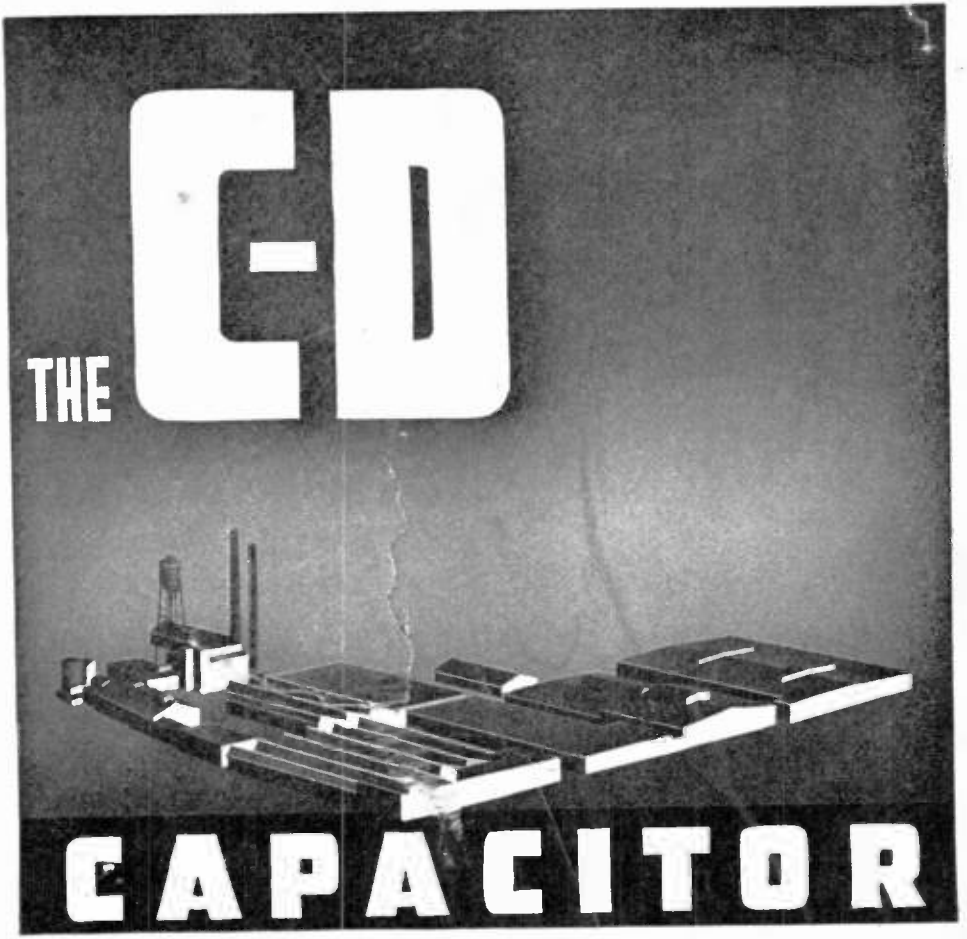


Vol. 5 JUNE, 1941 No. 6

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 Unpublished items will not be returned.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.

Personal and Portable Radios

Strong oscillation on lower half of dial, completely blocking all signals. The writer had this trouble with several personal and portable radios of different makes. On checking the I.F. frequency I found it was tuned to about 550 or 600 Kc. resulting in the oscillation. The remedy of course is to readjust the I.F. transformers to the manufacturers specified frequency. If the exact I.F. frequency is unknown 455 Kc. will be close.—*R. B. Olson, Rockford, Ill.*

Solder Resistant

Quite often it is necessary to do a soldering job on metal parts of a set where the solder is wanted to be applied only on a certain spot or within a limited area on the metal surface. The metal surface of the part to be soldered must, of course, first be cleaned thoroughly. Then with an ordinary lead pencil the part on which the solder is not wanted or to be prevented from running is marked directly on the surface, leaving the part on which the solder is wanted clean.—*Bert Parks, Ligonier, Pa.*

Realigning Small Sets

There are many types of small sets in use which employ a 2 gang tuning capacitor to cover the broadcast band only, and have no padding capacitor for the low frequency end of the dial. Tests reveal that few of these are in perfect alignment, and the only remedy is to shift the I.F. frequency to align with the antenna and oscillator circuits.

First check the I.F. frequency to see that it is approximately correct for the receiver being aligned. Then align the receiver at 1500 K.C. After this is done, introduce a 600 K.C. signal to the antenna or loop, and tune the dial to the highest reading of the output meter. Then carefully align the I.F. circuits, using the smallest possible signal from the generator.

After aligning, watch the output meter while you retune the dial. If an increased reading results, continue the I.F. tuning operation until re-alignment and retuning gives no increase in reading on the output meter. Re-set the dial for correct calibration at 600 K.C. if necessary, and then re-align the set at 1500 K.C. for correct calibration. It will now be in proper alignment at both

ends of the dial. The importance of using a low signal from the generator cannot be over emphasized, as this is extremely important in all aligning operations, in order to prevent AVC action.

