Vol. 15 DECEMBER, 1950 No. 12

CORNELL-DUBILIER ELECTRIC CORP.
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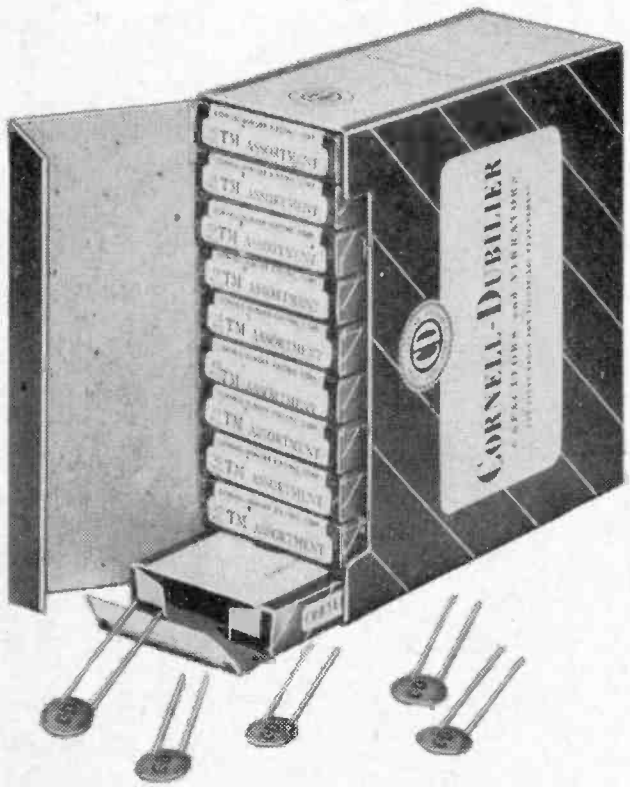

For TV replacement—and many other HF uses—Cornell-Dubilier has scientifically chosen the five most often needed values of TINYMIKE* ceramic capacitors, and has packaged ten (two of each), in a handy, low-priced assortment. The same high-quality design and construction that has made C-D capacitors famous for over 40 years are now incorporated in these improved, rugged, precision-assembled ceramic disc units.

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BEST BY FIELD TEST

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Other plants: New Bedford, Worcester and Brookline, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, O.

AN INEXPENSIVE, VARIABLE-FREQUENCY AUDIO TEST OSCILLATOR

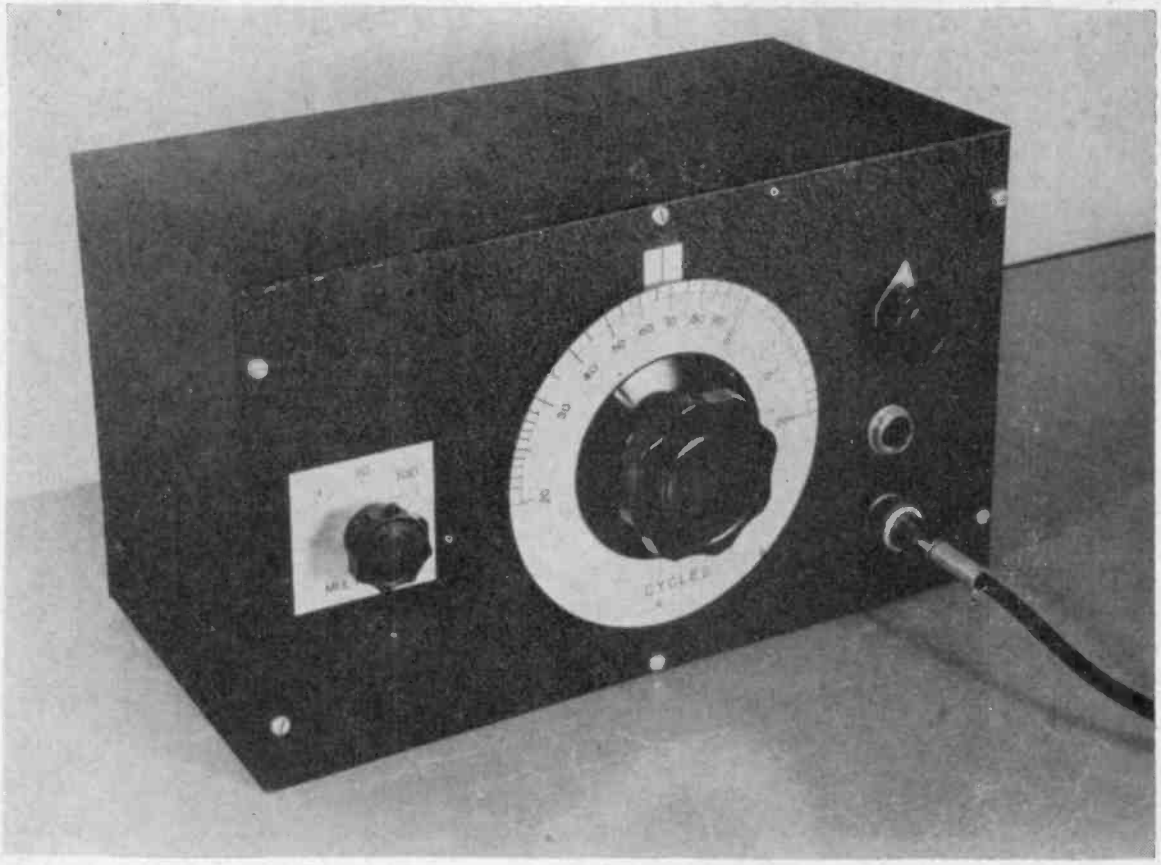

Fig. 1. External view of the completed oscillator. Compare with Figure 3 to identify the panel controls.

The Wien bridge-tuned resistance-capacitance-type audio test oscillator has, for several years, been a favorite among home-builders of test instruments. This oscillator provides stable, wide-range operation at low distortion and is easy to build. Its only two drawbacks, from the experimenter's point of view, have been (1) the rather large 4-gang tuning capacitors previously specified in the constructional literature, and (2) inability in most cases to obtain in home-built models good waveform at frequencies below about 100 cycles.

The oscillator described in this article overcomes the first objection by employing a regular 2-gang midget broadcast tuning capacitor with 365 micromicrofarads per section. Good sine waveform is obtained at low frequencies by employing a slightly different circuit from the ones which previously have been widely used.

The new circuit (See Figure 2) makes use of improvements discussed in the following articles: *A New R-C Oscillator Circuit* by Milton H. Crothers (Radio & Television News, May 1950, page 12 Radio-Electronic Engineering Section) and *The Cathode-Coupled Amplifier* by Keats A. Pullen, Jr. (Proceedings of the I. R. E., June 1946, page 402).

