NATIONAL RADIO NEWS

IN THIS ISSUE

Adding Record Players to Radio Receivers

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Soft Spots

JUST as a soft spot in an apple or a melon makes it unfit for sale, so a soft spot in a man's character makes it difficult for him to sell himself. An employer, looking for men to promote, to take over his work when he is ready to retire, looks for sound men—men without any soft spots in their characters.

How about us—do we have any soft spots that might interfere with our success?

This soft spot may be a streak of laziness, a tendency to shirk responsibility, to pass the buck, to pity ourselves, to put off until tomorrow what should be done today, to put pleasure before work—to name but a few.

Be honest with yourself. Don't blind yourself to your "soft spot." It is no disgrace to have *had* a soft spot, the disgrace comes only when the soft spot is allowed to grow, only when you make no attempt to eradicate it.

J. E. SMITH, *President.*

Don B. Looney

Adding Record Players To Radio Receivers is Easy and Profitable

By Don B. Looney

N. R. I. Consultant

THE experienced radio serviceman finds that adding record players to radio receivers is worthwhile and profitable. The beginner also can do this work as it is not very difficult. However, he needs to know the basic circuits that are used and these are discussed in the following section of this article. The methods used for doing the work also will be shown.

Two types of pick-up are widely used, the crystal and magnetic. In the past few years, the crystal has been used, probably, more widely than any other type.

Fig. 1.

The reason for this is that the crystal pick-up has excellent fidelity, is reasonably priced and may be installed without great difficulty. It does not require a transformer to match the impedance of the crystal to the input circuit of the audio amplifier. The magnetic type, on the other hand, usually has a comparatively low impedance and must be matched by means of a transformer to the audio amplifier input. This results in additional expense. Also, if the coupling transformer is a cheap one and not very well designed the fidelity will be poor in comparison with that afforded by the crystal type.

In Fig. *1*, the basic circuit of a crystal record player is shown. The pick-up develops a signal

Fig. 2.

voltage. This signal voltage is applied to the load R_L. This load may be the input resistance of an audio amplifier.

In Fig. *2*, the basic circuit of a magnetic type is shown. The impedance of the magnetic pick-up is stepped up by transformer action to match the impedance of the audio amplifier input circuit. Therefore, secondary L_2 will have more turns than L_1.

In practical circuits, some means must be provided for controlling the volume level. This is illustrated in Fig. *3*. A potentiometer is shunted across the output of the crystal pick-up to govern the volume level. Moving the arm closer to point 1 results in an increase in volume and moving the arm closer to point 3 results in cutting the volume level.

In Fig. 4. the control of volume for the magnetic type of pick-up is illustrated.

In Fig. 4-A, the voltage applied to L_1 is increased when the arm of the potentiometer P is moved closer to point 1 and the voltage is decreased when the arm is moved closer to point 3. A decrease in applied voltage results in raising the volume level.

In some cases, the potentiometer may be located in the secondary circuit as shown. Fig. 4-B.

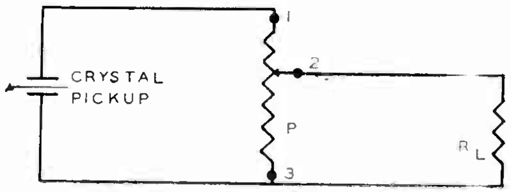

Fig. 3.

Here, the magnetic pick-up delivers the voltage to the primary L_1. The output voltage of the transformer which appears across L_2 is applied to potentiometer P. Moving the arm closer to point 1 results in an increased voltage being applied to the load resistor R_L and moving the arm closer to point 3 decreases the voltage.

In some cases, it is not practical to add the record player to the circuit of the receiver by a direct connection. A wireless record player arrangement may be used.

This is shown in block diagram fashion in Fig. 5. The original sound stored in the record is taken off by means of the pick-up. An audio signal voltage delivered by the pick-up is applied to the grid of an oscillator tube. Audio modulation of the r.f. oscillator takes place. The result is that an r.f. signal which is modulated is sent out to the radio receiver. A short piece of wire may be used as an antenna by the oscillator. Because of coupling between the short piece of wire and the antenna circuit of the receiver we have an injection of the modulated r.f. voltage into the receiver circuit. The receiver then builds up the r.f. signal just as it would if it were tuned to an ordinary radio station, demodulates the signal and supplies power to a loudspeaker which reproduces the sound.

Adding the record player by the direct wire method involves three definite steps: study of the receiver circuit, mounting of the switch used for changing over from radio to phonograph operation and connecting the various parts required.

When a wireless type of record player is used, however, no direct connection is used. The signal provided by the wireless record player is tuned in on the radio receiver. Usually, the wireless record player has a signal frequency which may be near 1400 or 1500 kc.—at a quiet point in between regular stations operating on the broadcast band. An adjustment is provided in the wireless record player circuit for control of the operating frequency so that the record player signal can be adjusted.

For example, if a broadcast station is operating on 1450 kc. and another station is operating on 1500 kc., the wireless record player may be tuned

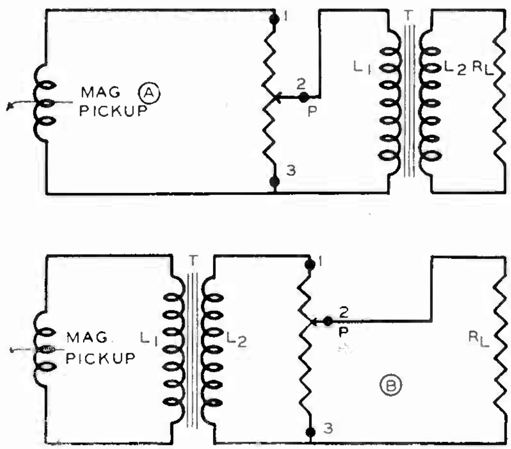

Fig. 4.

to a point mid-way between these two stations or at 1475 kc.

Then, a minimum of interference and cross-talk will result.

The receiver also would be tuned to the 1475 kc. frequency in the above example.

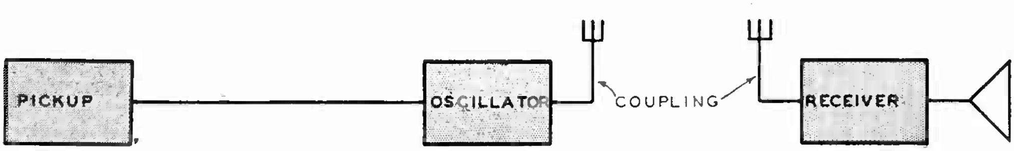

Fig. 5.

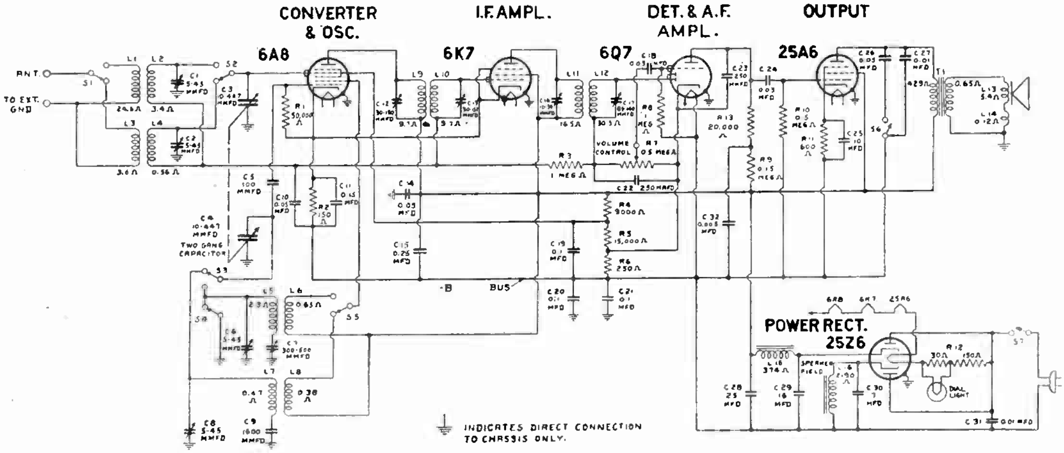

Fig. 6. G-E A-54 Circuit Diagram.

Other frequencies might be used, as dictated by local conditions and the operating frequencies of the broadcast stations locally.

The procedures used for making direct connections of record players to radio receivers will be covered first, then the wireless record player types will be discussed.

A Crystal Record Player Hook-Up

A typical radio receiver circuit diagram is shown in Fig. 6. This receiver is the General Electric A-54.

The set uses a high gain 6Q7 triode in the audio amplifier system. The record player may be connected using the method illustrated in Fig. 7.

The high side of the volume control is connected to the arm of a single pole double throw switch, S_1. It may be necessary, to prevent hum and noise pick-up, to shield the lead which goes to the switch and to ground the shielding to the lower terminal of the volume control, R_7.

One terminal of the switch is connected to L_{12} and R_3 (terminal A). The switch arm is thrown to this terminal when radio operation is desired. On phonograph operation, the switch arm is thrown to the opposite terminal, terminal *B*.

The switch does two things: shifts the volume control connection from the radio circuit to the record player circuit and also limits or prevents radio operation by breaking the circuit, on phono, between *A* and *C*. It is essential that the radio signal shall not feed through to the 6Q7 during phonograph operation. Otherwise, broadcast programs may be picked up and may interfere with the record player signal.

The advantage of using a hook-up of the type indicated is that the volume control of the receiver itself may be used for controlling the level of the record player. Many record players of the crystal type designed for a direct connection to the receiver have built into them volume controls which permit adjustment of the signal level. When the circuit indicated in Fig. 7 is used, the record player volume control may be set at maximum. Then, control over volume level is exercised by the receiver's own volume control, R_7.

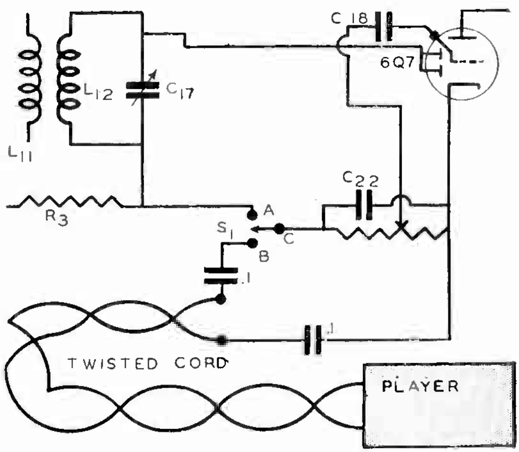

Fig. 7.

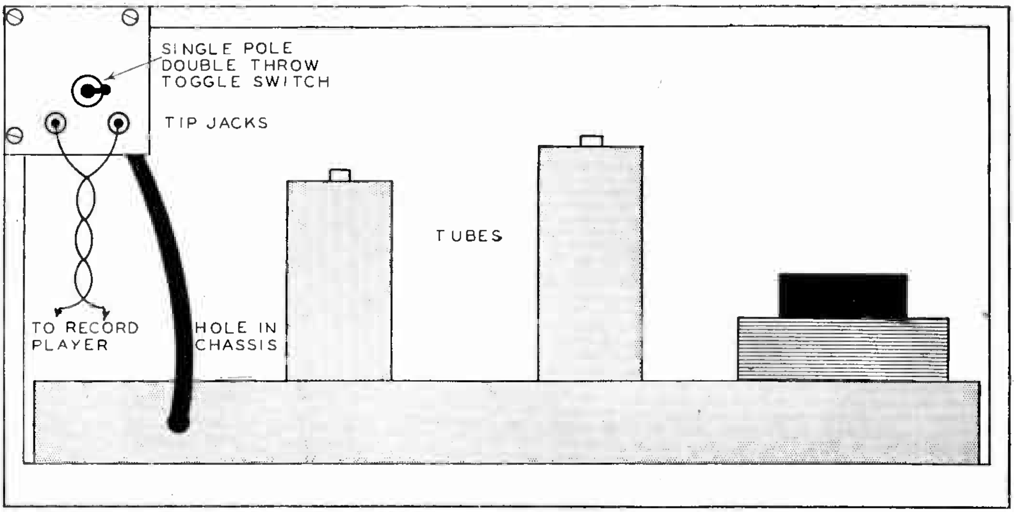

Fig. 8.

If the record player is located near the radio receiver, a shielded wire may be used for connecting the pick-up to the audio amplifier input circuit. If the record player is located a considerable distance away, fifteen or twenty feet, ordinary twisted lamp cord can be used for making the necessary connection. If, in the operation of the record player, an excessive hum is heard, try reversing the two leads to terminals 1 and 2.

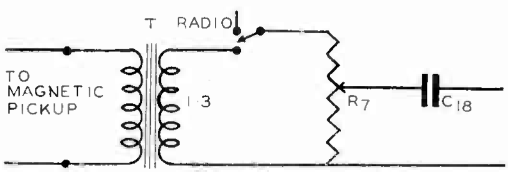

Fig. 9.

The switch used for changing over from radio to phonograph operation should be mounted in a convenient location. Fig. 8 illustrates a typical arrangement which works satisfactorily.

Phone tip jacks are mounted on a small piece of bakelite which in turn is screwed to the wood cabinet. A single pole double throw toggle switch is mounted on the piece of bakelite. Shielded leads run from the assembly to the receiver circuit. A hole is drilled in the receiver chassis to permit passage of the leads through the chassis wall. At the point where the shielded leads go into the chassis, tape insulation should be used. This will prevent noise from being generated when the shielding of the wires rubs against the metal surface of the chassis.

