

R. A. FESSENDEN.
 MEANS FOR THE TRANSMISSION OF ENERGY BY ELECTROMAGNETIC WAVES.
 APPLICATION FILED DEC. 19, 1906.

1,015,881.

Patented Jan. 30, 1912.

3 SHEETS—SHEET 1.

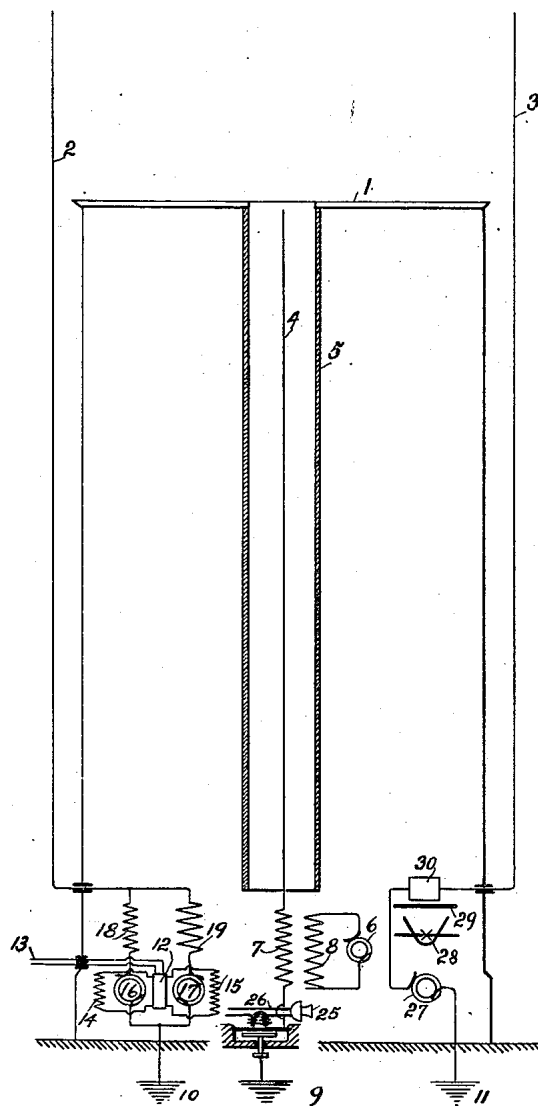


Fig. 1.

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William D. Hall

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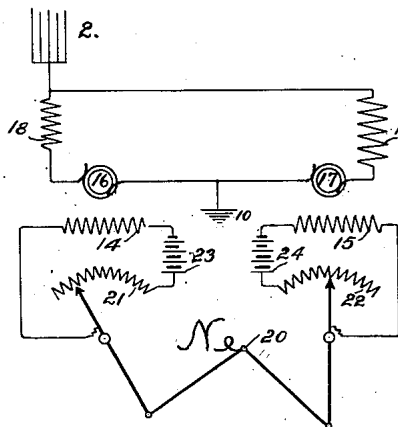


Fig. 2.

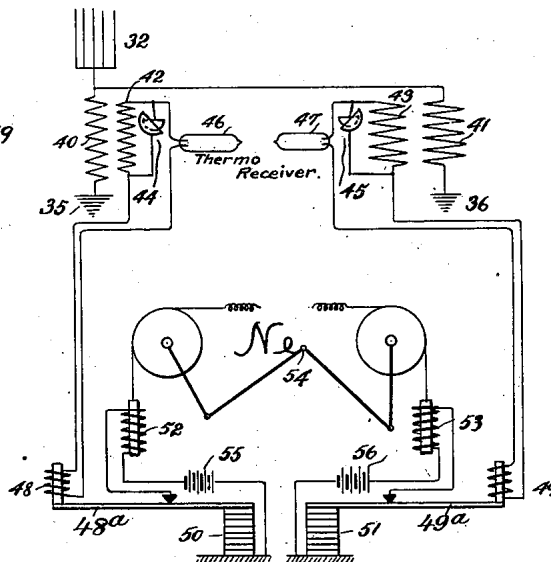


Fig. 3.

