RADIO ENGINEERING

The Technical Magazine of the Radio Trade—*Edited by* M.B.Sleeper

OCTOBER, 1926

What's Selling This Fall

Kits a Big Item in Sales Promotion

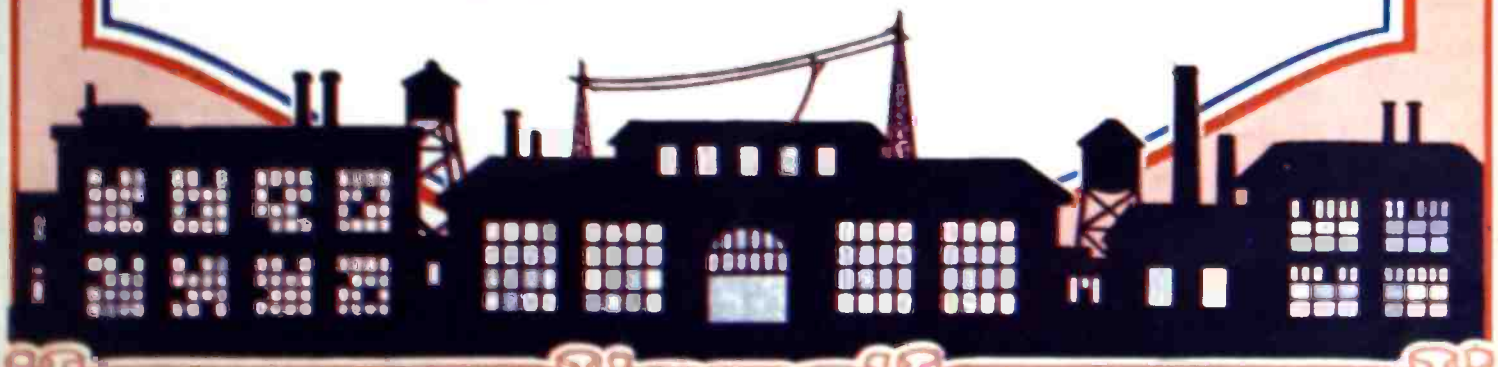
Dope on the important Kits and Manufacturers Combinations which are now in great demand

Materials for Radio Wiring

Complete specifications for the approved materials and parts for radio house wiring

Short Waves Increasingly Popular

Extreme long distance reception on S.W. is quickly catching popular fancy as public learns how



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VOLUME VI NUMBER 10
Sixth Year of Publication

"They last twice as long as the smaller Batteries of equal voltage"

"THAT'S a pretty broad statement, Tom. Won't you have to make it conditional on the number of tubes in the set or the use of the new power tubes?"

"No, sir! Under the same operating conditions—whether you use four, five tubes or more, whether you use a power tube that uses up to 135 volts, the Eveready Heavy-Duty No. 770 or the even longer-lived Eveready Layerbilt No. 486 will last twice as long as the smaller sized 45-volt batteries."

"Well, they ought to, they cost more."

"Yes, about a third more—but lasting twice as long, they cost much less."

"Your arithmetic is good, Tom, but if that's so, when I bought my set why did the dealer equip it with the smaller Eveready 772's? Why didn't he put in the Eveready Heavy-Duty Batteries?"

"He probably thought he was doing you a favor—making your first investment cost you a little less. That little difference looks like a lot to a good many folks who are buying their first set, equipped with tubes, loud speaker, 'A' and 'B' batteries and everything."

Heavy-Duty batteries last twice as long as the smaller batteries of equal voltage. Eveready Heavy-Duty Batteries are the great contribution that the world's foremost electro-chemical laboratories has made in "B" battery economy, dependability and satisfaction.

Dry "B" batteries give a noiseless current, pure D. C. (direct current), the kind that is essential if you prize pure tone.

Send for booklet, "Choosing and Using the Right Radio Batteries," which we will be glad to send you upon request. This booklet also tells about the proper battery equipment for use with the new power tubes. There's an Eveready dealer nearby.

Manufactured and guaranteed by

NATIONAL CARBON CO., INC.
New York San Francisco

Canadian National Carbon Co., Limited
Toronto, Ontario

NOTE: A "C" battery gives a quality of reception unobtainable without it and greatly increases the life of your "B" batteries.

LEFT - Eveready Layerbilt No. 486.

RIGHT - Eveready Dry Cell Radio "A" Battery, 1½ volts.

EVEREADY
Radio Batteries
-they last longer

Tuesday night means Eveready Hour — 9 P. M., Eastern Standard Time, through stations:

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WTAG—*Worcester*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
WCCO—*Minneapolis St. Paul*
KSD—*St. Louis*
WRC—*Washington*

RCA-power Radiotrons
volume
-without forcing

THE man who likes plenty of volume for easy listening usually has to drive the last tube of his set beyond its limit to get the music loud enough. And then it is no longer music. The RCA power Radiotrons are specially made to stand the strain in the last audio stage. They can handle plenty of volume without blasts or rattles, and therefore mean finer, clearer tone!

Dry battery power Radiotron UX-120 . . . . . $2.50

Storage battery or A.C. power Radiotron UX-171 . $6.00

Storage battery power Radiotron UX-112 . . . $6.50

Storage battery or A.C. superpower Radiotron UX-210 $9.00

Quality is a research story

The high quality of performance you get with a genuine RCA Radiotron is due to incessant research. The Radiotron laboratories find ways to make better tubes—they find ways to improve manufacturing processes—and they keep a constant check on the uniformity of the manufactured Radiotron. It pays to look for the RCA mark.

RADIO CORPORATION OF AMERICA
New York Chicago San Francisco

RCA Radiotron

MADE BY THE MAKERS OF THE RADIOLA

EDITORIAL

BATTERY eliminator sales are mounting by leaps and bounds. Dependable reports show that many concerns have already revised upward their production schedules.

At the same time, the dealers are reaping their share of grief which inevitably follows the popularization of new devices. Incidentally, the manufacturers of A. C. operated sets are finding their troubles greater than they anticipated.

When a customer buys a set, and adds a B battery eliminator, if dissatisfaction develops, the blame is usually laid to the eliminator, because the customer probably had the set working properly on batteries before, but when the two are put out in the same cabinet by one manufacturer, he must be prepared to stand behind the eliminator himself.

Practically all the eliminator trouble comes from misdirected effort to keep down manufacturing costs. That means reducing the amount of copper and iron in the chokes and transformers. Then, in the hands of consumers, outside of the ideal conditions under which they were tested in the laboratory, faults develop.

Experience shows that cheaply designed circuits develop noises and often upset the operation of the receiver entirely when the line voltage varies slightly from the rated value. The design tolerances are not sufficient. Again, a slight overload upsets these units.

Manufacturers of good rectifying tubes are doing a splendid job this fall to see that recognized manufacturers building complete eliminators or parts keep to such specifications as to do justice to the tubes. That has done a great deal to keep ill-advised companies from hurting the eliminator business thru bad engineering practice.

At the same time, dealers and jobbers can not be too careful in selecting lines to carry, because their situation is further complicated by the fact that eliminators which work in one city may not be satisfactory in another, due to the fact that line voltages vary considerably in different sections. More, in some towns the voltage fluctuation over a period of twenty-four hours is frequently alarming. If you have an electric stove in your home, you can make a simple test that may give a surprising result. Turn on one of the top plates and watch the time required to bring the element to full heat. Try this just before dark, try it again after dinner, and again around midnight. If the voltage is constant all the time, there will be no differences in your tests. It is a safe bet, however, that there will be considerable variation.

You can imagine what that means to a B eliminator. And you can see how important it is to make a thorough test of these units before offering them to your trade. If you can't get the right results, it is better to stick to batteries than to make the mistake of taking on eliminators which are not going to perform.

Responsible eliminator manufacturers will be glad to show you that they have engineered enough tolerance into their designs to take care of all normal conditions. If you can't get such a demonstration, play safe. Keep your customers and yourself out of trouble. Don't let the discounts out-weigh the importance of performance under conditions in your city.

M. B. SLEEPER,
Editor.

RADIO ENGINEERING

The Technical Magazine of the Radio Trade

Edited by M. B. SLEEPER

Vol. VI. **OCTOBER 1926** **No. 10**

Sixth Year of Publication

CONTENTS

In the November Issue

The radio factories are humming with such industry that it is hard to get material, at this time of the year, on things which are being done in the shops, but by much pushing and persistence we have obtained some inside dope with splendid photographs on some of the special processes which have been developed during the summer to speed up production.

The technical men will be quite delighted with the sets and parts. You'll find this information much too good to miss.

In the December Issue

December will devote a considerable space to articles and photographs showing things which dealers' technical men have done to push sales on complete sets and parts. You'll find this information much too good to miss.

RADIO ENGINEERING

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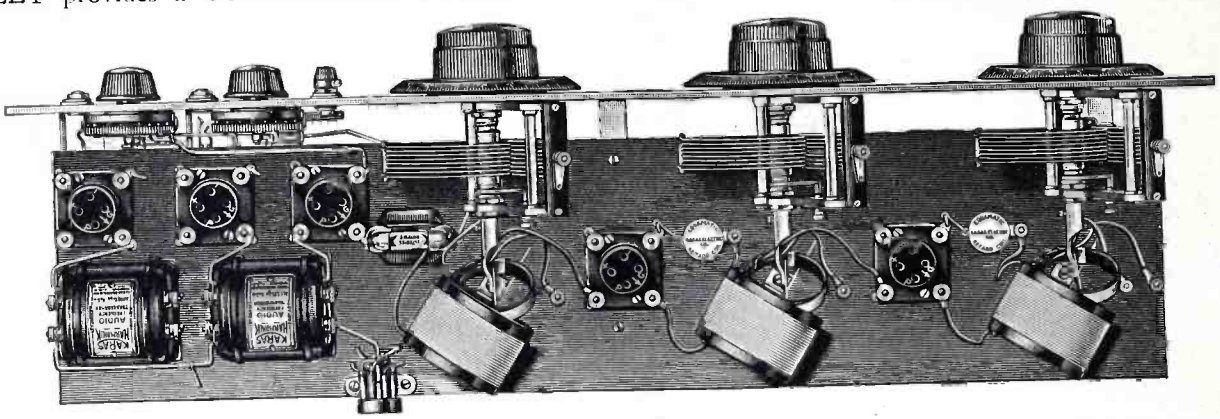
New York advertising office, B. S. Davis, 52 Vanderbilt Ave.

Chicago advertising office, E. H. Moran, 306 N. Michigan Ave.

The New Karas Equamatic*

Now Being Featured By Radio Mechanics

Fulfills in an extremely simple manner a very desirable and HIGHLY IMPORTANT FUNCTION that our foremost radio engineers have been striving to accomplish ever since the advent of radio broadcasting. THE EQUAMATIC SYSTEM AUTOMATICALLY provides a CONTINUOUS PRACTICAL MAXIMUM and an absolutely EQUAL TRANSFER OF ENERGY between primary and secondary inductances at all wave lengths by a coupling system unique to radio engineering practice—it also eliminates the overlapping of electrostatic and electromagnetic fields with their harmful, broadening and distorting effects.

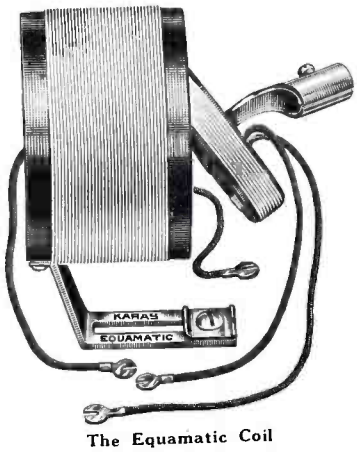


Pure Tone—Great Volume

The result of the EQUAMATIC SYSTEM from five tubes is a clean, clear, pure and powerful signal—equal in VOLUME to the usual six and seven tube sets—sharpness and SELECTIVITY equal to the superheterodyne—SENSITIVITY equal to a regenerative circuit—and a PURITY of tone equal to a crystal detector.

How It Works

In the EQUAMATIC SYSTEM the primary coils are attached to the shafts of the condensers—and are adjustable in their relation to both the condenser shafts and the secondary coils. The primaries are also ENTIRELY SEPARATED from the secondaries. The secondaries are adjustable to any angle in relation to the primaries and also as to their degree of coupling with the primaries. The primaries are AUTOMATICALLY, constantly and CONTINUOUSLY varied—at a definite, ever-changing rate of variation—with the turning of the condenser dials.



The Equamatic Coil

This POSITIVE, AUTOMATIC action provides the ABSOLUTELY EXACT amount of coupling—at every wave length setting—necessary to deliver to the secondary coils EXACTLY the amount of energy required to cause the tubes to constantly operate at their HIGHEST EFFICIENCY.

The Reason For It

In order to keep radio tubes CONSTANTLY operating at their highest efficiency—just under the oscillation point—it is ABSOLUTELY necessary to continuously maintain an EQUAL TRANSFER OF ENERGY between primary and secondary coils. In order to maintain this equal transfer of energy, every wave length setting must have a DIFFERENT AND EXACT coupling between primaries and secondaries. To secure PERFECT reception, every successively longer wave length requires a greater transfer of energy—therefore a correspondingly greater degree of coupling—than the preceding shorter wave length. The problem has been to provide this exact and constantly varying coupling by some simple mechanical means.

The EQUAMATIC SYSTEM solves this problem—does it POSITIVELY, SIMPLY and AUTOMATICALLY and does not resort to ANY losser methods whatsoever. On account of the extremely high efficiency of this system the reception from a home built five tube KARAS EQUAMATIC receiving set is as nearly perfect as radio reception can be with present day knowledge.

Easy To Build

A manual of complete diagrams and instructions for building this five tube KARAS EQUAMATIC receiver in complete detail is included with each set of KARAS EQUAMATIC coils. (This manual will be sent separately upon receipt of 10c to anyone interested.) The placing of every part and every wire connection is clearly explained. Even though you may never before have built a set, you can proceed without hesitation, confident of successfully constructing as efficient a receiving set as can be made. To build this powerful, sweet toned, long range receiver, you will need the Karas parts listed on the accompanying coupon.

Karas Micrometric Dial

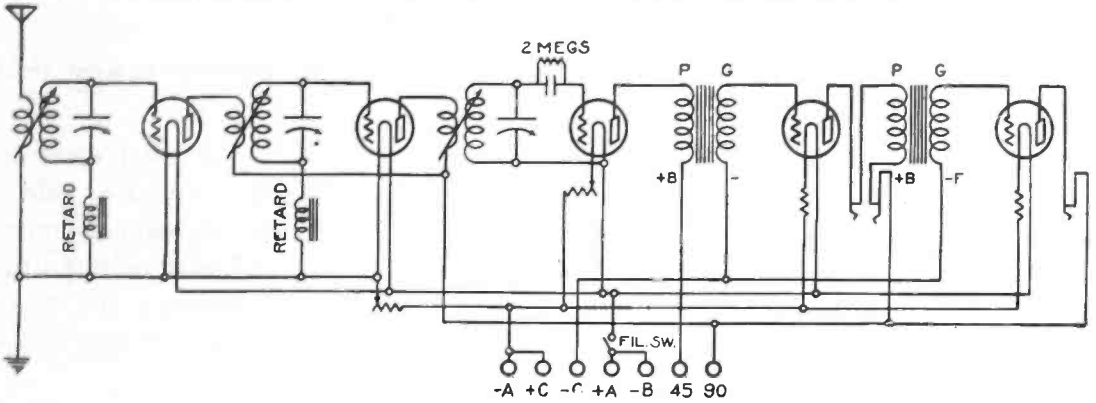
Because of the sharp tuning qualities of this set and the greater number of stations brought within range, Karas Micrometric Vernier Dials are ESSENTIAL to satisfactory operation. In these dials there is NO back-lash and none can ever develop. A light touch on the vernier knob and the dial moves INSTANTLY in either direction. Rough tuning is done with the larger knob, hair-line work with the smaller. The vernier ratio is 63 to 1. In the 180 degree type, used on the KARAS EQUAMATIC, there are 200 divisions precisely placed, and marked with gold inlay. Overall diameter is 4½" and the knobs are unusually large to give complete freedom from finger cramping when tuning for several hours at a stretch.