The ends of the wires which go into the tip jacks are secured properly. They are soldered to phone tips.

Screw terminal posts may be used in place of tip jacks if desired.

It also would be possible, in some cases, to mount the toggle switch on the chassis itself and to drill holes in the chassis for tip jacks or a telephone type jack.

However, the arrangement indicated is convenient and easy to use.

Connecting a Magnetic Pick-Up

The circuit used for connecting a magnetic type of pick-up to the General Electric A-54 is illustrated in Fig. 9. A matching transformer, *T*, is used. This transformer must have the correct turns ratio to match the pick-up head to the input circuit of the audio amplifier. Simply ask the radio distributor for a transformer which will match the pick-up to the input circuit. Be sure to specify the pick-up impedance, or give its make and model number to the distributor.

The magnetic pick-up, however, is less often encountered than the crystal type which is universally used. Therefore, this circuit is not of great importance to the average serviceman.

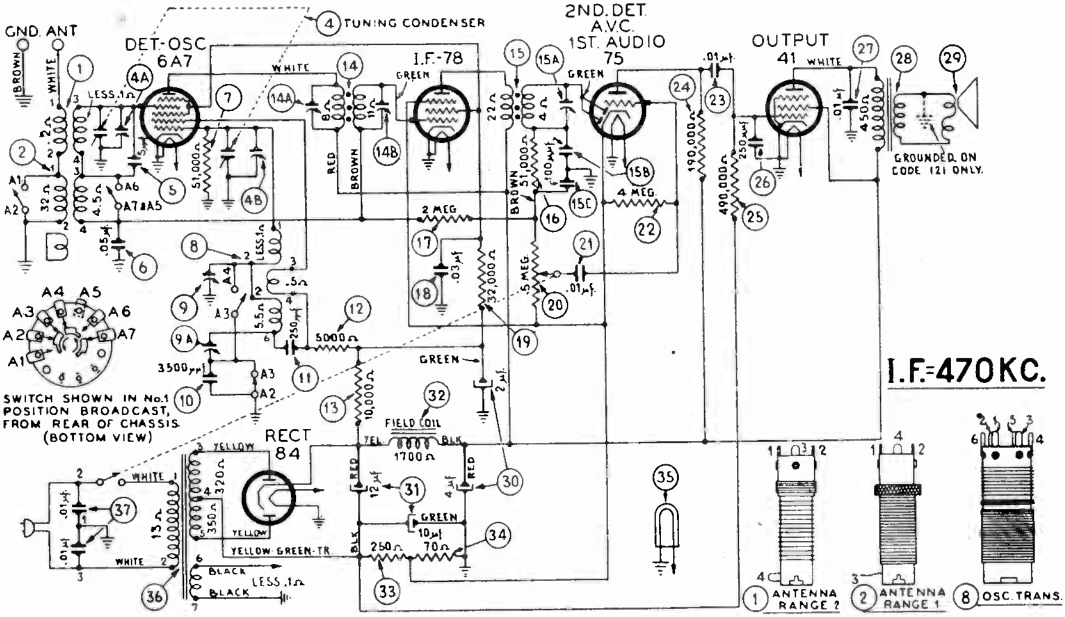

Fig. 10. Philco 38-15.

The high gain 6Q7, 6SQ7 or 6F5 tubes may be found in a great many radio receivers. The basic circuit shown in Fig. 7 is useful in hooking up the record player to such receivers.

Basic Principles

For example, the circuit shown in Fig. *10* fundamentally is the same as the circuit illustrated in Fig. 7 so far as the connection of the record player is concerned. The volume control, during radio operation, serves as a load for the diode detector. During record player operation, the volume control serves as a load for the record player.

The circuit of Fig. 7 would be used in hooking up a record player to the Philco 38-15 illustrated in Fig. *10*.

In place of R_7 used in the General Electric A-54, we would substitute resistor *20* which is the volume control in the Philco 38-15. Note the similarity of the circuits.

Converting a Detector Into a Voltage Amplifier

In Fig. *11*, the Emerson BB-208 is illustrated. This receiver uses a 6D6 as an r.f. amplifier, 6C6 as a detector, 25L6 as a power output tube, and a 25Z5 as a rectifier. The 6C6 detector may be converted into a voltage amplifier by making a simple circuit change.

The circuit used for connecting a crystal type record player is illustrated in Fig. *12*. Note that the cathode circuit resistance of the detector is changed when you switch over from radio to phonograph operation. The value originally was 25,000 ohms. A 5000-ohm 1-watt resistor may be connected in the circuit on phonograph operation.

The best value of *R* can be determined by experiment—until the tonal quality is good and reproduction is satisfactory.

In this circuit, a double pole, double throw switch is used. Contact *B* goes to the stator of tuning condenser C_2 and the secondary of transformer T_2. Contact *C* goes to the special volume control which is added to the radio. This volume control may be mounted on a small piece of bakelite along with the change-over switch and the terminals for connection to the record player.

The piece of bakelite may be mounted on the rear of the radio cabinet as illustrated in Fig. 8. If bakelite is not available, hard rubber can be used.

Blocking condensers are used in series with the record player leads. The reason is that the receiver is an a.c.-d.c. type and you want to prevent the line voltage from being applied directly to the pick-up unit through the chassis—which might result in shock to the owner of the equipment.

The connection to the arm of the switch at point A is kept short and direct. The piece of bakelite should be mounted near the detector tube at the rear of the radio. Don't shield the grid wire. The addition of the phonograph switching circuit results in disturbance of the original alignment, so, following the installation of the phonograph switching arrangement, realignment of the radio will be required to obtain best results when switched over to radio operation.

The connection from the arm of the lower portion of the switch at point D, goes by a direct route

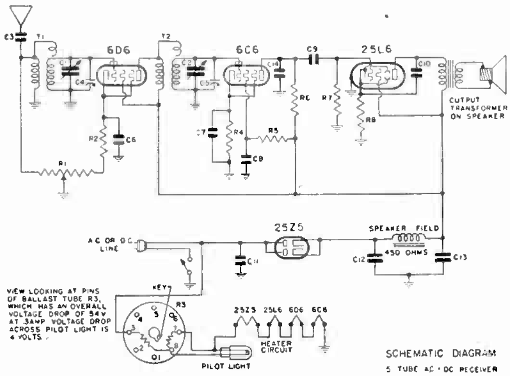

Fig. 11. Emerson B-B 208

to the cathode of the 6C6. Contact *F* connects through a 5000-ohm 1-watt resistor to chassis ground.

The use of a volume control at the receiver is recommended rather than the use of the volume control at the record player itself. The reason is simply one involving convenience. It is an easier matter to adjust the level at the radio than to adjust the level at the record player and most owners of radio receivers will request this type of connection.

The circuit arrangement illustrated in Fig. *12* might also be used in the case of the receiver shown in Fig. *13*, the Majestic 90-B. However, you very likely will find that the volume level is not very high and that somewhat unsatisfactory results are obtained. In place of the 6C6 you would use the 27 detector. The 27 detector is the tube which has its plate connected to the .004-microfarad condenser and the r.f. choke. Normally, the 27 detector supplies a fairly high signal voltage to the primary of the transformer illustrated in the figure. When switched over to amplifier operation, this driving voltage may not be sufficiently high to get full output from the push-pull 45 tubes.

It would be possible to add an additional stage of pre-amplification but this leads to circuit complications and is difficult.

To avoid these difficulties, a wireless type record player may be used. It can be hooked up conveniently without a great deal of trouble.

Wireless Record Players

The basic arrangement of a wireless record player installation is shown in Fig. *5*. A typical wireless record player is illustrated in Fig. *14*. The signal voltage developed by P_1, the crystal pick-up, is applied to potentiometer *R2*. This signal voltage may be controlled by *R2* and is applied to the grid of the 6A7. As a result, the space current of the 6A7 is varied according to the frequency of the input audio signal. Modulation of the oscillator section of the tube then occurs. The frequency of oscillation is governed by the setting of *C1* which is in shunt with the primary of *L1*. As mentioned earlier in this article, the frequency is adjusted so that the output signal has a frequency that is different than the frequency of any broadcasting station in the vicinity.

Switch *SW2* turns the record player motor on or off. Switch *SW1* turns the modulated r.f. oscillator and rectifier on or off.

Coupling to the radio receiver is afforded by means of a short wire connected to *C2*. This wire is placed near the antenna wire of the radio and

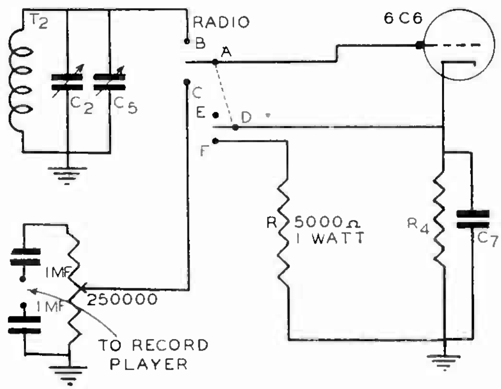

Fig. 12.

as a result a signal injection into the radio receiver occurs.

The 6A7 oscillator develops an r.f. voltage across *C1*. The oscillator is modulated at the frequency of the audio signal delivered by the pick-up *P1*. Condenser *C2* controls the amount of coupling between the oscillator and the radiation device —

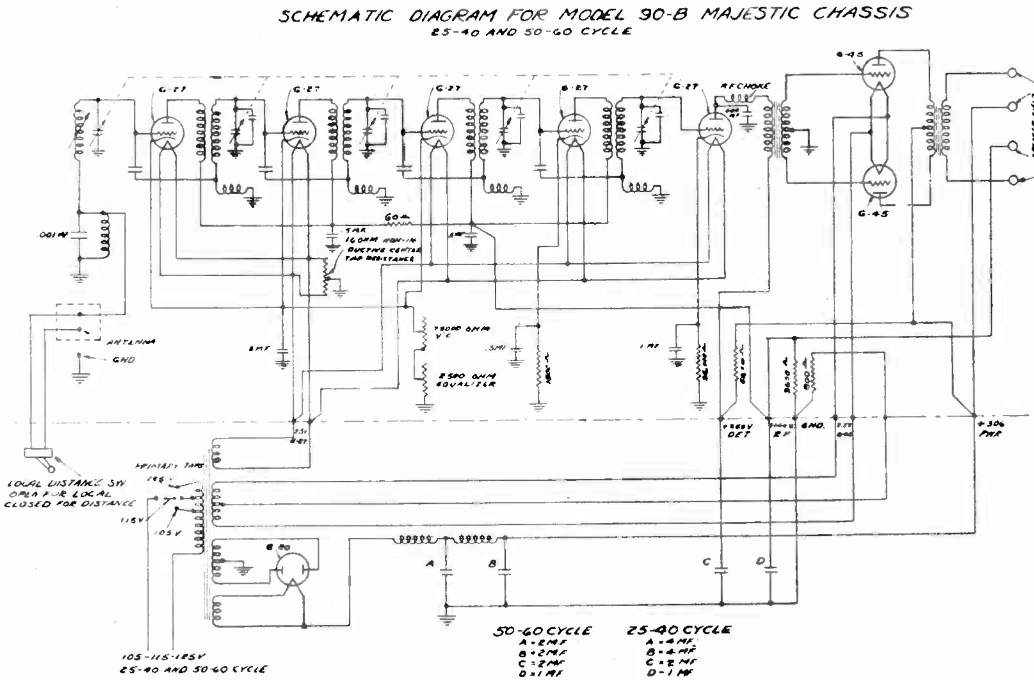

Fig. 13. Majestic 90-B.

this radiation device is the short wire connected to the record player and $C2$.

A resistance-capacitance filter is used in the record player. This filter consists of $R5$ in conjunction with $C6$ and $C7$, and serves to get rid of the a.c. components and to provide d.c. operating voltages for the 6A7.

The oscillator (6A7) and rectifier (25Z5) filaments are connected in series. The pilot lamp is also in series with the filaments and has shunted across it a resistance marked $R7$ on the diagram. The line voltage is dropped down to a safe value that can be applied to the filament circuit, by means of $R6$.

In Fig. *15*, another wireless record player circuit is illustrated. This circuit differs from the one previously described in that it is one in which a power transformer and full-wave rectification are used. The circuit of Fig. *14* uses a 25Z5 as a half-wave rectifier. A type 84 full-wave rectifier is used in the General Electric HM-21 wireless record player illustrated in Fig. *15*.

In this circuit, the frequency of oscillation is governed by the setting of $C1$. Increasing the capacitance value results in lowering the signal frequency and decreasing the capacitance raises the frequency.

The audio signal voltage delivered by the crystal pick-up is applied to resistor $R5$. The first grid, nearest the cathode of the 6A8G is "swung" by the

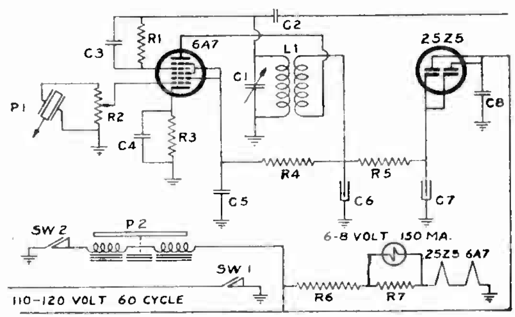

Fig. 14. Wilcox-Gay A-60.

record player voltage. Modulation of the r.f. oscillator then occurs. Coupling to the radio receiver is afforded by means of the short wire marked antenna in the circuit diagram.

