rent at a suitable voltage may also be used on the filament, provided that a means of obtaining the electrical centre of the filament (where the alternating of the voltage has no effect) by means of resistances, is used, as shown in fig. II. The condensers are for the purpose of bypassing r.f. currents. This apparatus could be mounted at the back of the baseboard where the tapping comes through.

Now the strength of the transmitter's signals and the distances coverable depend greatly on the voltage of the plate power supply, or on the amount of power input to the valve. With a voltage of 100 to 200, all New Zealand will be easily covered, and occasionally Australia, on the higher amateur wave bands, and with from 300 volts upwards nearly all the world may be worked on the shorter wave-lengths. This transmitter works well with from 100 to 300 volts on the plate of the valve, and is not designed for use with over 300, as receiving valves do not stand up for long to higher voltages, and heavier coils would be required.

The plate supply may be obtained either from receiver B batteries or from the A.C. mains, suitably rectified and filtered, as in a B eliminator; the oscillator plate current does not normally exceed 20 milliamps. It is most important that if rectified alternating current is used (R.A.C.), it should be well smoothed, as the pureness of the signal's note depends largely on this. As explained in the last article, a rough, harsh note is caused by using unsmoothed R.A.C., while a pure musical one covering less territory of the band results from using direct current or well-smoothed R.A.C. These types of notes are respectively termed R.A.C. and D.C. notes.

If batteries are not available, a good way of using the A.C. mains for power supply is by means of a chemical rectifier, which for low voltage is both cheap and simple. The parts for such a rectifier may be obtained for a few shillings, and with

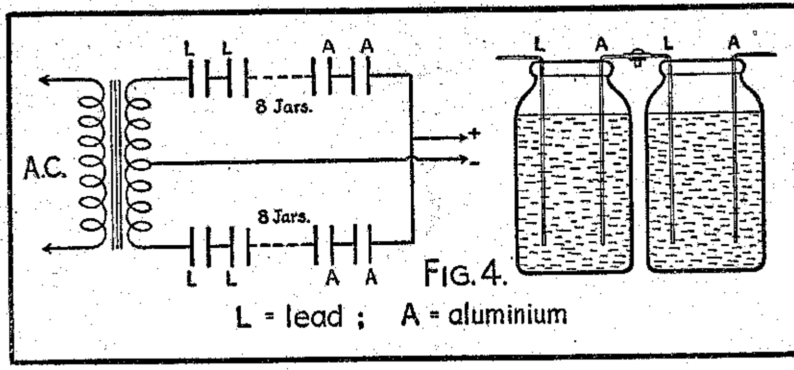


FIG. 4.
L = lead; A = aluminium

a suitable filter, such as four 2 mfd. condensers, it should give a DC note. There is a voltage drop of about 20 per cent. through a chemical rectifier, so a transformer delivering 400 volts with a centre-tap should be used, a suitable one being described in the "Radio Listeners' Guide." It may also have a filament winding on it to supply current at 6 volts for the filament of the valve. About eight jars in each "leg" of the rectifier should be used, as shown in fig. III, with lead and aluminium electrodes in a saturated borax solution, so that there are about 2½ square inches of each electrode in the solution in each jar. The rectifier must be "formed" in the usual way by placing an ordinary 230-volt lamp in series with it, and running the current until the lamp becomes dim. It is worth while noting that the regulations prohibit the use of "slop" rectifiers unless a transformer is used between them and the mains. A full-wave rectifying valve would be less trouble to hook up than the chemical rectifier, but would cost more and need more filter, also the latter rectifier requires little attention once installed properly. To conclude the power supply discussion, suitable power switches should be connected so that the transmitter may be turned on or off quickly.

### The Antenna Supply.

THE last, but not least, part of the transmitter is the antenna, or radiator. So that waves of the desired frequency will be most easily radiated by them, antennas must be of definite overall lengths, the best being half the length of the waves being radiated, and they must be "fed" from the oscillator through the antenna coil at one of several definite points in their lengths.

Thus for frequencies of 3500 to 4000 kilocycles (85 to 75 metres), which is the amateur band in which the oscillator is tuned, the length of the antenna should be 132 feet, or about 40 metres (1 metre equals 3¼ feet). To most easily obtain this length, what is often termed an antenna-counterpoise system may be used, as shown in the accompanying diagrams, the total length of the antenna and counterpoise being in each case 132 feet, and feeding taking place at either of two suitable places—in the centre, or quarter-length from the lower end. As the latter type is the better radiator, it should be used if sufficient length in the antenna (99 feet) can be obtained.