Previous circuits have employed a tungsten-filament lamp as a non-linear cathode resistor in the first tube. In

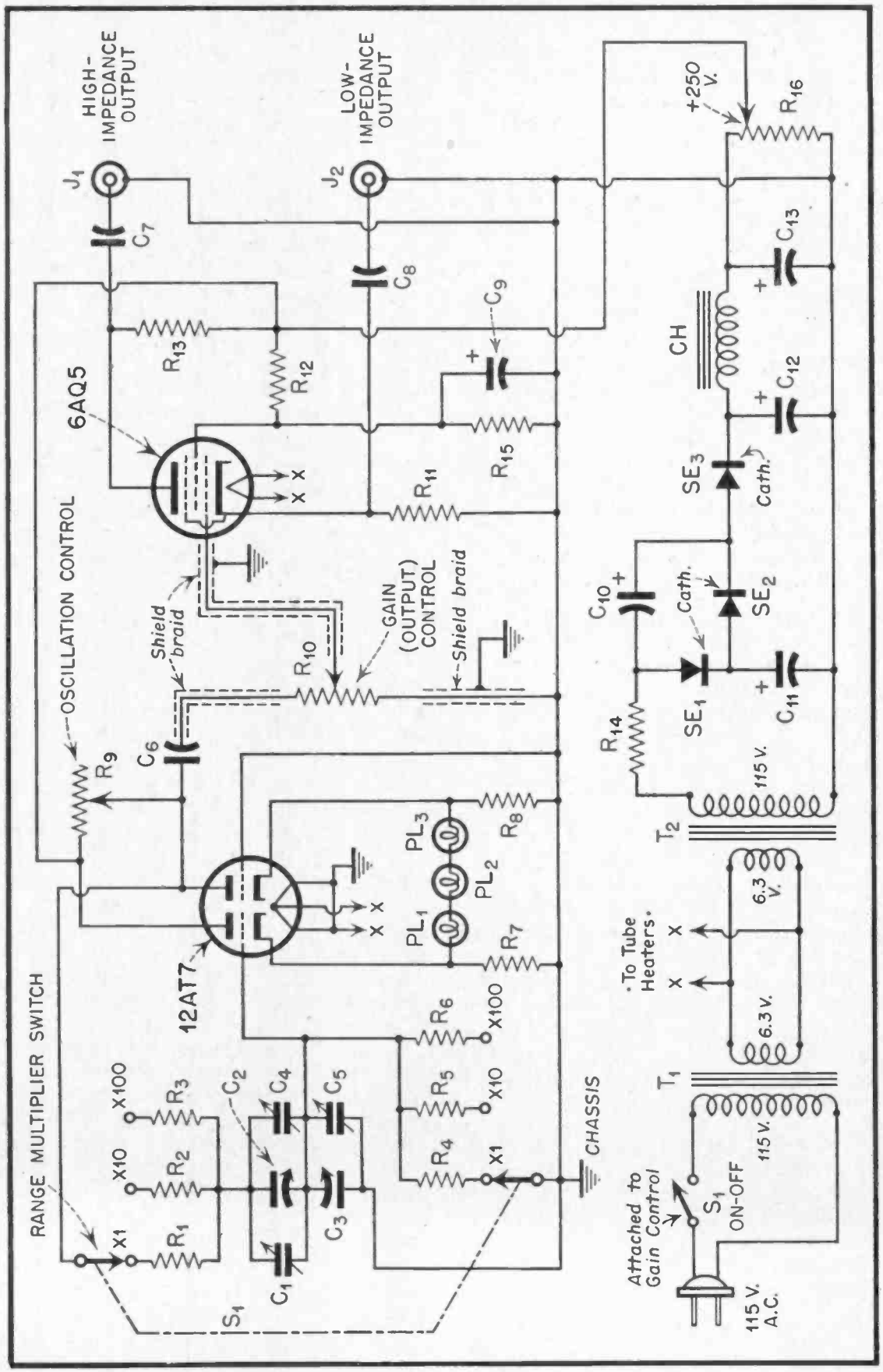
HIGH-IMPEDANCE OUTPUT
LOW-IMPEDANCE OUTPUT
J1
J2
C7
C8
C9
+250 V.
R16
C13
CH
C12
6AQ5
R13
R12
R15
R11
SE3
Cath.
OSCILLATION CONTROL
Shield braid
GAIN (OUTPUT) CONTROL
Shield braid
R10
C10
Cath.
SE2
SE1
C11
R14
115 V.
T2
C6
R9
PL3
PL2
PL1
R8
R7
12AT7
To Tube Heaters
6.3 V.
6.3 V.
R6
X100
R5
X10
R4
X1
CHASSIS
RANGE MULTIPLIER SWITCH
X100
X10
X1
R3
R2
R1
C2
C4
C5
C3
C1
S1
T1
115 V.
Attached to Gain Control
S1 ON-OFF
115 V. A.C.

Fig. 2.

LIST OF COMPONENTS
(*See Figure 2*)

C_1, C_4, C_5—50 mmfd. midget air-tuned trimmer—Hammarlund APC-50
C_2-C_3—The 2 sections of a dual 365 mmfd.-per-section midget broadcast tuning capacitor
C_6, C_7, C_8—0.5 mfd. 600 v. oil—Cornell-Dubilier DYR 6050
C_9—10 mfd. 25 d. c. w. v. electrolytic—Cornell-Dubilier BR 102A
C_{10}, C_{11}, C_{12}, C_{13}—20 mfd. 450 d. c. w. v. electrolytic—Cornell-Dubilier BR 2045
CH—10-henry 75 ma. midget filter choke—U. T. C. R-18
J_1, J_2—Concentric-type female chassis jacks—Amphenol 80-C
PL_1, PL_2, PL_3—3-watt, 120 v. miniature lamps—General Electric 3S6/5
R_1—20 megohms ½ watt carbon
R_2—2 megohms ½ watt carbon
R_3—200,000 ohms ½ watt carbon
R_4—20 megohms ½ watt carbon
R_5—2 megohms ½ watt carbon
R_6—200,000 ohms ½ watt carbon
R_7—2000 ohms 2 watts carbon
R_8—2000 ohms 2 watts carbon
R_9—25,000-ohm potentiometer
R_{10}—0.5 megohm potentiometer
R_{11}—250 ohms 2 watts carbon
R_{12}—50,000 ohms 1 watt carbon
R_{13}—10,000 ohms 10 watts wirewound
R_{14}—20 ohms 5 watts wirewound
R_{15}—40,000 ohms 1 watt carbon
R_{16}—10,000 ohms 25 watts wirewound, with slider
S_1—2-pole, 3-position, ceramic-insulated, non-shorting rotary selector switch—Centralab
S_2—S. p. s. t. toggle switch installed on potentiometer R_{10}
SE_1, SE_2, SE_3—150-ma. selenium rectifiers
T_1, T_2—6.3 v., 1 amp. filament transformers—Merit P-2944

Figure 3, it will be noted that a pi network composed of 3 lamps and the two cathode resistors, R_7 and R_8, is employed in the new arrangement. All three lamps in series are essential to satisfactory low-frequency operation of the circuit. The oscillator proper includes the two triode sections of a 12AT7 tube, the second triode being a grounded-grid amplifier. Transfer of energy from the first to the second triode is by way of cathode coupling. Feedback is transmitted from the plate of the second triode, through the R-C bridge circuit, to the grid-cathode input of the first triode. These changes in circuitry afford excellent waveform throughout the frequency range 20 to 20,000 cycles.

