

RADIO Engineering

A Magazine of Technical Accuracy for the
Radio Set Builder, Engineer and Manufacturer



Edited by
M.B.SLEEPER



OCTOBER 1925

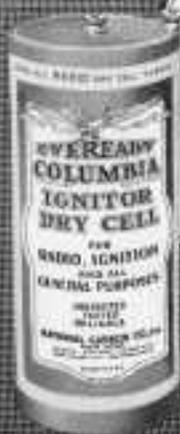
VOL. V NO. 10

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Eastern Standard Time
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RCA

announces

three new power tubes

for greater volume

RCA announces three important new Radiotrons. Their contribution to radio progress is *greater power*. They mean greater volume on dry batteries — and greater volume on storage batteries. They mean better tone, because they mean volume of sound without distortion.



For technical descriptions of the new Radiotrons, write the nearest R.C.A. office for the literature folder.

- A—New Radiotron UX-120—(for great volume on dry batteries) \$2.50
 B—New Radiotron UX-112—(Similar to Radiotron UX-201-A, but several times as powerful) \$6.50
 C—New Radiotron UX-210—A super power tube several times as powerful as UX-120 \$4.00



Radiotron

AN RCA PRODUCT

RADIO CORPORATION OF AMERICA • CHICAGO • NEW YORK • SAN FRANCISCO

RADIO ENGINEERING

Edited by M. B. SLEEPER

Fifth Year

Vol. V, No. 10

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Radio Engineering, October, 1925, Vol. V, No. 10. 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.

BAKELITE

REG. U.S. PAT. OFF.



Sangamo fixed condenser of molded Bakelite made by Sangamo Electric Co. Springfield, Ill.

A mica condenser—sealed within a protecting Bakelite shell

To make a fixed condenser that would be proof against moisture, heat, cold, fumes and mechanical injury was the aim of the Sangamo Electric Co.

The several elements of a fixed condenser are usually clamped together and left exposed to injurious temperature and climatic conditions. In a Sangamo condenser these delicate elements are sealed within molded Bakelite, their original accuracy and capacity being thus permanently protected.

Through the use of Bakelite many radio parts and accessories are being improved. Perhaps you are making some part that would be better, look better and sell better if made of Bakelite. Why not consult our engineers with regard to its possibilities?

Write for Booklet 38

BAKELITE CORPORATION

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Bakelite is a synthetic resin which is produced by the condensation of phenol and formaldehyde. It is the only material which can bear the highest temperatures.


BAKELITE
Bakelite is a synthetic resin which is produced by the condensation of phenol and formaldehyde. It is the only material which can bear the highest temperatures.

THE MATERIAL OF A THOUSAND USES

"Simplify Radio"

says
Daven



Daven Engineers Blaze Another Trail

THE biggest of all the little things in radio is the grid leak. The Daven Grid Leak is known the world over as the grid leak of permanent, constant value. It is standard.

Almost as important is the condenser. But grid condensers change with temperature and humidity. The mica in condensers lacks uniformity or is impure. The tin foil plates melt or change their capacity.

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For dealers: Send your letterhead or card, or this coupon and we will have our nearest distributor communicate with you.



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Type MU-20 increases the amplification of the Daven Super-Amplifier to equal or exceed that obtainable with transformer coupling. A one-purpose, three-element tube, 6-volt, 1/4 ampere—\$4.00 each. Daven Power Tube Type MU-6 is recommended for last or output stage—\$5.00.

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The Improved Roberts



Approved by **\$60⁸⁵** Cabinet Extra
 Ten leading manufacturers



Send for this most complete book giving full instructions on assembling, wiring, and operating the Hammarlund-Roberts receiver.

25c

The All-American Radio Corp. contributes the Rauland Lyric Transformer to the efficiency of this new receiver.

The new Hammarlund-Roberts receiver is the united achievement of ten leading engineers, endorsed by ten of the best-known radio manufacturers. No one man's or one group's conception of five tube possibilities but the composite of the leader's convictions.

This concentration of the leaders upon one purpose—the perfection and intense application of tried and proven radio principles—has produced new results. Results so vital and so valuable that they put the Hammarlund-Roberts far beyond your expectations of performance.

In designing this new standard of efficiency, the consulting engineers had at their disposal the finest parts the market affords—regardless of cost. They were not handicapped in building to a price.

These ten leading manufacturers offer to the American public greater value than ever before. A radio receiver constructed throughout of the latest, most efficient part designs at a price within the means of every one. A five tube receiver that equals the Super-Heterodyne in selectivity and volume. A receiver so simple in design that anyone can build it from the instructions in the "Hammarlund-Roberts Construction Book." You will wonder at this new simplicity; this new efficiency; this new saving.

Write for this most complete book.

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 Union Radio Corp.
 International Resistance Co.
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No-Old Sockets and dials, Carter Rheostats, Jacks and Switches approved for the Hammarlund-Roberts.

Who Reads Radio Engineering?

FOUR YEARS ago, only a few hundred men earned their living at radio. The several thousand experienced technical men now employed in dealer, jobber, and manufacturing organizations were then experimenters.

Men experienced in merchandising and selling, but new to radio, are building their success on the judgment and skill of the boys who used to be radio experimenters, now grown into positions where, collectively, they control the purchasing of the entire industry.

Constantly and regularly, for eleven years, they have read articles by M. B. Sleeper, written for them in the old days, about experimenting, developing with them as they took on the responsibilities of radio as a business, to articles on design and manufacturing.

They read Radio Engineering because it is the technical magazine of the business, because it has grown up with them, advanced with them. That Radio Engineering has changed and broadened out is natural, for it is the only radio publication owned and edited by a man experienced in commercial design and manufacturing, and who maintains a large consulting practice.

Subscriptions to Radio Engineering do not come in the form of pencilled scrawls from the boys who like the cover design. They come in the form of purchase requisitions from Atwater Kent, Stewart-Warner, Radio Corporation of America, Western Electric, as well as from dealers and jobbers.

That's why we can say truthfully that if you can sell the readers of Radio Engineering you have sold the men who control the purchasing of the radio industry.

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

This is the third of a series of six advertisements published to show frankly and truthfully, 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.

3

The AMSCO ALLOCATING CONDENSER

(STRAIGHT LINE FREQUENCY)



Spreads the Stations Over the Dial

— The new AMSCO Allocating Condenser is the triumphant combination of electrical engineering and mechanical ingenuity. Electrically efficient in unscrambling the stations on your dials. Each dial degree from 1 to 100 will be found to represent 10 broadcasting kilocycles accurately over the entire scale—“a station for every degree.” Mechanically ingenious in correcting the fault of other S. L. F. Condensers—it conserves space! Scientific low-loss construction. Rigidity with light weight.

Made in three capacities—Single or Stinson. Ask your dealer or write for details of entire AMSCO Line of engineered radio parts.

AMSCO PRODUCTS, INC., Dept. B
Broome and Lafayette Streets, New York City



New!—a handsome instrument at a low price. The AMSCO Vernier Dial gives finger to your fingers. Steps down 13 to 1, backwards or forwards, fast or slow, without momentum or backlash.



Dubilier Micadons

—*standard fixed radio condensers*

Nearly all of the leading manufacturers of radio sets have adopted the Micadon as their standard.

A layman might be fooled. Not so these manufacturers. They need fixed condensers with *accurately matched* and permanent capacities, and they know which are the best.

*Send 10c for 32-page booklet
"Applications of Dubilier Condensers in
Radio Circuits." Address Dept. K-2*

Dubilier

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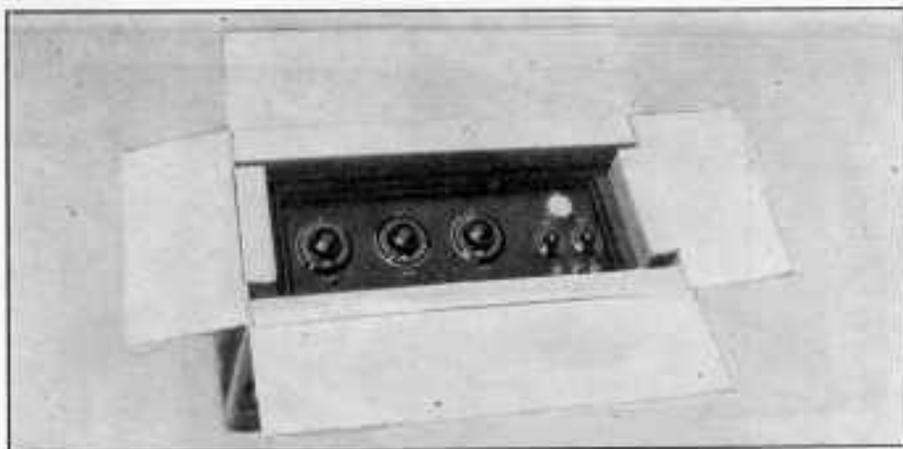


Fig. 1. The air cushion carton recommended by the American Railway Express Company.

The Express Company Tells Its Story

The American Railway Express Company is studying packing methods to help reduce damage in transportation.—By J. H. Butler*

FEW people realize to what extent the American Railway Express Company is concerned in the technical phases of the industries which look upon the Company as merely an agency for transportation. When goods are delivered to us, we do not feel that we are called upon only to move them from one place to another. We assume the responsibility of delivering them in a safe and sound condition providing, of course, that they are turned over to us in packing which makes this practical.

On our own initiative, however, we make independent investigations into the shipping problems of many different industries. We developed egg crates which are practically 100 per cent. safe, although we are still following up this situation because, due to new methods, hens are laying larger eggs, and shippers sometimes use cases designed for smaller eggs. We learned that bees, packed in the same way, sometimes travelled safely, and sometimes suffered heavy

casualties—depending upon the food they were given.

As for radio—you would be surprised to find out how much we know about this subject, particularly concerning tubes. We must, in self-protection. When a claim is made for tube breakage in transit we examine the tubes to see, first of all, if they are new. Sometimes people put in claims on tubes of types which have not been made for years, or tubes which obviously have been in use for a long time. We have a Jewell testing instrument to show us exactly what is wrong.

We have given much attention to the packing of radio sets and accessories. The important factor about these items is that they are not damaged by sharp jolts or falls. We do not handle packages that way. The trouble comes from the slight vibration to which sets are subjected in the railway cars.

Receiving sets, loud speakers, batteries, tubes, and all the numerous parts and accessories which go to make up complete sets have become an impor-

*General Manager, Department of Public Relations, American Railway Express Company.



Fig. 2. An air cushion carton ready for shipment. Heavy gummed tape provides strong reinforcement to make the carton resist pressure which would force it out of shape. Note the FRAGILE labels on each side

tant express traffic. An enormous distribution of these articles is carried on between manufacturers and distributors or jobbers on the one hand and dealers and ultimate users on the other. It is a traffic that offers immense possibilities for this business and we are encouraging it by giving the very best service in moving it.

Yet one disturbing feature of the traffic is that our problems in handling have become more difficult, because of the delicate character of these instruments. This is reflected in the many new and annoying kinds of claims which have developed of late.

In any new industry which has advanced as quickly as has Radio almost everything is an experiment.

This is of direct interest to us in the transportation business, as it affects, in one way or another, our ability to handle such shipments as they should be handled—without damage. We are moving many commodities as fragile as radio sets and supplies and there is no reason to allow an increase in loss and damage on this traffic.

Of course, proper packing is an important consideration at the start. In radio, as in other new industries, this is a matter of experimentation to determine just what is necessary to produce the perfect package.

Manufacturers and the Company alike have been studying this problem, so that we know how to prepare a radio

set so that it will carry safely to its destination. Likewise, tubes, loud speakers and parts can be so protected in their preparation for shipment that with proper handling practically no damage will occur.

At the outset it is essential to realize that all radio shipments are highly fragile and easily damaged. Shippers are asked to place on such shipments the caution marks Fragile, Handle with Care, Glass, or This Side Up. Where this is done, employees use extra care in moving such business. Caution marks or labels, printed in red, should be placed on all sides of a shipment. Of course, This Side Up should be placed on the top of the carton.

So many types and sizes of radio sets are manufactured that it is difficult to give more than general suggestions for the essential of good packing practice in preparing these instruments for shipment.

Even the B. C. L. knows how delicate are the parts which go to make up receiving sets. If the smallest wire is broken, the plates of a condenser shorted, or the panel cracked, the set is unworkable. Most of the cabinets are highly polished. An unusually hard fall or a bad breakage of the carton, caused by something thrown against it, or an unusually heavy object resting on it, may cause very serious damage.

Generally speaking, a radio receiving set is best protected in what is known

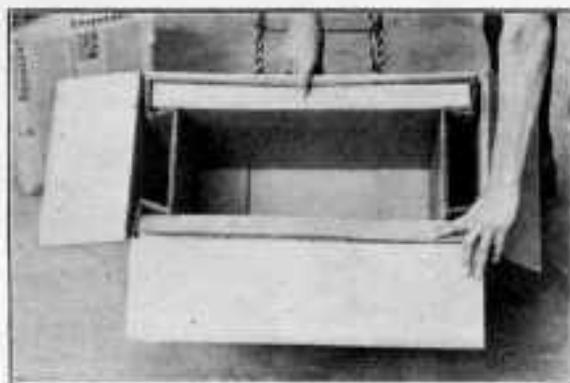


Fig. 3. The air cushions are made in such a way as to form a separate chamber on all six sides of the carton. They absorb shocks and vibration where excelsior or paper pass them on to the set.

as the "air cushion" box or carton. This carries the set in suspension, absorbing most of the shocks and jars ordinarily encountered in transportation.

The cushion consists of corrugated board, made of standard material, scored or bent to provide at least a 2-in. open space between the inner wall of the outside carton and the top, sides and bottom of the set. The materials used for the cushions should be of the same test strength as that of the outside carton.

The shipping unit is thus a box within a box. The cushions around the set prevent the air from escaping. This gives a spring-like quality that prevents shocks which the package may receive in transit from reaching the heavy though delicate set inside, and at the same time hold it tightly so that it cannot shift.

When a manufacturer adopts the use of a close fitting carton to be placed around a set, and this in turn is put in an air-cushion carton, it is necessary that the distributor or dealer employ the same methods in reshipping. In other words, the close-fitting carton should not be used as a shipping container by itself. This obviously does not protect the set from shocks, as the air cushions and outer container are missing.

The carton must meet our Classification requirements as to Mullen tests of material used and must carry the box-maker's stamp and certification. The Classification as yet does not carry specific regulations as to the packing of

radio sets. Cartons must be made and used for a particular size of set to accomplish the best results. Two or three different sizes cannot be shipped safely in an air cushion box made for one particular type. Moreover, the cushions defeat their purpose if the corrugation breaks on the scoring or are weak when used a second time.

It is apparent that neither loose excelsior nor paper used for cushioning neutralize the jars of ordinary handling, because when crushed down, especially if a wooden box is used, such jars are carried to the set.

It is recommended that to protect the cabinet and panel from scratching, the set be wrapped first in waxed paper. A great many well-known manufacturers have adopted this practice, probably originated by the Victor Talking Machine Company.

Of course, breakage may occur due to inherent weaknesses in the materials used by manufacturers. Our loss and damage supervisors have been studying this phase of the problem and manufacturers are gaining experience that will help to eliminate these evils. Two instances will suffice to show what is being done in this field. Our supervisors recommend that cabinet manufacturers have the grain of wood in the end pieces of a cabinet run vertically and not horizontally. The reason for this is that when the end pieces are grooved out where the back panel fits, the wood is

weakened and slight shock will cause the ends to split with the grain. If cabinets are made of green wood or unseasoned lumber, improperly dowelled or grooved, this also causes trouble.

Then there is the question of panel breakage. Some sets have the heaviest parts mounted on the panel. This is particularly true of condensers, some of which are quite heavy. They put quite a strain on the panel and make it susceptible to cracking. In shipping, such parts should be supported underneath so as to relieve the strain of the weight on the front panel.

Tubes should not be shipped in the sockets of radio sets because it may result in damage to both. The more elaborate type of receiving set, especially those similar to desks or tables in form, require the same general type of packing boxes used in shipping phonographs. Like musical instruments, they must be boxed or crated.

After the manufacturer, our next problem is to educate the distributor and dealer. Of course, the set is just as fragile on its second journey, whether it be from distributor to dealer or from the latter to a customer. Possibly the set may be returned to the manufacturer for mechanical defects. The same precautions in the matter of packing are necessary. Manufacturers should call this to the attention of the dealers. It is imperative to place the air cushion inserts in their proper positions to obtain the full effect of the protection.

The occasional shipper is perhaps our most difficult problem. He is the purchaser of a set who wished to return it for reasons of his own. Or he may be a set builder who has made an outfit for some one else. In either case, he may not give much thought to the proper packing, because he feels that it is less important than the construction to which he has given so much care and time. He is liable to feel that our handling and not his packing was responsible for breakage if it occurs.

Radio fans have been known to place sets in wooden boxes and use scrap

paper for cushioning, or to put them in tight fitting second-hand cartons and expect the express company to deliver them in perfect condition. If the radio fan could be induced to give the same care to packing that he does to fixing up the circuits, our troubles would be less.

Loud speakers are an important radio accessory with which some troubles are being encountered because of faulty packing. One type—the bell loud speaker now in the widest use—comprises a heavy base and a bell-shaped horn made of wood or fibre. A new type rapidly growing in popularity is the cabinet loud speaker which is almost as fragile as the set itself.

Most manufacturers use cartons especially made for their particular type of loud speaker, but in reshipping, unless properly placed in the box, damage may result, particularly to the horn. Here are some general recommendations regarding the packing of loud speakers:

The cartons should be large enough to allow at least 2 in. on the bottom and top of the mouth of the bell. The base should be packed separately, either in another carton or in a compartment separated from the bell. A hole should be cut in the cardboard which fits into the carton, to hold the neck of the bell firmly. Corrugated board should be placed between the base and the horn, provided the base is packed in the same carton.

The elbow should be protected with at least 1-in. filler to fill out the depth of the box. The cover of the box can then be closed and sealed. The marking should be clear and fragile labels placed on all sides, with *This Side Up* on the top.

There should be at least one cushion or filler to protect the mouth of the bell from coming up against the bottom of the carton.

Cabinet loud speakers should have the same care and protection in packing as the radio set itself. The use of air cushions is advised.

Standard individual tube cartons adopted by the leading manufacturers

of radio tubes are proving satisfactory. Any attempt to substitute a cheaper carton for tubes which are intended to be shipped by express is discouraged. Some of the manufacturers of cheap tubes are placing their products in cartons that do not protect the tube in transit.

A tube carton is not expected to be strong enough to prevent the tube from being smashed in the event of an accident, but the essential requirements are first to hold the tube firmly so that there will be no play in the package and second to provide a cushion of some sort to protect the tube from shocks and jars.

The outer package container must be strong enough to protect the tube cartons from injury. At the present time, no attempt is made by manufacturers or wholesalers, except in the case of transmitting tubes, to cushion the tubes except in the individual containers, but the outside cartons are made of tested material shaped to hold a certain number of tube cartons. There is enough give in the entire package to carry the tubes safely if handled carefully.

Most manufacturers pack their tubes as follows:

11's and 12's.—Tube wrapped in several layers of cotton felt and placed in triple slide box made of double face corrugated strawboard. Packed 50 and 100 to the carton.

99's.—Tube wrapped in one layer of cotton felt, then wrapped in special corrugated paper wrapper and placed in individual carton to fit. Packed 50 and 100 to the carton.

00's and 01A's.—Tube wrapped in special corrugated paper wrapper, placed in individual carton to fit. Packed 50 and 100 to the carton.

