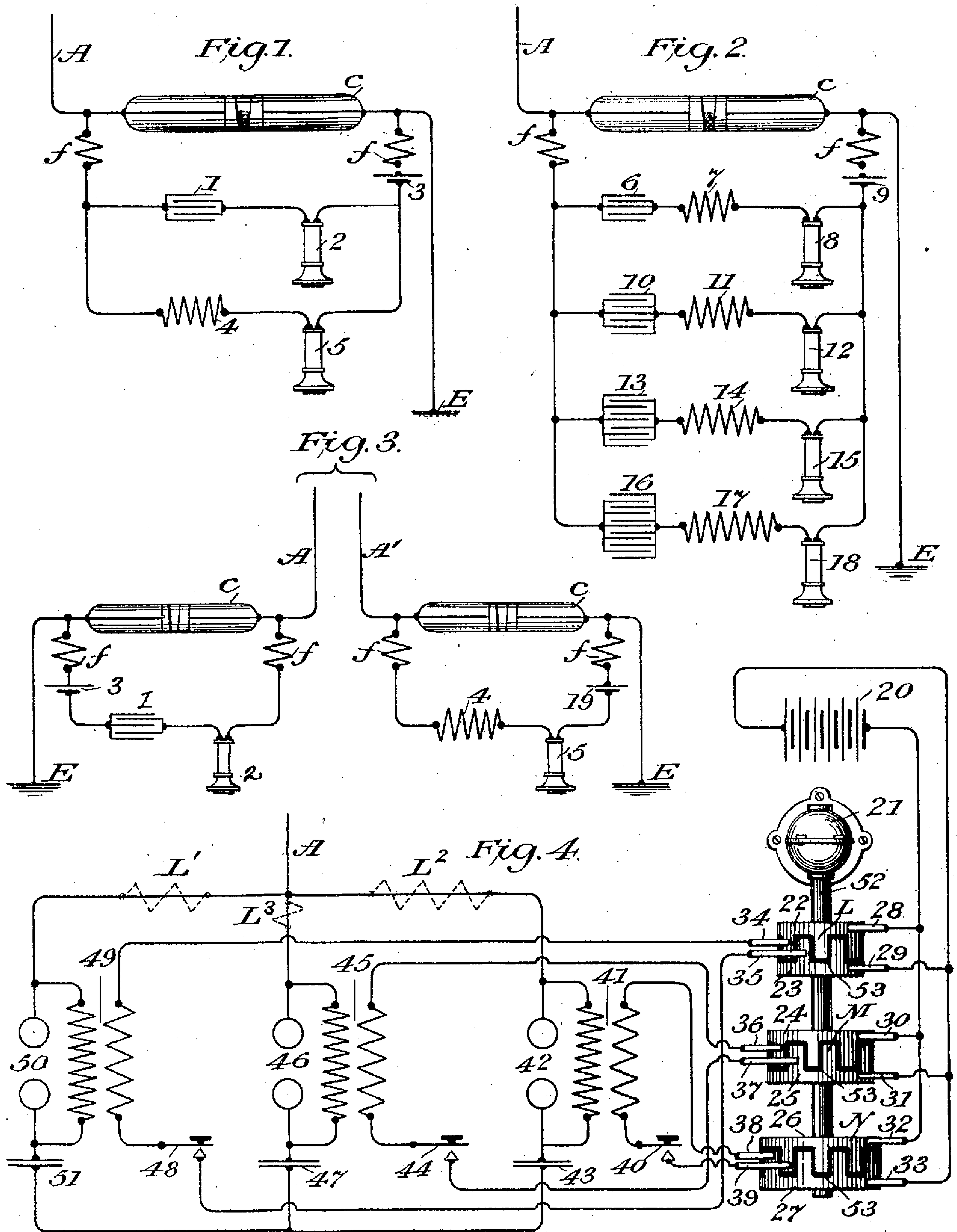
No. 711,266. Patented Oct. 14, 1902.

H. SHOEMAKER.

WIRELESS SIGNALING SYSTEM.

(Application filed Sept. 22, 1902.)

(No Model.) 2 Sheets—Sheet I.



Witnesses:
H. L. Ramey
F. H. Hiatt.

Inventor:
Harry Shoemaker
by Cornelius D. Ehret
his Atty

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Fig. 5.

