

# RADIO Engineering

The Technical Magazine of the Radio  
Trade ~ Edited by M. B. SLEEPER



DECEMBER 1925

20c

VOL. V NO. 12

**EVEREADY HOUR  
EVERY TUESDAY AT 9 P. M.**

*Eveready Standard Time*

For real radio enjoyment, tune in the "Eveready Group," broadcast through stations—

<b>WEAF</b> New York	<b>WCAC</b> Pittsburgh
<b>WAB</b> Providence	<b>WSA</b> Cincinnati
<b>WEEI</b> Boston	<b>WWJ</b> Detroit
<b>WTAR</b> Worcester	<b>WDCB</b> Minneapolis
<b>WAB</b> Buffalo	<b>WDC</b> St. Paul
<b>BSB</b> St. Louis	<b>WDC</b> Des Moines

## For radio economy

EVEREADY Radio Batteries are noted for their long service and economical operation. They are made in different sizes and types so that every radio user can enjoy the economy and convenience to be had by fitting exactly the right Eveready to his receiver. Five of the dry-cell types of Eveready Radio Batteries are here illustrated and described to make it easy for you to decide just which will give the longest and most economical service on your set. A dealer near you sells Evereadys.

*Manufactured and guaranteed by*  
**NATIONAL CARBON CO., INC.**  
New York San Francisco

*Canadian National Carbon Co., Limited*  
Toronto, Ontario

# EVEREADY Radio Batteries

*-they last longer*

No. 364  
Portable  
27½-volt  
Vertical  
Price  
\$1.75



Eveready Columbia Ignitor "A" Battery, the proven dry cell for all radio dry-cell tubes 12½ volts

No. 770  
22½-volt  
Large  
Vertical  
Price  
\$1.00



No. 771  
8½-volt  
"C"  
Battery  
Price  
40 cents

No. 886  
45-volt  
Layzell  
Extra-Large  
Vertical  
Price  
\$5.50





No matter what set you buy, be sure the dealer puts in genuine Radiotrons:

1V-100	\$2.50
1X-100	\$2.50
1X-120	\$2.50
1V-201-A	\$2.50
1X-201-A	\$2.50
1V-200	\$2.50
1X-200	\$2.50
WD-11	\$2.50
WD-12	\$2.50
WX-12	\$2.50
1X-112	\$6.50
1X-210	\$9.00

**Rectrons:**

1X-213	\$7.00
1X-216-B	\$7.50

A "1X" or "WX" tube is the same as the corresponding "1V" or "WD" tube, except in the design of the base.

# For every Christmas Radio Set use only genuine RCA Radiotrons

**R**EAD all the claims of all the makers of radio sets—and then remember this when you buy—that getting what is claimed for a set depends upon the quality of the *vacuum tube* put into it. You cannot get clearness—you cannot get distance—you cannot get volume—unless the *tubes* get it. That is why it is so important to look at the base of every tube, to be sure it is a *genuine RCA Radiotron*.

**A great gift  
for any fan.— at \$2.50**

A radio fan will appreciate a "spare" Radiotron, just as an autoist appreciates a spare tire. But the Radiotron—a genuine RCA Radiotron—costs only \$2.50. If you note what make of set a man owns, any dealer can tell you which *type* of Radiotron he uses, and you can give him exactly what he would choose for himself.

**for owners of Super-Heterodynes  
— the new power tube**

Every owner of a Radiola Super-Heterodyne can bring his set right up-to-date with the latest improvement, if you give him the new dry battery power Radiotron UX-120, and the adapter. The adapter costs but \$1.50. And this new tube means great volume with better tone than ever!

RADIO CORPORATION OF AMERICA  
CHICAGO NEW YORK SAN FRANCISCO



Radiotron  
1V-201-A,  
standard high-vac-  
uum tube for most  
dry battery sets.

# RCA-Radiotron

MADE BY THE MAKERS OF RADIOLAS

# RADIO ENGINEERING

*Edited by* M. B. SLEEPER

Fifth Year

Vol. V, No. 12

## Contents—December, 1925

	Page
Radio for Entertainment . . . . .	633
The New Type Browning-Drake . . . . .	634
Raytheon-Dongan Eliminator . . . . .	636
By R. L. Osborne	
Selling Loud Speakers . . . . .	638
By A. W. Harris	
Radio Service Record . . . . .	640
Editorial . . . . .	641
Working Data on the Unipower . . . . .	642
Selenium and Photo Electric Cells, Chapter IV . . . . .	644
By Samuel Weir	
Wavelength, Inductance, and Capacity Tables . . . . .	645
Construction of the New Yorker . . . . .	650
For the Dealers and Jobbers . . . . .	653
Data Tables on Variable Condenser . . . . .	658
Advertisers' Index . . . . .	686

---

Radio Engineering, December, 1925, Vol. No. 5, No. 12. Published monthly by M. B. Sleeper, Inc. Publication office, Lyon Block, Albany, New York. Editorial and General offices, 52 Vanderbilt Ave., New York, N. Y. Printed in U. S. A. Yearly subscription \$2.00 in U. S. and Canada; ten shillings in foreign countries. Entered as second class matter at the postoffice at Albany, New York, January 9, 1925, under the act of March 3, 1879.

---

# AMERTRAN

THE ORIGINAL

## DE LUXE



AMERTRAN

Types AF-7 and AF-8

AmerTran audio transformers Types AF-7 and AF-8 have been considered for years among the leaders in audio amplification. Their gain, efficiency, and reliability have been demonstrated in a considerable variety of uses.

Type AF-7 \$1.25—AF-8 \$1.50—both \$1.00 each



The

### AMERTRAN Power Transformer

Types PF-40, 50, F-40 coils 110 volt

Type PF-40 is intended for use on the standard 110 volt, 60 cycle house lighting circuit. It has three separate well-insulated secondary windings. These are enclosed in a strong metal case provided with mounting holes. The secondary leads are shielded with flexible wire, but long enough to reach the terminals on the outside of the metal casing. This transformer is well suited for supplying B.C. power for tube sockets, and is designed with the usual margin of safety.

\$11.00 each



### The New AMERCHOICE

Type 999

Type 999 is a specially designed impedance or choke coil of general utility, designed primarily for use in filter circuits. At its output impedance for bypassing direct current from the load inductance to a load as efficient and more economical than an output transformer. When used with a 100A. low impedance tube, it provides an over quality audio, due to the low output impedance. DC impedance is guaranteed by two adjustable leads, built in the case. \$10.00 each

## A New Standard of Excellence in Audio Amplification

**T**HIS new audio transformer has been developed for those who are satisfied only with the utmost in quality. It possesses an unusually straight line frequency characteristic extending the range below the lowest note now being broadcast, and actually shows a gain of about three octaves below that previously obtained.



The AmerTran De Luxe is a transformer of moderate size and weight, enclosed in a strong metal case with mounting holes at both top and bottom so that it may be inverted, affording simplified connections. While the AmerTran De Luxe will improve any set, appreciation of its uniform amplifying qualities can best be realized when operated in conjunction with straight line frequency loudspeakers, such as the best cone and disc types, and with a tube in the last stage capable of handling the output.

The AmerTran De Luxe is made in two types, one for the first stage and one for the second stage, and plainly marked as such. The chief difference between these two types is that the first stage transformer has approximately 50% greater primary inductance than the second stage transformer, thus more nearly corresponding to the operating impedances of the tubes out of which they work. For this reason it is advisable to purchase and operate these transformers by the pair!

PRICE, EITHER TYPE, \$10.00

Write for descriptive booklet on AMERTRAN Audio Products

### American Transformer Company

178 Emmet Street, Newark, N. J.

"Transformer builders for over twenty-four years"

**SOLD ONLY AT  
AUTHORIZED AMERTRAN DEALERS**



## MICARTA Enhances Beauty

A RADIO set is a conspicuous piece of furniture. It must present a pleasing appearance to be acceptable in homes of refinement. Make the enclosing case of your radio set harmonize with the attractive appointments of a well-furnished home.

The satin-like lustre of the Micarta Radio Panel enhances the beauty of the design and of the cabinet handi-craft. Micarta panels may be had in mahogany, walnut or ebony. This variety of finish permits individuality of style and close color harmony.

Some of the largest and most successful manufacturers of wireless equipment use Micarta Radio Panels as a finishing touch of beauty. They are aware that appearance is an important factor in the sale of a product placed in the home.

Westinghouse Electric & Manufacturing Co.  
East Pittsburgh, Pennsylvania  
Sales Offices in All Principal Cities of  
the United States and Foreign Countries

### *Tune in*

On one of the Westinghouse Broadcasting Stations tonight:

- KDKA**—East Pittsburgh, Pa.
- WBZ**—Chicago, Ill.
- KYW**—Springfield, Mass.
- KFKX**—Hastings, Neb.

# Westinghouse

2681741



## Howard Fixed Condensers

Of the many exceptional features embodied in Howard Fixed Condensers, the most unique is the method of assembly. A cap nut is used for this purpose instead of a rivet as is the usual custom. This is especially advantageous as it provides for accurate adjustment insuring the "fixed" rated capacity to be just as represented.

Only the best India Ruby Mica is used to separate the copper and brass conductors. Howard Fixed Condensers are all hand made, each tested on a capacity bridge and guaranteed to be noiseless and accurate. They are furnished in capacities of .00025, .0005, .001 and .002 M. F.

Get them at your dealers or write us.

*Capacities Guaranteed As Stated*



## Put Them on Your Sales Force

**J**IM McILHENNY, star salesman for Elliott-Lewis R.C.A. distributors in Philadelphia, called on Kleffman in Altoona, Pa., his mind all made up to take a real order for super-heterodynes. The minute he broached the subject, Kleffman called to the back of the store, "George, do we want any of these R.C.A. super-hets?" "No," came the answer. "We're doing well enough with neutrodynes and tuned R. F." George is Kleffman's technical man. Probably Jim McIlhenny just put him down as a wise guy. Salesmen aren't expected to say much more for the technical men in dealers' and jobbers' organizations when they spoil sales that way.

The truth of the matter is that they are pretty wise. They are held responsible for passing on the technical merits of new products, and of selling them and keeping them sold. It's only natural for them to play safe and say, "No."

But these men, if you have sold them, from their point of view, are the best assistants your salesmen can have. They will work for you if you sell them on the "technical safety factor" of your products and your organization.

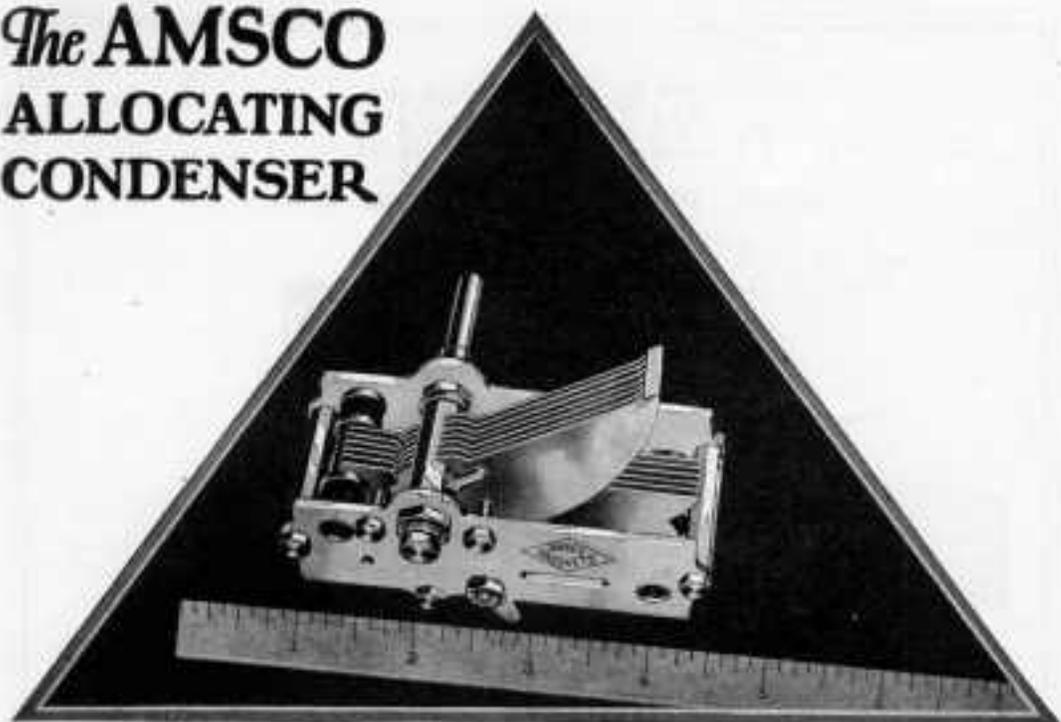
**Radio Engineering**, as a part of its 25,000 circulation, has over 9,000 paid subscribers who are employed as technical men in dealer, jobber, and manufacturing organizations. **Radio Engineering** is the only magazine in which you can talk to them directly and personally.

***Radio Engineering readers absolutely control the buying power of the Radio Industry***

*This is the fifth of a series of six advertisements published to show readers and distributors, the exact status of Radio Engineering as a publication—its circulation, range of influence, editorial policy, class of readers, position as an advertising medium, and why it has been accepted as the leading technical magazine of the Radio Industry.*

**5**

# The AMSCO ALLOCATING CONDENSER



## IT SAVES SPACE!

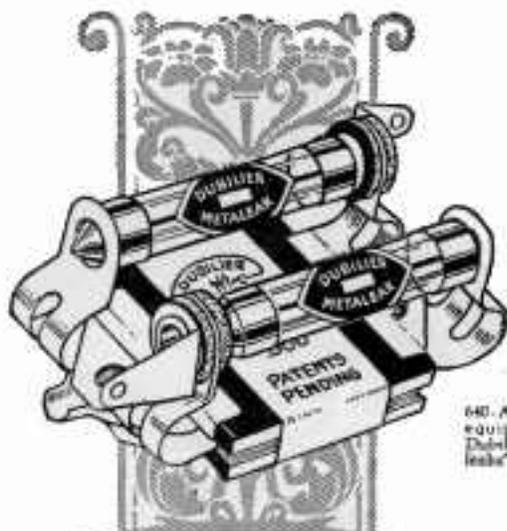
This straight line frequency condenser is a space-saver in the radio cabinet . . . . It can usually be substituted for the old type condensers in existing sets . . . . Once installed, it revolutionizes your ideas about tuning . . . . Those AmSCO half-a-heart-shaped plates add Kilocycles at the rate of ten to each dial division — giving "a station for every degree" . . . . All wavelengths—high or low on the scale—tune in with equal ease . . . . AmSCO allocation of the stations is uniform and correct to within a fraction of 1% . . . . Insist on AmSCO Allocating Condensers . . . . Made in six space-saving models, three Single and three Siamese, at reasonable prices

AmSCO Products, Inc., Dept. B  
Broome & Lafayette Sts., N. Y.



### OTHER AMSCO PARTS

Write for our booklet, "The Heart of the Hook-up" for full details and prices of the entire AmSCO line. AmSCO for Excellence.



640-A Micadon  
equipped with  
Dubilier "Meta-  
leaks".

### *The New Resistance Coupled Amplification Unit*

Dubilier has now perfected a new resistance coupled amplification unit.

It consists of the well-known 640 Micadon arranged with special clips for holding the new Dubilier metalized filament resistance units.

Together they form a device which is compact, easy to install, low in price—and thoroughly efficient.

Send 10c for 32-page booklet A-1, "Applications of Dubilier Condensers in Radio Circuits".

Address 4377 Bronx Blvd., New York

**Dubilier**  
CONDENSER AND RADIO CORPORATION



A. Atwater Kent, who is providing a new type of radio entertainment to about 75 per cent of our population

## An Opportunity to Sell Entertainment

The Atwater Kent concerts, broadcast each Sunday night from WEAF and its associated stations have given dealers a chance to sell radio on a real entertainment basis

MR. A. ATWATER KENT, in arranging for a full season of weekly concerts by world-famous artists who have never before entertained the radio audiences has made a tremendously important contribution to the permanent future of radio.

When the whole radio industry, and particularly the radio dealers, realize that this business can be made as permanent an institution as music itself, they will understand that there is no reason to fear a loss of public interest in communities within the range of the stations tied in with WEAF, from which the Atwater Kent programs are being transmitted.

As a result of the research and devel-

opment work done by the A. T. & T. Company, these stations transmit music more perfectly than it can be received on almost any set. It is now possible to hear the best artists in the country at no more expense than the cost of a radio set, the transmission is brought to the public with perfect quality, so that the dealer has only the problem of selecting receiving sets which will approach the perfection of the broadcasting equipment. Dealers who are guided in their judgment by the entertainment value of radio sets rather than by an extra five per cent in discounts can sell Anna Case, or Reinold Werrenrath to their customers instead of just plain radio outfits.

It is a very fortunate thing for the

public that Mr. Kent decided to broadcast through the A. T. & T. chain of stations, making the programs available to practically the entire country, rather than to operate a single broadcasting station to cover a comparatively small territory, as so many concerns have done.

Many dealers have capitalized the tremendous improvement in the quality of radio entertainment by selling sets this year to people who previously maintained that there was not enough broadcasting worth listening to to justify the purchase of a radio set, while to others; they have sold new outfits, capable of reproduction

in keeping with the quality of the programs, to replace old sets which did not do justice to the performers.

In addition, the movement to do away with regenerative sets of a type which radiate strongly enough to cause local interference has gained much strength.

The greatest stress put upon entertainment value, which calls for less complicated tuning as well as more accurate reproduction, probably accounts for the universal demand for straight line frequency condensers in order that the controls can be manipulated with greater facility.

## The New Browning-Drake Units

In addition to improving the Browning-Drake tuning units, the National Company has added to its line a set of chokes for impedance amplification

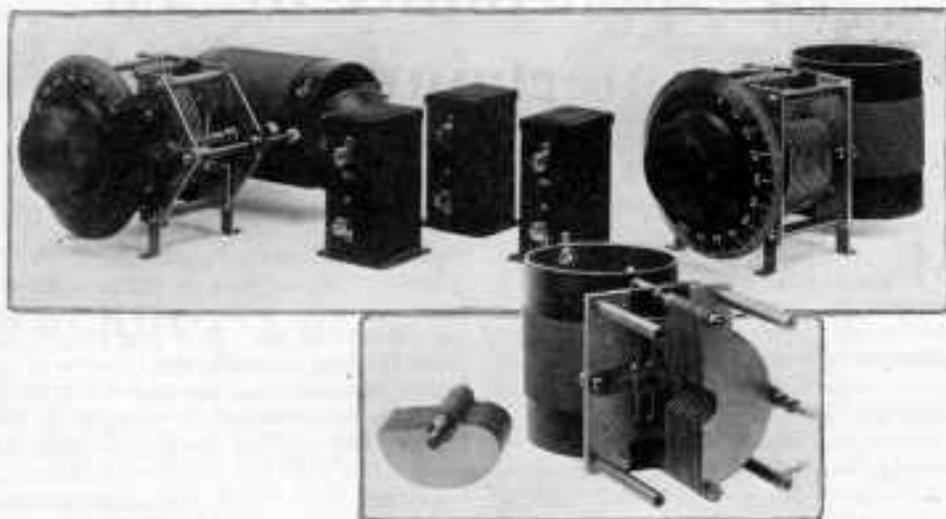


Fig. 1. Detail views of the new Browning-Drake units and the impedance coils.

THE National Company has done an unusual job, as a parts manufacturer, in the development of the Browning-Drake tuning units and in the sale of these items. Straight through the summer the demand for Browning-Drake coils held up and has increased greatly

this fall. Many of them have been used for the familiar Browning-Drake circuit, altho experimenters have devised many special hookups in which one or both of the tuning units are used.

This fall, the design of the condensers has been changed to give straight line

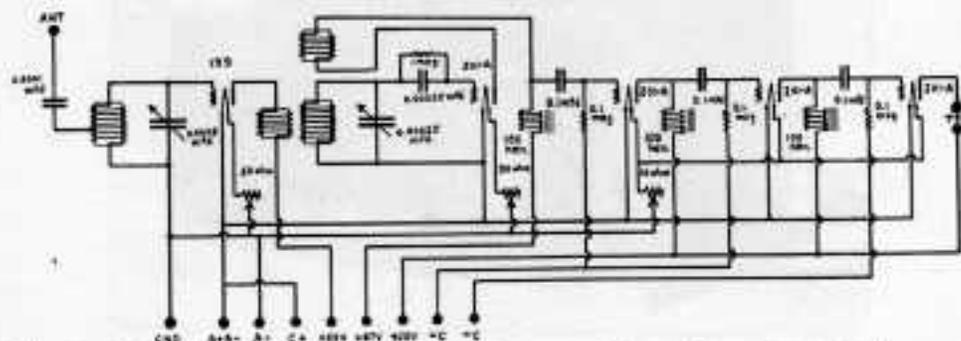


Fig. 2. Schematic diagram, showing the impedance coupled amplifier. Note that the amplifier voltage should be 90 and not 20, as the drawing was marked.

wavelength tuning. The design employed can be seen in the lower part of Fig. 1. The mechanical construction of the condenser has not been altered, nor the dimensions, but the rotary plates have been cut away to give greater separation at the lower end of the scale.