The Micrometric Dial

Five-Tube Receiver Sensation

Solves All Tuned R. F. Difficulties

The EQUAMATIC RECEIVER develops greater SELECTIVITY without distortion or loss of the higher musical notes and their harmonics. All of the radio frequency circuits of this receiver are in PERFECT BALANCE at all wave lengths and, once adjusted, the EQUAMATIC RECEIVER cannot howl or disturb nearby sets by going into oscillation. The life of both "A" and "B" batteries is greatly lengthened because maximum efficiency can be obtained at lower filament voltages. This also lengthens the life of the tubes. The first tuning dial can be easily synchronized with the other two.



Karas Orthometric Condenser

The sharpness of tuning of KARAS EQUAMATIC receiver is due in large part to the efficiency of the Karas Orthometric condensers used. The radio experts, editors and experienced fans choose these condensers for ANY type of set they may be building. The shape of the plates gives straight frequency line tuning and the 100 broadcast wave channels are equally spaced one division apart over a 100-division dial. Losses are extremely low because of brass tuning plates and end plates, soldered connections, pig-tail and placing of the hard rubber support strips.

Karas Equamatic Coils

The other factor in sharp tuning is the EQUAMATIC coils. Designed according to the very latest known FACTS for efficient handling of radio frequency currents, they pass an EQUAL and MAXIMUM amount of energy from primary to secondary at ALL wave lengths. The fields around secondaries are small and compact, and show little tendency for interaction. The adjustments possible in the coil mounting permit one to readily find a point of zero coupling between these secondaries. The primaries are sturdily built and mounted, and KARAS EQUAMATIC coils will not change characteristics from ordinary handling or temperature and humidity changes.

Harmonic Transformer

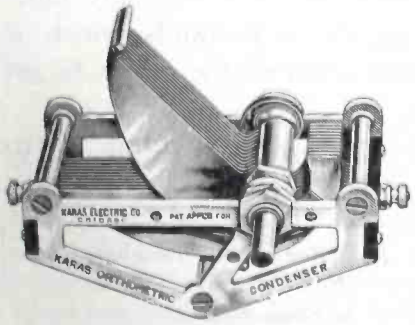
Karas Harmonic Transformer

Harmonic Transformer was the original high quality audio frequency transformer passing all audible notes and harmonics nearly equally; it has been unsurpassed by any subsequent development at ANY price. The wonderful reproduction and powerful volume of the EQUAMATIC RECEIVER is due largely to the use of two of these transformers. With Karas Harmonics there is no muffling of sounds—no fuzz on the edges of words—no thin, squeaky, distorted tones. Instead, every tone is clean-cut, separated and distinct from any other tone. Natural!

This even amplification of ALL audible frequencies is the result of scientific design. Larger coils containing many thousands of turns of wire give an unusually high inductance. Karas coil construction results in a low distributed capacity, insuring full amplification of high audio frequency harmonics and overtunes. Complete shielding prevents interaction and two of these units can be placed close together without distortion.

The output of EQUAMATIC RECEIVER is a smooth flow from the loud speaker of rich, round, full, mellow tones such as you have never before heard from any radio—a surprising volume of real music to which it is a delightful pleasure to listen.

** Licensed Under King Patents Pending.*



Micrometric Condenser

Order Through Dealer or Direct on This Coupon

The Karas apparatus essential to the construction of the five tube EQUAMATIC RECEIVER is carried by nearly every good radio parts dealer in most cities. Secure the parts from your dealer. If he is out of them, order direct from us using this coupon. Send no money. Just hand the postman purchase price plus a few cents postage.

KARAS ELECTRIC CO.

Manufacturing Plant: N. Rockwell St.
Offices: 1067 Association Bldg., Chicago.

KARAS ELECTRIC COMPANY,
1067 Association Building, Chicago, Illinois.

Please send me 3 Equamatic Coils ($12), 3 Special Orthometric Condensers with extended shaft ($21), 3 Micrometric Dials ($10.50), 2 Harmonic Transformers ($14), 2 Karas Retard Coils ($2.00) and 3 Special Brackets ($0.70). I will pay the postman $60.20 plus postage upon delivery. It is understood that I have the privilege of returning any of this apparatus for full refund any time within 30 days if it does not prove entirely satisfactory.

NAME .....

ADDRESS .....

If you send cash with order we'll ship this apparatus postpaid.

Who's Doing IT?

It is important to radio manufacturers to know who is setting the pace for the radio magazines —who has been doing the original thinking— who can be expected to do the next new things.

The idea of putting binding posts at the rear of radio sets, the popularization of neat wiring, the base panel method of assembly — all important in their time — are now a matter of history, so far back most radio men would have to get out old magazines to find that M. B. Sleeper was responsible for these fundamental contributions.

The six-year record of Radio Engineering Magazine will show that M. B. Sleeper owned the first radio magazine laboratory, published the first complete construction articles on sets built from standard parts, and taught the industry the importance of selling parts in set designs, rather than as separate, unrelated items.

Who originated the cooperative marketing method so popular this fall? Who sold the first cooperative advertising? Who sold the first construction blue prints? Who arranged the first international radio tests? The record of these and many other things is written in Radio Engineering. M. B. Sleeper was the man responsible for these things.

But last year's or last month's record isn't enough. What about today's performance, and tomorrow's?

Who's doing the biggest, newest things right now?

The president of one of the largest and oldest parts and instrument companies said recently: "I do not believe that the experimenters' magazines are getting one new radio enthusiast for every two that are dropping out, because they are too technical to attract new blood to the field."

Well, what is any magazine doing about this situation?

Yes, sir. M. B. Sleeper again — by bringing out RADIO MECHANICS MAGAZINE.— The first original idea in popular radio magazines, and a magazine that is original from cover to cover.

Why, when you see RADIO MECHANICS you'll realize that it is the only popular radio magazine there is! Glance over the illustrations and you'll realize how true this statement is.

And as for getting new business and more business — go over a copy of RADIO MECHANICS and you'll see, whether you are selling parts or sets, that it is the only radio magazine sold on the newsstands which is sufficiently different from all the others to get new readers.

READ RADIO MECHANICS FOR NEW IDEAS.

Radio Mechanics, Inc., Radio Hill, Poughkeepsie, N. Y.

Enter my subscription to Radio Mechanics, and send me a bill for $2.00. It will be paid upon receipt of the first issue.

Name..... Company.....

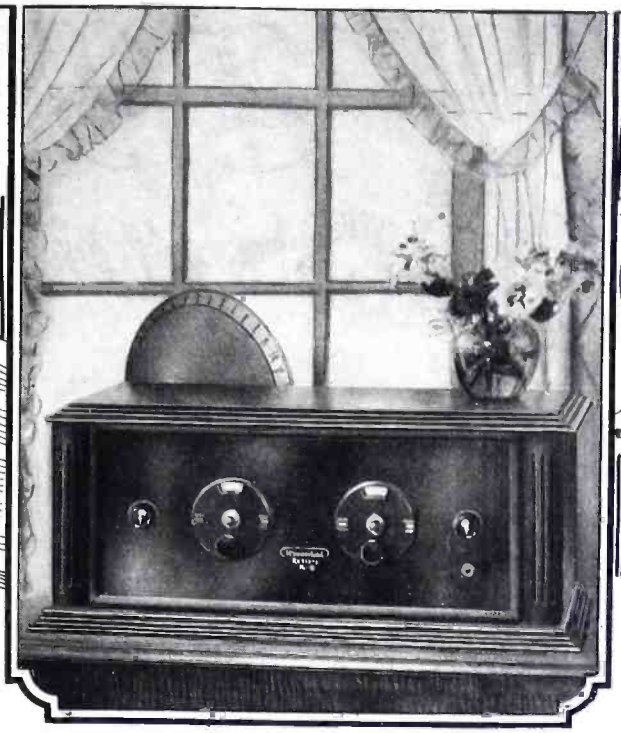
City..... State.....

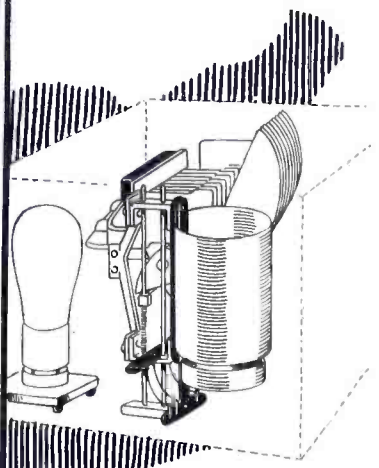
THE NEW SHIELDED HAMMARLUND-ROBERTS Hi-Q★

"HOW TO BUILD IT" BOOK

Complete instructions for assembling, wiring, and operating the Hammarlund-Roberts Hi-Q Receiver. Prepared under the direction of the Engineer-designers.

25c





Automatic Variable Coupling —same control operates tuning condenser and primary coil coupling simultaneously, gives maximum and equal amplification and selectivity over entire tuning range.

Stage Shielding — prevents coupling between stages, preventing oscillations and increasing selectivity. Clarifies reception.

Different And Finer Results From Different, Finer Engineering

THE new Hammarlund-Roberts Hi-Q is an entirely modern radio receiver, incorporating the latest approved features. The most important of these include dual tuning, stage shielding, automatic coupling variation, high detection efficiency, a high power output and that it is non-oscillating.

Tried and proven fundamentals have been adhered to; but they are applied in new and different ways that produce greater selectivity, clearer tone, simpler tuning.

This new Hammarlund-Roberts is the united achievement of ten of the leading radio engineers in the country; all concentrating on producing the most advanced and efficient receiver—regardless of cost.

YOU CAN BUILD THE HAMMARLUND-ROBERTS YOURSELF

Anyone can build the Hammarlund-Roberts HI-Q. All the research, the selection of parts, the exact placing of units, has been worked out in advance for you. And you have a receiver that will equal an eight tube set—simplicity of design and operation hitherto unthought of—all at less than half the price you would pay for a factory made set of anywhere near equal efficiency.

HAMMARLUND-ROBERTS, 1182-G Broadway, New York

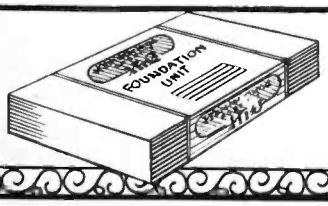
Hammarlund
ROBERTS
Hi-Q★

Parts complete (less cabinet) $63.05

★High ratio of reactance to resistance. High ratio—Great selectivity—Loud signals.

HI-Q FOUNDATION UNIT

Includes drilled and engraved Bakelite panel, drilled Bakelite sub panel, two complete shields, hardware, wire, nuts and screws. **$10.50**



ASSOCIATE MANUFACTURERS

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Martin-Copeland Co.
Radiall Company
Samson Electric Co.
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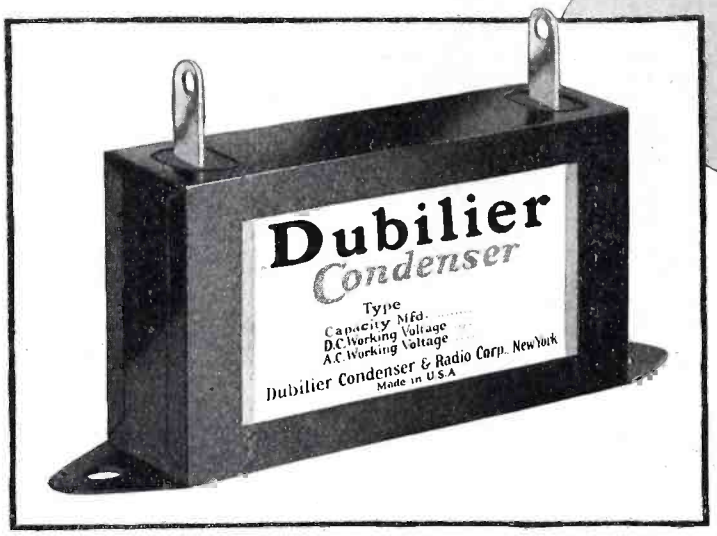
Eby Manufacturing Co.
Hammarlund Mfg. Company
International Resistance Co.
Westinghouse Micarta

The Passing of "By-Pass" condensers



Dubilier Condenser Type 907

Capacities 0.1 to 2.0 mfds.
Price $ .60 to $1.75

"By-Pass was the name originally given to small paper condensers by Dubilier. This name described their functions—such as shunting radio frequency currents around high resistances, and their use in amplifier circuits.

But now the clumsy old "By-Pass" condenser is out of date. The high voltage used in radio today along with sub-panel construction, demand a condenser of higher electrical efficiency and more compact size.

In the new Type 907, Dubilier has made a compact all-purpose condenser with a *working voltage* * of 160 volts D. C. With improved soldering lug terminals and mounting feet, Type 907 will give more efficient service in smaller space for every purpose for which the old "By-Pass" type of condenser has been used.

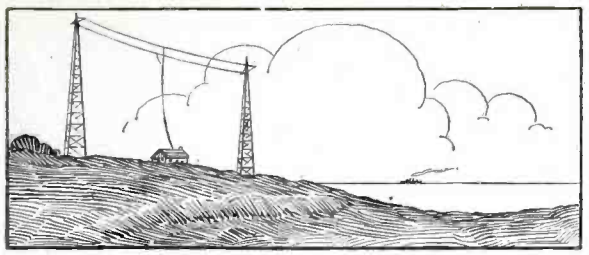
For long life at high voltages insist on Dubilier Paper Condensers.

Dubilier

CONDENSER AND RADIO CORPORATION

4377 Bronx Blvd., New York, N. Y.

*Working voltage means more than "test voltage." It is the voltage at which a condenser may be safely used in *continuous operation.*



THE NEW L-W CIRCUIT

A method of neutralizing which is independent of the vacuum tube capacities—By John Grabar

THE development of radio circuits of radically new design is becoming more and more the particular art of the skilled engineer. When the fundamental laws of electrical engineering are combined with sound mathematics, the result is usually an efficient product.

Engineering and mathematics have been combined by Messrs. Loftin and White in their paper on combined electromagnetic and electrostatic coupling, which they recently presented before the Institute of Radio Engineers.

The ordinary type of radio receiver employs inductive or magnetic coupling only. This system increases in efficiency of energy transfer (from primary to secondary) with increase in frequency. The result is unstability and non-selectivity at low wavelengths, unless neutralization, the introduction of losses or the mechanical variation of coupling is resorted to.

In order to illustrate the fundamentals of the L-W circuit, turn to Fig. 1. This is an ordinary electromagnetic system where two circuits are coupled through a transformer. We have a source of voltage of variable frequency. Circuit 2 contains a variable condenser to permit adjustment for resonance at all impressed frequencies. Then a curve between frequency and secondary voltage or energy will have the form as in Fig. 2. E_2 is the secondary voltage at resonance. As the frequency increases the curve C_1 has an upward slope, indicating an increase in the amount of energy transferred from circuit 1 to circuit 2.

This transfer of energy may also be accomplished electrostatically as shown in Fig. 3. C_1 is the coupling condenser and is very much larger than C_2, which is variable. A curve between the same ordinates as in Fig. 2, will have a downward slope, as Fig. 4 shows. The reasons for the slope of curves C_1 and C_2 are well known and so will not be discussed here.

If these two methods of coupling, namely, electromagnetic and electrostatic, could be combined the result would be a uniformly straight transfer of energy curve. Fig. 5 shows such an arrangement. The resultant curve of energy transfer is as shown in Fig. 6, where C_{1e} represents the summation of curves C_1 and C_e. However, to obtain this straight line care must be taken to insure the proper phase relation between the electromagnetic and electrostatic coupling. Should either L or L' be reversed, C_1 would be shifted below the zero line—negative energy transfer with respect to C_e— and the point where now the two curves cross would become O coupling and therefore zero energy transfer. It must be noted that zero coupling is a relative term and refers to the smallest coupling obtainable in this system. Even with correct polarity, the straight line may not be obtained, if other factors, affected by the introduction of capacity coupling, are not considered. Some of these factors are: amount of coupling, limitations of electrostatic field imposed by tuning condenser, etc.