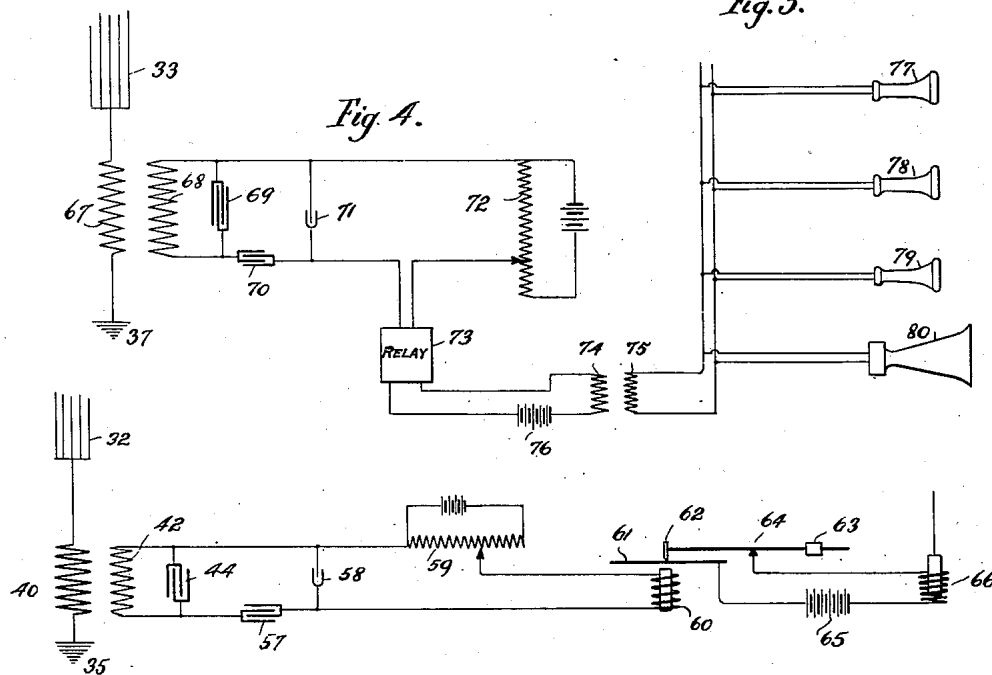


Fig. 5.

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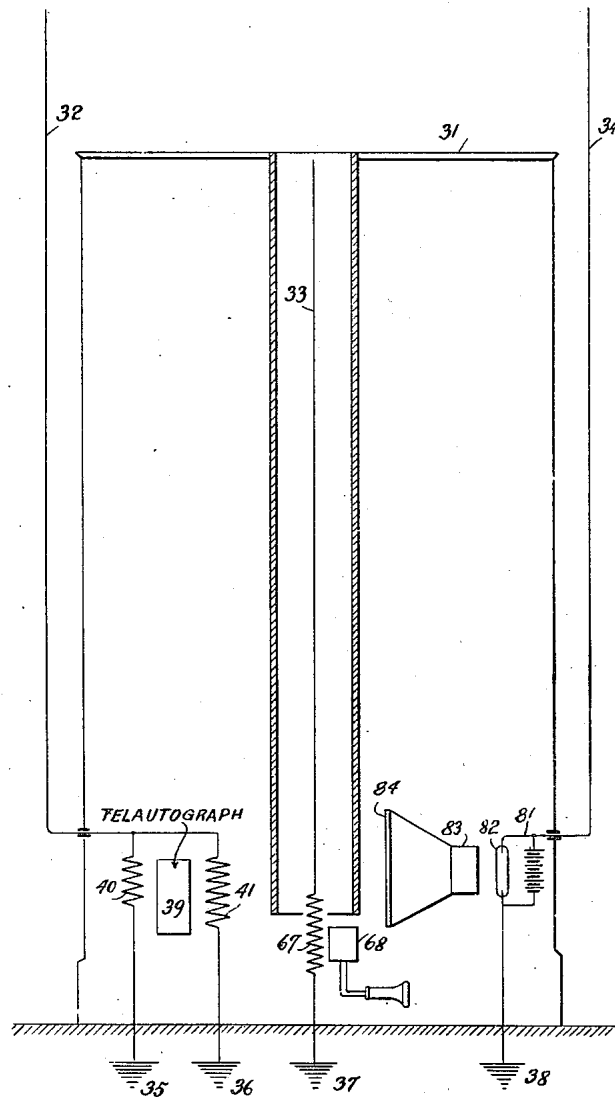


Fig. 6.

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UNITED STATES PATENT OFFICE.

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MEANS FOR THE TRANSMISSION OF ENERGY BY ELECTROMAGNETIC WAVES.

1,015,881.

Specification of Letters Patent.

Patented Jan. 30, 1912.

Application filed December 19, 1906. Serial No. 348,660.

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Means for the Transmission of Energy by Electromagnetic Waves, of which the following is a specification.

My invention relates to the art of transmitting by electromagnetic waves sounds, writings and pictures from a central station to a number of subscribers.