This aligning method will be found to improve many sets with built-in antennas, where full sensitivity is important, particularly with portables. —*Ralph W. Cutts, Bloomington, Ind.*

Detrola Model 310

Some of these sets employ plug-in ballast tubes while others use a perforated metal-cased type resistor. A few of the latter type of sets have been given to the writer for service. They developed a loud hum and distorted reception which cleared when the set was warmed up after a few minutes.

The cause of this trouble was found to be in the metal cased line resistor. This resistor has 3 soldering lugs brought out of the casing, one of which became shorted to the casing. After the resistor warmed up, the expansion caused the lug to release the short and the set would operate satisfactorily. However, the resistor element can easily be moved in its casing so that this short will not occur while the resistor is cold. —*M. Fairaizl, Cleveland, Ohio.*

Crosley 159-32 v. Sets

Squealing and oscillation trouble while tuning is caused by the 8 mfd. 200 volt condenser (B plus to ground). Loss of volume and tone is often caused by the 6 mfd. 25 volt capacitor connected from the type 43 tube cathode to ground. When replacing these capacitors use units of a higher voltage rating than the originals. File the synchronous vibrator's points and adjust by means of the four adjustment nuts provided. —*M. C. Turner, Langdon, N. Dak.*

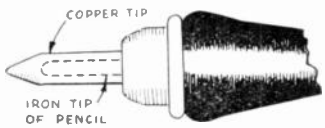
Color Coding Paint

Besides serving to beautify milady's hands, the writer finds that a brilliant red fingernail polish is very handy in the radio service shop or in the tool kit. Its bright color and quick drying features make it ideal for color-coding wire leads, marking plugs, etc. Its transparency also makes it suitable for coloring pilot lights.

Many other useful applications for this lacquer will suggest themselves to servicemen. It can be easily removed with polish remover, sold for the purpose, and like the polish it is inexpensive and readily available almost everywhere in comparison to special dial light, or color-coding paint which is usually sold only in larger quantities.—*Bob Lennard, Albany, Oregon.*

Soldering Iron Pencil

A handy soldering iron pencil can be made by fitting an electric wood burning pencil with a copper tip as shown in the accompanying illustration. While a small pencil soldering



iron of this kind can be purchased at many of the radio supply houses, there may be many servicemen who have a wood burning pencil that has served its use, and they may desire to convert it into a soldering iron for soldering on small work such as meters, I.F. transformers, headphones, etc.

The tip can be made of heavy ¼ inch copper tubing hammered to a point and fitted over the iron element tip of electric pencil as shown.—*Adam Wantuck, Yonkers, 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—2 Cinaudgraph FYA speakers, 2 Wright-De Coster speakers — 6 v. fields, 1 Brush Sound Cell Mike, 1 Amperite Mike. All in excellent condition. No reasonable offer refused. F. King, 256 E. Ettwein St., Bethlehem, Pa.

FOR SALE—Rider's Manuals volumes 4, 5, 6, 7, 8, 9 and 10, all new, $45 for the set. Will ship subject to examination. L. V. Rivermann, Melrose, Minn.

FOR SALE—Tube, various types. R.C.P. tube checker, 40-41 model. Benwood-Ling auto-radio filter pack. Solar capacitor Exammeter (quick check). Rider's manuals vols. 1 to 10 incl. Lafayette 35-watt sound system. Equipment used very little. Manuals like new. Wm. S. Hrasna, 219 Rankin St., Elizabeth, N. J.

FOR SALE—Rider's Manuals, Volumes 1, 2, 3 and 4 in good condition. $16.00. Ralph Hunter, 12 North St., Catskill, N. Y.

FOR SALE—582 Supreme Signal Generator, Instructograph with osc., key, phones and 5 tapes, 431 Readrite tube checker, 6 tube Knight auto radio, also National Radio Institute Radio Communications course. All like new. Clyde Halegus, Clark Lake, Michigan.

FOR SALE OR SWAP—Three auto radios, 1 Philco, 1 G. E. and 1 De Wald. Also 4 home radios, 2 Philcos, 1 Spartan and 1 Silvertone. Also several power transformers with H.v., 5 v. and 2 v. and 25 v. filament. Also a Philco Genemotor operating off 6 volts developing 100 d.c. at 70 m.a. Want a small pocket muti-meter. W. L. Anderson, 431 Garden City Drive, Syracuse, N. Y.

WANTED—Rider's Manuals, 5 to 11. Write stating which volumes you have, condition and lowest price. Frank E. Berg, 608—7th Street, International Falls, Minnesota.

WANTED—Used communications receiver, Sky Buddy S19R or similar. Must be in good operating condition. Edgar O'Rourke, Bear Lake, Mich.

WILL TRADE—Supreme 89 Deluxe Tube-Tester-Set-Analyzer in A-1 condition for Rider's Manuals Vols. 1, 2, 4, 5 and 6 inclusive or best cash offer takes it. Also Northwestern School of Taxidermy correspondence course complete. Thos. F. Shambach, Jr., Box 103, Middleburg, Pennsylvania.

