F. G. SARGENT.

WIRELESS TELEGRAPHY.

APPLICATION FILED NOV. 9, 1905.

957,001.

Patented May 3, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

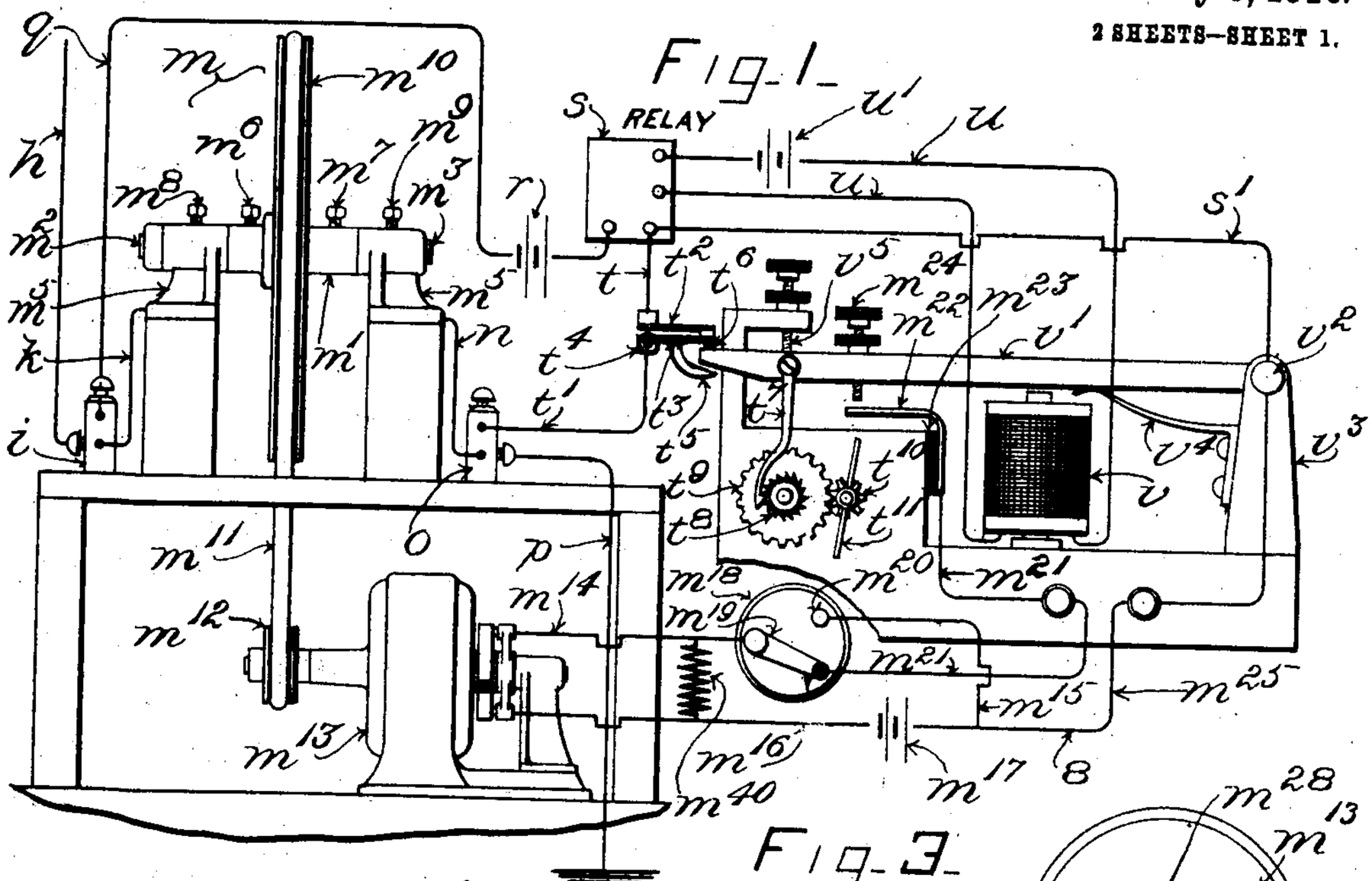


Fig. 2.

