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No. 6

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

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FOR VICTORY



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Leon Miley
Nine East Orange St.,
Lititz Pa.

Army-Navy Preferred List of Vacuum Tubes

(Issued March 1, 1943)

Unclassified General Purpose Tubes Selected Jointly by Army and Navy

To those concerned with Army or Navy equipment utilizing vacuum tubes, the following data is pertinent:

1. The accompanying Army-Navy Preferred List of Vacuum Tubes sets up a group of unclassified general-purpose tubes selected jointly by the Signal Corps and the Bureau of Ships. The purpose of this list is to effect an eventual reduction in the variety of tubes used in Service Equipment.

2. *It is mandatory that all unclassified tubes to be used in all future designs of new equipment under the jurisdiction of the Signal Corps Laboratories or the Radio and Sound Branch* of the Bureau of Ships be chosen from this list. Exceptions to this rule are hereinafter noted.*

3. The term "new equipments," as mentioned in Paragraph 2 above, is taken to include:

a. Equipments basically new in electrical design, with no similar prototypes.

b. Equipments having a similar prototype but completely redesigned as to electrical characteristics.

c. New test equipment for operational field use.

4. The term "new equipments," as mentioned in Paragraph 2 above, *does not* include:

*Attention is invited to the fact that the Radio Division (formerly Radio and Sound Branch) Bureau of Ships, has cognizance over all radio electron tubes (vacuum tubes) used by the Navy Department.

a. Equipments either basically new or redesigned, that are likely to be manufactured in very small quantity, such as laboratory measuring instruments.

b. Equipments that are solely mechanical redesigns of existing prototypes.

c. Equipments that are reorders without change of existing models.

d. Equipments in the design stage before the effective date of adoption of this Preferred List.

The foregoing statements in Paragraphs 3 and 4 above are explanatory in nature and are not intended to be all-inclusive.

5. In the event that it is believed that a tube other than one of those included in this Preferred List should be used in the design of new equipments for either the Signal Corps or Navy, specific approval of the Service concerned, is to be requested from the Signal Corps Laboratory concerned with such equipment; the said Laboratory will then make known its recommendations in the matter to the Office of the Chief Signal Officer where the final decision will be made and returned to the laboratory for transmittal to the party requesting the exception. When Navy equipment is concerned, the request or exception shall be addressed to the Bureau of Ships, Navy Department.

6. The publication of this list is in no way intended to hamper or restrict development work in the field

NOTE.—Owing to the limitation of Radio Service Hints received which can be considered of outstanding value for publication, this section of the C-D Capacitor will be temporarily curtailed, as many of our servicemen are now in the ranks of our armed forces.

of vacuum tubes or vacuum tube applications.

7. This list is to take effect immediately.

(Office of the Chief Signal Officer,
Headquarters, Services of Supply,
War Department,
Chief of the Bureau of Ships,
Navy Department.

RECEIVING

FILAMENT VOLTS	DIODES	DIODE TRIODES	TRIODES	TWIN TRIODES	PENTODES		RECTIFIERS	CONVERTERS	POWER	INDICATORS
					REMOTE	SHARP				
1.4	1A3	1LH4	1G4GT	3A5 1291	1T4	1L4 1LN5 1S5		1LC6 1R5	3A4 3Q4 3Q5GT 1299	991
5.0							5U4G 5Y3-GT			
6.3	6H6* 9006	6SQ7* 6SR7*	2C22 2C26 6C4 6J5* 1201 9002	6J6 6SL7GT 6SN7GT	6AG5 6AK5 6SG7* 6SK7* 9003	6AC7* 6AG7* 6SH7* 6SJ7* 9001	6X5GT 1005	6SA7*	6B4G 6E6G 6L6G 6H7GT 6V6GT 6Y6G	6E5
12.6	12H6*	12SQ7* 12SR7*	12J5-GT	12SL7GT 12SN7GT	12SG7* 12SK7*	12SH7* 12SJ7*		12SA7*	12A6*	1629

TRANSMITTING						MISCELLANEOUS			
TRIODES	TETRODES	TWIN TETRODES	PENTODES	RECTIFIERS		GRID CONT. RECTIFIERS	VOLTAGE REG	PHOTOTUBES	CATHODE RAY
				VACUUM	GAS				
304TH	807	815	2E22	2X2	4B25	394-A	VR-90-30	918	2AP1
801-A	813	829	803	3B24	83	884	VR-105-30	927	3BP1
811	814	832	837	5R4GY	866A	2050	VR-150-30		5CP1
826	1625			73R	872A	C1B			9EP1
833-A				371A		C5B			
838				705A					
1626				836					
8005				1618					
8026				8020					

* Where direct interchangeability is assured "GT" and "L" counterparts of the preferred metal tubes may be used.

U. S. SIGNAL CORPS NEEDS ENGINEERS

THE War Department, Aircraft Radio Laboratory at Wright Field, Dayton, Ohio, has a shortage of qualified civilian engineering and inspection personnel. Wright Field is the home of the Materiel Division of the Army Air Corps and there are concentrated all the experimental laboratories which are making such tremendous advances in the development of aircraft and aircraft accessories. The Aircraft Radio Laboratory is responsible for research, development, engineering, and inspection required in the radio field, incident to design, supply, and installation of radio equipment on aircraft.

The basic duties of a radio engineer are to perform or supervise the performance of professional engineering work in design, construction, research, and investigation. Responsibilities and duties are commensurate with the grade.

The Civil Service standards for Junior Radio Engineer, which pays \$2,000 per year, are a degree in electrical engineering from an accredited college. The next higher rating, Assistant Radio Engineer, \$2,600, has requirements of two years of progressive professional experience, plus substituted experiences year for year for college education that is lacking. A college degree, while very desirable, is not essential. A well qualified engineer without a degree is eligible for consideration.

Inspectors of Signal Corps Equipment are required to make inspections and tests of aircraft radio equipment to determine compliance with specifications, etc. This duty is usually performed at the plants of the contracting manufacturers. The salary range is from \$1,620 to \$2,000 per year.

The above salary rates are of course initial rates and promotions for higher rates of pay are made commensurate with responsibility and experience.

Engineers and service men who are interested in these positions are invited to submit a letter outlining their education and experience directly to:

DIRECTOR, AIRCRAFT RADIO LABORATORY
Wright Field **Dayton, Ohio**



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.

