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WIRELESS TELEGRAPHY.

The discoveries and inventions of Nikola Tesla have excited much interest in the scientific world, and, notwithstanding the fact that he has been very reticent regarding his achievements and prospective improvements, hints of his purposes have been dropped occasionally; so that so much of the public as is interested in him or his discoveries has been able to form a fair idea of the nature of his work. His inventions in the line of alternating current generators and motors are now well known, but his experiments in currents of high frequency and high potential are not so familiar.

Very recently Mr. Tesla has announced that he has completed his wireless telegraph to such an extent as to permit of telegraphy through the earth for a distance of 20 miles or more, and his experiments satisfy him of the feasibility of wireless telegraphy on a much more extended scale. In fact, he aims at nothing less than the establishment of a system of telegraphy that shall include the whole earth, and by which items of news may be distributed from one political or commercial center to every other such center throughout the world. This, Mr. Tesla claims, is possible without the interference of one set of signals with another.

He has constructed and tested both transmitting and receiving apparatus, and has found that a surprisingly small expenditure of energy is required. It is impossible at this writing to secure details of the apparatus, but it is known that he utilizes the static equilibrium of the earth. This he disturbs at one point, making signals which can be distinguished at one or more distant points.

In his earlier experiments in high frequency currents Mr. Tesla attained a frequency of 10,000 per second; now 2,000,000 oscillations per second is not deemed extraordinary. It is said that the success of the system is assured, but he will not come before the public until every detail is completed. It is understood that the transmission of power from place to place by means of a similar system is contemplated.

While Mr. Tesla has been wrestling with this great problem in this country, Mr. Marconi, a young Anglo-Italian, has been working on the same line in England under the direction of Mr. Preece. It is reported that Mr. Preece has succeeded in telegraphing with certainty and sufficient rapidity from Penarth to Weston-super-Mare, a distance across the water of seven or eight miles, without wires, and it is believed that this distance can be greatly extended.

It is said by The Engineer that the apparatus devised by Marconi is extremely ingenious, and has for its object the getting out of the Hertzian vibrations sufficient work for telegraphic purposes. The apparatus comprises a transmitter and receiver. The former consists mainly of a small Ruhmkorff induction coil excited by a couple of battery cells. The secondary or high tension wires terminate each in a metallic ball. Between the two balls is placed a cubical box containing oil. In the opposite sides of the box are fixed two brass balls, oiltight, so that one-half of each ball is in the oil in the box and the other half outside of the box. The balls do not touch. The whole arrangement has been designed by an Italian professor, Righi. On sending a current through the induction coil, Hertzian vibrations are set up in the balls and communicated to the ether. The oil has a peculiar effect, acting as a species of brake, the rapidity of the wave vibrations being only about one-half of that stated by Dr. Lodge. These vibrations are then given off into space all around in every direction. So far as known, nothing save metals appears to be opaque to them, and here, therefore, we have an analogy with the Roentgen ray.

Marconi's receiver consists of a tube about ¼ of an inch in diameter and 3 inches long, in which are two silver plugs terminating in wires, the ends of which are soldered to the silver plugs. The wires are fused into the glass. The tube is exhausted to a near approach to absolute vacuum. The faces of the two silver plugs are very close to each other, and the space between is filled up with an impalpable metallic dust. On the nature of this dust much depends. It must suffice to say that there are in it three constituents, one of which is nickel. Under ordinary conditions this powder will not conduct electricity, save feebly. Its resistance is very high. If a Hertzian ray falls on the little tube, the dust is polarized like the filings in a Hughes test tube, and the powder becomes a conductor. It will be seen at once that we have here a make and break which can be acted on from a distance, and an ordinary Morse sounder does the rest. But matters, after all, are not quite so simple. It is easy to dispatch into space Hertzian waves at intervals corresponding to dots and dashes, but the powder in the receiver, once polarized, remains polarized. To get over this obstacle, a tiny hammer is so arranged that, the moment a current passes through the tube, the hammer taps the side of the tube and depolarizes the powder ready for the next signal.

