

SHIELDED BROWNING-DRAKE

The following list will be a good guide, but a turn or two more and less should be also tried—the object is to use as few turns as possible without losing volume, and that is why the impedance of the valve should not be too high.

Impedance.	Primary turns.
20,000	22
18,000	20
16,000	18
14,000	16
12,000	14
10,000	13

A FINAL NOTE.

FINAL advice to constructors is to buy good components—any make that has quality and is of the correct value. Some constructors appear to go and buy, say, variable condensers, with little care as to the value of their capacity, and then comes along a letter of inquiry as to how the wrong valves can be worked in. Such tactics will not suit this receiver very well, so make sure of what you want, and save the dealer the trouble of guessing for you. The list given last week will be found a good guide with approximate prices, and all required values of condensers, etc. Note that if the absorption control of tickler is to be adopted, instead of a tickler knob, a carbon rheostat will be required, giving a maximum of 50 ohms. The writer feels confident that those who put the necessary care into the construction of this receiver will have a unit that they will be very pleased to possess, and one with which some good long-distance work will be performed.

Last week, in the section dealing with the R.F. transformer, what should have been the fourth line appeared as the sixth.

Constructors are asked to note that the height of the panel is 8½ inches, as stated in the first column and in list. Eight inches appeared on the diagram in error.

RESISTANCE COUPLED AMPLIFIERS

ALTHOUGH resistance coupling is generally looked upon as a reliable means of obtaining pure reproduction in an amplifier, there are points to be observed in order to ensure that this desirable quality is fully secured. The loss of low notes is avoided to a great extent by choice of suitable coupling condenser and leak. A more frequent trouble is the loss of high notes, and this defect has in many factory-built receivers been accentuated by sacrificing the upper musical scale in order to obtain general high amplification on the remainder of the scale.

STRAY capacities in the amplifier circuit contribute to the loss of high note amplification. These capacities are between the plate and filament of the valves, between the plate resistance and its holder, the joint grid-filament capacity of the following valve and across its grid leak and holder, and finally the grid-plate capacity of this valve.

The total of these stray capacities has the effect of a by-pass condenser of appreciable value, and according to the frequency of the note conveyed by the signal, has more or less effect upon amplification. This unwanted capacity has a very high impedance to the low notes, so that all the available voltage is transferred to the grid of the next valve, giving high amplification. This is assisted by keeping the value of the resistance as high as possible, that is, large compared with the internal resistance of the valve.

AS the frequency, that is the pitch, of the notes rises, the stray capacities offer less impedance to the total voltage, so that an increasing proportion is short-circuited or by-passed,

Possible Troubles in Audio Amplifiers

HOW SOME OF THEM MAY BE AVOIDED

IT is a comparatively easy matter for a constructor to build an audio amplifier from specifications and produce a piece of apparatus that will function well from the start and give good quality reproduction. Yet there are unavoidable circumstances that cause components to be used other than those specified, and certain license may be taken by the constructor in various ways, entailing slight modifications of various kinds. In such cases there is always the chance of introducing instability, which is invariably due to some form of "feed-back" or stray coupling, and the greater the amount of amplification, the greater is the danger of audio howl being produced.

One of the most frequent causes of oscillation in audio amplifiers is the high resistance of old or small dry cells, or in some cases an eliminator, supplying B current. This high resistance has the effect of forcing, or "feeding-back," an additional positive potential upon the plate of each valve preceding the last. This is assuming that all plates are fed from the same B supply. This effect, in turn, has an opposing action upon the grid voltages caused by the shifting of phases, with the result that there is a tendency to reduce volume of signals. In some circumstances there is the opposite effect of the signals being strengthened by the feed-back impulses, sufficiently strong, in some cases, as to cause oscillation. If each grid is in phase with the preceding plate and out of phase with the suc-

ceeding one, then in an odd number of stages the signal will be weakened, and in an even number of stages the signal will be strengthened, introducing the tendency to oscillation.

In some cases where R.F. amplification is high, and is coupled to the audio side through an inefficient coupling such as a small capacity condenser, then it may be necessary to include an R.F. stage in the number of stages, as mentioned above.

Transformer Coupling.

THE above remarks apply more particularly to resistance and choke coupling. With transformer coupling it is possible to make the grid opposite in phase to the preceding plate by reversing the connections to one winding, but this further complicates matters because the capacity between the windings then acts so as to reduce amplification.

Mention was made above of phases. These concern the grid voltages only, which are alternately negative and positive, and are quite independent of the direct B battery current. Certain conditions can cause a "lag" in the phases, so that when this is fed back to meet the original impulses, if the lag results in a total reversal, then the positive phase of the feed-back voltage meets the negative phase of the original, and vice-versa. This is a brief idea of the complicated questions involved in dealing with phase combinations.