In the accompanying drawings forming a part of this specification, Figure 1 shows diagrammatically apparatus for transmitting writings, sounds, either speech or music and for transmitting pictures. Fig. 2 shows an apparatus for transmitting writing, Figs. 3 and 5 show in detail apparatus for receiving the writing. Fig. 4 shows apparatus for receiving the sounds. Fig. 6 shows diagrammatically an office building arranged for receiving the writings, sounds and pictures.

In the practice of my invention I construct a central distributing station shown in Fig. 1 where 1 is a structure which may be an office building and 2, 3 and 4 are antennæ. The antennæ 2 and 3 are constructed in the fashion well known in the art. The antenna 4 is contained in a wholly or partly conducting tube 5 which may for example be a portion of an elevator shaft or an air shaft. The antenna 4 is supported in this shaft and is connected to a source of high frequency oscillations 6 by means of the transformer whose coils are 7 and 8, and the antenna 4 is grounded at 9. When high frequency currents are caused to flow into the antenna 4, if its electrical constants are properly proportioned the whole office building 1 may be caused to act as an antenna and to radiate out electromagnetic waves very efficiently. There may, of course, be two or more such antennæ in a single office building and the office building may be caused to emit waves of more than one frequency.

The antenna 2 is grounded at 10 and the antenna 3 is grounded at 11.

For the transmission of writing, an apparatus which may conveniently be of the Grey tel-autograph type shown at 12 and in Fig. 2 is used. This acts, either by manual impulses in a well known way or by

electrical impulses transmitted over the line 13 to affect the strength of the fields 14, 15 of the high frequency alternators 16, 17. These alternators 16, 17 are of different frequencies and are tuned to the compound antenna 2 by means of the inductances 18, 19. The fields of the alternators 16, 17 may be wound if desired differentially.

As shown in Fig. 2, in detail 16, 17 are the high frequency alternators of Fig. 1, 14, 15 the fields of the alternators, 18, 19 the tuning inductances and 2 the antenna. The motion of the writing point 20, by changing the resistances 21, 22 varies the currents flowing in the fields of the alternators from sources 23, 24, and thereby the strength of the emitted waves. Many modifications may be employed, for example the fields may be wound differentially or the resistances 21, 22 may be placed in the high frequency circuits instead of in the field circuits.

For transmitting speech or music the antenna 4 is used. This is operatively connected as mentioned above to the high frequency dynamo 6 through the transformer 7, 8. 25 is a telephone relay transmitter having a mouth piece for local talking and also being capable of operation from a distance through the circuit 26. The operation is well-known. (See Fig. 6 of my United States Patent No. 793,649.)

In Fig. 1 the antenna 3 is arranged to transmit waves representing pictures. This device comprises a high frequency alternator 27 to generate the waves, and by means of a light and projector 28, the picture to be sent is projected from the negative 29 on to the instrument 30. This is a high frequency commutator having numerous sections connected to a series of selenium cells, so that when the cells are affected the character of the waves is altered. The cells are arranged after the fashion of the grating of a half tone plate, and the aggregate character of the waves is governed according to the character and position of the light projected upon the grating of cells, which light is of course in turn governed by the picture to be transmitted. The particular construction of this device is not essential to my invention herein claimed.

Fig. 6 shows a subscriber's station. 31 is an office building, 32, 33, 34 being antennæ

respectively grounded at 35, 36, 37, 38. For receiving writing for example stock quotations, 39 is a writing apparatus, which may be of the Grey tel-autograph type, connected to the antenna 32 through the two primaries 40, 41 as shown in detail in Fig. 3.

In Fig. 3, 32 is the antenna grounded at 35 and 36, 40 and 41 are primaries whose secondaries are 42 and 43. 44 and 45 are variable capacities, 46 and 47 are receivers of any suitable type producing indications by continuous current, for example thermoelectric receivers of tellurium and silicon which furnish their own current, as is well known. 48 and 49 are small plunger magnets which, by means of their supporting lever beams 48^a and 49^a resting on carbon resistances 50 and 51 control the magnets 52 and 53 of the Grey tel-autograph 54. 55 and 56 are local batteries for actuating the tel-autograph.

In operation the waves received affect the instruments 46, 47 so as to produce currents in the coils 48, 49 which fluctuate in accordance with the fluctuations and the stream of waves sent, which in turn of course are varied in consonance with the movements of the writing point 20 of Fig. 2. The writing point 54 of Fig. 3 being governed in its position and motions by the magnets 52, 53, excited by the sources 55, 56, it will be observed that these last mentioned circuits are controlled by changing the resistance of the carbon resistances 50, 51 which in turn are altered in resistance in accordance with the movements of the magnets 48, 49 and thus with the character of the trains of waves transmitted.