The new choke coils will interest set builders and designers who are working with impedance coupled amplifiers. The chokes, illustrated in the November issue of *Radio Engineering*, are enclosed in very attractive cases, finished in crystallizing lacquer. The front of the case, however, where the binding posts are mounted, is of hard rubber. These chokes have been carefully designed to provide a maximum inductance with the lowest resistance. For this reason, first-grade transformer iron is employed for the core, and an air-gap is provided. In the final assembly, the air-gap is adjusted to give the exact value of inductance required.

Fig. 2 shows the circuit for the standard Browning-Drake hookup with impedance coupled amplification. Stopping condensers of 0.1 mfd. are specified, altho some set builders prefer to increase this value, up to 1.0 mfd.

All three gridleaks are of 0.1 megohm. These values are recommended because of the fact that a grid bias is to be on each amplifier tube. In Fig. 2 you will see that there are two binding posts marked —C. The left hand binding post takes a lower value of grid bias for the first two tubes, with a larger voltage on the grid of the third tube.

201-A amplifier tubes are indicated in the diagram, but a UX-112 tube can be

used in the last stage, by making arrangement for the higher filament current on the UX-112.

Another excellent combination is the use of two Mu-20 and a Mu-6 Daven tubes. These High-Mu tubes are just as good in impedance coupled amplifiers as they are in the resistance type.

Three plate-voltage binding posts are indicated in Fig. 2. The left hand binding post, marked 22 volts, is for the R. F. amplifier. Some experimenters prefer to use a higher voltage, altho this is largely a matter of the individual characteristics of the UX-199. With the lower voltage, it is not as liable to oscillate. 67 volts are used on the detector. If the voltage is cut down to 22 it will probably be necessary to put a fixed condenser of 0.00025 around the choke in the detector plate circuit. This fixed condenser should not be used unless it is necessary, and the value should be kept at minimum. Otherwise, the condenser will have the effect of by-passing the higher frequencies. This point must be watched carefully, because any distortion introduced here will be amplified in the succeeding stages. The third post should have 90 to 135 volts. It is marked +20V in error.

Some very interesting experiments have been made with this particular circuit to increase the efficiency of the detector. It works much better with a D-21 Sodian, and there is no tendency to oscillate. In fact, the plate coil has very little effect on the volume. However, the Sodian is so much more sensitive than a 201-A that it more than makes up for the lack of regeneration.

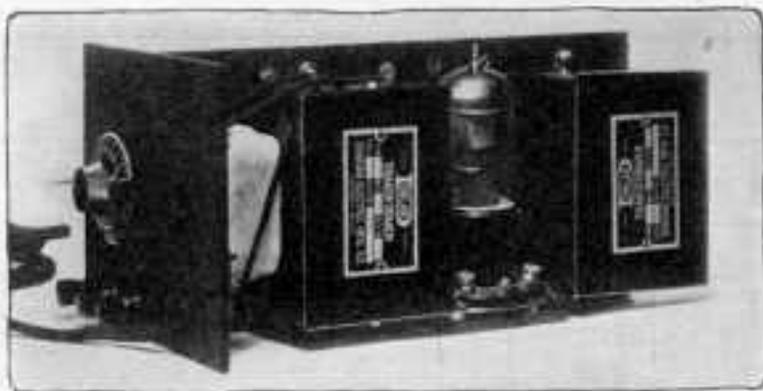


Fig. 1. This design, made up on two Celoron panels, is both compact and convenient.

## Raytheon-Dongan Eliminator

Describing a design which radio dealers can follow out in merchandising Dongan transformers and chokes and the Raytheon tube—By *R. L. Osborne\**

**E**ACH season has brought new demands for special devices. This fall, the B battery eliminator is specially favored, and radio dealers have had their technical men at work to get up designs which their customers can follow, having purchased the parts.

Of the variety of types that have been built, there are a number of features which will recommend the combination shown in the accompanying photographs. It has been made up with the Dongan type 509 transformer and two type 514 chokes. In addition, there are two fixed condensers of 0.1 mfd., one of 0.5 mfd., two of 2.0 mfd., and two of 4.0 mfd. All the condensers were obtained from the Potter Manufacturing Company, of Chicago. The circuit employed is that recommended by the Raytheon Manufacturing Company, manufacturers of the Raytheon tube.

In the matter of convenience, this design is particularly good, for the parts could not be compressed into a smaller amount of space. Some cabinets will accommodate the complete eliminator in the compartment made for batteries, while there is ample space in any of the console cabinets. The tube is quite well protected from injury. The wiring has been carefully laid out so as to prevent

the slightest possibility of short circuits. The little panel at the front, measuring 6 ins. in width and 5 ins. high carries a Royalty variable resistance of 1,500 to 100,000 ohms, a very neat toggle switch for switching from high to low power, and three Eby binding posts marked GND., B DET+ and B AMP+. All the other parts are fastened to the rear panel which is 10 ins. long by 5 ins. high. It is fastened to the front panel by four angle brackets, two on each side at the top, and two on each side at the bottom. In the picture showing the under side, you will see a 10,000-ohm Electrad resistance, and the small bakelite plate,  $2\frac{3}{8}$  ins. wide by  $2\frac{1}{2}$  ins. long, which supports the Naal standard base socket. This panel is also fastened in place with a pair of angle brackets.

This rectifier unit, with a Raytheon tube, operates 10 or 12 201-A type tubes at full capacity, and without any hum. The latter is important, for some eliminators do not hum on a light load, but make a most objectionable noise the minute a heavy load is put on. The rectifier tube is an outgrowth of the old S tube. It operates on the same gas conduction principles. There is no filament to burn out or to become exhausted by constant use. The tubes should last for several years.

\* Chief Engineer, Dongan Electric Mfg. Co.

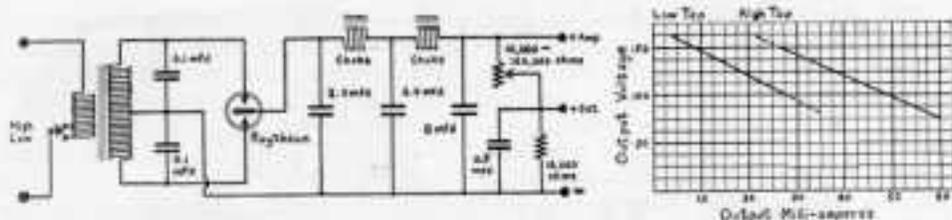


Fig. 4.—Wiring diagram of the Raytheon-Dongan eliminator, and a curve showing the voltage against current drain. The upper curve was taken with the switch on the tap of the transformer primary wind, giving a higher secondary voltage, and the lower curve with the full primary, at which adjustment the secondary voltage was reduced.

Moreover, the tube provides full-wave rectification, for both halves of the alternating current cycle are used. This makes the unit more economical in current consumption than the half-wave type, and makes less work for the filter circuits to do. The voltage characteristic is unusually constant. This is indicated in Fig. 4.

You will note that there are two curves. The upper one is the curve for the unit when the transformer primary tap is connected by the toggle switch. Throwing the switch to the other side connects the full primary winding, reducing the secondary voltage by reducing the primary-secondary turn ratio.

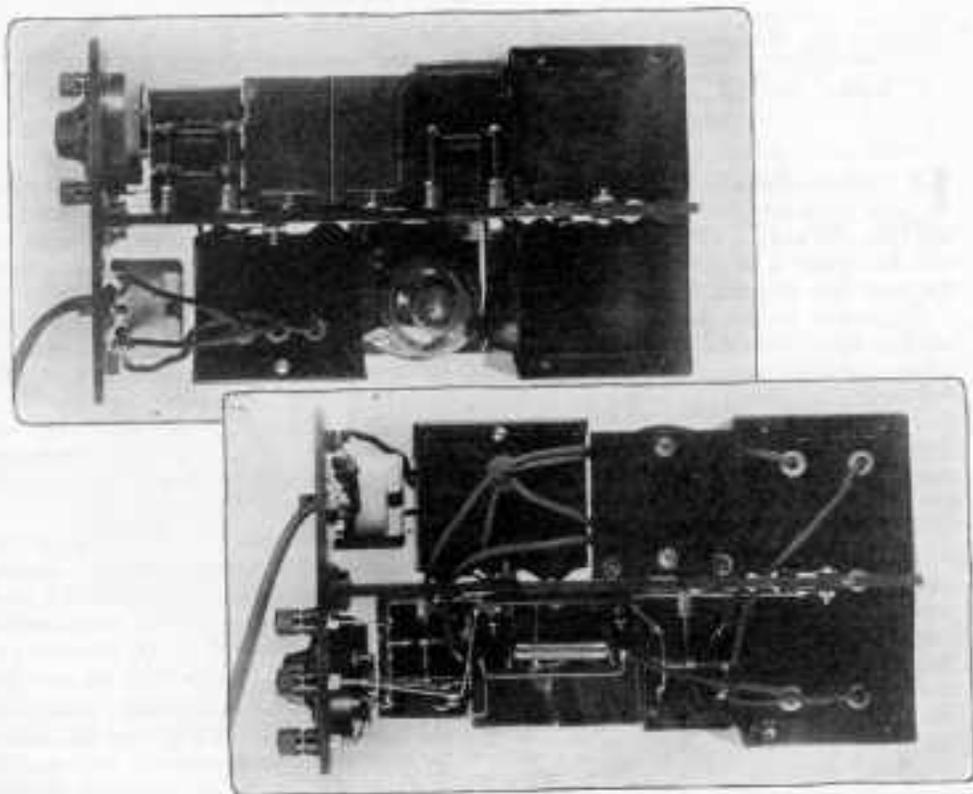


Fig. 2. Above, looking down on the top of the unit. Fig. 3. Below, the under side of the eliminator, showing the resistance mounting and the connections.

The filter circuit in Fig. 4 was designed by Prof. F. S. Dellenbaugh, Jr., of Massachusetts Institute of Technology. He is one of the foremost authorities on filter design in this country. So carefully has the filter circuit been worked out that, under all ordinary loads, it is impossible to hear the slightest hum either with headphones or the loud speaker.

In operating a device of this kind, it should be borne in mind that more care in handling the equipment and wiring it is called for than when a 6-volt battery circuit is used. There is nothing danger-

ous about the unit provided ordinary care is observed. One special fact should be borne in mind. When the unit is turned off, the lamp socket switch should be turned off first, and then the tubes. Try the set with first the tap and then the full primary coil, so that you can get the correct voltage. Also, adjust the variable resistance, as this controls the voltage. The fixed resistance of 10,000 ohms, from the detector post to B—, is designed to give 22 volts. The curve shows the approximate voltage from the amplifier post to B—.

## How an Engineer Would Sell Loud Speakers

Salesmen shouldn't be engineers, but successful salesmen do make use of their knowledge of engineering principles — By *A. W. Harris\**

**I**T must be conceded by everyone who is in close touch with radio engineering that the era of Better Radio Reception has made a marked advance during the past few months.

Engineers in the laboratories of the leading radio manufacturers, of this and other countries, have concentrated on the refinement of detail, in order to reduce that bug-bear of good reception—distortion. In the Engineers' Clubs and meetings, the layman listening in to the general conversation would often hear such expressions as peak frequencies, width of frequency band, etc., and he would soon discover that everyone was seeking to get a flat curve with a wide frequency range. The net result of all this patient investigation and improvement in design has been to nearly double the musical range of the better receiving sets.

Music consists of vibration mathematically arranged to produce harmony.

Middle C on the piano is 250 vibrations per second and its octaves are multiples thereof. To reproduce music from the highest notes down to the deep bass tones in all its beauty, and speech with its over-tones, requires vibration, varying from about 80 to 6000 per seconds, to be accurately reproduced, first by the receiving set and then by the loud speaker. Many of the receiving sets offered by the leading set manufacturers this year are able to accomplish this with a large degree of success.

Now comes the problem of the Loud Speaker and acoustic engineer. During the past few months he has had the same bee in his bonnet. He has been searching for and dreaming of the flat curve as high above zero and as wide as possible.

There are two components that make the loud speaker, the unit and the acoustic section. It is possible to have a good unit ruined by a bad acoustic section, or a good acoustic section spoiled by a poor unit. There are many types of

\* Chief Engineer, Amplion Corp. of America.

loud speaker units on the market today. There are poor units which are nothing more than slightly enlarged telephones to which are attached horns of indifferent design. These speakers will often only reproduce about two octaves in the musical scale. There are Units which give good tone quality and volume, and include a wide frequency range, but are so fragile in their construction, having several delicate moving parts, that they soon lose their tone and volume. Then there are the really good "Units built to last." These Units are sturdy in construction and as carefully designed as a Rolls-Royce car. They are an engineering job, embodying strong permanent magnets of the highest grade magnet steel, coils scientifically constructed and tested, laminated pole pieces and diaphragms made of a special alloy and mounted so as to cover the widest range of vibrations possible.

There are horns or acoustic sections which will not pass more than three octaves on the musical scale. They are so badly designed and the impedance is so great, that base notes below 300 vibrations per second are lost and hence a good unit is spoiled.

A good acoustic horn is a transmission system capable of passing into the atmosphere vibrations up to 5000 per second and as low as 100. There is a definite relation between its length, rate of taper and size of opening for a predetermined low limit of tone. Any bends required to enable it to be fitted into a small space in a cabinet must be carefully designed so as not to interfere with the correct degree of taper called for by theory.

In other words, just as the best set manufacturers have, by careful investigation and great outlay of time and money, succeeded in increasing the efficiency of their sets, so the loud speaker manufacturers of standing have backed them up by making loud speakers capable of conveying to the public the best that the radio set can reproduce, in the form of true music and speech.

It will easily be understood, therefore, that if you place an engineer in a general Radio Store filled with a miscellaneous collection of different type loud speakers and ask him to sell them to the general

public, he will approach the proposition at an entirely different angle from the ordinary salesman. When he looks at the various assortment of speakers, good, bad and indifferent, he calls to mind his laboratory experience and experiments of the past months. He is naturally anxious that the increased efficiency of the receiving sets shall not be cramped and curtailed by a badly designed speaker. He is determined that his customer shall get the full benefit of the deep bass notes and the high treble notes in the musical scale.

He will first find out what set his prospective customer is using. He will familiarize himself with the characteristics of the various sets. He will know the sets which favor the low notes and are deep toned and therefore require or balance better with a higher pitch speaker and others which are high in pitch and more suited to a low, deep mellow speaker. When a lady customer wants to buy a speaker because it is artistic, and he knows it is badly designed, he will not necessarily talk of high and low vibrations, but he will demonstrate it to her and point out how, for instance, in reproducing Rachmoninoff Prelude it cuts off all the rich deep and stirring base notes and turns the great masterpiece into a parody. He will then switch on a good speaker and she will at once notice the difference. She will not know that those wonderful bass notes are in the region of 100 vibrations a second. She will not know that the laboratories of the factory which made that speaker, spent time and brains and money to enable the speaker to reproduce those notes.

She will not know that Liszt's Third Rhapsody has notes running up to 5000 vibrations, but she will be thrilled by their beauty and the engineer would point out these facts to her.

Then he would like to show her an oscillator test, using an oscillator giving cycles from 50 to 5000 and explain to her how obstructions in an acoustic system set up resonance at various frequencies so that the speaker, though giving volume, lacks quality. In fact there are so many things he would want to explain that I do not think an engineer is the right person to sell loud speakers!

## PDQ RADIO SERVICE

Phone Market 7195

### Replacement

Ant., Gnd. ....  
Battery A, B, C. ....  
Tubes 1, 2, 3, 4, 5, 6, 7, 8. ....  
Loud Speaker .....  
Grid Leak .....  
Special .....

### Repair

Ant., Gnd. ....  
Battery A, B, C. ....  
Eliminator .....  
Loud Speaker .....  
Connections .....  
Inside Wiring .....  
Special .....

Date \_\_\_\_\_ Charges \_\_\_\_\_ By \_\_\_\_\_

The service record used by the PDQ Radio Service

# Record Builds Confidence

A service record, left with the customer, protects him and helps the installation and maintenance men

THE little card reproduced here was worked out after eighteen months of experience in handling radio maintenance and repair work and the men who did it. We started out to give quick, snappy, and satisfactory service at charges reasonable enough that people wouldn't feel that their sets cost too much to keep up.

We paid our men enough to attract those really expert in radio work, but I must admit we had troubles. The first thing we noticed were that our men either added a little personal profit for their sales, which they didn't turn in, of course, or else they felt they ought to make the most of each job by doing things which weren't necessary. Both these things might have been all right for installation men from a department store, but they wouldn't do for the kind of a business we were trying to build up.

After trying this thing and that, we settled on the service ticket, a form card to be left in the set at every call. Putting the charges on the ticket made it a receipt to the customer and gave the service man the feeling that the next man would see the record of his work and the amount he charged. It also put a

curb on the "mystery work" by requiring the man to record exactly the things he had done.

In addition, we capitalized the use of these cards by pointing out in our small local advertising that, by furnishing the service tickets, we provided a detailed record of renewals and faults. This wasn't so popular with dealers in our city who sold second grade sets which the owners called on us to service, because, on the strength of the ticket records, faults were brought out so obviously that those dealers had to take the sets back, but it gave the owners real confidence in us.

Also, locating trouble on a second or third call was made much easier by the records of work which had been done before. On the second call the new card was clipped to the first with an ordinary paper fastener.

This service ticket is a small thing, but it has helped us in handling our men, and I think it is largely responsible for the good will we have built up. We can give PDQ service, and we do it so reasonably that we get practically all that work which is done in our city.

# RADIO ENGINEERING

M. B. SLEEPER, Editor

F. A. SKELTON, Managing Editor

Published monthly by

M. B. SLEEPER, Inc.

Publication Office, Lyon Block, Albany, N. Y.

Editorial and General Offices

A-52 Vanderbilt Ave., New York, N. Y.

Chicago Advertising Office

E. H. Moran, Bell Building

307 North Michigan Ave., Chicago

---

Twenty cents per copy in the United States and Canada; in foreign countries one shilling. Two dollars per year; twelve numbers in the United States and Canada; ten shillings in foreign countries.  
Copyright 1925 by M. B. SLEEPER, Inc.

---

Vol. V      DECEMBER, 1925      No. 12

---

## EDITORIAL

**I**T IS natural to say it's much easier for the editor of a magazine to talk about running a jobber's or dealer's business than to get out and do it, but few jobbers or dealers realize what a clearing house for ideas, expressions of opinion, and advance plans is the office of a technical radio publication.

Now, regardless of how I would do things, if I were a jobber or dealer, very often I can see handwriting on the wall which says that things must be done, whether in one way or another.

Right now, with the whole industry in a blue haze over the disappointingly small amount of business done up to the end of October, the handwriting has come again. The words are clear and distinct. They are familiar words, but this winter they have a new significance—Quality and Service.

The public is thru with radio as we used to know it. The public has had all it will absorb of radio sets that aren't house broken. Music or nothing is the answer to dealers and manufacturers who have sold and built sets which do nothing more than demonstrate that more or less intelligible speech and music can be transmitted thru the air.

Nor is the public willing to turn radio engineer. Time was when sets had to have hinged covers, because looking at the works was a part of the thrill of having a set. But no more. There was lots of comment when R. C. A. put out the super-heterodyne with the works in a box filled with pitch. No one got excited this fall when sets were completely enclosed, even to covers over the tubes.

The public is running true to form. It buys amusement. It isn't amusing any more to get out and get under. Fortunately for radio, however, the charm of music never wears off. I said music. That's the only kind of a set that has a place in our homes. Why, another year and those rattling, ear-splitting radio sets will be as scarce as a phonograph with morning glory horns.—And, by the way, if we had realized that sooner, the Victor Talking Machine Company wouldn't have felt it worth while to develop the Orthophonic phonograph. Instead, they capitalized the big failing of radio—quality. They have already a service organization which puts to shame the service provided by radio manufacturers.

No radio business this fall? Don't let yourself believe that for a minute. There's more than ever, but not so many are getting it. Companies that are building house broken radio sets, or parts manufacturers who are tying in their products with successful construction designs are exceeding all records. But not every dealer is getting this merchandise. The fact that a manufacturer is working on a franchise plan doesn't prove that his product is up to this season's standards, and concerns who have the real goods to sell know that they will be only as satisfactory as the sales and service facilities provided by the dealer.

If you can't get these goods to sell, or if you don't know that only these goods are selling, don't blame the industry or the public. The fault is yours.

M. B. SLEEPER,  
Editor.

# Working Data on the Unipower A

The complete story of the 4-volt and 6-volt Unipower devices made by the Gould Storage Battery Company.

Through the successes and failures of various A battery devices, the Gould Storage Battery Company has been conducting a most thorough investigation into the question of A power derived from 110 volts A.C. The conclusion reached by their engineers is that the most satisfactory method is to combine in one unit a storage battery and charger. The charger is of the lead-tantalum-acid type, using the same container, same type of cell, same electrolyte and negative electrode as the battery cells.

There is no deterioration in the use of the rectifier other than that existing in the normal life of a storage battery. It requires only the addition of water put in the same time water is put in the battery cells. This design makes it possible to cut off the charge when the electrolyte is evaporated to a point below the lead point. This makes it impossible to injure the battery plates because of failure to put in water. The rate of evaporation in both the battery and rectifier cells is the same as in any of the ordinary types.

The following data and the information given on the page opposite will be found of tremendous assistance to those who are called upon to install and service the Unipower devices.

