R. H. MARRIOTT.

ELECTRICAL TUNING DEVICE.

APPLICATION FILED AUG. 24, 1909.

978,606.

Patented Dec. 13, 1910.

3 SHEETS—SHEET 1.

Fig. 1

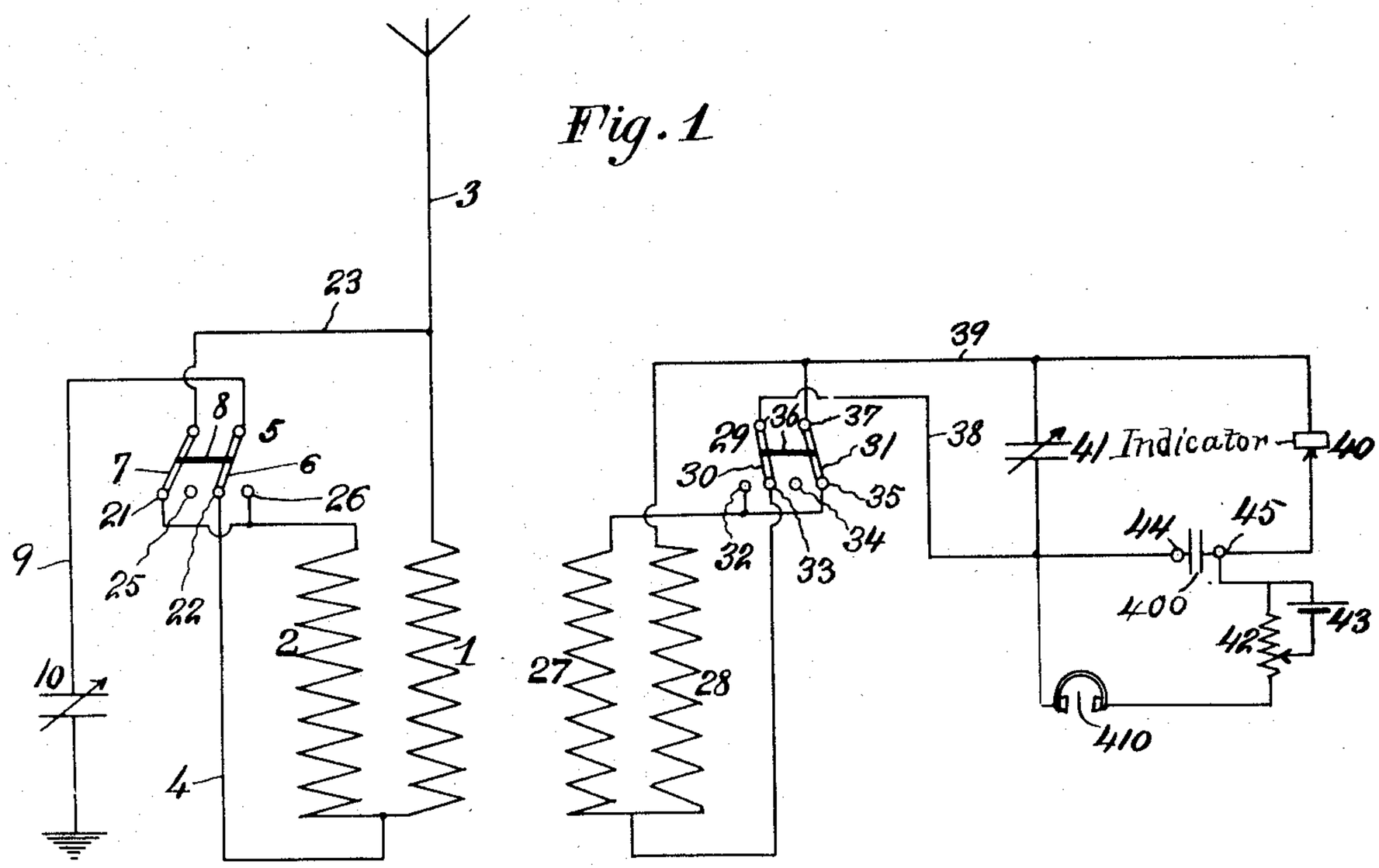


Fig. 2

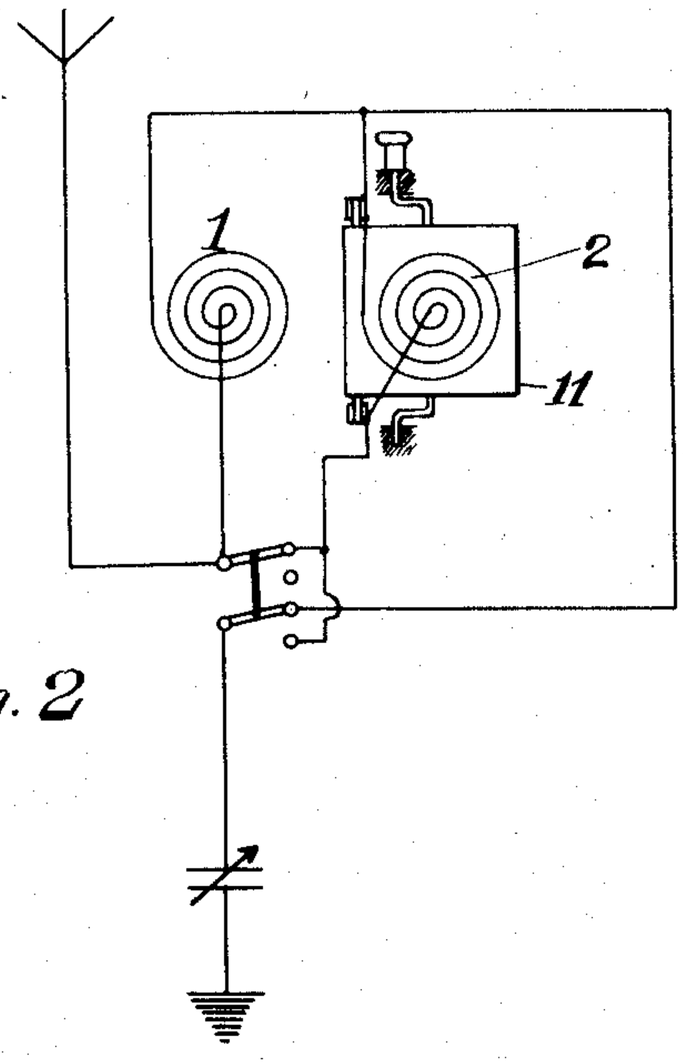


Fig. 3

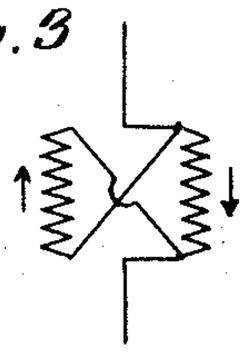


Fig. 4

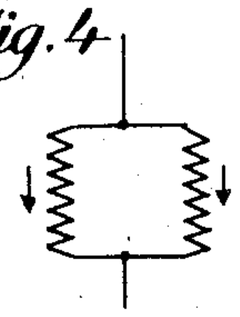


Fig. 5

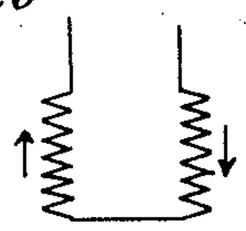
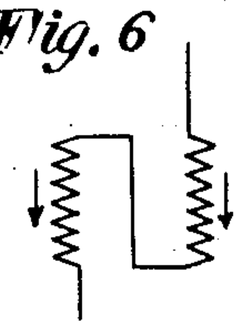


Fig. 6



Witnesses
H. A. Conigsberg
M. Prevert.

Inventor
Robert H. Marriott
By his Attorney
M. F. Bissing.

R. H. MARRIOTT.

ELECTRICAL TUNING DEVICE.

APPLICATION FILED AUG. 24, 1909.

978,606.

Patented Dec. 13, 1910.

