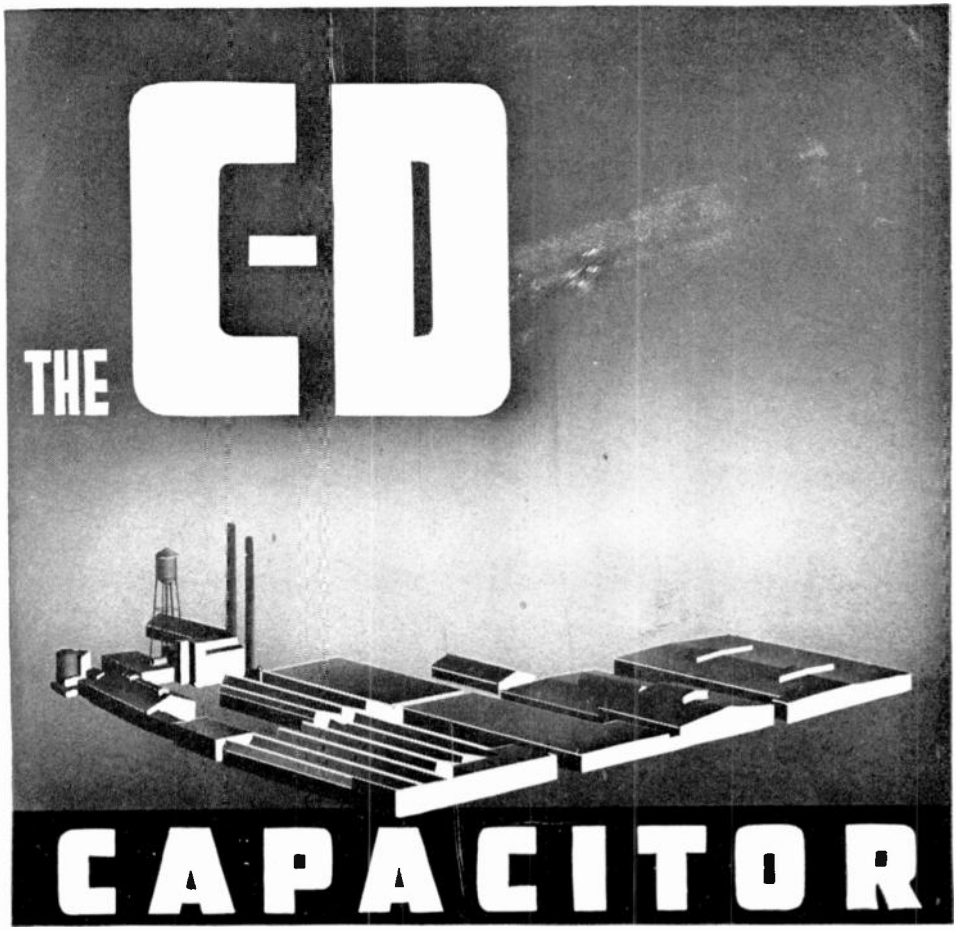

Vol. 4 AUGUST, 1940 No. 5

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

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

RADIO SERVICE HINTS

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

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

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 Unpublished items will not be returned.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

Pilot Light Tester

A pilot light tester comes in extremely handy for checking the pilot lights of sets on various jobs. One can easily be installed in any tube checker having parallel wired filament connections.

Simply install two pilot light sockets on the panel of the tester, one for screw base bulbs and one for bayonet base bulbs. The filament selector switch controls the voltage supplied to the pilot light test sockets.—*D. J. Foard, Kalamazoo, Mich.*

Restoring Volume Controls

Volume controls often become very noisy long before they are actually worn out. This is very often caused by a glazing formed on the wire surface. This can easily be restored by cleaning the surface with carbon tetrachloride, using a small brush. After being well cleaned apply a thin coating of petroleum jelly.

The writer finds this little trouble saves the cost of installing a new unit in all cases except where a control has been worn or burned out.—*Robert J. Oja, Calumet, Mich.*

Quick Tube Checking

When an AC-DC set comes in your shop, and on connecting it, the tubes do not light (or heat up if metal tubes), remove the chassis and check the d.c. resistance of each tube with an ohmmeter. If a tube is burned out it may be quickly located by this method.

In this way considerable time is saved in locating burned out tubes. Ordinarily, it would be necessary to remove each of the tubes in a set to be individually tested in a tube checker. — *Edgar O'Rourke, Bear Lake, Mich.*

Line Hum Elimination

Very often a loud hum will come through sets on a frequency of certain nearby broadcast stations which many servicemen will believe to be caused by the station.

The writer experienced this in his locality and has discovered that it can be entirely corrected by the following procedure.

A .05 mfd. 600 volt tubular bypass capacitor is connected from one side of the power transformer primary to the chassis or ground which removes this objectionable hum in every instance.—*Robert J. Oja, Calumet, Mich.*

G. E. 1938 Battery Models

When distortion occurs in this model, even though tubes and batteries check satisfactorily, the trouble can very often be traced to defective grid bias cells in the circuit of the first audio stage.

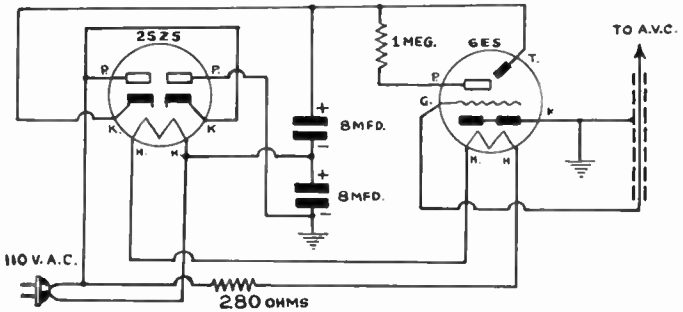
This condition may seem to be caused from other sources but in practically every instance in sets serviced by the writer, it was the bias cells.

