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H. SHOEMAKER.

MULTIPLEX WIRELESS SIGNALING SYSTEM.

APPLICATION FILED DEC. 23, 1901.

NO MODEL.

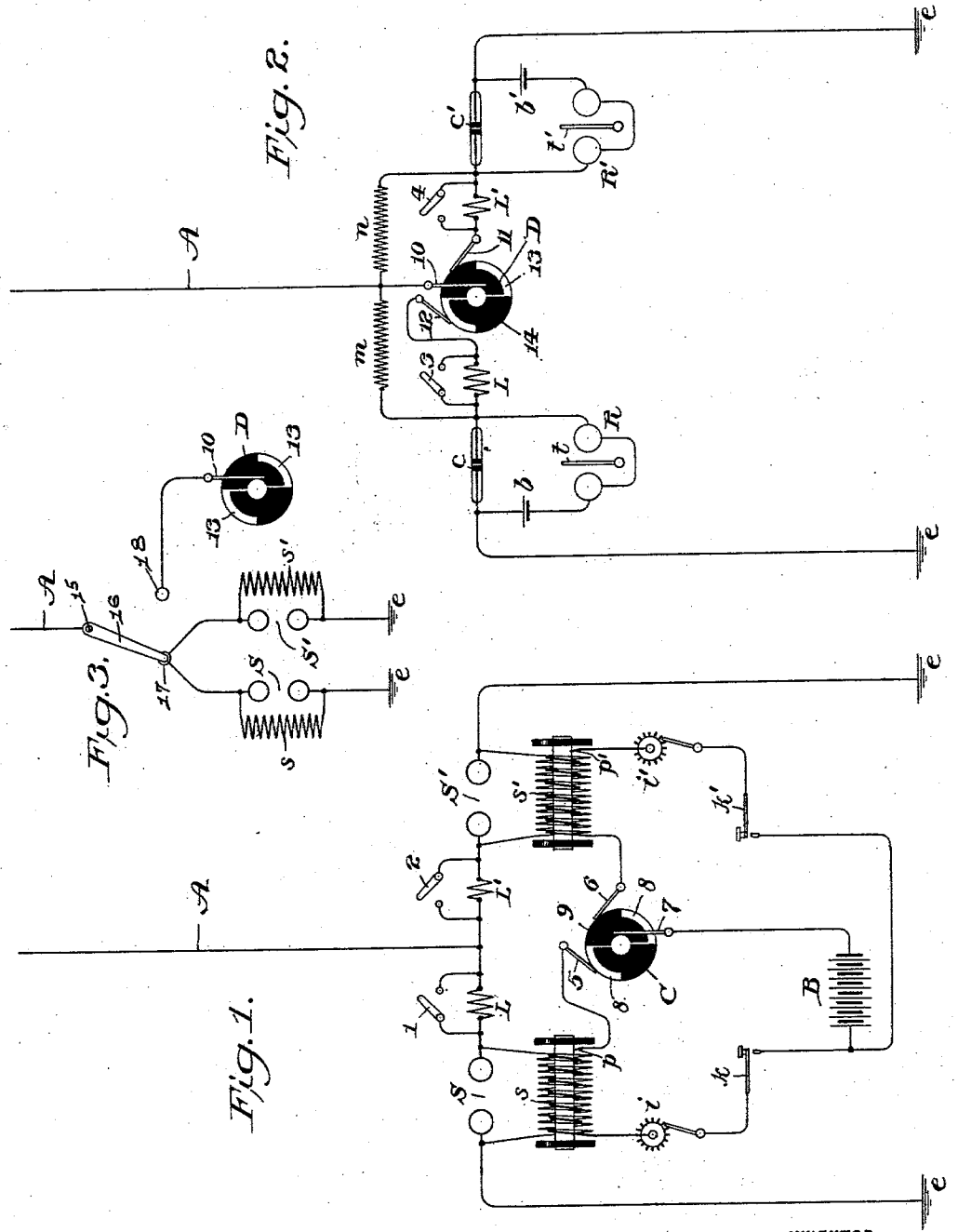

Fig. 2.

Fig. 3.

Fig. 1.

WITNESSES:

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MULTIPLEX WIRELESS SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 717,767, dated January 6, 1903.

Application filed December 23, 1901. Serial No. 86,947. (No model.)

To all whom it may concern:

Be it known that I, HARRY SHOEMAKER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Multiplex Wireless Signaling System, of which the following is a specification.

My invention comprises a method of transmitting simultaneously from the same instrument several separate and distinct signals or messages and receiving all through the same receiving instrument and reproducing each signal or message upon the proper recording means.

It comprises also an apparatus for carrying such method into operation.

The invention relates more particularly to such signaling systems in which there are no artificial conductors extending between the transmitting and the receiving stations, the energy used being of an electrostatic or electromagnetic or combined electrostatic and electromagnetic wave form.

The transmission and reception of several messages simultaneously is accomplished by the synchronism of commutators at the transmitting and receiving stations. Each individual transmitting instrument has use of the radiating-conductor in a certain order of succession, and at the same instants of time, or practically so, the associated receiving instrument is in communication with the receiving conductor or device.