There is nothing in common between ethereal or wireless telegraphy and telegraphy by induction; the phenomena are wholly distinct. The Hertzian radiance is akin to light, and the polarization of the powder in the receiver finds its analogue in the molecular change which is wrought by light in a sensitized plate.

DIRECT CONVERSION OF HEAT INTO ELECTRICITY.

Mr. H. Barringer Cox lately delivered a lecture before the New York Electrical Society, on the direct conversion of heat into electricity. The lecturer has recently commenced in England the manufacture of thermopiles on a commercial scale. These thermopiles are designed to give a large current output without regard to voltage, and with the least possible expenditure of heat. Another important feature of the pile is the peculiar construction of the junction of the members of the elements, by which rapid deterioration at the junction is avoided.

The element is formed of a casting composed of an alloy of antimony 2 parts, zinc 1 part, and a thin strip of copper connecting the inner end of one casting with the outer end of another. The junction is effected by casting the alloy on the ends of the copper strips at a high temperature and under pressure, thus causing the alloy to unite with the copper, forming a graduated alloy without any line of demarkation between the copper and the alloy.

In the ordinary thermopile the junction is at the surface, and the transmission from metal to metal is abrupt. This form has been considered very effective. Mr. Cox has found that this is a mistake, and that by utilizing the graduated junction according to his invention, most of the imperfections of the thermopile are avoided.

PAINT AS A PROTECTION TO METALLIC STRUCTURES.

The Department of Public Works of New York City is about to carry out a test of the preserving qualities of various kinds of paint which will be of the greatest interest to all engineers and builders, and should provide them with some much needed data. The experiments are to be made on a massive steel viaduct which carries One Hundred and Fifty-fifth Street across the elevated tracks of the Manhattan Railway Company. The test is to be carried out in a thoroughly scientific and practical manner, and great care will be taken to shut out any disturbing element which might affect the value of the results. A tight board roof will be built beneath the viaduct to shield it from the smoke of the locomotives. The first operation will be to clean off all the old paint and rust by means of the sand blast, and this will be done until the surface of the metal presents a clean and bright appearance. The paint will be put on within three hours from the time the cleaning is finished.

The various manufacturers will be invited to tender bids and provide specimens of their paints, and these samples will be used in painting the structure. The precautions which are being taken will insure that the different varieties of paints will have the same opportunities to show their good qualities, and the results will be watched with close attention by those who are responsible for the erection and preservation of all classes of structural steel and ironwork.

GREAT PASSENGER STATIONS OF THE UNITED STATES.

The time has gone by when it could be said that the passenger stations of the great American railroad system were unworthy of the size and wealth of roads which they accommodated. It is true that previous to the present decade the provision of terminal accommodation had not kept pace with the extraordinary growth of the railroads, and any visitor to our shores was apt to be greatly disappointed at the insignificant terminal structures through which he was introduced to our world-renowned system of railroads. There was one notable exception, as far as New York was concerned, in the case of the Grand Central station, at Forty-second Street—a building which, after a quarter of a century of existence, still ranks as one of the largest buildings of its kind in the world. The past few years, however, have witnessed the construction of a series of truly magnificent stations, which for size, accommodation, and artistic effect are unrivaled by anything abroad. Among the most notable of these are the Broad Street station of the Pennsylvania Railroad, with its great arched span of 300 feet, total length of 592 feet, and accommodation for 16 tracks. The Philadelphia and Reading Railroad terminal station in the same city is not so wide, being only 260 feet, and it accommodates two tracks less, but it is remarkable for its enormous length of 800 feet. A considerably larger structure is the North Union station at Boston, which covers 23 parallel tracks, is 460 feet wide and 500 feet in length. This, again, is greatly surpassed by the Union station at St. Louis, which easily takes rank as the largest structure of the kind in the world. It is 600 feet in width, 630 feet in length and accommodates 30 tracks. The dimensions given above are for the train sheds alone, and do not include the waiting rooms and office buildings. The St. Louis station, however, will be eclipsed in size by the South Terminal station at Boston, which is to provide for 28 tracks under a roof which will be 650 feet wide and 710 feet long. From these figures it can be seen that it will take 10½ acres to accommodate the train shed alone.