H. P. DONLE.
VARIABLE INDUCTANCE.
APPLICATION FILED DEC. 15, 1917.

1,332,463. Patented Mar. 2, 1920.

2 SHEETS—SHEET 1.

Fig. 2.

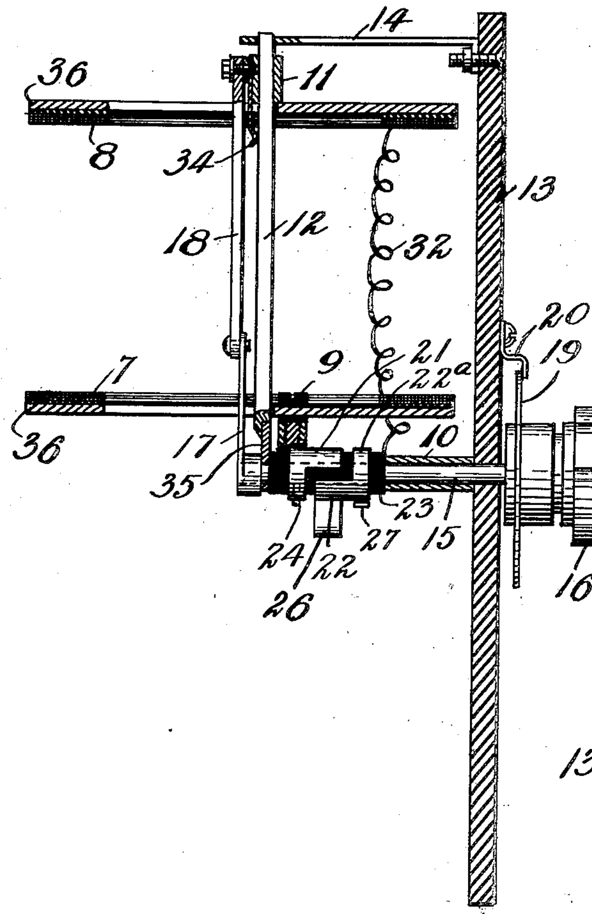


Fig. 1.

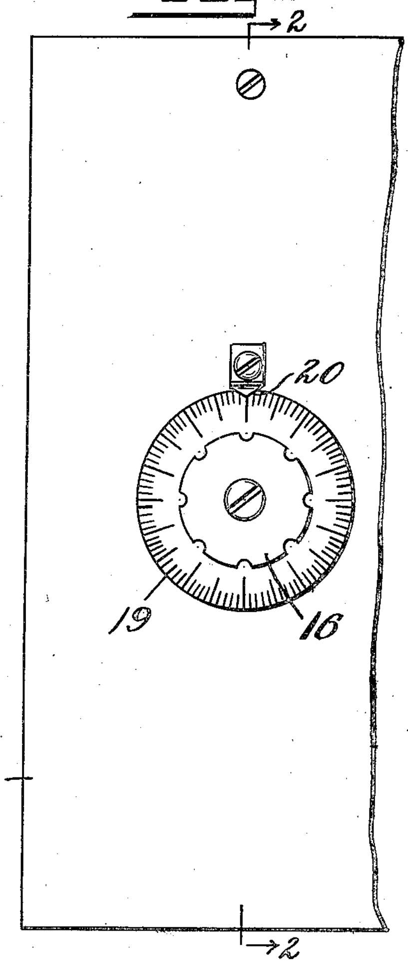
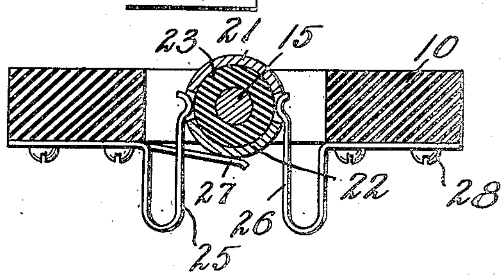


