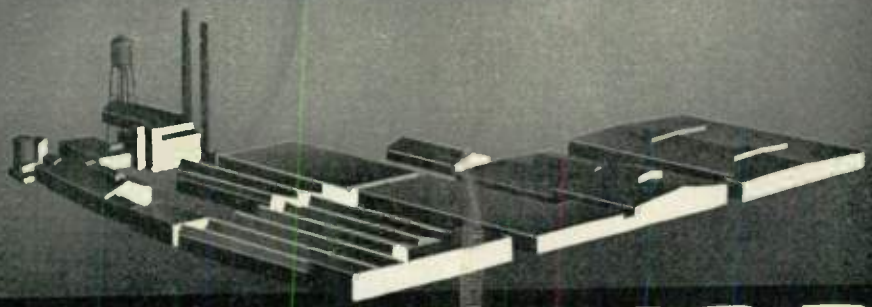
THE C-D CAPACITOR



Vol. 5 MAY, 1941 No. 5

CORNELL-DUBILIER ELECTRIC CORP.
HAMILTON BOULEVARD
SOUTH PLAINFIELD, N. J.

Sec. 562, P. L.&R.
U. S. POSTAGE
PAID
So. Plainfield, N. J.
Permit No. 1

Mr. George M. Beale
130 25th Ave.
San Francisco, Calif.

RADIO SERVICE HINTS

Practical Suggestions on Solution of Radio Servicing Problems Encountered In Actual Experience by Servicemen Everywhere

This section, conducted by our servicemen readers, will be a regular feature of the C-D Capacitor, and is intended to provide other servicemen with helpful notes on testing, locating troubles in specific models of sets, repairing them, or any other suggestions to simplify service work.

Cornell-Dubilier will pay $2.00 for each hint published in this section. Notes must be limited to 75 words, or less. Any number of hints may be submitted at one time. Unpublished items will not be returned. Be sure to give your name and mailing address. Send hints to: Editor, C-D Capacitor, Cornell-Dubilier Electric Corp., So. Plainfield, N. J.

Clean Parts Make Big Improvement

When the principal causes of trouble have been corrected and repaired in all sets, the writer has found that a big improvement in the operation can be effected if the set is given a thorough cleaning.

Apply carbon tetrachloride with a small brush to the ground springs of variable condensers, volume control bearings, and other moving parts where dirt and dust collects. Then when the set is cleaned thoroughly realign the set to compensate for changes in calibration from warped and worn metal parts. By doing this the improved results in the operation of any type of receiver will more than pay for the little extra effort on the part of the serviceman to satisfy a customer whose repeat business he expects.—*O. K. Powell, Ainsworth, Texas.*

Low Turntable Speed

On a number of occasions the writer has had to repair phono-radio sets such as the Stromberg-Carlson 1941 models and others which employ Webster record changers that developed low turntable speed. This trouble was usually found in the gear coupling with the motor and large changing mechanism gear.

To remedy this, remove the middle gear and polish the shaft and hole with fine emery cloth. Then clean the gear thoroughly with gasoline and reassemble the mechanism being sure to reoil same with a high grade machine oil. Spring and spacing washers must be replaced as found originally with the spring washer on the bottom side of the shaft.—*Nicholas G. Laditka, Cleveland, Ohio.*

Continuity Check with Tube Tester

A tube checker can be used as an emergency continuity tester in the following manner. Set the tube tester for "short test" and plug the test prods into the plate and cathode prongs of some tube socket. Whenever continuity exists, the neon indicator will glow. The capacity of capacitors can be checked by noting the brightness of the indicator and comparing its brightness with known capacities. This test can even be used with small mica capacitors.—*J. S. Jackson, Jr., Bowling Green, Ky.*

Substitute Tubes

Several types of a.c.-d.c. receivers employing beam power tubes very often distort tone and quality of reception after the set has been on for five or ten minutes. After checking all capacitors and other parts in the set, and seeing that the voltage is about 74 on the screen grid of the beam power output tube, try replacing with a new output tube. Tubes such as the 2516, 3516, 5016, and 35A5 will very often check O.K. on a tube checker, yet the tubes will cause a drop in voltage sufficient to cause the distortion. The writer found that the bantam type tubes have been the cause of this trouble in many sets.—*Milton V. Ratynski, Richmond, Va.*

A 6-Volt Battery for 2-Volt Tubes

Any 6-volt three cell storage battery may easily be converted into a 2-volt battery as shown in the accompanying sketch.

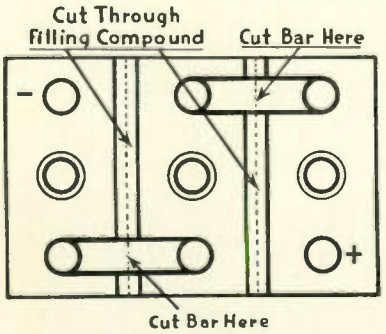


Fig. 1- 6volt Battery

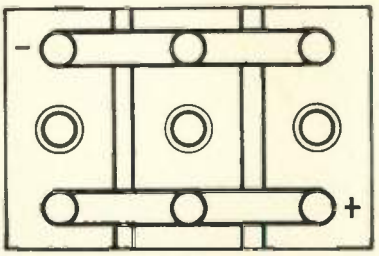


Fig. 2 - 2 volt Battery

The first operation is to disconnect the terminal bars between the three 2-volt cells by cutting them apart with a hack saw. See Fig. 1. The sealing compound on the top of the battery is then cut through with a knife so that the center cell can be raised and its position reversed as shown in Fig. 2.

