,162 miles of open railway; Austria, forty-five millions and a quarter on 9,165 miles; Spain, twenty-six millions on 1,450 miles; Italy, twenty-five millions on 1,350 miles; Russia, forty-three millions and upwards on 1,289 miles; Belgium, eighteen millions on 955 miles; Switzerland, ten millions on 600 miles; Egypt, four millions on 204 miles; the United States, one hundred and ninety-three millions and a half on 22,384 miles; the Confederate States, nearly forty-nine millions on 8,784 miles; Brazil, five millions on 111 miles and others in progress.

The Gutta-percha Tree.

The tree called the Isonandra Gutta, which furnishes the gutta-percha, is a native of the Indian Archipelago and the adjacent lands. A few years since this substance, now of such widely extended use, was totally unknown in Europe, for though from time immemorial the Malays employed it for making the handles of their hatchets and creeses, it was only in the year 1843 that Mr. Montgomery, an English surgeon, having casually become acquainted with its valuable properties, sent an account of it, with samples, to the Royal Society, for which he received its gold medal. The fame of the new article spread rapidly throughout the world; science and speculation seized upon it with equal eagerness; it was immediately analyzed, studied, and tried in every possible way, so that it is now as well known and as extensively used as if it had been in our possession for centuries. The Isonandra Gutta is a large high tree, with a dense crown of rather small dark green leaves, and a round smooth trunk. The white blossoms change into a sweet fruit, containing an oily substance fit for culinary use. The wood is soft, spongy, and contains longitudinal cavities filled with brown stripes of gutta-percha. The original method of the Malays, for collecting the resin, consisted in felling the tree, which was then placed in a slanting position, so as to enable the exuding fluid to be collected in banana leaves. This barbarous proceeding, which, from the enormous demand which suddenly arose for the gutta, would soon have brought the rapidly-rising trade to a suicidal end, fortunately became known before it was too late, and the resin is now gathered in the same manner as caoutchouc, by making incisions in the bark with a chopping-knife, collecting the thin white milky fluid which exudes in large vessels, and allowing it to evaporate in the sun, or over the fire. The solid residuum, which is the gutta-percha of commerce, is finally softened in hot water, and pressed into the form of slabs or flat pieces, generally a foot broad, a foot and a-half long, and three inches thick. Gutta-percha has many properties in common with caoutchouc, being completely insoluble in water, tenacious but not elastic, and an extremely bad conductor of caloric and electricity. The uses of gutta-percha are manifold. It serves for water-pipes, for vessels fit for the reception of alkaline or acid liquids which would corrode metal or wood, for surgical implements, for boxes, baskets, combs, and a variety of other articles.—*Hartwig's Tropical World.*

Statistics of Agriculture.

The Commissioner of the Agricultural Bureau, at Washington, has furnished a table regarding the growing crops, which has been made up from reports furnished to the department from all the counties in all the States not under Confederate rule, from which it appears that there is an increase of one-tenth in the area of winter wheat sown, as compared with last year—though the general appearance of the crops was not so favorable. In spring wheat the area sown and the appearance of the crop is about the same as last year. In rye there is an increase of the area sown of one-twentieth, while the appearance is equally favorable. In corn there is also an increase in the area sown, but the appearance of the growing crop was not so good. Sorghum has been cultivated on a vastly larger scale, there being an increase in area of more than one-half the total area last year, while the appearance of the crop is more favorable. It is expected that this article will make its appearance in the market in large quantities nex fall. In cotton, which has been put under cultivation in Delaware, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Ohio and Pennsylvania, there is a vast increase in the land put under cultivation.

The New Postal Law.—On page 38 will be found an abstract of the new postal law, and we believe that all our readers will be interested and benefited by a perusal of it. All California letters are now carried for three cents (formerly ten cents), and there are other privileges which will be of interest to every one.