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No. 12

CORNELL-DUBILIER ELECTRIC CORP.
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TESTING A. C. MOTOR STARTING CAPACITORS

Capacitor-type a. c. motors now are widely used in refrigerators and in many other household and commercial machines. High-capacitance a. c. capacitors start these motors as 2-phase units. After the motor reaches full running speed, or slightly before, an automatic switch cuts the capacitor and the starting winding out of the circuit, and the motor runs as a single-phase unit.

The capacitor thus is in the circuit only for a few seconds and usually is called upon to start the motor only occasionally. A motor starter capacitor accordingly need not be designed for continuous service. This is an advantage because small-sized electrolytic capacitors which furnish the high capacitance required for motor starting purposes can be used only for **intermittent** alternating current service.

Satisfactory operation of the motor depends a great deal upon the quality and condition of the capacitor. For example, it is imperative that the capacitor have the lowest practicable power factor. A high power factor is undesirable since it will reduce the motor starting torque. (A 2-to-1 increase in power factor can reduce the starting torque by as much as $2\frac{1}{2}$ to $9\frac{1}{2}$ per cent.) The best power factor would, of course, be zero, but such perfection is not obtainable in practice. The practical power factor range

in Cornell-Dubilier etched-foil dry electrolytic a. c. capacitors is $4\frac{1}{2}$ to 8%. However, technicians in the field accept as satisfactory any power factor not higher than 10 per cent. It is important also that the capacitance of a motor starting capacitor be as close as possible to the value specified by the motor manufacturer and indicated on the capacitor label. Moreover, this capacitance must remain reasonably constant in service. If the capacitance is too low, starting torque will be lost. But a capacitance increase, up to about 15% of the rated value, seldom affects starting of the motor.

A. C. Capacitor Ratings

Cornell-Dubilier electrolytic motor starting capacitors are supplied in the capacitance range 10 to 498 microfarads at 110 volts a. c. operating, 38 to 420 ufd. at 125 volts, and 10 to 157 ufd. at 220 volts. In addition to the electrolytic line; oil-impregnated, oil-filled Dykanol a. c. capacitors (especially suitable for continuous-duty services) are supplied in the capacitance range 1 to 50 ufd. at 165 volts a. c. operating, 1 to 50 ufd. at 220 volts, 1 to 60 ufd. at 330 volts, 1 to 20 ufd. at 375 volts, 1 to 35 ufd. at 440 volts, 1 to 25 ufd. at 550 volts, and 1 to 25 ufd. at 660 volts.

The operating frequency range of both electrolytic and Dykanol types is 50 to 60 cycles.

Testing A. C. Electrolytic Capacitors

The instruments ordinarily used by radio servicemen for checking capacitors cannot be employed for testing electrolytic motor starter capacitors. These instruments include bridges,

simple microfarad meters, capacitor analyzers, etc. The reason for this is that a. c. electrolytic capacitors must be checked at their rated a. c. operating voltage, and this voltage is not supplied

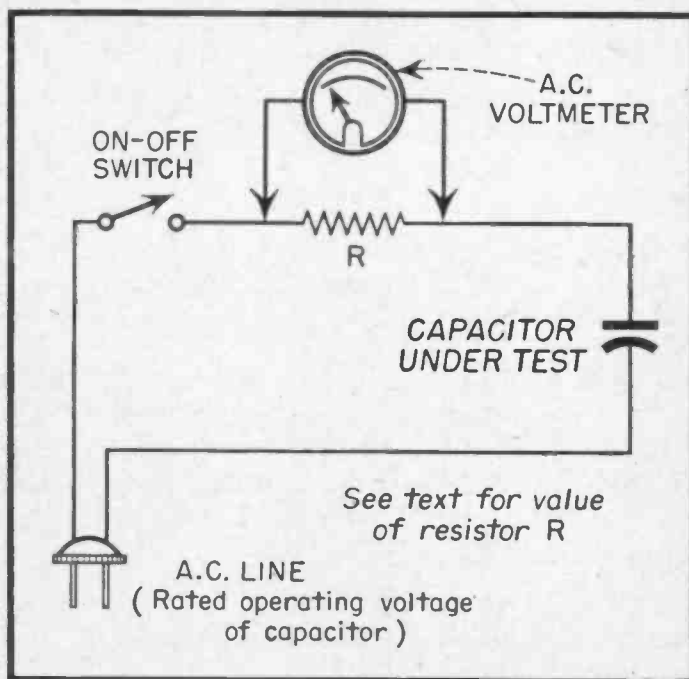
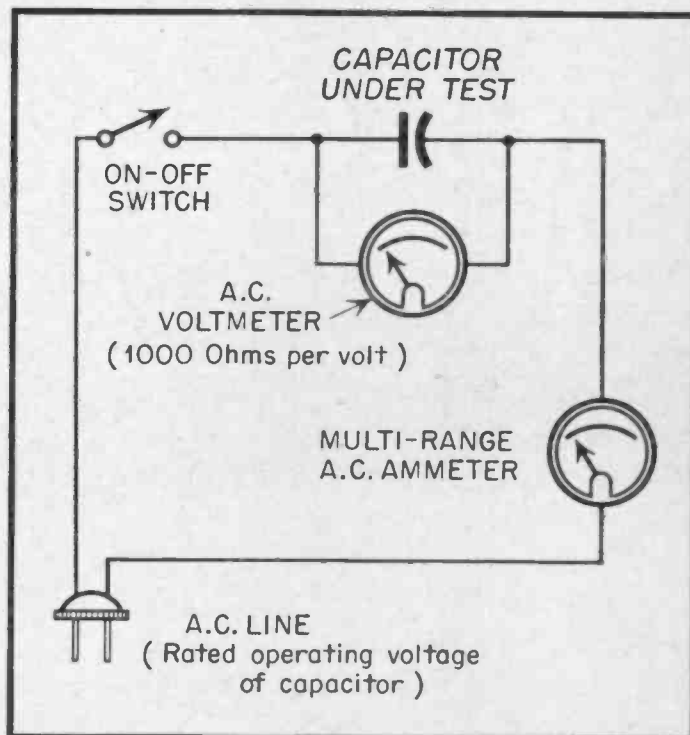


Fig. 1. Circuit for short-circuit test. •

Fig. 2. Circuit for quick capacitance check.



by the instruments referred to. In some instances also, the microfarads scales of radio test instruments do not reach the high values common to motor starter capacitors.

The important quantities which must be measured are **capacitance** and **power**

cedure, taking the steps in the order listed:

(1) Make your test as rapidly as possible. If this rule is not followed, the capacitor will be forced to pass current longer than is safe and may become damaged.