The correction naturally is to replace the defective cells with new ones of the same type.—*Henry J. Sundmeyer, London, Ark.*

Troubles in Portables

Since portable sets are subjected to considerable jarring and rough handling parts below the chassis are usually well anchored. However, it is best to check for loose parts and connections. Tube shields are often found to be the source of fading and noise trouble.

Remove the loose shield, clean the bottom and base on the chassis with sandpaper. With long nose pliers or cutters put a crimp in the shield so that it fits tight. Clean the gang capacitor and 85 millihenry choke and other connections before replacing the chassis in cabinet.—*L. W. Krizan, Chicago, Ill.*



An Output Meter for Aligning

A simple output meter circuit employing a type 6E5 magic eye tube is shown in the above diagram. Self powered it operates on 110 volts a.c. The grid of the 6E5 is connected to the A.V.C. line of the receiver to be aligned.

To align a set, feed the signal into the set and adjust until deflection is indicated in the 'magic eye." Adjust trimmers for minimum shadow on the eye.—*Edgar Boles, Marion, Ill.*

Atwater Kent Model 55

When this receiver has low screen voltage in the order of 15 to 20 volts it is logical to suspect the trouble may be caused by the 6,000 ohm resistor in the volume control circuit. However, several cases of this nature disclosed this was not the fault.

The writer finds in most cases this trouble is caused by the .1 mfd. screen-grid bypass capacitor which becomes leaky.

To correct this condition replace the leaky bypass unit with a 400 volt unit of the same capacity.—*W. H. De Ring, Newark, N. J.*

(*Continued on page* 11)

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—Crystal mike and pick-up arm. State lowest price, make, model, and condition. Jacks Radio Shop, 2609½ W Cervantes St., Pensacola, Florida.

SELLING OUT—Vernon model PT fone and CW portable transmitter, complete $35. Majestic battery portable, complete $10. Climax 3-band all-wave radio $15. Large quantity of used meters. Send stamp for list. L. Tulauskas, 9323 Rhodes Ave., Chicago, Ill.

FOR SALE — Two Inter office (Intercall) systems. Both units of each system are master units. $25 for each 2-unit system. V. J. Brown, 324 Western Ave., Connersville, Indiana.

WANTED—Scott, National, Hammarlund or other high grade S.W. receiver. Have cash or Hallicrafter, RCA auto radio, Triplett tube tester, De Forest Radio Course, parts, etc. O. F. Klein, O.K. Radio Service, 2235 N. 39th St. Milwaukee, Wis.

FOR SALE—Supreme 504 tube tester-analyzer $35. Hickok counter model MW-35 tester-analyzer, incl. 3 meters, two 5¼" and one 3" illuminated, sensitivity one mil. and 200 microamp., $12. RCA record player R-100, $5.00. Henry W. Drenk, 1846 N. Mohawk St., Chicago, Ill.

WANTED—1938 or 1939 Radio Servicing Course and late model radio testing apparatus. Please send list of what you have. Alfred J. Shelvock, 88-48 199 St., Hollis, New York.

WANTED—Any commercial S.W. receiver for about $5.00. Also A.C. volt-ohm meter at about 1,000 volts. Ross Walker, 1117 Clalua Way, San Jose, Calif.

FOR SALE—National NC 80X AC-DC communication receiver, brand new, has been in dead storage. Has 10 tubes, 550 kc to 32 mc with crystal, 4 bands. P.M. dynamic speaker, built in steel cabinet. Costs $99 wholesale. R. L. Patterson, 1629 Park Ave., New York City.

TRADE OR SALE—Dayrad 200 tube tester-voltohmeter combination. Tests all tubes to 117 volts. Also meters and other testers. Want ½" electric drill, Rider's, vols. 1 and 9. Ace Radio Lab., 202 W. 13th St., Lorain, Ohio.

FOR SALE—Rider's vols. 1 to 4, also signal generator, tubes, books and other radio equipment. Write for list at bargain prices. James Bizzaro, Statue of Liberty, Bedloes Island, N. Y.

WANTED—Rider's and Gernsback's service manuals. State prices and condition of volumes. Frankart Radio Service, 741 Michaels Ave., Ft. Wayne, Ind.

WANTED—Rider's Manual vol. 3. Please state price and condition of book. Sandman Elec. Service, 227 So. Pearl St., Havana, Ill.

FOR SALE—Radio business, established 1928. All necessary equipment, parts and tools. Business now paying. Competent, live wire can make it go places. Price $1,000. W. R. Newman, P.O. Box 1153, Tyler, Texas.

FOR SALE OR SWAP—P.A. amplifiers, speakers, W.E. trumpets with Gibbs giant units, meters and armature parts. R. H. Krueger, 220 Ringold St., Janesville, Wis.

(Continued on page 12)

ELECTROLYTIC CAPACITORS*

AN ELECTROLYTIC capacitor will not retain a charge since it always acts as if it had a resistor connected across it. An equivalent circuit of such a device is shown in Fig. 1, where C is the capacity (assumed to be of infinite resistance to d-c) and R is the d-c resistance in ohms which is associated with the electrolytic. This parallel resistance should not be confused with the equivalent series resistance. The latter is entirely different and can be neglected in this instance since it is only a few ohms whereas the parallel resistance is of the order of several hundred-thousand ohms.