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

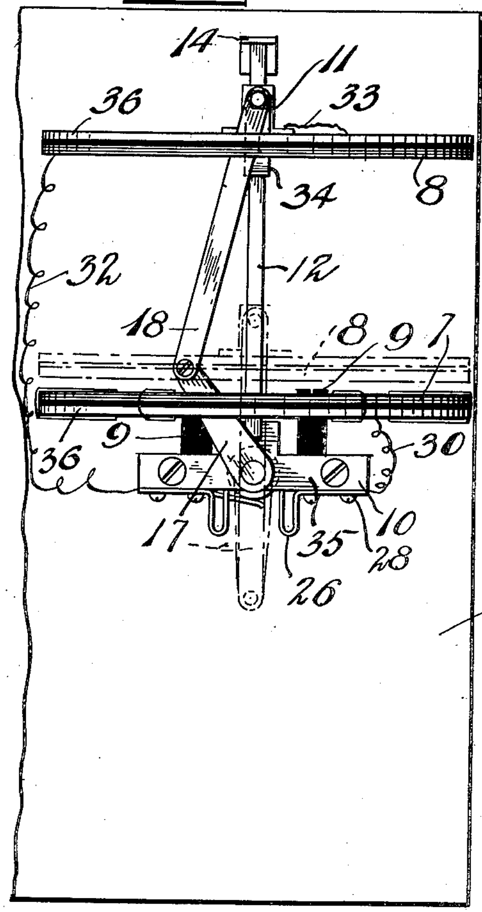


Fig. 5.

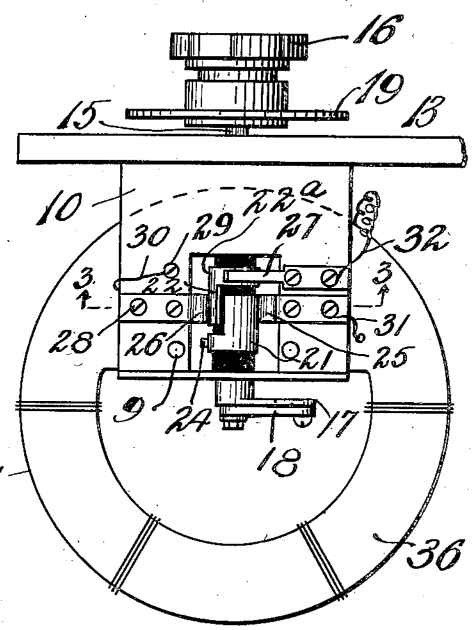
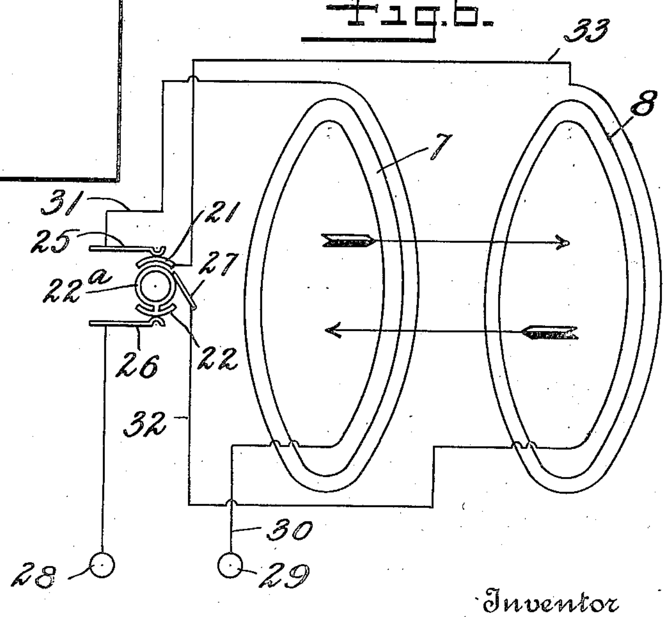


Fig. 6.



