Mainly about Construction

BY "MEGOHM"

MAKING SPIDER-WEB TUNING COILS

HANDY AND COMPACT FOR CRYSTAL RECEPTION

THIS is a simple method of making tuning-coils having a similar effect to the honeycomb type. Owing to the style of construction, this type of coil is most suited to turns numbering not more than a hundred. However, this is no hardship, as one hundred turns have a minimum wavelength of over 800 metres—much above the broadcast level, and the coils most required have not more than 50 or 60 turns..

MAKING THE COILS.

A support for the wire has to be provided, and this may be either motor-hood celluloid, or hard, thin card, such as Bristol board. The former is first cut to shape by marking out a circle of suitable diameter for the number of turns to be put on the coil, 26's s.w.g. wire being a suitable gauge. If there is any doubt about size, make the circle oversize, as it can easily be trimmed down afterwards. Fifty turns of 26's enamelled wire occupy one inch, and 75 turns one and a half inches, so sizes may easily be reckoned. Now the making of a fifty-turn coil will be described as an example.

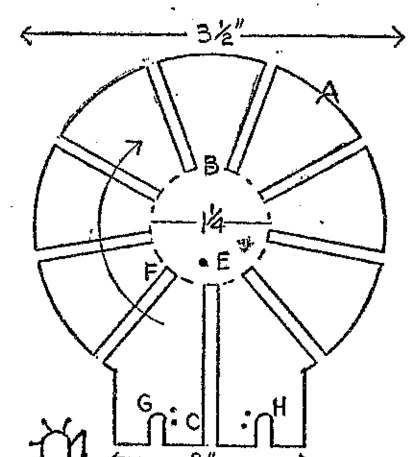
With a pair of dividers or compasses, radius 1¾in., describe a circle A, 3½in. diameter. Then with radius 5/8in., describe the circle B. Now mark off the square portion, from circle to edge, C, ½in., and length D, 2in. Now the two slots G, H, are cut, their centres being 1 1/8in. apart, 3/8in. deep, and just over 1/8in. wide. Nine slots are to be cut as shown, equally spaced, each 1/8in wide. Note that the slot at C is to be marked first, and others will come in the right positions. It is an essential feature that there should be an odd number of slots.

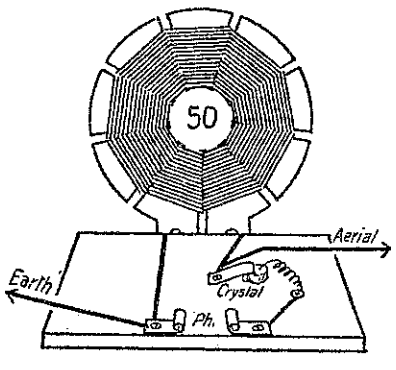
Winding is commenced by piercing a hole at E, passing four inches of wire through, then proceeding to slot F, passing the wire through that, under the former, up through the next slot, down through the next, in the direction of the arrow, always pushing the wires towards the centre. This winding is continued until the requisite number of turns has been wound. It will be seen that the odd number of slots causes the turns to come on opposite sides of the former, automatically spacing them out. Counting across the turns on one side of the coil gives half the total number of turns actually wound.

The end of the wire is cut off with a few inches to spare, and is passed down through one of the holes at H and up through the other, then threaded in and out a few times through holes in the edge of the slot, then cut off close and the enamel taken off with glass-paper round the slot H. The beginning of the wire is then finished off in the same way. Such a coil may then be secured under two washers held by two screws the correct distance apart.

WAVELENGTH OF COILS.

The approximate number of turns for a given wavelength is given to enable constructors to provide a suitable number of turns for the station they wish to receive. For fine tuning it is necessary either to connect a variable condenser across the coil or to have two coils so that their distance can be varied to "tune-in" the station. A 40-and-30-turn makes a good combination, but depends to





some extent upon the wavelengths to be received. These wavelengths only refer to 26's wire on a former as specified.

20 turns......185 metres
30 turns......250 metres
40 turns......330 metres
50 turns......405 metres
60 turns......490 metres
70 turns......580 metres.