Merits of "Push-pull" Amplifier.

WHERE it is desired to use a common plate supply and yet be free from any tendency to audio oscillation or instability, the push-pull type of amplifier should be used, as in this method of amplification the signal current does not traverse the battery (or eliminator) at all.

From the above remarks the conclusion may be drawn that it is best to use a low resistance B supply in order to avoid any possible trouble from interaction between stages, or different portions of the circuit, such as would cause audio howling or oscillation. As dry batteries grow old their internal resistance increases and their voltage drops, so that after a certain drop in voltage it does not pay to keep them in use if quality reception is desired, partly on account of the noise much resembling static, which accompanies reception when a dry battery is becoming "bone dry."

"Motor Boating."

NOTHING said above has any connection with another audio trouble known as "motor boating." Howling is not motor boating. The latter is more often experienced in resistance-coupled amplifiers, and is easily recognised by the comparatively slow put-put-put sound. It is a limiting or blocking action, caused by the coupling condensers storing up electrons on the grid side faster than the grid leak can carry them off to the negative side of the filament. The grid of the succeeding tube gradually assumes a more negative bias until it finally becomes so negative that no plate current flows in the output circuit of that valve, which is then said to be "blocked." Then the grid leak passes the accumulated electrons, and the current is restored, only to continue to repeat the same action. One cure of this trouble is to use an impedance in place of the grid leak, as owing to its comparatively low resistance the electrons will flow away as fast as they arrive instead of accumulating. This makes for quality also, as any tendency to "motor boating" is accompanied by distortion, due to the grid charge being at one of the extremes, or off that portion of the curve which allows of even amplification.

Another improvement, if not incorporated already, is to place condensers of 1 mfd. each across each amplifier B voltage, whether from battery or elim-

AUCKLAND DIRECTORY

What to Buy and Where

ATWATER-KENT RADIO	Frank Wiseman, Ltd. 170-172 Queen Street.
ALTONA & HAMMARLUND-ROBERTS SETS.	Johns, Ltd. Chancery Street.
AMPLION LOUDSPEAKERS	All Radio Dealers.
BREMER-TULLY RADIO	Superadio, Ltd., 147 Queen Street.
BURGESS RADIO BATTERIES,	All Radio Dealers.
CE-CO VALVES	All Radio Dealers.
FADA RADIO	Radio Supplies, 251 Symonds Street.
FEDERAL, MOHAWK, GLOBE	Federal Radio House, 8 Darby Street.
GILFILLAN AND KELLOGG	Harrington's, Ltd., 138-140 Queen Street.
GREBE RADIO	Howie's, Dunworth Building, Custom St. B.
MARCONI ECONOMY VALVES	All Radio Dealers.
MULLARD VALVES	All Radio Dealers.
RADIOLA RECEIVERS	Farmers' Trading Co., Ltd., Hobson Street.
RADIOTRON VALVES	All Radio Dealers.
RELIANCE BATTERIES	Reliance Battery Mfg. Co., Ltd., N.Z. Made. 96 Albert Street.
PHILIPS VALVES AND APPARATUS	All Good Radio Dealers.

inator, and these condensers should be placed within the amplifier. If such condensers are already installed, an increase of their capacity is recommended.

Another method of overcoming the trouble is the staggering of resistance values and also the staggering of plate voltage values. Replacing the grid leak in the amplifier by one of lower value will tend to stabilise the circuit, but this is only done at the expense of volume.

Care must be taken in placing the transformers in an audio amplifier, as interaction between these when placed too close together may cause howling, especially if the transformers are of an unshielded pattern.

NEXT WEEK'S FEATURE FOR CONSTRUCTORS

A SEPARATE RF UNIT FOR THE UX222 VALVE

Next week will be described the construction of a single-valve unit employing the new shield grid valve. This circuit was recently published in America, and when a copy reached "Megohm" he decided to build the unit at once and test its value. The unit does all that is claimed for it, and in a test upon an ordinary four-valve Browning-Drake, about double the usual volume was obtained.

This will suit many constructors who do not wish to go to the length of constructing the receiver now being described, but which is, nevertheless, strongly recommended as a quality receiver much ahead of the unshielded type which has hitherto been constructed.

The unit, though specially adapted to the Browning-Drake, can be attached to practically any receiver.



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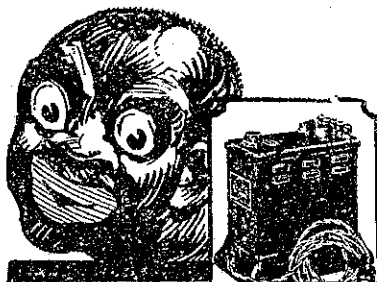
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