WANTED — for cash very urgent, test equipment, volt-ohm mil. meter, tube tester and others. Prefer Hickok but will consider any make. Also want Rider's Manuals No. 6 to 13 incl. What have you for cash on the line. Edw. J. Danaher, c/o University Radio Service, 134 Merrimac St., Buffalo, N. Y.

WANTED — Latest type test equipment. Will pay cash or trade Corona portable typewriter, radio parts or tubes. Sam Berenblum, Greenwich, Conn.

WANTED — 1/100 ampere meter fuses. Urgently needed. Will pay cash. Daniel L. Schacher, 4608 Forbes St., Pittsburgh, Pa.

FOR SALE—Supreme signal generator for sale \$20.00. Central Film, Hastings, Mich.

WANTED — Analyzers, meters, test sets, Rider's manuals, books, etc. 16 mm. projector silent and sound, 6 and 10 amp. charger bulb, radio tubes, all kinds. Hastings Elec. Co., Hastings, Mich.

FOR SALE—Supreme 592 set tester and Solar CB-1-60 capacitor analyzer. Both purchased in 1942. Milton V. Ratuski, 81 Highland Blvd., Keansburg, N. J.

WANTED — 1 No. 739 meter made by Triplett in A-1 condition. B. A. Crossno, Route 2, Paris, Ark.

WANTED—A late model modern tube tester new or used. Have 1935 RCA service manual for sale or swap for other service notes. Marvin Gurlin, Haddon Ave., West Berlin, N. J.

WANTED — Good condenser checker. State price and condition. John E. Lorraine, 211 Summer Ave., Newark, 4, New Jersey.

FOR SALE—1 CCH Carron signal tracer. Make offer. Want Radio instruments, dynalizer. Louis Bauernfeind, Hortonville, Wis.

WANTED—Test sets, meters all kinds; radio tubes, parts. Robleski Electric, Hastings, Mich.

WANTED—Used high impedance crystal microphone. State lowest price. Leonard Poole, Herndon, Va.

WANTED—Repeating guns, not in working condition, good ac signal generator, grandlathers clock, any condition. Cash or trade. Have coaster brakes, bike parts, saxophones, radio phono parts, other articles. W. J. Closson, 295 8th Street, Troy, N. Y.

SELL OR SWAP—Slightly used Eisco 32 volt dc to 110 ac; Jannett 110 dc to 110 ac, both 300 watts, for late model test equipment. Also have quantity Atwater Kent new parts. Radio Parts & Equipment Co., 244 Clinton Ave., N. Rochester, 5, N. Y.

SALE OR SWAP — One National 100X communications receiver, excellent condition, with crystal filter. What offer swap in radio equipment? All mail answered. Stephen Luisser, 1758 Main St., Northampton, Pa.

WANTED—Late model tube tester, also set tester. M. F. Mantia, M.D., Darien, Georgia.

WANTED—URGENT—Volt-ohm-mil. meter 3 in. or larger, for use in army radio station. Sgt. J. C. Sack, 30 comm. sqd., Hotel Alamac, 71st and Broadway, New York City.

FOR SALE—Several units, heavy duty, copper oxide rectifiers. Write for description. Frank L. Riggs, 100 River Lane, Rockford, Illinois.

WANTED—Rider's manuals, vols. 10, 11, 12 and 13. State condition and price. Fred. Hartman, 32 54th St., Woodside, L. I., N. Y.

FOR SALE—Rack for Precision E 200 and 954, \$17.00; radio parts; Radio Craft 9, \$1; Radio News 7, \$1; Popular Mechanics 7, \$1; Popular Science 9, \$1; Ranger free point tester with space for vom \$5. T. Wojciechowski, 2837 Fulton St., Brooklyn, N. Y.

WANTED—Will pay cash for Rider Chan-
alyst RCA stock 162; Rider volt-ohm-mil
RCA stock 163; oscillograph RCA 3 in.
stock 155 or 2 in. stock 151-2; tube tester
RCA stock 156 C or 156 B; RCA service
notes, vols. 1929-30, 1937, 1939. State
condition and price. G. Massey Gum,
Frankford, Delaware.

SELL OR SWAP—Cardwell 3000 v. mid-
ways, 3 MT-50 Gs, 2 MT-100 Gs; 2 MR-
260-Bs. 6 Sangamo A-50 .002 mid. 5000
volt mica condensers. 1 motor driven
Clough-Brengle FM with tube as in
OMA unit, makes any oscillator into FM.
2 crystal mikes, astatic units, Thordar-
son T-17-R-31 power transf. and input,
output and filter choke for 20 watt up.
Condition excellent. R. N. Eubank, 1227
Windsor Ave., Richmond (22), Va.

WANT — Dry disc rectifier units with or
without transformer up to 3 amps. 110
v. types ac to dc up to 100 ma. Speaker
field supply types, or old trickle charger
types ok if have any output. Elkon
type EBH. Closed single circuit tele-
phone jacks. Jewell, Weston, Simpson,
Triplett dc ma meters 0-25, 0-100, 2 in.
preferred, exact range not necessary.
Give prices or idea of items you need
in trade. R. N. Eubank, 1227 Windsor
Ave., Richmond (22), Va.

WILL BUY—A 110 v. ac motor, 1/2 to 1
hp, 1800 or 3600 rpm. Will pay good
price and answer promptly. W. H.
Webb, Box 804, Belle, W. Va.

WANTED—Supreme tube tester, model
589, or something of similar capacity in
some other good make. C. M. Fulcher,
2415 W. Main St., Richmond, Va.

FOR SALE—Precision model 862 VOM
panel mounting, new \$39.95 plus ship-
ping charges. Walt Hasskamp, Cros-
by, Minn.

FOR SALE—Automatic record changer in
original carton \$30; wireless record
players, new, \$20; Triplett VOM and
oscillator combined in portable case
\$25 or make offer, FOB. Sterling W.
Reed, Majestic Hotel, Broad and
Girard Ave., Philadelphia, Pa.

WILL TRADE — Radio City multi tester
(volts, ohms, ac, dc, etc.), for refrigeration
tools, need service valve wrench
adapters, etc. Mel Avedon, 648 Lin-
wood St., Brooklyn, New York City.

FOR SALE—Philco audio signal generator
model 044, like new, \$20; one Vibroplex
lightning bug, new, \$13; 1941 models.
Wanted, late model tube tester. C. E.
Middlesworth, R. D. No. 1, Lewisburg,
Penna.

WANTED—32 v. converter, 110 output,
either rotary or vibrator style. Please
state condition and price. Norbert
Rudie, Holdingford, Minn.