In the system herein shown the usual aerial conductor and ground plates are shown, though the system is adaptable also to those systems where a plurality of aerial conductors are used with or without ground-plates or in those systems where ground-plates only are required.

Figure 1 is a diagrammatic view of a transmitting station adapted for transmitting simultaneously two messages. Fig. 2 is a diagrammatic view of a receiving-station adapted to receive simultaneously two messages. Fig. 3 shows diagrammatically the switch for throwing into connection with the radiating-conductor either the transmitting or the receiving apparatus.

A represents the aerial conductor as now commonly used in wireless telegraphy. In two branch circuits, Fig. 1, to earth-plates *e e* are the oscillators or spark-gaps S S'. The secondary windings of two transformers *s s'* or other source of high-potential electricity connect to the balls of the oscillators S S'.

B is a source of energy which connects through the shaft of commutator C with brushes 5 and 6 alternately, 5 being shown in contact with the metallic segment which is in connection with the shaft above mentioned. It is to be noted that the brushes 5 and 6 bear upon the commutator at points ninety degrees apart. Brushes 5 and 6 connect, respectively, to primaries *p p'* of the aforementioned transformers. The other ends of these windings connect, respectively, to the interrupters *i i'*, which in turn connect through keys *k k'* to the other terminal of source B.

The operation of the transmitter is as follows: Upon depressing the key *k* an interrupted current is produced in the primary *p* during all such time that brush 5 is in communication with segment 8. During such intervals brush 6 is out of circuit and bears upon the insulating material 9. The result is a series of sparks at S and a charging and discharging of conductor A, with a resultant radiation of energy to the receiving-station. It is seen that the key *k* therefore controls the aerial conductor A during half the time only. During the remainder of the time the aerial conductor is under control of key *k'*. From the location of the brushes 5 and 6 it is seen that upon the rapid rotation of commutator C keys *k k'* control the aerial conductor alternately. The speed of commutator C is so high, however, that to all intents and purposes key *k* can transmit messages as if *k'* and its associated circuits were entirely absent.

In Fig. 2, D is a commutator similar to the one used with the transmitter and runs synchronously with it, so that during the time that brush 5 is in contact with the metallic segment brush 12 is in contact with a similarly-located segment. The details of the

system and apparatus whereby synchronism of the commutators is obtained are shown in my application, Serial No. 104,614, filed April 25, 1902. The brush 10, connected to the aerial conductor, bears upon the shaft of the commutator D and is in electrical connection with the segments 13 13. Brushes 11 and 12 are disposed similarly to brushes 5 and 6 of the transmitter and at ninety degrees with each other. From brush 12 there is connection to wave-responsive device *c*, whose remaining terminal connects to earth-plate *e*. In shunt around such responsive device is a circuit including a source of energy *b* and the usual relay R, whose tongue *t* controls the tapping devices, recorder, &c. Likewise brush 11 connects to one terminal of wave-responsive device *c'*, whose remaining terminal connects to earth-plate *e*. In shunt around the device *c'* is a circuit including a source of energy *b'*, and the relay R', whose tongue *t'* controls the usual local circuits. *m* and *n* are inductances of high value which are in shunt across the break between the brushes 12 and 11 when they leave the conducting-surfaces in connection with the aerial conductor A.

The operation of the receiver is as follows: When key *k* at the transmitter is sending and at every instant that the brush 5 is in contact with a conducting-segment of the commutator C, the brush 12 is in contact with a conducting-segment of the commutator D and causes the wave-responsive device *c* to be in electrical communication with the receiving aerial conductor. Likewise, when brush 6 of the transmitter is bearing upon the insulating portion of commutator C the brush 11 is similarly pressing upon the insulating portion of the commutator D. The result is that during half the time synchronously and simultaneously with each other the transmitter operating through spark-gap S controls the wave-receiving device *c*, with its associated recording mechanism and circuits, and alternately with transmitter S and responsive device *c* and for an equal period of time transmitter S' and responsive device *c'* coöperate together. In consequence an operator at key *k* can influence and control the recorder operated by relay independently of the remaining transmitting and receiving circuits. The same is true of the operator at key *k'* or any further number of keys which may, without departing from the spirit of my invention, be made to control corresponding receiving devices, all communicating with the same transmitting and receiving aerial conductors.

In Fig. 3 the switch 16 is in electrical contact at its pivot 15 with the aerial conductor A, which serves both for transmitting and receiving. Switch 16 is movable by electromagnetic or other means of contact with points 17 and 18 and, as shown, in contact with 17 is in the transmitting position S S' with associated secondaries *s s'*, indicating the transmitting apparatus shown in Fig. 1. Connection is made from point 18 to brush 10 of the receiving-circuit.