For the purpose of calculating the rate of discharge of an electrolytic capacitor, the following formula applies:

$$E = E_m e^{-t/RC} \qquad (1)$$

where E is the voltage across the capacitor at any instant, E_m is the initial voltage to which the capacitor

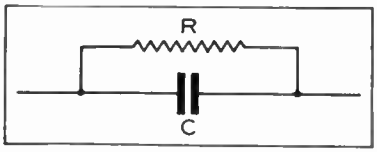


Fig. 1. An electrolytic capacitor always acts as if it had a resistor connected across it.

is charged, e is the natural logarithm base, t the time in seconds measured from the start of the discharge cycle, R is the resistance in ohms and C the capacity in farads. The current at any instant may be derived from the relation

$$E = iR$$

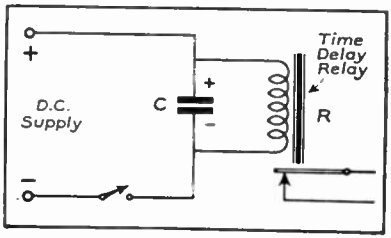


Fig. 2. A practical application of the discharge characteristics of a capacitor is in time delay relay circuits.

Then, by substitution

$$iR = E_m e^{-t/RC}$$

or

$$i = \frac{E_m}{R} e^{-t/RC} \qquad (2)$$

If it is desired to predict how long it will take for the capacitor to discharge to some predetermined voltage, equation (1) may be solved for time (t).

$$\log_e E = \log_e E_m - \frac{t}{RC} \qquad (3)$$

or

$$t = RC \log_e \frac{E_m}{E} \qquad (4)$$

The discharge of the capacitor through its own inherent resistance cannot be too accurately predetermined because the resistance is variable and depends on the instantaneous voltage. For example, a properly designed 8-mfd, 450-volt unit will have a maximum leakage of 0.3 ma at its rated voltage. This cor-

* By Stanley Walters of the C-D engineering staff in "Service" magazine.

responds to a parallel resistance of 1.5 meg. When the voltage has dropped to 300, the leakage current will be approximately 0.08 ma which corresponds to a resistance of 3.75 meg. These values are only very approximate since individual capacitors will vary considerably.

When a capacitor is to be used in this connection, there is generally an additional resistor connected in parallel with the unit of much lower value than the resistance of the capacitor alone. This makes the over all resistance more nearly constant, and the discharge can be predicted with greater accuracy. The value of R then becomes the resultant of the added resistor and that of the electrolytic, using the relation:

$$R = \frac{R_1 R_2}{R_1 + R_2} \qquad (5)$$

Practical Application

A practical application of capacitors in this connection is in a circuit where it is desired to hold a relay in the actuated position for a short period of time after the applied voltage to the relay is removed. A typical circuit is shown in Fig. 2. Many elaborations of this are possible.

In this case the additional resistance connected in parallel with the capacitor is the d-c resistance of the coil of the relay, R.

A typical set of curves showing these discharge characteristics are given in Fig. 3. These curves are plotted on semi-logarithmic paper, since the logarithmic nature of the discharge makes the resulting curves straight line.

(*Continued on page* 11)

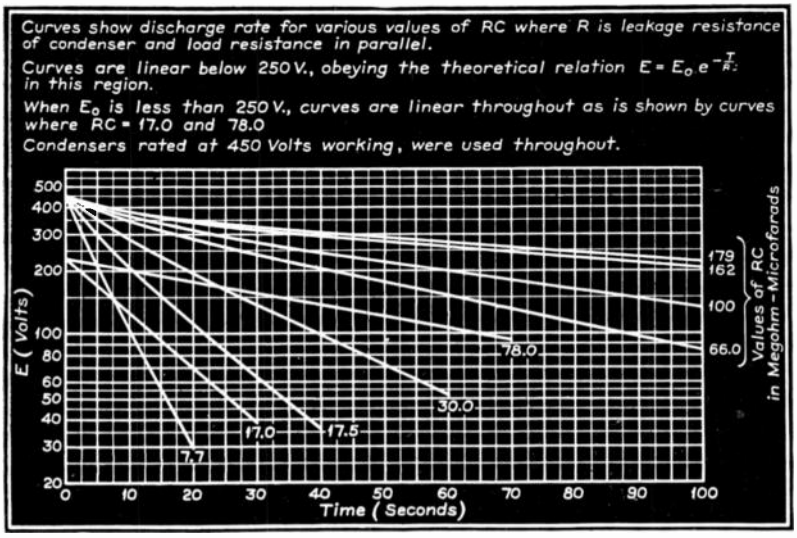


Fig. 3. The discharge rate of an electrolytic depends upon its inherent resistance which varies with the instantaneous voltage.

SERVICING PUSH-BUTTON TUNERS*

THERE are three basic systems of push-button tuning in use at the present time; mechanical, electrical switching, and motor or solenoid driven systems.

With mechanical tuning, the movement of the button mechanically rotates the condenser through some sort of rocker arm. If permeability tuning is used, the movement of the cores is mechanically driven direct from the button. With this system, since the energy for the operation of the mechanism comes directly from the button, the pounds push required depends upon the friction and mass of the mechanism plus length of stroke of the button.

In variable condenser mechanical tuning systems, several types are in use today. The accuracy of tuning with the buttons depends upon four things; original lineup by customer or serviceman, mechanical accuracy of setting of the variable condenser, electrical stability of the oscillator, and stability of the intermediate frequency amplifier.