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UNITED STATES PATENT OFFICE.

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VARIABLE INDUCTANCE.

1,332,463. Specification of Letters Patent. **Patented Mar. 2, 1920.**

Application filed December 15, 1917. Serial No. 207,256.

To all whom it may concern:

Be it known that I, Harold P. Donle, a citizen of the United States of America, residing at Meriden, Connecticut, have invented a new and useful Variable Inductance, of which the following is a specification.

The objects of this invention are in general to provide a simple and compact form of inductance for radio apparatus which can readily be adjusted continuously throughout a relatively wide range.

Briefly stated the invention comprises a pair of coils which are relatively adjustable toward and away from each other with means for shifting the coils and means for automatically changing the electrical connection between the coils in the course of such shifting movements.

In the accompanying drawings I have illustrated the invention embodied in a pratical commerical form but I would have it understood that changes and modifications may be made without departure from the true spirit and scope of the invention.

In said drawings:—

Figure 1, is a front or face view of the inductance as mounted on a suitable base.

Fig. 2, is a partly sectional view taken substantially on the plane of the line 2—2 of Fig. 1.

Fig. 3, is a cross section view of the commutator taken substantially on the plane of the line 3—3 of Fig. 5.

Fig. 4, is a rear view of the device looking at the left hand side of Fig. 2.

Fig. 5, is an end view looking upward at the lower end of Fig. 2.

Fig. 6, is a wiring diagram of the device.

7 and 8 designate the two coils mounted so as to be movable relatively toward and away from each other, 7 in this case being a stationary coil secured by screws 9 to a suitable base 10 and 8 being a movable coil mounted on the slider 11 which works on a rod 12. The screws 9 are preferably made of non-metallic material so as not to distort or affect the lines of force issuing from the coils. I have found horn fiber suitable for making such screws.

All the parts thus far described are mounted on a suitable base 13 which may simply be a slab of insulating material, serving as the face plate of the instrument.

The support 10 for the stationary coil is shown as a block of insulating material secured on the back of the face plate and the coil supporting rod 12 is shown supported by this base and a supplementary bracket 14 secured on the back of the face plate.

The means for shifting the movable coil in respect to the relatively stationary coil comprises in the present disclosure a shaft 15 passing through the face plate and journaled in the support 10, said shaft having an operating knob or handle 16 on its forward end and a crank arm 17 on its rearward end connected by a pivoted link 18 with the coil carrying slider 11. The operating knob in the illustration carries a dial 19 with which registers an index or pointer 20, said dial being suitably calibrated to indicate various degrees or values of induction.

The shaft 15 by which the movable coil is shifted also is utilized in the present disclosure to operate a switch for changing the electrical connections between the coils. Specifically this switch is in the nature of a commutator mounted on the shaft and made of two reversely placed contact segments 21 and 22 carried by an insulating bushing 23 secured on the shaft. One segment 21 is shown electrically connected with the shaft by means of a set screw 24 and the other segment is insulated from the shaft by the bushing 23. Oppositely disposed contact springs 25 and 26 are shown mounted on the support 10 in position to engage the segments. A third contact spring 27 is also shown mounted on the support 10 in position to constantly make connection with the contact segment 22, which for the purpose may have a band or ring extension 22^a for engagement by said brush or spring 27.

The circuit connections usually employed are illustrated diagrammatically in Fig. 6. Here the two external terminals are designated 28 and 29, the first of these being directly connected with the brush 26 and the second being connected with one end 30 of the stationary coil 7. The other end 31 of the stationary coil is connected with the commutator brush 25. One end 32 of the movable coil 8 is connected with the brush 27 and the other end 33 of said movable coil is connected with the slider 11, said slider carrying a brush 34 bearing on the coil supporting rod 12. This rod is electrically connected with the bearing plate 35 in which the shaft 15 is journaled and as the segment 21 is electrically connected with the shaft through the medium of the set screw 24, a continuous electrical connection is thus provided from one end of the movable coil to segment 21.