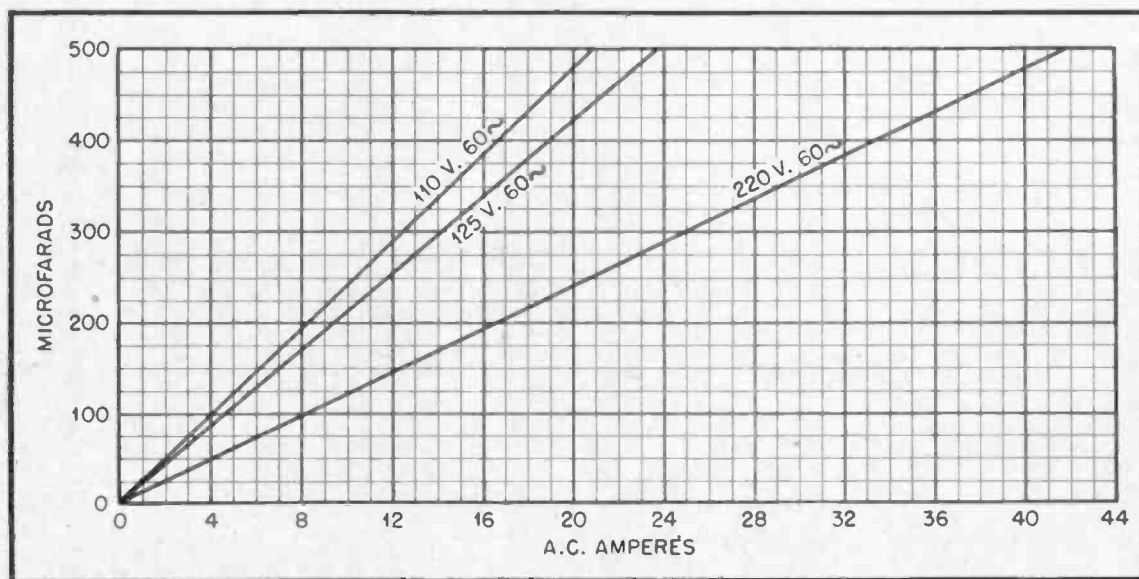


Fig. 3. Curves for determining approximate capacitance from ammeter readings.

factor. Some other well-known tests, such as d. c. leakage and leakage to can are not as important in establishing the quality and condition of a. c. electrolytic capacitors. The three essential instruments required for checking a. c. electrolytic capacitors are (1) a. c. voltmeter, (2) a. c. ammeter, and (3) a. c. wattmeter. Each meter should be a multi-range instrument.

In order to prevent burning-out a meter in case the capacitor is shorted, a preliminary short-circuit test must be made before attempting to check capacitance and power factor.

When checking a. c. electrolytic capacitors, observe the following pro-

(2) Always test the capacitor first for short circuit. **Make the short-circuit test at the rated a. c. operating voltage of the capacitor.** Use the circuit given in Figure 1. For 110 or 125 volts, resistor R may be a 500-watt cone-type heater element. Or it may consist of one 500-watt (115-volt) lamp or five 100-watt (115-volt) lamps connected in parallel. For 220 volts, use four 500-watt cone heaters or ten 100-watt (115-volt) lamps in series-parallel. To make the short-circuit test: first measure the line voltage with the voltmeter, then measure the voltage drop across resistor R. If the two voltage readings are equal, the capaci-

tor is shorted and should be discarded. If the voltage across the resistor is lower than the line voltage, the capacitor has some capacitance and the other tests may be undertaken.

Where P is the wattmeter reading
 E , the voltmeter reading, and
 I , the ammeter reading

(5) To determine the capacitance accurately from the meter readings

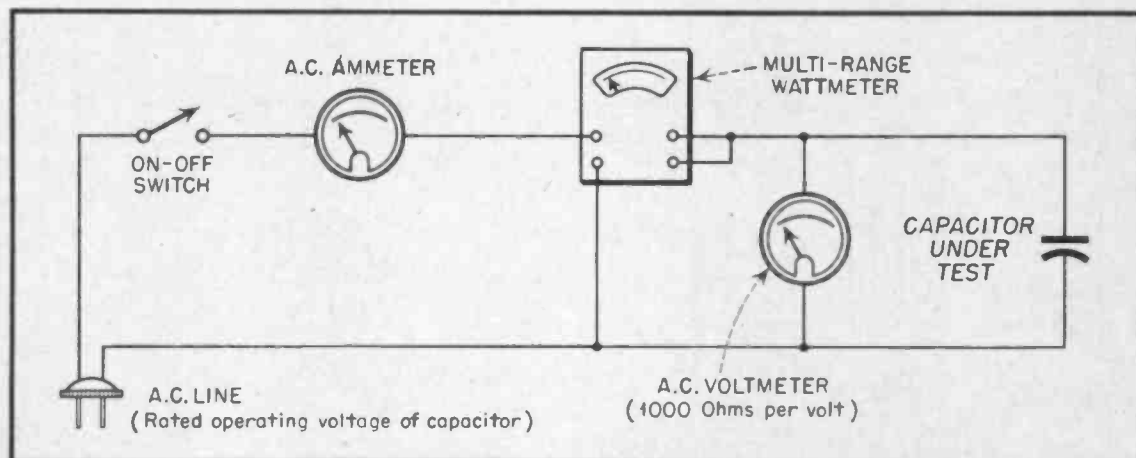


Fig. 4. Complete circuit for checking capacitance and power factor. Read watt losses without capacitor and subtract from reading with capacitor in circuit.

(3) Check Capacitance. For a quick check of the approximate capacitance, use the circuit given in Figure 2 and refer to the graph, Figure 3, which gives the capacitance corresponding to the ammeter reading. The capacitance value obtained by this method will only be approximate. The capacitance can be determined more accurately by means of the setup shown in Figure 4. The method is explained in Section 5.

(4) Check Power Factor. Use the circuit shown in Figure 4. The power factor (in per cent) is found by dividing 100 times the reading of the wattmeter by the voltmeter reading times the ammeter reading. Expressed as a formula this is:

$$\text{p.f.}(\%) = \frac{100P}{E \times I}$$

obtained with the circuit given in Figure 4, use formula below. With the meter readings designated by the same letters given in the preceding paragraph, the capacitance formula is:

$$C(\text{ufds.}) = \frac{2650 \times I}{E} \text{ for 60 cycles}$$

Change the numerator to 3183 when the frequency is 50 cycles.

Testing Oil-Type A. C. Capacitors

Dykanol type a. c. capacitors may be checked in the same manner just explained for a. c. electrolytic capacitors. However, Dykanol capacitors are designed for continuous-duty applications. It therefore will not be necessary to rush the tests, since these capacitors will not be damaged by normal test currents.



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 transaction 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—Fully equipped radio and television store, going business, best location, sacrifice, illness, small overhead. Nathan Udell, 1287 Kaighn Ave., Camden, N. J.

FOR SALE—Presto model K8 new recorder, \$200; RCA model 120 TV converted to channel 10, \$250; Precision EV10, with probe, new, \$85; Hickok 288X, new, \$120. R. H. Cherrill, 4235 E. Barnett St., Phila. 35, Pa.

WANTED—Ham transmitter, 100-200 watts, 10 and 20 meters, phone and c.w. Willis Radio Service, PO Box 352, Beaufort, N. C.

