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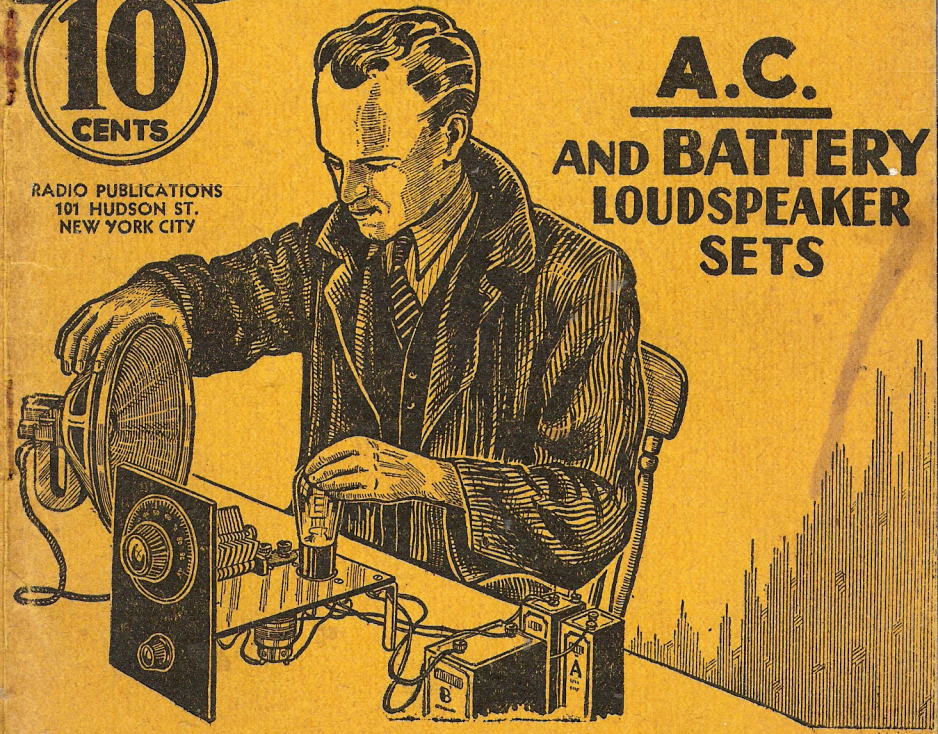

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THE "MEGADYNE" ONE-TUBE LOUDSPEAKER SET

By **Hugo Gernsback**

IN this article, the author describes the first practical one-tube loudspeaker set using a pentode tube. The set has been tested experimentally in a number of locations in the metropolitan New York district by several independent experimenters. In all instances, its performance was astonishing; not only did it bring in all locals on the loudspeaker with sufficient volume to fill a large room comfortably, but distant stations as well.

Such stations as KDKA Pittsburgh, WTAM Cleveland, WBZ Springfield, WTAC Hartford, Conn., and many others were received with fair loudspeaker strength.

Experimenters and fans who have looked forward to a REAL one tube set now have their wish fulfilled.

THE advent of the new and more efficient tubes has made it possible to build radio sets which were not dreamed of five yeare ago. I have often stated editorially, that the radio art is headed in a direction where in the near future, it will be possible to obtain as much volume from a single one-tube set as we formerly obtained with a seven or ten-tube set.

Development of the Megadyne

Some time ago, I started to experiment with the idea of producing a one-tube loudspeaker set that would actually work and could not be classed as "tricky." I thought that the efficiency of the new screen-grid and pentode tubes would make this possible. A few of them were tried in all sorts of circuits, but it was found that no matter how good the usual circuit arrangements were, the volume that could be obtained from a loudspeaker was not sufficient to call it loudspeaker volume.