Two heavy lead terminal bars made from an old lead pipe can then be used to reconnect the cells as shown. Holes drilled through the bars and into the terminal posts may be tapped for machine screws in order to make good electrical contact with terminals.—*H. J. Sundmeyer, London, Ark..*

Chevrolet 1940 Custom Receivers

On checking noise suppression in sets of this model as given in the July 1940 issue of the "C-D Capacitor" it was found the sets were still noisy. All capacitors were installed and checked O.K. on the generator, ignition switch and ammeter, and grounds on front wheels, cylinder head, and mufflers. However, it was finally found that grounding the front of the set chassis with heavy copper braid to the metal dash board completely eliminated all noises. This additional means of noise elimination has been successful on most all sets of this model which the writer has been called upon to service for noisy reception.—*Leo Stein, Mt. Vernon, N. Y.*

A Free Market-Place for Buyers, Sellers, and Swappers.

These advertisements are listed FREE of charge to C-D readers so if there is anything you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

FOR SALE OR TRADE—Argus C3 camera. De luxe readycase. Five optical glass filters and sunshade. Like new. Also back issues of short wave magazines and assortment of radio parts. Carl A. Karhuse, 1546 E. 31st Court, Lorain, Ohio.

FOR SALE—Rider's Manuals 1 to 6 inclusive, with complete index. All in perfect condition. Best offer takes them. J. French, 476 Main St., Stamford, Conn.

FOR SALE OR TRADE—Instructograph, built in a.c. oscillator, speaker, ten tapes. Also Clough Brengle O.C. test oscillator, recalibrated recently. Want good direct dial reading signal generator, Rider Manuals or what? Sams Radio Service, 8707 12th St., Detroit, Mich.

SWAP—QST's for photographic equipment or sell—Feb. to Dec. '26; Feb. '27 to Jan. '29; June, Aug. to Nov. '29; Jan. '30 to April '31; Nov., Dec. '31; Jan. to Oct. '32. Herman Yellin, W2AJL, 351 New Lots Ave., Brooklyn, N. Y.

POSITION WANTED—Would like to hear from some service shops that need a radio man. Prefer location in west or northwest U.S.A. Correspondence invited. Roy Wade, Wetmore, Kan.

FOR SALE OR SWAP—Complete R.C.A. Institutes service and operating course, also have new and used watches and new rings both diamond and stone set. Want miniature camera. Fred Turnell, 214 West Main St., Havana, Ill.

SWAP—Supreme standard diagonometer, cost $97.90. Rider's Manuals 1, 2, 3, and 4. No. 1 auto manual, all in perfect condition. Philco signal generator model .088 (battery). Want 9" or 10" screw cutting bench lathe or wood working power tools. J. S. Jaroszewski, 805 N. Elmer St., South Bend, Ind.

SWAP—American dynamic mike, new Guthman 5-10 converter complete with hardware, two 78 speed turntables, 18" P.M. speakers, crystal pickups, good key, small typewriter Corona No. 3 needs spring. Want factory service manuals, P.A. equipment, Morrison signal tracer. Want to buy Webster 6-v P.A. amplifier. Shines Radio Shack, 69 W. 23rd St., Chattanooga, Tenn.

WANTED—Jewell analyzers 199 and 444. Also Jewell volt-ohmmeter, R.C.A. tip file, R.C.A. No. 156 tube checker, Rider chanalist and back issues of Radio Craft, Radio Today and Radio News from 1920 to 1941. Quote best cash prices. H. B. Howell, Route 1, Anna, Texas.

FOR SALE OR SWAP—5 tube amplifier—10 watts output. Homemade job for record playing and public address work. W. Vangilder, 210 Stevens St., Fairmont, W. Va.

FOR SALE OR TRADE—New transmitting and receiving tubes, new radio parts. Wanted metal lathe, drill press, or what have you to trade? Frank Caulkins, 385 Perkins St., Akron, Ohio.

(*Continued on page* 10)

SERVICING INTERMITTENTS*

Methods and tricks to use in finding faulty parts which cause periodic operation

Intermittent reception is a broad term which includes fading, slow and rapid, static-like noises which are due to set or antenna-ground faults. All of these troubles may be considered akin and a common procedure can be used for hunting them.

Intermittents are not difficult to recognize as a type of trouble, but there may be a problem deciding whether the trouble is in the set or elsewhere. Antenna, ground, or the a.c. line may be the cause.

External Faults

The aerial system should be the first point of inspection when tackling an intermittent case. Connections from the far end of the wire to the set must be really given a "going over." Wrap-arounds are not good enough. Every joint should be soldered securely. Lightning arresters are a particular source of intermittents or noise. The bolts passing through the porcelain housing loosen through expansion and contraction, sometimes permitting the two gap blades to touch—result, plenty of noise and intermittents.

Ground leads, too, are subjects for suspicion. Large variations in ground resistance cannot be tolerated. Connections to the water pipe should be close to the entrance into the ground to avoid as many joints in the pipe as possible, as these are usually painted and have considerable resistance. Grounds in extremely dry locations, formed by driving rods or pipes into the earth, may be improved by saturating the soil with a salt-water solution. Replace badly rusted, loose clamps.

The power line and house wiring is, many times, the cause of the intermittent operation of the set.

