March 4, 1924. 1,485,776

J. K. M. HARRISON

MARINE SIGNALING APPARATUS

Filed Jan. 3, 1920 3 Sheets-Sheet 1

FIG. V.

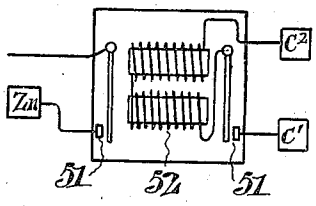


FIG. III.

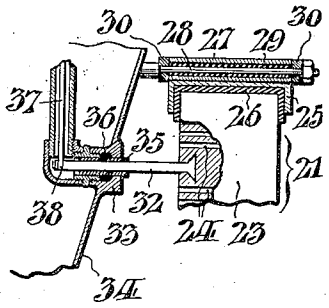
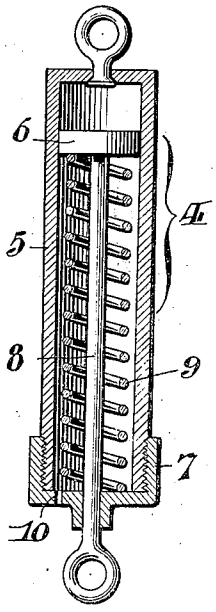


FIG. II.



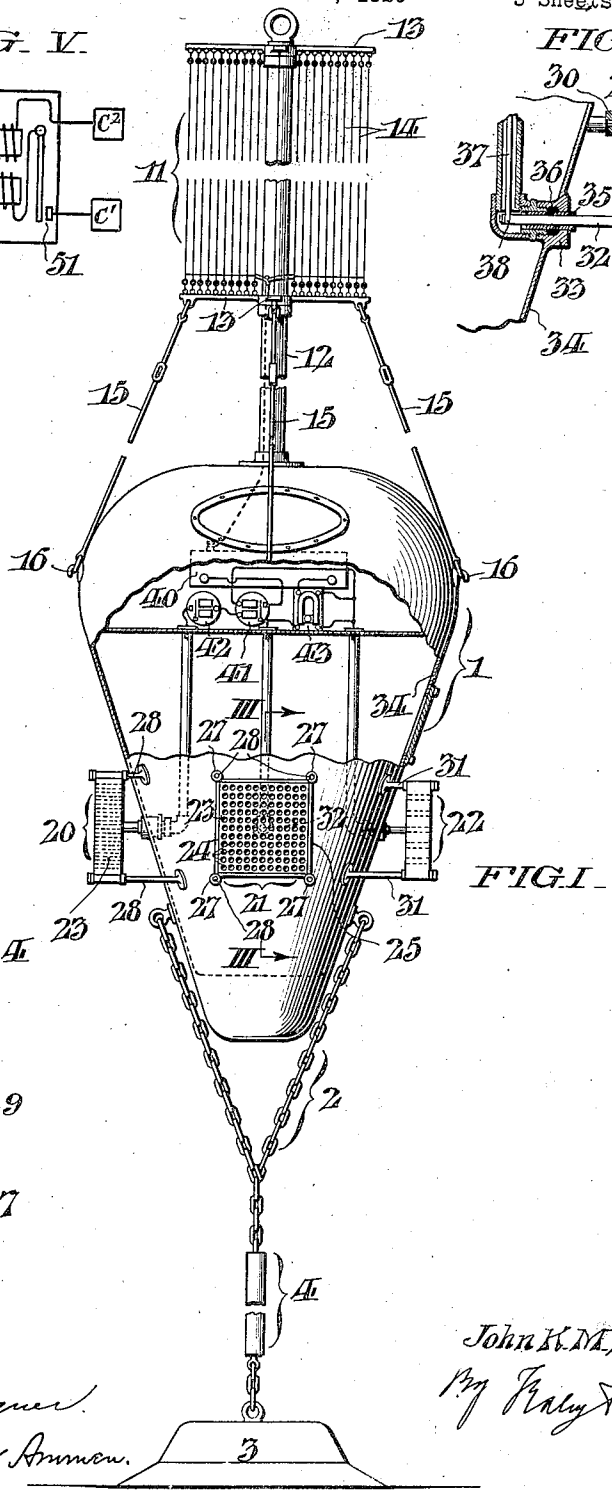


FIG. I.