I then resurrected my old *Interflex* idea, a circuit that I devised in 1925. This circuit was exceedingly popular at the time and several hundred thousand receivers using this circuit were built all over the world. To those who have forgotten the circuit, and to those

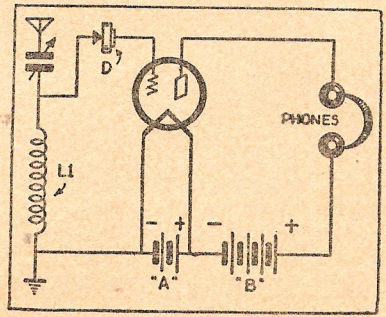


Fig. 1.—Showing "Interflex" Circuit.

who were not in radio at the time, I outline the circuit herewith in its fundamentals:

Figure 1 shows how the crystal detector is connected directly into the grid of a tube. The circuit is not of the reflex type, nor is there regeneration in any form. The crystal in the grid circuit acts as the *detector*, while the vacuum tube acts as an *amplifier*. The amplification obtained, depending upon the sensitivity of the crystal, is from 10 to 20, and may be greater in some cases. In other words, by using a crystal detector, the addition of the tube will give real amplification. The circuit is remarkable in that there is no distortion and the reception of the signal is clearer than when the tube is used alone; it being well known by radio engineers that the present vacuum tubes are poor detectors, whereas, due to the perfect rectification possible, there is nothing better than a crystal detector for clarity.

The Interflex system is made use of in the Megadyne (*megas*, the Greek for great; *dyne* from the Greek for power) and the results

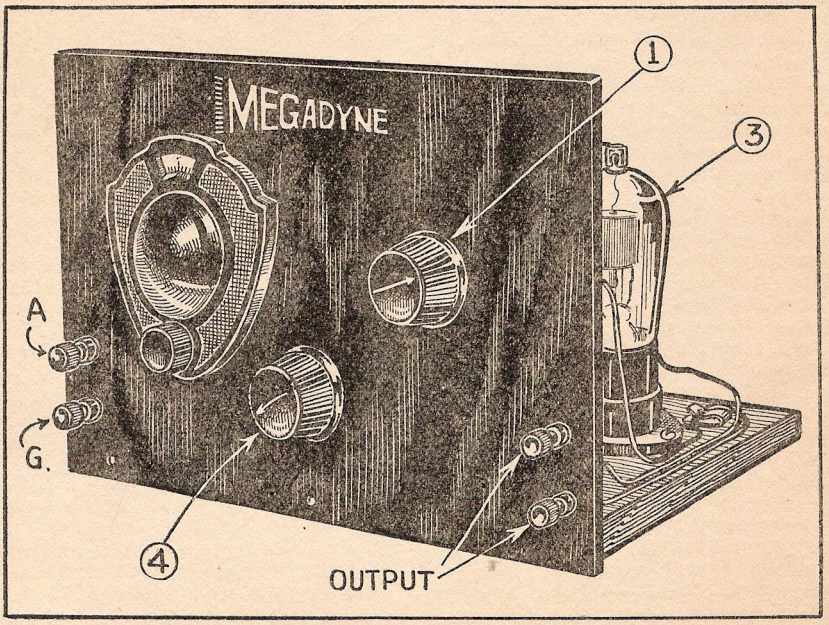


Fig. A.—Front View of 1-Tube "Megadyne."

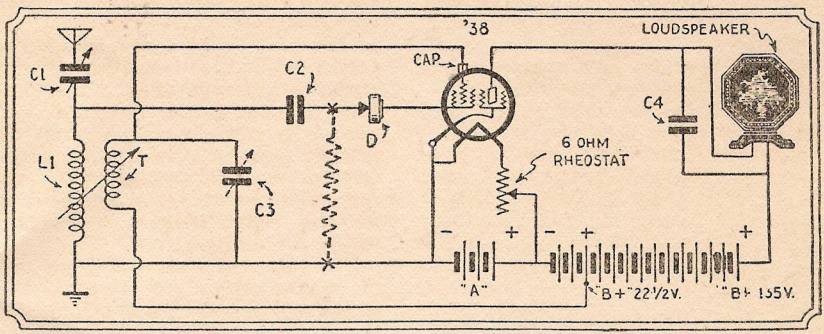


Fig. 2.—Schematic Diagram of the "Megadyne."

are astonishing. The final circuit of the one-tube loudspeaker set is illustrated in Fig. 2. It will be seen immediately that an entirely new circuit is used and, as a matter of fact, it will be noted that the tube works "backwards." The positions of the screen-grid and the control-grid have been reversed; the writer found that in practice this combination gave far greater amplification than the straight circuit. The reason for this is probably to be found in the better utilization of the space charge.

When building the Megadyne set, be sure to follow the circuit exactly, and for best results use the parts specified. Fig. A and B clearly show the layout of the components on the panel and base board.

