

April 20th, 1929

15 Cents

RADIO

REG. U.S. PAT. OFF.

WORLD

The First and Only National Radio Weekly

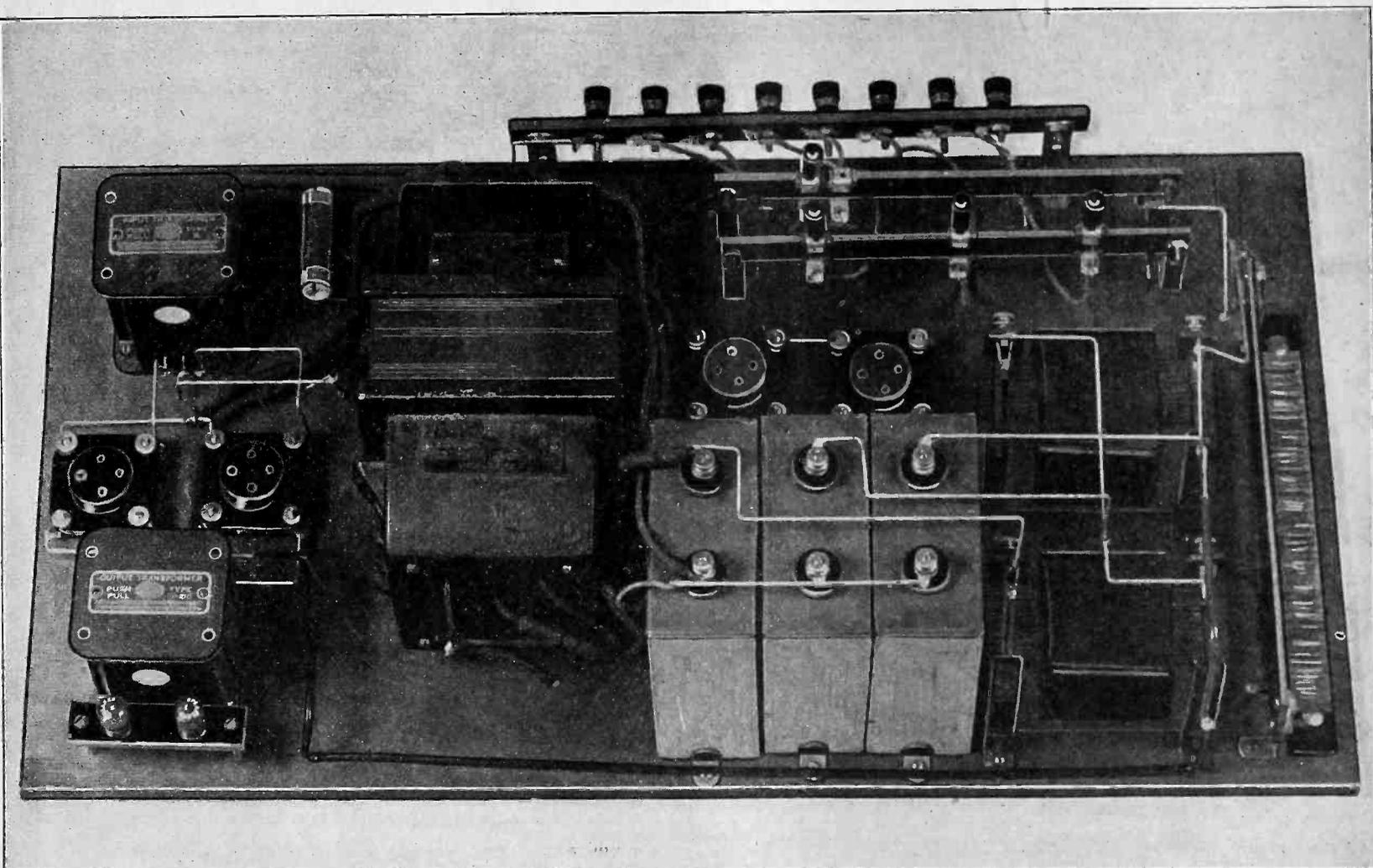
369th Consecutive Issue—Eighth Year

CRYSTAL RECTIFIER A JOKE
COMPARED TO GRID BIAS

250 Power Amplifier
with Receiver to Match

*Selectivity's Strangely
Stagnant Change!*

LACAULT'S POWER PACK!



A photograph of the LaCAULT power pack and push-pull amplifier designed especially for the RE29 receiver. See article on pages 12 and 13.

TELEVISION
AUDIENCE PUT
AT 20,000!

EXERCISING TO
RADIO CALLED
HARMFUL!

VOICES SAME,
WOMEN MIXED
IN PLAYLETS

NEW CHAIN
READY TO OPEN
SEPT. 1st

To-Night

will you hear Clear Notes like this?



or will you hear This?



LINE NOISE ELIMINATOR makes any electric or any electrified radio play as quietly as any battery operated receiver. It silences all stray line noises which enter the receiver through the power packs of electric sets and eliminators. With the Si-Len-Ser

MUSIC CLEARS UP

The SI-LEN-SER can be used on A.C. or D.C. 110 volt, 220 volt or 32 volt arm lighting systems. Price **\$12.50** AT ALL GOOD DEALERS Write for circular on "How to Eliminate Line Noises in Electric Radios."

Distributed by LEADING JOBBERS Manufactured and Guaranteed By **Trutone Radio Sales Co.** 114-116 Worth St., New York, N. Y.

Gothic Polo Speaker, \$15.00

Housed in a beautiful Gothic structure of genuine walnut; hand-rubbed to an attractive finish, the Polo driving mechanism and cone combine best quality reproduction with finest appearance. The grille is specially constructed for two-tone effect, so popular in walnut these days. The Polo Speaker in the Gothic housing is an adornment, besides being an outstanding speaker in performance. The design of the cabinet is exclusive. The height is 12 1/2". Shipping weight, 10 lbs. Cat. No. T.M.P.G.....



\$15.00

GUARANTY RADIO GOODS COMPANY
145 West 45th Street, New York City

Twice as Much for Your Money!

Send \$6.00 for one year's mail subscription for RADIO WORLD (52 numbers, one each week), and you will be given one full year's subscription for any one of the following six magazines:

- | | |
|---------------------------------|-----------------------------|
| Radio News (monthly) | Radio Engineering (monthly) |
| Science and Invention (monthly) | Youth's Companion (weekly) |
| Radio, San Francisco (monthly) | Boys' Life (monthly) |

SPECIAL TWO-FOR-PRICE-OF-ONE COUPON

RADIO WORLD, 145 West 45th Street, New York City (Just East of Broadway): Enclosed please find \$6.00, for which send me RADIO WORLD each week for one year, 52 numbers, and also send me, without extra cost, for one year ONE of the following magazines as indicated:

- | | |
|--|--|
| <input type="checkbox"/> RADIO NEWS | <input type="checkbox"/> RADIO ENGINEERING |
| <input type="checkbox"/> SCIENCE AND INVENTION | <input type="checkbox"/> YOUTH'S COMPANION |
| <input type="checkbox"/> RADIO (San Francisco) | <input type="checkbox"/> BOYS' LIFE |

[Put a cross in the proper square above. Fill out coupon and send \$6.00. If you are a subscriber for RADIO WORLD or for the other magazine you select, or both, check off squares below, as left.]

Present RADIO WORLD subscribers may renew under this offer. If renewing, put a cross here

Name.....

If renewing for the other magazine you select, put a cross here also

Street Address.....

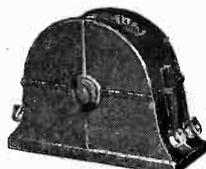
City..... State.....

THIS OFFER EXPIRES AT NOON ON APRIL 30TH, 1929

LYNCH

Tubadapta improves TONE by preventing overloading of power tube

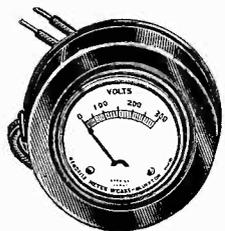
ARTHUR H. LYNCH, INC.
1775 Broadway New York City
Send for free Lynch radio manual



VICTOREEN
Super Coils
Write for Free Blueprints of New Victoreen Circuits
Geo. W. Walker Co.
2825 Chester Avenue.
Dept. B Cleveland, O.

Recent Issues of RADIO WORLD, 15 cents each. Any number published in 1928 available for a short while. Six issues 75 cents, 10 issues \$1.00. Send stamps, coin or money order NOW, before the issues are sold. RADIO WORLD, 145 West 45th Street, New York City.

HIGH RESISTANCE VOLTMETERS



0-300 v., in portable type, full nickel finish, 30" tipped cord (illustrated at left). (Cat. No. 346) \$4.50

0-500 v., Tests ALL power packs, B eliminators, etc. Same casing as above. (Cat. No. 347) \$5.00

Just the thing for service men, custom set builders, home experimenters.

GUARANTY RADIO GOODS CO.
145 W. 45th St., N. Y. City

WHAT RADIO COMPANIONSHIP DO YOU ENJOY?

ARE you meeting weekly the best minds of radio? Do you keep abreast of all the new circuits, the intimate details on perfecting existing sets, and get the inside track on sensitivity, distance reception, tonal quality, and how to achieve them? Do you keep fully abreast of the news of radio, technical and non-technical? If not, here is your chance to enjoy the writings of Dr. Lee De Forest, McMurdo Silver, J. E. Anderson, Herman Bernard and a host of other radio engineers who contribute their knowledge to you through the medium of Radio World, the first and only illustrated national radio weekly. **SEVEN YEARS OLD!**

You can find no magazine that better caters to your needs than Radio World, which specializes in most intimate revelations of the ins and outs of the best circuits, with technical accuracy second to none. Enjoy the weekly companionship of Radio World's famous contributors, and glean the news of radio, from the four quarters of the earth.

Short waves? Radio World will tell you all about them. Extremely sensitive broadcast receivers? Their construction and operation are fully discussed with confident regularity. Power supplies—push-pull or otherwise? AC receivers? Screen grid tubes? Large receivers that give a super-abundance of performance—small, economical receivers that give performance out of all comparison to their size? Are you interested in these? Then you're interested in Radio World. Send \$1.00 now for a ten-week subscription for Radio World (regularly \$1.50), and in addition you will be sent FREE any one of the following panel meters:

- | | | |
|--|--|---|
| <input type="checkbox"/> 0-6 Voltmeter D.C. | <input type="checkbox"/> 0-10 Amperes D.C. | <input type="checkbox"/> 0-100 Milliampers D.C. |
| <input type="checkbox"/> 0-50 Voltmeter D.C. | <input type="checkbox"/> 0-25 Milliampers D.C. | <input type="checkbox"/> 0-300 Milliampers D.C. |
| <input type="checkbox"/> 6-Volt Charge Tester D.C. | <input type="checkbox"/> 0-50 Milliampers D.C. | <input type="checkbox"/> 0-400 Milliampers D.C. |

Put a cross in the square next to the meter you desire, and return this slip with one dollar, whereupon we will send you Radio World by mail each week for ten weeks. Present mail subscribers may renew their subscription under this remarkably generous offer by putting a cross in this square.

15c per copy
\$6 per year

RADIO WORLD
145 West 45th St., New York City

Published Weekly



Vol. XV, No. 5. Whole No. 369.
 April 20th, 1929
 15c per Copy, \$6.00 per Year
 [Entered as second-class matter, March 1922, at the Post Office at New York, N. Y., under Act of March, 1879.]

Latest News and Circuits
 Technical Accuracy Second to None
EIGHTH YEAR

A Weekly Paper published by Hennessy Radio Publications Corporation, from Publication Office, 145 West 45th Street, New York, N. Y.
 (Just East of Broadway)
 Phone: BRyant 0558 and 0559

SAME VOICES AMONG WOMEN STUMP EXPERT

Chicago.

The main difficulty in using women in sketches over the air is that feminine voices sound so much alike, said Lester Luther, dramatic coach of the WENR players.

"The trouble at present is that when you attempt to present any kind of a sketch in which there are three or four women, their voices all sound so much the same. You can't tell whether it's Mary or Josephine who is talking, unless there is something in the text to differentiate," Mr. Luther continued.

More Personality Needed

"This means that women must develop more voice personality, or they will fall behind in the progress of the development of radio programs.

"Of course, if you have a sketch where there is only one woman, it makes no difference, but if in your sketch there are two characters, both representing young girls, it is almost impossible for the audience to tell which is which. You can have the characters mention their names in the dialogue each time, but this is awkward. The other way you differentiate is to use dialect, but most of the time this is not practical.

Praises "Real Folks"

"One of the best sketches of this kind on the air today is 'Real Folks' program over the NBC chain. The women who take part in this sketch have injected a voice personality that makes it easy to know which one is talking. Here at WENR we are attempting to do the same thing in 'The Smith Family,' a comedy sketch.

"With men there is a much wider difference in the inflection and tone quality of voice."

THE KILLER INSTINCT

Chicago.

A novel feature was introduced recently during the Sunshine Hour at 10 a. m. central standard time over WENR, when a program composed of all the recent melodies that have been "done to death" over the air was given.

BREMER-TULLY SOLD

The Brunswick-Balke-Collender Co. has bought out Bremer-Tully, Chicago. J. C. Tully and H. A. Bremer retired from the B.-T. Co. With the sale goes the RCA license and other licenses.

'Terrible Voices' Among Announcers

Oakland, Calif.

Gladys M. Petch, who completed a world tour of radio stations when she spoke recently over KGO, is noted in Europe for her "fine radio voice." She said:

"The criticism is often made of Americans that they speak with a harsh nasal twang. I think this is true for the most part, but it is not only true of Americans, but of people the world over who are not careful of their speech tones.

"Some of your radio announcers in this country have terrible voices, though of course there are some fine exceptions. I believe that the radio is going to concentrate public interest on the speaking voice and do a great deal towards improving speech."

FINDS U. S. BEST IN BROADCASTS

The American system of radio broadcasting is best, said Alessandro Banfi, chief engineer of the Italian Broadcasting Company. There is virtually no department of radio in which the United States does not excel European stations, in his opinion.

Mr. Banfi based his statements on a three-week inspection tour of National Broadcasting Company units, made while waiting completion of arrangements for the installation at Rome of the largest broadcasting station in Europe. Equipment for this station, 50-kilowatt unit, will be furnished by the Radio Corporation of America for operation in October.

Prior to coming to America, Mr. Banfi visited many of the larger radio stations in Europe, including those in London and Berlin. He will sail for Italy soon.

It is planned to make the new station at Rome the first link in a chain of similar high-powered units through Italy, he said. Six low-power stations are now operated by the company.

Although the superiority of the American system is evident from practically every angle, there is such a vast difference in the methods that an accurate comparison cannot always be drawn, Mr. Banfi said. The only exception he made to his statement regarding the American programs was in the type of entertainment offered. He thinks most European stations offer a higher class of programs, in the sense of more classical music, although he lauded the American method of diversifying the broadcasts.

CMC ON 356.9 METERS

The former call letters of PWX, Havana, Cuba, familiar to DX fans, have been changed to CMC. The wavelength is 356.9 meters, frequency 840 kc.

NEW BIG CHAIN BEING FORMED FOR SEPT. 1st

Boston.

Eric H. Palmer, vice-president of the Allied Broadcasting Companies, Inc., announced that the formation of a new chain of broadcasting stations with outlets in the principal cities is under way. The Allied Broadcasting Companies, Inc., represents in the East the nucleus of the chain now known as the American Broadcasting Company on the West Coast.

Adolph F. Linden, president of the Puget Sound Savings & Loans Association and owner of the Camlin Hotel, Seattle, is president of the new chain.

Arrange for Other Stations

The company now owns and operates four stations in the West: KYA, San Francisco; KJR, Seattle, Wash., which will be the key station; KEX, Portland, Ore., and KGA, Spokane, Wash.

The company also says it holds leases or options on other stations on the Pacific coast and in the Rocky Mountain region. Some of these are KMTR, Los Angeles; KDYL, Salt Lake City, Utah, and KLZ, Denver, Colo. Arrangements have also been made with WLTH, WCGU, WSGH and WSDA, all in the vicinity of New York, to connect with the new chain.

According to Mr. Palmer the new chain will offer new ideas in broadcasting. Among these he mentioned that the programs offered will contain a maximum of high-class entertainment with a minimum of advertising. Another is that on certain days of the week the programs will originate on the West Coast, with Western ideas of presentation, and on other days the programs will originate in the East.

Expect to Start September 1st

According to the plans, the most modern types of transmitting stations will be erected in New York and in Seattle. This will be made possible by purchasing and dismantling smaller stations which are now using low power and which divide time.

The plans also call for the operation of three stations in New England. Final arrangements with these stations are nearing completion.

It is expected that the new chain will be ready for operation by September 1st.

POLYMET BUYS WIRE CO.

Strand & Sweet Manufacturing Corporation, of Winsted, Conn., maker of copper magnet wires, has been purchased by Polymet.

SURVEY FINDS TELEVISION IN TINKER STAGE

Limited television, rather of an experimental nature, is nearly a success, but popular television, meaning a field of reliable public entertainment and instruction, is still far off, said Louis B. F. Raycroft, reporting to the radio division of the National Electrical Manufacturers Association. He is director of the division and vice-president of the association. He said:

"Television in its narrow sense, such as silhouette movies and single figures in action, has made definite advance toward commercial success. In its broader sense, however, television, as the farseeing eye of football and baseball games, is still in the distant future.

Standardization Needed

"No single step to the consummation of this ideal is of greater importance than the standardization of all the elements which determine the specifications to which the television reproducer must be designed, and no great progress in the commercialization of television is possible until satisfactory standards have been determined.

"Nothing of practical value has yet been accomplished along these lines which takes into account the latest progress in the art and the entertainment and quality requirements which must be met.

"A number of parts manufacturers during the past two years have made components of one kind or another but most of them have already discontinued the manufacture of such parts because the market has not yet been developed.

Experimental So Far

"As long as the performance of devices offered the public is of a low order of merit from the entertainment standpoint their existence in the market is of interest from the experimental rather than the entertainment standpoint. It must be recalled, however, that broadcasting itself grew to its present importance upon the foundation of the experimenters' interest."

"Nothing Like It,"

He Says of Diamond

EDITOR RADIO WORLD:

I congratulate you for publishing such a wonderful radio circuit as the 4-tube Screen Grid Diamond of the Air.

For the last year I have been chief radio service man for the largest radio store in Kitchener, Ont., and I can honestly say that I haven't heard anything like that circuit yet.

My log so far consists of 165 stations reaching out as far as Mexico City, Florida, California, Winnipeg, and Cuba. My record pick-up for one night was 52 stations, and I received the call letters of them all.

One night I brought over another type set and the Diamond won out in volume, tone, and picking up stations, especially on the low wavelengths.

EDGAR REIST,

R. R. 2, Waterloo, Ont., Canada.

WHO FIVE YEARS OLD

Des Moines, Ia.

WHO celebrated its fifth anniversary recently with a two-hour night program.

Ten musical organizations participated in the program.

Song Is Her Solace Now Baby Is Gone

Chicago.

Paul McCluer, "Sunshine Hour" announcer of WENR, asked the audience whether he should discontinue playing "The Big Tin Pan Parade," a special feature of the hour on Saturday morning. Among the hundreds of answers received was one from Mrs. Violet Nelson, Cicero, Ill. She wrote:

"For months my three-year-old son and I listened to your hour, and his favorite number was 'The Big Tin Pan Parade.' He was even learning to sing it, and then he fell ill with pneumonia. For hours he was delirious and in his delirium kept mumbling parts of the song. His last words were the words of the song. He was my only child and now, as I sit at home alone and hear the number played, it seems that Buddy is still with me, sitting beside me and singing, as he used to do. I am hoping you will continue the number in your program."

NEWS WANTED ABOVE ARCTIC

Chicago.

From the interior of Alaska has come a plea for news by radio.

The request is contained in a letter to WENR from Mrs. Inez E. Moore, Alaska division, Bureau of Education, U. S. Department of Interior, stationed at Shungnak, Alaska. Mrs. Moore says that she is able to tune in the Chicago station every night. She wrote:

"News items from several stations mean so much to us. Would we be imposing on you to ask you to read a few items just before you sing your closing song? We would be very grateful. The Oakland station, KGO, is putting on Alaska News flashes twice a week, but sometimes we are unable to get this station and we regret it, for they have been so kind, and they seem to pick news which we desire most.

"We are seventy miles north of the Arctic Circle and about four hundred miles inland from Kotzebue Sound. In Winter, only first-class mail is carried on the dog sleds and that comes just once a month, so we must wait until boats run in Summer for our papers and magazines. Thanks to the radio, we get much news almost as soon as those at home."

Victoreen Surplus Stock Great Bargain

The Geo. W. Walker Co., 2825 Chester Avenue, Cleveland, Ohio, merchandisers of Victoreen radio products, has a surplus of standard Victoreen RF kits, each consisting of four No. 170 RF transformers, one No. 150 oscillator coupler and one No. 160 antenna coupler. These kits formerly sold for \$37.00, but are now offered, while they last, for the attractively low price of \$6.00 per kit.

There is also a limited supply of 112 audio units, consisting of two transformers in one housing. These have been reduced to \$8.95 per unit. This is a splendid opportunity for Victoreen fans to secure their favorite parts at very attractive prices.

SAYS 20,000 SEE TELEVISION JENKINS SENDS

According to conservative estimate, there are over 20,000 "lookers-in" tuned to the experimental programs broadcast by the Jenkins W3XK station at Washington, D. C. These "lookers-in" are scattered over the entire United States, some reporting regular reception of images as far as the Pacific coast. For the most part, the apparatus employed by these television enthusiasts is entirely home-made.

Just what do these "lookers-in" get with their present home-made television receivers? Why do they indulge in this work? These questions are answered by G. E. Foreman, 621 Fourteenth Street W.E., Washington, D. C.:

Pictures Well Defined

"Of course the pictures are not perfect, but they are well defined and easily recognizable, and absolute perfection at this stage of the art means little to me. The fact is that the apparatus is just as it was on the night of January 21st, when the first movies were received.