03's and 03A's.—Tube wrapped in several layers of cotton felt and placed in individual cartons to fit. Then nested in excelsior in a larger one piece corrugated paper strawboard box sealed, which in turn is again nested in excelsior, in an 11" x 18" box. Only one tube in the package.

Large power tubes suspended in can-

vas slings in regulation X-ray tube crates.

Too much care cannot be exercised when shipping tubes by express in small lots. The tube carton is not intended to serve as the forwarding container and tubes must not be shipped in this manner. The tube carton must be placed in another strong container large enough to allow several inches of excelsior on all sides of the tube containers.

When placing tubes of any description in the tube containers be careful to wrap them evenly in the felt and corrugated wrappers and make sure the ends are well covered.

Tubes must not be shipped in the sockets of radio sets. No matter how carefully the radio set itself is packed, there is more filament vibration and this vibration in transit will break the filaments. Tubes should be in the regulation cartons provided by the manufacturer.

Tubes that have been used should not be shipped by express. The filament in an old tube is exceedingly brittle and will not stand handling. A used tube may have hundreds of hours of life left in it and ordinarily it will function until its normal life has expired, but do not attempt to ship it. Handle it with more care than you would a bad egg.

It is not desired that packages containing tubes from the manufacturer, dealer or occasional shipper be marked Radio Tubes, but the shipper should mark all packages containing tubes **Fragile—Glass—Handle With Care.**

One more point—remember that there is no economy in cheap cartons. You can't see the strength of corrugated boards. You have to experience it, and if your experience is unfortunate, it will be at your expense because the Company cannot allow claims on shipments improperly packed. On the other hand, if you will get your cartons from reliable, established concerns, you will have the assistance of their service men who are experienced in the science of packing.

Electrical Characteristics of Radiotrons and Rectrons

Model	Use	Base	Grid-Converter M.P.D.	Grid-Leak	Detector Grid Return Lead	"A" Filament (Supply)	"A" Battery (Supply)	"A" Current (mA)	"A" Detector	"B" Battery (Supply)	"B" Current (mA)	"B" Negative Battery (Supply)	Plate Current (mA)	Output Resistance (ohms)	Micro-Phonics	Voltage across Plate	Max. Diameter	Max. Height
Radiotron... UV-199	Detector Amplifier	UV 199 Base	00025 2 to 9	+P	4.5	3.0	06	45	90	4.5	2.3	15,000	415	6.25	1.5"	3 1/2"	1 1/2"	4 3/4"
Radiotron... UX-100	Detector Amplifier	R.C.A. Std. Stand- and UX Base	00025 2 to 9	+P	4.5	3.0	06	45	90	4.5	3.3	15,000	415	6.25	1 1/2"	4 3/4"	1 1/2"	4 3/4"
Radiotron... UV-205	Detector Amplifier	Navy Base	00025 1 1/2 to 2	-P	6	5	1.0	10 to 22 1/2	—	—	—	—	—	—	—	—	1 1/2"	4 1/2"
Radiotron... UX-206	Detector Amplifier	R.C.A. Leg. Stand- and UX Base	00025 1 1/2 to 2	-P	6	5	1.0	10 to 22 1/2	—	—	—	—	—	—	—	—	1 1/2"	4 1/2"
Radiotron... UV-203-A	Detector Amplifier	Navy Base	00025 2 to 9	+P	8	3	.25	45	90	4.5	2	12,000	675	8	1 1/2"	4 1/2"	1 1/2"	4 1/2"
Radiotron... UX-201-A	Detector Amplifier	R.C.A. Leg. Stand- and UX Base	00025 1 to 9	+P	6	5	.25	45	90	4.5	2	12,000	675	8	1 1/2"	4 1/2"	1 1/2"	4 1/2"
Radiotron... WD-11	Detector Amplifier	WD-11 Base	00025 3 to 5	+P	1.5	1.1	.25	22 1/2	90	4.5	2.8	14,000	400	5.6	1 1/2"	3 1/2"	1 1/2"	4 1/2"
Radiotron... WD-12	Detector Amplifier	Navy Base	00025 3 to 5	+P	1.5	1.1	.25	22 1/2	90	4.5	2.8	14,000	400	5.6	1 1/2"	3 1/2"	1 1/2"	4 1/2"
Radiotron... WX-12	Detector Amplifier	R.C.A. Leg. Stand- and UX Base	00025 3 to 5	+P	1.5	1.1	.25	22 1/2	90	4.5	2.8	14,000	400	5.6	1 1/2"	3 1/2"	1 1/2"	4 1/2"
Radiotron... UX-112	Detector Amplifier	R.C.A. Leg. Stand- and UX Base	00025 3 to 5	+P	6	5	0.5	22 1/2 to 45	10.5	10.5	7.9	4800	1670	8	1 1/2"	4 1/2"	1 1/2"	4 1/2"
Radiotron... UX-120	Audio Amplifier Last Stage	R.C.A. Std. Stand- and UX Base	—	—	4.5	3.0	.125	—	1.15	22.5	6.5	6000	500	35	1 1/2"	4 1/2"	1 1/2"	4 1/2"
Radiotron... UX-210	Amplifier Oscillator	R.C.A. Leg. Stand- and UX Base	—	—	8	7.5	1.25	4.25	35	35	23	5000	1500	7.75	2 1/2"	5 1/2"	2 1/2"	5 1/2"
Radiotron... UX-474	Voltage Regulator Tube	R.C.A. Leg. Stand- and UX Base	—	—	6	6.0	1.1	157.5	10.7	6	4.5	8000	940	7.5	2 1/2"	5 1/2"	2 1/2"	5 1/2"
Radiotron... UV-476	Ballast Tube	Standard - Mogul Type Screw Base	—	—	6	6.0	1.1	112.5	7.5	3	1	9700	715	7.5	2 1/2"	5 1/2"	2 1/2"	5 1/2"

Rated Voltage: 90 Volts D. C.
Starting Voltage: 125 Volts D. C.
Maximum D. C. Current: 40 Milliamperes.
Current Rating: 1.1 Amperes.
Voltage Range: 40 to 60 Volts.

1 A* 2 1/2"
2 A* 2 1/2"
2 A* 2 1/2"

Voltage Drop Across

Half Zenith Filament

5
45-0

At 70 Milliamperes D. C.

At 90 Milliamperes D. C.

Filament Terminal Voltage: 2.0 Volt

Filament Current: 2.8 Amperes

Max. A. C. Input Voltage per Anode: 220 A. C. (R. M. S.) or 440 across both Anodes. †

Max. D. C. Load Current: 65 Milliamperes

Filament Terminal Voltage: 1.5 Volt

Filament Current: 1.25 Amperes

Max. A. C. Input Voltage: 250 A. C. (R. M. S.) †

Max. D. C. Load Current: 65 Milliamperes

Radiotron... Protective Double Contact
UV-877 Tube Keypost Auto-mobile Type

Rectron... Full Wave R. C. A. Leg. Stand-
UX-213 Rectifier and UX Base

Rectron... Half Wave R. C. A. Leg. Stand-
UX-216-B Rectifier and UX Base

* At normal operating grid voltage. (Not at zero grid)

† Plate voltage for a "leg" see p. 90 to 135 volts.

‡ C. M. S. indicates "RMS Mean Square" as indicated on an A. C. voltmeter.

§ Connections to each of base for third terminal which is the lead to mid-point of filament.

¶ The plate current values given are less than those obtained with zero grid, but are the currents actually obtained when the tube is operated at indicated values of plate voltage and grid bias voltage.

** When 6 volt supply is used, no rheostat is required.

New R. C. A. Tubes

THE Radio Corporation of America has announced the introduction of three new types of radiotrons designed especially for audio-frequency amplification and two new types of rectifier tubes to be marketed under the trade name "Rectron," the latter intended for use in "B" battery eliminators and other similar devices for obtaining filament grid and plate voltages from A. C. lighting circuits.

The new radiotrons and rectrons were designed for specified uses resulting from new developments in the radio art. None of these tubes supersede the present five standard types of radiotrons. They do, however, occupy special fields of usage as set forth in greater detail below.

Radiotron UX120 is a new dry battery amplifier tube designed to provide increased loud speaker volume and improved quality of reproduction from dry battery operated sets.

The UX120, when used in the last audio stage of dry battery operated receivers and connected to a loud speaker, preferably of lower impedance, provides loud speaker volume double that obtainable with the UV201A tube used under the same conditions.

Through the use of a special adapter, shortly to be put on sale, the UX120 may be employed in the last audio stage of any set using the UV199 tube.

Radiotron UX112 has been developed to meet a demand for increased loud speaker volume and improved quality of reproduction from radio sets operated by storage batteries where UV201A is now used in the last audio stage.

As an audio amplifier UX112 occupies a position midway between the dry battery power amplifier, UX120, and the A. C. power amplifier, UX210.

Radiotron UX210 is a super-power amplifying tube of exceptional merit designed to produce loud speaker volume considerably in excess of that obtained with present types of tubes and to give undistorted output at such volume.

UX210 may be employed in the last audio stage of existing types of receivers

provided the proper filament grid and plate voltages are applied.

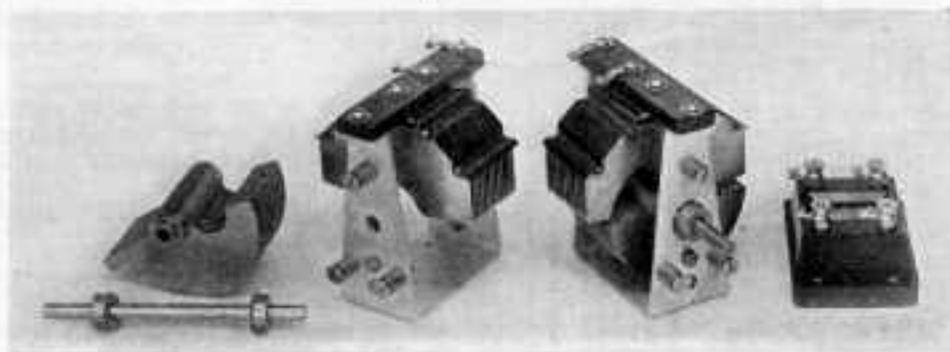
Radiotron UX210 is a power tube of exceptional long life and of such characteristics that it also may be used for amateur radio transmission.

Rectron UX216B is a high power (60 milliamper output) single wave rectifier, a new development which will be employed in the new rectifier-amplifier units for the operation of high power loud speakers. A tube of the general characteristics, construction and operating life of UX216B is not to be confounded with certain inferior types of rectifier tubes which have appeared on the market and which have been found to have extremely short operating life under the strain imposed by "B" battery eliminators.

Rectron UX213 is a double-way rectifier giving outputs of approximately 50 milliamperes.

It was also announced that another group of tubes is soon to be marketed under the trade names of radiotron UX874, UV876 and UV877. These tubes are for regulation of line voltage, plate voltage and for the protection of the plate circuit. The UX874 is a voltage regulator tube having a rated voltage of 90 volts and a current carrying capacity of 15 milliamperes. It is 5 5/8 inches high, 2 3/16 inches in diameter and fits in the standard RCA large UX base socket. The Radiotron UX876 is a ballast tube having a current carrying capacity of 17-10 amperes and a rated voltage of 40-60 volts. It is 8 inches in length, 2 1/16 inches in diameter and fits in a standard mogul type screw base. Radiotron UV877 is a protective tube. It is 2 1/2 inches in length, 1 7/16 inches in diameter and fits in a double contact bayonet type automobile socket.

New Condensers and a Resistance Unit



THE Precise Manufacturing Company is now making delivery on two new variable condensers. They are practically identical in design except that, on one type, the rotary plates are made with a short tab, as will be seen from the illustration of the variable plate unit. The condenser is made in such a way that the shaft can be removed entirely.

These condensers were designed by Mr. McLaughlin, of the Precise Manu-

facturing Company. He will be remembered as the designer of the single control super-heterodyne described some time ago in QST Magazine.

Another item, shown at the right of the illustration, is the Brach resistance coupled unit. This contains two resistance elements and a 1 mfd. by-pass condenser. The high capacity is used to by-pass the low frequencies.

RADIO ENGINEERING

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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

K. 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.

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Vol. V OCTOBER, 1925 No. 10

EDITORIAL

THE average man in the radio business, whatever part he takes, is a decidedly phlegmatic individual. It is not surprising, then, that the technical men from the radio dealers and jobbers, visiting the several hundred booths at the two New York Radio Shows, chorused "Nothing but the old stuff," as they left the exhibits.

That was an unfortunate reaction, but it was largely the fault of the manufacturers themselves because they do not understand, or attempt to understand, the men who are directly responsible for the sale and maintenance of their products.

Bob Smith went to work for a grocery store because his father told him it was time for him to contribute to the family budget, and because, having learned arithmetic and reading, he was mentally equipped for the job.

But Bill Jones went to work in a radio store because he found radio so interesting as a hobby that he wanted to give all his time to it, and being quick and clever enough to have taken it up voluntarily, he was mentally equipped to absorb as much in the way of a radio education as opportunity permitted.

Glancing thru the dealer-jobber merchandising papers to which his employer subscribed, he saw the Stromberg-Carlson advertisement headed, "The Symbol of Integrity," found that, "Bosch pre-

sents the Amborola," read that Music Master is, "The most inspiring name in the whole field of radio," came to a five-page advertisement in which R.C.A., "Announces a Selective Dealer Policy," and was finally told that Kolster Radio is, "The Season's Sensation."

Then, not from a feeling of obligation but with a genuine interest in the things he was going to see, anticipating the usefulness of what he would learn, Bill Jones went to the Radio Show.

And what did he see? Lifting the lid of the Stromberg-Carlson set he discovered that the Symbol of Integrity was tightly sealed in several neat-looking cans—and that was all he did see. He asked one of the men in the booth, someone from the sales department, a simple question about what was in those cans, but the salesman suddenly felt an urge to buy a glass of grape juice, and walked away without hearing the question.

The Amborola presented a most attractive appearance, in a beautifully finished cabinet, and the inside had possibilities, for at least it was unusual, but Bill walked on because it's hard for anyone to be interested in a thing he can't understand.

It was discouraging, but Bill remembered that he could expect to get some real ideas from whatever new came from Ware. There it was, in the Music Master booth, a handsome outfit, thoroughly intriguing, one tuning control, a knob to rotate the loop, and everything. Opening the cover he found—tin cans again. The loop caught his eye, such a little one! How could that do the job? He stood on one foot and the other, waiting for someone to stop talking about the value of a Music Master franchise long enough to tell him what was in the Ware set that produced any real results on such a loop. Finally, discouraged he walked away.

The R.C.A. line—there was something good, even if the only thing they told a fellow about was the selectivity of their dealer policy. Bill would get some dope on their new sets.—He did. He got the information that there wasn't any dope about them!

Without much enthusiasm, altho he had looked forward to seeing the Kolster sets and what they had in them, he stood before the season's sensation and absent-

(Concluded on page 524)

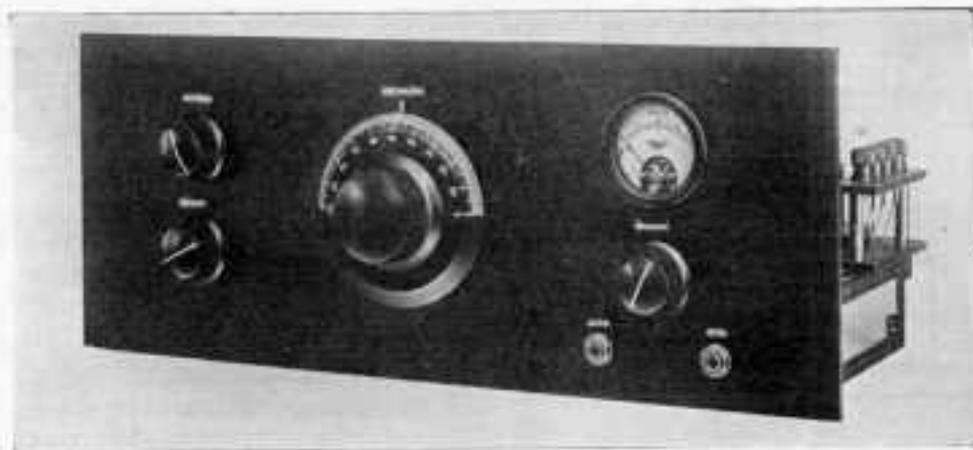


Fig. 1. The filament voltmeter is becoming increasingly characteristic of radio receiving set panels

Three-Circuit Set The 1926 Model

A design which incorporates several features which improve this ever-popular type of set, and offers suggestions which can be incorporated in other circuits.

SETS come and go, replacing each other in steady succession, but there is no end of interest in the old stand-by, the three-circuit tuner. Even now letters come from old readers who built the type 1900 and X-1900 sets years ago, telling of the continued service they have had from these sets. They have asked, however, for a more up-to-date design, wishing to incorporate some of the new parts brought out this season, but unwilling to depart from the circuit which has served them so well.

Features of the Type Two things we thought important to use in the set were the S. L. F. condenser and Jewell filament voltmeter. They are not only essential for this outfit but for all new equipment. Doubt is sometimes expressed concerning the advantages of S. L. F. tuning, but only from those who speak without experience, for S. L. F. control is so different from S. L. C. tuning as to make it a decided novelty.

As for the voltmeter, if you have had a meter on a set, it becomes so much a necessary habit as a speedometer on a motor car. You feel lost without it. Tubes are cheap enough so that their life is not of vital importance, but there is nothing more exasperating than to find that the tubes light though the set does not work because someone, running the tubes too brightly, has burned off the oxide, thus stopping emission. A professional set builder in New York equips all his outfits with voltmeters, and has engraved on the panel, under the meter, KEEP THE POINTER BELOW FIVE VOLTS.

There have been some complaints on the X-1900 because the circuit did not regenerate above 450 meters. Accordingly, we used for this set the new Samson tuning unit, employing one of the movable coils as a tickler. The other coil replaces the tapped coil of the old variocoupler. With the 0.0005 mfd. Karas condenser, the wavelength range is from 200 to 600 meters.

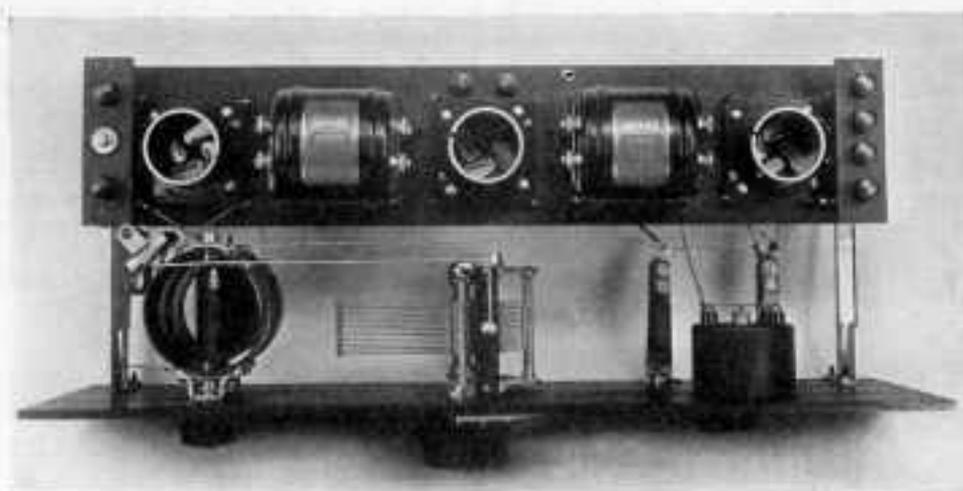


Fig. 7. All the parts are easily accessible for assembly and adjustment

Some of the rheostats made four years ago developed trouble from loose wire, so we picked the Carter type, both because the wires can't very well loosen up and because it's the neatest little rheostat wire ever seen.

