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WORLD

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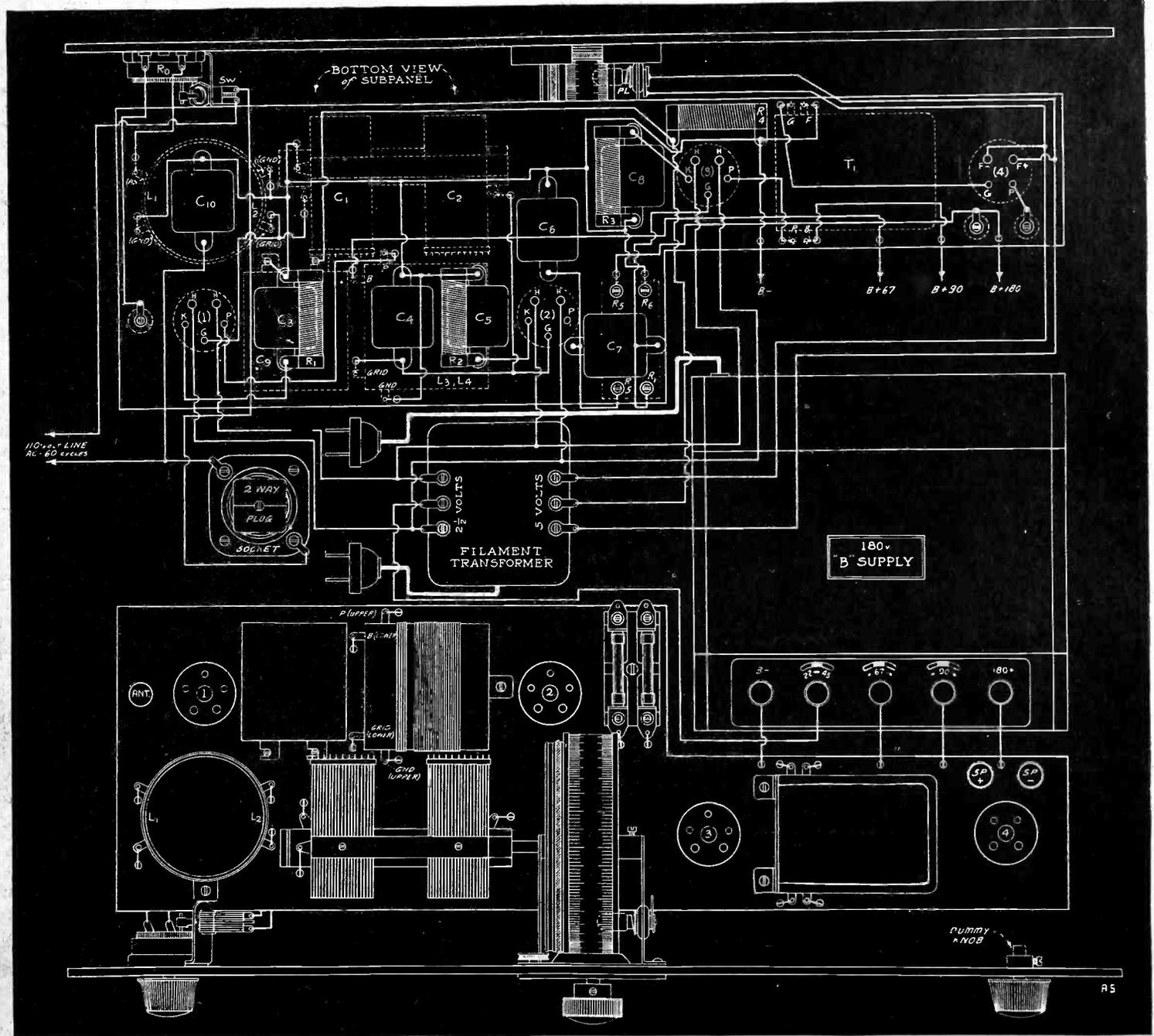
Line Noise Elimination

How Speakers Work

Chain Order
Is Postponed
Another Month

Experts Clash
On Ending Life
of Radio Board

AC 4 PICTORIAL DIAGRAM

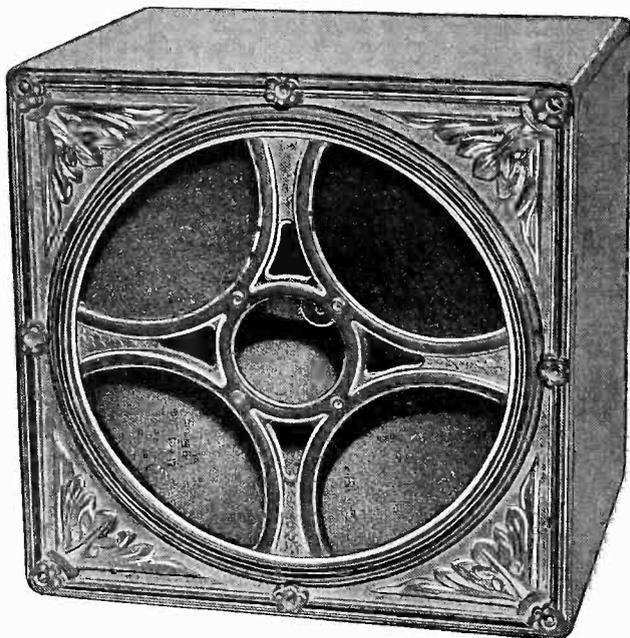


The Diagram of the AC 4 is One-third Scale.
Below is the Top View. Above is the Interconnected Bottom of the Subpanel,
with wiring drawn in the proper direction.

See article on pages 16 and 17

New Ivory Finish POLO SPEAKER

The Most Beautiful Reproducer on the Market!

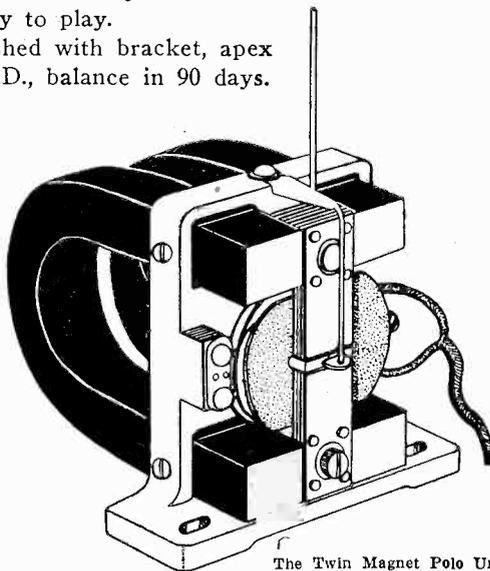


The polished tusk of an elephant is one of the choicest substances for the production of art objects, including precious carved trinkets. This Ivory effect is now obtainable in the Polo Speaker (shown 1-3 scale). A new spraying process gives the real ivory effect—as entrancing as anything you've ever seen.

THE table Model Polo Speaker (illustrated) in a de luxe ivory finished housing, with moulded metal front piece, makes an outstanding table model speaker. It will stand the heaviest load—even two 250 tubes in push-pull without rattling—yet it is so sensitive it will work well from any output tube, even a 201A! The super-sensitive Twin Magnet Polo Unit is used, with a Burtex cone. Order one today at \$13.50, on 10-day trial. Pay \$9.00 C.O.D., rest in 90 days. You will receive the factory-built speaker, all ready to play.

The Polo Twin Magnet Unit is furnished with bracket, apex and 10-ft. cord, at \$10.00. Pay \$6.00 C.O.D., balance in 90 days.

A characteristic of the Polo Unit and the Polo Speaker is full, rich rendition of the low notes, due to even frequency response over the entire audible scale.



The Twin Magnet Polo Unit

Acoustical Engineering Associates,
143 West 45th Street, N. Y. City.
(Just East of Broadway)

Please ship at once:

One Ivory Finish Polo Speaker, at \$13.50; \$9 payable C. O. D., rest in 90 days.

One Polo Unit with bracket, apex, chuck, nut and 10 ft. cord, at \$10.00; \$6.00 payable C. O. D., rest in 90 days.

[Put cross in proper square above.]

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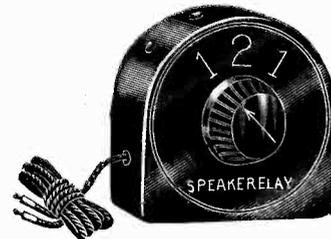
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Six Months 3.00
One Year, 52 Issues 6.00
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please find enclosed

\$100.00 WORTH
of Pleasure and Convenience
for Only **\$2.00**



IF you have two loudspeakers and want a convenient method of playing both at the same time, or one at a time, the Speakerelay gives you that service at the turn of a knob. Simply connect the Speakerelay cord tips to the output (speaker posts) of your receiver, and put the cord tips of one speaker in the first two holes (shown on top in illustration) and the cord tips of the other speaker in the remaining two holes (not shown). Then point the knob to "1" at left to play the speaker whose cords are at left, or point the knob to "1" at right to play the other speaker. Or, to play both together, point the knob at "2".

Instead of using two speakers you may use one speaker and one pair of earphones. This is a great asset when tuning in DX, for with earphones you may readily discern the call letters that might not be so plain on the speaker. Also, any weak station may be tuned in with more accurate sharpness with earphones—and remember the speaker may be going all the while!

Another fine advantage is that anybody hard of hearing can listen to any program on the earphones, while the others hear it from the speaker—all simultaneously, remember!

Or you might want to listen in late at night on earphones alone, so as not to disturb anybody. Your set may have no detector listening post. Simply cut out the speaker—by a mere turn of the Speakerelay knob—and adjust the volume control of your receiver until reception is just comfortably loud on earphones.

Get one of these Speakerelays today, at only \$2. It is sturdily built in a molded bakelite casing, only 2 3/4" high. Positive, unerring contact affords dependable results. It offers instantaneous convenience. There is no loss in volume when this device is used.

Members of the trade, service men, salesmen, etc., use the Speakerelay to compare two speakers in a store or in the home.

You can get \$100 worth of service out of one of these \$2 products!

Cat. No. 121 (illustrated).....\$2.00

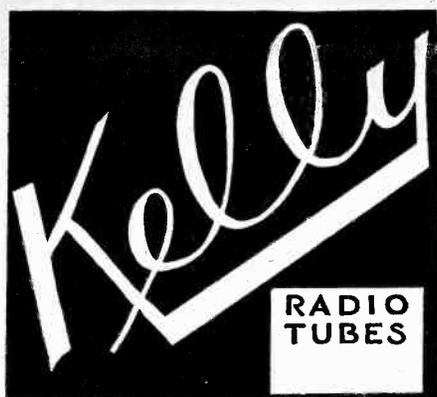
If you desire a Speakerelay that enables comparison of four different speakers, so any one may be played at a time, but all connected in the casing, then order Cat. No. 1234.

Cat. No. 1234.....\$2.50

We stock the Speakerelays in quantity and sell them singly or in multiple lots, on an immediate delivery basis. We also have them on display at our office, so, if convenient, come in and see them.

A five-day money-back guaranty attaches to each purchase of a Speakerelay.

Guaranty Radio Goods Co.
145 West 45th Street
New York City
(A few doors East of Broadway)



**LONGER LIFE
BETTER TONE
MORE VOLUME**

A guarantee slip is contained in each carton. Fill this out and earn FREE tube insurance. Built to excel, KELLY TUBES open new vistas of radio reception.

401A	\$1.00
4X Special Detector	2.00
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422 SCREEN GRID

Our 422 stands up.

440 HIGH MU

great for resistance or Impedance audio

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Screen Grid Universal

One screen grid 422.....\$3.50
Two 410A at \$1.00 each..... 2.00
One 412A (for 135 volts)..... 2.00
or One 471A (for 180 volts)..... 2.00
Send \$7.50 for set of four tubes for this receiver.
Specify whether power tube wanted is 412A or 471A

KELLY TUBE COMPANY
57 Dey Street New York City
10-Day Money-Back Guarantee

Front Panel and Subpanel for the

Screen Grid Universal

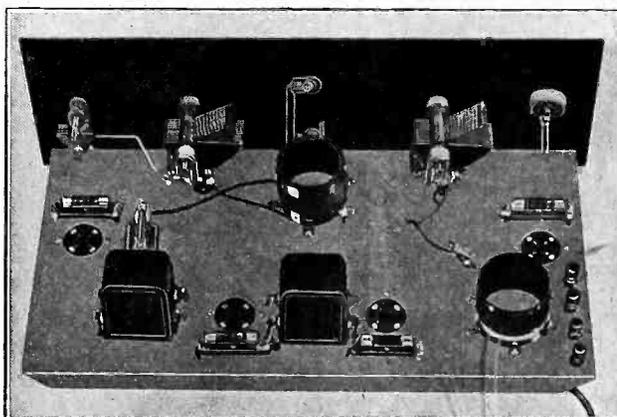
Bakelite front panel alone, drilled....\$2.35
Drilled aluminum subpanel alone, with self-bracketing feature, built-in sockets, extra washers and hardware..... 3.00
Both front and subpanel together.... 5.00

GUARANTY RADIO GOODS CO.
145 West 45th Street, New York City
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RADIO WORLD, published every Wednesday, dated Saturday of same week, from publication office, Hennessy Radio Publications Corporation, 145 West 45th Street, New York, N. Y., just east of Broadway. Roland Burke Hennessy, President; M. B. Hennessy, Vice-President; Herman Bernard, Secretary. Roland Burke Hennessy, Editor; Herman Bernard, Managing Editor; J. E. Anderson, Technical Editor; Anthony Sodaro, Art Editor.

RADIO WORLD, a weekly paper, published by Hennessy Radio Publications Corporation, from Publication Office, 145 West 45th Street, New York, N. Y. Phone: BRYant 0558 and 0559. 15c per copy, \$6 per year. This issue is dated February 2d, 1929, and is Vol. XIV, No. 20. Whole No. 358. Entered as second-class matter, March, 1922, at the post office at New York, N. Y., under Act of March 1879.

**Build the New
SCREEN GRID UNIVERSAL!**



Unusual Results on Four Tubes!

HOW much can one achieve on only four tubes? The new Screen Grid Universal is the answer. It meets all the requirements of the wavelength reallocation, brings in distant stations distinctly, affords exceptional tone, and is easy to build. You'll be surprised at the results. Your friends, too, will admire your receiver. You can sit them down in your parlor and give them loud-speaker reception of distant stations they never heard of—100-watt stations, too!

The screen grid tube is used as a radio frequency amplifier in a new and most efficient manner. Correct circuit design and co-ordinated parts make this circuit outstanding. Build it now!

Very Selective, Yet Lots of Volume!

Two dials tune in the entire wavelength band, using either .0005 mfd. or .00035 mfd. tuning condensers. The circuit affords all the selectivity you need, separates stations excellently and without "background reception," and despite this fine selectivity, affords more than enough volume, so that you must tune it down with the volume control, even on far-distant stations!

The screen grid RF tube is followed by two -01A tubes, while the output tube may be a -12A or -71A power tube, depending on whether you have 135 volts or 180 volts maximum at your disposal.

Screen grid coils especially designed for this receiver permit you to obtain any desired degree of selectivity, but always with a high level of reproduced sound. The primary of the interstage coupler is tuned, while the secondary doubles the voltage by step-up ratio.

The circuit is stable, easy to build, easy to tune. Build it from the official blueprint and the theoretical expression and constructional details in the December 1st, 8th and 15th issues. This blueprint was made directly from the laboratory model of this receiver as constructed by Herman Bernard, the designer. It is a remarkable blueprint, because the wiring that is done on top of the subpanel is shown just as you want it, in the actual manner of its appearance. Also, the wiring underneath the subpanel is shown as it actually appears. Hence there are two separate, clear life-sized views on one sheet, not just one view, made to appear "transparent." When you turn the subpanel upside down for underneath wiring you don't have to imagine the direction the leads take. Nothing is left to the imagination.

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Enclosed please find \$1.00 for which send me at once a blueprint of the 4-tube Screen Grid Universal Receiver, as designed by Herman Bernard.

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SCREEN GRID COILS for the

4-tube SG Universal

- Antenna coil, Model RF5 for .0005 mfd..... \$1.00
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SCREEN GRID COIL CO.
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Complete Kit of Parts for the Four-Tube Screen Grid Universal

As Specified by Herman Bernard
What You Get L1, L2—One Screen Grid two-winding RF transformer, with center-tapped secondary; Model 5RF for .0005 mfd. L3, L4—One Screen Grid high impedance interstage coupler, with center-tapped primary; Model 9TP for .0005 mfd. C1, C2, C3—Two Hammarlund Midline .0005 mfd. tuning condensers. C4—One Hammarlund junior condenser; Cat. No. MC11 (50 mfd.). R1—One Lynch metallized grid leak, 2 meg. R2—One No. 622 Amperite, with mount. R3, R4, R5—Three No. 1A Amperites with three mounts. Rh—One 50-ohm rheostat. Y1, Y2—Two National new audio transformers. SW—One filament switch. PL—One pilot light bracket with lamp. Two dials with two dial pointers. Two knobs. Four binding posts (Ant., Gnd., Speaker plus, Speaker minus). One 10x20-inch aluminum self-bracketing subpanel, with sockets affixed, and including hardware and insulating washers. One 7x21-inch drilled Bakelite front panel. One nine-lead battery cable. One Peewee cell.

\$35.00

NET
Blueprint Free With Each Kit Order
CUSTOM SET BUILDERS SUPPLY CO.
57 Dey Street, New York City
Tel. Barclay 8659 Corner Greenwich Street

BLUEPRINT FREE!

4-Tube Screen Grid Diamond of the Air Blueprint, full sized picture wiring diagram; also schematic diagram and panel layout.

At 15c per copy RADIO WORLD costs you 60c for four weeks. But if you send 50c NOW you get the first and only national radio weekly for four consecutive weeks and this handsome official blueprint FREE!

This blueprint is life-sized and shows in easy picture diagram form how to mount parts and wire this super-sensitive receiver. One screen grid tube is used as radio frequency amplifier. The rest of tubes are two-01A and one 112A.