"Since then, my room has been filled with spectators each evening that the pictures were on, and I have been besieged with requests to view the movies. Due to this popularity, it has been impossible to make very necessary changes in the set and televisor, which would greatly improve the reception.

"The interest in practical television, even to the experienced radio enthusiast, is surprising.

Old-Timers Enjoy It

"Persons old in the radio art, and amateurs with coast-to-coast reception of audible radio to their credit, have sat before my set and gazed in wonder at the tiny image, and have laughed heartily at the antics of Sambo as he chases his dinner.

"Concerning the more serious side of television, I believe experimenters are fortunate to have a station like W3XK from which to receive. The modulation is perfect, the voice of the announcer being clear and distinct, and the television note exceedingly clear and crisp. The reception is so loud that a minimum of regeneration is all that is necessary, which clears up the picture tremendously."

Freshman Seeks

Television Channels

Washington.

The Chas. Freshman Company, Inc., has applied to the Federal Radio Commission for two television broadcast channels with the transmitters to be located at its factory situated at Clifton (Allwood), New Jersey.

The channels have been requested for experimental purposes for broadcasting regular television programs to aid the rapidly augmenting group of television "hams."

BOY EARNS \$150 A DAY

Donald Novis, of Pasadena, Calif., who won the first prize of \$5,000 for boys in the 1928 Atwater Kent Radio Audition, has completed an engagement in a singing picture with Ronald Colman at Hollywood. It is understood his compensation was \$150 per day and that the same producer has engaged him on a six months' contract as support for a woman star in a new light opera.

BID OF 95c ON DOLLAR TAKES SIX MAGAZINES

The bid of B. A. MacKinnon, publisher and circulation expert, for the Experimenter Publishing Company and its subsidiary, the Conrad Company, both companies petitioned in bankruptcy, was accepted by the creditors' committee before Peter B. Olney, Jr., referee in bankruptcy, in New York City. The bid was about \$520,000, on the basis of \$25,000 down, \$175,000 in fifteen days and the remaining \$300,000 in notes due September 30th, and payment of part of expenses. Specifically, Mr. MacKinnon bid full payment of creditors and \$20,000 toward administration expenses. As these are expected to be about \$35,000, the creditors would sacrifice the difference, and get 95 cents on the dollar.

WRNY Sold

The Experimenter Company publishes "Radio News," "Science and Invention," "Amazing Stories," "Your Body," "Aero Mechanics" and "How to Make It," besides operating WRNY. This station, with short-wave station 2XAL, was sold to Chester W. Cuthell, a lawyer, of 20 Pine Street, representing a client. The bid of \$100,000, all payable in ten days, was accepted.

Conrad publishes "Radio Listeners' Guide and Call Book."

The final bids were far better than the first ones received, and the entire bankruptcy case was described by interested lawyers as a model one.

Experimenter failed with more than \$500,000 liabilities and Conrad with about \$114,000 liabilities.

MacKinnon on Job

Mr. MacKinnon has made arrangements to continue the existing magazines, with his business associates, comprising the MacKinnon-Fly Publishing Company, which thus becomes one of the world's largest magazine publishing houses. Besides what it has added by the new purchase the company publishes "Screen Book Magazine," "Plain Talk Magazine," "Complete Novel Magazine" and "Complete Detective Novel Magazine."

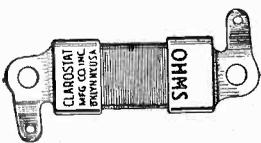
Mr. MacKinnon is giving his personal attention to the Experimenter-Conrad group, of which Arthur H. Lynch, formerly editor of "Radio Broadcast," is editorial director.

It is planned to house all the publications under one roof.

Clarostat Strip Resistors

Following the production of the Clarostat "Hum-Dinger," the Clarostat Manufacturing Co., Inc., 291 North Sixth Street, Brooklyn, N. Y., announces a line of new Clarostat strip resistors. These were produced by Clarostat engineers to meet the demand for inexpensive fixed resistors. These strip resistors will meet a multitude of uses, among them

those of filament protection, low voltage grid bias, stabilization of radio frequency tubes, in conjunction with screen-grid tubes, for grid biasing the heater type A.C. tubes, and many others. Full information on the many uses of these valuable appliances, together with prices, may be had from the above concern. Mention RADIO WORLD.—J. H. C.



Singers Cup Ears to Hear Own Voice

One of the peculiar characteristics of singers before a microphone is the almost universal custom of cupping the right hand behind an ear. James Melton, National Broadcasting Company tenor, explained that because of the orchestra he had to do it in order to hear himself sing.

"If I didn't hear my own voice I might be off in tone," he said.

THEY SAY

JOSEPH D. R. FREED, president, Freed-Eisemann Radio Corporation: "Within ten years television receivers will be in every home that boasts a radio set today. Many will, no doubt, have one in five years. There will be very few that will have them before that time because television will not be perfected for home use much before five years. Think how long after the first broadcast of sound the first real broadcast of entertainment arrived. However, television is developing along lines which will make the radio receivers marketed today part of the new television receivers. Fans will not have to scrap their radio receiving sets in order to enjoy television. They will only have to purchase supplementary receivers."

* * *

CLARENCE A. EARL, president, Chas. Freshman Co., Inc.: "I feel radio will always have an appeal beyond the purely commercial. Radio manufacturers and radio broadcasters are doing something besides making money. Everyone in our field who has been and is making headway in the public favor is doing so because of the public service that he is rendering. Radio is the greatest public service institution of the century."

DUETS RECOGNIZED AT LAST

Chicago.

A new feature has been added to the program of WENR, Chicago. Each Monday and Friday between 11 p. m. and 2 a. m. central standard time, Thora Martens, mezzo-soprano, and Edward Davies, baritone, are to give a series of duets from the various light operas. Both Miss Martens and Mr. Davies have had theatrical experience.

OBJECT TO PRISON SCENE

Oakland, Calif.

KGO is the recipient of a request from a California highway foreman employing convicts for road work, stating "Please play more classical music. Members of the gray-walled fraternity from San Quentin are fed up on jazz. They would like to have you play a selection from 'Faust,' preferably not the Prison scene."

BALKITE SELLS DEALERS

Glenn L. Alspach has been elected president of the Balkite Radio Company, a corporation recently organized to take over the radio business of the Fansteel Products Company, manufacturers of the Balkite line of A. C. radio receivers and the Symphon. Mr. Alspach announced a direct-to-dealer policy on the part of the Balkite Radio Company.

HAS 100 MMFD. CAPACITY

Due to the loss of a line in the notice of the Hammarlund new equalizing condenser printed in the April 13th issue of RADIO WORLD, the maximum capacity was not stated. This new Hammarlund item, the EC-80 equalizing condenser, has a minimum capacity of 20 mmfd. and a maximum of 100 mmfd.

EXERCISES ON RADIO CALLED A SALES HOAX

Dr. Jesse F. Williams, professor of physical education, Teachers College, New York City, advises against radio or other calisthenic exercises. He said:

"The propaganda regarding the value of morning exercises is a commercial exploitation of people's desire to keep fit. What we ought to do is to make them get their exercise in a wholesome manner.

Walk Four Miles a Day

"Everyone should walk at least four miles every day. He should take up some outdoor sport, such as tennis, golf, swimming, horseback riding or hiking. The people who try to beat the game of life by living in an unusual and different manner are dying in large numbers these days."

Calls These Harmful

Among the exercises he considers harmful are back-bending, trunk-bending and leaning over and touching the floor with one's knees straight.

Exercises are broadcast from many stations. Some of these features are maintained by the stations themselves, but most of them are sponsored, as by life insurance companies and makers of elastic devices used for calisthenics.

Brennan Appointed to 'Radio News' Staff

Arthur H. Lynch, the editorial director of "Radio News," announced that John B. Brennan, Jr., well-known radio engineer and through his writings already known to hosts of radio experimenters, has been placed in charge of the laboratory and has also been made technical editor of that publication.

Mr. Brennan was technical editor of "Radio Broadcast" for four years and has been engaged in radio research work over a long period of time. He assisted in the development of such outstanding successes as the Roberts 4-tube receiver, the General Radio Universal receiver and the Aristocrat.

Millen Is Promoted by National Company

James Millen, for several years consulting engineer and sales executive of National Company, Inc., has been appointed general manager of the company. Mr. Millen, who started in radio as a magazine contributor following his academic training, has developed into one of the industry's leading sales executives. National Company is one of the foremost manufacturers of precision radio parts and licensed apparatus. Its office and factory are at 61 Sherman Street, Malden, Mass.

A THOUGHT FOR THE WEEK

SOMEBODY with a big stick should get after those radio wisecrackers who are using the microphone for disseminating wisecracks that belong in the gutterways of the night clubs. The public likes sprightliness and humor; it will even stand a certain amount of low comedy. But night club slush and indiscriminate burlesque show badinage have no place on the air. Get after the offenders and send them back to the slums whence they came.

CHANGES ASKED BY 14 STATIONS IN THREE ZONES

Washington.

Changes in frequency, hours on the air and licenses were made by the following stations:

PACIFIC ZONE

KGAR, Tucson Motor Service Company, Tucson, Ariz., requests authority to move to other quarters in same city.

KFQU, H. E. Riker, Holy City, Calif., requests change in frequency; new frequency not specified; increased power from 100 watts to 250 watts or 500 watts power and change in hours of operation.

KPJM, Frank Wilburn, Norris Hill, Ariz., requests authority to move from Prescott, Ariz., to Norris Hill. This applicant recently sold station to Miller & Klahn.

KOY, Nielson Radio Supply Company, Phoenix, Ariz., applies for a station license under a construction permit issued February 18th, 1929, date of completion March 15th, 1929. Status of construction permit issued, 1,390 kilocycles 500 watts with unlimited time.

KGIR, Symons Broadcasting Company, Butte, Mont., requests authority to change the construction of apparatus, requests increased power from 250 watts to 1 kilowatt, requests change in frequency, not specified. Requests increased hours from sharing with KFBB to unlimited time.

Leonard B. Brant, Klamath Falls, Oreg., requests the authority to erect a new station using 1,200 kilocycles 100 watts power and full time.

KDB, Santa Barbara Broadcasting Co., Santa Barbara, Calif., requests increased power from 100 watts to 500 watts power and change in frequency from 1,500 kilocycles to 1,270 or 1,280 kilocycles.

SOUTHERN ZONE

WNOX, Sterchi Bros. Stores, Inc., Knoxville, Tenn., requests permission to transfer its license to Sterchi Bros., Inc., from Sterchi Bros.

Travis Y. Oliver, El Dorado, Ark., requests the authority to erect a new station, using 40 watts power, frequency of 1,300 kc., and daytime hours only specified.

KLCN, Charles Leo Lintzenich, Blytheville, Ark., requests change in hours of operation from daytime to night hours.

Noel Waller, Dresden, Tenn., requests authority to erect a new station using 15 watts power 1370 kc. and daytime hours.

EASTERN ZONE

WLBX John N. Brahy, Long Island City, N. Y., applies for radio broadcasting station construction permit at request of the Commission to cover change in apparatus from composite to crystal control composite.

MIDDLE WEST ZONE

KFJY, C. S. Tunwall, Fort Dodge, Iowa, requests authority to move to other quarters in the same city.

WCAH, The Commercial Radio Service Co., Columbus, Ohio, requests increased power from 250 watts and 500 watts temporarily, to 500 watts full time.

RCA MERGER NEEDS LAW

Washington.

The proposed merger of RCA and the International Telephone and Telegraph Company is prohibited by law, so if it is to go through, Congress must amend the law first, government legal officials stated.

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

Carl E. Spencer, 230 Minot Ave., Auburn, Maine.
Isaac N. Cecil, Rt. 1, Box 185-A, Barberton, Ohio.
J. A. Johnson, Depoy, Ky.
Carl H. Witt, 916 Kearney St., Atchison, Kans.
Jos. Van Husk, 1715 N. Madison, Bay City, Mich.
E. C. Saunders, 510 E. N. 3rd St., Sweetwater, Texas.

J. D. Miller, 108 Pico St., Taft, Calif.
David C Thayer, 446 Central Park West, N. Y. City.

John Roberts, Apt. 324, 1947 B'way, N. Y. City.
M. J. Young, 619 Cedar St., Allentown, Pa.
J. Rogers, Radio Club, Jamaica High School, Jamaica, L. I.
S. Knutson, Jewell, Iowa.

Clifford McLeod, 15743 Lesure Ave., Detroit, Mich.
F. Falkner, Brigham City, Utah.
D. H. Page, Brigham City, Utah.

F. Walters, Eighth, cor. Main, Roebing, N. J.
H. Becker, 439 Col. Ave., Holland, Mich.
E. Meistirling, Albuquerque, N. Mex.
Supreme Instruments Corp., Greenwood, Miss.
C. Constantinescu, Lethbridge, Alta., Can.
I. Gill, Ft. Lyon, Colo.

G. Morecroft, Jr., 212 Fruit Exch. Bldg., Pittsburgh, Pa.

D. Howard, 3724 Parrish Ave., E. Chicago, Ind.
Chester L. Price, 1 River St., Cohoes, N. Y.

A. B. Enyeart, 48 1/2 N. Orange St., Medford, Ore.
J. M. Peterson, The J-M-P Mfg. Co., 3407 Fond du Lac Ave., Milwaukee, Wis.

Thos. Harrison, Jr., Spriceland, Ind.
Frank Idner, 309 Okeechobee Rd., West Palm Beach, Fla.

Paul H. Geiger, 1361 Marlboro Ave., Pittsburgh (21), Pa.

Geo. E. Grosvenor, R. F. D. No. 1, Olyphant, Pa.
Jas. F. Golden, 4018 Wilsby Ave., Baltimore, Md.
A. E. Averrett, 18 Bedford Rd., Schenectady, N. Y.
Wm. Gadow, 2243 E. Minnehaha, St. Paul, Minn.

S. J. Ceranski, 6043 Harrell Ave., Detroit, Mich.
Stanley W. Barnett, Studio Mgr., WBAL, Baltimore, Md.

H. M. Beattie, care The White Co., 7821 St. Clair, Cleveland, Ohio.
H. McCrea, O. U. A. M Bldg., 15th & Esrey St., Chester, Pa.

Wm. F. Warner, 687 Buffum St., Milwaukee, Wis.
Bert P. Hanavan, 1658 Farwell Ave., Chicago, Ill.

A. W. Cargill, Sr., care Gulf Refining Co., Green St. & Queen Lane, Philadelphia, Pa.
J. H. Malinosky, 460 Lafayette St., Baton Rouge, La.

H. A. Dean, Cape May Court House, N. J.
W. A. Bond, Meaford, Ont., Can.

J. A. Hodge, 339 Greeley Ave., Kansas City, Kans.
Geo. A. Lyter, 29 Feeder Ave., Lewistown, Pa.

H. E. Trott, Sec'y, Mt Hamilton Radio Club, 121 Alpine Ave., Hamilton, Ont., Can.
E. W. Penson, 1130 W. Shepherd St., Denison, Tex.

Robt. J. Eccles, 3905 N. 10th St., Philadelphia, Pa.
C. R. Ogden, 802 F St., N. W., Washington, D. C.

Ulpiano R. Amuniz, P. O. Box 1633, Habana, Cuba.
H. J. Denny, 6736 Glenwood Ave., Chicago, Ill.

Simon Soplo, 190 Virginia Ave., Shenandoah, Pa.
Edw. Bosse, 60 Main St., Spencer, Mass.
Victor Santini, Terminal Bldg., 215 E. 149th St., N. Y. City.

J. M. Clark, 1315 Houston Ave., Houston, Tex.
A. E. Granger, 1505 Yagle Ave., Moores, Pa.

Amador Garay, 25-79-42nd St., Long Island City, N. Y.
R. B. Ottey, 508 Third St., West Fairview, Pa.

George Frech, 987 Trinity Ave., New York City.
Radio Sta. WDFY, 667 Madison Ave., Meadville, Pa.

Stephen Malik, Box 40, Bentleyville, Pa.
John K. Chase, Montevideo Water Dist., Santa Barbara, Calif.

J. O. Gough, 125 E. 35th St., Los Angeles, Calif.
Jos. Greig, Gen. Del., Lafayette, Ind.

A. E. Hamly, 1219 W. South Ave., Independence, Mo.
J. P. Porter, 195 Aiken St., Chester, S. C.

W. H. Elliott, 157 Williboro St., Verdun, Que., Can.
O. C. Kena, 1607 Crump, Ft. Worth, Tex.
G. L. Bixby, 504 Lawrence, Ann Arbor, Mich.

C. H. Bickert, 120 1/2 N. 5th St., Salina, Kans.
Lloyd D. Bettis, 619 E. Gray St., Norman, Okla.
F. E. Stromer, 7821 Burnham Ave., Chicago, Ill.
Ford Day, 1808 Duncan Ave., Chattanooga, Tenn.
R. Hophan, 925 St. Nicholas Ave., N. Y. City.

HARBORD RANKS BOARD SYSTEM WITH LUCIFER

Springfield, Mass.

Federal "Commissions" were criticized as obtrusive and of doubtful constitutionality by Gen. James G. Harbord, president of the Radio Corporation of America, addressing the Chamber of Commerce. He found fault with the Commission structure as it applies to the Federal Radio Commission and others. He said in part:

"Following the creation of the Interstate Commerce Commission, Congress, seldom unwilling to increase the office-holding class, established other Commissions. By 1900 there were three of such independent commissions, costing annually \$820,000. By 1923 there were 33 of these unnatural children born outside the terms of the original marriage contract sealed by the Constitution between the States and the Federal Government, and their cost, with other extra-constitutional bodies, amounted to \$550,000,000 per year.

Radio Board Born

"In 1927 a notable thirty-fourth was born, the Federal Radio Commission, doomed by the officiating obstetrician to a life-limit of one year, unless extended by the act of the surgeon himself, the United States Congress. It deals with a subject interesting to every member of the Congress because of its demonstrated political potentialities, a subject difficult, highly technical, and constantly in the public eye.

"Its every action has had to be taken with an eye over its shoulder at a body which within one year was to decide on the further extension of its life. Senators and Congressmen have thought it not unworthy of their high place to try to influence its action in favor of special interests.

"The Commission as it obtains in our Government is quasi-legislative, quasi-executive and quasi-judicial. It promulgates its own orders, and passes upon their execution as in its judicial capacity. Created by law, it belongs neither in the legislative, executive or judicial divisions of our Federal Government, so wisely and specifically described and prescribed by the Constitution.

Some Run Wild

"Theoretically the Commission is supposed to receive a supervision from the President which it is humanly impossible that he shall give. Except in certain limited cases of appeal it has no responsibility to the judicial authority. Such control as is exercised by Congress appears to be limited to confirmation by the Senate when individuals are nominated by reappointment. These commissions either by default of proper supervision run wild uncontrolled power, or they become the tool of an irrepressible and somewhat unscrupulous fraction of our national legislature.

"Three dozen Federal Commissions finding duties of executive, legislative and judicial character outside the broad fields of those properly charged under the Constitution, with such functions, leisurely but expensively seek activity which will justify their existence and secure extension and prolongation of power and life. No greater opportunity for official mischief through idle brains or pernicious activity has existed since Lucifer left Heaven."

RADIO COLORED LIGHTS REVEAL 'PLANE HEIGHT

Schenectady, N. Y.

Red, green and yellow lights, familiar in railroad signals, and in more recent years in highway traffic signals, have now been adapted to aviation in a new radio echo altimeter developed by Dr. E. F. W. Alexanderson, consulting engineer of the General Electric Company. This new device was demonstrated at the All-American Aircraft exposition in Detroit.

However, the lights in the altimeter do not indicate "stop," "go," and caution." In the Alexanderson altimeter, which was shown here as a laboratory model and which has been successfully employed in actual flights, the lights give a visual warning of depth to the flier.

When the green light flashes on the cockpit panel the pilot knows that he is 250 feet above ground, when the yellow shows he is 100 feet above ground, and the red lights give a positive warning that the ground is only fifty feet below.

Aid to Safety

Nearly two years ago army fliers from Wright Field consulted with engineers and other scientists of the General Electric Company, outlining to them some of the most serious problems of aviation. Among these problems they mentioned the importance of a method for measuring the absolute height above ground.

In rain and in fog, as well as in night flying, the pilot has no means of knowing infallibly his distance above ground and consequently the perils of operation under these conditions have been very great.

Dr. Alexanderson set to work on the theory that the time interval required for a radio impulse to travel from the plane to the ground, and back again to a receiving set on the plane, might be practically adapted as a reliable altitude indicator.

How System Works

Because the time interval between the outgoing and the reflected radio impulse is so short, radio waves traveling with the speed of light, an indirect method of making such measurements was adopted by Dr. Alexanderson. In his experiments he used an oscillating receiver, one of the type which sends out a wave which may be picked up on other receivers as a squealing note or beat. The echo or reflected signal was picked up on the same receiver which sent out the wave.

Dr. Alexanderson discovered that every time the airplane changed altitude by half a wavelength, a whistling note went through a complete tone cycle, from low pitch to a high pitch and back again to a low pitch. By counting the cycles of the tone it was possible to measure the altitude, the measuring stick being one-half the wavelength of the antenna oscillator.

By means of the meter, graduated from 3,000 to 200 feet, the pilot may read his altitude within those limits, at any time.

NEW CORPORATIONS

Adirondack Radio Distributors, Albany, N. Y.—Atty. S. D. Cohen, 8 West 40th St., New York, N. Y.

Lyon Radio Corp., Syracuse, N. Y.—Atty. J. A. Powelson, Syracuse, N. Y.

Model Radio Corp., Paterson, N. J.—Atty Maurice E. Nolan, Paterson, N. J.