WILL SWAP—Portable phonograph with
spring wound motor, crystal pick-up,
3 tube amplifier, 6" p.m. speakers,
volume and tone control; complete
with batteries for a 16 mm. projector.
Harold H. Greger, 154 S. Hedges St.,
Dayton, Ohio.

WILL SWAP—Philco rf assembly (6K7 rf,
6C5 osc., 6L7 converter) with tubes,
for two high quality 455 kc iron core
interstage type i.f. transformers, one
455 kc B.F.O. iron-core transformer,
and an 11"x7"x2" chassis. W6TSU, 22
Muller St., Vallejo, California.

WANTED—Volt ohm meter, output meter,
modern tube tester, capacitor analyzer.
Theodore Lohr, 140-28 247th St., Rose-
dale, L. I., N. Y.

FOR SALE — Million signal generator,
model Q, Supreme VOM, model 543;
Supreme tube testers, model 589; Ameri-
can combination tube tester and VOM
model 4102; Million VOM, model D; Su-
preme freq. modulator 529. All instru-
ments newest models. Philco Clough-
Brengle OCA signal generator. All at
prewar prices. Bill Gall, Engineer,
WEBQ, Harrisburg, Illinois.

FOR SALE—3 Riders manuals, vols. 1, 3,
4, \$5 each; Solar capacitor analyzer,
type CB \$25; model 589 Supreme tube
tester \$25; model 85 supreme tube
tester \$10; model 221 Triplett dc milli-
ammeter 0-150 new \$5. All articles
guaranteed like new. C. E. Breth, 213
South 4th St., Youngwood, Pa.

WANTED—Supreme model 592 set tester
or similar tester and L C checker. State
price and condition. Theodore A. Folta,
300 Nichols St., Utica, N. Y.

(Continued on page 11)

REPLACING SCREEN-GRID TUBES WITH VARIABLE-MU TYPES *

PART II

Receivers with Cathode-Bias Control

A good example for sets belonging to the second group, volume by cathode-bias control, is also a Stromberg-Carlson receiver which was very popular in 1929 and still is a fine set for tone quality. I am referring to Models 641, 642, 652, and 654. There are few Service Men who will not remember this set, which uses a double volume control on a long shaft and has caused many a headache from a service standpoint. The sudden action of the control makes volume adjustment difficult and it often becomes noisy, causing fading. Effective repair meant generally a standard replacement control which was usually more critical than the original. Yet nothing is simpler than to change this set to use 35's

in the controlled r-f stages instead of 24A's. It can be done in 10 minutes with the addition of only a one-watt resistor and what a difference! The circuit diagram of the set is found in Rider's Manual, Book 1, page 8. The voltage distribution in a simplified form is shown in Fig. 3, together with the antenna portion of the volume control. At first inspection, it is seen that the first two r-f stages are controlled by volume control No. 1 in such manner that the cathodes are raised positive with respect to ground. At the same time the antenna is progressively shorted to ground by way of a 20,000-ohm potentiometer. Volume control No. 1 comprises an 800-ohm potentiometer in series with a 170-ohm minimum bias resistor shunted across the

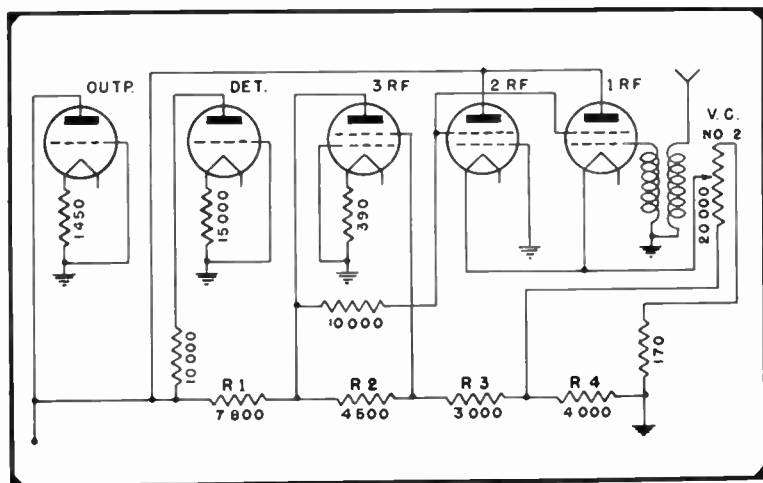


Fig. 3. Voltage distribution system of Stromberg-Carlson 641, 642, 652, 654.

* By Frederick E. Bartholy in "Service" Magazine.

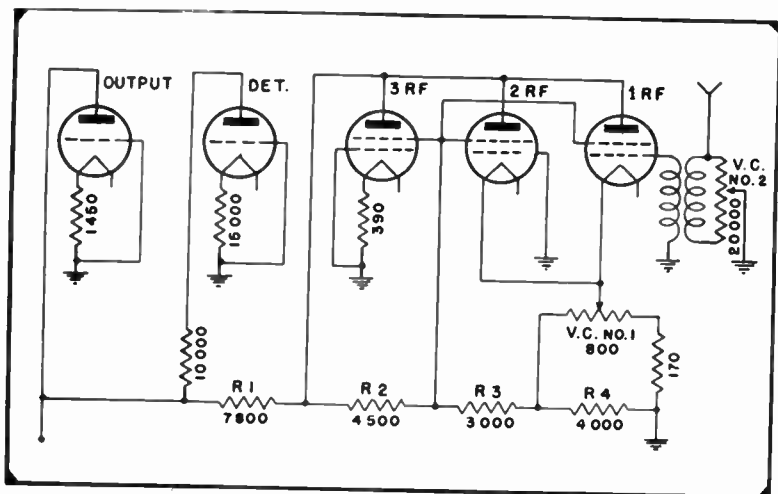


Fig. 4. The simple changes made in Fig. 3 to provide variable-Mu tube substitution.

4000-ohm portion, R_4 , of the voltage divider.

To illustrate a purely practical method of changeover, the following considerations are given. The portion comprising R_4 with volume control No. 1 in parallel must necessarily offer a lower resistance than the 800 ohms of the volume control No. 1 alone. Calculating this resistance, as we have done before, we obtain 780 ohms. This indicates that as far as the voltage divider is concerned the volume control portion is the one which largely determines the voltage drop across R_4 . Since 24A tubes are used, this drop may be assumed to be about 13 to 15 volts. It becomes immediately apparent that if we remove the volume control No. 1 from R_4 , there will be a much larger voltage drop across the latter because of the higher resistance. It is true that such a procedure will change the bleeder circuit, but in most cases, it will be found that this does not cause any serious difficulties.

