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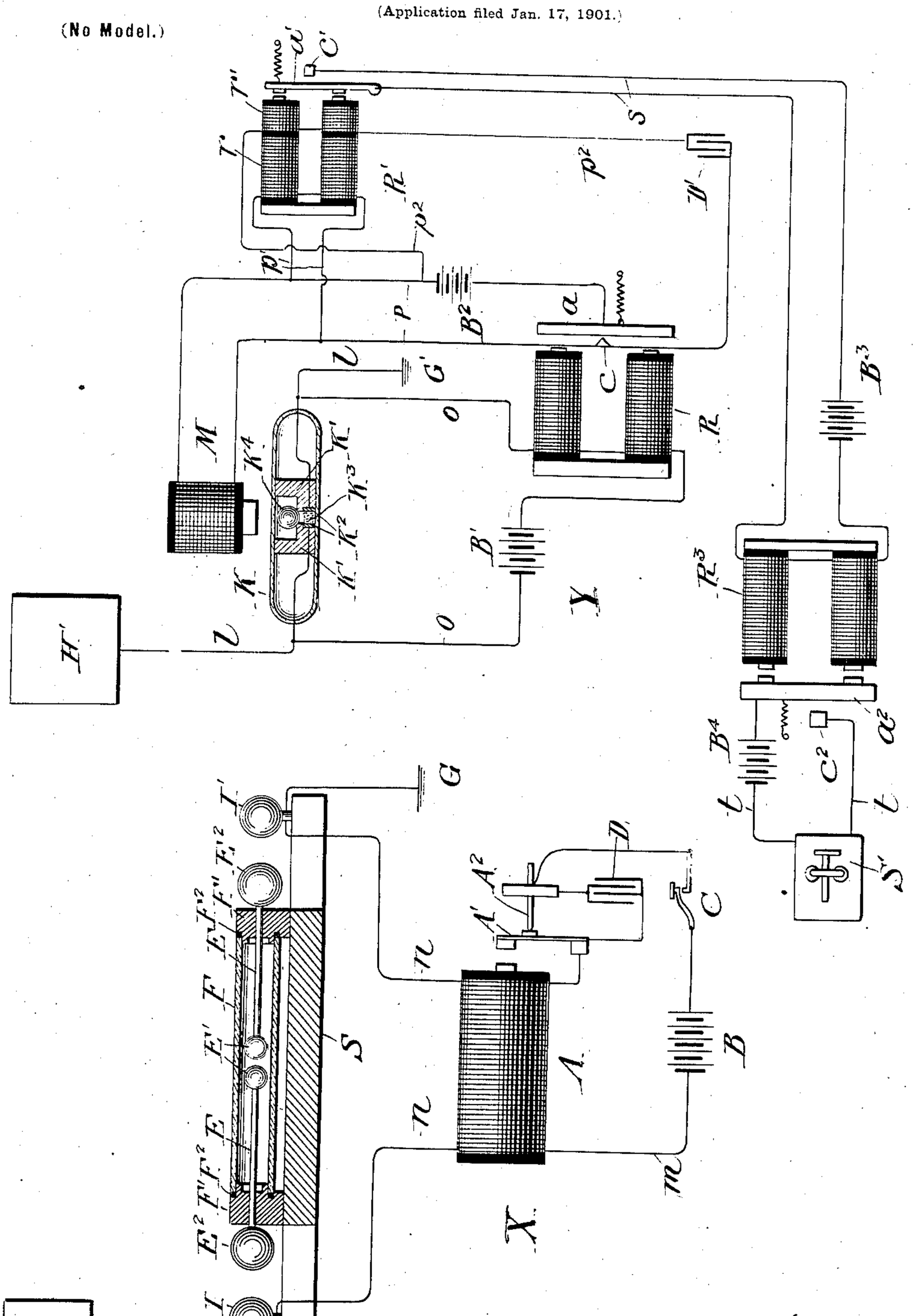
H. SHOEMAKER.

WIRELESS TELEGRAPHY.