The reset accuracy of the mechanical system is, to a large extent, dependent upon the operation of the button by the customer, as well as accuracy of the mechanism itself.

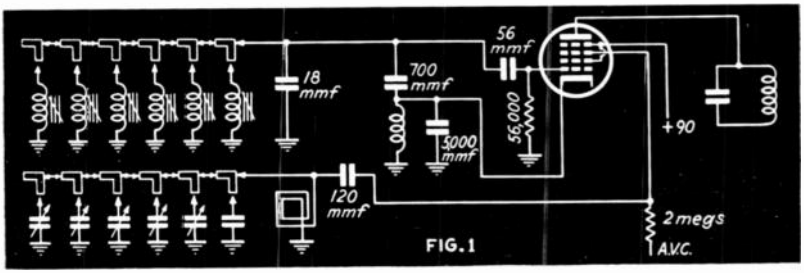


Fig. 1—Typical pushbutton circuit with good stability. Oscillator circuit is permeability-tuned and shunted by 18 mmf. compensator condenser

Since this system is normally operated without a latch, the tuning depends upon the amount of push applied by the operator.

Drift

Oscillator stability may be divided into four different stages; stability with temperature, voltage, humidity, and ageing.

Most of the drift with temperature is caused by variations in capacity in coil trimmers and switch parts. This may be compensated, if consistent, with a negative co-efficient

* By L. R. Kirkwood in "Radio and Television Retailing."

shunt condenser across the oscillator tank. If the variable tuning capacitor changes value with temperature, it may be necessary to compensate the inductance of the oscillator coil. A condenser with a negative temperature coefficient of .2 percent for 30 centigrade change in temperature of a value between 15 and 25 mmfd, will normally compensate the oscillator with sufficient accuracy for push-button tuning. With this system, some receivers have been compensated to maintain drift with temperature to less than 2 kc over 30 centigrade temperature range on the broadcast band. In order to accomplish the above specification, it was necessary to replace the normal mica shunt capacitor with an air dielectric shunt capacitor and the mica trimmer series condenser with a fixed silvered mica condenser. Variable inductance was used to align at 600 kc.

Some of the design precautions to reduce shift with humidity are impregnation of coil, oscillator socket, range switch, variable condenser stator supports; use of air dielectric trimmer, and the use of waxed or bus wire. It is possible to maintain the shift with humidity to a small amount if these precautions are taken.

Shift with ageing is a troublesome problem as some mica trimmers change capacity after going through many heat cycles.

In order to maintain a constant oscillator frequency it is necessary to eliminate movement of parts and wires. This is greatly solved by the fact that set-up is not normally made until receiver is installed in the customer's home.

The voltage stability of an oscillator using normal circuits is sufficiently good so as to cause very little worry. This only becomes a serious problem if sharp intermediate frequency amplifiers are employed.

In the receiver using four circuit intermediate frequency amplifier, a drift of less than 2 kc does not seem to be objectionable. If the i-f is broader, larger variations may be tolerated, or if more circuits are employed, greater stability may be required.

The drift of the intermediate frequency amplifier is as important as oscillator drift to maintain correct alignment of pushbutton receivers. Although the percentage drift may be larger since the frequency is usually from 2 to 4 times lower in the broadcast band.

A type of intermediate frequency transformer which lends itself to stable performance is the permeability tuned fixed condenser type. The principle advantage of this type is that stable, sealed condensers may be used.

Tuning Systems

Electrical switching systems differ in type of circuit elements and method of set-up. Trimmer-tuned is

the cheaper of the methods but not usually as stable as others. The most common system in use is permeability tuned oscillator and trimmer tuned antenna systems. This method gives good oscillator stability and medium cost of construction.

tage of this system is ease of operation and set-up.

Solenoid tuning is another method of operation similar in action to motor tuning but with faster action.

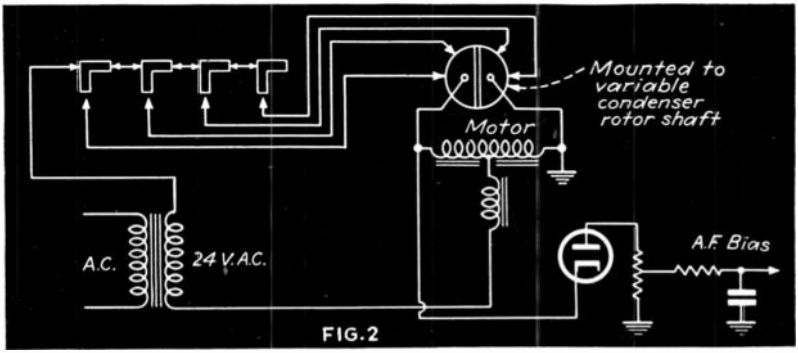


Fig. 2—Motor driven selector system with muting circuit for eliminating noise between stations

The third system, used when no loop is employed, is tandem permeability tuned oscillator and antenna. This method gives good stability and ease of set-up but more expensive construction. The principal advantage of electrical switching pushbutton systems is ease of operation. Its disadvantage is lack of flexibility of station selection, more difficult setup and expensive construction.

Motor tuned systems are usually made up of an induction motor mechanically connected to a variable condenser. Station selection is accomplished by a selector connected to variable condenser. The advan-

Motor, solenoid and mechanical tuning depend for their accuracy on the mechanical accuracy of the various mechanisms as well as the electrical stability of the receiver circuits.

Typical System

An electrical switching system in use is shown in Fig. 1 on page 7. Permeability tuning is used in the oscillator and trimmers are used to tune the loop.