The AC-4 type is a 4-volt unit capable of operating up to eight 199 tubes or their equivalent. It works on 110 to 125 volts, 60 cycles, altho types can be obtained for 25 or 50 cycles. The capacity of the battery unit is 18 ampere hours. AC-4 weighs 14 lbs. 6 oz., or, when packed, 22 lbs.

The wiring diagrams show a resistance in the charging circuit, which can be short circuited by a push-pull switch. When the resistance is in the circuit, a trickle charge of 0.1 to 0.13 ampere flows into the battery. With the resistance short circuited, the charging rate is increased to 0.4 or 0.5 ampere. The current con-

sumed at trickle charge is 6 watts or 15 watts at the high rate.

The AC-6 operates up to eight 201-A type tubes, and works from the same supply lines. The capacity is 40 ampere hours. AC-6 weighs 39 lbs., or 48 lbs. packed. The trickle charge is 0.35 to 0.45 ampere or 1.3 to 1.5 amperes at the high rate, consuming 12 to 15 watts or 40 to 45 watts respectively for the two adjustments.

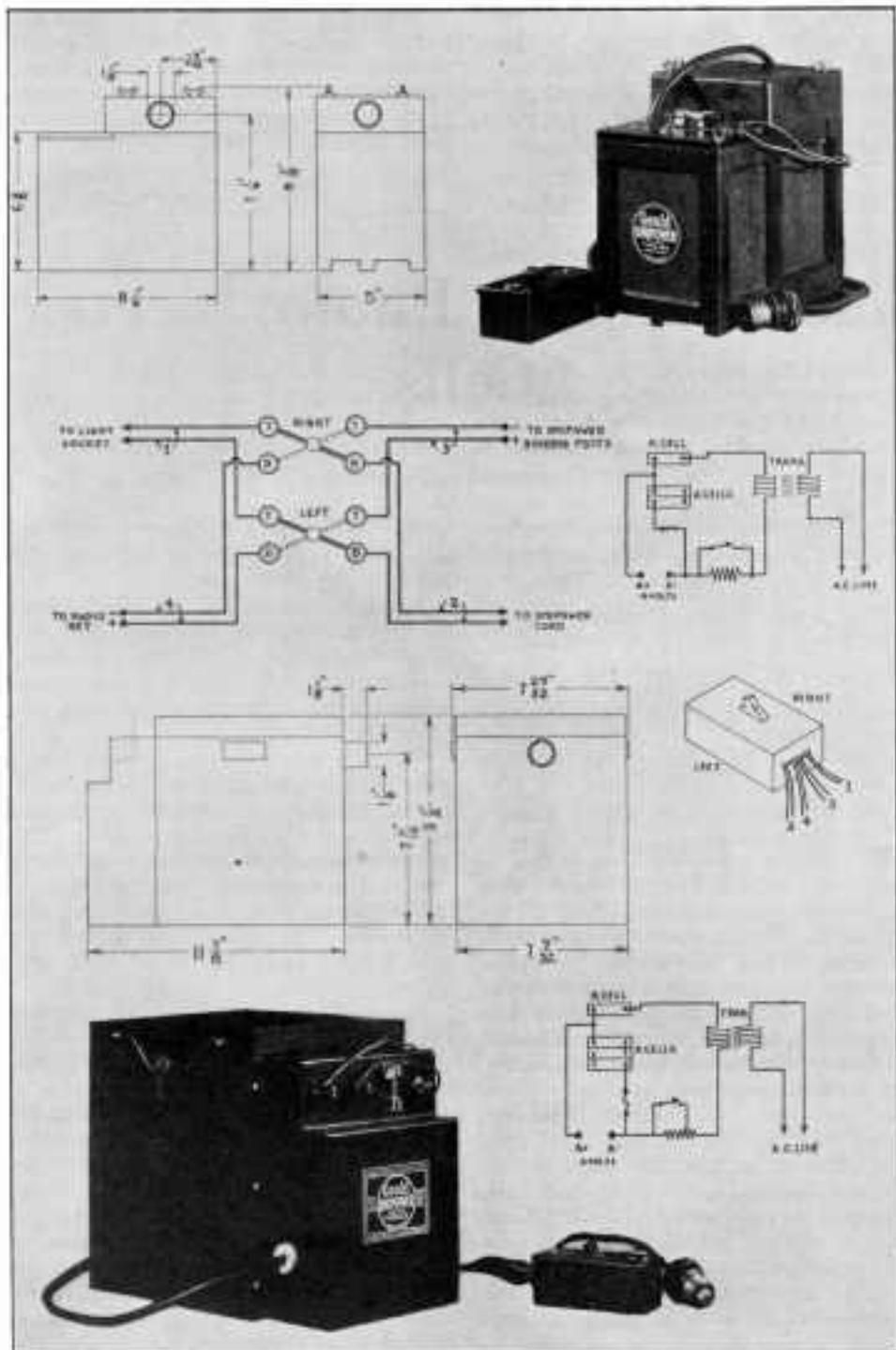
The electrolyte in all cells is of the standard specific gravity, 1.250 when fully charged. Normally water must be added to the AC-4 once in three months or once in two months to the AC-6.\*

With each unit a Master control switch is supplied, shown in the illustration opposite. The connector for the AC supply should be put into a lamp socket, and the cord to the set connected to the A+ and A- battery terminals. In one position of the switch, the line is connected to the Unipower transformer primary and connections between the Unipower of the radio set are broken, allowing the battery to charge. With the switch in the other direction, the supply line is disconnected, and the Unipower put on to the set. It is, therefore, unnecessary to turn the tubes off at the radio set itself. If the control switch is used for that purpose, the battery is always on charge when not in use. If the set has been run considerably, the switch on the Unipower should be put on the full charge setting, or with only normal operation on the trickle charger.

For those who have a Unipower B supply also, a special cord can be provided to control the B battery.

The special virtue of this device is that the human factor, as far as possible, has

\* Interesting data on the theory and principles of lead-tantalum-acid rectifier is given in Technology paper 365, published by the Bureau of Standards, Government Printing Office, Washington, D. C., and a complete explanation of the trickle charge is given in Storage Batteries, by Viral.



Details of the AC-4 and AC-6 Gold Unipower devices.

been eliminated. It is not possible to repeatedly discharge the battery completely before it is recharged, a practice which greatly reduces the life of a battery, there is no fluctuation in A supply voltage, and it is just as noiseless as a plain storage battery with a separate charger.

A vent from the battery is furnished so that any gases can escape through a hole in the side of a cabinet, altho experience in this respect does not indicate that the metal parts of the set are damaged, even over a considerable period of time, by exhaust gases.

## Selenium and Photo Electric Cells

### Chapter IV. The Purpose of Annealing Selenium and the Methods Employed—By Samuel Wein

THE literature is replete with reference on annealing selenium, a process employed to enhance its light-sensitive characteristics. Various temperatures and processing has been advocated from time to time.

However, the essentials for selenium cell construction, as has been pointed out, consists essentially in spreading the selenium into thin films over a large active surface, and by annealing and processing this phase of the operation.

That the resistance of selenium cells varies with the annealing temperature is evident, as shown by Dieterich<sup>26</sup> who verified the observations of Ries<sup>27</sup> in regard to the variation of resistance with annealing. Thus, Ries records two cells that were annealed at different temperatures, and shows that the higher the temperatures to which the cell was heated the lower was its ultimate resistance. The method employed by Ries differs from that used by Dieterich, however, in that he subjected the individual cells to a series of temperature changes, alternately heating and cooling each cell, measuring its resistance and sensitiveness while it was at room temperature. In these experiments each cell was subjected to a high temperature only once, but the results were the same as those obtained by Ries.

The influence of annealing on the resistance of the cells can be clearly

seen. The higher the temperature of annealing and the longer the time, the lower is the resistance.

It was further found that if cells were annealed for a short time only, and at a high temperature, and the annealing carried on to completion at a lower temperature, the resistance of the cells was materially reduced.

The resistance of the freshly made cells was, in general, low, but increased gradually, and this reached a constant value in a few weeks after making. This gradual, permanent-increase is no doubt due to the contraction of the selenium and its consequent tearing away from the electrodes. The resistance of the various cells ranged from 12,000 to 92,000,000 ohms.

Ruhmer<sup>24</sup> has shown that he was able to prepare two types of selenium cells, these he calls "hard" and "soft" cells, their difference in behavior being due to the allotropic forms of crystalline selenium. A soft cell is coarse grained, whereas a hard cell is fine grained, and can be obtained by annealing at a somewhat lower temperature. This gives a relatively smaller change in resistance to weak illumination than the other type. The soft cells are very sensitive for low light intensities, but their resistance change when exposed to strong illumination is small compared to that of the hard cells.

The single crystals of selenium made by Brown<sup>38</sup> have an extraordinarily high sensitivity as compared with a selenium cell, but they also have the characteristic slow recovery after exposure to light. From published data, it appears that a single crystal of selenium, 1 mm. in area, is 100 times as sensitive as the best selenium cell.

Many experimenters are inclined to believe that addition agents to the selenium increase the sensitivity to light considerably. This phase of selenium cell construction has not, unfortunately, been investigated to any great extent. Several investigators undertook to find out the extent of these increasing sensitiveness by these additional agents. The results gotten are contradictory and not dependable.

Moss<sup>39</sup> showed that mercury combines at ordinary temperature with selenium, producing a superficial film of comparatively low resistance. This effect is produced with vitreous as well as with the granular or metallic form of selenium.

Tisdale<sup>40</sup> corroborated the findings of Moss, in this case using bismuth and arsenic.

Coblentz<sup>41</sup> forms molybdenum selenide by precipitation from ammonium molybdate on hydrogen selenide. This compound showed no marked actino-electric effect.

A German worker<sup>42</sup> subjects amorphous selenium to the action of a quinoline solution. The mixture is heated to 200° C., and then allowed to cool very slowly for two or three days. Highly sensitive selenium cells it is claimed are made from the use of such selenium compounds.

**WARNING.** The red fumes from selenium, when subjected to elevated temperatures, are exceedingly poisonous, they corrode the skin, and have a tendency to affect the nails, coloring them reddish-brown and producing pain, which lasts for hours. They also affect the nasal channel, and with delicate matured individuals, it brings forth bleeding. Great care must be exercised when experimenting with selenium on this account.

<sup>38</sup> Dieterich. *Phys. Rev.* vol. 4, (2) page 470, 1914.

<sup>39</sup> Ries. *Das Elektrische Verh. des Krist. Selens*, etc. 1902.

<sup>40</sup> Ruhmer. *Elektrotech. Zeit.* vol. 25, page 1021, 1904.

<sup>41</sup> Brown. *Phys. Rev.* vol. 4, (2) page 85, 1914.

<sup>42</sup> Moss. *Proc. Roy. Soc. Lond.* vol. 25, page 22, 1875.

*Nature.* vol. 77, page 198, 1908.

<sup>40</sup> Tisdale. *Phys. Rev.* vol. 12 (2), page 334, 1918.

<sup>41</sup> Coblentz. *Bur. Stand. Sci. Pap. No. 462*, page 596, 1922.

<sup>42</sup> German. *Chem. Abst.* page 2586, 1920. German Pat. No. 304, 261.

## Wavelength, Capacity, and Inductance Tables

On the following pages is a table showing the wavelength of circuits containing combinations of capacity and inductance from 0.00001 mfd. and 0.02 millihenry to 0.0020 mfd. and 200 millihenries.

To determine the wavelength of any circuit, select the column headed by the correct value of inductance, and run down to the figures opposite the given capacity. The number thus located is the wavelength of that combination of inductance and capacity.

A very small error is, of course, introduced by the distributed capacity in the

coil and the associate circuit, but the percentage of error should be very small in well designed sets.

The values of inductance are given in millihenries. To change to centimeters, multiply the inductance expressed in millihenries by 1,000,000. In other words, 1,000,000 cms. = 1.0 mh. Therefore, for example, 0.02 mh. = 20,000 cms., or 1.3 mh. = 1,300,000 cms.

To change microfarads to micro-microfarads, multiply the capacity in microfarads by 1,000,000. In other words, 0.0002 mfd. = 200 mmfd.

C	0.02	0.025	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.20
0.00001	27	30	33	38	42	46	50	53	57	60	65	71	75	80	84
0.00002	38	42	46	53	60	65	71	75	80	84	92	100	107	113	119
0.00003	46	52	57	65	73	80	86	92	98	103	113	122	131	139	146
0.00004	53	60	65	75	84	92	100	107	113	119	131	141	151	160	169
0.00005	60	67	73	84	94	103	112	119	126	133	146	158	169	179	189
0.00006	65	73	80	92	103	113	122	131	139	140	160	173	185	196	207
0.00007	71	79	86	100	112	122	132	141	150	158	173	187	200	212	223
0.00008	75	84	92	107	119	131	141	151	160	169	185	200	213	226	238
0.00009	80	89	98	113	126	139	150	160	170	179	196	212	226	240	253
0.00010	84	94	103	119	133	146	158	169	179	189	207	223	238	253	267
0.00012	92	103	113	131	146	160	173	185	196	207	226	244	261	277	292
0.00014	100	112	122	141	158	173	187	200	212	223	244	264	282	299	315
0.00016	107	119	131	151	169	185	200	213	226	238	261	282	302	320	337
0.00018	113	126	139	160	179	196	212	226	240	253	277	299	320	339	358
0.00020	119	133	146	169	189	207	223	238	253	267	292	315	337	358	377
0.00025	133	149	163	188	211	231	249	267	283	298	326	353	377	400	421
0.00030	146	163	179	206	231	253	273	292	310	326	358	386	413	438	462
0.00040	169	188	206	238	267	292	315	337	358	377	413	446	477	506	533
0.00050	188	211	231	267	298	326	353	377	400	421	462	499	533	565	596
0.00060	206	231	253	292	326	358	386	413	438	462	506	546	584	619	653
0.00070	223	249	273	315	353	386	417	446	473	499	546	590	631	669	705
0.00080	238	267	292	337	377	413	446	477	506	533	584	631	674	715	754
0.00090	253	283	310	358	400	438	473	506	536	565	619	669	715	759	800
0.00100	267	298	326	377	421	462	499	533	565	596	653	705	754	800	843
0.00110	280	313	342	395	442	484	523	559	593	625	685	740	791	839	884
0.00120	292	326	356	413	462	506	546	584	619	653	715	772	826	876	923
0.00130	304	340	372	430	481	526	569	611	645	680	744	804	850	912	961
0.00140	315	353	386	446	499	546	590	631	669	705	772	834	892	946	997
0.00150	326	365	400	462	516	565	611	653	690	730	800	864	923	979	1,032
0.00160	337	377	413	477	533	584	631	674	715	754	826	892	954	1,011	1,062
0.00170	348	389	426	491	550	602	650	695	737	777	851	920	983	1,042	1,099
0.00180	358	400	438	506	565	619	669	715	759	800	876	946	1,011	1,073	1,131
0.00190	367	411	450	520	581	637	687	735	780	822	900	972	1,041	1,102	1,162
0.00200	377	421	462	533	596	653	705	754	800	843	923	997	1,069	1,131	1,192

C	0.25	0.30	0.40	0.50	0.60	0.7	0.8	0.9	1.0	1.2	1.4	1.6	1.8	2.0
0.00001	94	103	119	133	146	158	169	179	189	207	223	238	253	267
0.00002	133	146	160	180	207	223	238	253	267	292	315	337	358	377
0.00003	163	179	207	231	253	273	292	310	326	358	386	413	438	462
0.00004	189	207	238	267	292	315	337	358	377	413	446	477	506	533
0.00005	211	231	267	298	326	353	377	400	421	462	499	533	565	596
0.00006	231	253	292	326	358	386	413	438	462	506	546	584	619	653
0.00007	249	273	315	353	386	417	446	473	499	546	590	631	669	705
0.00008	267	292	337	377	413	446	477	506	533	584	631	674	715	754
0.00009	283	310	358	400	438	473	506	536	565	619	669	715	759	800
0.00010	298	326	377	421	462	499	533	565	596	653	705	754	800	843
0.00012	326	358	413	462	506	546	584	619	653	715	772	826	876	923
0.00014	353	387	446	499	546	590	631	669	705	772	834	892	946	997
0.00016	377	413	477	533	584	631	674	715	754	826	892	954	1,011	1,066
0.00018	400	438	506	565	619	669	715	759	800	876	946	1,011	1,073	1,131
0.00020	421	462	533	596	653	705	754	800	843	923	997	1,066	1,131	1,192
0.00025	471	516	596	666	730	789	843	894	942	1,032	1,115	1,192	1,264	1,333
0.00030	516	566	653	730	800	864	923	979	1,032	1,131	1,221	1,306	1,385	1,460
0.00040	596	653	754	843	923	997	1,066	1,131	1,192	1,306	1,410	1,506	1,596	1,686
0.00050	666	730	848	942	1,032	1,115	1,192	1,264	1,333	1,460	1,577	1,686	1,788	1,885
0.00060	730	800	923	1,032	1,131	1,221	1,306	1,385	1,460	1,599	1,727	1,846	1,959	2,065
0.00070	789	864	997	1,115	1,221	1,320	1,410	1,496	1,577	1,727	1,866	1,995	2,116	2,230
0.00080	843	923	1,066	1,192	1,306	1,410	1,509	1,599	1,686	1,846	1,995	2,133	2,262	2,384
0.00090	894	979	1,131	1,264	1,385	1,496	1,599	1,686	1,768	1,959	2,116	2,262	2,399	2,529
0.00100	942	1,032	1,192	1,333	1,460	1,577	1,686	1,768	1,855	2,065	2,230	2,384	2,529	2,665
0.00110	985	1,083	1,250	1,398	1,531	1,654	1,768	1,875	1,977	2,165	2,339	2,500	2,652	2,795
0.00120	1,032	1,131	1,306	1,460	1,599	1,727	1,846	1,959	2,065	2,262	2,443	2,612	2,770	2,920
0.00130	1,075	1,177	1,359	1,520	1,665	1,798	1,922	2,039	2,149	2,354	2,543	2,718	2,883	3,039
0.00140	1,115	1,221	1,410	1,577	1,727	1,866	1,985	2,116	2,230	2,443	2,639	2,821	2,992	3,154
0.00150	1,154	1,264	1,460	1,632	1,788	1,932	2,065	2,190	2,308	2,529	2,732	2,920	3,097	3,264
0.00160	1,192	1,306	1,509	1,686	1,846	1,995	2,133	2,262	2,384	2,612	2,821	3,016	3,199	3,372
0.00170	1,229	1,346	1,554	1,737	1,904	2,056	2,198	2,332	2,457	2,692	2,908	3,108	3,297	3,475
0.00180	1,264	1,385	1,599	1,788	1,959	2,116	2,262	2,399	2,529	2,770	2,992	3,199	3,392	3,576
0.00190	1,299	1,423	1,643	1,837	2,012	2,174	2,324	2,465	2,598	2,846	3,074	3,286	3,485	3,674
0.00200	1,333	1,460	1,686	1,885	2,065	2,230	2,384	2,529	2,665	2,920	3,154	3,372	3,575	3,770