(Application filed Jan. 17, 1901.)

(No Model.)



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WIRELESS TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 671,406, dated April 2, 1901.

Application filed January 17, 1901. Serial No. 43,631. (No model.)

To all whom it may concern:

Be it known that I, HARRY SHOEMAKER, a citizen of the United States, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Wireless Telegraphy; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to new and useful improvements in wireless telegraph systems, and has for its objects to provide a system embodying a novel form of emitter or oscillator and means for increasing the effective force of the ether-waves at the transmitting-station and a simple and efficient form of coherer and restoring mechanism at the receiving-station in connection with means to produce dots and dashes in accordance with the Morse code at the receiving instrument.

The preferred form of my invention is illustrated in the accompanying drawing, representing a system having a transmitting and receiving station.

In the drawing two stations are represented, one having a transmitting apparatus X and the other a receiving apparatus Y; but it is to be understood that in the operative commercial arrangement of the system each station will be equipped with both transmitting and receiving apparatus.

The transmitting apparatus comprises an inductorium or Ruhmkorf coil A, the primary of which is energized by a suitable battery or current source B in circuit *m*. The interrupter comprises the vibrating armature A′ and adjustable stop A^2, such as are ordinarily employed. In series with the primary is an ordinary sending-key C, and in a derived circuit with the interrupter is a condenser D. The effect of the condenser D is to reduce sparking at the interrupter and produce a more rapid and very uniform action of the induction-coil.

To the secondary of the induction-coil is connected an external circuit *n*, terminating in two balls or spheres I I′, preferably of brass, adjustably mounted on an insulating-base S. The balls I and I′ respectively are connected to an aerial conductor-plate H and a "ground" G.

The oscillator or emitter comprises a tube F, of glass or other non-conducting medium, which is mounted at its ends in supports F′, connected to the base S. A tight joint is secured between the tube F and its supports by packings or gaskets F^2. Adjustably mounted in the supports are two conducting-rods E E, each of which has secured to it an external metal ball E^2 and a smaller metal ball E′. The balls E^2 E′ are of a diameter considerably less than the bore of the tube and occupy positions in proximity to each other to provide a slight air-gap between them. The tube F is filled with air or, preferably, a non-corrosive gas under heavy pressure to provide a suitable dielectric medium for the spark-gap between the balls E′. Heretofore it has been the practice to employ vaseline, oil, or the like material between the balls; but I have found that an oscillator so constructed is sluggish in action and that after a spark has passed between the balls considerable time must elapse before another discharge will pass the oil dielectric, thereby rendering the action of the transmitting apparatus slow. This effect is apparently due to carbonization of the oil between the balls and the formation of a low-pressure gaseous envelop about the sparking-terminals. By employing a gaseous dielectric under heavy pressure this objectionable retardation in the oscillator is eliminated, as the high-tension gas always preserves a uniform medium in the spark-gap, thereby greatly increasing the rapidity and regularity of action of the emitter.

The receiving apparatus (illustrated at the right of the drawing) comprises an aerial conductor-plate H′, connected by a conducting-wire *l* through a detector or coherer to earth at G′. Said coherer consists of an evacuated tube K, provided with two L-shaped blocks of insulating material K′, having in their contiguous inner faces plates of conducting material K^2, preferably of silver, of less height than said faces. The space between the blocks is filled to the height of the conducting-plates with metal filings K^3 of the character usually employed in coherers. Each of said plates is connected to the wire *l*, which

is sealed in the opposite ends of the tube K. A ball K^4, of magnetic material, occupies the space above the filings and normally rests on the edges of the blocks K'. This ball, together with the electromagnet M, hereinafter described, forms an automatic tapper or decohering device.