The type 84 is used as a full-wave rectifier. Resistor *R*6 in conjunction with condenser *C5B* and *C5A* serves as a filter to remove the a.c. components and to provide a pure d.c. for operation of the 6_A8_G modulated oscillator.

The motor is indicated as *M*1 and is connected to the power line circuit through switch *S*1. This switch also turns on or off the oscillator and rectifier power supply systems.

The condensers marked *C*6 have low impedances at r.f. frequencies and prevent the signal generated by the wireless record player from getting into the power line. Also, the condensers help in preventing line noise and interference from entering the record player and modulating the oscillator.

The tonal quality and response of the pick-up are affected by the presence of *R*4 and *C*4 in series. As the frequency rises, a greater amount of signal current flows in *C*4 and the output level of the pick-up is attenuated. This results in an improvement in the tonal quality since the crystal pick-ups often have a tendency to sound "squeaky," and high pitched. Using the proper values of *R*4 and *C*4, the frequency response can be straightened out.

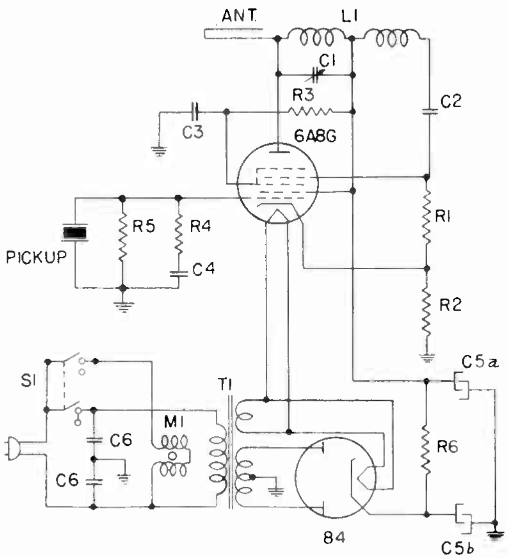

Fig. 15. General Electric HM-21.

Wherever possible, the direct connection type of record player pick-up should be used. The reason is that the direct connection results in limiting noise and interference and generally permits better quality reproduction to be obtained.

The wireless record player installation should be used when it would be very difficult to use the direct connection or impossible to do so.

Bearing in mind the fundamental principles, and referring to the typical circuits illustrated, you should have no difficulty in hooking record players to radio receivers so that they will operate properly and correctly.

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Correction

On page 19 of the April-May issue of N.R.I. NEWS, a typographical error was made. The sentence, "If the 2-3 section is burned out but 2-7 is all right, shunt a 40 ohm 5 w resistor *across* 2-7 to continue operation of the tube and pilot lamp," should read "*across* 2-3."

n r i

Courtesy of Radio-Craft Magazine

"Could you put a fresh vacuum into it?"

n r i

"How did George break his leg?"
"Well, do you see those steps over there?"
"Yes."
"Well, George didn't."

Intermittent Fading of Radio Signals

By Leo M. Conner, N.R.I. Consultant

QUITE frequently a serviceman is called on to repair a receiver because signals fade suddenly from good volume to almost no volume. It is the purpose of this article to discuss the possible causes of this fading if it is due to some defect in the set and is not the natural fading we get on distant stations.

There are various types of intermittent reception, namely:

1. Set plays, cuts off and plays, at regular intervals.
2. Set plays, cuts off and doesn't play until the set is jarred. Mechanical disturbance.
3. Set plays, cuts off and doesn't play until the main power switch is turned off and on, or a control grid cap is touched, or some tube is pulled out of the socket, or turning off and on some light or electrical device on the same power line as the set.

Frankly, the isolation of the defect causing intermittent reception is the most intangible, most elusive sort of job that a serviceman may tackle.

If the set cuts off and plays, cuts off and plays at a definite time rate, you will invariably find the trouble due to a thermostatic electrical connection. In general, you will find it in a circuit which carries current. Thermostatic joints are those which make contact intermittently due to heat expansion of dissimilar material; for example, solder and copper. When the receiver, tubes or any part or any connection is at room temperature the connection is complete. When the temperature rises, dissimilar expansion opens the connection. If the temperature rise is due to heat produced at the joint, the cut-off will be of short time duration. If the temperature rise is due to the average heat of the chassis, the cut-off will be of longer duration. In the first case we probably have a break in a supply current carrying joint, and in the second case probably a signal carrying joint.

Tube Trouble

Tubes are often to blame for intermittent reception. If any of the welds between the elements and the support to the lead conductor should open or short because of expansion, the amplifying action of the tube is destroyed and the set cuts off. As soon as the tube cools off the connection is restored, or the short opens and the set plays. The set may not cut off entirely, merely fade to a low sound level.

Parts Troubles

Dirty variable condensers may cause fading or intermittent reception. This is especially true if the signal is brought back to full volume by slightly moving the tuning dial. Pay special attention to the wiping contacts which make contact to the rotor shaft of many condensers. If these contacts are dirty or corroded they may cause fading or even oscillation and squealing.

Resistors or coils carrying current may open up after carrying current for a short while. Any contact connection is subject to thermostatic action. One serviceman in an attempt to associate the time of cut-off with the probable cause of a thermostatic joint gives the following table:

Period	*Probable Cause*
0-3 *minutes*	Defective tube, supply current carrying joint. Resistors that are slow to heat up, particularly types with large heat radiation surfaces. Series filament resistors in universal d.c. and battery sets.
Over 5 minutes	Transformers, coil, or joints that are affected by the surrounding temperature or carry only weak currents.

In some cases the joint after opening up will stay open, because the joint has no spring to return the lead that moved away. The connection may remain open until the set is mechanically jarred. You may track this down by a stage by stage elimination procedure being extremely careful to prevent mechanical jarring.

Where the set is restored to operation by an electrical disturbance (try a mechanical disturbance first), reception may be restored because the electrical surge results in an arc connection. Look for sparks in the chassis. Noise will probably accompany the restoration of performance. An open circuit connection, like an open grid resistor or coil, may still permit the receiver to work until some electrode, particularly the control grid, develops a charge sufficient to block the operation of the stage. Any slight electrical disturbance will unblock the stage, restoring operation. In superheterodyne circuits the local oscillator may block and thus stop operation. Any electrical disturbance may re-establish oscillation.

Intermittent Fading

If intermittent fading is observed, then you may have an open by-pass condenser. Intermittent rises in volume may be caused in the same way. Be sure that the antenna and ground system is intact. Shake the aerial and ground leads, listening for noise, or better still connect a signal generator to the input after the fading appears. Thermostatic joints in coupling condensers invariably destroy reception and defects here may easily be confused with resistor and coil opens. Only a replacement condenser will check such defects.

One rather common cause is a defective coupling condenser in the resistance coupled a.f. amplifier. Pay particular attention to the coupling condensers if they are used in the audio amplifier. This trouble has occurred quite often in several of the older Philco receivers, and also in other sets using this type of audio amplifier.

A by-pass condenser in the screen or cathode circuits that opens intermittently will also cause fading. These condensers should be checked by shunting a condenser known to be in good condition around the condenser suspected of causing the trouble. Cathode, and to some extent plate, by-pass condensers have caused much trouble in Majestic receivers, especially in the older models.

Another possible cause for this fading is leaky filter condensers or by-pass condensers, either in the chassis or in the power pack. If any of these condensers are defective, the voltage output from the power pack will be lowered and the sensitivity of the receiver affected or the signal may even disappear entirely. If fading still persists after you have made sure all contacts are perfect, test the filter and by-pass condensers. They must be disconnected and given individual high voltage tests.

Isolating the Intermittent

A systematic procedure for isolating the defect of intermittent reception is recommended.

1. Start with a search of possible surface defects, including an inspection for a defective pickup system.
2. By an effect to cause reasoning you may be able to tell what and perhaps where the trouble may be.
3. Check tubes. Put in a new set of tubes and leave them play for a time greater than the cut-off period. Then replace the old tubes one at a time, each tube tested for a reasonable period.
4. Open chassis. Look for sparks and arcs. Look for corroded or resin joints. Check condensers for opens by shunting them with ones known to be in good condition. Be sure in the latter case that you make this substitution while the set has cut off.
5. Try a stage isolation procedure. In a.v.c. sets using a visual indicator, watch the indicator before and after cut-off takes place. In other circuits place a plate milliammeter in each stage. Where the number of meters are limited you will have to check one stage at a time. A change in any voltage supply circuit will generally show up as a change in plate current in the defective stage. Defects in signal circuits which do not carry an electrode current or complete a voltage connection can be located with the stage by stage elimination procedure.

You may start with the signal generator connected to the detector and leave the set on for a reasonable period. If the cut-off does not appear, advance the signal generator to the input of the previous stage. When reception is restored by the least touch or electrical disturbance, a stage elimination test is about the most reasonable procedure to take.

6. After the defective stage is found, inspect every circuit component. You may have to change every part in the circuit. Do so one at a time.
7. When you feel that the defect has been repaired, play the receiver for at least three to four hours over the cut-off period, before approving the job.

Keep a record of all defects for future reference. Be sure to record the make and type of receiver. Weaknesses in certain designs may result in intermittent reception. If you consult the service manager of the local distributor of the receiver you are working on, he may give you some valuable clues to the possible trouble.

It may take you ten minutes or ten days to correct an intermittent defect. Most of the time will be lost in waiting for the receiver to cut off. So always do such jobs along with other bench repair jobs. Intermittent reception defects traced to internal defects are best located at the bench and to one side so as not to interfere with your regular work. Be sure that the chassis is open, and on end so that you see and can get at every part. Don't get discouraged. The best service technicians realize that a defect of this kind has no mercy on their patience.

n r i

Attention GRADUATES!

Whenever you write the Institute or to any member of the Institute staff, please remember to write "Grad." (abbreviation for "Graduate") after your name, and, of course *always* include your *student number*.

Records of students and graduates are kept separate and by saving our very busy Filing Section this "look-up," you'll help us and also get faster service.

RADIO-TRICIAN
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Service Sheet
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NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

General Electric Models H639 AC and H639 DC

Alignment Procedure

ALIGNMENT FREQUENCIES

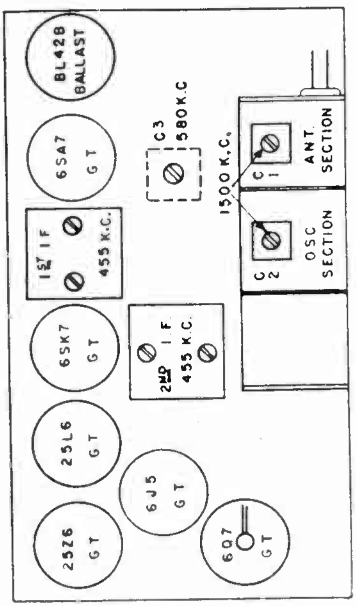
I.F. . . . 455 KC   R.F. . . . 1500 and 580 KC. The location of all trimmers is shown in Fig. at left.

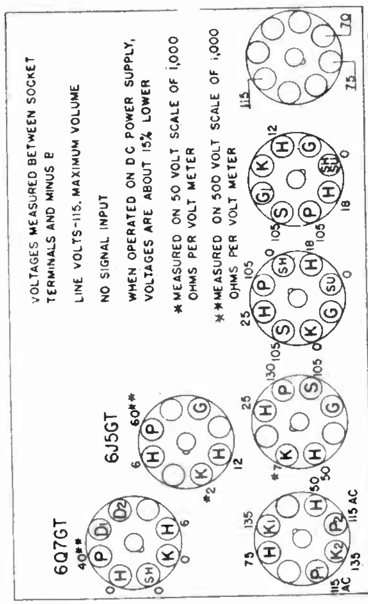
I.F. ALIGNMENT

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the grid of the 6SK7GT through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure, applying the 455 KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. ALIGNMENT

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500 KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.





BOTTOM VIEW OF CHASSIS

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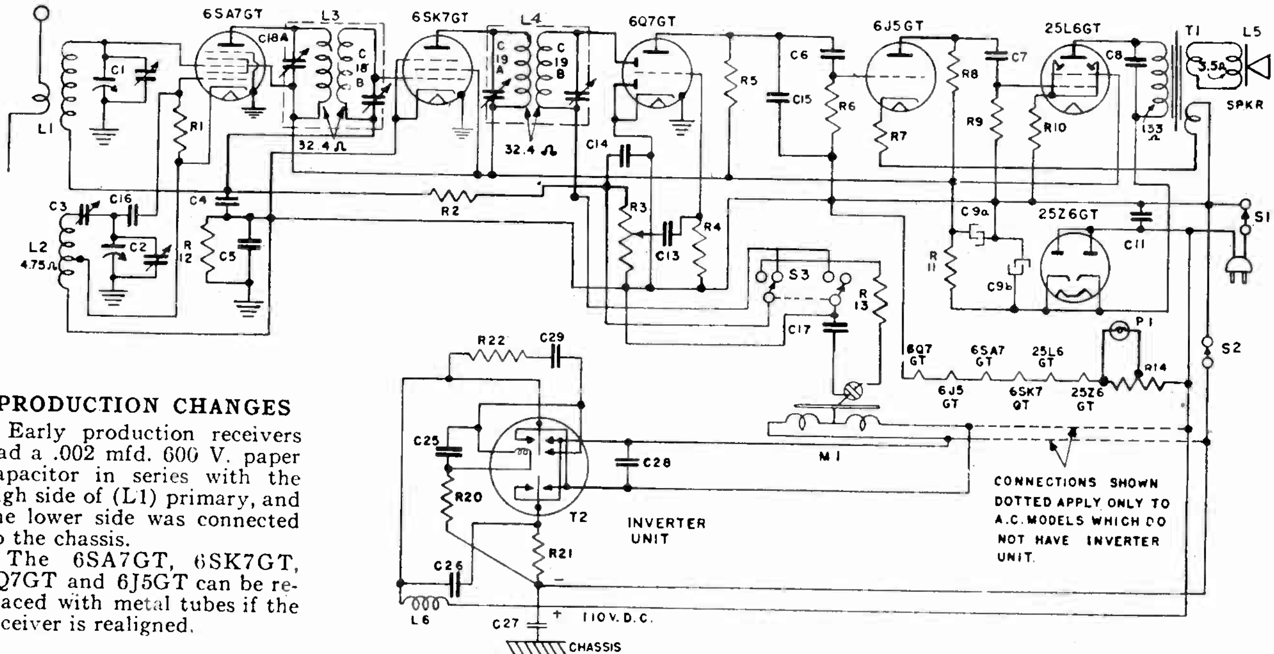

PRODUCTION CHANGES

Early production receivers had a .002 mfd. 600 V. paper capacitor in series with the high side of (L1) primary, and the lower side was connected to the chassis.