WANTED—Edison storage A batteries, Gecovalve (Osram) A373 diode, Leybold & Von Ardenne diode with movable cathode. Sell: 852s, 24/1500 v. dynamotor, 1 KW 8800 v. transformer TC-100 condenser, other apparatus. Grote Reber, 212 W. Seminary Ave., Wheaton, Illinois.

FOR SALE—A National SW 3 Receiver in excellent condition with one set of six volt tubes (2-6D6, 1-76) with one set of coils covering from 23-41 meters. Price $10.00. Norman D. Given, 16 Essex Street, Swampscott, Mass.

FOR SALE—Triplett No. 1200 A, V, O, M; Triplett No. 1232 signal generator; Webco "B" Eliminator, condenser tester, trickle charger, S.W. parts, lesson books, data books, tubes and parts; misc. assortment other parts. All excellent condition. Cash. Arthur W. Albee, Oshkosh, Neb.

(Continued on page 9)

BIASING METHODS*

PART I

FOR proper operation, each amplifying tube in a radio receiver commonly requires a negative grid bias. This bias voltage serves to prevent the grid from becoming positive when a signal voltage is applied, and thus eliminates any loading effect on the circuit which would otherwise occur. If the bias voltage is increased beyond the normal operating point, the amplification of the tube and its circuit is reduced, but a higher signal voltage may be applied to the grid without causing the grid to draw current. This method of controlling amplification and signal-handling ability is employed in automatic control systems, such as avc. The bias voltage not only controls the amplification of the tube and circuit; it also regulates the current flow in all the other tube circuits. Because it reacts upon other circuits in this manner, troubles in biasing circuits of modern receivers are often difficult to localize; every circuit we test seems to be affected when the grid bias is wrong. Further, many of the methods employed in applying grid bias to amplifying tubes are by no means simple, and, in view of the

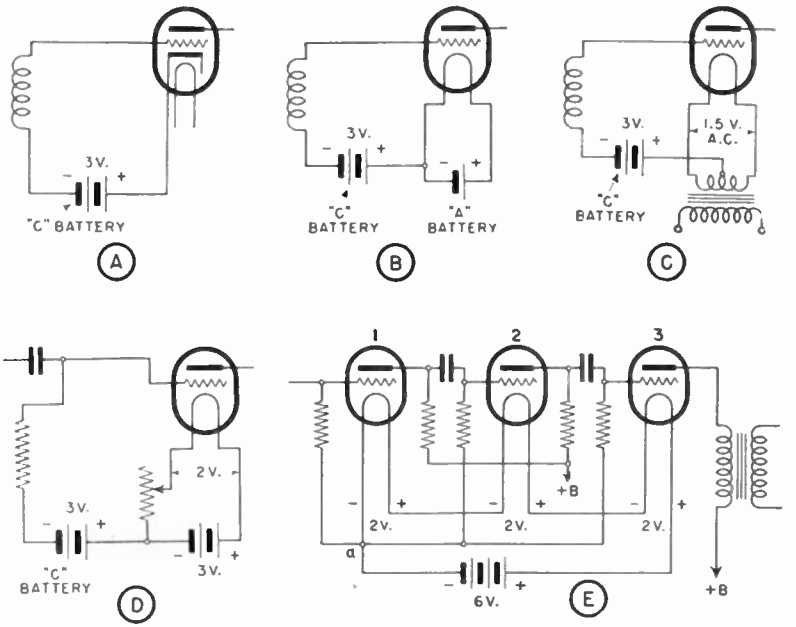


Fig. 1. Battery bias systems.

* *By courtesy of "Radio Service-Dealer."*

vital effect of this voltage upon performance of the receiver, this article explains such biasing methods.

But first let us start with some of the simpler circuits. And, before we go any further, let us make clear that when we speak of a negative bias, we mean negative with respect to the cathode, in tubes employing heated cathodes. If a filament-type tube is under consideration, then the bias is referred to the negative leg of the filament. When the filament-type tube is operated with a.c. on the filament, the bias is referred to the center tap on the filament winding on the transformer employed; or, if a center-tapped resistor is used for the purpose, to center tap of the resistor.

Battery Bias

Two of the simplest methods of applying grid bias are shown in Figs. 1-A and 1-B. In each case the bias battery positive terminal connects to the cathode or the negative filament, so the grid bias is equal to the battery voltage. In Fig. 1-C, however, though the battery voltage is the same, and the rated bias, based on the return being made to the center tap of the filament transformer, is 3 volts, as in the circuits of Figs. 1-A and 1-B, the actual bias is less. This is because each leg of the filament, being heated by a.c., becomes alternately positive and negative by an amount equal to the filament voltage—1.5 volts in this case. Therefore, the center-tap return corresponds to one-half the total filament voltage, or ¾ volt, and the actual bias is less than the battery voltage by an equivalent amount. Thus, with the constants given, the effective bias on the grid is —2¼ volts, and not —3 volts, as in the previous instances. In tube manuals, you will note that frequently the bias specified for filament-type tubes for a-c operation is accordingly increased so that the effective bias may be the same for both methods of operation.

