the immediate ill effects of blocking of the prothoracic spiracles by *Tarsonemus woodi*, the causal parasite of Isle-of-Wight (Acarine) disease.

Spiracular muscles (apparently similar in function to those of *Apis mellifica*) have been found in *Vespa sp.*, *Bombus sp.*, and a wild bee (? *Prosopis*). In a modified form, they are present in *Formica sp.*, being there apparently attached to the anterior edge of the tergum, and not to the sternal apophysis.

To see these, as well as the other abdominal muscles of the bee, I may mention that material preserved in equal parts of methylated spirit and formalin, deeply coloured with light green so as to stain the muscles, is excellent. Dissect in water.

ANNIE D. BETTS.

Hill House, Camberley, Surrey.

Symbiotic Bacteria and Phosphorescence.

IN Prof. Gamble's review of Buchner's "Tier und Pflanze in intrazellularer Symbiose" (NATURE, May 6) reference is made to the work of Pierantoni, according to whom the luminous organs of cephalopods are "essentially cultures of bacteria in media suitable for their nutrition and in situations favourable for obtaining oxygen."

The claims which are made for the existence of similar symbiotes in fire-flies and many other phosphorescent organisms may be extravagant, but Newton Harvey's recent announcement in the Year-book (No. 20 (1921), pp. 196-97) of the Carnegie Institution of Washington is exceedingly important in this connection. Harvey worked on two fishes with very large luminous organs—Photoblepharon and Anomalops—at Banda in the Dutch East Indies. He found bacteria always present in the organs, and emulsions of these organs behaved exactly like emulsions of luminous bacteria. The light continues night and day without ceasing, independently of stimulation. This is characteristic of the light due to luminous bacteria and fungi alone among organisms. Harvey did not succeed in growing the bacteria artificially, however; but considering the conditions under which they apparently live, this would, naturally, be a task of great difficulty. Dahlgren (see the same reference) seems to have confirmed Harvey's discovery in other fishes.

Luciferin and luciferase could not be demonstrated, which is also characteristic of luminous bacteria.

F. A. POTTS.

Trinity Hall, Cambridge.

Stone Preservation.

MAY I throw out a suggestion, which, I believe, is new, as to a method for preserving decaying sandstones from further decay?

Certain compounds of alcohol-radicles with silica, when exposed to moist air, hydrolyse, deposit hydrated silica in a coherent form, and thus act as a cement. The ether can be thinned with alcohol, and is a very stable body so long as it is not exposed to moisture, and if a piece of rotten sandstone is treated with it, in the course of a few days the sandstone hardens up and the resulting cement resists the attacks of acids.

Unfortunately, this process does not solve equally well the important problem of preserving limestones, since, though it binds the particles of limestones together, it does not protect the particles themselves from attack.

A. P. LAURIE.

Heriot-Watt College, Edinburgh, May 31.

Oscillation Circuits for the Determination of Di-electric Constants at Radio Frequencies.

DURING the last year or so a number of investigators have made use of the underlying principles of the heterodyne system of wireless telegraphy in the determination of di-electric constants. The extreme sensitivity of this method, and its freedom from some of the weaknesses which have rendered precise measurements by the older methods difficult of attainment, are rapidly increasing its popularity, and any changes which make for simplicity and for still greater certainty are of interest.

For no apparent reason circuits of the type used only for receiving signals have, so far as the writer is aware, been employed, though greater efficiency is to be expected from the use of a transmitting circuit in conjunction with such a receiving circuit generating local oscillations. In either case it is preferable that the oscillation circuit, of which the condenser containing the material under investigation forms a part, should not rectify, as rectification is necessarily accompanied by distortion of wave form.

Instead of using the two electrically insulated circuits hitherto employed the writer prefers that shown in Fig. 1, in which simple transmitting and receiving circuits are combined in such a way that

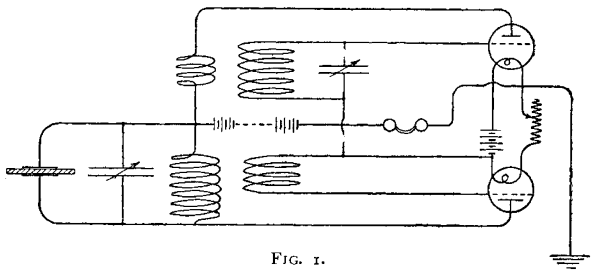

FIG. 1.

oscillations of two different frequencies can be generated although both valves are fed from the same filament-heating and anode batteries. An additional reason why only one valve should be used for rectification with this particular arrangement lies in the fact that, if both valves were rectifying, the unidirectional pulses of current of audible frequency produced in each of the circuits by the rectification of the interfering oscillations would tend to produce a steady current, since they would be quite out of phase with each other.

As is well known to workers who have had experience of apparatus of this kind, changes in the value of the filament-heating current by altering what is virtually the resistance of a valve affect, to a certain extent, the frequency of the oscillations generated. This trouble can be lessened to a very great extent by taking the heating current for both filaments from the same battery of accumulators. The filaments can be connected in parallel, but there is more to be gained by connecting them in series, as will be apparent from the figure. It will be seen that, although the two grids are at the same potential with respect to earth, their potentials with respect to the heated filaments are quite different; in the case of the valve shown in the lower half of the figure the potential difference is such that it can "oscillate" only, while the other valve can both oscillate and rectify.

In conclusion, it should be stated that this letter is written with the kind permission of the Director of Artillery, War Office.

P. A. COOPER.

Explosives Branch, Research Dept.,
Woolwich, April 15, 1922.