The oscillator portion of the circuit is resistance-capacitance-coupled to a 6AQ5 power amplifier stage. The cathode resistor, R_{11}, in the latter stage is unbypassed to reduce distortion. High-impedance output is obtained by capacitance coupling through C_7 to the 6AQ5 plate. Low-impedance output is secured by capacitance coupling through C_8 to the 6AQ5 cathode. The 6AQ5 grid resistor, R_{10}, is the output (gain) control potentiometer.

Three frequency ranges are provided. These are 20 to 200 cycles when switch S_1 is in its X1 position, 200 to 2000 cycles with S_1 in its X10 position, and 2000 to 20,000 cycles with S_1 in its X100 position. The single tuning dial (See Figure 4) reads 20 to 200 cycles. The proper number of ciphers is added mentally to the dial readings when the range switch, S_1, is in its X10 and X100 positions.

The two 365 uufd. sections of the tuning capacitor are designated C_2 and C_3 in the circuit diagram. The main dial is attached to the shaft of this tuning capacitor. Capacitors C_4 and C_5 each are 50 uufd. air-tuned trimmers, one connected in parallel with each tuning capacitor section to set the capacitance range of the latter to 40-to-400 uufd. C_1 is a third 50 uufd. air-tuned trimmer used to compensate C_2 for the stray capacitance to chassis across section C_3 of the main tuning capacitor. C_1, C_4, and C_5 are set during the initial calibration of the instrument.

The lowest range, 20 to 200 cycles, is obtained when the 20-megohm bridge

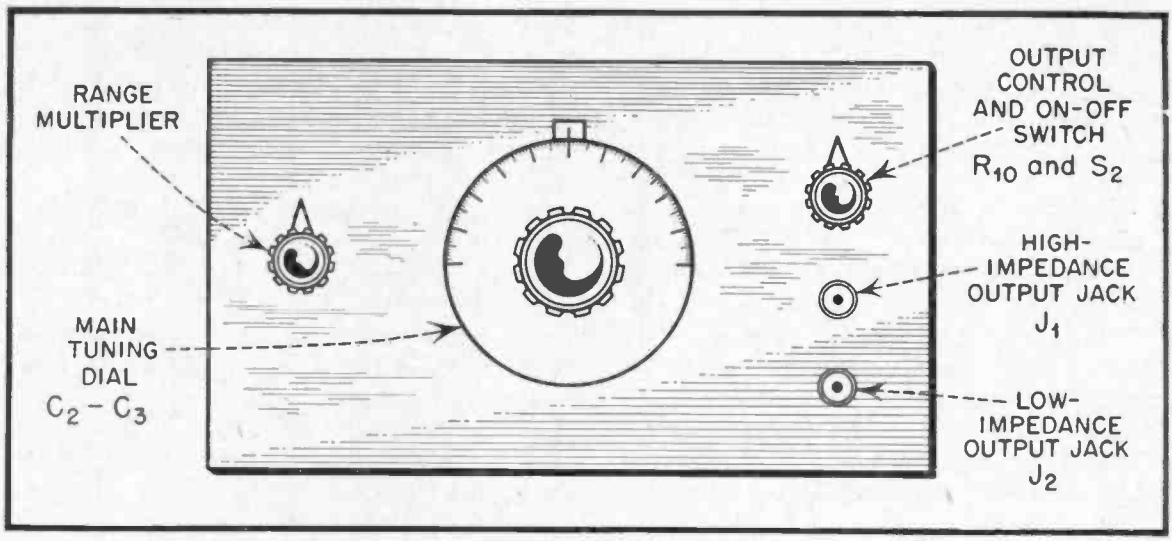

Fig. 3.

resistors, R_1 and R_4, are switched into the circuit. Resistors R_2 and R_5 each must be exactly one-tenth of the resistance of R_1. Resistors R_3 and R_6 likewise each must be exactly one-tenth of the resistance of R_2.

The plate load resistor of the first triode is R_9. The value of this resistor for a given tube governs readiness of the circuit to oscillate at low frequencies and also influences the purity of low-frequency waveform. For these reasons, R_9 is made variable. R_9 is set for optimum operation during the initial calibration, as will be explained later.

A miniature, tubeless power supply is employed. This is a voltage tripler circuit using three selenium rectifiers. To prevent electric shock hazard and to minimize hum transmission and "hot chassis" difficulties, isolation from the power line is secured by means of two small 6.3-volt filament transformers connected "back-to-back". Since all miniature components are employed throughout the power supply, this entire unit may be mounted compactly under the chassis. By so doing, all power supply components are removed from the vicinity of the tuning capacitor above chassis. The chassis itself thus provides shielding, and the usual complete shielding of the tuning components is not necessary. In previous oscillator designs, it has been necessary to erect a baffle shield between the tuning capacitor and the top-of-chassis power supply, or to box the power supply completely. The on-off power switch, S_2, is attached to output control, R_{10}, and is actuated by this control when in its extreme counterclockwise position.

Oil-type capacitors are used for C_6, C_7, and C_8, since capacitors of this type will give the highest long-term stability. Tubular electrolytic capacitors are used in positions C_9, C_{10}, C_{11}, C_{12}, and C_{13} for ease in mounting below chassis.

The Editors believe that this design furnishes a reliable small-sized oscillator which has all of the desirable features of similar instruments costing over one hundred dollars. It employs a minimum of components is light in weight, and can be assembled by any radio technician.

Construction

The oscillator, as shown in the photograph, is built in a standard metal "radio utility" case (Bud CU-1124) 12 inches long, 7 inches high, and 6 inches deep. The metal chassis, companion to the box, is 2 inches high. If space is a factor, these dimensions can be reduced somewhat without impairing operation of the instrument.

Since the rotors and frame of the tuning capacitor (C_2-C_3) are connected directly to the grid of the first triode, this capacitor cannot be mounted in contact with the chassis. Furthermore, care must be taken to reduce the stray capacitance between the capacitor frame and chassis to a minimum. With this in

mind, the tuning capacitor and trimmers C_1, C_4, and C_5 are mounted on a polystyrene plate and the latter supported above the chassis on four ceramic pillar-type standoff insulators. A rectangular cutout is made to remove a portion of the chassis directly under the capacitor assembly. This further reduces stray capacitance by eliminating the most "capacitive" portion of the chassis.

Because of the high resistance of the lowest-frequency range resistor, R_1, leakage in switch S_1 must be kept as low as possible. This dictates use of a ceramic-insulated range switch. Range resistors R_1 to R_6 are soldered directly to the range switch contacts and are connected to the tuning capacitor by means of the shortest and most direct possible leads.

The 12AT7 tube is the only one requiring a shield. This tube must be mounted as close as practicable to the tuning capacitor. The 12AT7 heater sections are connected in parallel, as shown in Figure 2, to permit 6.3-volt operation.

The three lamps, PL_1, PL_2, and PL_3, are mounted close to the 12AT7 socket. Since these lamps do not light, their life will be unlimited.

Range resistors R_1 to R_6 must be chosen to have exact or approximate 1% resistance values specified. A good freshly-calibrated ohmmeter or a resistance bridge should be used in selecting these resistors.