When volume control No. 1 is disconnected, the voltage drop will be 50 volts, which is ample for our purpose. Our problem is now to make this volt-

age available for raising the potential of the cathodes of the first two r-f tubes. We could replace the 4000-ohm section of the voltage divider with a 4000-ohm potentiometer, to be the volume control. This would call for a special control, wire-wound, to carry the bleeder current as well as the current which flows through the r-f tubes. It is much simpler to use a standard control of comparatively high resistance with respect to the resistance of R_4 in parallel with the latter. The next thought is, why could not the 20,000-ohm antenna section volume control No. 2 be used for this control, inasmuch as with 35's there is no need any more for controlling the antenna circuit? Presto, we remove the connections from volume control No. 2. In doing this, we must make sure that the antenna coil return is properly connected to ground and also that the antenna coil input is connected to the antenna post. These connections have been made before at terminals of the control. The cathode returns of the two radio frequency tubes are connected to the rider of the control and the two terminals thereof across the 4000-ohm portion of the voltage di-

vider R_4 in series with the 170-ohm minimum bias resistor. In making this connection, care should be taken that when the control is turned clockwise, the rider should go towards the minimum bias resistor, and when it is turned to the left, it should increase the positive voltage on the cathodes.

The additional bias so obtained when the cathodes are at the maximum positive potential will lower the screen and plate voltage of the controlled tubes and the lowering of the screen voltage will reduce the gain considerably. Therefore, the controlled tubes should operate preferably at higher plate and screen voltages. This can be accomplished very easily by moving the plate return of the first and second r-f tubes one tap ahead on the voltage divider and the screen return of these tubes over to where the plate return was before. A series resistor in the screen grid circuit will give a better regulation of the screen voltage. This can be determined experimentally by turning the volume control to maximum and adjusting a variable resistor in series with the screen grid circuit, until the screen voltage reads 90 or 100 volts. It was found that 10,000 ohms gave satisfactory regulations. Fig. 4 shows the simple changes made in the circuit of Fig. 3.

Receivers with Standard Cathode-Bias Control

In the two examples given, we have considered receivers with grid bias control and cathode bias control both taken from the main voltage divider circuit. In the third example we shall consider even simpler circuits which, due to their popularity, may be called the standard cathode-bias volume control circuit. It is found in a great many receivers which use 24A tubes and even in those using 35's, before the advent of automatic volume control, now in practically every receiver. For this reason, no specific receiver need be considered as an example. Instead, let us consider the simple so-called antenna-C-bias circuit. Essentially it comprises a variable cathode

resistor for the controlled tubes and an antenna shunting resistor. The cathode bias is derived solely from the plate current. There are two distinct types. In one, shown in Fig. 5, separate potentiometers are used for the antenna and the cathode circuit. These are connected together by being on the same shaft, or are made as double controls for simultaneous actuation.

The second type is common in later model sets and utilizes only one con-

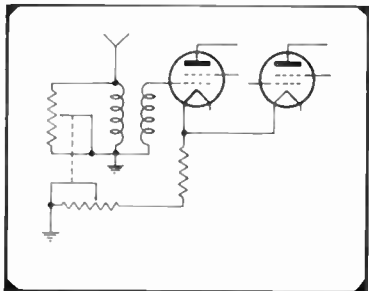


Fig. 5. A typical antenna-C-bias circuit, wherein separate potentiometers are used for antenna and cathode.

trol, the two functions of antenna and cathode control being combined by grounding the rider and connecting one terminal of the potentiometer to the antenna and the other to the cathodes of the controlled tubes as shown in Fig. 6.

The controls encountered in these sets may have various values generally from a few thousand ohms up to 50-thousand. These values depend on the number of tubes controlled and the plate current which flows when the cathode control is at the minimum volume position. It will be found that at the off position of the volume control, the cathode bias is generally in the neighborhood of 10 to 12 volts, e.g., at a voltage which will not place the tube too near to cut-off in order to avoid operation at the curvature of the characteristics resulting in the undesirable effect called cross-modulation. We need not go into this since our purpose is to eliminate the evils by

changing to super-control tubes. Our problem again is more cathode bias, that is, at least 40 volts. We can also eliminate the antenna control which so often introduces noise and fading. In changing over, we must increase the voltage drop across the cathode potentiometer. Since we need a considerable increase, we cannot depend on plate current alone, particularly since it is at the lowest value when we want the highest cathode voltage.

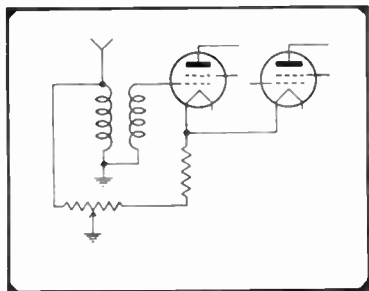


Fig. 6. Single control with dual function antenna and cathode control.

In practically all cases, we can obtain the increased voltage without changing the original control of the set—provided that the control is in good condition—by connecting an auxiliary bleeder circuit, as shown in Fig. 7, from the cathode end to a point of positive potential such as the screen grid tap or the plate return point. The bleeder circuit should not carry more than 5 or 10 mills in order not to offset the voltage distribution circuit. When the control is of sufficiently high value, at least 10,000 ohms, the bleeder circuit current of 4 milliamperes will give a 40 volt drop. The additional 4 milliamperes drain will have no appreciable effect on the voltages. For this reason, it is better to have a volume control of sufficiently high resistance. Otherwise, if the control is, let us say, only 1000 ohms, ten times the current will be needed to produce the 40 volt drop, that is, 40 milliamperes. A current drain of this order is likely to lower the voltage consid-

erably at the point from which it is taken; not to mention that an increased wattage must be dissipated by the control and the bleeder resistor. In the former example, the watts dissipation of the 10,000 ohm control is only .16 watt, whereas in the 1000 ohm control, it will be 1.6 watts.

The bleeder resistor can be calculated very easily when the voltage is known at the point to which it is connected. For example, with reference to Fig. 7, let us assume that R_1 is to be connected to the 180 volt terminal and it is desired to obtain 40 volts across the 10,000 volume control. The current to produce this voltage is

$$\frac{40}{10,000} = .004.$$

The resistor R_1 must drop $180 - 40 = 140$ volts. $R_1 = \frac{140}{.004} = 35,000$ ohms. The watt capacity of $R_1 = .004^2 \times 35,000 = .56$. Therefore, a one-watt resistor will be satisfactory.

