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RADIO WORLD

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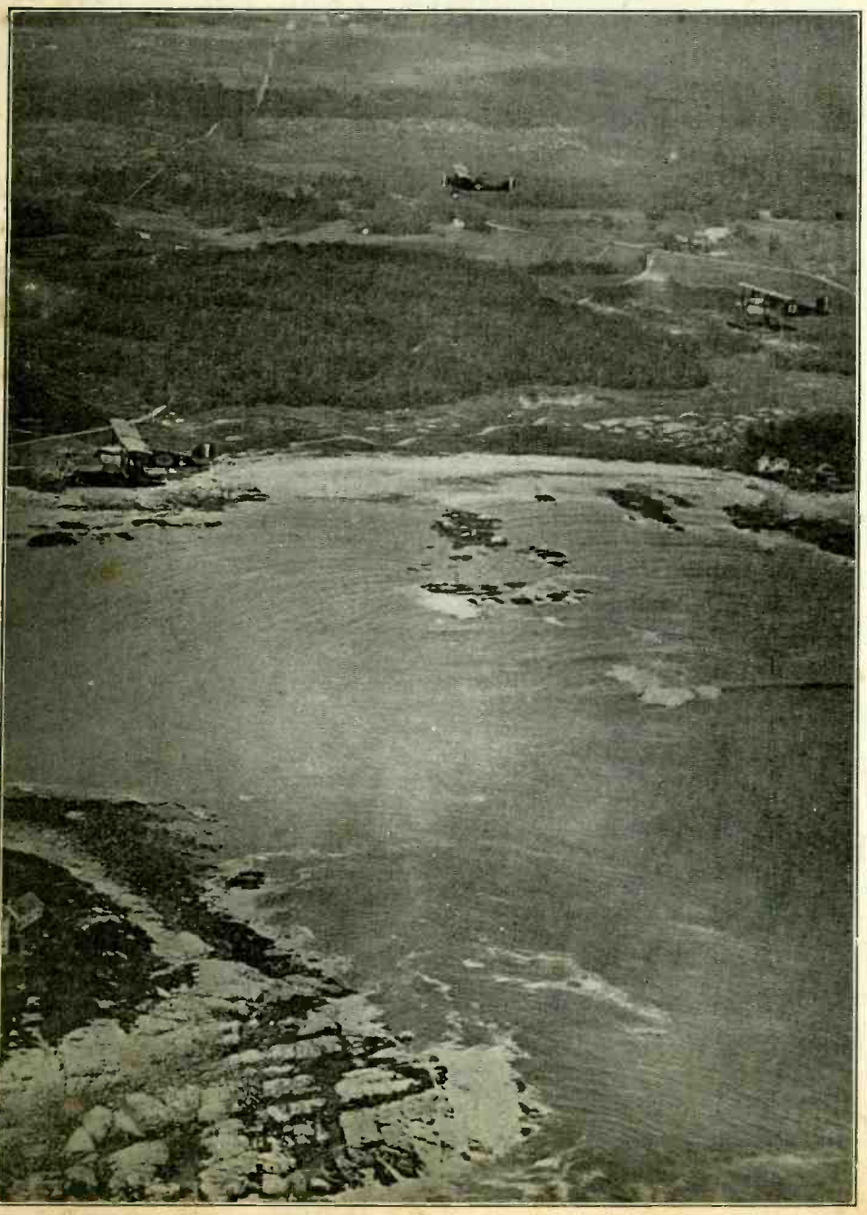
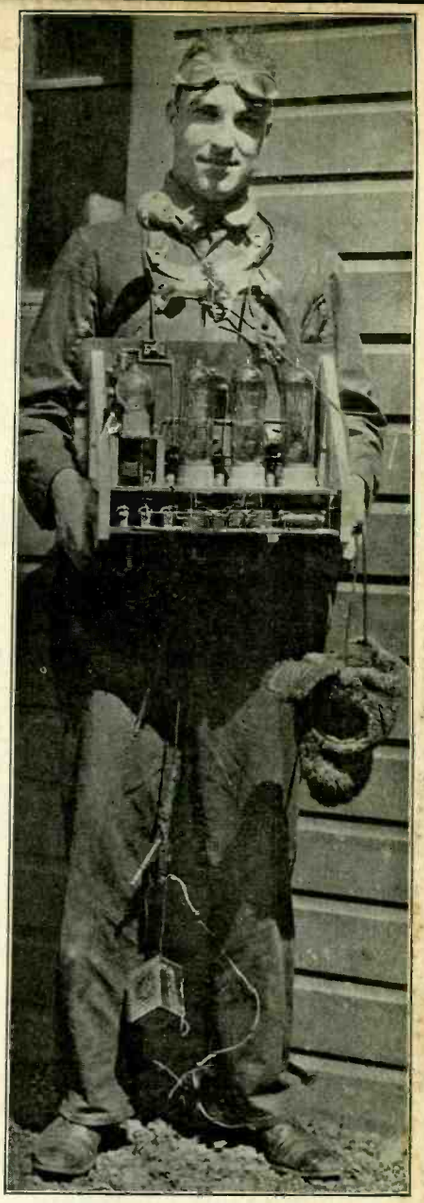
VOL. 5. NO. 26. ILLUSTRATED EVERY WEEK



(Kadel & Herbert)
HERE THEY ARE—the three planes that accomplished the historic achievement of circumnavigating the globe, the first time that was ever done by air. The three Lieutenants are guiding their planes while a radio conversation is held during the last leg of their flight.

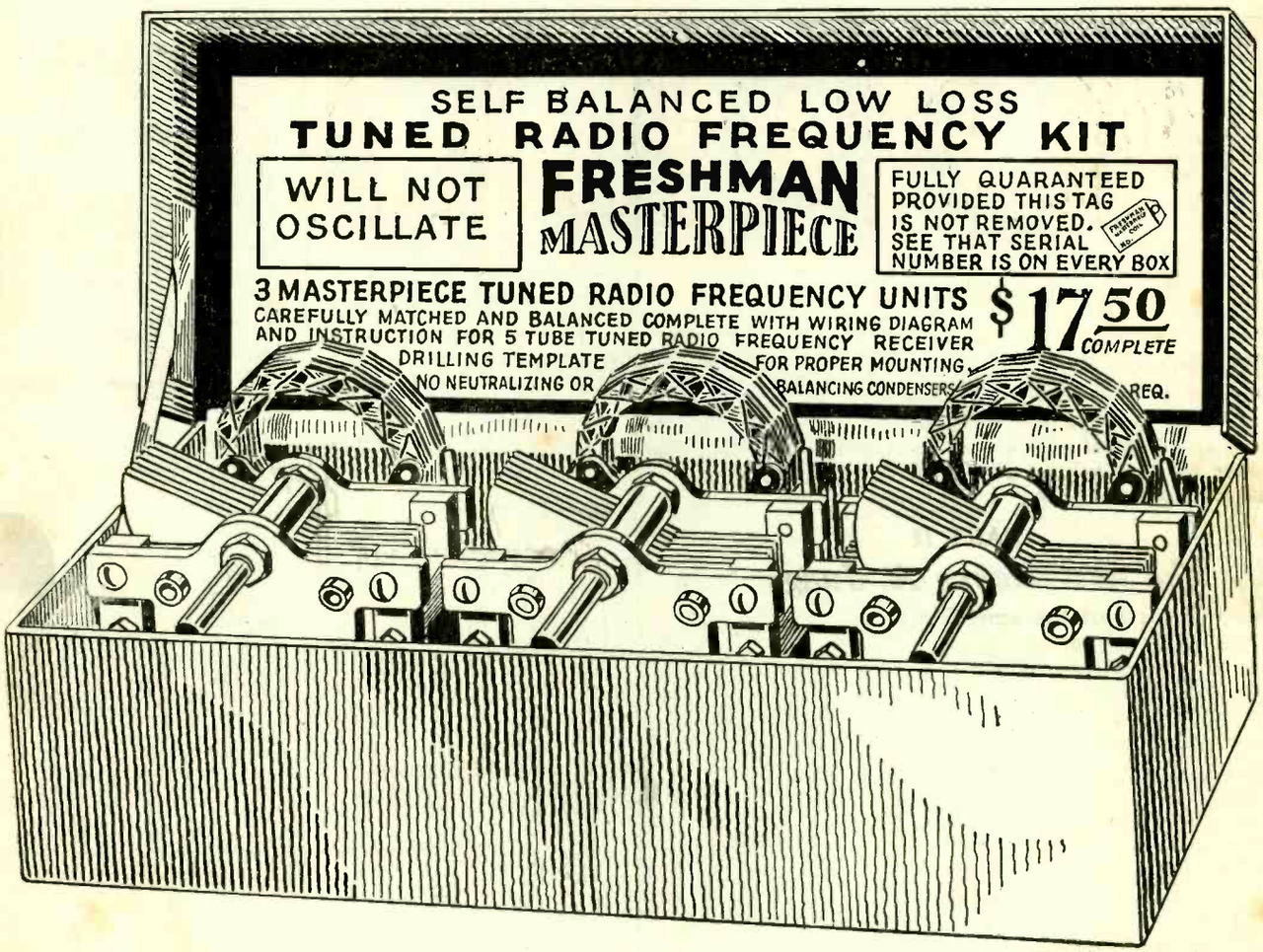
AT LEFT, the arrival of Lieuts. Lowell H. Smith, Leigh Wade and Eric Nelson, U. S. A., en route to Boston, after their round-the-world flight. Their radio-equipped planes were followed by Lieut. Franklin L. Rash, in a pursuit plane, from which he talked to them and to radio fans who thus got first-hand details. It is estimated 1,000,000 persons listened to Lieut. Rash. The whole nation responded with admiring welcome and now these intrepid aviators are enjoying the tumultuous hospitality of the West. President Coolidge lauded them.



(Kadel & Herbert)
LIEUT. FRANKLIN L. RASH, with the 50-watt transmitter he used in an Army plane to radiocast the news of the reception in Boston to the round-the-world fliers.

It's Results that Count!

When you build a 5-tube tuned radio frequency receiver you want a set that does not oscillate and does not require laboratory testing before it can be of service.



NO NEUTRALIZING OR BALANCING CONDENSERS REQUIRED

With these marvelous units you can easily build a five tube tuned Radio Frequency Receiver that will be highly selective as well as a remarkable distance getter, bringing in all stations with pleasing clarity and volume.

Kit consists of 3 Masterpiece Tuned Radio Frequency Units carefully matched and balanced. Complete with wiring diagram and instructions for building any 5-tube tuned radio frequency receiver and also drilling template for proper mounting $17.50

CHAS. FRESHMAN CO., INC., 106 Seventh Avenue, New York City

VOLUME FIVE OF

RADIO WORLD

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The Tubeless AF Amplifier

THE Telephone Relay System is used and the Amplifier may be added to any Detector outfit, even to a simple Crystal Set.

[In the September 13 issue of RADIO WORLD, *Father Judge described a selective crystal hook-up which he devised, using a Lego fixed crystal. That is the detector circuit of his novel hook-up—a receiver that works a loud speaker without tubes. The present and final instalment deals with the amplifier.]*

PART II

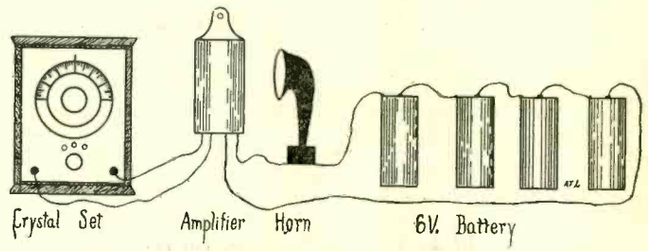
By The Rev. Henry A. Judge, S. J.

THE parts of the amplifier (Fig. 4) are contained in a black metal cylinder about the size of a pint cream bottle. Owing to the size of the permanent magnet it is quite heavy.

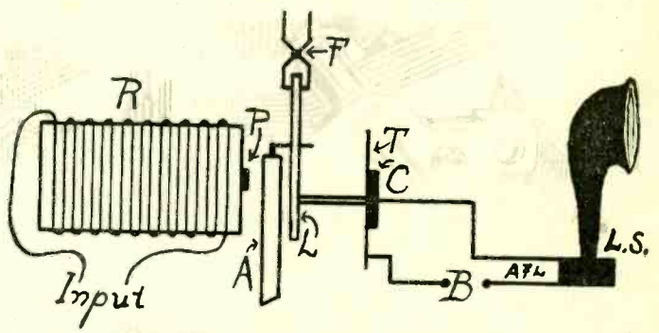
R is the receiver magnet with its wires, A is an armature, L a lever connected with the armature and also with the transmitter diaphragm (T) of the amplifier; B is a battery of 6 or 7 volts, and LS is a loud speaker. The action of the amplifier is as follows: A voice current which I call the input, which may be supplied from a telephone or any other source, enters the coils of the amplifier magnet R and magnetizes the core or pole piece (P). The latter attracts the armature A with varying strengths. Thus A vibrates, causing L to vibrate. This in turn agitates the amplifier transmitter (T) and hence varies the resistance of the carbon button (C). The flow of the battery (B) naturally varies with these variations of resistance and reproduces the pulsations in the loudspeaker. Thus the varying voice currents of the input are reproduced in an amplified form. The fulcrum of the lever L is at F and can be adjusted so that the lever arm may be made longer or shorter. This serves the purpose of increasing or decreasing the amplitude of the vibration of the lever and hence also of the diaphragm of the transmitter, according as it will be more or less effective.

This amplifier is made up in two forms, one for a current of 110 volts and the other for a current of 6 or 7 volts. The latter type was used with an Edison battery of 6 volts connected to my head-set. I connected my phone terminals of the crystal set to the amplifier and without any optimism I can say the result was splendid.

Although the writer succeeded beyond what was generally considered possible in amplifying the crystal detector input, he did not think his duty done until he tried other arrangements which might give him still



ARRANGEMENT of detector, amplifier, loud speaker and 6 or 7-volt batteries in circuit used by Father Judge.

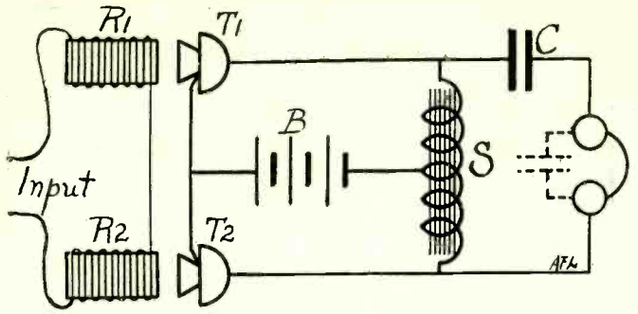


THE PARTS of the amplifier (Fig. 4). R is the receiver magnet; A, armature; L, lever; T, transmitter diaphragm; B, battery, 6 or 7 volts; LS, loud speaker; C, carbon button; F, fulcrum of lever; P, pole of the magnet, i. e., core.

better results. In this connection he would like to say that he does not consider the results obtained a maximum. He took an amplifier which was not made for light aerial currents but for heavy battery currents. He applied it without any adjustments whatever. It is more than likely that others who have much better facilities and more time at their disposal will devise more efficient instruments and thus secure better results. Furthermore, he does not believe that he has exhausted all the ways of obtaining greatest volume and greatest selectivity. I say nothing about distance because this will take care of itself, and is not to be expected loud in a crystal set. The readers will be interested in an effort to get these better results, and the description here subjoined will be for tyros a little lesson in electricity.

I took, therefore, two of the relays, or amplifiers described and joined them to a split telephone coil. The windings of the wire of the amplifier receivers are joined inversely. The battery is connected to the middle of the split coil and between the transmitters. Around the ends of the same coil the head-set is shunted through a large condenser (Fig. 5). R^1 and R^2 are the receivers of the amplifiers; T^1 and T^2 are the transmitters; B is the battery; S, the split coil; C, condenser; P, the phones. The battery is one of 6 or 7 volts; the split coil is about 3½" long, the bundle of soft iron wire being about ½" in diameter and the wire is about

Signals Amplified Mechanically



TWO RELAYS were used by Father Judge and better results obtained (Fig. 5). R1 and R2 are the receivers, i. e., the output of the crystal set and input of the amplifier; B, battery, 6 or 7 volts; S, split coil; C, 1 or 2 mfd. condenser; T1 and T2, amplifier transmitters.

No. 24, having a resistance in its whole length of about 17 ohms. The condenser is a large one, of 1 or 2 microfarads. The action of the battery current in this circuit is as follows: The current passes into the middle of the telephone coil, S, and divides up and down and penetrating the two amplifier transmitters, T^1 and T^2, and then returning to the opposite pole of the battery, B. As the coils of the receivers, R^1, R^2, are joined in opposite directions, any pulsation from the crystal detector, which supplies the input, attracts the one, say, of R^1 and releases the other diaphragm, i.e., of R^2. This closes to some extent the battery current in one transmitter, but opens it in the other. Hence the flow of the current which before was equally divided increases through one-half of the telephone coil, while it decreases through the other. The next pulsation from the crystal set will be in an opposite direction, and this time the very opposite effects will be produced in the telephone coil. Before any variations of current took place the battery current passed steadily into the split coil, magnetizing it but not passing into the phones, on account of the blocking effect of the condenser. As soon as the variations take place, the condenser is no longer an obstacle, but the current as well as the recoil of the magnetized soft iron wire pass by way of the condenser and the phones, and reproduce the sound. "Why," you will inquire, "use only two relays?" In order to get some extra power. If only one be employed, the battery is at one time, i.e., when the resistance of the transmitter is reduced, working with greater energy than at another time, when the resistance of the transmitter is increased. This is not the case when we have two relays working simultaneously as described. At the very instant that one transmitter closes the other opens, and vice versa, and thus the battery is always exerting its maximum efficiency. It is evident that the amount of battery current actuated by the input is double that of a single amplifier. It will be very interesting to know that the manufacturer with a single telephone transmitter actuates successfully fifty amplifiers and megaphones. The amount of current used in this case is 200 watts!

The only drawback to this system of reception is the rather high price of the amplifier. If some ingenious person will devise a cheap relay, radio reception will become an inexpensive matter.

[*The End*]

To Prevent Radiation, Stop Oscillation

By Brewster Lee

ARE we this season again going to listen to the radio concerts with an accompaniment of oscillation howls and squeals from the incorrectly operated regenerative sets? Let us fervently pray that such will not be the case. As in the past, every Winter season brings an enormous new legion of radio fans, most of whom enter the all-absorbing game with a 1-tube regenerative set.

It is the duty of manufacturer, jobber and retail dealer to supply radio buyers with literature telling them how to tune their sets properly so that the sets will not be made to oscillate. Every regenerative set is a potential source of interference if it is not tuned in accordance with the best radio ethics. The popular method of turning up the tube and close coupling the tickler coil or other means of obtaining regeneration, and then fishing around on the dials until the station desired is located by its whistle, is the one and only objection to that kind of a set. The regenerative circuit is one of the most sensitive known, and for that reason its use is popular. But the users of such sets should learn to tune the set by the voice and music alone, and not by the whistle. The best way to do this is to run the tube at normal brilliancy and loosen the tickler coil coupling so that there is no hiss or other internal sound present in the phones. Loose coupling means the two coils are not even nearly parallel. The grid should then be tuned to the station and regeneration increased up to the point of maximum amplification without allowing the tube to break over into oscillation with the characteristic click, hiss or howl.

If the rotor is several inches away from the stator it is often easier to control regeneration, for the sudden "plop" characteristic of sharp regeneration is avoided.

How to Make Non-Corrosive Flux

CELLULOID dissolved in acetone makes a very good binder for radio work. It should be used in place of shellac, collodion, etc. Rosin dissolved in rubbing alcohol, with a couple of drops of glycerin, makes an absolutely non-corrosive flux. A drop on a piece of wire suffices for most joints and makes a neat and noiseless job.—A. F. L.

Making a Fixed RF Transformer

By A. F. Lapierre
Consulting Engineer

THE fixed radio-frequency transformer here described was designed to cover the radiocast wave band and has its maximum voltage amplification peak at 410 meters. However, the curve shows a good amplification constant over the whole wavelength band and the transformer is remarkably efficient, due to its special construction.

The wavelength range of a radio-frequency transformer depends partly on tube capacity and on the inductance of the primary and secondary and the mutual inductance between these units of the transformers. This transformer was designed for use with the 201A or 301A type tube. One of the difficulties that had to be surmounted was the elimination of self-capacity in the windings. In this instance this was accomplished by winding several small coils and connecting them in series. Each separate coil is so small that its self-capacity is minute and as the coils are connected in series the total self-capacity is about one-fifth the capacity of one of the windings, as there are five windings to the primary and secondary respectively. By the use of an iron core the natural period of the transformer windings is broadened. Due to magnetic qualities of the core and to the wide separation between coils and between primary and secondary the design is efficient and intercoil capacity is kept practically at zero. The losses inherent to an iron core are compensated for by the elimination of capacity as well as by the use of less wire than when an air core transformer, because the iron core increases the inductance value of the windings and also eliminates the distortion sometimes present in an untuned aircore transformer.