Even in Auto Boss Checks Up Studio

Chicago.

The police department squad cars in Chicago have recently installed Silver-Marshall radio receivers to permit keeping in touch with headquarters while patrolling their beats.

Taking an idea from the police, Walter Preston, director of the WBBM Air Theater, Chicago, has ordered a receiver installed in his new car so that he can keep check on the broadcasting programs even while riding to and from work.

Knowing that the boss is listening to their efforts every minute, the staff are constantly on their toes every moment the station is on the air.

Three New Phonovox Models Announced

Three new Phonovox Electric Pick-ups, known as the Super Phonovox Series 106, are announced by the Pacent Electric Co., New York City. The new Phonovox models are specially designed with the requirements of the modern power amplifier and power speaker in mind, and are built to bring out the full effect of the modern electrically-cut type of record. The Series 106 designs are the result of more than a year's laboratory work.

The new models are said to cover a frequency range of from 40 to 8,000 cycles, with a practically flat curve. The variable fulcrum feature, developed by Pacent engineers and incorporated for the first time in the 106 Phonovox models, is largely responsible for this remarkable range. Needle scratch has been materially reduced by lessening the natural period of resonance of the armature and of the pick-up unit as a whole.

Special attention has been paid to proper rendition of the low frequencies. By counterweighting of special design the inertia of the tone arm is brought into play to secure highly efficient tracking on the low end of the frequency scale.

The new Series 106 Super Phonovoxes are marketed in three distinctive models, all fetchingly modernistic.

The Super De Luxe Model 106A, supplied without counterbalanced tone arm, is equipped with universal bracket to fit either right or left hand tone arm. The Super De Luxe Model 106B is complete with counterbalanced tone arm. The third model, known as the Ultra Phonovox 106, is equipped with counterbalanced tone arm and an automatic on-off switch built in the base of the supporting stand.

All models are equipped with new hinge, so that the pick-up unit proper can be easily swung back to permit easy changing of needles.

Stations by Frequencies! Stations by Call Letters! Frequency-Wavelength Table!

Everyone should have an up-to-date, versatile list of all the broadcasting stations in the United States and possessions. RADIO WORLD, in its April 13th issue, published the full list of such stations by frequencies (with wavelength next to each corresponding frequency). The call letters and location were given, too. Therefore the stations are listed in the order they appear on your dial. Also you have an automatic frequency-to-wavelength and wavelength-to-frequency conversion table. *It's all on one page!*

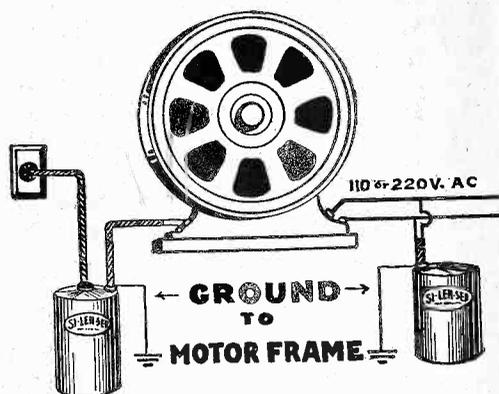
Complete on the next page (back of the other one) is published the list of these stations in the alphabetical order of their call letters, with location and frequency given. If you want to know what wavelength the frequency equals, consult the frequency list on the prior page.

Therefore you can tear out this sheet and the printing on both sides will locate any station for you, no matter if your clue is the call letter, the wave, the frequency, or incomplete identification aided by the unknown's position on your dial in respect to some station of known frequency.

Send 15c for a copy of the April 13th issue to RADIO WORLD, 145 West 45th Street, New York City, or start your subscription with that issue.

TWO CURES FOR INTERFERENCE AT THE SOURCE

In line with the findings and recommendations of the Bureau of Standards for the cure of electrical interference and with the aid of efficient apparatus developed for this purpose, no radio listener need longer be troubled with this form of annoyance. Thousands of fans have used the Si-Len-Ser at the set; here are some tried suggestions for using it at the source of the noise-breeding apparatus.



Illustrated are two optional hook-ups in conjunction with refrigerator or oil burner motors. Above is shown the Si-Len-Ser plugged to the light socket and the motor plugged to the Si-Len-Ser. Below is shown the Si-Len-Ser plug removed and the two leads crossing the line feeding the motor. The illustration above shows the Si-Len-Ser attached to the input, and that below shows the Si-Len-Ser attached to the output.

On electric refrigerators it is possible to plug the refrigerator motor feed-line into the Si-Len-Ser, and the plug of the Si-Len-Ser into the light socket. If this is not effective, it is essential to strip the plug from the Si-Len-Ser and take the two wires from it. Cross the motor leads with them.

On various types of oil burners, using motors of one-quarter horsepower or less, cross the Si-Len-Ser leads to the motor. Experimenting is necessary with the ground wire, in some places it being more effective if grounded to the frame of the motor. In other places it is not essential to use the ground at all.

Flasher signs are prolific and most annoying sources of interference. The above

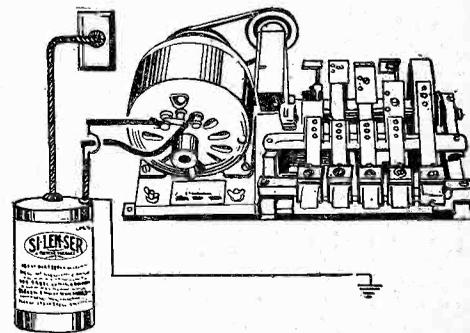


diagram gives a practical method of using the Si-Len-Ser for the purpose of curing the cause. These methods are given by Julien J. Proskauer, inventor of the Si-Len-Ser, and head of the Tru-tone Radio Sales Co., 114 Worth Street, New York City. Further information may be had from him, if needed. Mention RADIO WORLD.—J. H. C.

Crystal Hopelessly Out

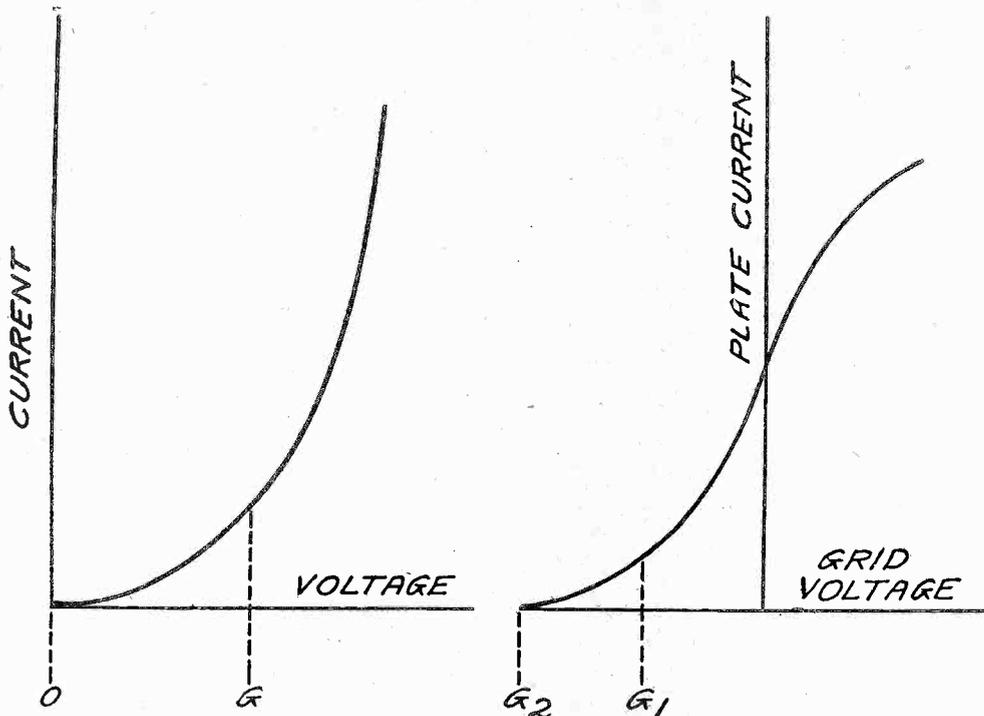


FIG. 1

THIS SHOWS THE SIMILARITY OF THE CHARACTERISTIC CURVES OF A CRYSTAL, LEFT, AND OF A TUBE DETECTOR, RIGHT. BOTH PRODUCE THE SAME KIND OF QUALITY.

WE don't hear so much these days about "clear as a crystal" or "clear as a bell." Both of these expressions have been the standard of clarity both in lay and technical radio circles. Now these expressions are used only by a radio enthusiast who cannot find adequate words to describe the quality of the tone of his set or loudspeaker.

The expression "clear as a crystal" assumed a new and different meaning when radio broadcasting was first introduced. It became the symbol for irreproachable quality of reception, of freedom from circuit noises. But not until some of the fans had ventured to use a tube or two for audio amplification.

When headsets were used with crystal detectors the quality of the received signals was satisfactory, enjoyable. But when a tube was added it was discovered that the quality was not nearly so good. When two tubes were added the sound became atrocious. When the third tube was added, with improvised loudspeakers, the quality was such that many people could no longer tolerate it, even in the face of novelty.

Where Blame Lies

It was assumed that the tubes were to blame for the enormous difference between the qualities of crystal sets and tube sets. The crystal was given credit for the high quality and the tubes for the distortion.

There are a few who still cling to the belief that there is something inherently superior in the crystal over the tube as a detector. To these, radio of today is not what it used to be. The only saving thing about radio now is the superior quality of the programs transmitted. What a shame that we cannot get these wonderful programs with the clarity of the old crystal set! What a shame!

It is a still greater shame that these pessimists do not revert back to the crystal sets for a while, that they do not discard the modern receivers for the sets of 1921 and listen to the 1929 programs with a crystal and a head set with a

variometer for tuning. Arrange a crystal set of the type which was considered perfect in the old days and compare the results directly with those of an up-to-date high power receiver with dynamic speaker.

The Verdict

There is no doubt of the verdict. The crystal will be adjudged in contempt.

Valve Excels in Selectivity, Only Internal and Voltage - Are Against It—Fallacy of Parallel to "Clear

By J. E. Technica

Not because the crystal is incapable of any better detection than a tube, but because the headset will not compare favorably with the audio portion of the modern receiver. The crystal is a good detector. But so is the tube. As regards quality under similar conditions, if it is possible to bring them about, there is no appreciable difference. Both are good. The crystal excels in one particular, and that is the freedom of tube and battery noises. In all other respects the tube excels.

But even with respect to tube and battery noises the difference is so slight that it is of no consequence. The verdict is overwhelmingly for the tube.

With respect to selectivity there is no comparison whatsoever. The crystal set has next to none. The tube set is selective. Of course, the greatest thing against the crystal is the necessity of constant tinkering with the catwhisker or other contactor to keep the crystal in a receptive mood.

Characteristic Curves Tell

The characteristic curves of the crystal and the tube detector indicate clearly that there can be no difference in the quality of the two detectors. The curve at left in Fig. 1 shows the curve of a typical crystal, that at the right the curve for a tube. Over the operating range of volt-

Unification of the

By Edgar

In some locations certain sets are very noisy because they pick up all the disturbances which take place in the power lines. Every time a light is turned on there is a pop in the loudspeaker. Every time a light is turned off there is another, and often that pop is more severe.

When larger electrical appliances, such as vacuum cleaners, washing machines, toasters, and heaters, are turned on or off there are very serious disturbances in the line, and hence in the loud speaker. Some electrical devices continually make and break the circuit, and when these are in operation there is a steady roar

in the speaker. At times this is so loud as to drown out the signal completely.

Noise Killers

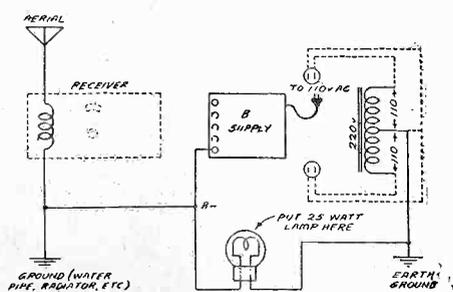
Many devices have been suggested and tried for remedying this condition. Most of them are filters of some kind. Whether or not these are effective in suppressing the noise depends on their type, the kind of radio receiver and on the relation of the set to the line.

Some of these filters are guaranteed to work only when the noise comes in over the line. But very little of the noise gets into the set by way of the power leads. Most gets into the circuit by way of the antenna, just as the desired signal. This is true even if the noise is generated in the line.

Yet the filters usually are effective in suppressing the noise. How can such a filter be placed in the power leads when the noise does not enter the set that way? How can a dam in one channel stop the flow of current in another? There must be some condition in the line which explains this seeming contradiction. There is.

Stopping Noise at Source

It has always been recognized that line noises should be stopped at the source. The best way of stopping interference by



ELECTRIC LIGHT CONNECTED BETWEEN GROUND ON SET AND GROUNDED 110-VOLT LINE.

Classed by Tube Detector

Sensitivity and Volume, and Supply Noises, Both Very Slight, Clear as a Crystal" a Fitting Name for a Bell."

Anderson

Editor

pages they have the same slope qualitatively.

Suppose the crystal is operated at zero bias, as most crystals are. The crystal then becomes a true rectifier but one in which the rectified current is proportional to the square of the applied signal voltage. If the tube is operated with a suitably large negative bias, its curve has the same shape. The tube becomes a voltage rectifier in which the rectified voltage is proportional to the square of the signal applied. Whatever distortion results from the curvature results equally in both.

But the tube is not a true current rectifier. It draws no current from the tuned circuit. The crystal does. And therein lies the difference between the selectivities of the two arrangements. When current of signal frequency flows in the rectifier circuit the selectivity drops.

Bias on Crystal

Suppose the crystal is operated with a bias voltage, as some crystals are. More current flows and the crystal circuit becomes less selective, although more sensitive. When the tube detector is operated with a negative bias of suitable value, the curve near the operating point is just like the curve of the crystal at its operating point. The tube becomes more

sensitive, but it does not become less selective, but more selective!

The nature of the detection is the same in the two cases because the curves are similar. In both the output is proportional to the signal voltage applied, just as when no bias was used. The amount of distortion in the detected signal bears the same relation to the desired audio signal in both instances. It would in any type of rectifier in which the output varied with the square of the applied voltage.

The amount of distortion in any case in which the detection follows the square law depends on the degree of modulation of the carrier wave received. The smaller the percentage of modulation the lower the percentage of distortion. If the wave is 100 percent modulated the second harmonic distortion will be 25 per cent of the fundamental desired, and the total distortion is 50 per cent of the fundamental. Since there cannot be a greater modulation than 100 per cent, 50 per cent is the greatest possible distortion. In practice the percentage of modulation has been considerably less than 100 per cent. For a long time 40 per cent was maintained as standard. Recently it has been increased considerably, even up to 100 per cent.

Source of Major Distortion

The crystal received the benefit of the lack of knowledge of audio amplification in the early days. It also enjoyed a certain amount of squatters right. It was first in the field. Had the tube preceded the crystal the tube would have received the benefit and we should never have heard about the new meaning of "clear as a crystal."

The atrocious quality of early broadcast reproduction was not due to the detector at all. It was due to the use of a multitude of scratchy rheostats, to improper control of the audio frequency amplification, to the use of too low plate

voltages, to the absence of grid bias, to the use of tubes inadequate to the demands placed on them, to the use of audio transformers that were designed to distort and to the use of loudspeakers that could not be made to speak intelligibly. It was due to the lack of experience in audio frequency amplification.

Clear as a Bell

"Clear as a bell" was the other standard of clarity and purity of radio reproduction which was used when superlatives failed to express the enthusiasm adequately. And what does this comparison signify? It signifies dissonance, for it is well known that bells do not produce good musical tones. It is true that the fundamental tone of a bell is clear, but the fundamental is not the only tone that it produces when it is struck. It produces many harmonics of audible intensity, and all of these are mutually dissonant. Harmonics are here used in the mathematical sense, which for some musical instruments is different from the musical meaning. The seventh harmonic of a piano string is dissonant. All the harmonics of a bell are dissonant.

Silver-Marshall

To Exhibit Sets

Models of the new Silver-Marshall factory-made receivers will be shown at the June R. M. A. Trade Show in Chicago. These include console lowboys and highboys at approximately \$149 and \$189 list prices. These models, incorporating the same chassis, will utilize the new AC screen grid tube.

A new factory on the west side of Chicago, to be occupied within a few weeks, will provide over 100,000 square feet, or four times the manufacturing space now utilized by Silver-Marshall in their present location on Jackson Boulevard.

According to McMurdo Silver, founder and president of Silver-Marshall, the new factory will be modern to the utmost detail, and will provide sufficient production capacity to take care of the contemplated production of screen grid receivers on a rigid schedule, and to provide in addition ample facilities for the manufacturing of receivers of more conventional type, which will be supplied to other manufacturing and merchandising concerns under private brands.

Ground Potential

Bruce

an undesired broadcaster is to shut down that station. Every source of line noise is a little broadcaster which sends out the disturbances not only along the line, but also into the air. When it is stopped or squelched it can cause no trouble. And a filter across the contacts which are the

seat of the disturbance squelches the noise or prevents radiation.

The closer the filter is to the source the more effective it is. But even if it is at some distance away, it helps and it is for this reason that a filter placed at the power input stops much noise.

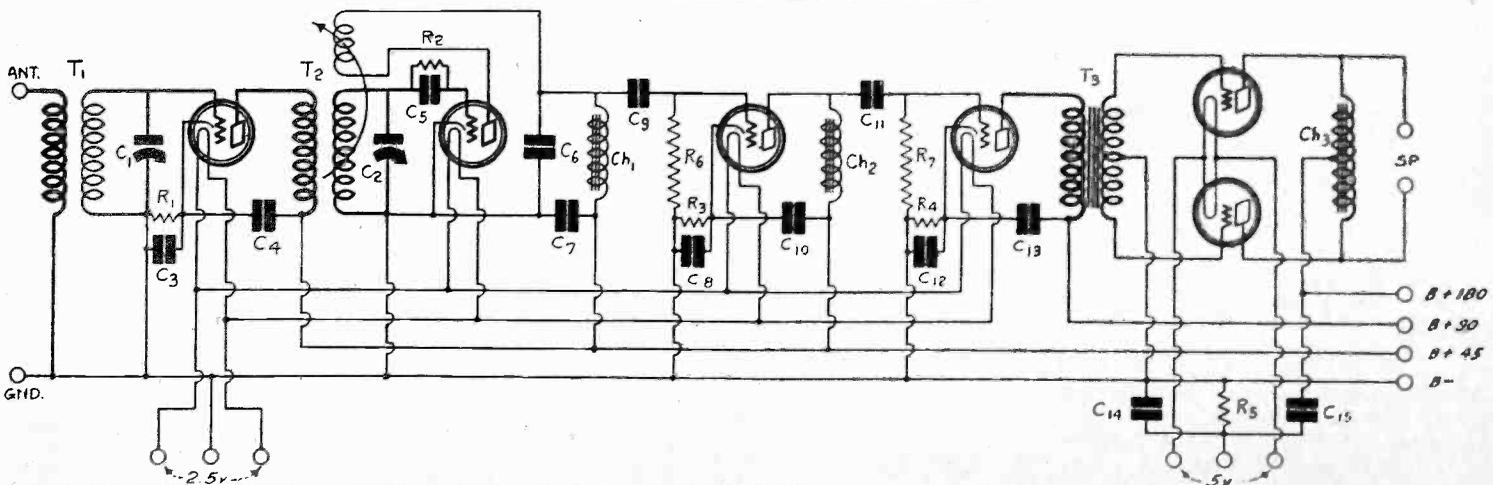


FIG. 2

THIS CIRCUIT EMPLOYS A TUBE DETECTOR IS SENSITIVE AND SELECTIVE, AND IS CAPABLE OF GREAT OUTPUT, YET ITS QUALITY IS VASTLY SUPERIOR TO THAT OF AN OLD SIMPLE CRYSTAL SET. PARTS OF MODERN DESIGN AND PROPER VOLTAGES AND TUBES ACCOUNT FOR IT.

The Mystery of the of Sele

By Homer

Consulting

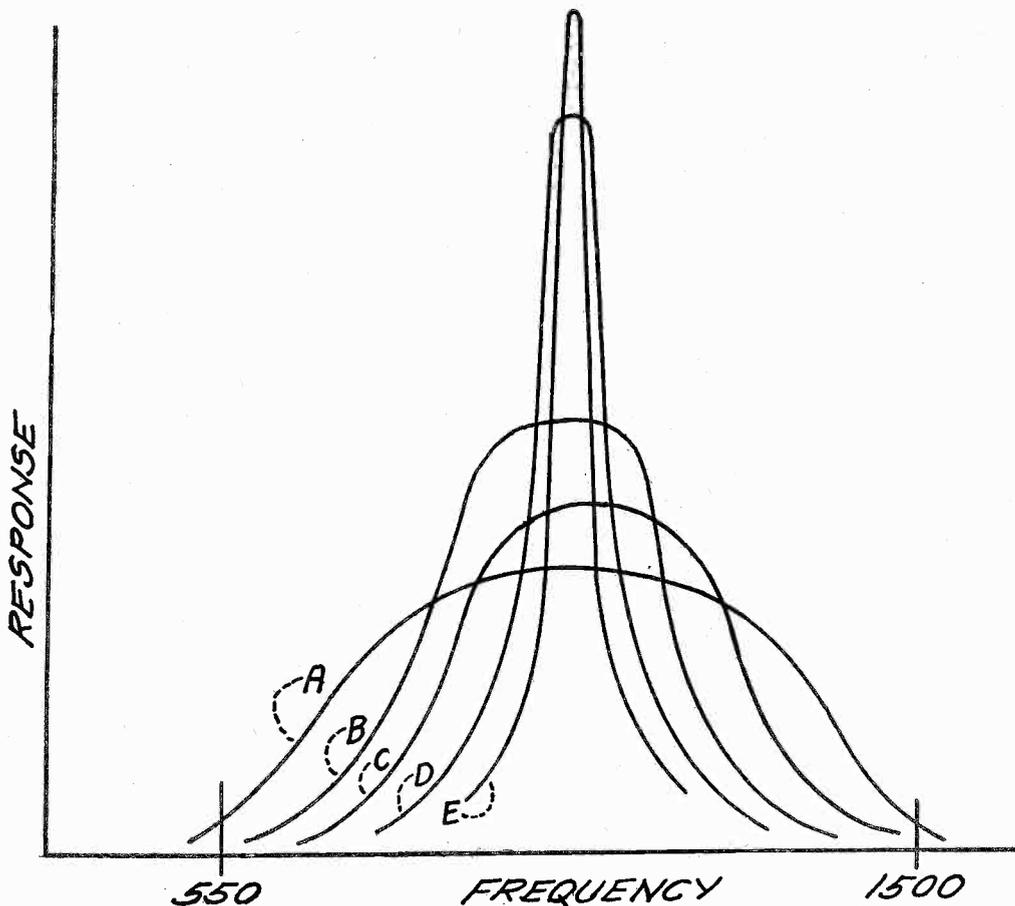


FIG. 1

CURVES SHOWING THE INCREASE IN THE SELECTIVITY OF RECEIVERS FROM THE BEGINNING OF BROADCASTING UNTIL THE PRESENT TIME.

