



Construction of a Two-Stage Audio Frequency Amplifier

(Part One)

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The vacuum tube, although first, and perhaps best known to radio listeners as a detector of radio signals, has a large field of use as an amplifier. The development of its use as an amplifier however, was done in connection with ordinary telephony rather than with radio. Thus the problem is to handle voice and musical sounds in the form of electrical currents; to amplify these electrical currents and in the end to use them to produce the original sounds with an increased volume.

The amplification is accomplished with a combination of amplifying transformers and vacuum tubes. The vacuum tubes do all of the real amplifying however. The so-called amplifying transformer does not increase the power but transfers it to the next amplifying circuit, changing at the same time the ratio of the current and voltage to values which are better for operating the

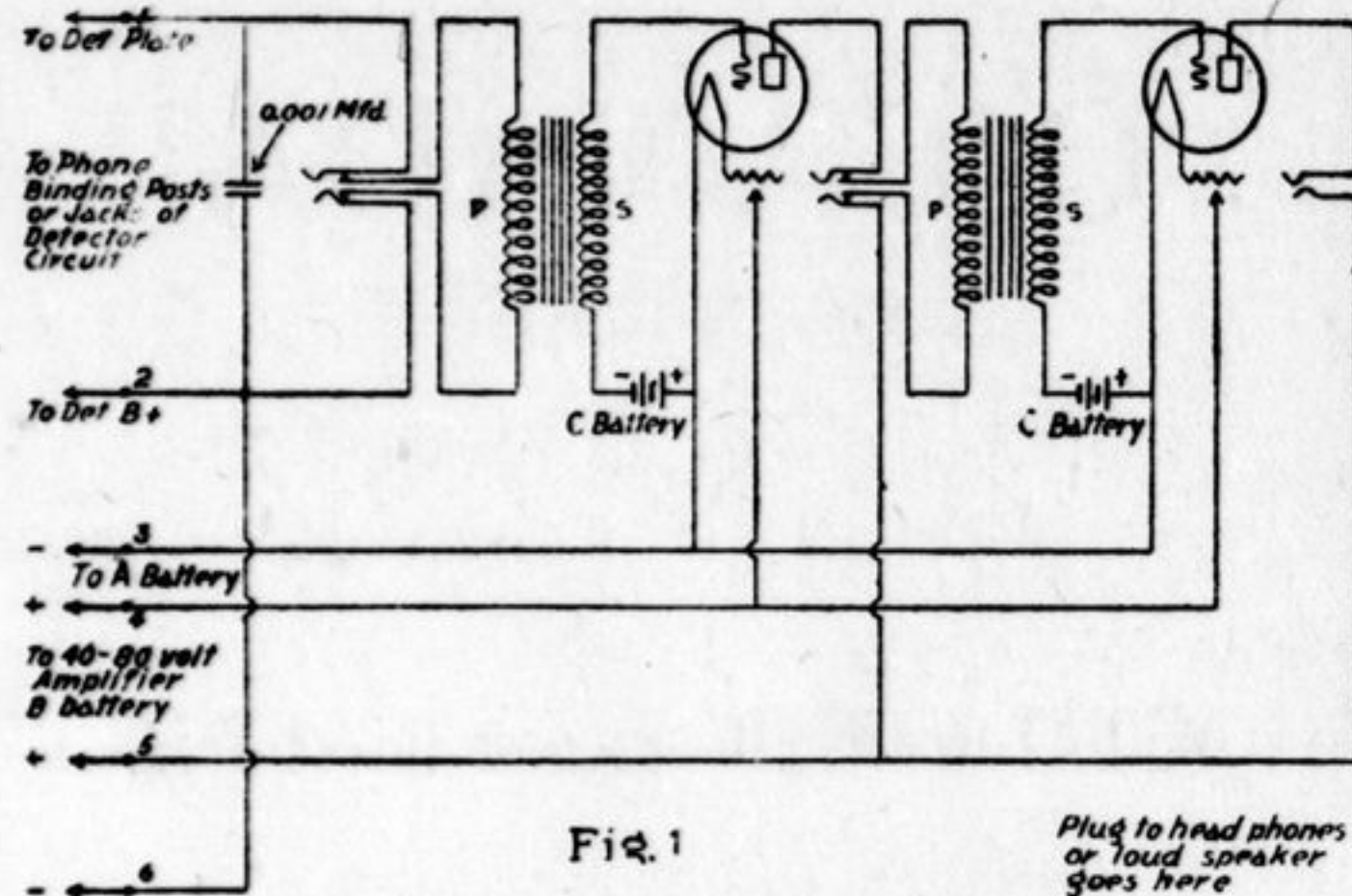


Fig. 1 Two Stage Amplifier

following amplifier tube. The vacuum tube controlled by the secondary voltage of the preceding amplifying transformer releases the increased amount of power from the B batteries.