L L' are inductances of different values connected, respectively, in the circuits of transmitters S S'. Their purpose is to give to the radiated energy a predetermined frequency, and it is therefore possible to transmit from the aerial conductor A in Fig. 1 alternately energies of different frequencies. The electrical constants of the aerial circuit, taken in conjunction with the induction L, determines the frequency of the waves emitted where it is generated by transmitter S, and likewise L' determines the frequency of the waves generated by the transmitter S'. At the receiving device shown in Fig. 2 similar inductances L L' are shown connected, respectively, to the wave-responsive devices *c c'*. This adds to the simple feature of multiplexing the idea of selectivity. The inductances L L' with the transmitter in Fig. 1 may be short-circuited by switches 1 and 2, and at the receiving-station inductances L L' may be short-circuited by switches 3 and 4.

It is to be noted that the sources of energy *b b'* are connected on the earth side of the responsive devices *c c'*. The sources *b b'* are generally primary or secondary cells and possess quite a large amount of capacity, and were such cells connected on the side of the wave-responsive devices next to the brushes or aerial conductor a large portion of the received energy would flow into these cells or condensers and prevent the requisite rise of potential at the terminals of the wave-responsive devices.

What I claim is—

1. In a signaling system a combination of a plurality of generators, means for throwing said generators into operation successively, means for controlling the circuits of the generators by and in accordance with the signals sent, and means for impressing the modified energy derived from said generator upon the natural media.

2. In a signaling system the combination of a radiating conductor, a plurality of generators connected with said conductor, a commutator for controlling said generators and a plurality of means for controlling the radiated energies by and in accordance with the signals sent.

3. In a signaling system the combination of a transmitting-station and a receiving-station, means at said transmitting-station for generating electrical radiant energy, means for subjecting such energy successively to the control of a plurality of keys, a commutator at the receiving-station for throwing successively into the influence of the received energy a plurality of responsive devices.

4. In a wireless-telegraph system the combination of a plurality of generators of radiant energy, means for rendering said generators successively inoperative, and means associated with each generator for modifying the

energy thereof by and in accordance with the signal sent.

5. In a wireless-telegraph system, a radiating conductor, a plurality of means for charging said conductor successively and means for controlling each charging means by and in accordance with the signal sent.

6. In a wireless-telegraph system, a plurality of transmitting devices at the transmitting-station thrown into and out of operation successively, a plurality of responsive means at the receiving-station thrown into and out of circuit successively and synchronously with the corresponding transmitters.

7. In a multiplex wireless-telegraph system the combination of a plurality of transmitters, a plurality of receiving devices, means for throwing said transmitters into and out of action successively and means for throwing said receivers into and out of action successively and synchronously with the transmitters.

8. In a multiplex wireless-telegraph system the combination of a plurality of synchronously-operating commutators, a plurality of transmitters controlled successively by a commutator and a plurality of corresponding receivers controlled successively by the receiving-commutator.

9. In a signaling system, means for impressing upon the natural media a plurality of signals in the form of a modified electrical radiant energy, and means at a receiving-station operating synchronously with the controlling means at the transmitting-station for selecting each signal to the proper recording instrument.

10. In a wireless signaling system, a plurality of transmitters, each emitting energy representing a distinctive signal or message, means for successively bringing said transmitters into communication with a radiating-circuit, a plurality of wave-responsive devices at a receiving-station, each controlling a circuit for reproducing a predetermined signal or message, and means for bringing said wave-responsive devices successively into the influence of a receiving-circuit synchronously with the means at the transmitting-station for bringing the transmitters successively into communication with a radiating-circuit.

11. In a wireless signaling system, a plurality of transmitters, means for permitting the radiation of energy from said transmitters in rapid succession, a receiving-station, a wave-responser at said station for each transmitter, and means for bringing each wave-responsive device into communication with the receiving-circuit during each interval of time that its associated transmitter is emitting energy.

12. In a wireless signaling system, a plurality of transmitters, a radiating-circuit, a commutator for rendering said transmitters successively operative, a receiving-circuit, a plurality of wave-responsive devices each corresponding with a certain transmitter, and a commutator rotating synchronously with the commutator at the transmitter for bringing said wave-responsive devices successively into communication with the receiving-circuit.

13. In a wireless signaling system, a plurality of transmitters, each adapted to emit characteristic energy, a commutator for bringing said transmitters successively and rapidly into action, a plurality of wave-responsive devices at the receiver, each associated with a circuit selective of a characteristic transmitted energy, and a commutator rotating synchronously with the transmitting-commutator for bringing said wave-responsive devices successively under the influence of the transmitted energy.

14. In a wireless signaling system, a plurality of transformers, an operator's key controlling each transformer, a commutator, for bringing said transformer successively into circuit with a source of energy, and means for impressing the electroradiant energy derived from said transformer upon the natural media.

15. In a wireless signaling system, a plurality of wave-responsive devices, a local circuit controlled by each wave-responsive device, and a commutator for bringing said wave-responsive devices successively into communication with a receiving-circuit.

16. In a wireless signaling system, a wave-responsive device, a commutator for bringing said wave-responsive device at intervals into communication with a receiving-circuit, and a relatively great inductance in shunt to the break of said commutator.

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Witnesses:
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