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THE MARCONI WIRELESS TELEGRAPH SYSTEM.

When Mr. Marconi sends a signal from Glace Bay, N. S., to Poldhu in England, what he does is to create a disturbance, a wave motion in,—let us call it for convenience,—the ether, which wave motion radiates in all directions, extends across the ocean, and probably travels much faster than light. That is to say, the wave (not the ether) crosses the ocean in less than the one hundredth part of a second. Careless observers imagine that the transit of a wave is the same thing as the transit of the substance of which the wave is composed. Persons see a huge wave containing many tons of water approaching the shore, and they imagine that the water itself is moving nearer to the land. What is really approaching, is not the water, but an undulation of the water. At the sea-side you may see two wave systems approach and actually pass through each other, without either affecting the other. These analogies are pertinent to the subject under discussion because they illustrate exactly what happens in wireless telegraphy. They serve to show how Marconi manages to hit the target every time, and how he manages to keep his messages from getting mixed up with each other.

If you throw a stone into a pond it starts a series of concentric ripples, a miniature wave system, radiating in all directions. The ripples (not the particles of water affected by them) cross the pond in every direction. If you throw two stones into the pond at some distance from each other, you start two wave systems. The interesting point is that when the two wave systems come in contact each pursues the even tenour of its way totally unaffected by the other. This is precisely what happens with Marconi's various systems of electric waves.

But now comes the very natural question, if a hundred electric wave systems are being radiated in all directions by a hundred Marconi-sending stations, how is it possible to provide that each wave system shall reach the particular receiving station for which it is intended and no other? As a matter of fact each wave system will reach each and every receiving station; but each distinct wave system will only affect the receiving apparatus it is intended to affect. We shall better appreciate the possibilities in this direction if we take into consideration an analagous state of affairs in connection with the phenomenon of sound as we pointed out in an article on this subject in our issue of 17th January, 1902. A simple experiment will suffice to illustrate. Stand near a piano and sing a certain note, say, middle "C," the middle "C" string of the piano will immediately respond, and no other string will be affected. This phenomenon, however, will not occur unless the string and voice are in perfect tune. This sympathetic vibration is often a nuisance to a pianist. He notices that whenever he strikes a certain key there is a secondary unpleasant, jarring sound. At first he thinks it is a defect in the piano. A few minutes' investigation may reveal the fact that the secondary sound comes from the chandelier, or from some piece of metal or glass in the room, nowhere near the piano, but the note given out by the metal or glass when struck happens to correspond exactly in pitch with that of the troublesome wire of the piano. There is nothing erratic or uncertain about the actions and reactions of these sound waves. A thirty-two foot organ pipe will always give out exactly sixteen vibrations per second; a sixteen foot pipe exactly thirty-two vibrations, and one foot pipe exactly five hundred and twelve vibrations per second. A sound wave whatever its origin, which vibrates at the rate of 512 per second will always set in sympathetic vibration any object whatever which is timed to vibrate at that rate. The law is as absolute as the law of the pendulum. You may swing the pendulum a long distance or a short one, but the number of oscillations per second depends absolutely