3 SHEETS—SHEET 2.

Fig. 7

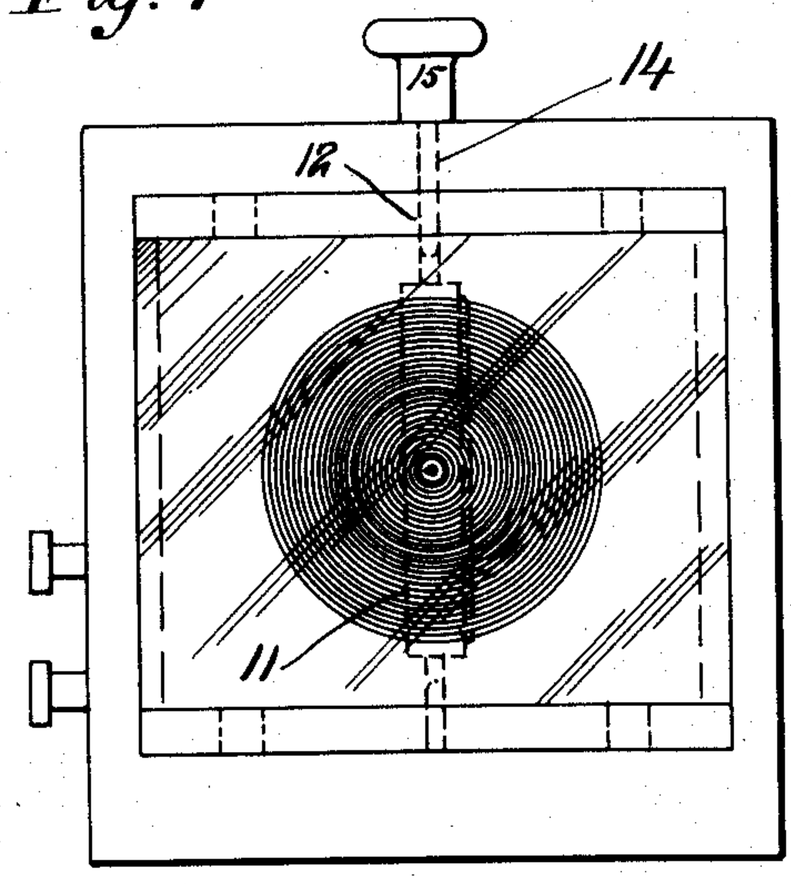


Fig. 8

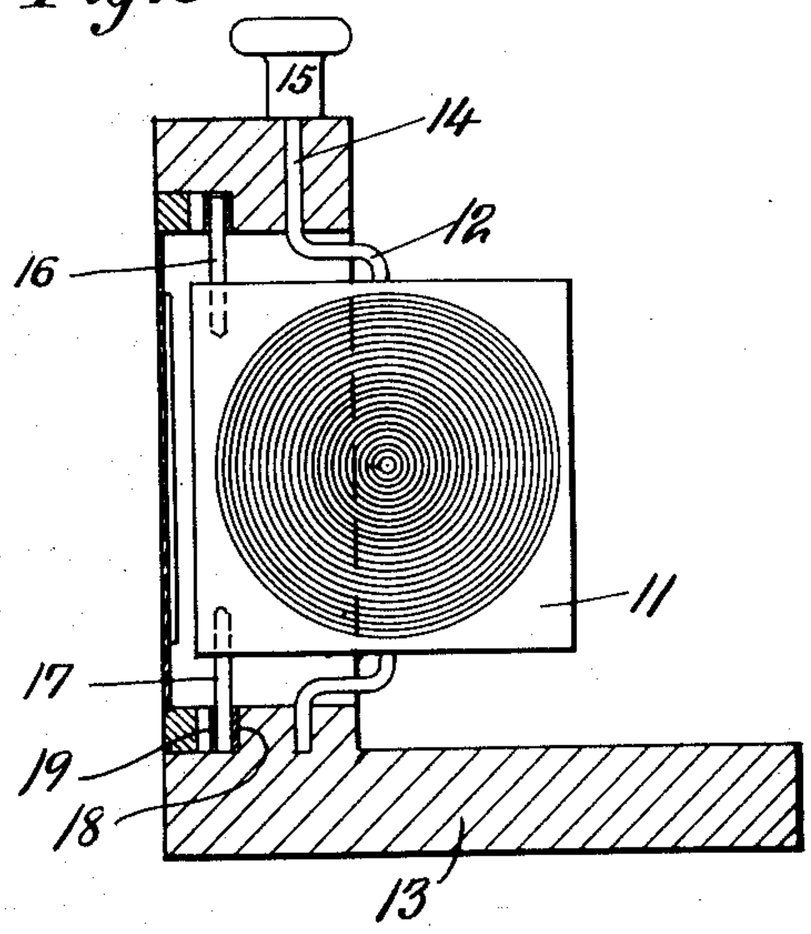


Fig. 9

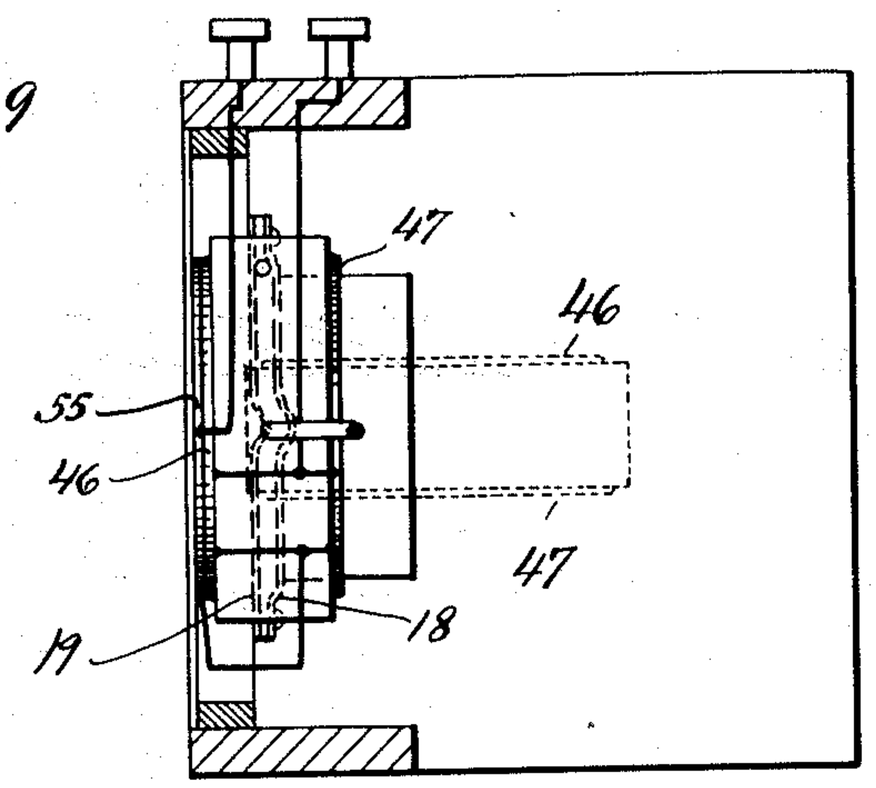
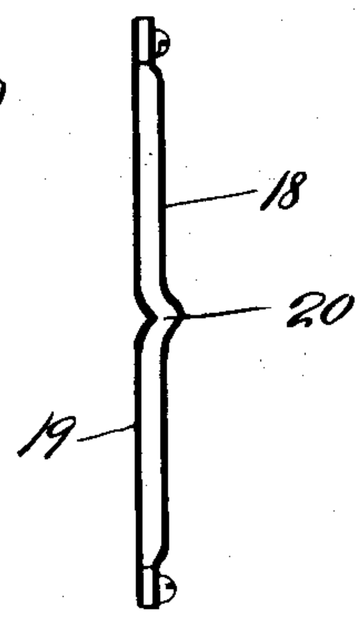


Fig. 10



Witnesses
Edward Knigsbery
M. Everett.

Robert H. Marriott Inventor
By his Attorney
W. J. Bissing

R. H. MARRIOTT.

ELECTRICAL TUNING DEVICE.