This circuit gives you distance, tone quality, ease of performance. No shielding, no neutralizing required!

Radio World, 145 West 45th Street, New York City

Enclosed please find 50 cents (stamps, coin check or money-order) for which send me RADIO WORLD for four weeks, and free Diamond S. G blueprint.

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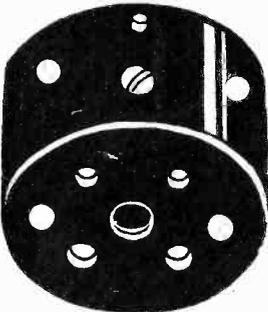
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Renewal.

If you are already a mail subscriber for RADIO WORLD you may extend your subscription four weeks and get free blueprint, but put a cross in the square.

SAVE THOSE TUBES!



Many persons have sets with Navy type sockets—the kind with the collar on and the bayonet hinge for the pin on the base of the tube. If you put a UX 199 tube in a Navy type socket a short may blow out all the tubes. Play safe and have fine contact blades. Use an adapter that fits UX 199 into Navy sockets (Cat. No. UX). Price 30 cents each.

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McARTHUR'S SHELL TALLIES for scoring at bridge parties or for bridge favors. A beautiful, dainty, unusual and useful gift utterly unlike anything else you have ever seen. When you use them at your next bridge party, all your friends will want to know where you got them. \$3.00 a dozen (for twelve place cards and tallies), postpaid. C. McArthur, 620 Plaza Place, St. Petersburg, Florida.

**KILLS
RADIO
NOISES**

**ELIMINATES
A·C·HUM
LINE NOISES
AND ALL DISTURBANCES
FROM ELECTRICAL SOURCES**



The SI-LEN-SER makes any electric or any electrified set play as quietly and free from hum as any battery operated receiver. The SI-LEN-SER silences all stray power line noises which enter the receiver through the power packs of electric sets and eliminators.

The SI-LEN-SER eliminates absolutely all hum from powerhouse generators, and all bothersome knocks and noises that emanate from such electrical sources as nearby power lines, such electrical devices as electric refrigerators, vacuum cleaners, oil burners and other noise-breeding electric household apparatus.

EASY TO HOOK UP

All that's necessary is to plug the SI-LEN-SER into your wall or light socket, plug your set into the SI-LEN-SER, then make a ground connection. That's all there is to it. The SI-LEN-SER is small and compact, being 3½ inches in diameter and 5 inches high. In addition to eliminating hum and other noises the SI-LEN-SER also prolongs the life of your A.C. tubes and enables you to use them at their maximum efficiency.

USED ON ANY VOLTAGE FOR ANY CURRENT

The SI-LEN-SER is absolutely universal. It works efficiently on either alternating or direct current and on any voltage or cycles, with any eliminator, either old style or new. The SI-LEN-SER is the device that all radio engineers have been seeking to make the electric set perfect. With the SI-LEN-SER, the clear and noiseless reception of a battery-driven receiver is now possible with the convenience of an electric radio.

Sold by All Dealers

If your local dealer cannot supply you with a SI-LEN-SER, write us direct. The SI-LEN-SER is approved by radio engineers and fully guaranteed against electrical and mechanical defects.

\$12.50
List

Positively no C.O.D.'s unless accompanied by 20% of the price.
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NEW YORK, N. Y.

AC DYNAMIC CHASSIS

110 volt 50-60 Cycle Model, with Built-in Rectifier and Output Transformer

YOU simply must get a dynamic speaker. There's nothing more important to your radio installation. Everybody's getting one. Why deny yourself the advantages of most superior tone realism? Your set can't overtax a dynamic speaker. You can't buy anything at anywhere near our prices that will give you such satisfaction.

All you need is the chassis. It plays splendidly just as it is. You may put it in a baffle box, or in a cabinet, if you like.

If your home is wired for electricity of the alternating current type, 110 volts, 50 to 60 cycles, then get the AC model at \$23.52. It has a plugged cord for connection to the lamp socket or convenience outlet. The two extra leads, with tips on, go to the output posts of your receiver—the speaker posts.

The AC model has a built-in rectifier that changes the AC (alternating current) to DC (direct current) and filters it. The rectifier is

shown at right in the illustration. Also there is a built-in output transformer. (at left in illustration). Your receiver therefore needs no output transformer—there is one in the dynamic chassis.

For best results use as the output tube of your receiver any of the following power tubes—120, 171, 171A, 210, 250, or two in push-pull. If your set has a 112 power tube put in a 171 and increase the negative grid bias. If your set has a 112A or a 201A for the output tube, put in a 171A and increase the negative grid bias. No other changes are necessary.

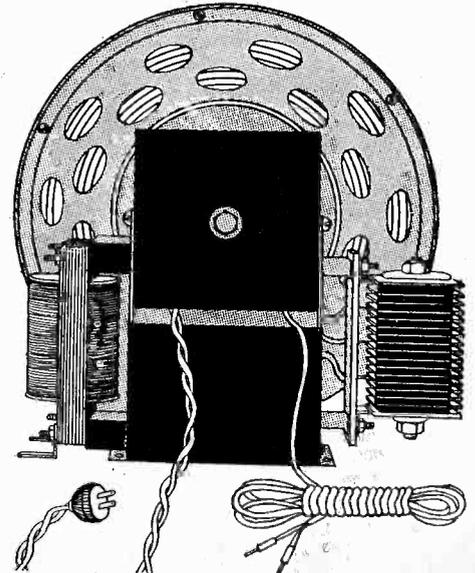
Remember that the dynamic is this year's supreme contribution to radio, and you must share in this fine advantage to enjoy the best and be thoroughly up-to-date.

6-VOLT MODEL

If you have a 6-volt storage battery to heat the filaments of your tubes you may use the 6-volt model dynamic chassis with equal results. The current drain is low. But if you have AC house supply of electricity, even if you use a storage battery, the AC model dynamic chassis is recommended, because if you decide at any time to have an AC set you'd have to retain the storage battery just to run the 6-volt model. If you have no electricity in your home, then you must use the 6-volt model. It looks exactly like the other model, except that the rectifier is omitted as unnecessary. The current used is already direct. The output transformer is built-in, however. Both models perform alike.

\$17.64

\$23.52



The AC model, 110 volts, 50 to 60 cycles, is illustrated. It has built-in rectifier and filter and built-in output transformer. Price, \$23.52

Acoustical Engineering Associates,
143 West 45th Street, N. Y. City
(Just East of Broadway)

Please ship C.O.D. at once.

- One 110 volt, 50-60 cycle AC Model dynamic speaker chassis at \$23.52, plus cartage cost.
- One 6-volt Model dynamic speaker chassis at \$17.64, plus cartage cost.

Name

City State.....

Address

CALDWELL ALL SET TO RESIGN BY NEXT MONTH

Washington

Having hinted several times that he would like to resign, to resume his editorial work with the McGraw-Hill Publishing Company, of New York, Commissioner Orestes H. Caldwell has decided that "now is the time," and will not seek reappointment, even if the White bill is enacted to extend the life of the Commission for another year, until March 15th, 1930.

Mr. Caldwell was editor of "Radio Retailer," published by the company. He accepted appointment by President Coolidge in the expectation he would not be away from his editorial work for long. But he has been at his task almost two years, and each time he tried to detach himself from his present duties some radio problem would arise, and he would stay in office.

Played Leading Part

During part of his tenure he was being paid by the McGraw-Hill Company the difference between his salary as Federal Radio Commissioner and the larger pay he received from the publishing company as editor, but after this fact was aired in Congressional hearings the difference payments were discontinued, at Mr. Caldwell's request, so he has an added reason to return to his life work.

During his tenure Commissioner Caldwell has played a leading part, and has earned much respect for his frankness, even from those who disagreed with him on the policies he advocated. He has been an enthusiastic supporter of high power and cleared channels, has freely admitted shortcomings of the Commission, advocates that its life as an administrative body be permitted to expire, without extension, and has stated that little of an emergency nature remains to be solved.

Has Been Storm Center

Mr. Caldwell is a radio experimenter himself, and his home in New York is equipped with many novel radio and other electrical devices, some of them of his own invention, many at least of his own devising.

Congressional storms have swirled about Commissioner Caldwell's head, and his very confirmation was the subject of heated debate in the Senate.

With his engineering knowledge he has been able to get a good grasp of the radio problems.

Louis G. Caldwell, general counsel of the Commission, not related to Commissioner Caldwell, recently resigned, but had to defer the effective date, because of legal problems of the Commission, in which he was specially well versed. Counsel Caldwell is a Chicago lawyer, specializing in radio work, and will return to private practice, effective February 23rd.

CONVENTION THIS MONTH

The annual convention of the Federated Radio Trade Association will be held in Buffalo, N. Y., February 18th and 19th.

TWO BEAUTIES HEARD



MARY LEWIS, FORMER "FOLLIES" GIRL, NOW A SOPRANO OF THE METROPOLITAN OPERA COMPANY, NEW YORK CITY, SANG CALIFORNIA SPANISH FOLK SONG AT A RECENT ATWATER KENT RADIO HOUR.



BEATRICE HARRISON, ENGLAND'S BEST KNOWN WOMAN CELLIST, WAS HEARD ON THE SAME PROGRAM.

ORDER LIMITING CHAINS PUT OFF UNTIL MARCH 1

Washington.

The effective date of the chain broadcasting order of the Federal Radio Commission, limiting duplicated operation on cleared channels to stations more than 300 miles apart, has been postponed from February 1st to March 1st, under a General Order adopted by the Commission.

The action was taken on motion of Commissioner Lafount. He said that studies thus far show that the probability is "that the effect of General Order No. 43 as it now stands will be to deprive important regions of programs which they now desire."

The Commission adopted the original General Order in September, to become effective along with the general reallocation of November 11th. But stations, manufacturers and listeners complained, and the Commission, in October, deferred the effective date until February 1st. Pending a survey of the effect of the order and the extent to which regions desiring certain programs would be deprived of them.

The new general Order, (No. 57) follows in full text:

"The Federal Radio Commission hereby postpones the effective date of General Order 43, limiting duplicated operation on cleared channels to stations more than 300 miles apart until March 1st.

"The full text of the resolution introduced by Commissioner Lafount, and adopted by the Commission, with Commissioners Sykes and Pickard dissenting, follows:

"Whereas, the Engineering Division of the Commission has not yet completed its survey of the effect of Order No. 43 to determine to what extent regions of the country desiring certain programs will be deprived of them, and

"Whereas, it appears from the study so far made by the Engineering Division that the probability is that the effect of General Order No. 43 as it now stands will be to deprive important regions of programs which they now desire, and

"Whereas, it appears necessary that a method be evolved for determination by the Commission of the question as to whether there is excessive duplication of programs in any particular region, and if any, the plan of remedy therefor.

"Be it therefore resolved, that the effective date of General Order No. 43 be further postponed until March 1st, 1929, and that a General Order to this effect be issued and promulgated."

TELEVISION HEARING SOON

Washington

A hearing as to the advisability of permitting visual broadcasting within the broadcasting band will be held at the Federal Radio Commission on February 14th.

Evidence as to whether television and picture transmission can be accommodated on a 10-kilocycle band of frequencies, as is audible broadcasting; whether such transmission will result in undue interference with broadcasting; whether there is any general public interest in having such transmission take place in the broadcast band rather than on short waves will be heard.

LET BOARD DIE, IS PLEA OF ONE COMMISSIONER

Washington.

One of the Federal Radio Commissioners opposes the White bill to extend the life of the Commission for one year; that is, until March 15th, 1930. That Commissioner is Orestes H. Caldwell, of New York (First zone). He testified before the House Committee on Merchant Marine and Fisheries. He believes the Department of Commerce can administer radio affairs and that the Commission may serve as a quasi-judicial body solely.

Commissioner Caldwell, replying to Representative Davis, of Tullahoma, Tenn., declared that the administrative activities of the Radio Commission should return to the Department of Commerce.

Representative Davis called attention to testimony before the committee two years ago by Herbert Hoover, who, as Secretary of Commerce, declared that the problem of radio was too big to place upon any individual and that it should be vested in a commission. At that time, said Mr. Davis, Secretary Hoover declared that "big contests" would arise.

Did Well in Past

Mr. Caldwell responded that the Department of Commerce, under Secretary Hoover, had handled radio problems well in the past, and that he has "every reason to believe that they will be handled well in the future."

"President-elect Hoover years ago gave warning to this committee that were disregarded and that apparently have come true," said Representative Davis.

"It is a revelation to me," Commissioner Caldwell observed, "how much Mr. Hoover knew about the subject then. The Commission is just learning it now."

Asked by Representative Davis whether conditions were "better or worse" as a result of the reallocation, Mr. Caldwell said he considered the "general situation is improved," and that "certainly every effort has been made to give greater service to the most people." He added that he thought this has been done.

Query on Favoritism

Representative Davis endeavored to bring out that of the 43 stations of the Columbia Broadcasting System, only one, WCCO, at Minneapolis-St. Paul, had a power assignment in excess of 5,000 watts, in contrast to the several stations on the National Broadcasting Company's chains, that have power of 50,000 watts.

Discusses Cleared Channels

"Are not these stations of the Columbia chain serving the country satisfactorily without high power?" he asked.

Mr. Caldwell explained that the Commission has not taken into consideration the fact that a station was a chain station in assigning it a cleared channel and that all stations on cleared channels are potential users of super-power. Two of the Columbia chain stations are authorized to use that amount of power, he said.

ART LECTURES TO BE GIVEN

Cincinnati

A series of art lectures will be broadcast from WLW by Dr. Henry T. Bailey, head of the Cleveland Art School and curator of the Cleveland Museum, beginning Tuesday, February 12th, at 1:30 p. m.

'TIS AS IT SEEMS



(Paramount)

SOME OF THE TOOTS OF A BABY HORN AND THE PLUNKS OF A XYLOPHONE SOUND AS IF THE PLAYERS WERE MAKING FUNNY FACES WHILE PRODUCING THE MUSIC. SO IT IS, AS NEIL HAMILTON AND MISCHA AUER PROVE AT KNX, LOS ANGELES.

TRADE IS COOL TO BOARD LIFE

The life or death of the Federal Radio Commission is a matter of small concern to the Radio Manufacturers Association, said Bond P. Geddes, after a trip to Washington, where he held conferences.

Mr. Geddes said:

"The sentiment regarding the life or death of the commission is scrambled. There seems to be an indifference on the part of Congress and also in radio circles. However, the radio manufacturers are perfectly agreeable to try the commission for another year.

"The current situation is very much involved politically. Some of the politicians apparently want to kill the Commission, so to speak, by tying the bill to extend its life up with more radio legislation, which will no doubt lead to a jam and final blocking of the bill at the final session of Congress.

"No one seems to be particularly worried, because all realize that should the control of broadcasting pass to the Department of Commerce, it will be in able hands, as it was previous to the creation of the Commission."

Ether is Owned By Whole World

Ottawa, Canada.

The whole world owns the ether, the International Radio Conference agreed, thus sustaining the principles laid down in the 1927 conference that there is no sovereignty in the ether. Each country is duty-bound to prevent interference in its own domain, and by mutual agreement with neighboring countries to aid the same end co-operatively.

Canada, Newfoundland, Cuba and the United States participated in the conference. Federal Radio Commissioner Sykes, on behalf of the United States, reciprocated Canada's good wishes.

VAUDEVILLE'S MASTERS GIVE THRILLING HOUR

The masters of the art of vaudeville selection, arrangement and presentation put on the best regular variety bill that ever graced the air when the Radio-Keith-Orpheum Hour was inaugurated recently. WEAf was the station. The coast-to-coast chain carried the program. The new hour was thrilling—a perfected structure in every detail. Not only was the program notable for the top-notch talent, with every act a feature, but it marked the first official public appearance of the new entity, R-K-O, in which the Radio Corporation of America and the Keith-Albee-Orpheum group have a united interest. The RCA interest is through its subsidiaries, the National Broadcasting Company and Photophone. The link-up as to Photophone affects "talkies" in K-A-O theatres.

New Attitude

The winning of the great vaudeville booking and theatre-owning organizations to radio represented a complete reversal of the early reaction to radio, which was then regarded as a menace to the vaudeville theatre. However, radio has proved its worth, and the co-operative use of this medium is expected to make radio listeners still more anxious to see and hear the great artists in person on the stage.

The first program comprised eight vaudeville features and an address by Hiram S. Brown, president of R-K-O.

Remote control was worked in its intricate aspect without a hitch, since voices were carried by wire from Boston, Chicago, Milwaukee and Philadelphia, and "nemoed" with fine skill.

The Bill

The program, and the theatre in which the artist was booked at the time of the broadcast, follow:

Henry Santry and his band, Keith Memorial Theatre, Boston.

Will Fyffe, Scotch comedian, Keith's Palace Theatre, New York.

Adele Verne, pianist, Palace Orpheum Theatre, Chicago.

Glenn & Jenkins, colored comedians, Grand Opera House, Philadelphia.

Mae Murray, screen star, and her Marimba Band, New York, Hippodrome.

Nick Lucas, comedian and singer, Palace Orpheum Theatre, Milwaukee.

Address by Mr. Brown.

Marian Harris, singing comedienne.

Henry Santry and his band.

R-K-O Orchestra.

The Hour is expected to be a feature each Tuesday evening.

Fight on Davis Law

Is Started in Ohio

Columbus, Ohio.

Asserting that the Davis equalization amendment to the Radio Law injures all zones except the Fifth (Far West), and that Ohio suffers particularly, C. C. Hollenbach, director of WAU, Columbus, has asked the twenty-six stations in Ohio to join in a demand for rescinding the amendment.

The support of United States Senators and Representatives is to be enlisted.

SHORT WAVES TO ONE GROUP UNDER ATTACK

Washington.

At Congressional hearings on the bill to extend the life of the Radio Commission for one year Representative Free, of California, raised questions affecting the propriety of the grant by the Commission of forty shortwave permits to the Universal Wireless Communications Co., of Buffalo, N. Y., to send and receive messages. Commissioner Sykes, Lafount and Robinson voted in favor of the grant. Commissioners Caldwell and Pickard did not.