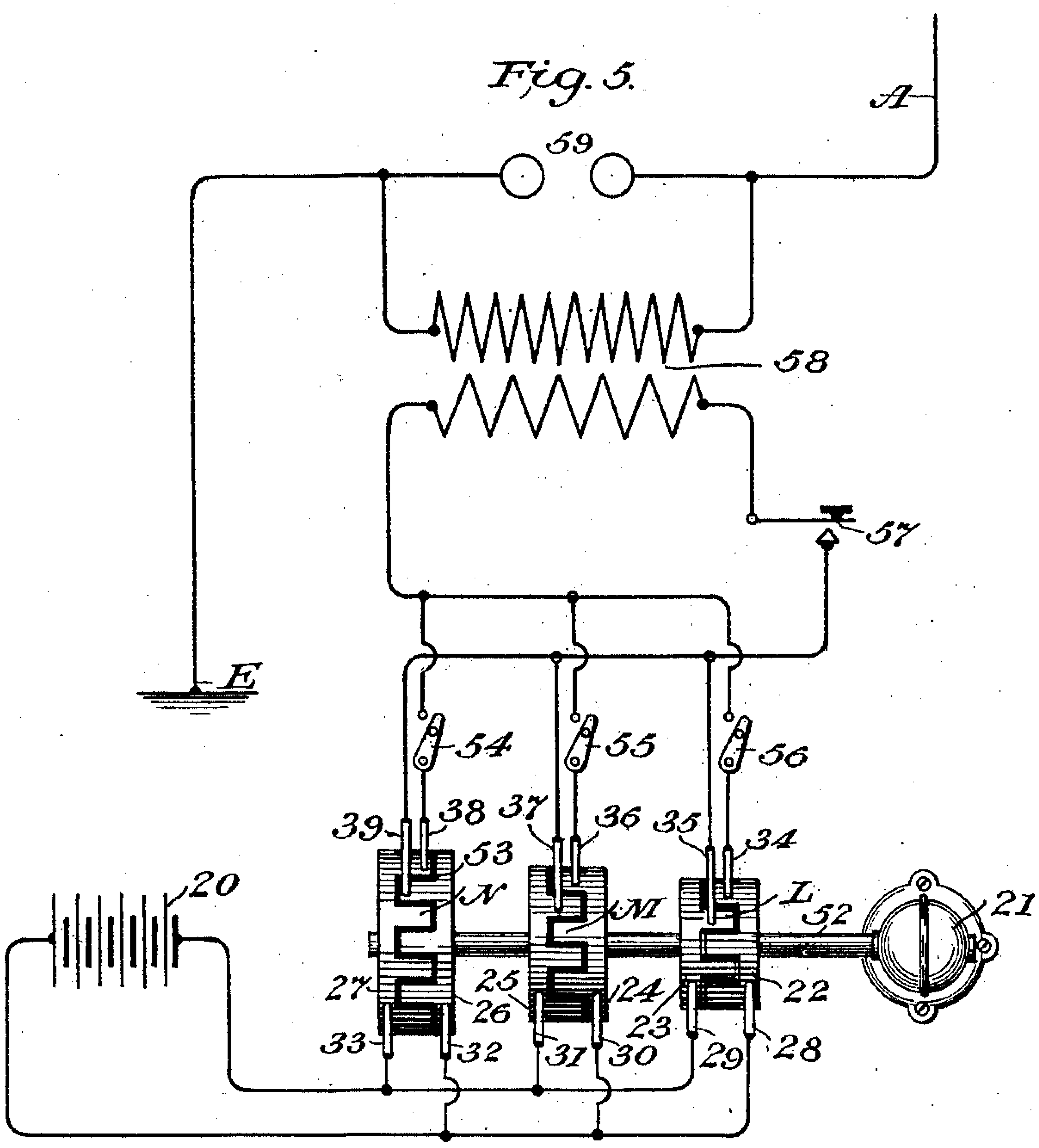


Fig. 6.