APPLICATION FILED AUG. 24, 1909.

978,606.

Patented Dec. 13, 1910.

3 SHEETS—SHEET 3.

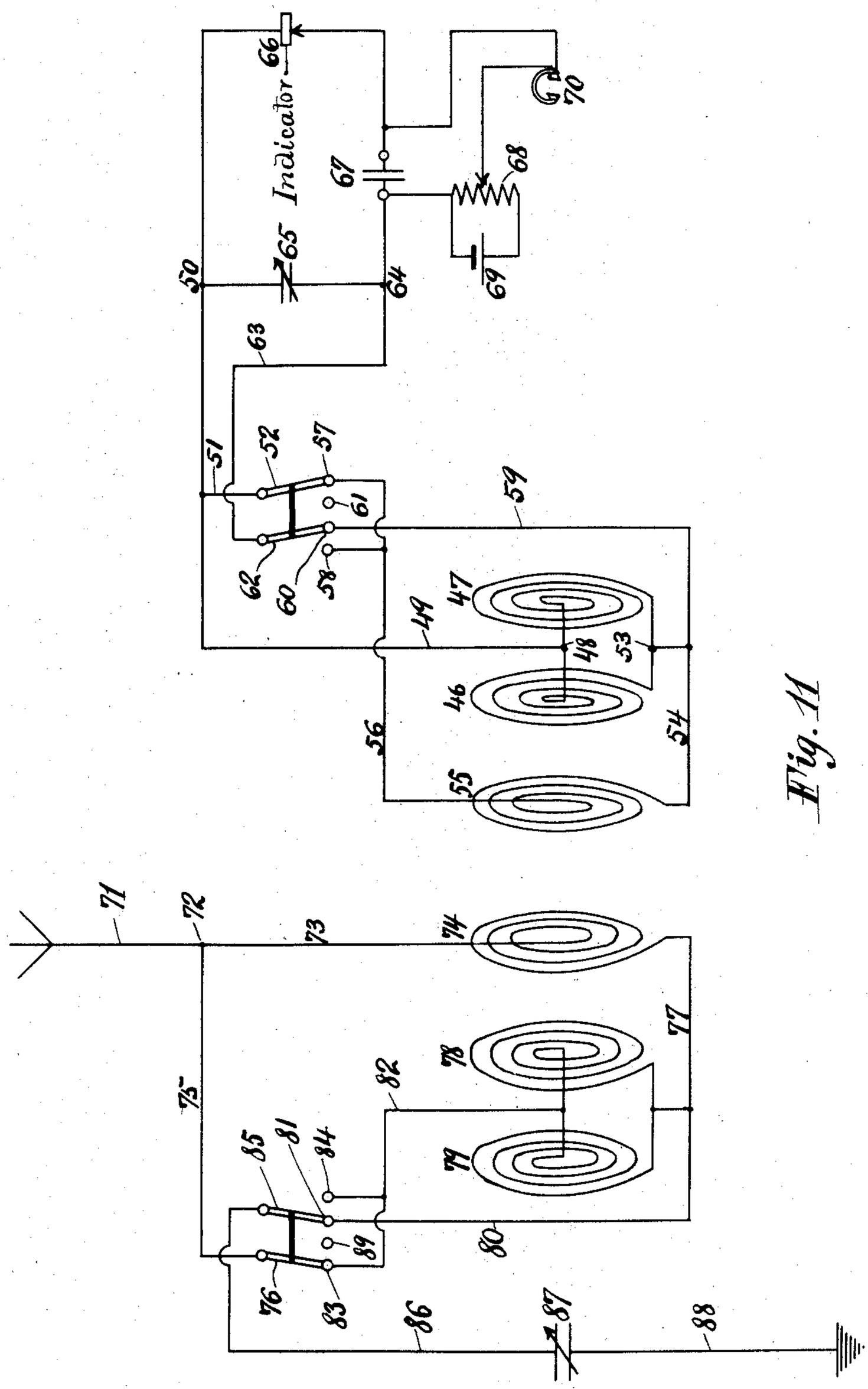


Fig. 11

Witnesses
H. L. Kniseley
M. Frevert.