By adding a few turns to the above in order to get above the wavelength required, it is possible to either twist taps into the last few turns of the coil, or tune-in and take turns off until maximum signals are obtained, and thus have a coil that tunes in the nearby local station without the use of a condenser or other tuning arrangement. This constitutes a very simple method of crystal reception, and might be fixed up as shown below. A piece of board 5 by 3 inches will hold the complete outfit. The coil is secured by washers and screws into the pack edge of the board, the two connecting wires being also held under the washers. The crystal is clamped by its edge under a slip of 18's brass sheet secured by a screw into the wood, the connecting wire being trapped underneath, and continued to the aerial. The other side of the coil connect to the 'phone clip and then to earth. The 'Phone clips are made of thin brass curled up as shown and held by a small brass screw.

About 50 to 54 turns brings in 2YA at short range of a few miles without any critical tuning, but at a distance careful tuning becomes necessary, and a tuning condenser essential. Even then if the number of turns on the coil is almost correct, but just below the wavelength of the desired station a vernier condenser of only two or three plates would accomplish the exact tuning.

FACTS ABOUT TUNING COILS

Whilst on the subject a few hints affecting the construction of coils generally will be of interest. A coil, whether spider, solenoid, or honeycomb, has a wavelength of its own, without any tuning arrangement entering in to the question. A condenser connected in "parallel" across the two ends of the coil increases the wavelength, but a condenser connected in "series," with one end to the coil and the other end to aerial or earth, reduces the wavelength of the coil to an amount depending upon the capacity of the condenser. If this condenser is variable, then we have a means of altering the wavelength of the coil to any wavelength within a certain range. If a condenser is connected to a coil in "parallel," we cannot tune to a wavelength below that of the coil alone, and in fact with the condenser set at minimum, there would be a slight extra capacity added to that of the coil, so that the minimum wavelength tunable would be slightly in excess of the coil alone. Now it will be seen that if we wish to tune over a certain range of metres with a coil and variable condenser, the natural wavelength of the coil must be a few metres below the minimum wavelength required, and the condenser must be of sufficient capacity to enable the combined effect to reach the maximum wavelength desired.

If tuning is to be accomplished with a slider, then the coil must have a wavelength slightly in excess of the required maximum, and lower wavelengths are then tuned in by tapping a reduced number of turns with the slider.

In deciding the details of construction for a coil, the chief factors governing the wavelength are:

1. Diameter of coil,
2. Gauge of wire.
3. Number of turns.
4. Amount of space between turns.

Increasing the diameter of the coil, keeping the same number of turns, increases the wavelength, so that we can increase the diameter and reduce the number of turns to keep the same wavelength. Reducing the diameter lowers the wavelength, so adding turns would keep it the same. Increasing the diameter does not effect a proportional increase in wavelength. Doubling the diameter of a 50-turn, 2-inch coil with a maximum wavelength of 315 metres would only increase the wavelength to 505 metres.

The gauge of wire being reduced, increases the wavelength. If a 3in. solenoid is wound wtih 50 turns of 20's wire its wavelength will be 365 metres, whilst if the gauge of wire is reduced to 22's it will be 390, 24's 410, 26's 435, 28's 450, 30's 470 metres.

The increase of the number of turns increases wavelength. A 3in. solenoid wound with 20 turns of 24's wire has a maximum wavelength of 215 metres, and if the turns are increased to 40, the wavelength is 355 metres: to 80 turns, 575 metres.

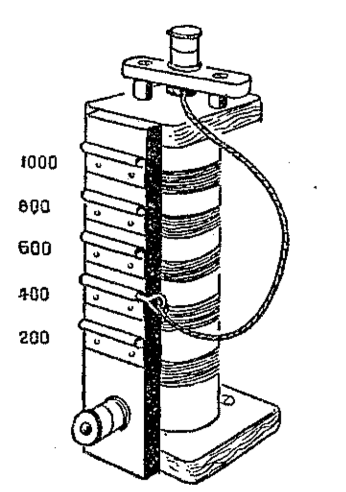
Spacing the turns slightly apart instead of winding each one close to the preceding one, is known as "low-loss" winding. This spacing reduces loss by causing the radio-frequency currents to traverse the whole length of the coil instead of allowing an appreciable amount of the energy to take a short cut by skipping from turn to turn across the short path between closely-wound turns. Spacing turns slightly reduces wavelength but only a few extra turns are required to compensate for this. Spacing makes tuning more selective, that is, makes it less easy for a station to spread over a large number of degrees on the dial.

