

windings may be disregarded or they can be applied to the filament of the power valve of the receiving set. "B" is as before, from the centre tap of the secondary.

A Request for a Circuit.

"RELATIVE to your article in this week's issue of the 'Radio Record' on radio frequency amplification and its use on shortwave, should you recommend an all-wave circuit using one stage of screen grid R.F.?"

ANSWER: We have noted this request, and shall endeavour to fulfil it shortly.

"Pentode's" Dynamic Cone.

"H. F.B." (Auckland) asks: "Is the ratio of the transformer for the dynamic cone described by 'Pentode' based upon the impedance or the resistance, and what type or make of transformer would you suggest? I have made up the speaker but find a 25 to 1 transformer is unobtainable in Auckland. I have been advised to make one. If I should have to do this, could you give the details of same?"

"My gap for the moving coil is at present 1.16 of an inch. Would it be advisable to increase this?"

ANSWER: A 25 to 1 transformer should be obtainable, for it is understood that one maker at least has such products on our market (Ferranti). If yet, the transformer cannot be obtained and other readers have found this difficulty, "Pentode" will give full constructional details of a suitable transformer.

Shielding a Receiver.

"A. J.S., of Nelson, writes: "I have a five-valve neutrodyne (factory-made), and I wish to shield it, but I am not clear about the coils, which are mounted on the moving condensers, and are set at an angle of 56 degrees. Could I use these, and, if so, would I leave them as they are or would I shift them and set them as described in the 'Record'?"

ANSWER: There is no need to shift them merely remove the condenser from the panel, drill a corresponding hole in the shield box, and reinsert the condenser as described in the 'Record.' The coils, however, could be removed and set down as described.

The Capacity of a Condenser.

MY condensers consist of six moving plates and five fixed plates. What are their capacities? How many plates are there in a .0005 condenser? asks "A.J.S."

ANSWER: The number of plates for any one capacity is not definite, but the condenser in question is in all probability a .00025. A .0005 condenser has usually 13 moving plates, and 14 fixed plates.

An Amplifier for Volume.

"D. S." (Market Cross) asks if the amplifier described by "Pentode" (push-pull) would give more volume than the amplifying stages of his set.

ANSWER: This cannot be stated, unless the particulars of the amplifier in the set are known, but it would be fairly safe to assume that the number of valves and their characteristics being the same, the push-pull would be the better amplifier.

COULD the volume of "Pentode's" amplifier be increased by using more expensive transformers than those specified?

ANSWER: Generally speaking, more expensive transformers than those used by "Pentode" would tend to improve quality rather than volume.

COULD another stage be added to the amplifier?

ANSWER: No, it is not practical.

I wish to supply a dance hall from four dry batteries. Would the push-pull amplifier be sufficient?

ANSWER: It should be, yes, for "Pentode" has used the same amplifier for this purpose many times.

A Corner for Beginners

The Neutralisation Process.

BETWEEN the grid and the plate of the valve a capacity erect known as the anode grid capacity is set up, and unless there is some method of preventing the energy so generated from feeding back into the aerial, the set is going to act as a transmitter, and all the neighbourhood will be interfered with.

To combat this, in the radio frequency stage, a method known as neutralisation is employed. This is quite frequently referred to as balancing. The object of balancing is to provide a second feed-back between the various other external circuits to connections outside the valve. The second feed-back is arranged so that energy passing through it is equal in amount to the valve feed-back but is opposite in phase or polarity. The effect of the valve feed-back is then exactly balanced by the external feed-back. The result of combining these two feed-backs is to destroy the effect of both, so that regeneration and oscillation are prevented.

A simple analogy may make this clearer. If an acid is split or taken internally, the simplest method of preventing its action is to neutralise it by an alkali which, though in itself as dangerous as the acid, when applied to the acid neutralises its effect or kills it. Exactly the same thing happens when the set is balanced.

Principally, there are three methods of balancing. Of these the most popular balanced circuit was the neutrodyne. From the condenser that tunes the grid coil of the aerial circuit a lead was taken to a tap near the filament end of the secondary winding of the following transformer. This connection was broken by a neutralising condenser. Thus the feed-back from the grid was intermingled with the feed-back from the transformer which was opposite in polarity, and so one destroyed the other.

The Roberts method is very similar except that the balancing energy is secured from a special winding in the radio frequency transformer, and the balancing condenser is adjusted so that it allows enough feed-back to just compensate for the internal feed-back of the valve.

