

APPLICATION FILED AUG. 26, 1904.

Patented Feb. 2, 1915.

2 SHEETS—SHEET 1.



WITNESSES:
J. Herbert Bradley.
Frieda E. Wolff.

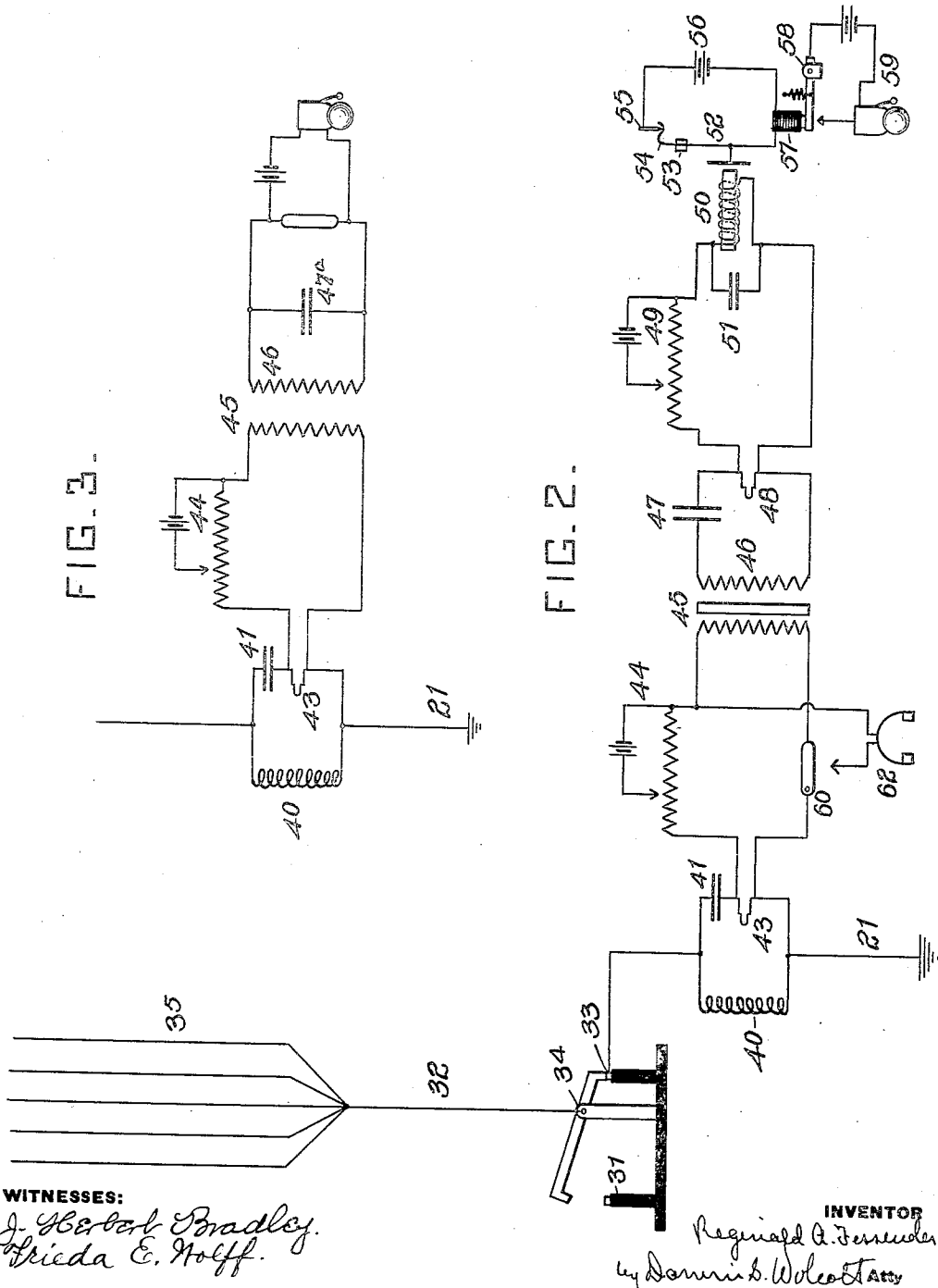
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R. A. FESSENDEN.
 SENDING MECHANISM FOR ELECTROMAGNETIC WAVES.
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1,126,966.

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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

REGINALD A. FESSENDEN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO SAMUEL M. KINTNER, OF PITTSBURGH, PENNSYLVANIA,
AND HALSEY M. BARRETT, OF BLOOMFIELD, NEW JERSEY, RECEIVERS.

SENDING MECHANISM FOR ELECTROMAGNETIC WAVES.

1,126,966.

Specification of Letters Patent.

Patented Feb. 2, 1915.

Application filed August 26, 1904. Serial No. 222,302.

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Sending Mechanism for Electromagnetic Waves, of which the following is a specification.

This invention relates more particularly to complete generating, sending and receiving outfit necessary for a wireless telegraph station.

It comprises many new and useful separate details as well as the organization and combination of said details in a complete practical outfit for a station of the class described.

In the annexed drawings Figures 1 and 2 are views partly in diagram showing respectively the transmitting and receiving sides of the system. The two figures are really a single view divided for convenience and parts common to both sides of the system are shown in both views. Fig. 3 is a modified arrangement of call.

Power is furnished by the explosive motor 1 provided with a sparking dynamo 2 connected by lead covered wires 3, 4, with the spark coil 5 which in turn is connected by similar wires with the spark plug 8. The spark coil connections are armored in this way to prevent stray energy excited by the violent internal reactions of this part of the plant from reaching the wave detector or its connection during receiving.