The circuits including the antenna 32 and coil 40 on the one hand and the circuit including the antenna and the coil 41 on the other hand are respectively arranged as well known in this art, by tuning to respond to oscillations produced respectively by reason of coils 18, 19 in the sending circuits of Fig. 2.

In Fig. 5 is shown a different method of actuating the tel-autograph magnets. Here 32 is the antenna grounded at 35, 40 the primary of the transformer, 42 the secondary, 44 and 57 condensers, 58 a liquid barretter, 59 a potentiometer, 60 a telephone magnet, 61 a telephone diaphragm, 62 a balanced contact, 63 being a balancing weight and 64 the knife edge, 65 is a local battery and 66 is one of the magnets 52 or 53 of the tel-autograph above described. The received waves causing by their fluctuations a variation in the current at 60, alter the character or mean time of contact at 62.

It is found in practice that the intensity of the local current in the magnet 66 depends upon the intensity of the oscillatory currents received by the antenna 32.

For receiving sounds, the antenna 33 in

Fig. 6 is used. 67 is the primary of a transformer operatively connected to the apparatus 68 which is shown in detail in Fig. 4.

In Fig. 4, 33 is the antenna grounded at 37, 67 is the primary of the transformer, 68 its secondary, 69, 70 are condensers, 71 a receiver, 72 a potentiometer, 73 a telephone relay, 74, 75 are the primary and secondary of a telephone induction coil, 76 a local battery, 77, 78, 79 telephone receivers and 80 a loud speaking telephone.

The telephone receivers and loud speaking telephones are connected in at the office of the subscriber.

The device for receiving pictures is connected with the antenna 34, grounded at 38 and by means of a local battery 81 which excites the vacuum tube 82, the fluctuations or alterations in characteristics of the wave trains received are caused to reproduce the picture on the instrument 83. This is an arrangement of oscillating mirrors which operate upon the principle of persistence of visual impressions, but the particular construction not being a part of the invention here claimed is not described here.

By the above described apparatus I may transmit from a central distributing station all of the news of the day, such as reports and pictures, or music, or conversation to a great many subscribers simultaneously. The transmission of all intelligence appealing to the different senses being accomplished by the agency of electromagnetic waves, which makes it very efficient and economical as will be readily understood. The present application is intended to cover the general system and the transmission of writing by electromagnetic waves, and the transmission of pictures is claimed elsewhere.

What I claim herein is the following:

1. In the art of transmitting intelligence, the combination with a radiating structure for electromagnetic waves, of means to excite the same for radiation of waves representing sound, writing and pictures simultaneously, and a receiving station having means to select the waves of the three kinds and simultaneously reproduce sounds, writing and pictures.

2. The combination with a sending device and a receiving device operated by electromagnetic waves, of means for generating a continuous train of waves and modifying them in groups, representing several kinds of intelligence, and means at the receiving station for selecting the several groups and thereby reproducing several characteristic kinds of intelligence, substantially as described.

3. In the art of distributing intelligence, the combination of a central station having devices for generating a continuous stream of electromagnetic waves, and modifying

them in accordance with speech and handwriting, and a plurality of receiving stations having devices for selecting the said modified waves and reproducing the said speech and writing, substantially as described.

4. In the art of transmitting intelligence, a generating station having a wave emitting device, and generating means associated therewith to effect the emission of a continuous stream of electromagnetic waves, apparatus for modifying said waves in accordance with several forms of the intelligence to be transmitted, and a receiving station having a plurality of receivers, each of which is adapted to respond to the modified waves representing one form of intelligence; substantially as described.

5. Apparatus for transmitting intelligence, comprising a sending antenna, a generator for causing the antenna to emit a continuous stream of electromagnetic

waves, a tel-autograph arranged to modify the action of the generator, a receiving station, and a tel-autograph connected in the receiving circuit of the receiving station, and tuned to respond to the modified impulses produced by the tel-autograph at the sending station.

6. In apparatus for transmitting of energy, a building having an interior conducting shaft, a wave generator within the building, and a conductor extending upwardly from the wave generator through the shaft whereby both the shaft and the conductor form part of the antenna; substantially as described.

Signed at Brant Rock, in the county of Plymouth and State of Massachusetts this 17th day of December A. D. 1906.

REGINALD A. FESSENDEN.

Witnesses:

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