No. 775,337. PATENTED NOV. 22, 1904.

R. L. DE MOURA.

WIRELESS TELEPHONE.

APPLICATION FILED OCT. 4, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

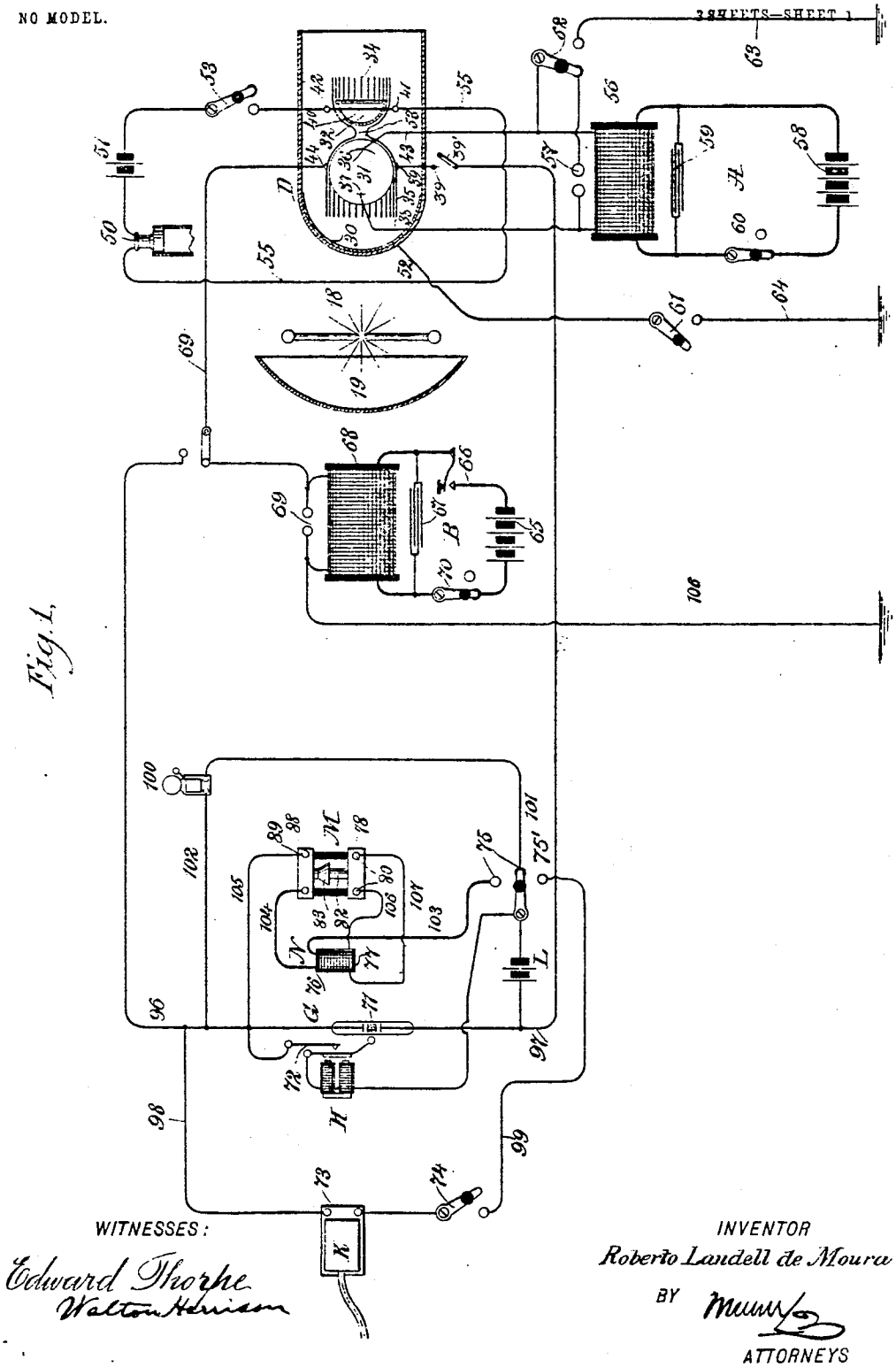

