

RADIO

VACUUM TUBE WHEN USED AS AMPLIFIER

It Will Function Thus for Either Radio Frequency or Audio Frequency.

Starting today we shall give a detailed description of the vacuum tube when used as an amplifier. This series, as in the past, is continuous and if clipped out and saved will be convenient for reference.

When the three-electrode vacuum tube was used as a detector, the circuits associated with it were such that where a symmetrical alternating difference was applied to the grid, a symmetrical change in plate current resulted. That is to say, the vacuum tube acted as a rectifier. In addition to rectifying, the tube also amplified. The variation in plate current was "K," where "K" is the amplification constant of the tube, times what it would have been in a two-electrode tube, for the same potential impressed on the grid.

By properly adjusting the electrical constants of the circuits associated with a three-electrode tube, symmetrical

straight-line, then CD will equal BE, or so long as the working range falls within straight line portion of the characteristic curve, symmetrical changes in grid potential will cause symmetrical changes in plate current. From this it can be seen that if the working point "A" be selected near the bend of the characteristic curve, symmetrical changes in grid potential will not cause symmetrical changes in plate current. Since the plate current variation in such case would bear only slight relation to the grid variation in potential, the output of the tube would be distorted.

In applying amplifiers to receiving sets used to pick up radio stations, distortion is one of the greatest difficulties to overcome. Too strong signals will result in decreased amplification. In Figure 22 if the applied variation in grid potential were 10 times that shown in the example, the plate current would not change 10 times as much, because of the bends in the curve, due to saturation. Finally, a condition can be reached where the use of an amplifier tube will decrease the signal strength because of the saturation of the tube.

The rectified incoming signals would be louder without the use of the amplifier tube, because of the inability of the plate current of the tube caused by saturation to increase in proportion to the signal strength.

There are, in general, two factors that can be taken from the characteristic curve and the second is the length of the straight portion of the curve. The slope of the straight por-

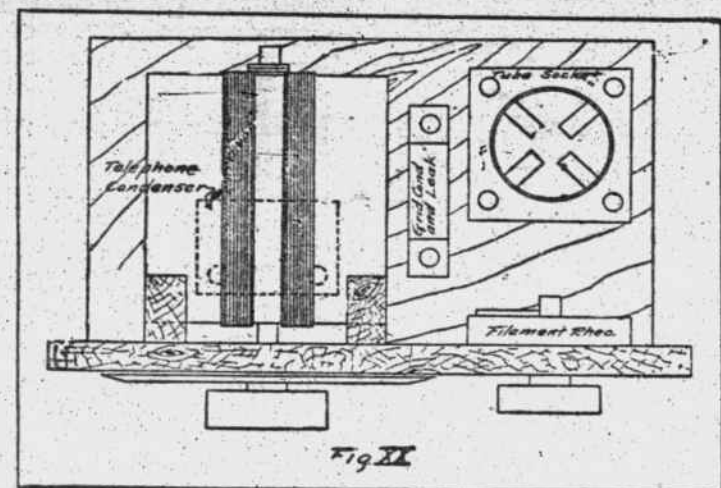


Fig. XX

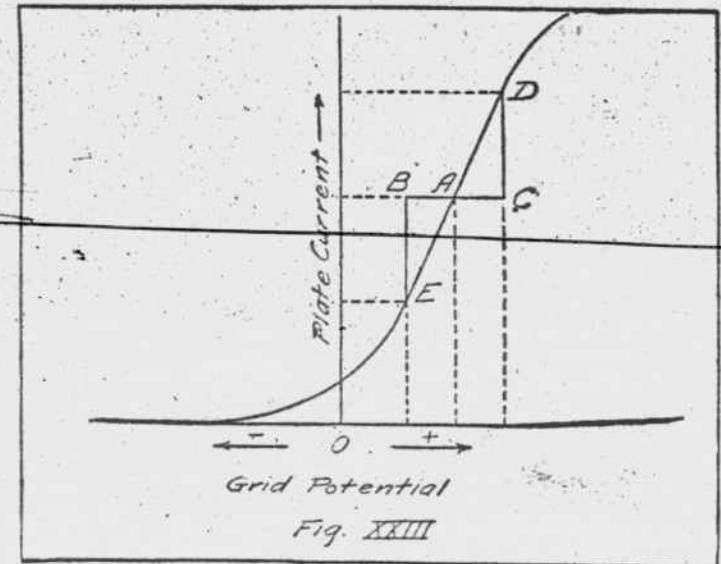


Fig. XXIII

cal variations of grid potential can be made to produce symmetrical variation in plate current, which are "K" times the amplitude of the plate circuit variations of a similar two-electrode value with the same applied grid potential. This means that if a three-electrode tube is used in the proper circuits in a radio receiver, the signals can be made to appear as though the received signal is "K" times as strong as it actually is. If two tubes are used with their proper circuits in conjunction with a radio receiver the received signals will appear to be "K" times as strong as they actually are and so the apparent strength of the incoming signal is multiplied by "K" for each additional tube added to the receiver circuit.

A vacuum tube used in conjunction with a circuit that will cause the plate current to vary in exact proportion to the applied grid voltage, but apparently controlled by "K" times the actual grid voltage variation, is called an amplifier. If the tube functioning as an amplifier is used to amplify the incoming signal at radio frequency, before it is rectified by the detector, it is termed a radio frequency amplifier. If the tube functioning as an amplifier is used after the incoming radio frequency has been rectified by the detector, it is termed an audio frequency amplifier.

