

# The Finer Details of Radio

## Matching Impedances for Dynamic Cones



RECENTLY the writer has been experimenting with moving coil speakers, and his practical experience, gained after many sad failures, may prove of interest to others.

In the case of dynamic cone speakers, impedance of the moving coil has to be matched to suit that of the valve. While in England fully 90 per cent. of speakers of this class are wound with high resistance windings suitable only for use with a 1-1 output transformer or a choke filter system, Americans adopt only the low resistance windings. Output transformers of various ratios are available from 25-1 to 4500 to 1, and it depends upon this ratio as to how many turns are required for the moving coil.

It has been stated that the moving coil and valve impedance must be matched. This is quite correct, whatever the method of output, but in the case of a step-down transformer the ratio of the transformer must be given consideration. A mistaken idea seems to exist in some quarters that the valve has to be matched to the transformer primary, and the moving coil to the secondary of the transformer. This is quite wrong. So long as the impedance of the transformer primary is well above that of the valve its value is not critical, and as far as

### By "PENTODE"

efficiency is concerned, the higher the impedance the better. It is the load on the transformer that matters, and in this case it is the moving coil. Assuming that a reliable make of transformer is used, it is the ratio that counts. The number of turns on the

*Several correspondents have written to the R.R. asking for a few articles of a more technical nature, now and then. Judging by the text of their letters, they are keen amateurs, and, having passed their ABC stage in radio, want to keep fully abreast with the times. In an attempt to interest this ever-increasing number of real enthusiasts, a small article of technical value and interest will be given regularly.*

moving coil multiplied by the transformer ratio give the impedance of the load in the anode of the last valve.

In the case of a single valve in the last stage, the output transformer must

have an impedance of 5000 to 6000 ohms, and all commercial speaker manufacturers in both countries base their speaker design upon the characteristics of their more or less national valves. It will now follow that it is inadvisable to use English valves upon an American speaker or visa versa.

There are, however, ways out of the trouble, and the following list of turns will not only be of use to any who are designing moving coil speakers, but will help in the selection of a more suitable output valve for either an English or American speaker.

#### Data For Moving Coils.

Valve, or impedance. Ohms.	Turns for H.R. coil.	Turns for 25-1 step-down transformer.
2500	1000	50
2750	1300	55
3500	1650	65
5000	2100	105

These figures show that a moving coil of 105 turns in conjunction with a 25-1 transformer would not give anything like efficiency if used after a valve with an impedance of 2500 ohms. In actual fact a marked predominance of the low tones would occur with an absence of the many harmonics that are the timbre of most string instruments.

#### Valves in Parallel.

THIS data concerns only a single power valve. When two valves are worked in parallel the impedance

## Working with Europe

### Two-way Communication

THE "Radio Record's" technical correspondent writes:—"What must rank as a wonderful achievement in shortwave transmission occurred on Easter Monday evening. Mr. Roy Clarke, Apu Crescent, who operates under the call-sign of ZL2AW, Wellington, carried out seven separate and distinct transmissions between the hours of 4 p.m. and 5 p.m. (New Zealand time)."

"Working on about 100 watts, on a band of 20 metres, Mr. Clarke succeeded in working the following amateurs. The report for volume is given, after each station, that is, the volume at which Mr. Clarke received the respective stations, and in Mr. Clarke's case, the overseas amateurs reported having received 2AW for the most part at R7 and not below R6, which is, in itself, a splendid achievement."

EAR96 (Spain) R7.  
F8HO (France) R6.  
5BZ (Croydon, England) R3.  
6AVL (Hawaii) R5.  
9DLY (South Dakota, U.S.A.) R5.  
3BD (Melbourne, Australia) R5.  
1AX (Mr. Jack Orbell, Auckland) R7.

To carry out this feat in one solitary hour is good, solid working, and only a detector and one stage of audio was used.

tion of the valves used by the average constructor are of similar types and characteristics as prevail in Europe. Power valves having low impedances are sold, more so than for those for which available speakers are designed.

Perhaps it has already been realised that an ideal arrangement, for anyone desirous of getting the best from his outfit, is obtained by the use of a push-pull amplifier using two low impedance valves fed to the speaker through a centre tapped choke to the transformer usually incorporated in the speaker itself. No by-pass condensers are necessary, and if a choke is not available the primary windings of a push-pull output transformer will meet the case, leaving the secondary terminals free. The diagram given indicates the method.

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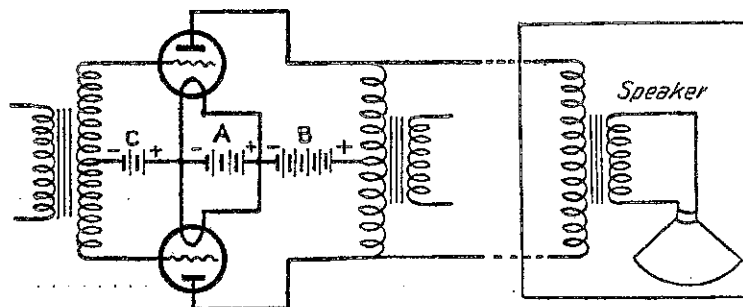
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be of reliable make and liberal in both iron and wire.

D.C. current to the order of 20 to 25 milliamperes is flowing through the primary, thereby lowering its impedance, and lowering the efficiency as a whole, and if insufficient iron is used, saturation occurs, and insufficient wire lowers the impedance whatever the current flowing.

#### English and American Methods.

COMPARISONS were given of the English and American methods. One must not get into difficulties through working to specifications of the construction of an English moving coil speaker, and attempting to run it on the average American valve. Let me explain more fully. In England the standard valve upon which most of the speakers are designed to be used is the LS5A, with an impedance of 2750 ohms. The equivalent American valve is the UX 210, having an im-

pedance of 5000 to 6000 ohms, and all commercial speaker manufacturers in both countries base their speaker design upon the characteristics of their more or less national valves. It will now follow that it is inadvisable to use English valves upon an American speaker or visa versa. There are, however, ways out of the trouble, and the following list of turns will not only be of use to any who are designing moving coil speakers, but will help in the selection of a more suitable output valve for either an English or American speaker. These figures show that a moving coil of 105 turns in conjunction with a 25-1 transformer would not give anything like efficiency if used after a valve with an impedance of 2500 ohms. In actual fact a marked predominance of the low tones would occur with an absence of the many harmonics that are the timbre of most string instruments.

Certainly most of the M.C. speakers in New Zealand are of American make, designed for an output valve of 210 characteristics, while a large propor-