Connected in derivation with the coherer and circuit *l* is a main circuit *o*, containing a battery B' and a relay R, having a normally-retracted armature *a*. Connected with said armature *a* and the front contact *c* of said relay R is a circuit *p*, having a battery B^2 and an electromagnet *m* in series. In derivation of circuit *p* is a circuit *p'*, including the coil *r* of a compound relay R'. Connected with the front contact *c* and one side of the circuit *p* is a circuit p^2, which includes in series the other coil *r'* of the compound relay R' and a condenser D. Said relay R' controls an armature *a'*, which is normally held against back contact *c'*, thereby closing a circuit *s*, containing a battery B^3 and a relay R^3. Said relay R^3 controls an armature *a* and normally holds it away from the back contact c^2 against the tension of a retractile spring.

A Morse sounder or equivalent signaling instrument S' is connected in circuit *t* with an energizing-battery B^4, which circuit is normally broken at the back contact c^2 and is closed when the armature a^2 rests on contact c^2.

Heretofore it has been difficult to produce simple dots and dashes at the receiving-station, and it has been customary to represent a dash at the receiver by a series of impulses and a dot by a less number of impulses. This expedient resulted in a rapid flickering or buzzing of the moving member of the receiver, which made it necessary to permit the member to come to rest after each character transmitted and also required the service of a specially-trained operator. By the arrangement described above I am enabled to employ an ordinary type of receiver—as, for instance, a Morse sounder—which produces positive dots and dashes precisely as in ordinary telegraphy in accordance with the operation of the transmitting-key C.

The operation of the system above described is as follows: The sending-operator manipulates the key C in accordance with the Morse code and at each "make" the induction-coil A is set in operation, its interrupter producing a very rapid series of makes and breaks in the circuit *m*, thereby inducing a rapidly-alternating current in the secondary. The discharge from the secondary takes place across the air-gaps between the ball-terminals of the emitter, resulting in the well-known electric oscillations from the aerial plate H, which are radiated into space in waves. As above described, the intensity, rapidity, and regularity of the discharge are greatly enhanced by the gaseous dielectric under pressure in the tube F, and by employing an inert or non-corrosive gas the surfaces of the balls E' are not tarnished or corroded, even under long-continued use. Some of the ether-waves emitted from H are taken up by the corresponding aerial plate H' at the receiving-station Y and carried by the circuit *l* to the detector or coherer, which immediately becomes active, allowing the local battery B' to operate and energize relay R. The energization of the said relay draws up armature *a* against the contact *c*, thereby closing the circuit of battery B^2 through the magnet M, which attracts the ball K^4 in the coherer, which delivers a sharp blow on the inside of said tube, thereby causing the particles in the detector to decohere and break the circuit of battery B, which deenergizes relay R, and consequently the magnet M, allowing ball K^4 to fall. Each impulse received at H will produce a complete cycle of operations just described. Hence to permit the ball K^4 and the armature *a* to operate with sufficient rapidity to respond to each action of the coherer the movement of both is very small. In addition to the energization of M at each impulse the current from B^2 passes by way of shunt-circuit *p'* to the coil *r* of relay R', causing said coil to attract its armature *a'*. In the regular practice of the art as heretofore developed this relay R' or its equivalent constituted the receiver or sounder. Hence a dot of the Morse code (indicated at relay R') would consist of a number of rapid clicks of the armature corresponding to the number of impulses received and a dash would be composed of a relatively greater number of clicks. It is my purpose to avoid this vibration of the armature and cause it to produce the simple dot and dash of the code. When the circuit of B^2 is closed at *a c*, the circuit p^2 of the auxiliary coil *r'* is also closed through the condenser D', and when the circuit from B^2 is broken said condenser discharges through circuits *p* and p^2, continuing the energization of coil *r'* and holding the armature *a'* attracted during the intervals between impulses. Relay R' therefore constitutes a receiver in itself, which responds to the impulses of the transmitter in the aggregate, producing as a short forward stroke of the armature the dot corresponding to a series of impulses and as a prolonged forward stroke the dash which results from a relatively greater number of impulses.