Returning again to the characteristic curve of the three-electrode vacuum tube, shown in Figure 23, notice its shape. Suppose that a positive potential was applied to the grid by means of a "C" battery so that the tube would function at a point represented by "A" on the characteristic curve. If now the applied grid potential from the "C" battery be reduced by an amount represented by A-B in Figure 23 the corresponding reduction in plate current will be represented by B-E. On the other hand if the grid potential be increased by an amount represented by A-C, where A-C equals B-E, the corresponding increase in plate current is C-D.

If the portion of the characteristic curve in the region of A-B is a

tion of the curve determines the amplification of the tube. The more nearly vertical the straight portion of the curve is, the greater will be the change in plate current for a given change in grid potential, or in other words, the louder will be the response in the telephone receivers corresponding to a given received signal. The length of the straight portion of the curve determines the maximum variation in grid potential that will cause the tube to function properly without distortion.

TIPS TO RADIOISTS

At Muncie, Ind., bacon was fried by means of a radio current. At last an explanation for that "frying" noise.

Gifford Pinchot, nominated for governor of Pennsylvania by the vote of the people, acknowledges his great indebtedness to the radio. A primary coil no doubt played an important part.

An inventor of Chicago claims to have invented radio apparatus that permits of successful communication with the spirits. We hope that the anti-prohibitionists will not misinterpret this claim.

The police department of Portland, Ore., has asked for an appropriation for radio receiving and broadcasting stations and to equip the police automobiles with radio apparatus. Copper wire, it is needless to say, will be used.

Lord Northcliffe, famous English editor, in speaking of the future of journalism, recently predicted that radio would have an effect upon the publication of newspapers that will equal the invention of the linotype and high-speed press. He said that radio would undoubtedly come into general use of newspapers and news-gathering agencies.

Daddy's Evening Fairy Tale

by MARY GRAHAM BONNER

LEADER SHEEP

"These are the ways of Sheep," said Leader Sheep.

All the Sheep listened to Leader Sheep.

"It is true," he said, "that Sheep are timid. They are somewhat like the members of the Deer family in that way."

"They are of a very much afraid of a dog. A sheep has been known to die from having been frightened by a dog."

"But that does not happen often, and he as brave as possible, Sheep!"

"Eaa, baa, baa," bleated the Sheep.

"We will be as brave as possible, baa, baa."

"Good," said Leader Sheep. "That is what I want to hear. Baa, baa, baa, that is what I want to hear."

"And you heard it, didn't you?" the Sheep said. "Baa, baa, baa, you heard it."

"Yes," said Leader Sheep, "I did, and it made me happy."

"Baa, baa, baa," the Sheep bleated. "He heard it, and it made him happy."

"All Sheep must be good to their little ones just as they have always been. The Daddy Sheep and Mother Sheep have always been kind and sweet and loving to the darling little lambs and so they must always be."

"They will always be loving to the darling lambs," said the Sheep. "Baa, baa, baa. A Daddy Sheep or a Mother Sheep cannot help but be good to the young."

"That is right," said Leader Sheep. "That is the way it has always been."

"And that is the way it should always be."

"And it is the way it will always be, baa, baa," bleated the rest of the Sheep.

"That rejoices my heart," said Leader Sheep. "Ah yes, that rejoices my heart."

"Baa, baa, baa," said the other Sheep. "It rejoices his heart."

"There is always only one leader among a flock of Sheep," said Leader Sheep, "and as you have chosen me to be your leader, or have consented to let me be your leader, I hope you will always follow me."

"We will always follow you, Leader Sheep," they said. "Baa, baa, baa, we will always follow you."

"That, too, rejoices my heart," said Leader Sheep.

"Baa, baa, baa," said the other Sheep. "Leader Sheep is having a good time, for his heart is being rejoiced every few moments."

"That is true," said Leader Sheep. "That most certainly is true."

"And now, Sheep, I wish to tell you that if I go through a fence you must all go through the fence too. I do not mean of course that you are to go through the wood part, or wire part of a fence."

"But if I go through the hole of a fence you must go through the hole of a fence too, following me."

"Baa, baa, baa," bleated the Sheep. "We will follow you, Leader Sheep."

"That rejoices my heart," said Leader Sheep.

"Baa, baa, baa," said the other Sheep. "Once more his heart is rejoicing."

"True, true," said Leader Sheep, "once more is my heart rejoicing."

"If we see a stone being thrown we will keep away from that part of the countryside. Oh yes, we will be careful."

"I will lead you to the top of a high hill and there we can see about us."

"We will follow you, Leader Sheep. We will follow you, baa, baa, baa."

So the Sheep all followed Leader Sheep. And wherever he went, they went too.

The little lambs played and had a very good time, jumping up and down and copying each other. Why one would do the rest would do, showing that even though they were young they too would follow a leader.

And Leader Sheep led the others safely and well.

RIDDLES

What is it that has three feet, but no legs?
A yard measure.

What kin is that child to its own father, who is not its own father's son?
His daughter.

What wind does a hungry sailor like?
One that blows foul (fool) and chops about.



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