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MARINE SIGNALING APPARATUS

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FIG. IV.

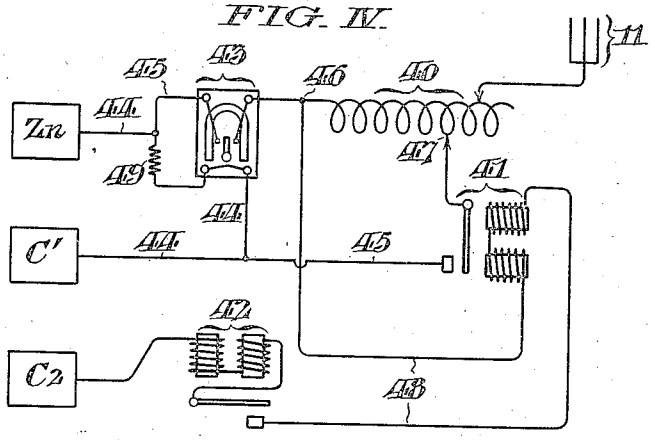


FIG. VI.

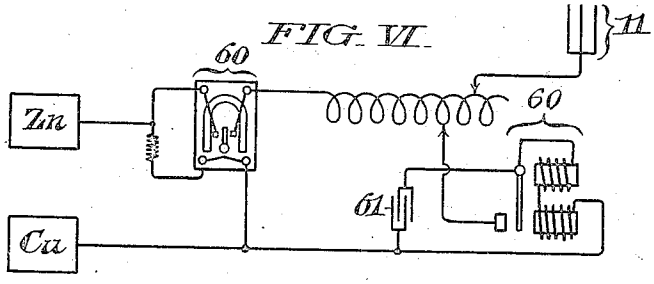
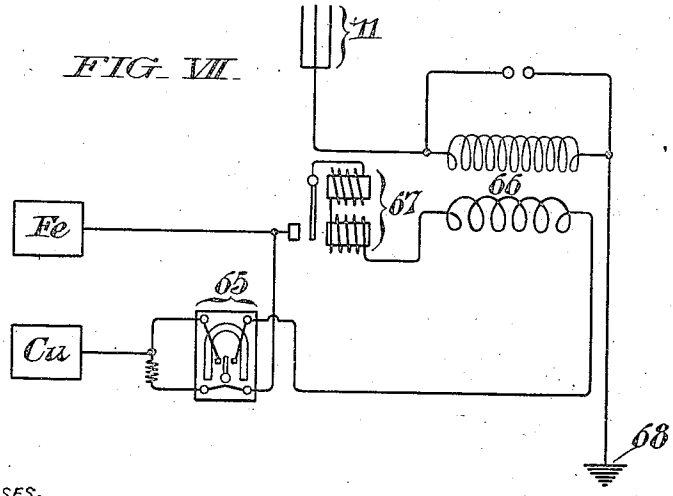


FIG. VII.