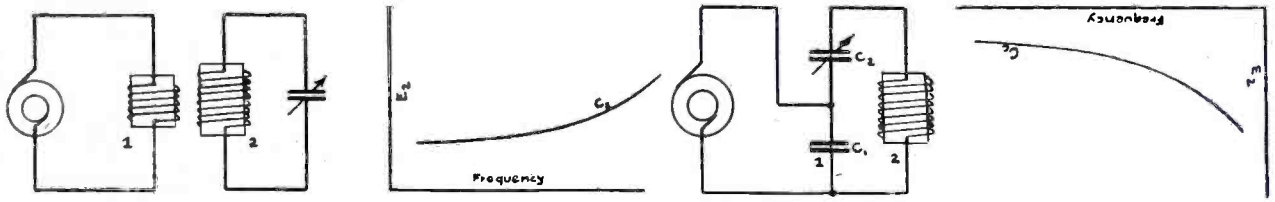
Those considerations are fairly simple and the circuit as is Fig. 5 easily constructed. When applied to a vacuum tube amplifier the problem becomes a more difficult one. The prime source of difficulty is the inherent tube capacity. Due to this capacity the current in the plate circuit will affect the grid of the tube. The common name applied to this action is regeneration.

To produce regeneration, the plate circuit must have an inductive reactance. A resistive plate circuit will neither aid nor oppose regeneration. On the other hand, a capacitive circuit will prevent regenerative action. The detrimental effect of the grid-plate capacity of a vacuum tube is well known. Attempts have been made by manufacturers and engineers to overcome it or nullify it. Practically all of the systems in use either produce an inefficient receiver—losser methods—or do not entirely wipe out regeneration—neutralizing schemes.

The Loftin-White system is very flexible. With constant coupling it is possible to construct a receiver which will be just on the point of oscillation for the entire range of broadcasting frequencies. Letting either the capacitive or inductive coupling predominate will produce a receiver that will give more energy on higher or the lower wavelengths. Fig. 7 illustrates the L-W circuit.

Looking at circuit 7, a choke coil is found inserted in the plate circuit. This choke provides sufficient inductance so that the plate voltage may fluctuate the required amount. Condenser C_1 blocks the plate potential. Therefore the choke furnishes a path for it. C_2 is the tuning condenser but also acts as a blocking condenser to prevent the application of plate potential to the grid of the succeeding tube.

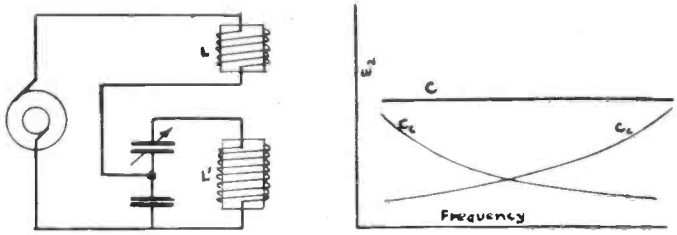
In the ordinary receiver, using elec-



Figs. 1 and 2. Illustrating the effect of frequency upon magnetic coupling. Figs. 3 and 4. The action which takes place with electrostatic coupling between circuits

tromagnetic coupling there is a tendency to regenerate excessively at the high frequencies. If the coupling is then so adjusted as to just stop oscillation on the lowest wavelength, the receiver will be found to be very inefficient at the higher wavelengths and furthermore selectivity will be poor at the lower wavelengths. This condition therefore limits the wavelength range.

With the new type of coupling no such limitation is imposed. By adjusting the constants of the circuit we can have maximum regeneration over a range of 150 to 600 meters, or increasing regeneration on the high wavelengths. In other words, we have a new regenerative control which can be set once and then will be fixed for all frequencies.



Figs. 5 and 6. Loftin and White combine magnetic and electrostatic coupling to produce constant coupling at all frequencies

Another great benefit derived from this coupling—of interest to manufactures especially—is the fact, that due to the loose coupling employed in the electromagnetic portion of the circuit—the other coupling is capacitive—fewer turns are needed on the primary to duplicate conditions of ordinary receivers. As a result the distributed capacity of the circuit is reduced, producing a lower minimum capacity, and therefore a lower wavelength may be reached. Using ordinary commercial condensers, sets have been changed to go down as far as 210 meters, which originally barely reached 230.

Loftin and White constructed a set with a circuit as in Fig. 7, adding two stages of audio. The only criticism to be heard was that the receiver was too selective for the ordinary operator to cover DX.

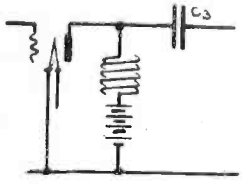


Fig. 8. The value of C_3 determines the amount of regeneration in the plate circuit

Finally we come to the step which will be a boom to many. This coupling, with a condenser C_3 added in the plate circuit, may be employed in the construction of tuned radio frequency receivers that will not oscillate and will be *entirely independent of tube capacity*. Not only is it impossible to neutralize perfectly the ordinary receiver for more than one frequency, but this neutralization only holds for the set of tubes in the sockets. But here we have a scheme which gives entire freedom from oscillation no matter what type of tube is employed.

Fig. 8 is a reproduction of circuit 2 of Fig. 7, with the exception of condenser C_3 in the plate circuit. We stated before that a resistive plate circuit cannot produce regeneration and a capacitive reactance in the plate will oppose regeneration. If we then insert a capacity of sufficient magnitude in 2 to completely oppose the inductive reactance, the plate circuit will have no undesirable influence upon the grid. The energy now in the plate circuit is only the one produced and amplified by the tube at the efficiency of resonance. Where a number of steps of radio amplification are to be constructed, it is preferable to increase the capacity of C_3 slightly beyond the amount required for a resistive plate circuit. This will make the path slightly capacitive and will effectively take care of any stray feedbacks due to leads, etc., that might arise.

To summarize: The L-W system of coupling will produce a constant transfer of energy for all frequencies. It offers a control for regeneration which may be ajusted once for all frequencies. It permits loose magnetic coupling and therefore a wider range in frequencies may be covered with ordinary commercial condensers. A receiver may be "neutralized" for all frequencies, independent of tube capacity.

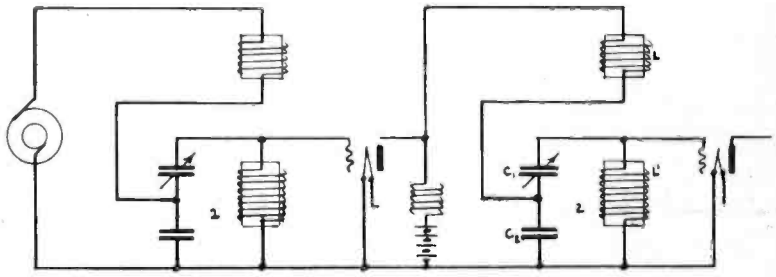


Fig. 7. Complete circuit of the Loftin-White receiver. This is one of the applications of the system. Using this method, it is possible to obtain a sufficiently constant regeneration to make a single-control, 3-circuit tuner

A New Book on Eliminators

More power supply devices will be sold this season than ever before. The new book published by the Acme Apparatus Company on this subject should therefore prove of great value to the dealer and service man. The information contained in it deals with the theory and construction of both A and B eliminators.

The first few pages are devoted to a theoretical consideration of alternating, direct and rectified current. This gives a comprehensive view of the difference between A. C. and D. C. Furthermore, it brings out the fact that rectified A. C. is not a pure direct current, but has fluctuations which must be ironed out before it can be applied to a radio set.

An interesting diagram will be found on page 6 of the book, which shows the necessary sections and units for good rectification and filtration. With the picture presented in mind, the circuits of the various eliminators on the market will be easier to understand.

A number of pages have been devoted to filters. This is an all important subject, for upon the design of this feature will depend the success or failure of the device. Circuits are given for both A and B eliminators, with constants of the chokes and condensers used. The A supply filter is of particular interest, because of the novel use of the storage battery. C eliminators have been neglected for quite some time, but here will be found a circuit which is simple to put together, yet should give exceptional results.

There are any number of ways of connecting the rectifying device into the circuit. On page 12 there are several diagrams for electrolytic and vacuum tube rectifiers. A small but important item in an eliminator is the control unit. This book presents some interesting dope on the proper construction of control units.

As a whole, the Acme book on power supply is a timely bit of information useful to the dealer and service man as well as the general public.

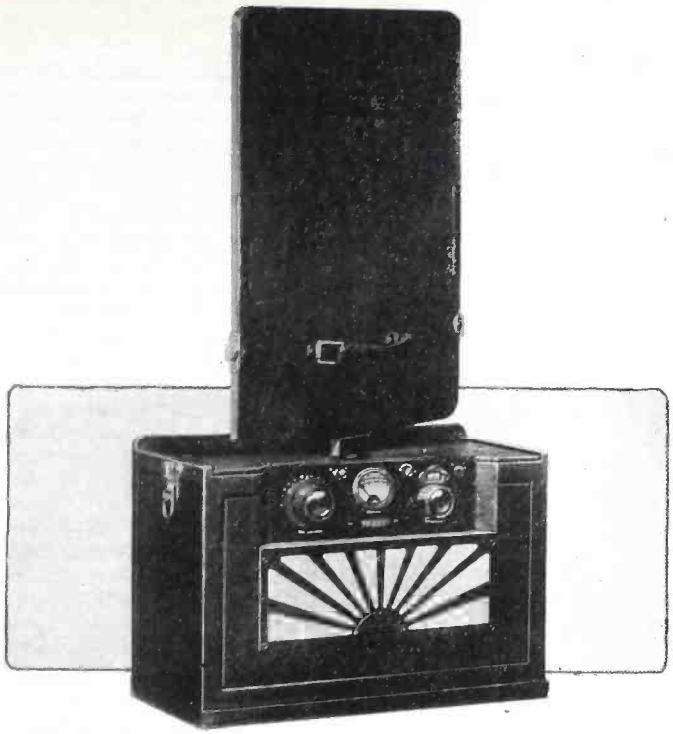


Fig. 1. The 1927 Operadio is built by a company which has always specialized in the manufacture of light-weight equipment

Operadio Adds a Tube

More pick-up with advances in the tuning circuit design, loud speaker, volume control, and mechanism

THE Operadio Corporation of Chicago announces as a new model for the 1927 season, a seven tube set which, while maintaining the essential form of previous models, contains radical changes in design.

The new set, designated as Model-7, represents the culmination of five consecutive years of development of loop operated, self-contained sets. As in previous Operadio models, the new set is of the combination home-and-portable type and is a remarkable piece of radio engineering. Contained within the compact carrying case, the dimensions of which are 17x12x9 ins., there is a highly efficient seven-tube set as well as ample battery supply and self-contained loud speaker.

The set utilizes six 199 type tubes and one power tube. The tuned input supplies one stage of tuned radio frequency and two transformer coupled stages. Behind the detector are a transformer stage and two resistance coupled stages of audio frequency. As in a previous model of the Operadio, the radio frequency transformers are entirely shielded and hermetically sealed in one can, with the audio frequency equipment in another. These cans, mounted beneath the gang socket as shown in the accompanying illustration, give very short leads. Since both units are impregnated in a high insulating, low dielectric wax, the possibility of damage or unstable operation from the effects of humidity is practically eliminated. The gang socket with the attached cans and tubes are mounted by an ingenious spring suspension which solves one of the most difficult problems encountered in all self-contained sets, namely: trouble from microphonics.

The self-contained loud speaker with a 24-in. air column is of unique design and in combination with the resistance coupling of the audio frequency, produces a truly remarkable tone quality.

This new model covers completely and efficiently the entire broadcasting wave band from 200 to 550 meters with untuned transformers, an engineering feat of which the designers are justly proud. The tuned input and the tuned stage of radio frequency are ganged together under one dial. Due to the inherent balance of the circuit, single-dial tuning for all local and the stronger distant stations is obtained without any adjustment whatsoever of other controls.

As in previous models of the Operadio, a high grade voltmeter is incorporated in the set to insure that the proper voltage is impressed on the dry battery tubes and also to enable the owner to determine at all times the exact condition of both A and B batteries.

One of the new features of this model is the arrangement of the volt-

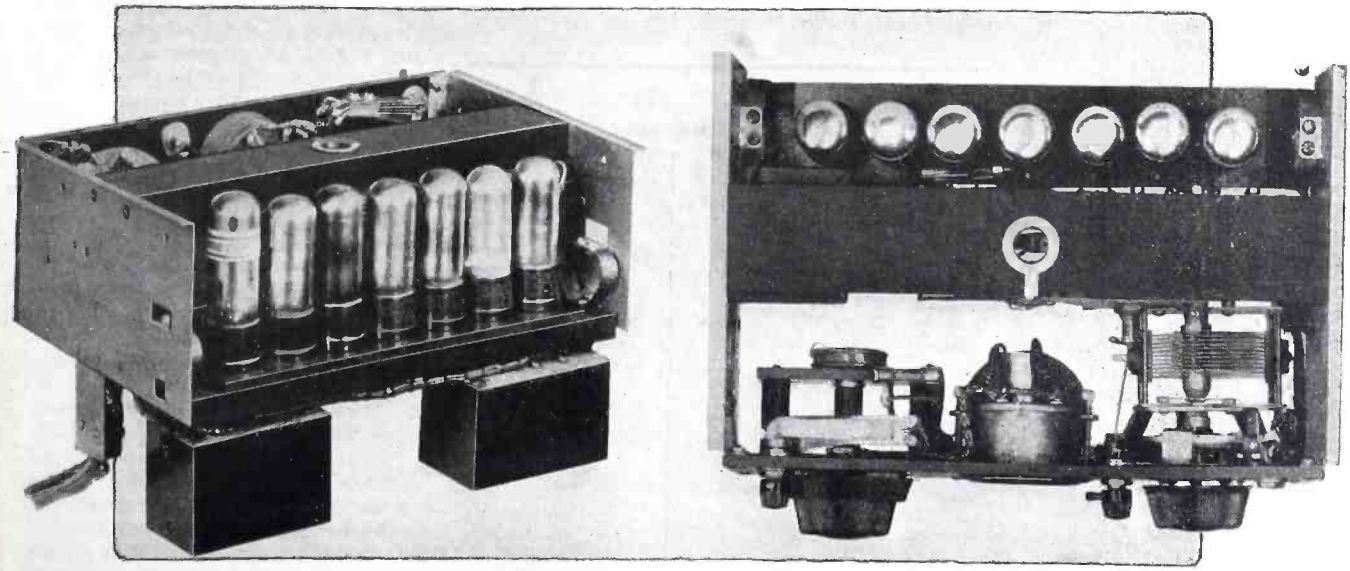
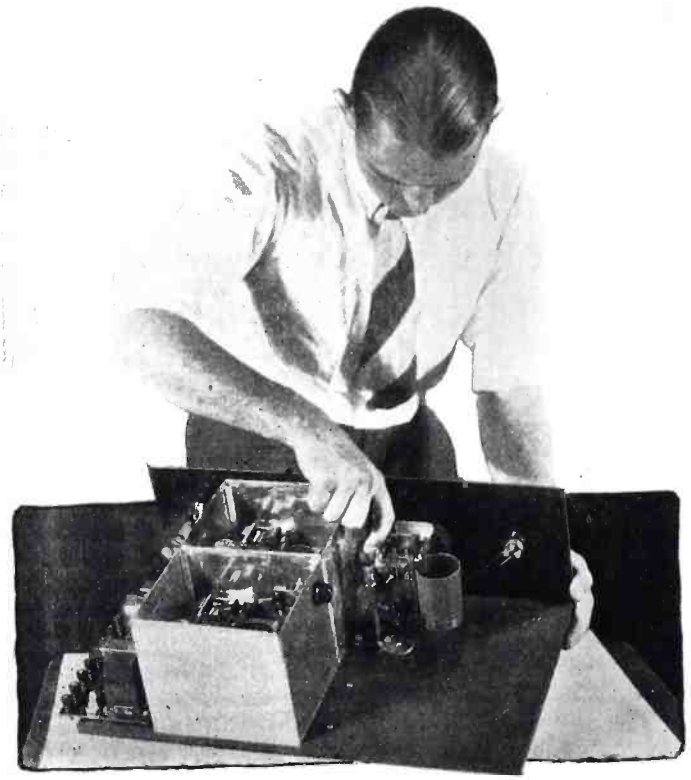


Fig. 2. Rear and top views of the 1927 Operadio. Note the catacombs, below the tubes, which contain the radio and audio amplifying circuits. The top view shows some of the mechanical developments

age control whereby it is impossible to supply to the tubes more than the correct voltage of 3.3 volts. Another desirable feature of the set, particularly in metropolitan centers where there are strong local broadcasting stations, is the volume control provided by a variable resistance across the input of the second audio tube. With the volume control at this point in the circuit, any change in volume desired can be obtained without affecting the tuning. When a station is tuned in accurately on its wave, the volume is regulated entirely by the volume control without de-tuning, with the attendant danger of running into other local stations. This control gives a volume regulation from a whisper to full reproduction.