Power Line Ground

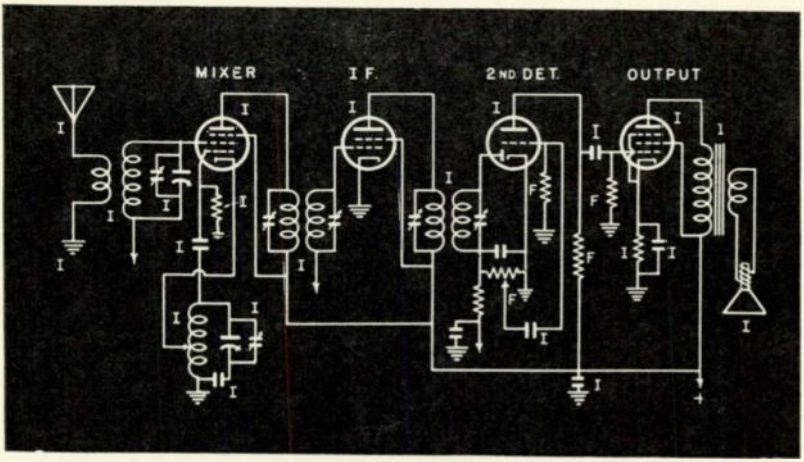
Bad connections, loose bulbs, fuses and other appliances are many times the cause of intermittents. Wiring may be loose at outlet plates, or elsewhere in the house. Such conditions may be observed with a light connected to the radio outlet. Use a low wattage bulb and watch for flickering.

One of the worst power line intermittents is due to the varying ground path between the set and earth. A set playing at normal volume level will suddenly become twice as loud or cut off altogether as some appliance is turned on elsewhere in the house. This usually occurs when radio and appliance are on the same branch circuit. The

* *By courtesy of "Radio Today."*

reason for this remote and undesired volume control is a poor ground on the set. As lights or other electrical devices are paralleled across the line, the impedance path to ground is reduced, thus boosting the signal.

Any that are even slightly suspicious should be temporarily replaced as a test. Tubes with indirectly heated cathodes are usually the ones to cause trouble rather than the filament types.



Some of the more common causes of intermittents and fading. Parts labeled I are sources of intermittents and those marked F cause fading. Their effects are sometimes reversed.

A.C. sets are subject to this sort of trouble more than the a.c.-d.c. variety. The reason being, that a.c.-d.c. sets are connected directly to the line, while a.c. sets are isolated by the transformer. A cure may be effected by placing two 0.01 mfd. paper capacitors in series across the a.c. line-side of the power transformer and connecting the junction of the capacitors to the chassis of the set. A good separate set-ground may be needed in stubborn cases.

After the preliminary investigation of the antenna, ground, and power line has been made, the next step should be the testing of the tubes, especially for shorts while hot.

Spotting Troubles

The obvious method to use in speeding up intermittent searches, is that of identifying certain characteristic types of action at particular points in the circuit. Intermittents ahead of the second detector will affect the AVC circuits, while those in the audio section will not unless shorts change tube voltages. Intermittents in circuits ahead of the volume control will be varied in volume, while those "back" of control will not. For example, this is the method of distinguishing IF transformer failure from audio transformer breakdown. The type of crackling noise is exactly the same, but audio

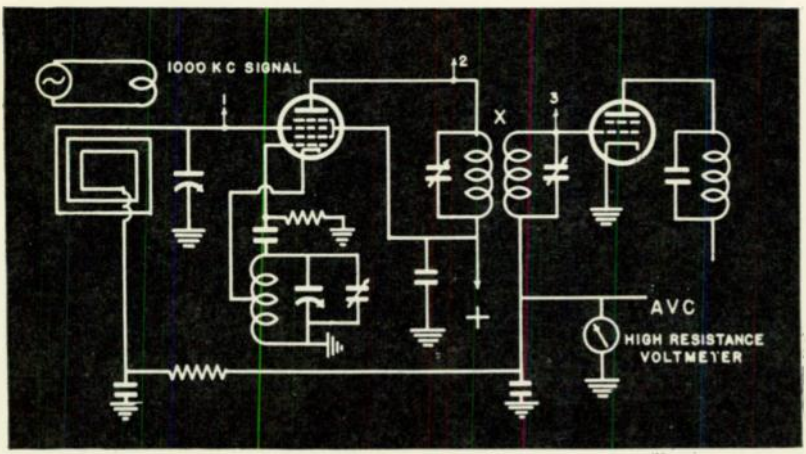
transformers are generally located after the volume control and, therefore, don't have their ailings varied in strength by the control.

Voltage Boosting

Faults producing intermittents may occur in any portion of the circuit. Parts which have screen or plate d.c. voltages on them are usually the ones which cause intermittent operation of the set. These parts may be weak and break down at some crucial moment when the line voltage, and consequently the d.c. operating voltage rises. For this reason, the location of these faulty parts may be speeded up by boosting the over-all voltage on the set until the erring condenser, resistor, transformer, etc., is broken down permanently. This process may take a few innocent parts with it, but the result will be a better set, since those weaker sisters will be out.

For this work, some sort of auto-transformer will be handy. The line voltage may be raised about 10 per cent from the usual value under which the set was working. Breakdowns may not be due to the higher voltage alone, but also the rate of rise of voltage. For this reason, the line voltage should be "jogged" with the auto-transformer.

Particular things to examine as possible sources of intermittents are screen and plate circuit by-pass condensers, bad connections, open IF or audio transformers, breakdown of high value resistors. Interstage coupling capacitors, especially in the audio section are a major cause of intermittents. The usual complaint is due to connecting leads breaking off from the foil, but with no external indication. Give these a little axial exercising.



Basic method for locating intermittent with signal tracing. Signal is picked up at 1 and 2 OK. Varying signal at 3 indicates faulty IF transformer. Other sections checked similarly.

Power Supply Failures

Power supply failures that occur intermittently will present themselves by varying the current drain of the set and the wattage input. This is also the case of by-pass units which are a part of the d.c. power network. A power line wattmeter or other indicator is valuable as an indicator of this trouble. If such an instrument is not at hand, a substitute may be rigged up with a 25-ohm 100-watt resistor in series with an outlet receptacle. The resistor should be of the semi-variable type. Connect your a.c. voltmeter across the resistor and adjust the slider until approximately two volts drop is obtained with the set plugged into the outlet. Any change in the power input to the set through shorts or opens in the circuits will show up on the meter. The device may be calibrated into watts. Watts equal to E^2/R.