The core is made up of silicon steel laminations .003 of an inch thick, ½" wide and 2¼" long. Sufficient laminations are necessary to make a core ½" thick. Before assembling the core dip half of the laminations in japan or some other good insulating varnish and allow to dry hard. This is important, as each piece of steel must be thoroughly insulated one from the other so that they will not short circuit. Only half of them are insulated so that the laminations may be closer together and the entire core have a lower loss. In assembly start with an insulated lamination and place on it one that has not been dipped. Alternate in this fashion until the entire core has been built up. Finish with an insulated piece. The core is then wrapped with two or three layers of heavy bond paper that has been previously dipped in insulating varnish and set aside to dry until gummy.

When the core is in this condition it is ready to wind. The primary consists of five separate sections of thirty turns each, wound with No. 36 enameled DSC wire. The secondary has the same number of sections and turns except that it is wound with No. 40 enameled DSC wire. This size wire must be used so that the impedance of the secondary matches the tube grid-to-filament impedance. The diagram shows how the winding is done in pyramid fashion, keeping the base as small as consistent. The separation between coils is about 3/32" and the separation between primary and secondary is about ¼". All windings must be in the same direction. After the coils are wound on the core the whole is dipped in molten paraffin to bind the whole and keep the coils from loosening. A small box is now constructed of light wood. Its inside dimensions are about 3" x 1" x 1" and the transformer is put into the box. The loose ends, of which there are four, are placed out of the way and the transformer covered with paraffin to keep moisture from the windings and to keep the core from striking the sides of the box. The leads are then soldered to four binding posts that are

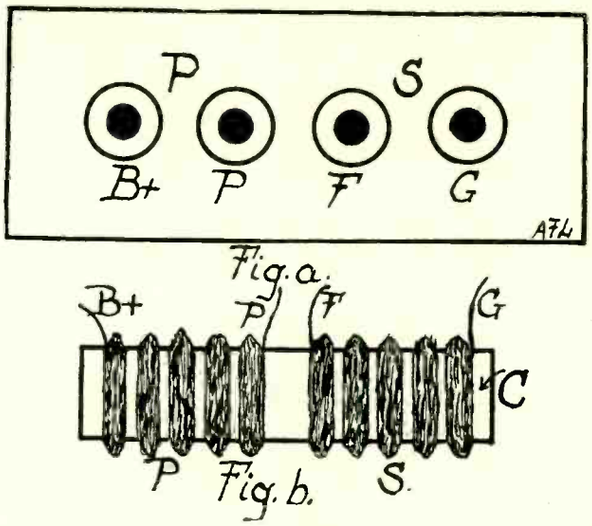


FIG. A (at top) shows the cover of the wooden transformer box. The binding posts are mounted on ⅝" centers. The top is made of bakelite ⅛" x 1¼" x 3¼". Fig. B (below) shows the coils wound on core C. The primary and secondary are made up of five sections each, separated 1/16" to 3/32", and each five are series-connected. The leads are lettered so no mistake should be made in connecting. Use nothing but rosin core solder or non-corrosive flux when soldering. The diagrams are actual size.

mounted on a strip of ⅛" bakelite which should be large enough to cover the top of the box. The binding posts are marked as shown in the diagram.

The transformer is then ready to mount in any standard radio-frequency circuit and should give excellent results.

[*Those who construct this unit are requested to write to Results Editor, Radio World,* 1493 *Broadway, New York City, and state how they fared. When possible give the trade names of the parts you use, or the manufacturers' names. Results letters will be published, including trouble-shooting letters. Readers may include questions in the same letter. The questions will be answered in the Radio University Department.*]

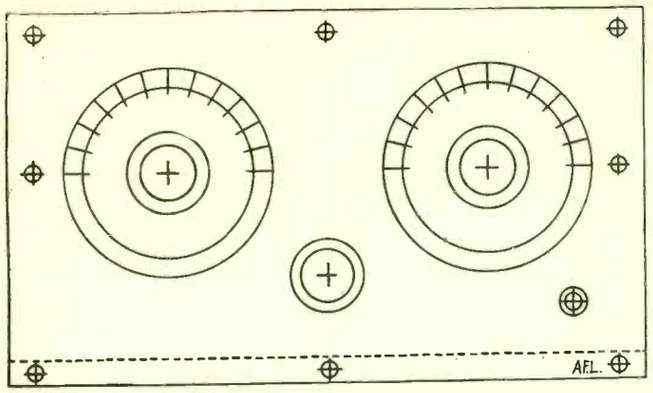
Why Transformer Ratios Are Vital

WHEN it is said that a transformer ratio is 9 to 1 the meaning is that the number of turns of wire on the secondary is nine times as great as the number of turns on the primary. Some manufacturers recommend a high ratio transformer on the first stage and a low ratio on the second stage because they feel that the voltage on the first stage is low enough to warrant the use of a high ratio transformer without distortion. A high ratio transformer on the second stage increases the voltage to such an extent that distortion may occur. Minimum distortion is obtained with low ratio transformers such as 5 or 3½ to 1 ratio on both stages. If distortion results from the use of a high ratio transformer on the first stage it is very likely that the distortion will be intensified as well as the signal by the second amplifier.

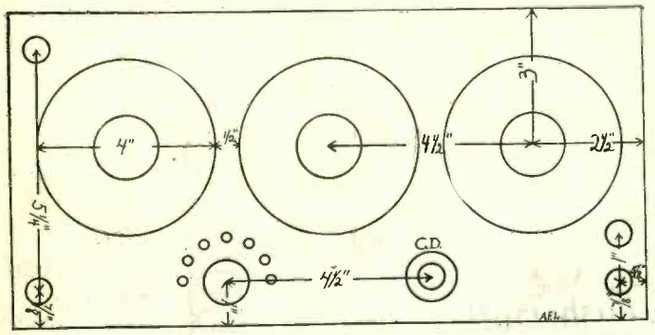
Changing Wavelength

A CONDENSER in series with the antenna or ground reduces the wavelength. The smaller the capacity of such a condenser the greater will be the reduction in wave length. A loading coil is used to reach higher wavelengths than the set can otherwise reach in connection with a particular antenna. It produces the same results as lengthening the antenna or placing a fixed condenser in parallel with aerial and ground.

How Many Controls Are Best?



IF THE CONTROLS are to be kept down to two in a regenerative set, an aperiodic primary must be used for best results. Two controls will suffice for a reflex, if it consists either of crystal detector and a tuned RF stage or if a tube is used for detection. The Super-Heterodyne has only two controls.



THREE CONTROLS are used more often than two in the better kind of sets, for even the regenerator is improved by the use of a tuned primary. Suppose you want to add RF to a 3-control regenerator? Shall you use four controls? In a straight crystal set three controls and a tap switch are advisable for greatest selectivity if a variocoupler is used.

By Wainwright Astor

THE experimenter is constantly confronted with the problem of determining how many controls for the set he is to build. Though one control is the least he can have there is no maximum.

In a 1-dial set, if it is of the regenerative sort, there are really two controls always. Whenever there is regeneration there must be a separate control so the amount of regeneration may be varied. Sometimes the variation is very slight over a fairly wide band, even over so much as a 200-meter range. By fairly loose coupling, that is, having the rotor a few inches from the stator of the coupler, the entire radiocast band may be covered with only a variation of five or six degrees on the regeneration dial. This, however, is never true of a 1-dial set, because with that outfit a rheostat is always the regeneration control. Unless one is fascinated with the idea of having only one dial on a regenerative set he would fare better by taking the rheostat out of the critical class and using a coupler rotor or tuned tertiary for regeneration control.

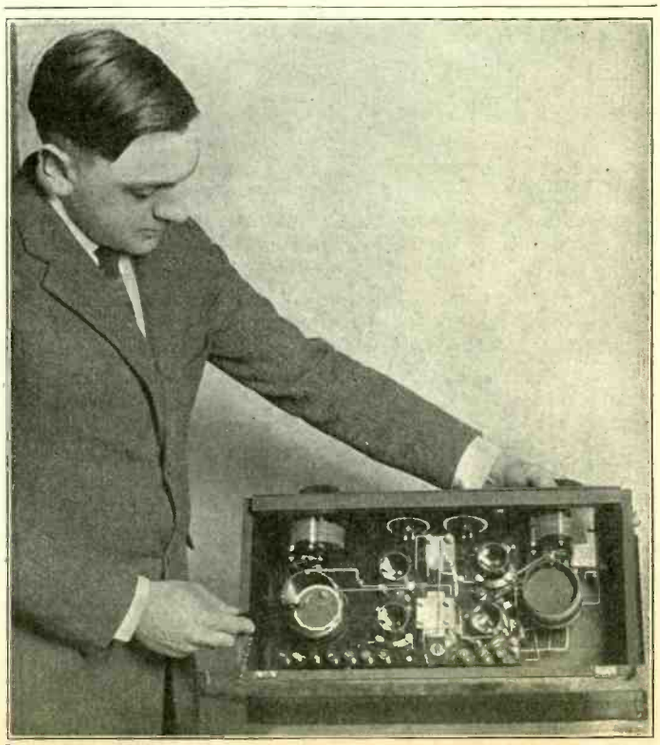
Therefore in a regenerative set you have two controls, at least, and the question arises whether it is preferable to have three.

Some persons argue that as man has only two hands, a set should not have any more than two controls. They might as well say that as a man has only two hands he should not have more than two pockets. So long as the controls are not critical three are not too many. In fact the highest efficiency from a regenerative set is obtained only by the use of three controls. To keep the controls down to two in the regenerative class the practice has become popular of using an aperiodic primary. This consists of several turns of wire, usually from ten to fifteen. Even the aperiodic primary is tuned because the secondary is coupled with it and there naturally results a forced tuning, that is, the wavelength to which the secondary is responding by virtue to the setting of the variable condenser becomes to an extent the wavelength to which the primary responds best.

This, however, is not the most accurate way of tuning the primary because the primary's response to the wavelength of the tuned secondary is only approximate. The aperiodic primary has a natural period or wavelength, which is the result of the antenna capacity and the primary inductance. Therefore, when the wavelength to which the secondary is tuned is so low that it is very near the natural period of the inductance and capacity in the primary, the control in the regeneration becomes difficult, the tuning critical and losses are sustained by virtue of the escape of high-frequency currents through the antenna circuit, a sort of reversed feeding not at all like in the Superdyne! A corollary of the phenomena is familiar to all fans who have experimented with radio-frequency amplification. The RF transformer gets into difficulties with low waves unless the set is neutralized, as in the Neutrodyne.

Some loss in volume is sustained when an aperiodic primary is used. Also tuning the primary seems to improve the tonal quality. The best regenerators are the three variometer, variocoupler-two variometer, the three-honeycomb coil and similar hook-ups that tune all three circuits. The only advantages of the aperiodic primary are the elimination of one control and the consequent slight reduction in cost of construction. The cost of upkeep is the same. The two-control regenerator, with aperiodic primary, however, is as selective as any other regenerative set and certainly selective as any present needs require. It compares with the Super-Heterodyne for selectivity.

The problem arises as what to do about controls when it is desired to add a stage of radio-frequency. If we took the 3-circuit regenerator, with each circuit tuned, and added a stage of tuned RF, we would have four controls, and most persons throw up their hands at this.



PHILIP E. EDELMAN, noted radio engineer, and the pride of his efforts, a receiver he designed but which he says is too difficult for any one except a radio engineer to build. However, Mr. Edelman is at work on a series of articles for RADIO WORLD on using electric light service for A and B batteries.

Making a Crystal Set Work

First Aid to the Listeners-in and Novices

By N. N. Bernstein
Technical Editor

THE man who has trouble getting beyond KDKA needs all the advice and information possible to help him to duplicate or better DX feats of his neighbors. Generally speaking, the newcomers in radio are the ones who tumble into the many pitfalls strewn along the path from the simple crystal receiver to a multi-tube set. Every radioist has his or her pet radio set, be it a 1-tube regenerator or a 9-bulb Super-Heterodyne. Every true fan is loyal to his particular radio. He is deeply immersed in his own favorite circuit and will hear of no other. Then, the time comes when something new to him is tried out and the fun begins. If the new outfit works the first time a general holiday is declared and the delighted builder inflicts himself on neighbors and friends with words of praise for and laudation of the new love.

But, if after toiling for several successive nights on the very latest circuit and he is quite sure that every wire is in its right place, tubes good, batteries connected properly and the antenna and ground on, the outfit refuses to perk up, then is the time that the fan needs advice.

The simplest method of picking up wireless or radio waves (they are the same thing) is by the use of an aerial wire, crystal detector and a pair of ear receivers. The aerial wire serves to pick up the waves and the crystal changes this weak electrical current into a form which may be heard on the ear receivers. Fig. 1 shows the circuit diagrammatically, A representing the antenna, D the crystal detector, P the ear phones and G the ground. Every electrical circuit must have a return connection in order that current may flow. In radio receivers the current or signal comes in on the antenna, goes through the detector and phones and back through the ground, thus completing the circuit.

It so happens that the radiocasting stations send out the radio waves, on which the voice and music travels, on different frequencies, commonly called wavelengths. At the receiving end we are able to pick out the different wavelengths by means of a tuning coil, represented in Fig. 2 by coil T. The arrow connecting the aerial to the coil denotes that it is variable. That is, the coil is made up of a number of turns of wire wound on a cylinder with connections taken from the winding at each given number of turns. A switching arrangement cuts out or adds to the total number of turns as desired, to tune to the proper wavelength. Here the earphones are shunted across the crystal, where they will function, as in Fig. 1. The complete circuit is formed by the antenna, tuning coil, phones and crystal.

In Fig. 2, the tuning is rather broad, that is, the tuning accomplished by the single tuning coil is not sharp enough to select the desired wavelength to the exclusion of all others. Fig. 3 is an improvement in that it uses two coils placed in inductive relation to each other, the energy being transferred from one to the other through the air. The signal passes down the antenna, is tuned in the primary coil P and returns via the ground. In its passage, however, the current in the primary induces a similar current in the secondary coil S, which travels through the crystal and earphones and the signals are thus heard. The arrow cutting through both coils denotes that their position, in relation to each other, is variable. This combination of coils is known as a variocoupler, the secondary coil of which may be turned within the outer or primary coil to change the inductive relation. This aids greatly in tuning. The movable coil is called the rotor. The other is the stator. Taps, if taken, always are from the

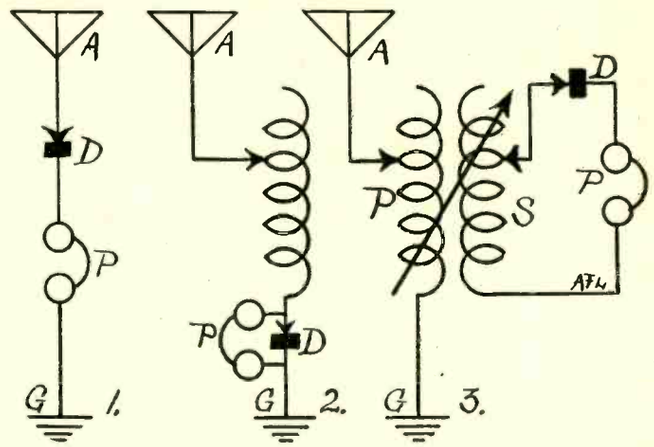


FIG. 1—The simplest receiving circuit, untuned. Fig. 2—The addition of a tuning coil enables the selection of different wavelengths. Fig. 3—Adding selectivity to the simple tuned circuit.

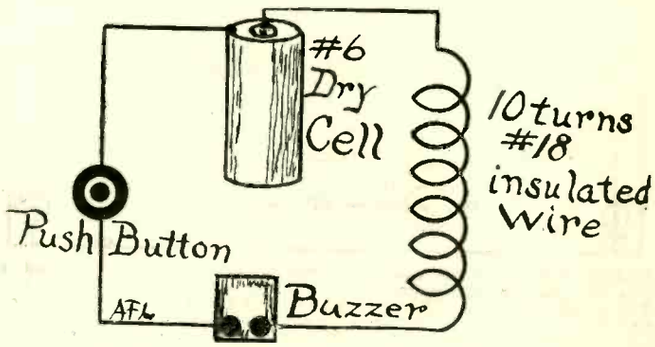


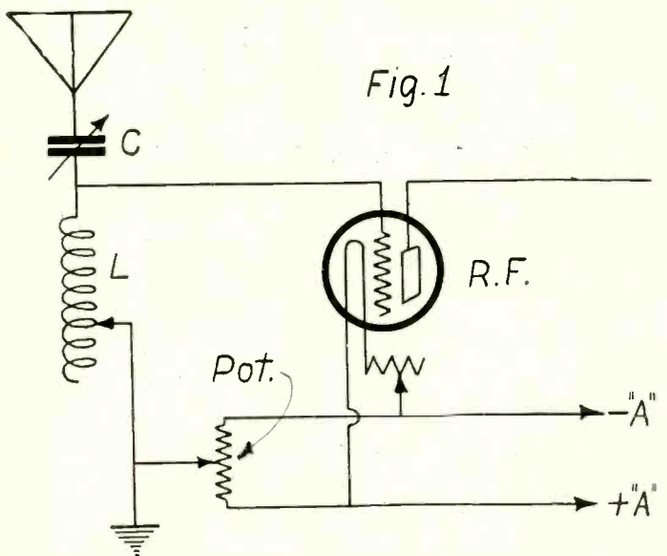
FIG. 4—A dry-cell, buzzer and small coil of wire, the coil placed a few inches away from the tuning coil of the receiving set, makes the correct adjustment of the crystal possible whether or not signals are being received. This is the well-known "buzzer test."

stator. Crystal detectors are species of raw minerals, though some modern crystals are synthetic, that is, the raw material has been chemically treated to make it sensitive to radio waves. The most popular natural crystals for radio use are galena, silicon, a zincite—bornite combination, and carborundum. These mentioned are adjustable, or should be adjusted to their most sensitive condition by means of a fine wire (catwhisker) or sharp point which makes contact with the most sensitive point on the crystal, which is determined by test. Some manufacturers find the most sensitive point and permanently fix the wire to it to form a fixed crystal.

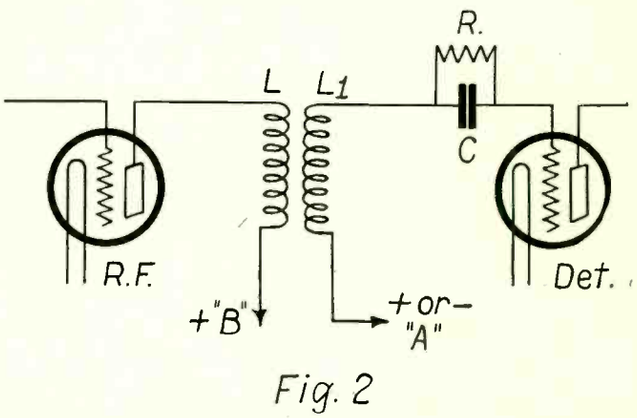
Since there is no way of knowing that the detector is adjusted to its maximum sensitivity if the set is not tuned up and a station is being received, some sort of testing device is necessary. In Fig. 4 we have such a device, which, in effect, is really a miniature station which sends out radio waves for extremely short distances. It consists of a dry-cell battery, an ordinary electric buzzer, a push button or key, and an inductance or small coil of wire. These four are wired in series, i. e., end to end, as shown in the sketch, and the inductance is placed adjacent to the tuning coil or variocoupler of the receiving set. When the key or button is depressed current will flow through the buzzer and coil. The current will be broken up into the same frequency that you hear the buzzer vibrating at. The current flowing through the coil will induce a similar current in the receiving set coil and thereby have an effect on the crystal detector, which is adjusted by means of the catwhisker until the loudest sound is heard. At that point the crystal will respond best to the radiocast signals.

RF Amplification Simplified

MUCH Sharper Tuning, Greater DX, and Reduction of Annoyance from Static, are Among the Advantages of Adding RF—Fundamental Circuits Presented—Variocoupler Used as RF Transformer—How to Employ Single Coils, Variometers and Mutual Inductances—Variety of Methods Enables You to Add RF by Using Coils You Probably Now Have—Tips by An Expert.



THE AERIAL CIRCUIT may be tuned in an RF stage. The variable condenser is 23 to 43 plates and the coil may be a honeycomb of 75 or 50 turns. The condenser is of larger capacity than usual because it is in series with the aerial. Notice that a potentiometer is used. The two terminals go to the A— and A+. The mid-point is connected to the end of the coil. The tap-switch shown need not be used if a selective tuner follows the RF. The A battery is not short-circuited by the potentiometer because of the high resistance of P, i. e., 300 to 400 ohms. The output of the tube (i. e., the plate) goes to the tuning coil, if only one RF stage is used. This plate must be joined to the B+ 90 volts and it is usually done through a coil.