In Fig. 1-C, the return to the filament was made through the transformer winding; in Fig. 1-D, the return to the negative filament is made through a rheostat. In the latter case, since the 3 volts of the A battery supply is reduced to 2 volts by the rheostat, there is a voltage drop of 1 volt across the rheostat. This, in effect, adds a volt to the C battery, so the effective grid bias becomes 4 volts instead of 3 volts. If the rheostat had been placed in the positive leg, the C battery could be returned to the negative A battery terminal without changing the bias.

When the filaments of tubes are connected in series, and the grid return is made to some point along the string, the bias may be obtained as illustrated in Fig. 1-E. Note that, while all the grids return to the same point a, the bias applied to each grid is different. Thus, for tube 1, the grid returns directly to its own negative filament terminal and accordingly the grid bias is zero. For tube 2, however, the grid return must travel through the filament of tube 1 to reach its negative terminal; consequently, the effective grid bias is equal to the filament voltage of the tube 1, or 2 volts. For tube 3, the grid return passes through the filaments of both tubes 1 and 2; the grid bias is therefore the sum of the filament voltages, or 4 volts. This method of biasing the grids is frequently utilized in hearing aids.

Cathode Bias

Most receivers are line-operated. And, in such receivers, the most familiar method of obtaining grid bias is by the use of a cathode resistor, as shown in Fig. 2-A. Actually, what happens in this circuit is that the cathode is rendered positive with respect to the grid—which is equivalent to saying that the grid is made negative with respect to the cathode. Just how this takes place is pretty generally understood, but for the benefit of some of our more recent associates, let us briefly review the subject.

When a positive voltage is applied to the plate of the tube, electron current flows from the cathode to the plate; thence back to the cathode through the external circuit. In Fig. 2-A, the cathode resistor R is part of the external circuit through which

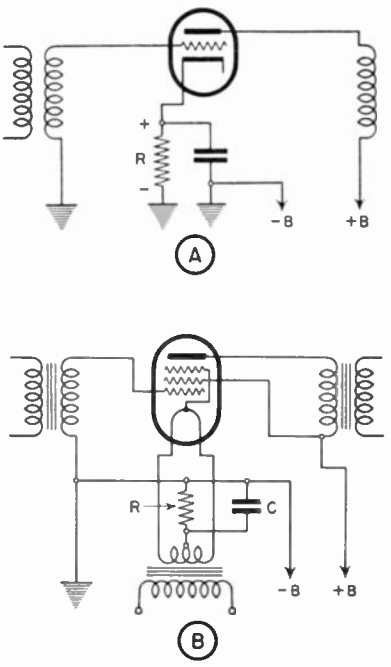


Fig. 2. Cathode bias.

this current must flow. And, by Ohm's law, when current flows through a resistance, a voltage E equal to IR is developed, in which I is the current in amperes and R is the resistance in ohms. Thus, in this circuit of Fig. 2-A, if we assume the resistance to be 300 ohms and the current to be 10 milliamperes (.010 ampere), the voltage drop becomes 300 x .010 or 3 volts. This is a good thing to know in cases where cathode-resistor values cannot be determined. By consulting a tube manual and noting the rated plate current (if the tube is a triode) the cathode resistor value required may be calculated.

For tubes with screens and other grids drawing current, we must add their currents to the plate current in order to determine the resistor value required for the cathode. In Fig. 2-B, where a pentode is shown, the screen current also must pass through R to return to the cathode. If this were a type 47 tube, for instance, in which the plate current should be 31 ma (.031 amp.) and the screen current 6 ma (.006 amp.) when the plate and screen voltages are 250 and the grid bias 16.5 volts, we can figure the value of cathode resistor, R, required as follows:

$$R = \frac{E}{I} = \frac{16.5}{.031 + .006} = \frac{16.5}{.037} = 446 \text{ ohms}$$

Actually, as you will note, the tube manuals specify 450 ohms. The value is not particularly critical.

One point should be emphasized—don't attempt to apply these formulas to resistance-coupled stages. When there is a high resistance in the plate circuit, the actual plate voltage is not the same as the plate supply value, due to the drop in the plate resistor. Therefore, we cannot take the rated plate current at a given operating voltage as a means of calculating the bias resistor needed. The required value, in the case of high-mu triodes, may be obtained by using load lines and characteristic curves, but since most tube manuals give tabulated values for many sets of conditions, there is no need to go to this trouble. For pentodes in resistance-coupled stages, the application of load lines is very complex, but, again, the tube manuals furnish ample data for suitable values.

Power Supply Bias

When the bias voltages are obtained from the power supply, the principal factors are no longer the plate current of the amplifier tube, but the total current of all the tubes, and of the bleeder resistor in the power supply. In determining the polarities and return points for the various tube elements, remember that the cathode of the rectifier is always the most positive point and the plate, or plates (of a full-wave rectifier) are the most negative.