Representative Bland questioned Mr. Caldwell concerning the recent shortwave allocation.

"Will the establishment of the radio telegraph network of the Universal Communications Company create a competition with the Western Union and other telegraph companies" he asked.

Approves Competition

"Yes, and I think it would be desirable," responded Mr. Caldwell.

Representative Rowbottom (Rep.), of Evansville, Ind., said he understood this "is the complaint that the metallic wire companies have against the wireless company."

Representative Larsen, of Georgia, asked Mr. Caldwell why the Commission had denied the application of the Radio Corporation of America for short waves. He cited the fact that the Radio Corporation has been long in the trans-Atlantic and trans-Pacific radio field.

Chance for R. C. A.

Mr. Caldwell indicated that the Radio Corporation would obtain some short-wave channels. He declared he had heard it said that the short-wave channels allocated to the Universal Company were worth \$1,000,000 each.

WHAT READERS WRITE

EDITOR RADIO WORLD:

I HAVE read with interest comments and articles on the reallocation of stations and can heartily agree with WLW that the air is full of howls and squeals.

I also noted an article in which the Radio Commissioners try to discourage stations from appealing to their listeners for justice.

I don't agree with them. For instance, KFBK, of Laramie, Wyo., the only station in Wyoming, has 500 watts on 600 kc. It has appealed for 1,000 watts, but without success; also for better frequency, with the same result. This channel is congested in the local territory, as San Diego interferes at all times. Wyoming ought to be entitled to at least one station with 1,000 watts and on a good channel.

Further, the chain stations have increased. Now we get from ten to twenty different channels with the same programs. The Commission may have helped some localities, but not this.

The wave channels from 900 kc. up are just a muddle. The idea of giving a station low power and putting it on a low wavelength is bad. Low power and high wavelength would come nearer spreading them out.

CLARENCE A. BRADY,
Columbine, Colo.

"MIKE" FOREVER



HAVING BEEN WGY'S LEADING LADY WHILE A STUDENT AT ALBANY, N. Y., AND ALSO A STAGE ACTRESS LATER, ROSALINE GREENE IS NOW LEADING LADY OF THE EVEREADY HOUR, IRRETRIEVABLY WON BACK TO THE MICROPHONE AS AGAINST STAGE APPEARANCES. SHE IS SHOWN IN CHARACTER, OTHERWISE HER HAIR WOULD BE COMBED.

OUR ROSALINE IS "OFF" STAGE

Rosaline Greene, who was leading lady of the WGY players at Schenectady during her college days in Albany, is now the leading lady of the Eveready Hour. She is supported by a regular stock company.

Recently she played in stock and on Broadway, but she possesses no desire to win triumphs on the "visible stage." She admits frankly that she likes radio better than the stage, and that she would far rather play to an invisible audience of a million or more listeners than before a visible audience in a theatre.

On the stage she played "Josephine" to Lionel Atwill's "Napoleon" in the play of the latter title.

"I don't want to be any other type of actress," she said recently. "Why should I? I started in radio, have made my chief progress in it, and find a variety in it that the legitimate stage doesn't possess. As for responsiveness, I often get more letters about one appearance than an entire theatre audience numbers.

Possessed of a voice that won first prize at The Radio World's Fair, the Eveready leading lady is dowered with more than the average actress' share of beauty and charm.

Rosaline Greene was born on Long Island and attended the New York State Teachers College at Albany.

"I love radio," she says simply. "It's meat and drink to me. I hope I am in it always."

MONOPOLY SUIT HELD QUASHED ON THE MERITS

Washington.

The resolution requesting the Federal Trade Commission to turn over to the Attorney General all the testimony in the case against the Radio Corporation of America, General Electric Company, and six other companies alleging monopoly and unfair competition in violation of the anti-trust laws, is founded upon "an implication of fact entirely erroneous," Mantion Davis, vice-president and general counsel of the Radio Corporation, said.

The full text of Mr. Davis' statement follows:

"An implication of fact entirely erroneous is the foundation and the basis of the resolution introduced by Senator Dill in the Senate and by Representative Davis in the House.

Wrong Implication

"The resolution implies that the Federal Trade Commission on December 19, 1928, dismissed the proceeding then pending against the General Electric Company, the American Telephone and Telegraph Company, the Westinghouse Electric and Manufacturing Company, the Radio Corporation of America, and others, on the ground that the Federal Trade Commission had no jurisdiction of the matters complained of.

"The proceedings before the Federal Trade Commission and the order of dismissal entered by it support no such conclusion. The proceeding was dismissed by the concurrence of four of the Commissioners, one of whom announced that he concurred for the reason that the Commission was without jurisdiction to enter an effective order. The fact that three other Commissioners concurring found no occasion to qualify the basis for their concurrence conclusively indicates that the respondents' motion to dismiss 'because of lack of sufficient proof,' as well as for lack of jurisdiction, had been sustained.

Lack of Proof

"The complaint was filed January 24, 1924, and thereafter the Commission for four years took testimony all over the United States. The testimony covered 16,967 pages and was finally concluded in 1928.

"Shortly after the Commission had concluded its voluminous testimony, the corporations concerned, on the record which the Commission itself had made and without taking any testimony on their own behalf, set the case down for a hearing on the ground that the evidence taken did not support the complaint and on the further ground that the Commission was without jurisdiction.

"Voluminous briefs were filed and a full argument was had. More than five-sixths of the briefs and arguments were directed at the issue of the failure of the Commission's proof. After a deliberate consideration of briefs and arguments the Commission dismissed the complaint without calling on the corporations concerned to produce any testimony.

"The record cannot support any other conclusion than that after four years of earnest effort and 17,000 pages of testimony the Federal Trade Commission could not find sufficient evidence to justify conclusions that the corporations concerned had violated the laws of the United States relating to trusts, monopolies and unfair competition."

CONGRESS GETS ADVICE TO O. K. 250,000 WATTS

Washington. Commissioner Caldwell opposed the Davis amendment or so-called equalization law as defeating just equalization. There are five zones. These, he said, are so dissimilar in shape that it is impossible to give to certain geographical areas as many radio facilities as they can accommodate, but which are restricted because the law provides that each zone shall have an equal amount of channels, stations and power assignments.

The zone system, said Caldwell, should be dropped altogether, with the states basis substituted.

Zones Work Hardship

The zone system, he declared, works hardship on the fifth or Pacific zone, which is geographically large and could accommodate more stations than the small and compact first or Eastern zone, without overloading the channels.

But the law provides that there shall be no more stations in the fifth than there are in the first zone, or that each of the five zones have the same amount of facilities.

Peculiar atmospheric conditions also must be taken into consideration, according to Mr. Caldwell. "There should be equalization of programs and field strength rather than equalization of transmitters," he said.

Recommends 250,000 Watts

Replying to questions of Representative Reid (Rep.), of Aurora, Ill., Mr. Caldwell said the "highest possible power" should be put on cleared channels in order that the greatest service may be provided to rural listeners.

He said he believed the authorities should "insist upon higher power" in the interest of the public and that later the maximum power assignments will not be 50,000 watts as at present, but perhaps 250,000 watts.

"Super-power is the only way the farmer can get satisfactory service," said Mr. Caldwell. "It is his only chance at anything. There are 40,000,000 farmers who, prior to the allocation, got little or no radio."

R.M.A. to Maintain Trade Bureau in N. Y.

Establishment at New York headquarters of the Radio Manufacturers Association of a merchandising bureau was recommended by the Merchandising Committee, headed by L. E. Noble of Buffalo, N. Y., and approved tentatively by the board of directors.

Lloyd A. Hammarlund, of New York, chairman of the statistics committee, reported progress in developing reliable and accurate industry statistics.

New and valuable measures to extend the credit and collection service were reported by Theodore Sheldon, of Chicago, Chairman of the credit committee.

KILO—How good is your set?

WATT—Not good enough to do all I want it to do, but better than its trade-in price. If I could choose between buying a new set and enduring the old one, I'd buy the new one and give the old one away.

KILO—That's why I brought my car.

THE AIR COLUMN

The Radio Commission will hold a hearing to determine whether television equipment that people don't possess is popular with those who would like to know what it is all about.

* * *

Brazilian trying to monopolize the word "radio" should pick on the word "interference" instead.

* * *

Radio trade is indifferent to whether the Federal Commission lives and the Commission may return the compliment.

* * *

R. C. A. says the monopoly case was dismissed by the Federal Trade Commission because no monopoly was proved. Excited Congressmen can't understand why such action should be taken on so flimsy a ground.

* * *

Commissioner Caldwell favors letting the Radio Commission die, but the Commissioners who don't intend to resign can't agree with him.

* * *

The chain limitation order is honored more in the postponement rather than in the effectuation.

* * *

The West Coast enjoys programs sent by chains from the East Coast, and nativity doesn't matter.

* * *

EVERY TIME A LISTENER TUNES IN ONE STATION HE TUNES OUT 700 STATIONS.

* * *

Rosaline Greene wants no stage life, but a microphone life only. She gets so many responsive letters after broadcasting, she explains. The most important and persuasive missive is a slip of paper reading: "Pay to the order of Rosaline Greene."

* * *

WAIU director says the reallocation injures all zones except the Fifth (Far West), while Commissioner Caldwell says the Fifth fares the best. That puts the Third in first place by the doctrine of general average.

* * *

All ratings of zones are inversely on the square.

* * *

Distribution of radio privileges is one thing on which the American public cannot agree. They get too much information from people more eager than able to give it, therefore don't quite finish believing one thing before they start doubting it.

* * *

With fewer axes to grind, stations would have fewer problems to solve. With fewer problems to solve they would have more time to devote to program improvement. With more time to devote to programs they would give better service. If they give better service they become worthy of a cleared channel and high power, and have to meet attacks, instead of making them. So what's the use?

* * *

Congress said: "Let there be no equalization," and there was the deuce to pay instead.

* * *

Chairman Robinson wants a graduated license fee imposed on stations, so they will appreciate their privileges and act more responsibly. Why not tax the Chairman on that theory and let the stations alone?

* * *

The problem of radio installation in an airplane is to make the set and equipment lighter than possible, stronger than conceivable, and more sensitive than imaginable, without making a forced landing.—H. B.

NEW BID MADE TO MONOPOLIZE WORD "RADIO"

A second application in Brazil to obtain a trade-mark monopoly of the word "radio" was followed recently by a second protest of the Radio Manufacturers' Association to the State and Commerce Departments at Washington to protect general interests in the general term of "radio."

Second Attempt

A few months ago J. B. Junqueira, a Brazilian citizen, attempted to acquire exclusive rights in Brazil to the word "radio," by filing an application for trade-mark registration of the word. The R. M. A. protested and the State Department followed with energetic protests through the U. S. Embassy at Rio de Janeiro.

Early in January the R. M. A. was advised by C. J. Junkin, chief of the division of commercial laws, Department of Commerce, that the Radio International Corporation, Limited, had made another application for trade-mark registration of the word "radio."

R.C.A. Man Helps

Paul Dana, the Brazilian representative of the Radio Corporation of America, is lending his personal efforts at Rio de Janeiro in aiding the protest.

Increased Voltage Boosts Sensitivity

An ingenious service man recently utilized a simple stunt as a signal booster for electric sets by simply lowering the resistance of part of the fixed resistance network by use of an additional variable resistor. By this means an adjustable resistor of sufficient current-carrying capacity may be shunted across the maximum and the RF tap of the fixed resistance network and adjusted until the desired signal is obtained.

Volume and sensitivity are increased to an astounding degree. By employing a standard clarostat or a power clarostat, it becomes possible to obtain such a precise adjustment of resistance that the detector will operate at maximum sensitivity at any frequency without spilling over or breaking into oscillation. Fine results will be attained by adjusting the resistance over the entire wave length band, so that at the higher wave lengths less resistance will be required in order to obtain higher voltage on the radio frequency tubes and detector, while more resistance or less voltage will be necessary at the lower wavelengths where the tendency toward oscillation is found to be more pronounced.—J. H. C.

DYNAMIC SPEAKER AMPLIFIERS

The American Sales Co., 21 Warren Street, New York City, has obtained the available supply of Uni-Rectrons, for which there has been quite a demand of late, due to particular adaptability for dynamic speaker operation. The Uni-Rectron is a super-power amplifier, requiring no batteries for operation, being plugged directly into the 110 volt, 60 cycle line. The Radiotron 281 rectifying tube provides the voltage for the Radiotron UX210 power amplifying tube. Those interested should write above concern. Mention RADIO WORLD.—J. H. C.

NOVEL COURSE FOR ENGINEERS BEGUN BY N.B.C.

The variety of knowledge necessary to enable an engineer to render versatile service at a broadcasting station has prompted the National Broadcasting Company to inaugurate a special students' course. The company found there is a shortage of men equipped to render the necessary service, as engineering college graduates do not possess the wide scope of essential knowledge.

O. B. Hanson, manager of the N. B. C. plant operation and engineering department, said:

"Such a course is found to be necessary because it is becoming increasingly difficult to find engineers whose experience and contact are such that they can step into radio work without specific training.

Lack Diversified Knowledge

"We found that men efficient in the control rooms knew practically nothing about maintenance or transmission, while in the same fashion, men trained for the field group were unversed in other branches of the plant operations and engineering departments. When they could not be found the new course was created as an experiment."

The first enrollment consisted of seven college graduates, from 21 to 25 years old.

Mr. Hanson said the radio broadcast engineer must have a varied and complex knowledge of music, high-grade transmission, acoustics and the art of radio generally, both from the transmission and receiving viewpoints.

Morris Conducts Course

R. M. Morris is conducting the course, which covers the five technical branches of plant operations and the engineering department in six or eight months, the length of time depending on the student and his ability to assimilate the knowledge. A month or more is spent, progressively in the control room at 711 Fifth Avenue, New York City, the transmitting stations at Bellmore, L. I., and Bound Brook, N. J., the maintenance department, the field department and the laboratory.

Kay Finds Children Unafraid of "Mike"

Atlanta, Ga.

Microphone fright on the part of children is virtually unknown, said Lambkin Kay, WSB director and famous announcer.

Men used to addressing visible audiences often are frightened before the microphone, he added. He cited the case of one who was struck dumb with fright and handed his speech to an announcer to read.

Two Men Join Staff Of WABC Announcers

Ralph Wentworth, for several years an announcer at WEA, is now an announcer at WABC. He is heard regularly over the Columbia chain.

David Rosenthal, formerly of WBG, New York City, is now an announcer at WABC also.

They Say

ORESTES H. CALDWELL, Federal Radio Commissioner: "The Davis amendment works unjust inequalities on various States, quite the reverse of the equalizing sought. For example, under the application of the zoning in the Davis amendment, Texas is allowed less than one-half the number of wavelengths to which California is entitled. Yet Texas is larger than California in both population and area." * * *

DAVID SARNOFF, executive vice-president of the Radio Corporation of America: "Broadcasting has destroyed the incongruity of shoes and ships and sealing wax, of cabbages and kings. The witticism formerly evoked by the combination of soap and music, shoes and opera, oil and history has somehow lost its point. For, after all, the quality of a program rendered by a great artist of the operatic or concert stage is not influenced by whether it is supported by subscribers of the Metropolitan, or by toothpaste manufacturer seeking good-will for his product." * * *

HENRY A. BELLOWS, former Federal Radio Commissioner, now manager of WCCO, Minneapolis-St. Paul: "Chain broadcasting should not be regulated either by Congress or by the Radio Commission. The present complaint of the same programs dominating the dials will be cured by the requirements of the listeners and by the radio advertisers and not by legislation." * * *

GEORGE ENGELS, director of National Broadcasting and Concert Bureau: "Schumann-Heink, McCormack and other great singers who have appeared before the microphone have influenced numbers of people to develop their own vocal talents. Such broadcasts always brings in numerous letters asking for advice about voice development. Invariably a microphone performance by Casals, Zimbalist, Harold Bauer or Kochanski is followed by requests for information about proceeding with the study of the instruments these artists represent." * * *

C. J. PANNILL, vice-president and general manager, Radiomarine Corporation of America: "The design and manufacture of aircraft radio is a distinct problem of its own. The stringent limitations of weight and space must enter into the calculations, while care must be taken to insure simplicity of operation together with maximum efficiency. Transmitting and receiving equipment for installation on practically any type of airplane has been produced, rated at 100 watts, with a radio telephone transmitting range of about 150 to 200 miles, and a radio telegraph (CW) transmitting range of from 500 to 800 miles in daylight. The total weight, including wind-driven generator, is 86 pounds. This equipment may be had with a dynamotor energized from the same 12-volt storage battery which controls the starter and the lights of the plane." * * *

THE REV. DR. A. EDWIN KEIGWIN, pastor of West End Presbyterian Church, New York City: "The early outcry against the sacrilege of including religion in 'scrambled radio programs' is today shortsighted. For that sacrilege has turned out to be a Providence."

PACTS CALLED BIG DETRIMENT TO A FREE AIR

Washington

Charges that control of radio by a "radio trust" is a menace to the safety of the Republic, were made before the House Committee on Merchant Marine and Fisheries by Oswald F. Schuette, executive secretary of the Radio Protective Association.

Mr. Schuette testified in favor of the White bill to extend the life of the Federal Radio Commission another year after March 15th, and explained that he represented forty-four independent radio tube and accessory manufacturers which constitute the association.

Cites Agreements

In a statement read to the Committee, Mr. Schuette said the association makes a specific recommendation to Congress to instruct the Radio Commission, before granting any further licenses or renewals of licenses for communication or broadcasting, to make sure that the applicants have no outstanding contracts or other agreements "which would restrict them in making the fullest use of the wavelengths allotted to them."

He said the association had particularly in mind the agreements under which the Radio Corporation of America, the American Telephone and Telegraph Company, General Electric Company, Westinghouse Electric and Manufacturing Company, the United Fruit Company, and their various subsidiaries such as the National Broadcasting Company and the Radio Marine Corporation of America, "created the radio trust."