In order to employ an ordinary telegraph-receiver, the additional circuits *s* and *t* are provided. The forward stroke of the armature *h'* breaks the circuit *s*, deënergizes relay R, and closes circuit *t* at a^2 c^2, thereby energizing *s* for a dot or dash, in accordance with the movement of said armature *a'*. By this means the message or signal may be transmitted and received with great rapidity by operators who are only familiar with the action of the common form of transmitting and receiving instruments.

It will be seen that I have produced a system that is more rapid and efficient in operation than any heretofore known, that is capable of transmitting intelligence to greater

distances because of the increased regularity and intensity of the oscillations and the increased sensitiveness of the detector or coherer, and that meets the commercial requirement of producing simple dots and dashes at the receiver.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An emitter of ether-waves, comprising sparking-terminals, and an inclosing envelop of gas under pressure.

2. An emitter of ether-waves, comprising sparking-terminals, and an inclosing envelop of non-corrosive gas under pressure.

3. An emitter of ether-waves, comprising a pair of sparking-terminals, and an inclosing casing therefor containing a non-corrosive gas under pressure.

4. In a transmitter of ether-waves, the combination of a current source, having an earthed and an aerial conductor, an emitter between said conductors comprising sparking-terminals, a casing therefor containing a gas under pressure, and means to control said current source.

5. In a transmitter for ether-waves, the combination of a current source having an earthed and an aerial conductor, a sparking-conductor in each of said conductors and an emitter between said sparking-conductors, said emitter comprising sparking-terminals having an inclosing casing containing gas under pressure.

6. In a detector for ether-waves, the combination of a tube containing metallic powder, a circuit through the powder, means carried in said tube for shaking the powder, and means to operate said shaking means.

7. In a detector for ether-waves, the combination of a tube, insulating-blocks in said tube, metallic powder between said blocks, a circuit through said powder, means in said tube supported by said blocks for shaking the powder, and means to operate said shaking means.

8. In a detector for ether-waves, the combination of a tube, insulating-blocks in said tube, metallic powder between said blocks, a circuit through said powder, a magnetic vibrator in said tube supported by said blocks, and an electromagnet actuated by the circuit to operate said vibrator to shake the powder.

9. In a detector for ether-waves, the combination of a tube, L-shaped insulating-blocks in said tube, metallic plates secured to said blocks, metallic powder between said plates, a circuit through said plates and said powder, a magnetic body supported on said blocks above said powder, and an electromagnet actuated by the circuit to move said body, and thereby shake the powder.

10. In a system of ether-wave telegraphy, the combination of an emitting apparatus, and a receiving apparatus, the latter comprising a receiving-circuit including a coherer, a main circuit in parallel with said coherer, a relay-circuit controlled by said main circuit, a signaling-relay therein, and means controlled by said relay-circuit to render said signaling-relay active between the impulses impressed on said relay-circuit.

11. A receiving apparatus for ether-wave telegraphy comprising a receiving-circuit including a coherer, a main circuit in parallel with said coherer, a relay in said main circuit, a second circuit controlled by said relay, a signaling-relay in said second circuit, and means controlled by said second circuit to render said signaling-relay active between the impulses impressed on said relay-circuit.

12. A receiving apparatus for ether-wave telegraphy comprising a receiving-circuit, including a coherer, a main circuit in parallel with said coherer, a relay in said main circuit, a second circuit controlled by said relay, a compound relay having its main coil in said second circuit and its auxiliary coil in circuit with a condenser, whereby said auxiliary coil is energized by the condenser-discharge during the intervals between impulses.

13. A receiving apparatus for ether-wave telegraphy comprising a receiving-circuit, including a coherer, a main circuit in parallel with said coherer, a relay in said main circuit, a second circuit controlled by said relay, a compound relay having its main coil in said second circuit and its auxiliary coil in circuit with a condenser, whereby said auxiliary coil is energized by the condenser-discharge during the intervals between impulses, an additional relay, a circuit therefor controlled by said compound relay, a receiver and circuit actuating the same controlled by said additional relay.

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

HARRY SHOEMAKER.

Witnesses:
G. V. GEHRING,
R. LEAMAN.