We couldn't help wishing for something in a particularly nice low-ratio dial for the condenser, but we couldn't locate one except the National, and it didn't occur to us, until too late, that we could have used it by spacing the condenser back from the panel by standard coil support pillars. There is plenty of room if you want to make your set that way.

The design of the tube panel is not unusual, though we departed from current practice in the arrangement of the binding posts, and worked in the ever-useful Walbert lock switch to cut in or out on the antenna series condenser. Three Walbert sockets are provided for the tubes, with Karas A. F. transformers mounted between them. The complete parts list is enumerated in Fig. 6.

One other detail is interesting—the use of the Lastites under the tube panel. As plain terminals, to replace a lug and nut, they are splendid, particularly as the Lastite is prevented from coming loose by the wire soldered to it. When used as nuts and also as supports for long leads, they are especially handy. They are employed in this manner on

the screws fastening the transformers and sockets.

If a screw is too long for a Lastite, put the screw in place and clamp it with an ordinary nut. Cut off the screw close to the nut, remove the nut, thus cleaning the thread, and the screw will be just right to take the Lastite.

The phone jack is arranged to operate the detector and first audio stage, or the detector and both amplifiers. With the phones at the first jack, two tubes light when the rheostat is turned on, or all tubes with the phones at the second jack. It is not ordinarily considered good practice to use one rheostat with this system because the rheostat setting changes as two or three tubes are turned on. In this case, there is no harm, since rheostat is simply moved enough to bring the voltmeter back to 5 volts.

Drilling Use good material for the
the panels. This set was made
Panels with Celoron panels, the front measuring 7 by 18 by 3-16 in., and the base panel 3½ by 17 by 3-16 in. Hard rubber is all right for the front panel, but on the tube panel additional bracing at the center, in the form of one or two pillars, is needed to prevent sagging from the weight of the transformers.

Full-size panel patterns for this set, showing the exact location and size of

each hole, can be obtained from the Blue Print Department, or the dimensions can be scaled off from Figs. 4 and 5, as they are exactly one-half size.

If you make the holes with a hand drill, do not put the panel on the edge of a table and drill over the side. This bends the panel slightly, causing the drill to work outward from the table. Put the panel flat down on a smooth piece of scrap wood.

Note 1—Put the screw through the tube panel, then put on it two 11/16" brass pillars.

Note 2—The upper screw must be cut off and put into a Lastite instead of a nut. This Lastite is 01.

Note 3—Put a lug pointing outward under the Lastite on ANT. The upper terminal of the 0.0001 mfd. Micadon, P2, will be soldered to it later.

Note 4—P1 is bottom lug on Micadon.

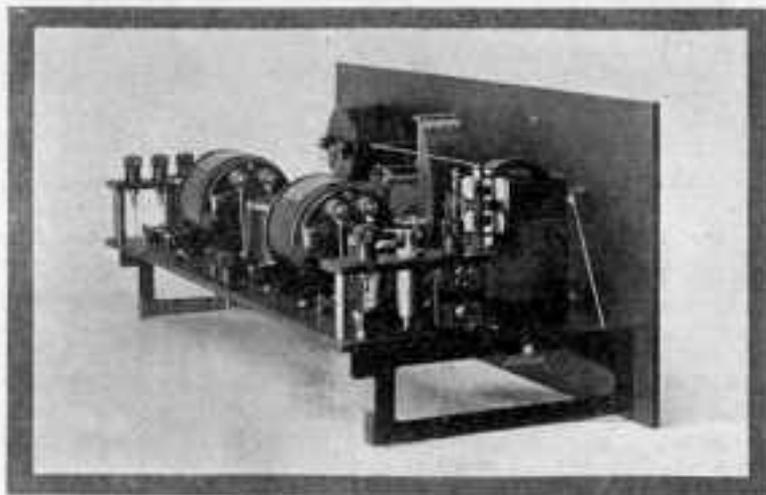


Fig. 2. Here you can see the arrangement of the right hand terminal panel and the method of mounting the grid condenser.

Assembly and Wiring Fig. 6 gives the step-by-step instructions for assembling and wiring. Follow these through with Figs. 4 and 5. In case the picture wiring diagram seems different from the schematic, follow the former, as it was made directly from the original model which we built at the Darien Laboratory.

You will see that connections are made with Wirit, and all joints soldered. It is not advisable to depart from this practice. Some set builders prefer stranded rubber covered wire. We have been advised against it, however, because the sulphur released by the rubber as the wire is heated is apt to corrode the wire. Bus bar is not favored for owing to its stiffness, it makes the soldered joints come loose.

Following are the explanatory notes for the step-by-step instructions.

Note 5—With the front corner holes already drilled in the tube panel as a guide, drill them through brackets A and O.

Note 6—Use 3/4-in. 6-32 R.H. screws for the sockets and 1/2-in. 6-32 R. H. screws for the transformers. Use Lastites instead of nuts on screws a, d, f, g, i, j, and k.

Note 7—Insulate this wire with varnished tubing.

Note 8—Put Lastites on I for terminals 11 and 12.

Note 9—Mount K with the coil with fewer turns toward the bottom of the front panel. Put a lug under one of the screws holding the upper front shaft bearing to make terminal K5. This is used instead of the lug at the rear.

Note 10—Solder the lug N2 to bracket O.

Note 11—Solder the lug on M directly to lug K2.

Note 12—P2 is the Lastite on the lower terminal of P.

Testing and Operating Before the final installation, set up the outfit on the testing bench. Put the tubes in place, connect the A battery, and turn up the rheostat. The voltmeter should not register more than 5 volts, the correct filament voltage for UV201-A and

Put the upper coil of the tuning unit at an angle of 45° , and rotate the lower one, at the same time turning the variable condenser. As soon as you pick up a whistle, reduce the tickler coupling, and get an exact setting on the condenser.

The three-circuit tuner is very easy to operate, but there are little tricks which you will learn gradually as you get the knack of handling the outfit. For long

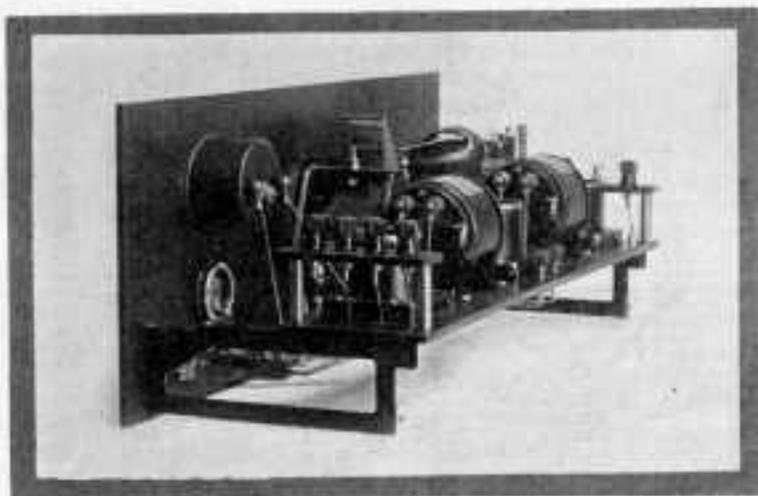


Fig. 3. From this and you can see the new Jewell meter, designed to mount without screws, and the Carter rheostat.

similar tubes. Remember that the meter does not show the A battery voltage, but only what is actually applied to the tubes.

Remove one of the A battery leads and touch it to each of the + B posts. If the tubes light then, there is a short circuit.

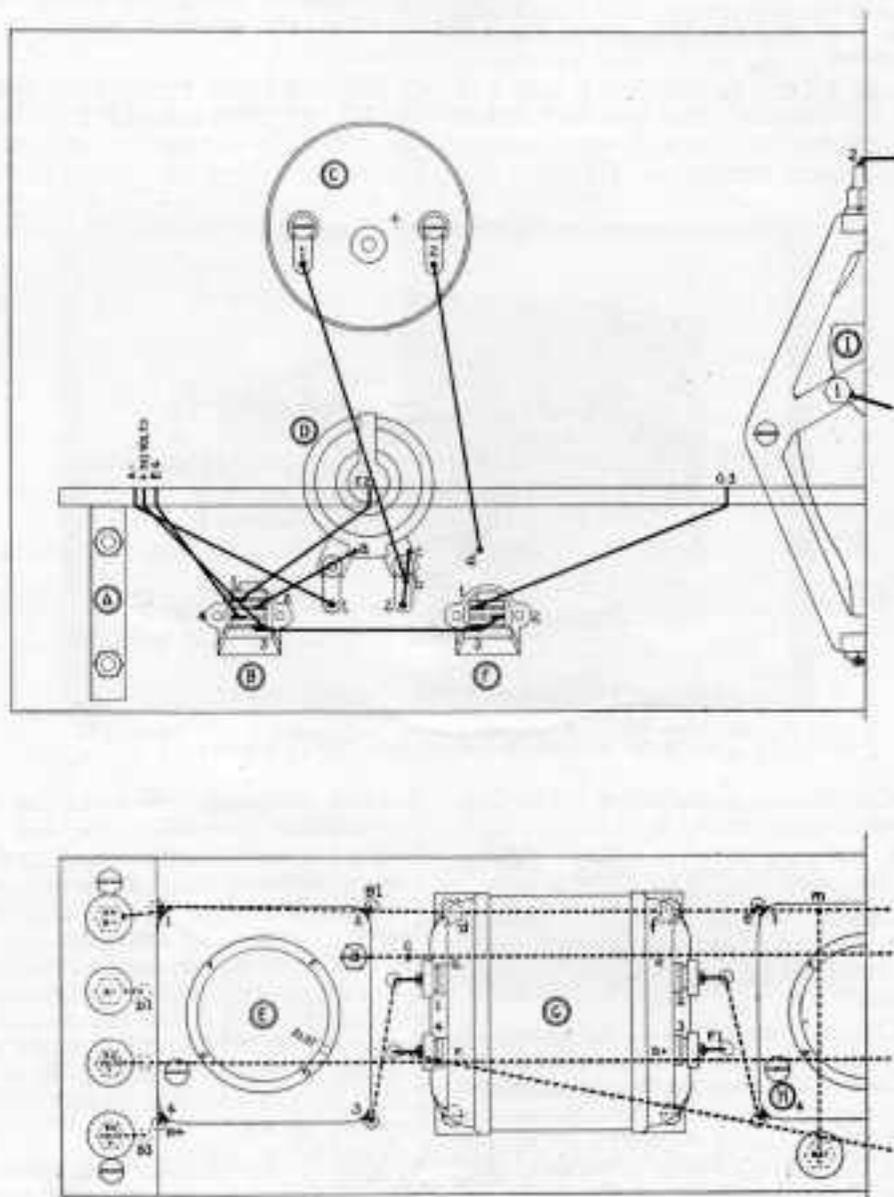
Connect the batteries, as shown in Fig. 6, and put on the antenna and ground. The antenna can be of almost any size up to 125 ft. In that case the lock switch should be pushed in, to connect the series antenna condenser. Below 50 ft. the condenser should be cut out by pulling the plunger out to the stopping notch.

Plug in the phones at each jack. This should make a strong click in the phones. If it does not, the B battery is low or there is an open in the plate circuit.

distance reception, this outfit has few competitors. It will be recalled that during last year's transatlantic tests probably more three-circuit tuners got across than any other type of receiver. There is just one thing to watch out for. If you want quality, you must not force the set to the point of oscillation. This ruins the quality of any circuit and does not do justice to the transformers or the loud speaker. Excessive coupling from the tickler simply increases the noise and destroys the tone.

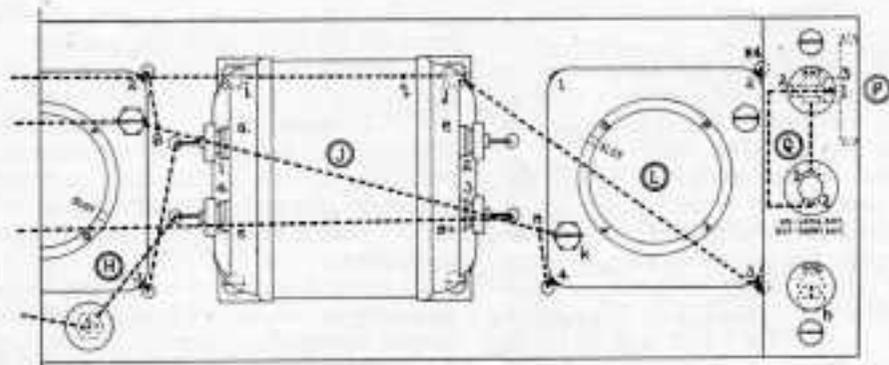
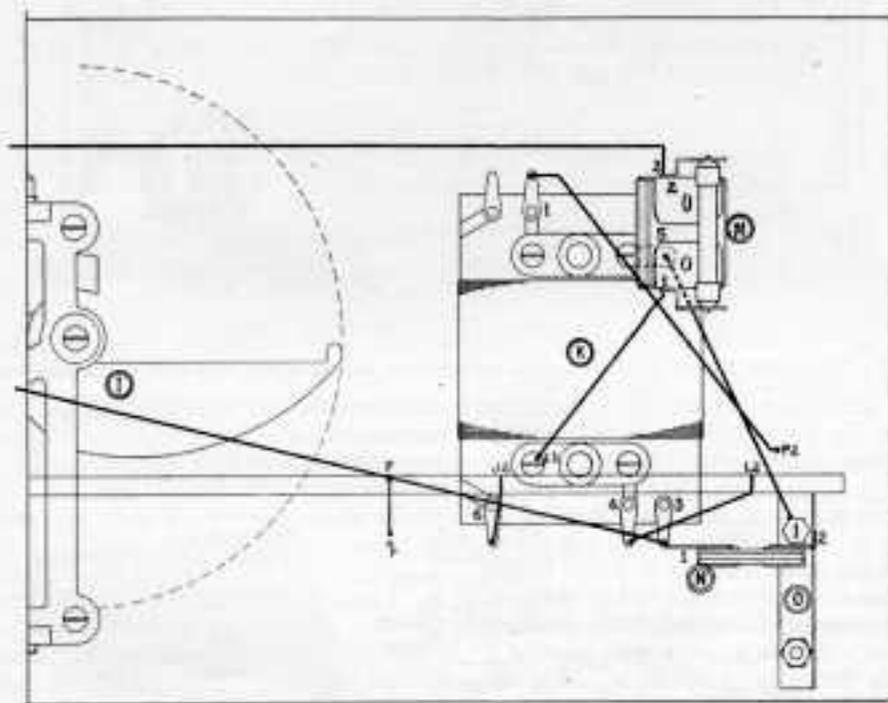
Reading the Diagrams For the benefit of those who are not familiar with the new type of picture wiring diagram, a few suggestions will be helpful. The drawings in Figs. 4 and 5 are divided into two parts, showing the front panel and the instruments mounted on it, with the base panel and its parts drawn below.

All the wiring between parts on the



Des. by M. B. S.	RADIO ENGINEERING	
Dr. by J. L. L.	3-CIRCUIT RECEIVER—	
Ch. by	1936 MODEL	
W. by M. B. S.	Diagram Dept.	Radio-Engineering Dept.
Control.	Job 7175	Aug. 20, 1935
Scale: Full Size	Dr. 12-25-3	Sheet 1

Fig. 4. Left hand half of the picture wiring diagram, showing the connections as they were actually made on the original model



Des. by H.B.L.	RADIO ENGINEERING	
Dr. by L.L.	3-CIRCUIT RECEIVER	
Ch. by	1925 MODEL	
In Chg. W.C.B.	Darwin, Conn.	Incl. Wiring Diagram
Printed	Job 1719	Sept. 1, 1925
Scale Full Size	Dr. 10-25-E	Sheet 2

Fig. 5. Right hand half of the picture wiring diagram. Wires indicated by dotted lines are those run underneath the tube panel.

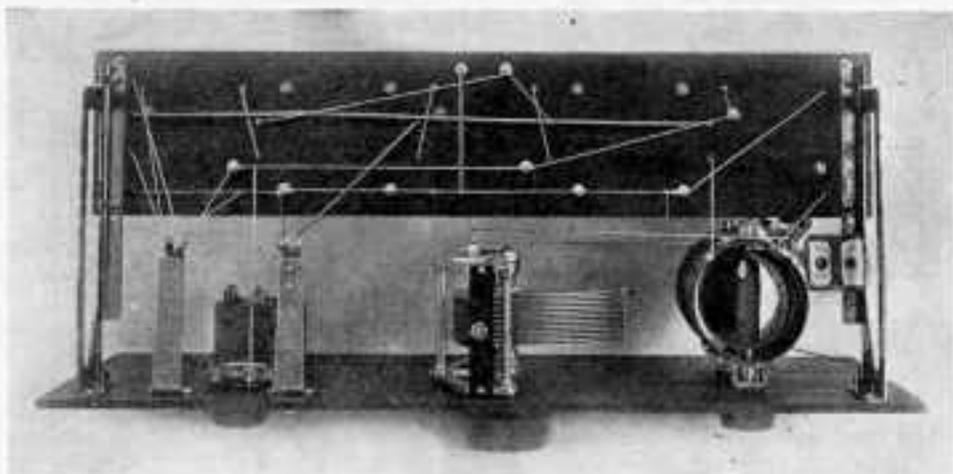


Fig. 6. The under side of the tube panels showing the wiring of the transformers and sockets

front panel are shown above and the wiring for parts between instruments on the tube panel, down below. Where wires run from one panel to the other, they are drawn on the upper part. Take wire $p-q$. You will see that this is drawn above, the wire fastened at p and ending in a dot at q . From the end of the wire, q , run your eye down directly, and you will see a dot on another wire marked q . This is the point to which the other end of $p-q$ should be connected.

Each instrument is marked with a capital letter, and the terminals of that instrument are indicated by numerals, starting at 1. The variable condenser, I , for example, has two terminals, 11 and 12.

When connections are made to wires, and not to instrument terminals, they are marked with small letters, as in the case with p and q . The binding posts are indicated by the markings which they carry instead of by capital letters.

The reason for employing this method is to make the terminals easy to locate, where before, using only numbers running sometimes above 100, 50 might be at one end of the panel and 51 at the opposite end.

