S. EISENSTEIN.

WIRELESS SIGNALING SYSTEM.

APPLICATION FILED AUG. 25, 1905.

991,837.

Patented May 9, 1911.

Fig. 1.

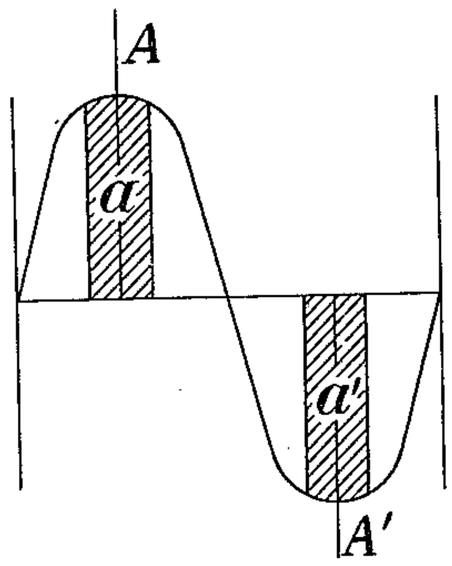


Fig. 2.

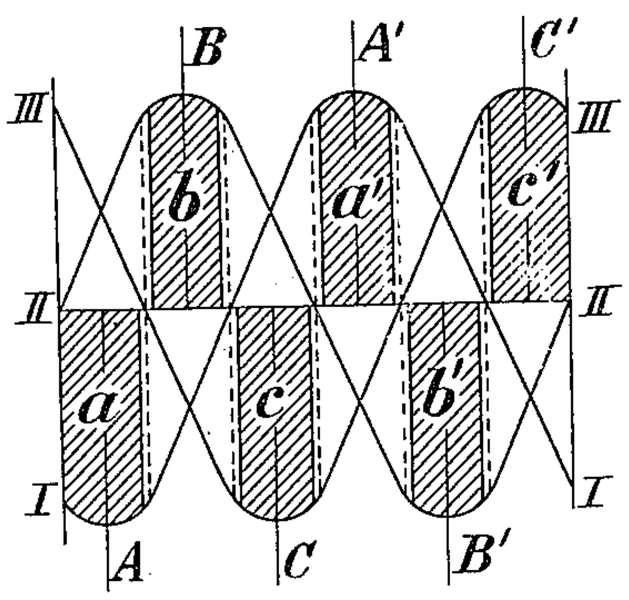


Fig. 3.

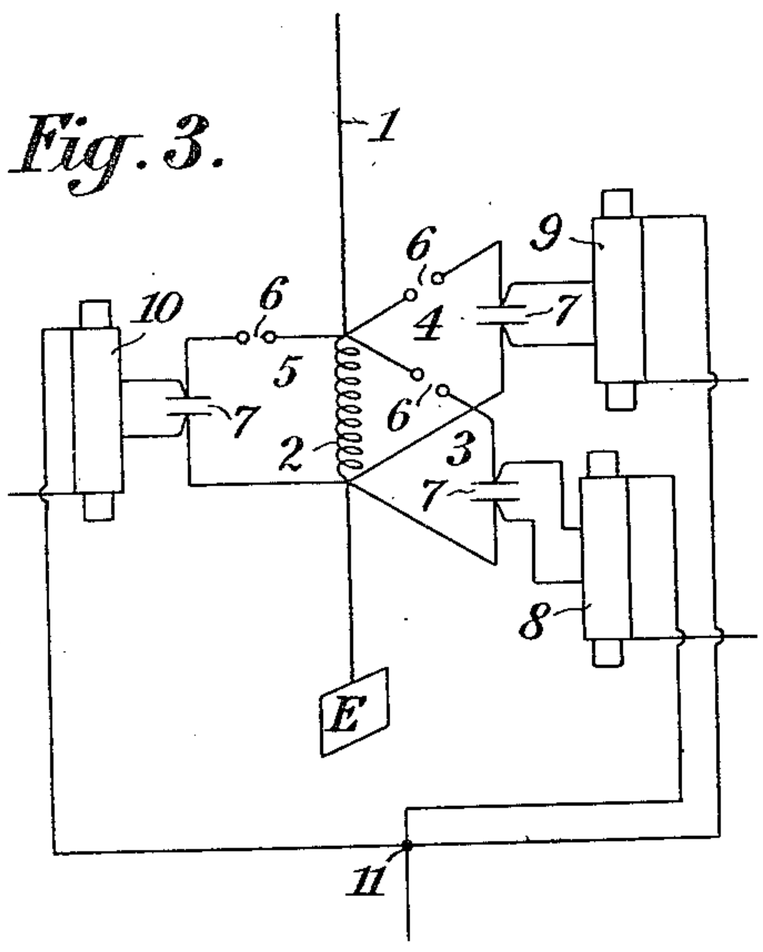
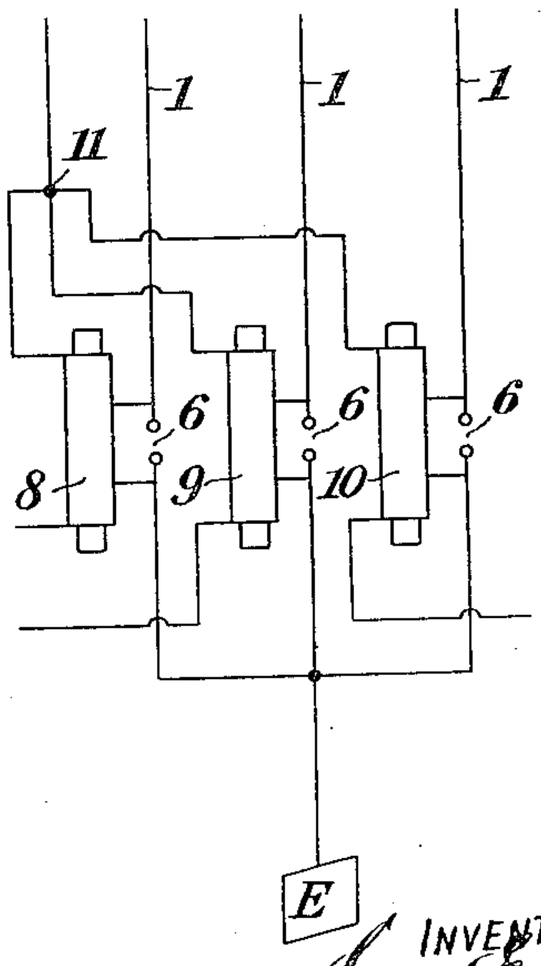