Inventor
Robert H. Marriott
By his Attorney
W. D. Binning

UNITED STATES PATENT OFFICE.

ROBERT H. MARRIOTT, OF BROOKLYN, NEW YORK, ASSIGNOR TO UNITED WIRELESS TELEGRAPH COMPANY, A CORPORATION OF MAINE.

ELECTRICAL TUNING DEVICE.

978,606. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed August 24, 1909. Serial No. 514,441.

To all whom it may concern:

Be it known that I, ROBERT H. MARRIOTT, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Electrical Tuning Devices, of which the following is a specification.

My invention relates to tuning devices, and more particularly to tuning devices employing a fixed and a movable coil for varying the inductance.

One of the objects of my invention is to provide a variable inductance for the high frequency transmission of electrical energy forming part of a tuning device, in which inductance a fixed coil and a movable coil are used, the said coils being capable of being placed in inductive relation and being conductively connected, and the movable coil being provided with means for presenting one side and then the other to the fixed coil, whereby a variation in the inductance for tuning is produced.

Another object of my invention is to provide the apparatus and system described, with a switching means whereby said fixed and movable coils may be thrown in parallel or in series, as desired.

Another object of my invention is to provide a simple form of mechanism for actuating the frame carrying the movable coil.

With the above and other objects in view, my invention consists in the parts, improvements and combinations more fully pointed out hereinafter.

Referring now to the drawings which are attached to the specification and form a part thereof: Figure 1. is a diagrammatic illustration of the system, showing the circuits. Fig. 2. is a diagrammatic view of the aerial receiving circuit, containing a fixed coil and a bodily movable, reversible movable coil. Fig. 3. illustrates one mode of connection of the fixed and movable coils, the coils being in parallel, and the current flowing so as to diminish the self-induction. Fig. 4. shows a parallel connection of the coils with the current flowing so as to increase the self-induction of the system. Fig. 5. shows a series arrangement of the coils, the current flowing so as to tend to diminish the self-induction, and Fig. 6. shows a series arrangement of coils, the current flowing so as to increase the self-induction. Fig. 7. is a view of the frame carrying the movable coil shown in Fig. 2. Fig. 8. is another view of the parts shown in Fig. 7 with the movable coil at right angles to the fixed coil. Fig. 9. is a cross-section showing another form of the invention, in which two coils are carried by the movable frame, instead of one. Fig. 10. is a detail view of the conductive guideway for the lower pivot pin of the movable frame shown in Figs. 7 and 8. Fig. 11. is a diagram showing the connecting circuit of the coils illustrated in Fig. 9.

In accordance with the invention, a fixed coil 1. and a movable coil 2. are connected in the receiving circuit of the high frequency system for the transmission of electrical energy, the particular form of the system illustrated being one provided with an aerial 3. to which the coils are connected. The coils are connected with ground by means of a wire 4. and switch 5. having arms 6 and 7 connected by cross-bar 8., the ground wire 9 passing through the condenser 10 of variable capacity.

The movable coil 2. is carried on a frame 11. and always remains at one side of the face of the fixed coil 1. Means are provided for bodily moving the coil and frame so as to alternately present first one side of the coil and then the other to the fixed coil 1. These means may be varied. In the particular embodiment of the invention illustrated, the frame 11. has a crank 12 attached thereto. The lower end of the crank enters into the base 13, the lower end turning in the base. The upper end 14 of the crank is provided with a handle 15 so as to permit turning of the frame. Suitable means are provided for guiding one end of the frame 11 as it is revolved by the crank. A pair of pivot pins 16, 17, are provided for this purpose. These pins are secured to the frame and move in suitable guide-ways at the top and bottom of the supporting standard. The guide-ways for the pivot pins are preferably made of spring metal as indicated in Fig. 10. The strip 18 has a guiding channel 19, formed between its walls and is provided with a reëntrant portion 20, so as to guide the pin and insure reversal of the frame 11.