The 6SA7GT, 6SK7GT, 6Q7GT and 6J5GT can be replaced with metal tubes if the receiver is realigned.

RADIO CHASSIS

C-1	Antenna section of tuning condenser
C-2	Oscillator section of tuning condenser
C-3	"B" band padder
C-4	.05 mfd. paper capacitor
C-5	.20 mfd. paper capacitor
C-6	.005 mfd. paper capacitor
C-7	.005 mfd. paper capacitor
C-8	.01 mfd. paper capacitor
C-9	30 mfd. 150 V. dry electrolytic
C-10	50 mfd. 150 V. dry electrolytic
C-11	.05 mfd. paper capacitor
C-13	.03 mfd. paper capacitor
C-14	470 mmf. mica capacitor
C-15	220 mmf. mica capacitor
C-16	47 mmf. mica capacitor
C-17	0.1 mfd. paper capacitor
L-1	Beam-a-Scope
L-2	Oscillator coil
L-3	1st I.F. transformer
L-4	2nd I.F. transformer
P-1	Pilot lamp Mazda No. 44
R-1	33,000 ohms carbon resistor
R-2	2.2 megohms carbon resistor
R-3	0.5 megohms volume control
R-4	15 megohms carbon resistor
R-5	470,000 ohms carbon resistor
R-6	1.0 megohms carbon resistor
R-7	3300 ohms carbon resistor
R-8	39,000 ohms carbon resistor
R-9	470,000 ohms carbon resistor
R-10	150 ohms carbon resistor
R-11	1000 ohms 1 W. carbon resistor
R-12	470,000 ohms carbon resistor
R-13	100,000 ohms carbon resistor
R-14	BL-42-B ballast resistor
S-1	Power switch (comb. with R-3)
S-2	Motor switch
S-3	Radio and phono switch
T-1	Output transformer

INVERTER UNIT

C-25	0.1 mfd. paper capacitor
C-26	0.5 mfd. paper capacitor
C-27	.01 mfd. paper capacitor
C-28	0.5 mfd. line capacitor
C-29	0.1 mfd. paper capacitor
R-20	2200 ohms 1 W. carbon resistor
R-21	25 ohms wire wound
R-22	220 ohms carbon resistor
L-6	4 uh choke coil
T-2	Vibrator unit

Dressing Up the N. R. I. Tester

By R. H. SCHAAF

N.R.I. Consultant

MANY of our students have built protective cases for their N.R.I. Experimental Testers. The accompanying photographs show the work of Student Lester E. Terry of Tampa, Florida. Fig. 1. gives you a front view of the instrument and shows the extra panel he added to carry the potentiometer, meter pointer adjustment and bias changing switch, together with the neat plywood case covering the entire instrument. Fig. 2. shows his novel meter pointer adjusting device.

The case is made of ¼-inch plywood and fits over the entire unit. It is an excellent protection for the battery and further serves to keep dust and dirt out of the switch contacts.

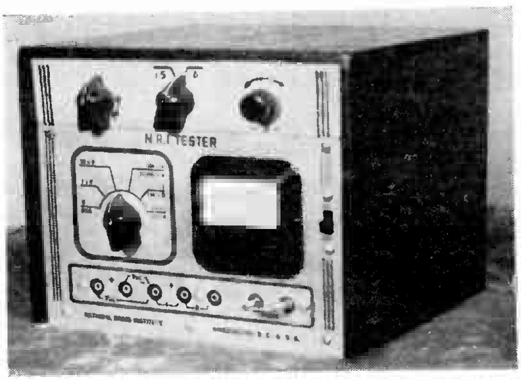

Fig. 1

So that the additional panel may be flush with the front of the original panel, the bottom edge of the new panel is off-set a slight amount. The decorative scheme of the main panel was extended to the new panel. This is clearly shown in Fig. 1. As shown in Fig. 2, terminal 10 of the potentiometer is now grounded to a solder lug on one of the bolts holding the two panels together.

The control shaft (or the rotary contact) of the switch used to change the C-bias must be well insulated from the panel to prevent short-circuiting the C battery. Furthermore, Student Terry points out, it is absolutely essential that this switch make a positive contact in each position. The most ingenious part of the whole scheme is the method used to move the meter pointer zero adjustment. A ⅜-inch wood dowel was slotted on one end, and drilled at the other end so that it could be fitted snugly over the adjustment knob

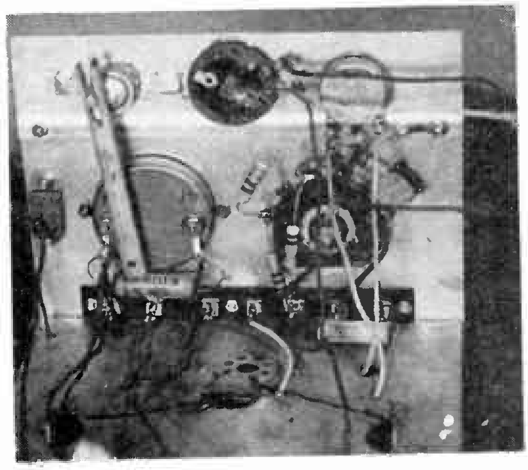

Fig. 2

and cemented in the proper position. The slot fits over a pin on a small wheel so arranged that when a knob on the front panel is turned, the pin moves the dowel back and forth. The diameter of the wheel and the length of the dowel are critical for they are the factors controlling the amount of movement obtained for the zero adjustment.

In conclusion, we'd like to point out the very obvious fact that there are many other ways of achieving the same effects. For instance, the cover of the cabinet might be hinged so as to make an extra panel unnecessary. On the other hand, a pulley and belt drive arrangement could be used to adjust the meter pointer. The primary objective is to protect the battery and the wiring of the tester. Be sure that whatever means you take to accomplish these ends does not in any way interfere with, or change, the normal operation of the tester.

Audio and R. F. Office Communications Systems

By WILLARD MOODY

N.R.I. Consultant

Willard Moody

BY communication equipment, we mean equipment that may be used for sending voice signals over wires, permitting contact, for example, between an executive in an office and his secretary, or possibly between a counter clerk and a chef in a restaurant, or in a drugstore where lunches are served. In large cities particularly, where rapid service is required, such equipment is in common use and must be maintained.

A general understanding of the basic principles which underlie the operation of the equipment is helpful.

The circuits of two typical communication systems will be analyzed.

In general, the communications system is a wire type, using a special audio line, or a "wireless" type using the power line for transporting a modulated r.f. signal. We shall consider both types, first the wire type. The Philcophone, shown in Fig. 1, is typical of the wire type.

Philcophone. An examination of the schematic diagram of the Philcophone indicates that provision is made for the operation of one or more distant loudspeakers in conjunction with the master unit which contains the audio amplifier and a local loudspeaker.

Provision is also made for switching over from "talk" to "listen," using a switch marked No. 13 on the diagram. The lever is located on the front of the cabinet. When the switch lever is up, the equipment is set to the listening position. To talk, you press the lever of the switch.

To understand the operation of the equipment, we shall assume that the switch is in the listen position. Then, a person speaking into the distant loudspeaker will cause (by the action of the sound waves) the speaker to generate a signal. In reality, the speaker is used as a microphone. The audio signal is sent out over the audio line to the primary of the input transformer marked No. 4 on the diagram.

Permanent magnet dynamic speakers are used in the system.

The signal voltage which is applied to the primary of transformer 4 causes a signal current to flow. This current in flowing through the winding develops a magnetic field and flux circulates in the core, linking with the secondary and inducing in the secondary a higher voltage.

The impedance of the input circuit is low and the impedance of the secondary circuit of transformer 4 is high—to match the grid input impedance of the first audio amplifier tube which is the 6K5G.

The amount of signal voltage delivered to the 6K5G grid is controlled by the setting of potentiometer 6 which acts as a volume control.

The signal potential appearing between the arm of the potentiometer and the upper terminal of condenser 5 is applied to the grid-cathode of the 6K5G through condenser 2 and from the lower terminal of the potentiometer to the cathode through condenser 8, which has a low impedance at the operating frequency.

Resistor No. 1 establishes the bias potential on the tube.

The tube builds up the signal and applies it to grid resistor 23 of the second 6K5G through condenser 24.

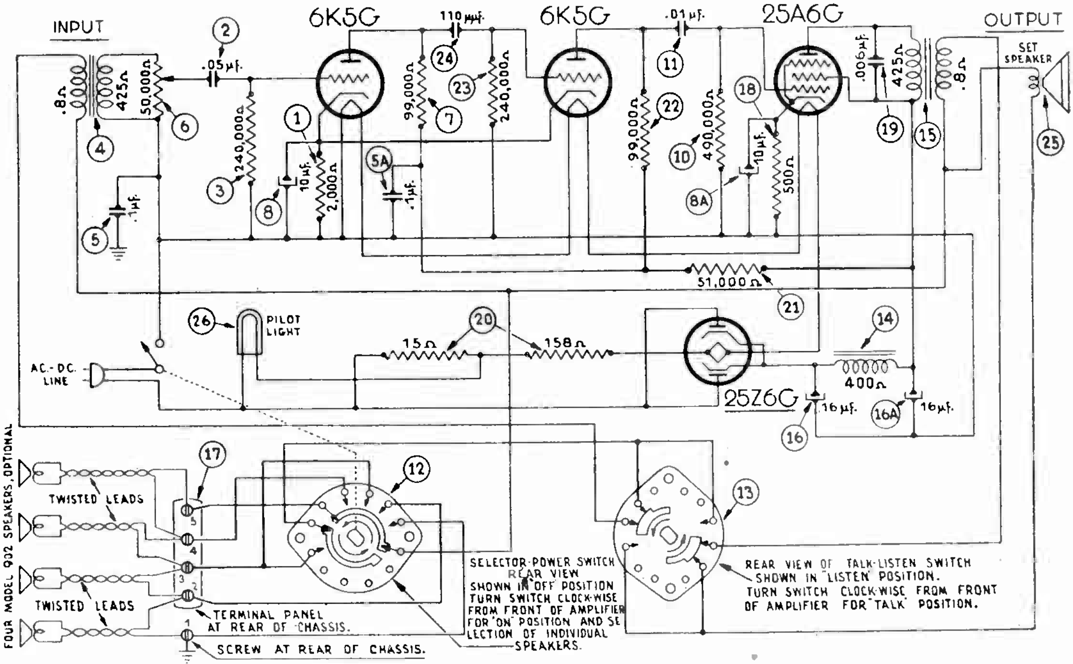

Fig. 1

The signal voltage developed by the second 6K5G is applied to grid resistor 10 of the 25A6G power output tube through condenser 11. The output tube then develops a signal current in the primary of transformer 15.

The signal current flowing in the primary of transformer 15 develops a magnetic field and the flux circulates through the core and links with the secondary, inducing into it a signal voltage. The path from the upper terminal of the secondary is to the switch, through the switch to the voice coil, and through the voice coil to the lower terminal of transformer 15. Assuming that the distant speaker is being used as a microphone, the signal voltage developed by that speaker is applied to the input of the audio line and arrives at the Philcophone master unit. The way in which the signal reaches the primary of input transformer No. 4 can be understood by tracing from the upper primary terminal of this transformer to the contacts of switch 13 and switch 12. Switch 12 is a selector switch. It is shown in the "off" position. A simplified sketch of the input circuit with the switches omitted is shown in Fig. 2.

The d.c. operating voltages required for the plates of the 6K5G tube and the plate and screen of the 25A6G are furnished by the 25Z6G, which functions as a half-wave rectifier.

The input filter condenser is marked 16 and the output filter is marked 16A.

When the local loudspeaker is converted to service as a microphone, upon pressing the listen-talk switch to the talk position, the signal voltage developed across the voice coil of the local speaker, voice coil 25, is applied to the primary of transformer 4. The output voltage of the amplifier, appearing across the secondary of transformer 15, is then fed to the audio line as shown in the simplified sketch of Fig. 3.