RECENTLY a radio fan wrote a letter to this effect:

"I have had my receiver for seven years and it has given very good results. It used to be very selective—could tune in all the stations without interference. But gradually it has become less and less selective. Now it is almost impossible to tune in any station without interference. The circuit is regarded as a good one. Why has it lost its selectivity?"

Many similar letters of this type have been received during the last five or six years. All correspondents want to know why their sets have lost their selectivity.

That, of course, is a serious problem. Why do sets lose their selectivity? Perhaps some sets do lose their selectivity, but not many of them do it gradually. When a set loses its selectivity it is usually because some defect has developed—suddenly.

Selectivity Needs Grew

The answer to the correspondents' questions is that the sets never had any selectivity. It was only the realization of the fact that it was not selective enough which developed gradually. And that would have developed even if the set had not been used more than twice, first when it was obtained and again when the broadcasting situation is what it is today.

At the beginning of broadcasting there

was only one station in the field. It operated on a low power and on 360 meters. A crystal set could be, and was used for receiving it, provided that the station was not over a few miles away. No selectivity at all was necessary, and the first sets had none. There was some need for selectivity to eliminate code interference on 600 meters, but in those days a little interference was not objectionable.

Soon there was a second station established. But it was put on 360 meters, and still there was no need for any great selectivity. As interest in broadcasting grew other stations were erected, and all were put on the 360 meter wave. Crystal sets with the crudest types of tuners were sufficient. Since all the stations were on the same wave they could not be separated by tuning, and code interference was the only type that counted. The stations did not interfere among themselves much because the power was low and all was local reception.

But other broadcasters wanted to enter the field and cases arose where two wanted to broadcast in the same locality. It was necessary to assign more channels. Hence, 400 meters was added to the broadcast band. Now there was a real need for some selectivity, because crystal set owners wanted to pick up one station at a time to the exclusion of the other. Attention was given to selective

crystal sets. Selective crystal sets! They did exist then, but they are no more. Yet we have the same circuits now as then. The crystal set circuits have not changed, but the broadcast structure has!

Tube Enters

The first real step toward selectivity was the substitution of a tube detector for a crystal. However, some of the single circuit tuners, with direct antenna coupling, were not much more selective than the better types of crystal sets. But they were much more sensitive. Both the early crystal sets and single circuit tuner tube sets were selective enough as long as broadcasting was done only on 360 and 400 meters with 500 watts power.

The first need for greater selectivity was felt when distant stations were tuned in. When there was a low power station in one town operating on 360 meters and a similar station at a distant point operating on 400 meters, the tuners used were not able to separate them. Hence, the cry for greater selectivity arose.

There was much tampering with the antenna circuit with the object of increasing the selectivity of the receiver. Some success was achieved but only at the sacrifice of sensitivity. The gain was not real.

Regeneration Introduced

Two circuit tuners were used to advantage. That is, the antenna was tuned first and then the secondary was tuned to the same frequency, and the coupling between two coils made loose. There was a gain. Selectivity was improved without much loss in sensitivity.

The DX bug took hold of everybody, because there were now stations all over the country. DX hunting brought in regeneration, and it brought back the single circuit tuner, which had largely lost its position.

Regeneration in single circuit tuners created a million miniature transmitters. That was the era of "blooming" when it did not make much difference whether the set was selective or not. Nothing could be received without ruinous whistles. The campaign for the abolition of single circuit regenerative sets yielded the radio frequency set with a single circuit tuning first and a two-circuit tuner with regeneration next. This was guaranteed by the experts to be a sure cure for "blooming."

Of course, it was no cure at all, only a slight palliative. But that circuit did lead to the two-stage tuned radio frequency circuit and the beginning of real selectivity. This advance came as a result of the orderly allocation of channels 10 kilocycles apart, ranging from 550 to 1,500 kilocycles.

Cross Talk Increases

The stations had multiplied so fast that the need for high selectivity had run away from actual selectivity of receivers then in use. There was much complaint of cross talk, of heterodyning and of "blooming." This evil died down when DX

Slow Disappearance

Activity

Daniels
Engineer

hunters found that much better results could be obtained from local stations without so much fussing with the controls. Even the tuning and regeneration controls passed as a result, or some of them. Heterodyning remained, and so did cross talk. In fact, both grew worse as the stations kept increasing without any legal control.

The necessity for greater selectivity increased as the stations multiplied. Manufacturers and designers of sets met the condition. Many sensitive circuits were developed, such as the Neutrodyne, the Superdyne, the Diamond of the Air, the Browning-Drake and any number of Super-Heterodynes.

Power Rise Complicates Situation

As the rivalry among the stations increased their power increased also. All of them tried to increase the coverage so as to include millions of listeners where they had been satisfied with thousands before. This put a still greater demand on the selectivity of the receivers. In certain localities no receivers could be found which were satisfactory.

Some complaints were justified, others were not, because listeners tried to do the impossible with their receivers. For example, a fan who lived within a mile of a 25,000 kilowatt station would try to pick up with loudspeaker volume a 500 watt station located 2,000 to 3,000 miles away and expected no interference from the local station. And he tried to do this with a set which was designed for local reception, or perhaps with a set which was designed when all broadcasting was done on 360 and 400 meters.

The necessity for high selectivity is greater today than ever before because the power is greater and every channel is occupied. At this time there is no great difficulty in getting a selectivity that is high enough, but it is difficult to get such selectivity which will not at the same time eliminate most of the timbre of the music. It is to solve this problem that band pass filters are now being tried out. They are supposed to give a 10 kilocycle selectivity with equal transmission inside the band and with no transmission outside. Of course, such selectivity cannot be attained, and neither would it be entirely desirable if it could. But by means of such filters much greater actual selectivity could be obtained without ruining the quality than is possible with ordinary tuned radio frequency circuits.

Selectivity Lags Need

Although present-day receivers are very selective as compared with sets of a few years ago, they are not selective enough to meet all reasonable demands. The actual selectivity lags behind the need, just as it has done since the day the second wave was added to the broadcast channels. And it probably will continue to do so as long as the power of broadcasting stations continues to increase.

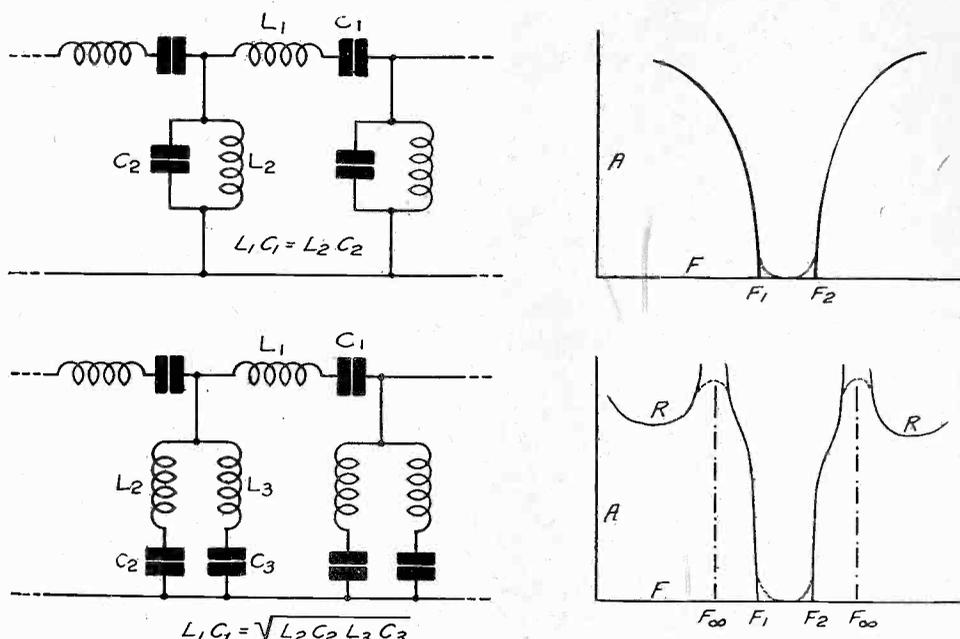


FIG. 2

BAND PASS FILTER CIRCUITS NOW BEING USED IN MODERN RECEIVERS TO OBTAIN 10 KC SELECTIVITY WITHOUT CUTTING SIDE BANDS. UPPER—A SIMPLE BAND PASS FILTER WITH ITS CHARACTERISTIC. LOWER—A BAND PASS FILTER WITH SHARP CUT-OFFS.

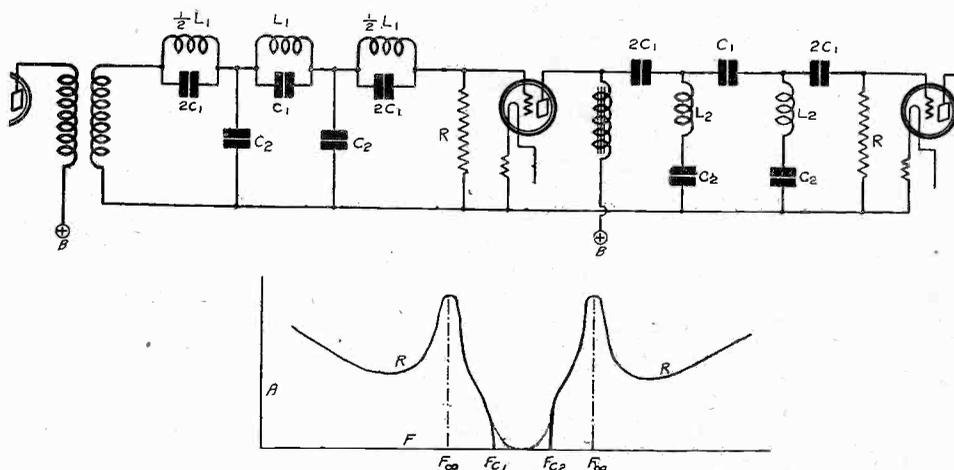


FIG. 3

A METHOD OF COMBINING A LOW PASS AND A HIGH PASS FILTER FOR SECURING HIGH SELECTIVITY WITHOUT CUTTING SIDE BANDS, SUITABLE FOR THE INTERMEDIATE CHANNEL OF A SUPER-HETERODYNE.

The growth of selectivity of radio receivers is graphically represented by the curves in Fig. 1. Curve A represents the selectivity of the earliest receivers used in broadcasting. If one of these receivers was tuned to the 360 meter wave it brought in with practically the same intensity everything within the present broadcast band. There was very little discrimination, and at that time no need for providing any.

Curve B shows a selectivity just a little greater. It was obtained on single circuit crystal sets when the tuning was done entirely in the antenna circuit. Curve C

shows approximately the selectivity of the early receivers having an untuned antenna and a tuned secondary.

Curve D represents the selectivity of the earlier tube sets in which not more than two tuned circuits were used without any regeneration. The selectivity obtained with regeneration or with three sharply tuned circuits is represented by Curve E. Of course, Curve E does not represent the greatest selectivity that has been used. There are many regenerative circuits having three or more tuned stages, as well as many Super-Heterodynes, which are much sharper.

Intimate Details of Construction Design of Power

By R.

[R. E. Lacault, who died recently, had just completed his best receiver, the RE29, described in the April 6th and 13th issues and continued this week. Mr. Lacault was connected with radio since 1911, first as amateur then in the commercial field. During the World War he was connected with the Signal Corps of the French army (radio section), where he designed several pieces of apparatus for war use. Later he worked on the transmission of pictures by wire and radio. He is the originator of the famous Ultradyne, LR4 and R.E.L. 9. He adapted the Strobodyne for use in this country and perfected it with shield grid tubes the following year. In his present receiver, the RE29, he uses the famous Ultradyne system of modulation for the first time in conjunction with screen grid tubes.—Editor.]

THE RE29 consists of a 6-tube design, including the first audio, the filaments of these tubes being battery-operated. Then there is a Push-Pull Am-

plifier and B Supply, built separately. Of course the push-pull stage is the second audio stage. Nevertheless we will refer, for clarity's sake, to the 6-tube design as the "receiver" and the other as the "power supply," which supply, by the way, is AC operated.

This receiver is built on a baseboard 25 1/4"x12", which should be made of wood that will not warp. With a square and rule draw a line right in the center of the board from front to back. Then draw another line 1 1/2" to the left of the center line. Last of all draw another line 1/4" away from the front edge of the base-

Next place two blocks or legs in the back corner to raise baseboard so that the surface is 1" above bottom of cabinet. The thickness of the blocks or legs in the back depends of course upon the thickness of the baseboard. Next drill all the aluminum shields according to the templates which are furnished with the official set of blueprints. The blueprints may be placed over the various shield pieces and the holes punched with a sharp tool or regular punch. Then drill each piece of aluminum separately by placing

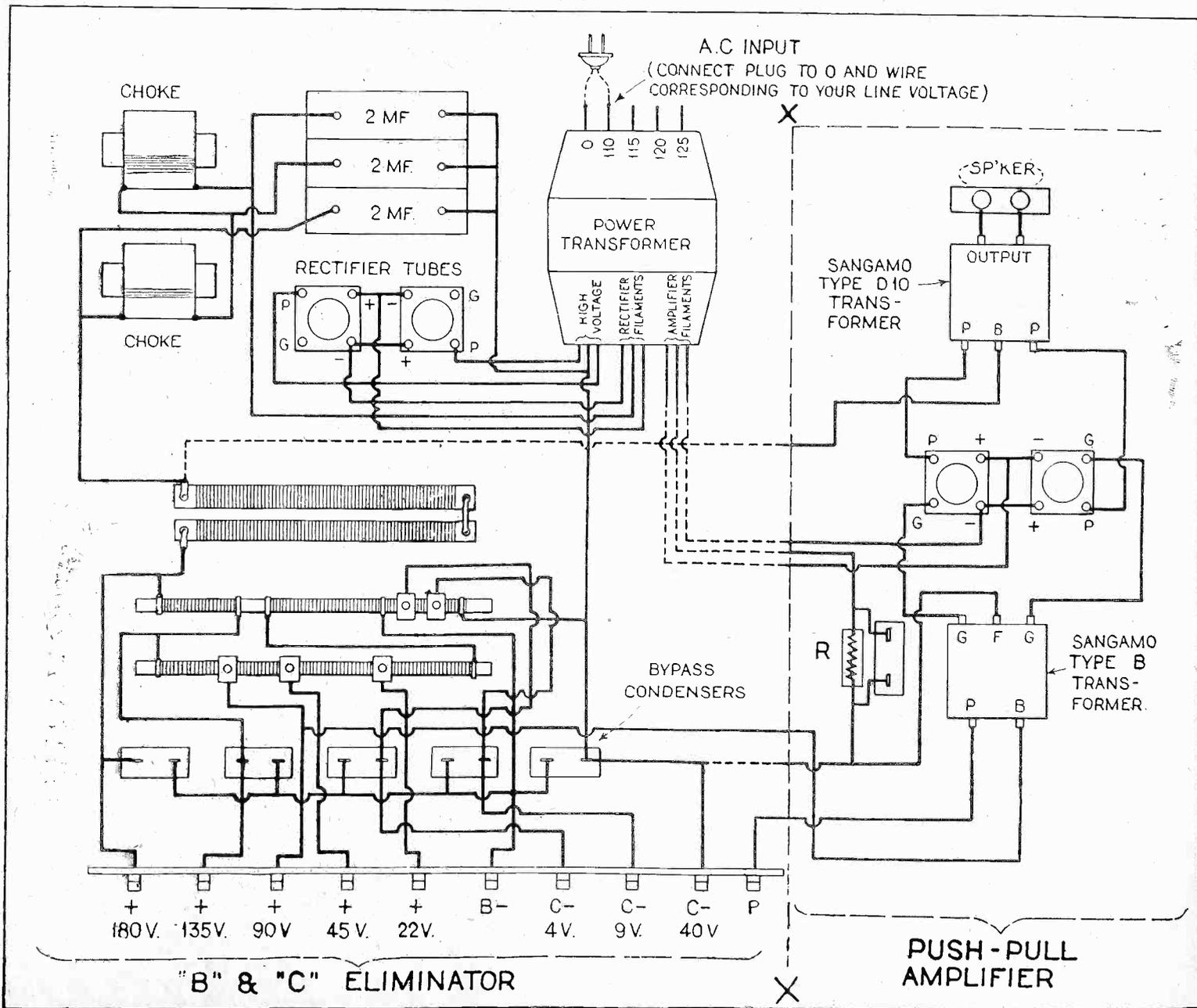


FIG. 4

HOW THE POWER PACK AND THE PUSH-PULL AMPLIFIER FOR THE LACAULT RE29 RECEIVER SHOULD BE WIRED UP FOR BEST RESULTS.

Construction of the RE 29; Supply Revealed

Lacault

a board underneath and using a sharp drill so that the holes are drilled straight.

How Shields Are Secured

Next place the bottom of the shields on the baseboard so that the left edges of the front and back shields are exactly on the line drawn $1\frac{1}{2}$ " to the left of the center line on the baseboard. At the same time the front edge of the forward shield should be exactly on the line drawn $1\frac{1}{4}$ " away from the front edge of the baseboard. The blueprints show this clearly.

The right-hand shield is lined up on the front line and against the others as shown in the pictures. The shields are held in place by screwing down the coil bases and the sockets. These bases are raised above the shield with two spacers furnished with the coil and once these are screwed down they hold the bottom of the shields in place. The blueprints contain a detail of this mounting method.

When mounting the coil bases, notice the position of the white holes into which the coil is plugged. One hole is in the center of the base while the three others are offset. This is visible on the blueprints and it is important that these bases be mounted in the right way.

Next, mount the other apparatus (on the left side of the baseboard) and drill right through the baseboard. These holes are used for the wiring which is made under the baseboard.

Use a $\frac{1}{4}$ " drill to drill the shields and the wiring holes in the baseboard.

Mounting Insulating Rings

To support the tube shields covering the shield grid tubes it is necessary to modify two sockets. The easiest way is to proceed as follows: Countersink the mounting holes so as to use a flat-head machine screw. Then remove the thumb screws and nuts which are holding the floating part of the socket. Once the screws are removed be careful not to

turn the center part of the socket, since each blade must remain in its original position.

Then place two No. 6/32 flat-head brass machine screws in the mounting holes to fasten the socket later on the baseboard, and place the bakelite insulating ring over the socket after the four nuts have been removed from the threaded studs. These studs take the place of the screws and nuts which originally held the socket together.

After the four brass nuts have been placed back on the studs, the socket is again assembled but with a bakelite ring around the floating part. On each one of the rings you will notice that one of the studs shows through the bakelite, on the rim. This particular stud should be placed so that it holds the minus A terminal on the socket. This arrangement is provided to ground the tube shields to the minus A when they are slipped over the tube.

Tin the Plug Wires

If it should happen that the insulating rings you obtain do not have the stud showing through the bakelite merely solder a wire to the bottom of the tube shield and fasten the other end of the wire to the aluminum shield under a screw or nut.

After all the parts are fastened on the board you may start the wiring. The wire (rubber covered) is looped, cut and soldered to the various lugs. This is an easy and rapid way of wiring.

When connecting the various wires to the fixed part of the cable plug which is fastened on the baseboard it is best to tin the wires. It is then easy to heat the small tubes into which the wire slips.

As you solder the wires to the plug, make sure that there are no strands of wire touching the next plug.

How Shields Are Grounded

One must be careful, however, where the wires pass through holes in the shields. Once all the wiring on the baseboard is done, the partitions of the shields

may be installed and the wires passed through the holes which have been drilled previously. Begin with those connections right behind the panel and work toward the back. It is easier to solder the connections.

The corner posts of the aluminum shields are fastened with long machine screws through the baseboard. The head of one of the screws holding a corner post of each shield should be soldered to the minus A wire so as to ground each shield.

Panel Data

The panel supports only the two dials and the switch. The templates for the National type E dials are furnished with the dials, and the distance, from the bottom and the edge of the panel are given in one of the blueprints.

The panel is mounted last of all and is adjusted as follows:

Lift up the set and let it rest on the back shield so that the front of the set is flat and on top. Unscrew the set-screw of the right-hand dial and drop the panel so that the right condenser shaft fits in the dial hole.

Straighten the lower edge of the panel with the baseboard and with a sharp tool punch the edge of the board through the three mounting holes. In this way one avoids the binding of the right dial.

A good precaution is to check the wiring once it is completed and, leaving the minus of the A battery connected to the minus terminal, touch all the other wires in the cable to make sure that no tube lights. If one does light, there is something wrong in the wiring.