Potentiometer R_9 is mounted on the chassis close to the 12AT7 socket. Since this control is set during the initial calibration and needs no readjustment except when the 12AT7 tube is changed,

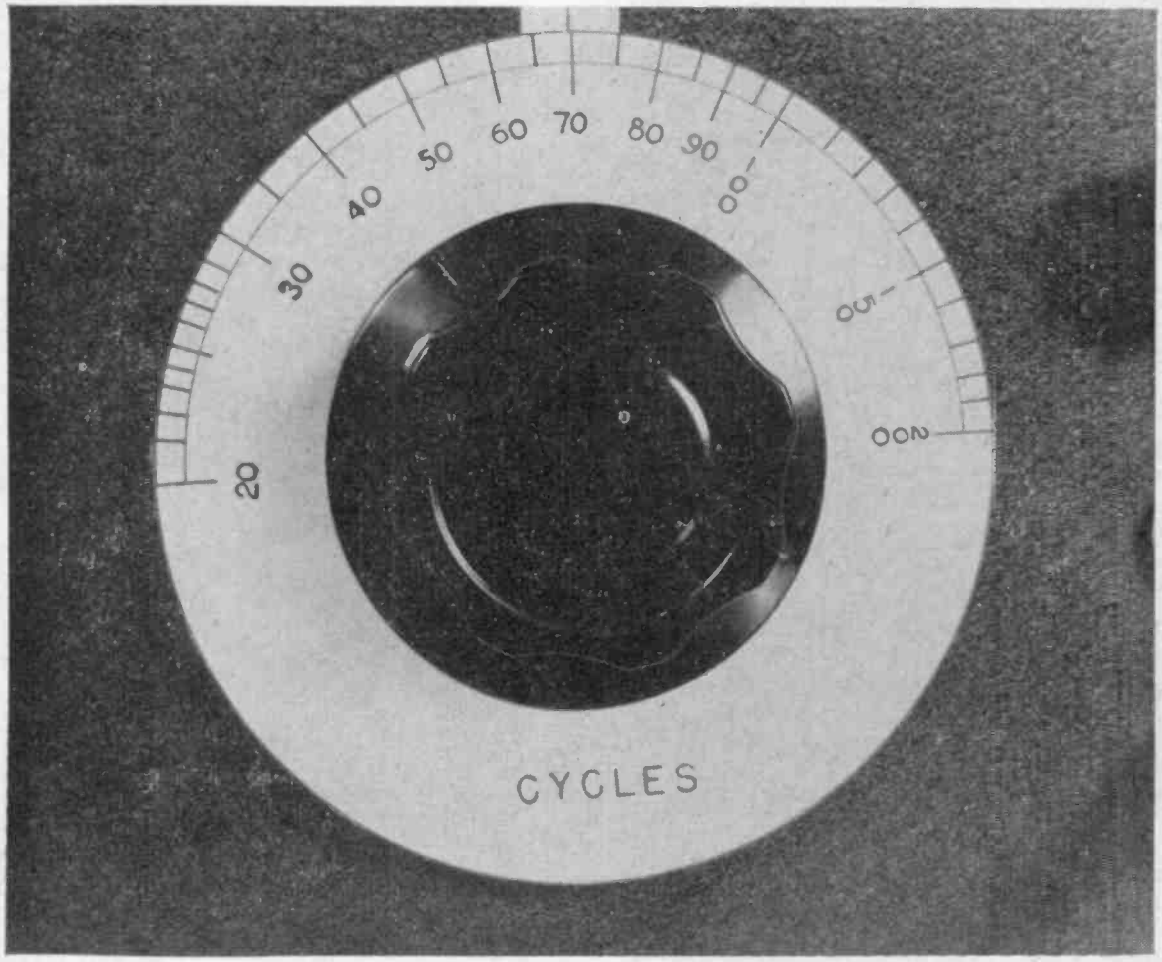

Fig. 4. Closeup of the main tuning dial, showing hand calibration. The dial is 5 inches in diameter and is plain white Bristol board cemented to metal plate. A disc of transparent celluloid or other plastic covers the completed dial face to prevent soiling.

it does not have to be accessible from the front panel. For that reason, it is provided with a slotted shaft for screwdriver adjustment.

The output control, R_{10}, can be mounted at some distance from the two tubes, provided its leads are covered with shield braid grounded to the chassis at one point.

The output jacks, J_1 and J_2, are of the concentric type and match the companion male cable plug. This arrangement provides a shielded output system which is advantageous when testing high-gain amplifiers and other equipment having high-impedance input circuits.

To minimize hum generation, the tube heater leads must be twisted together throughout their entire length and run close to the chassis. One terminal of the heater circuit must be grounded, preferably at the 12AT7 socket. All ground returns in the 12-AT7 circuit must be made to a *single* point on the chassis.

A small metal shield plate is fastened vertically below the chassis to isolate the power supply components, including resistor R_{16}, from the rest of the oscillator circuit. The positive and negative high-voltage d. c. leads and the twisted heater leads pass through small holes in this partition.

The tuning dial is made from a 5-inch-diameter aluminum disc covered with a disc of white Bristol board attached with Duco cement. After marking-in the calibration points lightly with pencil, the graduations finally are inked-in with black India ink. The dial then is covered with a disc of transparent celluloid or other plastic, to prevent soiling. Figure 4 shows how the dial graduations are spaced for the particular tuning capacitor employed by the Editors.

Adjustment and Calibration

After completing construction of the oscillator, check the wiring carefully for errors. If the hookup is correct, make the adjustment and calibration according to the following directions, observing the steps in the order given.

(1) Set the slider on resistor R_{16} about 1/4 of the way up from the grounded end.

(2) Set range switch S_1 to its X1 position.

(3) Set potentiometer R_9 to its maximum-resistance position.

(4) Set potentiometer R_{10} to about 1/2 maximum.

(5) Set trimmers C_1, C_4, and C_5 each to 3/4 of maximum capacitance.

(6) Set tuning capacitor C_2-C_3 to its maximum-capacitance position.

(7) Connect a pair of high-resistance headphones temporarily to the low-impedance output jack, J_2.

(8) Plug-in the power plug and switch-on the power. Allow about 2 minutes for the tube cathodes to heat.

(9) After the tubes come up to operating temperature, a steady audio tone should be heard in the headphones. Because of the low frequency, the headphones may not reproduce the audio very audibly. Advance the tuning dial to the minimum-capacitance position of the tuning capacitor and listen. If no sound is heard, slowly adjust R_9 until the oscillator goes into operation. Remove headphones.

(10) With the aid of a high-resistance voltmeter connected between B-minus and the slider of R_{16}, adjust the position of the slider until exactly 250 volts are delivered at the slider. At this point, tighten the slider. In making this adjustment, be careful to avoid electric shock. After adjusting the voltage, repeat Step 9.

This completes preliminary adjustment of the circuit. The most satisfactory and accurate calibration is made with the aid of another direct-reading variable-frequency audio oscillator and an oscilloscope. The circuit for calibrating is given in Figure 5.