Right up to the minute is the design of the HiQ. Except for the foundation unit, all parts required are standard items equally useful in other circuits, a factor of importance to the dealers

The Question of Q

Telling the first story of the new Hammarlund-Roberts construction kit

EVERY dealer is aware of the gratifying response accorded by the fans to the Hammarlund-Roberts kit, which embodied its own version of the one stage of tuned R. F. and regenerative detector combination. This year Hammarlund-Roberts have scored again with their Hi Q kit, designed around a circuit radically different from that of its older brother. Following in the footsteps of its illustrious predecessor, the new kit contains parts which are the products of ten leading manufacturers. Aside from the circuit, the new outfit has been changed in constructional details to conform with the latest ideas and best engineering practice.

Of particular interest and benefit to the dealer is the fact that he need stock no special parts, aside from the Foundation Unit, which cannot be used in some other set or circuit. The coils, for instance, are adaptable to almost any circuit, as is the rest of the associated equipment.

This kit possesses several unique details of construction and assembly which can be stressed by the dealer for strong selling points. For example, the shields are shipped in knocked-down form and can be assembled easily without the necessity for soldering laps or joints.

The assembly, as a whole, presents one of the most attractive, efficient, and easily constructed designs that have yet been placed on the market. Simplicity of control is attained by ganging on one shaft the condensers which tune the second R. F. and detector circuits. The secondary of the antenna coil is tuned separately to compensate for the variations introduced by the use of aerials of different lengths and capacities. Thus the tuning is done with only two dials, which is a most desirable feature.

It will be noticed, by reference to the large picture, that no shielding is employed around the first stage of R. F. An explanation of why this shielding has been omitted will be of interest to the technical men.

The energy entering the set by way of the antenna is minute, and the direct pick-up by the coil itself is very much smaller. If we take steps, by shielding these parts, to prevent this small amount of stray energy from entering the set, we have actually accomplished very little, and have probably not bettered the operation of the receiver at all. We have, however, complicated the construction greatly, and have also definitely increased the cost of the parts.

The circuit itself consists of two stages of tuned R. F., neutralized by the well known Roberts method, a non-regenerative detector, and two steps of transformer coupled audio. It can be safely said that the R. F. stages are far more efficient than is the conventional design, due to their Auto Coupling feature.

The Auto Coupling is a very clever arrangement of varying the coupling between the primary and secondary coils as the circuits are tuned. Reference to the photograph on the opposite page will enable the reader to understand more easily the description of how this is accomplished.

The secondary coil is mounted on brackets affixed to the frame of the tuning condenser. The primary coil is in turn mounted on two rods, which slide through holes pierced in the mounting brackets of the secondary coil. A cam is fastened to the rotor shaft of the tuning condenser, and bears against a cross rod which is connected to one of the rods which actuate the primary coil. The shape of this cam has been mathematically calculated so that the primary coil, or in other words the coupling, is automatically varied an amount definitely in proportion to the variation in frequency.

This kit incorporates just about every useful feature that one could desire, without recourse to the uncertainties of reflexing, or the instability commonly inflicted as a penalty for the use of regeneration.

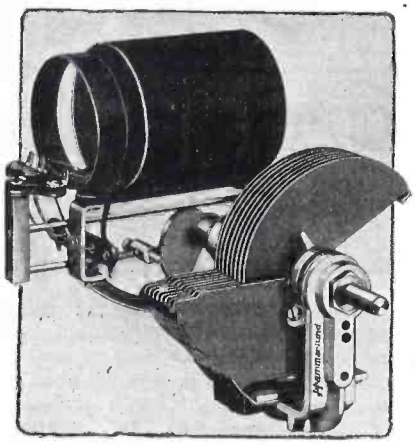
Another noteworthy feature is the use of a separate sub panel of Bakelite Micarta, upon which are mounted the new type Samson audio transformers. This sub panel serves also as a connection block, and is drilled to hold the Eby binding posts, to which all battery connections are made.

This arrangement permits the assembling of the audio amplifier, including the Amperite filament ballasts and Benjamin sockets, as one complete unit. The advantages of this scheme are apparent, for the constructor is

enabled to do the most difficult part of the wiring before the set is completely assembled. Thus the necessity for the gymnastic contortions required when soldering in inaccessible places is obviated.

The wiring has been further simplified by using one of the new Carter products, which incorporates a rheostat and filament switch in one unit. The rheostat controls the filament voltage of the R. F. tubes, and serves as an effective volume control. A Carter Imp antenna switch is provided to compensate for different antenna lengths, and also regulates the selectivity or the ease of tuning as desired.

The Hammarlund-Roberts Foundation Unit consists of a drilled and engraved Bakelite Micarta front panel, a drilled Bakelite Micarta sub panel, complete aluminum shields, an extension shaft, equalizers, a fixed resistance, wire, and screws, in fact all the special parts needed to construct the outfit. In addition to the parts already named, the assembly requires a set of Hammarlund variable condensers, Auto Couple coils, and midget condenser, Sangamo fixed condensers, Durham grid leak, Marco vernier dials, and a Carter jack.



This unit, specially designed for the HiQ, can be used in any tuned R. F. Set

Heretofore, high reactance has been inseparably associated with correspondingly high resistance. However, in order to be efficient, a circuit should have a high value of reactance, and a low value of resistance. The direct ratio of reactance to resistance, is expressed by the formula Q=X/R.

This circuit has been designed to give the highest possible reactance consistent with the lowest possible resistance, hence the name, Hi Q.

General Radio Units

General Radio has placed on the market two neat designs of B eliminators and power amplifiers. Type 390 uses a UX-213 and a UX-171. The other type, 395, is designed for the Raytheon B H tube and the UX-171. Both designs are identical with the exception of the power transformer.

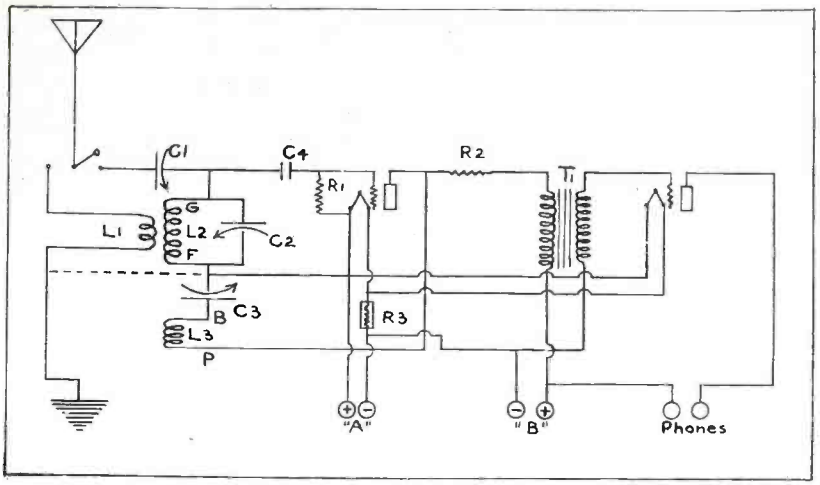


Fig. 1. Bert Smith's own schematic for his S. W. receiver design

Around the World on S. W.

*A design based on the experience of operators on polar and tropical expeditions—By Bert Smith**

DUE to the comparative newness of short wave receivers, many faulty designs have been recommended to an innocent and trusting public. It is therefore most important that the technical men in the radio business sponsor only those parts and circuits which have been thoroughly tried in actual service at the hands of experienced ham operators.

The growing use of short waves for broadcasting has served to stimulate the interest of the average listener in short wave receivers, and has therefore opened a field which promises to be very profitable for the dealer who recognizes these possibilities and features short wave kits and parts.

The dealers' technical men, selling short wave kits and explaining short wave circuits, may be confronted with a large number of questions. Some of the ones most commonly asked for:

1.—Do you encounter dead spots in the tuning range where the detector will not oscillate?

2.—Is the set free from body capacity?

3.—Are the coils readily interchangeable so that quick and easy shifts of wave bands are effected?

4.—Is the control of regeneration smooth and uncritical, with a minimum of de-tuning effect?

5.—Is the set easy to wire and free from freak construction?

6.—Is the set easy to tune?

7.—Is the tone quality good so that the set can be used enjoyably on the broadcast band?

8.—Has the set good distance getting ability?

The answers to these questions are:

1.—This receiver will regenerate freely on any and all of the wavelengths it covers, which are from 15 to 550 meters. This is assured by the resistance in the plate circuit of the detector, the fixed tickler, L3, and the regeneration or throttle condenser, C3.

2.—Body capacity will be noticed only when setting the antenna series condenser, C1. This is not troublesome, however, since C1 has one best setting for each coil used, and requires no further adjustment. The control knob on the shaft of C1 has been brought out to the panel merely for convenience. The rotors of condensers C2 and C3 are both attached to the low potential side of their respective coils, and no trouble will be experienced from body capacity with them.

3.—The Aero coils are provided with small plugs and suitable minature jack mountings into which they can be quickly plugged. The Primary coil L1 is not removable, but is so hinged that the best coupling can be obtained for any antenna used.

4.—Control of regeneration is smooth and effective at all wavelengths. If the detector goes into oscillation with a sudden plop, the trouble will generally be found to be the use of an improper value of gridleak. The utmost flexibility of regeneration control is assured by the fixed tickler coil, and variable regeneration condenser.

5.—The wiring and assembly of the set is simplicity itself. All wiring can be done and the set can be put into operation for testing before the front panel is attached. All apparatus is laid out so that the wiring is short and direct and the leads are readily accessible. Very little wiring is done under the sub-panel.

6.—There is only one tuning control and the regeneration control. There

* Allen D. Cardwell Co.

Complete construction article in RADIO MECHANICS, November, 1926.

are no supplementary rheostats or other knobs to turn. The antenna series condenser is set once for each coil used on the short waves, and is not even in the circuit when the broadcast band is covered.

7.—The use of a high grade audio transformer assures excellent tone quality. Furthermore, the R. F. currents are effectually choked out of the audio end, which removes a frequent cause of distortion and noise. This receiver, coupled to a power amplifier of approved design, will deliver signals of a quality to satisfy the most fastidious listener.

8.—Under favorable conditions, using the short wave coils, the distance reach of the receiver is almost unlimited. Australian, French, and Brazilian stations have been received in a single evening.

Dealers may encounter sales resistance due to the fact that many people have constructed S. W. sets which gave indifferent results, or no results at all, and they will probably find quite a few prospects who would like to build S.W. outfits but have been advised by their friends to "lay off."

There seems to be a great deal of misunderstanding in the minds of the public about S.W. equipment. The design of a S.W. receiver is much more than figuring an inductance, a variable capacity to tune it with, and tacking on behind some method for obtaining regeneration. A number of circuits which have appeared in magazines and newspapers seem to have been designed in this manner, since, when constructed, they gave anything but gratifying results.

In the S.W. set to be described here, the deficiencies and shortcomings of other designs have been carefully studied and either elimmated or avoided. The resulting receiver, therefore, is one which the technical man may safely recommend, and one for which the dealer may sell parts without fear of comeback.

When designing this receiver a number of rather novel but exceedingly useful things were done. First, since lengthy experiments have led us to believe that a long antenna capacitatively coupled to the grid of the detector tube gives the best results on S.W. reception, an antenna series variable condenser, C1, Fig. 1, was incorporated in the circuit.

On the other hand, inductive coupling, using an aperiodic antenna, is preferable for the broadcast band. Provision for this form of coupling is made, and the change is readily accomplished by merely disconnecting the antenna from the series condenser and hooking it to the primary coil, L1, Fig. 1.

Regeneration is obtained by a method which has proved most satisfactory on S.W. receivers. In Fig. 1, resistance R2 between the plate of the detector and the primary of the audio transformer obviously presents a higher resistance to the R.F. currents than the tickler L3, and the regeneration condenser C3. Further, since the capacity of C3 is small, audio frequency can not get through it and the result is a smooth control of regeneration on all bands with a minimum of distortion caused by stray R.F. in the A.F. amplifier.

Another advantage of this system is that no point will be found at which it is necessary to use a large advance of the tickler condenser in order to obtain enough regeneration. Due to the voltage drop through the resistance R2, the detector will be found to operate best on about 90 volts. Thus only one B plus lead is necessary on the set and the wiring is further simplified.

The construction of the set merits more than passing mention, due to its unusual features. All of the parts are mounted on the sub-panel in such a way that the entire receiver can be completely wired and tested before the front panel is put on. This method greatly facilitates the mounting, wiring, and testing.

In order to obtain the excellent results of which this receiver is capable, it is most important that not only the best of parts be used, but also that the parts are properly correlated.

The Aero Coils used in this receiver are of excellent design and of low loss construction fully in accordance with the latest and best engineering practice. The variable condensers are Cardwell, one Taper Plate, type E, controlling regeneration, one type D for secondary tuning, and one type D for the antenna series condenser.

On the sub-panel, which is mounted on Silver Marshall brackets, we find the mounting for the Aero coils, two Airgap tube sockets, an Amertran De Luxe first stage audio transformer, an Electrad resistance, grid leak, and condenser, and Eby binding posts for battery connections and phones or power amplifier input. One Amperite, type 112, controls the filament current of both tubes.

On the front panel are a National dial for turning the secondary condenser, two Kurz Kasch knobs for the antenna series and regeneration condensers, and a Frost toggle filament switch.

Varion for A. C. Operation

A set made from standard parts which takes A, B, and C from 110 volts, A.C.

THAT this is the year of battery elimination, there is no doubt. Any one connected in any way with the radio business can attest to the interest that this problem is arousing over he entire country. The radio fan of today is tired of playing with trick circuits. Still, he wants something to keep him interested and on the qui vive. A. C. operation will do that. Furthermore, radio is finding its place in the home as a piece of furniture of pleasing appearance. This implies the hiding or eliminating of a great many appliances previously found attached in a helter-skelter fashion to the radio set. With A. C. operation, all unsightly wiring is done away with.

With 110-volt alternating current forming approximately 90 per cent of the major installations in this country, interest and importance naturally centers on battery elimination from that source. During the past few years a large number of truly satisfactory B eliminators have been placed on the market, but the number of A eliminators released has been very small. This has been due largely to the bulk and expense involved. If the eliminator is to work with a standard radio set without any changes being made in the receiver, the A current to be rectified and filtered must necessarily be high. For example, a set using five 201-A tubes consumes one and one-quarter amperes of current and the filter apparatus, to smooth out this amount, must be far too bulky and expensive for widespread public acceptance.

Because of the difficulties of handling large quantities of rectified direct current, it was decided, in designing the Varion Receiver, to use 199 tubes with their filaments connected in series, up to the last tube. At this point, where all of the voltage amplification gains made throughout the set must be translated to terms of power, the 199 was obviously unfitted and a power tube of the 112 or 171 type was decided upon. The filament of this last tube is supplied with A. C. from a five-volt center tapped filament winding on the power transformer. The filament current of a 199 is only sixty milliamps at three volts. This means that the filaments of five such tubes connected in series will draw only sixty milliamps at fifteen volts. This is readily obtainable from any well designed eliminator. Of the several methods of rectification that could be used, the vacuum tube type was decided upon.