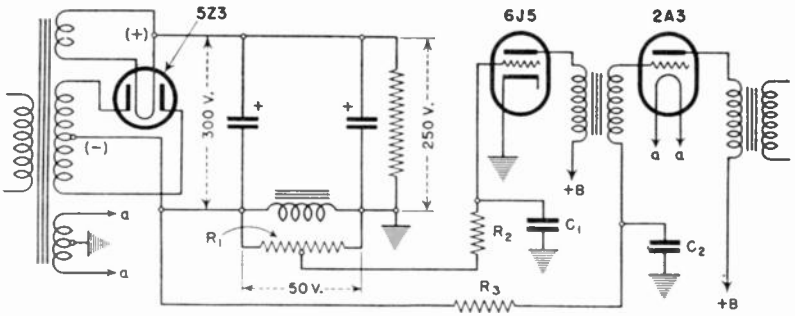


Fig. 3. Bias from negative leg of power supply.

This is shown in Fig. 3. The total power-supply voltage is 300, of which 250 volts is employed as the plate supply and the balance for grid biasing. Note that the choke is placed in the negative leg of the power supply. The most negative points are, as stated above, the plates of the rectifier. The center tap of the high voltage winding of the power transformer is at substantially the same negative potential as the rectifier plates, since the d-c resistance of the winding is very low and consequently there is very little voltage drop in the winding. When the cathodes of the amplifier tubes and B minus are joined—both are grounded in the diagram—the full bias of 50 volts is applied to the type 45 tube grid. While this bias voltage must pass through the resistance-capacity filter R3-C2, since the grid draws no current there is no voltage drop across R3 and therefore no loss in voltage. The 6J5 requires less bias; consequently, a tapped voltage divider R1 is shunted across the filter choke to obtain the proper voltage. In some receivers the choke itself is tapped. If it becomes necessary to replace such a choke, and an exact replacement is not obtainable, it is well to remember that a voltage divider such as R1, can be used to accomplish the purpose when a standard choke of the same d-c resistance as the tapped choke is employed. The bias voltage is filtered through R2-C1 before being applied to the 6J5 grid.

In some receivers, the C bias is grounded instead of the B minus. In such cases, remember that the bias is always figured with reference to the cathode, not to the ground. If the cathode is connected to some point along the power-supply bleeder which is positive with respect to the point to which the grid is returned, then the grid bias will always be negative, regardless of the position of the ground. In some circuits, in fact, the B plus is grounded; for example, in cathode-ray oscillographs. The cathode is then highly negative with respect to ground, and to the plate. But this is equivalent to saying that the plate is positive with respect to the cathode, so the position of the ground makes no difference.

(To be continued in next issue)

THE RADIO TRADING POST

(*Continued from page 4*)

FOR SALE—Kadette Tunemaster, model KRC-2. In good condition, price $8.00. What have you got for trade? Mr. Marion Francis, 1232 E. 75th Street, Chicago, Ill.

FOR SALE—One Triplett 440 tube tester and one 550 oscillator, $10.00 each, $15 for both. A-1 condition. Lincoln Radio Service, Star City, Ark.

WILL SWAP—Complete radio engineering and television course for communications receiver in good condition, 500 watt a.c. generator, or what have you? Carl H. Stello, Beltsville, Md.

FOR SALE OR TRADE—Combination R.C.P. 405 V.O.M. and Triplett 1220 A free point, in carrying case. Also Superior signal generator. Will trade for photographic gear of equal value. What have you got. Describe fully. W. S. Crooks, R 3, Kent, Ohio.

FOR SALE—Keystone 16 mm. movie projector; Model 75 with 500 W. lamp, etc. Also 8 mm. Keystone R-8 Projector. Both like brand-new, costing $55 each. Offered for only $35 each, money-back guarantee. Tone's Radio, 126 Fourth Avenue, Paterson, N. J.

SWAP OR SELL—4-CW transmitters (complete), 15 relays (24 volt d.c.), 5 tube radio chassis—20-550 meters, recording leadscrew assembly. Want typewriter, enlarger, vending machines, electric drill or what have you? Stanley, 2748 Meade, Detroit, Mich.

SELL OR SWAP—Auto radios, meters, radios, phono pickups, RCA oscillator, various transformers, speakers, tubes, genemotor, S.W. converters, radio manuals and magazines, parts, etc. Very reasonable for cash. Oliver F. Klein, c/o OK Radio Service, 2235 N. 39 St., Milwaukee, Wis.

FOR SALE—CB oscilloscope type CRA, signal generator model OMA, frequency modulation, perfect condition, $45 takes both. Argus model A candid camera and fixed focus enlarger model EF, good condition, $12 for both. Jensen HF dynamic, Model A-12, $5.00. S. Di Mayo, 505—85th St., Brooklyn, N. Y.

