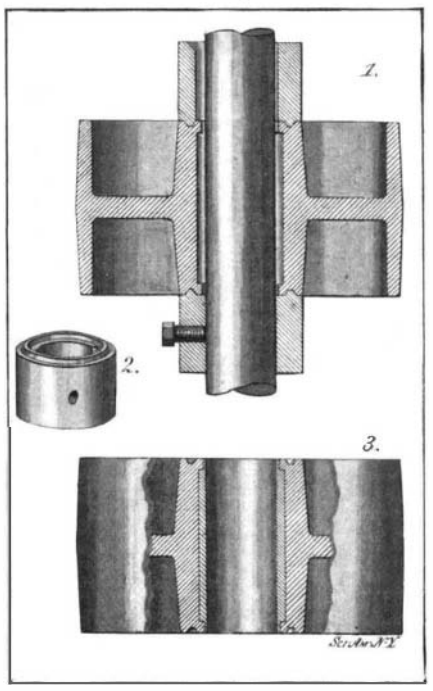
BABBITTING DEVICE.

Our readers are well aware of the fact that in order to provide a better wearing surface in the hubs of loose pulleys, idlers, etc., Babbitt metal bushings are often used. Since this metal does not appreciably contract or expand when subjected to varying temperatures, the bushings are ordinarily cast in the hub about the shaft, and used without subsequent turning or boring. The most important requirement of this process is that the pulley be held in proper central position relative to the core or shaft. Provision for this is made in a device invented by Mr. John N. Schumacher, of 634 Washburn Avenue, Chicago, Ill. This device is illustrated in the accompanying engravings. Fig. 1 shows the pulley and shaft held in proper position preparatory to the babbitting process. Two collars are fitted on the shaft, one at each end of the hub, and are securely held in place by set screws, as shown. Each collar is provided at one end with an annular rib adapted to fit snugly into a corresponding recess or seat in the hub of the pulley. The upper collar, which is shown in Fig. 2, is provided with a pouring channel leading to the bearing recess in the hub, and a vent channel is formed in the collar on the opposite side. With the several parts in the position shown in Fig. 1, the Babbitt metal is poured in through the pouring channel, then it flows into and fills the recess around the shaft, while the lower collar prevents the escape of the metal from the recess. Air can escape from the recess through the air vent, so that the metal forms a homogeneous bearing, as shown in Fig. 3, thereby avoiding undesirable blowholes. By having the ridges on the collars engaging seats on the ends of the hub, the latter is held in perfectly true position relative to the shaft.



BABBITTING DEVICE.

THE FESSENDEN WIRELESS TELEGRAPH SYSTEM.

BY A. FREDERICK COLLINS.

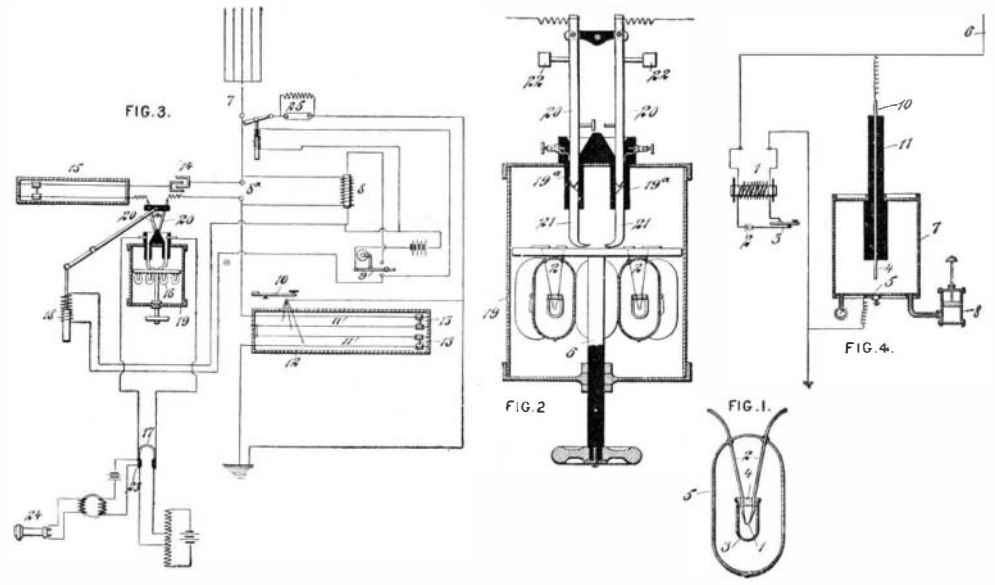
The long and thorough course of investigation instituted by Prof. Reginald A. Fessenden, during his work for the U. S. Weather Bureau, in an attempt to find a detector of electric waves more sensitive, accurate, and rapid than the ordinary coherer, has culminated in a new system of wireless telegraphy.