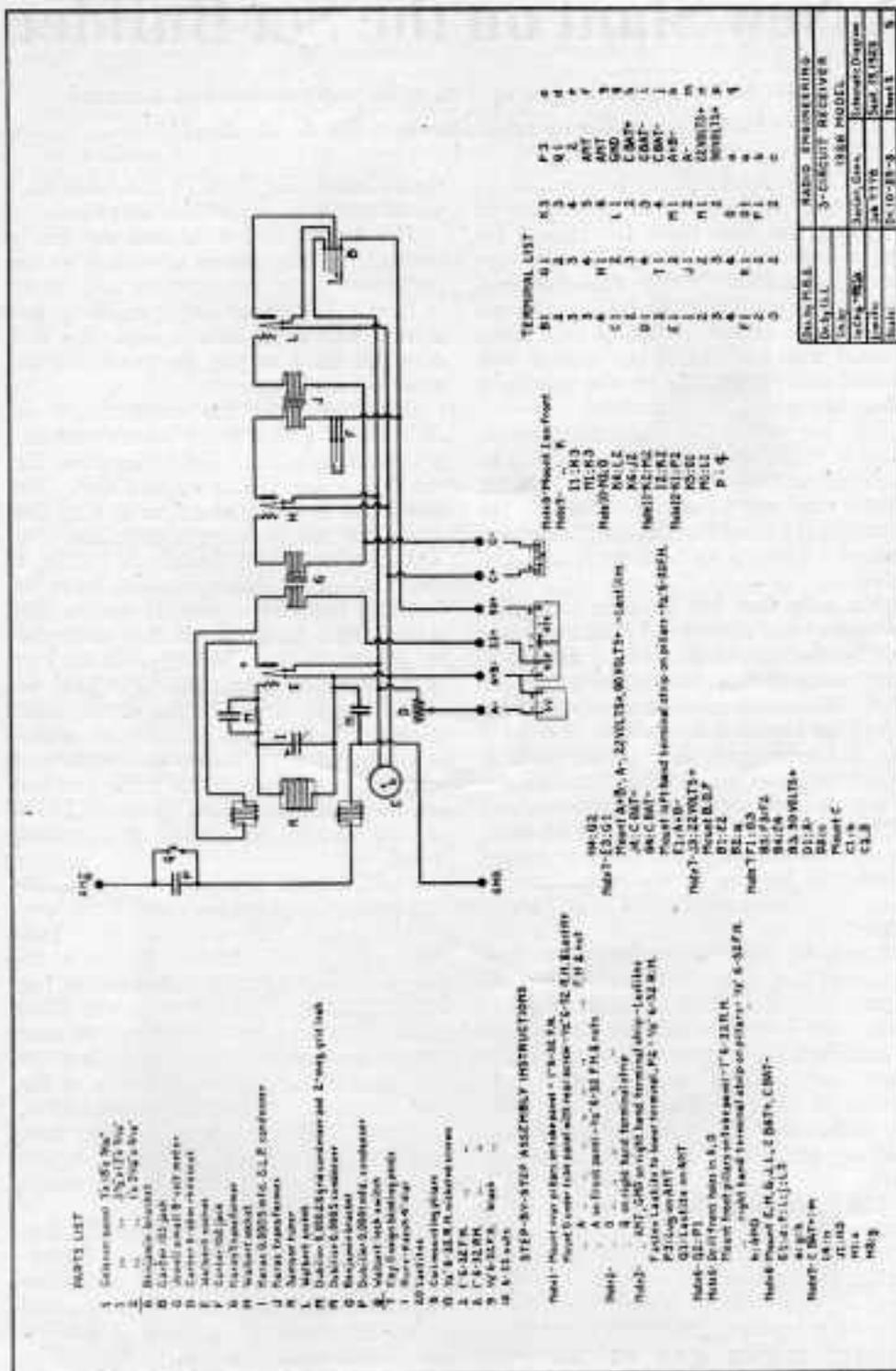
In Fig. 6 you will find the terminal checking list. Here every terminal is listed. If two connections are made to the same terminal, it is listed twice. Therefore, as you follow the step-by-step instructions, you should check over the connections on the list. When the set is

completed, if you have checked the same connection twice, or have failed to check a connection, you have made a mistake in the wiring. This makes mistakes practically impossible, or, if they are made, very easy to locate.

Notes on the Three-Circuit Tuner

If you are not familiar with receiving sets of this type, you may not understand just what is meant by "Three-Circuit Tuner". The regenerative three-circuit tuner is comprised of three separate circuits, the antenna to ground circuit, which includes the primary coupling coils of the tuner, the secondary circuit comprising the main tuner inductance, variable condenser, and the grid and filament of the tube, while the third circuit runs from the plate, through the adjustable tickler coil, on to the primary of the first A.F. transformer, and down to the B battery. It is by coupling the plate and secondary circuits to the other that amplification through regeneration is obtained, making the two circuits react upon each other.

In this particular set it was not found necessary to put a 0.0005 mfd. fixed condenser across the primary of the first A. F. transformer as is customary. If you use any transformer other than the Karas you may find it necessary. This is done to allow the R. F. currents to flow around the transformer, but the small capacity of the fixed condenser offers too high a resistance to low frequency audio currents.



PARTS LIST

- 1. Selenium rectifier 1/2 x 1/4 x 3/16"
- 2. " " 1/2 x 1/4 x 3/16"
- 3. " " 1/2 x 1/4 x 3/16"
- 4. Resistor 100K
- 5. Carbon 100K
- 6. Carbon 100K
- 7. Carbon 100K
- 8. Carbon 100K
- 9. Carbon 100K
- 10. Carbon 100K
- 11. Carbon 100K
- 12. Carbon 100K
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- 16. Carbon 100K
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- 97. Carbon 100K
- 98. Carbon 100K
- 99. Carbon 100K
- 100. Carbon 100K

STEP-BY-STEP ASSEMBLY INSTRUCTIONS

- Step 1 - Mount over plates as indicated - 17-18-19-20
- Step 2 - Mount over plate as indicated - 21-22-23-24-25-26-27-28-29-30
- Step 3 - Mount over plate as indicated - 31-32-33-34-35-36-37-38-39-40
- Step 4 - Mount over plate as indicated - 41-42-43-44-45-46-47-48-49-50
- Step 5 - Mount over plate as indicated - 51-52-53-54-55-56-57-58-59-60
- Step 6 - Mount over plate as indicated - 61-62-63-64-65-66-67-68-69-70
- Step 7 - Mount over plate as indicated - 71-72-73-74-75-76-77-78-79-80
- Step 8 - Mount over plate as indicated - 81-82-83-84-85-86-87-88-89-90
- Step 9 - Mount over plate as indicated - 91-92-93-94-95-96-97-98-99-100

- 101. Selenium rectifier 1/2 x 1/4 x 3/16"
- 102. " " 1/2 x 1/4 x 3/16"
- 103. " " 1/2 x 1/4 x 3/16"
- 104. Resistor 100K
- 105. Carbon 100K
- 106. Carbon 100K
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- 174. Carbon 100K
- 175. Carbon 100K
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- 194. Carbon 100K
- 195. Carbon 100K
- 196. Carbon 100K
- 197. Carbon 100K
- 198. Carbon 100K
- 199. Carbon 100K
- 200. Carbon 100K

Radio P.M.E.	RADIO ENGINEERING
City: L.L.	3-CIRCUIT RECEIVER
Co. No.	1925 MODEL
in Chg.	Jacob Glass
checked	Jak V. Van
Date	Dec. 10-23-25
Sheet	Sheet 3

Fig. 6. Schematic diagram, showing also the battery connections. The complete list of parts and constants, step-by-step assembly instructions, and terminal checking list are given

A New Slant on the Set Builder

The set builder is no longer an evil to be suppressed, but a useful factor in radio merchandizing.—By E. R. Doyle*

THE professional set builder, working individually or in the employ of a dealer, has done much for radio. He has a first-hand knowledge of local operating conditions which manufacturers do not appreciate and the B.C.L. does not understand. The professional is in direct contact with his clients, and cannot hide behind correspondence or the telephone when his sets do not function.

The big factor the trade must appreciate in the professional builder is that he is experimenting and studying everything that is new and promising. Thus he encourages his clients to realize greater and greater efficiency in both parts and circuits.

Not only that, but he is an advertiser of radio—not merely by contact selling but by demonstration. He is known to his friends and acquaintances as an expert. When the manufacturer's set falls down, he remedies the failure and saves the manufacturer and sometimes the dealer the grief of servicing complaints.

He writes for the newspapers and magazines. He is a connoisseur of quality in broadcasting, and takes a sincere interest in keeping up the enthusiasm all around. He makes the game worth while.

More, he originates many tricks, fundamental and otherwise, that get into accepted practice. He follows the new circuits, and knows what they are worth. Sometimes, he improves them or makes them more practical.

One of his best jobs has been in making radio cost less for the public by simplifying and adapting circuits to special uses.

The professional radio builder is not a competitor of the set maker in any sense. While in the past, his number has been legion, he is now reduced to a picked band of experienced experts. He takes care of a broader class than any manufacturer, ranging from the man who

wants much for little to the man who wants the best, regardless of price.

The dealers find these men extremely useful in giving special assistance to his customers. For example, he may want to have a low priced super made up for a man who must have a super-het but does not want to pay the price for the manufactured type.

Sometimes they are employed to be on hand to advise parts buyers and experimenters on Saturday afternoons. He can talk sense on factory sets also. He sells more by being an authority than the dealer can sell by being a merchant.

A successful set builder is really a dealer himself. He specializes more or less and becomes expert in certain circuits. That he is a constant infringer on patents is true, but there is no way of determining when this is ethical or not as long as the public can do the same thing. His freedom from prosecution, as compared with dealers and manufacturers, is a benefit to the trade and the art, for it permits him to try out all kinds of new circuits in a truly professional spirit.

The Cardwell Company is one manufacturer which has gone out of its way to encourage the professional. This company not only asks its dealers to allow professionals a special discount but it has featured the work of many of these men. It is now endeavoring to educate other members of the trade as well as the public to the value and service of the free lance and commercial experimenter. It is now helping to organize these men into a guild in order to promote higher standards of dealer service and manufacturing conscience.

This is a year in which the professional must fight for his business. Nevertheless, as the public begins to appreciate that luxurious cabinets and ornamental panels often hide a multitude of inferior parts and unsatisfactory workmanship, it will tend to place more confidence in

* Allen D. Cardwell Mfg. Co.

the professional. As one set builder says on his letterhead:

"There is no substitute for the personal equation in the manufacture of super-fine radio receivers. My responsibility extends beyond ordinary guarantees and all designs are far in advance of commercial types. Ask my patrons."

We need the professional builder to set a pace in standards and refinements. We need him to try out, test, and rate

circuits. We need him to give dignity to radio merchandising as something above soap and potatoes. We need him to work out new ideas for the radio magazines. We need his enthusiasm, criticism, and interest in all matters of the art. Unless we encourage him and recognize him with discounts and publicity, we tend to reduce that valuable quality of pioneering which is so marked an asset of the composite American.

Selectivity and Quality

Perfect A. F. amplification and true loud speaker reproduction cannot give distortionless speech and music if the R. F. tuning circuit is not right.

JUDGING from some of the advertisements, distortionless reception is simply a matter of using the ABC loud speaker or the XYZ amplifier. But that is not true, of course. The perfect loudspeaker is one which reproduces exactly what the A. F. amplifier puts into it, and the perfect amplifier is one which amplifies exactly what the detector put into it.

However, the perfect amplifier and loud speaker may give very poor reception—if the R. F. tuning circuits are not right. This is a matter to which little attention has been paid in the past. Now, with S. L. F. condensers available, it is very easy to determine the effect, and the extent of the effect, of tuning upon the quality of reception.

Drawings of R. F. oscillations modulated at audio frequencies do not give true pictures of the actual effect, for they look like constant radio or carrier frequencies in A. F. groups of varying amplitude. This is wrong, because the oscillations sent out from the transmitter are of varying frequencies, frequencies equal to the constant R. F. carrier frequency plus and minus the changing audio frequencies.

Therefore, when you tune into a broadcasting station transmitting at 300 meters or 1,000,000 cycles your set must be adjusted to respond to frequencies

from 1,000,000 minus 5,000 cycles to 1,000,000 plus 5,000 cycles, for the range of audio frequencies is from about 20 to 5,000 cycles. Expressed in kilo-cycles, when you tune to a 1,000-cycle transmitter your set must tune broadly enough to pick up 995 k. c. to 1,005 k. c.

To take an extreme case, if your set were so sharp that it would respond to exactly 1,000 k. c. only you would hear nothing in the loud speaker. Such tuning is indicated by the line A, Fig. 1. If it were only broad enough to respond to 999 to 1,000 k. c., B-B, Fig. 1, you would not be able to hear audio frequencies above 1,000 cycles. That would not give you intelligible signals.

Consequently, it has been determined by the Western Electric Company that tuning must be broad enough, for telephone reception, to give signals 5 k. c. each side of the carrier frequency which are equal to one-half the strength of the signals at resonance with the carrier. This is shown in C-C, Fig. 1.

The preceding paragraph may seem obscure, but it is simple in actual demonstration. Put together a three-circuit tuner, using a Karas S. L. F. condenser for tuning. On a 100-division scale, one degree rotation changes the tuning by 10 k. c. Tune in a broadcasting station and note the scale reading at maximum

signal strength. Then turn the dial $\frac{1}{2}$ degree. That changes the tuning by 5 k. c. If the station is cut out all together, the tuning is too sharp to give perfect quality reception. If, as accurately as you can judge, the volume is reduced not more than 50%, the upper audio frequencies will not be cut off.

Many designers of tuned R. F. sets and straight regenerative receivers have been puzzled by poor quality in spite of

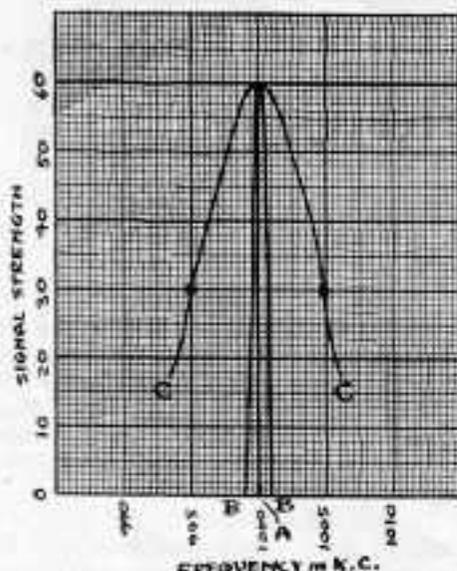


Fig. 1. This curve seems broad when expressed in frequency, but appears sharper when drawn against wavelength.

their efforts to obtain perfect A. F. amplification and reproduction. The trouble can be located, usually, in the super-selectivity of circuits operating just under the oscillating point.

Such circuits are dependent upon the regenerative condition for volume, but unfortunately bringing up the volume by this method usually increases the selectivity so much that part of the audio frequency side bands are cut off.

The foregoing answers the questions which some of our readers have asked concerning the reason for the improvement in quality obtained with the RX-1 receiver, thru the elimination of regenerative action. That is, for best quality, the volume should not be stepped up by a method which also makes the tuning too sharp.

Except in locations directly adjacent to transmitting stations, the RX-1 is sharp enough to separate stations 10 k. c. apart, the standard separation for broadcasting stations. Moreover, a very short antenna, 15 or 20 ft. in-doors, can be used for local reception, and 50 to 100 ft. for DX, because very little pick-up is needed, owing to the high R. F. amplification, for receiving stations up to 25 miles away.

(Continued from page 513)

mindedly turned the knob of the single-control receiver. Looking down on the scale, he noticed that it wasn't possible to read the numbers thru the slots in the celluloid, made a mental note to the effect that they should supply a chair with every set, and went home.

Next morning his employer asked him what he thought of the show. Bill said, "Oh, I went up there. Stifling hot wasn't it?"

"See any new lines that looked good?"

"No, nothing but the old stuff."

Imagine what a different impression he would have carried away if Stromberg-Carlson had taken enough interest in Bill Jones, the man who is paid to know about technical matters, to tell him what was in those cans, and why they have started to use them. How can he know what to think about the Ammorola? Will the Music Master salesman be able to overcome his prejudice bred from ignorance? Will he dare to say that he has confidence in the new R.C.A. equipment? Will he believe that Kolster can design radio sets as well as measuring instruments? Or will he cover up his lack of knowledge and fear from ignorance and urge his employer to keep to the old lines they always handled?

This winter, thru the thick of the fight for consumer acceptance, for dealer promotion, for jobber contracts, someone may be able to go over the top on the support of the technical men who can make sales merely by the expression of their opinion, and who create opinion in direct relation to the service they know how to give after the sales have been made.

M. B. SLEEPER,
Editor.

Manufacturers and Designers

Reference Data on

TRANSFORMERS

The data presented have been carefully compiled with the assistance of the manufacturers represented. By removing these pages from the magazine you will have a complete reference file on audio, radio, and super-heterodyne transformers. Next month this section will be devoted to B battery eliminators.

This amazing test

proves tone troubles ended **\$10.00**

Shows that amazing new audio gives almost perfect tone curves. Also greater volume than 3 stages of resistance coupled amplification. Send coupon.

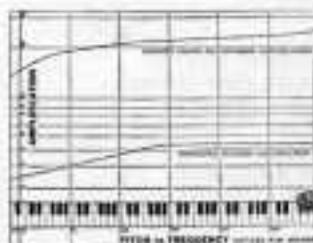
A NEW audio frequency transformer has been perfected, called the Erla Concert Grand. Tests prove it the most perfect transformer ever built. It is manufactured by the Electrical Research Laboratories, the largest manufacturers of radio parts in the world. This new transformer is so nearly 100% efficient that the difference is too slight for the human ear to detect.

New Kind of Audio

We found that ideal audio reproduction could not be obtained with ordinary construction. Usual types allow too much leakage to amplify properly at low frequencies. So ours is different.

Every detail in the Erla Grand Concert Audio is manufactured under strict laboratory supervision. Each audio undergoes an exacting laboratory test and inspection before it is permitted to go out. From start to finish this is a strictly laboratory job. We say without hesitation that here is by far the finest audio made today.

DEALERS—Exclusive franchisees are available to high class dealers in localities still open. Write or wire immediately.



It saves you money, too. For two stages with the Audio Grand gives greater amplification than three stages of resistance coupled amplification.

Use the Free Coupon

Get the Audio Grand at your dealer's, or if he cannot supply you send direct. See what a tremendous difference it will make in your set. Send your name and we will tell you many things you ought to know about audio frequency amplification.

ELECTRICAL RESEARCH LABORATORIES
2500 Cottage Grove Ave., Dept. 14-A, Chicago

ELECTRICAL RESEARCH LABORATORIES
2500 Cottage Grove Ave., Dept. 14-A, Chicago

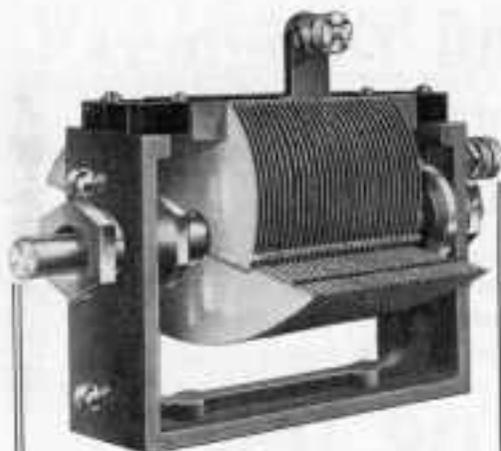
Send me information about the Erla Grand Concert Audio. Also latest developments on audio frequency amplification.

Send me..... Audio Grand. I enclose \$.....

Name

Address

City..... County..... State.....



Much smaller than any other

Samson Uniform Frequency Condensers are only $2\frac{1}{2}$ inches with plates wide open. Therefore, you can easily replace the condensers in your present set without crowding and get a station for each division of the dial. Despite their compactness they are more efficient than if they were three times as large. Capacities 250, 350 or 500 m. m. f. Single or three hole mounting. Grounded rotor, low loss type.

A Laboratory Precision Instrument at no more than a radio part price

You must consider as fine instruments and not merely as radio parts

Samson Uniform Frequency Condensers

which are machined to 1/10,000 part of an inch and entirely silver plated. Stator and rotor plates in addition are gold plated to prevent oxydization. Price \$6.50 to \$7.00.

Write at once for Bulletin 33; sent free on request

Member R. M. A.