SWAP—American Dynamic mike D8T for factory service sheets or notes, crystal mike Shure 701a for good Wheatstone Bridge or good Condenser tester; 14 in. P.M. speaker Utah for good mike stand, new style, RCA S.B. mike for Readrite output meter. Shines Radio Shack, 69 West 23rd Street, Chattanooga, Tenn.

FOR SALE—Philadelphians Attention! A 1940 Triplett portable laboratory, needs repairs, reasonable offer accepted. Have complete DeForest R. T. & S. correspondence course also other radio books, reasonable. Call Mon. or Thurs. evenings. Ray Hartlein, 2643 S. Pershing St., Philadelphia, Pa.

FOR SALE—Best offer takes, Supreme 550 Analyzer, Rider's manuals, vols. 4 and 5, Gherardi's Radio Physics Course, Modern Radio Servicing with Radio Field Service Data, Rider's Servicing Super-Hets. All practically new. Leonard Sherin, 572 Belmont Ave., Brooklyn, N. Y.

FOR SALE—Readrite Model No. 710 Tester, A-1 condition with full instructions as issued when purchased, $5.00. Monroe H. Barto, 1117 Birch St., Reading, Pa.

SWAP OR SELL — Argus EF 2 speed printer (enlarges 35mm to 2½" x 4"), bakelite roll developing tank, 3 bakelite developing trays, thermometer, darkroom bulbs. Good for 35mm work. Practically new. Also genemotor and new RCA 913 tube. Want PA equipment, good all-wave receiver, or what have you? Robert Harrison, 14 Silver St., Waterville, Maine.

FOR TRADE—"Rex" office typewriter for cutting head, lead screw, recording motor or amplifier. Give technical description of article and condition. Harry Kay, Rt. 2, Box 255, Imlay City, Mich.

FOR SALE—Rider's Manuals like new. Vols. No. 1 to 6 $5.00 each. Vols. No. 7 to No. 10 $6.00 each or $50 for the 10 vols. Arthur B. Rich, 95 Hyde St., Burlington, Vt.

WANTED — Complete Master Teleplex Code practice machine or other models with tapes. Am also interested in Infinal price, model, condition and numstructograph code machines. State ber of tapes in first letter. Mario Cecconi, 1443 Overing St., Bronx, N. Y.

FOR SALE—Readrite 431 tube tester, $8.00; Super Radio Course and Lab. course, over 60 texts bound in 3-ring binders, $25.00; Superior signal generator, 5-bands, $8.00. Send cash for delivery. Pesarchic's, Box 462, Fairfield Ave., Johnstown, Pa.

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.

FOR SALE—400 volt 150 mill. genemotor, Thordarson 1 KVA, 25,000 volt transformer, electric eye equipment, talking light beam apparatus, etc. Want an 8 mm. movie projector over 200 watts. J. R. Blundin, 352 W. 4th St., Mt. Carmel, Pa.

FOR SALE—Supreme radio analyzer model 339, Readrite tube tester model 430, Rider's Manuals 2, 3, 4, and 5, "Servicing Receivers by Resistance measurements," "Servicing Superhetrodynes" by Rider. Reasonable price, A-1 condition. Michael Bottos, 454 Pursel St., Phillipsburg, N. J.

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.

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 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.

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, 11343/4 W. Temple St., Los Angeles, Calif.

FOR TRADE—R.C.A. radio, sound and television course, Official Radio Service Handibook, Hawkin's 10 vol. Electrical Guides, model gas engine, model steam engine, technical books. Want—refrigeration manuals or course, also watchmaking course, screw cutting lathe, or what have you? Anthony F. Grimaldi, 133 84th St., Woodhaven, L. I. N. Y.

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 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.

FOR SALE OR SWAP—Original model of closet door work bench as described in July, 1937, Radio News. Interested in camera or P.A. equipment. Walter L. Linde, 72 Wadsworth Ter., New York, N. Y.

FOR SALE—In sealed cartons, G.E. tubes as follows: 2—12Z3, 5—38, 5—6F7, 4—36, 7—5W4, 2—25A6. Vito F. Daidone, 212 Fairmont Ave., Newark, N. J.

WANTED—Rider's Manuals 1, 2, and 3. State condition and price when writing. Stanley Luffy, R.D. 1, Box 38, Verona, Pa.

FOR SALE—A Torit acetylene torch kit No. 23, used for welding and soldering, used very little. Also N.R.I. radio fundamentals and servicing course. Complete except for experimental parts. Highest bidder takes one or both. Orris E. Stark, 302 E. Drayton St., Ferndale, Mich.

WANTED—16mm. used model K Eastman movie camera with f 1.9 lens. Will pay cash. Superior Radio Service, 215 W. Blackhawk Ave., Prairie du Chien, Wis.

FOR SALE—Complete N.R.I. radio course, like new, $30.00, also 40 late phono records 10c each and two brand new a.c.-d.c. plastic radio sets, have not been used $10.00 each. Write for details. Want Cinandograph SV-18-12, Utah L15P, or Jenson type J dual loudspeaker. E. P. Schoeneck, Route 2, Box 16, Wahpeton, N. D.