The oscillator circuit is made up of a variable inductance coil selected by the push-button switch shunted by an 18 mmfd. negative co-efficient

capacitor and 700 mmfd. silvered mica condenser in series with a 5000 mmfd. styrol roll condenser. The cathode tap is taken off between the 700 and 5000 mmfd. condensers. A coil is shunted across the 5000 mmfd. condenser to provide a d-c path for the tube current. The 700 mmfd. condenser and the cathode coil are used for manual tuning on the broadcast band. The 5000 mmfd. is used for series condenser on the short wave band.

The shunt push-button coils are solenoid wound on a styrol ⅜" OD moulded form. The coils are approximately ½" long. The cores are $\frac{5}{16}$" diameter by $1\frac{3}{4}$" long. These coils are designed to tune the oscillator from approximately 1000 to 2000 kc.

The temperature stability of the receiver tested was + 1 kc at 1500 kc signal and + .5 kc at 600 kc for 30 centigrade change in ambient temperature.

The oscillator variation with voltage was of negligible effect. The intermediate frequency transformers had a random shift of about one kc. through the heat cycle. This shift could be reduced by means of temperature compensating condenser across the coils.

A direct tuning motor push-button system is shown in Fig. 2. The selector is directly connected to variable condenser. The contacts, movable to station position, are selected on push-button switch. The motor will rotate until contact is broken by insulated portion of selector disc.

Motor Driven Types

If the mechanism goes past the insulated portion, the motor will automatically reverse. If the system is not properly damped, the mechanism oscillates and will not come to rest. Several methods have been in use to reduce this tendency and maintain accurate fast tuning. One system is to change the ratio of drive for a few revolutions as system is reversed, another to incorporate a fly-wheel which will retard the speed of reverse.

A method of obtaining audio squelch while tuning is shown. The a-c across the motor winding is rectified and used to bias off an audio amplifier stage while motor is tuning. The time constant must be such as to allow the mechanism to come to rest before squelch is released.

In past years, it was considered necessary to incorporate AFC on push-button receivers. Due to the increased accuracy of tuning and stability of the oscillator circuit, most receivers are now being built without this feature.

ELECTROLYTIC CAPACITORS

(*Continued from page 6*)

The deviation from the theoretical straight line is noted in the curves where the initial voltage is 450. The reason for this is that the inherent resistance of the capacitor is changing. The curves which have a lower value of total resistance are more nearly straight line, since the resultant resistance is more nearly constant for this case. The curves starting at 232 volts are also straight-line. This shows that if the initial voltage is considerably below the rated voltage of the capacitor the change in resistance with voltage is at a minimum and the discharge curve is more nearly straight-line.

The curves of Fig. 3 are drawn for various values of RC (the product of the resistance in *ohms* and the capacity in *microfarads*).

For most design purposes, a very good approximation for capacity can be made by neglecting the resistance associated with the capacitor. The ratio of initial to final voltage is first determined. Value of the initial voltage E_o will be the operating voltage of the relay coil. E will be the voltage at which the relay releases. The desired time of delay (expressed in seconds), the resistance of the coil, and $\log_e \frac{E_o}{E}$ are then substituted in formula

and the latter solved for capacity in farads:

$$C = \frac{t}{R \log_e \frac{E_o}{E}} \qquad (6)$$

This analysis is quite accurate if the values of R and C are such that their product (RC) is less than 90.

RADIO SERVICE HINTS

(*Continued from page 3*)

RCA-Victor Models 10T-10K

If sensitivity of this model seems low, check the bias switch (S7 indicated on service wiring diagram). The purpose of this switch is to increase sensitivity on the short and intermediate wave bands by reducing the residual bias on the AVC and detector tubes, and is operated by the range selector control.

When this switch is turned clockwise it may stop in one position and cause decrease in sensitivity. To correct this trouble, clean the contact points of the switch and lubricate the movable parts.—*Fred Karpen, Johnstown, Pa.*

Majestic 20

Although several years old there are many of these models still in use. When the first filter section breaks down the problem is to replace the unit most economically. The space is limited and voltage requirement is above that of the average in present day sets.

The writer finds that by using two of the small size tubular dry electrolytic capacitors of 4 mfd. 450 volts connected in series has served the purpose of replacement very satisfactory in every case.—*Claude Lydick, Kansas City, Mo.*

Arvin, Model 927

This set as well as several other makes which employ magic eye tuning indicators which do not deflect when tuning-in on stations may be easily corrected in the manner described in the following.

If the set operates satisfactorily except the tuning eye does not deflect, check the one meg. resistor in the tuning eye tube socket assembly for an open. Replace the open resistor with a new one meg. resistor and the eye will operate perfectly again. —*Joseph S. Napora, Uniontown, Pa.*

(*Continued on page 13*)

THE RADIO TRADING POST

(Continued from page 4)

FOR SALE—Readrite 407 tube checker, no case. Also Readrite ohmmeter, both for $3.50. Federal photo enlarger $5.00. Gammeter No. 4 Multigraph with ribbon and plenty of type $7.50 F.O.B. or trade for 1-3 h.p. 120 v. electric motor. Andrew F. Benedict, 375 Wilson St., Sharon, Pa.

SALE OR TRADE — 4 years "Service" magazines 2/32 to 2/36, Rider's "Practical Radio Repairing Hints," Jones 1937 Handbook. Want Astatic or Brush crystal pickup or crystal cutter for recording, crystal or velocity mike. Dillion Radio Service, 1224 Horne Ave., Hollywood, Calif.