The disadvantages of the ordinary coherer are manifold and have been discussed in all their phases during the past two years, while its good features may be summed up in the statement that it combines, to a remarkable extent, a certain degree of sensitiveness with a sufficient range of variability of resistance to operate a relay; but for rapid telegraphy, syntonic telegraphy, and telegraphy over extreme distances, in this very quality lies its greatest fault.

The magnetic effect of electric oscillations on a bar of iron or steel has been known a great many years, and based on this principle of magnetic permeability Fessenden designed his first detector, as described in the SCIENTIFIC AMERICAN of October 4, 1902, and for which the inventor obtained letters patent; but his *chef-d'œuvre* is a detector at once simple in construction, sensitive to feeble radiation, and rapid in its self-restoring qualities.

The detector is shown diagrammatically in Fig. 1, and is called a "current-actuated, wire-responsive device." It consists of a silver wire one-tenth of an inch in diameter and having a platinum core about three one-thousandths of an inch in diameter, drawn down until the external diameter of the silver wire is about two one-thousandths of an inch in diameter and the platinum wire is about six one-hundred-thousandths of an inch in diameter.

A short piece of the platinum-cored wire is bent into a U-shaped loop, Fig. 1, and its terminals attached to the leading-in wire, 2; the tip of the U-loop is immersed in nitric acid and the silver dissolved away from the platinum, the object of this procedure being to reduce its heating capacity to the lowest possible value. Further, to facilitate the radiation of heat, the detector is inclosed in a silver shell, and this is held in position by means of the glass brace, 4, attached to the leading-in wires. The shell, 3, in turn is inclosed in the glass bulb, 5, which is finally exhausted. The resistance of the U-loop detector varies from 30 to 600 ohms, and is exceedingly low considering the enormous resistance of a coherer. The device shown in Fig. 2 is arranged to hold eight detectors, so that in case one is burned out or otherwise disabled, a new detector is brought into service by merely turning the key, 6. In tuning this system to its complementary station, Fessenden does not employ the usual capacities in the form of condensers or inductances in the form of coils; by arranging a number of parallel wires in a box containing sufficient oil to cover them, and by means of a sliding contact, the capacity and inductance may be proportioned so as to obtain a sine wave, which is necessary to give good resonance effects. The complete sending and receiving system is shown in the diagram, Fig. 3, and the photographs, Figs. 4 and 5. In the diagram, 7 represents the antenna, having a large capacity, i.e., formed of a number of vertical wires in which the ratio of inductance capacity is smaller than in a single wire; 8 is the induction coil generator, having its spark-gap at 8*a*; a switch, 9, is arranged in the circuit of the induction in the place of the key ordinarily employed to make and break the primary current. The key, 10, throws the open-oscillator circuit out of tune when messages are being transmitted, for the coil is then kept continuously in action. This is done by means of the finger with which the key 4 is provided, and which is pressed into contact with one of the wires, 11, thus forming a shunt around a portion of the tuning-grid, 12; the contacts, 13 13, are movable and connect each pair of wires, so that the ratio of capacity to inductance per unit of length is the same, as nearly as possible, for all portions of the oscillator circuit. These movable contacts consist of bars having grooved wheels, the former being mounted in spring arms, shown in Fig. 3, fastened to adjusting blocks, and by this arrangement the contacts are held into electrical connection with the wires, 11, 11.



DIAGRAMS ILLUSTRATING THE FESSENDEN SYSTEM OF WIRELESS TELEGRAPHY.

The receiving circuit includes the antenna, 7, the condenser, 14, the tuning grid, 15, constructed upon the same principle as that described in connection with the transmission circuits, and the detector, 16; and these are connected in series with one another, but in shunt with the spark-gap, as shown in Fig. 3.