Before starting the calibration, allow both oscillators to warm-up for 1 hour, to insure good stability. Set the horizontal and vertical amplifier gain controls of the oscilloscope to maximum gain, switch-off the internal sweep, and set the synchronization to INTERNAL. The calibration will be made by (1)

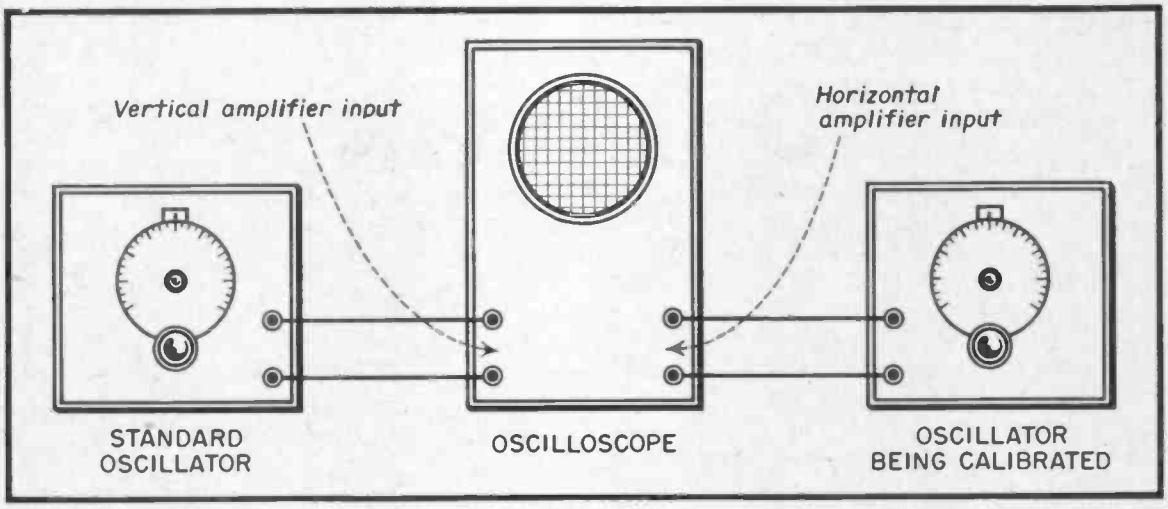

Fig. 5.

setting the standard oscillator to a desired frequency, and (2) rotating the dial of the experimental oscillator to obtain the same frequency. When the experimental oscillator is set exactly to the frequency of the standard oscillator, a *stationary* circle or ellipse will appear on the oscilloscope screen. This point of calibration then is marked on the dial of the experimental oscillator, and the standard oscillator is advanced to the next frequency. The more points checked, the more complete will be the dial graduations. The following procedure is recommended.

(1) Set the experimental oscillator to its X1 range, and connect the low-impedance output jack to the oscilloscope.

(2) Set the standard oscillator to 20 cycles.

(3) Set the experimental oscillator dial to obtain the stationary circle or ellipse pattern on the oscilloscope screen. Adjust the output controls of both oscillators and/or the oscilloscope gain controls to obtain a good-sized pattern on the screen.

(4) Temporarily connect the experimental oscillator to the vertical input of the oscilloscope, switch-on the internal sweep of the 'scope, and examine the waveform of the signal from the experimental oscillator. If it is not a good sine wave, adjust potentiometer R_9 to improve the wave shape. Also, adjust trimmer C_4 or C_5, as may be required, (with a long, insulated screwdriver) for further improvement. Restore connections between the oscillators and oscilloscope, as shown in Figure 5, and switch-off the internal sweep.

(5) Set the standard oscillator to 21 cycles, and tune the experimental oscillator for the stationary circle pattern. Mark this calibration point on the experimental dial.

(6) Repeat at as many points as possible between 20 and 200 cycles, marking each point on the dial of the experimental oscillator (See Figure 4 for guidance).

(7) It is necessary to calibrate only the 20-to-200-cycle range. If resistors R_2, R_3, R_5, and R_6 have been selected to have exact specified values, the 200-2000, and 2000-20,000 cycle ranges automatically will be in calibration.

(8) Remove the standard oscillator and connect the experimental oscillator to the vertical input of the oscilloscope, as explained in Step 4. Switch-on the internal sweep of the 'scope.

(9) Set the experimental oscillator to its highest range and tune its dial from 2000 to 20,000 cycles while watching the height (amplitude) of the pattern on the oscilloscope screen. If this height decreases appreciably as the oscillator frequency is increased, adjust trimmer C_1 (with a long, insulated screwdriver or alignment tool) until the height decreases only slightly, if at all, as the oscillator tuning is run through the 2000-20,000-cycle range.

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WANTED—Any information on prewar ham transmitter, model marine 18-A with 803 in final. Company out of business — need hookup very badly. Ervin E. Miller, 54 South 10th, Beech Grove, Indiana.

FOR SALE—Several Hallicrafter TV sets. 1950 models in factory cartons; No. 716, list $189, net $127.21; model 745, list $279.50 net, $176.50. John Marino, 108-24 35 Ave., Corona, L. I., N. Y.

FOR SALE—7 tube Philco receiver, range 540-1700kc. 2.3-2.6, 6-18 megacycles; plus weather aircraft beacons with output meter and big 7½" speaker, $30. Or trade for good S-38. Ken Mauldin, 650 Jenks Ave., Panama City, Fla.

SELL OR TRADE—Have QST mags. from 1934 to 1948, excellent condition. Ten cents a copy or what have you in audio equip? H. L. Messerschmidt, 329 So. Maple, Oak Park, Illinois.

POSITION WANTED—Experienced marine radio officer (now employed at sea) desires to locate ashore. 4 yrs. U.S. lines, U.S. Navy, U.S. Army Transport, etc., 3 yrs. radar tech, U.S. A.A.F, F.C.C. lic. 1st telegraph, 1st fone. N. J. or N. Y. area preferred. S. Herman, 450 Belmont Ave., Newark, N. J.

SWAP—NRI model 33 signal tracer for signal generator or small TV set. Tracer used less than three hours, with manual. Carl Moore, Jr., 432 Lookout St., Warren, Pa.

POSITION WANTED—Television installation and serviceman having 3 years experience and 2 years schooling, seeks position with reliable firm in N. Y. C. Will work as Serviceman's helper. Harry Singer, 1715 Bryant Ave., Bronx, N. Y.

POSITION WANTED—Young man, 22, single, ambitious, RCA Institute graduate, first class phone license, associate member IRE, interested in position as lab technician or station engineer. Prefer Florida. Romano Moglia, 433 E. 117 St., New York 35, N. Y.

FOR SALE—7" Hallicrafters model T54 in good condition. Best offer accepted. Will not ship. Prefer local buyer in New York-New Jersey area. Rocco Champi, 6 W. Washington Ave., Atlantic Highlands, New Jersey.

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FOR SALE—Eico model 425 push pull scope, factory built, never been used, satisfaction guaranteed or money back. Final price $50 COD, or money order. James Hurst, 22 June St., Fall River, Mass.