The motor 1 is connected by belt 9 to the alternator 10 which supplies current to the transformer 15. The flow of current to said transformer is controlled by the resistance 11 and rheostat 11^a. The resistance 11 is made great enough to cut down the current below the point at which the spark gap will break down so that when said resistance 11 is in series with the transformer no oscillations take place and no waves are radiated. The signaling is done by short circuiting said resistance by means of a relay 12 controlled by the makes and breaks of the sending instrument. This may be a Morse key but I prefer to use a typewriter having an automatic transmitting attachment as for instance, the well-known Yettman typewriter transmitter, the transmitter part of

which I have indicated diagrammatically at 13, the typewriting portion of the same being indicated at 14. A voltmeter and an ammeter conveniently placed in view of the operator indicate the conditions of this generator circuit.

The current is transformed to a voltage of about 25000 and passes from the transformer through heavy choke coil 16 to the condenser 18 forming part of a close circuit tuned as diagrammatically indicated at 27 to the frequency of the radiating circuit with which it is in parallel. These oscillatory circuits are proportioned and adjusted in any of the ways described in my prior patents as for instance 706,735 of August 12th, 1902. The choke coils 16, 17, are proportioned and designed to offer a maximum impedance to the oscillations of the condenser circuit in order that they may be kept from running back into the transformer and damaging the latter, as, for instance, by breaking down the insulation.

The discharge gap common to both the oscillator and radiator circuit is a multiple arrangement comprising discharge terminals 21, 22, of comparatively small cross section and an interposed comparatively massive disk 23. The spark gap is closed in and muffled by a case 24, preferably two concentric spaced jars of glass, or at least provided with a transparent window. Steadiness and efficiency of the spark gap discharge is insured by ventilation through an air inlet 26 and outlet 25. 26 and 26 preferably lead from and to points outside of the station. An additional advantage of this arrangement is that all gaseous products of the discharge are carried outside of the operating room.

Leading from the terminals of the spark gap are ground connection 61 and aerial connection 28. In the aerial connection I place in shunt to a coil 29 of small inductance, a micrometer spark gap 30 for use as an indicator of the oscillations of the radiating circuit or sending conductor. It serves many of the purposes and is much cheaper than a hot wire ammeter would be, though the latter may be substituted where desired. A key α which obviously may be a typewriter key, may be bridged around inductance 29 and used to change the tune without interrupting the sparks.

From the micrometer spark gap indicator the sending circuit is connected to a switch contact 31 preferably of spring material thence through the knife contact of a tilting switch 34 from the pivot of which leads the connection 32 to the radiator 35. The other end of tilting lever switch 34 is adapted when tilted the opposite way to connect the aerial 35 with the receiving contact 33 whence as shown in Fig. 2 is led a connection through the receiving circuit 40, 41, to the ground 21. The received oscillations built up by resonance are thus accumulated and finally dissipated as heat in the solid wire barretter 43. This receiver as fully explained in my prior Patents Numbers 706,742 August 12th, 1902 and 706,744 August 12th, 1902 is cumulatively acting and gives a single maximum impulse or effect for each complete wave train which represents the sum of the energies of all the waves of one wave train. As will be obvious the flow from the battery and potentiometer 44 fluctuates once for each wave train and these wave trains occur twice for each period of the generator 10. The fluctuations are uni-directional but after passing through the transformer 45, 46, the fluctuations appear as complete alternations in the secondary circuits 46, 47. These circuits are therefore tuned to a frequency twice that of the generator.

The resultant currents in 46, 47 may be caused to act upon a second barretter 48, to produce still more magnified fluctuations of battery current in 49.

In this latter circuit is a telephone 50 which may be shunted by a properly proportioned condenser 51 designed to balance the reactance of the coil 50. The diaphragm of telephone 50 supports a very light aluminum wire 52 which in turn supports one end of a steel needle 55. This arrangement may be mechanically tuned to the frequency of the wave train by sliding weight 53. The needle 55 is carefully adjusted so as to press lightly against the aluminum wire support to form a sensitive coherer contact there-

with. A battery 56 is arranged to supply electrical pressure to said contact and the pressure is adjusted so that the device will be normally cohered. This circuit is in series with an electro-magnet 57 which holds open a carefully balanced relay switch 58 controlling the circuit of a buzzer or bell 59. These variously cumulatively acting devices each building up in turn cause regular vibration of diaphragm of the telephone 50 and these acting on the reed 52, 53, tuned to the same period ultimately produce sufficient vibration of the latter to cause decoherence of the contact 54, 55, opening the circuit of battery 56 and sounding the call 59. In answer the operator may throw the switch 60 to cut in the receiving telephone 62 and to cut out the call.

46, 47^a in Fig. 3 are resonant to the group frequency and a coherer is arranged to be operated by the resonant rise of potential and it in turn controls a battery circuit which operates a call.

The tuned reed and coherer arrangement may be substituted for the transformer 45 in which case the secondary circuits are dispensed with.

I claim herein as my invention:

1. Apparatus for wireless telegraphy including a generator and transmitting apparatus, the latter including a typewriter and simultaneously operating code commutator, a resistance in the system, and a short circuit around the resistance, an electromagnetic circuit closer, for closing said circuit, and being controlled by said commutator.

2. In wireless telegraphy apparatus, the combination with a sending conductor of a small inductance in series therewith and a micrometer spark gap shunting said inductance, substantially as described.

In witness whereof I hereunto set my signature in the presence of two subscribing witnesses, April 20th 1904.

REGINALD A. FESSENDEN.

Witnesses:

ALICE E. HARWOOD,
JESSIE E. BENT.