Use a Voltmeter

If everything shows OK, connect the power unit and adjust the voltages. An accurate high resistance voltmeter will show exactly what you get and we urge you to use one. You can probably borrow one if you do not own this extra useful piece of apparatus.

Some tubes work better with a little more plate and grid voltage, others with less. In other words the set has to be adjusted for the tubes in use.

* * *

[Next week, issue of April 27th, will be published the final article of this series on the RE29 and its Push-Pull Power Supply, thus concluding Mr. Lacault's discussion of his final and best circuit.]

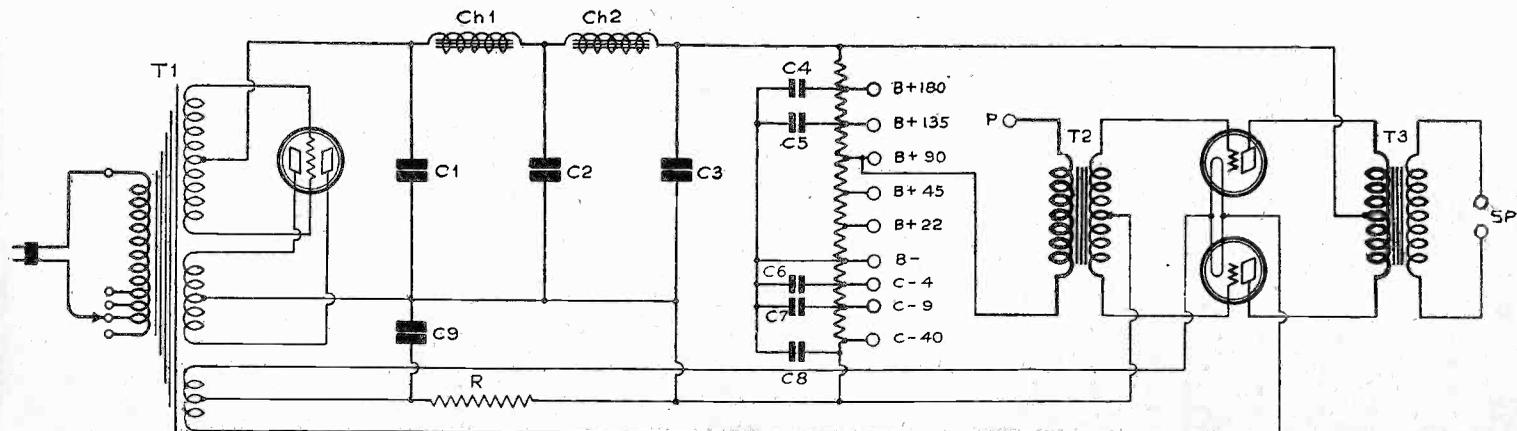
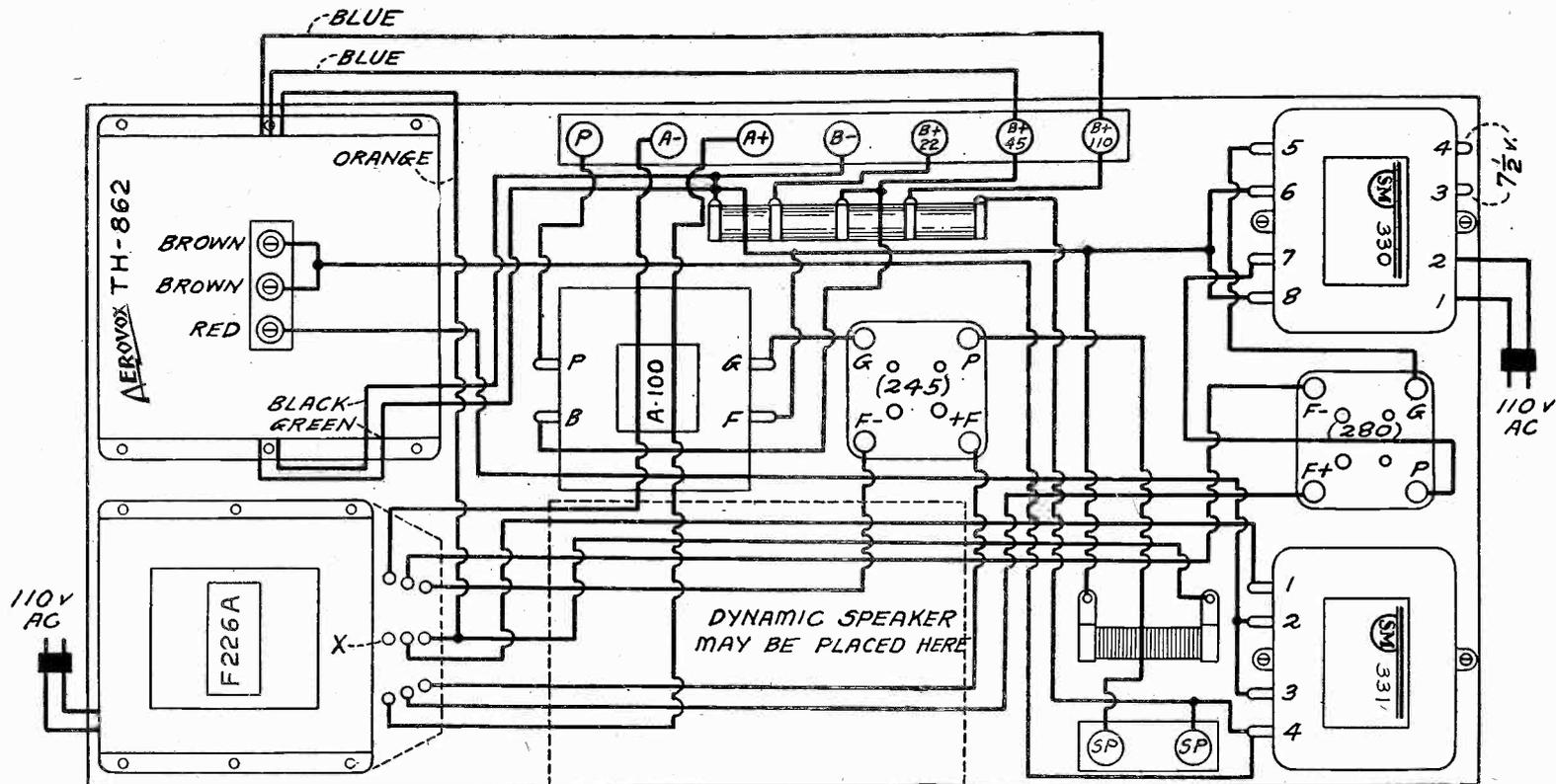


FIG. 5

THE SCHEMATIC REPRESENTATION OF THE DIAGRAM ON OPPOSITE PAGE.

An ACT Tuner Matched

By Herm



PLENTY OF "BREATHING SPACE" IS LEFT IN THIS POWER PACK, USING THE NEW 245 OUTPUT TUBE. FILAMENT VOLTAGE OF 2.5 FOR TUBES EXTERNAL TO THE B SUPPLY IS PROVIDED, AS WELL AS PLATE VOLTAGE FOR THE INCORPORATED SINGLE STAGE OF AUDIO AND FOR A RECEIVER THAT WILL BE USED WITH THE PACK.

[This article was begun last week, issue of April 13th.]

THE 245 power amplifier that is the subject of this article is intended primarily for operation of a dynamic speaker, and supplies the AC filament current for the 280 rectifier tube, the 245 last-stage power tube, and for the tubes of a receiver that may be built, using heater type tubes, i. e., AC-screen grid or 227 tubes.

In line with the dynamic speaker feature, room is left on the 10x20" baseboard for actually fastening the base of the speaker. The wire leads, shown in the pictorial diagram as crossing this reservation, then should be strung in the rear of the speaker and clear of its base. The whole outfit may be elevated, baseboard and all, by means of supporting beams, to the height required by a baffle, so that the cone of the dynamic speaker centers on the baffle opening at front. The speaker periphery may be pressed tightly against the back of the baffle. You won't have to screw the periphery to the baffle board, although this may be done, too, if desired.

Needs Separate Winding

If a receiver is used that has 227 tubes, and feeds into the one-stage audio amplifier of the pack, with its 227 tube, and finally into the 245 tube, you can see that all filament voltages will be 2.5 volts, excepting only the 280 rectifier tube, which is 5 volts. Thus do we get back to the common voltage so familiar in battery-operated receivers.

But the power tube should be fed from a separate 2.5 volt filament winding, otherwise the negative bias on the last tube would be a positive bias on the heaters of the other 2.5-volt tubes, and

it would be too high for the common purpose.

The question of heater bias is an interesting one, since confusing results sometimes obtain. For instance, a slight negative bias is recommended, say, about 6 to 9 volts, or a positive bias up to 45 volts as an experimental option in conjunction with 227 tubes. Simply connecting midtap of the heater winding to

LIST OF PARTS

T1—One filament transformer with two separate 2.5 volt windings (one at 10 amperes, other at 3.5 amperes) and one 5-volt winding at 1 ampere. (Merchandised by Guaranty Radio Goods Co. as Model F226A).

T2—One Silver-Marshall power transformer (S-M Cat. No. 330).

T3—One National audio transformer, Cat. No. A100.

Ch1, Ch2—One Silver-Marshall Unichoke (S-M Cat. No. 331).

C1, C2, C3, C4, C5, C6—One Aerovox filter-buffer condenser block, Type No. TH-862.

R1, R2, R3, R4—One Aerovox standard tapped Pyrohm resistor, type A (0, 3,000, 2,800, 750, 750 ohms).

R5—One Aerovox Pyrohm, 1,200 ohms.

Two terminal strips, one with speaker posts on, other with seven binding posts on.

Two standard sockets (4-prong).

One baseboard 10x20 inches.

One 280 and one 245 tube.

Hardware: Four mounting brackets for terminal strips, two for resistors.

ground causes the heater to be negatively biased to the extent of the bias on the particular tube analyzed.

As different tubes may have different biases, for instance, one voltage for radio frequency, another for detection and still another for first-stage audio, each tube is correspondingly biased, hence no common bias prevails for all. This difficulty gives rise to unusual effects, such as a gurgling form of oscillation when all stages are grounded at midtap of the heater voltage. Whatever voltage, positive or negative, and no matter to what degree, is chosen for heater bias, it must be remembered that actually each stage is differently biased if the negative grid biases are different. Hence in some instances it is well not to connect the midtap of the heater common to all tubes fed by that winding, although both positive and negative biases should be tried experimentally. The only negative practical is to ground, that is, B minus to heater midtap, although various positive biases are possibilities.

AC Screen Grid Caution

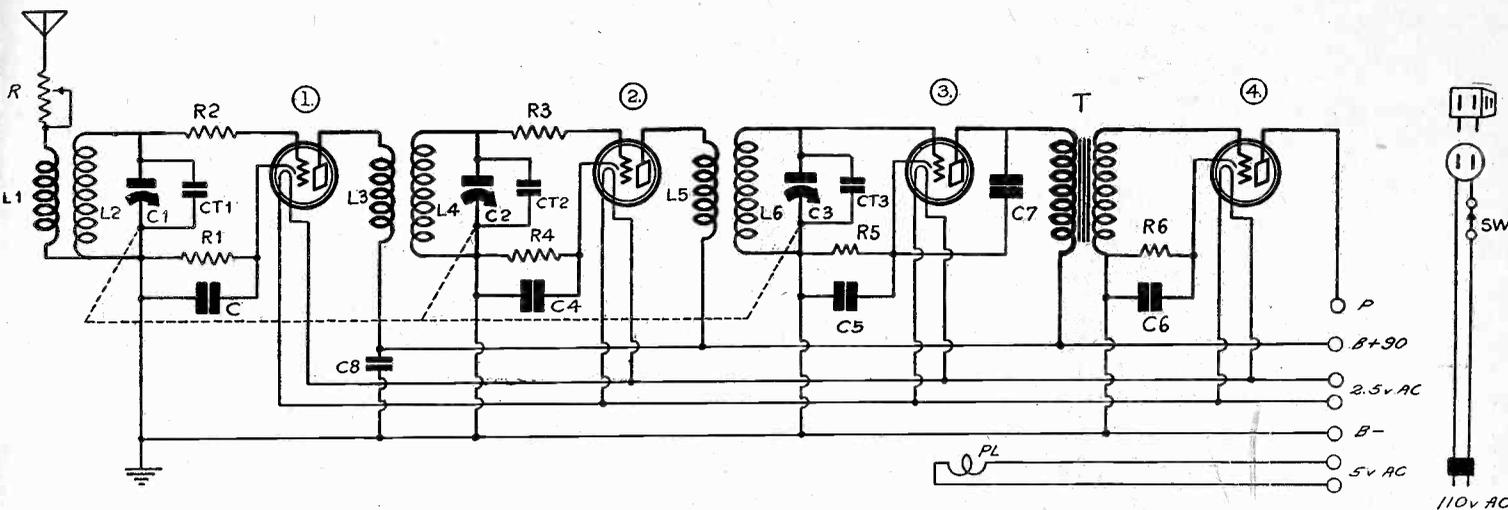
If an AC screen grid tube is used do not go any higher than 10 volts negative for the heater bias, as the 22 volts or 45 volts positive recommended experimentally for the 227 does not apply to the new AC screen grid tube.

The layout of parts takes considerable room, and if circumstances require it is possible to compress the 20" length to 16" or a little less, but the 10" depth is advisable, indeed, virtually imperative if the prescribed parts are to be arranged as shown, particularly at left and right in the pictorial diagram.

The resistor strip, shown at rear, may be mounted vertically, as this affords a

to a 245 Power Pack

ernard



DESIGN OF AN EXCELLENT FOUR-TUBE RECEIVER, INCLUDING FIRST STAGE AUDIO, TO WORK INTO THE 245 POWER PACK. SINGLE DIAL TUNING IS PROVIDED BY THE GANGED CONDENSER. ALL GRID RETURNS ARE TO GROUND, HENCE A COMMON ROTOR IS PRACTICAL. THE SWITCHING ARRANGEMENT PROVIDES SINGLE PANEL CONTROL OF RECEIVER, POWER SUPPLY AND DYNAMIC SPEAKER.

little better ventilation, due to the chimney effect. The resistor is wound on a hollow base.

The reason for showing the resistor in a flat position is that the connections to the lugs are exposed. There is no harm in adhering to the "couchant" method even in the actual construction, but at all hazards be sure to use the correct end of the resistor for B minus. This is the extreme terminal next to which are the respective 750-ohm ranges of the network, so marked on the Aerovox pyrohm.

Discussion of Heat

This resistor will get hot, must get hot, because it functions on the heat-production basis, so don't let that worry you. After the power pack has been in operation for a few hours the 330 will generate some heat, but never enough to make touching it uncomfortable. A little heat will appear in the 331. These facts are set down only because many persons who build B supplies wonder whether one thing or another should get hot, and if it does, is disaster staring them in the face?

The 7½-volt winding of the power transformer is not used in the B supply or in any receiver intended to feed into the power pack. But if you desire to use a 210 instead of a 245 in the pack, simply because you have a 210, you may heat the final tube with this extra winding, and arrange the biasing resistor in the new filament circuit.

Has Several Uses

As for its uses, the B supply furnishes one extra stage of audio, working into the newest power tube, one that with 250 volts on the plate and about 50 volts negative on the grid, gives about the same undistorted power output as a 210 with 350 volts on the plate.

It is therefore feasible to work an existing receiver, say, one that has a 171 or 171A output, right into this power pack, using the receiver just as it is, as to filament heating, but deriving the plate voltage from the B supply, if need be.

The extra stage of audio (in the power pack) will give more volume, but it is suggested you reduce the size of your aerial, or put a .00025 mfd. fixed condenser in series with the aerial, so that the usual selectivity will be improved. In

that way you will get better selectivity and better quality.

For a specially built receiver that will work nicely into this power pack, or into any other similar power pack, the illustrated design is suggested. This consists of four 227 tubes. Two are used as radio frequency amplifiers, one as a grid bias detector and one as first-stage audio. The filament transformer in the power pack, from the very winding that serves the filament of the 227 tube in the power pack, will heat all four tubes in the receiver.

This circuit is a standard one, using a single tuning control. The switch and volume control are built as one unit. The switch interrupts the special cable that is left permanently connected to the convenience outlet (the AC "hole-in-the-wall"). One AC cable goes to one side of the switch. A receiving plug picks up the other or set side of the switch and also the remaining lead of the AC cable. Insert a three-way socket-plug into this receptacle and you can control the filament transformer, power transformer and AC dynamic speaker (AC type or 90-to-110-volt DC type) from this single switch on the front panel. The design to the right of the circuit network shows how this is done.

Quality Detection

The circuit is a good one. It provides adequate amplification at radio frequencies, and affords the best type of detection, that obtained by making the grid of the detector tube negative to such an extent that the tube is operated on the flat portion of its characteristic curve. A very high degree of sensitivity is attainable by this method of detection, using the 227 tube, despite the usual remark that leaky-condenser rectification is much more sensitive.

The negative bias detector, like any other tube, can be overloaded, and once the condition of overload is even approached you have reached the danger point in the qualitative operation of any tube. Hence you do not use full detecting capability of the tube, since you want best quality. This sacrifice of a little sensitivity for better quality is not an admission that sensitivity is unattainable, but that it is undesirable at the large expense of quality involved. Hence, for

quality, use 50,000 ohms in the biasing section of the tube circuit (R5) and be sure to bypass the resistor with a condenser of .5 mfd. or larger capacity.

A Great Essential

Every biasing resistor should be bypassed. In some instances it is vital to attend to this seeming detail. In other instances it is merely desirable. A vital instance is in regard to radio frequency amplifiers. One might argue, with a show of soundness, that since a grid suppressor is used in each radio frequency stage (R2 and R3), and as biasing resistors (R1 and R2) are in the same essential circuits, why bypass one resistance only to introduce another? Simply because the plate current flows through the biasing resistors, and not through the grid suppressors. The biasers offer high resistance to a resonant radio frequency circuit passing plate current. *Selectivity is less, the more stages you add without the RF bypassing resistors.*

In the detector stage distortion runs high, even with grid bias detection, unless a suitably large condenser is used across the resistor (C5 across R5). Clarity and increased volume, plus improved selectivity, result as soon as you put even .00025 mfd. across the resistor. But as the detector handles audio frequencies as well as radio frequencies, a condenser of less than .5 mfd. should not be used here. For radio frequencies .02 is recommended, although from .0005 mfd. up will help.

Extreme Comparison

The first audio stage is least critical as to the bypass condenser across the biasing resistor, and small difference will be noted even if the condenser is omitted, but it should be included because this small difference is in a region where small favors are thankfully received, that is, in the low-note region. *Least important in the first audio stage, the bypass condenser is most important in the last audio stage.* Here it should be no less than 4 mfd. or the general amplification will be dealt a hard blow, and low notes ruined. The 4 mfd. condenser is one of the capacities in the Aerovox bank used in the power pack.

* * *

[Next week, issue of April 27th, details of the construction of the four-tube receiver will be published.]

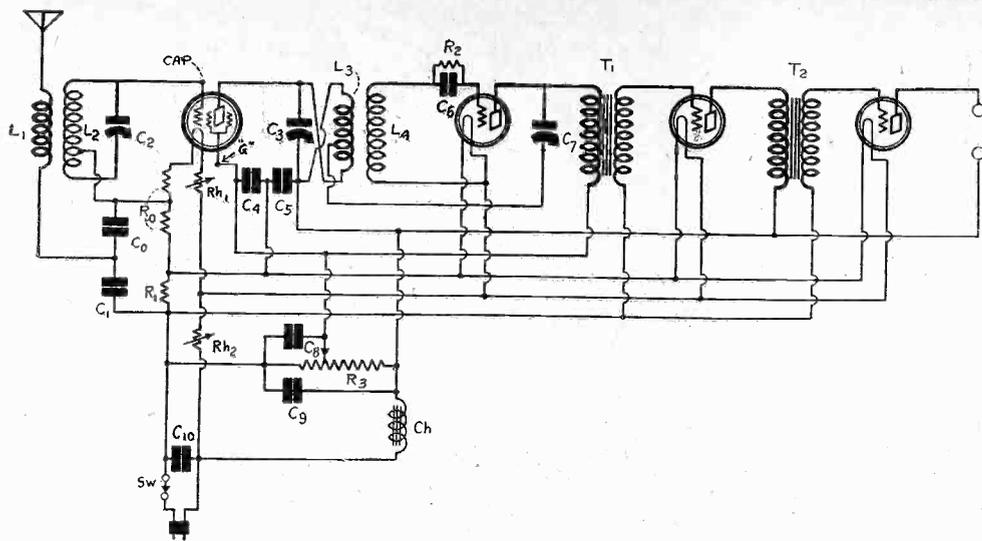


FIG. 741

THIS SHOWS HOW THE SCREEN GRID UNIVERSAL RECEIVER CAN BE ADAPTED FOR USE ON A 110 D.C. LINE. REQUESTED BY IRVING CANDLAND.

Radio University

QUESTION and Answer Department conducted by RADIO WORLD, by its staff of experts, for University members only.

When writing for information give your Radio University subscription number.

WHICH IS the better tube for amplification when AC is used on the filaments, the 201A or the 112A? Which requires the closer balancing of the center-tap of the filament?

(2)—Which is the better, the 226 or the 227?

(3)—Is it necessary to center-tap the heater of the 227 tube to eliminate hum?

(4)—How close is it necessary to balance the filaments of the various tubes?

ANTHON C. PETERSON,
Chicago, Ill.

(1)—The 112A is much better both from the point of view of amplification and lower hum.

(2)—The 227 is by far the better, and is the only one of the two which should be used for detection and audio amplification.

(3)—Some improvement will result from center-tapping the heating winding.

(4)—The center-tapping for all the tubes with the exception of the 227 should be closer than 1 per cent of the filament voltage. For the 226 tube this means that the center-tap should be within 15 millivolts of the true electrical center of the winding.

