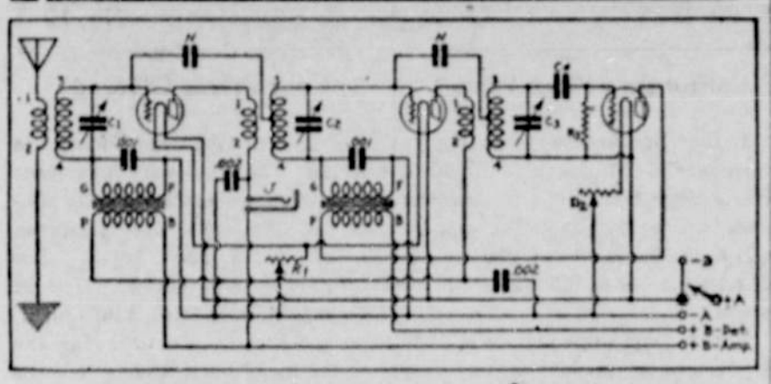
# RADIO



Wiring Diagram of a Three-Tube Neutralized Radio Receiver That Employs Reflex, for Which Strength, Tone, Minimum Distortion Are Claimed.

By SIDNEY E. FINKELSTEIN,
In New York Herald-Tribune.

The neutrodyne may be successfully reflexed, even as to both stages of transformer-coupled audio amplification, so that only three tubes are needed instead of five. In practice it has been found that this maximum reflexing of the neutrodyne is best achieved by resorting to the inverse duplex system. This is designed to spread the load more evenly over the tubes. The first audio stage is reflex in the second radio-frequency stage, while the second audio stage is in the first radio step. Thus, as the first radio stage handles the lightest radio load, this same tube is called upon to amplify at audio frequencies the final output, which is by far the greater. As the same system is used in both amplifying tubes, the load is about equal in both tubes, thus minimizing distortion. Indeed, the tone quality from the receiver shown in the diagram is delightful.

The best tubes to use for this circuit are those requiring a six-volt storage battery. They serve best because of their greater ability to stand the compound amplification due to the larger elements.

The set is one that cannot be expected to give perfect results instantly. No such expectation should be cherished regarding any home-made reflex.

**Size of Panel.**

It is not a circuit for the novice to be too confident over, as some skill in the placement of parts, avoiding of stray feed-back at radio and audio frequencies is necessary. The set, however, may be well constructed on a 7 by 18-inch panel, using a baseboard about 8½ inches deep.

The set, once in good working order, will be found on a par with the standard neutrodyne where four tubes are employed. The volume is great and the selectivity sufficient to meet the needs of the day.

The audio transformers preferred for this circuit are of the type entirely inclosed in a metal housing. The variable condensers may be instruments you have around the house now, the coils being constructed so that the broadcast range will be covered. However, if it is desired that the dials tune in step, then not only should instruments of the same maximum capacity be used, but they should be condensers made by the same manufacturer. This necessity arises from the divergence of actual maximum capacity as among condensers of different manufacture. Every condenser rated at .0005 mfd. has not just that maximum actually. Sometimes the variation is as much as 20 per cent. However, the best makes of condensers are so close to their rated capacity that no regard need be paid to the difference, if the same make is used, so far as coil-winding is concerned.

**Construction of Coils.**

In constructing the coils use fiber or hard rubber tubing, 3½ inches diameter, 4 inches high, the wire being No. 24 double silk covered throughout. The coils are wound with the primary at one end, one-half inch separation being left after the primary is completed and the secondary being wound next. Tiny parallel holes are drilled in the tubing for threading the wire terminals and thus making them secure. Enough excess wire is left at the beginning and end of each winding to utilize it for actual connection inside the set, instead of using bus bar or other such connecting wire for the purpose. About six inches of excess will suffice. What is not needed may be cut off later when the connections are soldered.

The primary of the aerial R. F. transformer, extreme left, has 20 turns. The secondary, shown next to it, has 45 turns, untapped. The two other primaries consist of 15 turns each, hence these interstage coupling primaries are different from the aerial primary. Also, the secondaries are different, in that a tap is taken at the fifteenth turn. A tiny loop is made and then grasped between the thumb and index finger and twisted around twice. Then the insulation is scraped off the tap, so that a wire may be soldered from the tap to one side of the neutralizing condenser N. Thus each of these two coils is wound with primary first, then secondary, the tap point being made 15 turns from the end of the primary. There are three coils to be wound, namely, the aerial R. F. transformer and the two interstage transformers.

The variable condensers that tune the secondaries are .0005 mfd. represented in the diagram by C1, C2 and C3. Thus the set has three controls. If only two controls are desired, a .001 double condenser, where each half is .0005 mfd., may be used, the common rotor connecting to A minus and the two stators connecting respectively to the grid of the second R. F. tube (second from left), and the coil side of the grid condenser, C4, which is .00025 mfd. It will be noted that this forces an apparent negative grid return in the detector stage, since there can be but one grid return at the ends of the two secondaries. In fact, however, the grid return is slightly positive in the detector stage, due to the manner of connecting the two-megohm grid leak, R3 (grid post of detector tube socket to A minus).

If .0003b mfd. variable condensers are to be used the coils would be made as prescribed, except that the secondaries would have 57 turns of wire, instead of 45. In this case the tap would be at the twentieth turn.

The tap is made nearer what is known as the grid end.

