

# The Truphonic Amplifier

**Case Presented for the New Form of Audio Coupling, Where Chokes Function Non-Magnetically in Plate and Grid Circuits, and Condenser Affords Coupling**

By A. N. Clifton

WHEN a transformer is used in audio frequency amplification, the grid potential has to be kept negative. When this is done no grid currents are present. The reason that grid currents are not permissible with transformers is because as soon as the grid goes positive there is a partly shorted circuit in the secondary of the transformer and a temporary reduction of the magnetic coupling. The result is distortion, evidenced by the presence of an over-emphasized first harmonic.

H. P. Donle, well-known scientist and inventor, has invented the efficient Truphonic system of audio-frequency amplification, in which there is no magnetic coupling. Fig 1 shows condensers through which the audio frequencies pass directly from the plate of the preceding tube to the grid of the following tube. The effect of this coupling condenser is not changed by grid currents. Consequently, with this system, we can use the entire portion of the curve, left to right, in Fig. 3. As point B on the curve is the mid-point, we can utilize twice as much of this curve as you can with a transformer. As the comparative power output is the square of the voltage fluctuations, we are able, therefore, to obtain the square of 2, or 4 times the power output as compared with a transformer.

**The Regular Impedance**

With the usual impedance circuit it is not possible to obtain large volumes without tube blocking. Another term for tube blocking is "volume limit." The usual circuit consists of a plate impedance, a coupling condenser and a resistance grid leak. If the coupling condenser is made large enough to pass the low frequency, then the grid leak must be made with a low enough resistance to keep the volume limit above that desired in operation. When this is done very little amplification per stage is obtained. That is why in the speech amplifiers of broadcasting stations they use so many stages of amplification and special types of tubes which have inherent high amplification characteristics. That is also why the single impedance method is not practical for receiving sets. The Truphonic Audio system completely eliminates this trouble, by replacing the resistance grid leak with a low DC resistance impedance coil.

This coil is a happy combination, afford-

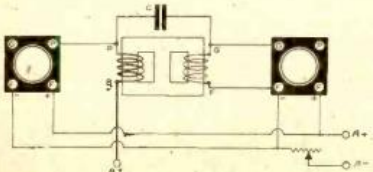


FIG. 2  
The same laminations used for both windings

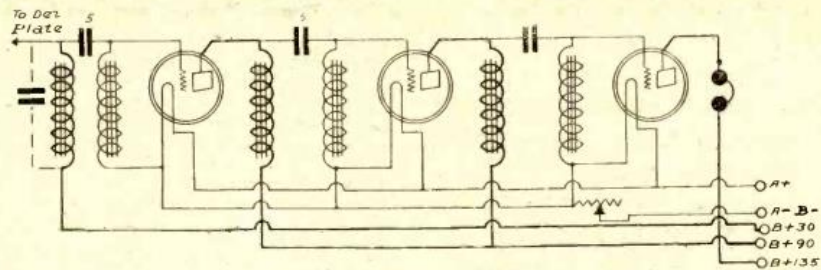


FIG. 1  
The double impedance audio amplifier. The coupling condensers are 0.5 mfd. each. The grid returns, shown at negative F, may be placed instead at negative A (the other side of the rheostat) if greater "free bias" is desired.

ing a volume limit 250 times that of the single impedance circuit using a .5 megohm grid leak, and at the same time, the impedance to the signal is over a million ohms at ordinary frequencies. This latter feature enables each stage to have an amplification factor which is very high compared with either resistance or single impedance circuits.

All frequencies are faithfully reproduced. This means that the amplification factor is kept constant within a very small percentage from the lowest notes received to the highest harmonics or overtones. Professor Morecroft of Columbia University made some measurements proving this fact.

**Two on Same Lamination**

In Fig. 2 is shown a diagram of a single unit and illustrates the "Figure 8" lamination by means of which the two choke coils are mounted on the same lamination. Tests have shown that there is absolutely no magnetic coupling between these two coils. If there were any magnetic coupling between them the advantage of power output of the system would be reduced in proportion to the ratio between the capacity coupling and the magnetic coupling.

Regarding the amount of amplification obtained, three stages of the new Truphonic audio will give a greater amplification than two stages of transformer in a ratio of about 5 to 4; therefore, three stages of this system can be used in place of two stages of transformer on any set regardless of the radio or detector circuits used.

**Indirect Output**

Maximum speaker operation is supplied by the three stages recommended. In addition an output unit for the protection of the loud speaker is advisable where power tubes are employed. The use of this output unit, which separates the direct from the alternating current of the output circuit, is desirable at all times, as it prevents demagnetization of the speaker, eliminates the possibility of burning out the speaker and also serves to eliminate distortion and preserve the delicate balance of the well-built speaker units. Any standard tubes may be used. Dry cell tubes may be used with entire satisfaction, although storage battery tubes are recommended for maximum results. The units are such that the only limit on undistorted output lies in the tubes and speaker. For this reason when maximum volume is desired the use of the power amplifying tubes, such as the 120, or equivalent for dry cells, or the 112, or 171, or equivalent for storage batteries is recommended.

A circuit consisting of two stages of tuned radio frequency amplification, a tube detector and three stages of Tru-

## Full Utilization of the Grid Voltage-Plate Current Curve of the Vacuum Tube Claimed—Theory of Avoiding Overloading or Volume Limit

phonic audio was published in the September 11 issue of RADIO WORLD. The Nald Localized Control was used for tuning in conjunction with shielded Sickles coils. The control unit includes the three variable condensers, mounted on a frame.

**Condenser Values**

The best value for the fixed condenser C8, as shown in the hookup published in that issue, has been found, after various experiments, to be .002 mfd. The value of C11 preferably should be 2 mfd.

It has been found helpful to the overall efficiency of the circuit to add a fixed resistor of 25,000 ohms, connected between the F post of the first Truphonic coupler and the common ground and A minus lead, in other words in series with the grid coil, a connection that will be readily understood by reference to Fig. 4 in last week's issue. Of course the other radio grid returns go directly to F minus, without inclusion of the resistance on their circuits.

The form of audio amplification represented by the Truphonic system became popular very swiftly, and it is a certainty that it will gain in popularity with great strides. Those whose sheer delight is tone quality, and who yet desire full volume without any sacrifice of the richness, will find in Truphonic audio something that will please their exacting tastes to a nicety.

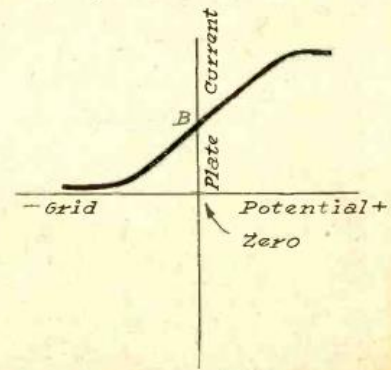


FIG. 3  
Grid voltage, plate current curve of a vacuum tube.