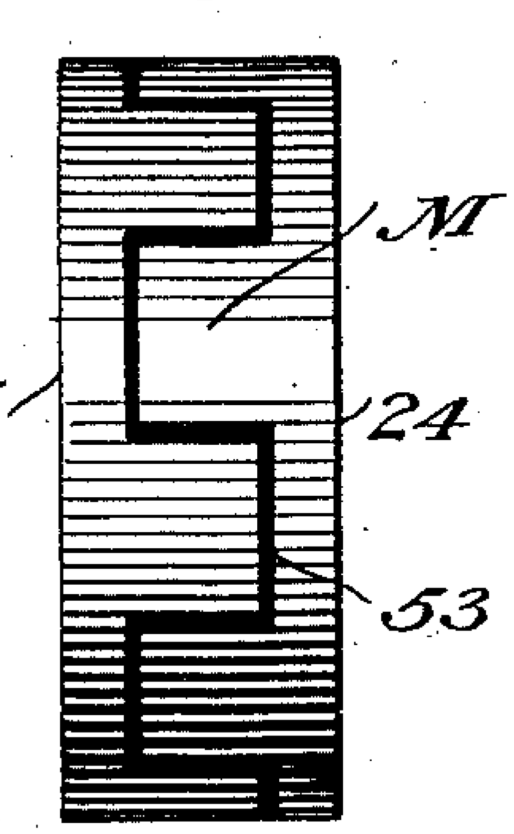
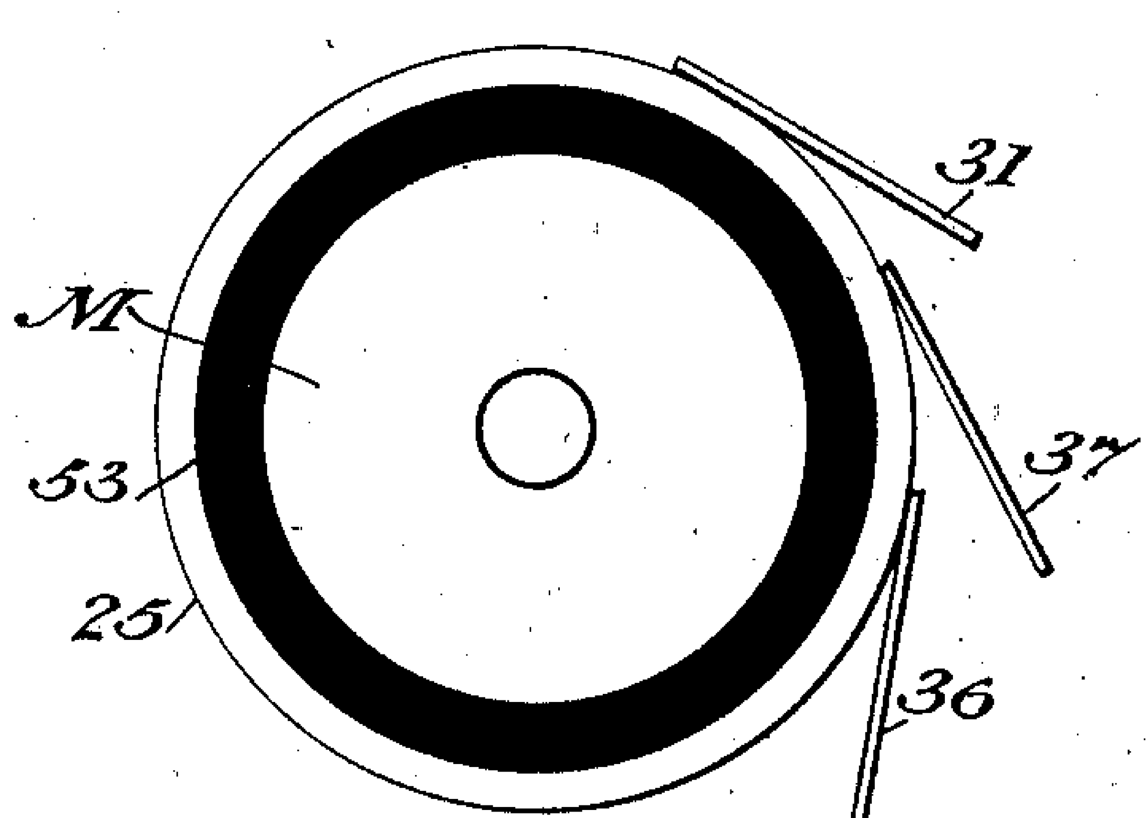


Fig. 7.



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UNITED STATES PATENT OFFICE.

HARRY SHOEMAKER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE CONSOLIDATED WIRELESS TELEGRAPH AND TELEPHONE COMPANY AND MARIE V. GEHRING, OF PHILADELPHIA, PENNSYLVANIA.

WIRELESS SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 711,266, dated October 14, 1902.

Original application filed September 13, 1902, Serial No. 123,237. Divided and this application filed September 22, 1902. Serial No. 124,295. (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 certain new and useful Improvements in Wireless Signaling Systems, of which the following is a specification.

My invention relates to signaling systems in which electroradiant energy is employed to represent the message or signal, such energy being transmitted through the natural media and causing manifestations at the receiving-station, which are translated into a message or signal.

My invention consists of a system for transmitting intelligence whereby a plurality of messages may be simultaneously or independently transmitted from or received at a single station.

My invention consists of a system where an element of a signal is represented by a train or trains of waves of electroradiant energy, such trains succeeding each other at predetermined and uniform rate.

My invention comprises a system where there are emitted simultaneously or independently from a single radiating-conductor a plurality of series of trains of waves of electroradiant energy, the trains of the several series succeeding each other at different uniform rates and wherein the trains of a series represent an element of a signal.

My invention comprises a system in which there may be received simultaneously or independently, at a single station either by means of a single receiving-conductor or several receiving-conductors, a plurality of messages or signals, each message or signal being represented by trains of waves of electroradiant energy succeeding each other at a distinctive and uniform rate.

My invention comprises a system in which a plurality of messages or signals may be received, either simultaneously or independently, by means of receiving-circuits, each of which selects a message or signal to the exclusion of all others in virtue of the rate of succession of the trains of waves of electroradiant energy representing the message or signal.

My invention comprises, further, a system in which at the receiver the trains of waves of electroradiant energy representing messages or signals control selective circuits in which are caused currents of frequencies equal to the frequencies of the trains of waves, and each circuit is so adjusted as to its electrical constants that it shall select a current of a frequency equal to the rate of succession of the trains of waves representing a message or signal.

My invention consists, further, in receiving simultaneously or independently upon a single receiving-conductor a plurality of series of trains of waves of electroradiant energy and subjecting a single wave-responsive device to all the series of trains of waves, the wave-responsive device controlling the production of fluctuating currents in as many local selective circuits as there are series of trains of waves, each local circuit controlling a fluctuating current of a frequency equal to the rate of succession of the trains of a single series, each series of trains of waves representing a message or signal.

My system comprises a plurality of stations each emitting trains of waves of electroradiant energy at a characteristic uniform rate and each equipped with means for selecting the several messages or signals to separate receivers or recorders, the trains of waves representing a message or signal succeeding each other at a characteristic uniform rate.

