

water. These were the proportions actually employed by Pfeffer and given by Ostwald and others. As compared with the conventional composition of a 1% solution they involve a deficiency of one ninety-ninth part of the sugar, which is far within the limits of error in these investigations; nor ought they to mislead any body, as the proportions of this kind of percentage are explained in the text-books and were given in my paper.

The departure from the conventional proportions of a one-per-cent. solution are not from error nor arbitrary, as the method of comparing the osmotic pressure of different solutions relatively to the gram-molecules of the substances dissolved involves the employment of a uniform quantity of the solvent.

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#### NOTES ON PHYSICS.

##### WIRELESS TELEGRAPHY.

AT a recent meeting of the Institution of Electrical Engineers, Marconi described his recent work along the lines of wireless telegraphy. In transmitting he uses a 10-inch spark coil and a battery giving about 14 volts and 6 to 8 amperes. For his spark circuit he uses two arrangements, depending upon whether it is necessary to confine the sending of the signals to one direction or not. In the former case cylindrical reflectors are used and capacity is obtained by strips of sheet metal attached to the two spark balls. In the latter case there are no reflectors and one ball is grounded while the other is connected to a vertical wire. A Morse key in the primary circuit makes the signals. The length of the vertical wire depends upon the distance to be covered. A wire 20 feet high will transmit one mile; 40 feet, 4 miles; 80 feet, 10 miles approximately; the distance seems to increase about as the square of the height of the wire. The receiver consists of a coherer, or sensitive tube, about four centimeters long, fitted with metallic pole-pieces and partly filled with nickel and silver filings. When not under the action of the radiation the resistance of this tube is practically infinite, but is reduced by the cohering of the filings

under the action of radiation to from 100 to 500 ohms. This allows a current to flow from a local battery through a relay circuit in which is a vibrating tapper and a sounder, or writer. The former, tapping the coherer, restores the high resistance by separating the filings. The receiver is also supplied, either with the metal strips and reflector or with the ground connection and vertical wire, according as the former or the latter is used in the transmission.

When the reflectors are used the ray within which the signals can be received may be made very narrow; in one case at a distance of  $1\frac{1}{2}$  miles it was only about 100 feet. Marconi found that horizontal wires were useless, and accounted for this by the theory that the waves from the vertical wire had a vertical plane of polarization and were, therefore, not absorbed by the surface of the earth.

A number of installations have worked successfully and without difficulty for prolonged intervals and in all sorts of weather. In one case an 18-mile transmission was carried on with an average of about one thousand words per day. With the vertical wire transmitter, hills seem to make little difference with the transmission. In one case a distance of five miles over land, with several intervening hills, was successfully covered.

F. C. C.

#### BOTANICAL NOTES.

##### AN ELEMENTARY BOOK ON LICHENS.

IT is a hopeful sign when we find amply qualified men engaging in the work of writing elementary text-books for the use of students in the schools. It has been the duty of the writer on more occasions than he has wished to severely criticise books written for beginners by those who themselves had but little knowledge of the matter treated. It has been at once the scandal and the weakness of the elementary science text-books that they have too often contained very little Science, for the very good reason that their compilers were unacquainted with Science. Some time ago Dr. Albert Schneider published a large treatise on the lichens, which at once proved his profound knowledge of the subject as well as his ability to communicate it clearly and forcibly. It is not necessary that