WANTED—Supreme 585 De Luxe Diagnometer, Rider's Manuals 1 to 6 must be reasonable. Have 2 powerizer amplifiers with B supply, 1 powerizer amplifier A, B and C supply, A eliminators, Majestic and Cornell B eliminators. Goldstone Radio, 1279 Sheridan Ave., Bronx, N. Y.

FOR SALE—Radio sales and service business. Fully equipped. Established 10 years. Leaving for West. $2,000 cash will have it. Movel Radio Service, 113 Lexington Ave., New York City.

SALE OR SWAP — Instructograph code machine, 10 tapes, built in a.c. oscillator and speaker, peak preselector tunes 14 to 200 meters. Meissner noise silencer with tubes; Hetrofil. Want Rider Manuals, test equipment, or what have you. Sam's Radio Service, 8707 12th St., Detroit, Mich.

WANTED—Scott 30 tube receiver or National or Hammarlund set. State price and condition, etc. O. K. Radio Service, 2235 N. 39 St., Milwaukee, Wis.

WILL SWAP — Weston tube checker for metal and glass tubes octal or standard, counter type. Will trade for large amplifier for P.A. system over 40-watts and high gain. Swap 203A tube for mike stand. Shines Radio Shack, 69 W. 23rd St., Chattanooga, Tenn.

FOR SALE OR SWAP—Supreme 400 tube tester and Supreme 550 analyzer, like new. Want table model radio-phono. Also have back copies of Radio News, Radio-Craft. Chuck's Radio Service, 716 Seventh, S.W., Massillion, Ohio.

FOR SALE OR TRADE—Sprayberry's complete Radio Course in A-1 condition, $30 p. p. anywhere in the U.S.A. Will trade for equivalent value in Rider's manuals or test equipment. Robert S. Haworth, Box 13, St. Leo, Fla.

FOR SALE OR SWAP—Tubechecker including case, 2 meters, 5" meter from Weston 676. Emission and neon leakage-test. Completely rebuilt. Toggle system. Loctal sockets. Want camera or what have you. Sid Weisberger, 380 Kosciusko St., Brooklyn, N. Y.

FOR SALE OR TRADE—Adco tube tester, $4. Three volumes of Moyer & Wostrel's "Radio Construction and Repairing," "Practical Radio," and "Radio Receiving Tubes" all for $5, or trade for Rider's vol. 4 or 5 or 7. W. H. De-Ring, 62 Vincent St., Newark, N. J.

WANTED—Good used Hallicrafters model S-20R Sky Champion or similar communications receiver. M. J. Dodge, Crozet, Virginia.

FOR SALE OR TRADE—One W.E. 60-watt P.A. amplifier, like new, $50. Two Philco 12" PM speakers with baffles, $20 for both of them. One phonograph and pick-up, $8.50. Used parts of all kinds. What do you need? Walter Keith, Newton, Iowa.

SELL OR TRADE — 26 issues of Radio-Craft, May 1930-June 1932; 76 Radio News, Jan. 1931-April 1937; 8 Radio Today. The lot for $10 f.o.b. K. C., or trade for typewriter or 22 rifle. Lydick Radio Service, 1536 Lister Ave., Kansas City, Mo.

FOR TRADE—6L6 CW transmitter, code practice oscillator, 3918 crystal, French mike, copies of QST, Radio, Radio News, Modern and Popular Mechanics magazines. Want drill, typewriter, photo equipment, Hawaiian guitar or other musical instruments. Stanley J. Zuchora, 2748 Meade St., Detroit, Mich

SALE OR SWAP — 5-battery 6-amp. charger; back issues most radio magazines; B batt. eliminators and auto-radio B supplies. Want p.a. equipment and accessories, Rider manuals and photographic equipment. Geo. Kinkade, 910 Adams St., Wilmington, Del.

FOR SALE—P. A. outfit—1 Webster-Chicago 20 watt amplifier with two mikes, built-in turntable, one floor stand, two speakers, one cartop platform, two speaker and mike cables. Will take $50. Bob Roy, Jr., Alexandria, Tenn.

FOR SALE—Radio text books by Rider, Ghirardi, Moyer & Wostrel, Henney and others. All books in perfect condition, some brand new. Excellent for library and reference. Complete list upon request. Irving Specland, 531 East 4th Street, Brooklyn, New York.

(Continued on page 14)

RADIO SERVICE HINTS

(Continued from page 11)

An Effective Scratch Filter

Hissing noise caused by needle scratch on records becomes particularly objectionable to many owners of phono-radio combinations, and the writer has installed a simple scratch filter which proves satisfactory in almost all cases of such complaints.

A 2,000 ohm volume control resistor is merely connected in series with a .01 mfd., 400 v. tubular paper condenser and 85 millihenry choke coil across the primary of the input transformer and pickup.

Many other forms of scratch filter circuits have been tried on various types of phono reproducers but this arrangement seems to produce the best all-around results.—*Pesarchic Electronic Lab., Johnstown, Pa.*

Tube Testing

When you have an A.C. set in the shop which requires all tubes to be tested, the first thing to do is to remove the rectifier tube and then turn on the set. The filaments will then be warmed up for quick checking in the tube tester, but their envelopes will not be too hot to be handled. Removing the rectifier tube may also save further damage due to D.C. shorts in the set.

—*Wayne Storch, Beecher, Ill.*

Stewart-Warner 07-5B1

A Varsity model set of this type was recently brought to the writer's bench which half the time received even the most powerful stations at low volume. In fact, the volume cut down so low the stations could scarcely be heard.

After checking all voltages, etc., and finding them O.K. it was found that the bakelite strips riveted to the speaker frame was barely large enough to pass the voice coil wires to clear the frame thus partly grounding the wires.