* * *

DOES ANY CURRENT flow in the screen grid circuit of the 222 type tube? I don't believe it does, because the tube works when I touch the screen grid post on the socket with one hand and touch the 45 volt tap on the battery with the other.

(2)—If any current does flow, about how much is it?

(3)—What is the maximum amplification that can be obtained from a screen grid tube and how can it be estimated?

ELMER BENNETT,
Marion, Indiana.

(1)—A small current flows. It is so small that you cannot feel it when it flows through your body.

(2)—Usually the current is less than .25 milliamperes. Sometimes less than .1 milliamperes.

(3)—The maximum amplification is the product of the mutual conductance and the load resistance or impedance. Thus if the mutual conductance is 400 micromhos and the load resistance is 100,000 ohms, the amplification is 40. If the load resistance is .25 megohms the amplification is 100.

I WISH TO WIND some coils for a TRF receiver using 2.5 inch tubing. Will you please give the number of turns required for .0005 and .00035 mfd. condensers?

(2)—How many turns should be used for the primaries when -27 type tubes are to be used for amplifiers.

(3)—Should the antenna coil primary be the same as the others. If not, what difference do you recommend?

EDGAR HASSELL,
Brownsville, Tex.

(1)—See page 16 of the March 16th issue of RADIO WORLD for tabulated coil winding data.

(2)—The primaries connected to the plates of -27 tubes should have approximately one-fourth as many turns as the secondaries. Use fine wire for the primaries.

(3)—The antenna coil primary should be wound with heavier wire than the other primaries. The wire should not be finer than the wire on the secondaries, and preferably much heavier. Fewer turns may also be used, say one-fifth as many as on the secondary.

* * *

I AM PLANNING to build a device for recording sound, for which I need a microphone. What type do you recommend?

(2)—Is it necessary to have a microphone when recording programs received on the radio set?

(3)—I also wish to measure the amplification of my receiver at various frequencies. Can I use a microphone for this purpose?

WAYNE JACKSON,
Detroit, Mich.

(1)—The best microphone is the condenser type. This is also the most expensive. There are various carbon microphones with which good results may be obtained.

(2)—No. All you need to do is to convert the loudspeaker unit so that it may be used for engraving the vibrations on the record.

(3)—There are many different methods of measuring the over-all amplification of a receiver. In some of them microphones are used. The sound from the loudspeaker is picked up by the microphone and the resulting signal is amplified with a calibrated amplifier and its output compared with the input.

I HAVE CONSTRUCTED the screen grid Universal just as you described it. I used S-M 255 and 256 transformers. The set is satisfactory in all respects except that it does not oscillate on the longer wavelengths. Please suggest a remedy.

(2)—Will this set give more volume if I add another audio frequency amplifier? Is the addition advisable?

CLAUDE JENKINS,
St. Joseph, Mo.

(1)—Probably all you need is to increase the plate voltage on the detector. You might also insert an 85 millihenry choke coil in series with the lead to the first transformer.

(2)—If you add a tube that will handle more volume than the last tube you now have. Usually it is not advisable to have so much audio.

* * *

WHAT IS MEANT by the reverberation period of an auditorium or a room?

(2)—In what manner does this affect the acoustic properties of the room?

(3)—Does the reverberation period of the room have anything to do with the quality of a loudspeaker?

NILES MILES,
Boston, Mass.

(1)—It is the time of one period of the natural frequency of vibration of the air in the room.

(2)—It makes the room boomy and if the period falls within the speaking range it makes it difficult to understand a speaker in the room.

(3)—It accentuates the response of the speaker when the signal happens to be of the same frequency as the natural frequency of the room.

* * *

IS IT POSSIBLE to add an RF stage to my radio receiver without otherwise altering the set in any way? If so, please explain.

(2)—Would you recommend a screen grid tube for the added stage if it is practical?

(3)—Would there be any difficulty from uncontrollable oscillation as a result of adding the tube?

WILLIAM SODERMAN,
Chicago, Ill.

(1)—Yes, it is possible. Hook up the stage in the regular way and couple the plate of the tube to the antenna binding post of the set by means of a .001 mfd. condenser and supply the plate with voltage through an 85 millihenry choke coil.

(2)—No, not generally. There is no simple way of coupling the tube to the set to take advantage of the high amplification of the tube.

(3)—Very likely the circuit will be more difficult to handle after the tube has been added. But if a suitable rheostat is used in the added stage, oscillation can be controlled.

* * *

I RECENTLY BOUGHT a radio receiver which was guaranteed not to reproduce static. It worked satisfactorily for six months but lately it has been picking up static. What can I do to restore the set to its original condition?

(2)—Can you suggest any wave filter which will take the static out?

FRANK WILLIAMS,
Memphis, Tenn.

(1)—Just wait until Fall and the set will be all right again. It brings in static only when there is static in the air.

(2)—There is no such filter.

* * *

WILL YOU PLEASE publish a table of wiring data for various sizes of coil forms and for .00035 and .0005 mfd. condensers?

(2)—What diameter of wire and type of insulation are best suited for radio frequency coils that are to be tuned?

ERIC LINDSTEAD,
St. Paul, Minn.

(1)—The following table gives the winding data for some of the more common coil sizes. **D** is the diameter of the form in inches, **N** the number of turns of wire

per inch along the axis of the coil, n is the total number of turns on the coil.

D	Wire Size	N	$\frac{n}{.0005}$	$\frac{n}{.00035}$
1.5	32	60	76	100
1.75	30	54	66	88
2.00	28	47	61	78
2.25	28	47	53	68
2.50	26	41	50	65
2.75	26	41	44	58
3.00	24	34	44	57
3.25	22	29	43	56
3.50	20	23	43	56

(2)—There is no best diameter and size of wire, but the most suitable wire size for the size of coil is given in the table. Use any standard type of insulation.

* * *

I AM PLANNING to build a television receiver. Can a synchronous motor be used for receiving all transmissions regardless of the speed?

(2)—If not, what kind of motor would you recommend?

(3)—Is it possible to use the same scanning disc for different types of television transmissions?

CARL CALVIN,
San Francisco, Cal.

(1)—You can use a synchronous motor for only one speed, unless you use an appropriate system of gears.

(2)—A variable speed induction motor.

(3)—Only the kind of scanning disc used at the transmitter can be used for receiving; that is, one producing the same number of lines per frame.

* * *

WHEN SPECIAL PROGRAMS are broadcast for Commander Byrd are the regular broadcast waves used? If not, how are the signals transmitted?

(2)—Can you suggest a receiver which will pick up these signals if they are not sent on broadcast waves?

ANTON BAER,
Denver, Colo.

(1)—Sometimes the programs go out on a special short wave channel only and sometimes they are sent out on broadcast waves as well. The signals are usually sent out from Schenectady from a specially constructed directive antenna.

(2)—Any short wave receiver covering the frequency used can be employed. Since the transmission is directive and pointed directly to Little America, only those in the direct path will have much chance of picking up the signals.

* * *

PLEASE PUBLISH a circuit diagram of the four-tube Universal screen grid receiver adapted for operation direct from a 110 volt D.C. line.

(2)—Please give the values of chokes and condensers.

(3)—Can the radio frequency coils and the audio transformers used in the battery set also be used in this electric set?

IRVING CANDLAND,
Portland, Ore.

(1)—See Fig. 741 for the circuit diagram.

(2)—C0, C1, .001 mfd.; C4, C5, .01 mfd.; C8, C9, 2 mfd.; C10, a large electrolytic condenser. The rest as usual. Ch, .25 henry.

(3)—Sure.

* * *

PLEASE TELL ME where I can get a filament transformer having two 2.5 volt windings and one 5 volt winding. The 2.5 volt windings should have a combined current capacity of 9 amperes and the 5 volt winding a capacity of 3 amperes.

(2)—Will this transformer handle a circuit having 5 heater type tubes, of which two are screen grid and two type 245 tubes?

(3)—If not, recommend a transformer that will handle this combination.

MARVIN JONES,
Allentown, Pa.

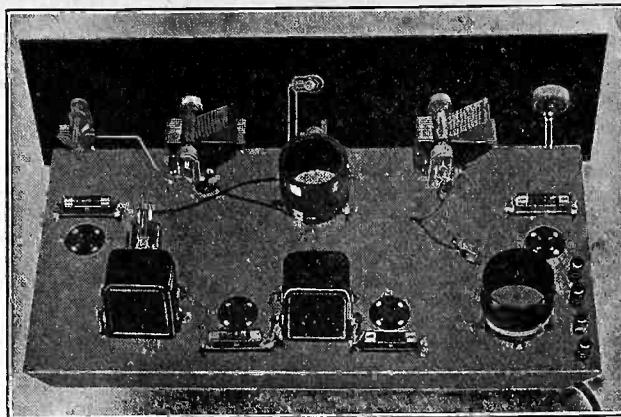
(1)—The F226A transformer advertised in this issue will handle the job.

(2)—Yes.

(3)—This transformer will handle more than is required.

FIG. 742

A photograph of the interior of the D.C. four-tube screen grid Diamond. Requested by Clifford Burr.



I AM TROUBLED a great deal with interference from a local broadcaster. It covers most of the dials. Can you suggest a remedy that does not involve rebuilding the circuit?

(2)—Would it help to add another stage of tuned radio frequency ahead of the receiver?

(3)—Would anything be gained by adding an audio frequency stage and using a smaller antenna?

FRANCIS MAHONEY,
Richmond Hill, N. Y.

(1)—The simplest remedy is a wave trap. Wind 43 turns of No. 22 D.C.C. wire on a 3-inch bakelite form and connect a .0005 mfd. condenser across the coil. Wind 10 turns of the same size wire on the form and connect this in the antenna circuit. Tune the trap to the interfering station and the rest of the circuit to the station you want.

(2)—It would help some if the tuner of the added stage was very selective.

(3)—Very little.

* * *

I HAVE an audio transformer coupled receiver and wish to add a stage push-pull with two 245 type tubes. Can this be done?

(2)—If you think it can be done, please publish a diagram or refer me to a place where I can see one.

(3)—Can A.C. be used on the filaments of the push-pull stage even if the tubes in the receiver are heated by battery?

(4)—Can I use the same B battery eliminator for both the push-pull stage and the receiver?

GORDON SINCLAIR,
Cincinnati, Ohio.

(1)—Yes.

(2)—See page 16, April 13, 1929, issue of RADIO WORLD.

(3)—Yes.

(4)—Yes.

* * *

PLEASE PUBLISH a wiring diagram of the A.C. screen grid Diamond of the Air and also a diagram showing the layout of the parts.

(2)—How does this receiver compare

with the battery operated Diamond?

JOHN BIGLER,
New Haven, Conn.

(1)—You will find both these diagrams on page 18, April 13th issue of RADIO WORLD.

(2)—It gives approximately the same results under the same conditions. It is more sensitive, and of course, like all A.C. circuits, it hums a little unless it is well bypassed to stop feedback.

* * *

I AM ABOUT to build a receiver containing three tuning condensers. Which do you recommend, .00035 or .0005 mfd.?

(2)—Please state the reasons for your choice.

(3)—Also please give the wiring data for the coils to be used with the condensers selected, as I wish to wind my own.

(4)—Would you recommend coils with diameters as small as 2 inches? I should like to use this size if it is advisable.

(5)—What type of audio amplifier would you suggest for home use on a dynamic speaker?

ERNEST BEHR,
Milwaukee, Wis.

(1)—All around .0005 mfd. condensers are the better.

(2)—The main reason for selecting this size of condenser is that it will cover the broadcast band. The smaller condenser does not always do that.

(3)—You will find the wiring data on page 16, March 16th issue of RADIO WORLD, or on this page.

(4)—Yes, coils of this size are all right in a set having three tuned circuits.

(5)—One stage of straight transformer audio and one stage of push-pull with two 245 tubes.

* * *

PLEASE PUBLISH a layout diagram or a photograph of the four-tube D.C. screen grid Diamond showing the arrangement of the parts on the panel and on the baseboard.

CLIFFORD BURR,
Lexington, Ky.

(1)—See Fig. 742 for a photograph of the receiver.

Join RADIO WORLD' University Club

And Get Free Question and Answer Service for One or Two years.
This Service Only for Those Who Subscribe by Filling out
This Coupon and Sending Remittance.

Subscribe for RADIO WORLD for one year (52 numbers, one each week) at \$6, or two years at \$10 (104 numbers) by filling out this coupon and enclosing remittance. You will then become a member of RADIO WORLD'S University Club and receive a secret number.

Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put at the head of your letter. If already a subscriber, send \$6 or \$10 for renewal from close of present subscription and your name will be entered in Radio University. No other premium given with this offer.

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for RADIO WORLD for one year (52 nos.); or \$10.00 two years (104 nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for the period of this subscription, and send me my secret number indicating membership.

Name

Street

City and State



Fourteen Circuits

Each Shown in Colored Picture Diagram, Colored Schematic Diagram and Front Panel Layout

Get This FREE Book!

Complete AC electric receivers, with B eliminators included, also AC receivers without B eliminators, also battery operated models, all easy-to-build circuits, using your own parts.

RADIO WORLD, 145 W. 45th St., N. Y. City. (Just East of Broadway)

Gentlemen: Enclosed please find \$1.00 for which please send me Radio World each week for eight weeks (regular price, \$1.20) and besides send me a FREE copy of the 1929 edition of The Radio Blueprint Library of AC and Battery Hookups.

Name

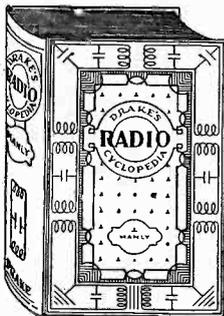
Address

City..... State.....

Note: Present mail subscribers may take advantage of this offer by putting a cross in this square. Your subscription will be extended eight weeks.

YOU MUST GET THIS BOOK!

DRAKE'S RADIO CYCLOPEDIA (New Edition)



BOOK IS 2 1/2" THICK, WEIGHS 3 1/2 LBS., 1,025 ILLUSTRATIONS.

has been developed to answer the questions of service men, custom set builders and home constructors, of experimenters, students, salesmen and operators of receiving equipment and to allow all these to have instant access to the information they want. The author, Harold P. Manly, has collected and translated into plain English the material formerly obtainable only from dozens of scattered sources.

Each rule, fact, method, plan, layout and diagram is instantly picked out and separated from everything else by placing all subjects in alphabetical order with cross references for every imaginable name under which the information might be classed. This alphabetical arrangement lets the experienced worker refer directly to the one thing in which he is interested at the moment without hunting through non-essentials. The needs of the beginner are cared for.

The important articles deal primarily with receivers and reception. They do not stop with the electrical end, but go also into the mechanics of construction. Every new thing in radio is covered in detail. 1,680 Alphabetical Headings from A-battery to Zero Beat

1,025 Illustrations, Diagrams, Layouts and Graphs 920 Pages. Each 6 by 9 inches 240 Combinations for Receiver Layout

OF THE PRINCIPAL ARTICLES

159 Concern service men, 129 help the set builder, 162 help the experimenter, 155 interest the student, 75 assist in sales work, 73 interest set owners.

GUARANTY RADIO GOODS CO., 145 W. 45th St., New York, N. Y. (Just E. of B'way)

Gentlemen: Please mail me at once the new (second) edition of "Drake's Radio Encyclopedia," by Harold P. Manly, just published, with all the latest technical information in it. I will pay the postman \$6.00 plus a few cents extra for postage. If I am not delighted, I may return the book in five days and you will promptly refund my purchase money.

Name

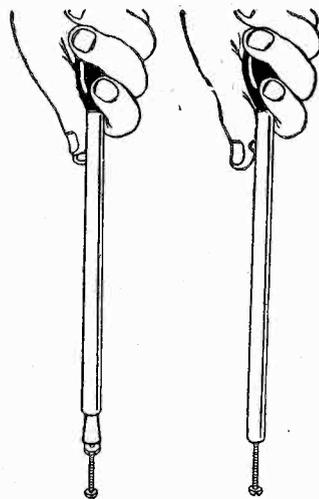
Address

City..... State.....

5-DAY MONEY-BACK GUARANTY!

SOCKET WRENCH

FREE



Push out control lever with knob (as at left) and put wrench on nut. Push down on handle only (at right), then turn nut left or right.

ONE of the handiest tools for a custom set builder, service man or home constructor is a BERNARD socket wrench.

It consists of a 6 1/2" long metal tubing in which is a plunger, controlled by a knob. The plunger has a gripping terminal (called a socket, hence the name "socket wrench") that may be expanded or contracted to fit 6/32, 8/32 and 10/32 nuts, the most popular sized nuts in radio.

Use the knob to push out the plunger, press down on the handle to grip the nut, then turn the nut to left for removal or to right for fastening down. Total length, distended, including stained wooden handle, 10". Gets nicely into tight places. Send \$1 for 8 weeks' mail subscription for RADIO WORLD and get this wrench FREE.

No other premium with this offer. Present subscriber may extend subscription by stating he is one, and entitle himself to this FREE premium, making \$1 remittance.

RADIO WORLD

145 WEST 45TH ST., N. Y. CITY

BUILD A 36-INCH CONE—LOWEST COST FOR FINEST TONE!



- NEW POWERTONE UNIT with 5-ft. cord
- Designed Front Sheet
- Plain Rear Sheet
- Radio Cement
- Mounting Bracket
- Apex Chuck
- Nut
- Tri-Foot Pedestal
- Instruction Sheet
- ALL FOR ONLY

\$6.00

24" KIT, SAME PRICE. Build the speaker. If not overjoyed at results, return the built-up speaker in five days and get ALL your money back!

GUARANTY RADIO GOODS CO. 145 WEST 45TH STREET N. Y. City Just East of Broadway

BLUEPRINT of the New, Highly Selective Screen Grid DIAMOND (Four Tubes)

\$1.00

RADIO WORLD

145 West 45th Street New York City Few Doors East of Broadway

Import Your Own Goods

German Export Magazine published in English offers numerous bargains in latest articles, novelties and new inventions. Also opportunities for obtaining profitable distributing agencies. Sample copy 60 cents postpaid (none free or on memo). Two monthly copies \$1.00. Subscription price \$3.00 per year for 12 monthly copies with special privileges. Square Deal Supply Co., R-246 Fifth Ave., N. Y.

Cash in on This Offer Now!

ONE full year's subscription for any TWO of the following magazines given to you—RADIO NEWS or SCIENCE AND INVENTION or RADIO (San Francisco) or BOYS' LIFE.

Select any TWO of these four publications, each of which will be sent to you (at only one address, however) each month for twelve months—in other words, 24 issues—if you will send in now your subscription for RADIO WORLD for two years (104 numbers) at \$10.00. RADIO WORLD'S subscription price for one year is \$6.00, so you gain the extra 2 dollars by taking advantage of the liberal offer for two-year subscriptions; and, besides, you get a subscription for each of the TWO other magazines selected from the enumerated list, making a total of 128 numbers for \$10.00.

If you want to select only one from among the four other magazines, you may obtain this one for TWO years, so that you will be subscribing for RADIO WORLD for two years and for the other magazine for TWO years, all for only \$10.00 (both mailed to one address only).

These offers are rightly regarded as among the most liberal ever made, but as they are limited as to expiration date (see notice below) you must act now. Please use the attached coupon.

SPECIAL TWO-FOR-PRICE-OF-ONE COUPON

RADIO WORLD, 145 West 45th Street, New York City (Just East of Broadway): Enclosed please find \$10.00, for which send me RADIO WORLD each week for two years (104 numbers), and also send me, without extra cost, each month for one year each of the following TWO magazines—total, 24 issues—grand total, 128 numbers:

- RADIO NEWS
- SCIENCE AND INVENTION
- RADIO (San Francisco)
- BOYS' LIFE

If you want one of each, put a cross in a square next to the name of each of the two other magazines. If you want a two-year subscription for ONE of the above magazines, with the two-year subscription for RADIO WORLD (same grand total of 128 numbers), put two crosses before the name of one magazine.

If you prefer to pay \$6.00 for only one year's subscription for RADIO WORLD (52 numbers) and get one of the other magazines for one year, without extra cost, put one cross in one square in front of the name of one magazine.

Present RADIO WORLD subscribers may renew under this offer. If renewing, put a cross here

Name.....

Street Address.....

City..... State.....

THIS OFFER EXPIRES AT NOON ON MAY 30TH, 1929

Please look at the subscription date stamped on your last wrapper, and if that date indicates that your subscription is about to expire, please send remittance to cover your renewal.

In this way you will get your copies without interruption and keep your file complete. Subscription Department, Radio World, 145 West 45th Street, New York, N. Y.

Aluminum Subpanel for the New, Highly Selective SG Diamond

Battery or AC Model (specify which)

The best appearance of the New Diamond of the Air results from using the official aluminum sub-panel, 10 x 20 inches, with the four sockets built in, and with self-bracketing front. Hardware and insulating washers supplied with each sub-panel. The aluminum sub-panel is exactly the same as the one used in the laboratory models of the battery operated and the AC Screen Grid Diamonds. Holes are drilled for mounting parts, but as this aluminum drills like bakelite you can drill any holes you want.

Front Panels

The front panels for the battery model or the AC Diamond are of Bakelite, 7x21 inches, and are drilled with all necessary holes, each in exactly the right place. High-polish finish

RADIO WORLD, 145 W. 45th St., N. Y. City.
(Just East of Broadway)

Enclosed please find \$3.00 for which please send one aluminum subpanel 10x20" for the new battery model 4-tube SG Diamond of the Air, with sockets built in, and with self-bracketing front and side and rear supports; also send hardware and insulating washers.

Enclosed please find \$2.35 for which please send 7x21" drilled Bakelite front panel for the new battery model Diamond.

Enclosed please find \$3.25 for the 10x20" aluminum subpanel, etc., for the new AC Screen Grid Diamond.

Enclosed please find \$2.35 for the 7x21" drilled Bakelite front panel for the new AC Screen Grid Diamond.