AN UNTUNED RF TRANSFORMER is shown here (LL1). Two honeycomb coils L, 25 turns, L1, 75 turns may be used, closely coupled. Remove twelve turns from L. A variocoupler may also be pressed into service, L being the primary. But the rotor, L1, must have more turns put on it or be shunted with a .0005 mfd. variable condenser. In either event the RF stage would be tuned, however. Note how the plate of the tube at left is connected by L to the B+ 90 volts, as referred to in the caption of Fig. 1.

By A. P. Peck

Associate, Institute of Radio Engineers

WHY use radio-frequency amplification? Because the tuning may be greatly sharpened, greater DX may be expected and also static is not amplified to the same extent as the signals.

Many tuning devices may be employed to advantage in RF amplification. I will describe the fundamental circuits so that the reader can construct his amplifier with virtually any apparatus on hand. In the diagrams the filament circuits are not shown, so that the actual amplifier connections will show up to the best advantage.

An aerial tuning circuit that may be used with any one of the other diagrams is shown in Fig. 1. It consists of a variable condenser, C, and an inductance, L. The condenser is .0005 to .001 mfd. The inductance may consist of any one of several coils—spider-web, honeycomb, one slide tuner, tapped inductance or variometer. The use of one of the variable inductances will complicate the tuning somewhat, but is advisable if Fig. 2 or 3 is used, as they in themselves are not sharp in tuning. However, with any of the other illustrated circuits, a honeycomb coil or any other fixed inductance may be used with good results. Any coil should be of such a size that, with the condenser used, the combination will cover the radiocast band of wave-lengths. A 50 or 75 turn honeycomb coil will work. Other coils may be made in proportion.

In practically all RF amplifying circuits it is necessary to use a potentiometer to impress the proper bias voltage on the grid, thus keeping the RF tube from oscillating. This potentiometer is connected across the A battery as illustrated in Fig. 1. A switch should be provided so that the A battery current will not flow through the potentiometer when the set is not in use. The switch cuts off the A battery current at or near the source.

As for the circuits, first we have the best-known, yet by no means the best circuit, Fig. 2. This is usually called a transformer-coupled circuit, but an RF transformer need not be used. Note coils L and L1. These may be the primary and secondary of a transformer or they may be two honeycomb coils or a variocoupler that has been rewound with more turns on the rotor. The coupler rotor need not even be rewound if that coil is shunted by a .0005 variable condenser. The great objection to this circuit when a transformer alone is used is that the tuning is not sharp. However, by using coupler and condenser respectably sharp tuning results.

The circuits, Fig. 3 and 4, are known as the tuned impedance type. Fig. 3 is in actual practice the sharper tuned. In Fig. 3 an inductance coil and a condenser are connected in parallel. The plate current is fed to the RF tube through the coil (50-turn honeycomb or equivalent). I found that a coil wound as follows would give good results: 45 turns of No. 22 DCC wire on a 3″ diameter tube and shunted by a .0005 variable condenser.

The grid leak is connected from the grid to the filament and not across the condenser, thus departing from usual practice, for if the leak were across the condenser an undesirable voltage could be placed on the grid by the B battery due to conductive instead of inductive coupling between the RF plate and the detector grid.

Fig. 4 is another form of tuned impedance, a variometer being used for the tuning. Use a low-loss variometer having fairly large wire, because any resistance tends to broaden tuning.

The grid leak is connected from the grid to the filament for the same reason mentioned above.

Now we come to a combination of RF amplification

RF Combined with Regeneration

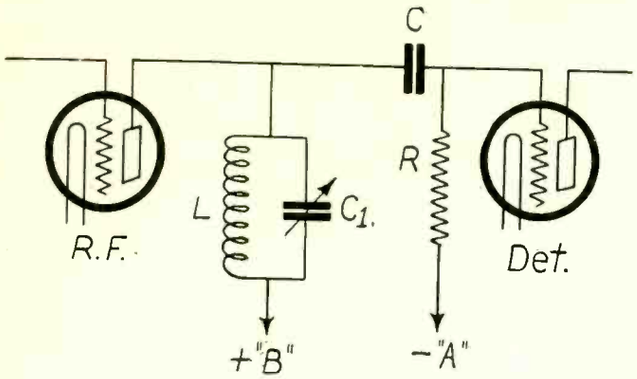


Fig. 3

TUNED IMPEDANCE is very effective. This consists of a single coil, either shunted by a variable condenser, or normal variometer fashion. Fig. 3 is more sharply tuned than Fig. 4, which is also in the impedance class. Note that the detector circuit is shown in Fig. 3. C is the grid condenser. R is the grid leak, connected from the grid post of the detector to the A—. This is essential to avoid putting the heavy B voltage on the detector grid, which would result if the leak were across the grid condenser.

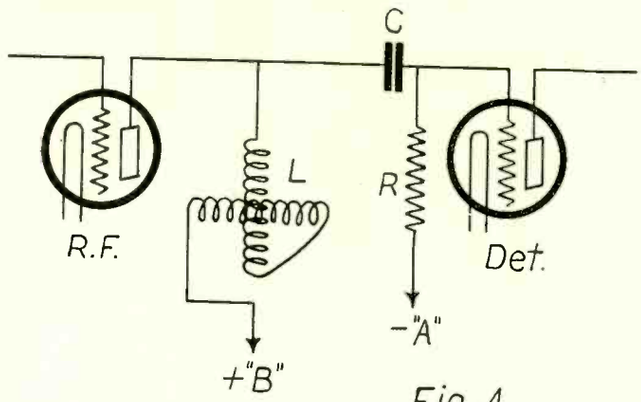


Fig. 4

A VARIOMETER may be used for tuned impedance RF. In this instance no variable condenser is necessary. The variometer is one of the best tuning devices known, so far as volume and clarity are concerned, but may be somewhat behind the coil-and-condenser combination when selectivity is to be considered. A variometer is almost a pure inductance. The highest general efficiency results when inductance is favored as against capacity, because inductance builds up voltage, while capacity saps it. Voltage is the goal in radio. This hook-up is the same as the one in Fig. 3, the tuning being by variable inductance instead of by variable capacity. The plate of the tube at right goes to one of the phones or to the P post of the transformer

and regeneration. This may best be done by placing the amplification in front of the tuner and using the tuner as the transformer. Some experimenters claim to have combined RF amplification with regeneration, carrying the regeneration through the RF tube. I have never seen one such set in successful operation and my own experiments along that line have been unsuccessful.

The single-circuit tuner, consisting of a standard variocoupler and a variable condenser, rewired, makes a good RF tuner with regeneration in the detector circuit, where it belongs (Fig. 5). The stator of the coupler acts as a tuned impedance coil and tunes the plate circuit of the amplifier and the grid circuit of the detector. The variable condenser assists in this tuning and since it is in shunt with the coil, it may be of a fairly small size, say .0005 mfd. Regeneration is accomplished in the same manner as in a single-circuit tuner, by feedback. The rotor of the coupler is connected in the plate circuit of the detector tube from whence it feeds back to the grid circuit. Thus we obtain louder signals than with a straight detector and without complicating the control.

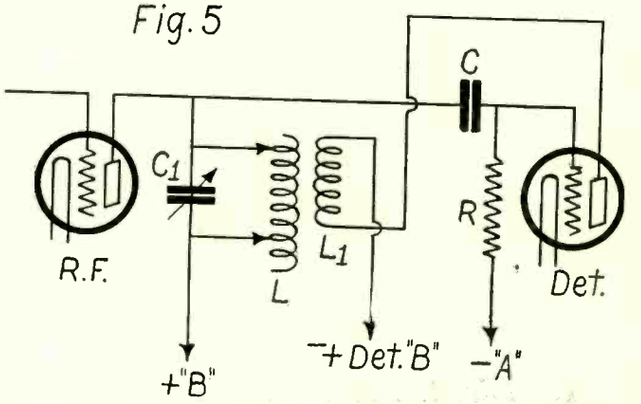
Fig. 6 is a tuner of the untuned primary type, used to good advantage. The aperiodic primary is in the plate circuit of the amplifying tube and serves to pass the oscillation along to the secondary, also fixed, but tuned by C1. The tickler, L2, is rotary and provides regeneration. L is the primary, L1 the secondary and L2 the tickler. Any standard untuned primary coupler may be adapted to a circuit of this type.

All of these six circuits deal with only one tube for radio-frequency amplification. However, the reader should be able to plan any circuit desired. Two stages may be used. A combination of Figs. 1, 2 and 3 is ideal for all-around work. All of the connections necessary for such a set are shown, it only being necessary to put the various circuits together and add the filament connections.

* * *

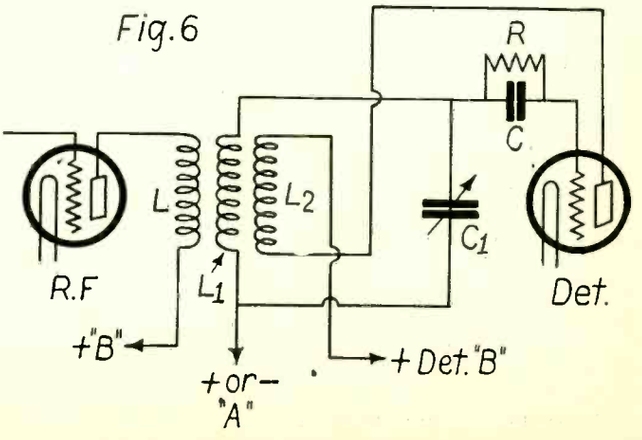
[*Those who construct any circuit are requested to write to Results Editor, Radio World,* 1493 *Broadway, New York City, and state how they fared. When possible give the trade names of the parts you use, or the manufacturers' names. Results letters will be published, including trouble-shooting letters. Readers may include questions in the same letter. The questions will be answered in the Radio University Department.*]

Fig. 5



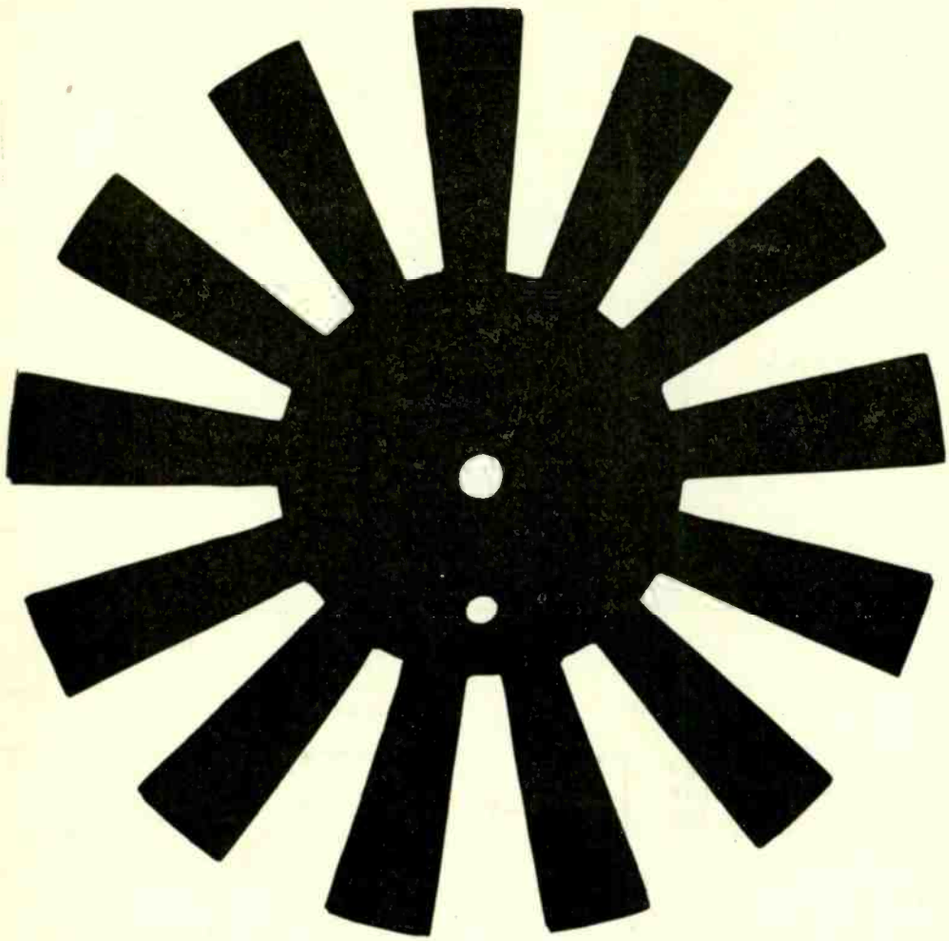
HOW THE SINGLE-CIRCUIT SET may be adapted to RF amplification. Note that regeneration is retained, the coil L1 feeding back the plate current to the grid of the detector, with a suggestion of RF and detector plates being in parallel. The plate of the RF tube and the B+ 90 volts (through L) replace the former aerial and ground connections, which are moved over to the RF circuit.

Fig. 6



THE MOST SELECTIVE regenerative tuner, the 3-circuit affair, is used here, preceded by a stage of RF. L is the aperiodic primary of the 3-circuit variocoupler...L1 is the secondary, tuned by C1. L2 is the tickler. With this circuit coil L in Fig. 1 needs no tap switch. Good results are obtainable without the potentiometer.

Preceding Regeneration with RF



FORM for winding the spider-web coil (Fig. 2). This coil, L1L2 in Fig. 1 on page 11, is the radio-frequency transformer. It is tuned by a variable condenser. Using tracing paper or tissue paper, trace the outline of the form. Paste the tracing on a piece of stiff cardboard, 6" x 6", and cut the form. Then wind the wire, as directed, in and out of the arms or spokes. The primary may be wound first, the secondary next. If the cardboard form is to be removed, paint the coil with collodion or secure it with linen thread, cut into 13 pieces wound around the coil and knotted.

By Lieut. Peter V. O'Rourke

IT is surprising to those who have not tried a stage of RF ahead of their regenerative set what a difference that addition makes. Signals are louder, greater DX is obtainable and speech that formerly came in "mushy" is cleared up wonderfully. The husky voices of DX stations or of stations nearby from which the experimenter may be shielded seem transformed as if by some magic throat lozenge.

As for increased volume, that is not one of the usually advertised advantages. But the first tube performs some detecting functions as well as RF and passes these audible signals on. One of the phenomena of some multi-tube sets is that, though they are selective, three or four stations may be heard at the same time. True, all stations not desired may be easily excluded, but it is a fact several can be brought in at once. This is because the RF tubes are detecting. Each secondary is tuned to a different station and the different signals stampede the phones. By adjustment of all dials to the one wavelength order is restored. Hence it is safe indeed to claim increased volume from an RF stage. If in doubt, listen to the difference.

Taking the 3-circuit tuner, one of the most selective receivers, you may add an RF stage more easily than to any other circuit (Fig. 1). Where the aerial and ground lines go to the aperiodic primary the plate of the RF tube and the B+ 90 volts are connected, respectively. The RF stage is wired like a detector circuit, but no grid leak or grid condenser is used there, to avoid making a detector of the tube that is to be the RF amplifier.

The combining of RF with regeneration requires some care, as the danger is that oscillations will ruin or prevent reception. However, the two great aids to DX—regeneration and RF—may be successfully combined, even without the use of a potentiometer to stabilize the circuit, i. e., check oscillations. The regeneration must be watched even more carefully than when it is used without RF. If at first you find that local signals are, if anything, weaker, the fault may be in the wiring, the grid and plate leads being close or parallel, a situation to be avoided. But you will be able to get the set working properly, without doubt, if you are careful. Then you will be able to hear locals with fine volume on the speaker with one stage of AF and you will be greatly pleased with the result.

One of the important considerations is to use low-loss parts. At least you will have a low-loss coil if you adhere to the following directions. Then if you use low-loss condensers you will be making great progress. Add to that, if possible, a low-loss tuning coil for the detector and you are on Easy Street.

Considering the detector part of the circuit, any of the commercial coils may be used, e.g., Globe, Bremer-Tully, Star, Uncle Sam, Air King, Ambassador, Transcontinental, or one may be made by the experiementer. (See RADIO WORLD, issue of September 13.) The primary is aperiodic, i.e., fixed and, as the saying goes, untuned. The secondary is tuned with a variable condenser, .0005 mfd., 23 plates. The tertiary or tickler connects the plate to one of the phones and is the coil wound on the rotor and moved by the coupler dial.

A 2-circuit variocoupler may be used, but must be converted into a 3-circuit coil. This is done by counting eight or ten turns at the beginning of the stator, cutting the wire, leaving slack for connections, threading the end through two holes in the stator form, and similarly securing the other free terminal.

The circuit, with RF stage, has three controls—1, variable condenser for RF stage; 2, detector variocoupler; 3, variable condenser across coupler secondary.

By adding RF you will get stations you never heard before. By using low-loss coils and condensers you will get still greater distance and sweeter tones.

The RF Coil

Using No. 18 double cotton covered wire, wind 12 feet on a spider-web form, leaving 6" at beginning and end for later connections. This 1 foot leaves 11 feet actually wound. Next wind 45 feet of No. 22 SCC wire, leaving slack as before for terminals. DCC wire would be better, but it is hard to get—if No. 22 is used. The short winding is L1, the long one L2. A 17-plate low-loss condenser (.00035 mfd.) will cover the band, but otherwise use 23 plates.

The two windings may be put on together, that is, as

Reaching Out for Greater DX

if they were one wire, then the secondary completed alone, or they may be wound separately. The experimenter may take his choice.

The designations of primary, secondary and tickler are not marked on the commercial 3-circuit coils. Considering the coil as mounted on the panel, the aerial would go to the binding post at extreme left of the coil, at bottom, as you look down on it. This post is nearest the panel at bottom. The next post to the right is for the ground. The third post, on the same line, is the grid connection and the next one, at back, is for the F+. Now take the posts at top of the coil. The one at the back, to the right, goes to the plate of the detector tube. Another post is right next to this, but no connection should be made to it, for it is affixed to the rotor shaft and the connection would pry loose if made to the post at left. The remaining post is near the panel, at top of coil, and goes to one of the phones. Do not run this lead from the end of the plate coil or tickler close to the panel, but use No. 14 round hard bare wire, or bus bar if that is more convenient, making a round turn at the point where you want the wire bent so it will go to the jack or the phone binding post. This lead may be brought straight down and thus over to the jack, but it is perhaps better to avoid this long lead.

It is not advisable to use bus bar, because of its squared edges. Round wire is much better, because its electrical conductivity is greater. The radio currents travel on the surface of the wire, a phenomenon known as the "skin effect," and the round form provides a greater total surface, hence offers a minimum resistance. The wire never need be insulated, except at danger points to avoid possible contacts that would short circuit the B battery. At these points a short piece of spaghetti may be used. To distinguish leads readily, you may slip on short collars of different colored spaghetti.

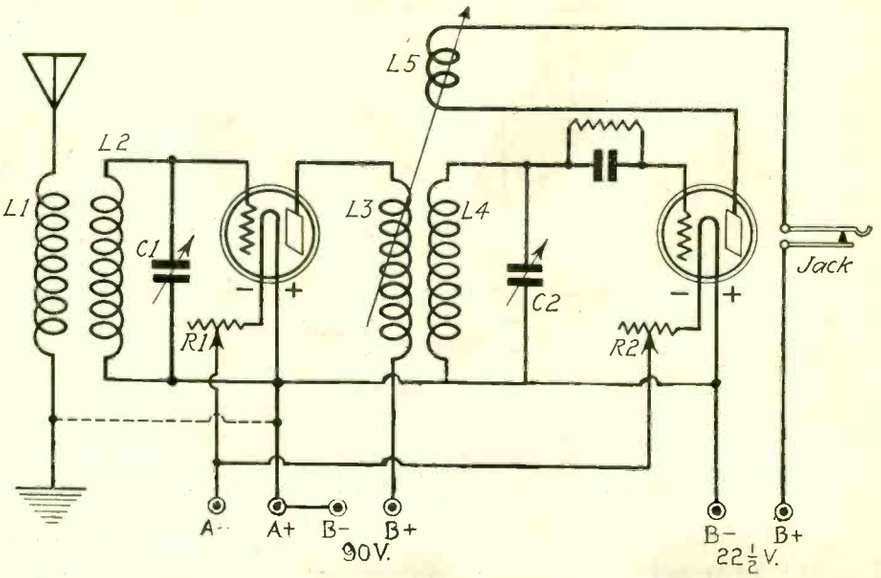


FIG. 1—Circuit network of the 3-circuit tuner, preceded by a stage of RF. The coil L1L2 is the RF transformer, home-made. L3L4L5 are the primary, secondary and tickler of the tuning coil, which preferably should be low-loss, though if you have a coil of another sort you may still get good results. Even a standard variocoupler may be used. In the July 5 issue of RADIO WORLD appeared an article describing how to convert a coil or variable condenser into the low-loss type.

Wiring Directions

1. Connect the A— on the battery to one terminal of the rheostat, R1, the other side of the rheostat going to F— on the RF tube socket (at left in diagram). The A+ goes direct from battery to F+ on socket. Connect the A— in the same way to the detector tube and the A+ as formerly. Connect B— and A+. That completes the A wiring.