FOR SALE—Radios. 10 tube airline model 62-132 with speaker, \$8.50, less speaker, \$6; Philco Transitone model PT25, \$7; Delco model R1202, ivory plastic case, \$10.50. All in good playing condition. C. W. Cassel, Route 4, Irwin, Pa.

FOR SALE—National SW-3 rec. with many added features. Matching 6" speaker in case and National power supply. Coils for 20, 40, 80. Finest condition. Worked 68 countries with it. First offer over \$25 accepted. L. E. Klingberg, 3535 W. 109th St., Inglewood, Calif.

FOR SALE—Brand new Westinghouse 3½" meter, 0-50V d.c., full scale, 1 M.A., white face, black lettering. \$4.95 ea. H. J. Lewis, 54 W. Illinois St., Chicago 10, Ill.

TRADE—New Seeburg record changer; new phono oscillator; voltmeter; GE micro-ammeter, 0-50. Need Sig. tracer, tube tester, sig. gen., manuals, radio books, and radios. Give full particulars. Sam Berenblum, Greenwich, Conn.

WANTED—Book, "Storage Battery" by Manley, published by Drake Co. State price and condition. Sylvester Pindroh, 2652 Woodland Ave., N. S. Pittsburgh 12, Pa.

FOR SALE—Superior, model BR-44 like new condenser tester and sig. tracer, \$20; Supreme model 599 tube and set checker, '46 model, perfect cond., \$47. Also speaker for Majestic model 90, perfect, make offer. Used 27 tubes, 50c ea. All replies answered. Bill's Radio Serv., 9937 Carpenter St., Chicago, Ill.

FOR SALE—Several hundred 6AK5 tubes guaranteed perfect, 49c ea. Small or large orders accepted. Also RCA tubes any quantity 50% off list, any number tube. Al's Radio Hospital, 323 Osborne Terrace, Newark, N. J.

FOR SALE—Mark 2 tank transmitter-rec., used but in good condition. Set of spare tubes included without antennas. Best offer. Clair Johnson, 507 Third Ave., Joliet, Ill.

FOR SALE—Gas explosion test meter. Make your offer. George Dramko, 410 East 11th St., N. Y. 3, N. Y.

N O T I C E

We regret any inconvenience caused by the delay in publishing many ads submitted for these columns, as they must be published in the order in which they are received. Also, many requests received are rejected frequently because of illegibility, or no name or address given, or possibly adjudged unsuitable for publication, or other reasons. Therefore, if your ad is delayed, or rejected please understand these circumstances and our effort to be of most helpful service to our readers.

Editor,

C-D CAPACITOR.

FOR SALE—20 sets Sam's Photofact in binders, also Zenith Manuals 1 and 2, and Trutone Manuals 1 and 2. Perfect condition, \$20 plus postage. Harry Nowakowski, 9148 Raymond Ave., Detroit 13, Mich.

FOR SALE—New Scott communication rec., model SLR-F, AC built with manual, range 80-550kc and 1.9-24mc, \$125. Also used unconverted BC224-4 rec. 1.5-18mc, good condition, \$25. Elmer Cosby, 619 49th Ave., Meridian, Miss.

SELL OR SWAP—7" Transvision television set, fully assembled with FM sound detection, plus cabinet, \$190, or what have you? Also governor-controlled hand wound Columbia phono motor; open to any offer. Gabriel Novick, 768 Rockaway Ave., Brooklyn 12, N. Y.

SELL OR SWAP—New WE dynamic mike, \$40; new Seeburg 78rpm record changer and recorder in case (unwired), \$40. Cash or swap for Colt .25 or .45 automatic or prism binoculars. Suburban Sound Service, 3625 Euclid Ave., Berwyn, Ill.

SWAP—BT-13 airplane, NC 69789, 800 hrs total, built 1944, easily modified to 4-place, \$375 (\$325 less radio and rear panel), or swap for car, camera, radio, or what have you? Al Pratt, 956 N. 15th, Milwaukee 3, Wis.

WANTED—Model 350PS power supply for Jefferson-Travis model 350A-1 transmitter-rec. Also want 115V AC gen. adaptable to car engine or gasoline engine unit. 500 watt minimum rating. Nelson K. Stover, Box 722, York, Pa.

SALE OR TRADE—Scott all-wave deluxe 12 superhet in playing condition, chrome plated. Talk-a-phone remote stations, model RU-433S, original cartons, unused. List \$13.95. Above for best offer, or trade for Riders' manuals. Radio Technical Service, 2821 Girard Ave., Phila. 30, Pa.

FOR SALE—Precision sig. gen., model E-200, practically new. First \$50 takes it postpaid. S. N. Feingold, 36 Hazelwood St., Malden 48, Mass.

SELL OR TRADE—Hammarlund Super-pro rec., 540-20,000kc continuous. Power supply included. Good condition, make offer. L. B. Gray, QTRS J-5-A, Ft. Belvoir, Virginia.

FOR SALE—New "Maico" hearing aid, used for exactly three weeks. Will sacrifice for quick sale. Braun's Radio Service, Bellevue, Ohio.

WANTED—35mm cameras, as Contax, Detrola 400, Leica, and lenses for same. Also other lenses and cameras. Write for offer on other foto items you have to sell or swap. Want Xenon f2 2" lens. Have full radio and parts line for trade or cash. Huntress Radio, 840 W. Cottonwood, Freeport, Ill.

SWAP—Pair of Dienstglas German binoculars, power 6x30, seldom used, straps, adjustable range. Want good sig. tracer or good assortment single ended octal tubes, locktal 7 and 14 volt tubes, and 45s. Angelo Bruno, 223 Baltimore Ave., Dundalk 22, Md.

WANTED—Quantity of aluminum alloy angle, 1½"x1½" approx. and in lengths and strength sufficient to be used in building relay racks. Give size, quantity and price. Allen L. Stratton, 443 Saratoga Rd., Schenectady, N. Y.

FOR SALE—Shipboard Main receivers and small boat Radiotelephone sets, new and used. Tropical Radio, Pier 7, North River, New York City.

FOR SALE—RCP model 668 VTVM like new, complete with test leads and instructions. Will guarantee. H. W. Schendel, 518 W. Main St., Sparta, Wis.

POSITION WANTED—Radio operator or television installation and repair. Graduate of New York Technical Institute, also Delehanty Institute. Courses were: Radio-television service, repair technical. Radio telephone. Holder of a radio telephone second class amateur license, lacking a lot of experience. Alvin B. Jordan, 990 Putnam Ave., Brooklyn 21, N. Y.

FOR SALE—Superior 1230 sig. gen., good condition, instructions, lead, \$15; Riders' I-V abridged, like new, index, \$15; VI, like new, \$7.50; VIII, XI, XII, XIII, like new, \$12.50 ea.; all 6 for \$65. Shipping charges collect. Vito M. Twaska, 3321 W. Carson St., Pittsburg 4, Pa.