FOR SALE OR TRADE—5000 ohms-per-volt VOM tester, $10; Aerovox condenser and resistor tester, $20; both with leads and papers, excellent cond. Want Feiler TS-3 stethoscope. Walter Siuta, 4011 Lawndale St., Detroit 10, Mich.

SELL OR TRADE—Superior model 450 tube tester; model CA-10 signal tracer; Colt 45 auto.; also H&R 922. Want S-53 or S-40. Make offer. James O. Thompson, Box 52, New Hampton, Iowa.

FOR SALE—1949 Keen motor scooter, battery, generator, and lights; Dumont 5" scope model 274; Precision sig. gen. E400; all like new. Also 12" Transvision deluxe TV set, working cond. Janesville Radio Shop, 21 N. Bluff St., Janesville, Wis.

FOR SALE—Rider's Manuals, one to ten, $50; RCA 155 scope, $50; S10X Hickok tube checker with multi-meter, $50. All perfect. Gilbert McQuate, 1023 Lincoln Way West, Ashland, Ohio.

FOR SALE—Precision model E-200 signal generator and Precision model 600 tube tester, both for $90. Elton Dimmitt, Fayette Hotel, 615 West 3rd, Ft. Worth, Texas.

FOR SALE OR TRADE—Two model 280 multirange combination voltmeter ammeters; four model 267 voltmeters and milliammeters; one model 301 voltmeter; also others. All Weston instruments. Want TV test equipment, tools. R. D. Kraus, Gillette, New Jersey.

TRADE—Philco model 1201 comb. radio and phonograph in good condition for a good signal tracer. Send complete details. Les Ludwig, 79 Tillinghost St., Newark 8, N. J.

FOR SALE—Power supply for portable radio with 2 rechargeable batteries (1 spare) all brand new, very compact, $8.50. Eric Scholar, Box 191, East Durham, N. Y.

FOR SALE—Several reels 35mm sound movie film in new condition. Good subjects, no junk. Make offer. Details on request. George Cannova, 215 Harvard St., E. Williston, L. I.

TRADE—912 Precision tube tester with roll chart for good reflex camera, f 4.5 lens or better. N. Walz, 508 Joyce Dr., Garland, Texas.

FOR SALE—Hallicrafter SX25 with extra tubes, wired for phonograph. Willing to trade for Leica IIIC with or without lens. W. H. Collins, 8353 St. Lawrence Ave., Chicago 19, Illinois.

FOR SALE OR TRADE—CIRE Communications Course, covers 4 elements. Will trade for Heathkit oscilloscope or C-D capacitor checker. A. K. Palmer, 410 So. 17th St., Fort Smith, Ark.

WANTED—Partner with some knowledge of television. Paragon Radio Service, 170-26 Jamaica Ave., Jamaica 3, L. I., N. Y.

SELL OR SWAP—Jackson 640 signal gen.; enlarging lens; Hamilton master watch. Wm. T. Clark, 329 N. 16th St., Albuquerque, N. M.

TRADE—BC 312 receiver for a Collins AR-2-13 unconverted transmitter. J. P. Hyde, Manassas, Va.

FOR SALE—Rider's Manuals, Nos. 14 and 16, new condition, $12 and $6 respectively, or $16 takes both. Jerry Johnson, P.O. Box 405, Washington, Iowa.

FOR SALE—Riders Manuals, 1 to 6 inclusive, in very good condition, $30. Oliver Hemmerlein, 109 First Ave., Huntingburg, Indiana.

TRADE—Have RK707B tube. Will trade it for Hallicrafter SX-25, SX-24, or S-20R receiver. Kenneth Martin, P.O. Box 1272, 1422 W. 254 St., Harbor City, Calif.

FOR SALE—Excellent BC223AX transmitter, $15. Also Masco amplifier plus 12" speaker. Interested in SW receiver. Morgan W. Jenkins, 35 Wayne St., Carbondale, Pa.

FOR SALE—Philco 7050 tube tester; Solar capacitor resistor tester; Hickok 25,000 ohm per volt volt-ohm meter (probes, etc.). $135 takes all. R. Lovko, 1430 E. 55, Cleveland 3, Ohio.

FOR SALE—Riders Vol 1-4 in perfect cond., $20 fob; Lysco mobile 10M xmtr., $19; Parmetal 42" steel cab., $25; 5" scope Dumont. Ted Fischer, 3936 Ames St. N. E., Washington 20, D. C.

WANTED—VTVM, prefer Precision EV-10 with all probes and instructions. Also sweep gen. and scope, such as Precision E-400 and E-500, or equal. Must be in perfect condition. All cash. C. Elgasser, Jr., 1920 Fern St., San Diego, Calif.

FOR SALE—Navy type OQ proportional mutual conductance tube tester made by Weston. Excellent cond., less mutual conductance meter, $50. Also two link mobile xmitters type 25UFM, one less dynamotor, both $30. Frank A. Maruna, 3157 W. 38th St., Cleveland 9, Ohio.

TRADE OR SELL—SCR-522 transmitter-rec., good condition, not modified. Need communications receiver or what have you? T. T. Crittenden, 4144 Randolph St., San Diego 3, Calif.

TRADE OR SELL—Automatic single speed record changer, 10 or 12 mix, crystal pickup; Johnson 5 hp outboard motor, Norwood Exposure meter; camera lenses. Delaney Motion Picture, 494 Cline Ave., Mansfield, Ohio.

FOR SALE—Heath VTVM model V-4A with RF and hi-voltage TV probes, complete, $34.50. Tompkins Sq. Radio Co., 117-119 East 7th Street, New York 3, N. Y.

WANTED—Instruction manual for aircraft radio dir. finder, mod. DZ-1 type CRV-46123. I. Ruslander, 1510 Nelson Ave., Bronx 52, N. Y.

WANTED—Capitol Radio Engineering Course. Advanced Section 2. J. Bazewick, 3000 No. Christiana, Chicago 18, Ill.

FOR SALE—NC173 with speaker, used very little. Best offer over $140. N. P. Stephan, Manchester, Md.

WANTED—Will buy transmitting, special-purpose and receiving type tubes. B. N. Gensler, 136 Liberty Street, New York 6, N. Y.

SELL OR SWAP—BC-221-J (Zenith), original book and crystal, built in 2" speaker, refinished case, excellent condition, $65. Or what have you? Martin Herbstman, 1806 Sterling Place, Brooklyn 33, N. Y.

FOR SALE—RCA AVT-112A portable phone xmitter, tunes 2500-6500 kc., complete with 6V power supply and instruction books, less xtal, $25. Hal Magargle, 7237 Hilltop Rd., Upper Darby, Pa.

FOR SALE—Rider's Manuals 1 to 15 (except Vol. II), $95; Feiler signal tracer, $20. All very good condition. Thomas Lamb, Box 59, Connelly, N. Y.

WANTED—TV test equip and radio test equip. Have TV equip. and PA equip. to swap for what have you? Dependable Radio Service, 3509 Rossville Blvd., Chattanooga, Tenn.

WANTED—110V 1200 watt 60 cycles automatic gas engine generator. Prefer system which starts itself when light is turned on. Give full details and price. No junk wanted. Ellison Radio Service, Centertown, Ky.