Freedom Spells Progress

The very progress of the radio art, said Mr. Schuette, depends upon "freedom of competition." Consequently, he declared, wavelengths should not be given to any applicant "who is bound, by his affiliations or his contracts, to restrict the fullest use of the channels that may be allotted to him." These franchises, he said, should be given only to those who come with free hands, unbound by any agreement that might interfere with the freedom of competition in radio.

Mr. Schuette charged that because "agreements which created the radio trust," the American Telephone and Telegraph Company, which, he said, owned the wire telephone monopoly, and also was given "the wireless telephone monopoly," one cannot telephone by wireless telephone from San Francisco to New York, but can to London.

Favors Present Provisions

The telephone company, he said, "by that exclusive control of wireless telephony on land has been able to prevent the development of radio competition for its wire system."

Mr. Schuette said the association favored the provisions of the present radio law limiting broadcasting licenses to a maximum of three months and other licenses for not to extend one year. Only in this way, he said, can the Commission retain control over these channels.

The Commission's counsel says that three months is too short a life for a license, as the Commission's work is crowded.

WBBM ON COLUMBIA CHAIN

The Columbia Broadcasting System has added WBBM, Chicago, to its chain.

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers, jobbers, dealers and mail order houses are published in RADIO WORLD on request of the reader. The blank at bottom may be used, or a post card or letter will do instead.

RADIO WORLD,

145 West 45th St., N. Y. City.

I desire to receive radio literature.

Name

Address

City or town

State

V. J. Ericson, 563 Maron Ave., So. Jacksonville, Fla.
 Joseph Duder, 49 Delafield St., Poughkeepsie, N. Y.
 Harry Bullings, Rt. F, Box 525, Fresno, Calif.
 J. G. Schaf, 215 Clinton Ave., Albany, N. Y.
 Radio Parlor, 2336 Oak St., Baltimore, Md.
 Camille Alberts, 103 Price Pl., Akron, Ohio.
 L. E. Carter, 514 Harrison St., Portsmouth, Va.
 W. E. Tillman, Moultrie, Ga.
 Chas. M. Britton, 25 So. Ashland, Chicago, Ill.
 Sherman Goldman, 5432 Livernois Ave., Detroit, Mich.
 Eugene Kirchner, R. D. No. 6, Box 155, Wheeling, W. Va.
 Madison Cooper, Jr., Box 36, Calcium, N. Y.
 V. L. Duhem, 3215 Foothill Blvd., Oakland, Calif.
 Geo. T. Wick, 2679 Jackson St., Dubuque, Iowa.
 Irving Levee, 616 Lafayette Ave., Brooklyn, N. Y.
 T. L. Mitchell, Patillo, Colleton Co., S. C.
 R. S. Wright, 35 Woodside Terr., Springfield, Mass.
 A. F. Day, Sergeant, Ky.
 John Egan, 531 N. 35th St., Phila., Pa.
 Samuel Kaff, 3857 N. 18th St., Philadelphia, Pa.
 M. R. Veiten, 11645 Appoline, Detroit, Mich.
 Wilbur Jennings, 1411 Main St., Fredericksburg, Va.
 J. S. Geoghegan, 552 King St., Stratford, Conn.
 A. H. Lander, 1225 Warren Ave., Campello, Mass.
 J. R. Milligan, Box 424, Blackwell, Okla.
 Chas. Newman, 3730 California Ave., St. Louis, Mo.
 Frank Copeman, 15 West 37th St., New York, N. Y.
 R. H. Parker, 205 King St., Midland Ont., Can.
 Roy D. Burnett, South Kent, Conn.
 Jas. C. Leitch, 7613 Hampson St., New Orleans, La.
 Joseph Kaminski, 2133-No. Laramie Ave., Chicago, Ill.
 Sgt. S. J. Herzog, Chanute Fields, Rantoul, Ill.
 Fred Lindquist, 1614 Harmon Pl., Minneapolis, Minn.
 O. A. Ganestorp, Elbow Lake, Minn.
 H. M. Erickson, 740 Webster Ave., Chicago, Ill.
 Walter Stone, 557 E. 169th St., New York, N. Y.
 F. J. Wheeler, 3046 Virginia Park, Detroit, Mich.
 G. H. Field, 2040 E. Madison St., Phila., Pa.
 M. Bauder, 4310 S. Prieur, New Orleans, La.
 Fred Tonyes, 506 Federal St., Camden, N. J.
 Jess Garwood, 1762 N. 47th St., Merchantville, N. J.
 Ralph E. Mosloy, 1015 Bales, Kansas City, Mo.
 W. S. Yates, Box 146, Mohrland, Utah.
 Toth System Mailing Service, 9910 Cumberland Ave., Cleveland, Ohio.
 John S. Wallis, 118 Cartier Ave., Quebec, P. Q., Can.
 Jos. S. Dale, Jr., 3972 Packard St., Long Island City, N. Y.
 M. A. Porter, 1655 Vine St., Chicago, Ill.
 Ernest C. Baker, Yarmouth South, Nova Scotia, Can.
 Nathan D. Potter, Enfield, Mass.
 Wm. F. Kocher, 923 Liberty St., Allenton, Pa.
 R. Dubosky, 219 W. Kline Ave., Lansford, Pa.
 Wm. Lawson, 606 Adams St., Decatur, Georgia.
 H. A. Griffith, 1611 College St., Knoxville, Tenn.
 Thos. A. Green, 74 Saratoga Ave., Yonkers, N. Y.
 Roy Cairns, 483 Upland Ave., San Pedro, Calif.
 A. F. Moyer, 47 Main St., Germantown, Ohio.
 H. B. Snyder, 329 Park Drive, Youngstown, Ohio.
 Miss May E. Harrington, 24 Elm Ave., Norwichtown, Conn.
 Frank Miller, 5920 Junction St., Los Angeles, Calif.
 F. D. Cozard, 3939 Spencer Ave., Norwood, Ohio.
 J. W. Barbour, 437 Greenwood Ave., Clarks Summit, Pa.
 R. M. Waterman, Fairfield, Iowa.
 A. J. Beimrohr, 416 S. 13th St., Omaha, Nebr.
 Raymond Gregg, 1132 S. 105th St., Cleveland, Ohio.
 Eugene H. Fenner, 67 Providence St., Providence, R. I.
 J. J. Behnisch, 130 Clifford Ter., San Francisco, Calif.
 J. A. Thornton, 141 Qustin St., Elberton, Ga.
 H. D. Miller, Mountain Lake, Minn.
 O. Ingmar Oleson, Ambrose, No. Dak.

Impedance A

Combination Works Splendidly

By Capt. Peter

Contributing

A RADIO fan who appreciates a set which is operated entirely by AC, which is easy to operate, which is selective and sensitive, which does not hum, which is capable of fine quality, and which is capable of operating any loudspeaker cannot overlook the merits of the following six tube set, for it possesses all these qualities.

It is usual to employ three element AC tubes for radio frequency amplifiers and sometimes for the first audio frequency amplifier. But these tubes are quite subject to hum. Therefore the —27 heater type tube is gaining rapidly in favor with the engineers. Consequently they are used in this AC receiver to the exclusion of the —26 type tubes.

It is also customary to employ audio frequency transformers for coupling between the audio stages. It is an admitted fact that impedance coupling gives exceptionally fine reproduction. Hence this type of coupling is used in this six tube receiver between the detector and the first audio tubes and between the first and second audio tubes.

The last stage in the circuit is push-pull and employs two —71A tubes. It is not necessary to use larger tubes than these when two are used in a push-pull circuit because they will operate any loudspeaker with enough volume for any home. If larger tubes are used in the output stage it is necessary to redesign

the stage preceding so that that stage can deliver enough undistorted output to feed the power stage. With two —71As a single —27 with a suitable transformer T3 between them will handle the signal without overloading.

The output of the push-pull stage is taken across the mid-tapped choke coil Ch3. No transformer is needed between the speaker and the tubes, because the matching is good enough with most speakers. If two speakers are available they should be connected in series.

When a dynamic speaker is used no output transformer is needed because there is already one built into the speaker.

Note that no coupling condensers are used between the speaker and the tubes. None is needed and none is desirable. The only object of the condensers is to prevent direct current from flowing through the speaker or the primary of the speaker transformer. In a push-pull stage the two plates are at the same DC potential and no current will flow when the condensers are absent. There is an exception if the two push-pull tubes are not well matched. Then a small current will flow but not enough to cause any damage. No two similar tubes can be so unlike unless one is dead, and then it is time to replace it.

The two choke coils Ch1 and Ch2 should be high inductance chokes. It is permissible to use the secondaries of two audio transformers. And these transformers need not be of the best variety. The steady plate current that flows through them is so small that there is only a very small reduction in their inductance.

Use By-pass Condensers

The capacity of each of the coupling condensers C9 and C11 should be about .25 mfd., although they may be as small as .02 mfd. The required size depends on the values of the grid leaks R6 and R7. If each of these is one megohm the condensers may have the smaller values. If the resistance are reduced the condensers should be increased in proportion. The product of the grid leak and the grid condenser should be about .02 or larger, ohms and farads being the units.

As a means of eliminating as much as possible back coupling between any two stages, individual grid bias resistors are used for all stages. R1 is 750 ohms to give a bias of about 1.5 volts on the RF grid. The detector tube is operated at zero bias, except for the voltage drop in R2 caused by the grid current.

R3 is also 750 ohms since a bias of 1.5 volts is all right for that tube. The fourth tubes needs 6 volts since the plate voltage is 90 volts. The plate current is then 3 milliamperes, so that the value of R4 should be 2,000 ohms. R5 carries the plate current of two 171A tubes. The drop across the resistor R5 should be 43 volts, and since the current in it is normally 40 milliamperes, the value of R5 should be 1,075 ohms.

A glance at the circuit diagram Fig. 1 will show that there are many by-pass condensers inserted in various places. Are all these really necessary? Cannot some or all of them be left out?

Surely they can be left out. It is easier to leave them out than to put them in. It costs less both in money and effort.

LIST OF PARTS

- T1—One Model RF5 Screen Grid antenna coil.
- T2—One Model T5 three circuit tuner (Screen Grid Coil Co.).
- T3—One National push-pull input transformer.
- Ch1, Ch2—Two national coupling impedances or secondaries of audio transformers.
- Ch3—One National output transformer (use primary only).
- C1, C2—Two Hammarlund .0005 mfd. tuning condensers.
- C3, C4—Two Aerovox .001 mfd. condensers.
- C5—One Aerovox .00025 grid condenser with clips.
- C6—One Aerovox .00025 mfd. by-pass condenser.
- C7—One Tobe 1 to 4 mfd. condenser.
- C8, C10, C12, C13, C14, C15—Six Tobe 1 mfd. by-pass condensers.
- C9, C11—Two Aerovox .02 mfd. condensers, or larger.
- R1, R3—Two Tobe Veritas 750 ohm, 2 watt resistors.
- R2—One Lynch metallized 2 megohm grid leak.
- R4—One Tobe Veritas 2,000 ohm, 2 watt resistor.
- R5—One Tobe Veritas 1,000 ohm, 5 watt resistors plus a 75 ohm resistor.
- One heating transformer having one 2.5 volt, 7 ampere winding and one 5 volt, one ampere winding, both center tapped.
- Four Y type sockets.
- Two X type sockets.
- Four binding posts (Ant., Gnd., Sp. Sp.).
- Ten battery leads for plate and filament voltages. (Short heavy filament leads.)
- One National B battery eliminator with electrolytic condensers.

F with-27s

My With Push-Pull Output

V. O'Rourke

Editor

Smith and Daniels Start Sales Company

Two well-known radio aces have formed a sales combination. They are Bert E. Smith and A. J. Daniels, who have opened offices at 50 Church street, New York City, and put out their shingle bearing the name of Gotham Engineering and Sales Co., super power-manufacturers' agents.

Bert E. Smith is one of the few real

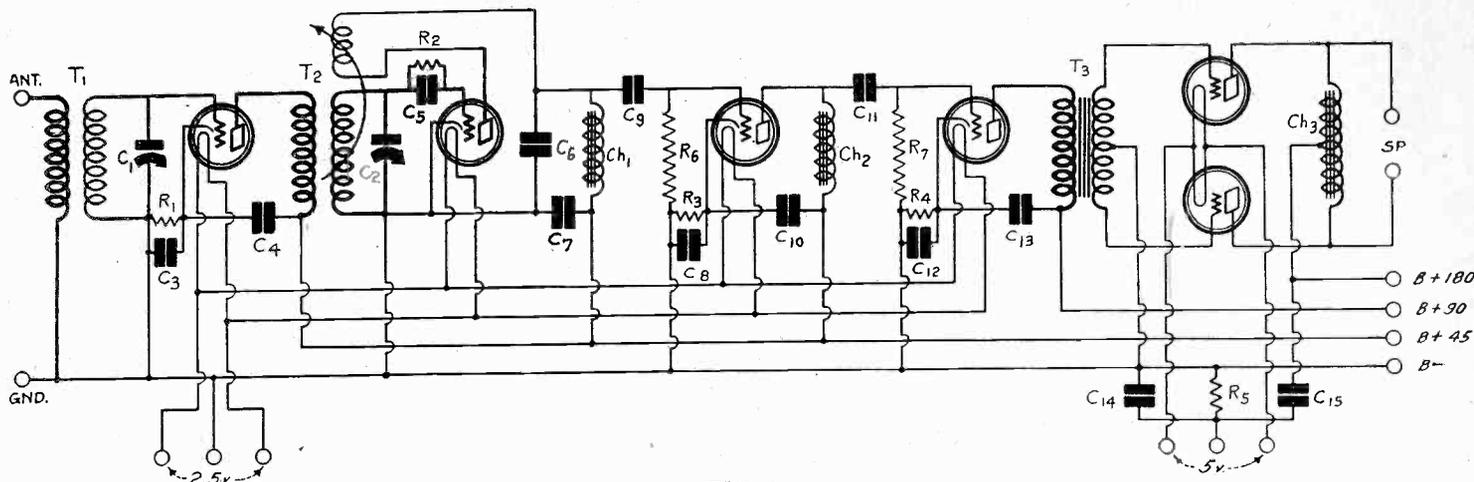


FIG. 1

THIS IMPEDANCE AND TRANSFORMER COUPLED PUSH-PULL AC RECEIVER IS EASY TO OPERATE, SELECTIVE, SENSITIVE, HUM FREE AND VOLUMINOUS.

There are many other parts of the circuit that could be left out. For example, after the circuit is completed the tubes might be left out. The circuit will not work very well that way, so the tubes are put in.

The grid bias resistors could be left out, too. But it has been found that a grid bias on each of the tubes makes the set work very much better. This has been found by experiment, not by any listening test. Many radio fans have come to the conclusion that the set works better without the grid bias. It is so easy to draw the wrong conclusions by a listening test when one particular feature is observed and not the overall performance.

It has also been found by experiment that by-pass condensers serve a very useful purpose in a set. And this conclusion can be verified by a listening test. So it must be more important to use by-pass condensers and many of them than to use grid bias. And there are very few fans now who are not convinced that grid bias is necessary for the best overall performance of a set.

Values of Condensers

C3 by-passes radio frequency currents across the resistors R1 and C4 by-passes radio frequency currents across the plate leads and the B battery eliminator. Since both of these work at radio frequency they may be .001 mfd. units. C6 is connected across the output of the detector and hence must not be too large. Neither must it be so small that it will not by-pass the radio frequency currents. There is a considerable capacity in the coil itself, and this is in parallel with C6. Hence the value of this condenser should not be larger than .00025 mfd.

All the remaining by-pass resistors work at audio frequency, some across the grid bias resistors and some across the plate voltage supply leads. Each may have a value of 1 mfd. But C7 may well be as large as 4 mfd. because if this is large much feedback is eliminated.

It will be noticed that the midtap on the 2.5 volt heating winding has been connected to B minus or to ground. This connection is usually sufficient to eliminate any residual hum. But if there is some left the center tap on this winding may be connected to the 45 volt tap on the B battery eliminator.

When two or more tubes are put on the same heating winding and the same grid bias resistor, there is a back coupling from the plate circuits of all the tubes to all the grid circuits preceding. Thus there is a very good chance of starting oscillation in the circuit. The common resistor must be thoroughly by-passed if squealing and distortion are to be avoided.

Cathodes Always Independent

In the case of heater type tubes the cathodes are always independent. Several such tubes can be put on the same heater winding and still allow the use of separate grid bias resistors. This versatility of the heater tubes is just one of their advantages.

Of course, it is possible in AC heated circuits to use the same method of obtaining bias as is used in DC circuits. The mid-points on the transformer secondaries and the cathodes of the heater tubes are connected to the same point. This point may then be regarded as the general zero potential datum of the circuit. There will be no local zero levels, for they are all the same. But this point cannot be the lowest potential point in the circuit. That point must be reserved for the grid bias on the power tube, or that tube which requires the greatest bias. The grid returns cannot be connected to the same point. Each grid return must be connected to a suitable point on the output voltage divider below that point which has been chosen the zero point.

This method is used in most circuits and it offers little trouble so far as understanding it is concerned. Not so, however, when it comes to common coupling. The same bias resistor is used for same resistor is used for all the tubes, or a portion of the resistors is used for all. It is necessary to by-pass all the grid return taps to the zero point.

One point not generally understood is that with a battery-operated receiver B minus is at the same potential for all tubes, since B minus is connected to A+ or A-, and the one connection affects all the tubes alike. But with AC tubes each one may have its own connection to B minus, hence each may have a different negative bias equal to the voltage drop in a heavy resistor.

pioneers in radio, having erected one of the earliest amateur stations many years before the World War. Shortly after the establishment of the radio industry, he joined the Allen D. Cardwell Manufacturing Co., as sales and advertising manager. After years of valuable service with this concern, he became advertising manager for the Aerovox Wireless Corporation, moving later to Chicago to join Aero Products, Inc.