2. Connect the beginning of L2 to the grid of the first tube and to the stator of C1. The end goes preferably to the A—. Connect it there, though connection to A+ (shown in diagram) will work. The connection to A— goes to the battery itself or to the battery side of the rheostat—NOT to the socket side of the rheostat. The end of L2 goes also to the rotor plates of C1. Connect L1 at beginning to aerial and at end to ground. Ground may go also to A— as a test.

3. The plate of the RF tube goes to the beginning of L3 (aperiodic primary of variocoupler) and the end to B+ 90 volts. The beginning of L4 goes to one side of the grid condenser, the other side of that condenser going to the G post on socket of second tube (at right). The beginning of L4 also goes to the stator of C2, the rotary plates going to F+ and to the end of L4. This grid return to A+ (i. e., tracing the lead from the grid of the tube) is correct for a detector circuit, the minus being preferred only for amplifier circuits. Connect the beginning of L5 to the plate of tube No. 2, the end of L5 going to one of the phones. See if the rheostats will light the tubes. If so, connect B+ 22½ volts to the other phone. The B+ 22½ and detector plate would go to the jack springs if a jack (single-circuit kind) is used.

For 199 or 299 tubes use 45 volts on the detector B circuit. The best tubes are 201A or 301A for the RF and 200 or 300 for the detector. These require a 6-volt storage battery. But 199 and 299, using dry cells, work splendidly in both sockets. The 11 and 12 tubes will work well. Only one stage of AF is needed to work a speaker on all stations up to 100 miles away in any case.

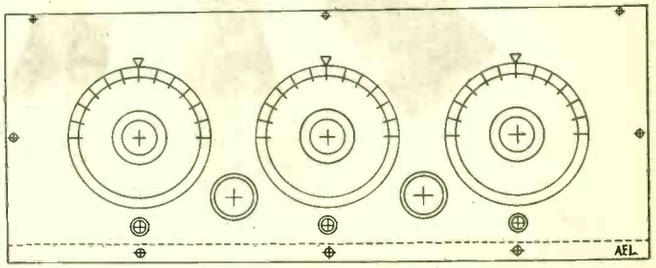


FIG. 3—Panel layout of a 3-circuit tuner preceded by an RF stage. At left, the RF condenser dial. Center, detector wavelength dial. Right, dial for rotor of variocoupler.

[*Those who construct this circuit are requested to write to Results Editor, Radio World,* 1493 *Broadway, New York City, and state how they fared. When possible give the trade names of the parts you use, or the manufacturers' names. Results letters will be published, including trouble-shooting letters. Readers may include questions in the same letter. The questions will be answered in the Radio University Department.*]

How to Avoid Body Capacity

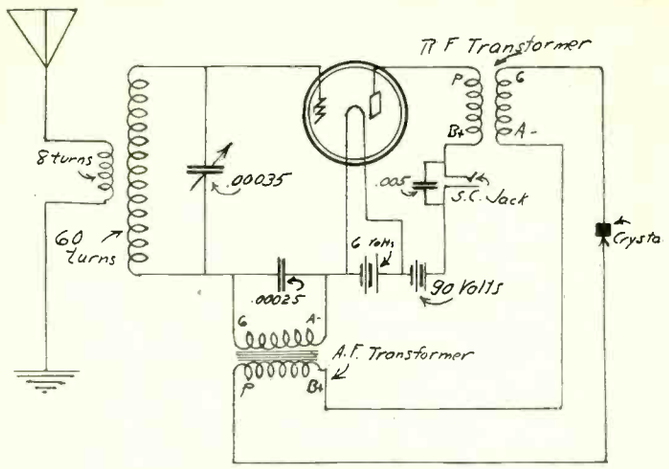
BY connecting the movable plates to the ground or filament side of the circuit the effect of body capacity can generally be eliminated. The difference in the connections is more noticeable when weak signals are received. In the case of the antenna series condenser the rotary plates should be connected to the wire leading to the ground, and the stationary plates to the antenna.

AMPERE HOUR DEFINED

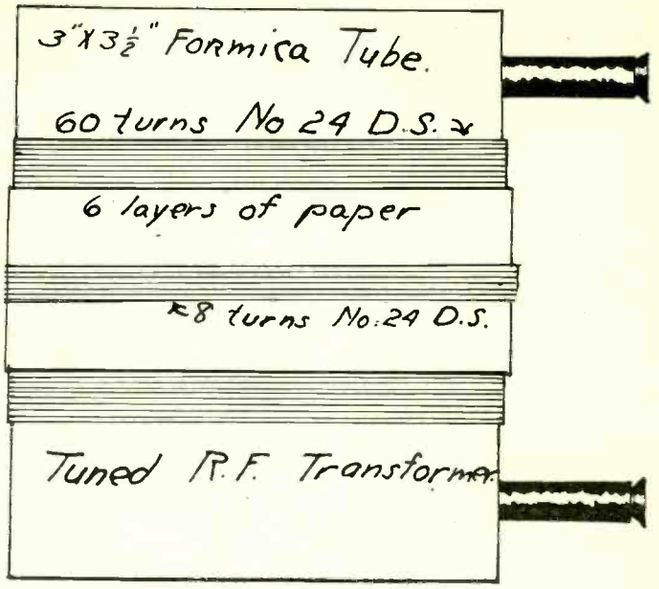
THIRTY ampere hour capacity means that if one ampere is drawn from a cell every hour it will last thirty hours.

A 1-Dial 1-Tube Reflex

It Works a Loud Speaker on Local Stations



CIRCUIT NETWORK (Fig. 1) for getting locals on a loud speaker, using one tube. The primary of the tuning coil has 8 turns of No. 24 DSC wire, the secondary 60 turns. The variable condenser, the only control, is .00035 mfd., normally 17 plates. A crystal is used as detector. The RF transformer may be any good commercial one. The 201A or 301A tube, with 6-volt storage battery, gives best results, but the 199 or 299 tube or equal is satisfactory, too. Fine quality of tone is produced in either case, and the plate voltage should be 90 in either instance. The AF transformer should be placed behind the socket on the baseboard. A filament switch should interrupt the positive A lead between battery and tube.



HOW to wind the timing coil (Fig. 2). A Formica or other tube, 3 inches in diameter by 3½ inches high, is used. The secondary, 60 turns, is wound first. Six layers of wrapping paper go over this. Then the 8-turn primary is wound atop the paper, which, in the diagram, hides part of the secondary.

By Byrt C. Caldwell

A SIMPLE 1-tube receiver, with one control, which is selective, sensitive, and gives good tone, in addition to enough volume for lour speaker use on the local stations, is described herewith. Fig. 1 shows the layout of the panel, 7" x 9". Use radion or formica. All dimensions are shown on the drawing. It will help a great deal if a template is made on ordinary paper for marking the panel. The tuned radio-frequency transformer should be made by winding 60 turns of No. 24 DSC wire on a formica or radion tube. Six layers of ordinary wrapping paper are wound over this. (If you are not in a crowded locality, about two or three will be enough. This will reduce selectivity slightly). Eight turns of the same wire are wound over the paper. The ends of the wires are fastened in the tubing under copper soldering terminals.

It is essential that a low-loss variable condenser be used for real results. The tuning coil is connected to the rear of the condenser by means of small brass supports and in a perpendicular position. The audio transformer is placed to the left of the receiver, and the other RF transformer is placed at the right. Any good make of audio and radio frequency transformers will do. It will be noticed that there is no rheostat. The writer has tried it with and without the rheostat, and better results were obtained wihout it. The tube socket is placed directly beneath the center of the tuning coil, so that the tube comes up in the center of this.

Use a great deal of care in wiring. The hook-up of this receiver is exceedingly simple and the arrangement of the instruments allows very short, efficient connections. Be sure that every connection is very thoroughly soldered, for the action of the receiver depends largely upon this point.

The capacity of the variable condenser is only .00036 mfds. This capacity will cover the radiocasting wavelength band as well as will a .0005 condenser of the older type. The fixed plates of this condenser should be conencted to the grid of the tube. A .00025 mica condenser is shunted acros sthe secondary of the audio transformer ,and one of .005 mfd. capacity is shunted acros sthe phones.

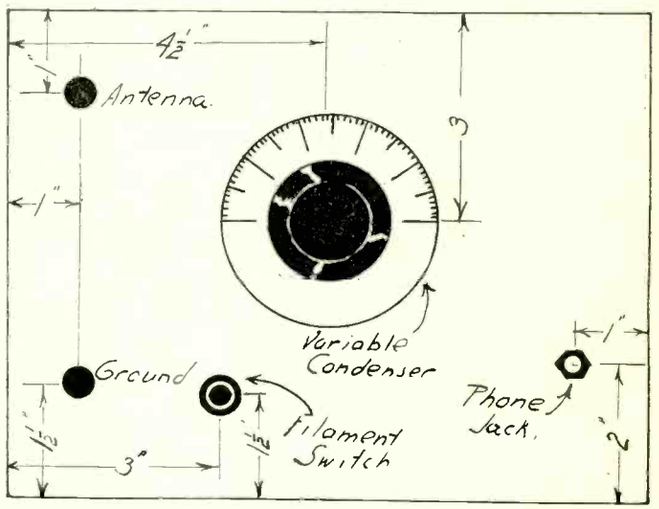


FIG. 3, panel layout. As no rheostat is used a filament switch is substituted to turn the tube on or off. The panel is 7 inches by 9 inches.

The very best tube for use with this receiver is the 201A. With this, a 6-volt A battery and a 90-volt B battery are required. If a smaller tube is desired, the 199 may be used. The same B battery voltage may be used.

A movement of one division on the dial completely tunes out the local stations when they are coming in on the loudspeaker. With about 20 feet of wire, indoors, for an antenna, the local stations come in loud enough to be heard any place in a 9-room house and speech may be understood almost 100 feet from the loudspeaker. For a single tube outfit, this receiver is hard to beat.

* * *

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A Handy Experimental Layout

By Herman Bernard

FOR those whose particular delight is to try out different circuits in the fascinating hunt for the ultimate in radio it is out of the question to drill a panel for each circuit. Sometimes experimenters will test five or six circuits a week, or even more, and it would be a serious waste of time as well as an unpardonable drain on the purse to buy a new panel even for each third or fourth effort. Therefore some elastic arrangement must be devised. There are several ways of facilitating these tests and I am going to outline the one I use.

On all variable condensers I use 4" dials. I measure the extreme horizontal distance between the mounting holes on the front of the condenser and make sure that the hard rubber I use for mounting the part is at least this width. Of course you may make the panel piece 4" wide, and I do this frequently, but sometimes you run short of panel material and it is therefore useful to conserve resources. Having mounted the condenser, I wind a coil that, in conjunction with the condenser, will cover the radiocast band of wavelengths. As far as possible I try to use condensers of the same make and number of plates, for then matching becomes easier and also the curve of the condensers is the same, doubly insuring similar settings for all dials on all condensers. If the condensers are of the same number of plates but of different makes I may expect some disparity in dial readings, although this is not foregone.

As for coils, I use the Dynocoil type. This consists of No. 22 double cotton covered wire, wound on a spider-web form. With a 23-plate condenser I usually find that the range is struck just about right when 45 feet are used for the secondary and 11 feet for the aperiodic primary. The coil is mounted directly on the back of the condenser by means of brass angle bars, the coil being parallel with the end plates. I use only low-loss condensers in all hookups and tests.

Two small holes are bored about ¼" from the bottom of a 4x4" baseboard and through these holes wood screws are inserted for mounting the panel strip to the small baseboard. Now I attach coil and condenser to a random socket, with a condenser and leak on the grid, and tune in WEAF. The standard dial setting for this station is 72 in my laboratory. The wavelength is 492 meters. Any one can pick out a station that keeps to its wavelength with regularity and figure out about where the station should come in for preservation of the full range. The highest wavelength station that I can normally expect to reach is WNYC, 526 meters. This would come in at 82 if WEAF came in at 72. However, there is still some leeway from 526 meters up, represented by the 18 degrees still unaccounted for at the end of the dial (100 minus 82). There are really only about 8 such degrees, for the last ten degrees should not be counted. Variable condensers as a rule do not add pro rata the capacity that might be expected when turned from 90 to 100. In my reckoning I always hold to 90 as the maximum reading for regular variation. The increase is very little after 90.

Granting that you have selected your station, either one in the upper reaches of wavelengths or one that is extremely low, stick to that and make your tests for matching coil and condenser only when the selected station is on the air. If you find that your station—we will suppose it is 492 meters—comes in around 90, you know you have too much inductance. A safe rule is that anything near 500 meters should come in near 70. You will remove some of the wire from your coil. Do this turn by turn. Finally you will hit the right number of turns. Secure the end of the reduced winding, so it will stay put. Now you have a matched tuning instrument or radio-frequency transformer and accompanying variable condenser. If the reading is too low at first, add more turns to the secondary.

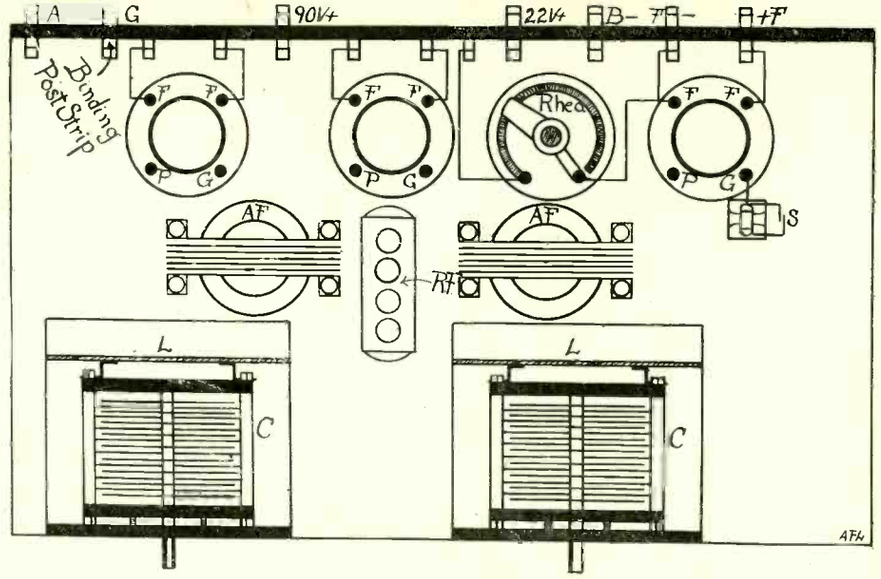
From your experience you probably know just at what reading your pet station should come in, but if you do not know, you may arbitararily give a reading of 70 to 75 to a station very near 500 meters.

If two variable condensers you desire to use have not the same maximum capacity, say one is 23 plates and the other 17 plates, you will have to use a coil of higher inductance for the 17-plate instrument, for instance, 55 to 60 feet of wire for the secondary. The primary is always the same, granting that an aperiodic primary is used. As this variety is the most selective, it alone will be considered.

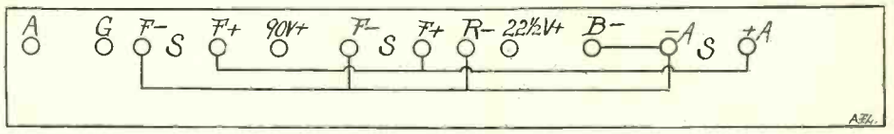
It is not vital, of course, that the dial readings be identical for all condensers for a given station, although for mother and sister this will facilitate tuning, or at least remembering the combination that opens the door to the station. The combination, of course, may be logged just the same with condensers of unequal maximum capacity. WEAF, instead of being 72, 72, 72, might be 76, 72, 72. The first condenser could be made to read 72, also, but if it is 17 plates you want the reading to be as high as possible, so that all the capacity you can crowd into the circuit will be used on the high wavelengths. Otherwise you will find that, with the large inductance you had to use, the condenser at zero would not reach the lowest waves. An alternative would be to tap the coil, say, at a point one-third from the end of the secondary winding, but that isn't being done and I don't recommend it.

Now all our coils are wound and fastened to the backs of all our condensers and the units mounted on small panels and baseboards. The next step is to get a large baseboard—7x24" not being a bit too large—and arrange thereon three tubes. These

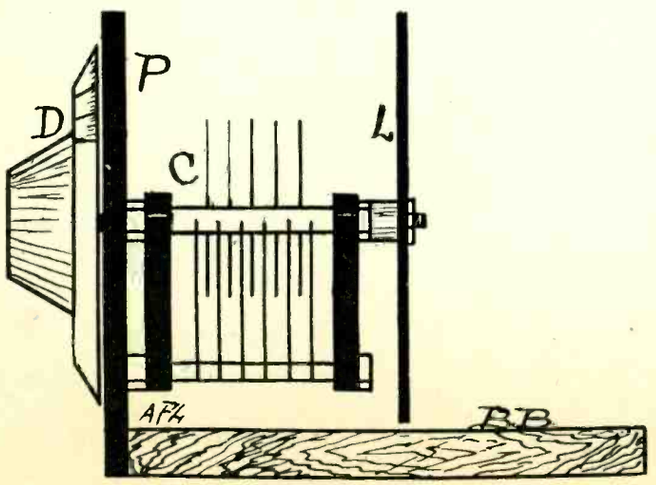
(*Continued on page* 30)



TOP VIEW (Fig. 1) of an experimental layout, 18" wide x 7" deep. This gives a good selection in trying out circuits. In rear is the A and B battery input, also aerial and ground (A and G at left). The maximum in an efficient reflex hookup with this outfit is one stage of tuned RF, one stage of untuned RF, detector, one stage of AF reflexed to the first tube and one straight AF stage last tube. RF is the fixed RF transformer. If two tuned RF stages are to be included in the operating range, use 24" width. If possible, use 8 or 9" depth. This makes plenty of room for a third coil-and-condenser combination (LC), to go at extreme right. No extra tube will be added for detector tryouts.



THE TERMINAL STRIP (Fig. 2), at right angles to baseboard, located at rear.



HOW each unit is assembled. The hard rubber panel (P) is just wide enough for mounting the condenser (C). The panel is attached to a 4" x 4" baseboard (BB). L is the coil, mounted on back of the condenser. The small baseboard is screwed to a large one, 7" x 18" or 7" x 24", depending on the variety of circuits the experimenter desires to test. Behind this unit is an AFT and tube. (See Fig. 1) Referring back to Fig. 1, a switch permits cutting out the grid condenser, for crystal-reflex tests and the A leads may be separately connected to socket posts as needed, or switches inserted.

$1,000,000 a Year for Hazeltine

From Freed-Eisemann Alone He Earns Rate of $480,000 a Year, and There Are Ten Other Licensees of His Neutrodyne Patent—Freed-Eisemann's Sales During Four Quarters Grew as Follows: $42,000, $115,000, $687,000, $2,000,000.

THE marvelous growth of sales of Neutrodyne complete sets, kits and parts and the stupendous royalties earned by Prof. Louis A. Hazeltine, of the Stevens Institute of Technology, were revealed in the opinion of Federal Judge Inch, in Brooklyn, N. Y., deciding the suit of the Hazeltine Research Corporation against the Freed-Eisemann Radio Corporation.

As told in RADIO WORLD last week, the court denied the Hazeltine Corporation's demand for cancellation of the contract held by the Freed-Eisemann Corporation. This contract fixes the royalty to Prof. Hazeltine at 6% of the complete set (amounting to about $4.50 a set). The demand for forfeiture was made by Hazeltine on the basis that non-payment of royalties constituted forfeiture. The court held the contract did not provide for forfeiture on that ground. Judge Inch ordered the royalties, deposited by Freed-Eisemann with the court, paid to Prof. Hazeltine.

The Freed-Eisemann Corporation, on the other hand, counterclaimed that the contract should be reformed so that the 6% royalty would apply not to the complete set, but only to the Neutrodon or neutralizing condenser, making the royalty about 30 cents. In this connection the Freed-Eisemann corporation accused their patent lawyers, particularly Messrs. Russ and Taylor, of Pennie, Davis, Marvin & Edwards, singling out Mr. Russ individually.

Lawyers Are Upheld

This law firm also represented Prof. Hazeltine in his patent application at Washington. The Freed-Eisemann Corporation alleged it had been rushed into signing the contract, that Mr. Russ had stood for the 6% on the complete set, and that he had acted more in Prof. Hazeltine's behalf than in theirs. Also some allegations of bad legal advice were made. The court held there was no proof whatever of these charges against the lawyers and that the 6% royalty on the complete set was Prof. Hazeltine's insistent idea, and Mr. Russ only took notes at the conference that led to the contract.

The court said:

"The quarter ending December 31, 1922, according to the Freed-Eisemann statement, shows sales of $687,000, and the quarter ending March 31, 1924, sales of $2,000,000."

On the basis of $2,000,000 a quarter the business would be $8,000,000 a year and a 6% royalty would amount to $480.000. Although business naturally fell off in Summer, the increase in sales has been so steady that the drop may be offset by the gain, and the total business for 1924 actually reach $8,000,000.