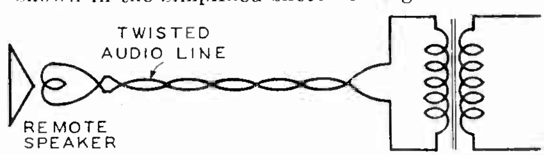

Fig. 2

The distant or remote speaker then reproduces the sound originating at the master station.

Note that the line impedance is low. Transformer 4 is a step-up transformer and transformer 15 has a step-down ratio.

Using a low-impedance line, noise pickup and the induction of stray hum or noise voltages is limited.

Typical servicing troubles are the following: Dead, distortion, hum, noise.

Dead. The equipment may be "dead" in the event of a tube failure, short circuit, or excessive leakage in a filter condenser, an open voice coil or a poor connection. To localize the trouble, use the stage-by-stage method of testing. As an illustration, advance volume control 6 to maximum. Touch your finger to the top cap of the 6K5G. If a noise isn't heard in the loudspeaker continue the test by touching the top of the 6K5G. If it's heard now, it's likely that condenser 24 is open and a new condenser can be installed temporarily, the results noted.

In other words, check the audio amplifier system just as you would any standard audio amplifier in an ordinary radio receiver.

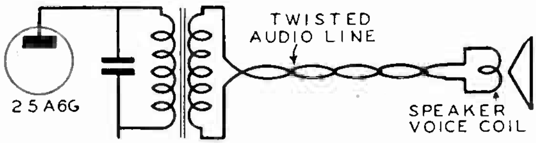

Fig. 3

Distortion. If distortion is observed, frequently the output tube will be responsible for the condition. It may become gassy after warming up.

To test the tube effectively, simply try another tube of the same type or measure the voltage across resistor 10 with condenser 11 disconnected. If a voltage reading is obtained, a new output tube should be installed. If the reading is obtained only with condenser 11 in the circuit, replace the grid condenser as this test shows that it is leaky.

Hum. Hum very commonly is due to cathode-to-heater leakage in one or more of the tubes.

Equipment of this type often is operated for several hours at a time. Considerable heat is dissipated and generated and tube cathode-to-heater leakage troubles often develop.

The filters may become defective. They can be tested by the substitution method.

Noise. The equipment may be excessively noisy because of some inherent defect such as a loose connection, microphonic tube. or because the audio line itself is picking up considerable noise. Keep the line away from power wiring.

To determine whether or not the noise is inherent in the equipment, disconnect the leads to the input of the amplifier at terminal strip 17. A certain amount of background noise will be heard normally. However, the noise level should not be excessively high.

If the apparatus is used in a d.c. district in a large city where elevator motors and other equipment generate considerable noise, a line-noise filter may be applied to the amplifier to cut down on the noise level.

In some cases noise will be due to an off-center voice coil, with the coil rubbing against the pole piece of the loudspeaker. Recentering will correct the condition.

After a unit has been in service for some time, the switch contacts may become noisy. They can be cleaned using carbon tetrachloride or an equivalent solvent.

Another widely used type of communication apparatus is the "wireless" type. We shall now consider some of the basic operating principles of this equipment.

The Zenith Radio Nurse. This equipment gets its name from the fact that the pick-up unit may be placed in a child's room and the receiving unit in the parents' room, but it may also be used for communication purposes in an office or elsewhere. In any event, the fundamental principles underlying this device's operation are the same as for other types of wireless communicators involving the building up of the voice signal, the modulation of an r.f. oscillator, and the sending out of the modulated r.f. wave over the power line to the distant receiver where it is detected or demodulated.

The demodulated or audio signal is then sent to an audio amplifier tube which builds it up and supplies signal voltage to the primary of an output transformer. The output transformer permits coupling of the output tube to the loudspeaker voice coil and the sound is reproduced.

This type of equipment is sometimes referred to as "carrier current," and the same electronic principles are applied, on a greater scale, in the maintenance of complex power systems in the electrical field. Here, however, we are concerned primarily with radio applications as we may expect to encounter them in the course of every-day work.

Referring to Fig. 4, sound waves striking the diaphragm of condenser microphone No. 1 cause an audio voltage to be produced. This voltage is applied to the grid of the 79 voltage amplifier tube through condenser C2. The signal path from the lower terminal of the mike is to the cathode of the 79 directly. The audio output voltage, which is considerably larger due to the gain of the tube, appears at the plate of the 79 located close to the filament in the sketch. This signal voltage of the plate is applied to the following grid resistor, R5, through C3.

The larger amplified output voltage of the second section of the 79 appearing at the top plate in the sketch, where the +32 volt legend ap-

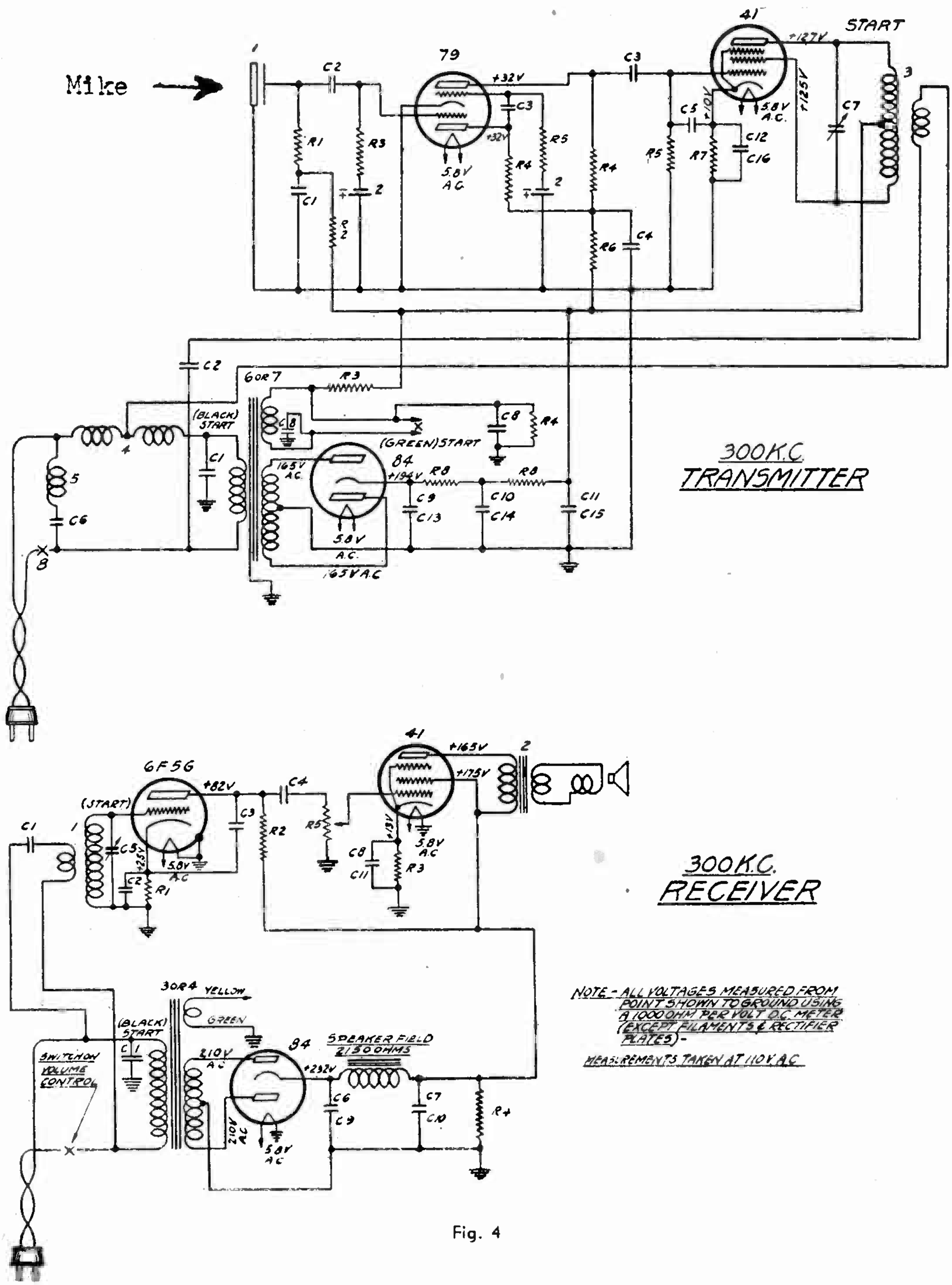
Mike
79
41
START
84
6 OR 7
(BLACK) START
(GREEN) START
300 K.C. TRANSMITTER
6F5G
41
(START)
30 R 4
YELLOW
GREEN
(BLACK) START
84
SPEAKER FIELD 2150 OHMS
SWITCH ON VOLUME CONTROL
300 K.C. RECEIVER
NOTE - ALL VOLTAGES MEASURED FROM POINT SHOWN TO GROUND USING A 1000 OHM PER VOLT D.C. METER (EXCEPT FILAMENTS & RECTIFIER PLATES) -
MEASUREMENTS TAKEN AT 110 V A.C.

Fig. 4

pears, is applied to grid resistor R5 of the power output tube through condenser C3.

Condenser C5 serves as the grid condenser of the 41 r.f. oscillator.

In addition, condenser C5 helps to keep r.f. out of the audio system. It has a relatively low impedance at the r.f. frequency of the oscillator. This frequency is 300 kc.

The d.c. voltage required for operation of the preamplifier which builds up the microphone signal, and the 41 oscillator, is obtained from the power supply system using a type 84 full-wave rectifier.

The resonant frequency of the oscillator is determined by the setting of condenser C7 which resonates with the tapped coil of the r.f. transformer marked No. 3.

The oscillator is coupled to the power line because of the mutual inductance existing between the winding in the 41 r.f. oscillator plate circuit and the winding which is connected to condenser C2. The induced voltage in the secondary circuit is applied to the power line. Trace from the upper terminal of the secondary coil of transformer 3 to terminal 4 in the primary circuit of the power supply. Trace from the lower terminal of the r.f. secondary to point 8 in the primary circuit. Elements 4, 5, and 6 combine to form a harmonic filter, resonating at 600, 900, and 1200 kc., thus preventing interference of the r.f. oscillator with broadcast receivers.

At the receiving station, the r.f. voltage of the line is applied to the primary of transformer 1 of the 300-kc. receiver through condenser C1. The signal current circulating in this primary develops a magnetic field and there is an induction of a voltage at the r.f. level of 300 kc. into the secondary circuit. This voltage is built up by resonance. The resonant circuit consists of the secondary of transformer 1 and condenser C5.

Condenser C5 is adjusted so that the circuit is tuned to the oscillator frequency of 300 kc.

The 6F5G is used as a detector. The demodulated voltage or audio signal voltage appearing at the plate of the tube is applied to the grid of the 41 power output tube through condenser C4 and R5.

The audio voltage on the grid is controlled by the setting of R5. Moving the arm closer to C4 increases the audio signal voltage, and moving it away from C4 towards ground decreases it.

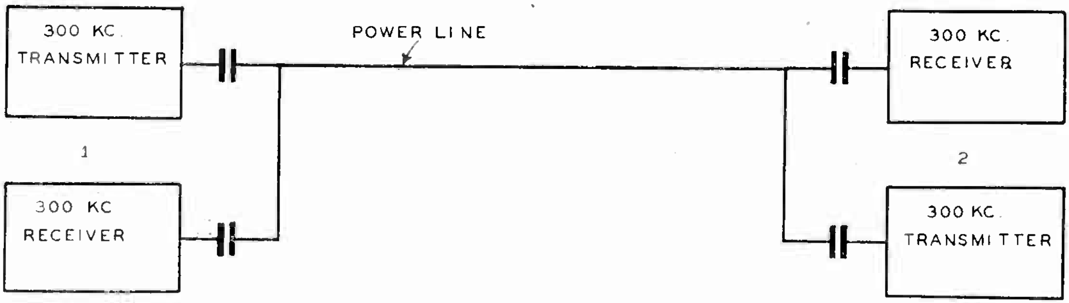

Fig. 5

The signal voltage between the grid of the 41 and ground is amplified and appears at the plate. This larger voltage is applied to the primary of transformer 2. The signal current flowing in the primary of transformer 2 develops a magnetic field and the core flux of the transformer cuts the secondary and induces a secondary potential. This voltage is applied to the voice coil of the loudspeaker and the sound is reproduced.

The d.c. voltages required for the operation of the plate of the 6F5G and the plate and screen of the 41 are obtained from the full-wave rectifier power supply system which, like the transmitter, uses a type 84 rectifier tube. Filtering is afforded by condenser C6-C9 and C7-C10.

The equipment described (Zenith Radio Nurse) is one-way equipment. That is, the Zenith "Radio Nurse" consists of a sending unit (transmitter) and receiving unit (receiver), permitting the person located at the transmitter to speak to a listener at the receiver. To allow the listener to "talk back" an additional "Nurse" is required, consisting of a second transmitter and receiver. This is shown in block diagram fashion in Fig. 5. Using this system, speaking into the 300-kc. transmitter at point 1 will result in your hearing the signal on your own 300-kc. receiver, which is not desired. At the same time, the distant 300-kc. receiver will pick up the signal, demodulate it, and reproduce it, which is desired. If both transmitters are used at the same time, on the same frequency, crosstalk and distortion will be produced. To avoid this undesirable state of affairs, we can use separate frequencies for the transmitters. This is illustrated in Fig. 6.

