The difficulty of maintaining a circulation of pure air in those portions of the vessel below the surface of the wa­ter might be removed by adapting the openings between the timbers of the frame to this purpose. Pure air might by their means be easily supplied to the lower part of the “ between decks,” or even to the hold, through pipes ; and the foul, heated, and therefore rarefied air, would rush from the upper part of the between decks, or of the hold, through a second series of pipes. The writer of this article proposed a plan for effecting this to the Admiralty, on his return from a cruise in the experimental squadron of 1827. The same principle is adopted now, very generally, to ventilate ma­nufactories and other large and closely-peopled buildings.

The most active agent in the work of the decomposition of timber is the oxygen which it contains, whether this de­composition be rapidly induced by fermentation, or is more slowly and gradually taking place under the influence of the law which renders decay the necessary consequence of or­ganization. The oxygen, which, during the vitality of the plant, was held in harmless combination, is set free, and im­mediately begins to act upon the woody fibre of the felled timber, and induces a slow combustion, the effect of which is the evolution of carbonic acid gas, and the carbonization of the wood, by which the tenacity and adhesiveness of its several parts are gradually destroyed. Timber, therefore, begins to deteriorate and to decay from the moment of its being felled ; and indeed a gradual diminution of its strength may be observed during the process of its seasoning, which only ends with its total decomposition. The hastening the seasoning process is, however, advantageous, by depriving the timber of the superabundant moisture, and of the juices, which might otherwise induce an unduly rapid decomposi­tion.

The decay of timber has been frequently classed under two heads, natural decay, and decay from dry rot. Proba­bly there is not such a marked distinction between these two decomposing principles as might be imagined. Very frequently the decomposition of timber is attended with the apparently spontaneous vegetation of parasitical fungi ; and, according to common acceptation, that species of decay which is accompanied by the vegetation of these fungi has received the appellation of dry rot. The term was applied to it in consequence, probably, of the peculiarity attending it, that the decomposed wood had become a dry friable mass without fibrous tenacity. Whether the seeds of these plants are lying dormant in the juices of the timber while in a state of life and health, and the vegetative principle in them becomes active only when decomposition has furnished them a nidus, or whether they are floating in the atmosphere, and vegetate whenever favourably placed, is a point not yet established. However this may be, as in general this pe­culiar decay may be traced to imperfectly seasoned mate­rials, we consider it may fairly be supposed that the seeds of the fungi are contained in a fit state for vegetation in the juices of such timber ; and although it sometimes occurs and spreads among seasoned timber, it appears previously neces­sary that damp should have renewed and revived the vege­tating principle in the seeds, and fermentation and decom­position have provided them a nidus. They then flourish and acquire strength on the sustenance which they draw from the decomposed wood ; and in the same manner, and with a similar deteriorating effect as the parasitical plants which sometimes vegetate on the living tree, these destroy the dead timber, by abstracting all but the earthy particles, which are left without fibrous texture.

Dryness, cleanliness, a free circulation of air, or the en­tire exclusion of it, appear to be the best preservatives against, or checks to, vegetable decomposition ; while damp accumulations, and a vitiated atmosphere, rapidly induce it.

If the foregoing statement of the principles on which the decomposition of timber depends be correct, it is evident

that its tendency is progressive, and that the decay must rapidly spread, from the accumulation of the deteriorating influences. It is also evident that the only means to check undue decay is by a removal of the inciting causes; and that the only means to prevent it, is to guard against those circumstances which are most liable to induce it, and to avoid the use of those materials in which it is most easily induced.

Unseasoned timber should never be used, and even the most seasoned timber should only be used when in a dry state. When kilning plank was first adopted, now up­wards of a century ago, the planks, after being set to the form of the body, were taken off to dry ; this, however, was unnecessary, kilned plank drying almost at the mouth of the kiln. All decayed and all diseased portions of the wood should be carefully removed, and also the whole of the sap or imperfect wood, which, from being more soft and spongy in texture than the spine, absorbs moisture more easily, and, being also more filled with the vegetating principle and the vegetable juices, is more liable to fermentation, and conse­quently to decomposition, and to the growth of the fungi.

We shall now consider the premature decay of timber induced by the substances which are used in connection with it. Of these the iron for fastenings has by far the most injurious influence. This is probably owing to the great affinity which exists between that metal and oxygen, so that each fastening becomes an absorbent of oxygen, either from the atmosphere or from the wood which sur­rounds it, and which is again supplied from the atmosphere. The surface that is first subjected to this change is con­verted into the brown oxyde of iron, which may be termed a supersaturated oxyde, and parts with its superabundance of oxygen to the lamina of pure iron immediately beneath it, while the surface absorbs a fresh store of oxygen from the wood ; and thus the process of oxidation goes on through successive laminæ of the iron, until the whole of its metallic nature is changed, and its utility as a fastening is destroy­ed, while it becomes a reservoir of oxygen, which acts evidently on the woody fibre around it, and, by carbonizing it, rapidly and effectually destroys its tenacity.

In this view of the action of iron in accelerating the de­composition of timber, we may trace the reason why its effect varies so much in different woods. Mackonochie, in his admirable Prospectus, says that oak is found to contain a much smaller proportion of oily or resinous particles than many other kinds of wood ; and that, besides the lignic acid which it has in common with them, it contains an acid pe­culiar to itself, called the gallic acid, and that, therefore, the quantity of oxygen in oak is very considerable ; that, on the contrary, in teak it is much less, while in this wood the resinous particles are so abundant as to have procured the teak-tree a place amongst the terebinthinous plants. He argues, that the iron, which cannot easily be protected before being applied as a fastening, acquires a protecting covering from the oily or resinous juices of the wood, pressed from the abraded vessels in the action of driving. This coating, which cuts off its influence on the oxygen, will be more or less perfect, in proportion to the quantities of the protecting substances contained in the wood. He states, on the authority of the experience of the shipping built in India, and used in the India trade, that the average duration of an iron-fastened teak ship is thirty years ; and consequently he argues that it is a misapplication of ex­pense to use copper fastening with teak, as the additional advantage gained is not at all commensurate with the ad­ditional expense. But with oak the circumstances are dif­ferent ; the action of oak on copper is not near so destruc­tive of its metallic structure as it is on iron ; and, on the other hand, the re-action of the metal on the wood is not so destructive of its ligneous fibre. The oxyde of copper, which forms almost immediately on its coming in connection