The Stupendous Growth

The opinion refers to evidence of sales which may be summarized as follows:

Period	*Sales*	*Royalty*
Quarter ending July 1, 1923.....	**$42,000***	**$2,500**
Quarter ending Oct. 1, 1923.....	**$115,000***	**$7,000**
Quarter ending Jan. 1, 1924.....	**$687.000**	**$40,000**
Quarter ending March 31, 1924...	**$2,000,000**	**$120,000**

*Estimated

Thus the business of the first quarter during which the firm was in the business of selling Neutrodynes (ending July 1, 1923) was about trebled in the second quarter. The third quarter was five times as big as the second and the fourth quarter more than three times as great as the third. The fourth quarter was almost 50 times as great as the first ($2,000,000 as against $42,000).

This represents one of the most romantic business successes ever achieved in radio. It must be remembered that the Freed-Eisemann Corporation is only one of the eleven Neutrodyne licensees, although the largest. An idea of the fortune Prof. Hazeltine is reaping may be gleaned from the assumption his income is probably nearly three times that derived from Freed-Eisemann alone, or now more than $1,000,000 a year.

Mr. Russ, the court pointed out, brought Prof. Hazeltine and Freed-Eisemann together. Prof. Hazeltine demonstrated a Neutrodyne satisfactorily.

"Might Suggest Gratitude"

The opinion continues:

"Although Mr. Russ and Mr. Taylor have been accused of fraud and misrepresentation by Messrs. Freed-Eisemann yet it clearly appears from the above that it was due solely to this opportunity voluntarily suggested by Mr. Russ that Messrs. Freed-Eisemann have made a fortune. For, from what would appear to have been a very small busniess in crystal sets, which they were doing in November, 1922, Mr. Eisemann testifies that the present net worth of their business, not more than a year and a half afterwards, is $300,000 a year, and that they have employed as high as 570 workmen, and have a very large number of outstanding valuable contracts for the purchase of their sets.

"It seems to me, it could be fairly argued, that such a state of facts might suggest gratitude to and not abuse of Mr. Russ and Mr. Taylor. Prior to this law suit such a feeling seems to have existed in the minds of the others of the Independent Radio Manufacturers (the Neutrodyne licensees, of whom Freed-Eisemann was one)."

$30,000-a-Year Offered

The court, after telling how Mr Freed evidently fully understood the contract as signed, continued:

"The defendant (Freed-Eisemann) and possibly one or two others who were also experiencing success, now commenced to endeavor to substitute a plan to which they hoped they could obtain the consent of the inventor, Professor Hazeltine, that of a lump sum royalty of $30,000 a year, instead of the contract royalty of 6 per cent. on a set.

"While this campaign consisted of the buyers' laments over the contract and the danger of being put out of business by competition and certain other pleas not unfamiliar in some business dealings, since 1000 B. C. (Proverbs XX:14), they finally culminated in the long letter of December 12, 1923 with some 19 distinct heads, most of which is in the record.

"The truth is that such grievance of fraud or mistake as now appears is a sham and never was thought of until this law suit and was not really worked out then until most able counsel had vigorously put the answer together.

"I am unable to stop here without saying that it seems to me that charges of fraud and professional misconduct should not be lightly put aside.

"Business emergencies or greed require no such sacrifice as an attempt upon a young lawyer's honor and future nor justifies an attempt to get more money than allowed by a contract by trying to besmirch the hard-earned reputation of an established firm of reputable lawyers unless facts are presented in a credible form that plainly show that unfortunately some temptation has been yielded to."

Business So Big Freed-Eisemann Enlarges Quarters

HAVING had their production facilities taxed to the limit during the season just past, the Freed-Eisemann Radio Corporation is preparing to meet the demand for their new line of Neutrodyne Receivers by taking on another floor of the Sperry Building, Brooklyn. This floor, on the fifth story, will provide 17,000 additional square feet of factory space. The new radio Receivers have been met everywhere with great enthusiasm, and the national advertising featuring the new Freed-Eisemann line undoubtedly will stimulate sales to the point where every available inch of factory space will be needed to construct sets enough to meet the demand.

Judge's Full Opinion in Suit by Hazeltine Corporation vs. Freed-Eisemann Made Public—History of Negotiations and of Signing of Contract for 6% Royalty on Price of Complete Sets Discussed—Professor Would Not Take $30,000 a Year.

Col. Green Radiocasts Movies

COL. E. H. R. GREEN, son of the late Hetty Green, has succeeded in transmitting motion pictures sixty feet by wireless, according to his secretary, W. H. R. Marshall.

Mr. Marshall said Col. Green has been at work on his invention at his place in South Dartmouth, Mass. He also said a laboratory has been built for further experiments and that by agreement with Dr. Samuel Stratton, of the Massachusetts Institute of Technology, experts from that institution will carry on the work, all expenses being paid by Col. Green.

In another year Col. Green expects the device will be perfected, his secretary declared. He said the principle of radio movies is the same as that by which still pictures are transmitted by wire. Further explanation is impossible, he declared, because of the intricate nature of the apparatus.

The idea came to Col. Green a year and a half ago. He then constructed a special building for experiments and spent more than $200.000 on it. Some of the delicate machinery was imported from Germany.

Col. Green has been called the world's foremost amateur radio fan. With an income of approximately $1.000.000 a year he has had unlimited means for experimentation. For many years he has been interested in all new inventions. He is said to have introduced the first automobile in Texas, his home State.

At South Dartmouth he has built a general radiocasting station for the public known as WMAF and had a huge amplifier tower constructed for the reception of programs from New York and other cities. More than 1,500 persons park their automobiles at the base of the hill on which the tower is built to listen to the programs every night. A series of huge horns amplify the programs many thousand times.

According to Mr. Marshall, who was secretary to Mrs. Hetty Green for four years before her death. Co. Green, who is crippled in one leg, became interested in radio as the result of his own infirmity and spent considerable money that persons who were shut in by illness might be entertained by the radio programs. The station at the Green estate is the one that radiocasts the program from the Strand Theater in New York every Sunday night.

The Radio University

A Question and Answer Department conducted by RADIO WORLD for its Readers by its Staff of Experts. Address Letters to Radio University Department, RADIO WORLD, 1493 Broadway, New York City.

I desire to build the best Superdyne that can be built. I want to use the very best parts obtainable but am not able to experiment with different makes of instruments, therefore I rely on RADIO WORLD *to guide me right. What are your recommendations for the best Superdyne?—M. E. Williams, Box 848, Ranger, Tex.*

Possibly the best you can do in a Superdyne is to construct the 5-tube low-loss set described by N. N. Bernstein in RADIO WORLD for August 23 and 30. This latest set employs low-loss coils and condensers with three stages of resistance-coupled audio-frequency amplification. The volume and clarity are remarkable and DX stations are reported by readers who have built the set to come in like locals.

* * *

Can a storage B battery be charged with a DC 32-volt lighting plant outfit? Will a rectifier have to be used and what is the usual cost of one? The kind of battery I have reference to is made up of Edison elements.—C. R. Lytle, Hitchcock, S. D.

Fig. 35 is a specially designed circuit for charging the type of storage B battery you have reference to from a 32-volt lighting plant. As these plants are without exception direct current generators, no rectifier is necessary, so that expense is saved to you. The three groups of black dots on the diagram denote double-pole, double-throw switches, three of which are necessary. The 10-ohm rheostat is of the ordinary type used on radio receiving sets for filament control. The batteries are arranged in three groups of 26 each and connected as shown to the proper switch. When the set is in use, all three switches are thrown to the right (D). To charge, throw all three switches over to the left (C). The charging rate will be about one-half ampere, and a full charge will take about 10 hours, depending on the condition of the battery. The resistance of the rheostat is increased as the charge progresses.

* * *

Please publish a diagram of the circuit I am herewith sending with the addition of one stage of audio frequency, so that I may hear the DX stations better.—Paul Whalen, 5302 Buchanan St., Los Angeles, Cal.

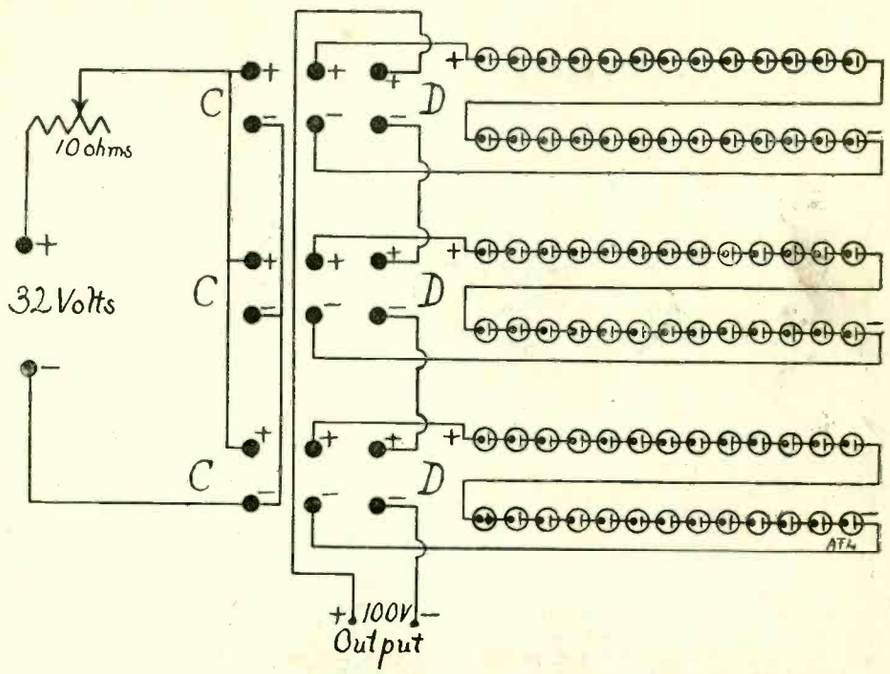


FIG. 35—How to charge a 110-volt storage B battery from a 32-volt farm lighting plant (direct current). The cells are arranged in three groups of 26 or 78 cells in all. These three groups are charged in series-parallel and discharged in series. Asked for by C. R. Lytle, Hitchcock, S. D.

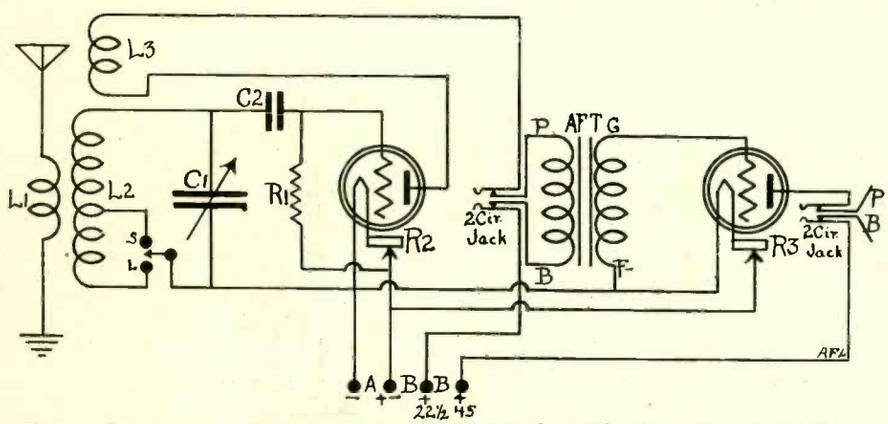


FIG. 36—One stage of audio-frequency transformer-coupled amplification connected to single-tube regenerative set. Locals may be heard with good volume on the loud speaker and DX stations on the head phones. An extra 22½-volt B battery is necessary. Circuit requested by Paul Whalen, 5302 Buchanan St., Los Angeles, Cal.

Fig. 36 is your circuit with one step of AF added. If you use a double-circuit jack after the second tube, as drawn in the diagram, you will be able to add another step of audio by connecting the second AF transformer to the points on the jack marked P and B, and by making exactly the same A and B battery connections on the third tube as on the second tube as shown.

* * *

In going over my old copies of RADIO WORLD *I find in the issue of August 9, under the Radio University department, Fig. 27, a diagram of a honeycomb coil regenerative set. Please inform me if one stage of radio-frequency and two stages of audio frequency could be added to this hook-up to advantage. If so, will you please publish a diagram?—E. L. Strebe, 452 Morgan St., Tonawanda, N. Y.*

Fig. 37 is the regenerative circuit as appearing in the August 9 issue with the addition of the radio and audio-frequency stages that you asked for. The absorption coil is moved over next to the radio-frequency tuning unit where it will be of the most use. Referring to the diagram, the constants are: C1, .0005 mfd. variable; C2, .0005 mfd. variable; C3, .00025 fixed; C4, .0005 mfd. variable; L, 50 turns on 3½" tube; L2, 40 turns on 3½" tube; L3, 10 turns on 3½" tube; L5, 50 turns on 3½" tube; L4, 30 turns on 2¾" tube; R1, 2, 3, 4, rheostats to match tubes; R5, 2 meg. leak; J1 and 2, double-circuit jacks; J3, open-circuit jack. Coils L and L2 are wound on the same tube, and coils L3 and L5 are wound on the same tube. L4 is wound on the separate smaller size tube. All wire is No. 22 SCC.

* * *

In June 21 issue of RADIO WORLD *you supplied data for the construction of a frequency changer which required two fixed couplers as per list of parts given in the articles. These fixed couplers are listed as L1L2 and L3L4. The data as to these inductances seem to be rather general. Are they just coils wound on tubing? If so, what is the best size of wire and tubing to use? L3 and L4 were given as having a variable number of turns. Will any number between the limits given be satisfactory? Would honeycomb coils give satisfactory results in this frequency changer?—G. A. Scott, University of Pittsburgh, Department of Physics, Pittsburgh, Pa.*

The couplers for the Metaform Frequency Changers are fixed coils, 3½" bakelite tubing being used for both and wound with No. 22 double silk or cotton covered wire. The number of turns on L3 and L4 is to be determined by the builder of the unit who detracts from the maximum as given in the instructions until the best value is reached. The ratio always remains 1 to 2. Do not know how honeycombs would work out as they have not been tried.

* * *

Please let me know if I can use the Cardwell .0005 mfd. low-loss condensers in the Dynoflex. I would like to build this set if I could use the above. Would the same number of turns of wire on the coils be used? What ratio transformer is necessary?—Morris Dorsey, 604 Woodward Ave., Atlanta, Ga.

The Cardwell condenser may be used with good success in the Dynoflex circuit. The constants will remain the same for the coils as published in the August 9 issue of Radio World. The tuning will be somewhat sharper with the condensers you have. The audio-frequency transformer may be from 5-1 to 10-1 ratio, but should be of a good make. This set works a loud speaker on one tube.

The transformer in the first AF stage is 5-to-1, and the one in the second stage 3 or 4 to 1.

* * *

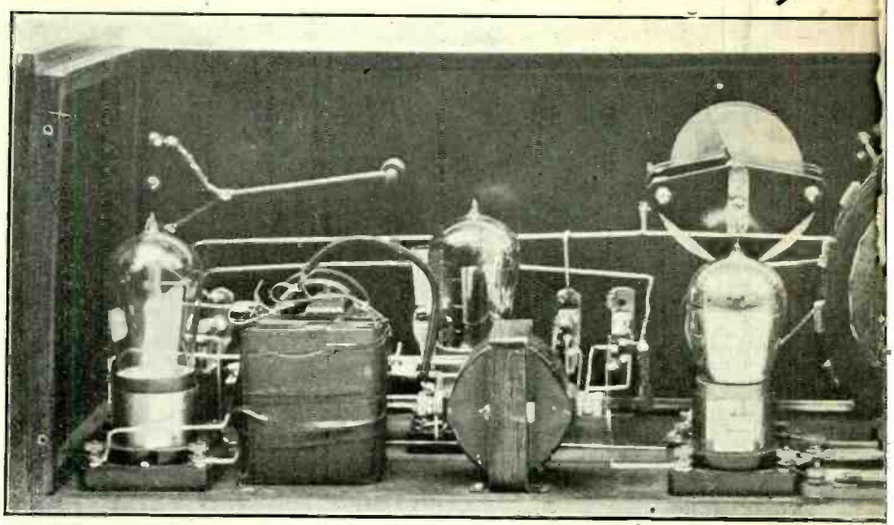
I have a home-made crystal receiver with home-made primary and secondary coils. All connections are tight, but all I hear is a steady buzz. There are three high tension wires of 13,000 volts each about 30 feet from the antenna, which is at right angles with the lines. A neighbor across the street has his antenna only 15 feet away yet gets good results on a vacuum tube set. I took my set to his house but still could only hear the buzz. What can the trouble be?—Paul Scharf, R. F. D. No. 3, Princeton, N. J.

You are evidently using a straight crystal hook-

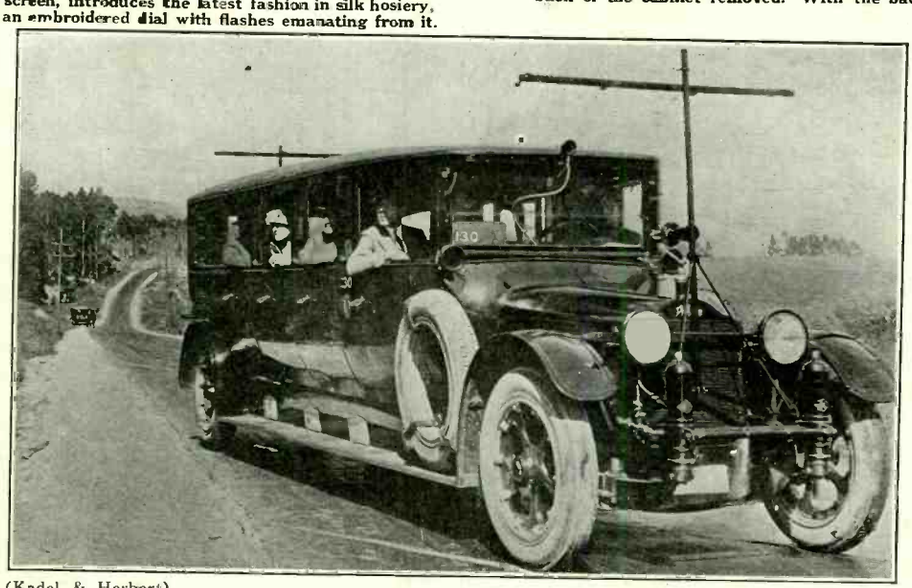
(Concluded on page 27)

What Is It? — Neat RF Circuit, S

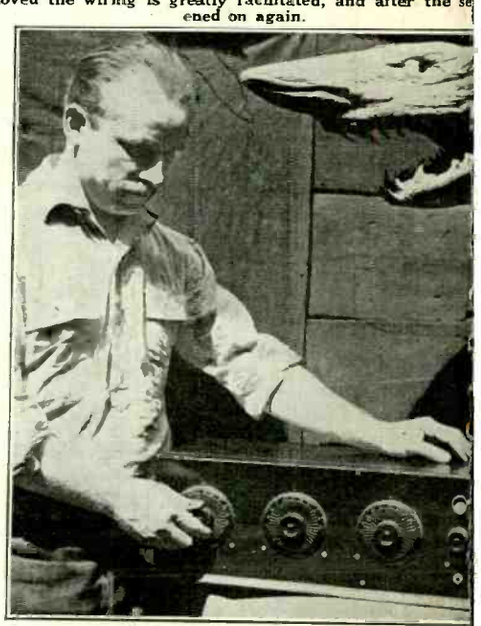
(Kadel & Herbert)
VIRGINIA PEARSON, who beautifies the silver screen, introduces the latest fashion in silk hosiery, an embroidered dial with flashes emanating from it.



(Kadel & Herbert)
A 4-TUBE SET employing a stage of fixed radio-frequency amplification, detector and two stages of a spider-web coupler, which has five taps taken from the primary. One variable condenser tunes the prim The tube at the left is the radio-frequency amplifier, and next to it, at left, is the fixed RF transformer By placing the grid leak and condenser as shown the builder eliminated long leads. The two stages o tube. Two 4½-volt C batteries, placed in series, provide the negative grid bias for both AF tubes. Th back of the cabinet removed. With the back removed the wiring is greatly facilitated, and after the se ened on again.



(Kadel & Herbert)
RADIO CONCERTS for the patrons of the California Transit Company is the latest radio development on the Pacific Coast. With only a 3-tube outfit, and handicapped with the necessity of operating with a low antenna, the tests proved successful. It is planned to equip all buses with sets operating speakers.

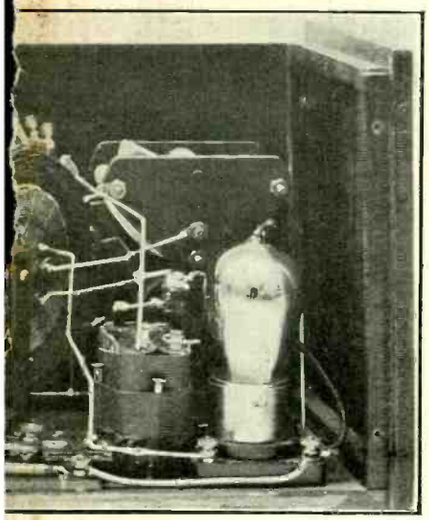


(Kadel & Herbert)
NOT MANY fans have a loud speaker like this one is placed inside of the mummified shar

(Foto Topics)
STATION 2CMG, the Hudson River Yacht Club, is fully equipped with its own receiving and transmitting outfit, through which the fleet may keep in constant touch with the home port. The members of the club show their interest by being present at the meetings.