WANTED—Neon electric sign for RADIO & ELECTRIC SHOP. Please state price and size. Will pay cash. Lawrence Chronister, Paola, Kan.

WILL TRADE—Remington automatic rifle 22 cal. long, good shape. Aerovox No. 75 condenser analyzer, Supreme 535 scope 2 inches. Want good outboard motor, cash, or beat frequency oscillator. Also have radio books for trade. Popma Radio Service, Orange City, Iowa.

FOR SALE OR TRADE—12", 25watt dynamic speaker with field supply in baffle case, 2 genemotors, battery charger 4-2 amp. Want a.c.-d.c. voltmeters, 40 meter Xtal, small transmitting tubes, Xtal earphones, etc. Floyd Paul, 773 N. Alexandria, Los Angeles, Calif.

WANTED—A record cutting machine, complete with amplifier, mike. Must be in perfect working condition. Trade or sell 5 x 7 plate camera with tripod and all equipment, W. E. tubes all new, other radio test equipment and manuals. David Meyerson, 3425 Knox Pl., Bronx, N. Y.

FOR SALE OR TRADE—2 12" P.M. Philco speakers, 1 P460 Webster electric P.A. system. What have you? Have lots of radio parts and odd amateur radio equipment. Walter D. Keith, 315 E. 3rd St., N. Newton, Iowa.

WILL SWAP—15 watt phono-amplifier, eight tubes, push-pull 6V6-G's, rimdrive motor, volume indicator, 10" speaker, crystal pickup in portable case. Unit practically brand new has space for carrying records, will include cutting head and mike for recording. Want—Sky-buddy or other ham receiver in good condition. Thompson Irwin, 37 Cottage Park Rd., Medford, Mass.

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.

FOR SALE—New model 1280 Tube and set tester combination, complete for $15.00 cash, F.O.B. and other equipment cheap. George A. Remling, 22 Lawrence Ave., N. Tarrytown, N. Y.

WANTED—Modern test equipment. Write stating condition, make, price, etc. Leo Stein, 7 Monroe St., Mt. Vernon, 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—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—Readrite Ranger tube tester, like new, model 432A—$10.00. Paul J. Rumbol, 14 North Wood St., Greenville, Pa.

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—Used Candler course. State price. Have slightly used Echophone receiver. Herbert Schumann, Battery C 26th C.A.T.B., Camp Wallace, Texas.

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.

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.

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.

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

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

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.

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.

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—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.

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

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.

(Continued on page 14)

CAPACITY MEASUREMENTS*

If You Know the Resistance of Your A.C. Voltmeter Use This Chart to Read Values From .0005 to 1 mfd.

TO USE the chart shown on the opposite page note your line voltage, which we shall call E_1.

Next connect the unknown condenser in series with the meter across the line and read the new voltage, E_2. This second reading should then be expressed in percent of the line voltage by using the formula shown at the bottom of the chart.

When this percentage and the resistance of the meter are known the chart shows the capacity. On the chart find the intersection of the horizontal line marked with your meter resistance and the vertical line corresponding to the percentage of line voltage. The nearest slanting line now indicates the capacity.

Example: Suppose the line supply is 110 volts and with the condenser in series the reading is 40 volts. This amounts to slightly over 36 percent of line voltage. When the meter resistance is 100,000 ohms, the chart shows that the capacity is .01 mfd.

Larger Values Easily Measured

According to the chart, the highest capacity that can be measured with an instrument having 100,000 ohms resistance is about .04 mfd. Larger condensers will all show about the same reading. A new range for larger condensers can be obtained by using a lower-resistance instrument. However, a 100,000 ohm meter can be used simply by shunting it with a lower resistance. The value of R in the chart is then equal to that of the meter and auxiliary resistance in parallel. For instance, 11,000 ohms in parallel with the 100,000 ohm meter reduces the value of R to 10,000 ohms.

One might also use a lower range of the voltmeter and measure across the filament winding of a transformer supplying voltage to a tube.

Example: With the 5-volt range (5000 ohms resistance) we measure first the filament voltage from a tube-loaded transformer. Let this be 5 volts. Then a second reading with the unknown condenser in series is found to be 3.4 volts which amounts to 68 percent of 5 volts. In the chart it will be seen there is no provision for as low a meter resistance as 5000 ohms. In that case one uses a multiple of 5000 such as 50,000 ohms. For this resistance and 68 percent, the capacity is .05 mfd. For 5000 ohms as meter resistance it is then .5 mfd.