FOR SALE—"Sparx" 905 sig. tracer, brand new in original carton, \$30. D. G. Epard, 853 6th Ave. S. E., Rochester, Minn.

FOR SALE—(Books) Fundamentals of Radio; Understanding Radio; Applied Wing Theory; Aircraft Const. and Repair; Ques. and Ans. for Aircraft and Eng. Mech. \$1 each. Excellent Cond. A. Cherry, Jr., Box 65, North Branch, New York.

FOR SALE—Slightly used model 80 Webster-Chicago portable wire recorder, complete, \$130; Minerva Tropic-Master, \$30; portable hand crank 500 volt Megger in carrying case, \$65. Reliable Radio Sales, 441 Angela Ave., Arabi, La.

WANTED—Used public address equip. Send full description and lowest price. Fidelity Sound, Fox Spring Ave., Flemingsburg, Kentucky.

SELL OR TRADE—Large stock of cartoned standard brand tubes of late manufacture, and record changer. Want war surplus, good used test equip., or anything useful in radio service work. Wood Radio and Electric Shop, 2036 Chalfant St., Wilkesburg, Pa.

FOR SALE—New Hickok oscilloscope, model 195, \$100. The instrument has never been used. Instructions included. Edwin A. Gruneich, Buffalo, N. Dakota.

WANTED—To contract small radio or amplifier sub-assembly or complete assembly. State your requirements. Bob's Radio Service, 186-09 - 122 Ave., St. Albans 12, N. Y.

FOR SALE—Simpson sig. gen., model 315, like new, \$50. Simpson 260 multi-tester with case, almost new, \$40. Both FOB N. Y. B. Cohen, 183 Greenpoint Ave., Brooklyn 22, N. Y.

FOR SALE—G.E. sig. gen., model 3A in perfect condition, at almost half its original list price. G. Ross, 1815 Phelan Place, Bronx 53, N. Y.

TRADE—One complete set of Coyne's Applied Practical Electricity, 7 volumes, never used, for 16mm picture projector in good condition, or used typewriter. All replies answered. G. L. McCreary, Box 45, Tiger, Arizona.

TRADE—RCA console combination model U-132 in excellent condition, for late model Webster changer with variable reluctance pickup. M. Bloom, 3080 Hull Ave., Bronx 67, N. Y.

FOR SALE—\$20 takes a new emission type tube tester. For details write: Jim S. Berry, Summerville, Georgia.

SELL OR SWAP—Italian communications rec., 200 kil. to 22 meg.; two tube ac-dc short wave rec., and coils; micro and milliammeter movements; code oscillator. Can use sig. gen. and other equip. Norman Rothbard, 9814 Foster Ave., Brooklyn 12, N. Y.

FOR SALE—National 1-10 rec., complete with National power supply and coils to cover 1-10 meters. Like new. Less speaker, \$45. Keith Slack, 2328 - 44th St., Des Moines 10, Iowa.

FOR SALE—Hammarlund Comet Pro, complete with cabinets, tubes, and speaker; Sparten modernistic table model, No. 5018; Motorola car set; Thor Binks, model 17 spray gun. Want Precision VTVM or tube tester. Glenn Watt, Chanute, Kansas.

FOR SALE—Television rec., 7" Transvision, completely wired from kit, without cabinet, guaranteed to work, \$150 FOB. Charles W. Hewlett, 325 Leffingwell Ave., Kirkwood 22, Missouri.

FOR SALE—Modern Radio Servicing and Radio Physics Course by Ghirardi, \$4 each. Both in perfect condition. Merritt Malvern, 26 South Irving Terrace, Kenmore 17, New York.

SELL OR TRADE—Good auto radio for a good ac-dc battery portable radio. Also have 10 auto radios for sale. H. B. Tense, 148 Woodland Ave., Little Ferry, N. J.

FOR SALE—Rebuilt speakers or will rebuild your old one, if suitable, with original type cones. Have several used radios, bat. and electric, in good cond. Want old Edison-type cylinder records in good cond. Thelbert D. Brown, Bethel, Vermont.

WANTED—Numbers 6, 10, 11, 15 Riders' Manuals. Write giving cond. and price. Maze Radio, 744 East 9th St., Houston 7, Texas.

FOR SALE—Riders' Manuals 1-7, \$28 takes all; also RCA Service Notes 1923-1937 (8 vols. clothbound) \$8. Ernest L. Sachs, 119-20 Union Turnpike, Kew Gardens 15, N. Y.

MOVIE PROJECTORS—Ampro Arc, Ampro-sound UA, Premier-10, and Premier-20 motor interference successfully eliminated if equip. sent to us prepaid. Louis U. Diemert, 810 Charleston St., Mobile 21, Alabama.

FOR SALE—Thordarson T-30W10 amplifier, 10 watt, 10 tubes, like new, solid walnut cabinet, beautiful panel. New \$300; sell for \$100. Send stamp for photostat of manual. A. J. Garatti, 151 Farmington Ave., Hartford 15, Conn.

SELL OR SWAP—"Pan American" trumpet and portrait lens. Want 1/4" electric drill or radio equip., such as cond. checker, tube checker, VTVM, etc. All inquires answered. Richard D. J. Lytwyn, 3057 Fischer, Detroit 14, Mich.

FOR SALE—Old radios and parts dating back to beginning, B. eliminators, relay switches, etc. Advise your selection at your own price, Marothy Radio Shop, 123 E. Park Ave., Coldwater, Mich.

FOR SALE—New National NC-57 communication type rec. for amateur or SWL. Tunes 540kc to 56mc continuously for broadcast and world wide SW reception, (tunes amateur 6 meter band) one set headphones with phone plug and one radio log. All for \$70. Paul Wm. Sabo, 1631 North 47 St., East St. Louis, Ill.

SALE OR TRADE—New Globe portable model 456 with batteries, \$13; florescent lights; phono parts; crystal mike and stand; meters and other parts. Want BX crystal mike and Echophone EC-1 rec. All letters answered. Richard Igou, 413 Bluegrass Ave., Madison, Tenn.

FOR SALE—Radio, excellent condition, Majestic built URR-100, ac-dc or battery operation, broadcast and SW bands. Best offer over \$45. E. J. Shafer, 4718 20th Rd. N., Apt. 103, Arlington, Va.

FOR SALE—E200C Precision sig. gen., brand new, \$50. Ray Barrows, 58 Monticello Ave., Newark, N. J.

FOR SALE—E200-C sig. gen., new, \$65; Riders' Manuals, 11, 12, 13, new, \$13, or all three for \$36; tubes; Army sig. gen No. I-198-A, covers 8mc to 26mc, needs calibration, \$8; television set built in television school, 3 channels, 5" tube, \$50. All shipped COD. Wilbur Kespert, Box 6A, Youngsville, N. Y.

FOR SALE—40 and 80 meter VFO exciter for Meissner 150-B. Good cond., \$40. B. R. Spells, 1410 Grandhaven St., Salinas, Calif.