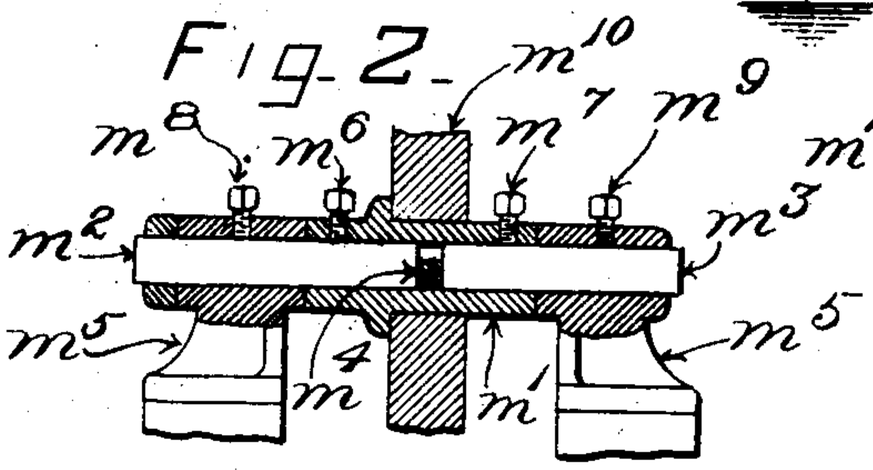


Fig. 3.

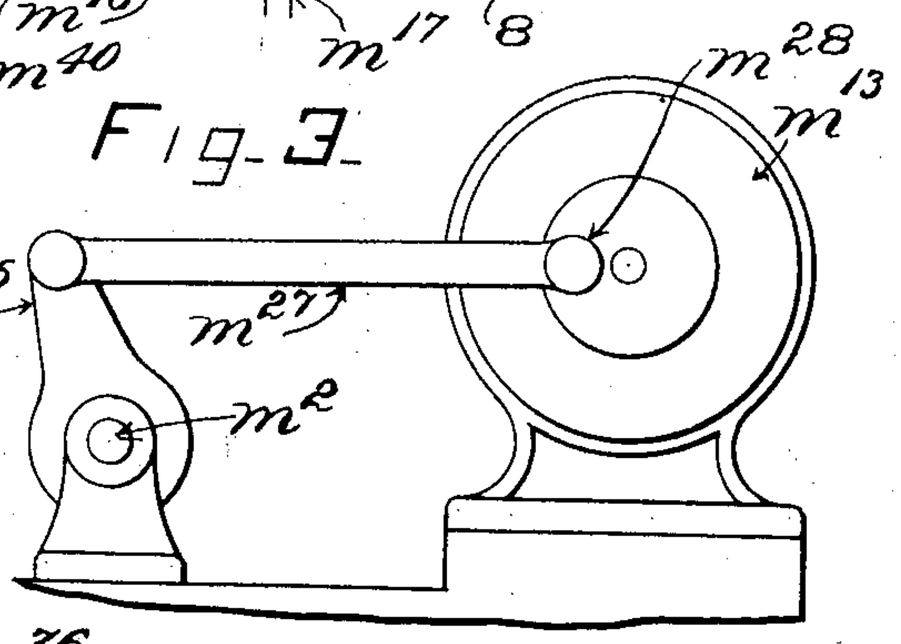


Fig. 4.