A. J. Daniels also rates as a pioneer, having served in the Navy radio service during the war. After leaving the Navy he joined the Pfanstiehl Radio Co. as research engineer, afterwards being connected with the Rauland Manufacturing Co., and the New England Mills of Chicago. Later he too was associated with Aero Products Co. He was chief engineer.

The new concern represents the Potter Company of North Chicago, manufacturers of paper condensers; also several lines in the Metropolitan area and New Jersey and will also undertake special engineering designing work.—J. H. C.

Utilities' Stations Called Rightful

Washington.

Another point of difference between Chairman Robinson, of the Federal Radio Commission, and one of the Commissioners, was brought out at a Congressional hearing when Commissioner Caldwell favored granting of broadcasting licenses to public utilities. Chairman Robinson is opposed to such practice.

Said Commissioner Caldwell: "I am opposed to our chairman's views on this subject absolutely and completely."

To his knowledge, Caldwell said, stations are operated at Boston, Cleveland, Baltimore, Chicago and Indianapolis by public utilities groups. As long as a particular station is rendering a "good service" to the public, and its programs are as good as programs of other stations, it is serving in the public interest, he declared.

How Good Part

By John B.

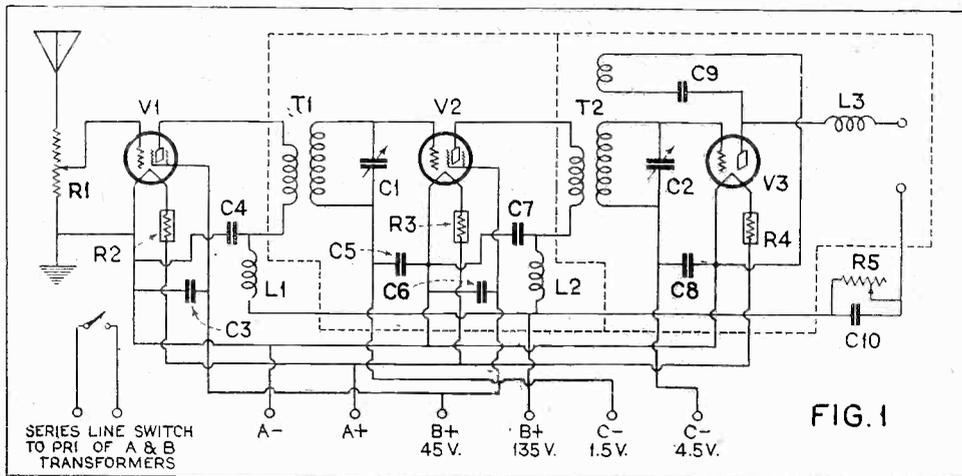


FIG. 1

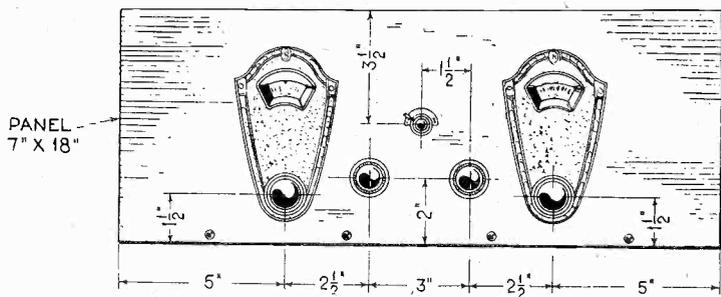


FIG. 2

A RECEIVER, to be truly satisfactory, should possess selectivity, sensitivity and tone quality.

Primarily the tone quality is a function of the audio channel and depends largely upon the quality of the apparatus used in its make-up, such as transformers, tubes, etc.

The selectivity and sensitivity requirements are by no means easy of fulfilment. If a receiver has been designed to be ultra-sensitive the great sensitivity will not manifest itself only in the reception of distant stations but also in the reception of locals. Moreover, when local stations are tuned in with such a receiver the enormous signal strength will cause an apparent broadness of tuning, thus defeating the requisite of selectivity.

If a receiver be designed to be highly selective then it will be difficult to "find" the far distant stations.

The answer lies in obtaining an approximation of the essential qualities of selectivity and sensitivity.

The receiver designed and described here is one that uses as a basis for its circuit a standard three-circuit tuner to which has been added a stage of shield grid amplification.

Efficiency Rated First

No attempt has been made to eliminate controls. Each tuning condenser, of which there are two, has its own tuning dial. The amount of signal energy admitted to the receiver is controlled by a potentiometer in the antenna circuit for volume control. Regeneration of the detector circuit is controlled by another variable resistance, located in the plate circuit of the detector tube.

As an aid in the prevention of broadness of tuning each of the tuned circuits has been completely contained in shield cans, thus preventing the coils themselves from picking up signals.

signed for shield-grid tube insures not only a maximum transfer of signal energy but also, because of their compact form and the employment of shield cans, complete isolation of each of the tuned circuits.

In addition to the shielding, each of the circuits of the RF stages is filtered and bypassed with RF chokes and condensers so that none of the RF energy can find its way into the B supply circuits and cause an unstable condition to exist.

The Tuner

Fig. 1 shows the complete tuner circuit of the receiver, which for convenience is divided for construction into two parts: the tuner and the amplifier-power supply. The shield-grid tube V1, with associated apparatus, makes up the first RF stage. Coupling of the antenna to this tube is obtained through the variable resistance R1, the volume control. The RF transformer T1 is an Aero coil designed for use in the antenna circuit of a receiver but is used here to couple the first RF stage to the second RF stage.

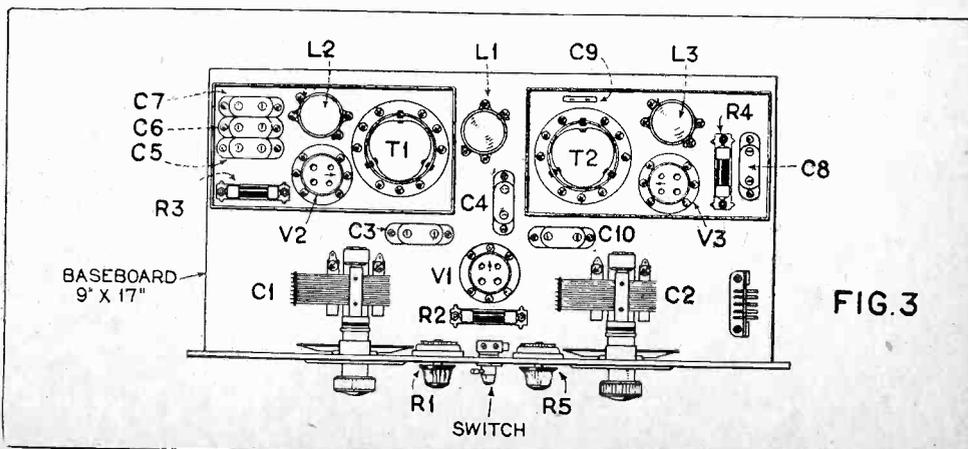


FIG. 3

- LIST OF PARTS FOR RECEIVER**
- C1, C2—Two Hammarlund midline condensers .00035 mfd.
 - C3, C4, C5, C6, C7, C8—Six Tobe bypass condensers, 0.5 mfd.
 - C9—One Tintytube condenser, .002 mfd.
 - C10—One Tobe bypass condenser, 1 mfd.
 - T1—One Aero Coil No. U-923.
 - T2—One Aero Coil No. U-73.
 - L1, L2—Two Hammarlund RF chokes No. 250.
 - L3—One Hammarlund RF choke, No. 85.
 - R1—One Electrad Royalty Tonatrol type A.
 - R2, R3—Two Amperites, No. 622, with mount.
 - R4—One Amperite, No. 1A, with mount.
 - R5—One Electrad Royalty Variable Resistance, 0-500,000 ohms, type L.
 - V1, V2—Two type 222 tubes.
 - V3—One 201A, 112A or 200A type tube.
 - Two National Velvet Vernier Dials, type E.
 - One AC 110-volt switch.
 - One connector cable and plug.
 - Two Silver-Marshall Box Shields, No. 631A.
 - Three Silver-Marshall sockets, No. 511.
 - One Panel 7x18 inches.
 - One Basebord 9x17 inches.
 - Two Boxes Corwico Solid Braidite.

In the circuit described here the entire primary winding is used as the plate winding for V1.

The secondary is tapped, but for this circuit the tap is disregarded.

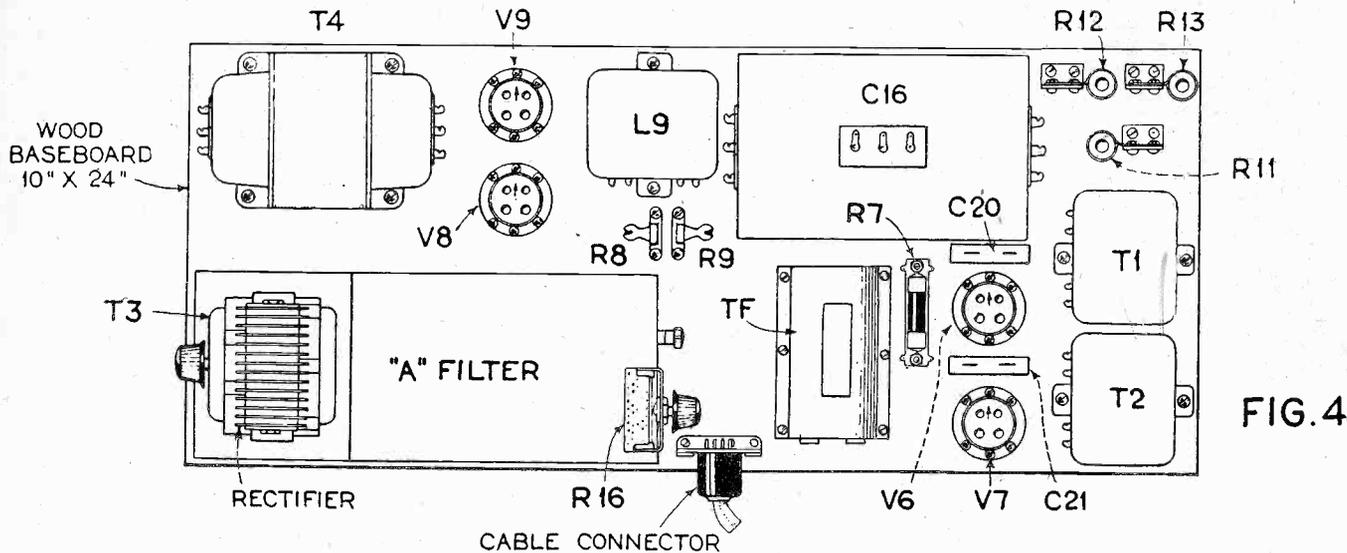
Between the first and second RF stages the RF transformer T2 is employed as a coupling medium and is especially designed for use with shield grid tubes. This coil has a moveable tickler coil which in operation is merely placed at the best operating point and then left in that position, as control of regeneration is obtained by means of the variable resistance, R5.

All the tubes in the tuner unit have their filaments adjusted automatically by the use of Amperites. Each of the screen grid tubes employs an RF choke in the plate circuit together with the requisite bypass condensers as indicated. It is equally essential that the screen grid element of these tubes be bypassed, by the condensers C3 and C6.

The filament switch is not only a filament switch but controls the turning on

Work Wonders

ennan, Jr.



and off of the entire power by making and breaking the contact to the AC line which supplies the current to the primaries of both the A supply and the B power transformer.

The circuit shows the negative side of the filament supply grounded. However, in some installations where an A supply other than a storage battery is employed it is well to ground the receiver or at least the filament supply through a suitable fixed condenser of 1 or 2 mfd. Otherwise a short-circuit of the line is possible.

Fig. 2 shows the general layout of the panel for the tuner unit while Fig. 3 gives the placement of the parts, etc.

AF Circuit and Power Supply

The A supply consists of a step-down transformer, a rectifier of the dry type and a suitable filter consisting of chokes and condensers. With such an arrangement it is possible to supply from the 110 volt AC line the necessary filament voltage to supply up to about ten quarter ampere tubes.

The Truvolt resistor, R16, is employed to regulate or adjust the voltage output of the A supply to the requisite 6 volts. The A supply furnishes filament voltage to all the tubes in the tuner unit and to the first audio stage of the audio channel. The last stage of the audio channel employs a type 250 tube, which has its filament energized directly from the filament terminals of the B power transformer.

The audio amplifier consists of two stages of transformer coupled audio frequency amplification employing the new Silver-Marshall transformers. Bypassing and filtering is also efficiently employed here to prevent audio frequency oscillation or hum being produced to the detriment of tone quality.

As a coupling medium between the plate of the 250 tube and the loudspeaker a suitable tone filter is employed, TF in Fig. 5. To obtain full benefit of the fine tone quality and high order of volume of which the amplifier described here is capable it is recommended that a dynamic speaker be employed.

How Bias Is Obtained

The B supply consists of a step-up transformer, T4, two rectifying tubes ar-

anged for full-wave rectification, V8 and V9, a filter choke, L9, a filter condenser C16 and a voltage divider R13.

C bias to the 250 tube is obtained by voltage drop through the resistor R11 while that of the first audio stage employing a 112 tube is obtained through the resistor R10. C bias for the screen-grid

tubes and the C battery detector is obtained through the resistors R15 and R14 respectively.

The layout of the amplifier-power supply unit is shown in Fig. 4. If desired, the construction of this unit may be altered so that a deck type of assembly may be employed. That is, on the lower deck may be placed the B supply apparatus; on the next deck may be placed the A supply apparatus while on the top deck may be located the audio amplifier.

LIST OF PARTS FOR AMPLIFIER-POWER SUPPLY

A Supply

T3—One Step-Down Transformer.
R16—One Electrad Truvolt Variable Resistance, 3 ohms.

One Elkon Rectifier.
One Tobe A filter.

For Audio Amplifier

T1, T2—Two Silver-Marshall Audio Transformers, Nos. 225 and 226 respectively.

TF—One National Tone Filter, type 250.

Two Silver-Marshall Sockets, No. 511.
R7—One Amperite type, 1A, with mount.

R8, R9—Two fixed resistors, 50,000 ohms.

Two single resistance mounts.

C20, C21—Two Tobe bypass condensers, 1 mfd.

V6, V7—112-A tube and 250 tube respectively.

One Box Corwico Solid Braidite.

One connector cable and plug.

R14—One wire wound resistance, 700 ohms.

R15—One wire wound resistant, 300 ohms.

B & C Power Supply

T4—One Silver-Marshall Line Transformer, No. 328.

Two Silver-Marshall Sockets, No. 511.
C16—One Tobe 250 B Block.

L9—Silver-Marshall Unichoke, No. 331.
R10—One Electrad wire wound resistor, 300 ohms.

R11—One Electrad Truvolt fixed resistor, 1,500 ohms.
R12—One Electrad Truvolt fixed resistor, 10,000 ohms.

R13—One Electrad Truvolt fixed resistor, 8,000 ohms.

V8, V9—Two 281 tubes.
One Box Stranded Braidite.

One baseboard, 10x24 inches.

Wiring Hints

In wiring the tuner unit it is recommended that a well-insulated soft copper wire such as Corwico solid Braidite be used. This wire is easy to use, takes solder well and may be nicely bunched in cable formation.

For the A and B supply and for the audio channel it is recommended that a heavier flexible wire be used such as Corwico stranded Braidite. All AC leads such as that to the filaments of the 250 tube should be twisted to minimize the possibilities of the production of hum, etc.

(Concluded next week)

Rider's Testing Treatise Appears in New Form

The Radio Treatise Co., of 1440 Broadway, New York City, publishers of books written by John F. Rider, announce a revised edition of the "Treatise on Testing Units for Service Men." This new issue is printed and bound, contains approximately 18,000 words describing the most modern testing units.

Constructional details inclusive of parts used are given for each tester and among the numerous portable and stationary testing units are full details including the wiring diagram of the Weston 537 AC-DC set and tube tester. The table of contents includes such items as tube reactivator; calibrated vacuum tube bridge; Weston model 537 AC set tester, B eliminator tester, signal generator for receiver testing, radio frequency oscillator, capacity tester, resonance indicator, multi-range meters, complete test bench panel for service station, resume of meter design, etc. The book consists of 48 pages.

Loudspeakers

By J. E. Smith

President, National Radio Institute

[Parts I and II of this article were published in the January 19th and 26th issues. Part III, the conclusion, follows.]

THE field winding is different than that shown in Fig. 10 for a horn type speaker, a sit is designed for 100 watts, 50 milliamperes, instead of 6 volts, 2 amperes.

The voice current coil is wound on a circular tubing and connected to a frustum of a cone as shown at a'. Glued at the frustum of the cone is a spider membrane, held to the center core by a screw, to centralize and hold the voice current coil in the magnetic gap, the spider however being so designed as not to impede the motion of the cone.

The cone is six inches in diameter, made of manila paper and placed behind a suitable baffle board. The current in the voice coil is obtained from a high ratio step-down output transformer, the primary of which is connected to the plate circuit of a large power tube.

Voice Coil in Circular Bobbin

In Fig. 12A is shown another type of successful power cone. In this case the voice coil is wound on a circular moulded bobbin glued near the apex of the cone and centralized in the magnetic gap by a small leather diaphragm which is stretched between two rings. A small stretched leather diaphragm also aids in the performance of the cone. The cone is a full cone having a diameter of 10 inches or 12 inches with an apex angle of 120°. The center core of the magnetic circuit is cupped to allow room for the apex of the cone. In this type of dynamic speaker a 350 volts, 50 milliamperes field winding is employed, consisting of 50,000 turns of No. 33 B. & S. enamel wire.

Dynamic speakers differ principally in the method of centralizing the voice coil in the magnetic gap. A great many of these speakers use the three-point suspension for positioning the voice coil. Some of the suspensions are non-metallic, such as bakelite; others are made of aluminum or phosphorus bronze.

When dynamic speakers are used as Power Cones, to work from the output of such power tubes as the 210 or 250, the field excitation consists of a rectified voltage obtained from one of the sections of an electrical filter circuit.