(International Newsreel)
CHRIS McMANIES, of Boston, is deaf and blind, but he enjoys all the pleasures of the radio. By placing his fingers on the diaphragm of the ear-phone he is able to read the audible vibrations. He is also an expert touch typist and takes his notes from a dictophone.

hort Leads — Fun During Work



udio. The antenna and first tube are tuned by the
ıary and the other, a vernier, tunes the secondary.
. The second tube from the right is the detector.
f audio amplification are at the left of the detector
photograph of the entire set was taken with the
t is completed the back and hinged cover are fast-

(Gilliams)
A SURE 'NUFF SUPER caught in the act of construction. Robert Frazer, of Los Angeles, had to appropriate all the space in his garage to accommodate his radio workshop, where he has built many different types of sets and circuits. Every time a customer comes in for gas, the radio art suffers.

A loud speaker phone
's head.

(Fotograms)
THE PRIZE-WINNING TWINS at the Saratoga, N. Y., baby show, May and Roderick Sutton, use the same radio receiver, but with two pairs of phones. Should there be dissension in the camp when Roderick wants to hear the baseball scores, and May the sandman story, the twins will have to use separate sets. Notice the study in childhood expression that the photograph presents.

(Kadel & Herbert)
SECRETARY OF THE NAVY WILBUR on inspection tour of the radio equipment of the Navy Department. The Navy Radio has become indispensable to the government. Over 500 messages a day go through this office for the various government departments and officials, to and from every part of the world.

(Foto Topics)
HENRY FISKE TARBOX may be young in years, but by the looks of this outfit he built, he must be old in experience. The circuit is a combination of radio-frequency and regeneration and is changed by throwing over the switches seen in the foreground.

(Foto Topics)
MRS. CHARLES GUGGENHEIMER and Adolph Lewisohn, who are responsible for the Lewisohn Stadium concerts radiocast all during the summer months. Mr. Lewisohn finds it easy to keep young with radio.

RADIOCAST PROGRAMS

Thursday, September 18

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—3 P. M., tenor solos by Max Jacob Hamer; 3:15 P. M., piano recital by Rita Lownsberry; 3:30 P. M., anecdotes and songs from George White's Scandals of 1924 by Will Mahoney, comedian. 6:15 P. M., Albert E. Sonn in his weekly talk on "Radio for the Layman." 6:30 P. M., "Music While You Dine," Jimmie Lent and his orchestra. 7:20 P. M., resume of the day's sports with "Jolly Bill" Steinke.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—11 A. M., grand organ. 11:30 A. M., weather forecast. 12 N., luncheon music by the Tea Room Orchestra. 12:55 P. M., Naval Observatory time signal. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports. 10:55 P. M., time signal. 11:02 P. M., weather forecast.

WRC, Washington, 469m (640k), E. S. T.—5:15 P. M., instruction in international code. 6 P. M., Children's Hour by Peggy Albion. 8 P. M., Motoring Talk auspices of American Automobile Association. 9 P. M., Eliland Song Cycle by Von Fielitz, direction of Louis Thompson. 9:55 P. M., time signals and weather forecasts.

WDAR, Philadelphia, 509m (590k), E. S. D. S. T.—11:45 A. M., daily almanac. 12 Noon, organ recital from Stanley Theatre; features from the studio; Arcadia Cafe Concert Orchestra. 2-3 P. M., Arcadia Cafe Concert Orchestra; artist recital from the Studio. 4:30 P. M., artist recital from the Sudio; magazine corner. 5:45 P. M., sporting results and special announcements; 7:30 P. M., Dream Daddy with the boys and girls.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—2:15 P. M., baseball scores inning by inning. 5 P. M., baseball scores. 6:30 P. M., dinner concert by the KDKA Little Symphony Orchestra, Victor Saudek, conductor. 6 P. M., baseball scores. 6:30 P. M., The Children's Period. 6:45 P. M., address by a representative of Automobile Club. 7 P. M., baseball scores; Shade and Ornamental Trees. by the Fruit Growers Nurseries. 7:15 P. M., program arranged by the National Stockman and Farmer. 7:40 P. M., stockman reports of the primary livestock and wholesale produce markets. 8 P. M., concert arranged for Spanish speaking countries by the KDKA Little Symphony Orchestra; Nazarine La Marca, tenor. Announcements made in Spanish and English. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 337m (890k), C. S. D. S. T.—5:02 P. M., news, financial and final markets. 5:35 P. M., children's bedtime story by "Uncle Bob." 6 P. M., dinner concert. 7 P. M., "Twenty Minutes of Good Reading," by Rev. C. J. Pernin. 7:20 P. M., musical program. 8:15 P. M., "Safety First" talk by Mr. Z. C. Elkin. 9-10:30 P. M., "At Home" program.

WBZ, Springfield, Mass., 337m (890k), E. S. T.—12:55 P. M., time signals; weather reports; Springfield market report. 6 P. M., Leo Reisman Hotel Lenox Ensemble. 6:30 P. M., songs by Bill Coty and Jack Armstrong. 6:40 P. M., Leo Reisman and his Hotel Brunswick Orchestra. 7 P. M., results of games in American and National leagues. 7:05 P. M., market reports. 7:10 P. M., letter from New England Homestead; "At the Theatres," with A. L. S. Wood, dramatic editor. 7:30 P. M., bedtime story for the kiddies. 7:45 P. M., concert by Charles R. Hector with his St. James Theatre Orchestra. 8:15 P. M., Railroad Night.

WAAM, Newark, N. J., 263m (1140k), E. S. D. S. T.—8 P. M., a genuine musical surprise. 8:30 P. M., Irene Appel, soprano and Herbert E. Stickles, pianist. 8:45 P. M., Gene Collier in his "Radio Reel." 9 P. M., piano solo by Louis Ahles; banjo solo by Charles Cusanelli; cornet solo by George Turner. 9:30 P. M., Cattellos Radio Entertainers. 10 P. M., Henry LeCault, harmonica player. 10:30 P. M., continuation of dance program by Cattelo's Radio Entertainers.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., Leonard Partridge's Mayflower Orchestra. 6:30-7:30 P. M., dinner music by Paul Specht's Alamac Orchestra; violin solos by Olcott Vail, accompanied by Stephen Balogh. 9:30 P. M., Chas. Strickland's Palisades Park Orchestra. 10 P. M., Spear's Dance Orchestra. 10:30 P. M., Phil Romano's Roseland Orchestra. 11 P. M., Vincent Lane, Irish tenor. 11:10 P. M., Victor Wilbur, baritone. 11:20 P. M., Loew's vaudeville stars. 11:30 P. M., Parody Club Orchestra.

WWJ, Detroit, Mich., 517m (580k), E. S. T.—9:30 A. M., "Tonight's dinner" and a special talk by the Woman's Editor. 9:45 A. M., Public Health Service bulletins; talks of general interest. 10:25 A. M., weather forecast. 11:55 A. M., Arlington tmie. 12 P. M., Detroit News Orchestra. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5 P. M., baseball scores. 7 P. M., Detroit News Orchestra; Cyril Wezemael, baritone. 10 P. M., dance music by Jean Goldkette's Victor Recording Orchestra.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 A. M., household hints. 10:55 A. M., time signals. 11 A. M., weather and river forecast. 11:05 A. M., market quotations. 12 Noon, Chimes Concert. 12:15 P. M., weather forecast. 1 P. M., closing stocks and markets, including weekly report of wool market. 7 P. M., sport news and weather forecast. 9 P. M., orchestra program; the Palmer School Radio Orchestra.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—7:30-8:30 P. M., concert. 9:30-10:45 P. M., concert by negro singers from Cleburne, Texas.

WEAF, New York, 492m (610k), E. S. D. S. T.—11-12 A. M., talks to housewives and Vee Lawnhurst, pianist; market and weather reports. 4-5 P. M., Moonlight Instrumental Trio; children's stories. 6-11 P. M., dinner music from Rose Room of Hotel Waldorf-Astoria; mid-week services, auspices Greater New York Federation of Churches; Bob Schaefer, popular singer; Howard Forst, saxophonist; Evan Davies, impersonator; talk by the Bank of America; Effie de Niffen, pianist; Amphion Male Quartette; Vincent Lopez and his orchestra.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—3:30 P. M., baseball scores. 4:30 P. M., stock market reports; the Sunshine Girl; Pittsburgh Livestock quotations. 6:30 P. M., dinner concert from William Penn hotel. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores. 8:30 P. M., Moore's Cafeteria Weekly Radio Review.

WLW, Cincinnati, O., 423m (710k), C. S. D. S. T.—4 P. M., piano recital by Miss Adelaide Apfel. 10 P. M., message from the United States Civil Service. 10:30 P. M., concert program by The Milnor Instrumental Trio.

WJY, New York, 405m (740k), E. S. D. S. T.—7:30 P. M., weekly French lesson. 9 P. M., Al Reiser's Club Ferreri Orchestra.

WJZ, New York, 455m (660k), E. S. D. S. T.—10 A. M., daily menu. 10:20 A. M., "The Progress of the World." 10:35 A. M., "Planting," Peter Henderson Co., Thomas V. Peck. 10:50 A. M., Eleanor Gunn's fashion talk. 1 P. M., Nathan Abas' Hotel Pennsylvania Orchestra. 5:30 P. M., State and Federal agricultural reports; farm and home reports; closing quotations New York Stock Exchange; foreign exchange quotations; Evening Post News. 7:55 P. M., Collier's Weekly, Jno. B. Kennedy. 8 P. M., Wall Street Journal review. 8:10 P. M., Irene Jacques, soprano; Mrs. Anne Tindale, accompanist. 8:30 P. M., Wanamaker Organ Concert, Chas. Conbourn, organist. 9:30 P. M., John V. L. Hogan, "Outline of Radio History." 10:30 P. M., Waldorf-Astoria Dance Orchestra.

Friday, September 19

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—3 P. M., George Perry, tenor, and Russell Blumstein, pianist, joint recital. 3:15 P. M., soprano solos by Gertrude Bronenkant. 3:30 P. M., concert by orchestra of the S.S. President Harding, U. S. Lines. 6:30 P. M., "Man in the Moon" stories for the children by Josephine Lawrence and William F. B. McNeary. 7 P. M., joint program by Frederick Tedesco, accordian player, and Elic Ellstrom, violinist. 7:20 P. M., resume of the day's sports with "Jolly Bill" Steinke.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports; dinner music by A. Candelori and his Hotel Adelphia Roof Garden Orchestra. 8:30 P. M., special program from Fox Theater Studio. 9:10 P. M., musical program, direction of W. Palmer Hoxie and J. W. Leman. 10 P. M., grand organ recital, Harriette G. Ridley. 10:30 P. M., dance program by A. Candelori and his orchestra.

WRC, Washington, 469m (640k), E. S. T.—3 P. M., Fashion Developments of the Moment prepared by "Women's Wear." 3:10 P. M., song recital by Arthur McCormick, baritone. 3:20 P. M., "Beauty and Personality" by Elsie Pierce. 3:25 P. M., current topics. 3:35 P. M., piano recital by Ethel Grant. 3:50 P. M., Magazine of Wall Street. 4 P. M., song recital. 5:15 P. M., time signals and weather forecasts. 6 P. M., stories for children by Peggy Albion.

WDAR, Philadelphia, 509m (590k), E. S. D. S. T.—2-3 P. M., Arcadia Cafe Concert Orchestra; artist recital from Studio. 4:30 P. M., artist recital. 5:45 P. M., sporting results and special announcements. 7:30 P. M., Dream Daddy with the boys and girls. 8 P. M., "Turning the Pages," a book review and guide to new books and authors by Arnold Abbott; dance music by Charley Fry and his Million Dollar Pier Orchestra; WDAR Weekly Sportsman's Talk and Forecast by H. W. Shaner.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—5:30 P. M., organ recital by Paul E. Fleeger. 6 P. M., baseball scores; dinner concert. 6:30 P. M., The Children's Period. 6:45 P. M., news bulletins. 7 P. M., baseball scores. 7:40 P. M., Stockman reports of the primary livestock and wholesale produce markets. 8 P. M., concert by the Ingram Ladies Choral Society, assisted by Marie Bennett, soprano and Adolph MacLuckie, tenor. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 337m (890k), C. S. D. S. T.—5-5:30 P. M., news, financial and final markets; Dun's Review and Bradstreet's Weekly Review of Chicago Trade. 5:35 P. M., children's bedtime story by Uncle Bob. 6 P. M., dinner concert. 6:30-7 P. M., program broadcast from KYW's studio in the Duncan Sisters offices. 7 P. M., speeches, auspices American Farm Bureau Federation. 8-9:30 P. M., midnight revue.

WBZ, Springfield, Mass., 337m (890k), E. S. T.—12:55 P. M., time signals; weather reports; Springfield market report. 6 P. M., dinner concert by the WBZ Trio. 7 P. M., results of games in American and National leagues. 7:05 P. M., market reports. 7:10 P. M., Current Book Review by Court Square Book Store. 7:30 P. M., bedtime stories for the kiddies. 10 P. M., recital by Raymond J. Kelley, tenor, playing his own accompaniments. 10:30 P. M., soprano recital by Jean Livingstone Sherborn, accompanied by Mertina Bancroft, pianist and accompanist. 10:55 P. M., time signals; official weather reports. 11 P. M., concert by the WBZ Trio.

WHN, New York, 360m (830k), E. S. D. S. T.—5 P. M., Original Cambria Serenaders, Geo. Cambria, leader. 6:30-7:30 P. M., dinner music by Paul Specht's Alamac Orchestra; violin solos by Olcott Vail, accompanied by Stephen Balogh. 9:30 P. M., Crystal Palace Orchestra. 10 P. M., Gem Safety Razor Orchestra. 10:30 P. M., Fletcher Henderson and his Roseland Orchestra. 11 P. M., Wright and Bessinger, harmony singers. 11:10 P. M., Arthur Stone, world's famous blind pianist. 11:20 P. M., Loew's vaudeville stars. 11:30 P. M., Club Alabam Orchestra.

WWJ, Detroit, Mich., 517m (580k), E. S. T.—8 A. M., setting-up exercises by R. J. Horton, physical director. 9:30 A. M., "Tonight's Dinner" and a special talk by the Woman's Editor. 9:45 A. M., Public Health Service bulletins; talks of general interest. 10:25 A. M., weather forecast. 11:55 A. M., Arlington time. 12 P. M., Detroit News Orchestra. 3:50 P. M., official weather forecast. 3:55 P. M., market reports and baseball scores. 5 P. M., baseball scores. 7 P. M., Detroit News Orchestra; Alice Graze, soprano.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 A. M., household hints. 10:55 A. M., time signals. 11 A. M., weather and river forecast. 11:05 A. M., market quotations. 12 Noon, Chimes Concert. 12:15

Who Is America's Most Popular Radio Entertainer?

The Answer Will Be Published in the October 4 Issue

To enable RADIO WORLD *readers on the West Coast to mail their ballots for the most popular entertainer, in time for counting, the closing time has been extended to September 24. All ballots must be in* RADIO WORLD'S *Office by September 24, or bear postmark not later than 11:59 P. M. of September 24.*

Everybody is interested in this query: Who is America's most popular radio entertainer? You have your favorite. Who is she or he? Let us know your choice, whether a comedian, an opera singer, a jazz band, or a story-teller.

RADIO WORLD wants to be able to tell the world the name of the entertainer who stands highest in the regard of listeners-in.

Use the accompanying blank and mail to Radiocasting Manager, RADIO WORLD.

Cut off. Fill out. Mail today.

RADIOCASTING MANAGER, RADIO WORLD,
1493 Broadway, New York City.

Dear Sir:

My favorite entertainer is.....Station.....

Name .....

Street Address .....

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Yearly subscribers for RADIO WORLD may, when sending in their $6.00 for a yearly subscription, vote the entire fifty-two issues in advance for their favorite entertainer, when they so designate their desire to do so. In the August 16 issue was published a tally showing H. M. Snodgrass, of WOS, Jefferson City, Mo., leading.

P. M., weather forecast. 1 P. M., closing stocks and markets. 7 P. M., sport news and weather forecast. 7:15 P. M., educational lecture. 8 P. M., musical program of old-time music, furnished by old-time fiddlers. 9 P. M., Weekly Tourists' Road Bulletin.

WBAP, Fort Worth, Tex., 476m (620k), C. S. T.—7:30-8:30 P. M., concert. 9:30-10:45 P. M., concert by the Palo Pinto Square Dance Band.

WEAF, New York, 492m (610k), E. S. D. S. T.—11-12 A. M., health talk by the New York Health Speakers' Service; talk on dahlias by Marshall A. Howe of the New York Botanical Gardens; market and weather reports. 4-5 P. M., "Club Program for Women," with talks by May Laird Brown and Mary Garrett Hay, Hon. Vice-President of the General Federation of Women's Clubs. 6-10 P. M., dinner music from Rose Room of the Hotel Waldorf-Astoria; Jordan M. Cohan, pianist; "The Happiness Boys," Billy Jones and Ernest Hare; William Chosnyk, violinist; B. Fischer and Company's "Astor Coffee" Dance Orchestra.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—3:30 P. M., baseball scores. 4:30 P. M., Sunshine Girl; stock market reports; Pittsburgh livestock quotations. 6:30 P. M., dinner concert. 7:30 P. M., Uncle Kaybee. 8 P. M., baseball scores; Ben Fields will sing several popular songs. 8:30 P. M., musical program.

WLW, Cincinnati, O., 423m (710k), C. S. D. S. T.—11 A. M., weather forecast and business reports. 1:30 P. M., market reports. 3 P. M., stock quotations. 4 P. M., piano recital by pupils of Leo Stoffregen; violin solos by Fred Schroder.

WJY, New York, 405m (740k), E. S. D. S. T.—7:30 P. M., Leonard Nelson's Knickerbocker Grill Orchestra. 8:15 P. M., Time Pop Question Game.

WJZ, New York, 455m (660k), E. S. D. S. T.—10 A. M., daily menu. 10:20 A. M., arts and decorations talk. 10:50 A. M., Eleanor Gunn's fashion talk. 1 P. M., Hotel Ambassador Trio. 4:30 P. M., Hotel Astor organ recital. 5:30 P. M., State and Federal agricultural reports; farm and home reports; closing quotations New York Stock Exchange; foreign exchange quotations; Evening Post News. 7 P. M., Lafayette Hotel Orchestra. 8 P. M., Wall Street Journal review. 8:15 P. M., Looseleaf Current Topics, William H. Allen. 8:30 P. M., Warner Hawkins, pianist. 10:30 P. M., Harold Stern's Belleclair Towers Orchestra.

Saturday, September 20

WOR, Newark, N. J., 405m (740k), E. S. D. S. T.—6:15 P. M., "Music While You Dine," Ernie Krickett's Orchestra. 7:15 P. M., resume of the day's sports with Jolly Bill Steinke. 8:15 P. M., "Personal Close-ups of the Three Presidential Candidates" by Hon. John W. Barrett, former American Ambassador and Chairman of the International Pan-American Committee. 9:30 P. M., Clarence Buddington Kelland, author, short story and scenario writer. 9:45 P. M., program under the direction of Mabelanna Corby. 10:15 P. M., The Gotham Entertainers in a popular program.

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—11 A. M., grand organ. 11:30 A. M., weather forecast. 12 Noon, luncheon music by the Tea Room Orchestra. 12:55 P. M., time signal. 4:45 P. M., grand organ and trumpets. 7:30 P. M., sports results and police reports. 10:55 P. M., time signal. 11:02 P. M., weather forecast.

WRC, Washington, 469m (640k), E. S. T.—5:15 P. M., instruction in international code. 6 P. M., Children's Hour by Peggy Albion 7:45 P. M., bible talk. 9 P. M., talk by C. Frances Jenkins. 9:55 P. M., time signals and weather forecasts.

WDAR, Philadelphia, 509m (590k), E. S. D. S. T.—11:45 A. M., daily almanac. 12 Noon, organ recital from the Stanley Theatre, Arcadia Cafe Concert Orchestra; features from the Studio. 2-3 P. M., Arcadia Cafe Concert Orchestra. artist recital. 4:30 P. M., dance program. 5:45 P. M., sporting results and special announcements. 7:30 P. M., Dream Daddy with the boys and girls.

KDKA, Pittsburgh, 326m (920k), E. S. D. S. T.—12 M., weather forecast; stockman reports of the Pittsburgh livestock and wholesale produce markets. 2 P. M., popular concert, with baseball scores, inning by inning. 5 P. M., baseball scores. 5:30 P. M., dinner concert by the Westinghouse Band, T. J. Vastine, conductor. 6:30 P. M., The Children's Period. 6:45 P. M., Last Minute Helps to Teachers. 7 P. M., baseball scores; sports review by James J. Long. 8 P. M., concert by the Westinghouse Band; Max Kroen, baritone, and Edwin Kroen, tenor. 9:55 P. M., time signals; weather forecast; baseball scores.