**Proper Connection of Coils.**

The aerial R. F. T. is connected with the aerial joined to the beginning, i. e., top of the primary winding, when the form is so placed that the primary is above the secondary. The end of the primary goes to ground. Now connect the beginning of the secondary, not to the fixed plates of C1 and to grid, but to the negative A and the rotor plates of C1. Numerically, as per diagram, connect 1 to aerial, 2 to ground, 3 to minus A and 4 to grid. This is the inverse method of connection, the orthodox observance of polarities. With the rest of the R. F. wiring, however, this system is not followed. The first interstage coupler (neutroformer) shown to the right of the first tube, is connected with the primary beginning (1) joined to plate, the end of the primary (2) going to B plus amplifier voltage. Here the beginning of the secondary (3), which adjoins the end of the primary, connects the grid (instead of, as in the previous case, to low potential), and the end of the secondary to negative A. Thus the top, which is 15 turns from the beginning of the secondary, is nearer the terminal thereof (3) which connects to grid. The method just described is one wherein the primary connections are reversed, that is, the polarities oppose at the adjoining points (2 and 3). In neutrodyne construction this is correct.

The second interstage coupler is connected in the same manner as the preceding one (that is, unlike the aerial coupler), except that (3) goes to one side of the grid condenser, instead of conductively to grid. The other side of the grid condenser is joined to the grid post of the detector tube socket.

Four by-pass condensers are used, two of .001 mfd. each, across the secondaries of the audio transformers, and two of .002 mfd. from the end (B plus amplifier lead) of the two interstage coupling primaries to negative A, to by-pass the R. F. current around the batteries.

A separate rheostat, R2, actuates the detector tube and is of 20 ohms resistance for the six-volt storage-battery-operated tubes. R1 controls the two amplifier tubes and is 15 ohms. A battery switch, S, may be used to turn the set on and off as a unit.

The coils should be mounted at a 57.3 degree angle. The neutralizing condensers should be adjusted until there is no squealing.

## Bottle Coil

A coil wound on a round bottle eliminates much high distributed capacity found in "pickle bottle" coils. The wire is wound about the bottle, on which three strips of gummed paper are laid gummed side up, as is the case in the "pickle bottle" coil.

# DAIRY

## MOST ECONOMICAL PRODUCER OF FOOD

Although the statement that the dairy cow is the most economical producer of human food of all the different classes of live stock, is a fact, it does not hold true for each individual cow. The one most important factor in profitable milk or cream production is the ability of the individual cow. It does not matter what breed you own o what family within the breed, there are always certain individuals that are more economical producers than others. According to the latest available figures, the average milk production for the dairy cows in the United States is 4,200 pounds of milk, points out J. P. LaMaster, chief of the dairy division at Clemson college.

South Carolina has just recently started developing its dairy herds, and although we have no available figures on the actual production of all the cows in the state, it is very obvious that the production is much lower than this average for the United States. This means that if we are to make dairying a profitable farming operation, we must not only get more cows, but we must especially improve the average production of all of our cows. The individual farmer can do this in three ways:

First, by keeping records on the cows he now owns, and this does not mean official records, but the actual weighing of the milk each produces at each milking. Totaling this record each month and also keeping a record on the feed each cow consumes in a month, he can in a few months tell which of his cows are the best.

The second way by which the farmer can improve the producing ability of his herd is by buying cows which have already made creditable records proving that they do have this ability to make a profit on feed consumed. This is a rather expensive way because the farmer who has made this record on the good cow wants to keep her and in order to buy her, it is necessary to pay a premium. Also, in buying cows, there are chances for loss in bringing in diseases and other troubles of which you have no knowledge when you make the purchase.

The third way is a combination of the first and the use of a bred-for-production dairy sire on the cows you now own and which are selected from your herd as being the best, judging from the records they have made.

## Feed for Calves Where Milk Is Not Available

Where milk is not available for calves, give the following: Take 50 parts finely ground corn, 15 parts linseed oil meal, 15 parts finely ground rolled oats, 10 parts dried blood flour, 10 parts skim-milk powder, one-half part salt. Stir up with warm water at the rate of one pound of the meal mixture to about six pounds of water. Increase gradually as the whole milk is decreased, until at the time the calf is 50 days old it should be getting only the gruel. At this time one and one-half to two pounds of the meal mixed with the water will constitute a day's feed. The total quantity of milk used is about 300 pounds; if less is fed the calves are likely to be unthrifty.

## Better Dairy Practices to Increase Production

By increasing the average production of his cows about one-fourth, and at the same time reducing his production costs one-seventh, Arnold Graue of Jackson county, Minnesota, has increased the profit from his cows, above cost of feed and labor, more than 70 times.

He increased the production of his herd by culling out the poorer cows of his herd and replacing them with higher-producing heifers of his own breeding. He cut down on his production costs by installing an engine to run his cream separator and by building a milk house close to the barn, thus reducing the labor of handling his milk.

## Egg Shipping Business Allied With Creamery

A good many of the co-operative creameries as well as the smaller private creameries are planning on handling the eggs of their patrons. The reason for this is the feeling that the egg-shipping business is closely allied with the creamery business.

Some of the creameries which have tried this line of work are voting to continue it during the coming year. The reason which is advanced is that it is unnecessary to set up two organizations to handle two products which are so closely related and which may be more economically handled by one organization.