It has been customary heretofore in wireless signaling systems for the purpose of securing selectivity to attune a circuit or circuits at the receiving-station to the frequency of the transmitted electroradiant-energy waves. In my system, however, the selection or tuning has reference more particularly to the rates of the trains of waves representing a message or signal. At each spark at the spark-gap at the transmitter there is emitted from the radiating-circuit a train of waves of electroradiant energy, in some cases the number of waves per train reaching the number of two thousand, the frequency of said waves themselves being from in the neighborhood of one hundred thousand per second to several millions per second. The tuning or selecting has heretofore been accomplished by adjusting the constants of the receiving-circuit so as to select radiations of these enormously-high frequencies. In my system, however, the selection has reference to the rate of succession of the trains of waves or, in other words, to the rate of succession of sparks at the spark-gap of the transmitting apparatus.

In the primary of the transmitting-transformers I employ alternating currents or reversed currents of a definite and uniform rate, so that at the spark-terminals there are produced sparks at the same rate as the rate of the current in the primary of the transformers. In other words, the rate of succession of the trains of waves of electroradiant energy transmitted is equal to the rate of the current in the primary of the transmitting-transformer.

At the receiving-station instead of adjusting the circuits to the frequency of the radiant energy itself there are produced in local circuits fluctuating currents of a periodicity or frequency equal to the rate of succession of the trains of waves or, in other words, equal to the rate of the sparks of the spark-gap at the transmitter and the current in the primary of the transmitting-transformer. It is to be understood, however, that though my selectivity is obtained by adjustment of the constants of circuits with relation to the rate of succession of the trains of waves I may in addition attune the receiving-circuit to be selective of waves of electroradiant energy of a certain frequency, and thereby have double selectivity, or selectivity of two kinds.

In my system there may be a plurality of stations each emitting its trains of waves at a characteristic and uniform rate, and each receiving-station of the system is supplied with as many selective circuits as there are remaining stations in the system, each circuit being adjusted as to its electrical constants to be selective of fluctuating currents of a frequency equal to the rate of succession of the trains of waves of a certain station. For example, station No. 1 may transmit trains of waves at the rate of two hundred per second, station No. 2 at the rate of three hundred per second, station No. 3 at the rate of three hundred and seventy-five per second. Station No. 1 when operating as a receiver will have then two local circuits, one of which will select fluctuating currents of a frequency equal to three hundred per second, thereby selecting a message coming from station No. 2, and another circuit selective of fluctuating currents of a frequency equal to three hundred and seventy-five per second, which will select the message being transmitted from station No. 3. Similarly when station No. 2 is operating as a receiver it will then be supplied with two local circuits, one of which is selective of fluctuating currents of a frequency equal to two hundred per second, and therefore selecting the message being transmitted from station No. 1, and another circuit adjusted to select fluctuating currents of a frequency of three hundred and seventy-five per second, and therefore selecting a message being transmitted from station No. 3. Likewise when station No. 3 is operating as a receiver it has two local circuits, one of which is selective of fluctuating currents of a frequency of two hundred per second, and therefore selective of the message being transmitted from station No. 1, and another circuit adjusted to select fluctuating currents of a frequency of three hundred per second, and therefore selective of the message transmitted from station No. 2.

Though I have given but three stations in the example above, it is apparent how the number of stations may be increased simply by using different rates of succession for the trains of waves at each station and adjusting local circuits at each receiver to be selective of fluctuating currents of like frequencies.

At my receiving-station I prefer to employ a single wave-responsive device, preferably of the self-restoring type, which is subjected to the trains of waves arriving from the stations which may be simultaneously transmitting. In local circuits shunted around such wave-responsive device are means for rendering such circuits selective of fluctuating currents corresponding with the different trains of waves received, and there is common to all the local circuits a source of energy giving rise to such fluctuating currents under the control of the single wave-responsive device. At the transmitting-station an alternating current or a commutated direct current is employed in the primary of the transmitting-transformer, thereby setting the rate of succession of the trains of waves emitted by such transmitter.

For a detailed description of my invention reference is to be had to the accompanying drawings, in which—

Figure 1 represents in diagram the circuits at a receiving-station whereby two simultaneously-received messages may be separated and read or interpreted independently of each other. Fig. 2 represents in diagram the circuits at a receiving-station capable of recording independently four simultaneously-received messages. Fig. 3 represents in diagram a receiving-station employing two aerial conductors and a local circuit in conjunction with each aerial conductor, such local circuits, however, being selective of fluctuating currents of different frequencies. Fig. 4 is a view in diagram of the circuits at a transmitting-station where trains of waves may be emitted at three different rates. Fig. 5 is a view in diagram of the circuits at a transmitter whereby trains of waves of different rates of succession may be alternately impressed upon the natural media by a single oscillatory transformer and a single key. Fig. 6 is an enlarged view of one of the commutators employed at the transmitters. Fig. 7 is a side view of the commutator shown in Fig. 6.