A small strip of heavy insulating material such as heavy scotch tape wrapped around the frame answered the purpose and the trouble was immediately remedied.—*Harold Brown, Lohrville, Iowa.*

Noblitt-Sparks Mighty Mite

If this model set becomes noisy after being in use for some time check the capacitors directly under the tubes. This set is mounted in a metal cabinet to dissipate the heat caused by the new 35 and 70 volt tubes.

The heat causes expension of the three capacitors underneath the tubes causing high resistance joints. Correct this by replacing these capacitors with new units of the same ratings but move them under the speaker where heat is negligible.

This condition occurs in many other small sets where the heat from tubes plays havoc with the wiring as well as the capacitors and other parts.—*Sydney G. Miller, Boston, Mass.*

Soldering Iron Cleaner

Here is an easy way to clean your soldering iron without losing time for hurry-up jobs on the bench.

Obtain a swede brush for a dime at the 5 & 10c store which is made of fine stiff brass wire. Fasten it to the work bench with a few wood screws in a convenient location.

Simply rub the tip of the iron on this brush and it will brighten as clean as a new pin.—*C. R. Marchbank, Galena, Mo.*

THE RADIO TRADING POST

(*Continued from page 12*)

WANTED—Radio Physics Course. Cash for best offer. Also want other radio and electrical books and amateur equipment Jas. E. Smith, Box 612, Spindale, North Carolina.

FOR SALE—Rider's service manuals one to seven inclusive. Manual one and two very slightly worn. Three, four, five, six, and seven can't be told from new. Will sell complete set only. Cash $37.50 Includes index for group. W. A. Haeussinger, 1102 Marion Street, Winona, Minn.

WANTED—32 volt vibrator converter. State cash price and a.c. output wattage and condition. Also late model Hickok tube tester and No. 155 Hickok Trace-o-meter. State cash price and condition of instruments. John W. Reigel, R. No. 2, Annville, Penn.

WANTED—Power tools in good condition. Please mention your lowest cash price, description and condition of tools. Armand's Radio Service, 29 Nye St., New Bedford Mass.

FOR SALE—Filament transformers types T-644F33 $1.50, T-6416 $3.00, P-5011 $2.00 Modulation and driver transformers T-7084 $4.50, T-51D00 $1.50—10, 20, 40 TL line B&W coils $1.00 each, 2 Johnson 626 coils $1.00 each, Cardwell condenser XC100X5 $2.50. Wm A. Dixon, 1902 Seventh Ave., New York City.

FOR SALE OR TRADE—Copies of Radio-Craft, Radio Engineering, IRE Proceedings, Radio News, radio books and parts Want '38-'39 Radio News and '40 Communications, Electronics and '39 QST. L. W. Briggs, 103 Prospect St., Herkimer, N. Y.

WANTED — Ghirardi's "Radio Physics Course" and manual on Tesla coil apparatus. Have radio parts of all kinds and radio magazines for swap. Michael Crawley, 7 Walnut St., Pompton Lakes, N. J.

FOR SALE — Readrite model 432 tube tester in portable case, with loctal adapters and tube chart. Brand new. What am I offered? Lawrence Revermann, Melrose, Minn.

FOR SALE — Precision combination dynamic mutual conductance tube tester and 33 range rotary selective AC-DC multi range set tester Series 920 P in A1 condition—$40.00. Mackless Radio Service, 49 Parkville Ave., Brooklyn, N. Y.

WANTED — Tube tester and set tester Kindly give full particulars on condition of instruments and lowest prices. Howard Dodge, 484 Sayre Ave., Perth Amboy, N. J.

FOR SALE—Triplett model 1181-B portable radio laboratory set, includes 1151 all-wave S.G.; 1166 socket analyzer; 1125-A V-O-M at 1000 ohms per volt, new, $27.50, Complete N.R.I. radio and television course, 1937-38 edition, $12.50 Leo L. Bogdanor, 123 N. Hope St., Los Angeles, Calif.

SWAP — 15" Utah P.M. Speaker for a Model 750B military hand mike and a mike stand. Or, will trade a R.C.A. transmitting tube or Kellogg hand mike for floor mike stand. Shines Radio Shack, 69 West 23 St., Chattanooga, Tenn.

FOR SALE—Electric fence charger for operation on 110 volts a.c., guaranteed. $7.95 postpaid. H. N. Hauck, 726 Carrollton St., Metaire, La.

FOR SALE OR SWAP—Rider's manuals 1, 2, 3 and 5, Gernsback's manuals 1 and 2, Sprayberry's advanced radio course, service notes on early models of RCA, Philco, Crosley, Majestic, Atwater Kent and others. Also Triplett 1210A tube tester, 1220A free point tester and Superior all-meter tester. D. A. Nardo, 1611 Merchant St., Ambridge, Pa.

WANTED — Triplett 1181E or 1180E or Ranger 540-740 testers or any other portable laboratory battery operated equipment Also want Ghirardi books and Drake's books. Norval Nelson Halstad, Minn.

WANTED — N.R.I. or Sprayberry Radio Service Course, lessons only. Please state your price in first letter. W. Howard 140 West 238 St., New York.

FOR SALE — Clough-Brengle model OM oscillator complete $10.00. One correspondence course "Practical Mechanics of Radio Service" by F. L. Sprayberry, $15.00 R. B. McKinney, 223 E. Hopkins St., San Marcos, Texas.