C	2.5	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
0.00001	298	326	377	421	462	499	533	565	596	653	705	754	800	843	942
0.00002	421	462	533	596	653	705	754	800	843	923	997	1,066	1,131	1,192	1,333
0.00003	516	565	653	730	800	864	923	979	1,032	1,131	1,221	1,306	1,385	1,460	1,632
0.00004	596	653	754	843	923	997	1,066	1,131	1,192	1,306	1,410	1,509	1,599	1,686	1,885
0.00005	663	730	843	942	1,032	1,115	1,192	1,264	1,333	1,490	1,577	1,656	1,738	1,815	2,108
0.00006	730	800	923	1,032	1,131	1,221	1,306	1,385	1,460	1,599	1,727	1,846	1,959	2,065	2,398
0.00007	789	864	997	1,115	1,221	1,320	1,410	1,495	1,577	1,727	1,866	1,995	2,116	2,230	2,613
0.00008	843	923	1,066	1,192	1,306	1,410	1,509	1,599	1,686	1,846	1,995	2,134	2,262	2,381	2,865
0.00009	894	979	1,131	1,264	1,385	1,495	1,599	1,698	1,788	1,969	2,116	2,262	2,399	2,529	3,013
0.00010	942	1,032	1,192	1,333	1,460	1,577	1,686	1,788	1,885	2,065	2,230	2,384	2,529	2,665	3,149
0.00012	1,032	1,131	1,306	1,460	1,599	1,727	1,846	1,959	2,065	2,262	2,443	2,612	2,770	2,920	3,264
0.00014	1,115	1,221	1,410	1,577	1,727	1,846	1,985	2,116	2,230	2,443	2,639	2,821	2,992	3,164	3,526
0.00016	1,192	1,306	1,509	1,686	1,846	1,985	2,133	2,262	2,384	2,612	2,821	3,016	3,199	3,372	3,770
0.00018	1,264	1,385	1,599	1,788	1,959	2,116	2,262	2,399	2,529	2,770	2,992	3,199	3,392	3,576	3,995
0.00020	1,333	1,460	1,686	1,885	2,065	2,230	2,384	2,529	2,665	2,920	3,154	3,372	3,576	3,770	4,214
0.00025	1,490	1,632	1,885	2,108	2,308	2,493	2,665	2,827	2,980	3,264	3,526	3,770	3,998	4,214	4,713
0.00030	1,632	1,788	2,065	2,308	2,529	2,732	2,920	3,097	3,264	3,576	3,863	4,129	4,379	4,617	5,161
0.00040	1,885	2,065	2,384	2,665	2,920	3,154	3,372	3,576	3,770	4,129	4,400	4,768	5,057	5,331	5,960
0.00060	2,108	2,380	2,665	2,980	3,264	3,526	3,770	3,998	4,214	4,617	4,987	5,331	5,654	5,960	6,663
0.00080	2,308	2,529	2,920	3,264	3,576	3,863	4,129	4,379	4,617	5,057	5,462	5,840	6,192	6,529	7,299
0.00070	2,493	2,732	3,154	3,526	3,863	4,172	4,460	4,731	4,987	5,462	5,900	6,306	6,693	7,052	7,885
0.00080	2,665	2,920	3,372	3,770	4,129	4,460	4,768	5,057	5,331	5,840	6,306	6,741	7,152	7,539	8,429
0.00090	2,827	3,097	3,576	4,000	4,379	4,731	5,057	5,364	5,654	6,192	6,693	7,152	7,587	7,996	8,940
0.00100	2,980	3,264	3,770	4,214	4,617	4,987	5,331	5,654	5,960	6,529	7,052	7,539	7,996	8,429	9,423
0.00110	3,125	3,424	3,953	4,420	4,842	5,230	5,591	5,930	6,251	6,848	7,396	7,909	8,386	8,810	9,890
0.00120	3,264	3,576	4,129	4,617	5,037	5,462	5,840	6,192	6,529	7,152	7,724	8,261	8,761	9,233	10,320
0.00130	3,398	3,722	4,298	4,805	5,264	5,685	6,109	6,449	6,796	7,444	8,040	8,594	9,119	9,611	10,730
0.00140	3,526	3,863	4,460	4,987	5,462	5,900	6,306	6,693	7,032	7,724	8,344	8,922	9,459	9,973	11,150
0.00150	3,650	3,988	4,617	5,161	5,654	6,109	6,529	6,902	7,299	7,996	8,637	9,233	9,794	10,320	11,540
0.00160	3,770	4,129	4,768	5,331	5,840	6,306	6,741	7,152	7,539	8,261	8,922	9,536	10,110	10,660	11,920
0.00170	3,885	4,256	4,915	5,495	6,020	6,502	6,949	7,373	7,771	8,511	9,196	9,828	10,420	10,990	12,290
0.00180	3,998	4,379	5,057	5,654	6,192	6,693	7,152	7,587	7,996	8,761	9,459	10,110	10,730	11,310	12,640
0.00190	4,108	4,500	5,196	5,809	6,365	6,872	7,384	7,796	8,215	9,000	9,721	10,410	11,020	11,620	12,960
0.00200	4,214	4,617	5,331	5,960	6,529	7,052	7,539	7,996	8,429	9,230	9,973	10,660	11,310	11,920	13,330

C,	30.0	40.0	50.0	60.0	70.0	80.0	90	100	120	140	160	180	200
0.00001	1.032	1.192	1.333	1.460	1.577	1.686	1.788	1.885	2.065	2.230	2.384	2.529	2.665
0.00002	1.460	1.686	1.885	2.065	2.230	2.384	2.529	2.665	2.920	3.154	3.372	3.576	3.770
0.00003	1.788	2.065	2.308	2.529	2.732	2.920	3.097	3.264	3.576	3.863	4.129	4.379	4.617
0.00004	2.065	2.384	2.665	2.920	3.154	3.372	3.576	3.770	4.129	4.400	4.768	5.037	5.331
0.00005	2.308	2.665	2.980	3.264	3.526	3.770	3.998	4.214	4.617	4.987	5.331	5.654	5.960
0.00006	2.529	2.920	3.264	3.578	3.862	4.129	4.379	4.617	5.057	5.462	5.840	6.192	6.529
0.00007	2.732	3.154	3.526	3.863	4.172	4.460	4.731	4.987	5.462	5.900	6.306	6.693	7.052
0.00008	2.920	3.372	3.770	4.129	4.460	4.768	5.057	5.331	5.840	6.306	6.741	7.152	7.539
0.00009	3.097	3.576	4.000	4.379	4.731	5.057	5.364	5.654	6.192	6.693	7.152	7.587	7.996
0.00010	3.264	3.770	4.214	4.617	4.987	5.331	5.654	5.960	6.529	7.052	7.539	7.996	8.429
0.00012	3.576	4.129	4.617	5.057	5.462	5.840	6.192	6.529	7.152	7.724	8.261	8.761	9.233
0.00014	3.863	4.460	4.987	5.462	5.900	6.306	6.693	7.052	7.724	8.344	8.922	9.459	9.973
0.00016	4.129	4.768	5.331	5.840	6.306	6.741	7.152	7.539	8.261	8.922	9.536	10.110	10.660
0.00018	4.379	4.987	5.654	6.192	6.693	7.152	7.587	7.996	8.761	9.459	10.110	10.730	11.310
0.00020	4.617	5.331	6.060	6.529	7.052	7.539	7.996	8.429	9.230	9.973	10.660	11.310	11.920
0.00025	5.161	5.960	6.663	7.299	7.885	8.429	8.940	9.423	10.320	11.150	11.920	12.640	13.330
0.00030	5.659	6.529	7.260	7.966	8.637	9.233	9.794	10.320	11.310	12.210	13.060	13.850	14.600
0.00040	6.529	7.539	8.429	9.233	9.973	10.660	11.310	11.920	13.060	14.100	15.060	15.960	16.800
0.00050	7.299	8.429	9.423	10.320	11.150	11.920	12.640	13.330	14.600	15.770	16.800	17.880	18.850
0.00060	7.996	9.233	10.320	11.310	12.210	13.060	13.850	14.600	15.960	17.270	18.460	19.590	20.650
0.00070	8.637	9.973	11.150	12.210	13.200	14.100	14.960	15.770	17.270	18.660	19.950	21.160	22.300
0.00080	9.233	10.660	11.920	13.060	14.100	15.060	15.960	16.800	18.460	19.950	21.330	22.620	23.840
0.00090	9.794	11.310	12.640	13.850	14.960	15.960	16.960	17.880	19.950	21.160	22.620	23.940	25.200
0.00100	10.320	11.920	13.330	14.600	15.770	16.800	17.880	18.850	20.650	22.300	23.840	25.200	26.550
0.00010	10.830	12.500	13.980	15.310	16.540	17.680	18.760	19.770	21.650	23.390	25.000	26.520	27.950
0.00120	11.310	13.060	14.600	15.960	17.270	18.460	19.590	20.650	22.620	24.430	26.120	27.700	29.200
0.00130	11.770	13.560	15.200	16.650	17.980	19.230	20.390	21.490	23.540	25.430	27.120	28.830	30.390
0.00140	12.210	14.100	15.770	17.270	18.660	19.950	21.160	22.300	24.430	26.390	28.210	29.920	31.540
0.00150	12.640	14.600	16.320	17.880	19.320	20.650	21.900	23.080	25.200	27.320	29.200	30.970	32.640
0.00160	13.060	15.090	16.860	18.460	19.950	21.330	22.620	23.840	26.120	28.210	30.160	31.980	33.720
0.00180	13.460	15.540	17.370	19.040	20.560	21.960	23.230	24.570	26.920	29.080	31.080	32.860	34.750
0.00180	13.850	15.960	17.880	19.500	21.160	22.620	23.990	25.290	27.700	29.920	31.990	33.720	35.760
0.00190	14.230	16.430	18.370	20.120	21.740	23.240	24.650	25.980	28.400	30.740	32.860	34.850	36.740
0.00200	14.600	16.970	18.850	20.650	22.300	23.840	25.290	26.650	29.200	31.540	33.720	35.760	37.710

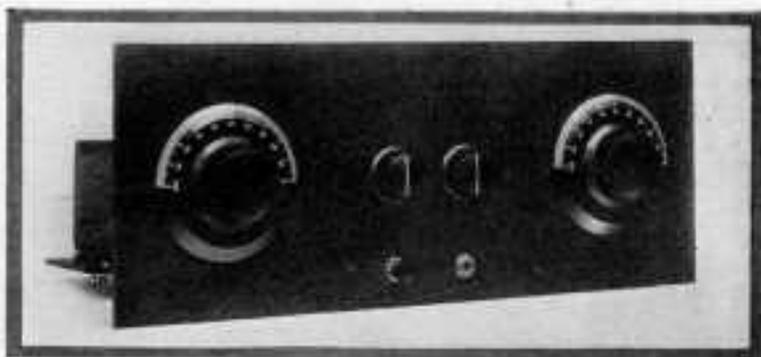


Fig. 1. The New Yorker has been made to appeal in appearance to the experienced designer as well satisfy in results the experienced B. C. L.

## The New Yorker

An outfit built to meet the special requirements of B. C. L.'s in the larger cities where there is much local interference. Dry cells can be used with the three UX-199's and one UX-120 tube.

**F**OLLOWING the publication of the RX-1 data in the New York Telegram, there appeared an article in the same paper describing a set built to overcome the faults encountered in operating the RX-1 in metropolitan districts.

Reports which have been sent in as a result of our requests for data as to the operation of the RX-1 indicate that, in practically every case, the only complaint with the RX-1 concerned broad tuning, and that could be overcome by shortening the antenna, or using an indoor antenna for local reception and an outdoor antenna for DX after the locals had shut down.

It did not seem to us that the set described in the Telegram as overcoming the assumed difficulties with the RX-1 was in any way an improvement except that it used plain regeneration to sharpen the tuning.

It was demonstrated in the October issue of RADIO ENGINEERING that regeneration, while sharpening the tuning, necessarily introduced considerable distortion, to say nothing of the increased disadvantage of radiation from regeneration in congested areas.

Knowing the RX-1 better than anyone else, and having a complete file of suggestions for special ideas to be incorporated in a different set, we developed

what we have called The New Yorker.

The New Yorker, however, is by no means an improved RX-1. It is simply a set which gives a variable degree of sharpness, quality of tone equal to the average receiver, and operates on dry cells for the A battery. The tuning is sharper than the RX-1, the receiving range about the same, and the quality satisfactory for most requirements. Certainly it is as good or better than ordinary regenerative receivers.

In short, it is a safe design to sell a man who wants tuning which will cope with the most difficult conditions, and who requires dry-cell operation. In addition, the T. C. circuit is employed to provide a degree of neutralization which very nearly eliminates radiation.

The outfit is built up around the Samson T. C. kit, consisting of a double-rotor coupler, antenna coupler, neutralizing condenser, and R. F. choke. The use of these instruments is illustrated in Fig. 5, the picture wiring diagram. The set has all the modern improvements. Silver-Marshall S. L. F. condensers are employed, and the new Pacent Isolantite sockets. Provision is made for the use of a UX-120 tube in the last stage, the filament of which is controlled by a 120 Amperite. Binding posts for the C battery are mounted directly behind the last



Fig. 2. Top, showing the clever arrangement by which the parts on the front and tube panels are made to fit in with each other. Contrast this with the very amateurish designs you have seen, and you will realize the thought and skill put into the development of this set, built in the Darien Laboratory.

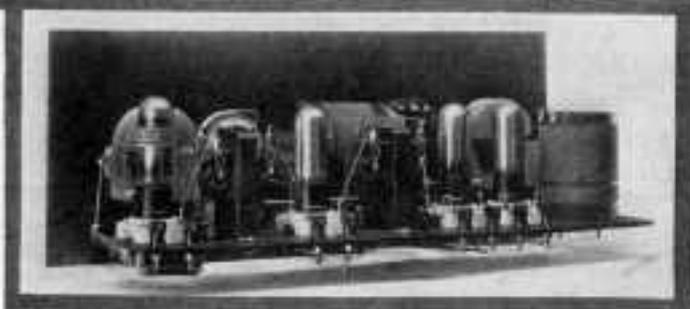


Fig. 3. The rear view shows the tubes in place, three UX-159's and a UX-120 for the last A. F. stage. This tube requires a 22-volt C battery, which can be a small size 22-volt B battery. Fig. 4, the under side, where you can see how the Lastites are used both as terminals and lock nuts. More complete details will be found in the data-prints which have been made up for set builders.



socket. Both A. F. transformers are the Amertran 1 to  $3\frac{1}{2}$  ratio type.

The photographs show the new Pacent porcelain-base rheostat of 20 ohms used in an unusual way. On the front panel is a Carter Imp switch. When the switch is thrown to the left, the first three tubes are connected to the tap on the rheostat which cuts in enough resistance to bring the voltage on the filament down to 2.75. With the switch at the right, the filament circuit is connected to the variable contact arm of the rheostat. This is adjusted to a point where the voltage on the tubes is 3, giving full volume. While this method does not represent any particular improvement, it is a simple way to

cut down the volume without the use of another jack.

As the photographs show, all the terminals are fitted with Lastites, and the wiring is done with Wirit. Terminals on the sockets, when they go up to the transformers, are made with Lastites above the bases. Where it was more convenient to connect underneath, the screws were put down through the contact springs, socket base, and tube panel, held underneath by Lastites which serve as terminals, nuts, and lock nuts. That is a particular advantage of the Lastite, for once a wire is soldered to it, it cannot very well turn loose.

Another feature of this set is the con-





New N. & K. loud speaker and feather-weight phone. The insert shows the diaphragm adjustment, designed to prevent excessive lightening.

**A** COMMUNICATION just received from Mr. Bulevre, advertising manager for the Daven Radio Corporation, states that the Daven Company is in full production on the Mu-20 tube for resistance coupled amplifiers and the Mu-6 power tube. Mr. Bulevre says that production has been increased as rapidly as possible since last July, the only difficulty being to get enough tubes to fill orders. This will straighten out those who are under the impression that, for one reason or another, these tubes have been discontinued.

With the advent of the UX-120 tube, for use in sets previously equipped with 199's throughout, there has been considerable demand for an adapter which will permit the connection of a UX-120 tube in the last socket of the R. C. A. super-heterodyne sets. An answer to this problem has been given by the Alden Manufacturing Company, of Springfield, Massachusetts. This adapter plugs into the socket and, with the separate set of contacts, holds the 120 tube horizontally. Leads are brought out from the adapter to allow for the addition of a 22½-volt C battery and an extra 45-volt B battery. This is absolutely essential to get the full efficiency of the UX-120 tube. Production on these adapters is now in full swing. Alden is also making adapters to allow the use of UX-120 and UX-199 tubes in the regular UV-201-A sockets, and another adapter to permit the use of large or small-base UX tubes in WD-11 sockets.

From the Federal Telephone Manufacturing Company, Buffalo, New York, comes the announcement that Lester E. Noble, for several years connected with the Company, has been made Vice President and General Manager. Mr. A. C. Stearns, Jr., a recent acquisition

from the Globe Electric Company of Milwaukee, has been made Advertising Manager.

Many of the technical men in dealer and jobber organizations, have aspired to membership in the Institute of Radio Engineers, but have not made application because they were under the impression that they were not eligible as Associate Members. While the Membership Committee passes on the individual qualifications of applicants, these men generally possess the necessary qualifications.

Since the first of the year, over 700 men have joined the Institute, many of whom are connected with merchandising and distributing organizations.

The Institute has recently published a very interesting booklet describing the various activities and giving also the qualifications for membership. The annual dues for an associate member are five dollars. This includes the bi-monthly Proceedings, in which various papers presented at the meetings are published. A copy of this booklet will be sent upon request to those writing to the Institute of Radio Engineers, 37 West 39th Street, New York City.

The Victor Talking Machine Company's line of Orthophonic victrolas is now on display, as well as the new clock-type loud speaker. In addition to developments in the phonograph part of the machine there are very interesting features in the radio set which is combined with it. One of the combination instruments has a five-tube R.F. receiver, Radiola No. 20. This works on an outside antenna or loop, with dry cells to supply the filament current.

Another type has the Radiola No. 25 six-tube super-heterodyne with the loop built on a door of the cabinet. This set, also working from dry cells, uses UX-199's and a UX-120, with a

special protector tube to prevent injury to the tubes in case of short circuits. Still another model has the Radiola No. 28, the new eight-tube super. These combination phonographs and radio sets are so built that the same sound passage is used for the phonograph or radio set.

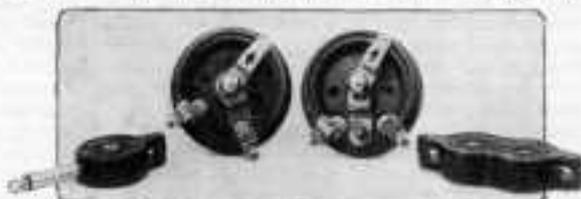
Amsco Products, Inc., of New York City, is supplying dealers with a set of three very



attractive ads for local newspaper use. One shows the S.L.F. condenser, another the vernier dial, and the third the condenser, socket, and rheostat. These items are very popular now and many dealers have taken advantage of this opportunity to keep sales moving by displaying these ads in their local newspapers.

Walter A. Heppner, well known for his work with the United States Army Signal Corps at Camp Alfred Vail, in New Jersey, has re-

Polyment automatic phone plug, rheostat, potentiometer, and cord extension connection. These are being sold both to the manufacturers and the retail trade.



cently joined the R. E. Thompson Manufacturing Company, to take charge of their laboratory force as chief assistant to Dr. L. F. Fuller, Vice President and Chief Engineer.

"12 New Patent Radio Essentials" is the title of a new booklet recently published by the Patent Electric Company of New York City. This booklet describes the Patent S.L.F. condenser, the new A.F. transformer, vernier tuning control, Isolantite and Pyrex sockets, the battery switch, porcelain and bakelite-base rheostats, a wide variety of jacks and jack switches, logging scale, a knob and dial to match the control on the bakelite rheostat, and several other items of special interest to set builders.

The Daven Radio Corporation, Newark, New Jersey, is now distributing a booklet which dealers' salesmen will find exceedingly useful in selling parts for resistance coupled amplifiers. This booklet also gives some useful data on the Mu-6 and Mu-20 tubes as well as on the Daven ballast-resistors and the leakcondenser.

The latter is a new device, designed to fit the regular gridleak mounting. It contains a gridleak and a special type of grid condenser which, by virtue of its construction, cannot vary in capacity.

The special Hammarlund S.L.F. condenser, used in the Hammarlund-Roberts construction kit, can now be obtained separately. This condenser has been very carefully designed to pre-

Polyment resistance coupling units, equipped with atopping condensers, and the by-pass condenser mounting. These make up a three-stage kit.

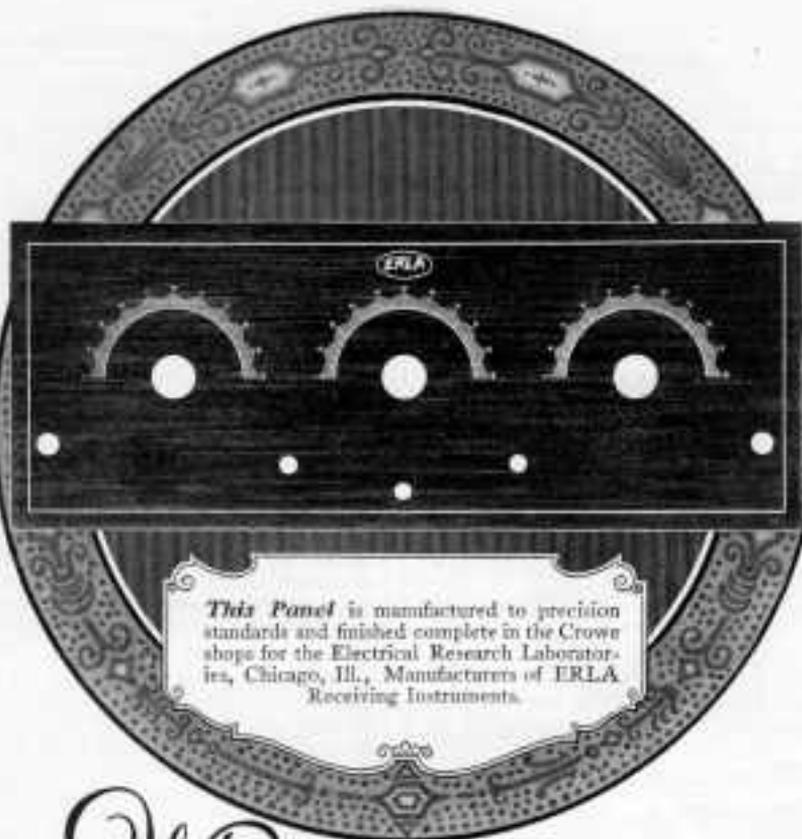
vent the development of mechanical faults which might be found in other S.L.F. types. It is interesting to note that only one small piece of insulation is used on the condenser. This is of Isolantite. Each condenser is provided with a shield plate, to be mounted in front of the rotor, if the circuit in which it is used causes any hand capacity effects.

Everybody will be much relieved to hear that an agreement has been made between the

United States, British, and Canadian authorities to prohibit the transmission of telegraph messages on 300 to 450 meters when ships are within 250 miles of the coast of the United States, Canada, or the British Isles.

The Operadio Company of Chicago is probably the oldest exclusive manufacturer of loop receivers. Year after year they have developed the Operadio outfit, always a self-contained portable set carrying the batteries within the cabinet. The newest model is a single-control set using six 199 tubes. The tuning is done with an S.L.F. condenser, covering a range from a little below 200 meters to 600 meters. A meter, mounted on the front panel, shows either A or B voltage. This development is the result of the combined efforts of Mr. J. M. Stone, President, W. B. Ricketts, Vice President and Sales Manager, and H. H. Shotwell, Chief Engineer. The Company has been under the management of these three men since it was first organized.