Intermittents are almost always tied up with a change in heat. When sets are brought into the shop, they should be left in the cabinet while operating runs are made. Wrap the set in heavy canvas or other slow-burning material to boost the temperature in the set. Condenser failures which cause intermittents will be broken down completely in the extra heat.

Fading Troubles

Slow fading is just as much a form of intermittents as the complete cut-off variety. Slow fading will usually be found due to changes in resistance of volume controls, bias resistors, and plate load resistors. Heat is the major factor in changing the value of resistors. Picking out the one which is giving the trouble will be a job in more complex receivers. Here again, the methods of observing other circuit variations can be used to advantage. Variations in the AVC bias, or second detector plate current, will indicate the trouble to be in the RF portions, of course. It is possible that an RF or IF tube screen-dropping resistors are changing value and the amplification of the signal.

Extra heat is often applied to hasten or completely break down parts causing intermittents. Methods of applying the heat range from use of a soldering iron near the part to the small alcohol blow-torch. A wire gauze or screen should be used between the flame and the part when the torch is employed. Do not let the open flame come in contact with any of the set parts. These tricks all require skill and care, but will often be valuable in hastening the breakdown of faulty parts.

Using the Signal

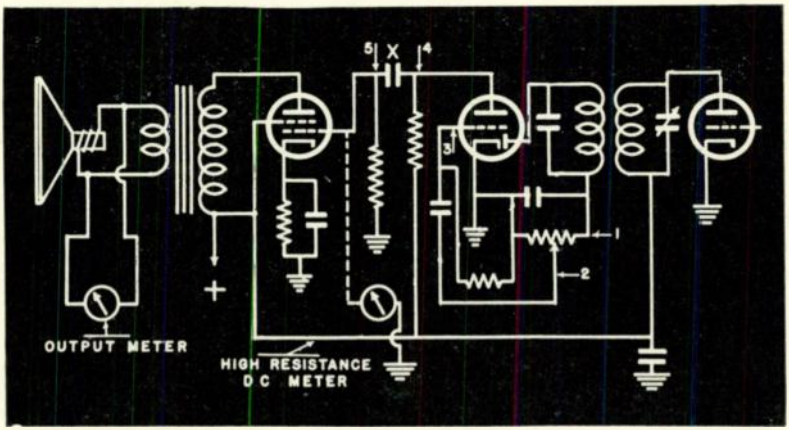
One of the advantages of signal tracing equipment is its use in hunting intermittents. By monitoring several vital parts of the receiver circuit at one time, any breakdown may be localized into one of these sections. Further and detailed testing of the parts in that section of the circuit locate the troubles.

Signal substitution is easily applied to intermittent hunting. Connect your oscillator so that it delivers a signal of the correct frequency to

the suspected stage or stages. The output meter connected in its usual way will show the intermittents and slow fading. By moving the signal toward or away from the output meter, the trouble is localized. Coupling condensers, RF and IF transformers are checked by putting the signal generator before and after the part while noting the action of the output meter. By-pass condensers in screen and cathode circuits must really do their job when the signal is applied to these circuits. A marked increase in the output will indicate that they are not working. Well shielded oscillator probes are needed to prevent excessive radiation to the grid circuit which would cause greater output and give a false indication.

Remove Suspected Parts

Where individual parts are suspected of causing the intermittents, they are more completely tested after they have been removed from the circuit. Capacity is easily checked while connected in the circuit by using any standard type of capacity tester. However, more than a capacity test is usually necessary. The leakage current at 10 to 20 per cent more than normal operating voltage should be measured while the capacitor is kept at a temperature equal to operating conditions. At least one tester of condensers puts a strong RF current through them to measure their impedance as well as capacity. Any capacitor which has a loose connection internally will be quickly broken down with the heavy current.



Signal substitution used in audio end to run down intermittent coupling condenser. Signal applied to 1, 2, 3, 4 and 5. Wavering of output up to 5 shows bad condenser. Leakage indicated by meter.

Noisy IF and RF transformers can be checked by putting a few mills of d.c. through each winding while listening to a pair of headfones attached to the free winding. Any noise will indicate that the winding connected to the d.c. is at fault because of a damaged winding or moisture. Remember that IF transformer windings usually have only about 10 ohms resistance, therefore, a d.c. test voltage should be quite low and a protective resistance used in series to prevent destroying the winding.

Use a System

While intermittent troubles are sometimes the most difficult to clear up, the development of a system for going after these faults will make the jobs simpler. The following is suggested as a guide to be so modified as is necessary to fit your particular equipment, etc.

First, examine the antenna, ground, and power line for loose connections, and high resistance grounds.

Second, check tubes, especially for shorts while they are hot and being tapped to vibrate the elements. Cathode leakage tests are also very important.

Third, attempt to localize the intermittent part by making a few checks of the AVC, or second detector cathode current, and whether the volume control has any effect on the occurrence and volume of the intermittents. Have the set operate for some time in its case, or wrapped up so that usual operating temperatures are reached. Use signal tracing and substitution as needed to find the difficult troubles.

THE RADIO TRADING POST

(*Continued from page 4*)

FOR SALE—Rider's Manuals 1, 2, 3, 4, 5, 6, and 7. All in perfect condition—eight months old. Ray A. Green, 3276 Guernsey St., Bellaire, Ohio.

FOR SALE—General Electric Handy-Phone master station and remote station in original cartons. 58 copies of Short Wave Craft from June 1931 to July 1937. In good condition. What am I offered? Edwin T. Larson, Martinsburg, Ohio.

