

In a boiler of good proportions he considered there should be no priming, but should any take place owing to dirtiness of water, passing from fresh water in salt, or *vice versa*, he recommended the use of tallow, or as a preferable expedient, if circumstances permitted, opening the fire-doors and slackening the fires. He considered, also, that some trouble might be caused by priming in small high-pressure marine boilers, unless great care was exercised.

The author devoted but a small portion of his paper to the consideration of the stationary and locomotive boilers, but occupied some of his remaining time in discussing the relative economy of the Cornish and locomotive boilers, considering the Cornish greatly superior, as in a locomotive the temperature in the smoke-box was notoriously greater than the temperature at the base of the chimney in a Cornish boiler, and that the heat passed up the funnel was a dead loss, except that which was necessary to keep up the draft.

The author concluded by giving the dimensions and mode of construction of one of Stephenson's 12 in. locomotive engines, as also that of Crampton's colossal engine, the Liverpool.—*Proc. Civ. and Mech. Eng. Soc.*

*The Decay of Timber and its Prevention.** By H. LETHEBY, M.B., M.A., &c., Professor of Chemistry in the College of the London Hospital.

SIR:—I regret that I was not able to be present at the Society of Arts, on the 30th May, during the reading of Mr. Burnell's very valuable paper on the causes of decay in building woods, and the means of preventing it; for, as I have directed much attention to the subject, and especially to the *modus operandi* of creosote, or dead oil, in preserving timber, I should have taken part in the discussion.

Mr. Burnell does not attach too much importance to the process of creosoting timber, when he regards it as the most effective of all the processes known for the prevention of decay; for, in truth, the dead oil of common coal-tar contains all the elements which are necessary for giving permanent stability to organic compounds, by checking decomposition, by opposing the processes of oxidation, and by destroying the vitality of the lower forms of animal and vegetable life. If, indeed, the application of creosote to timber has ever failed in preventing decay, it has been because of the improper use of it, or the use of an oil which has not contained a due proportion of its most effective constituent—carbolic acid. This it is which is chiefly concerned in strengthening the weak affinities of the young or immature constituents of wood. It coagulates the albumen and gives firmness to the cellulose matters that are so prone to decay, and which communicate by a sort of catalytic influence, their decomposition to the neighboring and more mature tissues. So powerful is the antiseptic property of this acid that, when separated from coal tar, it will at once arrest the decomposition of every kind of organic matter. I have seen it stop the putrefactive changes of sewage and cess-pool matter instantly, and it will even stay

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the more active decomposition of putrefying animal flesh. It is to be regretted that all samples of dead oil do not contain a like proportion of this valuable constituent. I have found that it ranges from 0.05 per cent. to rather more than 6 per cent. of the oil; and as the value of the oil is dependent on the proportion of this acid, it is a matter of some importance to know how its presence can be discovered. A rough estimate may easily be made by shaking up about half a pint of dead oil with its own bulk of a rather weak solution of caustic potash. After standing for a little while, the oil will separate, and the potash solution of the carboic acid may be poured off. On acidulating this with sulphuric acid, the carboic acid will separate, like an oil, and it may be known by its creosote-like odor.

Another important constituent of dead oil is the hydro-carbon, which gradually discolors the oil and thickens it by absorbing atmospheric oxygen and forming a solid pitch. This operates in preserving wood by appropriating the oxygen which may be within its pores, and so checking ligneous eremacausis. The resinoid body which is formed shuts up the pores of the wood and effectually protects it from the action of air and moisture. The presence of this hydro-carbon may be known by the darkening, and, as it were, drying of the oil when it is put upon white filter paper and exposed to the air. In the distillation of the oil this compound comes over most freely at the time when naphthaline distils; and as far as my experiments have gone, I am led to think that the best dead oil (that charged with most carboic acid, and the resinifiable hydro-carbon) comes over at from 360° to 490° Fahr. The carboic acid is most abundant in the runnings at or near to the first temperature, and the media for holding them in solution and applying them to the timber at the last. Naphthaline, and paranaphthaline, or salts, as they are sometimes termed, will of course come over at these temperatures; but as these substances are of no value whatever in preserving timber, they should be separated as far as possible by submitting the oil to cold and to the action of time. Dead oil should not be exposed to the air more than is necessary, in order that oxygen may not be absorbed and the oil thickened and discolored. Lastly, I may say that carboic acid and the hydro-carbons of dead oil are among the most powerful poisons to fungi, and acori, and all the lower forms of organic life. The oil, therefore, acts as a physiological preservative of timber. In point of fact its preservative action is of four kinds:

1. It coagulates albuminous substances, and gives stability to the constituents of the cambium and cellulose of the young wood.

2. It absorbs and appropriates the oxygen which is within the pores of the wood, and so checks, or rather prevents, the eremacausis of the ligneous tissue.

3. It resinifies within the pores of the wood, and in this way shuts out both air and moisture.

4. It acts as a positive poison to the lower forms of animal and vegetable life, and so protects the wood from the attacks of fungi, acori, and other parasites.

No doubt the action of the oil is injurious to higher forms of animal life. It is even offensive to ourselves, and hence the objection to its use in the interior of buildings. But I am led to think that this objection may be overcome by the use of agents, which, like nitric acid in its action on the benzole of the lighter oil of coal tar, may give to the dead oil a less offensive, if not a positively pleasant odor. When this is accomplished there can be no objection to its use in the interior of buildings, or for the preservation of ships.

*Description of a Steam Crane.** By MR. J. CAMPBELL EVANS,
of Greenwich.

The steam crane described in the present paper was designed more especially for use on board steam vessels; and the chief points to be aimed at were consequently compactness, facility of fixing, simplicity in the mode of working, and durability. In cranes usually constructed, the boiler being separate from the engine, the union joints of the steam pipe are very liable to leak; and the writer believes there are very few such cranes where this circumstance has not been a continual source of trouble and annoyance after a few months' regular work. Frequently the boiler is a considerable distance away from the cylinder, and then the steam and feed pipes are liable to be injured in stowing the cargo; in addition to which, the condensed steam strains the machinery, and keeps the deck of the vessel constantly wet and dirty.

To obviate these disadvantages, in the present steam crane, the boiler is placed as close as possible to the crane, and revolves with it; and by making the top of the boiler of cast iron, with lugs for attaching the tension rods, it serves the double purpose of boiler and crane post. The bed-plate upon which the crane and boiler are placed is fixed to the foundation-plate by a centre bolt, which bears all the upward strain; the downward pressure is taken by rollers, having their bearings in the bed-plate, and running on the foundation-plate, which is solidly bedded on timber laid on the deck of the vessel.

To avoid upright tubes and horizontal tube plates, the heating surface of the boiler is arranged in cones; the first cone or fire-box is exposed to the direct radiation of the fire, after which the heat passes through an opening nearly opposite the fire door into an annular space between the second and third cones, where it is absorbed by the water spaces on either side, and passes round to the funnel opposite. In this way a sufficient heating surface is obtained without any horizontal surfaces in the boiler for deposit to accumulate upon. The two angles or bottoms of the water spaces are below the direct action of the fire, and are connected by pipes to allow for the circulation of the water, provided with plugs and cocks for cleaning. The water tank is placed under the boiler; this position serving to heat the feed water and to preserve the cast iron bed-plate from danger of fracture by the heat of the fire.

The crane is worked by a single oscillating cylinder, supported by

* From Newton's London Journal, August, 1860.