The plate current of the tubes is not taken into consideration inasmuch as

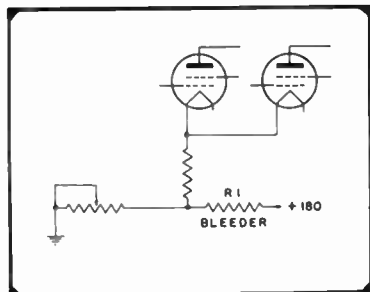


Fig. 7. Method of connecting an auxiliary bleeder circuit to obtain increased voltage without changing original control of set.

at the minimum volume position, the current is very small and as the volume control is progressively shunted to ground when volume is increased, the bleeder current also changes. This is of no practical consequence since this

change simply alters the ratio of control position with respect to bias voltage obtained. Linearity is not desired and controls with antenna tapers are preferable. The antenna connection can be disconnected or in some cases, left in the circuit in localities where unusually strong signals are encountered.

In a practical way, the following procedure is recommended. Place the type 35's in place of the 24A's in the controlled stages. Disconnect the antenna connection from the volume control if this is used. Take a variable resistor of about 100,000 ohms and connect one terminal to the cathode end of the control and the rider to a positive voltage tap, say, the plate B + terminal. Adjust the rider of this trial rheostat so that it is of maximum value. Tune in the strongest local station. Place the set volume control to minimum volume position. With type 35's, the station will be still very strong. Then adjust the trial rheostat to a point where the station is just inaudible. Re-tune the set while this is done since bias controls have a tendency to slightly detune r-f stages. The variable resistor is then removed and the value used measured with an ohmmeter. The resistance value indicated by the meter is then the correct one for the bleeder resistor. If it is desired to use the antenna side of the control also for smoother control action, since often the taper of the control on hand or in the set is not quite suitable for bias control alone, proceed as before with the following exception: adjust the trial rheostat until the station is at a fairly low volume and then connect the antenna back temporarily to the control. This connection should silence the set. A happy medium can be found by trying various degrees of volume with the antenna removed until there is smooth action with strong and weak stations. In all cases, it is recommended that the minimum bias resistor originally used be retained and left out of the bleeder circuit as shown in Fig. 7.

Receivers with Screen-Grid Volume Control

In sets where the volume control is effected by varying the screen-grid potential of r-f stages, distortion is particularly strong at high signal levels with the control turned to low volume. Changing these sets to accommodate 35's generally calls for replacement of the volume control, inasmuch as the value used for varying the screen voltage is generally only a few thousand ohms and the control is part of the voltage divider. We may proceed as described above, using a standard 10,000-ohm control for cathode bias with a suitable bleeder resistor. Making this change, the resistance value of the old control should be replaced by an equivalent resistor and the screen grid return connected to the terminal which gives the rated or maximum screen voltage. The cathode connection of the controlled tubes generally has a fixed minimum bias resistance, which can be retained, and is placed in series with the new volume control resulting in the circuit shown in Fig. 7.

THE RADIO TRADING POST

(Continued from page 6)

WANTED—A Superior tube and set tester Model 1280. State price and condition. Dewey Mell, 619 Ohio St., Lima Ohio.

WILL SELL—Several brand new Kolster K5 power amplifiers; Zenith 220 chassis and 2 dy. speakers; RCA Victor radios R. 32; GE K32; Brunswick 9 tube radios. Make offers. **WANT** DC milliammeters 0-75. State condition and price. Goldstone Radio, 1279 Sheridan Ave., Bronx, New York.

WILL TRADE for 35 mm camera or good signal generator: 110 volt ac generator for fan belt of car, puts out 110 v. at 500 watts, one paint spray complete, gun, hose lines, motor, compressor, air gages and 5 gal. pot. used about a year. John Arnold, P.O. B. 234, Bluffs, Illinois.

WANTED—Condenser analyzer and 0-1 ma milliammeter. State make, model, condition and price. Charles Morehead, Box 22, Flat Lick, Ky.

WANTED—Late model tube tester, Superior dynamometer, 50L6, 35Z5, 35L6, 5Y3 or any other good test equipment in A-1 condition. Cash or trade. Have radio items, etc. to trade. Give model number and condition, also price. Wm. A. Wallenbecker, 28 Washington, La Grange, Ill.

FOR SALE — Johnson 70CD130 variable condenser $\frac{1}{2}$ in. spacing, 2 National KW neutralizers, transformers, chokes, filter condensers, etc. National SW-3 with coils, 1750/1 gear reduction box, new $\frac{1}{4}$ hp 110 VAC 60 cycle motor, Precision model 900-A tester and analyzer, transmitting tubes T20, T40, RK57, T125, 03A, 866, speech amplifier complete. Nelson K. Stover, 751 Tioga St., York, Pa.

WANTED — Used Rider's manuals, complete set or any vol. Also need a six in. rule of any good make. Peerless Radio Co., 3721 Geary Boulevard, San Francisco, Calif.

FOR SALE—G. E. portable home recorder 1M7 and one mike wired for two microphones. 7 tube 6L6 output 30 watt open case amp., both \$65. One neon sign, 5 in. letters "Radio Shop," open case transformer \$15. R. R. Reid, Parkersburg, Iowa.

SELL OR SWAP—Intercommunicator set, master and 1 sub, will take up to ten subs, for test equipment, SW receiver, or what. Electronics mags., Keith Henneys Principles of Radio, 3rd edition, Fred. E. Vaughn, Box 546, Eugene, Ore.

WANTED—Jewell 199, and 444 set analyzer Jewell pattern \$7, dc voltmeter, 0-50 amps., 0-50 v., all in one testing instrument. Instruments must be in perfect condition. RCA 156A tube checker, counter or portable 156 model, Riders chanalyst or RCA testing instrument. Pliers, magazines, other test equipment. High price paid, state what you have. Howell's Radio and Electric Service, Anna, Texas.

WANTED—Radio meters, ac meters, milli-amp. or micro-amp. meters. Will pay cash. State size, make, type, and price. Ernest Harper, Morton St., Oakland City, Ind.

