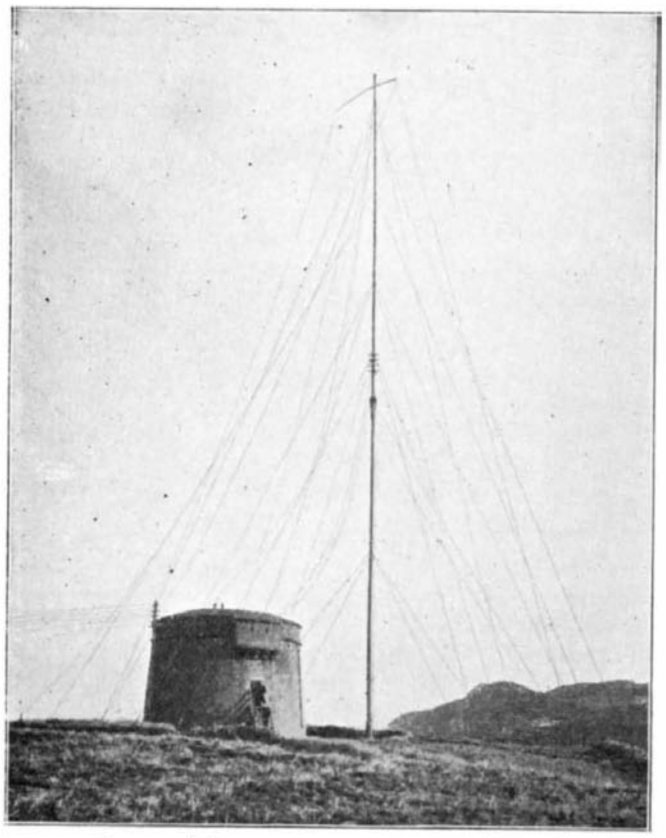
THE DE FOREST WIRELESS TESTS ACROSS THE IRISH CHANNEL.

During the early part of last December, Dr. Lee de Forest, inventor of the De Forest system of wireless telegraphy, conducted, under the auspices of the British post office, a series of experiments with his system between Holyhead and Howth. As briefly described in the SCIENTIFIC AMERICAN at the time, these experiments were very successful. We are now enabled to



HOWTH STATION OF THE DE FOREST SYSTEM INSTALLED IN AN OLD MARTELLO TOWER.

give our readers a complete description of the apparatus used at these tests, together with interesting photographs of the stations. The distance in a direct line between the two stations is 64 miles. At Howth the apparatus was installed in the old Martello tower, at present used as a cable station, the government mast, 120 feet high, being utilized for the erection of the aerials. At Holyhead the apparatus was installed at the top of a cliff, 400 feet above sea level, where a mast 180 feet high was used for supporting the antenna. One would naturally suppose that at such a height ideal conditions for wireless communication would be afforded. This, however, was not the case, for the composition of the cliff was of such a nature as to afford a very poor ground. For this reason the successful results of the experiments deserve all the more credit, for communication between the stations was maintained with practically free Hertzian waves, that is, the waves were not attended with the usual earth currents.

The accompanying diagrams illustrate the connections of the transmitting and receiving apparatus used at each station. Power was derived from a 3-horse-power petrol engine, coupled to a 1-kilowatt, 500-volt, alternating generator, operating at a frequency of fifty cycles. This current was not taken directly into the transmitting system, but supplied the latter through a one-to-one transformer *A*, the purpose of which was to steady the load and prevent injury to the generator from induced high potential caused by static discharges. From the secondary of the transformer, the current passed through a switch *B*, transmitting key *C*, regulator *D*, to the primary of the step-up transformer *E*. The regulator *D*, which is termed a "reactance regulator," provided a means for choking down the energy in the circuit in case it rose to such a point as to form an arc across the spark gap. The transformer *E* raised the potential from 500 volts in the primary to 20,000 volts in the secondary, and current at this pressure was conducted to the spark gap *G*, through a helix *F*. Connected in shunt with the circuit were a series of 12 Leyden jars. Dr. De Forest has discovered that the relative positions of the jars largely affect their efficiency. The best arrangement is to place the jars in a circle; but, for the sake of economizing space, the usual practice was followed of placing them in four rows of three jars each, and connecting them up in two parallel sets of six jars each. With this arrangement, the jars had a total capacity of 0.006 microfarad. The helix *F* was made of ¼-inch copper tube, coiled in a spiral 18 inches in diameter. This formed a cage about the spark gap. The self-induction of this helix, which could be varied by means of a movable contact, was utilized to obtain an approximate syntony of the system. Owing to the high frequency of the oscillations, a very slight movement of the contact sufficed to produce a marked effect upon the waves emitted.