Referring again to the circuit, we first have condenser C1, which is used to tune the antenna. Its capacity is .0005-mf. C2 is a small molded bypass condenser. .00025-mf. It is a new addition to the *Interflex* idea, and is quite necessary in this circuit. It will be found that the circuit does not operate well without the condenser at this point. Remember that all connections between C1 and the control grid of the tube should be just as short as possible. They cannot be too short.

As to the crystal detector, in the *Interflex* circuit, I recommended the use of a Carborundum detector. It is still perhaps the best detector for this purpose, but unfortunately it is no longer manufactured. I therefore substituted a fixed crystal detector which is of the iron-type variety and which works very well in this particular circuit. I do not recommend a galena detector as it is not stable enough. Next to carborundum, iron pyrites is the best.

Note that, in this circuit, the crystal detector works best in only one direction. Try reversing its connections, and you will quickly find out which is best. It is not possible to do this on locals as the circuit will be found to work even without the crystal for strong

locals. It is only on distant stations when the necessity and superiority of the crystal detector becomes apparent. When trying to ascertain which is the best position for the crystal, tune in a DX or weak station and then find out which way it works best.

Regarding the tube, the circuit will be found to work well with such tubes as the 222, 224, 247, 232 and 238. I found, however, that the best results are obtained with a 238 tube.

Condenser C4 may be .00025-mf. to .0005-mf. The best one is ascertained by experiment. Condenser C3 is of the variable compression type, obtainable on the market, the value being from .0003-mf to .001-mf. *This condenser, while adjustable, is not used as a variable, and once adjusted remains in that position.*

As to the loudspeaker, remember, we have not any too much volume, and for that reason only a *good* magnetic loudspeaker will perform well. I have used successfully the better magnetic types which are available now, such as the RCA 103. B.B.L. balanced armature type and also Baldwin loudspeaker units, which are very low priced and which, with the addition of a good horn, perform remarkably well.

Regarding batteries, the '38 tube uses 6.3 volts; the current consumption is low, i.e., .3-ampere. You can either use a 6-volt storage battery, or otherwise five new dry cells.

"B" Voltage: I recommend the use of 135 volts, though the set will be found to work well with only 90 volts.

The novelty of operation lies in the fact that the so-called screen-grid voltage connects to the control-grid—the cap of the tube.

And here is where some caution is necessary. If you use 135 volts, take a tap of 22½ volts *figured from the negative end of the "B" battery.* This tap goes to one side of the tickler as shown.

The three circuit tuner as used in this circuit may be any good type as long as it follows specifications. The secondary, wound on a bakelite or ordinary cardboard tube 2½ inches high. The tube is wound full 1⅜ inches with No. 30 D.C.C. wire. There are 68 turns all together. The tickler measures 1½ inches in diameter and about 1¼ inches wide. It is wound with the same size and kind of wire as the secondary, and there are 32 turns all together. The three circuit tuner specified has the usual primary. In this set it is not used and no connections are made to it.

Additional Notes

CAUTION. The tap on the "B" battery should not be more than 22½ volts, counting from the — B side. Considerably louder signals may be obtained by increasing this voltage to 45½ volts, *and here is where you have to be careful.* Certain types of tubes if used with a voltage higher than 22½ will "cherry" the grid, that is—due to the extra current flowing—the grid becomes over taxed. If you find that the grid gets red hot, disconnect the excess voltage immediately and go back to 22½ volts, as other-

wise you will blow out the tube; but this does not apply to all tubes. Certain tubes as, for instance RCA, or Cunningham 338 are not affected in this manner, and they will take as high as 67½ volts on the control grid without cherrying. Therefore, always be sure to watch the grid and see that it is not overloaded. I may add that I have not found any tubes that give better results (louder signals) when a voltage higher than 45 is used on the control grid.