The design of the eliminator circuit employed follows very closely that of common practice. The new Raytheon BH is used to rectify the A. C. However, several refinements in design and construction have been incorporated, which should be readily appreciated by the experimenter. The Amertran transformer used is of

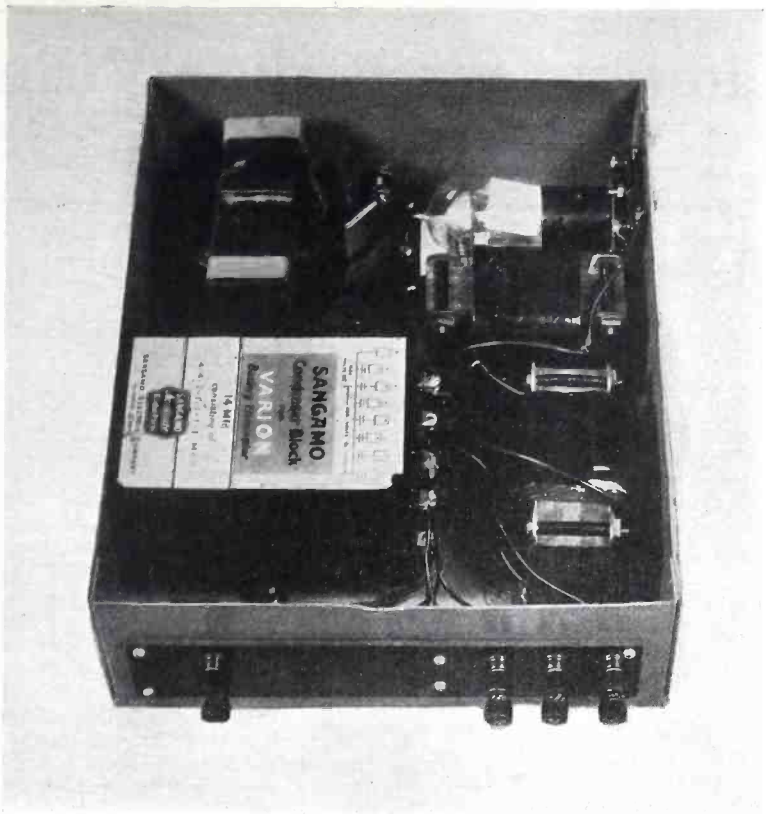


Fig. 1. The eliminator unit, made up of standard parts built into a new Raytheon circuit

special design and contrary to what seems to be general eliminator practice, the core is of such generous design as to prevent saturation at full voltage and load. Core saturation often gives rise to a hum which is difficult to locate and eliminate. The filament heating winding for the power tube delivers five volts at a one-half ampere drain. This is suitable for a UX-112 or a 171 power tube.

The Sangamo condensers used have ample capacity and are all rated at voltages far in excess of those met with in the operation of the eliminator, a point which will please those who have had the doubtful pleasure of blowing several ordinary filter condensers one after another on relatively high voltages.

Ward Leonard has contributed a Vitrohm Resistor directly to the radio experimenter. Besides having an indefinite life, these resistors have another very important characteristic for eliminator work. They possess a zero temperature coefficient. Therefore, their resistance will not vary with either load or temperature. The Centralab Radiohms used in the receiver are of the new heavy duty type, assuring smooth, noiseless operation.

A heavy gauge steel case is suggested for the Varion Eliminator. It will aid materially in preventing interaction between set and eliminator and resultant hum. The balance of the material in both the eliminator and the receiver is of standard design and has been chosen on its merit as a part of the circuit. If you desire to make substitutions for apparatus specified here, be sure that the new material is the exact duplicate, electrically, as the part which it replaces.

Independent of the type of power tube used, the 2250 ohm resistance in series with the center tap lead of the filament winding will give the correct negative bias to the grid of the tube. The C bias voltage is obtained by the drop across this resistance, through which the plate current of the power tube must flow. The heavier the current drawn through this resistance, the greater the voltage drop must be. It so happens that the characteristics of the 112 and the 171 tubes are such that with the correct plate volages, each will receive the correct negative bias.

A four mfd. condenser has been placed across the filament supply of the 199's. This is absolutely essential in this type of receiver. The plate return of the power tube is placed ahead of the filament supply terminals. In this way the plate current of the power tube is added to the filament supply of the 199 tubes. As this current is quite considerable in the case of a 171—about twenty milliamps—this method aids materially in reducing the load on the rectifier tube and filter circuit. It is important to note though, that without the four mfd. condenser across the line, the normal fluctuations in the plate current of the power tube will result in an unstable filament supply for the 199's. This will be evidenced by the inability of the

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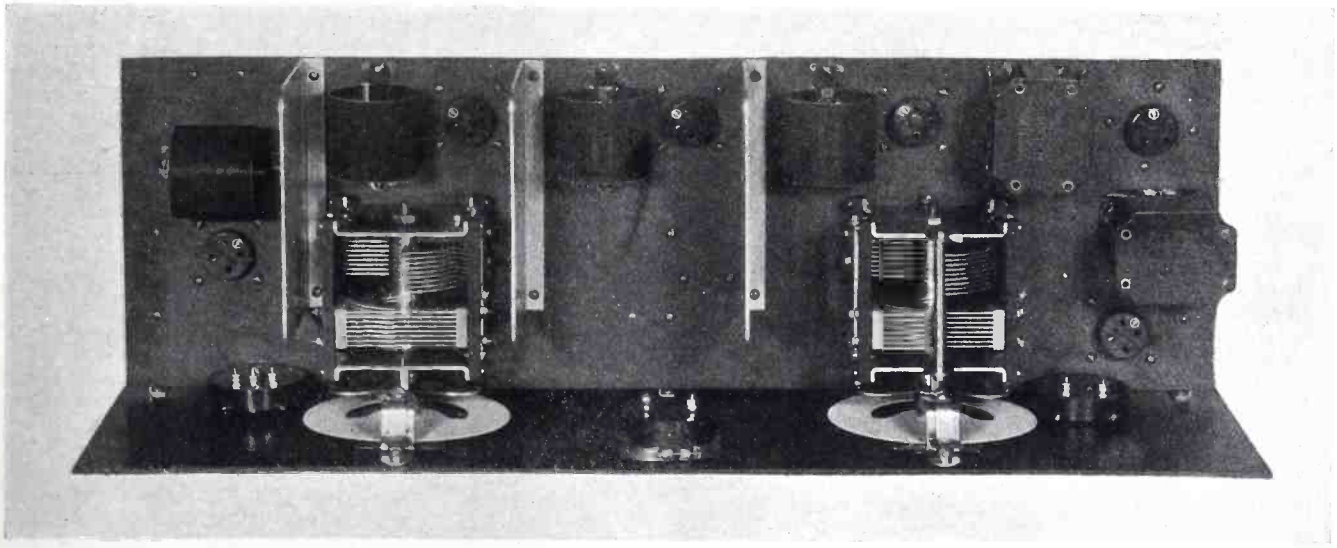


Fig. 2. Five 199 tubes and a 171 are used in this Varion set. The very finest parts have been chosen, and the circuit has been worked out with unusual thoroughness

Big Field for B Battery S. W. Telephone Transmitters

Short waves have opened another big field, for remunerative returns, to the dealer and service man. Many people are eager to try their hands on short wave work and the simplest thing to do is to hook up a small telephone transmitter operated from B batteries. The wide awake dealer will take adavntage of the demand for such material which will soon be created by *Radio Mechanics*.

In the December issue of that magazine there will appear a complete and detailed construction article, describing a telephone transmitter and receiver for short wave work. Amateurs and B. C. L.'s who have seen and operated the outfit are very enthusiastic about it and predict its immediate success. And the curious thing about the transmitter is that it is so inexpensive for the average fan to obtain. Why, the total cost is very much less than one would expect to pay for a good five-tube broadcast receiver. During the summer months consistent results with phone have been obtained over a range of 200 miles. Two-way conversations were carried on with ease over that distance. The transmitter is very compact, occupying about as much space as the B batteries needed for its operation. In conjunction with the short wave receiver, the whole outfit is compact, inexpensive to acquire and operate.

It is up to the dealer to get behind this and be prepared. Here are some of the manufacturers who will push the transmitter and receiver. The American Transformer Company is furnishing the audio transformers for the receiver. The modulation transformer in the transmitter is made by the Acme Apparatus Company. Benjamin sockets are used in both outfits. The variable condensers used are manufactured by Karas. Plug-in coils in the receiver and transmitter are of the Aero type. Amperites are used for controlling the filament current ampere of all the tubes. To indicate the amount of antenna radiation a 0-1 hot wire ammeter has been incorporated in the transmitter. This is put out by General Radio. A Sampson R. F. Choke is used in the receiver. For ease of handling, a Federal hand microphone is recommended for voice transmission. Some of the other manufacturers whose product are being used in the transmitter and receiver are Lynch, Durham, Eby and Garfield.

With this advance information in your hands it is up to you to be ready to serve your customers when the demand for these parts will arise.

Any dealer who will make up one of these outfits and let his customers talk by radio will be astonished at the sales created.

Materials for Radio Wiring

Describing approved methods for wiring buildings and homes for radio distributing systems—By R. C. Birkhahn

DEALERS and service men are beginning to acknowledge that there are great possibilities in radio distribution systems. The elaborate receivers of today, giving ample power and volume to fill a concert hall, lend themselves admirably to radio distribution. Forewarned is forearmed. Here are some of the details which must be worked out, if the distribution system to be constructed, is to operate satisfactorily.

Fig. 1 shows a circuit which may well serve as a guide for all more or less elaborate installations. Even small jobs may very well be based upon it. In the average house the microphone will not be used, but the rest of the layout is perfectly general.

Before attempting any installation, a suitable control room should be chosen, where the radio set or sets are to be located. This room should be removed as far as possible from elevator power equipment, circuit breakers, X-ray machines, motors and other producers of electrical disturbances. Of course, the room also must be easily accessible for operating the receiver as well as for terminating the distribution system.

With this accomplished, it should be determined how many loudspeakers and head-sets will be required. The wiring for these appliances should then be made heavy enough to prevent any considerable voltage drop between the outlets and the receiver. If it is desired to include a microphone in the system, a special three conductor shielded circuit must be used. This circuit should consist of a twisted pair of No. 16 double and a No. 16 single conductor, rubber covered, in conduit. This latter conductor should be grounded and connected to the conduit. No other circuit should be run in this conduit. This circuit should be terminated at each end by means of a three-conductor outlet receptacle at the microphone. The receptacle should be located as near as possible to the point where the transmitter is to be used. The grounded conductor is then connected to the polarized contact of the receptacle.

Between the amplifier and the head-set outlets, a two-conductor circuit will be required. This consists of a main trunk line running through the building, with parallel taps taken off at each floor and as many outlets as convenient connected to each tap in parallel. If only one floor is to be wired, these parallel taps can be omitted and taps taken directly from the trunk line to the outlets. It is good practise to take the taps off the trunk line through double-pole, single-throw snap switches. This provides a safe-guard, so that in case trouble arises in the wiring, the defective portion can be cut out and the rest of the system continued in operation.

Between each amplifier and the outlets for the loudspeakers, similar circuits will be required. If two radio receivers are used, this makes four distribution circuits. The easiest wire to handle and in fact the best to use, is a twisted pair of No. 16 gauge double wire in conduit. One precaution must be observed here. It is possible to run the two loudspeaker circuits in one conduit without experiencing any great difficulty, but never run a head-set and a loudspeaker circuit, from either the same or different receivers, in the same conduit. The loudspeaker circuit is subjected to heavier currents and voltages and if a break should occur, then it is possible, with a head-set line in its vicinity, that high voltages may reach the phones.

A number of service men have suggested that the wiring for the distribution system could be included in conduits carrying low voltage lines, as for example, indicator call systems, house telephones, etc. This is not very good practise. It is doubtful whether there would be any considerable saving in labor or material. To be placed in the same conduits with other lines would require the shielding of all the radio circuits to prevent interference. This shielding would probably cost as much, if not more, than the cost of separate conduits.

Each one of the circuits in the distribution system should terminate at the radio set in a two-conductor, flush-type wall outlet, easily accessible for the operator. At each location, where a headset is required, a jack with a switch plate should be installed. The Carter Radio Company has just placed on the market a wall plate with a jack attached. This is of standard size and form and has the appearance of a light circuit wall plate.

It becomes practically a necessity to include a volume control in the loudspeaker outlets, so that the volume can be adjusted to suit the persons listening in. The Carter Company has made provisions for this by including a special 500,000 ohm resistance with the jack on their control plate for loudspeaker outlets. It will be noted that the circuit has the resistances which control the loudspeaker volume permanently connected across the line. In other words, the arrangement is operating on the potentiometer principle. The Carter resistance is connected in series with the jack. Both methods should give good results.

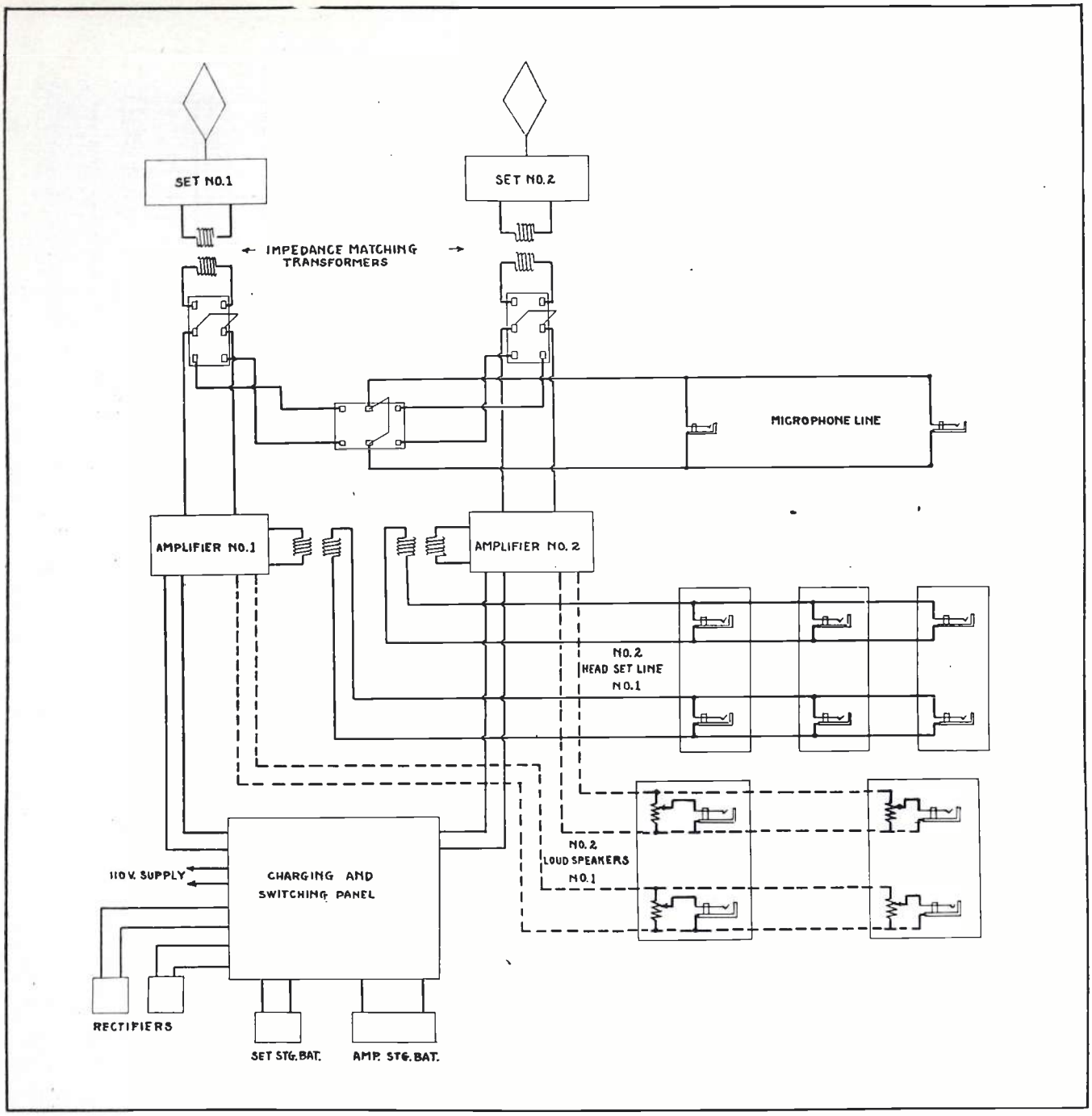


Fig. 1. Schematic diagram of the Western Electric installation at the Sydenham Hospital, in New York City

Each outlet should be mounted not more than five feet from the point where the head-set or loudspeaker is to be used. This is the usual length of the cord attached to phones and loudspeakers.