KYW, Chicago, 337m (890k), C. S. D. S. T.—5:02 P. M., news, financial and final markets. 5:35 P. M., children's bedtime story by "Uncle Bob." 6 P. M., dinner concert broadcast from Congress Hotel. 7 P. M., musical program. 8:05 P. M., talk by Vivette Gormarc of Peoples Gas Co. 8:10 P. M., short stories, articles and humorous sketches.

WBZ, Springfield, Mass., 337m (890k), E. S. T.—7 P. M., results of games in American and National leagues. 7:05 P. M., market reports. 7:30 P. M., bedtime story for the kiddies. 7:40 P. M., concert by the Hotel Kimball Trio. 9 P. M., program arranged by Mrs. Pauline Hammond Clark, presenting singers and instrumentalists. 10:55 P. M., time signals; official U. S. weather reports.

WHN, New York, 336m (830k), E. S. D. S. T.—8 P. M., Jimmy Flynn, tenor. 8:15 P. M., Eleanor Rose, soprano. 8:30 P. M., Charles Mansfield, lyric tenor. 8:45 P. M., Perfect Harmony Four Male Quartette. 9 P. M., Gertrude Sammis, concert pianist. 9:15 P. M., Charles Degele, violinist with Segerer Brothers in zither selections. 9:30 P. M., "What Your Vote Means," by John D. Flynn of the National Security League. 9:45 P. M., Fitzpatrick Brothers in old time medlies. 10 P. M., Charles Strickland's Palisades Park Orchestra. 10:30 P. M., Lottie Grooper, in French selections. 10:45 P. M., Vic and Jack Lauria, singing and ukulele. 11 P. M., Jimmy Clarke and his entertainers. 11:30 P. M., Fletcher Henderson and his Roseland Dance Orchestra.

WWJ, Detroit, Mich., 517m (580k), E. S. T.—9:30 A. M., "Tonight's Dinner" and a special talk by the Woman's Editor. 9:45 A. M., Public Health Service bulletins and talks of general interest. 10:25 A. M., weather forecast. 11:55 A. M., Arlington time. 12 P. M., Detroit News Orchestra. 3:50 P. M., weather forecast. 3:55 P. M., market reports and baseball scores. 5 P. M., baseball scores. 7 P. M., Detroit News Orchestra.

WOC, Davenport, Ia., 484m (620k), C. S. T.—9 A. M., opening market quotations. 10 A. M., household hints. 10:55 A. M., time signals. 11 A. M., weather and river forecast. 11:05 A. M., government bulletins. 11:15 A. M., closing market quotations. 12 Noon, Chimes Concert. 12:15 P. M., weather forecast. 7 P. M., sport news and weather forecast. 9 P. M., orchestra program by The Palmer School Radio Orchestra.

KSD, St. Louis, Mo., 546m (550k), C. S. T.—8 P. M., Missouri Theater Orchestra and specialties broadcast direct from Missouri Theater.

WEAF, New York, 492m (610k), E. S. D. S. T.—4-5 P. M., Bruno Brothers Dance Orchestra. 6-11 P. M., dinner music from the Rose Room of the Hotel Waldorf-Astoria, New York City; dance music by the Alpha Syncopators; Joseph Mathieu, tenor; Jimmie Clark, pianist; Viola Silva, contralto; Vincent Lopez and his Orchestra from the Hotel Pennsylvania.

WCAE, Pittsburgh, 462m (650k), E. S. D. S. T.—3 P. M., piano recital by Prof. Otto Kalteis. 3:15 P. M., baseball schedule; results of games. 4:30 P. M., Pittsburgh Livestock quotations. 6:30 P. M., dinner concert from the William Penn hotel. 7:30 P. M., Uncle Kaybee. 7:45 P. M., baseball scores; Lew KeKnnedy, popular songs. 8:30 P. M., musical program.

WLW, Cincinnati, O., 423m (710k), C. S. D. S. T.—11 A. M., weather forecast and business reports. 1:30 P. M., market reports.

WJZ, New York, 455m (660k), E. S. D. S. T.—1 P. M., Hotel Vanderbilt Orchestra; Joseph Strissof, director. 4 P. M., Everett Hirschfield, baritone. 5:30 P. M., State and Federal agricultural reports; farm and home reports; closing quotations New York Stock Exchange; foreign exchange quotations; Evening Post News. 7 P. M., Waldorf-Astoria Dance Orchestra. 9 A. M., May Singhi Breen, banjo. 10:30 P. M., Hotel Astor Dance Orchestra.

Sunday, September 21

WOO, Philadelphia, 509m (590k), E. S. D. S. T.—2:30 P. M., musical exercises, regular Sunday afternoon session of Bethany Sunday School. 6 P. M., sacred recital on the Wanamaker Grand Organ by Clarence K. Bawden. 7:30 P. M., evening services from Bethany Presbyterian Church, organ recital by Caroline Quigg, sermon by Rev. Dr. A. Gordon MacLennan.

WHAS, Louisville, Ky., 400m (750k), C. S. T.—9:57 A. M., organ music. 10 A. M., church service, auspices First Christian Church, the Rev. Dr. E. L. Powell, pastor; Chester Solomon, choir director; Miss Florence Montz, organist. 4-5 P. M., vesper song service and sermonette auspices First Unitarian Church; the Rev. Dr. Lon R. Call, pastor.

KYW, Chicago, 337m (890k), C. S. D. S. T.—10 A. M., Central church service broadcast from Orchestra Hall, Chicago; Dr. F. F. Shannon, pastor; musical program, direction of Daniel Prother. 1:30 P. M., Studio chapel service.

WGY, Schenectady, N. Y., 380m (790k), E. S. D. S. T.—9:30 A. M., service of First Baptist Church, Schenectady; sermon by the Rev. Gordon H. Baker. 6:30 P. M., service of First Baptist Church, Schenectady; sermon by the Rev. Gordon H. Baker.

KGW, Portland, Ore., 492m (610k), P. T.—6 P. M., church services.

WWJ, Detroit, Mich., 517m (580k), E. S. T.—7:30 P. M., services at St. Paul's Episcopal Cathedral, broadcast from the cathedral. 5 P. M., Detroit News Orchestra.

KFI, Los Angeles, 469m (640k), P. T.—10 A. M., L. A. Church Federation Service. 6:45 P. M., Metropolitan Theatre program. 8 P. M., Ambassador Hotel Concert Orchestra. 9 P. M., program from Examiner Studio. 10 P. M., Packard Six Orhcestra.

KGO, Oakland, Cal., 312m (960k), P. T.—11 A. M., service from Tenth Avenue Baptist Church, Oakland, California. 3:30 P. M., concert by KGO Little Symphony Orchestra, and All Souls' Episcopal Church Choir of Berkeley, California. 7:45 P. M., evening service, Tenth Avenue Baptist Church.

Monday, September 22

WHAS, Louisville, Ky., 400m (750k), C. S. T.—4-5 P. M., selections by the Alamo Theater orchestra; Harry S. Currie, conductor; police bulletins; weather forecast for Kentucky, Indiana and Tennessee; "Just Among Home Folks"; readings; late news bulletins. 4:55 P. M., local livestock, produce and grain market reports. 5 P. M., Central Standard time.

WGY, Schenectady, N. Y., 380m (790k), E. S. D. S. T.—11:30 A. M., stock market report. 11:40 A. M., produce market report. 11:45 A. M., weather report. 11:50 A. M., repor on farm movement of lettuce. 11:55 A. M., time signals. 1 P. M., music and talk, "Framing the Nursery Windows." 5 P. M., produce and stock market quotations; news bulletins; baseball results. 7:40 P. M., baseball results. 7:45 P. M., mandolin, soprano and piano selections.

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecast. 3:30 P. M., literary program by Portland Library Association. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weaher forecast and market reports. 8 P. M., concert.

WAAW, Omaha, Neb., 360m (830k), C. S. T.—7:30-9 P. M., Happy Home Orchestra; old time

(*Continued on page 28*)

A THOUGHT FOR THE WEEK

—A boy in the home, listening to the radio, is a better citizen of tomorrow than the boy on the street corner listening to nobody knows what.

RADIO WORLD

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SEPTEMER 20, 1924

Round-the-World Programs

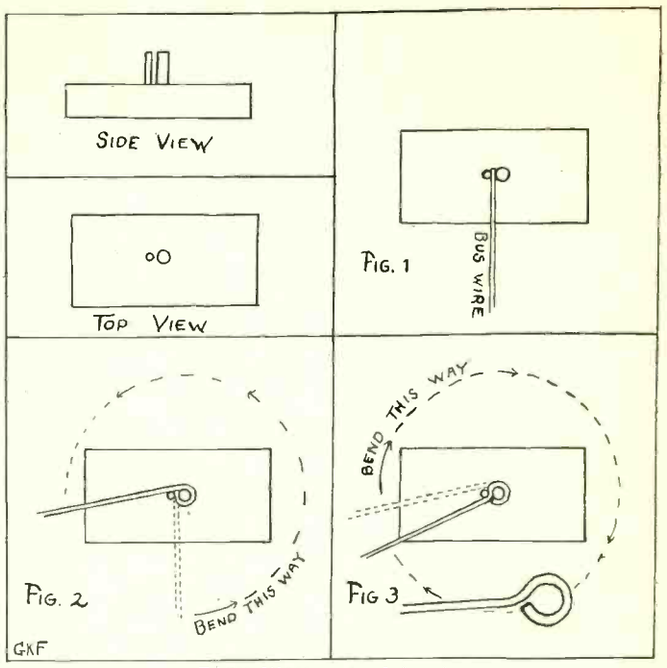
THE "round-the-world" feat seems to be the inevitable goal of science. Circumnavigation of the globe on a sailboat was the first record in this class. When a steamship did it many years later, and even when some of the American fleet circled the globe in fast time, there was less for scientists to gloat over, though justifiable pride was exhibited. Now the United States has achieved aerial circumnavigation. The next step, of course, will be for radio programs to circle the earth with regularity. That may be expected, too. While little may be in store for a few years in the receiving end, much may be done for improving transmission. Therein seems to lie the possibility.

Handy Bus-Bar Bender

By Guy K. Fuller

HERE is a kink that will help those who have no round-nose pliers in making neat eyeholes in bus wire for wiring their sets permanently.

Take a small block of hard wood about 3" by 6" and about 1" thick. Cut off the heads of two nails below the rough part. Use nails about the size of the screws or binding posts on your instruments, say one nail about 6 penny and one 10 penny. Drive nails in the block, leaving about 1" out, and just far enough apart to let bus wire through. This is important. Then fasten the block on your workbench or any place suitable where it may be left permanently. Place bus wire between nails as in Fig. 1 and bend, holding next to block, counter clockwise until you have completed the eye (Fig. 2). Now bend it back clockwise until you have the eyelet completed (Fig. 3). Slip the wire off the nail and you have a neat eyelet. If you wish to make a smaller eyelet just bend in opposite direction around the smaller nail.



EASY WAY to bend bus bar.

Marching Onward

THE Fall Buyers' Number of RADIO WORLD, dated September 27, on sale Wednesday, September 24, will contain a remarkable array of interesting articles including: Selecting a Complete Set, by N. N. Bernstein, Technical Editor; A 1-Dial, 2-Tube Crystal Reflex, by Byrt C. Caldwell; How to Make a Telephone Relay for Tubeless AF, by A. F. Lapierre, Consulting Engineer; The Lure of the Crystal, by Brewster Lee; Resistance-Coupled Audio Frequency, by Wainwright Astor; Oscillators, Their Functions and Uses, by J. E. Anderson, Radio Engineer; Why the Best Loud Speakers Behave, by Knolleys Satterwhite; The Amazing Growth of Radio, by Joseph Justice; Review of Radio Products; How to Make One Stage of AF, by Herman Bernard, and a Complete List of Radiocasting Stations.

RADIO WORLD

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A Weekly Paper Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y.

September 20, 1924
Vol. 5 No. 26
15 Cents.

A COMPLETE LIST OF RADIOCASTING STATIONS, revised and corrected up to the date of going to press, will be published in the September 27 issue of RADIO WORLD, on sale next Wednesday

Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers, are published in RADIO WORLD, on request of the reader. The blank below may be used, or a post card or letter will do instead.

Service Editor,
Radio World,
1493 Broadway, New York City.
I desire to receive radio literature.

Name .....

City or town .....

State .....

John J. Mahon, 730 Capouse Ave., Scranton, Pa.
W. J. Lester, Ada, W. Va.
Dick Randall, Winlock, Wash.
John Fox, 120 Essex St., Bangor, Me.
Thomas Mack, dealer, Clifton, N. J.
H. Speare, 1463 E. 26th St., Brooklyn, N. Y.
Robert H. Moore, 400 W. 23d St., N. Y. C.
Sanford Battery Service Co., Box 64, Sanford, Fla.
R. Gordon, 650 Center St., Waukegan, Ill.
J. K. O'Brien, 2116 Penn St., Kansas City, Mo.
H. L. Washburn, RFD 2, Potsdam, N. Y.
Carl G. Andrews, Madalin, N. Y.
S. T. Robinson, 123 S. Main St., Lewistown, Pa.
Frank Radio Co., 1325 S. 28th St., Louisville, Ky.
J. C. Overstreet, Jr., Plumerville, Ark.
Wm. Woolridge, Minot, N. D.
R. J. McLeod, 7725 Kellog Ave., Detroit, Mich.
Joseph Dunn, 13 Freeman St., Newark, N. J.
Paul S. Rader, Box 251, Jamesburg, N. J.
J. R. M. Dillon, Clarkston, Ga.
L. E. Siegfried, 1513 Tyndall St., Pittsburgh, Pa.
Louis L. Lauve, Jr., 366 Canal St., N. Y. C.
W. B. Hubbard, 1366½ N. St. Andrews St., Los Angeles, Calif.
J. H. McDandiels, 3405 Tracy Ave., Kansas City, Mo.
L. A. Jewell, 69 Leslie St., Buffalo, N. Y.
Tyler & Tyler Radio Corp., Box 639, Dallas, Tex.
E. Hemberger, Jr., Sea Gate, Brooklyn, N. Y.
George Calvert, 405 Wolfe St., Three Rivers, Mich.

Plan to Announce Election Result From Show

THE extraordinary progress made by the radio industry of the United States since the last National Radio Exposition in New York in 1923, and the many striking improvements in radio apparatus to be placed on the market in 1925, will be reflected in hundreds of exhibits at the Third Annual National Radio Exposition to be held on the main and mezzanine floors of the Grand Central Palace, New York City, November 3-8, inclusive. As the Exposition takes place during Presidential Election Week, leading radio organizations in the United States will co-operate with the National Radio Exposition to give a remarkable demonstration of the power and place of radio in the nation's political battles. Arrangements are now in progress to make the National Radio Exposition the last-minute forum of the Presidential campaign. Not only will facilities be placed at the disposal of the three candidates for the Presidency of the United States to radiocast from the Grand Central Palace closing messages to millions of radio listeners in the United States, but efforts will be made to radiocast election returns from the National Radio Exposition on a country-wide scale.

The country's favorite radio announcers and entertainers, withdrawn for the occasion from some of the larger stations, will take their turn at the microphone at the Exposition. The program will be under the direction of S. L. Rothafel ("Roxy"), whose admirers range into the millions.

New Corporations

Liberty Electric Corp., N. Y. C., 2,000 shares preferred stock, $100 each; 10,000 shares common, no par value. E. G. Schiffmacher, H. H. Haire, R. G. Levy. Attorney, C. A. Levy, 110 William St.

Alco Electric Co., N. Y. C., make dynamos, $15,000. A. Skillman, A. J. Johnson, E. Mellett. Attorney, H. Goldman, 120 Broadway.

Firms Worth $100,000,000 Join in New Association

CHICAGO.

SIX Chicago radio manufacturers, meeting at dinner, decided to organize an association of manufacturers for the purpose of improving and stabilizing the industry. Soon they saw the plan carried well forward toward success when the Radio Manufacturers' Association was permanently organized at a meeting in the Hotel Sherman, Chicago, attended by representatives of more than forty concerns representing more than $100,000,000 in the industry. Manufacturers from New York were represented in the organization, which is to cover the entire United States and Canada.

Major Herbert H. Frost was unanimously elected president, Frank Reichmann, vice-president and A. J. Carter secretary-treasurer. They, with A. A. Howard, E. N. Rauland, Philip Lenz, Jr., and J. McWilliams Stone, form the board of directors. Charles H. Porter was named as executive secretary. Two vacancies were left on the board to allow for future growth of the association.

The Radio Trade

Magnavox Spreads Out; Offers Receivers

THE Magnavox Company of Oakland, Calif., are distributing to their wholesale representatives two new Magnavox receiving set models, TRF-50 and TRF-5. The same circuit is employed in both models, the difference being that the TRF-50 (as illustrated) has larger cabinet with built-in Magnavox Reproducer. The new Magnavox set is a 5-tube tuned radio-frequency circuit consisting of two stages of tuned radio-frequency of special design, detector, and two stages of audio-frequency. A new type of amplifying network is used in the radio-frequency circuits. This circuit gives true power amplification at radio-frequency, resulting in an extremely high gain per stage. At the same time, the circuit is inherently stable and no potentiometer or other source of losses is necessary to prevent oscillation. This results in long life of both tube and B batteries. Another feature of this circuit is that the receptor is equally sensitive at long and short wavelengths.

Magnavox Broadcast Receivers offer simplicity of control, reproduction of exceptional clearness period cabinets which harmonize with any style in any desired volume and handsomely carved of furniture.

The Unit Tuner permits all tuning to be done with a single dial, this simplicity resultng from a unique method of balancing the constants so as to bring the several circuits into resonance.

TRF-50 is a cabinet set designed for convenience of operation as well as attractive appearance. This model contains a built-in Magnavox Reproducer unti of the semi-dynamic type which consumes no battery. Tubes and B batteries are readily accessible by raising the hinged dust-proof cabinet top equipped with automatic holder. A battery terminals are provided in the rear. TRF-5 model consists of a smaller and simpler cabinet without built-in Reproducer but with space for B batteries.

The Magnavox office in New York City is at 350 West 31st Street, and in San Francisco is at 274 Brannan Street.

The firm recently put tubes on the market.

Credit System Inaugurated in Chicago

A COMPREHENSIVE system for the interchange of credit information in the radio industry has just been installed in the central office of the Radio Manufacturers' Association, at 123 West Madison Street, Chicago, under the direction of the association's Credit Committee. This committee is composed of Walter H. Trimm, chairman; Donald MacGregor, Theodore Sheldon, Ronald Webster, John C. Tully and H. E. Wilkins. A committee report said:

"We are in a new business, a business growing faster than any industry in the country. It is not strange then that we need a source of credit information not heretofore provided. Our business is not confined to one class of merchants. We reach the radio jobber, the electrical jobber, the hardware jobber, the automotive jobber, the music trade jobber, and others. For our own protection we must have available all the credit information we can secure regarding all of our customers, no matter what their business may be outside of radio lines and your committee believes that the only way to secure this protection is to interchange credit information among ourselves."

Southwestern Show, Oct. 14 to 19, in Dallas

THE Southwestern Radio & Electrical Exposition will be held at Dallas, Texas, in the Parkmoor Building, October 14 to 19, inclusive. These dates are simultaneous with the Annual Texas State Fair which is expected to bring 1,000,000 visitors at Dallas. The mailing address of the exposition is Adolphus Hotel, Dallas. Admission price to the fair will be 25 cents.

Uses 1,000 Radio World Copies at Fair

Editor, RADIO WORLD:

THE 1,000 copies of RADIO WORLD were received and distributed at the LaPorte County Fair and the fair was a great success, especially from our viewpoint. We had a space 14'x23' in the arts building, where we displayed almost everything used in radio, and attracted most of the people who entered the grounds to the building with a Super-Heterodyne and two-stage power amplifier giving enough volume to completely drown out pianos and phonographs operated within a few yards of us.

THE RADIO CLUB INC.,
Chas. Middleton,
719 Michigan Ave., La Porte, Ind.

Tradiograms

THE MOHAWK ELECTRIC COMPANY is the new name of the former Electrical Dealers' Supply House. The firm manufactures radio apparatus. The address is Mohawk Building, Diversey and Logan Boulevard, Chicago.

THE BEL-CANTO MANUFACTURING CO. is located in its new and more spacious office, 872 Broadway, New York City. For the last three years the Bel-Canto office was on 34th Street, but the great growth of its business required more spacious quarters. The firm is preparing an interesting announcement.

Coming Events

SEPT. 22-28—First Annual Radio World's Fair, Madison Square Garden, New York City.

SEPT. 23—First Annual Banquet, Radio Writers' League, Hotel Majestic, New York City.

SEPT. 27 TO OCT. 8—Exhibition, National Association of Radio Manufacturers, Albert Hall, London, England.