FOR SALE—Webster Foundation wire recording unit. 8" speaker, mike, 5 tube radio for attachment; and also a phonograph with crystal pick-up and ruby point needle, \$125. Clyde E. Felty, RR 1, Liberal, Missouri.

WANTED—Radio position as assistant Graduate of National Radio Institute, now attending Penn Technical Inst. evening classes for television. One yr. experience. Richard Manning, 646 May St., McKeesport, Pa.

FOR SALE—Complete carrier-current transmitter. Operates on standard freq, 540kc to 700kc, complete in every detail with instruction booklet. Entire outfit for \$25, plus shipping cost. Bob's Radio Service, 11 Main Street, Johnson City, N. Y.

FOR SALE—One NRI sig. gen., model 88, \$35; NRI sig. tracer, model 33, \$45; NRI tube tester, model 67, \$45. All new with instructions. Harold N. Greene, 23 N. W. 9th St., Oswego, N. Y.

WANTED—Triplett model 1232A sig. gen. Must be in A1 condition with full instructions and accurately calibrated. Furnish full details and price asked. John Bates, 10 Central Ave., Paoli, Pa.

FOR SALE—Riders' Manuals from 1 to 6, \$36. Shipment will be made by American Express Co., collect. Jac's Radio and Refrigeration Serv., 615 - 11th St., Bremerton, Wash.

FOR SALE—BC-221 AK frequency meter. Internal tone, regulated ac power supply. good cond., \$35. Local sale only. Phone any evening, Nightingale 9-0871. M. Katz, 127-H East 85th Drive, Carnarsie, Brooklyn 12, N. Y.

FOR SALE—Sylvania type 134 Polymeter, like new; also 288X Hickok sig. gen., A1 shape. best offer. Kenneth E. Gould, 878 Mill St., Watertown. N. Y.

SELL OR TRADE—Whizzer Motorbike in excellent condition. Sell at a bargain or will trade for radio testing equipment or parts. Ocie Carter, 119 Norton, Sylacauga, Ala.

WANTED—Small communication rec., such as; Howard, Hallicrafter, or Hammur-lund. For cash or watches. Chas. H. Doolittle, 415 Irving Ave., Syracuse 10, N. Y.

FOR SALE—Electric hearing aids. Wholesale price \$29.50, in lots of 3. Samples, \$33.50. Money back guarantee. Debon-air Sound Systems, Box 56, Maspeth, N. Y.

FOR SALE—Automatic record changer crystal pick-up, like new, \$14. Also 2 meter M.O.P.A. Cardwell oscillator 6C-4's and 829 on aluminum chassis with switches and meter, \$25. P. H. Southworth, Pennington, N. J.

FOR SALE—3 new testing instruments. Triplett No. 3480 VOM and tube tester; Precision sig. gen.; Precision sig. tracer. Used 5 weeks, \$150. Or will trade, what have you? W. J. Merritt, 1831 C N. E., Miami, Oklahoma.

FOR SALE—Approximately 600 radio tubes in original cartons. 50% and 5% off current list, delivered. Edward A. Buchwald, RR 6, Ft. Wayne, Indiana.

FOR SALE—Riders' Manuals, vols. 1 to 5 abridged, and 8, 11 to 16. Used less than a year. Sell for highest cash price. Levengood Radio Service, RFD 1, Oley, Pa.

SWAP—One Ohlson 60 and one Drone diesel model engines, with props and spinnit in good condition. Will trade for used typewriter, Riders' Manuals, or other service literature. Druelinger Radio Serv., 1013 Berlin St., Mishawaka, Ind.

WANTED—Good used transmitter under 100 watts output. I have a Schwinn motorbike with accessories to swap. Value over \$200. Alex Parker, 889 Mission Canyon Road, Santa Barbara, Calif.

FOR SALE—Japanese pistols, model 25 and 94, both in fitted wooden case, \$40. Also 20" K and E polyphase slide rule in leatherette case, \$21.50. M. G. Moses, 40 Glenwood St., Albany 3, N. Y.

FOR SALE—McMurdo Silver Model 909 FM and TV sweep sig. gen., new in carton. Cost 48.50; ship anywhere post-paid, \$36.50 Jack's Radio Service, 111 W. Hoffman Ave., Lindenhurst, L. I., N. Y.

TRADE—Surplus and standard brand tubes etc., for test equip., Riders' Manuals, surplus equip, or what have you? Frest Radio Service, 811 - 21st St., East Moline, Ill.

SELL OR TRADE—Modern Radio Servicing, Ghirardi, good cond., \$4; Feiler TS-1 sig. tracer, vacuum tube probe, new cond., with batteries, \$8; Triplett tube tester 1210-A, all papers, 2 adapters, \$12; 1941 Mercury auto radio, 5 position tuning, \$35. Want all Riders' Manuals and 1939 Chev. radio. DeFrees, 15 De-Windt St., Beacon, N. Y.

FOR SALE—Triplett model 2432 sig gen., like new, \$45. Leland Johnson, 513 11th St. No., Benson, Minn.

WANTED—McMurdo Silver Masterpiece V or VI radio, state price. Also name of radio man in Chicago who can realign the IF of a Masterpiece V. Victor Epperson, 1611 So. Ridgeland Ave., Berwyn, Ill.

FOR SALE—Keystone movie projector and camera (latest model) at bargain price. Recently purchased with full 1 year factory guarantee. Deluxe carrying case given free with projector. Michael Passaro, 126 Fourth Ave., Paterson 4, N. J.

SELL OR SWAP—20 watt phono amplifier with Jensen 12" speaker in portable baffle; Solar CE-160 capacitor checker; AC sig. tracer; GE tube tester TC-3A; GE set tester UM-3; wire recorder, model A-1 drive. Want Hallicrafters T-54 television set. E. S. Arnauld, 24 Arch, Meriden, Conn.

FOR SALE—Abbott TR4B 2 meter transmitter-rec. (mobile), 6V-100mil-300V electronic vibrator supply, co-axial 1/2 wave dipole, 8" encased PM speaker, director and reflector attachments. All like new, \$50 Harry R. Williamson, 119 E. Broad St., Tamaqua, Pa.

SALE OR SWAP—Speco sig. tracer with probe "model stap" and instructions. Used twice, will swap for sig. gen. or \$25 cash. Cruz J. Morales, 574 Main St., Stamford, Conn.

SELL OR SWAP—Novex slide projector and viewer. Also R.C.P. No. 663A V.T. volt, ohm, and capacity meter. Want a deep sea rod and reel or a reflex camera. Ernest Peters, 2055 W. Raymonds Ave., Parkchester, N. Y. C.

FOR SALE—12" Oxford heavy duty speaker, 80 tubes, power supply and case, \$12; aluminum baffle for 12" speaker, \$8. Arnold Radio Co., 4341 California St., San Francisco 18, Calif.

FOR SALE—Brush soundmirror, 15 reels tape, excellent condition, \$170; Tripod 52x70 Dalite glass beaded movie screen, \$25; Zenith model A2A hearing aid complete less batteries, unused, \$36. Robert M. Reed, 2217 Wrocklage Ave., Louisville 5, Ky.