Samson Electric Company
Manufacturers since 1882
Canton, Mass.

Sales Representatives in Twenty Leading American Cities

SAMSON Helical Wound Audio Transformers
"The Standard for Comparison"

Amplify at all frequencies with practically no distortion. Choice of those who know in sets for their own use. Only transformers with famous SAMSON Helical Wound Coils. Two ratios—3 to 1 and 6 to 1. Price, either ratio, \$5.00.



SUPER SM PARTS



S-L-F!

Real S-L-F Condensers at last! Silver-Marshall has met the demand for an all-round straight-line-frequency condenser by producing an instrument that fills the requirements of lowest losses, small size, attractive appearance, and—most important—practical S-L-F tuning efficiency. All types supplied with pulley collars so that from one to four condensers may be controlled by a single knob, without separate verniers. S-M Condensers are entirely silver-plated—a feature that reduces losses lower than laboratory standards.

No. 310 .0025.....	\$6.00
No. 311 .0035.....	5.75
No. 312 .0025.....	5.50

S-M INTERCHANGEABLE COILS

This latest Silver-Marshall feature will be ready for delivery about September 15. The new series of interchangeable coils will be arranged with six contacts to the coil, to plug into a Bakelite 6-contact socket. Several sizes of oscillators, R. F. transformers and antenna adapters will be available for the wave-length range of 50 to 550 meters, using .00035 condensers. Send for circulars describing these coils. An absolute necessity on the all-wave receiver.

Circulars sent upon request.

Silver-Marshall, Inc.

108 S. Wabash Ave.
Chicago, Illinois

KARAS HARMONIK

AUDIO FREQUENCY

AMPLIFYING TRANSFORMER



The Triumph of a Masterpiece!

— A Marvel of Transformers that Brought Real Musical Quality to Radio Reception

JUST one year ago the Karas Harmonik Audio Frequency Transformer took the radio world by storm.

Nothing like it had ever been known before. For the first time, scientific study had been devoted to perfecting an audio transformer for the reception of broadcast music. The problem of amplifying high, low and medium frequencies to equal degree was finally solved. Bass notes were poured from the speaker in full strength and rich tone quality. The vital harmonics in rich overtones, formerly lost, were brought out in their full beauty by this marvel of audio transformers.

Music critics, who had always condemned radio music as false and distorted, approved the results of Karas Harmonik amplification with great enthusiasm.

Prominent radio engineers subjected Karas Harmoniks to exhaustive laboratory tests—and pronounced it a technical masterpiece. Technical editors who promoted the season's most successful book-ups specified Karas Harmoniks in their circuits. The triumph of the Karas Harmonik was complete.

But, for all of this, the enjoyment of Karas Harmonik amplification was too greatly confined to one class of radio enthusiasts. Home set builders bought Karas Harmoniks by the tens of thousands. They were free to pick and choose. They were most exacting in their demands for the newest and best developments.

It was the owners of factory-built sets who missed the delightful pleasure of real, true radio music in their homes. Set manufac-

turners were prevented by price from adopting Karas Harmoniks for their sets. So the ready-made set-buyer unless he undertook to switch transformers, had to do without Karas Transformers.

Today there are in use, hundreds of thousands of sets—good sets—which could be vastly improved in musical quality by the simple operation of replacing the old transformers with Karas Harmoniks. Perhaps you own one of these sets. It may be all you desire from the standpoint of selectivity of range, and other tuning qualities. But, if it is not equipped with Karas Harmonik Audio Frequency Transformers, you are NOT getting nearly the musical quality you can just as well enjoy.

Are you going to be content with anything short of the best?

You can install Karas Harmoniks yourself. It's a short, easy job. Or, any radio repair man can do it for you. Make up your mind to do it now—at once. Get a pair of Karas Harmoniks TODAY!

In large cities, most good dealers carry Karas Harmoniks—and in many small towns. If your dealer is out of them, order direct from us. Send us money. Just send the coupon now!

Karas Electric Co.,
4044 N. Rockwell St.,
Chicago, Ill.

The Distinctive Features that Elevate Karas Harmonik Transformers to the Highest Pinnacle of Success in the Radio World.

1. Many thousands of turns of wire
2. Low ratio of turns
3. Extra large quantity of special laminated iron in core
4. Controlled air gap
5. No core saturation
6. Minimum of reluctance
7. Laminated Mylarite and Eddy Current Lens
8. Low Distributed Capacity
9. Scientifically accurate shielding preventing intercoupling of electromagnetic and electrostatic fields.
10. Very High Primary Impedance
11. Extremely High Inductance
12. High and Even Impedance of all Audio Frequencies.

Karas Electric Co., Dept. 40-62
4044 N. Rockwell St., Chicago, Ill.

Please send me _____ pair(s) of Karas Harmonik Audio Frequency Transformers. I will pay the postman 21¢ plus postage on delivery. It is understood that I am prepared 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 _____

AUDIO TRANSFORMERS — Continued

Manufacturer	Over-all size	Mounting	Terminals	Ratio	Core	Wave length	Tuning	Last price
Premier Electric Co.	1 1/2 x 2 1/2 x 2 1/2	Open	Ends	1-1	Iron	300-600m.	Self	\$2.00
Quinn Radio Corp.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-10	Iron	350-550	Self	3.00
Radio Receiver Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-10	Iron	350-550	Self	3.00
Robertson-Davies Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite	Slide	1-3	Iron	350-550	Self	3.00
Sansone Electric Co.	1 1/2 x 2 1/2 x 2 1/2	Metal	Top	1-3	Iron	350-550	Self	3.00
Sterling Mfg. Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite	Top	1-3	Iron	350-550	Self	3.00
Thordarson El. Mfg. Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-3	Iron	350-550	Self	3.00
(Autotransfer)	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-3	Iron	350-550	Self	3.00

RADIO TRANSFORMERS

Manufacturer	Over-all size	Mounting	Terminals	Ratio	Core	Wave length	Tuning	Last price
Arco Apparatus Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite case	Top	1-10	Iron	300-600m.	Self	\$3.00
All-American Radio Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite case	Slide	1-10	Iron	350-550	Self	(1.90 tubey) (301 & tubey)
Chas. A. Brantton, Inc.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Slide	1-3	Iron	350-550	V. C.	4.50
Brooklyn Met. Sh. Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-3	Iron	350-550	Self	3.00
Electrical Research Labs.	1 1/2 x 2 1/2 x 2 1/2	Bakelite	Top	1-1	Iron	300-700	V. C.	.....
Federal Tel. & Tel. Co.	1 1/2 x 2 1/2 x 2 1/2	Open	Top	.....	Iron	300-700	Self	.....
Kellogg Sw'ld. & Supply Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite	Top	.....	Iron	175-300	Self	.....
National Trans. Mfg. Co.	1 1/2 x 2 1/2 x 2 1/2	Bakelite	Top	.....	Alr.	250-550	V. C.	3.35
Premier Electric Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Ends	.....	Alr.	250-550	Self	4.00
Radio Receptor Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-3	Iron	300-600	V. C.	1.00
Sterling Mfg. Co.	1 1/2 x 2 1/2 x 2 1/2	Metal case	Top	1-3	Alr.	300-600	V. C.	3.50

SUPER-HETERODYNE TRANSFORMERS

Manufacturer	Over-all size	Mounting	Terminals	Ratio	Core	Kilo-cycles	Tuning	Last price
Arco Apparatus	2 1/4 x 2 1/4 x 2 1/4	Open	Slide	1-10	Iron	30	Self	\$3.00
All-American Radio Co.	2 1/4 x 2 1/4 x 2 1/4	Bakelite	Slide	1-10	Iron	30	F. C.	.....
Chas. A. Brantton, Inc.	2 1/4 x 2 1/4 x 2 1/4	Metal case	Slide	1-10	Iron	70-15	Self	.....
Brooklyn Met. Sh. Co.	2 1/4 x 2 1/4 x 2 1/4	Iron case	Top	1-3 1/2	Alr.	60	F. C.	13.50
General Radio Co.	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3 1/2	Alr.	35	F. C.	4.50
Jefferson Elec. Co.	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3	Iron	35	Self	5.00
Kellogg Sw'ld. & Supply Co.	2 1/4 x 2 1/4 x 2 1/4	Iron case	Slide	1-3	Alr.	30	F. C.	.....
Phenix Radio Corp.	2 1/4 x 2 1/4 x 2 1/4	Bakelite	Slide	1-3	Alr.	48	Self	3.00
Sansone Electric Co.	2 1/4 x 2 1/4 x 2 1/4	Bakelite	Slide	1-3	Alr.	81	Self	5.00
Silver-Marshall	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3	Iron	60	F. C.	6.50
	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3	Iron	60	Special	6.50
	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3	Iron	60	Self	.....
	2 1/4 x 2 1/4 x 2 1/4	Metal case	Top	1-3	Alr.	60	F. C.	.....

DONGAN

Quality

Audio Transformers

That the engineers of forty-two leading Set Manufacturers choose Dongan Transformers (there are 35 different types) is convincing proof of Dongan supremacy. Fans who build their own sets can secure the best possible performance by using Dongan Audio Transformers.



Type S
Ratios:

- 2 —1, \$4 List
- 1½—1, \$1 List
- 6 —1, \$2.75 List

Set Mfg'rs.
Large plant facilities and an experienced organization make possible an attractive price on Transformers, Voltmeters and Chokes.

See your dealer or write to factory for information. Money orders are filled immediately.

Dongan
again keeps pace
with advancement.

The manufacturer of the
New Raytheon Tube
for B-Eliminators.

Specifies
Dongan Transformers

Specification No. 500
and Chokes.

Specification No. 514

Once more the correctness of Dongan design and accuracy of Dongan construction are recognized in selecting Dongan Transformers and Chokes for Radio's latest advancement—the Raytheon Tube.

DONGAN ELECTRIC MANUFACTURING CO.

2995 Franklin Street, Detroit, Mich.

Transformers of Merit for 15 Years.

Voltmeters

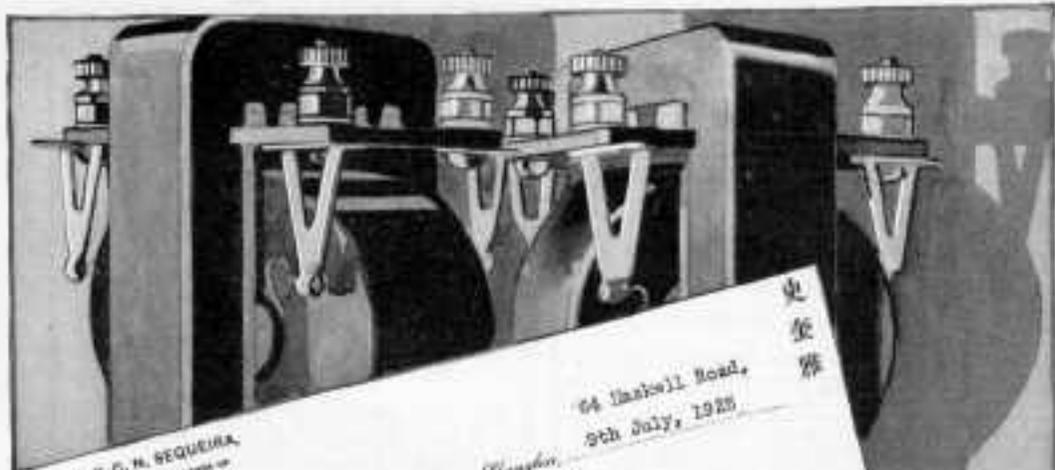
Each of the five types of Dongan Voltmeters is accurate over the entire scale. Par performance of any set can be secured by an occasional check on the B-battery and tube voltage with Dongan Voltmeters.



Type N
Panel Mountings
Nickel Finish,
Black Bezel
Clamp Mounting
Range
0—7, Volts,
\$3.75 List
0—50 Volts,
\$5.75 List
0—100 Volts,
\$2.00 List

Dealers

You know what it means to carry a standard line like Dongan. If you aren't acquainted with our sales plan write or wire.



史
安
雅

F. K. C. N. SEQUEIRA,

IMPORTER & DISTRIBUTOR OF
THE FINEST RADIO EQUIPMENT THROUGH
THE EAST DISTRICT - HONGKONG THROUGH
THE EAST DISTRICT AND THE WEST
THE GENERAL REQUIREMENTS THROUGH THE
TELEPHONE & CABLE

Shanghai
(China)

64 Hankwell Road,
8th July, 1925

American Transformer Company,
175 Basset Street,
Newark, N. J.

Dear Sirs:

I have the very great pleasure to inform you that on April
17 last I ordered some Radio goods from _____ Company of Chicago
amongst which was a pair of

The Very Best Obtainable Audio Frequency Transformers
irrespective of price

and they sent me a pair of AmerTrans.

Although I have tried and seen a lot of Audio Frequency
Transformers, the pair of AmerTrans is certainly superior to them all.

With these AmerTrans in my 3-tube Double Regenerative set,
I can not only get Japan and the Philippine Islands, but the appli-
fication is so very beautiful and clear that when I listen in to a
Violin Solo it seems that the player was inside the room, every note
clear and distinct.

This letter is written to show you my appreciation of your
wonderful Audio Frequency Transformers and you are at liberty to use
it or any part of it in any way you like.

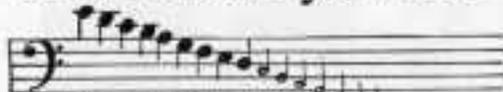
With best wishes for your continued success and sincerest
thanks to you for being the means of making me the proud possessor of
such a pair of beauties.

Yours very truly,

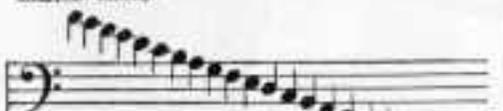
P.S. I need hardly tell you that all my Radio friends envy me the
possession of my Transformers.

AMERTRAN

What becomes of the bass notes in your set?



While the better transformers amplify only weakly over the entire upper and middle portions of the musical scale, from about 50 cycles downward there is a pronounced loss of amplification, as indicated above. Poorer transformers begin to drop off in amplification even higher on the scale with the result that lowest notes disappear entirely.



There is no variation in amplification over the entire range of musical frequencies with Thordarson Autoformers. No note is too low-to 2000 is too high to be fully amplified by the Autoformer. In addition there are three other advantages.

Four Great Improvements in Amplification!

Full amplification of those bass notes hitherto largely "lost"! Greater clarity on all signals! Improved reception of distant programs! Better volume control!

These are the four advantages achieved by this latest Thordarson development—the Autoformer. Thordarson has succeeded in utilizing, for the benefit of your radio set, the same principle used in the line amplifiers adopted by the more recent high-powered broadcasting stations. The excellent quality of these stations (due to perfect simplification) offers conclusive proof of Autoformer effectiveness.

Unconditionally Guaranteed

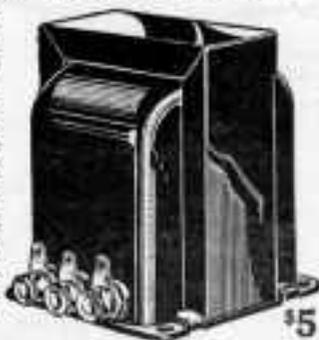
THORDARSON

Autoformer

Trade-Mark Registered

All Frequency Amplifier

Autoformer amplification is for those who seek the finest reproduction of programs to be had. It may be used with any set in place of the regular audio transformer hook-up. Full directions, with diagrams for building a Thordarson Autoformer Amplifier are supplied with each instrument. Or



Write for the Autoformer Hook-up Bulletin—Just Out!

THORDARSON ELECTRIC MANUFACTURING CO.
 1700 W. 18th St., Chicago, U.S.A.
 WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
 Chicago, U.S.A.



THE NEW MULTISTAGE MELOFORMER

A new audio frequency transformer scientifically combining tone and volume in correct proportions.

Construction radically new. Will work three stages

Factory type requires only 1 3/4" of space. THINK THIS OVER.

ROBERTSON-DAVIS' CO., INC.
 412 ORLEANS ST. CHICAGO, ILL.

MATCHED!



AERO COILS for Tuned R. F.

NOW—Aero Coils, the (patent-pending, 90% Air Dielectric, most powerful, most sensitive inductances are matched.

They are ideal for use with a gang condenser—or when used with three separate condensers. All three styles read exactly alike.

Set Manufacturers! Aero Coils will make your product out-perform competition by a wide margin. Write us at once.

Fact! If you want to know what tuned radio frequency is really capable of—Get a set of Aero Coils. \$12.99 a matched set, complete with brackets and full instructions.

Write for free "Aero Booklet"
AERO PRODUCTS, INC.
 217 No. DesPlaines St. Chicago

Checking RX-1 Operation

The first impulse of a man who can't get proper results from a set he has built is to blame the set. Nine times out of ten, the trouble is a mistake in assembly or faults in the auxiliary parts

IF YOUR B4 model of the RX-1 receiver does not work as it should, check over this chart and you will be able to locate the source of trouble. Remember, at the same time, that the RX-1 cannot be expected to do the impossible. It is not proposed as a set for coast-to-coast reception. It will not cut thru interference which paralyzes tuning. It does not eliminate static.

A. Tubes do not light

1. Tubes are burned out.
2. A battery has run down.
3. Battery leads are loose or broken inside the insulation.
4. Contact springs in sockets are loose or are bent down. Disconnect the B batteries before bending the springs up or you may burn out the tubes.
5. Rheostat lead from resistance wire is broken, or contact arm does not touch wire.
6. Filament circuit contacts on jack do not close.
7. Amperite defective.

B. Phones dead, tubes light, strong click

With plug in jack and tubes lighted, remove cord tip from plug. This should cause a strong click in phones or loud speaker. If it does not, phones are dead:

1. Antenna or ground is disconnected.
2. A battery is nearly run down.
3. Resistors in resisto-coupler left out or defective.
4. Open in primary of A. F. transformer.
5. Grid or plate socket contacts bent down.

C. Phones dead, tubes light, no click

Make the test as in B. If there is no click in the phones:

1. Loud speaker or cord defective.
2. Plug does not make contact.
3. B battery dead.
4. B battery leads reversed or loose.
5. Open in plate circuit of last tube.

D. Set oscillates

1. Antenna is disconnected.
2. Cut out antenna series condenser.
3. UV199 is defective.
4. RX-1 transformer wired incorrectly.
5. UV199 working at more than normal voltage.
6. D-21 Sodian working at more than normal voltage.
7. Plate resistor in resisto-coupler defective.

E. Tuning Broad

1. Coils on condensers open or wired incorrectly.
2. Antenna too long (local stations can be received on 20 ft. wire inside.)

F. Signals weak

1. UV199 defective.
2. Sodian defective.
3. Amplifier tubes defective.
4. Grid condenser or leak defective.
5. Open circuit in the wiring.
6. Amperite of too high resistance.
7. Antenna disconnected.