Now, a person speaking at station No. 1 will send out a 300-kc. modulated wave which will travel over the power line to the 300-kc. receiver at station No. 2. A person speaking at station No. 2 will produce a 320-kc. modulated wave which will be sent out over the power line to the 320-kc. receiver at station No. 1.

Because of the fairly wide difference in the operating frequencies, a 20-kc. difference, the tuned circuits in the receivers will be able to discriminate between the unwanted and wanted signals.

If interference should be experienced, the selectivity can be sharpened by connecting in series with the receiver at station No. 1 a 320-kc. wave trap of the series resonant type. The wave trap will pass the 320-kc. signal current efficiently but will reject signal currents having widely different frequencies than 320 kc. In a similar way, a 300-kc. series wave trap may be installed at station No. 2 in series with the 300-kc. receiver input.

A wave trap arrangement is shown in the lower part of the figure.

For simplicity's sake, only a single power line wire is indicated in Fig. 5 and in Fig. 6. Two wires are a part of every power line. Blocking condensers are connected between the signal units and the power line to keep out the power line current and to permit passage of the r.f. signals.

Typical service troubles are: Dead, distorted, weak, noise, hum, whistling or squealing.

If two oscillators are operating on frequencies which are fairly close together, a beat frequency or squealing note may be produced. For example, if one oscillator is operating on 300 kc. and the other is operating on 305 kc., the difference in frequency will be 5 kc. A kilocycle is equal to 1000 cycles and 5 kc. will mean that a 5000-cycle audio note or high-pitched note will be heard.

By using widely different operating frequencies and the wave trap, this type of interference can be eliminated or greatly reduced.

The service troubles that develop may be due to defects in the transmitter or receiver units.

Dead Transmitter. If no modulated r.f. output signal is obtained from the transmitter, the trouble may be that the oscillator is not functioning, that there is a defect in the preamplifier, or that there is an inherent defect in the power supply system.

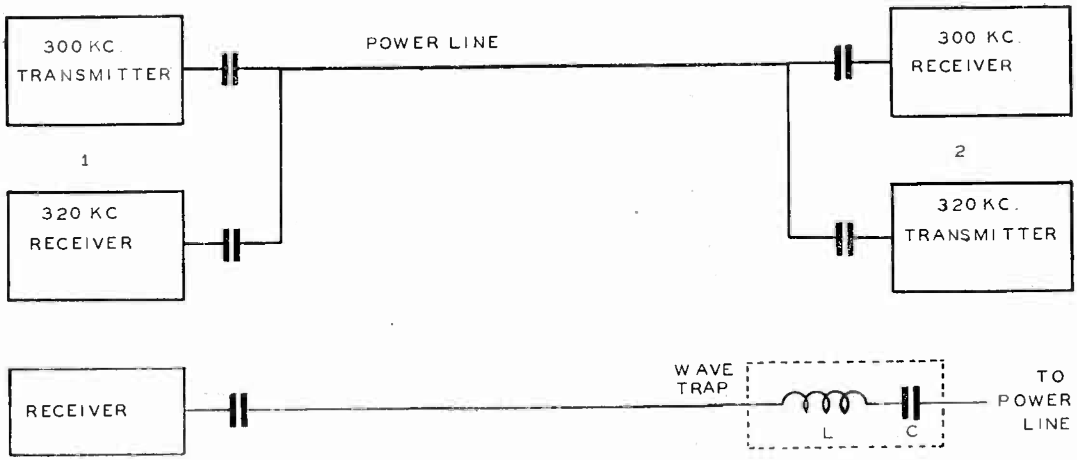

Fig. 6

The values of L and C are experimentally chosen to resonate at the frequency to which the receiver normally is tuned.

The adjustment of the oscillator frequency may be made by varying the setting of condenser C7 in Fig. 4 and the receiver tuned circuit may be adjusted by varying C5.

Increasing the amount of capacity of C7 or C5 will lower the operating frequency, and decreasing the amount of capacity will raise the operating frequency.

As a first step in checking the transmitter, you may measure the output voltage across C11-C15. This is a d.c. voltage. It will be fairly high. If no voltage is obtained, turn the power off and check the filter condensers C13, C14, and C15 for leakage. Check the filter resistors marked R8 for continuity and proper resistance values.

It would also be wise, as a first step in the event of trouble, to have the tubes tested in a tube tester, whether the unit happens to be the transmitter unit or the receiver unit.

Assuming that the power supply is all right and the modulated r.f. wave is not generated, look for trouble in the oscillator circuit. Check the continuity of the oscillator coil and the plate and screen voltages. Also, the grid should be negative with reference to chassis-ground.

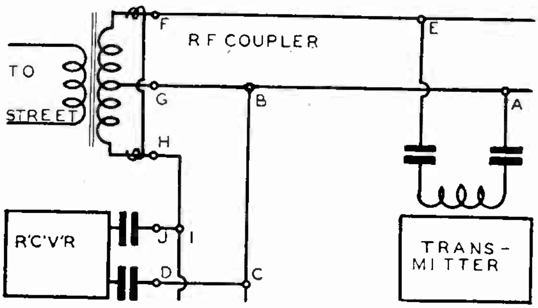

Fig. 7

Ohmmeter tests should be made only when the equipment is turned off and disconnected from the power line. Voltage tests can be made while the apparatus is actually in operation.

Assuming the oscillator is functioning, determine whether or not the preamplifier section is operating. A simple way of doing this is to connect a set of headphones across resistor R4 and to speak into the microphone. You should be able to hear a signal.

Dead Receiver. To localize the trouble in the receiver, advance the volume control to maximum and touch the high side of the control. A hum or noise should be heard indicating that the 41 power output stage is operating. If this response is not obtained, check the output stage and power supply. Check the operating voltages. Assuming that output voltage is not obtained across the resistor marked R4 which is in shunt with C7-C10, turn the power off and make a careful test of the power supply system, using an ohmmeter.

The continuity of the r.f. coil and the values of resistance in the detector stage may readily be tested with on ohmmeter. If you find, connecting a voltmeter between the plate of the 6F5G and ground, that a loud click is not heard, look for an open in R2 or C4. The part suspected may be tested by replacement if necessary. An open in C1 would cause trouble. The condenser can be tested by trying another one and observing the results.

Transmitter Distorted. Distortion in the transmitter may be due to a defect in the bias cell marked No. 2 on the diagram. The cell may be checked by replacement. Changes in value of the resistors will cause distortion and leakage in condenser C3 commonly causes the trouble. Parts suspected of being defective may be tested by replacing them and observing the behavior of the equipment. Excessive hum output from the power supply will result in a "garbling" effect. Gas in the 41 power output tube which is used as an oscillator in the transmitter may cause distortion. The tube may be tested by the substitution method. The usual test for gas, of connecting a voltmeter across the grid resistor, with the grid condenser disconnected, cannot be made. The reason is that the tube functions as an oscillator in this circuit and normally draws grid current and this current flowing through the grid resistance causes a voltage to appear across the resistor.

Receiver Distortion. Distortion in the receiver may be due to excessive leakage in condenser C4, a gassy output tube, or defective filters. Check the equipment just as you would test the detector and audio stages of a standard radio receiver.

Weak Transmitter. A lack of sufficient power output may be due to changes in the resistance values and in some cases to shorted turns in the secondary of transformer 3. The windings may be inspected visually. If there is obvious evidence, apparent to the eye, of corrosion, the transformer should be replaced. A lack of coupling to the line due to an open in condenser C2 may result in weak modulated r.f. output.

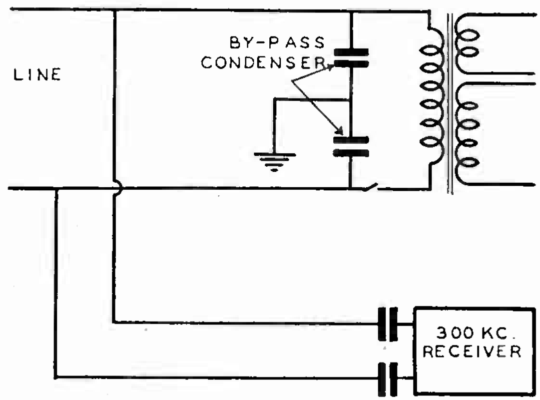

Fig. 8

In some cases, the signal will be very weak or may not be heard at all because of a lack of continuity or break in the signal path. Fig. 7 makes this clear. In many electrical distribution systems a transformer is used for stepping down the high voltage which is furnished by the street power line to the electric circuits in an office building or home. If the receiver is on one-half of the transformer and the transmitter is on the other half, there may not be sufficient coupling between points F and H to permit passage of the signal without undue attenuation.

It is possible for a trained person, such as an electrician, to connect in a safe way an r.f. condenser between points F and H. However, the ordinary person should not attempt to tamper with the electrical wiring. The voltage is high enough to be dangerous, and in addition damage to the power circuit may result if the work is not done properly. To avoid tampering with the wiring at all, a simple r.f. coupler may be used. A No. 14 or No. 16 insulated wire may have its ends wrapped around one of the power wires as shown in Fig. 7 to permit capacitive coupling between points F and H. The number of turns can be determined by experiment. Probably you will find that ten or fifteen turns at each end of the coupling wire will permit easy passage of the signal through the circuit. In doing this, a means will be provided for the r.f. signal to pass easily through the system from F to H—I—J and to the radio receiver tuned to 300 kc.

Ordinarily, special devices of this type will not be required but they may be necessary in office buildings where the signal will not "jump" the power circuits.

Weak Receiver. Weak reception may be due to a change in value in R1. If the value becomes lower than normal, the sensitivity of the detector will be reduced. If condenser C2 opens up or develops high-power factor, the gain will be lower than normal and also distortion may be observed. If condenser C5 is not properly tuned to the frequency of the incoming signal, reception will be weak. If any of the operating voltages are lower than they should be, the gain will be reduced.

Another point sometimes overlooked is this: If a radio receiver of an ordinary type tuned to broadcast frequencies is used alongside the 300-kc. receiver, plugged into the same electrical outlet, and the standard receiver has bypass condensers in the primary circuit with the midpoint of the condensers connected to the receiver chassis and to an external ground, the r.f. signal will be greatly attenuated. The receiver (standard receiver) should be used on some other electrical outlet in such circumstances. Also, don't attempt to apply a line-noise filter to the 300-kc. receiver—you will kill the r.f. signal input. The condensers bypass the r.f. signals.

This is illustrated in Fig. 8.

Because of the facts indicated, wireless or wired radio systems have definite limitations and very often the direct wire type is superior.

Noise—Transmitter. Loose connections in the transmitter unit may cause considerable noise. Go over the connections with a hot soldering iron if they appear to be defective. While the equipment is in operation, determine whether or not the tubes are noisy by tapping them individually and observing the results. Wires and parts may be wiggled while the unit is on to discover loose connections and defective parts. Noise in many cases may be due to the signal being very weak and not being able to over-ride the inherent noise in the power line. Therefore, if you find that a noise condition is encountered, check the equipment according to the instructions already given under the heading "Weak Receiver" or "Weak Transmitter."

Noise—Receiver. Noise in the receiver may be due to any of the circuit defects which commonly arise in ordinary radio receivers and cause noise —poor connections, defective tubes, defective parts such as C9 and C10. If the electrolytics age, frying and hissing noises may be produced and the units mentioned can be checked by trying substitution of them, observing the results.

Transmitter Hum. Hum in the transmitter may be due to defective electrolytics or an unbalanced rectifier system. In checking the emission of the 84 rectifier in a tube tester, make sure that you have approximately the same reading for each rectifier plate. Otherwise, the hum level of the equipment may be higher than normal. Also have the 79 and 41 tubes carefully tested to make certain that cathode-to-heater leakage does not cause trouble.

Receiver Hum. Excessive hum in the receiver may be due to any of the causes which are responsible for excessive hum in an ordinary radio receiver such as defective tubes, defective electrolytics and open grid circuits.

Whistling or Squealing in the Transmitter. Self-oscillation in the preamplifier may be responsible for the modulation of the oscillator with a squealing or howling note. This trouble is seldom encountered but it may develop. An open output filter condenser C15 or an open in C4 may result in oscillation. Incorrectly setting the frequency of the transmitter so that it beats with another transmitter used in the communication system, at an audio frequency, may be responsible for the howling or squealing note. For example, if the local transmitter operates on 300 kc. and the incoming signal is 305 kc., a beat note of 5 kc. will be generated. This signal may be picked up by the receiver and amplifier.

Whistling or Squealing in the Receiver. If the value of the volume control resistance R5 rises to a much higher-than-normal value, the gain of the 41 power output tube will be higher than it should be and the stage may break into steady or intermittent oscillation. An open in C7-C10 would permit oscillation and howling to develop.

If condenser C3 opens up, there may be sufficient feedback between the plate and the grid of the 6F5G, particularly if R2 rises in value, to cause self-oscillation and instability.

It should be borne in mind that this equipment is commercially manufactured equipment designed for a purpose—to do a job. Under present conditions it must be stressed especially that construction of the apparatus in the home or service workshop definitely is not recommended. You cannot obtain the parts necessary to do a good job.

Used and new equipment, however, possibly can be obtained. Consult your radio distributor and watch the classified advertisements in the newspapers which occasionally offer communication equipment for sale.

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FM Broadcasters Ready for Home Facsimile

In spite of the rapid development and use of facsimile service by everyday wire and radio, many people are unaware of its greater capabilities as a mass communications medium in the FM broadcasting field. This is largely because of the fact that facsimile transmissions have exclusively been employed to handle press newspaper reproductions. Many also confuse television with facsimile and ask why television ultimately will not perform this same service.