Fig. 4.



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WIRELESS SIGNALING SYSTEM.

991,837. Specification of Letters Patent. Patented May 9, 1911.

Application filed August 25, 1905. Serial No. 275,795.

To all whom it may concern:

Be it known that I, SIMON EISENSTEIN, a subject of the Emperor of Russia, residing at Berlin, in the Empire of Germany, have invented a new and useful Wireless Signaling System, of which the following is a specification.

My invention relates to improvements in senders of wireless signaling systems, whereby a very sharp selectivity is attained and any listening with a telephone is rendered most difficult.

I will now proceed to describe my invention with reference to the accompanying drawing, in which—

Figures 1 and 2 are diagrams, which will be referred to later on, Fig. 3 is a diagram of the sender in one mode of execution, and Fig. 4 is a diagram of the sender in another mode of execution.

Similar characters of reference refer to similar parts in the several views.

In the hitherto known wireless signaling systems it was customary to employ a single phase alternating current for energizing the sending circuit, which is controlled by a Morse key. The single phase alternating current, however, presents the disadvantage, that it is not possible to thereby attain so high a number of discharges as to avoid any listening with a telephone with perfect safety. For practical reasons the current is required to have from 50 to 100 periods at the most, as otherwise the capacity would be too insignificant. Even with a single phase alternating current with 100 periods the number of discharges is so small that it is easy to listen to the messages with a telephone, as is well known. In general the discharges take place in the proximity of the maximum of the tension of the current, which is marked by the perpendicular A in Fig. 1, where the curve of the single phase alternating current is shown. It would be useless to increase the discharge group (indicated by the hatched surface a or a') by so adjusting the spark gap, that the discharges take place at a lower tension, as thereby the disadvantage mentioned above is not avoided. For removing the said disadvantage, the single phase alternating current is according to my invention replaced by a multiphase alternating current. Fig. 2 shows for example the curve of a triphase alternating current, from which it will be apparent, that it is now possible to obtain more discharge groups than hitherto, the discharges taking place in the proximity of the perpendiculars A, B, C, A′, B′, C′, which represent the maxima of the tension. Evidently by the adoption of an alternating current with a high number of phases, say a six phase or a nine phase alternating current, it is possible to so increase the number of discharges as to render a listening with the telephone impossible. In all cases the frequency can be kept within practically allowable limits, say between 50 and 100 periods which is the ordinary or low frequency. When assuming a triphase alternating current and it is desired to avoid any listening with a telephone, of course it will be necessary to so adjust the spark gap, that the discharges take place at a lower tension, as is indicated by the hatched surface a, b, c, a', b', c', which represent the discharge groups. As each group comprises a whole series of consecutive discharges, of course the number of discharges is thereby increased in the desired degree.

The multiphase alternating current, when employed for energizing the sending circuit, presents quite a number of special advantages, which will be hereinafter named. Firstly, from Fig. 2 it is evident, that with a triphase alternating current it is possible to increase or to decrease the discharge groups a, b, c, a', b', c' by suitably adjusting the spark gap, so that either certain spaces are left between the several groups, or that the latter come in contact with each other and leave no spaces, or they may overlap each other. In the two latter cases, of course, a permanently energized sender is produced, which may be employed most advantageously in wireless signaling systems. Secondly, the multiphase alternating current presents the advantage, that within the same time a considerably greater amount of energy may be transmitted through the space, than hitherto. This is of special importance for those wireless signaling systems, in which the receiver is to be selective of energy of a predetermined frequency. With the aid of a suitable arrangement of the sender it is therefore possible, when employing a triphase or multiphase alternating current, not only to so increase the number of discharges as to render any listening with a telephone perfectly impossible, but also to transmit the energy over greater distances than hitherto owing