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

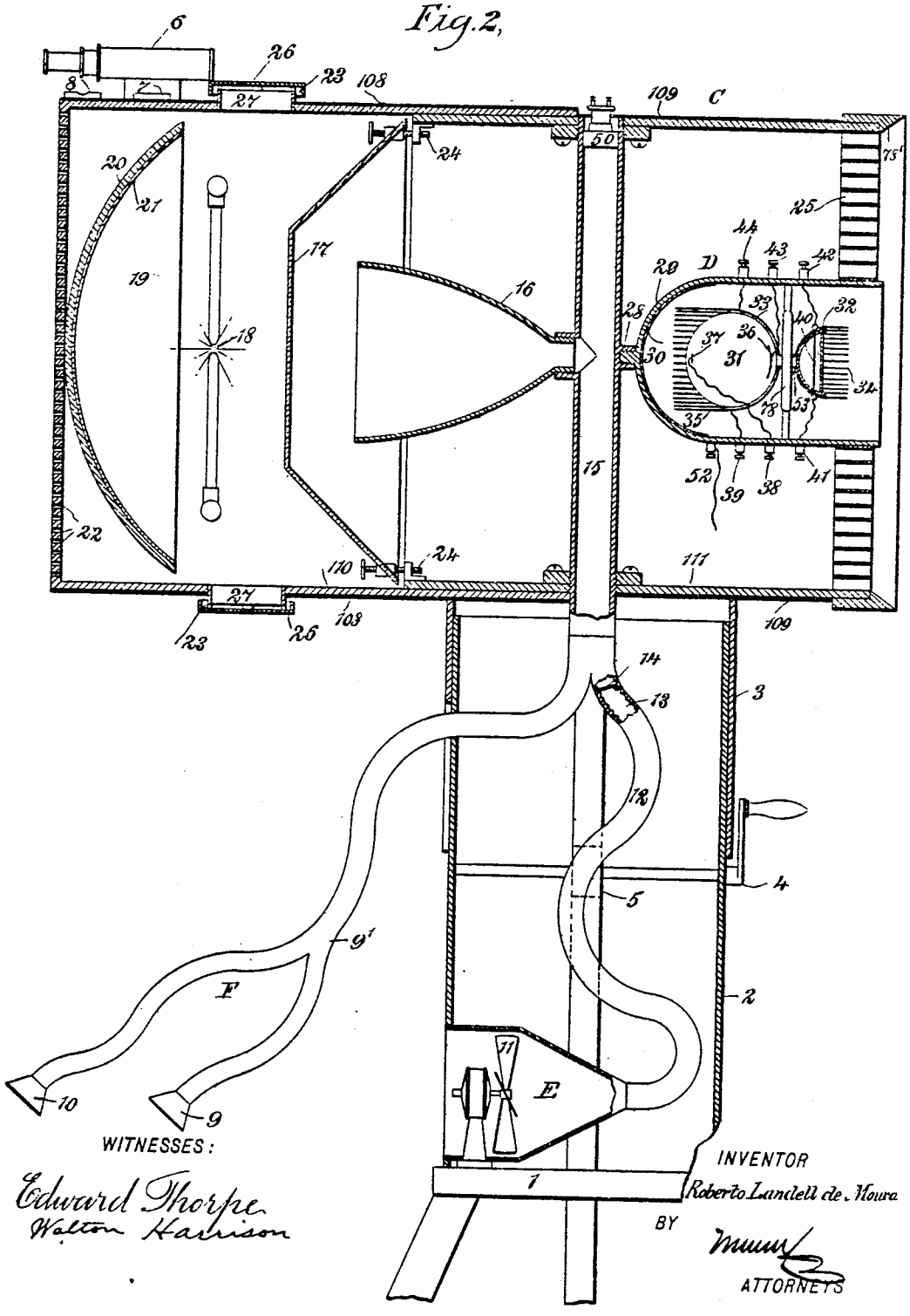

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Fig. 3.