G. Howling

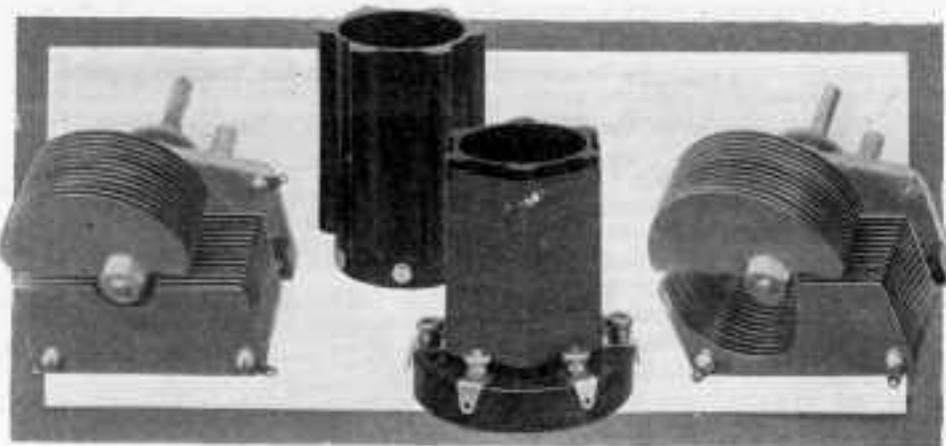
1. One of the grid socket contacts bent down.
2. Open in the grid circuit of one of the tubes.

H. Fading Signals

1. A or B batteries nearly run down.
2. Atmospheric conditions, for which the set is not responsible.

D-21 Sodian

The D-21 Sodian contains a small evacuated bulb inside the large frosted bulb. If the frosted bulb is cracked, the operation of the Sodian is not affected. Sodian tubes are surprisingly uniform. We have tested seven hundred D-21's, shipped in from various parts of the country, and have never found a defective tube.



Some new products just added to Silver-Marshall's line of parts, designed to meet the needs of set builders.

SILVER-MARSHALL have added some very useful parts to their line. These are shown above. On the left is an S. L. W. condenser, with an S. L. F. condenser on the right. An important feature of these condensers is that they do not take up any more space than S. L. C. condensers, as the small variation at the low end of the scale is obtained by cutting away the fixed plates.

Another device which will appeal to experimenters is the coil form and mounting. The coil form is made with six ribs by means of which the wire is held away from the tubing itself. Contacts are fitted at the bottom of the tube to which the ends of the coils are run. These engage with springs on the mounting socket. Although they can't be seen in the illustration, two springs are mounted inside to hold a very small rotating coupling coil. Binding posts and contacts are also supplied for making connection with the rotor.

The new Walbert S. L. F. dial is unique among the new types recently brought out in that it is similar to the ordinary vernier dial which has been marketed so successfully by that company. The dial, of German silver, has a beveled edge, leaving a small amount of space between the under side of the dial and the panel. This is the only space required for the S. L. F. operating mechanism. Under the knob itself is a 12 to 1 reducing gear similar in design to that employed in the ordinary Universer except that the reduction is less.

Another feature is that the pointer is attached directly to the shaft so that, although there is a comfortable amount of play in the knob, there is no play at all between the shaft, pointer, and scale.

Mr. Hutch, President of the Walbert Manufacturing Company, in commenting on this de-

sign, pointed out the fact that, although it is absolutely necessary to eliminate any movement between the shaft, pointer, and scale, a slight play in the knob mechanism itself should be allowed, nor is there any possible objection to it. This movement is comparable to the play which is always allowed in the steering wheel of an automobile, so adjusted in order to make the operation easier.

Isolantite is being much more widely used for insulation than ever before. The Patent Company, recognizing the qualities of this material, are using it for their new UX socket. It is ideal for insulation to radio frequencies and does not have the tendency to absorb moisture on its surface as is the case with glass or glazed porcelain.

The Teleforce Radio Laboratories, of Cincinnati, Ohio, under the management of T. E. New, are licensing manufacturers under their new system for single control. This method does not come under the claims of the Hogan patent, by the way. In the Teleforce method, a series of variable condensers can be controlled by one dial in such a way that some of the condensers may turn at higher rates of change than others. Moreover, by a very simple adjustment, if, when the set is tested out in the inspection department, the inductances are found to be slightly different in value, the rate of change of the corresponding condensers can be varied by small thumb screws on the mechanism. In addition, a thumb screw on the mechanism of the first condenser can be set by the individual purchaser so as to compensate for the particular capacity or inductance of his own antenna. This does away with all auxiliary adjustments, making the set truly a one-control receiver.

One of the first companies to get into actual production of S. L. F. condensers is the United Scientific Laboratories. Their condenser employs hard aluminum plates in both the rotor and stator with a heavy aluminum frame to maintain perfect alignment. The insulation is of Radon so placed as to carry the minimum mechanical strain. The condensers are made with maximum capacities of 0.00025, 0.00035, and 0.0005 mfd.

Peter C. Cordell, formerly in charge of assembly and production for the Erla Manufacturing Company has recently become production manager for Aero Products Inc., of Chicago, manufacturers of the Aero couplers and transformers.

The Haig & Haig, S. L. F. condensers are designed in a very interesting manner. It is necessary, in order to get perfect S. L. F. calibration, to have a correct minimum capacity value of zero on the dial. Accordingly, Haig & Haig condensers have an adjustable vane by which the correct minimum can be obtained for any circuit. In this respect they are different from practically all the other S. L. F. condensers which are not at all times accurate in calibration until the dial has been rotated for a few degrees.

Transformers of types designed for set builders and for manufacturers have been developed by the Robertson-Davis Company, Inc., of Chicago. The former type is very neatly mounted in a case of Bakelite or metal. The transformer is 2 ins. in diameter by 2-9/16 ins. high overall, while the manufacturer's type is 1 1/4 ins. in diameter and 1 1/4 ins. high.

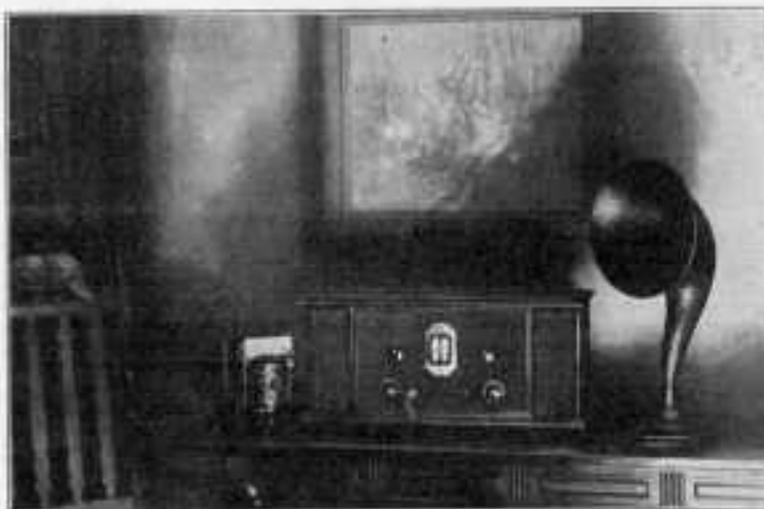
The Kuhlman Electric Company of Bay City, Michigan, have recently published a very interesting handbook on the electrical transformer. This bulletin is out of the ordinary in that the manufacturer does not talk about his product in the text. The new Kuhlman bulletin is brimful of practical engineering data and material for the electrical or consulting engineer, and the man who operates transformers.



Robertson-Davis are making Meltransformer types for both set builders and manufacturers.

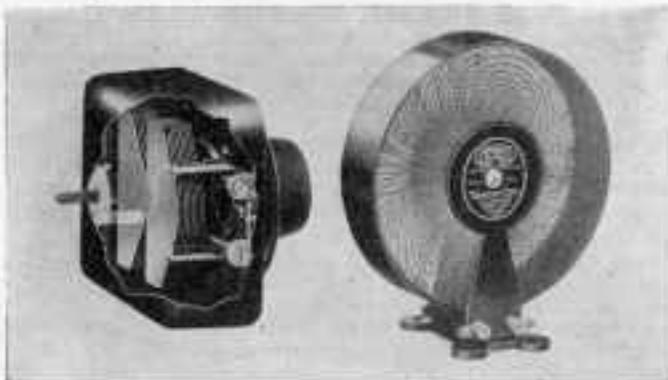
A copy can be secured by writing the Kuhlman Electric Co., Bay City, Michigan and ask for handbook "30 years of Uninterrupted Service to the Electrical Industry."

There is some real engineering in the new Eagle Neutrodyne. The development of this set has been along the lines of increased efficiency in the R. F. circuits through the employment of neutralization and improvement in the A. F. quality. Engineers of the Eagle Radio Company have selected Samson



One of the Kalster autos. These models are said to employ the Radio Frequency Laboratories' system.

All-American is producing a new variable condenser which has the advantages of small over-all dimensions and an enclosing case which makes it dust-proof. The Toroidal couplers and transformers are also new



transformers after a long series of investigations in which the function of the transformers tested were determined by the Oscillograph method, making each transformer write a visual of its operation through the range of audio frequencies.

Toroidal coils are now being produced by the All-American Radio Corporation of Chicago. They are made in two types, an antenna coupler, and radio frequency transformer. These are listed at \$3.50 each or they

manufacturing facilities of the C. E. Company but it gives some useful information concerning the manufacturing methods employed in making tubes and complete curves showing the various characteristics of C. E. tubes.

Set builders will be interested in the pamphlet on the D coil super-heterodyne, a design developed by the Central Engineering Laboratories of Chicago. This pamphlet, the price of which is 25 cents, describes the design of the outfit and gives complete instructions.



The development work done by the Eagle engineers deserves particular commendation, and should insure the acceptance of the new models. More expensive types are furnished in cabinets of very handsome design.

are sold in sets of three coils at \$10.50. This concern has also brought out S. L. F. condensers of 0.00035 and 0.0005 mfd. maximum capacity. They have the special advantage of being very small in size and they are enclosed, in accordance with the increasing demand this fall for protection against dust and dampness.

Anyone who thinks that all the independent tubes are manufactured in little back-alley shops should get a copy of the new catalog just published by the C. E. Mfg. Company, Inc., of Providence, R. I. This catalog not only illustrates attractively the

It was surprising to see at the New York Radio Shows how many commercial sets are equipped with panelites over the dials. These are provided not only to illuminate the dials but to give a visual indication that the tubes are on or off, since the use of the peep holes has been eliminated owing to the fact that they are of little service since the 201-A type tubes have come into general use. The Wallbert Manufacturing Company is selling the panelite for manufacturers and set builders, listing them at \$1.00 for nickel finish or \$1.25 for gold plating. These devices use a standard flash light bulb which draws practically no current.

Another Stride Forward

The sixth tube where it will do the most good,—an added stage of radio frequency,—three stages of "R. F." under perfect control. Selective—to the extent that further sharpness would cut off the side bands. Sensitive,—only a short indoor antenna needed for distant reception. Another stride forward, the new B-T contribution to radio—the "Counterphase Six".

(The COUNTERPHASE employs the exclusive B-T patented "bridge" oscillation control which secures maximum efficiency on all broadcast wave lengths.)

The B-T Torostyle Transformer

A big factor in the efficiency of the "Counterphase". We've employed all our experience in avoiding inductance pitfalls in the design of this coil and at last, after two years of intensive research, we have a transformer with negligible local pick-up, no inter-coupling and elimination of stray feed-backs. Contained in "Counterphase Kits". Also made for antenna coupling or as inter-stage R. F. Transformers.

Price, each \$4.00.



Kits containing essential parts for building the "Counterphase".
For 5 tube set..... \$28.50
For 6 tube set..... 38.00

The B-T Tandem Condenser [

We early decided that the "Counterphase" must not have more than two tuning dials. In other words, simultaneous tuning. Result,—the B-T, Type LD Condenser. Two units in one controlled from the same dial,—but no flimsy gears or balancing devices more unique than practical. The B-T "Tandem" is built along the same efficient lines as the well-known B-T "Lifetime" Condenser. Exact balance is obtained by sturdy little "trimmers" fastened solidly to the frame.

Price—13 plate, capacity .00025 (each unit) \$9.00
Price—17 plate, capacity .00035 (each unit) 9.50

Write for descriptive circulars.

Straight Line Frequency or Wave Length ?

Do you know both sides of the question? We make both kinds of condensers and tell both sides. Read about it in the "BETTER TUNING", a bi-monthly booklet, giving the latest trend in radio. 10c per copy or 50c a year.

BREMER-TULLY MFG. CO.

532 S. Canal St.

Chicago, Ill.



The Kurz-Kasch
ARISTOCRAT
E-Z-TOON
(EASY TUNE)

"Aligns rite—Holds tite"



0-100
100-0
\$2.25

0-200
200-0
\$2.35

The finest tuning now so necessary especially on the short wave sets is easily accomplished with the Kurz-Kasch Aristocrat E-Z-Toon.

50 to 1 ratio; a new principle of construction, no cogs or gears, no back lash or lost motion, when you remove your hand from the dial it stays pat.

Write for illustrated folder on this and other Kurz-Kasch products. The choice of over two hundred leading Radio manufacturers.



The **KURZ-KASCH Co.**

*Largest Exclusive Molders
of Bakelite*

Factory and Main Office, Dayton, Ohio

METRO

Jacks—Switches—Rheostats



Keelok Switches
List 75c

*Manufacturers and Jobbers.
Write for samples and prices.*

METRO ELECTRIC MFG. CO.
121 Prince St. New York City



DeJUR

ONE HOLE MOUNT
RHEOSTATS

Specified by M. B. Sloop for the RX-1 Circuit. (See Sept. Radio Engineering)

Easy to mount—no bulk and no tuning—perfect contact always—positive Bakelite throughout—resistant under use—shaft made in one piece.

Manufacturers and Jobbers—Write for samples and quotations.

DeJUR PRODUCTS CO.
Broome and Lafayette Sts. New York



PATENTS APPLIED FOR

Balkite

Radio Power Units

the ideal power supply for any radio set



**Balkite
Battery Charger**

This popular battery charger is entirely noiseless. It can be used while the radio set is in operation. Charging rate 2.5 amperes. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles. Also for 25-40 cycles with 1.5 ampere charging rate.

Price \$19.50

West of Rockies, \$20
In Canada, \$27.50



**Balkite
Trickle Charger**

Charges both 4 and 6 volt radio "A" batteries. Will furnish more current than is used for 6 dry cell or 2 storage battery tubes, if used only while the set is in operation. If allowed to "trickle" charge continuously will also furnish enough current for as many as 8 dry cell or storage battery tubes. Size 3 1/4 in. long, 2 1/4 in. wide, 5 in. high. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles. Price \$10

West of Rockies, \$10.50
In Canada, \$13

Balkite Radio Power Units are the ideal power supply for any radio set. They simplify and improve radio reception. They reduce the amount of attention you must give your set. With their use your current supply is always exactly what is required for each circuit.

For the "A" circuit there are the Balkite Chargers. The popular Balkite Battery Charger is entirely noiseless and can be used while the set is in operation.

For sets of smaller "A" current requirements there is the Balkite Trickle Charger. With a low capacity storage battery it enables owners of sets now using dry cells to make a most economical installation.

For the "B" circuit there is Balkite "B." It eliminates "B" batteries entirely and supplies plate current from the light socket. It fits any set of 6 tubes or less. For sets of 6 tubes or more there is Balkite "B" II.

Noiseless—No bulbs—Permanent

All Balkite Radio Power Units are entirely noiseless in operation. They have no moving parts, no bulbs, and nothing to adjust, break or get out of order. Each is a permanent piece of equipment with nothing to wear out or replace. They require no other attention than the infrequent addition of water. They require no changes or additions to your set.

Manufactured by
FANSTEEL PRODUCTS COMPANY, Inc.
North Chicago, Illinois

FANSTEEL
Balkite
Radio Power Units



Balkite "B"

Eliminates "B" batteries. Supplies plate current from the light socket. Operates with either storage battery or dry cell tubes. Keeps "B" circuit always operating at maximum efficiency. Requires no attention other than adding water twice a year.

Will serve any set of 6 tubes or less. Occupies about same space as 45 volt dry "B" battery. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles.

Price \$35

In Canada, \$49.50



Balkite "B" II

Same as the new Balkite "B" but will fit any set including those of 8 tubes or more. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles.

Price \$55

In Canada, \$73

The Quail Unitpower is equipped with a special Balkite Radio Power Unit

BALKITE BATTERY CHARGER • BALKITE TRICKLE CHARGER • BALKITE "B" • BALKITE "B" II

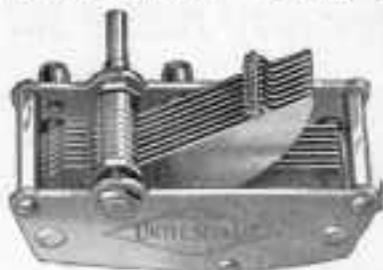
ALL BALKITE RADIO POWER UNITS ARE TRADED MARK LISTED U. S. PATENTED BY THE MANUFACTURER'S LABORATORIES

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STRAIGHT LINE FREQUENCY CONDENSER

PERFECT



- 1. CURVE—Perfect straight line frequency curve, obtained by sensitively designed plates.
- 2. BEARINGS—Coated ball and cone, which automatically take up the wear, thereby assuring perfect alignment at all times.
- 3. INDUCTION—570 c/s 1/2 scale of radium, exactly proportioned to prevent warping in any direction and to cut down losses to a minimum.
- 4. FRAME—Rugged stainless steel supporting parts.
- 5. ROTOR—Extra hard brass ground stainless steel, with exact and exact assembly.
- 6. STATOR—Extra hard heavy gauge stainless steel plates, braced and supported at three points, assuring rigidity and permanent alignment.
- 7. CAPACITY—Low minimum with uniform maximum capacities. Made in following sizes: .00025 mfd., .0005 mfd., .001 mfd.

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Omaha, Neb. 622 Superior Bldg.

Boston, Mass. 25 State St.

Can You Get GOOD TONE QUALITY from DISTANT STATIONS?

It is a rare combination—long distance reception with good tone quality. But you will find it in All-Amax, together with a selectivity that is unique for its sharpness in sets whose power is redoubled through the reflex principle. ALL-AMAX sets come factory mounted, ready to wire.

Ask Any All-Amax Owner!



ALL-AMAX SENIOR (a 3-tube-and-detector set).....\$42.00

ALL-AMAX JUNIOR (a 1-tube-and-detector set)..... 22.00

SPECIAL OFFER—Write mentioning RADIO ENGINEERING and we will send free a blue print of either ALL-AMAX, SR. or ALL-AMAX, JR.

ALL-AMERICAN RADIO CORPORATION, 4217 W. Belmont Ave., Chicago E. N. Rauland, President



Owning and Operating Station, WENR—265 Meters

ALL-AMERICAN

Pioneers in the Radio Industry

QUAM

CONDENSERS WITH THE
PYREX END PLATE
MAKE TUNING A REAL JOY



Furnished in straight line frequency and straight line wavelength design. The straight line frequency condensers spread all stations evenly around the dial according to frequency. The plates are so fashioned that no excess panel space is required.

The two to one helical gears assure sharpest tuning and smoothness of operation not possible where the dial is mounted directly on the rotor shaft.

$1\frac{1}{4}$ " leakage paths on a genuine Pyrex end plate make the QUAM the lowest loss condenser in the world. Sturdily built, with brass frame and plates soldered in place assure minimum resistance losses.

Beautifully designed and finished, it is truly the condenser that will last a lifetime and constantly give satisfaction.

.00025	\$6.00	With 4" bakelite
.00035	6.50	360° dial, add \$1.00
.0005	7.00	

QUAM Audio Transformers \$5.00

QUAM Radio Corporation
1925 S. Western Ave.
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The New Sensitive
Photo-Electric Cell

THE

PHOTOTRON

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

Price

\$20 Each

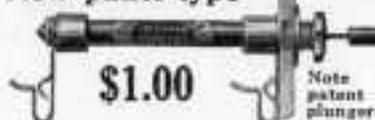
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Literature



Photion Electric Corporation
247 Park Ave., N. Y. C.
1625 S. Vermont Ave., Los Angeles

DURHAM Variables

New panel type



\$1.00

Note
patent
plunger

Provides short lead to tube socket or transformer. Requires area for $\frac{1}{4}$ " nut only. Appearance very neat.