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MARINE SIGNALING APPARATUS

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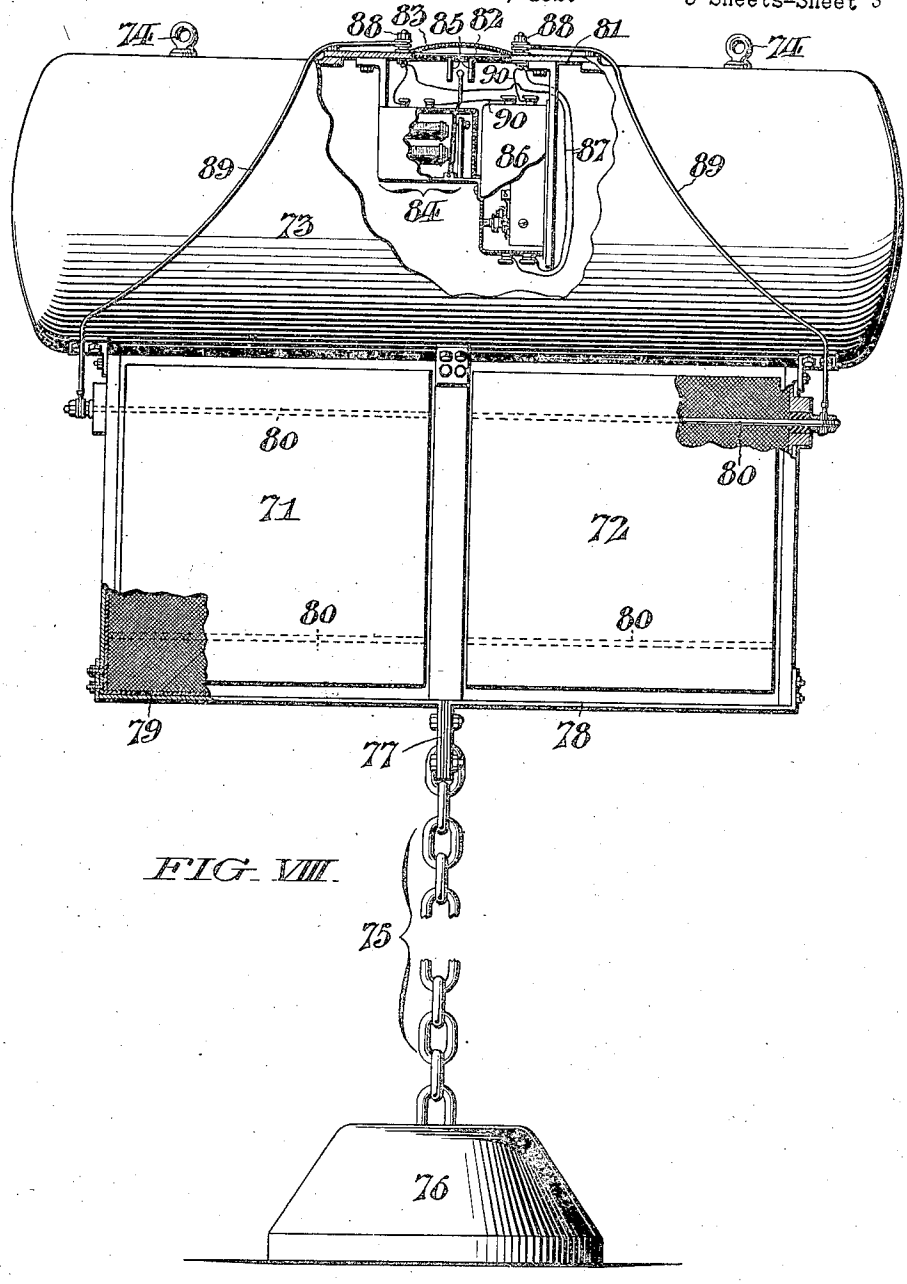


FIG. VIII.

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Patented Mar. 4, 1924. 1,485,776

UNITED STATES PATENT OFFICE.

JOHN K. M. HARRISON, OF OGONTZ, PENNSYLVANIA.

MARINE SIGNALING APPARATUS.

Application filed January 3, 1920. Serial No. 349,344.

To all whom it may concern:

Be it known that I, JOHN K. M. HARRISON, a citizen of the United States, and a resident of Ogontz, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Marine Signaling Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to marine signaling apparatus and the like, and more particularly to apparatus intended to give a signal of some kind for whose production power is required. It is my aim to provide an organization or apparatus which shall be reliable and certain in its action, durable and free from deterioration or derangement, and simple in construction and operation; and which shall require little attention when in service. The utility of such apparatus being, of necessity, dependent upon the power supply, my invention is especially concerned with this as a factor in securing all the advantages here set forth. The invention is especially applicable to signaling and marking buoys in situations such that extrinsic sources of power are impracticable, so that as regards production of power required for its operation the buoy equipment or organization in situ must be intrinsically complete and self-dependent. Other advantages obtainable through the invention will appear from the description hereinafter of the best embodiment at present known to me, while its scope will be indicated in my claims.

In the drawings, Fig. I, is a slightly diagrammatic elevation of the buoy organization embodying my invention, a portion of the exterior shell of the float or buoy proper being broken away to expose the internal parts.