It is not too early to remind the jobbers and



*This Panel* is manufactured to precision standards and finished complete in the Crowe shops for the Electrical Research Laboratories, Chicago, Ill., Manufacturers of ERLA Receiving Instruments.

## What means

From now on—this mark is inconspicuously placed on Crowe-made etched metal panels.

It means that the manufacturer of the set has taken great pains to obtain the best, most satisfactory panel. It also means that he has enjoyed, through his choice of Crowe craftsmanship, a definite saving of money; money

to expend in furthering the efficiency of the other phases of his product. For, when he buys Crowe panels, they come to him tuning scales and markings etched, all holes punched, ready to assemble.

You can enjoy the benefits of Crowe-Quality panels—and the economy of them.

*Write for Laboratory Reports on the use of metal panels in high frequency work.*

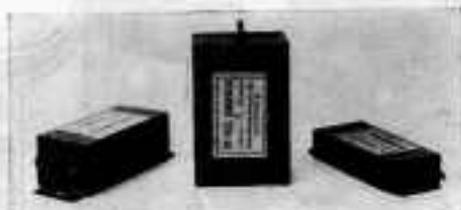


CROWE NAMEPLATE & MFG. CO.  
1749 Grace Street Chicago, Illinois

*Quality* **CROWE**  
**ETCHED METAL PANELS**

dealers that they should take advantage of the sales opportunity afforded by the International Test Week, of January 24th to 30th, 1926. At that time over seventeen countries will take part in the International Programs, and American stations will attempt to reach the listeners abroad.

That will be the time for set owners to overhaul their outfits, to improve their antennas, and to buy new tubes and batteries, if not new



Potter high-capacity condensers, designed particularly for eliminators.

outfits altogether. Newspapers all over the country will publish news about the tests and advance programs which can be capitalized by the local dealers.

Radio salesmen who have been in the game a long time will remember the Myers tubes, originally made in the United States and later in Canada, and will be pleased to hear that the Myers Radio Corporation has recently been organized in Cleveland, Ohio, for the purpose of manufacturing the newest type Myers tubes, equipped with the double-end contacts, and also other types with regular bases. The latter tubes will be regarded with much interest, while the former will be welcomed as old friends by those who have had such splendid results with the double-end tubes, particularly in R.F. and super-heterodyne amplifiers.

The Polymet Manufacturing Corporation, New York City, is putting some real effort behind the new Poly line. This includes a resistance coupled amplifier kit of 2, 3, or 4

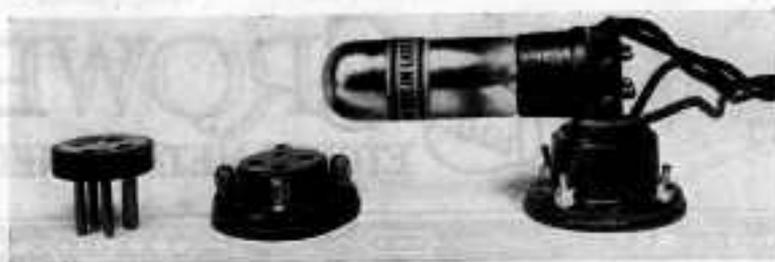
stages, selling for three, four, and five dollars, respectively. By-pass and stopping condensers are furnished with the kits, so that they do not have to be purchased separately. In addition, there are the 35c and 50c plugs, 200 and 400-ohm potentiometers, at \$1.00 and \$1.25, rheostats ranging from 6 to 30 ohms, as well as a line of fixed condensers and gridleaks in all the standard values. Another useful item is the extension connector. Fitted with a 25-ft. cord, the loud speaker is plugged in at one end of the connector, and the cord run to the receiving set, so that the loud speaker can be located about 30-ft. from the set, if necessary.

Having become firmly established in the American market, the Amplion Corporation of America, the United States associate of Alfred Graham & Company, London, England, the originators of the Amplion, have recently extended their operations in the United States by establishing a factory at 437 Eleventh Avenue, corner of 36th Street. The trade should welcome this development of the Amplion business because the Amplion Corporation can now be considered as an American industry and not as a branch of an English factory.

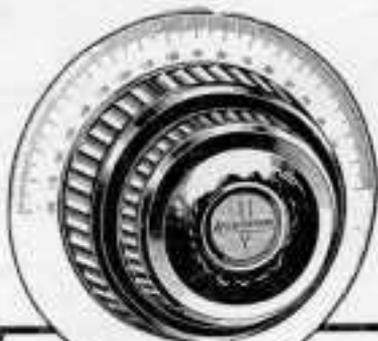
It is the intention of this company to specialize, for this coming season, on a new model unit for manufacturers of console sets and cabinet type loud speakers.

It should be clearly understood, however, that four or five of the essential internal parts of the Amplion mechanism will be continued to be brought from Alfred Graham & Company, London, England, in order that the quality of the Amplion, which is dependent upon these particular parts, will in no way be affected by American manufacture.

When the new manufacturers' units are distributed to those with whom the company now has contracts, it will be found that this product of the American company is certainly equal to, if not better than, the Amplion units that have in the past been imported from England.



WD-11 adapter, UX socket, and the UX-120 adapter for superheterodynes. These items are being produced by the Alden Mfg. Company.



Pat.  
April  
21, 1925

Other  
U. S. and  
Foreign  
Patents  
Pending

# The last word in tuning devices

When a micrometer control is so delicately geared that it brings in the most elusive stations within the scope of your set with deadly accuracy, and with ease, it fully deserves to be referred to as "the last word in tuning devices." Such is the Accuratune.

Volume and clarity are matters of course to a set equipped with Accuratune, because, geared on an 80-to-1 ratio for either coarse or infinitely fine tuning, it functions with precision and accuracy, with little or no effort on your part.

Easily substituted for ordinary dials without alteration of your set.

**MYDAR RADIO CO.**

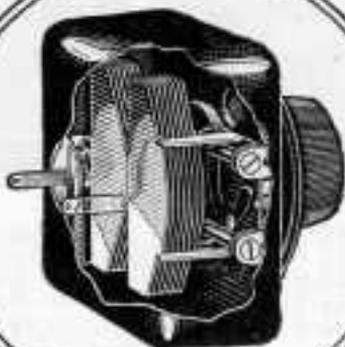
11 CAMPBELL STREET, NEWARK, N. J.

Geared  
80 to 1

## ACCURATUNE



**ALL-AMERICAN**  
TRADE MARK  
**STRAIGHT-LINE-FREQUENCY  
TUNING**



**ALL-AMERICAN  
Straight-Line-Frequency  
CONDENSERS**

Type C-25 Max. 150  
micromicrofarads  
(Min. 10.5 micro at  
400 meters) . . . \$4.30

Type C-20 Max. 100  
micromicrofarads  
(Min. 11.8 micro at  
400 meters) . . . \$3.00

Size of shaft  $3\frac{1}{4}$  x  $3\frac{1}{4}$ ",  
extending  $1\frac{1}{2}$ " back  
from panel.

**ALL-AMERICAN  
TOROID COILS**

Type T-1 Antenna

Coil . . . \$4.50

Type T-2 R. F. Trans-

former . . . \$3.50

Set of 3 coils complete . . . \$10.50

The R. F. Transformer has a small primary, closely coupled to the secondary, rotatably adjusted. The coils have taps for long and short-circuits. All bases are of bakelite.



**ALL-AMERICAN RADIO CORP., CHICAGO**

*Pioneers in the Industry*

# Manufacturers' and Designers' Data on Variable Condensers

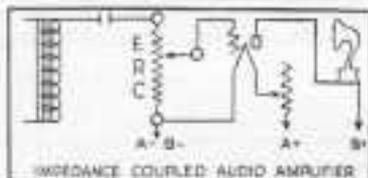
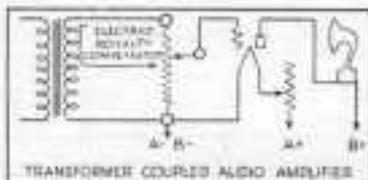
Note: The shaft length is the distance it extends in front of a 2/16-in. panel. Dimensions are given in the order of width, height with plates and depth behind panel.

Manufacturer	Movement	Vernier	Material		Type	Maximum capacity, m.c.f.	Method of assembly	Shaft	Overall size behind panel
			Insulating	End plate					
Aerway Elec. Appliance Corp., Toledo, O.	Rotary	None	Pyralite	Brass alum.	SLW	353	Submer- stator	1/4 x 3/4	4 x 2 3/4 x 2 1/4
All American Radio Corp., Chicago	360° sliding		Brass	Brass case	"	320, 360	Stacked	"	1 1/4 x 3 1/2 x 1 1/2
Amhuesor Sales Co., Inc., New York	Rotary	None	Aluminum	Aluminum	SLF	500	Die cast	"	5 x 3 x 3 1/4
Arson Products, Inc., New York	Sliding	Dial	Hard rub.	None	"	200, 300, 500	Stacked	Spec. dial	3 1/2 x 2 1/2 x 2 1/2
Barrett & Pades, Chicago						250			3 1/2 x 2 1/2 x 3 1/2
Benjamin Elec. Mfg. Co., Chicago	Rotary	None	Brass, all- ver-plated, eye-plated	Brass, all- ver-plated, eye-plated	SLW	500	Washer	1/4 x 1 1/2	3 1/2 x 2 1/2 x 3 1/2
Bremner Tubley Mfg. Co., Chicago						200			2 1/2 x 2 1/2 x 2 1/2
						500			2 1/2 x 2 1/2 x 2 1/2
						128	Die cast	1/4 x 3/4	3 1/2 x 3 x 2 1/2
						250, 354			3 1/2 x 3 x 2 1/2
						500			3 1/2 x 3 x 2 1/2
						750			3 1/2 x 3 x 2 1/2
					SLF	250			5 1/4 x 2 1/2 x 2 1/2
					"	300			5 1/4 x 2 1/2 x 2 1/2
					"	500			5 1/4 x 2 1/2 x 2 1/2
					SLW	Transform 200			4 1/2 x 3 x 2 1/2
					Mod. SLW 200	Transform 500			4 1/2 x 3 x 2 1/2
		Dial			"	400			3 1/2 x 2 x 2 1/2
					"	520			3 1/2 x 2 x 2 1/2
					SLC	32			3 1/2 x 2 x 3/4
		None			"	80			3 1/2 x 2 x 1
					"	200			3 1/2 x 2 x 1 1/2
					"	450			3 1/2 x 2 x 2 1/2
					"	850			3 1/2 x 2 x 2 1/2
					SLC	10, 150, 200	Rotary		3 1/2 x 2 x 2 1/2
					"	300, 450, 500	washer		4 x 4 x 2 1/2
					"	1000	Stator- stacked		4 x 4 x 3
					Mod. SLW	15, 50, 100, 220			4 x 4 x 4 1/4
					"	200, 300, 500, 425			4 x 4 x 3
Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.					SLF	240, 320, 340			4 x 4 x 4

# ABSOLUTE CONTROL OF Tone and Volume WITH THE Electrad Royalty COMPENSATOR



A wire wound, non-inductive high resistance potentiometer of unquestionable merit. Its mechanical construction is far superior to any similar device on the market. Can be attached to or used in the construction of any type of audio amplifier. The slight cost will be repaid many times by the remarkable results obtained.



The above diagrams clearly indicate the application of the "Electrad" Royalty Compensator to two popular types of audio circuits. There are three terminals provided as in the usual potentiometer—the center one being connected to grid of the last tube.

Type E—500,000 ohm Compensator—\$2.00  
"Electrad" Royalty High Resistances are also made in the following standard ranges:

- |   |        |
|---|--------|
| Type A (Variable Grid Leak), 1-15<br>to 7 megohms             | \$1.50 |
| Type B (Variable Resistance), 1,500<br>to 500,000 ohms        | 1.50   |
| Type C (Variable Resistance), 500 to<br>50,000 ohms           | 1.00   |
| Type D (B Eliminator det. control),<br>10,000 to 500,000 ohms | 2.00   |

On Sale at all good radio stores with other Guaranteed Electrad Radio Essentials.

# ELECTRAD

428 Broadway, New York City.

# COMPENSATED MULTIPLE VARIABLE CONDENSER



## One Dial Control

Here is the multiple condenser that made possible the New York Journal's sensational one-knob set.

### United Scientific Compensated Multiple Variable Condenser

It was found to be the only real and practical one-dial control unit on the market.

With this remarkable unit, New York fans are getting distance, razor-sharp selectivity, volume, tone—in fact, all-around real radio satisfaction, with only one dial.

This multiple is a straight line, low loss product and it can be built into any Tuned Radio Frequency circuit. Each condenser unit is evenly matched and balanced and the entire job is electrically and mechanically perfect.

Capacity, .00035 mfd. per unit.

Write for Full Particulars and Discounts

#### Branch Sales Offices

- |                      |                     |
|----------------------|---------------------|
| Chicago, Ill.        | Owens, Nebraska     |
| 55 W. Jackson Blvd.  | 425 Manhattan Bldg. |
| Minneapolis, Minn.   | Boston, Mass.       |
| 1036 Second Av., So. | 53 State St.        |
| San Francisco, Cal.  |                     |
| Pacific Building     |                     |

80 FOURTH AVE. NEW YORK CITY



Manufacturer	Movement	Vernier	Material			Type	Maximum capacity, m.m.l.	Method of assembly	Shaft	Overall size behind joint
			Tussaloiding	Flange	End plate					
Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.	Rotary	None	Hard rub.	Aluminum	Brass	SLF	900, 480	Stator-staked	3/4 x 3/4	4 x 4 x 0.5
.....	.....	.....	.....	.....	.....	SLC	Double 67	.....	.....	4 x 4 x 4
.....	.....	.....	.....	.....	.....	.....	Double 95, 142	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 250, 300	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 330	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 500	.....	.....	4 x 4 x 6
.....	.....	.....	.....	.....	.....	.....	Triple 85	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Triple 142	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Triple 250, 300	.....	.....	4 x 4 x 6
.....	.....	.....	.....	.....	.....	.....	Triple 350, 500	.....	.....	4 x 4 x 7
.....	.....	.....	.....	.....	.....	Mod. SLW	Double 40	.....	.....	4 x 4 x 4
.....	.....	.....	.....	.....	.....	.....	185, 98, 121, 215	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 305, 350	.....	.....	4 x 4 x 6
.....	.....	.....	.....	.....	.....	.....	Double 425	.....	.....	4 x 4 x 6
.....	.....	.....	.....	.....	.....	.....	Triple 65, 85	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Triple 131	.....	.....	4 x 4 x 5 1/2
.....	.....	.....	.....	.....	.....	SLF	Double 200	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 280, 330	.....	.....	4 x 4 x 5
.....	.....	.....	.....	.....	.....	.....	Double 450, 480	.....	.....	4 x 4 x 5
Crest Radio Corp., Chicago	.....	.....	Bakelite	Brass	Brass	Mod. SLF	500	Washer	3/4 x 5/4	4 x 3 1/2 x 3 1/2
Cruver Mfg. Co., Chicago	.....	.....	Hard rub.	Aluminum	Aluminum	SLW	250	.....	3/4 x 3/4	3 x 2 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	300	.....	.....	3 x 2 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	500	.....	.....	3 x 2 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	1000	.....	.....	3 x 2 1/2 x 2 1/2
Eight Tool Works, Inc., Elgin, Ill.	.....	.....	Bakelite	.....	Brass, sl.	SLW	250	Staked	3/4 x 1 1/4	3 1/2 x 3 1/2 x 1 1/2
.....	.....	.....	.....	.....	.....	.....	330	.....	.....	3 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	600	.....	.....	3 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	300	.....	.....	3 1/2 x 3 1/2 x 2 1/2
Elco Radio Corp., Newark, N. J.	.....	.....	Bakelite	Brass	Aluminum	Mod. SLF	115	.....	3/4 x 1 1/4	4 1/2 x 3 1/2 x 1 1/2
Elect Research Labs., Chicago	.....	.....	Hard rub.	.....	.....	SLC	275	.....	3/4 x 1 1/4	4 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	375	.....	.....	4 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	500	.....	.....	4 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	1070	.....	.....	4 1/2 x 3 1/2 x 2 1/2
Furnell Mfg. Corp., Newark, N. J.	360° sliding	.....	Pyralis	Brass	.....	Mod. SLW	250, 350, 500	.....	3/4 x 5/4	3 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	SLF	Also 500, 600	.....	.....	3 1/2 x 3 1/2 x 2 1/2
J. W. Jones Radio Mfg. Co., Inc., New York	Rotary	None	Bakelite	Aluminum	None	SLC	500	Washer	3/4 x 5/4	4 x 3 1/2 x 3 1/2
Resonance Co., Jersey City	180° slid.	.....	.....	Brass	Brass	.....	250	.....	.....	2 1/2 x 2 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	350	.....	.....	3 1/2 x 3 1/2 x 2 1/2
.....	.....	.....	.....	.....	.....	.....	500	.....	.....	3 1/2 x 3 1/2 x 2 1/2

# QUAM CONDENSERS

with the Pyrex end plate are the choice of radio engineers and experts—not only for their own receivers, but for testing work in their laboratory experiments.



## BECAUSE—

They are skillfully designed to get the best results out of a circuit and are not merely thrown together to sell at a competitive price.

Frame and plates are of brass, soldered in place.

The rotor is grounded to eliminate body capacity.

2 to 1 Helical cut gears give sharp tuning without a semblance of backlash.

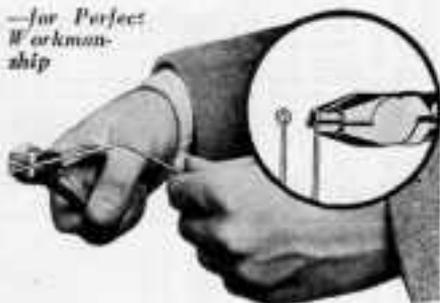
Pyrex end plate with  $1\frac{1}{4}$ " leakage paths assure lowest possible loss. (As a matter of fact the Quam shows less resistance than the laboratory standard). Straight line frequency and straight line wavelength. \$5, \$6.50 & \$7 for .0025, .0035 and .005 mufds. capacity. With 4" bakelite 360 degree dial, add \$1 to above prices.

Let us send you samples. Quam Audio Frequency transformers \$5.

**QUAM Radio Corporation**

1925 S. Western Ave.  
Chicago

—for Perfect  
Workman-  
ship



## Range

### COMBINATION RADIO PLIERS

(Patent applied for)

**M**ADE for the man that takes pride in his set, Range Pliers form perfect "loops" to fit both 6/32 and 8/32 screws. The pins, of chilled steel, cannot be damaged or broken.

Range Pliers cut sharp and clean. They bend angles without scratching your wire or bus bar. They'll do any job that ordinary pliers can do, and do it better. With them, you can wire any set in half the time, making perfect contacts without the mess and bother of soldering. They're guaranteed for one year. Price, \$3.50. Use the FREE TRIAL Coupon—today!

## RANGE CORPORATION

86 Church St., New York, N. Y.

Range Corp., 86 Church St., New York, N. Y.  
Send me a pair, postpaid—on 1-day FREE TRIAL.  
I enclose \$3.50. If not entirely satisfied I'll return  
the Pliers and you are to refund my money.

(Name) .....

(Address) .....