Standard type

fits all clips



75c.

Both types in these sizes

No. 100—1,000 to 100,000 ohms
No. 101—.01 to 5 megohms
No. 201 A—2 to 10 megohms

Use DURHAMS in all sets

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

An Amazing Improvement In Condensers!



The Chelten Straight-Line Frequency Condenser (Modified)

A condenser designed by the makers of the famous Chelten Midget, that invariably produces the results desired

Spreads low wave stations.

Does not crowd the high wave stations—the vital defect of ordinary straight-line frequency condensers.

Provides uniform station separation over entire tuning range.

Scientific design—Proven by severe operating tests.

Made with standard frame; soldered brass plates.

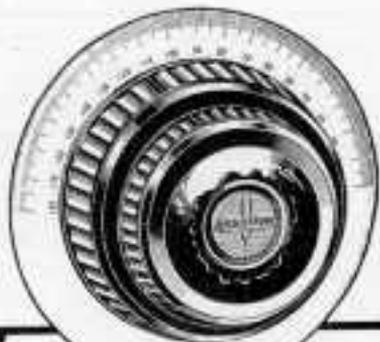
Manufacturers

The Chelten Condenser will help insure the results you want your set to produce. Write for details.

Fans—Dealers

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

CHELTEN ELECTRIC CO.
4859-65 Stenton Ave.
Philadelphia, Pa.



Pat.
April
21, 1934
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



EASTERN

pickle bottle

COILS

FOR THE

R X-1

The R X-1 has taken the country by storm!

No Oscillation!—A four tube circuit that needs no neutralization.—
Tremendous volume—Long distance range—Distortion eliminated.

The R X-1 is smooth working, non-reradiating and extremely selective. It has only two controls, is easy to operate, and is remarkably simple and economical to build.

Without recourse to regeneration to sharpen the tuning, but relying entirely on high efficiency through the elimination of losses in the coils, the major source of losses in all tuning circuits, a sharpness of tuning has been achieved that makes it possible to cut out Newark at 405 meters, and bring in Montreal at 411 meters, at New York City.

A difference of six meters is not remarkable at the low waves, but it is most unusual at wavelengths above 400 meters, for, at the longer wavelengths, the best neutrodyne and tuned R. F. receivers are rather broad and, in addition, drop off in amplification.

EASTERN PICKLE BOTTLE COILS are specified for this circuit, by
* M. B. SLEEPER.

Type R X-1 Coils Complete—\$6.00

EASTERN PICKLE BOTTLE COILS are also designed for perfect performance in the Roberts Circuit (\$8.50 per set), Browning-Drake (\$8), DX Superdyne (\$8 per set), 3 Circuit (\$6), and for Tuned R. F. for .00015 or .00035 condensers (\$2 per coil).

At your dealers or direct, postpaid.

EASTERN COIL CORPORATION

22 Warren Street

Dept. R. E.

New York

Easy to drill and cut

*A valuable quality of Radion
for set manufacturers*

ONE reason why set manufacturers find Radion by far the most satisfactory panel material is its ease of working. Radion Panels cut, saw and drill perfectly.

Edges are smooth and even; holes are trim and clean-cut. Radion does not chip or peel as do other panel materials. Workmen's time is saved and the finished job is much more attractive.

The beautiful finish of Radion Panels (with Radion Dials to match) enhances the appearance of any set. They are strong. They resist warping. And in these five important insulating qualities Radion is acknowledged to excel:

- Lowest angle phase difference
- Lowest dielectric constant
- Highest resistivity (megohms cm)
- Lowest power factor loss
- Lowest absorption of moisture

Manufacturers: Send us your specifications

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 parts. Radion is used on the leading makes of condensers.

AMERICAN HARD RUBBER COMPANY
Dept. M N 6, 11 Mercer St., New York City.

RADION

The Supreme Insulation

No Set is Better than its Parts



Unless each contributing unit performs its task without flaw, the most perfect results can never be achieved. The TRU-MAX amazing excellence of radio performance is due in no small measure to the contributions of the Pacent organization of distinguished engineers, who have provided either first or best, many improvements in radio receiving sets.

Pacent Parts are now used as standard equipment by forty leading set manufacturers. This fact is a clear indication of the prominent place held by Pacent Parts in the radio field. Whether you buy a set or build one, look for the Pacent trade-mark on every important unit. It is your assurance of highest quality and performance. Write for our new illustrated catalog.

Pacent Microvern

a super tuning device. Large stations by name, wave-length or frequency, Bakelite knob and silver or gold finish metal parts. Cat. Nos., 150S, 150Q, Price \$3.00.



You can now choose from forty sets, the manufacturers of which have selected Pacent Parts.

Charles Freshman Co.	F. A. D. Andrus, Inc.
Edward Warner Selsdonator	Pathe Phonograph and Radio
Corp.	Corp.
Greene Radio Corp.	Wave Radio Corp.
Antler-Palmer Co.	H. K. Thompson Mfg. Co.
Bristol Company	Essence-Magarty Corp.
Raynvox Company	Western Bell & Elec. Co.

MU-RAD LABORATORIES
and twenty-seven offices

PACENT ELECTRIC CO., INC.

Executive Office, 91 Seventh Ave., N. Y. C.

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Minneapolis	Birmingham	Zacksville
Boston	Philadelphia	Detroit
San Francisco	St. Louis	Pittsburgh
Canada: Liverpool	White Radio Limited	Hamilton, Ont.

Pacent

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RX-1 Dataprints

Save \$1.25—Get a set of RX-1 dataprints FREE by subscribing to Radio Engineering Magazine for one year. The cost of the Dataprints plus a year's subscription, is \$3.25. Send in \$2.00 for a year's subscription and the RX-1 Dataprints will be mailed to you without charge.

**ONLY
DATA-
PRINTS
ARE
SO
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1. Parts list
2. All constants
3. Battery connections
4. Picture wiring diagram
5. Schematic wiring diagram
6. Terminal checking list
7. Step-by-step instructions
8. Names of manufacturers
9. Full-size panel patterns
10. Accuracy in every detail

RX-1 results can be obtained only with RX-1 design, results never before considered even possible with a non-regenerative circuit, results which cannot be equaled with a set which oscillates. Be the first in your city to have the complete information given in the RX-1 Dataprints.

No special equipment except the coils and Sodian, no complicated wiring, no expensive parts—but RESULTS.

COMPLETE SET OF FIVE FULL-SIZE DATAPRINTS..... \$1.25

3-CIRCUIT SET Incorporating all the newest methods in an improved X-1900 type receiver. All parts are of standard makes which you can get from your local dealer.

COMPLETE SET OF FIVE FULL-SIZE DATAPRINTS..... \$1.25

BLUEPRINTS for STANDARD SETS

HAYNES TUNER, known as the "One Thousand Miles for Fifteen Dollars" set. 2 sheets..... .50

BROWNING-DRAKE 199, the standard B-D design, built for dry cell operation. It is equipped with four UV-99 or C-299 tubes. Type 7000, 5 sheets..... 1.25

BROWNING-DRAKE 201-A, using one UV-199 and three 201-A tubes, arranged to operate on a 6-volt storage battery. Type 6500, 6 sheets... 1.50

BROWNING-DRAKE FIVE, equipped with a 3-step resistance coupled amplifier. Uses one UV-199 and four 201-A's. The finest of all the B-D receivers. Type 7500, 5 sheets..... 1.25

COTTON SUPER, peer of long distance receivers, and the simplest of all eight-tube supers in design and construction. Type 7200, 7 sheets.... 1.75

SAMSON T. C. SET, the latest construction kit for tuned R. F. reception. Can be used with the Sodian detector. 3 sheets, with parts list, checking list, and assembly instructions..... .75

M. B. SLEEPER, Inc. Technical
A-52 Vanderbilt Avenue Publisher
New York City

\$5.00

CAP.
5005
MGA.

ULTRA-LOWLOSS CONDENSER



Positive as Big Ben

SET Big Ben at seven and at seven o'clock you're bound to get the alarm.

Just so, the Ultra-Lowloss condenser can be set at any wavelength—the corresponding station will come in clear and sharp. You know instantly where to turn, once a station of known wavelength is located. Makes tuning easy—direct—positive. Special Cutlass Stator Plates spread wavelengths evenly over a 100 degree scale dial so that each degree represents approximately $3\frac{1}{2}$ meters.

Ultra-Lowloss condensers are designed by R. E. Lacault, originator of the famous Ultradyne Receivers, and built upon scientific principles which overcome losses usually experienced in other condensers.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Design of lowloss coils furnished free with each condenser for amateur and broadcast wavelength showing which will function most efficiently with the condenser.



Cutlass Stator
Plates—shown
in an Ultra-
Lowloss
Condenser



A portion
of antenna
and circuit
design.

ULTRA-LOWLOSS CONDENSER

PHENIX RADIO CORPORATION
116-D East 25th St. New York

Na-Ald Sockets and the new standard tube bases

*Adapters for old sockets—and a
brand new socket too*

RADIO fans may now use the new standard base tubes in their old sockets. There is a complete line of Na-Ald adapters for this purpose.

- 1 There is the 419-X adapter which makes it possible to use the new UX-199 and UX-120 tubes in sockets originally made for UV-201-A tubes. 419-X sells for 35c.
- 2 There is the Super-Het No. 420-X adapted equipped with cables for connections. This adapter enables the owners of Radiola Super-Het, Radiola-Super VIII, and the owners of other sets using UV-199 tubes to get the great increase in volume and clarity the new UX-120 tube develops. Price of 420-X adapter, \$1.25.
- 3 There is a new adapter for use in making the shift from WD-11 to UX tubes. It is especially designed to enable the users of Radiolas II, III and III-A to enjoy the additional volume the new tubes provide. Price 421X—75c. No. 421XC, (with cables for connecting additional B & C voltage for UX 120 tubes) Price \$1.00.
- 4 The 481-X Na-Ald Socket is a brand new socket that will take any of the UX series of tubes without an adapter. Price 35c. No. 481XS cushion mounting, 50c.

You can obtain Na-Ald Adapters, sockets or dials at radio, electrical and hardware stores everywhere.

Write for catalog and free information on "What to Build," giving tested, selected circuits.

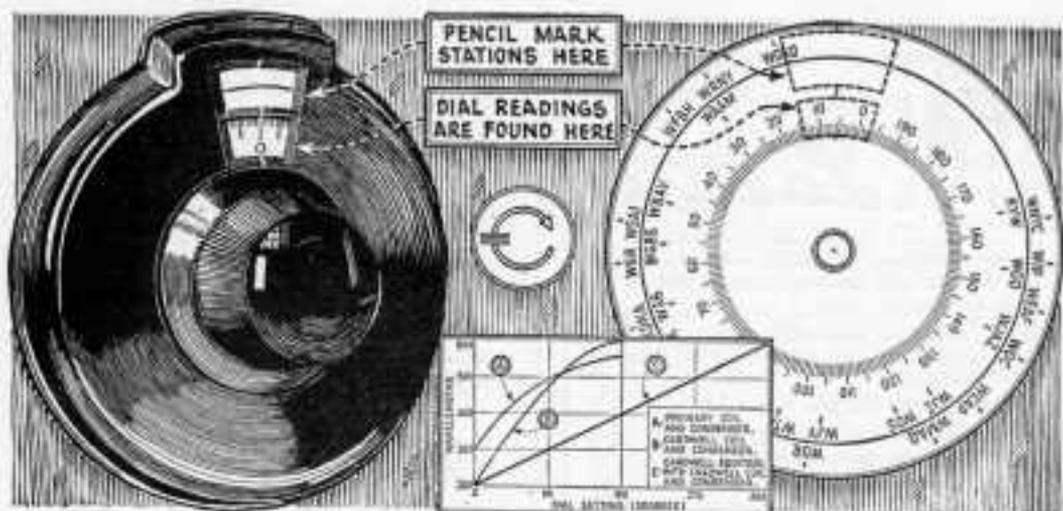
ALDEN MANUFACTURING COMPANY
Also makers of the famous Na-Ald Dials
Dept. M1

Springfield, Massachusetts

Alden Processed



Sockets and Dials



A NEW RADIO COMPASS

STRAIGHT-LINE tuning affords unusual convenience to the radio operator when the dial gives an equal separation of wave-lengths over its entire range. The Cardwell Equitrol dial is designed to afford not only equal spacing in wave-lengths but doubles the distribution on the dial by utilizing a 360 degree motion instead of the usual 180 degree. Thus it becomes a "compass" and the radio navigator can obtain his station "bearings" at any point without the usual crowding on the lower scale,—less than with most so-called "S L F" condensers because it is a 360 degree action dial. It makes Cardwell type "C" condensers semi-S L F.

The Equitrol is a variable ratio vernier dial. It operates with the standard semi-circular plate condenser and converts it into a "straight-line for wave-length" unit by compensating the curve shown in the graph above marked "B." By using the Equitrol it is unnecessary to dismantle a set by putting in specially shaped condensers in order to get "straight-line" results.

When used with efficient condensers and coils, such as Cardwell types, the maximum dial stability is obtained. Note how much wider the range in wave-lengths of curve "B" as compared with curve "A."

Equitrols will add to the attractiveness of your radio set. Pencil logging can be done with ease and neatness.

Write today for Bulletin No. 71. It tells all about the Equitrol. If you wish the name of a local dealer who stocks Equitrols, we will be glad to refer you to him.

Equitrols are sold singly, price \$8.50 and in sets of three, price \$10.00. When purchasing be sure to return the Government postal enclosed with all Cardwell units. It insures satisfaction and brings you new data on circuits and parts of interest.

The Allen D. Cardwell Manufacturing Corporation,
81 Prospect Street, Brooklyn, N. Y.



CARDWELL CONDENSERS

are made in two series. Series "B" have semi-circular rotor plates (S.C.P.). Series "C" have specially shaped rotor plates but the same size, over-all, size. They give semi-S L F calibration. Either type gives ample sensitivity in terms of dial reading and are considered the best in design of all low-loss condensers because they are the simplest. Note that there are over 120 variations: various transmitting, receiving, etc.

Series B			Series C		
Type	Cap*	Price	Type	Cap*	Price
154-B	150	\$4.00	160C1	130	\$4.00
141-B	250	4.25	170C1	250	4.25
151-B	300	4.50	180C1	300	4.25
152-B	350	4.75	171C1	340	4.50
121-B	500	5.00	172C1	380	5.00
122-B	1,000	5.00	173C1	1,000	7.75

* M.M.F. 15 percent if for slushbox or counter-clockwise dial.

CARDWELL EQUITROLS*

* Trade Mark Registry Applied For.

LAST A S I T TITE *Lastite*

CENTERED
TERMINAL

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:

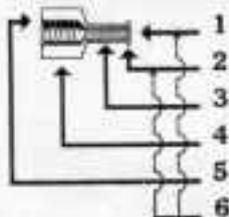
"With a bus wire soldered to it, the Lastite is its own lock out."

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 6-22 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 Hammett Road, Rosindale, Mass.

MOUNTFORD



(Patented—fits any mounting)

Plunger Type

VARIABLE GRID LEAKS Over a Million in Use

Overwhelming proof of their precision, reliability and efficiency. The Mountford organization are pioneers in the manufacture of grid leaks and to this day we are recognized as the country's foremost manufacturer of these highly important radio parts.

List Price

Variable Type, 1/4 to 20 Meg.—30c ea.
Fixed Type, 1/4 to 10 Meg.—25c ea.

Manufacturers

Special grid leaks to order in any quantity—of any resistance value as used in resistance coupling.

C. E. MOUNTFORD

468-467 Greenwich Street, New York
Mountford Products are an Asset to any Set

EBY PATENTED BINDING POSTS

Tops
Don't
Come Off



25
Different
Markings

Since binding posts cost so little and mean so much, why not treat your set to the best?

Practically any dealer can show you why EBY Quality Posts are preferred by most expert set-builders.

15c each—plain or engraved

The H.H. EBY MFG. CO., Phila., Pa.

Tone— Volume— Economy



Stands 9 inches high on a 6 1/2-in. square base. Made of *lytzer*, a scientific material that counteracts false tone vibrations. Black, resable finish. Adjustable for volume and clearness.

EXQUISITELY clear in tone — and *strong*; original in shape; economical in size and price; isn't that a whole lot to say of one speaker?

\$ 12.50

THIS new model speaker is the result of a long period of experimentation on the part of the makers of famous N & K Imported Phones. Their object was to combine the rich clearness and tone purity of N & K Phones with maximum volume, in a speaker that might be purchased at a popular price. In addition to accomplishing all these things, the N & K Model S Loudspeaker distributes the sound in all directions.

Wherever you go in the room, you get the full force of the broadcasting. This is surely an improvement over the old style horn shaped speaker.

To realize what all this means, you must *hear* the new N & K in comparison with other speakers. Ask your dealer to demonstrate it for you. If he is not yet supplied, ask us for name of a nearby dealer who sells N & K. Just drop us a postcard with your name and address.

The New  Imported
LOUDSPEAKER
MODEL S

NEUFELDT & KUHNKE DIV., Th. Goldschmidt Corp.
DEPT. K 10, 15 WILLIAM ST., NEW YORK, N. Y.



NAVY MODEL C-10 Super-Heterodyne

The Highest Class Receiver in the World

For any Circuit

Prompt shipment can be made on tested, standard apparatus of the following manufacture:

E. I. S., Inc.
 General Radio
 Willard
 Benjamin Electric
 Allen Cardwell
 Dybbler Formica
 Western Magnavox
 Jewell Amer-Tron
 Western Electric
 Radio Corporation
 Music Master Acme
 Cutler Hammer Frost
 Federal Kellogg

Wave length range 50-600 meters with removable Coils.

Panel Dimensions 28 3/16 in. x 8 in. x 1/4 in.

Only two major tuning adjustments.

Total amplification almost 2,000,000 times.

A high powered 10-tube Broadcast Receiver capable of receiving over 3,000 miles under favorable conditions, and having a degree of selectivity far in advance of others.

We believe the Navy Model C-10 represents final superiority over any receiver now being manufactured or even contemplated for broadcast reception.

Attractive illustrated literature gladly mailed upon request. Write direct to

NORDEN-HAUCK, INC.

Engineers

1617 Chestnut Street, Philadelphia, Penna.



3-Stage Resistance Coupled Amplifier Kit No. 1-C

Price \$6.75

Contains 3 "Electrad" Resistor Couplers, 1-00025, 1-005 and 2-006 "Electrad" Certified Mica Condensers, 1 condenser mounting, 2 "Electrad" Certified Grid Leaks, 4 "Electrad" Certified Resistors. Only other parts needed are sockets, one rheostat, binding posts and bus bar.