Other Methods

The field coil, besides being efficiently used for field excitation, may serve as a choke coil for the filter circuit. By the proper design of the rectifying and filter circuit, any field coil voltages and currents may be readily obtained.

In other dynamic speakers separate field excitation is employed. Two methods are used for this purpose, a vacuum tube rectifier or a dry rectifier. In the vacuum tube rectifier some rectifying tube such as the 280 or Raytheon must be used, and the field coil is connected directly across the rectified output. A condenser of 2 or 4 microfarads may be used across the field coil to filter the ripple.

Acoustical Measurements

Absolute rectification is not necessary in a field coil winding, as quite a large AC ripple may be tolerated before it is noticed as a hum in the voice coil. Satisfactory dry metallic plate rectifiers are designed for six volts one ampere output for dynamic speaker field excitation. It is expected that some of these dry rectifiers will be designed for much higher

voltages, such as 60 to 100 volts, with 50 to 100 milliamperes output.

In designing loud speakers it is important that the characteristics of the speaker will fit the condition of the vacuum tubes with which it is to be worked.

The resistance or impedance between the filament and plate elements of vacuum tube power tubes varies from 1,800 to 4,000 ohms. To obtain the maximum power in a loudspeaker device, the speaker must be designed to have an impedance to match that of the power tube, which does not mean they must be equal, but that the load should be twice the impedance of the plate.

In a loudspeaker unit the resistance R is the resistance of the winding, this resistance being the sum of the direct current resistance as measured on a DC wheatstone bridge, and the AC resistance, taking in the losses in the winding and iron parts depending upon the frequency. For very low frequencies this resistance R is very nearly equal to the direct current resistance, but for very high frequencies the losses of the unit cannot be neglected.

The reactance of the unit is similar to the reactance of a choke coil, its value depending upon the number of turns of the winding, the quality of the iron parts in the magnetic circuit and the length of the air gaps.

Three Measurements

There are three important measurements in taking the impedance value (Z) of a loudspeaker unit. Since the amplitude of the armature is at maximum at the lower frequencies and at minimum at the higher frequencies, the effective gap in the magnetic circuit differs with frequency.

For a given frequency the impedance value should be obtained when the diaphragm or armature is locked, or cannot move; this is called the stationary or damped impedance. Then the impedance value is to be obtained with the diaphragm free, called the free impedance, and will always be greater than the damped impedance. The difference between the free and damped impedance is called the motional impedance.

The motional impedance of a loudspeaker unit is one of the most important measurements necessary. The greater this value, that is, the bigger the difference between the damped and free values, the greater is the indication of transfer of mechanical energy into sound. This factor is extremely important in the study of bad mechanical and acoustic resonances.

After the loudspeaker has been properly designed to have the correct characteristic to match the tube it is going to be used with, some means must be provided to measure the sound output of the device.

Use of Condenser Microphone

This is done by the use of a condenser microphone, and its associated circuits. A condenser microphone is one of the best microphones used in broadcasting studios to-day. It is a sound pick-up device, and as the name indicates, works on the principle of a condenser. This unit has a very thin metal foil highly tensioned, separated about 1/1,000 of an inch from a thick metal plate. These plates are polarized at a very high voltage and as the sound waves strike the stretched diaphragm one plate is caused to vibrate,

affecting the capacity between the stretched diaphragm and thick metal slate, consequently affecting the voltage across it, which voltage is impressed upon an amplifying circuit and measured by an indicating device.

The natural period of the condenser microphone is above the audio frequency range and due to its construction it is just as sensitive to sound waves of very low frequencies as very high frequencies, consequently it is a very fine device to pick out any sound irregularities from a loudspeaker device.

Frequencies Tested

By keeping the energy constant at any frequency at the loudspeaker terminals and the condenser microphone and its associated amplifying circuit being essentially a straight line frequency pick-up circuit, any irregularities in the measurement is from the sound coming out of the speaker. Audio frequencies for these measurements are obtained from an audio oscillating tube circuit. Frequencies from 50 to 5,000 cycles are generally employed.

Loudspeaker curves always have had peaks and valleys, due to electrical and mechanical resonances, acoustic reflections and other irregularities. By sound measurements, these irregularities can be readily studied, improved and the range of the speaker extended.

Summary

The first acoustical device used for radio reception was the ordinary telephone receiver placed on the head over the ears. Radio soon became more than a novelty and the demand for receiving sets so great that a number of persons desired to hear the radio reception at the same time, so it was necessary to have some acoustical device which could give out the music to all in the room.

This brought about the first loudspeaker, and as the text brought out, this first speaker was nothing more than a horn on a telephone receiver unit.

This first loudspeaker lacked in good speech articulation because it did not reproduce the high frequencies and the quality of music was not natural since the fundamental notes and lower frequencies were not present.

Exponential horns with long air columns correctly designed made a great improvement in the reproduction of the low notes and careful consideration of unit construction made the unit more acceptable to the high frequencies.

To get high quality reception from horn type speakers great detail in construction of the component parts had to be taken and very long and expensively designed horns had to be employed.

With the introduction of the cone speaker these difficulties were overcome and better quality reproduction resulted. The greatest limitation in the horn type speaker was in the vibrating element, the diaphragm, it being too stiff and small to vibrate satisfactorily over a wide range of frequencies. The cone diaphragm is practically only limited to the unit actuating the cone.

The ordinary cone speaker is superior to the horn type speaker in quality reproduction and the "dynamic" cone speaker is still superior since it is capable of excellent quality with large volumes without distortion. The dynamic cone speaker is the most popular commercial reproducer of today, and will probably remain so for some time to come.

Power Line Noise

Sesame to Clear Reception Is a Real Boon

By James H. Carroll

Contributing Editor

RADIO reception from the viewpoint of the broadcast listener has at last approached the ideal. One might term it the rhapsodical stage.

With the perfection of modern broadcasting methods, receivers and speakers, it is truly a delight to listen to reproduction, whether of symphonic orchestration, modern syncopation, a good singer or talker. So closely does the approximation approach the original that the listener does not realize that it is radio.

Much has been accomplished in this direction during the past three years.

However, there is one drawback that may mar reception in any home. Every listener has experienced it. This is interference introduced through the power line, and it always has been with us. It is not inherent in any set and is entirely apart from static.

With the advent and perfection of the electric set and eliminators and power packs for use in the home, inductive interference has made itself more and more apparent.

Sources of Noise Increase

While radio apparatus has been improving, electrical appliances for the home have also been perfected, and have become more numerous. Manufacturers of electrical equipment have not done much to mitigate the possibility of these noises being broadcast from their respective appliances. They have not deemed it worth while, from their viewpoint, and it adds to the cost of manufacture. Therefore, alleviation rests upon the fan himself.

Among the most persistent and annoying causes of hum, buzz and rasping sounds are powerhouse generators, sparking commutators, trolley and elevated lines, electric refrigerators, oil burners and powerful vacuum cleaners. Among the lesser, but still annoying, sources are house line switches, buzzers, door bells, dial telephones, and defective fixtures.

Noises from these sources are not only picked up and amplified, as they intermingle with the radio and audio frequencies, but also by the set itself that works on an A or B eliminator or both combinations. As the sensibility of sets is being increased, so will more noises be picked up and the louder will they become. Super-heterodynes suffer greatly from these annoyances, due to extreme sensitivity. Inductive interference of this type also hampers DX reception, blocking it entirely in many instances.

Single Cause Cured Formerly

Heretofore the only remedy has been to trace the worst of the interfering causes and cure it alone. The public utilities all over the country are generally more than willing to co-operate with sufferers and many of the companies spend large amounts of money annually to minimize or avert the annoyances. Many of them maintain forces of men solely to trace down causes of interference.

Another persistent cause of radio annoyance is the violet ray or X-ray machine. In neighborhoods where there are many doctors and dentists X-ray machines are most prolific sources of interference. Other noises may be traced to the thermostatic type of electric heating pads and are caused by the opening and

closing of the thermostats. This type of apparatus may cause interference over a wide area and is difficult to locate, due to the intermittent operation. Sign flashers, coming into greater use for advertising, also cause interference.

Electric fans, especially of the cheap type of universal motor, may interfere with reception, as may washing and ironing machines. The induction type fans are less likely to cause trouble.

The most common causes of rasping interference are loose connections in lighting fixtures, wall and cut-out switches, electric irons and curling irons, vacuum cleaners, floor lamps, push buttons and buzzers. Any loose connections, even bulbs loose in their sockets in floor or table lamps, cause rasping noise in a set.

Care should be taken that all electrical contacts are thoroughly tightened and all bulbs securely screwed in their sockets.

Precautionary Measures

Another cause of severe interference to their neighbors can be brought right home to certain radio fans themselves who use vibrating types of battery chargers. They should know that chargers of the new dry type do not transmit this kind of interference and should throw out their antiques, replacing them with modern apparatus.

Those who suffer interference from trolley and elevated lines can do much to alleviate their unfortunate condition, which in some instances cannot be done by the operating companies due to prohibitive costs and mechanical difficulties. The antenna should not be run parallel to the trolley wire or electrified tracks. It should be run at right angles and kept as far away as possible from the source of noise, and the shorter it can be made, the better. A double antenna or counterpoise used as a ground also will be a great help as the interference picked up on the water pipe ground is generally greater than that on the antenna or electric light lines.

Our Knowledge Grows

Fortunately, as the sources of interference have increased, so also has increased our knowledge of minimizing or eliminating these troubles, and apparatus is constantly being invented to aid in the battle.

A new device, recently developed by the Trutone Radio Sales Co., New York City, and called the Si-len-ser, has successfully eliminated these noises.

The Si-len-ser is a compact device that plugs into the line. An extra lead is provided for grounding. The set plugs into the Si-len-ser.

The development of the Si-len-ser was first announced in Radio World recently. So great was the need for such a device and so well was attention directed to the device, that the manufacturers were flooded with inquiries. Representing Radio World, I myself tested out this device and was certain of its effectiveness. Retail stores, consumers, jobbers and others hastened to make their own tests, and all were so thoroughly satisfied that they told their friends and others about their "find."

The Si-len-ser had met the need superbly, so that the afflicted set users could install his own remedy and remove interference due to disturbing noises in the power line. The test centers about the

power line, for only when this picks up the interference is the Si-len-ser effective. Interference transmitted solely by radio frequency is not cured by the Si-len-ser. The manufacturer sets forth the following frank advice:

"Do not order a Si-len-ser until you first find out whether the disturbing noises are in aerial or in power line.

"To do this, sketch the antenna from the aerial binding post and turn your volume control up high. If the same noises are in the loudspeaker that there were with the aerial connected, you need the Si-len-ser. If there are no noises in the loudspeaker with the aerial disconnected, don't buy a Si-len-ser.

"The Si-len-ser removes AC hum, electric noises, spark interference, and every type of noise from electric line sources, but has nothing to do with aerial pick-up.

"The Si-len-ser is a scientific laboratory achievement for the removal of extraneous noises caused by electric household and power house apparatus and is an essential to every radio owner whose trouble is not due to aerial pick-up.

"Investigate your aerial as above stated and then order a Si-len-ser if you need one."

Still Up to Each Listener

Radio is making itself felt as a power in many ways besides its growth as a gigantic industry. Many real estate men are selling lots on the radio desirability of a given location. Most of the fine new apartments are being fully equipped for radio use and the millenium will have arrived when, out on the hunt for the new apartment, the agent will show us into a suite where every room has an aerial plug, convenient outlets for our sets or power apparatus, and built-in grills for our speakers, telling us that the doctor's office on the ground floor is fully shielded. The final touch will be added when he shows us a Si-len-ser attached to every outlet.

Until that happy day, however, we shall have to seek out and cure the causes of interference ourselves.

Harris Joins Insuline

Harold J. Harris has joined the selling staff of Insuline Corporation of America, 78-80 Cortlandt Street, New York City. Mr. Harris will call on the trade in New York City and vicinity under the direction of S. J. Spector, the president, who together with I. Heller has been responsible for the rapid growth of this concern. Mr. Harris will push the full line of Resistovolts made famous by Insuline, also the line of Television apparatus, radio panels, tubing and rods for all radio purposes. For catalogue address Mr. Harris and mention Radio World.—J. H. C.

A THOUGHT FOR THE WEEK

NOW that the R.-K.-O. circuit, which represents a combination made up of the Photophone Co., Inc., an R. C. A. subsidiary, and the Keith-Albee-Orpheum circuit, is functioning, the radio audience may be sure of hearing the best there is in vaudeville. But the so-called "sight" acts—the mystifying prestidigitateur, the graceful dancer and the breakneck acrobatic acts—must still find their professional habitat before the footlights only. But just wait until television comes into its own!

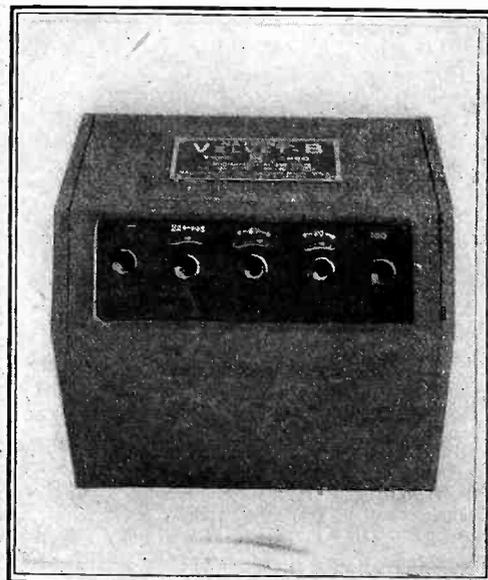
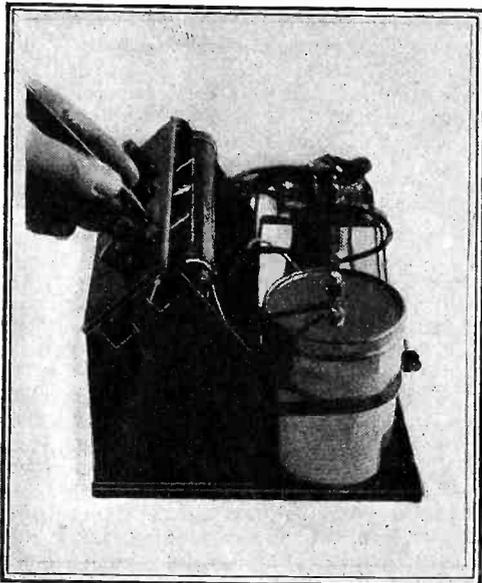
The Correct Con

As Exemplified in the A

By Herman

Managing

[Parts I and II of this article on the construction of the AC4, a receiver using three type 227 tubes and one 171 or 171A, were published in the January 19th and 26th issues. Part III, the conclusion, follows.]



THE COVER OF THE B SUPPLY HAS BEEN REMOVED, AS SHOWN AT LEFT, REVEALING THE 16 MFD. MER-
SHON CONDENSER. PENCIL POINTS TO FINGER-TIP VOLTAGE ADJUSTERS. IN CENTER IS A REAR VIEW
OF THE INTERIOR. NOTE HOW THE TUBE IS MOUNTED. THE COMPLETED B SUPPLY IS AT RIGHT.

THE wiring of the AC4 is easy, since there are only four tubes and the B supply is a factory-made product, and this case is a certainty even though the pictorial diagram of the wiring may suggest some complications. A quick glance may lead you to believe there is a lot of trouble in arranging and wiring the parts, but actually there is "nothing to it." Indeed this is the simplest AC receiver that has ever been offered to the home constructor, principally because every other model encouraged you to build your own B supply. But you could scarcely improve on the compactness and performance of the National Velvet-B, hence this was chosen.

The pictorial diagram on the front cover of this issue has the parts lettered to correspond with the designations on the schematic diagram, which is republished this week for your convenience.

The pictorial diagram is one-third scale, and is exactly the same as the blueprint, except of course that the blueprint is full scale. Besides, the blueprint also has the schematic diagram on it, and the complete list of parts.

When you build this receiver it is advisable you obtain a blueprint, as that will further simplify and expedite the work.

Nearly All Wiring Underneath

The top view on the pictorial diagram shows the simple layout, with the milk-ladle-shaped subpanel, which leaves room for the B supply. There is little wiring to greet the eye. Nearly all the wiring is done underneath, hence the concentration in the upper part of the pictorial diagram.

The leads from the filament transformer to the sockets should be twisted and kept as far away as possible from the detector plate and grid.

The filament transformer and the B supply are the last things to be connected, since you will want to handle the subpanel a great deal, and turn it hither and yon, during the wiring. Then, when the power sources are connected, the B supply and the filament transformer are

fastened to the bottom of the cabinet with woodscrews.

The B supply in particular affords facilities for using 1/2-inch right-angle brackets, the four corner screws being removed from the B supply casing and driven home again through holes in the brackets, the remaining bracket holes accommodating the woodscrews.

The two-way plug shown to the left of the filament transformer is any type of AC plug that receives the two plugs of the filament transformer and the B supply (one apiece).

Off and On

An AC socket of the porcelain type, with a screw plug inserted, makes ready for the reception of the two-way plug, or a screw-type two-way plug will fit in this socket. The AC cable, which you make, runs from the terminals of this porcelain socket to the line, although one side of the cable, of course, is interrupted by the switch SW. Hence the single switch controls all source of power. When the switch is turned to "off" position everything is off and stays off until the switch is turned "on."

To the opposite side of the line is connected a fixed condenser of .00025 mfd. This is to pick up the ground. One side of the line is at a ground potential. You can determine this readily enough by connecting the switch and the fixed condenser to opposite sides of the cable you

Six Brackets Secure Subpanel to Cabinet

The AC4 subpanel is to be supported by six brackets, not shown in the diagrams. They are ordinary angle brackets, placed at the five corners, the sixth bracket immediately to the left of the B supply. The bracket height depends on how high your cabinet compels the subpanel to rest above the bottom of the cabinet.

will extend from the porcelain socket to the wall fixture. After the set is in operation reverse the plug in the wall socket, to determine which connection gives the louder signals. The one that does so picks up the ground. However, the set will work well no matter which way the plug is connected into a convenience outlet. The object of getting everything straight is utter safety.

