Chat about Power Amplifiers



some the words, "power amplifier" are slightly misleading. One is inclined to consider that a small battery operated amplifier is capable of giving all the noise wanted, without goexpense of ing to the

purchasing or constructing the more elaborate piece of equipment known as the "power amplifier." Then again a power amplifier does not necessarily operate from the electric power or A.C. mains, although there are reasons which make them more easily adaptable to this source of energy, the principal ones being initial cost and running expenses.

Of the frequencies that make up the notes which make up the audible range, the lower ones require more energy to reproduce at the same intensity than the higher ones. Enough has been written upon the desirability of getting equal amplification of all notes for truer reproduction and the public tendency is for the inclusion of notes of the lower register. To this notes of the lower register. end amateurs change their audio transformers, buy better loudspeakers and even cut out the higher frequencies with by-pass condensers and resistances in an attempt to get more faithful reproduction of the low register.

It has been stated already that more power is needed to drive a speaker on the low tones and the amateur is in-

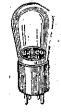
(Continued from page 35.)

If the trouble is not found by these tests, it is advisable for the novice to call some one in who is more familiar with sets and their troubles, in order to locate the difficulties. It is well, in fact, to have any installation checked by an older head. The above suggestions should not keep any one from undertaking the "Beginner's Three"; as the possibilities of encountering trouble in a set of this type are very slight, if the instructions are followed exactly. They are merely given so that if the omission of something causes trouble, the reader will have some means of locating it before calling for outside assistance.

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clined to be puzzled over this point when, as it is, he has to detune and SINCE the introduction of the recent-cut down the volume. It is almost a contradictory statement, but when it is understood that power is needed, not fiers can be constructed having a negactual amplification, the reader will begin to understand. is handled by the last valve.

Power Hums.

ly perfected A.C. valves, ampli-The only power when these valves are used the power available to the speaker is that which hum is the biggest hurdle to overcome. This Here again, the question of design is

CHOKE OR FIELD WINDING OF DYNAMIC CONE 000 g g ourren 2.UFd

Diagram 1.—Typical two-stage power amplifier.

power is really changes in current ac- of paramount importance. It will be

sufficient to operate the speaker on the suitability of each component used. notes below a certain frequency. The As three different sources of energy. remedy is, of course, a more powerful valve in the output stage. Unfortunately a larger valve takes more current to operate, higher B and C voltages, and expense is involved.

A power amplifier then is one that has ample power at its disposal to fully develop and reproduce low tones, giving more balance to any piece of music. The volume may not be any greater, but there is no comparison between the tone of a correctly designed power amplifier and that of an amplifier using general purpose valves and low plate potentials.

As in most other things, design plays the greatest part in the final result and the best advice to anyone contemplating the assembly of a power amplifier is to spend plenty of time in designing and arranging.

In the case of an amplifier using batteries there are no great difficulties, and given good class components almost anyone could build an instru- plied direct to the filament of any ment capable of giving results equal to power valve. The main transformer any of the commercial power ampli-But when the cost of batteries, etc., have been calculated it will be found to be equal to, if not more than, the price of components of an amplifier capable of being operated from the A.C. When the running expenses are taken into account a battery operated amplifier falls far behind in the question of economy

companied by the voltage fluctuations, seen shortly how many different fac-In the case of a small valve, changes tors determine the overall efficiency of in anode current are comparatively any A.C. operated amplifier and that small and the power available is in-deep consideration has to be given to

> e.g., the A, B and C supply, have to be available, some method of converting the alternating current input into a direct current and its distribution will In itself the have to be devised. amplifier has to contain a complete A, B and C eliminator. The question of the A power is solved by using the special AC valves for this purpose. The filaments of these valves are made of a fairly heavy gauge resistance wire, usually in the form of a ribbon, which is coated with thorium oxide, and designed to run on low voltage AC. In the case of the 226 type of valve the filament voltage is 1.5 volts, consuming between 1 to 1.5 amperes. By applying raw A.C. to these filaments and taking the grid return to the mid-point, using either a potentiometer or centretapped transformer winding, very little hum is introduced in one audio stage preceding the power valve. In the case of the last valve, raw A.C. can be ap-

has to be designed to supply A.C. voltages corresponding to the valves used.

Current for the B and C supply has

to be smooth and direct and after being stepped up to the desired potential by the main power transformer it has to be rectified and passed through a succession of chokes and filters, after which it is divided by a resistance known as a "potential divider." This part constitutes the B and C elimina-

In a previous article it has been explained that to obtain a negative bias applied to the grid, either the grid can be made negative with regard to the filament which is at earth potential or the filament can be made positive with regard to the grid which is at earth potential. The latter case is usually made use of in an A.C. operated amplifier, so that one single rectifying system gives both B and C potentials at the same time. As the power valve has a certain D.C. resistance of its own, this valve can be used to calculate the resistance suitable for the grid poten-

A far easier/method, however, would be to calculate the resistance necessary to give the required voltage drop, knowing the normal plate current of the valve. Also, as the plate-current has to pass through this resistance, its current-carrying capacity will have to be taken into account.

This explains the fundamental principles of the A.C. operated amplifier and Diagram I illustrates the circuit of a typical two-stage power amplifier. It can be seen that the main power transformer has four distinct secondary windings, delivering voltages suitable for the various filaments and also the high voltage windings, the voltage of which has to be given careful consideration, as will be explained later.

Following the B plus lead from the rectifying filament, we are lead to the chokes used in the smoothing circuit. By utilising the field-winding of a moving coil speaker in place of the second choke it not only fully smooths the direct current, but also provides, in an economical way, the energy for the M.C. speaker pot.

Two or three difficulties have to be overcome here and allowances made in the general design. A speaker field usually operates on the 110-volt direct current supply and passes as much as 95 milliamps. Now, if 95 milliamps is passed through the winding there will be a voltage drop of 110 volts across the speaker field. This voltage will have to be added on before it can be dropped and the high voltage winding on the power transformer will have to be suitably increased.

It was stated that 95 mills would be passed through the speaker when acting as a choke. No single valve of the 210 type should pass more than 24 mills, so a shunt resistance has to be used to bypass the remaining 70 mills.

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