POSITION WANTED — Competent radio service man would like position anywhere in U.S. Excellent references, 8 years experience. Address, E. Laurence Luke, Baltic, Ohio

POSITION WANTED—Young married man, 28, N.R.I. graduate with 4 years experience at radio servicing. Have some test equipment. Honest, ambitious, interested in any full time radio work. Harold Ferguson, Iron River, Wis.

WANTED—Rider's Manuals, must be in good condition, at a reasonable price for cash. Also want latest model Superior set tester. Tony Martin, 421 Hamilton St., Schenectady, N. Y.

WANTED—Rider's Manuals Nos. 1, 2, 3, 4, and 5. Please state condition and individual vols. or group, and lowest possible price. Foley Radio Service, P.O. Box 136, Foley, Ala.

WANTED—Will pay $10.00 cash for a Supreme model 89 deluxe tube checker in good condition. Radio Service Shop, Lefors, Texas.

WANTED—Rider's Service Manuals Nos. 1, 2, and 3. Must be in good condition. Please state price. Harry W. Hamlin, 9 d'Este St., Milo, Maine.

FOR SALE—Supreme 385 automatic $25.00 good condition. Ranger 5 band signal generator $6.00, good condition. Superior 1130S 6 band a.c.-d.c. signal generator, used once, $10.00. D. T. De Simone, 801 So. Oak Drive, N. Y. C., N. Y.

FOR SALE—All like new—Rider chanalyst $50.00, Supreme oscilloscope 546, $25.00, Supreme signal generator and frequency modulator 582, $25.00. Rider's Manuals 1 to 7, $25.00. Frank Bolfeta, 430 So. Ohio, Butte, Mont.

FOR SALE OR SWAP—Two Wright-Decoster 12 inch speakers, (para-curve cones) exciters and 64" x 46" x 25" horns with reflex channels. Speaker list $58. each. All for $30. Also have 110 v. a.c. generator and other items. Need Hickok traceometer. Precision Radio Service, Langdon, N. Dak.

WANTED—C.R. equipment and its allied accessories, V.T.V.M. and Rider's Manuals. Will pay cash or trade for anything from boxing gloves to microscopes, from motorcycle equipment to acetylene welding. Write for list. Edward Connor, 200 6th Ave., Wilmington, Del.

WANTED—Low frequency inverter model 90, RME, also oscilloscope type CRR, National rack type preferred, also Candler Senior Code Course. Advise condition and cash price. Harold Geise, 190 Highland St., Port Chester, N. Y.

FOR SALE — Clough-Brengle oscillator, model 110, in A-1 condition, slightly used, $35.00. 125 radio tubes of best sellers and a new tube tester purchased last fall. Francis E. Hofkes, Boyd, Wis.

WANTED—Rider's Manuals No. 5 and 11. Please state condition and cash price. I have latest R.C.A. Institute service course to sell or swap. Make me an offer. Geo. H. Cook, Jr., 8 Glynn Ave., Brunswick, Ga.

WANTED—For cathode ray oscillograph—a good frequency modulator and vacuum tube voltmeter. State price, make, and all particulars. J. Harry Gerrish, 331 Flower Ave., East Watertown, N. Y.

WANTED—Good used commercial ham receiver under $25.00. Please write, giving full particulars as to wave lengths covered and condition of receiver. Will pay cash. Calvin Showalter, Box 372, R.F.D. 3, Vienna, Va.

FOR TRADE OR SWAP—Model 136 R.C.A. communications receiver, used tubes, parts, speakers, transformers, transmitting parts, Tripplet tube checker—1938 model, large selection of meters, de luxe phonograph, etc. Arnold Halpern, Tudor Radio Service, 119 Tudor Pl., Apt. A, New York, N. Y.

WILL TRADE—Readrite tube tester model 431, good condition for pocket a.c.-d.c. V.O.M. or Triplett model 1125 V.O.M. Prefer Triplett 1125 or R.C.P. 446 or 413 pocket testers. H. R. Lauffer, R.D. 3, Greensburg, Pa.

WILL TRADE—Taylor 175 xmtr, PP T55 final, power supplies, no racks, Coto coils, tubes, instructographs, bug, old QSTs. Want power tools, anything else useful. Write for list. G. W. Twomey, M.D., Veterans Administration, Minneapolis, Minn.

FOR SALE—Readrite Ranger tube tester, like new, model 432A—$10.00. Paul J. Rumbol, 14 North Wood St., Greenville, Pa.

WANTED—Will buy back issue of Electronics of April, 1940. Dewey Mell, 619 Ohio St., Lima, Ohio.

FOR SWAP—R.C.A. radio course, QSTs, rotary converter, auto radios, 35mm. movie projector, Audel's Radio Guide. Want a small still and 8mm. movie camera, projector, enlarger, and equipment or what have you. Joseph Leeb, 1380 Merriam Ave., Bronx, N. Y.

WANTED—Communications receiver, signal generator, preselector, analyser, etc. Have 30 meters, tubes, magazines, Analyzers, checkers, motors, portables, genemotors, receivers, rifles, tools, code set, electric eye, rare Bibles, trombone manuals, National parts. Roby, 6305 Kenwood, Chicago.

WILL SWAP—Supreme tube tester model 85 with large fan meter, also Jewel 209 tube checker with one Na-ald adapter and one multi-dapter. Want Rider Manuals, 4, 5, 7, and 8. Millhurst Radio Service, Freehold, N. J.

FOR SALE OR TRADE—Esco slip clutch, 450 W., 110 v. a.c. generator—good condition, $75.00, or will trade for 6' trumpets or amplifiers. E. O. Reinhardt, 411 E. Pikes Peak Ave., Colorado Springs, Colo.