FOR SALE OR TRADE—Supreme 529 Frequency Modulator; Supreme 535 — 2" Oscilloscope; RCA Service Notes, 7 Vols. 1929-1937; RCA Test Oscillator 153. Want Superior Channel Analyzer, Perfex camera if in trade. T. Wojciechowski, 2880 Fulton St., Brooklyn, N. Y.

WANTED—Rider's Manuals Vols. 1, 2, 3, 4 and 5, price must be reasonable, also state condition of books. Ulysses B. Engram, 587—2nd Ave., Daytona Beach, Fla.

THE RADIO TRADING POST

(*Continued from page* 14)

POSITION WANTED — Young man 25, Coyne Electric, and Radio graduate Have 12 months experience in radio and electrical work. I have my own radio testing equipment. Ambitious, good worker and honest. Locate anywhere in South-East Floyd Browning R.F.D. No. 1, Toney, Alabama.

WANTED—To exchange ideas with other young electric men in the radio industry. E. L. Reeser, Electric Shop, Logan Kansas.

FOR SALE—1180 Superior combination multi-meter and tube tester A complete all-purpose testing laboratory Good condition Price $10.00. Matt Haligowski, 311 Wetmore St., Utica, N Y

FOR SALE—Gas model aeroplane. Room for radio control. Brown, Jr. motor Like new. 8 ft wing, 48" long, 1½" M & M air wheels, mechanical flight timer 10 sec to 5 min Complete ready to fly $10.00. Harry W. Hess, 25 So 43 St., Philadelphia, Pa.

SWAP—2 0-100 mill D C Weston 506 meters, 1 0-150 A C voltmeter Weston 506 1 3" Jewell 0-10 A C voltmeter 1 3" Hoyt 0-50-100 mill D C meter, 1 Bliley 7C25 K.C. crystal in holder, 1 anti-capacity 4 P-DT switch, 2 W E relays used in telephone circuits Want signal generator or tube checker Walter, Rd. 5, Box 377, Ft Worth Texas

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WANTED — Set analyzer of reputable make Please state make, model and condition of the instrument, also your lowest price S Borenblum, 417 Greenwich Ave., Greenwich, Conn

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FOR SALE—Superior Model 1230 tube and set tester complete now Will sell for $15.00 J. T. Wills, 35 No Washington St., Wilkes Barre, Pa.

POSITION WANTED—Young man, 27, N R I. graduate, two years' experience in radio servicing Ambitious, desires position in any branch of radio servicing field Prefer location in Ohio Ralph Yoder, Sugarcreek, Ohio.

WANTED—Communications receiver tuning from 550 K C to at least 40,000 K C State age, condition, and cash price, number of tubes etc. No home grown jobs. W A Haeussinger 1102 Marion St., Winona, Minn.

WISE AND OTHERWISE

Haberdasher: "These shirts are very strong, sir. They simply laugh at the laundry."

Customer: "Yeah, I know. I had some like that before. They laughed so hard they must have split their sides after I got them back from the laundry."

◆

"Do you play golf?" he asked of the simple but gushing maiden.

"Dear me, no," she bashfully replied, "I don't believe I should even know how to hold the caddie."

◆

Dr. Brown: "Frequent water drinking prevents you from becoming stiff in the joints."

Mr. Barleycorn: "Yes, but some of the joints don't serve water."

◆

Doctor: "Great Heavens! Who stuffed that towel in the patient's mouth?"

Patient's Husband: "I did, Doc. You said the main thing was to keep her quiet."

◆

Boss (pointing to cigarette stub on floor): "Jones, is that yours?"

Jones: "Not at all, sir—you saw it first."

◆

Customer: "Have you that book called 'Man, the Ruler'?"

Salesgirl: "Fiction department is on the first floor, sir."

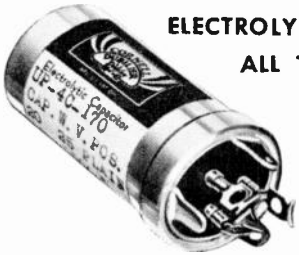
Jockeys or Capacitors...

WEARING the colors of the same stable, tipping the beams at the same figure, they're "look-alikes". Yet when one of these jockeys is up, what a difference in a thoroughbred's performance. That's because the *real* qualities are hidden to the eye.

It's true of men; it's true of capacitors. They may look alike, but when capacitors are "up", what a difference in performance!

Cornell-Dubilier capacitors outperform all others in length of life, surviving soundness and economy of operation. These characteristics derive from years of experience a unique combination of hidden ingredients found only in C-D's. More than thirty years of capacitor specialization stand behind Cornell-Dubilier's exclusive construction. Here is the proof of the pudding—the reason why you get more *for your money* when you specify C-D's . . . why there are more Cornell-Dubilier capacitors in use today than any other make.

ONLY CORNELL-DUBILIER ELECTROLYTICS OFFER ALL THESE *REAL* FEATURES



TYPE UP*

- **C-D electro-chemical etching process —eliminates corrosion**
- **Hi-pressure centrifuge impregnation —results lower power factor**
- **C-D super purity cellulose separator —gives longer life expectancy**
- **Double ageing — assures uniform and stable characteristics**
- **Special venting—eliminates danger of high internal pressures.**
- **Sealed aluminum container — ideally suited for operation under conditions of high relative temperature and humidity.**

The Type UP is the smallest can type capacitor available, and can be supplied in single, dual, triple and quadruple capacity combinations. Complete physical and dimensional data on request.

Remember! All C-D capacitors are union made and competitively priced.

*ETCHED PLATE, *NOT FABRICATED!*

REMEMBER! *ALL C-D CAPACITORS ARE UNION MADE AND ARE COMPETITIVELY PRICED*