Enclosed please find \$5.00 for both the aluminum subpanel, etc., and the drilled Bakelite front panel of the battery model.

Enclosed please find \$5.25 for both the aluminum subpanel, etc., and the drilled Bakelite front panel of the AC model.

Name

Address

City..... State.....

Most Selective DIAMOND

Follow Blueprint

THIS IS THE BATTERY MODEL

Here is the circuit of circuits—the design that makes a neighboring cleared-channel, high-power broadcaster snap out of audibility at a slight turn of the dial.

No need to worry about the selectivity requirements imposed on receivers by the reallocation.

Volume "to fill the house"—even on distance. Tone quality excellent.

Get the official blueprint of the laboratory model of the new SG 4-tube Diamond, exactly as built by Herman Bernard, the designer.

RADIO WORLD
145 W. 45th St., N. Y. City
(Just E. of B'way)

Enclosed please find \$1.00 for which please send at once the official blueprint of the new, highly selective 4-tube screen grid Diamond of the Air battery model.

60 cents extra for the February 9th, 16th, 23rd and March 2nd (1929) issues of Radio World, containing Bernard's articles on the construction of this receiver.

\$3.00 for 6 months (26 numbers) subscription for Radio World. Send Diamond blueprint and four Diamond issues FREE, in addition to 26 current issues.

Name

Address

City.....State.....

Blueprint of the AC Diamond

BUILD this 4-tube receiver, using one 222 tube, two 227 and one 112A (or 171A), and enjoy tone quality, selectivity and ease of control.

The official blueprint gives the picture diagram life size, both top and bottom views; also schematic diagram and list of parts. You can use your present B eliminator externally, but the filament transformer is a part of the circuit.

Enjoy the convenience of AC operation, and still have just as selective and sensitive receiver, by building the AC Diamond. If you have 110-volt, 50 to 60 cycle AC house current, then this is the circuit for you. Fine performance. No hum.

Radio World, 145 W. 45 St., N. Y. City (Just East of Broadway)

Inclosed please find \$1.00 for which send at once official blueprint of the 4-tube AC Diamond.

30c for the March 23d and 30th Issues (1929) describing this circuit.

\$3.00 for 6 months subscription for Radio World. Send blueprint and two AC Diamond issues FREE.

NAME

ADDRESS.....

CITY..... STATE.....

Orders - Inquiries



POLK'S REFERENCE BOOK and Mailing List Catalog

Gives counts and prices on over 8,000 different lines of business. No matter what your business, in this book you will find the number of your prospective customers listed. Valuable information showing how to use the mails to secure orders and inquiries for your products or services is given.

Write for FREE Copy

R. L. POLK & CO., Detroit, Mich.
Largest City Directory Publishers in the World. Branches in Principal Cities
Mailing List Compilers—Business Statistics
Producers of Direct Mail Advertising

List of Radio Stations

RADIO WORLD dated March 23d carried a full and thoroughly up-to-date list of broadcasting stations as they stood at the time of going to press. This list contained the stations in the order of frequency and gave the owner, location, power and time sharers.

Mailed for 15c a copy; or subscribe now and start with the March 23d issue.

Radio World, 145 W. 45th St. N. Y.

HBH Unit

ALL acoustical and radio engineers agree that the balanced armature type of loudspeaker unit is the best, the most sensitive and the most faithful of all magnetic units. But it is only in the HBH unit that superior designing skill, scrupulous care in the selection of the best materials, and extreme accuracy of manufacture have been combined and co-ordinated so as to bring out all the possibilities of the principle of the balanced type unit.

Any magnetic speaker requires a strong permanent magnet for its operation. The strength of the HBH unit is assured by the use of a long magnet of large cross-section, made of specially selected, high coercive-force steel, forged under the lowest heat possible, scientifically tempered in oil and aged.

The making of a permanent magnet requires a highly specialized skill. It must be forged, cut and tempered with as few heatings as possible, and no heating must exceed a certain temperature if the magnet is to retain its strength and permanence. Another important feature of the magnet which enhances its strength and permanence is that NO HOLES ARE CUT IN IT. The magnet is one solid piece of steel and the pole pieces are clamped firmly to the steel by screws in the die cast harness holding the pole pieces and the armature.

The sensitivity and efficiency of the unit are enhanced by the use of laminated, properly tapered silicon steel pole pieces. Eddy current losses are thus reduced to a vanishing minimum and all the force is concentrated on the ends of the armature.

The armature itself is made of carefully annealed soft iron, thus eliminating any residual magnetization and reducing eddy currents and hysteresis losses to a very small percentage of the energy involved in the operation of the unit. The armature is made short and heavy to enhance its effectiveness in translating electro-magnetic energy into sound.

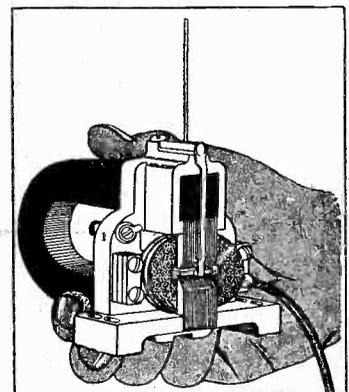
Nobody ever returned an HBH unit because of dissatisfaction with its performance! It stands up and delivers and continues to deliver. You can put 150 volts right through the magnet coils, steadily, without danger of the coil breaking. You don't need any extra power to operate this unit—as you do with dynamics—but get full efficiency at lowest cost and greatest economy.

Put this unit in your cone or cloth speaker in place of the unit now there and marvel at the difference! You will then recognize the technical superiority of this unit in terms of tone value and volume. It produces so much more volume than most other units that it makes distant stations sound like locals.

Order a unit today! Send \$4.00. Try the unit ten days. If not overjoyed, return it for full refund. Otherwise take 90 days to pay the extra \$1.95.

10-day money back guaranty!

90 days to pay in full!



The HBH Unit, representing the most skillful and sturdiest magnetic unit design. Mfgd. under BBL License.

Price \$5.95
Moulded bracket (extra) 65c

Guaranty Radio Goods Co.,
145 West 45th St.,
N. Y. City (Just East of Broadway)

Please ship one HBH Unit only on 10-day money-back guaranty; at \$4.00 down, balance of \$1.95 in 90 days, unless I return the unit in 10 days for full refund of \$4.00.

Please ship moulded bracket also at 65c.

Name

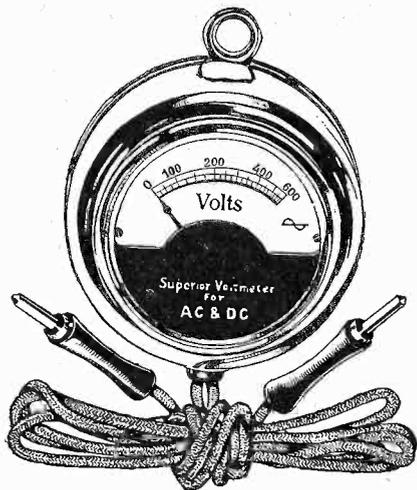
Address

City.....

State.....

O-600 V. AC and DC High Resistance Meter

Same Meter Reads Both AC and DC
Accurate to 1 per cent.



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.

GUARANTY RADIO GOODS CO.,
145 West 45th Street, N. Y. City.
(Just East of Broadway)

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.
[Put cross in proper square below.]

- \$7.00 enclosed.
- I will pay postman \$7.00 plus few cents extra for postage.

Name

Address

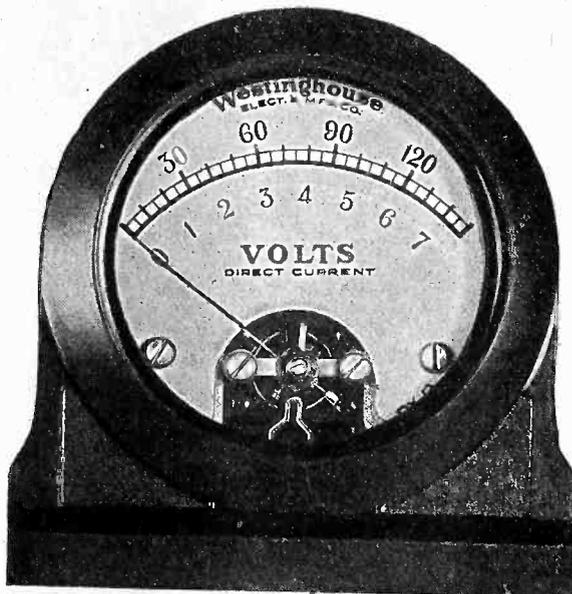
City State

DYNAMIC BAFFLE

Completely built up, for any type dynamic chassis. State what make dynamic you want it for. Cane slides, open back. De luxe finish. Size, 24x24 inches. \$12.00

GUARANTY RADIO GOODS CO.
145 West 45th Street, New York City

Westinghouse 0-7½, 0-150 VOLT-METER FREE!



This beautiful Westinghouse meter given FREE! Read generous offer!

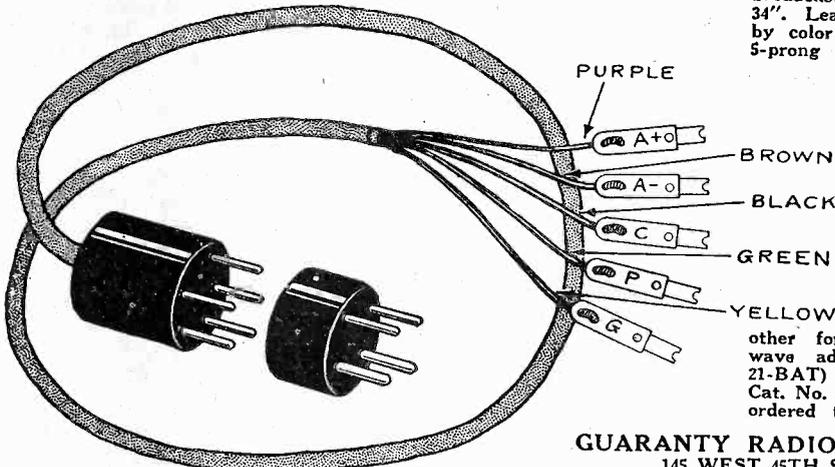
Double range direct current meter, 0-7½ volts legible to ¼ volt, and 0-150 volts, legible to 5 volts. The d'Arsonval Movement (dynamic principle) is used. Resistance is about 100 ohms per volt. A mirror strip, for observing the needle so as to hide its own reflection, facilitates closest reading, in conjunction with knife-edge. End-stops are built in. So is a zero corrector. The casing is moulded bakelite. The meter is illustrated full size. At rear are three posts—the common minus and the two positive posts. A connecting cable is furnished with each meter, lugs at one end, tip plugs at other. Send \$6 for year's subscription for Radio World (52 numbers) and get this genuine Westinghouse table model meter FREE! Present subscribers may renew under this offer by stating subscription expiration date and enclosing \$6.

Radio World, 145 W. 45th St.
New York City

PLUG AND CABLE for any SHORT WAVE ADAPTER

May also be used as a 5-Lead Battery Cable and Plug, in conjunction with a 5-prong (AC227) socket.

Handiest thing for ANY short-wave adapter. Put detector tube of your present set in socket of any short-wave adapter you build, put plug in detector socket of your broadcast receiver. Cable 34". Leads identified both by color scheme and tags 5-prong plug and 5-lead



cable for AC short wave adapter. May be used as 5-lead battery cable plug with UY socket (Cat. No. 21AC) \$1.50 4-prong extra plug only necessary addition to other for battery short-wave adapter (Cat. No. 21-BAT) \$0.50. Cat. No. 21AC and 21-BAT ordered together \$1.75.

GUARANTY RADIO GOODS CO.
145 WEST 45TH STREET
New York City Just East of Broadway

Quick Action Classified Ads

Radio World's Speedy Medium for Enterprise and Sales

10 cents a word — 10 words minimum — Cash with Order

WHY WORK for others? Employ agents yourself. Manufacture Toilet Articles, Specialties, etc., at home. 500% profit. \$1 brings complete line. Formco, Box 175, Algoma, Wis.

LATEST KNAPP A-ELIMINATOR. New \$16.00. D. L. Currens, Owensboro, Ky.

ARTISTS and Art Students are printing 250 signs or pictures an hour without machinery. Sample and particulars 10c. Straco, 1014 Mulberry, Springfield, Ohio.

SEEDS FOR SALE

ALFALFA SEEDS, hardy common varieties \$8.40, \$10.20, \$12.60, bushel; Grimm variety Alfalfa seed \$18. Scarified sweet clover \$3.90, \$5.20; Alsike or red clover \$15. Bags Free. Send for samples and catalogue. Kansas Seed Co., Salina, Kan.

EARN MONEY writing or drawing Jokes, Cartoons, Humor. Experience unnecessary. Vanbokern, Dept. 193-T, Covington, Ky.

FARM WANTED

CASH FOR YOUR PROPERTY, farm, business or residence. No matter where located. Free information. International Realty Co., Ford Bldg., Detroit.

RADIO RECEIVING TUBES, by Moyer and Wostrel, first edition just off the press. No radio service man, experimenter or student of radio should be without this authoritative book on the principles and applications of vacuum tubes. It answers all your questions relating to receiving, amplifying and rectifying tubes. Price postpaid, \$2.50 Radio World, 145 W. 45th St., New York.

ORIGINAL BALDWIN PHONES, tested and guaranteed, \$3.65, postpaid, Blan, the Radio Man, 89 Cortlandt Street, New York City.

MODEL SHIP for your RADIO. Unusually pretty 16" Santa Maria. Electric light in hollow of composition hull. Nothing to do but paint and rope. Pictured directions for roping. Kit \$7.50. Without light \$6.50. Completely finished \$15. Dr. Irl J. Neal, Mattoon, Illinois.

THORDARSON 210 power compact—Tobe condenser block; both for \$19.50. CeCo 281-210 tubes tested, both for \$9.75. C.O.D.—Rome Tire Co., 772 Pacific Ave., San Francisco, Calif.

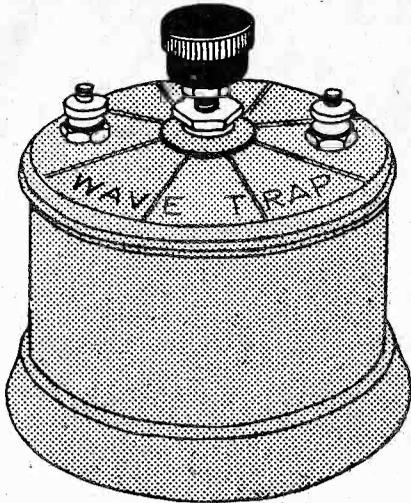
ARTISTS and Art Students are printing 250 signs or pictures an hour without machinery. Sample and particulars 10c. Straco, 1014 Mulberry, Springfield, Ohio.

PRINTING

500 GUMMED STICKERS 25c name and address printed
SUNPRINTERS
9379 Pryor—Detroit

THE CRAFTSMAN Dollar Speaker Filter is guaranteed to relieve speaker of the plate direct current, up to 250 volts. \$1.00 postpaid. Refund if not satisfactory. Attach dollar to This Ad and receive FREE Solid-molded grid-leak, 1 to 5 megohm. Craftsman Radio Products, 351 Halsey St., Newark, N. J.

Reallocation Requires Greater Selectivity



Use a Wave Trap. Spend \$1.50 to get clear reception.

How to hook up wave trap: disconnect aerial lead from set. Connect aerial to either post of the trap, other trap post to "Ant." post of set. Turn trap knob until interference disappears. Each different wave requires a different adjustment.

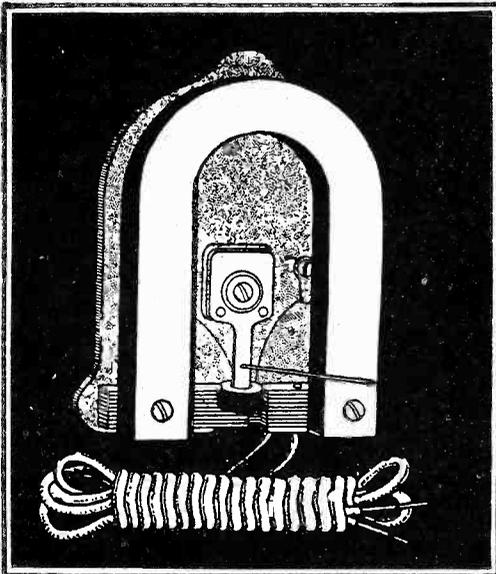
GUARANTY RADIO GOODS CO.,
145 West 45th Street, New York City
(Just East of Broadway)

New Powertone

Cone or Cloth Diaphragm Speaker

Unit

With 5-foot cord, less bracket, apex, chuck and nut. Cat. PA. **\$3.00**



New Moulded tri-foot bracket, fits Powertone. Polo, B.B.L., Brielle, Paratone and other units. Cat. BA.....65c
Apex, Thumbscrew and Chuck. Cat. AA.....10c
(Note: Cat. AA not sold alone.)

You Cannot Buy a Better Unit at Anywhere Near This Price!

The 1929 Model Powertone Unit, that drives any cone or similar type speaker, is an extremely sensitive and faithful reproducer. The magnet coil (the black ring under the pin in illustration) is wound to higher impedance than is ordinarily encountered. Volume is greater. The unit has an adjustable armature.

Guaranty Radio Goods Co.,
145 West 45th Street, N. Y. City
(Just East of Broadway)

- Please mail me at once C.O.D. (Check off)
- One Powertone Unit alone, Cat. PA. @ \$3.00.
 - One Tri-foot Bracket, Cat. BA @ 65c.
 - One Apex, one Chuck, one Thumbscrew, Cat. AA @ 10c.

Name

Address

City State

Front and Subpanel for the

AC4

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

GUARANTY RADIO GOODS CO.
143 W. 45th St., N. Y. City

For ANY Tube D.C. or A.C.

AMPERITE automatic filament control increases tube efficiency and lengthens tube life. \$1.10 with mounting (in U. S. A.)

Radiall Company
50 FRANKLIN ST., NEW YORK

FREE New "Amperite Blue Book" of latest radio information and circuit diagrams. Write Dept. RW 8

AMPERITE
REG. U.S. PAT. OFF.
The "SELF-ADJUSTING" Rheostat

Crosley \$10

TIP-TOP MUSICONE

List Price, \$37.50

YOUR PRICE



Cash in on this opportunity now! A genuine Crosley Musicone, Tip-Top Model, list price \$37.50, yours for \$10 while they last! This magnetic speaker produces excellent tone and will stand anything you've got—even two 250 tubes in push-pull! Works well out of any final audio tube, whether a power tube or not!

For only \$10 you get a Crosley Tip-Top, 9½" diameter Musicone, solid mahogany baffle, tri-foot stand, and 9½-ft. cord, all in factory-sealed carton, with instruction sheet and written guaranty!

The front is a beautiful sight, the bold grain of the sturdy mahogany catching the eye with almost hypnotic appeal. The finish is extra de luxe, a high polish rubbed in by expert hands. The gold- and black weave of the grille (at center) blends exquisitely with the master workmanship of the baffle. The edge of the baffle is scalloped.

The problem of combining a handsome piece of furniture with an excellent speaker is solved in the Crosley Tip-Top Musicone.

This speaker—including stand and baffle—stands 40" high. A thumbnut easily locks the baffle in place on the stand. Without loosening the nut you may turn the baffle to another angle. You can not tilt the baffle forward and backward. At rear is the cone proper, with its apex. This Musicone should need no adjusting, as it was carefully adjusted before it left the Crosley factory. A small opening in the rear of the cone renders access to the armature by insertion of a screwdriver. Full directions for adjustment are furnished with each speaker for those rare instances when adjustment is deemed advisable.

The 9½-ft. cord emerges gracefully at rear, from the golden fold of the turned-back flap of the grille. The shipping weight is 9 lbs.

FIVE-DAY MONEY-BACK GUARANTY ATTACHES TO EACH PURCHASE

Guaranty Radio Goods Co.
145 West 45th Street New York, N. Y.
(Just East of Broadway)

Choose Your Speaker from This Complete Array!

EXPONENTIAL TYPE HORNS

Modern acoustical science is striving to equal the performance of a large air column horn with powerful unit, while the horn enjoys its rightful popularity with trained experts. The larger the horn, the better, hence we offer two models: one with 7 1/2 ft. tone travel, the other (where space permits) with 10 ft. tone travel. The material used is patented Racon. Nozzle is standard size.

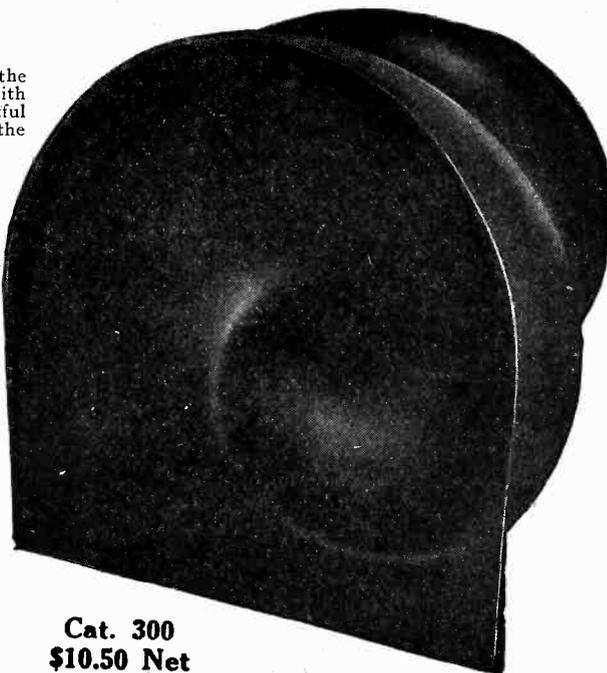


Cat. 200
\$7.50 Net

This horn has a 92-inch air column. No resonance peaks. Front, 18"x18". Depth, 13 1/2". Weight, 5 lbs.