FOR SALE—1 Precision 910 tube checker in metal case with handle, \$60; 1 Hickok SC 48 VOM, ac and dc to 1000 v., ohms, 5 ranges to 10 megs., 4 cap. ranges to 50 mfd. Built in socket analyzer inc. octal sockets and dc mls. Perfect \$65. 1 Dictograph IC system, with mike, built in desk model, master and 8 private phones, T and R in one piece, amplifier, \$150. Write, do not call. Sterling Electronic Lab., 521 W. 131 St., New York City.

WANTED—Condenser analyzer CD model BF-50, Solar CC or Jackson 650A. Also ohmmeter about 10 meg. or more. Jack's Radio Service, Lindenhurst, L. I., N. Y.

FOR SALE—1 RFO-5 Hickok scope, brand new. Sliding light hood front of tube, also hood attached to front of tube. Polystyrene bead co-axial cable connector to Y axis input, with 4 ft co-axial cable terminating in 6 in. rub. handle, where point, spade, or clip can be attached. \$150. Sterling Electronic Labs., 521 W. 131 St., New York City.

FOR SALE—Supreme model 385 analyzer and tube tester in good condition. Sell for \$35. Ralph F. Hunter, North St., Catskill, N. Y.

WANTED—Station allocator (RCA, Philco, or Precision), vibrator tester, resistance indicator, Aerovox capacity kit, bridge and LC checker, Hickok 202 Electronic VM capacity analyzer, and capacity decade (Solar, Sprague, C-D, or RSE), ABC portable bat. eliminators, Sprague Tel-ohmite, CD test mike, good radio and electrical courses. Give condition and cash price. Radio Elec. Service, 431 S. Broad St., Grove City, Pa.

SELL — Sterling 0-15 ac voltmeter, 0-15 dc milliamps, Weston 0-30 dc amps., GE 0-30 dc amps., pocket type 0-30 dc amps., 2000 mfd. 12 v. filter cond. (never used), 2 4 mfd. 1000 v. filter condensers (never used), Brandes headphones, dbl. button mike transf., \$14 takes all. Stanley, 2748 Meade St., Detroit, Mich.

FOR SALE — Radio replacement parts, tubes, condensers, resistors, speakers, amplifiers. Will consider swaps. What have you? Write for my complete lists. F. U. Dillion, 1200 North Olive Drive, West Hollywood 46, California.

WANTED — Recording equipment, dual speed turntable 16 in. Lead screw overhead cutting mechanism, crystal, magnetic head, 500 ohms. Will consider record-changer-recorder. Cash or part in trade. What do you need? F. U. Dillion, 1200 North Olive Drive, West Hollywood 46, California.

WANTED—A signal generator must be in good shape; set tester in good condition. Claude A. Charters, 441 Laura, Wichita, Kansas.

FOR SALE—Victor floodlight lamp No. 4, cast studio roller stand new \$15. No. 3 folding pocket Kodak leather carrying case, \$2.50 fair. 2c box camera \$2. 22 cal. Marlin repeating rifle, good condition \$8. George C. Hargett, 834 9th Ave. South, St. Petersburg, Florida.

WANTED—New or used UTC Varitones VT-1 and 2. Give condition and price. C. Huhn, 9012 102nd St., Richmond Hill, New York.

WANTED—URGENTLY — Ac voltmeters, 0 to 10 or 15, 0-5, dc meters 0 to 600 or 1000, 0 to 50; 0-1 milliamp. dc meters, 0-200 microamps dc meters, RCA volt ohmmist (Rider or Junior), VO milliammeters 5000 ohms per v. Model 530 P Hickok tube tester. Bond-Halstead, Inc., N.W. Cor. Eleventh and Tatnal Sts., Wilmington, Delaware.

WANTED—Gernsback manuals 6 and 7 intact, in good condition. Small pocket VOM; vol. 1, no. 2 Short Wave Craft. Following issues of Radio Today: Mar. to Dec. 1937 incl., all of 1938, 1939. Also first issue. John P. Morrison, Jr., Box 4254, Oklahoma City, Okla.

FOR SALE—Two WE 3 1/2 ft. trumpets with PM units 1500 ohms also 2 extra units. Ed Monahan, Shawomet, R. 1.

WANTED—Tube tester in good condition and VOM combination, in good condition. Give make, model and price. R. W. Thompson, Federal Dam, Minn.

FOR SALE—Radio City dependable tube tester, model 308, series D, with 9 in. Jumbo meter. Tests all tubes including 1942 type. Rolindex tube chart. Tester is in new condition. Will consider best cash offer. Write Clyde W. Wimer, R. D. No. 2, Ellwood City, Pa.

FOR SALE — Kenifell & Esser 18 piece drafting set in wood case. First \$25.00 takes it. M. Cimorelli, Catskill, N. Y.

WANTED—Good model capacity and resistance bridge. State model and price. Samuel Estra, P.O. Box 290, New Haven, Conn.

WANTED—Any vol of Rider's manuals, also interested in purchasing complete set. Quote lowest price and description. Want diagram manuals of specific manufacturers, such as Grunow, Philco, etc. M. N. Beitman, 3727 West 13th St., Chicago, Ill.

WANTED—Weston master exposure meter, model 850 or earlier model. In good condition. Please quote price. Cpl. Sidney Haskoe, Sig. Hq. and Hq. Co., Sub Post No. 1, Mitchel Field, L. I., N. Y.

FOR SALE—Webster-Chicago 30 watt public address system, Master series W-929-A. 6 v. d.c. 110 v. a. c. phono-turntable, two Jensen 12 inch speakers, Atlas steel baffles, crystal mike, chrome floor stand, 150 ft. heavy rubber covered cable. Just like new. Norman Eide, 6747 Stevens Ave. So., Minneapolis, Minnesota.

WILL SWAP a signal generator Triplett model 1232 for a good volt-ohmmeter, and pay the difference. Send full details. P. Covella, 190 Fulton St., Brooklyn, N. Y.

WANTED—Rider's manuals 9 to 13 inclusive at reasonable price. State condition and price in first letter. All letters answered. Fred Radio Service, 811 21st Street, East Moline, Illinois.

WILL SWAP—Model 89 deluxe Supreme tube tester. Will pay difference for shotgun, rifle or outboard motor. Supreme Radio Service, 3480 Guthrie St., East Chicago, Ind.

TRADE—RME 69 with preselector, extra 12 in. Jensen speaker, 90 odd, copies QST, 1921 to 1939. Leitz microscope with dark field condenser. Want recent Scott chassis or stamp collection. G. W. Twomey, M.D., Veterans Hospital, Minneapolis, Minn.