Briefly, facsimile involves the conversion of illustrations or other copy, such as printed matter, photographs, line drawings, sketches, etc., into an electric signal which can be sent over radio or telephone circuits. At the receiver, the signal is automatically converted back into its visible form appearing as a recorded replica of the original copy. The received copy is permanent and—like a printed magazine page—can be handled, observed or read whenever desired.

Television involves the conversion of visible aspects of subjects into electrical signals which can be sent to distant points. However, the speed of this conversion is such that ordinary telephone circuits or conventional sound-broadcasting equipment cannot handle the signal.

In commenting on new laboratory developments and new interest in FM facsimile broadcasting, Commander W. G. H. Finch stated that both FM broadcasters and newspaper publishers are recognizing facsimile not only as an aid to themselves, but as a service to the public much in the manner that the motion picture has recognized television.

★ Martin Hollenbeck, Jr.

The National Radio Institute sadly places a Gold Star on its Roll of Honor, beside the name of Martin Hollenbeck, Jr., who died of wounds received during the invasion of Iwo Jima.

Martin—or "Tinker" as we all called him here—was one of our most popular and most promising young employees. He was only 18. He left N.R.I. in July, 1944, to join the Marines and died on Iwo Jima March 10, 1945.

We will honor his memory always. And our deepest sympathy goes to members of his family.

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Our Cover

Our cover photo, this issue, is one of the most dramatic of the war. It shows the American flag going up on Mount Suribachi Iwo Jima. This picture was described by Navy Secretary Forrestal as "almost as gallant" as the Marines' fight up the sides of the volcano.

Of the six Marines shown in this historic flag-raising ceremony three have since lost their lives and one other has been wounded. These casualties occurred in later action on the island as the Marines pressed forward to the northern front.

When we study this picture for a few minutes and sense the tenseness of the situation—the daring and bravery of these young men, and realize that only three are now alive we have all the urge we should need to buy bonds to our very limit.

To crush Japan will take time, heroic and back-breaking effort. More of everything will be needed. More ships, more B-29's, more tanks, half-tracks, jeeps and trucks, more rockets, mortars, airborne Radar. These things cost money—a great deal of money.

Yes, let's put this 7th War Loan over the top. Let's back these boys with every dollar we can scrape up. That's the very least we can do in return for what they have done and are doing for us.

NEWS OF THE RADIO WORLD

BY *Willard R. Moody*

"Handie-Talkies" used by the Army are 5 tube sending and receiving sets which permit efficient radio telephone communication. Each Handie-Talkie weighs about 5 lbs. and contains 585 tiny parts. The batteries which supply power to it have a life of approximately 12 hours.

The Pennsylvania Railroad is investing a million dollars in radio equipment to facilitate operation of its 247 mile four-track main line between Harrisburg and Pittsburgh, one of the world's busiest stretches of railroad.

Railroad brakemen can use walkie-talkies for reporting on train conditions to yard officials.

The Rock Island Railroad uses 40 megacycle transmitter-receivers in the engine and caboose.

The Baltimore and Ohio Railroad, in the busy Baltimore district, uses a 50 watt, 156 megacycle fixed frequency transmitter, feeding into a 35-foot antenna mast on the roof of the B.&O. Building in Baltimore.

Special electronically controlled units aboard aircraft now make precision bombing under adverse flying conditions possible.

On a recent occasion, the Federal Communications Commission proposed in a report on postwar radio that frequency modulation broadcasting be given a new channel in the radio spectrum so that its full development will not be retarded.

Financing a postwar airport development program to cost approximately $800,000,000 recently was recommended by William A. N. Burden, Special Aviation Assistant to the Secretary of Commerce. Large quantities of Radio Communication equipment will be used at the airports, requiring radio operators and radio technicians for operation and maintenance.

The use of frequencies around 5000 megacycles and the experience gained at frequencies of over 30,000 megacycles, has resulted in the development of unique radio systems which will assume postwar importance.

How thirty Windchargers shipped from New York on August 10, 1940, recently arrived at their destination at Istanbul, Turkey, makes an interesting story. After almost a five year journey, by water and rail, through war torn countries, they apparently were left undamaged.

Electronics is applied in splitting seconds into 100,000's in an electronic time-interval counter recently developed for all types of Army and Navy guns. The "counter," developed by RCA, is widely used at Government arsenals and proving grounds to check the performance of a gun and ammunition in a few seconds.

RCA Communications, which operates more than fifty circuits between the United States and foreign nations, last year handled 130,000,000 paid words, and the estimate for this year is 145,000,000 words. Since May, 1940, more than 2,300,000 expeditionary force messages have been RCA sent and received.

Ten radio transmitters, transported over trackless wastes of China by truck and ox-cart, and operating from caves and temples, carried the burden of American Air Force ground Communications on the Asiatic battle front from the arrival of the Flying Tigers in 1941 until the present. The outstanding performance of American Military Radio equipment was revealed by an officer attached to General Chennault's fourteenth Air Force upon his return, recently, to the United States after twenty-five months of service in the Orient.

Radio stocks have gone up; some have doubled and others have greatly increased in value. Stock market figures indicate no other industry can point to such gains.

A new television receiver for post-war homes that projects pictures, like movies, that are brighter, clearer and five times larger than in pre-war sets, was demonstrated recently by Dr. C. B. Jolliffe of the Radio Corporation of America. The demonstration was held in New York. The screen of the new receiver is 16 x 21⅓ inches in size and is made of a special plastic that has been treated to make the picture show up brighter and clearer. It was made possible by four pre-war technical developments which Dr. Jolliffe credited to RCA scientists and engineers. These include an improved high-voltage projection tube, a unique high-efficiency optical system, the plastic screen and an automatic frequency control system.

N.R.I. STUDENT, WAR VETERAN, GETS $1,000 LOAN TO EQUIP HIS RADIO SHOP

LEBANON DAILY NEWS, LEBANON, PA.

EX-SOLDIER GETS FIRST G. I. LOAN HERE

The first G. I. loan in Lebanon County under the Servicemen's Readjustment Act of 1944 has been completed through the First National Bank of Lebanon to U. S. Army Veteran C. Richard Burch, of 248 South Ninth Street. The purpose of the loan is for purchase of equipment and supplies to operate a repair business for receiving sets.

Mr. Burch is a projectionist at one of the local theatres and will continue this line of work, operating his repair business during his free time. He received his honorable discharge as a private, Headquarters Battery, 193rd Field Artillery, after serving in the Army three periods of three years each, plus one year and five days or a total of approximately ten years. Mr. Burch is an advanced student of National Radio Institute at Washington, D. C., and was a wireless technician and communication man in U. S. Army.

Shown in the photo above is the actual presentation of the $1,000 check being made in the offices of the First National. Burch, on the extreme right, is being handed the check by John S. Bashore, president of the bank. Seated to the left is Melville M. Parker, the bank's cashier. Witnessing the presentation are (left to right): Harry M. Miller, commander of the Bollman Post, American Legion; Charles D. Hanner, commander of Fulmnan Post, Veterans of Foreign Wars, and Harry F. Hummel, veterans' representative for the United States Employment Service.

sent for when his advice is needed.
The president said the present

The above illustration is reproduced through the courtesy of Lebanon Daily News, Lebanon, Pa. It shows N.R.I. student C. Richard Burch receiving a check for $1,000 representing the first loan in Lebanon County under the Servicemen's Readjustment Act of 1944. Mr. Burch will use the money to outfit his Radio shop.

N.R.I. ALUMNI NEWS

How To Get Along With Others

By Dr. James F. Bender, Director

The National Institute for Human Relations

WHAT MAKES A PERSON POPULAR? We wanted to know the answer to this important question for a long, long time. So, several years ago we began to ask people to describe the most popular person they knew. Wherever we went, we took our note-book along, and jotted down the opinions of the kind-hearted men and women we button-holed. Before long we found that there were about 25 items most frequently used in describing the popular man and woman. We then put these items in the form of a printed list.

Next, we asked men and women in all walks of life—machinists and clergymen, stenographers and teachers, lawyers, and bricklayers, housewives and foremen, saleswomen and physicians, and many others—to arrange these items by numbering them—1 representing what in their judgment was the most important ingredient of popularity, and so on down the line, until the item they assigned 25 to was the least important. Finally we tabulated the results, and can you guess which item is most often put first? It isn't attractiveness of appearance, nor readiness to mix with others, nor even a ready and hearty laugh. These, too, are important aspects of popularity, but they aren't numbered 1 by the majority or people. Number one turns out to be: THE MOST POPULAR PERSON I KNOW CAN ALWAYS BE DEPENDED UPON TO DO WHAT HE (OR SHE) SAYS HE WILL DO.

Rather amazing, isn't it? Yet when we stop to consider, is it? For nothing wears so well in good human relations as dependability. The person whose word is his bond gives us a feeling of security. We can bank on him. We can look to him for help. That is why he is popular.

So, the way to become popular is to increase your dependability. And the way to climb the ladder to dependability is to accept more responsibility in discharging daily duties well. The wife who gets her husband off to work on time and in a happy frame of mind; the husband and father who takes pride in the welfare of his family; the stenographer whose letters continually improve; the worker who gets his job done on schedule or even before; the boss who doesn't forget to give praise where praise is due—these are the kind of habits that lay a solid basis of popularity. And by building many such habits you are preparing for greater responsibilities. THE WORLD IS ALWAYS LOOKING FOR MEN AND WOMEN WHO ARE DEPENDABLE.

When we pay our bills on time, our credit-rating rises; when we establish a reputation as a careful workman, rewards are bound to come; when we carry our share of the load, our stock goes up; when we keep our word, we have the admiration of our fellow workers. These are just a few every day examples of how people become popular.

And do you know what happens when you steer your course toward greater dependability? Way down deep within you, you have a growing conviction that you are gaining in personal power; that you are influencing people constructively both on and off the job; that you are getting more of the good things of life. And most satisfying of all, you have that glorious feeling that you are admired where you work, where you live, and where you play as one who can be counted on to do what you say you will do. THAT IS THE WAY TO INCREASE YOUR POPULARITY.

Baltimore Chapter

Meeting regularly at Redman's Hall, 745 W. Baltimore St., every second and fourth Tuesday of the month.

Here is the place to learn how Radio servicemen tick. Our practical Radio work, under the guidance of that expert H. J. Rathbun, our Vice Chairman, has just about taken over at our meetings because practical Radio work is what the members want to do.

Chairman E. W. Gosnell, who has been such a loyal leader for several consecutive years, is prompt in getting the business part of our meetings out of the way and then we go to it.

Occasionally, we have a speaker and otherwise vary the program. But you can always count on one thing—plenty of information on the actual doing of Radio work.

As usual, we plan to hold our meetings right through the summer months. So drop in on us. Remember, every second and fourth Tuesday at 745 W. Baltimore St., where we have spacious quarters. Come and meet E. W. Gosnell, H. J. Rathbun, G. Phillips, P. E. Marsh, S. H. Leidig, L. Arthur, J. Clark, our officers and all of the fellows who will give you a cordial welcome.

P. E. MARSH, *Secretary.*

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New York Chapter

One of our most interesting recent meetings was devoted, for the most part, to a discussion of the N.R.I. Tester. This is the tester that is given the students to build during their studies. Mr. Eugene L. Williams took the floor and gave a fine talk on the N.R.I. Tester. Mr. Williams spoke for about thirty-five minutes. This man Williams is a very fine speaker and the members like him very much.

Following this talk, Pete Peterson took over, as usual. His subject was "Tube Substitution." Peterson, as most everyone knows, is our Vice Chairman.

The following meeting was again turned over to Mr. Williams. Chairman Wappler asked him to continue with his interesting talk on the N.R.I. Tester. This time Mr. Williams spent most of the time allotted to him in answering questions pertaining to the Tester. What an interesting session that was! It made a big hit with our members, particularly those who still have their N.R.I. Tester to build.

Some of the members have asked for a fifteen minute period on Mathematics. We are going to try it for a while inasmuch as most of our members expressed an interest in the subject.

Pete Peterson concluded his talks on tube substitutions by passing out copies of a popular book "Sylvania Aids to War-time Servicing," through courtesy of Sylvania Products Corporation.

All meetings include a Service Forum. This is the place to ask your questions and get an understandable answer.

Manuel J. F. Corrar has been appointed our new librarian.

Here is a new idea. Led by Pete Peterson we will build a receiver on a large board and color each circuit differently. Then, at the following meeting, Mr. Peterson will take a section of the receiver and show the members just where to put the test leads for certain tests. The receiver he will build will be the first diagram in N.R.I. Reference Text 17X. This should go over big.

L. J. KUNNERT, *Secretary.*

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Chicago Chapter

Our last two meetings were held at Tony's Radio Shop, 3200 S. Morgan St. These were fine meetings. Two new members were introduced at our most recent meeting—we also had five visitors.

Mr. Milton C. Coleman of Radolek Company was our speaker. His subject was "The Future of Radio." He also gave us some interesting information on parts we can and cannot get under present conditions.

An Aligning and Neutralizing Kit was donated to the chapter by Mr. Coleman. We are very grateful to the Radolek Company for this fine gesture. The kit was disposed of then and there by selling a twenty-five cent chance to each one present. The kit was won by Joe Kapischke.