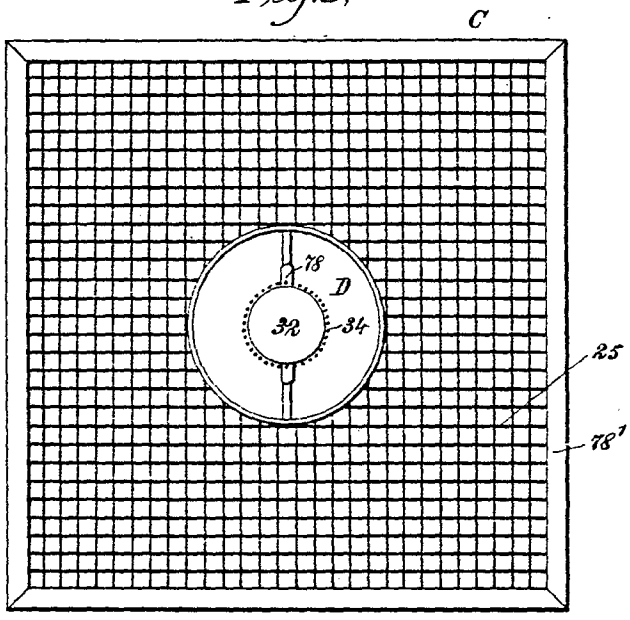
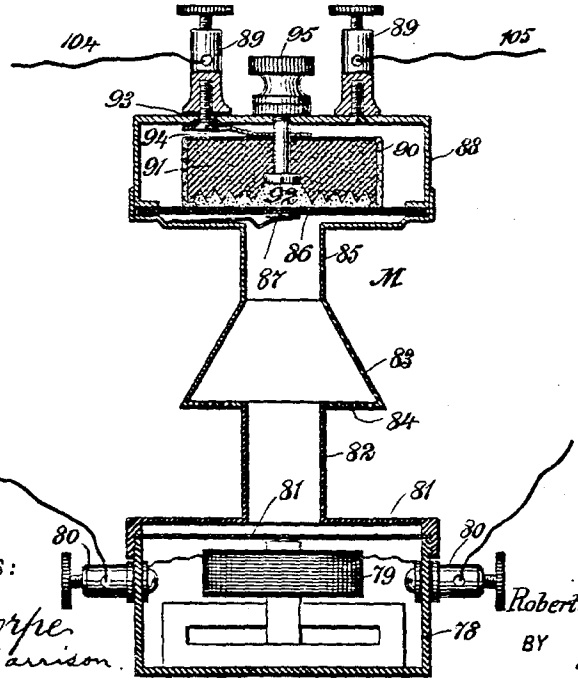


Fig. 4.



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No. 775,337. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

ROBERTO LANDELL DE MOURA, OF NEW YORK, N. Y.

WIRELESS TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 775,337, dated November 22, 1904.

Application filed October 4, 1901. Serial No. 77,576. (No model.)

To all whom it may concern:

Be it known that I, ROBERTO LANDELL DE MOURA, a citizen of the Republic of Brazil, and a resident of the city of New York, borough of Manhattan, county and State of New York, have invented a new and Improved Wireless Telephone, of which the following is a full, clear, and exact specification.

The object of my invention is to transmit and receive intelligence at a distance by means of sound and electrical waves, corresponding to articulate speech, without the aid of wires.

In the accompanying drawings like characters indicate like parts in all the figures.

Figure 1 is a diagram showing the apparatus at one of the stations, both for transmission and receiving. Fig. 2 is a sectional view of certain parts of the apparatus. Fig. 3 is a partial elevation thereof viewed from the front. Fig. 4 is a sectional view of a device for augmenting the sound-waves in receiving signals.

This apparatus consists generally in a device for transmitting and receiving vocal sounds and speech and includes a signaling device for attracting the attention of an operator. This signaling device is herein shown merely to exhibit the connection of the same with the telephone proper.

A divisional application claiming this signaling apparatus has been filed January 16, 1902, Serial No. 89,976.

Taking up first the telephonic transmission and receiving and referring particularly to Fig. 2, the frame 1 is provided with an upright tubular member 2, upon which telescopes another tubular member, 3, adjusted by means of a crank 4 and rack and pinion 5, to be elevated and lowered at will. Upon the member 3 is mounted a transmitter C. A telescope 6, compass 7, and level 8 are mounted on the transmitter for the purpose of pointing the same in alinement with a distant station. A tube 9′ has branched ends provided with terminal mouthpiece 9 and earpiece 10, and is united to another tube, 12, the two tubes being connected to the lower insulated end of a tube 15.