OCT. 1—Meeting of Institute of Radio Engineers, at 29 West 39th St., N. Y. C. H. de A. Donisthorp will read a paper, "Radio Direction Finding."

OCT. 4-11—Radio and Electrical Exhibition by the Radio Institute, 309 West Cordova St., Vancouver, B. C.

OCT. 14 TO 19, INCLUSIVE—Southwestern Radio & Electrical Exposition, Parkmoor Building, Dallas, Texas. Mailing address, Adolphus Hotel, Dallas.

NOV. 3-8—Third Annual National Radio Exposition, Grand Central Palace, New York City, under auspices of American Radio Exposition Co., 522 Fifth Ave., N. Y. C. Annual National Radio Convention in conjunction with show.

NOV. 24 TO 30, INCLUSIVE—International Radio Week.

DEC. 1 TO 8, INCLUSIVE—Boston Radio Exposition, Mechanics Building, Boston.

Business Opportunities Radio and Electrical

Rates: 40c a line; Minimum, 3 lines.

TECHNICAL GRADUATE, 30, wide, industrial experience dry batteries; food packing; general merchandising capable executive; invest $2,000, with services, going business. Box O, Radio World.

ESTABLISHED RADIO MANUFACTURER has opening bookkeeper-stenographer, take financial interest; salary; curiosity seekers don't apply. Box O1, Radio World.

Eletto Waxes Hot Under Collar Over Telegram

Blood Relationship Does Not Deter Him From Denouncing Cousin Ayeno

Salt Lake City, U. Sep124 17564 P.M. Collect

Ayeno Tammayota,
My blood relationship cousin,
Care Cheap Cut Rate Laundry,
San Francisco, Cal.

Say, gee and blazes, good American talk, why you send me so heavy collect telegram stop because we cousins make no right charge Niagara cascade and torrent dictionary words so much as per syllable stop I tell you truly like what you are (Deletion here by Western Union), and lot more besides stop why because you have so fine radio set you get insect house top dishonorable cranium head stop well, Eletto, I too got most fine set better more efficiently wonderful than yours stop my set not hand painted by Japan fool could say much worse only gracious Geisha beauty taking this on clicker machine not take down she lady more than you, Tammayato stop Anyway howsoever and additional my set better yours even lacking all those fooishments about dragons etcetera and likewise stop so I honorably issue most fearful challenge to you saying indubitably see dictionary my set less fool than yours like I less fool than you, cousin relation stop so I send this telegraph night letter very length wise but day time collect so cost more stop see how you like dig wonderful American dollars for great fool oration language over wires stop I also sent love and kisses because cost more your money stop now shut up radio set talk also mouth and all be happy.

Your blood relationship cousin,
ELETTO OATANNO,
Cut Low Price Laundry,
Salt Lake City, Utah.

GOLDEN-LEUTZ SUPER PLIODYNE-6

TRADE MARK REG.

"The Perfect Broadcast Receiver"

A New Superior Broadcast Receiver

SIMPLE—LONG RANGE—HIGHEST QUALITY—

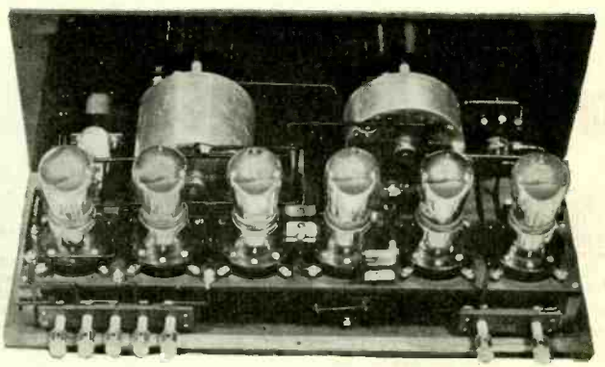
NON-RADIATING—NON-REGENERATIVE

Two Stages Tuned Radio Frequency—Detector and Three Stages of Audio Frequency Amplification

$95.00

Completely Constructed. Transportation Prepaid.

PLIODYNE 6
Front View Showing Simplicity of Control



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Rather than sell this high grade receiver to wholesalers at $190.00 less 50% discount we are going to sell it direct to you at wholesale, saving you $95.00 and at the same time giving you the finest set that can be bought for twice the amount.

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We will send the "Pliodyne 6" C. O. D., transportation prepaid, with privilege of inspection. If it does not appeal to you as the finest medium priced broadcast receiver you ever saw, return it to us at our expense.

Otherwise take advantage of

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Accept the C. O. D. and try the "PLIODYNE 6" for five days. If you are not satisfied in every way return it at our expense and we will return your money.

OUR GUARANTEE

We guarantee every Golden-Leutz "Pliodyne 6" to be the finest broadcast receiver that can be manufactured, using 6 tubes or less and to be satisfactory to you in every way and to reach you in perfect condition.

You take no risk whatever in sending us your order, for unless you are completely satisfied with the receiver and with your saving, you may return the receiver to us and we will refund your money.

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NOTE: We reserve the right to withdraw the Free Trial Offer if our Factory Production is exceeded. Golden-Leutz, Inc.

The Radio University

(Concluded from page 15)

up, or if it is a double circuit the wiring must be wrong. There is a good crystal circuit that will work without giving you a hum or buzz published in RADIO WORLD for September 13. Instead of the variocoupler you will have to use a variometer, but the results will repay you for the change.

* * *

I have a home-made Superdyne, using Tuska coupler and home-made plate impedance coil, Bradleystat on detector, Bradleyleak, three stages of audio amplification, 5-to-1, 3-to-1 and last step push-pull. I use 90 volts of the plates of the amplifiers with excellent results. However, I want to rebuild the set on the low-loss style as described in RADIO WORLD *for August 23 and 30. Would you recommend the Double Superdyne in preference to the single style? Will Globe Superdyne coils be satisfactory in the Low-Loss Superdyne?—I. E. Scott, Secretary, Masonic Hall, Cleburne, Texas.*

Before experimenting with the double Superdyne suggest that you get all the experience you can with the standard type. The Globe coils conform with the coils described in the Low-loss Superdyne article you refer to. You will get quite as much volume with the 3-stage resistance-coupled amplifier set as with your present outfit.

RADIO WORLD'S

Radiocast University

Questions and Answers On the Air Every Wednesday Evening at WLS, the Sears-Roebuck Station, Chicago — Department Conducted by Mat H. Friedman, RADIO WORLD'S *Chicago Representative.*

How can I shield the series antenna condenser and the variocoupler of my regenerative set from body capacity?—Charles Schock, 2703 W. Adams St., Chicago.

To shield the instruments cut out of a sheet of heavy tin or copper foil a pattern that will fit onto the back of the panel without touching any of the units or binding posts. Paste this on carefully with glue and solder a connection from the ground binding post to any part of the sheet. It will be easier for you to shield the whole set than portions of it.

* * *

I would like to get diagrams and constructional information of some good 3 or 5 tube set with which I can tune sharply and get good distance and volume. I am enclosing a diagram of the circuit I am using at present. With it I get the locals very well but cannot tune one out from the other and I cannot get anything out of town. Can you tell me why?—R. Kaan, 4141 Oakdale Ave., Chicago.

RADIO WORLD has published several excellent articles on how to make 3 and 5-tube sets quite recently among which are the Magnadyne, a 5-tube Neutrodyne, in the issues of August 16 and 23; a New Low-Loss Superdyne, 5 tubes, in the issues for August 23 and 30 a 3-Tube Reflexed Neutrodyne, in the issue for September 13. Any one of these circuits will do all that you ask. The articles are complete with diagrams, assembly plans and complete constructional information. The sketch you enclosed is an old single circuit regenerative hook-up that is not very efficient. Suggest that you build a more modern outfit as mentioned before.

Programs

Monday, September 22

(*Continued from page 19*)

dance music, auspices J. J. Markey & Son, South Omaha.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., address, Dr. Ellie W. Shuler, Geologist Southern Methodist University, on "History in Texas Rocks." 8:30 P. M., Mozart Choral Club, Earle D. Behrends, directing, in recital.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herald News bulletins. 5:30 P. M., Examiner news bulletins. 8 P. M., Evening Herald, Those Boys Dance Orchestra. 9 P. M., program from Examiner Studio. 10 P. M., Ambassador Hotel Cocoanut Grove Orchestra.

KGO, Oakland, Cal., 312m (960k), P. T.—4 P. M., Henry Halstead's dance orchestra. 5:30 P. M., Aunt Betty stories and KGO KiKddies' Klub. 6:45 P. M., stock reports, weather, S. F. produce news, baseball scores, and news items. 8 P. M., education program; course in agriculture, music, economics and literature; music by Arion Trio. 10 P. M. to 1 A. M., dance music program by Henry Halstead's orchestra and soloists, Hotel St. Francis.

KFAE, Pullman, Wash., 330m (910k), P. T.—8 P. M., piano numbers, Miss Mary Cameron; contralto solos, Mrs. LaVerne Kimbrough; The Practical in Higher Educaion, Dr. Holland; Alfalfa in the Dry and Wet Sections, Leonard Hegnauer.

CKAC, Montreal, 425m (700k), E. S. T.—1:45 P. M., Mount Royal Hotel luncheon concert. 4 P. M., weather, stock, news.

Tuesday, September 23

WHAS, Louisville, Ky., 400m (750k), C. S. T.—5 to 5 P. M., selections by the Alamo Theatre orchestra, Harry S. Currie, conductor; police bulletins; weather forecast for Kentucky, Indiana and Tennessee; "Just Among Home Folks"; readings; late news bulletins. 4:55 P. M., local livestock, produce and grain market reports. 5 P. M., Central Standard time. 7:30 to 9 P. M., concert by the Happy Hoosier Harmonists; late news bulletins.

WGY, Schenectady, N. Y., 380m (790k), E. S. D. S. T.—11:30 A. M., stock market report. 11:40 A. M., produce market report. 11:50 A. M., report on farm movement of lettuce. 11:55 A. M., time signals. 1 P. M., music and talk, "Eugene Field—American Poet and Humorist." 5 P. M., produce and stock market quotations news bulletins; baseball results. 7:40 P. M., baseball scores. 7:45 P. M., dance music by Domino Novelty orchestra.

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecas. 3:30 P. M., children's program. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weather fosecast and market reports. 8 P. M., concert.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., address, DeWitt McMurray, editor The Semi-Weekly Farm News, in a medley of humor, pathos and wisdom. 8:30 P. M., Tancred male quartet in standard and popular songs. 11 P. M., Grady Gilder's Heaveily Seven, an orchestra.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herald news bulletins. 5:30 P. M., Examiner news bulletins. 6:45 P. M., Aeolian organ recital. 8 P. M., Ambassador Hotel Cocoanut Grove orchestra. 9 P. M., program from Examiner studio. 10 P. M., popular ballad hour.

KGO, Oakland, Cal., 312m (960k), P. T.—1:30 P. M., N. Y. and S. F. stock reports and weather. 4 P. M., concert orchestra of the Hotel St. Francis. 6:45 P. M., sock reports, weatser, S. F. produce news, baseball scores and news items. 8 P. M., part one, given by Y. W. C. A., Oakland, California; Y. W. C. A. reserve code, song and yell; girls glee club; address. 10 P. M., to 1 A. M., dance music program by Henry Halstead's orcnestra and soloists, Hotel St. Francis.

CKAC, Montreal, 425m (700k), E. S. T.—4 P. M., weather, stock, news. 7 P. M., kiddies' stories in French and English. 7:30 P. M., Rex Battle and his Mount Royal Hotel concert orchestra; specialties by Rex Battle, pianist. 8:30 P. M., concert party of the White Star Dominion S. S. Doric. 10:30 P. M., Joseph C. Smith and his roof garden orchestra from the Mount Royal Hotel, George Fishburg, pianist.

Wednesday, September 24

WHAS, Louisville, Ky., 400m (750k), C. S. T.—4 to 5 P. M., selections by the Alamo Theatre orchestra; police bulletins; weather forecast for Kentucky, Indiana and Tennessee; "Just Among Home Folks"; readings; late news bulletins. 4:55 P. M., local livestock, produce and grain market

(*Continued on next page*)

Programs

Wednesday, September 24

(*Concluded from preceding page*)

reports. 5 P. M., Central Standard time. 7:30 to 9 P. M., concert by the K. & I. Terminal Railroad orchestra; late news bulletins; Standard time.

WGY, Schenectady, N. Y., 380m (790k), E. S. D. S. T.—11:30 A. M., stock market report. 11:40 A. M., produce market report. 11:45 A. M., weather report. 11:50 A. M., report on farm movement of lettuce. 11:55 A. M., time signals. 5 A. M., produce and stock market quotations; news bulletins; baseball results. 5:30 P. M., "Adventure Story."

KGW, Portland, Ore., 492m (610k), P. T.—11:30 A. M., weather forecast. 3:30 P. M., talk by Jeanette P. Cramer, home economics, editor of The Oregonian. 7:15 P. M., police reports. 7:30 P. M., baseball scores, weather forecast market reports. 8 . M., concert. 10 P. M., dance music by George Olsen's Metropolitan orchestra of the Hotel Portland.

WFAA, Dallas, Tex., 476m (630k), C. S. T.—12:30 P. M., musical program by artists from Dallas Theatre.

PWX, Havana, 400m (750k), E. S. T., 8 P. M., concert at the Malecon band stand by the General Staff band of the Cuban army.

KFI, Los Angeles, 469m (640k), P. T.—5 P. M., Evening Herald news bulletins. 5:30 P. M., Examiner news bulletins. 6:45 P. M., Nick Harris detective stories and vocal concert. 7:30 P. M., "Mammy" Simmons and Crosby Sisters. 8 P. M., Evening Herald-Kennedy broadcasters. 9 P. M., program from Examiner studio. 10 P. M., Hollywoodland Community orchestra. 11 P. M., Ambassador Hotel Cocoanut Grove orchestra.

KGO, Oakland, Cal., 312m (960k), P. T.—1:30 P. M., N. Y. and S. F. stock reports and weather. 3 P. M., musical program and Cora L. Williams Institute speaker. 4 P. M., Concert orchestra of the Hotel St. Francis. 6:45 P. M., stock repors, weather, S. F. produce news, baseball scores and news items.

KFAE, Pullman, Wash., 330m (910k), P. T.—baritone solos, Heber Nasmyth; piano numbers, Mrs. Louise Nasmyth; The Bee Keeper's New Year, B. A. Slocum The Practical in Education, Dr. Holland; Extension Service news.

CKKAC, Montreal, 425m (700k), E. S. T.—1:45 P. M., Mount Royal Hotel luncheon concert. 4 P. M., weather, stock, news.

RADIOGRAMS

NEARLY 85 PER CENT. of the music dealers of the country are now selling or plan to sell radio sets this coming season. The music trade realizes that a radio receiving set is a musical instrument in a very real sense.

IRELAND'S FIRST radiocasting stations to be opened in Belfast in October by the Duke of Aberdon, Governor-General of Northern Ireland. There are many radio enthusiasts in Ireland but so far they have had to depend on the British and Continental stations.

THE Hartford Travellers' Insurance Company is to have a radiocasting station of its own. The company recently erected in Hartford, Conn., a very large and handsome office building, surmounted by a tall tower, in which, it is said, the station will be located.

MAKING A LOW-LOSS RF COIL, by Neal Fitzalan. Dispenses with neutralization. Send 15 cents for Sept. 6 issue or start your subscription with that number. Radio World, 1493 Broadway, N. Y. C.

Circuit Tests

(*Continued from page* 13)

will give you as a maximum two for radio-frequency amplification and one for detector, if no reflecting is to be done, and a theoretical maximum of three stages of RF and three stages of AF, with crystal detector, if recourse is to be had to the reflex.

Whether it is possible to get good results by reflecting even two tubes for two AF stages, when they already are doing RF duty, I will leave you to find out to your own satisfaction when you set up the experimental outfit under discussion.

You may do your A battery wiring permanently on the large baseboard, keeping the A wires in the rear, however, due to the necessity for providing room in front of the board for AF transformers and for the baseboard of your coil-and-condenser units. The A wiring may be so done that a switch will light the first tube, another switch the second tube and a rheostat the third tube. As the first two tubes will never be used for anything save amplification, no rheostat is necessary. A fixed resistance may control both. One of these may be made at home from resistance wire, wound on a flat insulator, like a small strip of hard rubber, or one of the wire type may be purchased cheaply. Balanced fixed resistances may be used, also. One such resistance would do for the two tubes. For 201A or 301A twelve ohms would be about right, and about 15 ohms for 199 or 299. The 11 and 12 tubes would reuire only two or three ohms. However, the resistance is not critical in these cases. Remember, however, that this resistance controls TWO tubes, and as each tube is separately lighted by means of a switch you will not have the same resistance for one tube as for two tubes. I never experienced any unfavorable results doing this, but saved a lot of annoyance. In fact, for amplifiers some experts do not insist on the use of any rheostat and even publish circuits leaving them out. This I do not approve for storage battery tubes, because six volts are too much to deliver to the filaments. The tubes burn too brightly and their life is shortened. With the dry cell tubes 199 and 299 will handle the 4½-volt pressure and the 11 and 12 the 1½-volt pressure all right, with no resistance, whereas 201A or 301A function well on 5½ or less, though the source is 6 volts. The rheostat or fixed

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

5 CENTS A WORD. 10 WORDS MINIMUM. TELEPHONE YOUR CLASSIFIED IF IN A HURRY.
RADIO WORLD'S PHONE NOS. ARE LACKAWANNA 2062-6976.

Handy Layout

(*Concluded from preceding page*)

resistance causes the necessary voltage drop for the "wet" tubes.

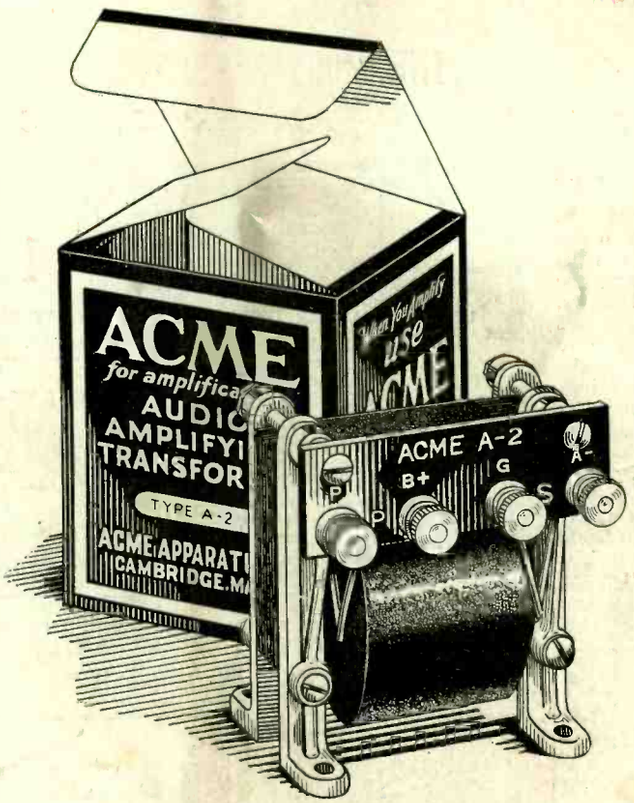
Really a great variety of circuits may be tested with the outfit—three sockets, three tubes, A and B battery, phones, speaker, two AF transformers, three home-made RF transformers as described, crystal detector and three variable condensers. If you have two or three variometers you are ready for almost anything except the Super-Heterodyne. Of course you will have some tubing and magnet wire around the house, also a spider-web form or two, or a template for on a spider-web form. Then in an emergency you can make needed coil in double-quick time.

The Neutrodyne may be made from this outfit, the Superdyne, the Dynoflex, the Solodial, single, double and triple circuit regenerators, unneutralized RF circuit—those are only a few.

After the A wiring is completed you mount the coil-and-condenser units to the large baseboard by drilling two holes in the baseboard of each unit and fastening the unit to the large baseboard with wood screws. If you ever want to move a condenser over an inch or two, all you need do is to remove the two screws and secure your unit in the new position. Anyone who has tried juggling condensers from one position on a panel to another, with all the consequent drilling and time-loss, will appreciate what a convenience the universal, easy-shift method is.

As for connecting wire, it is wonderfully easy to cut pieces of connecting wire into strips, 2", 3" and 6" long, and solder lugs to both ends of these. Turn the collar of the lug over onto the wire with a wire stripper for greater safety. If you substitute hexagonal nuts for the round ones on sockets and other binding posts you will be able to use a hex Spintite wrench and easily change connections. Otherwise you may encounter the difficulty of cramping your fingers into tight places to make some change. The wire strips may be used as needed to make connections. Once in a while a connection may be a little longer than the law allows, due to the fixed lengths of the strips, but this is nothing to worry about in an experimental circuit. If all leads are made short and direct in the permanent model that you build, why, that set should work still better, and hence you are merely building up an expected surprise for yourself!

Ask your neighbor —*he knows*



A-2
for volume

R-2-3-4
for distance

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