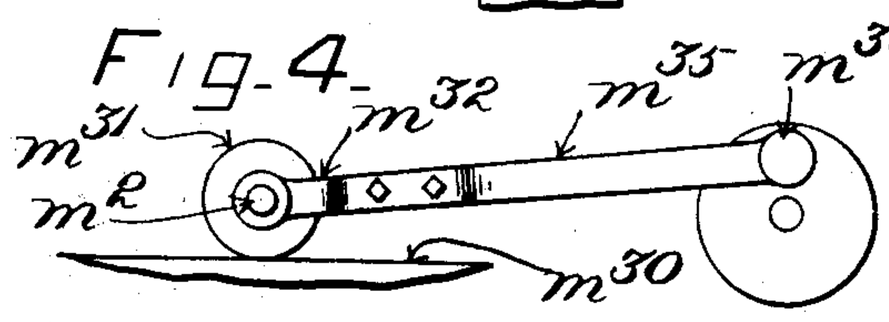
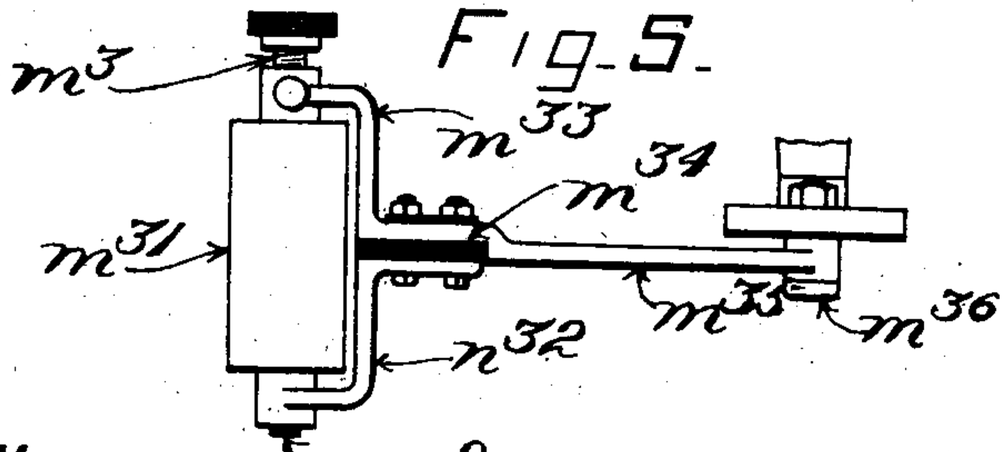


Fig. 5.



WITNESSES.

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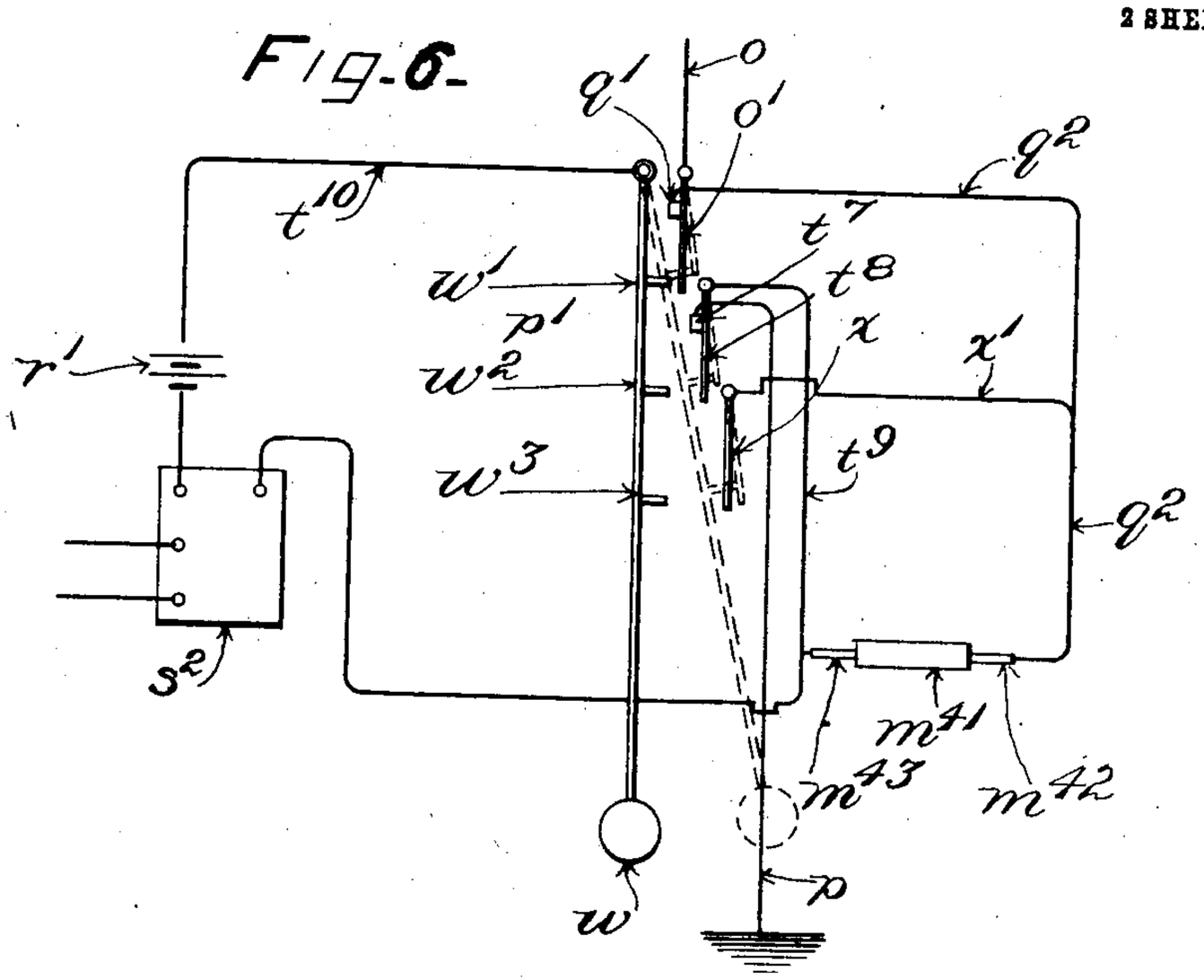
2 SHEETS—SHEET 2.