In Fig. 1, A represents the usual aerial conductor of a wireless signaling system, between which and the earth-plate E is connected the wave-responsive device *c* and which is preferably of any of the self-restoring types—for example, an electrolytic device, carbon device, or the carbon and metal devices. In shunt relation with the wave-responsive device *c* are two local circuits, one embracing the condenser 1 and the telephone-receiver 2, the other embracing the inductance 4 and the telephone-receiver 5. Common to both these circuits are the choke-coils *f f* and the battery or source of energy 3. By this arrangement of circuits it is possible to receive simultaneously two distinct messages upon the aerial conductor A and separate them to two distinct and separte translating devices, such as telephone-receivers. For example, one of the messages being received may be represented by trains of waves following each other at the rate of four hundred per second, while the other messages may be represented by trains of waves succeeding each other at the rate of one hundred and fifty per second. Under these circumstances the wave-responsive device *c*, which it is to be remembered is preferably self-restoring, alters its condition under the influence of both series of trains of waves and sets up, therefore, in the portions of the local circuits comprising choke-coils *f f* and the battery 3 two distinct currents of different frequencies. One of these currents fluctuates at the rate of four hundred per second, because the wave-responsive device *c* alters its condition four hundred times per second under the influence of the waves representing one message, and also a current at the rate of one hundred and fifty fluctuations per second, due to the one hundred and fifty changes in the condition of the wave-responsive device *c* in a second under the influence of the trains of waves representing the other message.

In the circuit embracing condenser 1 and the telephone-receiver 2 will be selected currents of the higher frequencies—namely, four hundred per second—while in the circuit embracing inductance 4 and the telephone-receiver 5 will be selected currents of lower frequencies or at the rate of one hundred and fifty per second.

It is a well-known fact that low-frequency currents can be separated or selected from high-frequency currents by this arrangement, because the condenser permits more easily the passage of high-frequency currents and excludes the low-frequency, whereas the inductance excludes the high-frequency and permits more readily the passage of low-frequency currents. The result is that in telephone-receiver 2 will be received the message represented by trains of waves succeeding each other at the rate of four hundred per second, while in the telephone-receiver 5 will be received the message represented by the trains of waves succeeding each other at the rate of one hundred and fifty per second. It is necessary, however, when it is desired to distinguish and separate more than two simultaneously-received messages to resort to the system described in Fig. 2. Here, again, A represents the usual aerial conductor of a wireless signaling system, between which and the earth connection E is the wave-responsive device *c*, preferably of the self-restoring type, as described above. Choke-coils *f f* and the source of energy or battery 9 are arranged as in the case of Fig. 1. Here are again shown four local circuits, the first embracing the condenser 6, inductance 7, and telephone-receiver 8; the second, condenser 10, inductance 11, and telephone-receiver 12; the third, condenser 13, inductance 14, and telephone-receiver 15; the fourth, condenser 16, inductance 17, and telephone-receiver 18. In these circuits a condenser and inductance are employed conjointly and operate, as is well known in the art of fluctuating currents, to respond more sharply to a fluctuating current of certain frequency to the almost entire exclusion of fluctuating currents of any other frequency. For this reason in the four circuits shown there are shown the combination of condensers and inductances of different magnitudes. The result is that the circuit of telephone-receiver 8 will respond to one frequency to the exclusion of others, circuit 12 will respond to another frequency, and the circuits of telephone-receivers 15 and 18 will respond to still different frequencies of currents. The action of the several series of trains of waves upon the wave-responsive device *c* in causing it to produce in the local circuits fluctuating currents of different frequencies is the same as that described in connection with Fig. 1. By the arrangement of circuits shown in Fig. 2, however, four messages may be simultaneously received and independently recorded to the tuning of local circuits by combined capacity and inductance. The arrangement shown in Fig. 2 produces sharper selectivity than in the case of Fig. 1, which may be said to select roughly rather than sharply.

In Fig. 3 I have shown two aerial conductors A A′ in place of a single one, and in conjunction with each is a wave-responsive device *c*. In the local circuit of each wave-responsive device is a telephone-receiver 2 and condenser 1, therefore corresponding with the circuit including condenser 1 and telephone-receiver 2 in Fig. 1. In shunt to the other wave-responsive device is the circuit including inductance 4 and telephone-receiver 5, as shown in Fig. 1, by the circuit including inductance 4 and telephone-receiver 5. In this case the wave-responsive devices are separate, and though both aerial conductors receive energy representing both messages, yet only the message represented by the trains of waves succeeding each other at high rate are received by telephone-receiver 2, and the message represented by trains of waves succeeding each other at low rate is recorded in telephone-receiver 5.