Fig. II, is a mid-sectional detail view, on an enlarged scale, of one of the parts shown in Fig. I.

Fig. III, is an enlarged fragmentary sectional view on a plane corresponding to the line III—III in Fig. I, illustrating structural details of a battery pole element shown in Fig. I.

Figs. IV, V, VI and VII, are diagrammatic illustrations of the electrical features indicated in Fig. I, and of certain modifications.

Fig. VIII, is a view similar to Fig. I, of a device adapted for emitting audible submarine signals.

The buoy organization shown in Fig. I, comprises a buoy proper or float 1, of usual form and construction, connected by a chain cable 2 to an anchor 3. Embodied in the anchor connection 2 is a device 4 intended to take up and relieve sudden stresses on the anchor cable due to the pitching of the buoy, etc. As will be seen from Fig. II, this device 4 comprises a tubular casing 5 attached to one section of the cable 2 and an abutment member 6 adapted to slide in said casing and attached to the other cable section. Between the abutment member 6 and a screw cap 7 (which forms one end of the casing and has an opening for the shank 8 of the member 6) is interposed a helical compression spring 9 of suitable length and scale. When unusual stress is brought to bear upon the cable 2 in consequence of pitching of the buoy float 1 or the like, the spring 9 yields sufficiently to prevent the stress from becoming excessive, and thus protects the cable 2 from breakage. The water in the casing 5 beneath the abutment member 6 acts as a cushion to afford a certain protection to the spring 9 against shock, since only a small opening 10 in the cap 7 is provided for its escape. When the stress on the cable 2 is relieved, the spring 9 returns the parts to their initial positions, the abutment member 6 being sufficiently loose in the casing 5 to permit the water in the upper end of the casing to flow out gradually.

The particular signaling means shown being intended to emit radio or wireless signals, the buoy 1 is provided with an aerial 11 shown as comprising a mast or standard 12 mounted on top of the buoy proper and provided with double cruciform cross arms 13, 13 between which are strung the antennæ wires 14. This mast is stayed to the buoy by guys 15 attached to the cross arms 13 and to hooks 16 on the buoy shell.

Power for producing the radio signals is provided by means of a galvanic cell or battery device forming part of the buoy organization and functioning on the galvanic couple principle with the sea water about the buoy as electrolyte. Preferably,—both for the sake of obtaining the greatest possible power from the battery, and to avoid electrolytic consumption of the buoy,—the buoy proper 1 and its associated parts 2 and 3 are not employed as pole elements of the battery, but instead separate pole elements 20, 21 and 22 are provided and insulatedly mounted on the buoy shell. As

shown, the pole elements 20 and 21 are intended to be made of carbon, and the pole element 22 of zinc. As will be seen from Figs. I and III, the pole elements 20 and 21 each comprise a rectangular body or slab 23 of ordinary battery carbon, which may be 12 inches square and 2 inches thick, and pierced with some hundred or more half inch holes 24 to increase its contact surface exposed to the sea water as electrolyte. This body 23 is held by its edges in a channeled metallic frame work 25, an insulating lining 26 of material such as rubber or bakelite being interposed to prevent destruction of the frame work by local electrolytic action between its material and the carbon. At each corner of the frame work is a tubular socket or ear 27 through which extends a metallic standard 28; if desired, additional protection against destruction by electrolysis can be afforded by insulation interposed between the frame work 25 and the standards 28. As shown in Fig. III, this insulation comprises a sleeve 29 of insulating material (such as bakelite) around the standard 28 within the socket 27 and a couple of insulating washers 30, 30 (of similar material) at opposite ends of the sockets.

The zinc electrode or pole element 22 may be of similar dimensions and form; but instead of being mounted in a frame work, it may be attached to the standards 31 by inserting them in sockets bored through it at its corners, the standards 31 being insulated as just described with reference to the standards 28 in Fig. III.

The properties of carbon are such that it is a very difficult matter to make a satisfactory, permanent electrical connection to a sea battery electrode of this material. As the sea water must permeate the electrode completely, the initial conductor used for the purpose must itself be of carbon. This carbon conductor must be brought within a water-tight space for the attachment of a metallic lead thereto (since the mechanical properties of carbon make such a lead a practical necessity in the great majority of cases), in order that the joint of the metallic lead with the carbon may not be destroyed by local electrolytic action. It is necessary, then, that the water be prevented from entering the water-tight space through the pores of the carbon conductor.