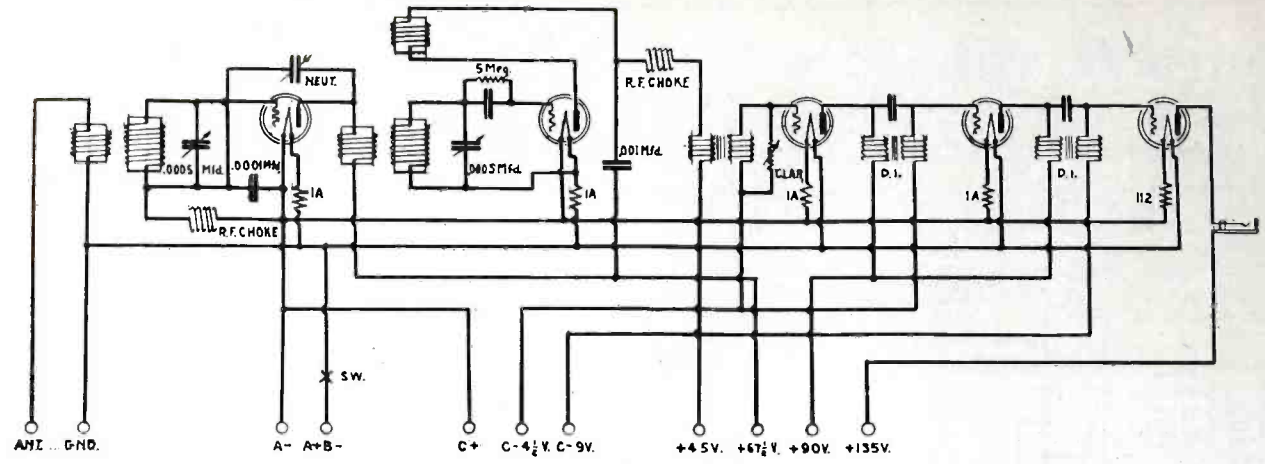
Finally, some thought must be given to the location of the small power plant needed for the operation of the receivers, and amplifiers if there are any. If possible, this should be located in the same room as the receivers, but usually, for the sake of appearance, the charging panel and batteries will have to be located in some out-of-the-way corner. No harm will arise from this so long as the battery wiring is made heavy enough. In fact, the wires from the power panel to the receivers should be able to carry at least twenty amperes. The power supply unit should be made as foolproof as possible. The best plan is to construct a panel to which all connections are made. Separate A batteries should be provided for external power amplifiers. This reduces the load on a single battery and prevents any interaction of the two circuits that might arise in the battery.

Resistances for Eliminators

Allen-Bradley have been working for some time to produce variable and fixed resistance specially suited to the particular requirements of eliminator circuits.

These items now in production, are being used by eliminator manufacturers and are also distributed through retail channels for set builders. The variable resistor, indicated as Bradleyohm-E, is larger in size than the other types, so made to accommodate extra long resistance columns of higher current-carrying capacity. They are made in several resistance ranges to suit the various eliminator circuits.

Bradleyunit-A is a fixed cartridge resistance containing a molded element of very constant resistance over a wide current variation. It is sealed as a protection against moisture, and equipped with silver-capped ends. Wires can be soldered to the caps, or the unit fitted into a standard resistance mounting.



Schematic diagram of the Dual TC receiver, including the latest refinements of design as indicated in the photographs on the page opposite

TC Set with Dual A. F.

This year the TC receiver can be made even better than ever by putting on the Dual A. F. amplification circuit—By C. J. Brown

SET builders, both amateur and professional, have welcomed the advent of the Dual TC receiver, for they were so delighted with the performance of the original TC design as it was brought out in the Boston Transcript.

Many a radio man can testify that, whether it's a factory-built set or a home-made job, the circuit used is no guarantee of performance. In fact, the sets most carefully engineered sometimes go wrong because, while they are unquestionably sound in theory, from the engineers' point of view, they don't measure up in the niceties of operation about which people are learning to be so particular.

Most all of us have had the experience of getting a first-class receiver in operation, expecting big things of it, only to find that it's wonderful when you can get a station right on the button, but it's so hard to go from one station to another and back again—a fellow just gives up in despair.

The fact that the TC receiver scores so nearly 100 per cent in its operating characteristics is largely responsible for its popularity, for it works so smoothly, without tricks and catches in controls. The neutralizing system, comprising an R. F. choke, 0.0001, mfd. condenser, and neutralizing condenser, is very quick and easy to adjust.

Another thing which has a strong appeal is the variable selectivity control. The primary of the R. F. transformer can be adjusted to make the tuning exceedingly sharp or quite broad, according to the requirements of local conditions.

Now the addition of Dual A. F. amplification makes the audio end the last word in quality. The Dual transformer, manufactured by Samson under license from Harold Donle, inventor of the Sodion and Donle tubes, is a most remarkable device. It combines impedance and transformer effects in a way that produces results which differ from either method used singly.

That is, the quality is considered, by those who have heard it, superior to that obtained from transformers, with volume greater than that given by impedances. The case of the Dual transformer contains a closed cone on which the primary and secondary are wound, and the stopping condenser which is connected to the plate end of the primary and the grid end of the secondary. Thus the external wiring to the binding posts of the Dual transformer is the same as for an ordinary transformer.

Tests made with very loud signals applied to the Dual A. F. circuit show that the design automatically compensates for overloading, so that it is practically impossible to cause distortion and blasting in the loudspeaker.

A number of dealers are moving Dual transformers in surprising quantities by demonstrating the actual operation of the A. F. circuit. These are being bought by B. C. L.'s, to connect to complete sets already in operation, or by set builders to put into various kinds of new circuits. Considerable interest has been aroused among the "amplifier experts" in one town by a dealer who has installed a set consisting of two stages of tuned R. F. and a detector, with a jack for connecting any type of A. F. amplifier. He challenged his customers to bring in their amplifiers and show him something better than the Dual A. F. unit which he made up to use with his demonstration outfit. With a little publicity from the local paper, he not only stepped up sales on Dual transformers, but managed to make himself known as the local authority on quality amplifying problems.

The Dual TC illustrated on the page opposite requires the following parts, according to the recommendations of J. Clapp, the designer:

2—0.0005 mfd. condensers.
1—0.0003 mfd. Samson neutralizing condenser.
1—0.0001 mfd. fixed condenser.
1—0.0005 mfd. fixed condenser.
1—0.0001 mfd. fixed condenser.
4—¼ amp. ballast resistors.
1—½ amp. ballast resistors.
1—5 meg. grid leak.
1—Clarostat or Centralab volume control.
2—No. 85 Samson R. F. chokes.
1—A. F. Transformer.
2—Samson Dual Impedances.
1—Samson Antenna coupler.
2—Vernier dials.
1—Open circuit jack.

The tubes recommended are UX 201-A's or CX 301-A's for the R. F. detector, and first two audio stages, with a UX 112 or CX 312 in the last stage. Binding posts are provided for 67½ volts on the R. F. tube, 45 volts on the detector, and 90 volts on the first two A. F. tubes, and 135 volts on the 112 in the last A. F. stage. These voltages are correct with the grid biases specified—4½ volts on the first two A. F. tubes, and 9 volts on the 112. These values are emphasized because they have been found to produce the best results, and should be used, so that the relation of C bias and plate voltage will not be altered, thus affecting the quality and volume.

Of course, the Dual A. F. circuit is applicable to any radio receiver, and it is certainly worth trying if you feel that your present system isn't right up-to-date, but if you want something altogether new, try the Dual TC, and you'll understand the continued popularity of the TC tuning circuit.

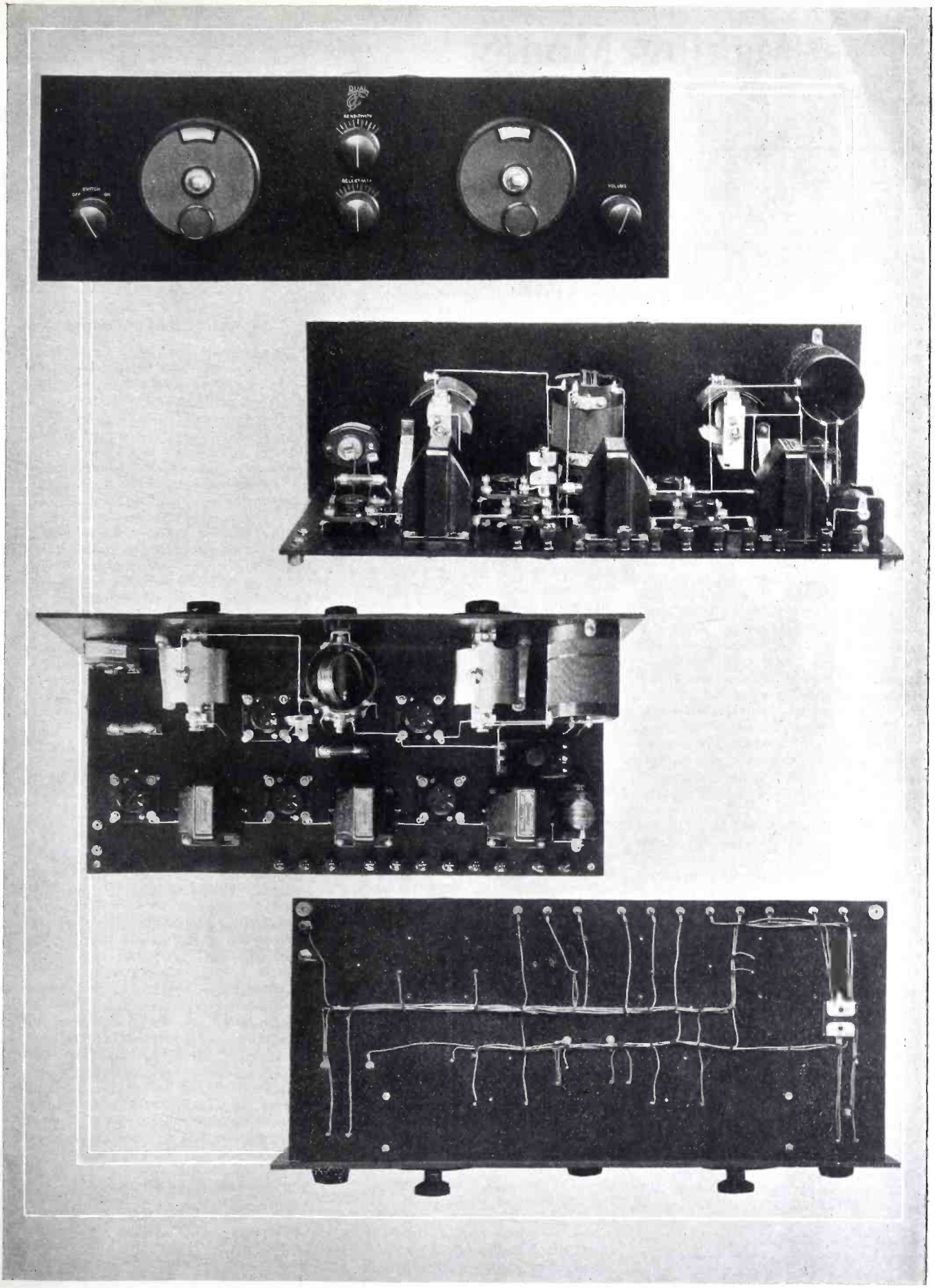


Fig 2. Four views of the assembled Dual TC, a development of the TC circuit so popular last year

Making Money

An entirely new phase of activity has opened to dealers who are selling parts or sets

THIS department was not inaugurated as our own little private pulpit from which to preach to the dealer some shopworn doctrine of salesmanship. Not by a long shot! We will leave sales methods to the dealers' ingenuity.

However, we shall set forth here some interesting advance dope on what's to appear in our new magazine, Radio Mechanics, one hundred thousand copies of which go on sale at the newsstands on the 10th of each month. For instance, in the November number we have an article on

Quality Amplification

What is the average man's idea of a power amplifier? Ask some of your customers, and the majority will probably tell you it's something used by radio stores as a ballyhoo to attract the public's attention. Others may say it is an infernal machine employed by its proud possessor to inform his neighbors that static is still with us.

Well, they're both wrong. A power amplifier properly constructed will deliver from a good loud speaker a wealth of music almost uncanny in its similarity to the original.

Yes, there's one in the November number of Radio Mechanics, described in language that anyone can understand. Complete instructions, including the wire-less wiring diagrams,* are given to show just how it is constructed.

This design uses the Amertran power transformer, chokes, and De Luxe audio transformer, Tobe filter condensers, a Daven Glastor and grid leak mountings, and an Aerovox resistor. The front and sub panels are of Bakelite, mounted on Radion brackets. A Federal potentiometer controls the C voltage, and the operating conditions are shown by a Jewell milliameter. General Raido sockets and an Electrad jack complete the assembly. This outfit bears the O.K. of J. L. Schermerhorn, chief engineer of the American Transformer Company, so nothing further need be said as to its merits.

If you build one of these outfits for demonstration purposes, you will save yourself a lot of energy otherwise wasted in sales talk. Just let the prospect hear a set using the power amplifier, and the same set without it. We'll let your cash register write the happy ending to this little story.

Selling Sets

"Well, the trouble is," began Mr. Set Prospect, "that I want some kind of a radio down at the house, but the Mrs. won't stand for it. Says she isn't going to have her living room all cluttered up with truck and wires and gadgets."

Ever hear that? Of course! But you won't hear it so often now that the Mrs. Set Prospects of the country have been looking at some of the home installations illustrated in Radio Mechanics.

And by the way, for those ultra fastidious people who want everything just so, Carter has just released some wall and base plates for radio use that are exact replicas of the switch plates used in electric light installations. These plates are made in various styles; some have jacks for the loud speaker, others add a volume control to the jacks. There are also plates with Imp jacks for the aerial and ground to which the lead in wires of the set are easily attached with Imp plugs.

We will have a complete article on wiring the house for radio in a forthcoming issue. Here will be a chance for the radio dealer who also sells and installs electrical fixtures and supplies to enter a new and profitable field.

Wirit

If you have had occasion to wire a large number of sets, you probably fully appreciate the shortcomings of the ordinary bus bar. If you bend it twice in the same place, it breaks. If you try to put a small hook on the end so as to fasten it to another wire while soldering, the hook either snaps off or fractures so as to make a high resistance joint and cause all kinds of trouble.

In the November issue of Radio Mechanics, clear and simple instructions are given on the use of Wirit. There is going to be a big demand for Wirit when the set building fraternity wises up to its merits, and sees how easy it is to shape and solder.

What Are the Short Waves Saying?

One of the neatest designs for S.W. sets appearing in a long time is embodied in Bert Smith's outfit. A description of this receiver will be found in this issue of Radio Engineering, and full constructional details are given in November Radio Mechanics. Bert Smith as you may know, is with the Cardwell Company.

This set possesses many unusual features. It fills the bill for a S.W. receiver that really perks, and is so simple of construction that it makes an ideal set for the novice to build. It is so designed that it works remarkably well on both S.W. and the broadcast band.

When used with the power amplifier described in another article in the same issue, this set will give the utmost satisfaction. It is truly an all-purpose, all-wave receiver.

It is built of such well known parts as Aero plug-in coils, Cardwell varibles, an Amertran De Luxe audio transformer, and Airgap sockets. An Electrad resistor, grid leak, and condenser, an Amperite, Eby binding posts, and a Frost filament switch complete the parts list. Tuning is done with a National Variable ratio vernier dial.

Automatic Radio Tuning

Widespread interest has been aroused by the new King system of automatically varying the coupling between the primary and secondary coils as the frequency is changed. This unique arrangement is designed to give uniform efficiency over the entire broadcast band, which is something a set employing coils with fixed couplings obviously cannot do.

November Radio Mechanics contains all the dope on the new Karas Equamatic. This is an ideal outfit for the home constructor who always wants the latest wrinkle in radio, and is the first version of the King invention to appear on the market.

The Equamatic coils and hardware, Orthometric variable condensers, Harmonik audio transformers, Micrometric dials, and mounting brackets are all made by Karas. The other parts consist of Benjamin sockets, Yaxley rheostats, jacks, and switch, Sangamo grid condenser and leak, and a Jones Multi-Plug for making all connections.