Fig. 6.



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UNITED STATES PATENT OFFICE.

FREDERICK G. SARGENT, OF GRANITEVILLE, MASSACHUSETTS.

WIRELESS TELEGRAPHY.

957,001. Specification of Letters Patent. **Patented May 3, 1910.**

Application filed November 9, 1905. Serial No. 286,456.

To all whom it may concern:

Be it known that I, FREDERICK G. SARGENT, a citizen of the United States, residing at Graniteville, in the county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Wireless Telegraphy, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a diagram of a receiving station containing embodiments of the features of the invention. Fig. 2 is a sectional view of the coherer of Fig. 1, and its supports. Fig. 3 shows in side elevation a modified coherer and means of effecting de-coherence. Fig. 4 shows in side elevation a further modification. Fig. 5 is a plan view of certain parts shown in Fig. 4. Fig. 6 is a diagram of portion of a modified receiving station.

In the diagram (Fig. 1) of a receiving station, *h* is the aerial, *i* a post with which the aerial is connected, *k* a wire leading from post *i* to the coherer, the latter being indicated at *m*. At *n* is indicated a wire leading from the coherer to a post *o*, and at *p* a ground wire which is connected with the said post *o*. At *q* is a wire leading from the post *i* to the battery *r* and thence to the relay *s*, and at *t*, *t'*, are wires extending from the relay to post *o*. At *u* is the line of the relay circuit, at *u'* a battery in such line, at *v* the coil or magnet of a receiving or signaling instrument, at *v'* a vibrator constituting or carrying the armature of the said coil or electro-magnet and pivotally mounted at v^2 upon post v^3, at v^4 a spring acting upon the said vibrator in opposition to the said coil or electro-magnet, and at v^5 a fixed contact-screw with which the said vibrator engages under the action of the spring v^4.

Decoherence is effected by communicating a turning or rotary motion to the coherer or one or more of its parts. Having reference to Figs. 1 and 2, which show a convenient form of coherer adapted to the purposes of the invention, *m'* in such figures is a sleeve or collar of vulcanite or other non-conducting material forming the body of the coherer, and m^2, m^3, are rods of conducting material which extend part-way within the opposite ends of the said sleeve or collar. At m^4, Fig. 2, is represented cohering material which is contained within the interior space of the sleeve or collar between the inner ends of the said rods. The outer portions of the rods project from the opposite ends of the body of the coherer, as shown in Fig. 2, and are entered into sockets or bearings with which fixed supporting standards m^5, m^5, are formed. Thereby the coherer is mounted upon the said fixed standards in the arrangement of coherer which is represented in Figs. 1 and 2. At m^6, m^7, are shown clamping-screws, the threaded stems of which fit screw-threaded holes which are tapped through the shell of the body of the coherer near the opposite ends of the latter, and which are adapted to engage by their inner ends with the portions of the rods m^2, m^3, that extend within the said body. Other clamping-screws m^8, m^9, have the threaded stems thereof fitted within screw-threaded holes which are tapped in the standards m^5, m^5, and are adapted to engage by their inner ends with the portions of the rods m^2, m^3, which enter the sockets or bearings of the said standards. A wheel m^{10} is fixed upon the body of the coherer. To the said wheel is applied the power by which the turning or rotary movement is occasioned. With the construction of coherer shown in Figs. 1 and 2 decoherence may be provided for in several different ways. According to the first method, the clamping-screw m^9 is tightened against the rod m^3 to hold such rod from turning, and the clamping-screw m^6 is tightened against rod m^2 to secure the latter rod and the body of the coherer together so that they shall turn in unison, the clamping-screws m^7 and m^8 being partly withdrawn so as to disengage them from the rods m^2, m^3, leaving the rod m^2 free to turn in the socket or bearing therefor in the corresponding standard m^5, and leaving the body of the coherer free to turn upon the rod m^3. When now, the wheel m^{10} is turned, the body *m'* of the coherer, and the rod m^2, will turn therewith, while rod m^3 will remain stationary. The turning motion of the body of the coherer, combined with the relative movement of the said body and the rod m^2 with respect to the rod m^3, will operate to break up the coherence of the material m^4. According to the second method of providing for effecting decoherence, the two clamping-screws m^6, m^7, may both be partially withdrawn so as to disengage them from the two rods m^2, m^3, and the clamping-screws m^8, m^9, set tightly against the said rods so as to hold the latter from turning. Turning