More Scientific Test

As an additional test, and one that does not depend on the foibles of the human ear, you may connect a 25-watt lamp, or any wattage electric house lamp you may have handy, putting it in an AC socket so you can run one lead to the side of the line that goes through the switch, while extending the other side to a radiator or cold water pipe. If the lamp lights the plug connection running to your receiver is in the wall outlet in the right direction, since a potential difference exists between the high side of the line and the radiator. Of course when a reversal is made the lamp will not light.

Mark the plug so that you will know top from bottom or one side from the other, in case you remove the plug for any reason and want to insert it correctly again without renewing the test.

By observing these precautions you will be following the rules of greatest sanity and safety, with the switch in the high side of the line, and the grounding condenser in the low side of the line. Thus when you break the connection through the switch you remove all possibility of shorting the line (blowing a house fuse is the usual result of such shorting) and you get your set all fixed up properly for distinction in radio frequency potentials as well.

Avoid Trouble

The matching of the coils is not necessary if they are wound very tightly, with the same number of turns, same wire, and same separation between each turn and between primary and secondary. You may wind them yourself that way with a winder or get the factory-made coils.

nections to the Line

C4 Compact Receiver

Bernard

Editor

The double condenser must be extremely accurate, for here alone would real difficulty arise. Use the specified Hammarlund double condenser and avoid the only possible source of serious trouble.

The placement of the coils, the type of winding and the number of primary turns insure successful synchronous tuning, if the RF and detector plate and grid wiring of the leads is made as shown, this referring particularly to their length.

The other considerations that absorb any set-builder's attention are volume, sensitivity, selectivity and hum.

Of course the matched working of condensers and coils is taken for granted, and reference to volume, sensitivity and selectivity has to do with things independent of the tuning mechanism. In this particular receiver there are such independent considerations that must be given attention.

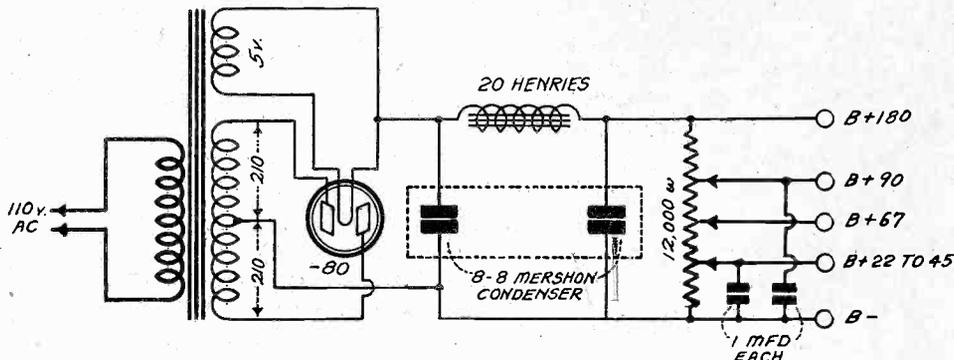
For Greater Volume

First, volume. This depends, in any instance, on how much aerial pick-up you are obtaining. As previously explained, this receiver will stand a long aerial, even 150 feet, including lead-in. If you use such an aerial, or one $\frac{3}{4}$ as long, you may use 1,500 ohms as the biasing resistor in the radio frequency tube circuit (socket 1). But if you are compelled to use a small aerial, or if for any other reason, such as a shielded location that is poor in receptivity, you may decrease the amount of resistance.

The Electrad product has a slider at the extreme end, so that naturally you use the full resistance at first, but if you want more volume you may loosen the set screw and push the slider over, even half way or more.

This remedy should be applied only if

if the bias is wrong the detection is absent. Mere amplification takes place all through the receiver and you hear nothing. It is impossible to obtain this result if



THE CIRCUIT DIAGRAM OF THE B SUPPLY USED WITH THE AC 4.

necessary, nevertheless it should be applied even if the volume on some stations is plentiful, while that on others is rather weak. Bring up the weak ones, for you may do so readily by the application of this remedy.

Use It as Expedient

When this operation is made the selectivity is slightly reduced and that is why a lower biasing resistance for the RF tube was not recommended in the first instance, and is not now recommended, except to meet the conditions just outlined.

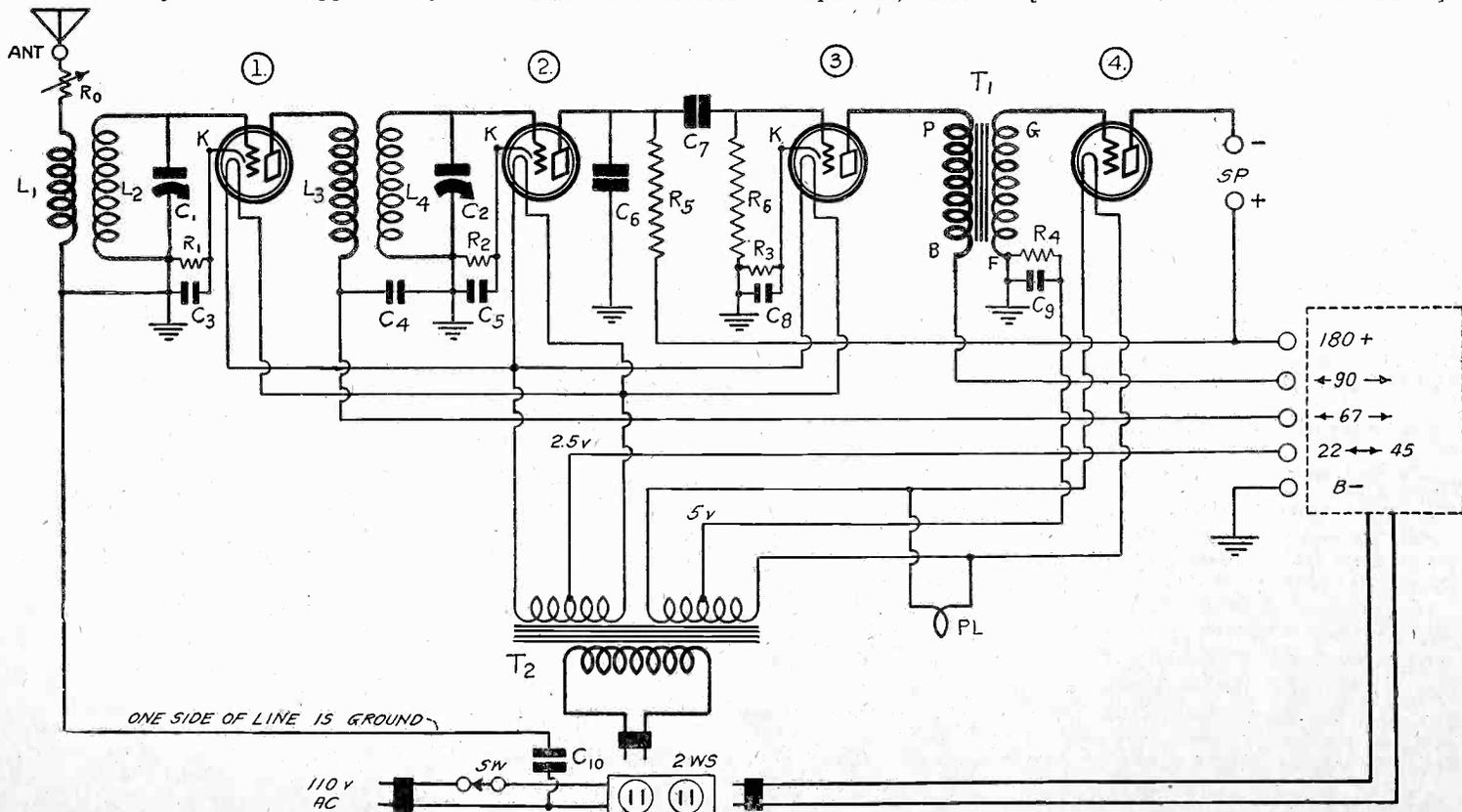
Obviously the sensitivity is affected by the resistance value, so that negative bias is decreased and sensitivity increased by the resistance decrease. As all receivers are compromises between selectivity, sensitivity and tone, you can adjust the receiver to your own requirements and thus obtain far better reception than would be possible on a "machine-made" model. The detector is important, since

you use the specified B supply, detector tube and value of biasing resistor R2.

The National B supply will deliver the correct voltage, the detector obtaining the full 180 at the high DC side of the resistor R5. You are not interested particularly in the current and voltage figures, but in the results, and the 50,000 ohm resistor gives you fine detection.

If you use twice as much resistance for R2, the detector biasing resistor, you would get louder signals, but the detector tube would overload easily and would carry too high a hum component. Most of the hum centers around the detector tube in an AC receiver. The 50,000 ohm value leaves you virtually free from hum if you will only keep the AC filament leads away from plate and grid leads of the detector, and of course keep the filament AC cable and the B supply cable likewise distant from the detector plate and grid leads.

[Other Illustration on Front Cover]



THE VALUE OF R1 CONTROLS SENSITIVITY AND VOLUME. THE TEXT EXPLAINS HOW TO ADJUST THIS PERMANENTLY FOR YOUR LOCATION. NOTE THAT THE GROUNDING CONDENSER C10, AND THE SWITCH SW, ARE ON OPPOSITE SIDES OF THE LINE. THIS IS IMPORTANT. THE TEXT TELLS WHY.

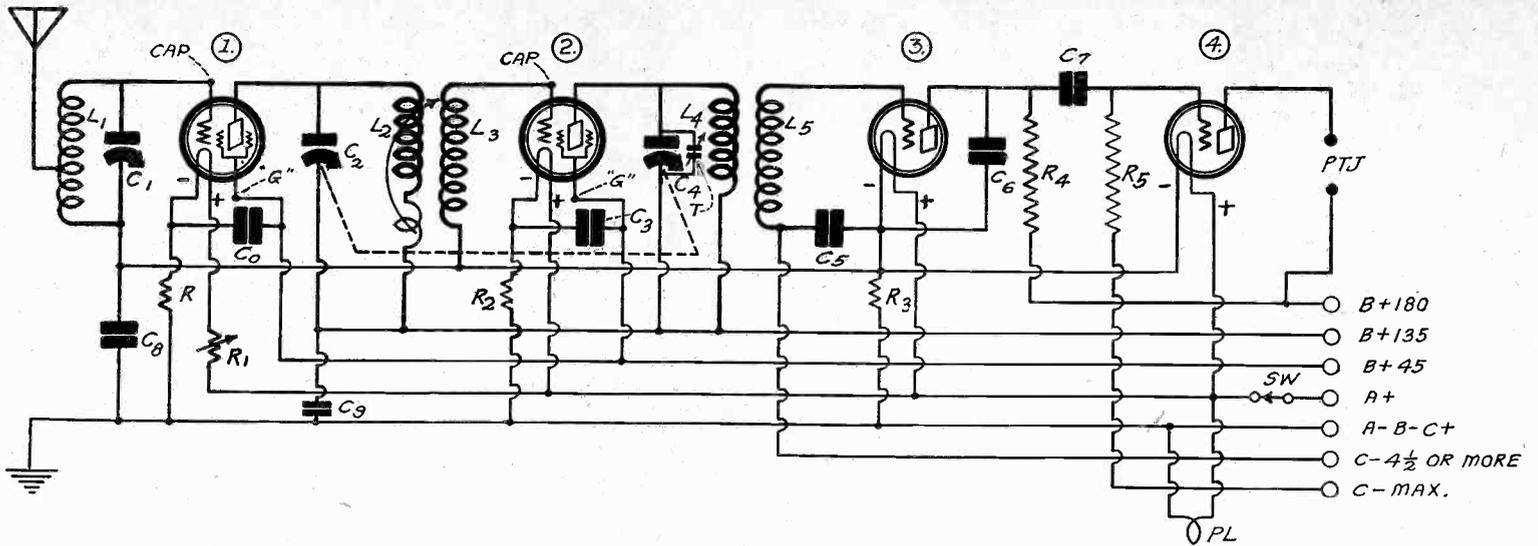


FIG. 727

THIS DIAGRAM OF A TWO SCREEN GRID TUBE RECEIVER WILL BE BOTH SENSITIVE AND SELECTIVE IF CARE IS TAKEN IN ADJUSTING IT. IT WILL ALSO BE STABLE IF IT IS WELL BY-PASSED AND SHIELDED. REQUESTED BY JOSEPH ZABRISKI.

Radio University

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I HAVE BEEN TOLD that all AC voltmeters and ammeters will measure DC as well. Is that true?

(2)—Are such meters as accurate as DC meters?

(3)—What type of meters are useful on both AC and DC?

WILLIAM BRADLEY,
Poughkeepsie, N. Y.

(1)—Yes, it is true.

(2)—They can be made as accurate, but if a meter is calibrated on AC precautions sometimes have to be made when measuring DC. For example, it may be necessary to measure the DC twice, reversing the current through the meter. The correct reading is the average between the two.

(3)—The three types of meter which can be used both for AC and DC are the electro-dynamometer, the thermocouple and the hot wire types. The electro-dynamometer type works on the principle of repulsion between two series connected coils through which the current is flowing. The repulsion is independent of the direction of the current and hence the meter measures AC as well as DC. The thermocouple type operates on the principle of the electromotive force generated at the junction of two dissimilar metals when heated. The current to be measured

heats the junction. The heating is not quite independent of the direction of the current and hence DC must be measured by allowing the current to flow first in one direction and then the other, taking the mean value. The hot wire type operates on the principle that the wire lengthens when heated by the current to be measured. It works equally on AC and DC.

* * *

IS THERE ANY advantage in using tuning coils of large length to diameter ratio and fine wire in receivers employing ganged condensers?

(2)—In making such coils should the primary be placed at one end of the secondary or should it be placed inside?

(3)—Is it advisable to place shields around such coils to prevent interstage coupling?

CURTIS AVERY,
Guthrie, Oklahoma.

(1)—There are some advantages. The coils are less selective than relatively shorter coils and coils wound with heavier wire. The lower selectivity makes it easier to tune the gang. Also the long coils have a more concentrated field so that interstage coupling is reduced.

(2)—The primary should preferably be placed inside because if it is placed at

one end the coupling between the secondary and the primary is too small.

(3)—It is not advisable to place the coils in small shields. It is better to put an entire stage inside one shield and keeping the coils as far from the shielding as practical.

* * *

WHAT SHOULD the grid bias on a CX-300-A tube be for most efficient detection? I am now using grid leak and condenser for detection but want to try the grid bias method.

(2)—Is the adjustment of the grid bias critical?

(3)—Is it necessary to take account of the resistance in the grid circuit resistance, that is the resistance in the secondary of the transformer?

FRED STOCKTON,
Binghamton, N. Y.

(1)—The tube is most efficient as a detector when the bias is 2.25 volts negative.

(2)—It is quite critical and should not be allowed to go outside the limits -2.5 and -1.75 volts.

(3)—There should be no resistance in the grid circuit, but the resistance in the secondary of a radio frequency coil need not be considered.

* * *

I AM PLANNING to build a four tube receiver using two screen grid radio frequency amplifiers, three tuners and one station of resistance coupled audio. Will you please publish such a diagram if convenient?

(2)—I have had good success with tuning the primary, and if you have such a circuit I should like to have it. Can the coils used in the Screen Grid Universal be used in this circuit?

(3)—Do you think such a receiver would be practical?

(4)—What size tuning condensers do you recommend?

(5)—Can the circuit be operated without shielding the radio frequency stages? If not, where should the shields be placed?

JOSEPH ZABRISKI,
Scanton, Pa.

(1)—See Fig. 727.

(2)—Yes. Omit the center tap on the interstage coils. But it is better to use tuned primary transformers without the tickler.

(3)—It can be made to be very sensitive and selective. Also stable if care is taken in building it.

(4)—Condensers of .0005 mfd. capacity and coils to match.

(5)—No. Use shields. Place the shields after the tube so one complete stage is shielded from all parts following. There should preferably be shielding all around each stage.