Suitable means are provided for throwing the fixed and movable coil in parallel or in series. I make use of the switch 5 for this

purpose. When the conducting switch-arms 6, 7, are on the contact points 21 and 22, as illustrated in Fig. 1., the wires 23 and 4 will connect the two coils 1 and 2 in parallel. When the switch 5 has its arms 6 and 7 in contact with the switch-contacts 25 and 26 (the contact 25 being a dead contact), the two coils 1 and 2 are thrown in series relation. It will be observed that 1 and 2 are in inductive relation with each other during the rotation of the coil 2.

The local receiving circuit, illustrated in Fig. 1., is likewise provided with a fixed coil 27, and a movable coil 28, which coils are in inductive relation. The fixed coil 27 is parallel to and opposite to the face of the fixed coil 1. The two fixed coils 1 and 27 are always in inductive relation and may be separated more or less or brought close together to vary this relation. By mounting the movable coils on frames and in such a manner that they always remain at one side of the face of the respective fixed coil, the movable coils do not project beyond the face which permits the fixed coils to be brought close together. The fixed coil 27 and the movable coil 28 may be thrown in parallel or in series with each other by means of the switch 29 and the arms 30 and 31. These arms cooperate with contact buttons 32, 33, 34, and 35, the buttons 32, 33, and 35 being connected with the circuit as indicated. The pivot points 36 and 37 of the switch are connected by wires 38 and 39 to opposite sides of the detector 40. A condenser 41 of variable capacity may be connected in the detector circuit, and the telephone 410, a potentiometer 42 with battery 43 are connected with the circuit at 44 and 45 as usual, and a condenser 400 is inserted between the points 44 and 45 to prevent the battery from running down.

In accordance with my invention, a manipulation of the switches 5 and 29 and a rotation of the movable coils 2 and 28 results in the arrangement of circuits and flow of current illustrated in Figs. 3, 4, 5 and 6. With the faces of the fixed and movable coils in juxtaposition, and with a parallel connection of the coils, the windings being connected as shown in Fig. 3, the self-induction of the coils is reduced to the lowest amount. By rotating the movable coil and presenting the other side thereof to the fixed coil, without changing the connection, *i. e.*, without moving a switch, the current flows as shown in Fig. 4, which increases the self-induction of the said coils. By throwing the switch and placing the coils in series, with the current in opposition, the arrangement shown in Fig. 5 is secured, with an increase of range in the change of self-induction over that of Figs. 3 and 4. By rotating the movable coil, still preserving the series arrangement, the current will flow as shown in Fig. 6, thereby increasing the self-induction still further. In other words, the self-induction may be made to vary from the amount produced by the arrangement of Fig. 3. to that produced by the arrangement in Fig. 6, gradually and by aid of a simple apparatus. By this means the wave length to which the circuit is tuned may be correspondingly varied.

Turning now to the apparatus shown in Fig. 9, this differs from the other figures in that two coils are carried on the movable frame instead of one. One of these coils and then the other is presented to the fixed coil. The coils on the moving frame are always connected in parallel relation, as indicated in Fig. 9.

Referring to Fig. 11, the connections of the apparatus shown in Fig. 9 will be apparent. Two apparatuses like those in Fig. 9 are used. One of them is placed in the aerial circuit and the other in the local detector circuit. The two coils, 46, 47, on the movable frame have their centers connected as at 48 by a wire from which a wire 49 leads to a binding post 50 which is connected with the detector circuit. A branch wire 51 leads from the wire 49 to a switch-arm 52. The two outer ends of the coils 46 and 47 are connected at 53, from which a wire 54 leads to the outside of the fixed coil 55. The inside of the coil 55 is connected by means of a wire 56 to contact points 57 and 58 of the switch. The outsides of the coils 46 and 47 are also connected by a wire 59 to a switch point 60. The switch point 61 is dead. From switch arm 62 a wire 63 leads to a binding post 64 which is connected with the detector circuit. By the above set of switches and connection, the fixed and movable coils may be thrown in series or in parallel relation with each other. A condenser 65 of variable capacity may be connected between 50 and 64 in a well known manner. To the terminals 50 and 64 may be connected a detector circuit including a detector 66, a condenser of fixed capacity 67, a potentiometer 68, (the latter supplied with current from a battery 69) and telephone receiver 70. The antenna circuit includes the antenna 71 which is connected to binding post 72 which is connected by wire 73 to inside of fixed coil 74 and by wire 75 to switch arm 76. The outside of coil 74 is connected by wire 77 to the outsides of the coils 78 and 79. A branch wire 80 leads from the wire 77 to switch point 81. The insides of coils 78 and 79 are connected, from which connection, wire 82 leads to switch points 83 and 84. Switch arm 85 connects by means of wire 86 to one side of a variable condenser 87, the other side of which is connected to ground by wire 88. Switch point 89 is dead. The fixed and movable coils of the antenna circuit may thus be thrown in series or in parallel. It