..... E

Manufacturer	Movement	Vernier	Material			Type	Maximum capacity, m.o.l.	Method of assembly	Shaft	Overall size behind panel	
			Insulating	Plate	End plate						
Karns Electric Co., Chicago	Rotary	None	Hard rub.	Brass	Bronze	SLF	100	Staked	3/4 x 7/8	6 1/4 x 4 1/4 x 2 1/4	
			"	"	"	"	233	"	"	"	6 1/2 x 4 1/2 x 2 1/4
			"	"	"	"	370	"	"	"	6 1/4 x 4 1/2 x 2
National Co., Inc., Cambridge, Mass.	Dial 5:1	None	"	Duralumin	Duralumin	SLC, SLW, SLW	200, 320	Washer	3/4 x 5/8	2 1/4 x 2 1/4 x 2 1/4 to 4 1/4	
			"	"	"	"	500 and 1000	"	"	"	4 x 2 1/4 x 2 1/4 to 4 1/4
			"	"	"	"	"	"	"	"	"
Facet Elec. Co., New York	"	None	Isolastic	Brass	Brass	SLF	500	Staked	3/4 x 3/4	2 1/4 x 4 1/4 x 1 1/4	
			"	"	"	"	500	"	"	"	2 1/4 x 4 1/4 x 2
			"	"	"	"	500	"	"	"	"
Phenix Radio Corp., New York	"	None	Bakelite	Brass	Brass	SLW	500	Die cast	3/4 x 5/8	2 1/4 x 2 1/4 x 2 1/4	
			"	"	"	"	500, 680, 90, 100	"	"	"	2 x 2 1/4 x 2 1/4
			"	"	"	"	200	Staked	3/4 x 3/8	2 x 2 1/4 x 2	
Premier Elec. Co., Chicago	"	None	Hard rub.	"	Brass	SLW	350	"	3/4 x 3/8	2 x 2 1/4 x 2	
			"	"	"	"	350	"	"	"	2 x 2 1/4 x 2 1/4
			"	"	"	"	500	"	"	"	2 x 2 1/4 x 2 1/4
Quam Radio Corp., Chicago	Gear 2:1	None	Pyrex	"	Pyrex	Mod. SLF	750	"	"	2 x 2 1/4 x 2	
			"	"	"	"	750	"	"	"	2 x 2 1/4 x 2
			"	"	"	"	250	"	"	"	2 x 2 1/4 x 2
Hathorn Mfg. Co., Inc., Jamestown, N. Y.	None	None	Bakelite	Aluminum	Bakelite	SLW	500	Die cast	3/4 x 5/8	2 1/4 x 2 1/4 x 2 1/4	
			"	"	"	"	150, 200, 250	"	"	"	2 1/4 x 2 1/4 x 1 1/4
			"	"	"	"	300, 320	"	"	"	2 1/4 x 2 1/4 x 2 1/4
Enclosed types.	"	None	"	"	"	"	500	"	"	2 1/4 x 2 1/4 x 2 1/4	
			"	"	"	"	150, 200, 250	"	"	"	2 1/4 x 2 1/4 x 2 1/4
			"	"	"	"	300, 320	"	"	"	2 1/4 x 2 1/4 x 2 1/4
Silver-Marshall, Inc., Chicago	Friction	None	Hard rub.	Aluminum	Brass	SLW, SLF	250, 320, and 500	Washer	3/4 x 5/8	2 1/4 x 2 1/4 to 3	
			Bakelite	"	Aluminum	SLW	350	Die cast	"	"	2 1/4 x 2 1/4 x 2 1/4
			Bakelite	"	Aluminum	SLC	350	Staked	"	"	2 1/4 x 2 1/4 x 2
E. S. Labov, Inc., New York	None	None	"	"	"	"	500	"	"	2 1/4 x 2 1/4 x 2 1/4	
			"	"	"	"	350	"	"	"	2 1/4 x 2 1/4 x 2 1/4
			"	"	"	"	500	"	"	"	2 1/4 x 2 1/4 x 2 1/4
E. S. Tool Co., Newark, N. J.	Vernier type	None	Hard rub.	"	"	Mod. SLF	250	Pat. case joints	"	2 1/4 x 2 1/4 x 2	
			"	"	"	"	300	"	"	"	2 1/4 x 2 1/4 x 2 1/4
			"	"	"	"	350	"	"	"	2 1/4 x 2 1/4 x 2 1/4
"	None	None	"	"	"	"	500	"	"	2 1/4 x 2 1/4 x 2	
			"	"	"	"	300	"	"	"	2 1/4 x 2 1/4 x 2 1/4
			"	"	"	"	500	"	"	"	2 1/4 x 2 1/4 x 2 1/4
"	None	None	"	"	"	"	500	"	"	2 1/4 x 2 1/4 x 2 1/4	
			"	"	"	"	300, 500	"	"	"	2 1/4 x 2 1/4 x 2 1/4
			"	"	"	"	Triple 250, 300, 350, 500	"	"	"	2 1/4 x 2 1/4 x 2 1/4

# Better Tone!

-- with dry cells and UX120  
than with storage batteries

*Note: The UX120 is a new three volt dry battery power tube. Used for audio frequency amplification, this tube will produce better quality and greater loud speaker volume than regular storage battery tubes.*

Any set owner can easily install a UX120 tube in his set in a few minutes by using the new Na-Aid Number 120 Connectoraid. It is a simple, efficient means of introducing the necessary additional "B" and "C" voltage required for this tube into the plate and grid circuit without rewiring the set. As easy to use as an adapter.

Just slip the Connectoraid onto the UX120 tube and put the tube in the socket. Connect the batteries and well, that's all there is to it--except to enjoy a quality and volume you would not have believed possible. No need to fuss with charging batteries. The simplicity, economy and freedom from attention characteristic of dry cells is now combined with the real volume and quality previously obtainable only with storage battery tubes.

The No. 120 Connectoraid is suitable for all sockets--metal neck as well as insulated. For sale at radio, electrical and hardware stores. Price, \$1.25.

## No-Aid Adapters



### Na-Aid Adapter 419-X

With this adapter the Na-Aid de Luxe Socket will take the new UX120 small base tube. Price, 419-X, 35 cents.

### Na-Aid 420 Connectoraid

No. 420, equipped with cables, enables owners of Radiola Super-Hot to get the great increase in volume and clarity the new UX-120 tube develops. Price, 420, \$1.75.



### Na-Aid Adapter 421-X

No. 421-X makes possible the shift from WD-11 to UX tubes. Especially designed to enable owners of Radiolas III, and III-A to enjoy the improved operation the new tubes provide. Price, 75c.

All Na-Aid products are for sale at radio, electrical and hardware stores everywhere. Send for complete data on adapters for new tubes.

### ALDEN MANUFACTURING COMPANY

Also makers of the Famous Na-Aid Sockets and Dials

Dept. N 2

Springfield, Mass.



# RAYTHEON

The tube that has perfected the  
B-battery eliminator



Perfected, because of the application of new and fundamentally sound principles to the rectifier. B-eliminators or parts, specially designed for use with RAYTHEON tubes are made by them and other well-known manufacturers, and are now on sale at your dealer's:

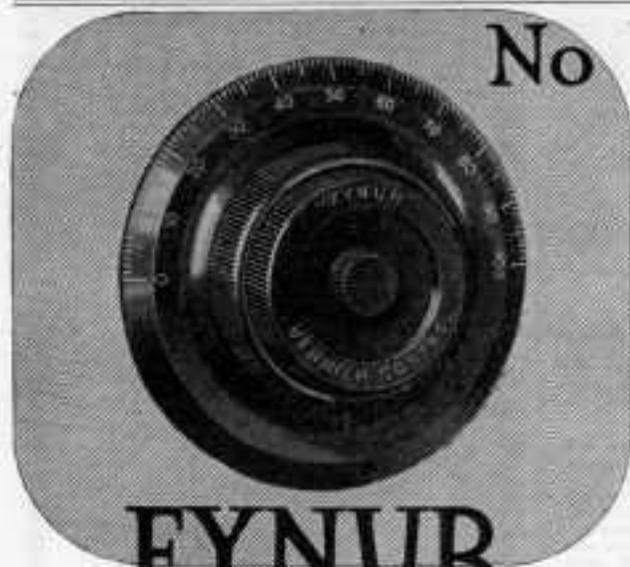
Acme Apparatus Co., Cambridge, Mass.  
All-American Radio Corp., Chicago, Ill.  
Dongan Electric Mfg. Co., Detroit, Mich.  
General Radio Co., Cambridge, Mass.  
Jefferson Electric Mfg. Co., Chicago, Ill.  
Mayall Radio Mfg. Co., New York, N. Y.  
Thorndson Electric Mfg. Co., Chicago, Ill.  
Tobis Deutschmann Co., Boston, Mass.

## RAYTHEON

Long Life \$6 Economy  
No Filament 6 Reserve Power

RAYTHEON MANUFACTURING CO.  
CAMBRIDGE, MASS.

Wholly AMERICAN APPLIANCE COMPANY



# No Backlash in this New Dial

## FYNUR VERNIER CONTROL

And that's only one of the Fynur's many mechanical superiorities. The dual control permits of a quick, general setting as well as infinitely fine vernier adjustment.

It's beautifully made—and so simple in construction that a child could take it apart and re-assemble it.

It operates by traction (not gears) so there can be no possible backlash or lost motion.

The Fynur is a quality dial for those who want the best. If not obtainable in your vicinity, we will gladly mail the desired quantity on receipt of price, \$3.50 each.

**AUGUST GOERTZ &  
CO., INC.**

270-286 MORRIS AVE.,  
NEWARK, N. J.



"A new 5-Tube Set with all the power and none of the grid of the Super" — so wrote Henry M. Neely, Editor of Radio in the Home, Philadelphia.

## Get This Book

Write today for this big fascinating 32-page booklet which tells how you can build the truly amazing new QUADRAFORMER receiver. Based on a new radio principle, five tubes give remarkable results.

Enclose 10c and you'll have it by return mail

**Gearhart-Schlueter Radio Corp'n**  
715 Younman Avenue, Fresno, California



## EBY CUSHION SOCKETS

*Provide a positive contact  
on a shock-absorbing base*

You can maintain a positive contact at all times, regardless of the size of the tube prongs or the amount of solder on the prong tip, with this new socket.

By an ingenious shock-absorbing feature EBY Cushion Sockets eliminate microphonic noises and are a guarantee against tube damage.

These sockets give the advantages of interchangeability and other desirable features of the new U. X. Tubes.

Don't take a chance on twenty loose connections in a five tube set. Ask your jobber about EBY Cushion Sockets today or write for complete information.

**H. H. EBY MFG. COMPANY,**  
4710 Stanton Ave., Philadelphia, Pa.  
Makers of EBY Quality Binding Posts

# For Long Distance with Big Volume and Keen Musical Quality



## -Install a pair of **KARAS** Harmonik Transformers in your radio set

**K**ARAS Harmonik Transformers deliver perfect music with loads of volume from stations one to two thousand miles away. Distant reception worth listening to!

With Karas Harmoniks in your set, you can truly enjoy radio broadcast music from near or from far. You can get it in all the volume desired without crowding your receiver to the distorting point. You can sit back in your easy chair and listen with keenest pleasure.

"Fishing" for distant stations becomes a matter of finding programs you want to hear—not straining to catch only the bare announcement, and compiling a list of call letters.

There's power and to spare in Karas Harmoniks. Power that brings the biggest volume without distortion. You hear big, full, round, sonorous tones because you get the complete musical tone. All the vital harmonics and rich overtones are there in all their naturalness. Low notes, middle notes and high notes all are amplified to the same degree—a rare achievement for audio frequency transformers.

The true characteristics of all musical tones are recreated in your speaker. Piano music pours forth with the rich beauty of the concert hall. The pure, liquid tones of a violin played a thousand miles away cannot be detected from those of a violin played in the same room. The inflections of the human voice are all retained—the very breathing of the microphone—the soft elusive sounds of S and Z.

If this is the kind of reception you want—whether distant or local, you want true Karas Harmoniks in your set. It's the only way you can get it over the radio. Don't wait to build a new set. Take the old transformers out of your present set and install a pair of Karas Harmoniks. The master you do, the music you will enjoy the highest quality of radio reception.

**KARAS ELECTRIC CO., 4162 N. Rockwell St., Chicago**  
For over 30 years makers of PRECISION Electrical Apparatus

\$7<sup>00</sup> Each  
at your  
Dealer's

**30 Day  
money Back  
guarantee**

—wherever you buy. If your dealer is out, order direct on this coupon. Send no money. Just pay the postman.

Karas Electric Co.  
4162 N. Rockwell St., Chicago, Ill.

Please send me \_\_\_\_\_ pair(s) of Karas Harmonik Audio Frequency Transformers. I will pay the postman \$7 apiece, plus postage, on delivery. It is understood that I am privileged to return the transformers any time within 30 days if they do not prove entirely satisfactory to me, and my money will be refunded at once.

Name \_\_\_\_\_

Address \_\_\_\_\_

If you send cash with order we'll send Transformers postpaid.



**Oh boy**  
**KESTER**  
*Rosin Core*  
**Radio SOLDER**

*Sure to Sift and Simple*  
 APPROVED BY RADIO ENGINEERS  
 A GENUINE SOLDER  
 CHICAGO SOLDER COMPANY

4224 Weyburn Ave., Chicago, U.S.A.

Wholesale and Retail Dealers Everywhere  
 Write for Literature

**B-K Mast Fittings**  
 are easily attached anywhere



These Fittings with  $\frac{1}{4}$ " pipe makes up a rigid and durable antenna installation.

—Price per set, \$1.50—

**ROBERT H. KIMES**

907A Schwind Bldg., Dayton, Ohio

Write for Literature



TRIDOT THREE STAGE RESISTANCE COUPLED AMPLIFIER, entirely assembled with 6 resistors and 3 .006 mica condensers. BETTER THAN TRANSFORMERS. LIST PRICE.....\$6.75 per complete Kit

Each kit of 3 Resistor-Couplers packed in attractive carton.

## SCORES

of RADIO MANUFACTURERS have adopted TRIDOT grid leaks as standard equipment for the receiving sets which they manufacture. TRIDOT grid leaks are impregnated, guaranteed accurate, and permanently noiseless.

Large scale production means decreased costs. These economies are passed on to users of TRIDOT products.

Correspondence is invited from reliable manufacturers and jobbers.



Your Own Name or Trade Mark  
 on Any Item

# TRIDOT

(Registered Trade Mark)

TRIDOT ELECTRIC CO., INC.

16 HUDSON ST., NEW YORK CITY

**SM****SILVER  
SIX****"SIX" FEATURES**

- 1 **SELECTIVITY** The "Six" may be adjusted to cut the sidebands on any broadcasting station.
- 2 **SENSITIVITY** The "Six" will go below the average, favorable noise level from its small antenna or loop.
- 3 **RANGE** Possesses an unlimited range. Will cover present American and Foreign Stations as well as all future wavelengths.
- 4 **S. I. F. Feature** In the "Six" means real ability to select and separate short wave stations.
- 5 **QUALITY** Almost perfect due to use of three stages of resistance coupled audio amplification.
- 6 **VOLUME** In excess of all practical requirements.

Designed by McMurdo Silver, Assoc. I. R. R.  
Complete description sent upon request.

**Silver-Marshall**

Inc.

108 S. Wabash Ave., Chicago

**C-10 Super  
Heterodyne****DETAILED CONSTRUCTION  
BLUE PRINTS**

The most sensitive and selective Super-Heterodyne set ever designed. It combines tuned radio frequency amplification with an improved Super-Het circuit, using 10 tubes. Full-size construction blue prints for this famous model can now be obtained from the Radio Engineering Blue Print Department.

**Price: Five Dollars Per Set**

Note: These prints give all data, parts lists, and other information necessary to build the C-10 model.

**M. B. SLEEPER, Inc.**

A-52 Vanderbilt Ave., New York City

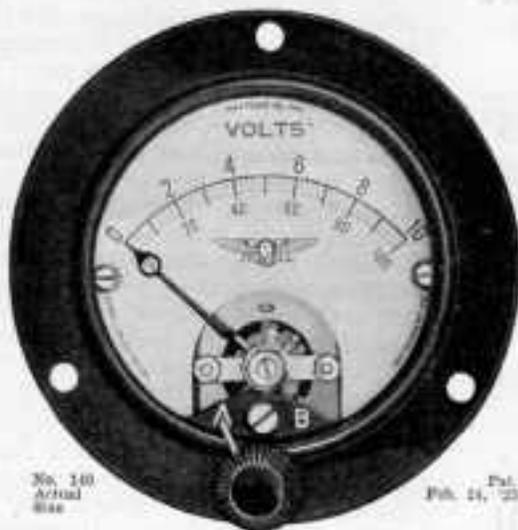
**From Herbert Hoover's Address to  
the 4th Conference**

**U**P to the present time, we have had a policy of absolute freedom and untrammelled operation, a field open to all who wished to broadcast for whatever purpose desired. I am convinced that policy was sound. It resulted in a wonderfully extensive development which could have been obtained in no other way. We have today 578 stations, and as no more than four of them are under the same management, no one can say there is not plenty of competition. Today every solitary channel in the ether is occupied by at least one broadcasting station and many of them by several. Of the 578 stations, 197 are using at least 500 watts of power, and there are now pending before the Department of Commerce over 175 applications for new licenses.

Higher power has greatly strengthened the service to listeners, but it has aggravated the problem of providing lanes through the traffic, for geographical separation must be greater. Heretofore, it has been possible to duplicate channels geographically to a large extent among those using 500 watts, but with the increase of power, this system becomes more and more difficult, for the borderland of interference is wider spread. We must face the actualities frankly. We can no longer deal on the basis that there is room for everybody on the radio highways. There are more vehicles on the roads than can get by, and if they continue to jam in, all will be stopped.

It is a simple physical fact that we have no more channels. It is not possible to furnish them under the present state of technical development. It takes no argument to demonstrate that 89 wave lengths, and no more are available, cannot be made to serve innumerable stations.

One alternative, which would only partly solve the problem, would be to increase the number of stations by further dividing the time of the present stations down to one or two days a week or one or two hours a day. From the listener's viewpoint, and that is the only one to be considered, he would get a much degenerated service if we were to do that.



No. 140  
Actual  
Size

Pat.  
Feb. 24, '23

## Read

—filament and "B" Battery voltage with one instrument. (Switch self contained.)

Just what engineers, manufacturers and set owners have been looking for—A high resistance double reading voltmeter in a two inch case.

Just say that you are a radio engineer and we will send you a bunch of radio instrument literature.

### Jewell Electrical Instrument Co.

1650 Walnut St., Chicago

"25 Years Making Good Instruments"

## DURHAM

### Variable Leaks

### Make Good Tubes Better



#### Standard Type

For any set. Snap in place of present fixed leaks. Adjustable in line with tube makers instructions.

75c



#### New Panel Mount

Accurate control of detector or audio at your finger tips brings better results.

\$1

**There's a DURHAM for every need**  
No. 100—1,000 to 100,000 ohms (audio).  
No. 101—.1 to 5 megohms (for UV-200 and W2-12).  
No. 201A—.2 to 10 megohms (for UV-199 or 201A tubes).

**DURHAM & CO., Inc.**  
1930 Market St., Philadelphia



## "BUFFALO"

### (TYPE) ONE HOLE MOUNT

### RHEOSTAT

Guard over contact slider eliminates all strains and prevents slider from breaking, bending, or twisting, assuring permanent contact. Break in resistance wire towards all end point on resistance unit, gives contact slider a continuous smooth running surface without dropping off the wire as contact sliders do on all other Rheostats.

The Buffalo type Rheostat is recommended to manufacturers as the best Rheostat manufactured for commercial use.

Made under DeJur exclusive patents.

### DeJur Products Co

199 Lafayette St., New York

## The B-T "Euphonic" Sets New Standards of Radio Reception



2.2 to 1, Price: \$5.00

4.7 to 1, Price: 5.75

A great improvement in iron distribution and more turns by 50 per cent than in the average "good" transformer.

B-T research has proved the value of these features to better sound reproduction.

A leading technical laboratory says of B-T Euphonica, "The best we ever tested."

We are confident no other method of amplification will give equal results.

Send for Literature describing B-T "Euphonica."

**Coming—**

### The Silent Socket

Watch for the appearance of B-T Silent Sockets. Put one on your detector and you won't recognize it as the same set.

This new B-T device eliminates microphonic noises,—and is the first thing we have found that is effective.

Price, including a B-T Universal Socket, \$1.25.

*Pioneers of "Better Tuning"*

**BREMER-TULLY MFG. CO.**

532 S. Canal St., Chicago, Ill.

## Why set manufacturers should use Radion Panels

*Appearance.* Radion Panels have a high-polished, satin-like finish that enhances the attractiveness of any set. They come in two colors, standard black and Mahoganite; the Mahoganite panels with their beautiful coloring and graining give an effect that is especially distinctive. Radion takes engraving beautifully.

*Efficiency.* Built to order exclusively for radio purposes, Radion meets the most exacting tests for high insulating qualities. Surface leakage and dielectric absorption have been proved to be exceptionally low. This is an aid in getting distance and volume.

*Convenience.* Another feature that recommends Radio Panels to the manufacturer is the ease with which they can be cut, sawed and drilled. Edges are smooth and even; holes are trim and clean-cut. Radion does not chip as do other panel materials.

*We invite manufacturers' inquiries*

WE ARE always glad to co-operate with manufacturers in meeting their requirements. We invite them to send us samples or specifications of panels and other insulated parts of radio instruments or radio sets. Radion is used on the leading makes of condensers.

AMERICAN HARD RUBBER COMPANY  
Dept. M N 8, 11 Mercer St., New York City

**RADION**  
*The Supreme Insulation*

# Hear Europe with the Universal Plio-6



35 Meters to 3400 Meters

## No Batteries

are required even to operate the powerful receiver pictured above, if you use the new laboratory type

## Model A Power Unit

A new broadcast receiver representing the highest type of efficiency obtainable in point of extreme range, tremendous audibility and remarkable selectivity.

### Maximum Efficiency—Inexpensive

Facts or Completely Constructed

Write for information today

## NORDEN-HAUCK, Inc.

Engineers

1617 Chestnut Street, Philadelphia, Pa.

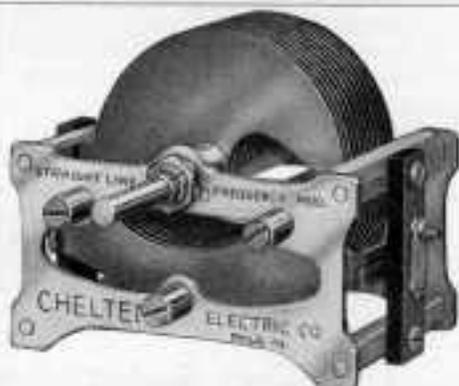
## HARD RUBBER PUNCHED GOODS CO.

148-150 Mulberry St., Newark, N. J.

Manufacturers of

BINDING STRIP PANELS  
BLOCKS AND STRIPS  
BUSHINGS  
CONDENSER END PLATES  
DISCS  
PANELS  
PICTURE FRAME BACKS  
AND EASELS  
PHONE JACK INSULA-  
TIONS  
ROD  
STRIP INSULATIONS FOR  
CONDENSERS  
TRANSFORMER INSULA-  
TIONS  
TUBING  
WASHERS AND OTHER  
ELECTRICAL INSULA-  
TIONS.