The most difficult problem, in building an audio frequency amplifier is to make the quality of the reproduced signal approach that of the original. The more a signal is amplified the harder this is to do, and as the best of the electrical apparatus is far from perfect, more or less distortion is always present. Great care is necessary in the choice of apparatus and its assembling, to keep distortion below the point where it makes amplification objectionable.

Selection of Parts

The points where distortion usually occurs are indicated in Figure 1 for reference.

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RADIO QUESTIONS AND ANSWERS

Mr. Sherrill will be glad to help you solve your radio problems. Write him, care of The Durham Chronicle.

W. L. C. asks: "What is meant by an aperiodic primary?"

Ans.—In some receivers the primary consists of a half dozen turns of wire closely wound over the secondary. Because of the close coupling to the secondary the condenser which tunes the secondary tunes the primary also.

D. D. says: "When receiving local stations on my Ultra-Audion set the louder notes of a singer or of a musical selection seem sort of flat and chopped off. One stage of A. F. amplification is used with this receiver. What can I do to remove this distortion?"

Ans.—Your description of the

GOLF AND DOCTORS

Metropolitan newspapers report that about every third man seen on the golf links these days is a doctor, and the popularity of the game with the physicians is revolutionizing Disease.

You may have noticed that there are not nearly so many operations for appendicitis as there were eight or ten years ago. It used to be the fashion to amputate an appendix first and then find out what its crime was afterward. But now in the large majority of cases the vermiform appendix gets sentenced to life imprisonment instead of capital punishment.

The reason for this is not that the doctors know any more about the appendix than they used to. The reason is simply that it takes time

ally takes place are, in the order of their importance: the amplifying transformers, the vacuum tubes, and the headphones or loud-speaker. In the cases of the amplifying transformers and the headphones and loud-speakers, the results are dependent more on the design and care in manufacture than on the operation. The only control that the radio experimenter can have over the quality of such apparatus in his set is by choosing standard products of reliable radio concerns. In selecting transformers, it should be remembered that although a high ratio between the primary and the secondary will give louder signals, a lower ratio will give less distortion. For radiophone reception, a ratio of three to one, or at most four to one should be used.

The distortion occurring in the amplifier tube is due principally to an improper grid voltage. This fault

is easily corrected by inserting C batteries as shown in the diagram. The values of C battery voltage necessary to correct the distortion in the tube depend chiefly upon the filament temperature and the plate voltage. As the UV 201A and the UV 199 tubes are probably the most used, the values of C battery voltage for different plate voltages are given below:

Plate Voltage	C Battery Voltage
40	0.5 to 1.0
60	1.0 to 3.0
80	3.0 to 4.5
100	4.5 to 6.0

NOTE: Part 2, to be published (next week), gives the layout for the panel and general construction dimensions. Save the diagram in Figure 1 for reference.

trouble indicates the need of a C battery for the amplifier. Connect a flashlight battery in the grid lead of the amplifier tube.

A. M. S. complains as follows: "I have just finished building a single tube reflex set and am having considerable trouble with howling. What can I do to get rid of this noise?"

Ans.—It is sometimes difficult to get rid of all of the howling in a reflex set. First be sure that you have a good contact on the crystal detector. Try using different sized by-pass condensers, reversing the transformer leads, etc. Finally try replacing the A. F. transformer with a different one.

to operate for appendicitis, and the physicians and surgeons prefer to give the time to golf. You can play nine holes in the time it takes to open a man with prayer and close him with apology.—Sudbury Star.

MORE PULPIT STORIES

An old Negro preacher was introducing a white preacher. The white preacher had offered to preach a sermon for the colored brother, and, in introducing the white preacher, the old Negro could not find enough adjectives with which to praise the visitor. "Dis noted preacher," said the old Negro to his flock, "is one of de greatest preachers of de age. He knows de unknowable, he kin do de undoable, and he can onscrow de onscrowtable!"

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FRANK BOHN AMAZED THAT CANADA REMAINS WITH BRITAIN

Journalist Who L lectured in Owen Sound a Few Years Ago Expresses His Views.

Mr. Frank Bohn, a well-known New York journalist and lecturer, who visited Owen Sound a couple of years ago as a lecturer on the Chautauqua tour, has written a long article for the New York Times about Canada, which appears under the heading: "Canada Gropes For Destiny As a Nation." The caption is probably based on Mr. Bohn's statement that we are "at the crossroads," and much more of that nature. He assures his American readers that geography is against us, or, rather, that every geographical consideration makes us a natural and logical part of the United States. This is how he wrote it out:—

"From the islands of the eastern coast of Nova Scotia to the islands on the far Pacific side—everywhere the geographical factor is arrayed against the independent life of the Canadian nation. For the Canadian land is not in the slightest degree an entity. Her southern and settled areas from a narrow band strung along the American frontier for nearly four thousand miles. These areas are naturally divided into four sections. The three Maritime Provinces and Southern Quebec are a continuation of the New England coastal region. And the people of the three eastern most provinces are one in every way with those of Massachusetts and Maine. Ontario is an integral part, geographically and socially, of Middle Western America. Again and again has the writer, in taking a train at New York city to lecture in some town of Southern Ontario, had a feeling of going home to his own people in the Middle West. The schools, the churches, the farmers' organizations, the Rotary Clubs of Ontario are all a perfect replica of those in Western New York, Ohio and Michigan. There is a different flag waving from the public buildings—that is all."