FOR SALE OR TRADE—Supreme No. 585 diagnometer in excellent condition and used very little. Will trade for high power transmitting final and modulator components. What am I offered? Bert Easton, 347 So. 4th Ave., Saginaw, Mich.

FOR SALE OR SWAP—Rider's 1, 2, and 3, good condition. Two Weston 0-1 mil. meters. Rola G 12-1000 ohm. For cash or can use inexpensive signal tracer and 8mm. projector, or what have you? Aaron Ignal, Blvd. Radio Service, 1485 So. Blvd., Bronx, N. Y.

POSITION WANTED—Motion picture projectionist 14 years experience, union, American. Will work anywhere at permanent job. H. Simmons, 497 Rentschler St., Akron, Ohio.

FOR SALE OR TRADE—Motorola "65" six tube auto radio, perfect condition, 1939 model, has Oldsmobile dial, $18.00, or trade for good a.c.-d.c. battery portable. Erwin Lee 2234 S. 108 St., West Allis, Wis.

FOR TRADE—1940 De Forest's training course in radio, television, and sound. More than 100 lessons in absolute A-1 condition, cost over $165. Want late model commercial amateur superhetrodyne in good condition. Edwin Gardner, 4151a Cleveland, St. Louis, Mo.

WANTED—Candler's, Jr. course in code instruction. Give all particulars and price asked. J. I. Smith, 30 W. Main St., Reynoldsville, Pa.

(*Continued on page* 14)

F-M BROADCASTING*

Much is heard these days concerning frequency modulation. While it is true that f-m is playing an ever more important role in radio broadcasting, the serviceman has had little servicing to do on f-m receivers. The obvious reason for this situation lies in the fact that only a small number of receivers are in the hands of the public. However, the Federal Communications Commission has granted some 43 construction permits for f-m stations in some 15 different states, and there are approximately 51 applications still awaiting official action. In view of this, it seems likely that the sale of f-m units will increase rapidly in the near future—and that the serviceman will soon be gaining practical f-m experience. In the meantime, it will be well to keep up to date on the subject.

The accompanying table lists the stations that have had FCC approval (to April 15) and gives their commercial call letters. In this connection it is interesting to note the method used in assigning these call letters. The first letter is either a W or K, depending upon whether the station is east or west of the Mississippi River. This is followed by two numbers indicating the frequency assignment in the 40-mc band. The final letters are used to designate the city or general locality of the station. For example, W63NY is a New York City station operating on 46.3 mc, while K47SL is located in Salt Lake City and operates on 44.7 mc.

At least two stations are operating on a commercial basis, the remaining stations are operating with experimental equipment while awaiting delivery of their commercial transmitters. Since the National Defense effort has made early deliveries questionable, many stations will be permitted to operate on a commercial basis with existing experimental transmitters.

Some sixteen or more f-m receiver manufacturers have been licensed under Armstrong patents, and eight or ten of these have already launched production. In general these sets may be placed in three classifications: (1) combination a-m/f-m sets, (2) straight f-m receivers, and (3) f-m tuners to be used with the audio portion of conventional receivers. In some cases the tuners will cover both the regular broadcast and the f-m band.

F-M BROADCASTING STATIONS

State and City	Owner	Call Letters	Freq. Mc.
CALIFORNIA			
Los Angeles	Don Lee Broadcasting System	K45LA	44.5
CONNECTICUT			
Hartford	The Travelers Broadcasting Svc.	W53H	45.3
	WDRC, Inc.	W65H	46.5
ILLINOIS			
Chicago	NBC	W63C	46.3
	WJJD, Inc.	W47C	44.7
	WGN, Inc.	W59C	45.9
	CBS	W67C	46.7
	Moody Bible Institute		47.5
	Zenith Radio Corp.	W51C	45.1
Rockford	Rockford Broadcasters, Inc.	W71RF	47.1

* *By courtesy of "Service" magazine.*

State and City	Owner	Call Letters	Freq. Mc.
INDIANA			
Evansville	Evansville on the Air	W45V	44.5
South Bend	South Bend Tribune	W71SB	47.1
Ft. Wayne	Westinghouse Radio Stations	W49FW	44.9
LOUISIANA			
Baton Rouge	Baton Rouge Broadcasting Co.	W45RG	44.5
MASSACHUSETTS			
Boston	Westinghouse Radio Stations	W67B	46.7
Springfield	Westinghouse Radio Stations	W81SP	48.1
MICHIGAN			
Detroit	Evening News Assoc.	W45D	44.5
	John Lord Booth	W49D	44.9
NEW HAMPSHIRE			
Mt. Washington	Yankee Network	W39B	43.9
NEW YORK			
New York City	CBS	W67NY	46.7
	Bamberger Broadcasting Svc.	W71NY	47.1
	W. G. H. Finch	W55NY	45.5
	NBC	W51NY	45.1
	Marcus Loew Booking Agency	W63NY	46.3
	Frequency Broadcasting Corp.	W59NY	45.9
	Metropolitan Television, Inc.	W75NY	47.5
	E. H. Armstrong		43.1
Schenectady	General Electric Co.	W57A	45.7
	Capitol Broadcasting Co.	W47A	44.7
Binghamton	Howitt-Wood Radio Co.	W49BN	44.9
Syracuse	Central New York Broadcasting	W63SY	46.3
Rochester	Stromberg-Carlson		45.1
NORTH CAROLINA			
Winston-Salem	Gordon Gray		44.1
OHIO			
Columbus	WBNS, Inc.	W45CM	44.5
PENNSYLVANIA			
Philadelphia	WCAU Broadcasting Co.	W69PH	46.9
	WFIL Broadcasting Corp.	W53PH	45.3
	Pennsylvania Broadcasting Co.	W47PH	44.7
	Westinghouse Radio Stations	W57PH	45.7
Pittsburgh	Walker-Downing Radio Corp.	W47P	44.7
	Westinghouse Radio Stations	W75P	47.5
TENNESSEE			
Nashville	National Life & Accident	W47NV	44.7
UTAH			
Salt Lake City	Radio Service Corp. of Utah	K47SL	44.7
WISCONSIN			
Milwaukee	The Journal Co.	W55M	45.5

THE RADIO TRADING POST

(*Continued from page* 11)

WANTED—Late Radio Service Course, also Electrical Course. Must be in good condition. Please state cash price and all particulars. Radio Electric Service, 323 Broad Street, Grove City, Pa.