In Fig. 4 is shown an aerial conductor A, which is common to three oscillators. Conductor A, spark-gap 50, condenser 51, and earth connection E represent one oscillating circuit. Conductor A, spark-gap 46, condenser 47, and earth connection E represent another oscillating circuit, and the conductor A, spark-gap 42, condenser 43, and earth connection E represent the third oscillating circuit. The spark-gap 50 is shunted by the secondary of the transformer 49, in whose primary is the controlling or operator's key 48 in series with the brushes 34 and 35, which bear upon commutator L, comprising two metallic portions 22 and 23, interspaced, as shown, and separated from each other by insulating material 53. Brushes 28 and 29 bear continuously upon 22 and 23, respectively, and are in communication with the source of energy or battery 20. 21 is an electric or other motor which is continuously rotating and driving the shaft 52, upon which are mounted several commutators. As is well understood in the art, the rotation of commutators L causes commutation of the direct current from source of energy 20 into reversed currents, which pass through brushes 34 and 35 through the primary of the transformer 49. In shunt to the spark-gap 46 is the secondary of the transformer 45, in whose primary are operator's key 44 and the brushes 36 and 37 in series. These brushes 36 37 bear upon commutator M, composed of the interspaced parts 24 25, separated by insulating material 53. The brushes 30 31 bear upon members 24 25, respectively, and communicate with source of direct current 20. The result of the rotation of the commutator M by the motor 21 causes reversed current to flow through the primary of the transformer 45 when the key 44 is depressed; but the rate of such current is higher than that of the current flowing through the primary of transformer 49, because commutator M has a greater number of segments. In shunt to the spark-gap 42 is a secondary of the transformer 41, in whose primary is the controlling or operator's key 40 in series with the brushes 38 39. These brushes bear alternately, as in the former case, upon members 26 and 27 on commutator N, these portions 26 and 27 being interspaced but separated by insulating material 53. Upon these members 26 27 bear continuously the brushes 32 and 33, respectively, which are in communication with source of direct current 20. Commutator N is driven by the same motor 21 and causes a commutation of the direct current, which then flows through brushes 38 39 through the primary of transformer 41 when key 40 is depressed. The rate of the currents through the primary of the transformer 41 is still greater than that of the currents through the transformer 45. This is due to the greater number of segments in commutator N than in commutator M. It is seen that the motor 21 drives commutators L M N simultaneously, but that due to their different numbers of segments they produce reversed currents of as many different frequencies. The condensers 43 47 51 are for the purpose of preventing interchange of energy between the secondaries of the transformers 41, 45, and 49. These condensers are of relatively small capacity, and therefore operate as impeding devices to the comparatively low frequency currents in these secondaries, though such condensers do not interfere with the extremely high oscillations in the radiating circuits.

Although in my system each transmitter need emit trains of waves at a single rate only, yet by the arrangement just described at a single transmitting-station three different rates are possible. By inserting between the spark-gap 50 and the aerial conductor A an inductance L' and between the spark-gap 46 and the aerial conductor A an inductance L^3 of different magnitude and between the spark-gap 42 and the aerial conductor A an inductance L^2 of a still different value it is possible to simultaneously transmit from the aerial conductor A a plurality of series of trains of waves at different rates and also to give to the waves of each series different periods. By depressing key 40, for example, trains of waves are emitted from the aerial conductor at a relatively high rate. By depressing key 44 trains of waves are emitted at a relatively lower rate, and by depressing key 48 trains of waves are emitted at a still lower rate. By this arrangement of the transmitting apparatus it is possible to send a message which may be read at a certain receiving-station only, while the receiving-station is supplied in its local circuit, as above described, with means for selecting fluctuating currents of a rate equal to that of the rate of succession of the trains of waves transmitted from a certain transmitting-station. For example, by depressing key 40 at a certain station a message may be sent to a certain other station, which receiving-station in the entire system is the only one having a local circuit selective of fluctuating currents of a rate equal to the rate of succession of the trains of waves emitted by oscillator controlled by key 40, such rate being dependent upon the number of segments in commutator N.

In Fig. 5 is shown a radiating aerial conductor, in series with which and the earth connection E is the spark-gap 59. In shunt to the spark-gap 59 is the secondary of the transformer 58, in the circuit of whose primary is the key 57. 21 represents an electric or other motor, which rotates continuously, driving shaft 52 and the commutators L, M, and N. The brushes bearing upon these commutators are numbered similarly to those in connection with Fig. 4, and the source of energy 20 is of the direct-current type in connection with the brushes bearing upon all the commutators. In series with the brush 38 is switch 54, in series with brush 36 is switch 55, and in series with brush 34 is switch 56. By closing any one of these switches 54, 55, or 56 and depressing the key 57, a reversed current will be sent through the primary of the transformer 58, and the rate of this current is dependent upon the number of segments in the commutator employed and also upon the rate of rotation of the shaft 52. For example, if the switch 54 is closed and key 57 is depressed a relatively high frequency reversed current will be passed through the primary of the transformer 58. If, however, switch 55 is closed and key 57 is depressed, a reversed current of lower frequency will be passed through the primary of the transformer 58 and likewise if switch 56 were closed and the key 57 depressed a reversed current of still lower frequency would be passed through the primary of the transformer 58. It is thus seen that with a single oscillatory transformer and a single operator's key there may be impressed at will upon the natural media different series of trains of waves, the series differing from each other in rate of succession of the trains of waves.

By the arrangement of circuits shown in Fig. 5 it is possible, therefore, to transmit trains of waves at different rates for the purpose of influencing a certain receiver, as explained in connection with Fig. 4.

Fig. 6 is an enlarged view of a commutator—as, for example M—which has interspaced metallic portions 24 and 25, which are separated from each other by insulating material 53.

In Fig. 7 is shown a side view of this commutator M, which has a central metallic portion which secures the commutator to the shaft 52, which passes through the central opening therein shown. Surrounding this portion is insulating material 53, and upon this insulating material is mounted the metallic portions 24 and 25, of which 25 is seen in edge view. Of the two brushes 30 and 31, 31 only appears in this view, and it may be said that the angular relations of these two brushes 30 31 is immaterial. The brushes 36 37 are shown displaced, however, as to their angular positions, and such is essential, as is well known in connection with commutators of this type. The bearing-points of the brushes 36 37 should be an angular distance apart equal to the angular distance between the centers of alternate segments of the commutator.