FOR SALE—Electropak 115 v.a.c. model 1, 6 v.d.c. output, \$3.00. Philco condenser meter model 010 \$4.50. Phono motor with turntable and pick-up, vol. control on pick-up, \$4.00. Book by J. F. Rider "Automatic Record Changers and Recorders," new condition, \$4.50. Walter F. Golczewski, 4427 E. Thompson St., Philadelphia, Pa.

WANTED—Any or all of Rider's manuals, from No. 6 on, including No. 6. Will pay cash, or have meters to swap. Write for list and description. Altona Electric Co., Galena, Illinois.

WANTED—Jensen type GHP or EHP 801 or 302 loud speaker in like new condition. Pay good cash price. Charles Weyl, 255 Harvey Street, Philadelphia, Pa.

HAVE CASH—Want late radio tube, set testers, Channel analyzers, scopes, radio books, P.A. amplifier using 866s, 6 ft. trumpets, oscillators, vibrator testers, radio tubes in sealed cartons, neon radio sign. Glen Smith, 323 Factory St., Watertown, N. Y.

FOR SALE—Volumes 1, 2, 3, 4, 5, 6 and 13 Riders Manuals in absolutely perfect shape, complete with index. Reasonable. Moch Radio and Sound Service, 5925 S. Albany Ave., Chicago, Ill.

FOR SALE—One G. E. 6 volt car radio, model B-40, A1 condition, 3 pc., \$10; one Delco 6 v. car radio, model R-663, under dash type, A-1 shape, \$10. one NRI study course, \$6; One RCP tube tester, \$6; steel tool box, new, \$1.25; tool box no tray \$0.80; one portable Triplett all wave, all purpose tester, 4 in. square meter, A-1 shape, less batteries, \$12.00. Clarence W. Hull, Mineral Springs, Pa.

WANTED—Would like to buy one Rider's Chanalyst by RC. State condition and price in first letter. Roberts Radio Service, St. Louis, Michigan.

WANTED—Grunow console radio, 10D or similar. C. M. Brennan, General Delivery, Columbus, Georgia.

FOR SALE AT ONCE—Modern, up to date equipped radio shop, good location and living quarters, cheap rent. Riders chanalyst and amp. Jr. voltohmst, Solar C-C-1-60 uni. speaker, CB mod. 131 Stanco auto radio pack, Supreme 582A signal gen. and freq. mod., Superior portable 503 modernized tube checker, Jackson mod. 636 counter type checker. Full set Riders manuals. 700 tubes. Misc. parts and store fixtures, electric drill and everything goes. Poor health reason for selling. \$2,000.00. Art Radio Service, 1422 7 Ave., Rock Island, Ill.

WANTED—Electric fan, 110 v., 60 cycle, 10 in. or larger; in A-1 condition only. GE, Westinghouse, or other make of equivalent quality acceptable. Cash or will swap radio, chemical and sporting equipment. Write Raymond H. Ives, RT 1c, U. S. Coast Guard, Communications Base, Portsmouth, Va.

WANTED—If available for moderate price a vacuum tube voltmeter, either commercial or home made; also signal tracing instrument of some kind. R. S. Burwen, 17 Sheffield Road, Melrose, Mass.

WANTED—Meters, signal generators, tube checkers, watt meters, VO meters, VT volt meters, Precision multipliers, DP DT toggle switches, manuals, phono motors, fluorescent lite transformers, copper oxide rectifiers, SW receivers, firearms, machinist, radio, carpenter, painters tools, calamine, paint brushes, wool sponges, cameras, etc. Describe fully. Robys' Swapmart, 3569 Cottage Grove, Chicago, Ill.

FOR SALE OR TRADE—Underwood No. 4 desk typewriter, standard keyboard \$20; Flexograph portable mimeograph \$8; Western 22 cal. semi-auto. rifle and 200 shells \$17.50; All-American tennis racket \$3; 1000 tested radio tubes 25c ea. and up. Radio magazines 8 for \$1. Include stamp for list. Roby's Swapmart, 3569 Cottage Grove, Chicago, Ill.

FOR TRADE—Several of each: 954, 955, 956 Acorn tubes, RCA, for cameras, photographing equipment, transmitting equipment, such as power transformers and filter condensers, radio tubes, test equipment, and Weston meters. Household Repair Service, 6 Market St., Pitts- ton, Pa.

WANTED—HA 100X and HA 113X trans- formers. Also HA 108X. Please state lowest cash price. A. F. Toth, 3608 29th St., Astoria, L. I., N. Y.

WANTED—Fishing equipment, reels, rods, lines, etc. Have many sizes of PM and dynamic speakers and many modern tubes to trade or will buy equipment. Joe Svant, 5438 So. Wolcott, Chicago, Ill.

WANTED—Radio City No. 411 or 411P supertester. Quote price, condition, in first letter. Joe's Electric Co., 525 N. State St., Jackson, Mich.

FOR SALE—5 Faradon condensers 5000 volts effective. .005 mfd. 15 amp. at 1000 k.c., 6 amp. at 100 k.c. Cost new about \$20, \$40 takes all. G. U. Cusack, Box 338, Fowler, Colo.

FOR SALE—ICS practical radio servicing course. Up to date, complete in every detail. Best home study course obtain- able, cost \$130, will sell for \$25 cash. Send \$5 with order, balance C.O.D. Rush money order at once or be too late. Write Clyde W. Wimer, Ellwood City, Pa., R. D. No. 2.

WANTED — Supreme Model 333 deluxe analyzer or the meter therefrom if in good condition. Write stating lowest price to Ridgley A. Tyrrell, Box 33, Packer, Conn.

WANTED—Any standard make condenser tester. Will pay cash. State lowest price. Will also pay cash for brand new radio tubes in original cartons; state your best discount from list prices. C. A. Goditus, 313 East Market St., Wilkes- Barre, Pa.

WANTED—Emergency -- Multi-range volt- ohm-m.a. meter. Scale 3000 to 5000 v., resistance not less than one million ohms, complete with batteries and leads. If not available 2000 v. range, with corresponding ohm and m.a. range. Wanted by soldier in the islands, un- able to get station equipment. Needs this equipment badly. Will pay cash for same. Paul Bauman, 242 Cambridge Ave., Jersey City, N. J.

FOR SALE OR TRADE for test equipment, or a Model WM Briggs and Stratton wash machine engine, many new and used radio parts and tubes. Write for list. Frank H. Carlson, New London, Iowa.