The tube 12 is provided with an upwardly-opening check-valve 14 and has at its lower end means for producing an air-blast comprising a chamber E, containing a fan 11. When one uses the fan and it is in action rotated by suitable power and a person talks into the mouthpiece 9 or 10, a blast of air opens valve 14 and passes up with the sounds from 9 through the tube 15, and the sound-waves with the blast of air are projected by the member 16 against the deflector 17 and by this are sent forth through the interior of the barrel C, which is also traversed inside by the pencil or ray of composite light from 18.

At 17 I show a plate of quartz-glass suitably framed and adjustable by means of the screws 24.

18 is a source of light, preferably an electric-arc lamp, whose light is rich in violet rays.

At 19 is a mirror, consisting of a back 20, which may be of polished metal or glass and of parabolic shape to reflect only actinic or violet rays. I do not confine myself to this form of light or the means shown for rendering its rays parallel or to the particular means for sifting out all but the violet or actinic ultra-violet rays, as any means may be employed that will produce violet or actinic rays or augment their intensity.

Back of the mirror and at intervals around the barrel of the transmitter are ventilating-openings 22 and 23, the latter provided with hoods 26 to keep out light. The barrel comprises two members 110 111 and 108 109, these telescoping together.

The quartz-glass 17 may be replaced by other substances which will deflect sound-waves and which may be resonant thereto, but will pass the violet or actinic rays of light. Sound-waves carried on the incoming air-blast are brought against this deflector 17 through the funnel 16.

A grating 25, of thin metallic slats covered with lampblack and crossing each other, splits up the light into a number of parallel beams, which I find adds to the efficiency of the apparatus. The member 25, Fig. 2, at its extremities is insulated and also its last central metallic plate, in which the member D is adjusted. The member 25, Fig. 1, is electrically connected with the wires 44 and 39 by means of two insulated wires, which pass through

the center of the insulating-jacket existing between the two metallic walls, which telescoping one in the other form the member D. The two connecting-wires, as well as the member 25, have no communication with the interior or the exterior walls of the member D. The plate 17, as stated, is in every case so constructed as to offer no obstruction to these violet rays. This is important, as my discovery has been that by means of these actinic rays of light the sound-waves impressed thereon can be carried to considerable distances.

Located centrally in the barrel of the transmitter is a smaller receiver-barrel 29, provided with a closed rounded interior end containing a reflector 30, preferably of metal. This barrel is carried on the upright tube 15, being screwed on a socket-support 28.

In the focus of mirror 30 is a hermetically-sealed and exhausted hollow semispherical member 32, covered with quartz-glass or other substance pervious to the violet rays and containing a selenium plate or grid 40, the general plane of which is vertical. Terminals 41 and 42 are provided for the selenium-cell, and a third, 52, is used sometimes with a ground-wire, by which undesirable static charges are dispersed. The selenium-cell and all attachments are carried on the insulated stem 53 on the post 78.

Two apparatuses like that of Fig. 2 adjusted one in front of the other and at a distance relatively short may be used for sending and receiving acoustically—that is, without the telephone 50 and also without the coöperation of the selenium plate 40. Then for sending the operator after having put in action the fan 11 and the light from 18, Fig. 2, speaks through one of the mouthpieces 10 9, closing the other. For receiving he stops the fan and holds 10 and 9 to his ears. The fan is used only in sending. The apparatus then works in a manner based on the well-known principles of the conjugate mirrors, and I find that the addition of certain kinds of light improves the effects in sending and receiving. The apparatus so taken may not be of great commercial value. However, I claim it, because, properly speaking, it constitutes the transmitter of my own wireless telephone, as my own selenium-cell, here described, constitutes its receiver. In my own wireless telephone—that is, with the coöperation of my own photophonic devices—my clear actinic light is absolutely necessary. I say "clear actinic light"—that is, light composed of clear light and actinic rays, as is that produced by an arc-lamp or by a blue glass in front of a source of common light. For sending at long distance I prefer the composite light produced by an arc-lamp. For producing actinic rays of violet light I may adjust inside or outside of the deflector 17 a thin pellicle made of suitable diaphanous substance. Thus in the top of the tube 15 a telephone-receiver 50 is mounted, connected in local circuit 55, containing a battery 51 and also including the selenium-cell 40 50. It is well known that the resistance of amorphous selenium varies inversely as the amount of light to which it is exposed, nearly. I have discovered that it varies more particularly as the intensity or density of the violet or actinic rays, giving thus a very delicate test for the presence of such rays. In this apparatus when a light from the distant station falls upon the selenium its resistance varies as the intensity of the light varies, that in turn varying with the sound-waves to which its source has been exposed, as already described, and the telephone-receiver 50 thereby reproduces these sounds with great fidelity. The listener can then hear by holding the telephone 50 or the mouthpieces 10 9 to his ears. In the last case he must close the communication between the members 16 and 15, Fig. 2. It is a singular and important fact that if the receiver be entirely removed, however, and the selenium not employed the apparatus shown still reproduces the sounds as stated above. I regard this as an important discovery and consider myself entitled to cover its application to useful purposes.