This is the simplest type of antenna for the beginner, though there are other types, employing different feed systems, and enabling the whole antenna to be strung well up in the clear—the disadvantage of the type described is that the radiator has to be brought into the station. However, it will work quite well until the beginner becomes "wise" to the various systems.

The antenna and counterpoise may be ordinary receiving aerial wire, preferably enamelled, and the insulation at the ends and where they enter the station should be good. It must be noted that the lengths shown are those from the far insulators right to the antenna coil, and they should be made exact to within one foot. The antenna should be strung as high as possible, 30 feet being satisfactory, and the counterpoise need not be run directly underneath the antenna. It may be any suitable distance not much beyond eight feet, above the ground.

As already mentioned, either system A (66 feet in both the antenna and counterpoise) or B (99 feet in the antenna and 33 in the counterpoise) may be used, but the latter is preferable if the lengths can be suitably worked in. The same antenna may also be used for receiving, a S.P.D.T. switch being arranged to throw it over to either transmitter or receiver.

We have now covered all the ground considered necessary in this article and if any reader requires further information it will be given on application to the writer, addressed to the "Record" office. In the next article there will be a description of the tuning of the transmitter and general operating practice.

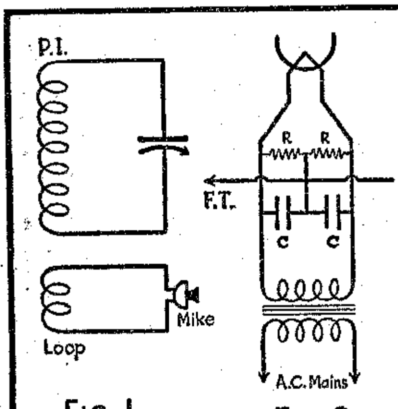


FIG. 1. FIG. 2.

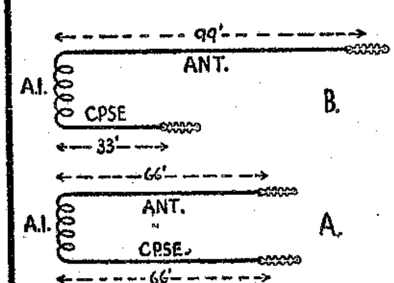


FIG. 3.

# Transmitting Without a License

## Amateur's Successful Bluff

FRENCH listeners were very amused recently over a joke played on them by a young wireless experimenter, eighteen years old, who has been transmitting for a period of a year under the name of "Paris Experimental" without any authority whatsoever. He has also been sending communications to the Press with reference to his programmes, power, wavelength, etc., many of which have been printed.

Although the communications were not accurate as to the power, and the programmes were not regularly followed, yet transmissions have taken place on 300 metres as well as on the short-wave band, and many conjectures have been made as to the situation of his "station." Unfortunately, recent activities of the police led to his discovery and arrest.



# Radio Used by War Spies

## An Ingenious Code

DURING the World War radio was extensively used by spies as a speedy and secret means of maintaining communication with headquarters. Telegraphy, of course, was the most common, and it ultimately led to the perfection of a spy-proof code cipher. It is a modification of the crossword puzzle.

A key is employed, consisting of a number of squares in each of which are all the letters of the alphabet. Over these squares is laid a piece of tracing-paper and a line is drawn from letter to letter, back and forth, spelling out the message. Then the zig-zag picture is wirelessed as a single unit. The receiving operator transfers the zig-zags to transparent paper, places them over his key and then untangles the message.

To wireless such a picture or map requires two cylinders of the same size, revolving at a predetermined speed in perfect synchronism. Size and speed can be varied at will, a fact that makes for the safety of the code, even though the key be stolen.

In the earlier part of the war some important radio messages from a German warship were once deciphered by accident. The messages had been intercepted and recorded by the British Admiralty, but the experts assigned to decode them were baffled. All they could hear when the records were played was an unintelligible gibberish that defied translation.

Then a lucky accident led to the solution. One day the gramophone ran down, and the experts were amazed to hear the message being spoken in plain German! The slowing down of the instrument had made the talk understandable. The Germans had made records of their messages and sent them through the ether at terrific speed, but the slow gramophone had betrayed them.

## Aviation Radio Routes

THREE main transcontinental aviation radio routes—northern, middle, and southern—were mapped out recently by the American Federal Radio Commission. Forty-six frequencies instead of the fourteen at present in use, were also allocated for aviation purposes.