Though I have shown but one receiving-station with different methods of arrangement of circuits at such station and though I have shown but two single transmitting apparatus, it is to be understood that in my system are a plurality of stations each equipped with devices herein shown and described. It is to be further understood that though I select principally by tuning the receiving-circuits to the rate of succession of the trains of waves I may also attune the aerial receiving-circuit or circuits arranged in inductive or conductive relation therewith to the rate of the waves themselves, thus securing, in effect, a double tuning. For example, at a certain station the rate of succession of the trains of waves may be three hundred per second, while the rate of the waves themselves may be five hundred thousand per second. At the receiving-station the circuit including or controlling the wave-responsive device would be attuned to a rate of five hundred thousand per second, while at the same time the local circuit controlled by said wave-responsive device to select the particular message would be selective of fluctuating currents of a rate of three hundred per second.

It is to be understood that the arrangement of the wave-responsive device need not be confined to the series arrangements herein shown, but that it may be arranged in a circuit inductively connected with the aerial circuit or it may be connected in shunt to the frequency-determining element of a resonant receiving-circuit, as is now well understood in the art. Furthermore, it is to be understood that instead of a single wave-responsive device in conjunction with a single aerial conductor a plurality of wave-responsive devices may be used either in series relation, parallel relation, or series-parallel relation. It is to be further understood that in conjunction with a single aerial conductor may be employed several branch circuits, such circuits when taken in conjunction with the aerial conductor forming circuits selective of different rates of transmitted waves.

This application is a division of application filed September 13, 1902, and bearing Serial No. 123,237.

I do not claim herein the broad invention of selection by means in general and of any kind, but reserve the same for another application. Herein I claim as the selecting means a circuit in virtue of whose electrical properties a predetermined message or signal is received to the exclusion of others.

What I claim is—

1. In a wireless signaling system, a wave-responsive device, and a plurality of selective circuits controlled thereby.

2. In a wireless signaling system, a wave-responsive device, and a plurality of parallel selective circuits controlled thereby.

3. In a wireless signaling system, a wave-responsive device, and a plurality of circuits controlled thereby, each selective of a predetermined message.

4. In a wireless signaling system, a wave-responsive device, and a plurality of parallel circuits controlled thereby, each selective of a predetermined message.

5. In a wireless signaling system, a wave-responsive device, and a plurality of circuits

controlled thereby, each attuned to a rate corresponding with the rate of succession of the wave-trains representing a predetermined message.

6. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of selective circuits controlled thereby.

7. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of parallel selective circuits controlled thereby.

8. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of circuits controlled thereby, each selective of a predetermined message.

9. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of circuits controlled thereby, each selective of a current fluctuating at a predetermined rate.

10. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of parallel circuits controlled thereby, each selective of a separate message.

11. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of parallel circuits controlled thereby, each selective of a current fluctuating at a rate characteristic of a predetermined message.

12. In a wireless signaling system, a wave-responsive device, and a plurality of circuits controlled thereby, each circuit so adjusted as to its electrical constants as to be selective of a current fluctuating at a predetermined rate.

13. In a wireless signaling system, a wave-responsive device, and a plurality of parallel circuits controlled thereby, each so adjusted as to its electrical constants as to be selective of a current fluctuating at a predetermined rate.

14. In a wireless signaling system, a self-restoring wave-responsive device and a plurality of circuits controlled thereby, each circuit so adjusted as to its electrical constants as to be selective of a current fluctuating at a predetermined rate.

15. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of parallel circuits controlled thereby, each so adjusted as to its electrical constants as to be selective of a current fluctuating at a predetermined rate.

16. In a wireless signaling system, a self-restoring wave-responsive device, and a plurality of circuits controlled thereby, each so adjusted as to its electrical constants as to be selective of a current fluctuating at a rate characteristic of a predetermined message.

17. In a wireless signaling system, a wave-responsive device, and a circuit controlled thereby, said circuit including capacity and inductance so related as to render said circuit selective of a current fluctuating at a predetermined rate.

18. In a wireless signaling system, a wave-responsive device, and a circuit controlled thereby, said circuit including capacity and inductance so related as to render said circuit selective of a current fluctuating at a rate characteristic of a predetermined message.

19. In a wireless signaling system, a wave-responsive device, and a plurality of circuits controlled thereby, each circuit including inductance and capacity so related as to render the circuit selective of a current fluctuating at a predetermined rate.

20. In a wireless signaling system, a wave-responsive device, a plurality of parallel circuits controlled thereby, a capacity and inductance in each circuit and so related as to render each circuit selective of a current fluctuating at a rate characteristic of a predetermined message.

21. In a wireless signaling system, a receiving-circuit, and a plurality of circuits controlled thereby, each circuit being selective of a current fluctuating at a rate characteristic of a predetermined message.

22. In a wireless signaling system, a receiving-circuit, influenced by a series of wave-trains, each series representing a separate message, and a plurality of circuits controlled by said receiving-circuit, each selective of a current fluctuating at a rate equal to the rate of succession of the trains in a certain series.