movement communicated to the wheel m^{10} and the body of the coherer relative to the two rods will cause the particles of the cohering material to separate from one another. According to a third method, both clamping-screws m^8, m^9, may be partially withdrawn so as to leave the two rods m^2, m^3, free to turn in their sockets or bearings in the fixed standards m^5, m^5, and the clamping-screws m^6, m^7, may be tightened against the rods so as to cause the latter to turn in unison with the body of the coherer. The turning movement will operate to break up the coherence. The same result may be attained within the spirit of the invention by communicating a turning movement to either or both of the rods m^2, m^3.

In Fig. 1 rotating or turning movement is transmitted to the coherer by forming the wheel m^{10} as a band-pulley having a grooved periphery, and by employing a driving-band m^{11} which passes around the said periphery and around the similar periphery of a driver band-pulley m^{12}, which last is connected with and operated by a motor m^{13}. By properly adjusting or co-ordinating the speed of the said motor and driver band-pulley m^{12}, these latter and the coherer may be turned or rotated continuously with good results, if desired, coherence continuing so long as the Hertz waves are acting, and being broken when they cease to act. A motor-circuit is indicated at m^{14}, m^{15}, and m^{16}, a battery in the said circuit being indicated at m^{17}, and m^{18} being a switch in such circuit by means of which the operation of the motor may be controlled manually. At m^{40} is a resistance connecting wires m^{14} and m^{16} between the motor and the battery m^{17} and switch. When the movable contact-arm m^{19} of the said switch rests against the fixed contact m^{20} with which the wire m^{15} is joined the motor is rotated continuously, as aforesaid. In Fig. 1 the movable contact-arm m^{19} of the switch is shown removed from the fixed contact m^{20} and resting against an opposite contact-point from which a wire m^{21} extends to a contact-spring m^{22} which is suitably insulated, as at m^{23}, from its support. The vibrator v' of the receiving or signaling instrument carries a contact-screw m^{24} for engagement with the contact-spring m^{22}, and when the said vibrator is moved in consequence of the action of the coil v of the said instrument the said contact-screw m^{24} is carried against the said contact-spring. The pivot v^2 of the vibrator v' is in electrical communication with the battery m^{17} of the motor-circuit, as by means of wire m^{25}. Consequently, in the position of the switch-arm m^{19} which is represented in Fig. 1, movement of the vibrator v' toward the pole-piece of the coil v placing contact-screw m^{24} in engagement with contact-spring m^{22} closes the motor-circuit, and the motor is caused to turn and to communicate movement to the coherer.