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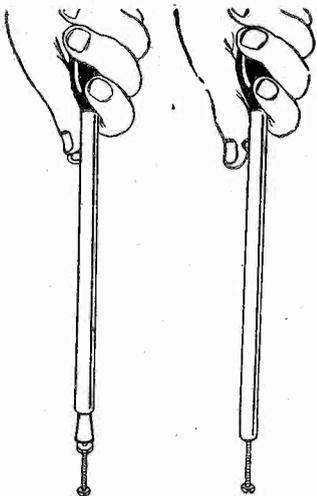
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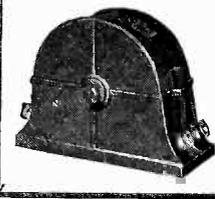
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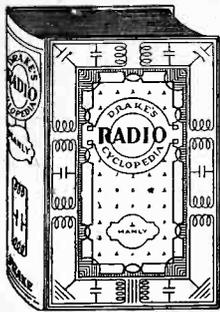
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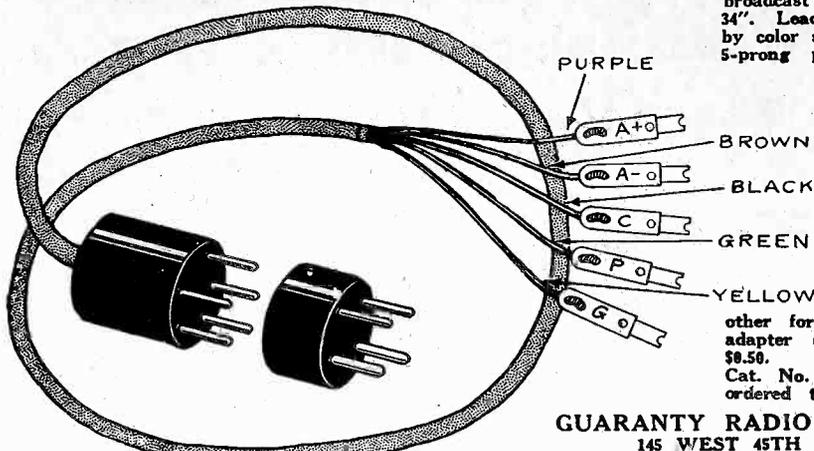
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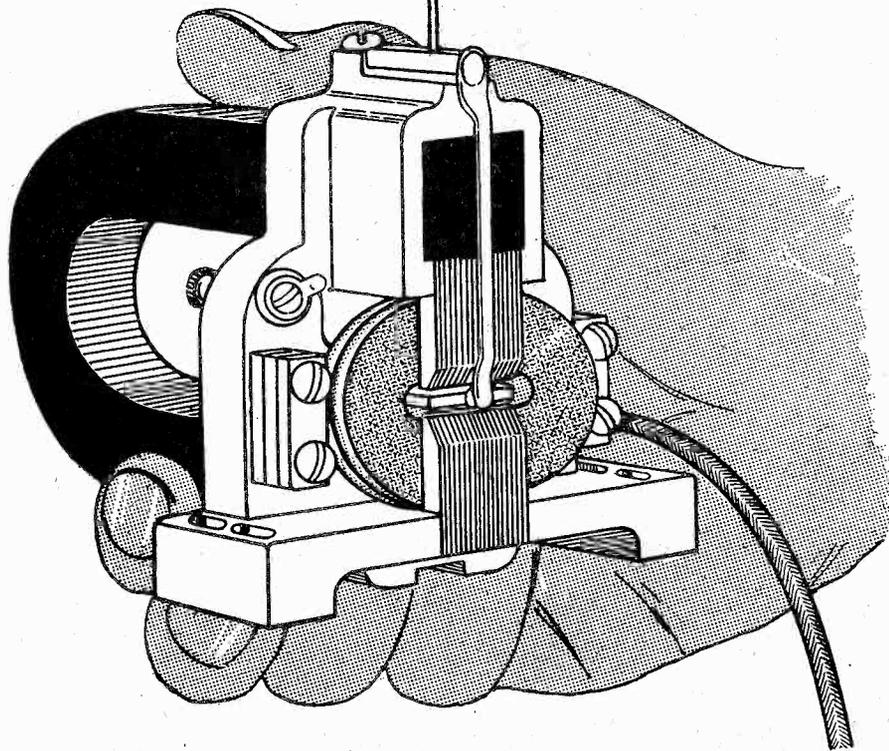
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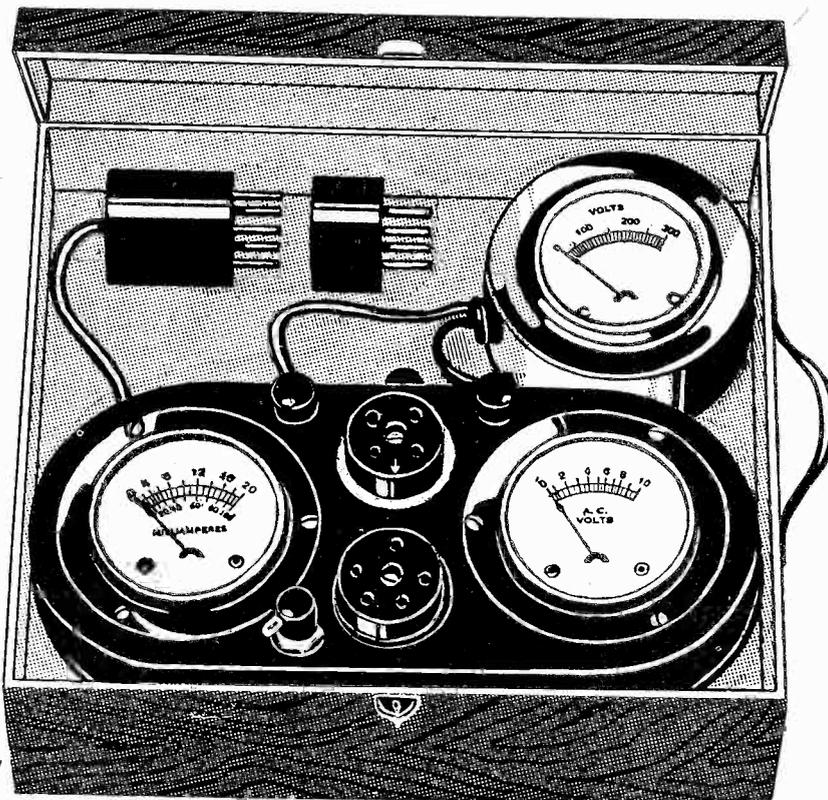
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- (5) to determine the condition of a tube, by use of the grid bias switch;
- (6) to measure any tube's electronic emission;
- (7) to regulate AC line, with the aid of a power rheostat, using a 27 tube as guide;
- (8) to test continuity of resistors, windings of chokes, transformers and circuits generally;
- (9) to find shorts in bypass and other condensers, as well as in inductances, resistors and circuits generally;
- (10) to read grid bias voltages, including those obtained through drops in resistors;
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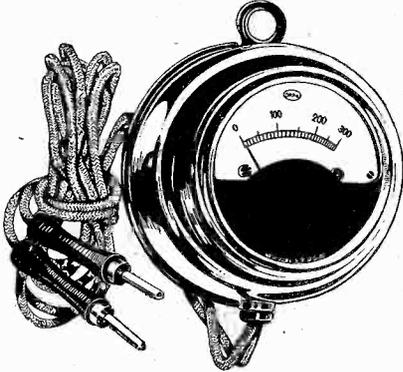
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For Portable or Panel Use



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High resistance 0-300 Voltmeter, accurate to 1%. Measures any DC voltage to 300, including B eliminators. Provided with 30" cord, with luxurious jack tips and hanger. Meter full nickel de luxe finish. No. 346F.
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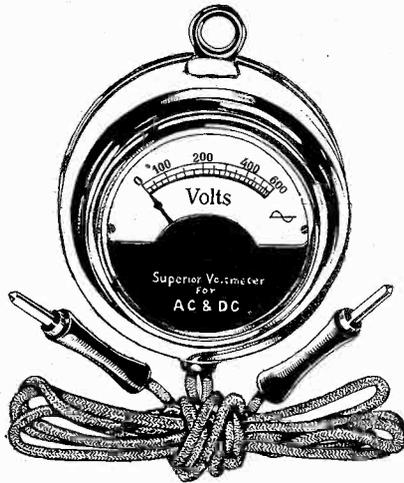
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High Resistance Meter
Same Meter Reads Both
Accurate to 1 per cent. **\$7**



The O-600 volt AC and DC meter (Cat. No. 600), with 3-ft. cord, de luxe tips and hanger \$7.00.

THE output voltages of all B eliminators, the voltages of all B batteries, as well as the house current line voltage, whether AC or DC, and the voltage across power transformer secondaries, can be accurately measured by this meter. The full scale is 0-600 volts, and this same meter measures both AC and DC. Since it is a high resistance meter, of extraordinary range, and accurate to 1% plus or minus, it is advisable to get this meter for your testing purposes, since it is like two meters in one—AC and DC. You can find trouble more quickly. Without it you can't tell if a power transformer secondary is delivering voltage. 10-day money-back guaranty.

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Please ship at once one 0-600 volts AC and DC high resistance voltmeter, accurate to 1% plus or minus (Cat. No. 600); meter equipped with 3-ft. cord, moulded tip receptacles, tips and hanger.
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THE AC 4

- Complete Kit of Parts for the AC4, less B eliminator\$36.75
- Complete Kit of Parts for AC4, with National B eliminator (180 v.) including 280 tube\$54.75
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Colors Prevent Error

Red lines are used in all the diagrams to denote filament leads, light blue lines for grid connections, green lines for plate leads and heavy and light black lines for the rest. You can't make a mistake if you let the colors be your guide.

The Radio Blueprint Library of AC and Battery Hookups, one volume in FOUR COLORS, is a veritable encyclopedia of tested DX hookups, with 45 illustrations of fourteen different circuits, and a textual explanation of each circuit. Besides, the booklet contains the Story of Radio, lists of parts for all fourteen circuits, and a Station Log Chart on which to record the stations you receive and the dial settings.

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Front and Subpanel

for the

AC 4

Front panel, drilled for National Drum Dial, volume control switch, and for "dummy".....\$2.35
Subpanel, 6x19", cut milk ladel shape, to permit room for B eliminator; 4 sockets built into subpanel; other holes drilled.....\$3.65

SPECIAL: We carry National Velvet B (type 3580) in stock, also 280 tube. Get our prices on these. Blueprint for AC4.....\$1.00

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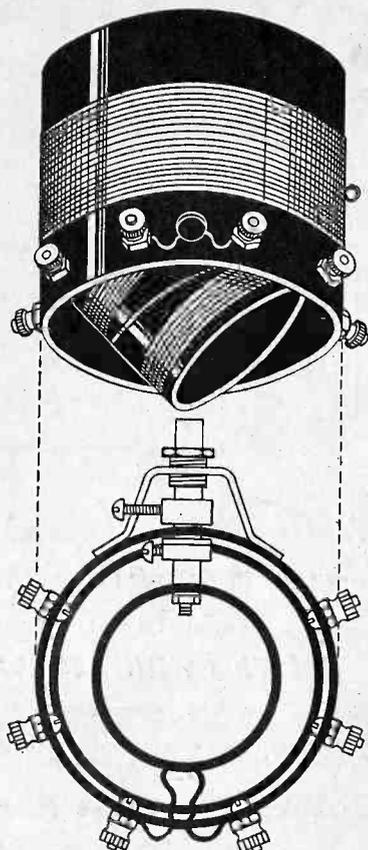
AC 4

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HOW TO USE SCREEN GRID COILS



Model 5HT. High impedance 3-circuit tuner, to work out of a screen grid RF tube. For .0005 mfd.\$3.00
Model 5HT. Same as above, but for .00035\$3.25

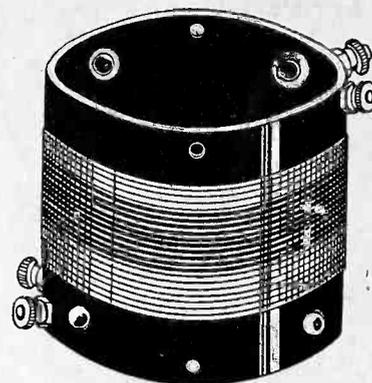
WHEN a screen grid tube is used as a radio frequency amplifier, the maximum gain, the best amplification, the most volume and the most DX are obtained by tuning the plate circuit. Then this enormous amplification is itself doubled by providing a secondary with twice as many turns as the primary has. The secondary is not tuned. The high impedance 3-circuit tuner at left (Model 5HT) is an example, as is the two-winding coil (Model 5TP) at lower left. The primary in these two instances is the outside winding and the tuning condenser goes across it. The secondary is wound on a separate form that is riveted inside the primary form. Preferably mount coils with binding posts at bottom for short leads. Then the connections for Models 5HT, 3HT, 5TP and 3TP are, from right to left as you look at the back of the coil: B+135, near front panel; plate of screen grid tube; two rotary leads (for tuner only); grid and (next to panel) grid return.

The antenna coil to use in screen grid circuits is 5A or 3A (upper right), because it is so designed as to equalize tuning. The low, almost zero, capacity between grid and filament of the tube is compensated by extra turns of wire, so that if the tube following the screen grid is of another type, for instance a regular detector, the elemental capacity difference is nullified. The antenna coupler has a continuous winding in shaded colors. The end with the larger number of distinctive turns goes to grid, the opposite end to ground. Either of the two remaining binding posts goes to antenna.

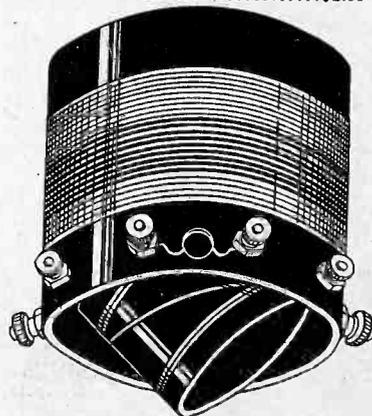
For single control screen grid sets the inductive trimmer type of antenna coupler (Model 5AS or 3AS, at right) should be used. The inductive trimmer coil for interstage coupling is Model 5TPS or 3TPS (not illustrated), but its connections are shown in the diagram at lower right. An inductive trimmer adds to or subtracts from the reactance, which is very important for resonance in single control sets. Trimming condensers only increase reactance, hence fail where decrease is needed.

Model 5TPS Interstage coupler to screen grid tubes, with inductive trimmer. For .0005 mfd.\$2.25
Model 3TPS, same as above, except it is for .00035.....\$2.50

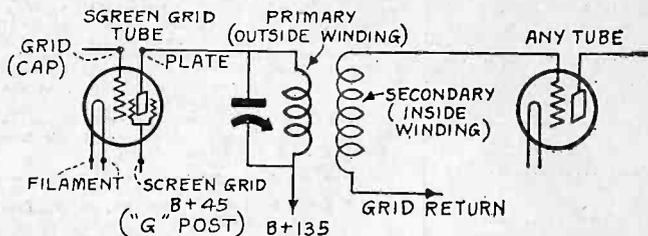
ALL ROTOR COILS HAVE SINGLE HOLE PANEL MOUNTING FIXTURE



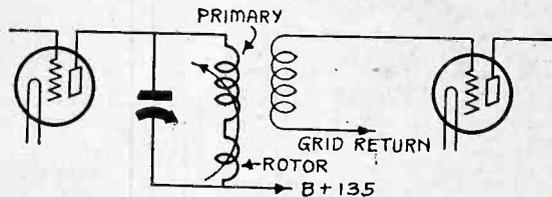
Model 5A. Conductively coupled antenna coil for input to screen grid radio frequency amplifier. For .0005 mfd. condenser. Price\$1.75
Model 3A. Same as above, but for .00035\$2.00



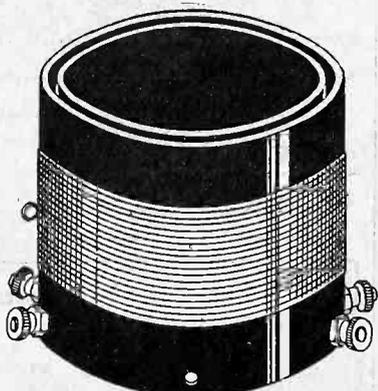
Model 5AS. Conductively coupled antenna coil for single tuning control screen grid sets. Rotor is an inductive trimmer. For .0005 mfd.\$2.75
Model 3AS, same as above, but for .00035\$3.00



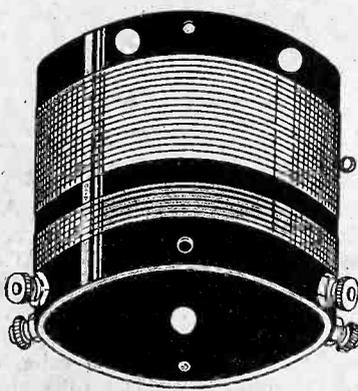
How tuned primary in plate circuit is wired for a screen grid tube. This illustrates the use of Model 5TP or 3TP, also Model 5HT and 3HT, except for the rotor coil connections.



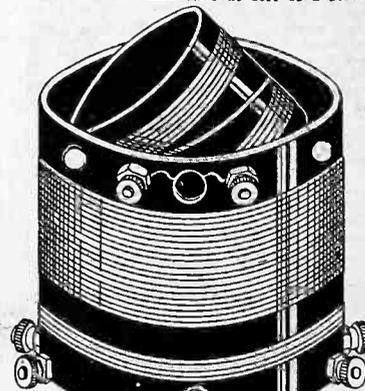
In single control circuits Model 5TPS is used as shown, for interstage coupling. The rotor is an inductive trimmer. The tube at left is a screen grid.



Model 5TP, the wiring of which is shown in the diagram directly above, is an interstage coupler for screen grid tubes. For .0005 mfd.\$2.00
Model 3TP. Same as above, but for .00035\$2.25



Model R5, interstage coupler for replacing present coil in existing receiver when screen grid tube is substituted. For .0005\$1.50
Model R3. Same as above, but for .00035\$1.75



Model T5, standard 3-circuit tuner, not for screen grid tubes, but for all others. For .0005\$2.50
Model T3, same, but for .00035.....\$2.75

Coils for Other Than Screen Grid Tubes

When any tubes other than screen grid tubes are used as radio frequency amplifiers, standard coils are used, for instance Models T5 and T3, the three-circuit tuner shown above at right.

For the antenna coil in such a circuit use one with two separate windings, the familiar radio frequency transformer, with about 14 turns on the primary. This RF transformer is therefore used as antenna coil and as an interstage coil.

The resultant loose coupling of antenna reduces the capacity effect of the antenna and thus the standard TRF coils, with 201A, 112A, 226, 227, 199 or 240 tubes, providing the same RF tubes are used throughout, may be used in single control sets without trimming devices. This is true if the coils are absolutely matched, as Models RF5 and RF3 are.

The small winding (primary) is connected in the antenna-ground circuit, or, for interstage coupling, in the plate circuit. The large winding (secondary) is tuned and is put in the grid circuit.

Model RF5. Antenna coil or interstage coupler for any and all tubes, excepting only screen grid tubes. For .0005\$1.00
Model RF3, same as above, but for .00035\$1.25
Model T5, standard 3-circuit tuner for .0005\$2.25
Model T3, standard 3-circuit tuner for .00035\$2.50
Model 5AC.\$1.50 Model 3AC.\$1.75

USE THIS COUPON

Screen Grid Coil Co., 143 W. 45th St., N. Y. C. (Just East of Broadway)

(Specify Quantity in the Squares)

Please mail me at once your following coils, for which I will pay postman the advertised prices, plus a few cents extra for postage.

Model..... Model..... Model..... Model..... Model.....

Name

Address

City State

SEND NO MONEY!