Located within the barrel 29, Fig. 2, and in the focus of the mirror is a Crookes tube or cathode-lamp 31. A series of wires 35 in the form of a crown surrounds the lamp and projects toward the mirror 30. The points of these wires are bent inward toward each other radially at right angles to the axis of the barrel and terminate in a small circle whose axis is coincident with the circle of their support. One of the extremities of this crown is contracted for receiving inside of it the selenium-cell. These two series of wires are electrically connected with each other and the binding-screws 44 39. They have communication only with one of the terminals of the selenium plate 40. Terminals 38 and 43 are provided for the Crookes tube and 39 44 for the crown-wires. The Crookes tube is carried on a stem 53 on post 78 and is connected with an oscillator 56, Fig. 1, provided with proper appliances, including sparking terminals 57 and condenser 59. The primary battery for the oscillator is shown at 58, with a suitable switch 60. The sparking apparatus as a whole is marked A. When switch 60 is thrown into the position shown, sparks that would normally pass between balls 57 pass to the Crookes tube in the usual manner. The rays from the tube are transmitted in all directions; but those passing straight out and those deflected by the mirror are united in a beam in the same path as that of the composite light.

At B, Fig. 1, is shown another sparking apparatus. Battery 65 is connected by transmitting-key 66 and switch 70 with condenser 67 and Ruhmkorff coil 68, having spark-gap

and knobs, as usual. One knob is grounded by wire 106 and the other is connected by wire 69′ to points 34 35. Switch 70 being thrown into the position shown and key 66 depressed according to a prearranged code there is an oscillatory discharge between the knobs 69 and the points 34 35 throw off etheric waves. I find that the reflector 30 serves to render these parallel, or substantially so, and to increase the distance of transmission, especially when short waves are employed. Key 66 thus serves to send waves corresponding with Morse or other signals and for calling.

A coherer 71 is connected by wires 96 97 with wires 39′ and the crown-wires above described. These wires act as antennæ, not only transmitting but receiving the Hertzian waves. The uses of this coherer in receiving signals, and its associated parts, will appear clearly from a statement of their operation. Incoming waves are conveyed to coherer 71 as electrostatic surgings along the wires from points 34 35, 64 61 and cause its coherence. Battery-current from L then passes through the coherer and the two windings of the induction-coil N, also to the tapper H, in the usual way to decohere the coherer. From the coil N connections are made to the harmonic call or "howler" M, which will be described. This consists of a telephone-receiver and a microphone brought together with an interposed column of air, so that when one starts to vibrate its diaphragm it starts the other, and as they are in closed circuit they mutually react to produce a steady noise of considerable loudness to serve as a call to the operator. The howler is particularly shown in Fig. 4. With the switch 75 as shown in Fig. 1 the current would pass to the bell 100; but with the switch thrown to 103 the howler is in circuit. A Morse register K may also be employed, having its own switch 74 and connected to the lowermost contact of switch 75.