to the great amount of energy sent out. Thirdly, from Fig. 2 it is at once evident, that the rate of speed, at which the signals are given, may be considerably greater than in the known systems, since there is no chance that the Morse key might be depressed at a moment when the sender is not energized, since the discharge groups immediately follow each other. Fourthly, it is obviously possible with the aid of suitable arrangements of the sender, to utilize the discharges during the several phases independently of each other for the conveyance of messages, so that a series of messages may be simultaneously transmitted from the same sender, while they cannot operate upon each other. It may be preferable to employ known devices for giving different wave lengths to the discharges produced during the several phases of the current, so that the various messages of different wave lengths transmitted from the same sender may be taken up by various receivers, the number of which is equal to that of the phases. Fifthly, it is possible to so construct the sender with a multiphase alternating current as energy, that the waves of different wave lengths produced during the several phases can be taken up and the messages recorded only by a single receiver which is made selective of them. In correspondence with the number of the phases at the sending station an equal number of recording devices will have to be arranged at the receiving station, for instance relays which are actuated one after the other by the waves of different lengths produced during the several phases, and jointly cause the messages to be recorded. Thereby any unauthorized capture of the messages will be rendered most difficult, since it is nearly impossible to make a receiver selective of the unknown different wave lengths. The so constructed sender may be further perfected by causing it to remain energized during a number of phases, while the messages or signals are given during a phase. With the aid of a suitable known device the phase, during which the signals are given, may be changed from the one to either of the other phases of the current, so that the wave lengths are of course varied accordingly. In this case it will be quite impossible for any one to catch the messages, since the waves permanently vary their wave lengths. Of course the receiver will require to be arranged in a similar manner as described above.

The sender may be constructed in various manners without departing from the spirit of my invention. Fig. 3 shows for example a sender arranged for a triphase alternating current. It comprises an aerial conductor 1, which is connected with the earth-plate E, and three secondary circuits 3, 4 and 5 connected in shunt to it and containing each a spark gap 6 and a capacity or condenser 7, while their common inductance 2 is contained in the aerial conductor 1. The capacities or condensers 7, 7 are in a known manner connected with the secondary coils of three transformers 8, 9 and 10, the primary coils of which are connected by lines on the one hand with a common point 11 in the sending circuit and on the other hand with the three collector rings respectively of the triphase alternator. Then the current produced in this generator will pass through the primary coils of the three transformers 8, 9 and 10 one after the other in correspondence with the consecutiveness of the three phases. The currents induced in the three secondary circuits 3, 4 and 5 one after the other will cause discharges between the spark gaps 6, 6. As already mentioned above, the discharge groups may be varied by suitably adjusting the spark gaps 6, 6, and also the wave lengths of the discharges produced during the several phases may be differently adjusted by means of known devices.

My invention may equally be applied to those senders, in which a spark gap is contained in the aerial conductor. An example is shown at Fig. 4, in which the aerial conductor is divided into three branches 1, 1, 1 corresponding to the three phases of the triphase alternating current employed. Each conductor branch 1 contains a spark gap 6, while beneath the three spark gaps 6, 6 the three branch conductors, 1, 1, 1 are connected by their main with an earth-plate E as usual. The three spark gaps 6, 6 are severally connected with the secondary coils of three transformers 8, 9 and 10, the primary coils of which are connected on the one hand with a common point 11 in the sending circuit and on the other hand with the three collector rings respectively of the alternator. In such cases the aerial conductor requires to be divided into as many branches as there are phases in the current.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a wireless signaling system, the combination of an aerial conductor having an inductance therein and having an earth plate, a plurality of secondary circuits shunted around said inductance and each having therein an adjustable spark-gap and a condenser, a plurality of transformers, the secondary coils of each being shunted around each of said condensers respectively, and conductors adapted to connect one terminal of the primary of each transformer to a collector ring of a polyphase generator whereby different discharges are caused to take place at the spark-gaps for each phase, the other terminus of said primaries being connected to each other.

2. In a wireless signaling system, the com-

bination of an aerial conductor having an inductance therein and having an earth plate, a plurality of secondary circuits shunted around said inductance and each having therein an adjustable spark-gap and a condenser, a plurality of transformers, the secondary coils of each being shunted around each of said condensers respectively, conductors adapted to connect one terminal of the primary of each transformer to a collector ring of a polyphase generator whereby different discharges are caused to take place at the spark-gaps, and means for utilizing the discharges during the separate phases independently of each other, whereby a series of messages may be transmitted by the same sender.

3. In a wireless signaling system, the combination of an aerial conductor having an inductance therein and having an earth plate, a plurality of secondary circuits shunted around said inductance and each having therein an adjustable spark-gap and a condenser, a plurality of transformers, the secondary coils of each being shunted around each of said condensers respectively, conductors adapted to connect one terminal of the primary of each transformer to a collector ring of a polyphase generator whereby different discharges are caused to take place at the spark-gaps, said secondary circuits being adapted to give waves of different lengths.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SIMON EISENSTEIN.

Witnesses:

WOLDEMAR HAUPT,

WILLIAM MAYNE.