WANT — Test equipment, meters, meter parts, precision multipliers, multiple rotary switches, bridges, decade boxes, tools, fire arms, of all types. Describe fully, state price. Roby's Swapmart, 3569 Cottage Grove, Chicago, Illinois.

WANTED — National NC 100X receiver. Will pay spot cash or trade following of your choice. Weston 676-R tube tester, Aerovox LC checker, C.B. oma oscilla- tor, also frequency wobulator from oma oscillator, portable dynamic tube tester, General Radio freq. meter con- denser, G. R. variometer, full details on request. All in new or good used con- dition. No junk. What items do you need. Also RCA capacity operated electronic control, new, model 41903. R. N. Eubank, 1227 Windsor Ave., Rich- mond, Va.

WANTED—Tube checker, signal generator also Rider's Manuals, vols. 10 to 13. Will pay cash. Must be in perfect condition. Eugene Gilbert, 1296 Sheridan Ave., Bronx, N. Y.

FOR SALE—WE high impedance headphones, complete with headband and cords. Nearly new. A. F. Toth, 3608 29th St., Astoria, La. 1, N. Y.

FOR SALE—1 Triplett VOM, 25 m. per volt, \$40, Red dot meters (twin); 1 Triplett tube tester model 1210A \$15; 1 Weston model 506 milliammeter (new) \$7, 0-100 m.a., case 2 3/8 in.; 1 Weston model 301 milliammeter, \$8, scale 30-0-30 zero center, 3 in. Cash or P.O.M.O. acceptable only. Shipment via P.P. insured. Reference: Union National Bank, Lewisburg, Pa. Frank L. Dodd, 300 Rural Ave., Lewisburg, Pa.

WANTED — Rider's Manuals volumes 11 through 13, good condition, cash. Advise what you have. Karl Wagner, C. C. Bk. Bldg., Des Moines, Iowa.

FOR SALE—National Communications receiver 101X complete with speaker, absolutely in perfect condition \$75.00. Radio W6WY, 1901 Park Drive, Los Angeles, Calif.

FOR SALE—Twenty Dubilier Mica Condensers, Type 1494; .0006 mfd, working voltage 25,000. Price \$50.00 each, fob, N. Y. C. N. R. Keidan, 515 W. 110th St., New York City.

WANTED—Radio service work, coils repaired, speakers, etc. Also plenty of 12SA7, 35L6, 50L6, 35Z5, 12SK7, 12SJ7, 12SA7, 80, 48, 5Y3, 6A8, 6K7, 6X5, 5Z3, 35Z4, 35Z3, 12Q7, 6H6, 25L6, 12K7, 6F6, 25Z6, 12A8, 6A7, 32, 34. Sell, trade or what have you? Drop me a line. Elmer Hoeppner, 1613 W. 4th Street, Davenport, Iowa.

WANTED—One National NC 100A or NC 100XA with or without tubes or speaker. Will pay cash or trade some of following: Weston 676R tube tester, Dumont 5 in. scope model 148 new tube, Clough Brengle OMA; FM and AM; all wave oscillator, dynamic portable tube tester, Clough-Brengle frequency modulator, motor plus tube type, transmitting equipment. Give full details first letter. Will do same. Bob Eubank, 1227 Windsor Ave., Richmond, Va.

WANTED—Rider's Manuals Nos. 10 to 13 also good output meter and late model tube tester. Fossum's Radio Service, Ashland, Wis.

WANTED—Will pay cash for r.f. meter 0 to 1 amp., also 0 to .5 amp., any make; also want capacitor analyzer and oscilloscope, any make. A. Y. Cottrell, Supt. Radio City of Lenoir, Lenoir, N. C.

WILL SWAP—Have ac-dc 4 tube TCA radio. WANT—Rider's Manuals, tube tester, or radio tester, will pay cash for Weston or some other good make dc milliammeter 0-75 or 0-100. Also typewriter. Louis A. Goldstone, 1279 Sheridan Ave., Bronx, New York, N. Y.

WILL SELL or SWAP—Have 3 Majestic 90 chassis and power packs, in playing condition. Want Rider's Manuals, tube and set testers. Give details in first letter. L. A. Goldstone, 1279 Sheridan Ave., Bronx, New York, N. Y.

FOR SALE or SWAP—2 G.E. generators, 1 600 v. .21 a. for plate; 1 12.5 v. 27 a. for fil. can be coupled together, also 1 AP772 RCA power amp. unit uses 1-50-2-81. terminals for input, osc. pl., vc., output, de cath. bias, amp. pl., amp. cath., pilot, amp. fil., det. fil., vc fil. Want—Meissner public address tuner or test equipment. What have you? John Holton, 2 Wallingford St., Dover, N. H.

WANTED—Repeating rifles and shotguns, not in working condition, ac signal generator, VT voltmeter, grandfather's clock any condition. Cash or trade. Have coaster brake, bike parts, saxophones, radio and phono parts, other articles. W. J. Closson, 295 8th St., Troy, N. Y.

FOR SALE or SWAP—Radio Sound and Television course, for a good tube tester, also have various parts in good condition which can be used by radio beginner at trade and lab practice, also have lab. course. Pesarchic's Radio Service, 420 Power St., Johnstown, Pa.

FOR SALE—Howard 435 communications receiver, perfect condition, little used. Best offer takes it. Louis Mackay, RFD No. 1, Box 19, Perth Amboy, N. J.

FOR SALE OR SWAP — Dunco low and high current relays, Clough-Brengle 3" oscillograph, Ferranti transformers, A. & B. series, and 3 Sangamo hour counters, and other items. Will sell or swap for VTVOM chanalyst or equivalent, A. F. oscillator. J. J. Bressler, 25 Dongan Place, New York City.

FOR SALE OR TRADE — Green Flier 7 speed motor with crystal pick-up \$12. Wood lathe \$12. Hickok AC49 tube tester with adapters for some octal tubes \$13.50. 14 in. Peerless speaker copper oxide rectifier and output transformer for PP45s, etc., \$2. A. Dwyer, 1418 81st St., Brooklyn, N. Y.

TUBES WANTED—Will pay list less 40% FOB your town. 1 to 200, 35L6; 1 to 300, 35Z5; 1 to 200, 50L6; 1 to 200, 12SA7; 1 to 100, 12SK7; 1 to 300, 35Z4; 1 to 100, 1A7; 1 to 100, 70L7; 1 to 100, 117Z6. Ship by Railway Express, COD to Success Radio Service, 122 Motor Ave., Salt Lake City, Utah.

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