If it's made from Sheet, Rod or Tube we make it



## THE CHELTEN Straight Line Frequency Condenser

(Modified)

A real Condenser scientifically designed from practical operating standpoint. Dependable in every way. Spreads low wave stations. Provides uniform separation over tuning range. Standard frame-welded brass plates.

Send for our booklet "Straight Line Frequency Tuning," an authoritative study on this vital subject. It's free.

CHELTEN ELECTRIC CO.,  
4859-65 Stenton Avenue, Philadelphia



"One-direction" speakers make "reserved seats" necessary, if you would hear clearly. Shaded portion indicates where the broadcasting has force and clearness.



The "all-direction" N & K Model S Speaker sends the tone all over the room.

## No "Reserved Seats" Needed

THE new N & K Model S Imported Loudspeaker is always pointed in *your direction*, no matter whereabouts in the room you are. It took N & K, pioneers in acoustics, to bring this revolution in speaker construction.

9½ inches high on a 6½ inch base. Made of burtex, a scientific material which eliminates false tone vibrations. Contains the famous N & K diaphragm unit, adjustable to every local broadcasting condition and variation in receiver construction. Tone clear, natural and lifelike. Volume equal to that of speakers costing several times as much money. Yet it sells for—

only **\$12.50** In Canada \$15

The popular price makes it a very profitable piece of merchandise for the dealer. Its all-direction feature and its excellent tone helps greatly in the demonstration and sale of complete sets. If your jobber is not yet supplied, get in touch with us.

N & K Imported Phones  
4000 ohms. List \$8.50  
N & K Imported Phonograph  
Unit. List \$7.50  
N & K Imported Loudspeaker  
Model W. List \$22.50

# The New Imported LOUDSPEAKER

MODEL S

NEUFELDT & KUHNKE DIVISION

Dept. K, 12, Th. Goldschmidt Corporation, 15 William St., New York City

# AMPLION

The World's Standard  
Loud Speaker

Alphonse Guzman & Co.  
London, England,  
Paris, France



Its clear  
tone comes from 30 years of  
loud speaker experience

Dealers, Jobbers & Retailers—wide advertising on a  
greatly extended basis makes The Amplion pro-  
position an attractive one. Write for full particu-  
lars concerning this internationally popular spec-  
imen of the original and oldest makers of  
loud speakers.

The Amplion Corporation of America  
Suite W, 280 Madison Ave., New York City  
Incorporated in Canada, Ltd., Toronto

To-day  
-in every  
good set!



Every Tube  
Full of Life!

What a wonderful difference AMPERITE makes! Every tube is so brimful of snap, so eager to deliver 100% value. Individual tube regulation to meet each tube's individual needs is the answer. And only AMPERITE can fill that requirement. Permits the use of any type or combination of tubes. Specified in all popular construction sets. Price \$1.10. There is an AMPERITE for every tube.

Write for free book-lets

Radiant Company

Dept. R. E.-16, 58 Franklin St., N. Y. City

# AMPERITE

The "SELF-ADJUSTING" Rheostat

# RADIO DEALERS

These Dealers are making  
money by selling "How to  
Build Long Distance Radio  
Sets"

CHARLEY IZENSTARK has sold 200  
copies of How to Build Long Distance  
Radio Sets since this M. B. Sleeper book  
was brought out on Sept. 25th.

COAST RADIO SUPPLY CO. has sold  
500 copies.

E. P. MILL has sold 200 copies.

OLIVER C. SCHROEDER CO. has sold  
200 copies.

These names have been picked at random  
from our order files. They have not only  
made a 100% profit on these books but  
a much bigger profit from the sale of  
parts to build the sets described.

"HOW TO BUILD LONG  
DISTANCE RADIO SETS"

is a 48 page book, printed on the finest  
paper, 6½ by 9½ ins., fully illustrated  
with detailed photographs, picture wiring  
diagrams, and circuits.

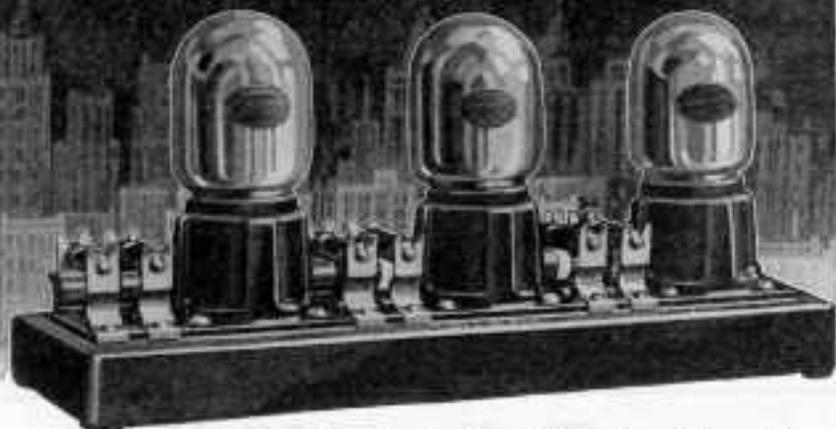
The designs shown include the famous  
Browning-Drake Five, Silver-Marshall  
Super-Autodyne, Browning-Drake 199  
Set, and the Samsen T. C. All these sets  
use standard parts which you have in  
stock.

The price of this book is 25c less 50%.  
Sell these books to keep parts moving.

SEND IN A TRIAL ORDER  
FOR TWENTY-FOUR COPIES

M. B. Sleeper, Inc.  
Technical Publisher  
A-52 Vanderbilt Ave.,  
New York

# Daven Tubes



## Resistance Coupled Amplification For All

THE Daven Super-Amplifier is for set owners who want more volume or for set builders or manufacturers who want resistance coupled amplification without the labor of assembly.

All the plate resistors, grid leaks and fixed condensers of the proper value, as well as all necessary binding posts, are supplied. There is nothing to do but connect with the tuner and the batteries.

Thousands have changed over their amplifiers to the resistance coupled system and testify to the wonderful improvement in richness and sweetness of tone and hearty, generous volume. The Daven Super-Amplifier makes even the best set a little better.

### A ONE-PURPOSE TUBE

The new Daven Tube MU-20, 6 volt,  $\frac{1}{2}$  ampere, increases the amplification of The Daven Super fifty percent, without distortion. The tone remains sweet and true. Daven Power Tube Type MU-6 is recommended for the last or output stage in any set.

Any Daven dealer will show you how to hook up the Daven Super-Amplifier.  
DAVEN PRODUCTS ARE SOLD ONLY BY GOOD DEALERS

*"The Sign of Merit"*  
**DAVEN RADIO CORPORATION**  
*Resistor Specialists*

Newark

Eng. U. Pat. OR.

New Jersey



#### Resistor Manual

The Handbook of Resistance Coupled Amplification at less than dealer's price. Direct by mail, postpaid 30c.

#### CLIP THIS COUPON

8-13-33

DAVEN RADIO CORPORATION  
126-140 Newark Street  
Newark, New Jersey

Please send me the following on Resistance Coupled Amplification:

Check one:

- Resistor Manual. 35c is enclosed.  
 Complete catalogue (free).

Name .....

Address .....

Please do not send your letter back or card, as this coupon and we will have our nearest distributor communicate with you.

**THE BIG LITTLE THINGS OF RADIO**

# NEW CARTER ITEMS

Original — Exclusive

"IMP" Pilot Switch



\$1.50

A red Pilot light shows when your "A" battery is "On"—no chance for going away and leaving your tubes burning. Single hole mounting, quarter turn switch—compact. Simple. Carter quality.

"Dialite"



\$1.75

Eliminate shadows and permit exact readings for logging your dials. Quarter turn snap switch combined with the light. Permits light to be turned off if desired when set is operating.

"Flat" Plug



\$0.75

Fits snugly against panel. Harmonizes with your Knobs and Dials and adds to the appearance of your set. Carlsburg down. Unightly tips uncracked. When set is closed, plug can be left in.

These and other new and original Carter products can be seen at your dealers. Ask him about them.

Works on 6 or 4½  
Valve Battery  
Draw negligible.



REGISTERED

## The New KURZ-KASCH Aristocrat E-Z-TOON Group Control (EASY TUNE)

Makes possible the tuning of two or more units with but one master control and in addition provides for Vernier adjustment of each unit.

Moving the master dial slowly usually gives indication of any station. As soon as the station has been located the tuning can be perfected by rotating the correcting Vernier on each unit.



Front View

The group control is simple to install. Everything complete—no additional parts to buy. It being unnecessary to drill the panel.

The parts consist of a small gear to fit over the shaft of each unit and a gear rack held in place by a small spring. This gives positive and simultaneous movement of each unit.



Kit Closed

The non-back lash, smooth adjustment of the Aristocrat E-Z-TOON dial has been maintained in each unit.

Complete with instructions in attractive Kit . . . . . \$7.50

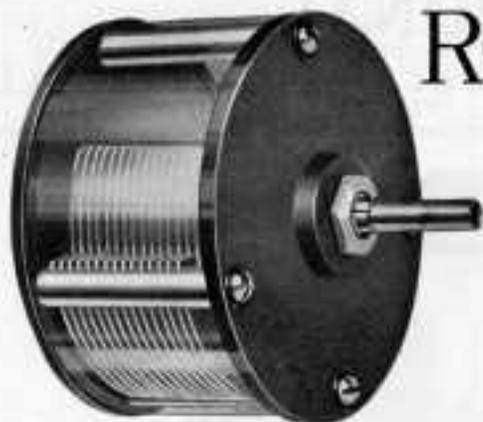
Write for illustrated folder giving complete information on this and other Kurz-Kasch Products

The Kurz-Kasch Company  
Largest Exclusive Molders of Babolite  
Dayton, Ohio.



Kit Open

# RATHBUN RADIO APPARATUS



## A Real Good Condenser

Among the superlatives and extravagant claims broadcast on radio apparatus—Rathbun Condensers stand out as real good condensers—at a fair price.



The end plates are of special Rathbun-enameled white enameled with an accuracy of 1/32nd of an inch. That dimension and size do not cause the plate to warp or change its perfect electrical constants.

Note that there is a spring chuck at the rear bearing plate. Adjusts down the tapered, with a joint bearing which wears down quickly.



The plates are held by slots in the tube. These cutouts are established by an intricate, expensive die casting process.



It may be seen that an unusually large area of contact is allowed on both top and side. The spring chuck bearing eliminates play, and it is so accurate that the front bearing alone keeps the Rathbun plates in perfect alignment.

Rathbun Condensers are guaranteed electrically and mechanically perfect. They are as well made, as skill, the best materials, and the honest desire to give full value can make them. In actual results you will find them *always* satisfactory.

Buy Rathbuns—try them on your set. The single hole mounting and pyralin dust bands are real features. And bear this in mind—if you can get better results in distance, tuning or volume from any other condenser your money will be immediately refunded.

**Rathbun Manufacturing Co.**  
INC.  
Jamestown, New York

# NATIONAL VARIABLE, *Velvet Vernier* DIAL

**Positive  
Control**

**Easily  
Mounted**

**Gearless**



**Variable  
Ratio**

**Velvet  
Smoothness**

**Ornamental**

**TYPE B**  
Patents Pending

This dial embodies a modified application of our "Velvet Vernier" mechanism designed to facilitate mounting on the  $\frac{1}{4}$ " shaft of any standard type of variable condenser, without the use of tools other than a screw-driver. It will replace plain dials on any receiver where sharper tuning is desired.

Of special importance is a new and novel device which enables the user to adjust at will the reduction to any ratio from 6-1 to 86-1. This feature aids greatly in the separation of stations operating on the lower wave lengths. This new dial is moulded from black bakelite in a highly ornamental design with perfectly uniform graduations.

## PRICE LIST

Catalog Symbol	Specifications	Price, Nickel Finish	Gold Finish
V. B. C.	Clockwise 0-200 (360°)	\$2.50	\$3.00
V. B. C. C.	Counter-Clockwise 200-0 (360°)	2.50	3.00

**NATIONAL CO., Inc.**

*Established 1914*

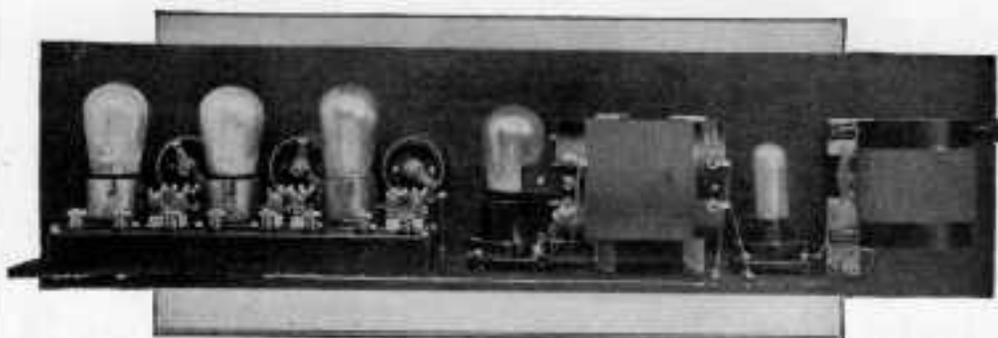
**110 Brookline Street**

**Cambridge, Mass.**

A very interesting and efficient audio amplifying unit made by the National Co. will be described in this space in the January issue.

# BROWNING-DRAKE FIVE

*New Type S.L.W. Tuning Units*



Parts Listed Below, All Panels Drilled and Engraved, \$59.90

## PARTS LIST, TYPE 1000, BROWNING-DRAKE RECEIVER

Type No.	Name	Price	Type No.	Name	Price
8035	1-Benjamin UV-201A Socket	\$1.00	8	1-Metro Keesek Switch	0.75
8040	1-Benjamin UV-120 Socket	1.00	B-D	1-Complete National Kit	32.00
TJ	2-Tylocks	2.50	B.P.	1-0.001 mfd. New York Coil	
SA	1-Daven Super-Amplifier	15.00		Fixed condenser	.40
G	1-3 Menzobn Eagle Grid-leak	.50		1-0.0025 mfd. New York Coil gridleak condenser	.45
P	1-Black Celoron Panel, 7 x 28 x 2/16 in.	4.50	38	2-Pkgs. of 53 soldering flux	.90
P	1-Black Celoron Panel, 3 1/2 x 5 3/8 x 2/16 in.	1.97	105	1-Angle bracket	.10
601	1-0001 Meadon	.33	14	10-Coil mounting pillars	.60
K	3-Ensign Binding Posts, plain top	.45	62	1-Pkg. of 10 1/2-in. 6-32 F. H. nicked screws	.12
	1-ohm Rheostat	1.50	43	2-Pkgs. 5/8-inch 6-32 R. H. nicked screws	.20
	1-20-ohm Rheostat	1.50	6	1-Pkg. of 10 3/4-in. 6-32 R.H. nicked screws	.14
	1-30-ohm Rheostat	1.50	143	1-Pkg. of 10 1 1/2-in. 6-32 R. H. nicked screws	.18
W	1-100 ft. spool of Wire	.50	49	2-Pkg. of 10 6-32 nicked nuts	.24
MR	2-Lengths No. 7 special varnished tubing	.30			

If you do not want to buy the complete Browning-Drake parts you can get any individual parts from DURRANT at the prices given above.

## RX-1 Construction Kits, Delivery for Christmas

If you want to hear the Christmas Carols with a fidelity of reproduction which will bring the spirit of Christmas to every member of your family, if you want real Christmas music unspoiled by distortion, unmarred by faulty tuning, put in an order immediately for an RX-1. It will be shipped immediately, allowing you time to get it working before the holiday.

Complete, illustrated instructions are furnished, with picture wiring diagrams and step-by-step assembly instructions. All parts required, including Celoron panels drilled and engraved, postpaid.....\$32.50

(Add \$1.00 for shipping west of the Rocky Mountains)

D-21 Sodium Tubes for use with RX-1.....\$5.00

**DURRANT RADIO, Ltd.**  
 SUPPLIERS TO RADIO SET BUILDERS AND EXPERIMENTERS  
 T-52 Vanderbilt Avenue  
 New York City





# Mohawk

Manufactured by Mohawk Corporation  
of Illinois, Independently Organized in 1924

## Radios - Kits - Parts

### 5 Tubes—Just One Dial to Tune

Mohawk No. 143 Kit includes Mohawk Three-tube balanced condenser, Mohawk Selecting Dial, three standard Motorola vacuum tube frequency Transformers. With this kit you can convert any five-tube, three dial tuned radio frequency receiver into a one-dial set. Price \$22.00 complete.



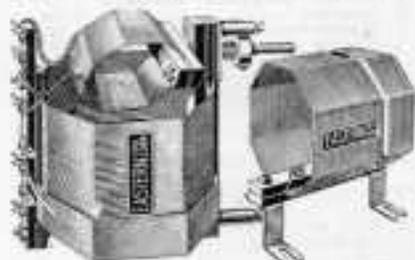
Mohawk Three-tube Balanced Condenser—*"The Heart of the Mohawk Radio."* Price \$12.

All the parts of the famous one dial Mohawk Radios can now be bought separately. You can easily assemble the complete Mohawk or install any parts of this remarkable set in the radio you are building or re-building. Only with the Mohawk three-tube balanced condenser can you get Mohawk performance and the unmatched simplicity of the Mohawk one dial control. This condenser is exclusive to Mohawk.

The separate parts come conveniently packed with full instructions for their use and installation. Mohawk Radios, Parts and Kits are sold by leading dealers.

Manufacturers  
Mohawk Corporation of Illinois Inc.  
Independently Organized in 1924  
Chicago, Ill.

Sales Department  
The Eiko Company  
1333 So. Michigan Ave.  
Chicago, Ill.



## EASTERN KNOCKOUT COILS

### Type R

Designed in strict accordance with Radio Broadcast specifications for the "Aristocrat" and for all Roberts Knockout Circuits, reflexed or unreflexed.

Per set, \$8.50

Eastern Coils are all in the efficient low loss pieble bottle form of winding, designed by M. B. Sleeper, guaranteed incomparable for the M. B. Sleeper RX-1, (\$6.00 per set). BROWN-ING-DRAKE (Type B-D, \$8.00 per set). THREE CIRCUIT SET, (Type 3-C Coupler, \$6.00), and for other leading circuits. Circular on request.

At your dealers or direct, postpaid.  
EASTERN COIL CORPORATION  
22 Warren St., Dept. R.E. New York



## Quality—the Key to Permanent and Profitable Patronage

### APEX VERNIER DIALS

RADIO purchases are now conducted on a progressive basis. Buyers are constantly searching for improved equipment. Quality receives the greatest consideration. Desires of particular operators insure development of profitable trade. APEX Vernier Dials stand for the greatest attainable value in dial construction and actual delivery of satisfactory service. They simplify undrivable elements and present outstanding improvements in desirable features. Make tuning positive—bring in a greater number of distant stations—simplify logging—and greatly enhance the beauty of any set. Ratio 10 to 1. Adaptable to any 1/2 inch shaft. Check size and counter clockwise.

ROYAL BRASS FINISH	3 1/2 inch—\$1.75 Net
4 inch—\$1.50 Net	SILVER FINISH
4 inch—\$1.75 Net	3 1/2 inch—\$1.50 Net
4 inch—\$1.75 Net	DE LUXE GOLD PLATED (14K) FINISH
4 inch—\$2.50 Net	3 1/2 inch—\$1.50 Net

For particulars relative to specially attractive proposition to dealers, write

APEX ELECTRIC MFG. CO.,  
Dept. 1178 1410 W. 59th Street, Chicago

SENSATION OF SEASON  
**B-ELIMINATORS**  
 Using new RAYTHEON Tubes

with

**DONGAN**



**Transformers**

- No. 309 Full Wave For Raytheon Tubes  
 No. 337 Full Wave For R. C. A. UX 213 Tubes  
 No. 337 Full Wave For Cunningham CX 313 Tubes  
 No. 534 Half Wave For R. C. A. UX 216 B Tubes  
 No. 534 Half Wave For Cunningham CX 316 B Tubes  
**List \$7.00**

Operating a radio set is now a source of keen delight to every member of the family. Consistent performance every night is assured with the new B-Eliminators using the remarkable new Tubes and Dungan Transformers and Chokes. And anyone can build this B-Eliminator at a small cost.

Indorsed by leading radio engineers and well-known magazine editors, every radio lover can now possess the simplicity and 100 per cent reception possible with the new Tube B-Eliminators.



**Chokes**

- No. 314 20 henry  
 No. 306 10 henry  
 No. 337 10 henry

**List \$5.00**

*Full instructions and description mailed on request. Ask your dealer or send check or money order to factory. Sold under guarantee.*

**FOR SET MANUFACTURERS**

**Type S  
 Audio Transformers**

Ratios	
2-1	\$4.00 List
1 1/2-1	\$5.00 List
6-1	\$2.75 List

Dongan is the standard maker of transformers and chokes for the leading manufacturers of B-Eliminators. Engineering data and quotations furnished on request.



More than 42 of the country's leading sets use Dongan Audio Transformers. Any type you require. Your requirements can be handled promptly in our big plant. Prices on request.