Driving motor, the unit needed to work the air column horns. Standard size thread. Cat. 203. Price, \$3.50 net.



Cat. 300
\$10.50 Net

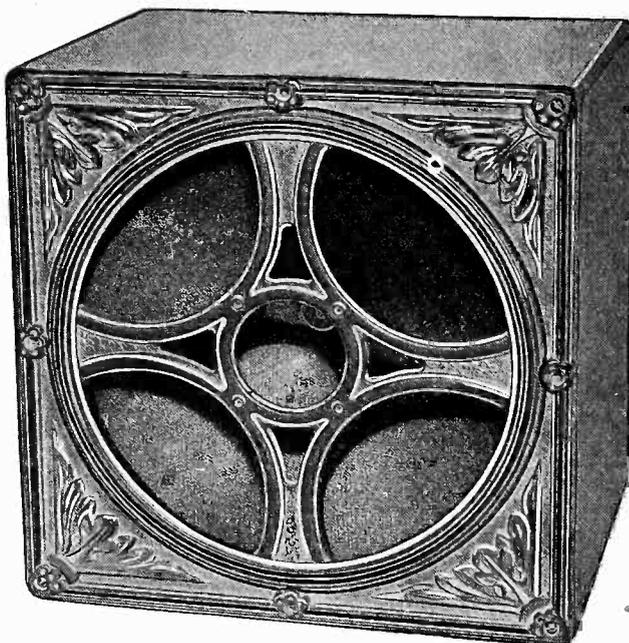
The larger horn is preferable, where space permits. Air column, 120". Front, 18"x18". Depth, 13". Weight, 7 lbs.

DYNAMIC CHASSES and Baffle

The dynamic speaker is the most popular one by far, and here is your opportunity to get a real fine chassis at a low price. Cat. 110 A.C. operates directly from the 110-volt A.C. (alternating current) lamp socket, to which built-in plug is connected, while the tipped cords go to your receiver output. Dry rectifier and output transformer built in this model.

Those whose place is wired with 110-volt D.C. (direct current) should use Cat. 110 D.C. @ \$17.50 net. Those who have no electricity should use the model that works from a 6-volt storage battery. Cat. 6 D.C. @ \$14.75 net.

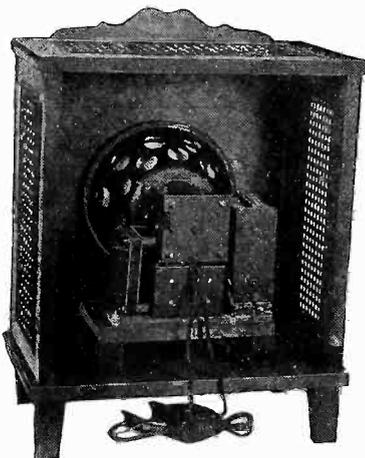
At left is illustrated an 18"x18" baffle, Cat. 111, with cane sides and top, for any dynamic speaker. Specify speaker. Walnut 5 ply veneer. Price \$11.00 net.



Cat. 113
Price, \$13.50 Net



Cat. 110 A.C.; Price, \$20.50 Net



Cat. 111; Price, \$11.00 Net

Cat. 110 A.C., shown inside, \$20.50 extra.

FILL OUT AND MAIL COUPON

ACOUSTICAL ENGINEERING ASSOCIATES,
143 West 45th Street, N. Y. City
(Just East of Broadway)

Please send me at once on 5-day money-back guarantee the following (check off):

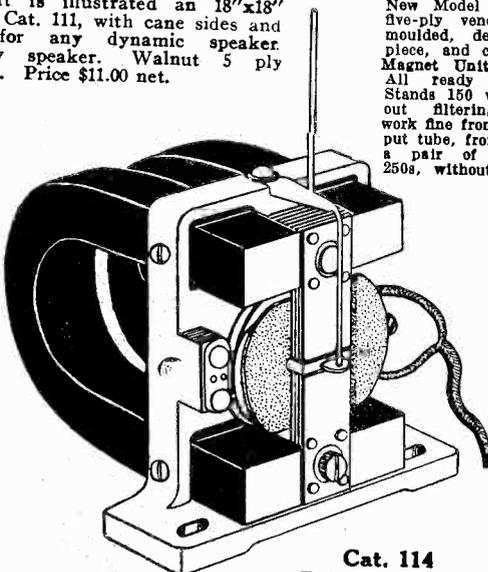
- | | |
|---|---------------------------------------|
| <input type="checkbox"/> Cat. No. 200 | <input type="checkbox"/> Cat. No. 111 |
| <input type="checkbox"/> Cat. 300 | <input type="checkbox"/> Cat. No. 113 |
| <input type="checkbox"/> Cat. No. 110 A.C. | <input type="checkbox"/> Cat. No. 114 |
| <input type="checkbox"/> Cat. No. 110 D.C. | <input type="checkbox"/> Cat. 114A |
| <input type="checkbox"/> Cat. No. 6 D.C. | <input type="checkbox"/> Cat. 115 |
| <input type="checkbox"/> Cat. No. 300 | <input type="checkbox"/> Cat. 116 |
| <input type="checkbox"/> Please send C.O.D. | <input type="checkbox"/> Cat. No. 203 |
| <input type="checkbox"/> Remittance enclosed. | Please send prepaid. |

Name

Address

City State

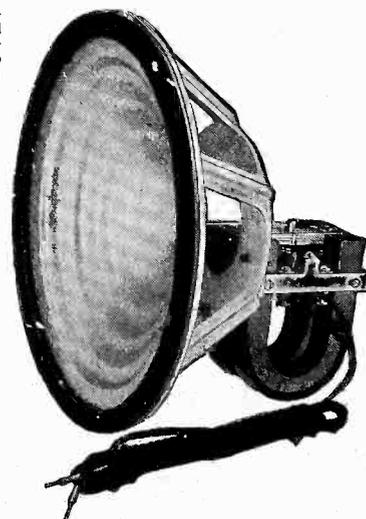
5-DAY MONEY-BACK GUARANTEE



Cat. 114
Price, \$9.25 Net

Polo Twin Magnet Unit—weight, 3 1/2 lbs., or twice as heavy as ordinary unit. Twin magnets double sensitivity. This unit gives more volume, clearer tone, and stands the gaff. Supplied with 10-ft. cord. Cat. 114. Tri-foot molded unbreakable metal mounting bracket and apex constitute Cat. 114A @ \$0.75.

New Model Polo Speaker, with five-ply veneer walnut housing, moulded, decorated metal front piece, and containing Polo Twin Magnet Unit and Textile Cone. All ready to play. Stands 150 volts without filtering. Will work fine from any output tube, from 201A to a pair of push-pull 250s, without rattling.



Cat. 115; Price, \$11.50 Net

Molded 9" spider, unbreakable metal, with Textile cone and felt ring and apex, and Polo Unit mounted on the assembly, which stands on own feet. Cat. 115.

"Look for the Green Box"



The Only Tubes with
5-Day Money-Back
Guarantee in Each Box

222 Screen Grid Tube \$3.50



AFTER having tried many screen grid tubes, many specialists have made Kelly 222 their choice. Our 222 stands up! Filament is not critical, but 3.3 volts work best. Plate voltage may be from 90 to 180, but negative bias of 1.5 volts remains the same. The screen grid voltage, G post of socket, may be 22 to 45 volts, depending on how much amplification you want. A working amplification of 60 is easily obtainable (60 mu.).

The plate current is virtually independent of plate voltage in the recommended range, 90 to 180 volts. This aids stability.

The cap at top of the tube is for familiar grid connection.

This tube is for battery or A-eliminator operation.

240 High Mu Tube \$1.25

Great for Detector or in audio channels where a resistor or impedance coil is in the plate circuit. Fil. 5 volts DC, plate 90 to 180 volts.

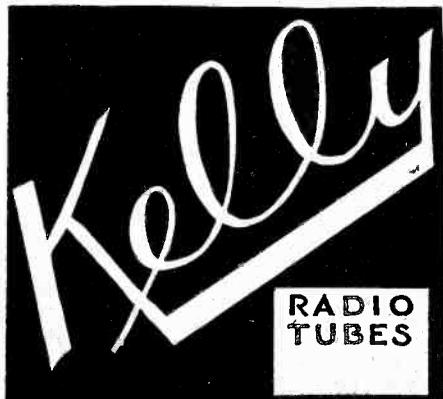
POWER TUBES

250.....\$6.00	210.....\$4.50
171A.....1.50	112A.....1.50

OTHER TYPES

280.....\$2.50	281.....\$3.50
227.....2.25	226.....1.25
201A.....1.00	199.....1.25

KELLY TUBE COMPANY
Walter J. McCord, Manager
57 DEY STREET, NEW YORK CITY
Suite 6 Tel. BARclay 8659.



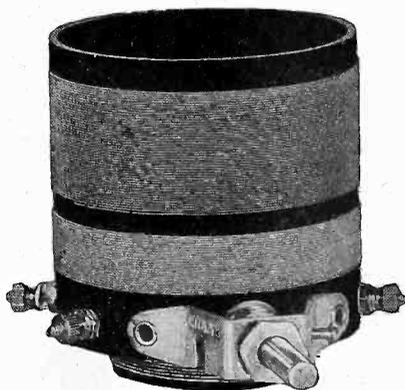
"Look for the Green Box"

**DIAMOND
Pair**



AC5 \$1.50

Highly selective antenna coil for any circuit, and interstage coil for AC circuits. Step-up ratio, 1-to-8. Tunes with .0005 mfd. Model AC3, for .00035 mfd.....\$1.75



SGT5 \$2.75

Tuner to work out of a screen grid tube. The large primary is fixed and is connected in the plate circuit of the screen grid tube. Tunes with .0005 mfd. Model SGT3, for .00035 mfd.....\$3.00

**UNIVERSAL
Pair**

TP5 \$3.00

Interstage coupler to work out of a screen grid tube, where the primary in the plate circuit is tuned, the secondary, in the next grid circuit, untuned. Tunes with .0005. Model TP3, for .00035 mfd.....\$3.25

RF5 \$1.50

Excellent selective antenna coil for any circuit, and interstage coil for any battery operated receiver, excepting output of screen grid tube. Tunes with .0005 mfd. Model RF3, for .00035 mfd.....\$1.75



A5 \$1.75

Conductively coupled antenna coil, for maximum pickup, where selectivity is not the main consideration. Continuous winding in two colors. Tunes with .0005 mfd. Model A3, for .00035 mfd.....\$2.00

Screen Grid Coil Co., 143 W. 45th St., N. Y. City

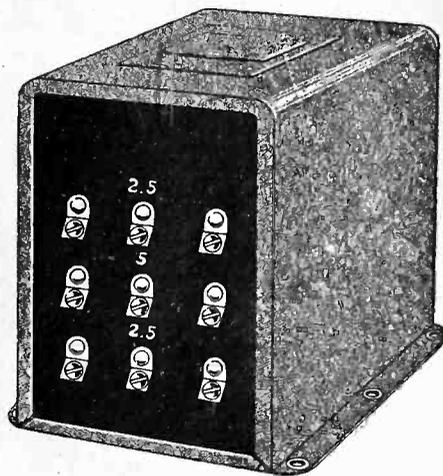
**WATCH YOUR
RADIO MANNERS!**

Don't let the radio set about its head off when your guests are trying to speak. That's the best way to lose friends. Instead, have a TABLE TYPE CLAROSTAT at your finger tips, and control loudspeaker volume to suit the occasion. Write for "Radio Etiquette" folder. Or ask your dealer about radio manners and how to acquire them.

CLAROSTAT MFG. CO., Inc.
291 North 6th Street, Brooklyn, N. Y.

CLAROSTAT

**Filament
Transformer**



The heater type tube draws 1.75 ampere at 2.5 volts. If several such tubes are used a heavy-duty filament transformer is necessary. The top 2.5-volt winding of this filament transformer easily carries NINE AMPERES, or enough current for five heater type tubes. The bottom 2.5-volt winding stands four amperes, or enough current to heat TWO MORE such tubes, a total of SEVEN TUBES! The power tube, if of the 5-volt type, may be heated from the 5-volt central winding. 5-volt power tubes in push-pull may be heated from this winding.

All three windings are tapped at the exact electrical center. This precision location, made with the aid of an impedance bridge, accounts for absence of hum otherwise caused by the last tube when heated directly with AC. The heater type tubes are indirectly heated by AC, since the filament that glows is fed by AC but communicates heat to the cathode or electron emitter.

The heater type tube is represented by the 227, excellent as radio amplifier and audio amplifier, and the exclusive type of AC detector tube. Also the new AC screen grid tubes, with the same filament voltage and current, are of the heater type.

The new power tube, 245, that at only 250 volts on the plate has the undistorted maximum power output of a 210 with 350 volts, uses 2.5 volts on the filament, at 1.5 ampere. Therefore the lower 2.5 volt winding of this filament transformer may be used for the new power tube. The 245 is not a heater type tube.

The transformer is beautifully finished in crackled glossy black, with bakelite front, and comes equipped with 5/2-inch AC cable with plug. Six riveted mounting holes for baseboard or subpanel. Size, 3 3/4 in. high, 2 3/8 in. wide, 3 in. deep. Shipping weight, 6 lbs.

Cat. F226A, for 50-to-60 cycles, 105-to-120 volts AC, Net Price\$6.00

Guaranty Radio Goods Co.
145 West 45th St.
N. Y. City

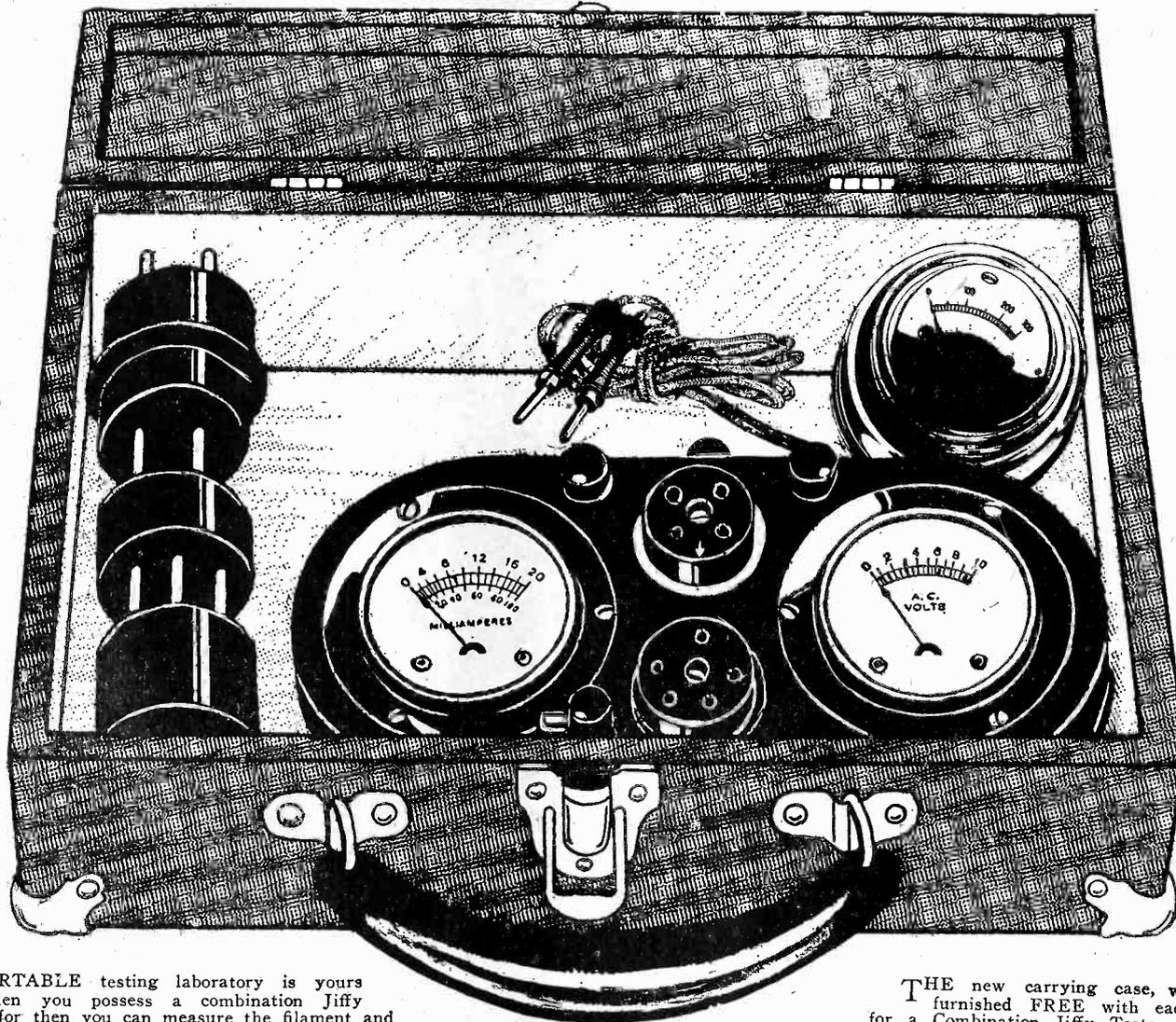
NEWS to Set Builders

Barawik offers set builders bigger bargains — bigger opportunities to make money this season. New sets, new kit ideas, all the leading parts, dynamic speakers, supplies, etc. Lowest rock-bottom prices. Bigger stocks, quicker service. Send for Big Bargain Book today — free.

BARAWIK CO., 1348 Canal St., CHICAGO, U. S. A.

New Style DeLuxe Leatherette Carrying Case FREE with each Jiffy Tester!

This combination of meters tests all standard tubes, including the new AC screen grid tubes and the new 245 tube, making thirteen tests in 4½ minutes! Instruction sheet gives these tests in detail.



A PORTABLE testing laboratory is yours when you possess a combination Jiffy Tester, for then you can measure the filament and plate voltages of all standard tubes, including AC tubes, and all standard battery-operated or AC screen grid tubes; also plate voltages up to 500 volts on a high resistance meter that is 99% accurate.

The Jiffy Tester consists of a 0-20, 0-100 milliammeter, with change-over switch and a 0-10 volt AC and DC voltmeter (same meter reads both), with two sockets, one for 5-prong, the other for 4-prong tubes; a grid bias switch and two binding posts to which are attached the cords of the high resistance voltmeter; also built-in cable with 5-prong plug and 4-prong adapter, so that connections in a receiver are transferred to the Tester automatically. Not only can you test tubes, but also opens or shorts in a receiver, continuity, bias, oscillation, etc. The instruction sheet tells all about these tests.

In addition you can test screen grid tubes by connecting a special cable, with clip to control grid (cap of tube) and other end of special cable to the clip in the set that went to the cap before the tube was transferred to the tester.

THE new carrying case, which is furnished FREE with each order for a Combination Jiffy Tester, contains the entire outfit, including the three meters, cable and plug, and three adapters (one for 4-prong tubes, two for 199 tubes). This case is 10½x7¾x3¼" and has nickel corner pieces and protective snap-lock. The case is made of strong wood, with black leatherette overlay.

To operate, remove a tube from the receiver, place the cable plug in the vacant receiver socket, put the tube in the proper socket of the Tester, connect the high resistance meter to the two binding posts, and you're all set to make the thirteen vital tests in 4½ minutes!

The Combination Jiffy Tester is just the thing for service men, custom set builders, experimenters, students, teachers and factories. Order "Jiffy 500." The price is only \$14.50.

If a 0-600 AC and DC high resistance meter (99% accurate) is desired, so house electricity line voltage and power transformer voltages can be measured, as well as plate voltage, instead of the 0-500 DC voltmeter, order "Jiffy 600" at \$15.50.

GUARANTY RADIO GOODS CO., 145 W. 45 St., N. Y. City. (Just East of Broadway).

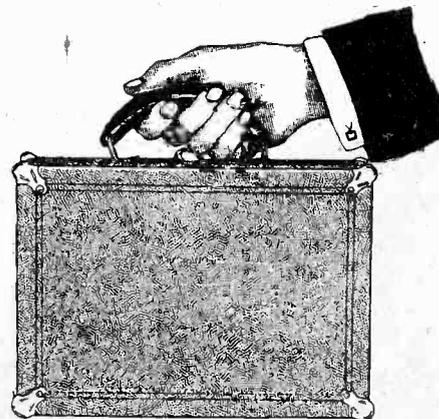
- Please ship at once on 5-day money-back guaranty one "Jiffy 500," at \$14.50, consisting of:
- (1) One Two-in-One 0 to 10 voltmeter for AC and DC. Same meter reads both. Scale especially legible at 1½ to 7½ volts. This meter reads the AC and DC filament voltages.
- (2) One DOUBLE reading DC milliammeter, 0 to 20 and 0 to 100 milliamperes, with change-over switch. This reads plate current.
- (3) One 0-500 volts high resistance voltmeter, 99% accurate; with tipped 30" cord to measure B voltages.
- (4) One 5-prong plug with 30" cord for AC detector tubes, etc., and one 4-prong adapter for other tubes.
- (5) One grid switch to change bias.
- (6) One 5-prong socket.
- (7) One 4-prong socket.
- (8) Two binding posts.
- (9) One handsome moire metal case.
- (10) One instruction sheet.
- (11) One de luxe carrying case.
- (12) One screen grid special cable.
- If 0-300 DC high resistance 99% accurate voltmeter is preferred to 0-500, put check here: Price is same, \$14.50.
- Same as above, except substitute a 0-600-volt AC and DC high resistance 99% accurate voltmeter (same meter reads both) for the 0-500 DC meter. Price \$15.50.

NAME

ADDRESS

CITY STATE

FIVE-DAY MONEY-BACK GUARANTY



The new de luxe leatherette carrying case is compact and handy. Size 10½" long, 7¾" wide, 3¼" deep.