Fig. 3 shows an arrangement by which for the purpose of occasioning decoherence, movement first in one direction and then in the reverse direction may be imparted to the coherer, or one or more of the parts thereof, instead of movement always in the same direction. In Fig. 3, m^{26} is an arm which is employed in lieu of the wheel m^{10} of Figs. 1 and 2, m^{27} being a connecting-rod having one end thereof pivotally connected to the said arm, and m^{28} being a crank which is connected with and operated by a motor m^{13}, the said crank having the other end of the said connecting-rod joined thereto. When the motor is caused to act, either continuously or intermittingly as explained above, the coherer is operated to occasion decoherence. Figs. 4 and 5 represent a construction in which the coherer is bodily moved to-and-fro, and is caused to roll first in one direction and then in the other by the contact of a cylindrical portion thereof with a stationary surface upon which such cylindrical portion travels during the said to-and-fro movement. In such figures, m^{30} is the stationary surface, and m^{31} is the cylindrical body of the coherer, such body resting upon such surface. The portions of the rods of the coherer which project beyond the ends of the said body are journaled in the arms m^{32} m^{33} of a connection m^{35} which is operatively connected with the rotating crank m^{36} of the motor, the said arms being suitably insulated from each other, as at m^{34}, Fig. 5.

In Fig. 5, the rod m^3 of the coherer is screw-threaded and provided with a knurled head for convenience in turning the same to screw it into or out of the body of the coherer in varying the distance between the inner ends of the rods m^2, m^3.

I find that improved results are attained in coherence by breaking the local circuit between the relay and the coherer so as to compel all of the Hertz waves to pass through the coherer, whereas when the local circuit is not thus broken such waves in part go around the local circuit through the relay, thereby losing a considerable share of their effect. A method of effecting such break is shown in Fig. 1, in which the wire t extending from the relay is connected with a fixed contact-piece t^2. The wire t' connecting with post o is in electrical communication with a contact-piece t^3 that is movable stiffly about a pivotal support at t^4 and adapted to engage with fixed contact-piece t^2. A portion of the vibrator v' enters between an arm or finger t^5 of the movable contact-piece t^3 and a block of insulating material t^6 which is attached to the latter. When the vibrator v' is drawn down by the action of the coil or electromagnet v, the said portion thereof acts against the arm or finger t^5 and

operates to move the movable contact-piece t^3 out of contact with the fixed contact-piece t^2. This breaks the circuit between wires t and t', and consequently the direct connection by way of such wires between the relay and the coherer. The relay, however, is connected by wire s' with pivot v^2 of the vibrator v'. Consequently, so long as the vibrator is in contact with the arm or finger t^5 the current continues to pass by way of the vibrator and the wire s' between the wire t' and the relay. When the vibrator starts to go back to its normal position, it leaves arm or finger t^5; thereby it first breaks the circuit between the relay and coherer entirely, and then strikes the insulation t^6 so as to press the movable contact-piece t^3 toward the fixed contact-piece t^2, so as by the engagement of these two contact-pieces with each other to restore the more direct connection aforesaid. The return movement of the vibrator is retarded by means of a dog or pawl t^7 which is hung from the vibrator and arranged to engage, in the depressed position of the latter, with a tooth of a ratchet-wheel t^8 that is fast with a spur-gear t^9 meshing with a spur-pinion t^{10} having connected therewith a rotary fan t^{11}. The delay in the rising movement of the vibrator which is due to the retarding effect of the said fan gives time for other Hertz waves to act upon aerial h and ground wire p while the circuit is broken between the relay and the coherer. If coherence in coherer m is produced through the action of such waves, a current through the relay will occur on the closing of the circuit between the movable contact-piece t^3 and the fixed contact-piece t^2; if no coherence has occurred, there will be no current through the relay.

