

direction of having a separate biasing resistor for each valve, an aim which the writer heartily approves as reducing any possibility of interaction. As there is no connection between the cathode and the transformer, there is no obstacle to providing a separate path between cathode and "B—" for each valve, and the insertion of a suitable resistance in each such path will automatically provide bias. Regarding the respective merits of methods 1 and

## Hum Control and Bias.

### Problems of A.C.

IN the early days of A.C. valves the question of the reduction of hum and grid bias was a difficult one. If alternating current is applied to the filament of a D.C. valve, the fluctua-

ed in the valve, and as the grid is also at earth potential, A.C. hum is the result.

To overcome this, the centre tap must be at the exact centre of the winding, and when the transformer is amateur wound there is a possibility that the halves of the windings will not be perfectly balanced. Where this is the case a centre tap of resistance of almost any value providing it is reasonably low (40-400ohms) may be shunted across the winding and the centre tap connected with the ground. Were a variable resistance used, it may be varied so that all hum is eliminated. Commercially-made transformers rarely require this potential divider (potentiometer) across them, as the centre tap has been made with the greatest of precision.

When grid bias is required, the procedure is much the same, except that a resistance is placed in series with the centre tap. The resistance is of a predetermined value, and will pass a definite amount of current, so that according to Ohm's law there will be a definite difference in potential between the end that is connected with the ground, and that connected with the centre tap. Thus the grid which is connected directly to the ground is still an earth potential, but the filament, although the P.D. existing between either leg is directly proportional to the windings, yet the difference between this and the ground can be varied by the resistance value. In this manner the filament is made positive to the same extent that in D.C. operation the grid is made negative.

The principle in the indirectly heated cathode type of valve has been explain-

ed in another article. The grid bias proposition remains the same. A resistance is placed in series which makes the cathode positive in relation to the grid. A centre tap with this latter type of valve is rarely necessary, though where hum cannot be reduced otherwise, the centre tap connected with the earth may improve matters.

Summing up then, the usual cause of hum is an unbalanced filament brought about by the centre tap not being connected to the electrical centre of a filament winding.

## Short-Wave Expansion

THE commercial demand in the United States for permission to construct and operate short-wave radio stations is widespread. Radio companies, telegraph companies, Press Associations, oil prospecting concerns, Government bureaus, aeroplane operating enterprises, public utility co-operations and even apple-growers in the Far West are among the diversified industries that have applied to the Radio Commission for short-wave licenses.

Nor is this agitation for the construction of short-wave stations confined to the United States. Practically every country in the world is hastening to erect commercial stations using the high-frequency channels. Canada, France, Germany and Brazil and many other countries are increasingly making use of short waves for a variety of communicating purposes.

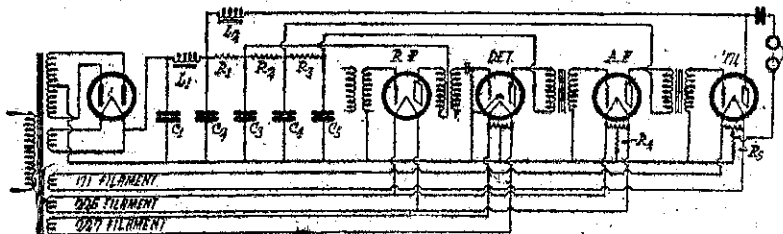


FIG. 3.—Current System to an A.C. Receiver.

3. the writer is not prepared to make any statement except that both are successfully used by different manufacturers, and either is capable, if a proper design is adopted, of giving every satisfaction in the hands of the amateur constructor.

### For Sale or Exchange.

See page 48 for column of casual advertisements.

tions in temperature cause fluctuations in the plate current. This results in A.C. hum. The development of the 225 valve with a broad strong filament to a very great extent overcame this, particularly so when the centre tap of the A.C. winding was connected with earth. This means that the difference in potential between the centre tap and the two extremes of the winding was directly proportional to the numbers of turns on either side of this tap. If this tap is not directly in the centre, it can be seen that there is an element unbalance.

## Know More About RADIO

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The "Radio Listeners' Guide" has been compiled by experts but the content is written in an easy-to-understand style. Every stage of radio is covered so that you can find out how to rectify any trouble without any previous knowledge of radio.

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## Some of the Sections

A general description of radio, receivers, and broadcasting is given so that readers unfamiliar with methods used, may have a full idea of what happens between the times when Mr. Announcer says "Hullo" and when it comes through your speaker.

Multi valve receivers are extensively dealt with, descriptive circuits are given of the most popular types, and full details re construction and tuning. The matter of maintenance is also dealt with in this section.

Perhaps the Glossary of Wireless Terms could be aptly described as one of the most helpful pages in the "Guide." Everything in radio is explained fully, even those wireless terms that have you tricked are dealt with in this section.

For those who desire to "sweep the world" the short wave section will be of undoubted assistance and the circuits and hints will help you to bring in all those stations your friends speak of so often.

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