will be observed that the movable coils 46 and 47 are wound in the same direction and the movable coils 78 and 79 are wound in the same direction. Moreover, the inductive effect of the movable coils on their corresponding fixed coil is either additive or subtractive in accordance with the movement of the frame carrying the movable coils. By separating the fixed coils, the inductive action of the antenna circuit on the detector circuit may be varied.

Having thus described an embodiment of my invention, it will be obvious that many changes may be made in its form without departing from the principle thereof.

Claims:

1. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, and means for bodily moving the movable coil so as to alternately present one side and then the other to the fixed coil, said movable coil being arranged at all times at one side of the face of the fixed coil.

2. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a frame, a movable coil secured to one side of said frame, said fixed and movable coils being in inductive relation, and means for bodily moving the frame so as to alternately present one side of the coil and then the other to the fixed coil, said movable coil being arranged at all times at one side of the face of the fixed coil.

3. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, a switch for throwing said fixed and movable coils in parallel, and means for bodily moving the movable coil so as to alternately present one side and then the other to the fixed coil, said movable coil being arranged at all times at one side of the face of the fixed coil.

4. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, switching means for throwing said fixed and movable coils in parallel and in series with each other, and means for bodily moving the movable coil so as to alternately present one side and then the other to the fixed coil.

5. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, said movable coil being arranged at all times at one side of the face of the fixed coil, a frame to which said movable coil is secured, and a crank attached to said frame whereby said frame may be moved to alternately present one side of the movable coil and then the other to the fixed coil.

6. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, said movable coil being arranged at all times at one side of the face of the fixed coil, a frame on which the movable coil is secured, a crank attached to said frame, and guiding means for said frame, the parts being so constructed and arranged that one side and then the other of the movable coil may be presented to the fixed coil.

7. A tuning device for the high frequency transmission of electrical energy, comprising a fixed coil, a movable coil, said fixed and movable coils being in inductive relation, said movable coil being arranged at all times at one side of the face of the fixed coil, a frame on which the movable coil is secured, a crank attached to said frame, a pivot for said frame, and a conducting guideway for said pivot, the parts being so constructed and arranged that one side and then the other of the movable coil may be presented to the fixed coil.

8. A tuning device for the high frequency transmission of electrical energy, comprising a pair of fixed coils, said fixed coils having their faces in inductive relation and opposite to each other, a pair of movable coils, one for each fixed coil, each movable coil being in inductive relation with the corresponding fixed coil, each movable coil being at all times arranged at one side of the face of the corresponding fixed coil, and means for bodily moving each movable coil to alternately present one side and then the other to the corresponding fixed coil.

9. A tuning device for the transmission of electrical energy of high frequency comprising a pair of fixed coils, each consisting of a flat spiral mounted on a frame, said fixed coils having their faces in inductive relation and opposite to each other, and capable of being moved toward and from each other to vary the inductive action, a pair of movable coils, each consisting of a flat spiral, each movable coil being in inductive relation with the corresponding fixed coil and each movable coil being at all times arranged at one side of the face of the corresponding fixed coil and means for moving each of said movable coils toward and from the corresponding fixed coil.

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

ROBERT H. MARRIOTT.

Witnesses:
W. C. MARGESON,
W. F. BISSING.