Suppose now that the distant operator depresses his signaling-key 66, causing etheric waves to be thrown off from his wire-points 34 35. These incoming waves, as stated, cause the bell 100 or the howler M to be actuated and call the attention of the home operator. He answers by means of his key 66, and conversation proceeds by means of the mouthpiece 9 and the earpiece 10, or telegraphic signals may be interchanged by means of the keys. These may be roughly taken on the howler, if desired. For sending electric impulses the operator closes the switch 69′ on the terminal of 69. For receiving the electric impulses he puts the same switch on the terminal of 96 and closes the switch 61. For sending articulate speech he lights the arc-lamp and speaks through one of the mouthpieces 9 or 10, closing the other. For receiving he closes the switch 53 and holds 50 to his ears or the two mouthpieces 9 10, closing in this case the acoustic communication between 15 and 16, as is said above. The coil 56 serves to augment the potential on the extremities of its secondary wires when it is used, together with the other coil, 68, through the secondary wires for the purpose of telegraphing by electric waves and flickerings of light, as is fully explained in the specification of my wireless-telegraph application, Serial No. 89,976. The wires 96 and 97 are provided with ordinary bobbins, and the parts H, K, 72, and 100 are provided with suitable resistances.

Referring to Fig. 4, 88 is a containing-box with carbon back electrode 90, adjustable by screw 92 and thumb-nut 95, and 86 is a carbon diaphragm with damper-spring 87. Granular carbon is interposed between back electrode and diaphragm, as usual, and connections made through the binding-posts 89. 78 is another box containing the receiver-magnets 79, acting on the diaphragm 81 and having terminal posts 80. The box 88 and the box 78 are connected by the tube 82, carrying a column of air and having an enlargement 83, with pressure-openings 84, which also serve to convey the vibrations out. In some cases the openings 84 may be made at one end to make the air-column a closed column. When the receiver-diaphragm is vibrated, it vibrates the column of air and thence the transmitter-diaphragm, which again produces changes in the current to the receiver, which again reacts, and so on harmonically, producing a long-drawn musical note of increasing and sustained loudness.

From this description it will be apparent that my invention consists, broadly speaking, in projecting electrical and other obscure waves of high penetrative force between stations and impressing on the column thus established the vibrations corresponding to speech-waves. In this way I have found the sound to be perfectly transmitted and apparently receivable without special apparatus. I do not assume that all sonorous waves or vibrations produced by my apparatus are limited or affected by means of the luminous column, but that all sonorous waves that start in the same path and travel therein with this column arrive therethrough at the receiving-station. Many ways of stating this may be conceived, but I shall claim its application. I shall also claim the means for rendering parallel all rays by means of a grating such as I have described and some details in the structure of the howler.

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

1. In a system of wave transmission, a source of waves, and a grating having its members coated with lampblack, substantially as described.

2. In a system of wireless telephony a call device comprising a microphone, a tube carrying said microphone at one end, a receiver at the other end thereof, an enlargement in the tube intermediate of its ends, and openings in said enlargement to permit communication between the outer air and the contained air column, substantially as described.

3. A wireless telephone, comprising a source of ordinary composite light, a violet-colored glass plate for stopping luminous and heat rays of said light while transmitting the actinic rays thereof, means for producing vocal sounds in the path of said actinic rays, and a light-controlled receiving device sensitive to said actinic rays, substantially as described.

4. A wireless telephone, comprising a source of light for producing actinic rays, a source of light for producing cathode-rays substantially in the path of said actinic rays, means for producing vocal sounds in the path of said actinic rays and substantially in the path of said cathode-rays, and a light-controlled receiving member for reproducing said vocal sounds, substantially as described.

5. A wireless telephone, comprising an ordinary illuminating member, a Crookes tube, means for producing vocal sounds adjacent to said illuminating member, and a light-controlled receiving device located at a distance, substantially as described.

6. A wireless telephone, comprising a source of common light, means for rendering the rays of light parallel, a source of cathode light, means for rendering parallel the rays of said cathode light, means for producing vocal sounds adjacent to the source of common light, and a light-controlled receiving device located at a distance, substantially as described.

7. A wireless telephone, comprising a source of common light, means for rendering the rays of said light parallel, a source of cathode light, means for rendering parallel the rays thereof, a sifting medium located in the path of said common light for modifying said light, an acoustic device for producing vocal sounds in the path of said light thus modified, and a receiving device located at a distance and sensitive to said light thus modified, substantially as described.

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

ROBERTO LANDELL DE MOURA.

Witnesses:
JNO. M. RITTER,
WALTON HARRISON.