As shown in Fig. III, the carbon slab 23, has a portion free of the surface-augmenting holes 24, and into a suitably shaped dovetail socket in this portion the dovetail ended rectangular carbon conductor rod 32 is tightly wedged,—mechanical tightness being relied upon for electrical connection, as well as for structural stability. This rod 32 extends through a stuffing box 33 in the shell 34 of the buoy. A rubber sleeve 35 on the rod 32 co-acts with the rubber packing 36 of the round stuffing box to accommodate the rectangular rod and to insure perfect water-tightness around the rod. To prevent water from entering through the pores of the rod 32, it is impregnated with suitable material such as tar or pitch,—which may be put in according to an ordinary process in which the rod is treated in vacuum to remove the air from its pores, and heated tar or pitch is admitted to the treating chamber to permeate the rod and fill its pores completely. The current lead 37 is attached at 38 to the end of the rod 32 within the shell 34, according to the usual practice with ordinary battery carbons.

The zinc slab 22 has a similar electrical connection into the buoy shell 1 to its lead,—except that its connection may be a round zinc or galvanized iron one fused or cast into it, and need not be impregnated.

It is to be understood that all exposed metallic parts of the buoy organization (other than the electrodes) that are in electrical connection with one another should be of the same metal, to obviate destructive electrolytic action.

Radio signals may be produced from the direct current furnished by the sea battery in any suitable manner. As shown in Fig. I and in the corresponding enlarged diagram of Fig. IV, there is employed an induction coil 40 together with interrupters 41 and 42 of buzzer type and a standard Weston circuit-closing relay 43. As shown, the carbon and zinc electrodes C^1 and *Zn* are connected together through the control circuit 44 of the relay 43, so that they continually tend to close the relay switch and connect the *Zn* electrode (through a circuit 45) to one terminal 46 of the induction coil primary. The other terminal 47, of the primary (with the usual provision for maximum power adjustment) is connected to the electrode C^1 through the parallel make and break interrupter 41. The control windings of the interrupter 41 are connected by the circuit 48 between electrodes *Zn* and C^2, the other series interrupter 42 being included in this circuit. It will be seen, therefore, that whenever this latter circuit 48 closes, the induction coil primary circuit 45 will be opened by the interrupter 41; and that almost as soon as the circuit 48 is closed, it will be opened again and the interrupter 41 be allowed to close the induction coil primary circuit 45 again. In this way, electrical oscillations of radio frequency are derived from the direct current furnished by the sea battery.

The function of the relay 43 is to take care of the polarization effect which reduces the available difference in potential between the poles of the sea battery. This makes the emission of signals intermittent, and so

greatly increases the life of the battery. If the device were operated continuously, there would soon be such a falling off in energy available from the battery that the device would cease to function. The relay 43 automatically takes care of this by opening the power circuit when the potential falls beneath a certain minimum voltage, and closing the circuit when the potential reaches a certain higher voltage, so that the operation is periodic or intermittent. To accomplish this, the controlling circuit 44 from the relay 43 is connected to the two controlling poles *Zn* and C^1 of the sea battery through a high resistance 49 of ten or twenty thousand ohms.

In practice, the motion of the waves tends to depolarize the anode and so counteract the polarization effect somewhat.

The aerial 11 is connected to the induction coil secondary in the usual way. The aerial 11 is grounded through the electrode *Zn*.

In Fig. V is shown a double interrupter 50 in which are combined the functions of the two interrupters 41 and 42 of Fig. IV. The construction and connections of the parallel make and break 51 are exactly like those in Fig. IV; the single set of coil windings 52 are connected like the windings of the interrupter 41,—the series make and break 53 being interposed in the same relation to them as the series make and break 42 of Fig. IV to the interrupter 41 there shown.