FOR SALE—Meters, several makes, low and high range, volts and milliamps, sell all or part cheap. Also several sizes P.M. and coil dynamic speakers. Want test equipment, V.T. voltmeter. Clark Bros. Radio Shop, Albia, Iowa.

WANTED—Rider's Manuals 5 to 9, 10, or 11. Give condition, etc., and best cash price. J. B. Mosley, 1426 N. 24th St., Birmingham, Ala.

WANTED—Late model set analyzer combined with up-to-date tube checker. Must be in good condition such as Precision 900-920P, Supreme 502-S, 506 Weston, 772. State lowest cash price. L. Stolove 715 Hopkinson Ave., Brooklyn, N. Y.

FOR SALE OR TRADE—Quiet power supply, dynamic speakers, small power transformer, sport magazines, radio magazines, and miscellaneous parts. Wanted—B eliminator, battery charger, midget radios, etc. Royce Saxton, R. 1, Pontiac, Ill.

FOR TRADE—Watches for radio test equipment. I have American and Swiss watches, both pocket and wrist for man or ladies, if interested send description of testers. R. I. Gardner, 2689 L St., San Diego, Calif.

FOR SALE—Rider's Manuals one to six with index, all in A-1 condition like new. All for $20.00 or $3.50 each. Also 1-2-3 combination volume for $6.50. Clinton Radio Sales & Service, 330 Clinton St., Hempstead, L. I., N. Y.

FOR SALE—Triplett 1503 analyzer and tube checker, Thordarson oscilloscope, Rider's Manuals Nos. 2, 3, 4, and 7, complete R.T.I. radio reference encyclopedia. $50.00 takes all or will sell separately if desired. Frank M. Falk, 30 South St., Three Rivers, Mass.

WANTED—Electrically operated a.c. code machine to cut and receive international morse code from radio receiver. State price, condition, and make. Victor Kozma, 3104 Wilkinson, New York, N. Y.

WANTED—Jensen PMJ-18 in A-1 condition, Radio News HI-FI amplifier, Rider's volumes 1, 2, and 10. State condition and price. Abernathy Radio, Blakesburg, Iowa.

WANTED—Will pay cash for any code machine in good condition. Send full particulars and price in first letter. Elizabeth Kalmer, 154 So. 3rd St., Brooklyn, N. Y.

WANTED—Used 18" dynamic speaker, P-M or E-M type. State factory model, price, condition and full description. Will pay cash. Ideal Radio, 1713 Larrabee St., Chicago, Ill.

FOR SALE OR SWAP—Precision model E200 signal generator, slightly used, bought the first part of this year. Will sell for $25.00. Also a copy of Modern Radio Servicing. What have you? Harwood Radio, 43 Harwood St., Dorchester, Mass.

FOR SALE—American D9AT mike, Shure 707A mike 455 kc. crystal filter, Radio City trouble shooter, 30 watt modulation transformer, Mac audio oscillator, R.C.A. 807 tube, Bliley 40 meter crystal in holder, Gilbert 200 power microscope. Fred E. Lee, 2239a Montgomery St., St. Louis, Mo.

FOR SALE—1940 N.R.I. radio servicing course, complete and like new, $25.00. Have many other radio books. John Broderick, 137 High St., Dolton, Mass.

FOR TRADE OR SALE—6-WE type 205D transmitting tubes, a 50 watt tube socket, 2 WE type 109A retardation coils, and 2 WE type 274A high vacuum rectifiers. Will sell all for only $18., or trade for good Xtal mic, or what have you. Wayne Mc Clung, 1114 Dawson Rd., Albany, Ga.

WILL SWAP—1 Supreme diagnometer test panel (original cost $160), also 1 Ranger model 640 free point tester, for volumes 1 and 2 Rider's Manuals in good condition. C. F. Delagi, 2175 So. Blvd., Bronx, New York City.

POSITION WANTED—Young man 24, graduate radio engineering course, amateur license, restricted radio operator permit. No bad habits, steady, good references. Wants job in experimental laboratory or business. Require about $40. week. Employed at present. Prefer New England or west coast. Carl H. Stello, Beltsville, Md.

FOR TRADE—Weston 771 tube checker. Can use a neon sign with or without transformer. Sign must read RADIO SERVICE. Also have other equipment to trade for sign. Mike Ola, 119 Tudor Pl., Bronx, N. Y.

FOR SALE OR TRADE—What am I offered for a "DeForest Radio-Sound-Television" course. Omnigraph code machine. A "Gardiner-Levering" automatic code sender. All A-1 shape. James E. Smith, B 612, Spindale, N. C.

WILL SWAP—11 blueprints, 2 single tube radios, button mike and transformer, magnetic speaker, 14 N.R.I. lessons. Want good battery volt-ohm-ma. meter. D. B. Brown, Park Spring, Texas.

FOR SALE—R.C.A. chanalyst in new condition. Also R.C.A. volt-ohmist. What am I offered? W. Sammons, 478 High St., Oshkosh, Wis.