Mr. Bohn is driven later on, in a moment of frankness, to admit that we in Canada are doing very well, notwithstanding our geographical handicap. The odd thing about his deductions is that practically everything he has said about Canada fits as well to the United States; so that the inducement to political union is as strong one way as the other. He also confesses that Canadians are uninterested in talk about annexation. Yet he cannot conceal his surprise at their contentment. He is particularly amazed that they should prefer to remain a unit of the British Empire rather than yield to the loadstone of affinity and throw in their lot with the United States. So he goes on to say:

"We have shown that Canada is not a geographical entity, and never can be; that the Canadians are not a separate people either politically or culturally, and never can be. Canada has indeed a choice to make. But that choice is of a different nature than she yet realizes. "It is the pull of the outer forces that results in this inner conflict. Being economically American, politically British and culturally nine parts of one to one of the other, the position of Canada is, no doubt, difficult and perplexing. When the Canadian goes to the theatre he sees, usually an American play. When he goes to the movies he sees reels of American make. A few Canadians who were born and educated in Britain read British papers and magazines. The native-born favor those of the United States. The very fact of proximity seems to be the dominating force."

Commenting on Mr. Bohn's Article a recent issue of the Ottawa Journal says:—"All this is amusing enough, though no doubt deceives some of the American people. We are only 'at the crossroads' in the imagination of Mr. Bohn. No people in the world are better satisfied with their heritage than are we Canadians; and no people are less likely to encourage a thought of new political alliances. Thirty-five and forty years ago the late Erastus Wiman wrote and talked more logically and convincingly than does Mr. Bohn now; and yet he was absolutely wrong. Even his policy of commercial union, and later of unrestricted reciprocity, had been the single effect of weakening the support of the Liberal party—which had taken it up—throughout the country. And it was weak enough, heaven knows, when it exposed the Wiman fad. And one remembers Goldwin Smith's preachments of the manifest destiny of Canada in "the continent to which we belong." Sensible Americans, who know anything at all about Canada, and the sentiment of the Canadian people, can hardly be misled by the nonsense of the arguments which Mr. Bohn has used in this discussion of the "unrest" he believes to be stirring in our country. The thing is not worth a categorical reply. It is sufficient to say that he is in the throes of a nightmare, and no one in Canada need be sufficiently concerned to wake him up.

It is a sign of a hard winter for a man when the hair on the squirrel is thick and when the hair on her old fur coat is getting thin.—Detroit News.

"UNTO THE THIRD AND FOURTH GENERATION"

(By Marjorie Bradford, B. Sc.)

"Sweetheart Slayer is accounted insane by medical experts,"—this headline recently appeared in an eastern Canadian paper. A rather familiar headline too, in these days when murderers almost without exception seek a mitigation of their punishment on an insanity plea. But as we read on in this gruesome tale, we discover that this young Canadian who is the murderer of his sweet heart, is suffering from mental disease and defect, which in its present development is diagnosed as dementia precox resting on an hereditary foundation, that in boyhood he had been known to a doctor as feeble and nervous and subject to night terrors; that his mother ten years ago was known to be weak mentally; that his grandmother some twenty years ago had been confined in a hospital for the insane. Thus are the sins and disabilities of the parent visited upon the children "unto the third and fourth generation." Nor does the grim procession of crime, disease and untimely death stop at the fourth generation. An hereditary taint in human stock has proven capable of infecting and corrupting whole communities, and we have some striking examples of its stupendous power in Canada to-day.

The case of the famous "Kallikak" family in New Jersey has become a classic, where in five generations a child born of a young soldier of good stock and a feeble-minded servant girl has given to society 143 feeble-minded, 36 illegitimates, 90 prostitutes, 43 grossly immoral, 24 confirmed alcoholics, 3 epileptics, 82 who died in infancy, 23 criminals and 8 keepers of disorderly houses.

Further investigations will doubtless reveal the existence of many "Kallikak" families. Our public institutions are filled with the offspring of diseased or feeble-minded parents who should never have been allowed to marry. They are providing the large part of the burden of crime, vice and misery in the world, and almost invariably must finally be maintained at the public expense in our prisons, asylums and hospitals. Humanity demands that these poor unfortunates be given the kindest treatment that modern science and knowledge has made possible. Any other would be incompatible with the principles upon which our civilization is based. But surely humanity demands more emphatically still that they be not allowed to bring more of their kind

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