**DONGAN ELECTRIC MANUFACTURING CO.**  
 2995 Franklin Street, Detroit, Mich.

*Transformers of Merit for 15 Years*

## The winding trail to true amplification



## is taken by many electrical engineers

Radio Engineers, University Professors, Electrical Dealers, and many employees of public service corporations who know show a marked preference for Samson Helical Wound Transformers in their own sets because of the advantages only obtainable with helical winding—an exclusive Samson feature.

# Samson Helical Wound Transformers

Only a few turns (these extremely low voltages) separate adjoining parts of wire on adjacent helical layers. This gives minimum leakage effect and makes paper insulation unnecessary. Greater efficiency through less resistance results as well as a minimum of distributed capacity effect which is the cause of distortion in transformers not having this helical winding.

From these advantages an extremely high amplification results that is practically equal over entire audible scale. Rich low tones, stifled by other transformers, are heard in all their beauty and amplified equally with the high notes. All notes of transmission come. You are among the broadcasting artists. Two ratios: 3:1 and 6:1. Price either ratio \$3.00.

## SAMSON ELECTRIC CO.

Manufacturers Since 1882  
Canton, Mass.

Sales Representatives in  
Thirty Leading American Cities



# LAST A S I T T I T E

CENTERED  
TERMINAL

# Lastite

If your object is to attain excellence in radio structure, the basic importance of the Lastite will interest you as much as it does us.

The Lastite is the only radio terminal that eliminates any possibility of imperfect contacts.

As Mr. M. B. Sleeper has said:

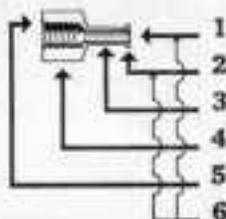
*"With a bus wire soldered to it, the Lastite is its own lock nut."*

There can be no structural element in radio more basically important than this feature of the Lastite.

Lastites hold the bus wires and, so, help you while you arrange them.

The Lastite is easier to solder to than a lug, is easier to put on, is stronger and looks incomparably better than any other kind of terminal.

*Being more than just a contact, the Lastite is the only radio terminal which can be advertised and recommended, on its merits, for the service it performs.*



- 1 Tube in which bus wire is inserted preparatory for being soldered. Tube will hold any size bus wire up to No. 14.
- 2 Thin, circular flange to which bus wire is soldered. The Lastite is thoroughly tinned, inside and out.
- 3 Thin wall of bus wire tube conducts little heat. Tube tapers toward the flange.
- 4 Quarter-inch hexagonal base nut.
- 5 Terminal base nut is threaded to fit 6-32 and 8-32 screws.
- 6 The tube and flange of the Lastite, being centered, vibration cannot act as leverage to work it loose. A bus wire locks it permanently.

PATENTS APPLIED FOR

Manufacturers and Distributors  
write or telegraph for samples

*William Stevens Co.*  
27 Hammatt Road, Roslindale, Mass.

# NEW YORKER

That's the name of the set you want to build to overcome extreme interference or to reach out for extreme distance. And it won't interfere with your neighbors' reception. The NEW YORKER data-prints give the full-size panel patterns, picture wiring diagrams, schematic, list of parts, and step-by-step instructions. REGULAR PRICE, \$1.00. Given free with a year's subscription or extension to Radio Engineering.

SAVE A DOLLAR

## These Names Are Famous Everywhere

**RX-1** Throughout the entire country, the RX-1 has become the standard of quality in reception. It is the easiest of all sets to tune. The simplicity of construction and low cost of parts has made it the most popular set brought out this fall. It is as sharp in tuning as is consistent with undistorted reproduction.

Complete data prints..... \$1.25

**B-D 5** Everyone knows the popularity of the Browning-Drake circuit, and the virtues of the Daven resistance amplifier unit. These two are combined in the B-D 5, the most successful of the various Browning-Drake combinations. Daven Mu-20 and Mu-6 tubes can be used. The B-D No. 5 design assures success.

Complete data prints..... \$1.25

**C-10 Super** This is the daddy of the super-heterodynes. It has everything that the most complete set can have—10 tubes, tuned R. F. ahead of the first detector, complete shielding, an efficiency which cannot be equalled by the simpler designs. Standard parts are used throughout.

Complete data prints..... \$5.00

**T. C. Set** The set that has the reputation for getting every last bit of results from four 201-A tubes, both as to volume and distance. Particularly good for those who want a genuinely good set that will always be good, for the parts have been chosen for substantial design and construction.

Complete data prints..... \$ .75

**New Yorker** When local conditions are so bad that you don't know what set to choose, play safe—build the New Yorker. It will cut out interference in a way which is positively uncanny. Or if you want DX—build the New Yorker. You never heard three 199's and a 120 do half as much.

Complete data prints..... \$1.00

These Are Sets of Established Reputation.

You Can Trust Them Absolutely.

**M. B. SLEEPER, Inc.** Technical Publisher

A-52 Vanderbilt Ave.

New York City



## The Best in the World

### No Batteries

are required even to operate the most powerful 15-tube receiver pictured above, if you use the new laboratory type

Model A  
Power Unit

One Customer Telegraphic: "Receiver assembled, performing like a thoroughbred."

The Amateur or Experimenter with his ultra-modern high-powered receiver is years ahead of Commercial Radio.

It is significant that unsolicited testimonials are constantly being received from even the far corners of the earth, where Norden-Hauck Engineers have furnished the finest radio apparatus known to the art today.

Quotations gladly furnished on radio parts and apparatus having non-intriguing uses.

Write for Literature

**NORDEN-HAUCK, INC., Engineers**  
1617 Chestnut St., Philadelphia, Pa.

## ROPE-CORE AERIAL

A marvelous new aerial that is guaranteed to give greater distance, easier tuning, more perfect selectivity. Consists of pure copper ribbon, heavily enameled, wound around sturdy, weather-proofed rope. Try this new aerial for better reception.

50 ft. ....	\$3.00	100 ft. ....	\$5.00
75 ft. ....	3.50	150 ft. ....	7.00



### ACORN WINDOW-LEAD-IN

Fits into such as pictured. Made of pure copper ribbon  $\frac{1}{2}$  in. wide, heavily enameled by special process. Triply insulated with water-proofed fabric. Thousands of users recommend them for satisfactory service. Each 35c. (Unenamelled—25c).

### Acorn Master Switch

Instantly connects the battery to the charger or to the receiver.

Single Socket Type.....	\$7.00
Double Socket Type.....	8.35

(For use with B-Eliminator)

DEALERS write for discounts **JOBBERS**  
Send for circular on Acorn Products

**Acorn Radio Prod. Co.**  
100 W. Madison St., CHICAGO

The New Sensitive  
Photo-Electric Cell

THE

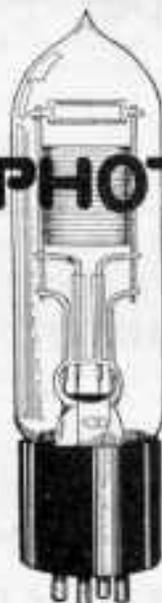
## PHOTOTRON

A Practical Alkali-Metal Tube for Radio Movies, Picture Telegraphy, Talking Movies, Etc.

Price

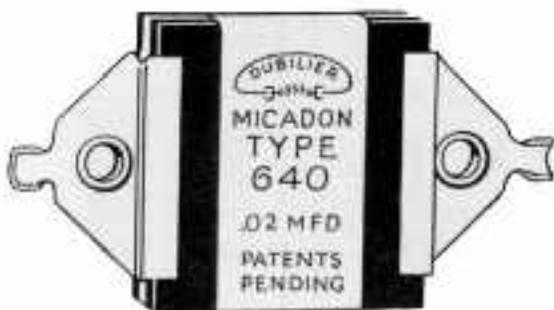
**\$20** Each

Write for Descriptive  
Literature



**Photon Electric Corporation**

247 Park Ave., N. Y. C.  
1269 Cochran Ave., Los Angeles



## MICADONS—the standard fixed radio condensers—are shielded by Bakelite

When William Dubilier set out to make a perfect fixed condenser, it was commonly supposed that eddy currents, brush discharges and other hysteresis losses were chiefly responsible for condenser troubles.

Dubilier discovered that compression overcame mechanical movements. This discovery made possible an efficient condenser for broadcasting. It is this same principle that is embodied in the Micadon.

After exhaustive tests, Dubilier found that Bakelite laminated was the best insulating medium obtainable for use in broadcasting condensers and Micadons. Bakelite laminated will not break, does not warp, and has high qualities as a dielectric. The development of the Micadon has been an outstanding achievement in which Bakelite has played an important role.

*Write for Booklet 38*

### BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.  
Chicago Office: 636 West 22d Street

4 We have an industrial master service file called "THE STORY OF BAKELITE", which shows the various stages of the manufacture of Bakelite from the raw materials down to the fabrication of a wide variety of finished products. It is a free, real subject, prepared on standard width non-inflammable card. 4 We will be glad to send a copy to any manufacturer who has the proper production apparatus.

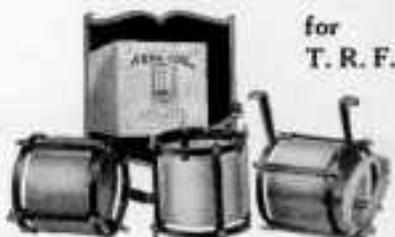


# BAKELITE



THE MATERIAL OF A THOUSAND USES

## Perfect Selectivity and More Power



for  
T. R. F.

**Get Manufacturers!** You can considerably better the power and selectivity factors of your product by using Aero Coils. And your clients will have added business. Aero Coils are patented. Let us prove those things to you. Send us one of your sets. We will install Aero Coils and return the set to you for your own tests. Do this now.

**Fact!** Build a real set. Use the new Aero-Dyne Circuit which we furnish and a set of Aero-Coil Method T.R.F. Coils. You will have a receiver which will function on a radio's wave; which will cut through the strongest local interference; which will bring in distant stations with amazing volume and clarity.

Aero Coils are sold by good dealers everywhere. If by any chance your dealer is out, order direct. "Patented Radio Frequency Kit" is \$12.00 including brackets and diagrams.

**AERO PRODUCTS, INC.**  
217 No. Desplaines St., Chicago.

**AERO COIL**  
The Patented  
Low Loss Inductance

Leading Manufacturers  
Save Space With

# DUPLEX



## CONDENSERS

Leading manufacturers realize that straight line frequency condensers are a necessary selling point—and many manufacturers incorporate this feature without sacrificing compactness by using DUPLEX S.L.F. CONDENSERS, with the cut-out stator. There are no odd-shaped plates to cause short-circuiting (a DUPLEX feature that saves servicing). And the name DUPLEX distinguishes parts that are fitting components of the finest radio receivers.

Correspondence from Set Manufacturers  
Invited

**DUPLEX CONDENSER & RADIO CORP.**  
44 Flatbush Ave. Extension, Brooklyn, N. Y.

## INDEX OF ADVERTISERS

	Page
<b>A</b>	
ACME Apparatus Co. ....	Inside Back Cover
Acorn Radio Prods. Co. ....	484
Aero Products, Inc. ....	486
Alden Mfg. Co. ....	493
All-American Radio Corp. ....	437
American Elec. Co. ....	487
American Hard Rubber Co. ....	668
American Transformer Co. ....	427
Amplicon Corp. of America. ....	672
Amazo Prods., Inc. ....	631
Aqua Elec. Mfg. Co. ....	680
<b>B</b>	
Bakelite Corp. ....	635
Brumer-Tully Mfg. Co. ....	469
<b>C</b>	
Carver Radio Co. ....	674
Chelton Elec. Co. ....	670
Chicago Solder Co. ....	666
Cross Name Plate & Mfg. Co. ....	653
<b>D</b>	
Deason Radio Corp. ....	473
DeJure Products Co. ....	468
Diamond Elec. Mfg. Co. ....	481
Dubilier Cond. & Radio Corp. ....	612
Duplex Cond. & Radio Corp. ....	686
Durham & Co., Inc. ....	668
Herrant Radio, Ltd. ....	678-679
<b>E</b>	
Eastern Coil Corp. ....	690
Ely Mfg. Co., The H. H. ....	664
Electrol, Inc. ....	678
<b>G</b>	
Gearty-Schlueter Radio Corp. ....	664
Goetz & Co., Inc., August. ....	664
Goldschmidt Corp., Th. ....	671
<b>H</b>	
Hammelund Mfg. Co. ....	Back Cover
Hammelund-Roberts. ....	688
Hard Rubber Punched Goods Co. ....	670
Howard Radio Co., Inc. ....	629
<b>J</b>	
Jewell Elec. Inst. Co. ....	668
<b>K</b>	
Karas Elec. Co. ....	665
Kinos, Robert H. ....	666
Kuro-Kasch Co. ....	474
<b>M</b>	
Mohawk Corp. ....	680
Moss & Co. ....	687
Mylar Radio Corp. ....	457
<b>N</b>	
National Carbon Co. ....	Inside Front Cover
National Co., Inc. ....	676-677
Norden-Hauch, Inc. ....	670-684
<b>P</b>	
Phosin Elec. Corp. ....	684
<b>Q</b>	
Quam Radio Corp. ....	661
<b>R</b>	
Radial Co. ....	672
Radio Cons. Labs. ....	687
Radio Corp. of America. ....	623
Radio Patents Corp. ....	687
Rance Corp. ....	661
Rathbun Mfg. Co. ....	675
Raytheon Mfg. Co. ....	663
<b>S</b>	
Samson Elec. Co. ....	682
Silver-Marshall, Inc. ....	667
Singer, M. D., Inc. ....	630, 667, 672
Stevens & Co., Wm. ....	682
<b>T</b>	
Tvitol Elec. Co., Inc. ....	666
<b>U</b>	
United Scientific Labs., Inc. ....	439
<b>W</b>	
Westinghouse Elec. Mfg. Co. ....	428

# I<sup>n</sup>d M REGISTRY

A REGISTRY OF RADIO INSTALLATION and MAINTENANCE SERVICE MEN WHO  
INSTALL, MAINTAIN, and REPAIR RADIO EQUIPMENT

Ill., Chicago—WEILAND & CO.  
6711 Stewart Ave. Tel. 1124 Normal

Md., Baltimore—THE RADIO EMER-  
GENCY CO.  
206½ Schenley Rd., Roland Park.  
Tels. Tuxedo 2088 and 1341.

N. Y., New York—APEX RADIO CO.  
123 Liberty St. Tel. Rector 3176

N. Y., New York—MONROE RADIO LABS.  
177 Greenwich St. Tel. Cort. 4485

N. Y., New York—RADIO CONST. LABS.\*  
71 W. B'way. Tel. Walker 2143

N. J., Ridgefield Park—S. G. WINTRING-  
HAM.  
95—7th St. Tel. Hackensack 2745W

O., Kent—KLADAG RADIO LABS.\*  
Kline Bldg. Tel. 127

## CONDENSERS

*(Manufactured Under Monobridge Patent)*

These condensers are especially designed for radio work. Made in suitable sizes with convenient terminals. Substantial metal cases with a heavy insulating enamel—air tight and moisture proof insuring a fixed capacity and constant insulating values indefinitely. Also supplied with hard wax or cloth covering. Highly efficient as by-pass condensers.

Capacities ranging from .01 to 5 microfarads.

Will stand a leak down test of 500 volts, D. C. Special resistors made up for higher voltages.

Prices quoted on request.



## AMERICAN ELECTRIC COMPANY

State and 64th Streets

Chicago, U. S. A.

## HAVE YOUR FAVORITE CIR- CUIT BUILT BY EXPERTS

Official Service Station for

RASLA  
SAMPSON  
BROWNING-DRAKE  
BREMER-TULLY  
SLEEPER BX-1

Our Expert Engineering Staff and Modern  
Testing Equipment Insure Complete and  
Better Service at Moderate Cost. Prompt  
Mail Order Service.

RADIO CONSTRUCTION LABORATORIES  
71-73 W. Broadway, New York City

## PATENT SERVICE

FOR THE MANUFACTURER—

We have retained experienced patent  
lawyers to create patent situations  
around the manufacturer's products.

FOR THE INVENTOR—

We aid and assist in the development  
of his inventions and represent him in  
negotiations with manufacturers. In  
meritorious cases we finance the work.

## RADIO PATENTS CORP.

INC. 1917

247 Park Ave. New York City.

## ENGINEERS

With experience in the design of Radio  
Transmitting Apparatus. Must be  
technical school graduates. Will not  
consider men without considerable  
practical experience. In reply state  
age, experience and salary expected.  
Address

M. B. SLEEPER, INC.  
53 Vanderbilt Ave., New York, N. Y.

## PATENTS

Write for free book

## MUNN & CO.

Founded since 1866 with the Scientific American  
648 Woodworth Building, New York City  
537 Scientific American Bldg., Washington, D. C.  
1326 Tower Building, Chicago, Ill.  
618 Hobart Building, San Francisco, Cal.  
349 Van Nuys Building, Los Angeles, Cal.



**\$60<sup>85</sup>**  
CABINET EXTRA

**Write for  
This Book**

This will lead to  
complete and to  
build the Hammar-  
lund-Roberts Re-  
ceiver from the  
instructions here.  
Fully illustrated.  
(\$5.95)

**ASSOCIATE  
MANUFACTURERS**  
All America Radio  
Co.  
Alden Manufacturing  
Co.  
R. & L. J. Germany  
(Amesbury)  
Carter Radio Co.  
Union Radio Corp.  
International Re-  
ceiver Co. Inc.  
"De Vries Re-  
ceivers"  
Washington Radio  
Manufacturing  
Company, Inc.

# Every Part Designed by a Specialist

EVERY single unit that goes to make up this remarkable receiver was chosen by a specialist after months of research. The transformers were selected by an engineer familiar with every reliable make; the condensers by a man who had made a special study of condenser construction and function. So it was even with the smallest, usually neglected units.

From the work of these engineer-designers, backed by the endorsements of ten famous radio parts manufacturers, comes the Hammarlund-Roberts, a receiver that is truly the ultimate in five-tube possibilities. The equal of any standard eight tube set in selectivity and volume—so simple in design and operation that any one might construct it. Priced amazingly low, the Hammarlund-Roberts offers the greatest value possible in the radio field today.

## Ranland-Lyric ALL-AMERICAN TRANSFORMER

This built the  
best and the  
most reliable  
in the world.  
Only one of its  
kind made.  
Look for it

# Hammarlund Roberts

Hammarlund-Roberts 1182-G Broadway New York, N. Y.



**NA-ALO**  
Disk  
and  
sockets



**Carier**  
Buttons  
and  
Exhaust



**UNION**  
Phone-  
The  
Jerk.  
**DURLAN**  
Resistor.



The Acme "double free-edge cone" loud-speaker. Puts back into the so-called "radio voice" the living, recognizable, individualistic tones of each speaker. Round model (shown) \$25. Cabinet model \$35.

## To our old friends of Radio Engineering—a little "tip!"

YOU have probably seen a dozen loud speaker advertisements in the last month. Horns, Cones, what not. You've read all sorts of claims.

Now just between us—as old timers, here's a tip.

Frankly, it relates to Acme, but you don't care do you, as long as you get what you're looking for?

Well to make it quick. Acme has a new "double free-edge cone" loud speaker. We have no reputation as slow pokes, but it's taken us exactly 5 years, thousands on thousands of dollars and 256 experimental models to make it right—to give exact reproduction of the human voice and all musical instruments.

Perhaps we need scarcely tell you

real amateurs what you can expect from speakers hastily conceived and hastily manufactured. If it has taken us 5 years with all our experience specializing on "amplification without distortion" what must be the answer?

So hear the new Acme—we know you'll know.

Meanwhile, if you haven't already a copy, be sure to send for the new 10th Edition of "Amplification without Distortion"—ask also for Bulletin T of Acme Transmitting Apparatus.

*Claude Harris*

President  
Acme Apparatus  
Company

Send for your copy!



# ACME

~for amplification

ACME APPARATUS COMPANY,  
Dept. H-11, Cambridge, Mass.

Enclosed find ten cents, stamps or coin, for my copy of the new 10th edition of "Amplification without Distortion." Please also send bulletin (T) on Acme Transmitting Apparatus.

Name .....

Street .....

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

The New

# HAMMARLUND

s-l-f  
CONDENSER



AN ENGINEERING

MASTERPIECE

ANY band of frequencies, in which the maximum is three times the minimum, can be covered by the new Hammarlund S-L-F Condenser, provided the minimum circuit capacity is one ninth of the maximum circuit capacity.

If these conditions are met, mathematical straight-line frequency distribution will be obtained, reading from zero to 100 on the dial.

Equivalent resistance, phase angle difference,

dielectric absorption, power losses, etc., have been reduced to the minimum.

Rugged and compact. Warpless aluminum alloy frame, grounded to the rotor. Hard brass plates, chemically treated against corrosion. Tie bars insure permanent alignment. Adjustable ball-bearings. Adjustable band brake. One small piece of Insulite insulation, placed outside of electro static field. Bronze clock spring pigtail. One hole mounting, with anchoring screw.

*This condenser is endorsed by the engineering designers of the Hammarlund-Roberts receiver. Complete instructions for assembling, wiring and operating this famous receiver will be sent upon receipt of 25¢.*

HAMMARLUND MANUFACTURING COMPANY

424-438 West 33rd Street, New York City

For Better Radio  
**Hammarlund**  
PRECISION  
PRODUCTS