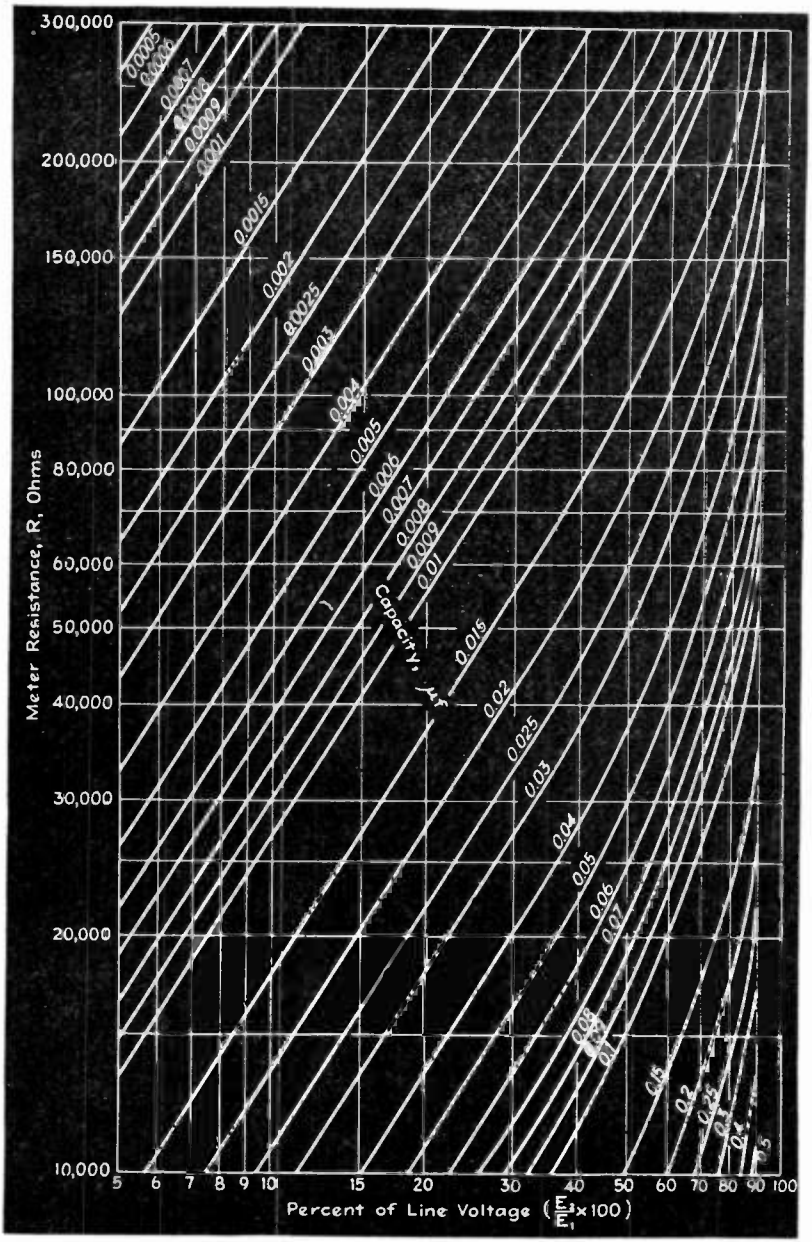
In other words, if all resistance values of the chart are multiplied by any factor, the capacity values must be divided by the same factor and vice versa.

For Small Sizes Too

The measurement of smaller condensers can be accomplished when a higher range and high-resistance volt-meter is used with a source of supply taken from the high-voltage secondary of a power transformer.

The chart was calculated for a supply frequency of 60 cycles. Those who employ 50 cycles should multiply all capacity values by 1.2, for 25 cycles multiply by 2.4.

* *By John M. Borst in "Radio and Television Retailing."*



THE RADIO TRADING POST

(*Continued from page* 11)

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.

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.

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.

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 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—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—Rider's Manuals vols. 1 through 7 $30.00. Good condition. Frank B. Husted, 386 Bedford Road, Pleasantville, N. Y.

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.

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.

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

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.

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

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.

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.

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.

FOR SALE—Premax vertical radiator, telescoping type, adjustable from 6 feet 5 inches, to 33 feet 9 inches, base insulator, made of high tensile copper-nickel steel tubing, cost $18.00. What am I offered for it? Dyer Matlock, Jr., Box 423, Mt. Pleasant, Tenn.

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

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.

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 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 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.

WANTED—C-D Capacitor Bridge, BN. Have motors, engines, radios, chassis, books, and parts. All correspondence acknowledged. A. Penquite, Jr., 513 So. 5th St., Marshalltown, Iowa.

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.

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.

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 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—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—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—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.

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.

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 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—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.

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

FOR SALE—Supreme signal generator model 570 de luxe series for panel mount, with original instructions, diagrams, charts, etc. in A 1 condition, $10.00. New 1941 Simpson signal generator model 310, $27.50. R. W. Garrison, Box 265, Cedar Falls, Iowa.

When You Move or Change Your Address

Be sure to notify the Mailing Dept. of "The C-D Capacitor," Cornell-Dubilier Electric Corp., South Plainfield, New Jersey, giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your co-operation.

MICA • PAPER • DYKANOL • WET AND DRY ELECTROLYTIC CAPACITORS

Cornell Dubilier

ELECTRIC CORPORATION

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

MORE IN USE TODAY THAN ANY OTHER MAKE