FOR SALE—610A Hickok TV generator, $140; Model 195B Hickok oscilloscope, $115; Supreme Model 565 vacuum tube voltmeter, $40. All in perfect condition. John Francis Abt, 10 Richards Avenue, Stamford, Conn.

SWAP—7" TV set in working condition. Need outdoor antenna for xmitter equip. R. Rositano, 28 So. Gate Court, Brooklyn 23, N. Y.

SELL OR SWAP—All makes of used radio chassis, spkrs., power packs, etc. Want Riders Manuals, portable typewriters, portable electric sewing machines, radio testers, Supreme 858 radio tester, deluxe. Goldstone Radio, 1279 Sheridan Ave., Bronx 56, N. Y.

FOR SALE—Detrola 5 tube SW and BC receiver, $11. Also transmitting apparatus. H. Southwick, City Home, Fall River, Mass.

TRADE—Recent course in Radio and Electronics (consists of more than 1st half) by Nat. School for Radio Books or Manuals. G. N. Manning, 201 W. Walnut Ave., Dalton, Ga.

FOR SALE OR TRADE—1950 Heathkit 5" oscilloscope, expertly wired, run only a few hours, easily worth $60. Will send express collect for best offer in cash, receiving tubes, or Riders Manuals. R. Burns, 1303 W. Phila., St., York, Pa.

FOR SALE—Model 405 Superior tube tester. Has built in condenser checker and tube noise test, in first class condition, $25. E. Bruno, 29 Lincoln Ave., Poughkeepsie, N. Y.

FOR SALE—5" Heathkit oscilloscope, assembled, works fine, $39.50. I. Karabush, 1331 N. Rockwell, Chicago 22, Ill.

FOR SALE—7" Transvision TV with magnifier in good shape. Works fine. Make offer. Greiner Radio Service Co., 299 S. Elmwood Ave., Buffalo, N. Y.

WANT—Sound recording tape and 16mm films. Have ham and photo gear for swap. L. Meister, 1526 Schley St., Hillside, N. J.

FOR SALE—Precision portable tube checker and set tester, 20,000 ohm meter, battery test, equipped with latest tube data and adaptors, all in first rate cond. The Killmer Co., Osseo, Minn.

FOR SALE—Rider Manuals from 1 to 14 in A-1 condition, $100; also Triplett Volt-ohm-MA model 2405, excellent, $50. Samuel Kesling, 300 Hadley Ave., Dayton, Ohio.

SELL OR TRADE—Telamike model 16, $35. Or will swap for Riders vols. 1 to 6, must be in good condition, no abridged. Andrew Selzer, 60 - 17th Ave., Newark 3, N. J.

FOR SALE—Solar CF-1-60 Exameter. M. G. Radio Lab., 927½ La Salle St., Ottawa, Ill.

SWAP—12" television set, RCA TRK-12 in operating condition. Want VTVM and scope. David A. Young, 242 E. 50th St., New York 22, N. Y.

TRADE—17 Angora Rabbits for radio, electrical, or TV equipment and parts. Interested in scopes or TV sets. Value of rabbits about $35. E. A. Vaughan, Pell City, Ala.

FOR SALE—A good McMurdo-Silver signal generator, used very little. Make offer. Joseph Hasquin, 104 Edgar St., Gillespie, Ill.

FOR SALE—NRI Home Study Course, complete with exp. manuals and VTVM. Best offer takes. Or will trade for Solar CF-1-60 Exameter. Dalla T. Watts, 1100 E. 30th St., Winston-Salem, N. C.

FOR SALE OR TRADE—Riders Manuals-Combined, in one book numbers 1 to 4 2767 pages in excellent slightly used condition. Also 5 and 6 in perfect cond. Herman Dewitz Radio Service, Wisner, Nebr.

POSITION WANTED—Television tech., 10 years radio and 4 years TV service, bench experience. Desires position in New England states. Walter Kul, 4705 Schley Ave., Baltimore 6, Md.

WANTED—Dial glass for Mopar auto radio model 600. Custom built for 1941 Plymouth. Paul's Radio Service, 39 Slope St., Plains, Pa.

SELL OR SWAP—Supreme model 576 sig. generator, 65kc to 20.5 megacycles. Want 10 meter converter. Leo Perlmutter, 61 Ravine Ave., Yonkers, N. Y.

FOR SALE—Weston model 301 0-300 ma. meter, $7.50; six 814 tetrodes, $6 each; fifty surplus quartz crystals in holders, 5740.000 to 8306.667 kc., 25 cents each; Riders Manual No. 11, $12.50. George J. Rosenblit, RFD 1, Wappingers Falls, N. Y.

FOR SALE—8 watt ac.-dc. 10 meter xmitter with modulator and power supply. 3200 volt ct xformer at 400 ma. 12 hy 500 ma. choke. Also excellent HK 257B. Albert Bruno, 2544 8th Ave., New York 30, N. Y.

FOR SALE OR TRADE—Best offer gets Mark II tank transceiver, phone-cw, 40 and 80 meters. 95% of all accessories, unconverted, and in good working condition. L. J. Wolken, Maryknoll Junior Seminary, Clarks Summit, Pa.

FOR SALE—RCA battery operated radio receiver, model AR8504, excellent condition, $28. Edward A. Spacek, 311 East 70 St., N. Y. 21, N. Y.

WANTED—Conversion details on R28/ARC5 U.H.F. receiver. Will pay any reasonable price. Ralph Carruth, South Byfield, Mass.

SELL OR TRADE—One copy of A. Ghirardi's "Modern Radio Servicing" in excellent condition. Sell for $2.50 or trade for another book on radio topics. Seymour Tenzer, 248 Stockton St., Brooklyn 6, N. Y.

FOR SALE—One NRI complete course. Make your offer. Winston Higgins, Mineral, Ark.

FOR SALE—One Motorola police receiver, 2-3 mc., dual vibrators, A.M., $40 cash. No C.O.D.'s please. Sam's Radio Service, Box 135, Rainier, Wash.

FOR SALE OR SWAP—Coyne Applied practical Radio, vol. 1 to 5. Or will swap for a good R.C. checker, or what have you? Alex Touche, 618 Hill St., Belle Vernon, Pa.

SWAP—Hickok 209 VTVM; Simpson 555 tube tester; Ferritt test speaker; 6-12 volt power supply; some tool books. Want 16mm sound on film projector, or what have you? Roy Breuscher, 5427 Lake Park Ave., Chicago 15, Ill.

SELL OR TRADE—Receiver BC-342J with 115V power supply, less speaker; NRI radio-TV servicing course, less experimental kits; model 900 Vomax, perfect condition. L. J. Pfandtner, 3230 Lake Ave., Baltimore 13, Md.

FOR SALE—Boehme high speed in recorder. Type 4-G, uses 3/8" paper, speed up to 400 wpm, 1-A condition. Shipping wt., 88 lbs. Sells from factory for $300 fob. Name your price. R. Weirick, RR 1, Vicksburg, Mich.

SELL OR SWAP—Eight good power transformers, 400-0-400 volt secondary, four filament windings, ideal for TV sets up to 19" tubes. Want vacuum tube voltmeter with ohms and a.c. scales. Gil Tint, 625 E. 14 St., N. Y. 9, N. Y.