The June meeting will be the last before summer recess. It is tentatively scheduled to be held at The Radolek Co., 601 W. Randolph St., Chicago, Ill. This is subject to change, however, so look for your notice from the Secretary. Which is a good way to suggest that you send your name and address to the undersigned if you live in Chicago or vicinity. The address of the Secretary is 2306 W. 51st St., Chicago, Ill.

Chairman Charles Kadlub wishes to express his appreciation to our members for their loyalty and fine support. He hopes the June meeting will be well attended and that the war situation will have improved so much by September that many of our members now working overtime will be able to meet regularly with us again.

LLOYD C. IMMEL, *Secretary.*

Phila-Camden Chapter

Jimmy Sunday gave us quite a talk on some of his experiences with tube substitutions.

Norman Kraft made a large drawing of a Philco eight-tube set which he has and used this schematic to check and locate the various circuits and visual parts on the set itself. He was assisted in this work by Laverne Kulp and Harvey Morris.

Harvey Morris, by the way, has developed into quite a lecturer, particularly on Radio servicing techniques.

The Chapter has just purchased a RCA Dynamic Demonstrator 111 Type 182 and a number of instruction books which will add to the interest of future meetings.

The Chapter is looking forward to the visit of Executive Secretary, L. L. Menne.

Our National President, Mr. Charles J. Fehn, is recovering from an unusual accident. He received a bump over the right eye, infection set in and affected both of his eyes. After being shelved for several weeks, Mr. Fehn is now fully recovered. Mr. Fehn has not yet explained how he received the bump over his right eye, at least he has not given a satisfactory explanation.

As if it were not enough for Charlie Fehn to be laid up, our very able Chairman Laverne Kulp also spent some time in a hospital while having his tonsils removed. He too is now fully recovered. While in the hospital Mr. Kulp permitted Norman Kraft to shave him, which shows how sick he really was.

Harvey Morris is frequently seen snooping around the Chapter tool chest looking for screwdrivers, pliers, etc., which he has lost and which he thinks the members have carried away from his place of business. If Harvey would follow his little daughter, Barbara Viola, to the place where she hides her favorite toys we think he would find his highly prized tools.

Librarian Chester Klabe is building a large cabinet to house most of the Chapter equipment. He ran out of lumber—could it be that he cut a few boards twice and still finds them too short? If we can get the cabinet completed without having another casualty in our Chapter ranks we will be happy indeed.

All students and graduates in this area are invited to attend any and all meetings. The address is Post Office Building, 4706 Comly St., Philadelphia 24, Pa., and the time, the first and third Thursday of each month at 8 P. M.

HARRY SCHNEIDER, *Secretary.*

Detroit Chapter

Our own Bernard Hiller gave a talk on "How Operating Voltages are Obtained from an AC Power Line." Mr. Hiller is extremely sincere and uses the blackboard to good advantage. It was a very good talk.

The following meeting our Chairman, Harold Chase, talked on Circuit Diagrams and that too was excellent. Mr. Chase is prospering in his Radio business and is bubbling over with enthusiasm.

The pictures in the last issue of the NEWS, showing some of our chapter activities, attracted a lot of attention. Five N.R.I. students telephoned to say they are interested in joining our Chapter and one arranged to visit the shop of Harry Stephens.

As a bit of side line to our regular meetings a group consisting of Hasen, Mrs. Hiller, Hiller, McMaster, Mills, Mrs. Oliver, Oliver, Mrs. Stephens and Stephens, attended a very nice movie and lecture on Electronics presented by Westinghouse through the courtesy of Detroit Edison Co. This was preceded by a tasty dinner in Detroit Edison's lunchroom.

We suspend meetings during July and August. Therefore, we will bring the season to a close with a dinner at the Rendezvous Hotel in Windsor. This will take place on Wednesday, June 27. Jack Hasen acted as a committee of one in locating this excellent spot and it has since been investigated by Mr. and Mrs. Earl Oliver and Mr. and Mrs. Harold Chase, who found everything very satisfactory. This usually is the outstanding meeting of the season because it is arranged for the wives as well as our members. Mr. Menne, of Washington, will come to Detroit for the event.

If you are interested in our chapter activities we shall be glad to send you notices if you will send your name and address to the Secretary at 5910 Grayton Rd.

HARRY R. STEPHENS, *Secretary.*

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Senator Hoyt Moore Visits N.R.I.

Mr. Hoyt Moore, who in 1929 was elected as the first Vice President of the N.R.I. Alumni Association, recently returned to the school for a brief visit. Mr. and Mrs. J. E. Smith entertained Mr. Moore and a group of N.R.I. executives at their home, at which time Mr. Moore exhibited some very interesting motion pictures which he took in Washington during the 1929 convention. Mr. Moore is now a State Senator in Indiana representing Marion County.

Here And There Among Alumni Members

In November 1942 we were notified that George W. Palin of Midway, Pa., was training to be a Flight Radio Operator. The other day he phoned us from Virginia where he is stopping temporarily. Mr. Palin now makes two flights a month—overseas. What a job that man has been doing!

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Mr. Ray Linganfield, who had that fine Radio store in Glendale, California, which was featured in N.R.I. literature, passed away. We will miss him. He was a grand man and a real credit to the Radio profession.

—————n r i—————

Alfred L. Smith has been made Supervisor of Police Radio Station KACC, Fairfield, Iowa, by his Chief, whose headquarters are in Des Moines. Part of Mr. Smith's job is to train three new operators, after getting some special training on his own part from the Chief Engineer at Des Moines.

—————n r i—————

Clive W. Keemer, of Dayton, Ohio, who is now Assistant Resident Inspector-in-charge, Electronics Section, General Electric Co., Bridgeport, Conn., informs us that his son Amos L. was killed in action while serving with the Marines. The boy was only 19 years of age. Mr. Keemer has two other members of his family in the service. He says "all I can do is try to get the material out so other boys may come home again."

—————n r i—————

Lawrence Hartgrove of Washington, N. C., Electrician, Navy Yard, 23 years' service in New York and Washington, became interested in spark system in 1908. Doing spare time Radio work—makes up to $35 a week.

—————n r i—————

Stanley D. Bartleman is an Engineer with Farnsworth Television Radio Corp., Marion, Ind. There he has become well acquainted with Dave Blackwell, who formerly was Chairman of Phila-Camden Chapter.

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To use the exact words of John J. O'Brien, 133 Durfee St., New Bedford, Mass., in an effort to track down that elusive Grid emission he went into the basement, fell in the ashpit and broke his arm not once, but in two places. These O'Briens! Mr. O'Brien, by the way, now has a lot of time on his hands—at least on his one good hand—and will be glad to hear from graduates in his vicinity who are interested in establishing a local chapter.

—————n r i—————

Cece Morehead, who served Chicago Chapter, so well in former years, is now living in Round Lake, Ill., where he raises ducks and cute little things like that. Our guess is that his good wife, Letha, does most of the work while Cece continues to tinker with Radio which is in his blood and there to stay.

—————n r i—————

We have a letter from Basil Hathaway of Tarboro, N. C., informing us that his friend and neighbor and a recent N.R.I. graduate, B. S. Sessoms, was killed in an automobile accident. Mr. Sessoms was physically handicapped and studied the N.R.I. Course through arrangements with the Department of Public Education, State of North Carolina. Mr. Sessoms made excellent progress. Too bad he should lose his life just when things began to look bright for him.

—————n r i—————

For crying out loud! Earl Bennett has taken up flying—in fact, has his flying license, and warns us that he is planning on flying to Washington to see us. The guy means it and do you know what we think? We think he will do it. He always was a bird!

—————n r i—————

Chester E. C. Short of Altoona, Florida, gets business from miles around. For example, the day he wrote us, he got two jobs, one from Stetson University, 30 miles away, and the other from Orlando, which is 42 miles from his shop. That's what a good reputation will do.

—————n r i—————

In December 1942 William Smith of Portage, Pa., took an examination for N.Y.A. radio instructor. He was accepted and continued as an instructor until July 1943 when the National Youth Administration was dissolved. Then he started his own Radio business, and in his first year took in $4,800, less cost and expenses.

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The two Radio shops in Corner Brook, Newfoundland, are owned by N.R.I. men. Had a nice letter from one of them, Bax Watton, who says they both are doing nicely. Plenty of work for all.

—————n r i—————

Albert A. Arnhym, who is Consulting Engineer with Solar Aircraft Co., San Diego, California, is an authority on Aircraft comfort equipment, such as heating, ventilating, soundproofing. Has written several books and many articles on the subject. For some time, Mr. Arnhym has been Consulting Editor for Aero Digest Magazine.

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Glen Mumper of Midway, Pa., graduate of 1932, is employed by Westinghouse as a Radio mechanic and is in line to head-up the Radio servicing department, out of Pittsburgh, for the Westinghouse Radio Co.

—————n r i—————

Charles Teresi of Chicago, Ill., who graduated in 1926, has recently renewed his membership in the N.R.I.A.A. Mr. Teresi works for a large Radio corporation in Chicago and still praises N.R.I. highly for what it did for him.

Educational at all Times

Both my wife and I just would not like to do without one issue of the NEWS. It sure is a wonderful magazine and educational at all times too.

ELROY E. SCHIZKOSKE,
Kitchener, Ont., Canada.

—n r i—

Mr. Moody—and us other Fellows

Your Mr. Moody has been a great help to me, with his articles in NATIONAL RADIO NEWS, as well as you other fellows. I save every one and have lots of occasions to refer to them, not to mention my textbooks.

RAY RICHARDSON,
Carterville, Ill.

—n r i—

Eleven Years an Alumni Member

I have belonged to the N.R.I. Alumni Association for almost eleven years. I like every item in the NATIONAL RADIO NEWS, especially the information on all the latest improvements.

T. E. ELLIS,
Richmond, Va.

—n r i—

News Contains Helpful Information

The N. R. NEWS is wonderful. I look forward to receiving it with great enthusiasm for it is sure to contain some very helpful information.

J. W. LAYNE,
Somerville 44, Mass.

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Thank You, Mr. Blair

Congratulations to you upon the splendid work you are doing for Alumni members. Little did I realize when I was a student how much valuable assistance I would receive upon graduation through my membership in the N.R.I. Alumni Association. I believe it is the finest organization of its kind in existence.

JAMES N. BLAIR,
Kansas City, Mo.

Refers to Story in Feb.-Mar. Issue

Thank you very much for the extra copies of NATIONAL RADIO NEWS, and the fine way you presented our story. We hadn't thought of you using the entire story, and we've had a number of compliments on it here.

When it first appeared in Radio Retailing and Television, we had a nice letter from the Wilcox-Gay people about Mr. Schlotz's unusual use of the Recordio, and we hope others will try that idea; it was such excellent advertising for us.

MR. AND MRS. TED SCHLOTZ,
Marion, Kansas.

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From a Beginner Student

It was an agreeable surprise for me to receive my first number of "National Radio News" No. 7, Vol. II. I read with great interest: "Soldering, a Basic Technique" and "Stage Recognition in Radio Servicing."

These articles are full of practical suggestions which will be of great use. The friendly spirit in which the Alumni division is conducted give me more and more confidence in N.R.I. Of course there are a few parts of the NEWS that surpass my present knowledge in Radio but I expect that my further training from N.R.I. will permit me to understand all.

BROTHER ALVAREZ,
Arthabaska, P. Q., Canada.

—n r i—

N.R.I. Text are on Instructors Desk

When you last heard from me I was in Primary School but now am taking the Advanced Radio Materiel Course at Bellevue. It is interesting to note that at Primary School and here at Advance School I have seen the N.R.I. course on several instructor's desks.

I see that the Detroit Chapter is going strong. I received a nice letter from F. E. Oliver recently telling me about Chairman Harold Chase's new shop. Regards to all.

FLOYD A. BUEHLER, S/1C,
Military Address.

Kirkpatrick P. Baker, N.R.I. Graduate and Employe, Receives Bronze Star for Outstanding Service in China

Y-Force Operations Staff, China Theatre . . . Technician Third Grade Kirkpatrick P. Baker, 29, of 2325 15th St., N. W., Washington, D. C., has been serving as a Radio maintenance man with a Y-Force base supply depot in Southwestern China.

Baker, who is a graduate of the National Radio Institute, 16th and U Sts., N.W., Washington, D. C., was employed by the Institute before entering the Army in September, 1942. He served in the War Department Signal Center in Washington before coming to India in May, 1944. Later he was flown across the Himalayan "Hump" in China, where he joined Y-Force, the American military mission which trained, equipped and supplied the Chinese Expeditionary Force for its Salween Campaign.

Through the Y-Force depot, to which Baker was assigned, flowed many of the vital supplies for the mountainous Salween fighting front. These were distributed with considerable difficulty and ingenuity over the rugged terrain by means of airplanes, trucks, pack animals and coolies.

Personnel of Y-Force played an important role in the success of the Salween offensive, fought in many instances in almost inaccessible regions in southwestern Yunnan province, including the 12,000-foot Kaoli Kung mountain range, a spur of the Himalayas.

Baker, whose father, R. D. Baker, Sr., lives at Fern Park, (Seminole Co.) Fla., has four brothers in the armed forces, namely, Lt. R. M. Baker, serving in the southwest Pacific; Col. W. E. Baker and Lt. R. D. Baker, Jr., both stationed in the U. S., and Sgt. J. M. Baker in England.

For his service with Y-Force in China, Baker is entitled to wear a Bronze Star on his Asiatic campaign ribbon. His wife's name is Frances Deare, and their son is named K. Philip Baker.

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Index