The aerials were connected to the oscillating circuit in a very ingenious manner, as shown at *H*. It will be observed that the antenna comprised five wires, secured at the top in an ebonite insulator and separated midway of their length by a rope spreader held taut by guy ropes. Four of the antenna wires were connected in parallel, leaving a single wire at the right. Two spark gaps, each 1-32 inch in length, were formed between these wires and the terminal of the oscillating helix. The high potential of the transmitting system sufficed to bridge these small gaps, but they acted as insulators for the receiving circuit. The latter was attached to the single strand of the antenna. The receiving circuit may be traced in Fig. 2 as passing through switch *B*, adjustable inductance *K L*, adjustable capacity *N*, responder *O*, and back through *M*, switch, *B*, and condenser *J* to the earth. The responder *O*, which was used at these tests, differs from the type heretofore used, but owing to the fact that patents on the improvements are not yet secured, we are unable to give details of its operation. In general, however, it works on the same principle as the original responder invented by Dr. de Forest. This, our readers will remember, was an electrolytic device, which is self-restoring on reception of the Hertzian waves. The local receiving circuit included a potentiometer *R*, and the signals were produced in the telephone *P*. In tuning up the receiving system the inductance *K L* and capacity *N* were adjusted to syntony with the transmitted waves.

While Dr. de Forest does not claim absolute secrecy by means of syntony, yet his success in tuning the two stations is indicated by the fact that after the first day's experiments his instruments were not in the least affected by the Marconi station which was operating three miles away.

During the course of the experiments the number of wires in the antenna was gradually cut down until but two remained, and with these communication between the De Forest stations was successfully maintained, though the sounds produced in the telephone were rather weak.

The sensitiveness of the system is shown by the fact that at one time the engine at Holyhead slowed down, diminishing the frequency of the transmitting spark. This was at once detected by the operator at Howth, who telegraphed back: "You have my sympathy. I hear your engine slowing down."

Those who witnessed the experiments were surprised

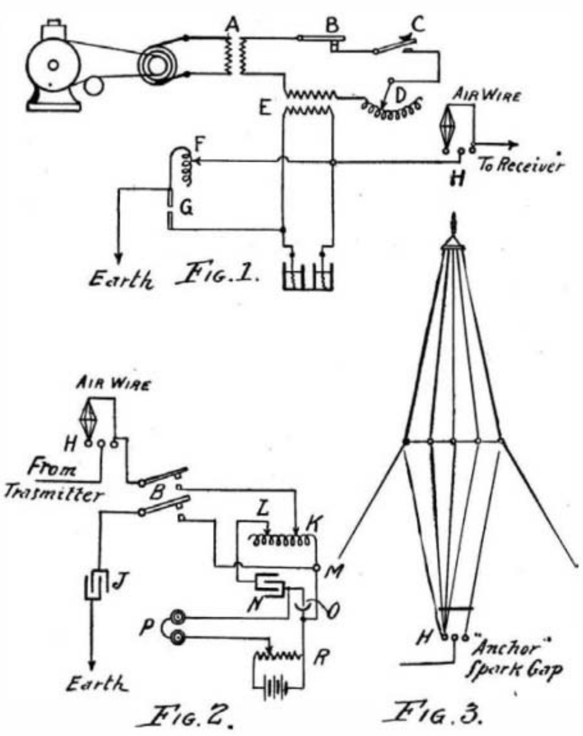


DIAGRAM SHOWING CONNECTIONS OF RECEIVING AND TRANSMITTING APPARATUS.

at the high speed at which messages were sent, the normal rate being about thirty words a minute.

The Union Engineering Club.

Two new club buildings will be erected in West Thirty-ninth Street, New York City, to be known as the Union Engineering Building. In these structures the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Society of Mining Engineers, and the American Society of Electrical Engineers will be housed.

These societies, with the exception of the Society of Civil Engineers, have formally agreed to unite under one roof. It is expected that the last-named society will within the next two weeks pass the favorable vote necessary to this union. The plans for this clubhouse are not yet complete, but each of these technical societies will have a floor for its exclusive use, including a small hall for special business meetings. There will also be provided a large hall for union meetings of all these societies.

Mr. Carnegie, in his letter of February 14, 1902, to the societies, declared: "It will give me great pleasure to give, say, $1,000,000, to erect a suitable union building for you all, as the same may be needed."

The total cost of these two clubhouses will be, it is said, over $2,000,000.

A new long-range torpedo has been invented by a young engineer in the torpedo factory at Fiume, Austria. The weapon measures 23 feet in length, is very slender but strongly built, and can be discharged with accuracy to a distance of 3,800 yards. Experiments have been carried out with this torpedo before the Austrian government with conspicuous success, and its capabilities are to be demonstrated at an exhibition before representatives of all the powers.

STATION AT HOLYHEAD FROM WHICH DE FOREST WIRELESS TESTS ACROSS THE IRISH CHANNEL WERE CONDUCTED.