FOR SALE—TV-FM booster, 2 to 6 and 7 to 13 channels, excellent buy. Charles Horn, 325 E. 163 St., New York 56, N. Y.

WANTED—Urgently needed. Oscillator coil for bands D and C of Grunow model 11A. Please state price. H. R. Lauffer, Crabtree, Pa.

SELL OR TRADE—Deforest course; Heath signal gen. and communications rec.; enlarger and darkroom equip.; Chicago rink skates; Webster record changer. Want 3 speed changer or portable electric saw. K. E. Alspaugh, 1362 So. Fairfield Ave., Chicago 8, Ill.

FOR SALE—High fidelity amplifier, 7 tubes. 6B4G push-pull outputs, 4-8-16-250 and 500 ohm output ranges, preamplifier for phono magnetic pickups, separate treble and bass controls, radio-phono-TV jacks, $50. Thomas Burgan, 116-58 130th St., S. Ozone Park 20, N. Y.

SELL OR SWAP—RCA AR8505 communications receiver, 540 to 30,000 kc., good working condition. Want 12" TV set. Best offer takes it. J. Watson, RFD 3, W. 22 St., Huntington, N. Y.

FOR SALE—Supreme 400-B tester; National 45 Band spread coils, 80 to 20; 80 meter transmitter 200 watt phone, will sell for parts; 1500 volt power supply, meters, etc. Joseph Blahovec, 102 Berry St., Dover, N. J.

WANTED—Oscillator and detector coils for National FB-7 receiver. 40,80, 160 meter band spread, and 34000 to 18000 kc. general coverage. Swap for 2400 volt potential transformer. L. F. Wanja, 804 Shady Lane, Dallas, Texas.

FOR SALE—Heathkit 5" scope, perfect condition, $30. Sid Winters, 143 Heyward St., Brooklyn 6, N. Y.

FOR SALE—Supreme 589-A tube tester with complete instructions, good condition, $25; Modern Radio Servicing by Ghirardi, $3; Radio Trade Service Kinks by Simon, $1.50. Want VTVM, oscilloscope, and Sam's Folders for No. 57 up. Rudolph Chaloupka, Jr., 1429 So. 58th Court, Cicero 50, Ill.

TRADE—Various surplus transmitters, receivers for firearms, military gun parts, or military optical equipment. Local deals preferred. John Riley, 310 N. Normandie Ave., Los Angeles 4, Calif.

WANTED—Small lightweight 200-400 kc. receiver, 6 volt battery powered. Must operate satisfactorily with 5' whip-type antenna. Or 200-400 kc. converter — to be used with car radio. O. C. Vidden, Fertile, Minnesota.

FOR SALE—Sparton radio chassis, AM, FM, and SW. Complete with speaker, look, and Seeburg changer. Excellent for modernization of old console, $60. Ned Fleishman, PO Box 703, Fayetteville, N. C.

SWAP—Good BC-645 high freq. xmtr-rcvr; two navy type No. 5 110 volt, a.c. 60 cycle selsyns, used; original vibroplex bug, good condition. Want 5" scope, sweep generator, or what? George H. Hague, 6 Carver St., Fall River, Mass.

SELL OR TRADE—Pilot FM tuner, $15. Want Electro-Voice model 630 hi-impedance microphone. E. F. Vanecek, 1265 Olmstead Ave., Bronx 61, N. Y. C.

FOR SALE—Model 80 Webster wire recorder, $85. Also good "Ballarini" 48 bass accordion, $85. Howe Radio Shop, Erskine, Minnesota.

FOR SALE OR SWAP—Gardiner model S tape sender, with 10 rolls double perforated tape, excellent, $18. Or trade for used EC-1 Echophone RCVR, or what have you? Eddie Lemoine, PO Box 54, Moreauville, La.

FOR SALE—Heathkit Television Alignment Generator assembled and in perfect condition, bargain at $35. Also Heathkit signal generator, $20. E. J. Martin, 43 William St., Hudson Falls, N. Y.

TRADE—BC-221-T frequency meter, excellent condition, complete with tubes, crystal, metal cabinet and original calibration chart. Trade for radio or photographic equipment. George P. Frank, Jr., PO Box 67, Mims, Florida.

FOR SALE—ICS radio and electronics course. Make offer. Glenn Gaskill, 108 Buerkin Court, Peoria, Ill.

FOR SALE—Meissner 8C FM tuner; Millen freq. meter set of units; 3" modulation scope; RME VHF-152-A converter 2-6-10-11 meters; plate dipper meter; Log Log Duplex Trig slide rule, case, instructions. Howard Severeid, 2924 Station St., Indianapolis 18, Ind.

SWAP—Radio parts, books, stamps, Nigerian cloth. Want record changer with or without cabinet, test equip., books, or what have you? J. Spriter James, 200 Highland Boulevard, Brooklyn 7, N. Y.

SALE OR TRADE—M17 Enfield 30-06 converted to sporter, old military sights removed and J2.5 scope added, perfect condition. Also BC-348 receiver. in good condition. Will sell or swap for radio equipment, TV, etc. T. Dugan, 163 Nichols, Syracuse, N. Y.

FOR SALE—Meissner De-Luxe shifter, $25 with coils; 250th unused tube, $22.50; Johnson 150DD70, $10. Marc Molyneux, Jr., 53 Gulf St., Chickasaw, Ala.

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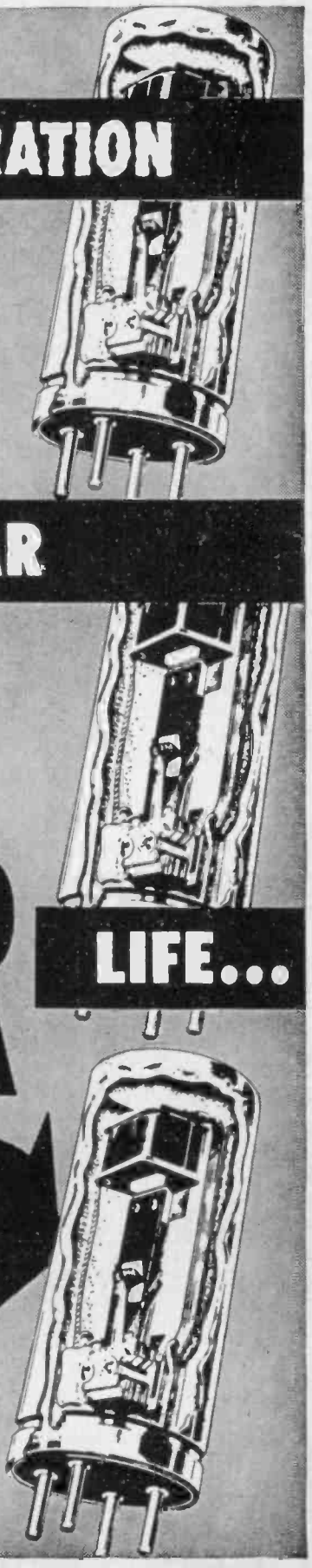

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