Useful Accessories

A handy little item, and one easily constructed, consists of a baseboard large enough to hold a Balkite trickle charger. Fastened to this baseboard is a small front panel, upon which are mounted Eby binding posts for battery connections, a Muter D.P.D.T. switch and a pair of Union phone tip jacks to receive a Hoyt or similar pin jack voltmeter. One position of the switch gives the voltmeter reading, while the other position places the battery on charge. A further advantage is that the meter is readily detachable so that it can be used for measuring other voltages.

Here's a chance for the dealer to use up some of his scrapped and left-over panel pieces, and to give the meters another boost.

Howard Dealers

Bill and Bud are right on the job again this month. They have just hooked up a Howard loop operated Neutrodyne, and they sent us a picture of the installation for November Radio Mechanics.

*Patent applied for.

Bud's letter is full of good stuff about the Howard set. What is even more important, it is written in simple, non-technical language that holds the reader's attention.

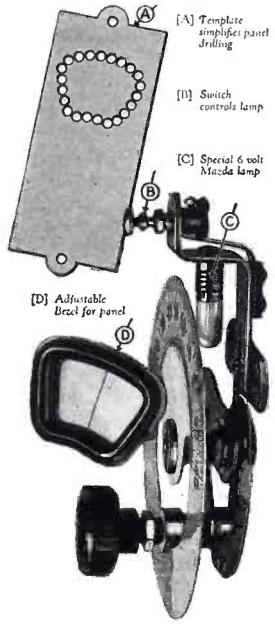
Give your Howard prospects the November copy of Radio Mechanics, and let Bill and Bud do the rest.

David Grimes

Dealers who are stocking Grimes' new Inverse Duplex kit will be interested in an article in the November Radio Mechanics about David Grimes himself.

The story is illustrated with pictures of Grimes' workshop, where he has spent the past year developing his idea of just what a kit for home construction should be.

This article is replete with incidents concerning the development of the new kit, and should be read by every dealer selling Grimes' Own Kit.



Dial Designs Changing

Where are the plain knobs and dials of yesterday? Demand now is for special designs

EXCEPT at the bargain counters, there seem to be very few people, now, looking for old style knobs and dials. Starting from the introduction of a few new types last spring, the demand is almost exclusively for flat dials and illuminated flat dials.

As a result, a splendid variety of designs is available to the set manufacturers and home builders. Marco is still running strong on their flat dials and have made an entirely new one, pictured above, which is in great demand. The dial itself is behind the panel, visible through a special bezel fitted in an opening which can be drilled out from a template furnished. The condenser is then mounted on a back plate, instead of going directly on the panel. A light and switch provide very attractive illumination.

National has made important changes in their variable ratio flat dial, greatly improving the appearance and further insuring continued smoothness of operation. A very clever arrangement is used to illuminate the dial, so that the opening glows with just the right amount of light to make it easy to read the divisions and the logging. Another feature which will be appreciated by those who must have everything just right, is the use of a positive fastening for the dial to the panel. The use of a pin fitting into a hole in the panel is all right in theory, but it hasn't worked out in practice.

Strangely enough, sales on the original National knob and dial have continued to increase when other manufacturers have dropped these types because of reduced demand. Probably that is due to the strong preference accorded this 6-1 ratio dial by the hams and the S. W. experts.

Kurz-Kash have a pretty job in their new flat dial. The shape is most attractive, improving the appearance of any set to which it is applied. The mechanism is clever, too, and very simple. Kurz-Kash are still doing a big business in the plain knobs and dials, while the small rheostat knob, with the engraved arrow, has been adopted as standard by most all manufacturers making rheostats, potentiometers and high resistances.

It was stated not long ago in RADIO ENGINEERING that parts and kits must follow closely the practise employed by manufacturers of complete sets, if that phase of the business is to be maintained. Certainly that has been borne out by the new requirements in dial designs, for it is certainly a result of the adoption by the set manufacturers of new control arrangements.

The Varion Receiver

(*Continued from page* 399)

operator to bring the set out of violent audio frequency oscillation.

As explained above, the tubes used are 199's in series, with the exception of the last one. It seems to be the rule that where a set is mentioned as using 199's in series, the average experimenter will shrug his shoulders and dismiss the subject as something too easy for consideration. There are a great many difficulties in series operation which are not realized until actual trials have been made.

The Varion circuit consists of three stages of R. F. amplification tuned with two dual condensers and controlled by a variable series plate resistance. The detector is non-regenerative and the audio side consists of two transformer coupled stages in which Amertran De Luxe transformers are used. It is a standard, recognized circuit such as has been constructed by thousands of fans all over the country.

There are many differences between the Varion and the majority of other series A. C. operated 199 sets. The grid returns are all made to the points which will give each tube in the circuit the correct negative bias. The detector operates with a positive grid return, the R. F. tubes with a negative bias of three volts and the first audio with a negative bias of nine volts. Across each of the filaments in the series connection, except the first, is a fixed resistance. The purpose of this resistance is to by-pass, from the tube filament, the plate current added to the line by the tube preceeding it. If this were not done, the last tube in the string would in all probability be receiving not less than 10 milliamps more filament current than the first tube in the series. Condensers have been incorporated to by-pass each filament. These add to the ease of control and prevent howling on strong signals. Their function is quite similar to that of the four mfd. condenser mentioned above.

These details, together with the general careful layout of the apparatus, account in a large measure for the Varion being a genuinely interesting as well as fine working A. C. job for the man who is after something new.

Gossip Around the Trade

H. H. Eby, Philadelphia, has added to their line a shielded dial designed to eliminate hand capacity. The shell is most attractively molded from bakelite, arranged for a hair-line indicator. It operates clockwise or counter-clockwise and takes only one hole to mount. These dials will be packed in cartons with 50 or 100 in a standard package. The retail price is $2.50.

The Wallbert Mfg. Co., Chicago, is in production on a very handsome line of receivers, using the Isofarad circuit with the shielded coils which characterized their line last year.

The R. M. A. Standards Committee has just made its report to the membership on standardization of radio design practice. Commenting on the report, A. J. Carter, Chairman of the Committee, said, "Because radio is a new industry, we will find it easier to standardize. In a few years, we believe the radio industry will have attained as high a point in standardization of markings, sizes of parts, and other important factors as any other industry in the country." Additional reports will be ready at the R. M. A. Convention which opens in Chicago on Saturday, October 9th, at the Congress Hotel.

Powerola Radio Corporation, New York City, has produced an A. C. operated receiving set. A six tube outfit with a plain cabinet lists for $155. They are also selling Powerola Chassis without a cabinet, to fit in a console cabinet, at $140.

Amsco Products, New York City, has brought out what they call a Tom Thumb Rheostat which measures only 1-¼ ins. in diameter behind the panel, mounts with a single hole and extends less than ¾ ins. behind the panel. It is made in the usual resistances of 10 to 50 ohms, listing at 75c, with the potentiometer listing at a slightly higher price.

A new pamphlet from Freshman describes the Freshman Master B Eliminator listing at $22.50. The A B C Power Supply lists at $55. The special Freshman storage A battery to be used in conjunction with the A B C Eliminator sells at $10.00, and a power amplifier lists at $50. All the circuit details of these units are given in the pamphlet. The A B C Eliminator uses a UX 213 tube for the B voltage and a trickle charger with a Tungar rectifying tube to keep the storage A battery fully charged at all times. An automatic relay is connected in the circuit so that the operation of the filament switch on the set puts the eliminator in operation. When the filament switch on the set is turned off, the relay automatically disconnects all power from the set and puts the storage battery on charge. This makes the operation of the outfit very simple indeed. The power amplifier uses UX 210 and UX 216 B tubes. List price includes the tubes. Input and output transformers for the power amplifier are provided in the unit.

Alden Mfg. Co., Springfield, Mass., has equipped a section of their new shop with automatic assembly equipment for turning out an enormous volume of Truphonic amplifier units. The individual Truphonic unit sells at $5.00 or $20.00 for the catacomb assembly.

C-10 Admiralty Receiver

Norden-Hauck used ten tubes in a super-range receiver designed for exceptional volume and range

TO many people, B.C.L.'s, as well as set-builders, there is a special appeal in super-power receivers, as expressed by many tubes. Certainly Norden-Henck is meeting this demand with the Super-10 Admiralty receiver, four views of which are given on the page opposite. The design is unusually handsome, even more impressive than it appears in the illustrations, for there is an assurance of precision built into the set, right from the engraving on the front panel to the layout of the instruments.

The circuit comprises five stages of tuned R. F., detector, and a combination A. F. power amplifier of four stages. Two dials are provided for R. F. tuning, one to operate the first condenser controlling the wavelength of the first secondary coil or loop antenna, as the case may be, and the other to adjust the five-unit gang condenser. This is rotated thru a reduction gear and a bevel gear, since the shaft of the gang condenser is parallel to the front panel. Both condensers are shielded.

A CX 300, UV 200 or B-6 Donle tube can be used for the detector. This is regulated by a separate rheostat.

Audio amplification is obtained thru one stage of transformed coupling followed by three stages of impedance coupling. In both R. F. and A. F. stages, UX 201-A or C301-A tubes are specified, altho a power tube can be put in for the last stage.

By using plug-in coils, the set is made to cover 35 to 3,650 meters, taking in the short wave bands, broadcasting, and the ordinary commercial bands.

Discussions concerning sets of this sort usually bring up questions as to the real usefulness of multi-stage R. F. amplification. On long waves, the five stages give tremendous amplification. At 200 to 550 meters the amplification per stage is less than the theoretical gain from cascade amplifiers. However, these succeeding "strainer circuits" very considerably increase the selectivity at each stage. That is the most important reason for their use in this set. The transformers are designed to produce only a slight tendency to oscillate. That is entirely eliminated by a simple, non-critical method. Resistances of 720 ohms are inserted between the grids and the junctions of the secondary inductances and tuning condensers. Thus the resistances are not in the tuning circuits.

In this set, as in previous models, General Radio parts are conspicuous. They include the special tuning condensers and rheostats. The total plate current is indicated by a Weston ammeter. Another Weston meter, with a double scale, connected by a nine-position switch, shows the voltage of the A battery, the voltage on the R. F. detector and A. F. filaments, two B voltages, and two C voltages In this way, the operation of the set can be checked without opening the cover of the cabinet.

All the sockets are made a part of the side and read panels. Special gripping contacts are fastened under the panels, making firm and positive connections. Spring mountings have not been found necessary as there is no tendency to mechanical howling when the loud speaker is placed correctly in relation to the set.

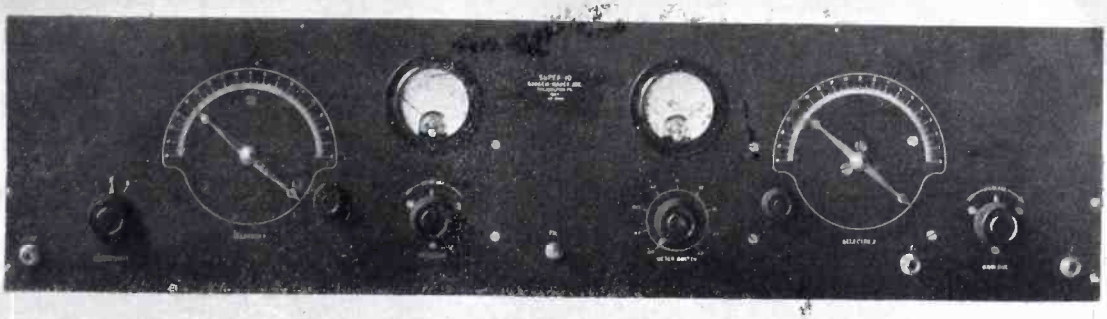
No expense has been spared to make the set as fine as can be, either in the selection of parts from other manufacturers—the designs of special instruments made by Norden Hauck. In short, the Super-10 is built as a superlating outfit, with the idea that the owner cannot buy anything better, no matter how much he is willing to pay.

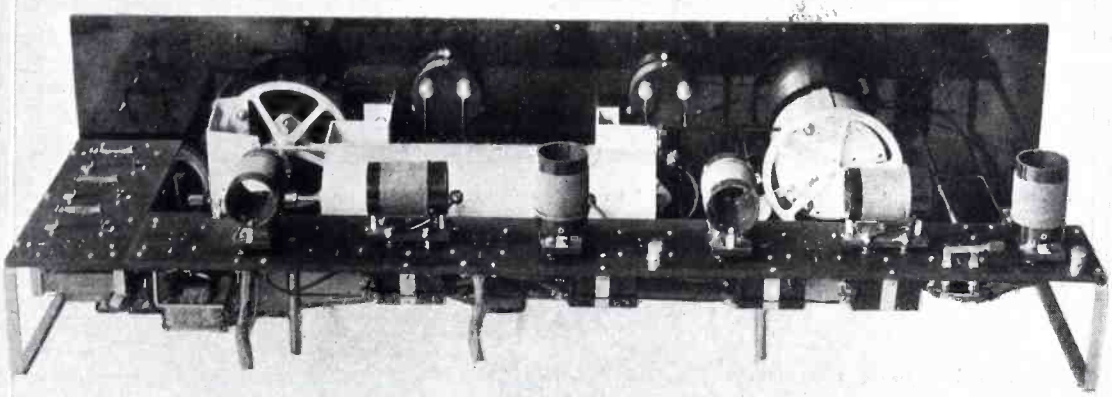
As an auxilliary to the Super-10, or any other kind of set, there is the A B C power unit. This is sold only as an assembled eliminator. The cabinet, of green-brown finished steel, measures 9 ins. wide by 10½ ins. high and 15 ins. long. On the front end is an ammeter to show the amount of current rectified. An ON and OFF switch, and adjustments for the A supply, detector B and amplifier B.

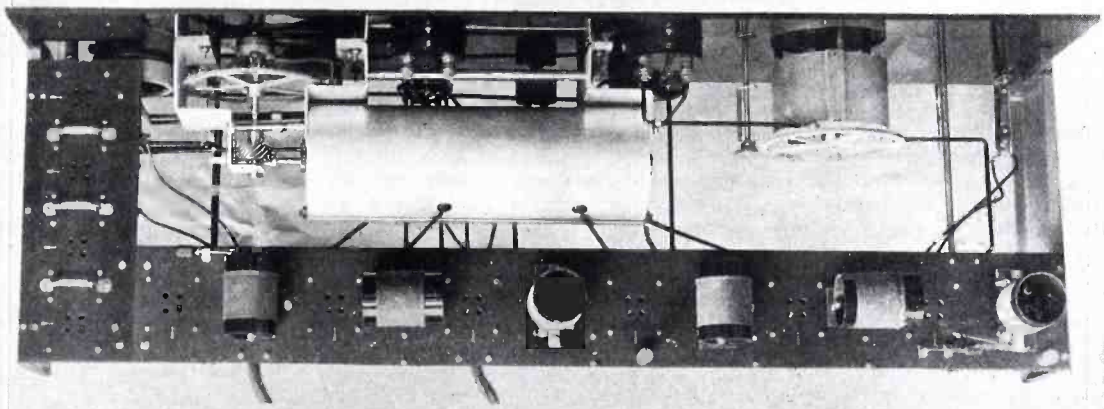
No details as to the circuit and method of A supply are available, but it is rated at 3.0 to 3.25 amperes at 6 volts. This is sufficient to supply 12 or 13 UV 201-A tubes.

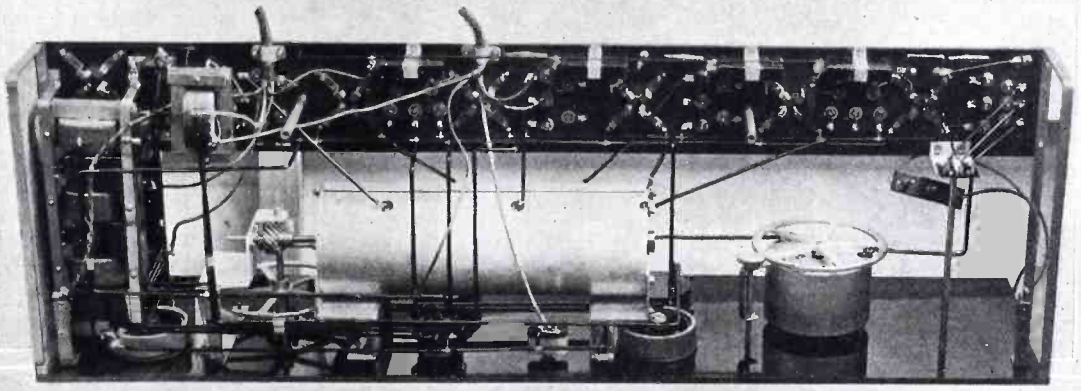
The B supply works from a UX-213, producing 65 to 70 mils. The detector voltage ranges from 12 to 60 volts and 40 to 200 volts on the high side.