TRADE—Latest NRI Radio and Television Course, all kinds of radio manuals and tubes. Want salt water fishing equip. I. Rudolph, 83 W. 188 St., Bronx 63, N. Y.

FOR SALE—2 home built instruments. Distortion analyzer, value \$60, sig tracer VTVM (not assembled), value \$85. Kit VTVM (not completed), value \$25. Tubes parts, resistors included. All for \$95. Arthur J. Cherpoff, 160 Bay 28th St., Brooklyn, 14, N. Y.

FOR SALE—Fairchild K-8 gunsight power units, with 6 Alnico generators, motor alternator, 8 tubes, condensers, Precision resistors, described Radio News Feb., 1945. New \$9, used \$5. J. W. Glenn, 124 Kenview Ave., Kenmore 17, N. Y.

FOR SALE—Transmitter, 200 watt complete with coils and tubes ready to operate, enclosed in steel cabinet, custom built, like new, \$125; Telrad freq. standard (new) \$19; Transmeter, \$20; Various other parts for sale. C. O. Hughson, Box 68, Chipley, Fla.

SELL OR TRADE—R.C.P. sig. gen., No. 705; 663A V.T. volt, ohm, capacity meter; Mercury 2 camera with extension tubes for copying, case, and flash attachment. Want a reflex camera or what have you? Wm. Bailey, 19 Stratton Road, Scarsdale, N. Y.

WANTED—Official handbooks or converting information on the Navy transmitter T-47/ART-13. Robert Larrabee, 255-37 Upland Road, Great Neck, N. Y.

FOR SALE—Model No. 450 sig. gen. 3 months old, 100kc to 35kc on fundamentals, and 25mc to 105mc on harmonics. Audio freq. of 400 cycles, operates on 110 to 120V 60 cycles, with instruction manual, \$45. Want Riders' vol. 10 to 14. Fred M. Merrill, Box 92, Callicoon, N. Y.

FOR SALE—Clough-Brengle instruments: Freq. modulated sig. gen., model OMA, \$40. R.F. sig. gen., model OCA, \$35; 3" oscilloscope, model CRA, \$50; Solar capacitor analyzer, model CB 1-60, \$20. All recently factory reconditioned. Bob's Radio Lab., 115 N. Main, White Hall, Ill.

FOR SALE—Precision No. 856 multi-tester, max. 6,000 volts provides accurate voltage current and resistance measurements in television and FM networks; AFC and AUC circuits brand new. Mahogany case with handle, list \$49.50, sell for \$30. Bill Graham, 66-24 Forest Ave., Brooklyn 27, N. Y.

SALE OR TRADE—Colt 45 cal. automatic pistol, shells and holster, \$50. Or will trade for Precision sig. gen. or 5" oscilloscope. B. J. Hanna, 1432 Dakota Ave., Flint 6, Mich.

FOR SALE OR SWAP—35 watt portable PA system, with 2 12" speakers; 8 watt PA or guitar amplifier; C-H 38 army surplus transceiver, made by DuMont, in original portable chest. Trade for anything usable or cash. Harry Davis, 728 East 4th St., Duluth, Minn.

WANTED—MoPar radio, original equip. for 1940 Dodge. Must be in good condition. State price and condition. Eugene Lee Olney, PO Box 379, Omaha, Nebr.

FOR SALE—Gibson Girl transmitter, with hydrogen gen. for balloon antenna, \$10. Dyer Matlock, Jr., 413 North 11th St., Las Vegas, Nevada.

FOR SALE—Parts from disassembled radio broadcast transmitter. 849's slightly used, 15 Weston 301 meters, transformers, HV condensers, etc., Write for list. Swap for photo equip considered. J. Geilenkirchen, 42 Barker Avenue, White Plains, N. Y.

FOR SALE—RCA Q-34 tuner, new cond. with output trans. and choke, \$45; Thor-darson 8 watt hi-fi, 2 channel amplifier, new, \$30; Wilcox-Gay Recordio, table model, blond mahogany, used some, perfect, \$95. Richard J. Preston, Lime Springs, Iowa.

SELL—QST '24-'39; Electronics '46-'47; Communications Aug. '46 to date; RCA Review '47; Television 3 and 4; Nucleonics 1st year; Tele-tech Jan. '47 to date. R. V. Osborn, 94 Colonial Road, Stamford, Conn.

WANTED—Manual on interference from motors, fluorescent lights, etc. Droesch Radio Service, 75-27 195th St., Flushing, N. Y.

SWAP—Send your complete list for mine. Radio and associated items. G. Samkofsky, 527 Bedford Ave., Brooklyn 11, N. Y.

FOR SALE—All components comprising deluxe hi-fi custom-built installation (except cabinets). Includes 20 tube FM-AM-SW radio-phono using new G.E. pickup and woofer-tweeter speakers. Also over 50 records, mostly 12" classical. All in excellent condition, \$150 or best offer. N. P. Forcier, 293 Jefferson, Salem, Mass.

SALE OR TRADE—New guaranteed tubes in cartons, 55% discount. State needs or write for lists. Also have 35 watt Masco amplifier for \$49.50. Want a recorder and TV set. Ben's Radio Serv., Rt. 2, No. Tonawanda, N. Y.

FOR SALE—45 watt amplifier for less than cost of parts. Inputs for 2 mikes and 2 phonos, tone controls, and built-in monitor speaker. Needs new filter condenser and additional shielding in 1st mike stage. Cabinet available. Joseph Lafreniere, 129 Natick Ave., Greenwood, R. I.

FOR SALE OR TRADE—New Speco ac-dc type sig. tracer; 32 automatic revolver. Want tubes. All inquiries answered. Fenters Radio Service, 107 Bond St., Attica, Ind.

WANTED—Position in radio station with opportunity for advancement. Former announcer for American Forces Network overseas. Anxious to learn station operation. Donald Chartier, 439 Lakeside Ave., Marlboro, Mass.

FOR SALE—15 watt PA system, complete, new, \$80; FM tuner, with self-contained power supply, as is, \$10; Maytag gas engine, $\frac{3}{4}$ h.p., \$20. Melvin Guy, 3310 Shady Ave., Pittsburg 17, Pa.

FOR SALE—Meissner 3 tube regenerative rec., 550kc to 15mc, complete with tubes. Otto Pollei, Jr., 2122 Edgeland Ave., Louisville, Ky.

FOR SALE—Supreme Audolyzer, model 562, in new condition, \$100 cash. R. E. Kane, 33 Montivale Ct., Ft. Thomas, Ky.

FOR SALE—Supreme multimeter, No. 670, \$25; Supreme tube checker No. 450, \$20. Both in excellent condition. Charles E. Reass, 90-11 133 Ave., Ozone Park 16, N. Y.

FOR SALE OR TRADE—Supreme tube and set tester, deluxe model 89, in good condition. Interested in drafting instruments or guns. Ray Hatfield, 610 West Scott St., Bloomington, Ill.