23. In a wireless signaling system, a receiving-conductor, a wave-responsive device influenced by a plurality of series of wave-trains, each series consisting of trains succeeding each other at characteristic rate, and a plurality of circuits controlled by said wave-responsive device, each selective of a message represented by a series of wave-trains succeeding each other at characteristic rate.

24. In a wireless signaling system, a receiving-conductor, a wave-responsive device influenced by a plurality of series of wave-trains, the trains of each series succeeding each other at characteristic rate, and a plurality of parallel circuits controlled by said wave-responsive device, each selective of a message represented by a series of wave-trains succeeding each other at characteristic rate.

25. In a wireless signaling system, a receiving-circuit attuned to the rate of the transmitted electroradiant-energy waves, a wave-responsive device influenced by energy received in said circuit, and a local circuit controlled by said wave-responsive device and selective of a message represented by wave-trains succeeding each other at predetermined rate.

26. In a wireless signaling system, a transmitter comprising means for transmitting wave-trains at a predetermined, uniform rate, a receiver comprising a wave-responsive device, and a local circuit controlled thereby and selective of a message represented by the wave-trains succeeding each other at predetermined rate.

27. In a wireless signaling system, a trans-

mitter comprising means for emitting wave-trains at a predetermined, uniform rate, a receiver comprising a wave-responsive device, and a local circuit, controlled thereby and selective of energy fluctuating at a rate equal to the rate of succession of the transmitted wave-trains.

28. In a wireless signaling system, a transmitter comprising means for emitting wave-trains at a predetermined uniform rate, a receiver comprising a wave-responsive device and a local circuit, controlled thereby and attuned to a rate equal to the rate of succession of the transmitted wave-trains.

29. In a wireless signaling system, a transmitter comprising means for emitting wave-trains at a predetermined uniform rate, and for giving to the waves of a train a predetermined periodicity, a receiving-circuit attuned to the periodicity of the energy-waves, a wave-responsive device included in said circuit, and a local circuit controlled by said wave-responsive device and selective of a message represented by the wave-trains succeeding each other at the predetermined rate.

30. In a wireless signaling system, a transmitter comprising means for emitting wave-trains at a predetermined uniform rate, and for giving to the waves of a train a predetermined periodicity, a receiving-circuit attuned to the periodicity of the energy-waves, a wave-responsive device included in said circuit, and a local circuit, controlled thereby and selective of a current fluctuating at a rate corresponding with the predetermined rate of succession of the wave-trains.

31. In a wireless signaling system, a transmitter comprising means for emitting wave-trains at a predetermined uniform rate, and for giving the waves of a train a predetermined periodicity, a receiving-circuit attuned to the periodicity of the energy-waves, a wave-responsive device included in said circuit, and a local circuit, controlled thereby and attuned to a rate equal to the rate of succession of the transmitted wave-trains.

32. In a wireless signaling system, a plurality of transmitters each emitting wave-trains at characteristic and uniform rate, a receiving-conductor, a wave-responsive device influenced by energies received by said conductor, and a plurality of circuits controlled by said wave-responsive device, each selective of a current fluctuating at a rate equal to the rate of succession of the wave-trains emitted by a certain transmitter.

33. In a wireless signaling system, a plurality of transmitters, each emitting wave-trains at characteristic rate, the waves of the trains having definite periodicity, a receiving-circuit attuned to the periodicity of the waves of the trains, a wave-responsive device influenced by the energies received by said circuit, and a plurality of circuits controlled by said wave-responsive device, each selective of a current fluctuating at a rate equal to the rate of succession of the wave-trains emitted by a certain transmitter.

34. In a wireless signaling system, a receiving-conductor, a wave-responsive device influenced by energy received by said conductor, and a local selective circuit controlled by said wave-responsive device.

35. In a wireless signaling system, a self-restoring wave-responsive device, and a local selective circuit controlled thereby.

36. In a wireless signaling system, a wave-responsive device, and a circuit controlled thereby selective of a current fluctuating at a predetermined rate.

37. In a wireless signaling system, a self-restoring wave-responsive device, and a local circuit controlled thereby selective of a current fluctuating at a predetermined rate.

38. In a wireless signaling system, a circuit selective of a current fluctuating at a rate equal to the rate of succession of transmitted wave-trains.

39. In the receiving-circuit of a wireless signaling system, a self-restoring wave-responsive device, and a circuit controlled thereby selective of a current fluctuating at a rate equal to the rate of succession of the transmitted wave-trains.

40. In the receiving-circuit of a wireless signaling system, a circuit attuned to the rate of succession of the transmitted wave-trains.

41. In the receiving-circuit of a wireless signaling system, a local circuit selective of a current fluctuating at a rate equal to the rate of succession of the transmitted wave-trains.

42. In the receiver of a wireless signaling system, a local circuit attuned to the rate of succession of the transmitted wave-trains.

43. In the receiver of a wireless signaling system, a self-restoring wave-responsive device, a local circuit controlled thereby and attuned to the rate of succession of the transmitted wave-trains.

HARRY SHOEMAKER.

Witnesses:
FREDK. W. MIDGLEY,
JAMES M. SAWYER.