The coils are disposed directly opposite or facing each other and are preferably wound each in the form of a flat annulus, as indicated, so as to expose practically all the windings to each other and they are maintained in substantial parallelism at all times, all of which results in the attainment of the greatest inductive effect.

The coils are usually made up of relatively fine wire and may be mounted on suitable flat disk-like insulating supports 36. The crank arm 17 or the connecting link 18 or both of these shifting devices may be made of insulating or non-metallic material so as not to effect the lines of force created by the coils. The slide rod 12 may be made of square or angular shape in cross section so as to prevent rotation of the relatively movable coil during the shifting thereof.

In the use of the device, when the indicating dial stands at the zero or lowest point on the scale, the coils are normally coupled in opposition and are in their most closely approached position. This condition is illustrated in dotted lines in Fig. 4 and in such case the inductive effect is lowest, practically zero when the coils are of equal strength, because the force of one coil opposes that of the other. As the dial is turned to the right in Fig. 4, the coils are gradually separated and thus the nullifying effect of one coil upon the other is gradually lessened until in about the fully separated condition illustrated in Fig. 2 the nullifying or opposing effect of one coil upon the other is practically obliterated. As the dial is further rotated the commutator shaft reverses the electrical connections between the coils to change them from opposing to coöperating relation. The force of one coil thereupon supplements that of the other and this effect is of course heightened as the coils are brought more closely together, consequently as the link and crank arm connection swings over past the dead center in the further rotation of the dial the coils will be drawn together, connected in coöperating relation and the inductance will be thus gradually increased. By the simple turning of the operating member therefore the coils may be approached and separated and be connected in opposing or coöperating relation, thus enabling a quick and accurate adjustment of inductance throughout a relatively wide range.

From the foregoing it will be seen that the invention is quite simple and compact in its construction and is readily adjustable to meet different conditions. The invention is particularly valuable for use in connection with condensers for varying the wave length because by means of it very accurate and quick results may be obtained.

I claim:—

1. Variable inductance for radio apparatus comprising, relatively movable coils, means for relatively separating and approaching the coils to vary the inductive effect of the coils upon each other, and means for automatically changing the electrical connections between the coils from opposing to coöperating relation in such movement of the coils.

2. Variable inductance of the character set forth in claim 1, wherein the change from opposing to coöperating relation is made at a point when the coils are separated to such an extent as to have practically no effect upon each other.

3. Variable inductance of the character set forth in claim 1, wherein the shifting means comprises a rotatable shaft and the circuit changing mechanism comprising a commutator mounted on said shaft.

4. Variable inductance of the character set forth in claim 1, wherein the shifting means comprises an operating shaft provided with a crank arm and a link connected between the crank arm and one of the coils.

5. Variable inductance comprising a coil, a supporting rod extending at right angles away from said coil, an operating shaft disposed at an angle to said rod, a coil slidably supported on the rod, operating connections from said shaft for sliding the coil on said rod and a commutator on the shaft for changing the connections between the coils.

6. Variable inductance comprising relatively stationary and movable coils, a commutator shaft, commutator segments on said shaft, brushes for engagement with said commutator segments, electrical connections between the coils and commutator and operating connections from said commutator shaft for shifting the movable coil.

7. Variable inductance comprising relatively stationary and movable coils, a commutator shaft, commutator segments on said shaft, brushes for engagement with said commutator segments, an external terminal for one end of the relatively stationary coil, an electrical connection from the opposite

end of said coil to one of the brushes, an external terminal connected with one of the other brushes and electrical connections from the opposite ends of the relatively movable coil to the commutator.

8. Variable inductance comprising relatively movable coils, a commutator shaft, commutator segments on said shaft, brushes for engagement with said commutator segments, electrical connections between the coils and said commutator mechanism, and operating connections from the commutator shaft for relatively separating and approaching the coils.

HAROLD P. DONLE.