The Rice method of balancing requires a centre tap on the grid coil of the aerial circuit which is connected to the filament negative. The plate of the radio frequency valve is then connected to the lower end of the grid coil through a balancing condenser.

The Neutrodyne method is that generally used and is the one employed with the Browning-Drake.

Adjusting the Balance.

IT can be readily seen from the foregoing that the amount of feed-back from the secondary of the second R.F. coil must be equal to the feed-back from the valve, and this must be regulated by the balancing condenser.

Thus the capacity of a balancing condenser is proportional to the internal capacity of the valve. It is rare that the internal capacity of one valve is similar to that of another valve, so that it is only to be expected that the capacity of

SHOULD I connect the terminals of the dynamic cone speaker direct to the "A" battery?

ANSWER: Yes, if this is of the type the field of which is excited by direct current of 6 volts. These field terminals are connected directly to the A battery.

WOULD a small amplifier connected to my set cause it to howl?

ANSWER: If carefully constructed, there is no reason why it should not, especially if a radio frequency choke and by-pass condenser are incorporated in the detector circuit.

the balancing condenser has to be altered every time a new valve is inserted in the radio frequency socket. Very few radio enthusiasts realise this, and very unsatisfactory reception following the change of radio frequency valve is quite common. Receivers that howl or whistle very frequently require reneutralisation.

With all the circuit connections properly made, and with a neutralising condenser, set at about one-half of its total capacity, signals from a station on about 300 metres are tuned in to a maximum. All the signals must come from the antenna, so remove the antenna and decide if this is the case. If not, tune to a weaker station.

The filament of the valve to be balanced is turned out by turning off its rheostat, by removing the filament control resistance, or by disconnecting a wire from one of the filament terminals. No other changes are made, and no other valves turned out, and the tuning controls are left unchanged. The signals from the station previously tuned in will still be heard with fair volume, because of the energy that passes through the internal capacity of the valve. The balancing condenser is then carefully adjusted until the signals are not heard or until they are at a minimum. This means that the internal capacity of the valve has been neutralised by the feed-back from the second coil. The set is now neutralised, and when the valve is turned on again, the signals will come in at far greater strength, and there will be an absence of noise caused by feed-back.

The procedure should now be gone over again with a different station, preferably one with a higher wavelength, then on one with a lower wavelength. If it requires a great deal of alteration to the balancing condenser an adjustment should be made so as to strike a happy medium.

When two stages of radio frequency are to be neutralised the stage nearest the detector should be neutralised first and quite separate from the first stage.

Batteries! Batteries! Batteries!

QUITE frequently from this corner the need of watching the batteries is stressed, but there are still very large numbers whose trouble can be traced down to this very simple cause. A radio service man tells the story of a happening just within the last few days.

A set of his installation commenced to cause trouble some while after it had been installed. Unfortunately,

the owners were that evening entertaining some friends, and when the set refused to function, the radio man was called. His first suggestion was: "How are your batteries?" The batteries were all right! They had only been in use two or three months. When it was suggested that they should be tested, it was explained that they could not possibly be at fault; there must surely be something else. To satisfy the family, the radio trader travelled many miles with a considerable amount of radio gear, including a voltmeter. His first action was to test the "B" battery. One registered 0 volts, the other 18 volts. Again the radio trader asked the man how long he had had his batteries, and then, and not until then, did he realise that the batteries had done eight months' service.

The Grid Bias Cells.

THE "C" or grid bias cell is one which usually receives little or any attention at all, although it certainly requires the least of the three. It must be remembered that a dry battery does not last for ever, even if no current be taken out of it. In fact, a life of twelve months under these conditions is all that can reasonably be expected.

The electrolyte in the battery gradually dries up completely in the course of time, rendering the cell useless, even if it is not used at all during the time, so that the grid bias battery should be renewed as a matter of course every nine months. The voltage, as shown on a meter, will decrease gradually owing to the increase of resistance of the battery, due to drying up of the electrolyte.

If the grid bias to the audio amplifier valve is too small, or becomes too small, serious distortion will be noticed, and a serious drain on the "B" batteries will take place. Also, the life of the valves will be materially shortened. It would not be out of place to point out the great importance of carrying out the valves manufacturers' advice as to providing the correct grid bias for each stage of amplification.

The usual all-purpose valves require in the vicinity of 9 volts grid bias, with 135 volts on the plate. But if a power valve is to be used in the last stage it will be found that the manufacturer recommends 15 to 22½ volts bias.



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