Fig. 6 shows an arrangement by means of which the connection between the relay and coherer is broken temporarily, and by which, in addition, the connections of the aerial o and ground wire p with the coherer are shortened temporarily so as to obviate tendency of the relay and sounder, when at work, to produce coherence. I have found that when the relay and sounder are at work they are apt to produce coherence in the coherer when the aerial and ground wire are connected, but if the wires in connection with the coherer are made shorter there will be no coherence produced. In Fig. 6 the relay is indicated at s^2, and the battery of the local circuit is indicated at r', the coherer being represented at m^{41}, and its rods being marked m^{42} and m^{43}, respectively. The aerial o is connected with the pivot of a movable contact-finger or arm o', which latter rests normally against a fixed contact-piece q' from which a wire q^2 leads to the rod m^{42} of the coherer. The ground wire p is connected with a fixed contact-piece t^7 against which rests normally a movable contact-finger or arm t^8, from the pivot of which leads a wire t^9 connecting with the rod m^{43} of the coherer and also with the relay. The wire t^{10} forming part of the local circuit leads from battery r' to the pivot of a pendulum w or equivalent vibrator carrying three projections w', w^2 and w^3. The projections w' and w^2 strike against the movable contact-fingers or arms o', t^8, in the swinging movement of the pendulum, so as to press the said contact-fingers or arms away from the fixed contact-pieces q' t^7. The projection w^3 of the pendulum makes contact with a movable contact-finger or arm x, from the pivot of which a wire x' leads to the wire q^2. In operation, the pendulum or vibrator w is set to vibrate at the required speed. While the projections w', w^2, w^3 of the said pendulum or vibrator are out of contact with the fingers or arms o', t^8, and x, the aerial o and ground wire p are in circuit with the coherer. The local circuit is broken, however, at the pendulum or vibrator. When, now, the swinging of the pendulum or vibrator carries the projections w', w^2, and w^3, against the movable contact-fingers or arms, the circuit is broken between aerial and ground, respectively, and the coherer, the local circuit being at the same time closed by the contact of the projection w^3 with the contact-finger or arm x, and the branch circuit x', q^2, embracing the coherer also being closed through contact of projection w^3 with contact-finger or arm x. Should there have been coherence occasioned in the coherer through the action of Hertz waves, a current through the relay will now be produced; if there has been no coherence occasioned, there will be no current through the relay. The projections w' and w^2 strike the contact-fingers or arms o', t^8, before the projection w^3 strikes the contact-finger or arm x, and conversely the projection w^3 leaves the contact-finger or arm x before the projections w', w^2, leave the contact-fingers or arms o' t^8. Therefore, the action of the relay is caused to take place after the aerial o and ground wire p have been disconnected from the coherer, and such action is caused to terminate before the aerial and ground wire are again placed in circuit with the coherer. As the projection w^3 moves away from the contact-finger or arm x, the circuit between the relay and battery and the coherer is opened. It is during the time of the open circuit that the Hertz waves are permitted to act to occasion coherence in the coherer. During such open circuit all the waves which impinge on aerial o and ground wire p pass over the same and through the coherer m^{41}.

What is claimed is:—

1. In a wireless telegraph system the combination with a coherer in which loose comminuted cohering material is employed, an i a receiving instrument, of a rotary moto which by movement of rotation of constant

direction imparted to the coherer effects decoherence, and circuit-connections by which rotation of the motor is occasioned when the Hertz waves act.

2. In a wireless telegraph system, in combination, the receiving instrument, the coherer containing loose comminuted cohering material, a rotary motor operatively connected with the coherer to occasion decoherence, and a motor-circuit which is closed by the action of the said instrument in receiving.

3. Receiving apparatus of a wireless telegraph system provided with a circuit-breaker for the local circuit, connected with the relay-circuit and operating to break the direct connection between relay and coherer to compel all the Hertz waves to pass through coherer, and establish an indirect connection therebetween.

4. Receiving apparatus of a wireless telegraph system provided with a circuit-breaker for the local circuit, connected with the vibrator of the receiving instrument to open the direct connection between coherer and relay to compel all the Hertz waves to pass through coherer, and establish indirect connection therebetween by means of the said vibrator.

5. Receiving apparatus of a wireless telegraph system provided with a circuit-breaker for the local circuit, connected with the vibrator of the receiving instrument to open the circuit to relay to compel all the Hertz waves to pass through coherer, and means to retard the subsequent closing of the said circuit to give time to receive the action of the said waves.

6. Receiving apparatus of a wireless telegraph system provided with a circuit-breaker for the local circuit operated by the vibrator of the receiving instrument to open the circuit to relay to compel all the Hertz waves to pass through coherer, and means combined with the said vibrator to retard the return stroke thereof.

7. In a wireless telegraph system, in combination, the receiving instrument, the coherer, a motor operatively connected with the coherer to occasion decoherence, and a motor-circuit which is closed by the action of the said instrument in receiving.

8. In a coherer, in combination, a rotatable chambered member, opposite rods entering the chamber, cohering material between the proximate ends of the said rods, and means whereby the respective rods may be held from rotation or engaged with the said member to rotate therewith.

9. In a coherer, a rotatable chambered member, opposite rods entering the chamber, cohering material between the proximate ends of such rods, supports for the rods, and means to hold the rods from rotation relative to such supports.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK G. SARGENT.

Witnesses:

ARTHUR E. DAY,

W. F. SARGENT.