WANTED—8mm camera and projector. Will swap radio tubes and parts or cash. Julian DeWolf, 14751 Tacoma Ave., Detroit 5, Mich.

SELL OR TRADE—Sonar XE10, Versatex xtal mike, 42" enclosed. Par metal cabinet, all like new, \$40 or 35mm camera. Al Hoffmann, 275 Woodbine St., Brooklyn 21, N. Y.

FOR SALE—Triumph No. 351 multimeter, 5,000 ohms per volt, top condition, \$12; Supreme 543S 5,000 o.p.v., new, \$14.50; Precision 920P tube and set tester, good condition, \$45. H. N. Goldberg, 4625 N. Lawndale, Chicago, Ill.

FOR SALE—Army surplus CCT-46217-11 tube radio rec., 2 to 20mc freq. range, in good condition, \$70. William Schechter, 1337 Teller Ave., Bronx 56, N. Y.

FOR SALE—Hewlett-Packard Audio oscillator, model 200-A, range 30-30,000 cycles, panel mounting, slightly used but in excellent condition, \$65. Wagner Radio, 1704 S. Michigan, Chicago, Ill.

FOR SALE OR SWAP—Have a C-D capacitor bridge, model B.N. like new. Will sell for \$15 or swap for a good sig. gen. Charles Mazar, 154, Rockaway Pkwy, Brooklyn, N. Y.

FOR SALE—1947-48 NRI radio, FM, communication and television course. 67 lessons plus 14 reference textbooks and radio dictionary. Altogether 82 books, in perfect condition, \$22.50. Also 23 Radio-craft magazines, \$3. Both postpaid. Casimer Kusak, 111 Hirschbeck St., Buffalo, N. Y.

SELL OR TRADE—New Chrome Alloy tool sets in metal boxes; multitesters for communications rec.; test equip; meters; rifle; shotgun; portable typewriter, power tools; camera. Roby, 1119 Milwaukee Ave., Chicago 22, Ill.

FOR SALE—R.M.E. low freq. converter, model L.F. 90, black crackle finish, good condition, \$20. Harold Geise, 33-08 84th St., Jackson Heights, N. Y.

FOR SALE OR TRADE—One home built amplifier, with mike and phono input, installed in a commercial built chassis, complete with 2 12" speakers. Also one Sparton battery portable and other radio parts. Want 2 1/4 x 3 1/4 press camera. George H. Hague, 6 Carver St., Fall River, Mass.

FOR SALE—Movie camera, 16mm, f3.5 lens, 50', perfect, \$45; New Mercury No. 2, 35mm, case, cost \$90, sell for \$70; Vario 35mm, f4.5, \$31. Adams Radio Service, 1101 Elm St., Utica, N. Y.

SWAP—I.C.S. correspondence course in inventing and patenting, complete in heavy binder. Want complete correspondence course in radio servicing. Joseph L. Whatley, 603 - 17th Ave., Munhall, Pa.

FOR SALE—Precision E-200 sig. gen., like new, \$50. C. N. Sibbing, 1736 E. 31 St., Cleveland 14, Ohio.

FOR SALE—New BC-348, freq. meter, transmitter, tubes, etc. Send for list. Milton Kalashian, 2 Congress St., Newburyport, Mass.

FOR SALE—Jewell sig. gen., \$10; series 832 Precision volt-ohmmeter, \$6; series 510 tube tester, \$35; wireless phono oscillator, \$3. Want 8mm movie camera, 16 gauge shotgun, or what have you? Jack Miller, 1017 Cedar, South Bend 17, Indiana.

SELL OR TRADE—Lens for 7" Transvision, like new, \$15; new Jerrold booster for television antenna, \$19. Or will trade for sig. tracer. Arthur Berger, 1062 N. 46 St., Philadelphia 31, Pa.

FOR SALE—Riders' Manuals, 7 through 14 inclusive, like new, \$95; Sprague Tel Ohmike, model 16, like new, \$32; 50 assorted Centralab volume controls, new in cartons, \$25. Marathon Radio and Electric Co., Main St., Hopkinton, Mass.

FOR SALE OR TRADE—Brand new 12A6 tubes at 50c ea.; new emission type tube checker \$20; model 312 Chicago industrial VOM, \$5. Will sell for cash or what have you? Jim S. Berry, Summerville, Georgia.

FOR SALE OR SWAP—8mm Eastman camera, f3.5, with case; 8mm Keystone projector, with case. Both perfect. Want ship to shore receivers, 6 volt, or any 6 volt battery sets having 1700kc to 5000 kc band. Make offer. William Gorges, Atlantic 1, North Carolina.

WANTED—Microwave Techniques, published in 1944 by the U.S. Ships Bureau. F. E. Miller, 3122 S. E. 73rd. Ave., Portland 6, Oregon.

WANTED—Oscilloscope TS-34A-AP or Dumont 3" or 5" oscilloscope. State price and condition in first letter. D. Ashepa, 1950 Andrews Ave., Bronx 53, N. Y.

FOR SALE OR TRADE—Leeds-Northrup potentiometer, complete with type R wall galvanometer, No. 2100 lamp and scale, and Eppley standard cell. Want a frequency standard. Henry Wagner, 4411 Indianapolis Blvd., East Chicago, Indiana.

WANTED—Hy 17 dynamo for Art-13 trans., BC 451 control box. Chandler Radio Telegraphy course. W. E. Schwenzer, 3619 Peach, Erie, Pa.

FOR SALE—School studio installation: 4-channel amplifier, 2-channel amplifier, oscillator, large control console, 2 mikes, Presto 16" 33-78 rpm 2 unit portable recorder, etc., at small fraction of original cost. Richard Lewis, Pacific Union College, Angwin, Calif.

FOR SALE—Many radio parts. Tubes, Triplett tester, 625NA like new, \$35; HQ-129 rec., used about 20 hrs., \$135. Send for list. Pat Esposito, 1720 - 57th St., Brooklyn, N. Y.

FOR SALE—Riders' Manuals, 8 to 15 inclusive, in new condition; Superior model 450 tube tester, \$20; other items. John W. Grubb, 220 Furst St., Flemington, Pa.

SWAP—1/4 hp motor, 110V, 60 cycles; Stanley combination plane. Want 3" oscilloscope in good condition. Lloyd Ramsey, 1258 Norwood Rd., Cleveland 3, Ohio.

FOR SALE—H16 Bolex f1.5 lens, case and meter, \$235; 4x5 Speed Graphic, complete with W.A. lens, \$250; 2 BC 683 6 volt and 110 ac, \$50 each; Wilcox-Gay recorder, portable with dynamic mike, 300 record blanks, \$155. K. Coleman, Box 808, Ft. Pierce, Fla.

FOR SALE—High voltage transformer, 2 windings, Kenyon 2840-0-2840 and 3400-0-3400, 400 mils each winding, \$45. Also Hickok model 530 tube tester, A1, \$50: Conrad Radio, 12908 Lorain Ave., Cleveland 11, Ohio.