Condenser C3 is important because it adds to the volume of the

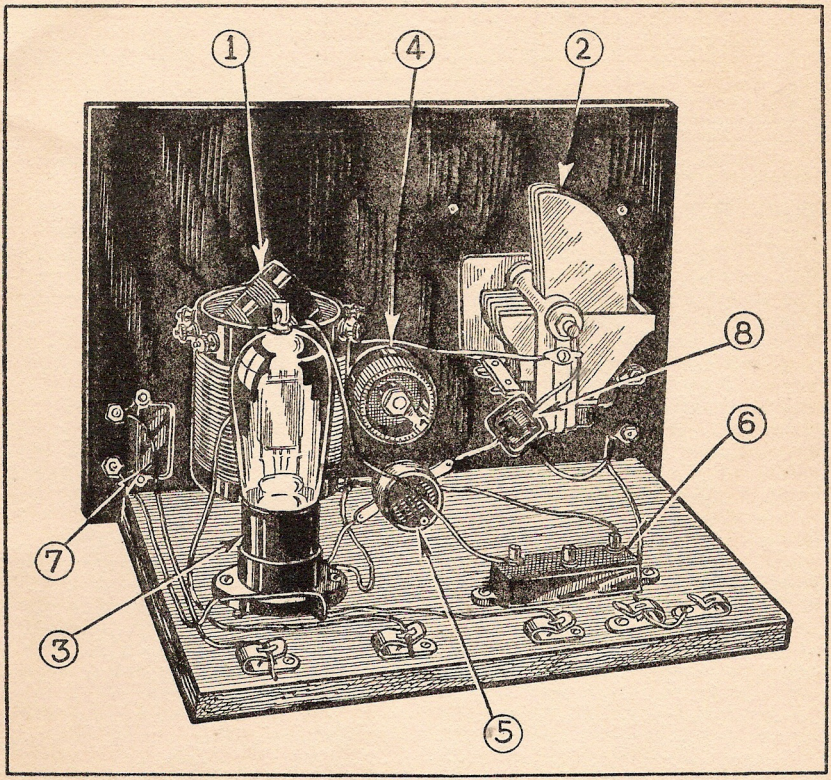
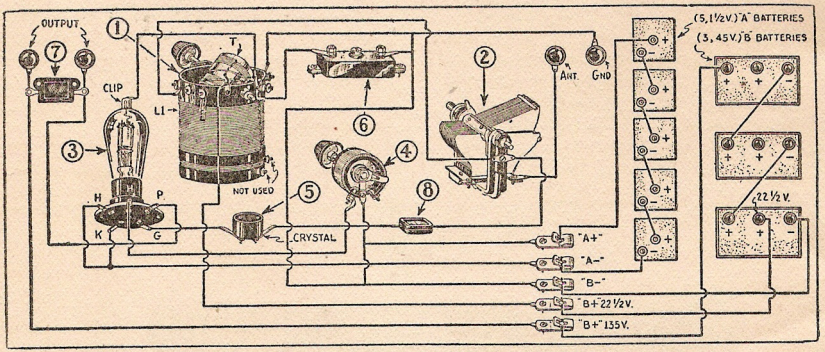


Fig. B.—Rear View Showing Placement of Parts.



Complete Pictorial Layout and Electrical Connections for the "Megadyne." Designating numbers correspond with those on Fig. B.

signal. It is critical and should be adjusted to the lower waveband (higher frequencies). Select a station between 200 and 250 meters. The signal should not be too loud. Then with a screwdriver, which should be insulated, begin *slowly* to adjust the adjustable condenser. You will find that adjusting this condenser also affects the tuning somewhat. It will, therefore, also be necessary to adjust the tuning condenser C1 slightly until you reach a point in your adjustment of C3 where the signal comes in loudest. Some tubes have a tendency to "motorboat"—a sort of clucking, puttering noise is heard in the loud speaker: condenser C3 corrects this condition to a great extent. When the best adjustment has been found for the lower waveband, leave the condenser and do not touch it thereafter. Do not use too much regeneration because you will then get distortion although the signal will be louder. Best results will be obtained when the set oscillates slightly, or just below the oscillating (whistling) point.

If, in rare instances, you find you cannot get the set to oscillate, try increasing the capacity of condenser C4. A larger condenser here sometimes helps. If the set still refuses to oscillate, it will then be necessary to use a higher voltage on the control grid. Try 45 volts with a series resistance so as to keep the grid from getting red.

Sometimes reversing the polarity of the tube heater or tickler leads helps.

If the set tends to "choke up," indicating that the signal grid is "blocking" it may be necessary to shunt 25 to 7 megohm gridleak across the signal grid (screen-grid of the tube) and cathode. This is indicated on the schematic diagram at the points marked "X." It might be well to use a variable gridleak.

Outside of this, the set will probably not be found to be tricky.

Of course, the set may also be used with headphones substituted