ELECTRAD INC

425 Broadway, New York City



To obtain hair-line selectivity,
stop local station interference or tune broadly at will, use the

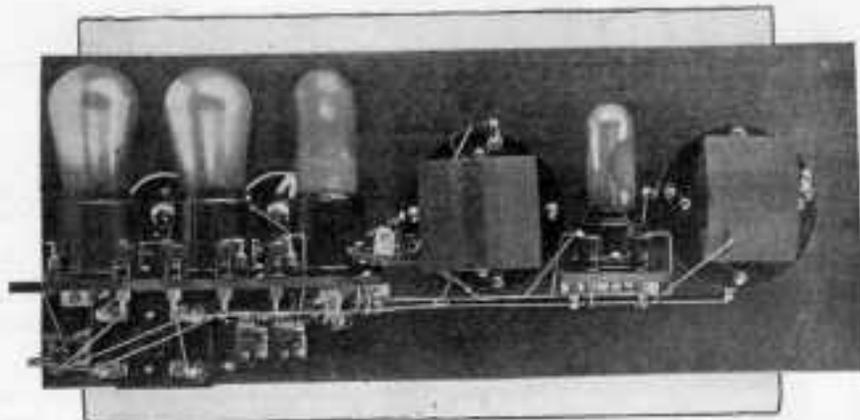
Samson
Double Rotor
COUPLER

It is just the thing for one stage high efficiency RF amplification. Also used as coupler in 2 and 3 circuit tuners. Write for Bulletin 34.

SAMSON ELECTRIC CO.

Manufacturers since 1922 Member E. M. A.
 CANTON, MASS.

Sales representatives in principal cities.
 Export Office, 220 Broadway, New York City.



Complete RX-1* Kit \$32.50

By purchasing the construction kit you save over five dollars. Following is a list of parts included in the kit. Any of the parts can be bought separately.

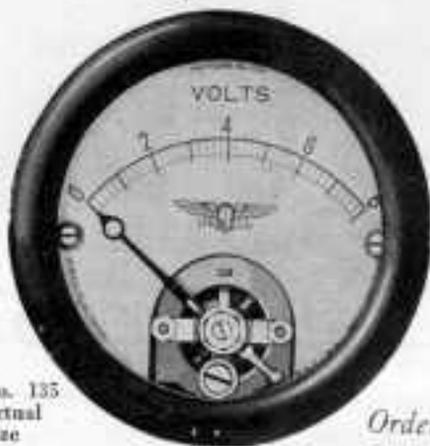
Cat. No.	Quantity	ITEM	
1	1	7" x 18" x 3/16" Black Celoron, drilled and engraved	} \$4.50
1a	1	3 1/2" x 7" x 3/16" cut, drilled	
1b	1	3 1/2" x 3 1/2" x 3/16", drilled	} 1.00
2	1	499 Naald sockets	} .50
3	2	401 Naald sockets	} 1.00
4	1	S. L. W. No. 20 0.00035 Rathbun condenser	} 3.00
5	1	S. L. W. No. 30 0.0003 Rathbun condenser	} 3.00
6	1	1 set Eastern RX-1 coils, licensed by M. B. Sleeper	} 6.00
7	1	BMS single filament control O. C. Jack	} .99
8	1	6V-199 Amperite	} 1.19
9	1	HWAL-3/1 Sanson transformer	} 5.00
10	1	No. 42 Daven Resisto-coupler	} 1.50
10a	1	O. 1 Meg. Daven resistor	} .75
10b	1	1.0 Meg. Daven resistor	} .60
11	1	N. Y. Coil grid leak condenser, 0.00025	} .45
12	1	Eagle 3.0 Meg. gridleak	} .45
13	1	29 ohm DeJur Jr. rheostats	} 1.80
13a	2	K2844 Naald rheostat knobs	
14	1	3044 Clockwise Naald dials	} 1.00
15	6	Eby Ensign binding posts, engraved	} .90
16	1	20 Ft. coil wire	} .25
17	35	6/32 Lestites	} .60
18	1	Length varnished tubing	} .10
19	4	Angle brackets	} .40
20	8	Coil mounting pillars	} .64
21	10	1/8"-32 F. H. lacquered screws	} .15
22	11	1/8"-32 R. H. nickled screws	} .10
23	8	3/8"-32 R. H. nickled screws	} .18
24	1	1/8"-32 R. H. nickled screws	} .05
25	30	3/64 6-32 nickled nuts	} .25
26	10	Soldering lugs	} .10

D-21 Sodian tested for RX-1 sets (add 10c for insurance) \$5.00
 Eastern RX-1 coils, made under M. B. Sleeper license 6.00
 Accuratune vernier dials, 80 to 1 ratio, per pair 7.00

**Trade mark registration applied for. These parts are sold under M. B. Sleeper license.*

Address your orders to A-52 Vanderbilt Ave., New York City

DURRANT RADIO, Ltd.



No. 135
Actual
Size

RADIO ENGINEERS

—let us send you circular No. 776 describing our new high resistance voltmeters in small 2-inch cases.

Jewell Engineers have become Radio Engineers also. We have followed radio from the early days and we have developed more special radio instruments than any other manufacturer.

Order from Dealer

Jewell Electrical Instrument Co.

1650 Walnut St. - - Chicago

"26 Years Making Good Instruments"



A plug and socket between the radio and the batteries is as essential as the plug and socket on an electric iron. Buy a Multi-Plug for the set you now have or are building. Used as standard equipment by over thirty American manufacturers.

See our dealer or write for descriptive circular G.

Type BM for set builder...\$4.50

Type BP for any set... 3.00

HOWARD B. JONES, Chicago



Jones
MULTI-PLUG
THE STANDARD SET CONNECTOR

Obsolete

Take the
"GUESS"
Out of Tube
Control

\$1.10
- Everywhere

Amperite automatically controls tube current, eliminates hand rheostats, filament meters, guessing and all tube worry.

Simplifies wiring, tuning and operation. Permits the use of any type of tube in any combination of tubes.

Tested and used by more than 50 set manufacturers and in every popular construction set.

RADIALL COMPANY
Dept. 22-41, 30 Franklin St., New York City

Write for
FREE
Hook-ups



AMPERITE
The "SELF-ADJUSTING" Rheostat



The real solution to the tuning problem!

MAKE your radio a 1926 model. Replace your present Dials with Rathbun Straight Line Frequency Converters which spread all stations within the range of your receiver uniformly around the whole circle of 360°. All stations are a uniform distance apart on these new Converters which is the ideal tuning condition.

Why be satisfied with Dials or Condensers which are limited to 180° or only half the dial? Why stop at 180° when there are 360° in the circle? No gears with their back lash, no friction with its slippage in Rathbun Straight Line Frequency Converters—only two moving parts, a variable cam and a lever. Easily and quickly installed on any set—it is not necessary to cut Condenser shafts or drill panels.

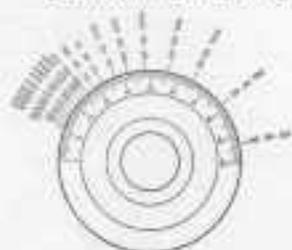
The Rathbun Straight Line Frequency Converter is one of the few really new things in Radio during the past three years.

Don't forget that we build the Rathbun Single Hole Mounting Condenser with genuine Bakelite ends. This year's models are all enclosed with transparent pyralin dust bands which preserve their high efficiency for life. Small, light, rugged, handsome and none lower loss or higher in efficiency. Reasonably priced.

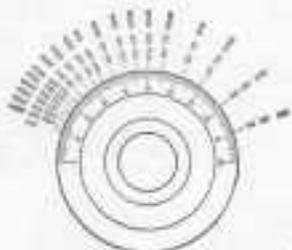
Ask your dealer for Rathbun Straight Line Frequency Converters. If he has not yet stocked them, he will quickly obtain them.

PRICE \$3.50

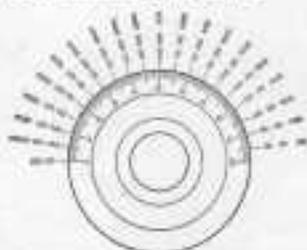
**Rathbun
Manufacturing Co., Inc.
Jamestown, N. Y.**



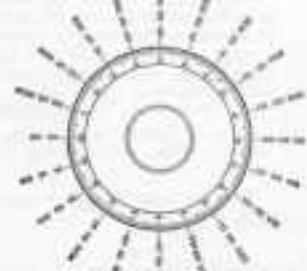
Stations indicated in bicycles and wave lengths showing crowding with an ordinary capacity condenser



Stations partially separated and tuning slightly improved with a Straight Line Wave Length Condenser



Practically even separation over half the dial with a Straight Line Frequency Condenser



Complete and equal separation of stations over the entire dial with the Rathbun Straight Line Frequency Converter

NEW CARTER "IMP" LOCK SWITCH

LOCK
Pat. 1-20-23

Quarter turn filament switch with "Off and On" Name Plate



Locks and protects your set

3 keys furnished with each switch

75c

In Canada: Carter Radio Co., Limited, Toronto

Write for catalogue of other CARTER Products



Any Dealer can supply



What a
whale of a
difference
a Stasco
Makes!

Try adding Stasco Rheostats to your receiving set and notice the great difference in reception, volume and distance.

The exclusive feature of a spring contact plate allows your tubes to receive a steady uniform current. That means flickering of tubes becomes a "back-number."

Made of bakelite only. Five different designs. With either black or mahogany knobs.

Dealers, write for our interesting proposition.

Sheffield Trimming & Stamping Corp.
211 Centre St. - - New York City, N. Y.

Also manufacturers of Rheostats, Basils, Potentiometers, Grid-Leak Mountings, Battery Clips, etc.

"THE TUBE WITH A PEDIGREE"



A RADIO tube is only as good as its characteristic curve reading. We furnish with each MUSSELMAN CERTIFIED TUBE a curve sheet showing the exact reading for that particular tube.

Both tube and curve sheet are serially numbered, so that you, or any engineer, can check our figures. Remember this point: That a characteristic curve reading is the only way across run measure the value of a radio tube. List: \$1.00 each. If your dealer cannot supply you, order direct from this advertisement.

Agents, manufacturers, and dealers are invited to write for details as to sales franchise

Manufacturer
THE VAN HORNE CO.

Franklin

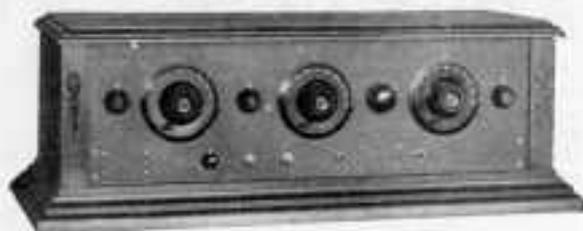
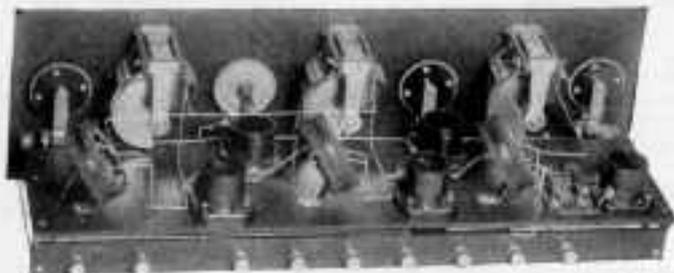
Ohio

Sales Office

A. J. MUSSELMAN

656 Washington Blvd.

Chicago



Joseph Calcaterra's Five-Tube Tuned Radio Frequency Receiver

In the past few years scores of loudly heralded "wonder" circuits, with fancy names, have come into the market only to disappear like soap bubbles. And the end is not yet; others will follow, this year and next.

Meanwhile Joseph Calcaterra's 5-tube tuned Radio Frequency Receiver has grown steadily in the confidence and favor of thousands of "wise" fans. Day by day, under all conditions, it has proved its efficiency, its unflinching selec-

tivity, its distance-getting ability and its splendid volume.

Two stages of tuned radio frequency, giving the desired qualities of selectivity and ability to bring in distant stations, a vacuum tube detector and two stages of audio frequency amplification to strengthen the signal for loud speaker operation are used in this standard circuit.

You can purchase for only \$55.00 all the parts required to build it, not including accessories.

Sent FREE Diagram, and Complete Simple Instructions

Fully illustrated with photographs, wiring diagram, layout of parts and full-sized panel-drilling templates. Copyrighted, 1925. Written in easily understood, non-technical language. Don't wait. Get your copy now. A postal brings it free.

KELLOGG SWITCHBOARD & SUPPLY COMPANY
1036 W. Adams St., Dept. J, Chicago, Ill.



All who are thoroughly informed on the sound science of advanced radio principles are quick to recognize in Apex Vernier Dials qualities that are imperative to the utmost of Radio utility, value and beauty of appearance.

APEX VERNIER DIALS

provide widest possible range of selectivity and a degree of positiveness seldom acquired. Greatly increase the usability of any set and bring in those distant stations that are a joy to every true radio enthusiast. Positively no back lash. Artistic design. Ratio 12 to 1. Adaptable to any $\frac{1}{2}$ inch condenser shaft. Handsomely finished in Royal Brass, \$2.00; Satin Silver, \$2.50; DeLuxe Gold (24K) \$3.50, list.

Apex Rheostat Dials

are designed with an inimitable touch of beauty that imparts a tone of elegance to the most attractively designed set. Size 2 inches. Fit any $\frac{1}{4}$ inch shaft. Royal Brass Finish, 75c—Satin Silver Finish, 85c—DeLuxe Gold (24K) \$1.00, list.

Complete descriptive matter upon request.

APEX ELECTRIC MFG. COMPANY
Quality Radio Apparatus
1410 West 59th Street, Dept. 428, CHICAGO

Oh boy
KESTER
Rosin Core
Radio SOLDER

Sure is Safe and Simple
APPROVED BY RADIO ENGINEERS

A GUARANTEED PRODUCT
CHICAGO SOLDER COMPANY
4224 WRIGHTWOOD AVE., CHICAGO, U.S.A.

Manufactured by M. J. Kester, Chicago, Illinois
Approved and Tested under
U. S. PATENT CAN. PATENT CAN.

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



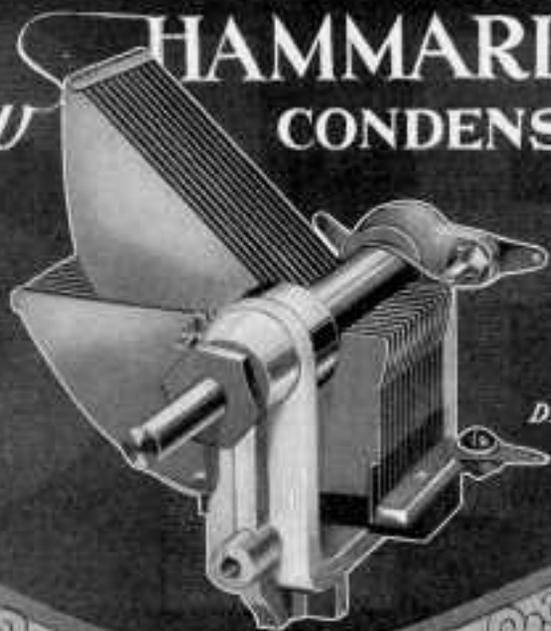
Adjustable to any position
Wiring always taut
GUARANTEED FOR A LIFETIME

THE AALCO—the lowest resistance loop made—measures continuous selectivity and range, and perfect dial matching made possible by variable inductance. Constructed of the highest grade materials in a new and masterly design. Length, 24 in.—Normal Ht. 33 in.—Wavelength range 175-600 meters. **LABORATORY TEST RESULTS UPON REQUEST.**

Price \$15.00
AALCO RADIO LABS.
6338 Cottage Grove Ave., CHICAGO.

The
New

HAMMARLUND CONDENSER



*Distributes
Stations
Equally*

A STRAIGHT-LINE FREQUENCY ACHIEVEMENT.

RUGGED, compact, sublimely efficient, with all the refinements of 15 years' experience comes the latest Hammarlund achievement—the variable condenser that distributes stations equally over your dials and solves the problem of critical tuning for all time.

You will recognize many distinctive "HAMMARLUND" features of world renown. Others are new—the perfections of advanced engineering and the natural progress of the art.

Soldered, non-corrosive brass plates, with sturdy tie-bars that insure permanent alignment; one small piece of Isolantite insulation placed outside of the electro-static field; warpless aluminum frame grounded to rotor; adjustable ball bearings at both ends of rotor shaft; bronze clock-spring pigtail; single hole mounting; a separate "hand-capacity" shield for use if needed. Made in all standard capacities; a quality product at a moderate price.

At the Better Dealers. Write for Descriptive Folder

HAMMARLUND MANUFACTURING COMPANY
424-438 West 33rd Street New York City

For Better Radio
Hammarlund
PRECISION
PRODUCTS

MANUFACTURERS—

*What Controls Your Choice in
Audio Transformers
Quality? Performance? Price?*



Type A

37

Set Manufacturers Use
SHORE TRANSFORMERS
to insure the highest efficiency

CORE—Highest Content Silicon Steel.
Ample Cross Section.
Shell Type Core.

COIL—Ample No Load Primary Inductance.
Layer Wound—Layer Insulated.
Impregnated.
Strong Flexible Leads.

Type A—Commercial Model—Shielded.
Type B—Special for Manufacturers.

*We also supply special duty transformers,
choke coils, "R" Battery Eliminator Filter
Parts, designed to specifications.*

Attractive Proposition Awaits
Manufacturers and Jobbers
Who Communicate With Us.

SHORE
Electric Company, Inc.
64 University Place
New York

"In Business Since Radio Started"

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Iⁿd M REGISTRY

The men whose names are listed below are prepared to handle all emergency work, take care of batteries, and replace tubes. Their charge is \$1.50 per hour, not including travelling time except to unusual distances.

The charge for listing in this section is 50c. for one month, \$2.00 for six months, \$5.00 for twelve months, payable in advance. The * indicates that we have received letters from six set owners stating that the man after whose name the * appears has handled their I and M work satisfactorily.

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Mich., Detroit—J. E. JOHNSON
91 Gladstone Ave., Tel. Empire 8581J

Minn., Minneapolis—GEO. A. BECKER
4709 Wentworth Ave. Tel. Locust 6291

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

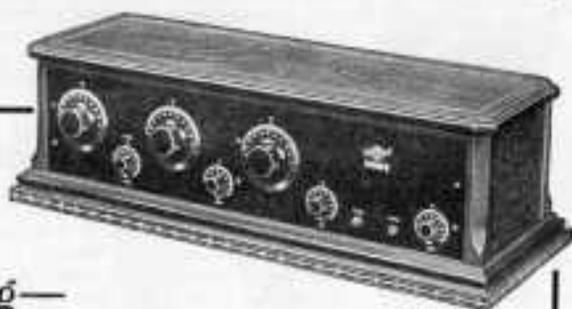
N. Y., New York—HERBERT MULLER
954 Lexington Ave. Tel. Rhldr. 3905
154 Nassau St. Beck. 8040

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. WINTRINGHAM,
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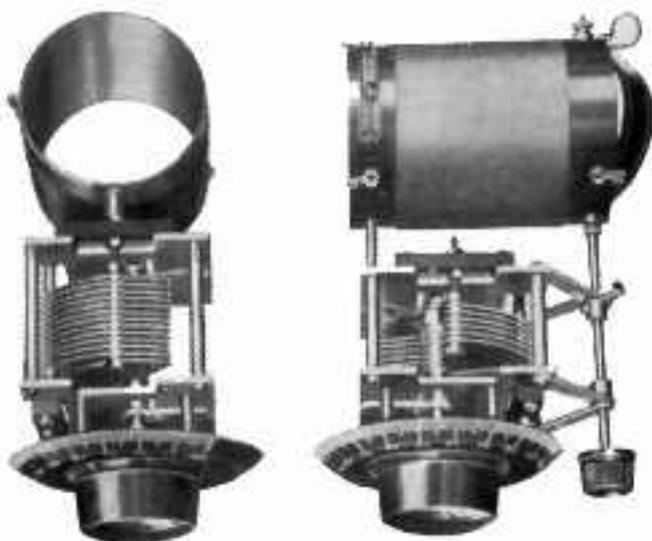
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