SELL OR SWAP—Used table model radios, all in cabinets, tubes all OK. For sale or what have you? D. B. Hoffman, 960 E. 12th St., Brooklyn, N. Y.

SELL OR TRADE—Signal Corp. School Manuals, Test and Repair, vols. 1, 2, 3, complete with all schematics. Greg Swiska, 109 East School St., Woonsocket, R. I.

FOR SALE—Rotary converter, 1500 VA output, 115 volts in, 110 volts out, at 13 amperes, like new, in original plush lined case. Murray Schlein, 562 W. 113th St., N. Y. 25, N. Y.

FOR SALE—Model TVL Vision Tele-booster, covering channels 2 to 6, like new, used only a few weeks, \$10. Will pay postage. Ernest Lemire, 23 Bartlett St., New Brunswick, N. J.

FOR SALE—Complete radio shop equip. 3 test instruments; 10 Riders' Manuals; neon radio service sign; NRI course; Ghirardi Trouble Shooters Manual; Ghirardi Modern Radio Servicing; 10 Utah speakers; 18 coils, ant. and OSC; condensers, resistors, etc. All in A1 shape. Best offer over \$295. Vanden Berg Radio Service, Chandler, Minn.

FOR SALE—"QST" back issues, Sept. '29 thru Jul. '33, Sept. '33, May, Oct., Nov., Dec., '34, most in excel. cond., .20 ea.; 872A's and 805's plus socket, new, \$1.75 ea.; Amertran 5 H $\frac{1}{2}$ A. fil. chokes, \$3.50 ea., FOB; Sig. Corps. 1-222 Sig. Gen., 8-230mc, new cond., \$55, FOB. Arthur Koehler, 130 Wadsworth Ave., New York 33, N. Y.

FOR SALE—371-B tubes, netting at \$20 ea. Special, \$15 ea., or 2 for \$27.50. Orig. cartons, new, never used. J. Craig, 1921 Belmont Ave., Chicago 13, Ill.

ATTENTION—Tulsa, Oklahoma. Contemplating moving this area first of year, desire contacts with persons interested opening Radio Service Shop. Have car, all instruments, veteran. Bob Holtz-hauer, 2656 W. Washington Blvd., Chicago 12, Ill.

SELL OR SWAP—Several reels 16mm sound film, shorts and features. Also features rented at low rates. Write for lists and prices. H. B. Davenport, 3904 Glendale St., Philadelphia 24, Pa.

FOR SALE—Radio tubes. All brands, all types, in cartons, perfect, 10 for \$2.50, 100 for \$22.50. Every tube checked. List free. Clarendon Radio Service, Box 302, Clarendon, Texas.

FOR SALE—First \$25 takes 8mm projector. Stewart-Warner 533A converted to 300W prefocus ac-dc service. Baldwin, Box 373, Emporium, Pa.

FOR SALE—Simple photo electric relay. Operates with interruption of flash-light beam at 20' or more. Used for controlling home appliances or motors. Pictorial diagram, 25 cents each. Luis San-doz, 46 Elmwood Ave., Dayton, Ohio.

WANTED—Technical Manual, AN16-30ARC-5-2 for Arc 5 equip., in good condition. Will purchase or exchange for other Technical manuals. Joseph D. Ogle, RFD, Avon, Conn.

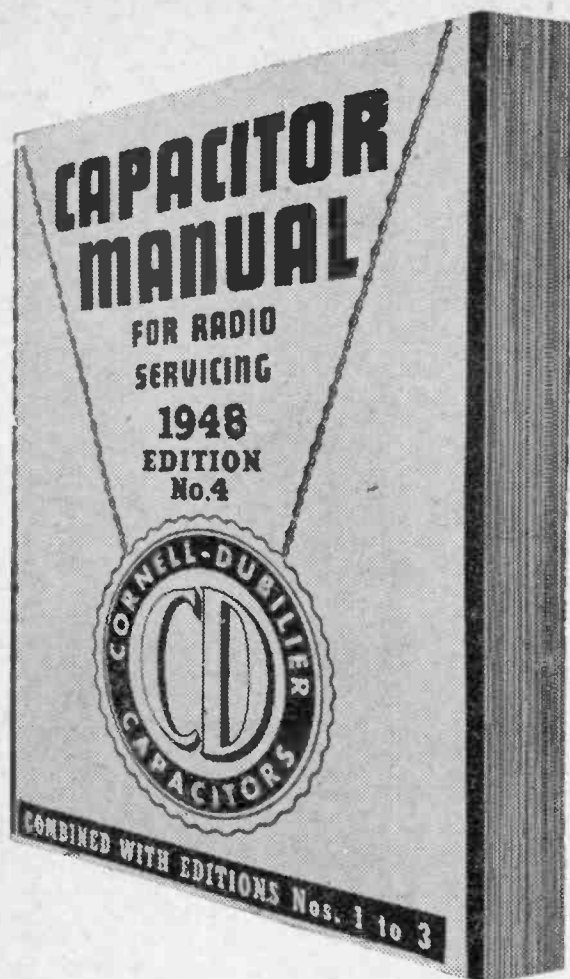
FOR SALE—12B8 and 25B8 tubes, adaptor units, using 2 miniature tubes. Takes less space than orig. 12B8 or 25B8, do same work. \$2.75 ea. postpaid. Write for free bargain catalog. Commercial Radio, 36 Brattle St., Boston, Mass.

FOR SALE—Radio Sales and Service business. Want to buy Radio Sales and Service business in some east Texas city. Albert H. Harrell, Box 121, Pine-tops, N. C.

SELL OR TRADE—Test equipment, cheap. Will take cameras and pistols in exchange. Van's Studio, Berlin, Md.

SELL OR SWAP—Radio, television and math books; CA-11 sig. tracer, with phones; Hurricane model airplane eng., complete, like new. Want 35mm camera, portable typewriter, or midget portable radios. Hilltop Radio Service, East Canaan, Conn.

FOR SALE OR TRADE—Presto recorder, model 6D, type MLC16. 2 speed 16" aluminum turntable, with synchronous motor. Model 1-B cutter head converted at factory to 1-C. Complete in carrying case 13"x21"x21". Want good communications rec. E. J. Bernet, Box 1884, University, Virginia.



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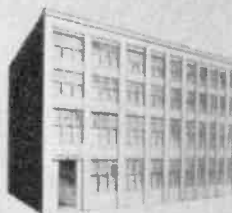
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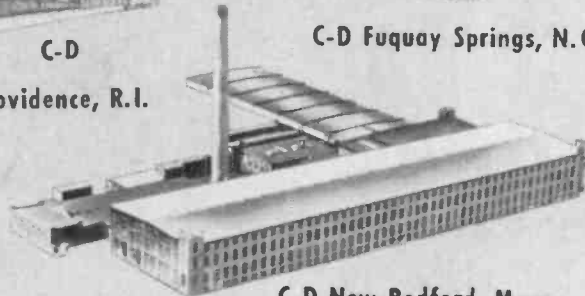
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