FOR SALE—Supreme Analyzer model 500, completely modernized, Gernsback Manuals 1 and 2, BP-10 R.C.A. Personal radio perfect condition, L-C checker—used three weeks, Astatic microphone JT-30-TT, new, never used. Best offer takes any or all. Supreme Radio Service, 103 E. Franklin St., Sparta, Wis.

WANTED—Rider's Manuals vols 1, 2, 3. Must be in good condition, state lowest price. R. J. Sherman, 619 So. Euclid Ave., Sioux Falls, S. D.

WILL SWAP—L.E.S. course in electrical engineering for tube tester, or what have you in test equipment? Alva L. Crouch, 633 W. Main St., Thorntown, Ind.

FOR SALE OR SWAP—Nat. TMA50A, SW3 and coils, 807, Thordarson 750-550 ct 100 va 60 cycle transformer, etc. Crosley type "D" antique pocket book variable condenser, Want meters, bridges, physics or radio engineering books. A. A. Fazakas, 1 Cathedral Ave., Nutley, N. J.

WILL SWAP—12" Tesla coil, Rochelle crystals, stopwatch, Corona typewriter, R.F. meters, test equipment, manuals, magazines, drafting sets, M.G. for R.C.A. 1S4BFO, 50W sockets, bakelite material, tools, meters, T-55 HF200, 1500 V. 300 Mil. P.T. R. Denmark, 1475 Walton Ave., New York, N. Y.

FOR SALE OR TRADE—Buescher, "C" melody saxophone, brass finish and case, needs cleaning but no dents. Want—signal generator, late tube tester, condenser analyzer, Rider's Manuals, "RCP" No. 411 super-tester, or guns. Leonard Stretz, Box 304, Boonville, Mo.

WANTED TO SELL—Rebuilt meter movements. Universal, a.c. and d.c. various scales. One thousand, twenty-five hundred ohms per volt. Compact assembled test kits, milliamohmeters, Western Electric magnetic speaker model 540 AW. E. M. C. D. Bendheim, 22-33 Thirty-first St., Astoria, L. I., N. Y.

FOR SALE—Supreme 385 analyzer and tube tester, Rider's Manuals, clean and good as new from 2 to 7 inclusive, N.R.I. radio and television course. Best offer takes any or all. Everything shipped C.O.D. Harold M. Gross, R.R. 3, Richmond, Ind.

FOR SALE—Triplett tube tester model 1613 for portable or counter use, $20. cash, as good as new. White Plains Radio Service, 136 Martine Ave., White Plains, N. Y.

WANTED—Copy of Rider's publication, "Power Supplies" in new condition. F. E. Flint, P.O. Box 86, Elizabeth, W. Va.

FOR SALE OR SWAP—Back copies of radio magazines and radio text books, amateur radio handbooks, eight volumes power plant engineering books and am interested in screw cutting lathe attachments, drill or condenser checker. Wm. E. Barrett, 2828 So. 9th St., Sheboygan, Wis.

WANTED—Motor generator or converter, 110 v. d.c. to 110 v. a.c. about 100 watts output. Rider Manuals 9, 10. State price F.O.B. N. Y. C., and condition. M. Wangler, 234 W. 13 St., New York, N. Y.

WILL TRADE—Diesel Engineering course in easy understandable lecture form. Complete engine theory with diagrams. Want V.T.V.M. or radio test equipment. L. Reves, 1134¾ W. Temple St., Los Angeles, Calif.

FOR SALE—1938-39 National School of Electronics radio and television course in good shape, over 100 lessons. Will sell for $50.00. Chas. E. Lowry, Blue Mound, Kan.

FOR SALE—Supreme Signal Generator model 189 $15.00, also Solar capacitor analyzer type cc160 $12. both in good condition. Lerch Music Shop, 22 E. Bway, Port Jefferson, L. I., N. Y.

WILL SWAP—New radio books, parts, sets, etc., for U.S. or foreign stamps. What do you have in stamps? What do you want? Major Fred Luther Kline, 146 N. Prospect St., Kent, Ohio.

FOR SALE OR TRADE—Two button carbon mike, one Kellog and one Weston electric 387, never used. Want a 5 x 7 view camera with good lens and shutter. Edward V. Colman, Radio Service, Woonsocket, S. D.

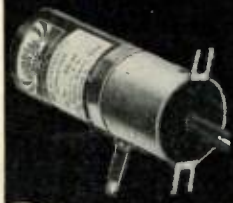
WANTED—203-A, 211 or other transmitting tubes of 100 watts, R.F. output, also 1200 volt 200 M.A. power transformer, may be used but must be in good condition. All letters acknowledged, state lowest price. Jos. Woscyna, 7 Lincoln St., South River, N. J.

ten years together

CLIPPER SHIPS AND CDs

THERE IS MORE MONEY FOR YOU IN C-D CAPACITOR PERFORMANCE

FLYING CLIPPER SHIPS — in regularly from Rio, Lisbon, Honolulu — tell a dramatic story of capacitor performance. For arctic and tropic are only a day away on the international routes of Pan American Airways System. And Cornell-Dubilier capacitors, built to specifications, have been serving Pan American now for ten years— in its transmitters and receivers in aircraft and airport.



DEPEND ON C-Ds FOR PROFIT TOO

This record is the most convincing proof of Cornell-Dubilier's claim to distinction: the *extra* dependability 31 years of experience have built into CDs. You can rely—for service, profit and repeat business—on the capacitor that's standard equipment in "America's Merchant Marine of the Air." Send for Catalog 185A.

MICA • PAPER • DYKANOL
WET AND DRY ELECTROLYTIC CAPACITORS

Cornell Dubilier

ELECTRIC CORPORATION

1049 HAMILTON BLVD. • SO. PLAINFIELD, N. J. • BRANCH DIVISION: NEW BEDFORD, MASS.