the ground line the sapwood completely decays, while above the ground line a thin shell of dry, hard outer wood remains, with the decay running up beneath it. This is entirely a result of moisture conditions. The same phenomenon often occurs in water tank staves where the outer face is too dry, and the inner face too wet, to decay, while an intermediate zone may completely disintegrate.

A certain amount of air within the wood is absolutely necessary for decay. The organisms need it for their growth. In saturated wood the air is, for the most part, displaced by water and fungous growth is impossible. The very widespread idea that decay is due to alternate wet and dry conditions has developed through observation of the way timbers behave when exposed to the elements. Take, for instance, a railway tie partly embedded in soil. During a dry season it may dry out to such an extent that decay is very slow, then come the rains, and if only sufficient water falls to put the tie in a good moisture condition it begins to rot rapidly again, and will continue to do so as long as the moisture and temperature are favorable. If, on the other hand, there is a long-continued rainy period the tie may soon become saturated and decay will stop again and remain practically at a standstill until the stick dries out sufficiently to admit the necessary amount of air. Thus, in the alternation of wet and dry conditions, one gets at some point intermediate between the dry and wet ranges a condition at which decay is at its maximum.

The third essential condition for rapid fungous growth is a suitable temperature. For the majority of species the most favorable temperature lies between 75 and 85 deg. F. There are some exceptions to this, however, in the case of certain of our very destructive fungi. Of a series of some 50 species which we have tested in our laboratory none would grow above 118 deg. F. However, this does not necessarily mean that they would be quickly killed at this temperature.

In general, wood-destroying fungi are much less tolerant of high temperatures than low ones, which temperatures slightly above the freezing point will usually permit some growth. In fact, the writer stored a large number of stock cultures of different fungi in an ice box where the temperatures vary around 40 to 60 deg. F. Under these conditions several fungi isolated from building timbers grew luxuriantly. The fact that all the species of fungi occurring naturally in a given locality can withstand the most severe winter weather shows their extreme hardiness to low temperatures. While growth may be almost completely suspended under these circumstances the organisms will normally recover their growth capacity soon after being placed under more favorable conditions.

Mycelium in wood is often very long-lived in timber dried in the air at moderate temperatures. Once it gets well distributed throughout the wood, it is doubtful, in very many cases, whether the wood can again become free of infection as a result of natural atmospheric conditions. One case on record shows that a stick infected with one of our common species contained very vigorous mycelium after having been kept in a warm, dry room for a period of four years.

The second stage in the life-cycle of a wood-destroying fungus consists in brackets or shelves, "toadstools," or often only compact incrustations which appear on the surface of the timber after decay has become well started. Their function is to produce spores, which are comparable to the seeds of ordinary green plants. Being very minute (finer than flour) these spores are readily carried about by air currents and lodging on the surface of moist timber, at a favorable temperature, germinate to produce new infections. The number of spores produced is beyond the ordinary comprehension. According to Professor Buller's studies on *polyporus aquamosus* the number of spores produced by a single specimen of this fungus may in the course of a year be "some fifty times the population of the globe."

A large part of the infection of timbers in the open occurs through the agency of these spores, but in buildings, where fruit-bodies are less likely to develop, they play a less important rolê.

Decay in Building Timbers.—The principal causes for decay fall, roughly, under the six following heads:

1. Placing non-durable timber in moist, ill-ventilated basements or enclosures beneath the first floor, or laying sills in direct contact with the ground.
2. Embedding girders and joists in brick or concrete without boxing the ends.
3. Placing laminated flooring in unheated buildings in a green or wet condition.
4. Covering girders, posts, or laminated flooring with plaster or similar coating before being thoroughly dried.
5. General use of non-durable grades of timber in a green or only partially seasoned condition.
6. Use of even dry timber of low natural durability in buildings artificially humidified to a high degree, as in textile mills.

A further element of danger lies in the use of timber infected during storage or which has become infected through neglect after purchase and delivery.

There seems to be some divergence of opinion regarding the use of laminated flooring. In many buildings it has proven completely satisfactory. In others it has given very poor service. All the complaints investigated by the writer have shown the trouble to be due to the use of wet material. This, at best, dries very slowly in an unheated building. Covering such timber with plaster, or any other heavy coating, when moist will almost invariably cause trouble. If difficulties with laminated flooring are to be avoided the timbers will have to be thoroughly air seasoned and kept dry during construction.

This leads us to a consideration of the advisability of covering materials in mill-constructed buildings. A number of cases already investigated indicate clearly that the practice should not be recommended except with extreme caution, and a close knowledge of the condition of the timber as it goes into the building. A building was erected about 3 years ago, in which the construction was under way throughout the winter, so that the timbers were subject to periodic wetting from rains and snow, the timbers being for the most part, of poor quality, low density, mostly rapid growth, very knotty, and often with a large proportion of sapwood. Laminated floors of mixed quality, usually sappy and wide-rimmed southern pine, scant 3 ins. by 6 ins. in size, were laid throughout the building, with the ends resting directly on the girders, with about 5-in. bearing. The ceiling, girders, and posts were all encased in plaster board, leaving a narrow air space between the board and timbers.

This combination of circumstances—low quality timber, high moisture content, and plaster board covering—caused the timber to rot rapidly, particularly at the bearings of the laminated floor on the girders.

How to Control Decay.—The possibility that timber may reach the consumer with infection already in it is by no means remote. Many lumber yards are in a highly unsanitary condition as regards the presence of destructive