Neutralisation of the Browning-Drake circuit is a variable factor dependent upon the self-capacity of the R.F. side of each particular receiver. The set constructed by the writer neutralises with the small capacity condenser described in the article, and sets of similar construction should act similarly, but variations in wiring and deviations from specifications introduce capacity that will in some cases require an ordinary midget condenser for neutralisation. The capacity of the R.F. value used also has a direct influence upon neutralisation.

AN EXPERIMENTAL RADIO-FREQUENCY CHOKE

A USEFUL UNIT TO CONSTRUCT

This is a radio-frequency choke for use in Reinartz or other circuits, and for convenience in trying out new hook-ups every 200 turns is tapped, quick connection being made by moving a pin to the required position. If the approximate number of turns required is known, and the choke is for permanent use, the tapping arrange-



ments may be left out. A simple way of constructing such a permanent choke is to wind the groups of turns upon a ¾-inch test-tube.

The overall height, as illustrated, is deep, ¼-inch wide, and not less than ¼-inch apart. If the spool ends are not used a small square of wood is 5 inches. The central core of wood, the core of a wire spool or other suitable former of ¾ or 7-8-inch diameter. Five slots are cut or turned, 1-8-inch fitted at top and bottom, and down the front is a strip of ebonite, ¾ to 1-inch wide. Upon this strip are riveted five pieces of 28's brass sheet, curled up to take the connecting pin (14's wire) attached to the top terminal by a short flexible lead.

The size of wire to be used is 36's s.w.g., 200 turns in each slot. When passing from one slot to the next a loop is made in the wire, sufficiently long to clean up and solder to the corresponding rivet at the back of the ebonite. The lower end of the coil connects to the lower terminal, and top of coil to top brass strip on ebonite. The circuit leads are connected to the two terminals, and moving the pin puts in the required number of turns. The wire is wound irregularly, crossing and recrossing, as this helps to keep down self capacity.

The top terminal is supported upon a slip of ebonite, raised up by screwing down upon collars made by rolling up a strip of the 28's brass sheet.

CRYSTAL JOTTINGS

The precise manner in which the rather quaint term "cat's-whisker" first came to be used in order to designate the fine wire metallic contacts which are used with many types of rectifying minerals still remains one of the insoluble mysteries of wireless science. To the average-minded wireless enthusiast who is not blessed—or cursed, as you please—with a vivid and poetical imagination, there are practically no points of resemblance to be seen between the ordinary metallic crystal tickler and the hirsute facial appendage of that noble animal, the felis domestica.

EFFECT OF OXIDATION.

When the volume of sound which is produced by the receiver diminishes, many owners of crystal sets almost invariably blame the crystal itself for the fault. But in many cases, however, such diminution efficiency of the reception is often due to the cat's-whisker becoming oxidised. The remedy is to snip a small portion off the end.

Cat's-whiskers which are made of gold or platinum, of course, do not give rise to this sort of trouble, because they are untarnishable. However, silver takes a considerable amount of tarnish when it is exposed to some atmospheres, so that cat's-whiskers which are made from this metal are not always so free from this defect as is generally supposed.

A NOVEL CONTACT.

The "brush" contact takes the form of a number of fine wires bundled together, and gives very good results with a number of crystals, for when this is used a contact is always made with some part of the crystal, no matter how severe may be the vibration to which the detector is subjected. But, on the other hand, the device works badly with some varieties of crystals, for it is a fact that many radio crystals, and especially some of the patent galena ones, give by far their best results when the contact is made at a single point only. Why this should be so is by no means clear.

In December last, a correspondent, "R.M.," Dargaville, sent in a query which was answered by post. Owing probably to the address being rather scanty, this letter has been returned, so if the information is still desired this correspondent should write again.

Raytheon B eliminator tubes are now stocked by Messrs. Thomas Ballinger and Co., Ltd., Victoria Street, Wellington, at 36s. each plus postage. A Raytheon BH tube delivering not less than 85 milliamps is suited to most eliminators. The same firm also has in stock the Mullard DU2 full-wave high-tension rectifier for B eliminators at 25s., plus postage. This valve has a filament requiring 1 1 amp. at 4 volts. The DU10 is a half-wave, the filament requiring .77 amp. at 2.7 volts, price 17s. 6d., plus postage.