In Fig. VI is shown an arrangement in which the series interrupter and the corresponded anodes are omitted, a copper anode *Cu* being used instead of a carbon one. As here shown, the winding of the interrupter 60 is connected in series with the induction coil primary and the interrupter make and break. The interrupter is shunted through a condenser 61 of about 0.1 microfarad capacity. Here electrical oscillations of radio frequency are derived through the action of the interrupter 60. The ground is through the cathode *Zn*.

In Fig. VII, I have shown a construction in which the relay 65 bears to the anode *Cu* the same relation as in Figs. V and VI to the cathode *Zn*,—the cathode *Fe* being here of iron. The relatively low resistance primary of the induction coil 66 is connected between the electrodes *Cu* and *Fe* through the relay switch on the one side and the series interrupter 67 on the other. The induction coil secondary is here grounded to the buoy shell at 68. Here electrical oscillations of radio frequency result from the action of the interrupter.

In every case, the interrupter windings or coils, should be of comparatively low resistance,—about 0.5 ohm.

In Fig. VIII, I have shown an apparatus intended to give an audible submarine signal. As here shown, the battery comprising the pole elements 71 and 72 is attached to the lower side of a cylindrical casing 73 which contains the operating parts and is intended to be suspended from an ordinary channel marking buoy or the like by means of cables attached to eyes 74. This submerged apparatus comprising the pole elements and the case 73 is connected by a chain or other cable 75 to an anchor 76, this chain being attached to a bracket 77 on the framing 78 of the pole elements.

As here shown, the pole elements 71 and 72 are made up of a multiplicity of metal plates perforated or otherwise honeycombed and stacked or nested together, so as to have very large effective exposed or wetted interstitial surface. Each pack of plates is mounted in a channeled metal framing 78, suitable insulative lining 79 being interposed between the pole element and the channel framing. The plates are secured together by tie-rods 80 one of which projects sufficiently to serve as a terminal for each pole element. In the upper side of the case 73 is an opening normally closed hermetically by a cover 81 into which is set a thin plate 82 that serves as a bell or sound producing diaphragm. This diaphragm may be protected by a grillage 83.

Besides an ordinary bell ringing buzzer 84 whose hammer vibrates between brackets 85 on the plate 82 there is mounted on the cover plate 82 a circuit interrupter 86 shown as having the form of a standard Weston circuit closing relay. The control circuit of this relay 86 is connected by leads 87, 87, to terminals 88, 88 secured watertight in the cover 81. These terminals are, in turn, connected by exterior waterproof insulated leads 89, 89 to the terminals 80, 80, of the pole elements 71 and 72. The make and break of the relay 86 is connected by leads 90 across the terminals 88, 88 in series with the operating magnet circuit of the buzzer 84. It will be seen, therefore, that the submarine bell 82 will be periodically or intermittently operated to emit oscillations of auditory frequency at intervals depending on the polarization and depolarization of the battery 71, 72,—relay 86 acting to open the buzzer circuit when the potential of the battery falls below a certain value, and to close it again when the potential rises above a certain higher value.

Having thus described my invention, I claim:

1. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte, and means for emitting oscillatory signals requiring electric power for its operation and receiving such power from said battery.

2. A signaling buoy equipment compris-

ing a galvanic battery with pole elements exposed to the sea water as electrolyte, signaling means requiring electric power for its operation and receiving such power from said battery, and means for periodically interrupting the battery circuit.

3. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte, signaling means requiring electric power for its operation and receiving such power from said battery, and means actuated as a result of the battery polarization for periodically interrupting the battery circuit.

4. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte, and means for emitting oscillatory signals receiving and requiring for its operation only the power from said battery.

5. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte, and means for emitting radio signals operated by power from said battery.

6. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte; means for emitting radio signals receiving and requiring for its operation only the power from said battery; and means actuated as a result of the battery polarization for periodically interrupting the battery circuit.

7. A signaling buoy equipment comprising a galvanic battery with pole elements exposed to the sea water as electrolyte, a radio sending aerial carried by the buoy, and means for deriving electrical oscillations of radio frequency from the direct current furnished by said battery and transmitting them to said aerial.

In testimony whereof, I have hereunto signed my name at Philadelphia, this 31st day of December 1919.

JOHN K. M. HARRISON.

Witnesses:
JAMES H. BELL,
E. L. FULLERTON.