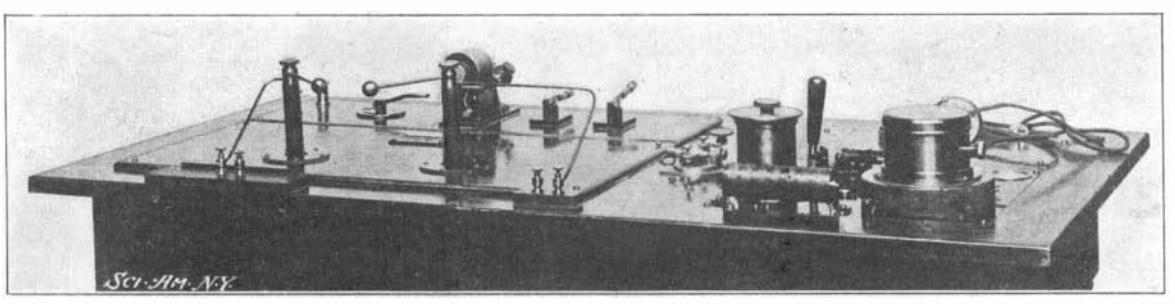
Instead of the usual Morse register, a pair of head telephones, 17, is employed to translate the received impulses into the regulation dots and dashes. In the circuit with the receiver are two cells having a slightly different E. M. F., and connected to oppose each other.

These constitute the essential parts of the Fessenden system, and all other devices shown are auxiliary ones for the purpose of protecting the instruments from lightning discharges, to facilitate the switching of currents, or for the purpose of obtaining call signals. For instance, the detector, 16, is cut in or out of the receiving circuit by the operation of a solenoid, 18. The turntable carrying the detectors is inclosed in a metal case, 19, Figs. 2 and 3, the leading-in wires passing through tubes of insulite, 19*a*; the rods, 20, are movable and extend through the insulating tubes and form contacts with the rods, 21. The weights, 22, are used to draw the contacts, 21 and 20, into connection when the solenoid is rendered inactive.

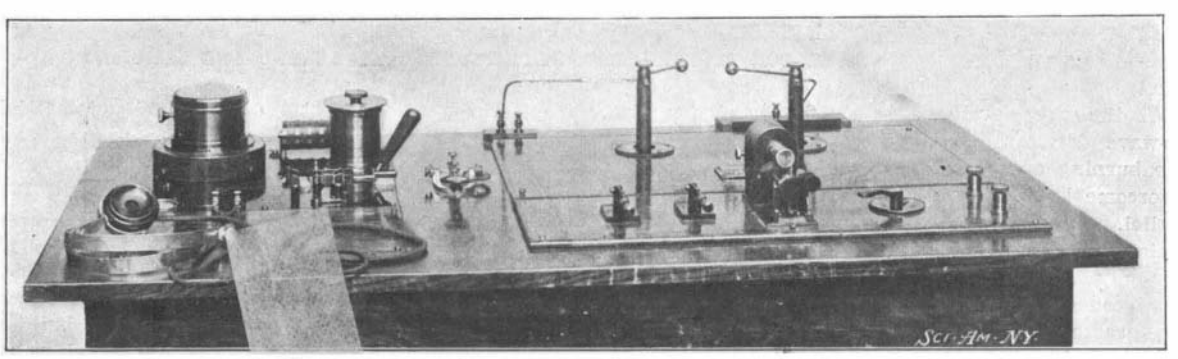
The detector employed for calling is made less sensitive than those for receiving messages; this is done by making the loop, 14, longer and thicker than usual, so that it will retain its heat longer, when the effect of the oscillations will be rendered cumulative, and the call may then be made by telephone, ballistic galvanometer bell, or other responsive device. To render the call more decisive, a microphonic contact, 23, i. e., an appliance on the coherer principle, with the transformer, 33, and an indicating mechanism, 24, is inclosed in the circuit.

Fessenden employs a lightning arrester, formed of filings made from an alloy of 95 per cent of gold and 5 per cent bismuth, placed between terminal conductor plugs ⅛-inch in diameter; it is represented in 25, Fig. 3. To further exclude extraneous wires and the potential differences created between the antenna and the earth, and to which are due false signals, especially in this type of apparatus, the system of circuits shown in Fig. 3 is used. It consists of two circuits, each of which is tuned to the other as well as with the apparatus of its complementary station. When sending, the two circuits are operated in parallel.

The accompanying photographs show the practical construction of the Fessenden apparatus, and are front and rear views respectively. Much of the apparatus, including both the transmitter and the receiver, is incased in the table; thus the induction coil is hidden from view,



FESSENDEN COMBINED SENDING AND RECEIVING APPARATUS, REAR VIEW.



FRONT VIEW OF THE FESSENDEN COMBINED SENDING AND RECEIVING APPARATUS.