C voltage is also furnished from an arrangement which increases the voltage automatically as the plate voltage is raised.









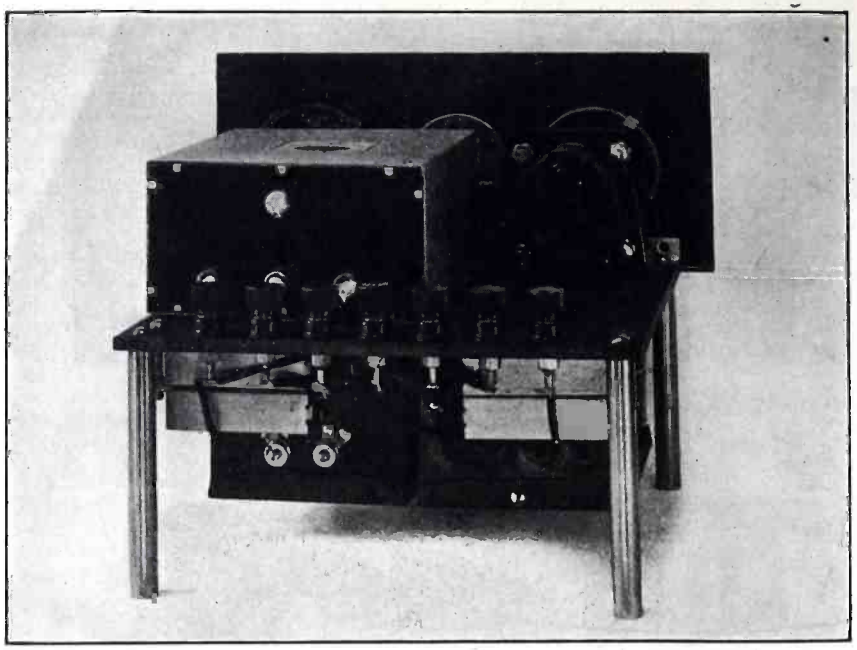


Fig. 1. Rear of the US-76 ellminator. Note that the Raytheon tube is mounted horizontally

US-76 Power Supply

Construction data on a Raytheon Power Supply for the US-76 Short Wave Telephone Transmitter—By S. W. Nichols

THE power supply unit provides A, B, and C power for the US-76 radiophone transmitter. Tubes operating with any considerable plate current, as transmitting tubes do, have this plate current added to the current in the filaments normally supplied by the A battery. The additional current is greatest where the filament is welded to the leadwires and dwindles off to nothing at the point farthest from where the B-minus is connected to the filament circuit. If the negative B battery is connected to one side of the A battery as in ordinary receiving practice, it means that the plate current is added to the A battery current in one half of the filament and subtracts from it in the other half; the effect is to shorten the life of the filament and to add resistance to the plate circuit, also to the grid circuit if positive C returns to the same place as negative B.

The best way out of this difficulty is to light the filaments with alternating current and make the plate and grid returns to a center-tap on the transformer winding supplying the filaments. The 60-cycle supply does not introduce a hum into the tube output if the center-tap is accurately located.

The B and C power is supplied by the Raytheon tube and filter, the voltage being divided between grid and plate by the 1800-ohm Federal potentiometer.

A few connections on the transmitter must be changed before lighting the filaments on A. C. The oscillator coils and microphone battery filament returns were originally made to the negative side of the filament. This line is retained as the center tap to the filament secondary. On the unit two one-tenth microfarad condensers are connected between the center-tap and the sides of the filament circuit, to lower the resistance for the alternating part of the plate current.

The microphone must still be supplied with D.C. and as the current is considerably greater than the maximum output of the high voltage rectifier it is intended to operate it from the receiver A battery.

The small Hoyt voltmeter is connected across the filament terminals. This is the only type of meter which can be used, as most filament meters operate only on D.C. To avoid unbalancing the center-tap, the rheostat for regulating the voltage is located in series with the primary.

Although only seven inches high, to match the transmitter, the unit appears taller because of the long supporting pillars below the instrument panel. A seven-inch sub panel runs back from the bottom of the instrument panel and is supported at the rear by two pillars In keeping with the power-panel style of design the tube is mounted horizontally. It can be pushed into its socket from the rear quite easily but it should not be necessary to put a tube in very often, for the Raytheon lasts almost indefinitely.

A Tobe standard Raytheon filter condenser block is used but as the filter is only single stage, the extra 2 mfd. condenser is used across the C bias resistance. The single choke filter is used to reduce the voltage in the filter system. When the modulator tube is properly biased and the oscillator tube oscillating smoothly they will take comfortably all the plate voltage the unit will supply. The ripples from the rectifier need less smoothing out than when supplying a receiver, but the system of taking C battery from the same source tends to neutralize any possible hum by the opposite voltages on grid and plate which exist at any point in the A. C. cycle.

Fig. 2 gives the wiring diagram of the power supply unit and of the transmitter, as well as the connections between them. Complete construction details of the transmitter were published in Radio Engineering for May, 1926.

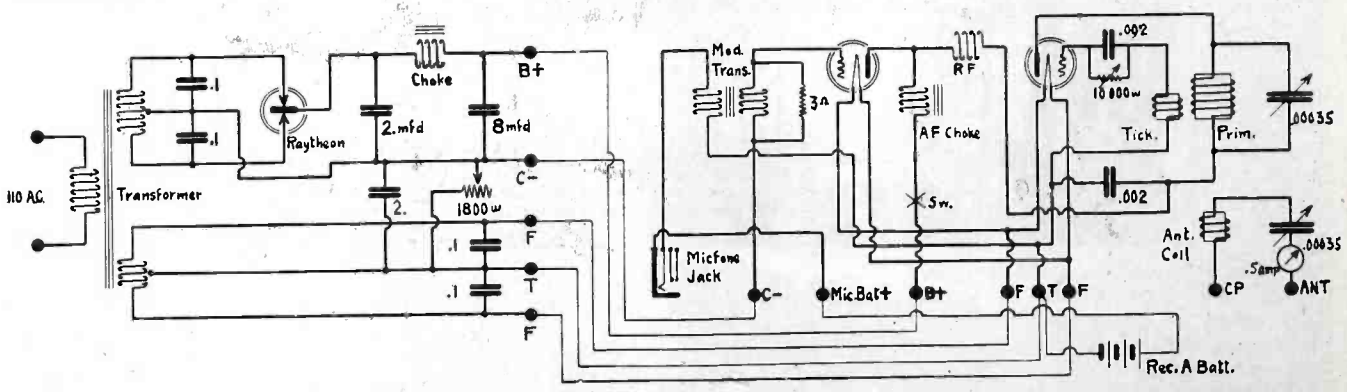


Fig. 2. Connections for the power supply, at the left, to the US-76 short wave telephone transmitter, at the right

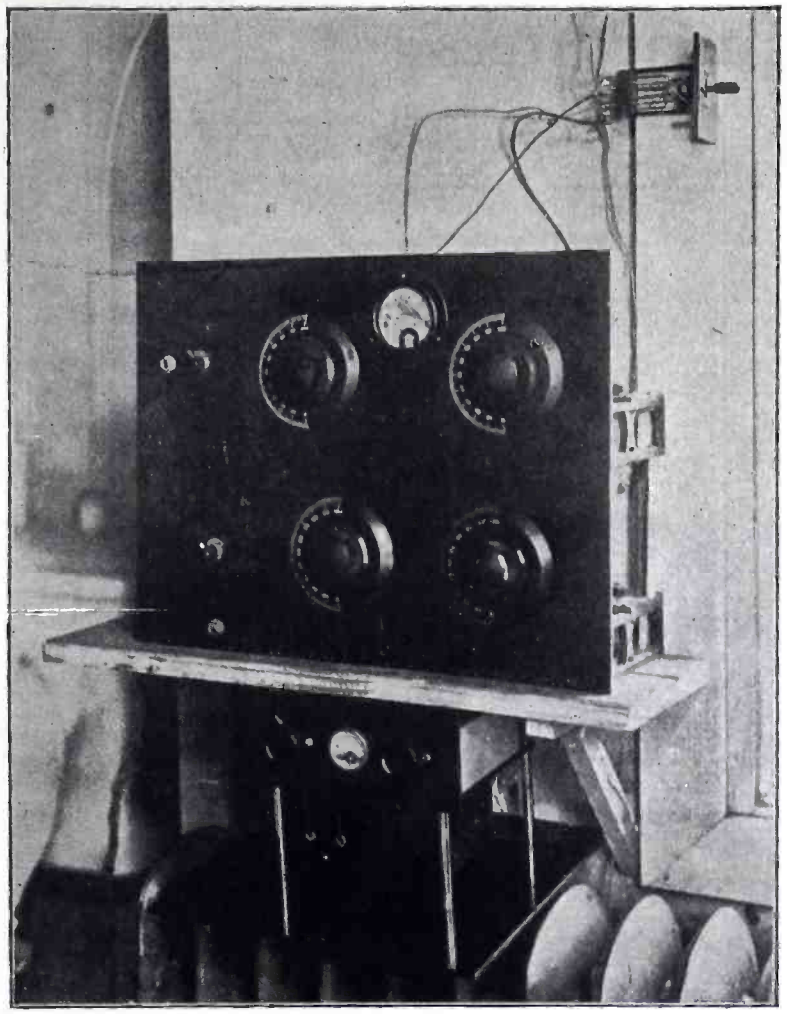


Fig. 3. The S. W. receiver and transmitter, with the power supply unit beneath

The transmitter was then described as a battery operated outfit, using about 180 volts on the tubes. By means of the power supply unit, however, A. B, and C batteries are eliminated, considerably simplifying the installation. Only the microphone is run from the storage battery which lights the filaments of the receiving tubes.

The power transformer is the Dongan No. 537. This is the type which has a low voltage winding, with a center-tap, for filament lighting. A Dongan No. 1591 choke smooths out the rectified current.

In the filter circuit there is a Tobe condenser block, from which 8, 2, and 2 mfd. taps are brought off. This unit is on top of the base panel. Underneath, there are four 0.1 mfd. condensers, two to go across the high-voltage secondary, and two across the low-voltage secondary of the transformer.

The Pacent rheostat, in series with the primary winding of the transformer, is not shown in Fig. 2, nor the Hoyt A. C. voltmeter, which goes across the F binding posts of the supply unit. They, as well as the Federal potentiometer, are mounted across the front panel.

In the installation as we set it up at the laboratory, another device was added. It was a relay, built to break 110 volts, so that, when the tubes of the receiving set were turned on, the 110-volt current was applied to the power unit.

After several months of service, the US-76 radiophone transmitter is still going strong, doing 40 or 50 miles regularly on phone even in the summer. As soon as the atmosphere clears up a little, these results should be extended considerably.

Western States Sales

Western States Sales Company, Inc., Los Angeles, Calif., has just been formed to represent Eastern manufacturers who are planning to increase their Pacific Coast business.

B. R. Hassler, for three years General Sales Manager for Colin B. Kennedy, is the President, Geo. J. Lane, Vice President, has been in charge of California sales for Kennedy, and E. W. Kennard, Secretary and Treasurer, handled the Central and Northwest territory for Kennedy.

The new concern will occupy offices in Los Angeles, San Francisco, and Seattle, covering the states of California, Oregon, Washington, Utah, Idaho, Montana, Nevada, and Arizona.

Micarta Fabricators

Micarta Fabricators Inc., New York City, combines the facilities of Poster panels and Goldstein.

They are handling decorating and machining of Micarta for radio manufacturers and dealers as well.

The range of Micarta materials this year is solid black, natural core—black on both sides and tan center—burl walnut, grain walnut, burl or grain walnut on one side and black on the other, mahogany on both sides or mahogany on one side and black on the other. With increased facilities Micarta fabricators should handle a tremendous amount of panel and special machinery work this winter.

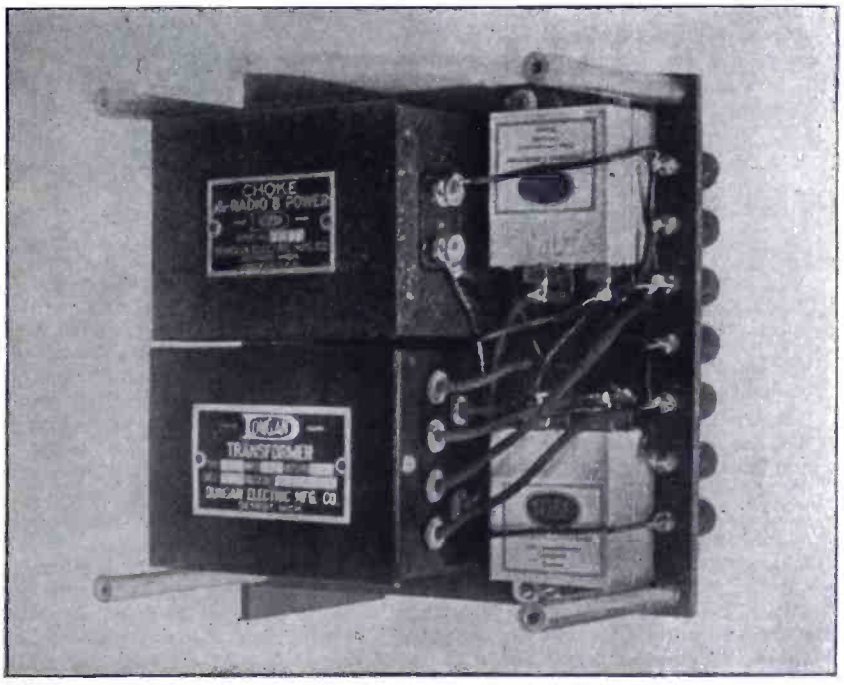


Fig. 4. Bottom view, showing the transformer, choke, and a part of the filter

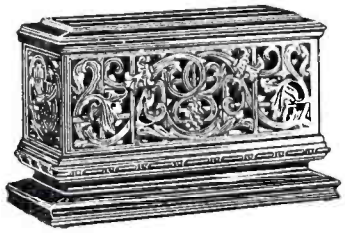
The Parts Manufacturers

Current news about the activities and plans of the radio manufacturers and concerns which make things used by the industry

Amplion

The Amplion Corporation of America, 280 Madison Avenue, New York City, is making some new speakers in addition to their well known horn types. The cabinet model illustrated contains an air column 48 inches long in a mahogany cabinet 18 in. by 12 in. by 9 in. The list price is $45.00.

The cone model is housed in two-tone mahogany. The over-all dimensions are 14 in. by 14 in. by 9 in. The list price is $30.00.

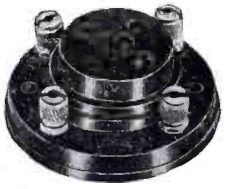


The Amplion Cabinet Speaker

Alden

The Alden Manufacturing Company, 52 Willow Street, Springfield, Massachusetts, has recently released several new items. The Localized Control Unit made by this concern consists of from two to four variable condensers of .00035 mfd. capacity, mounted on one shaft and so arranged as to be turned all together or separately.

Alden also announces a new spring cushioned tube socket, which is designed to absorb both lateral and transverse shocks. This socket is of the UX type and the springs are extended so as to form the soldering lugs.



Alden Spring Cushioned Socket.

Alden is also making a new amplifier, known as the Truphonic. This amplifier comes in kit form, or completely assembled, as the purchaser desires. It consists of three stages of double impedance audio amplification, and output unit to keep the direct current out of the loud speaker windings. The amplifier comes complete with a connecting cable, including a special attachment to facilitate its use with existing sets.

Belden

The Belden Manufacturing Company, 2314 South Western Avenue, Chicago, is marketing a complete aerial outfit in kit form.

This company also manufactures wire for every radio purpose, such as loop wire, rubber covered flexible stranded wire for sets which employ the cabled method of wiring, etc.

Belden Aerial Kit.

Carter

The Carter Radio Company, 300 South Racine Avenue, Chicago, has several new items. The Hi-Ohm made by this company is now available in models which incorporate an automatic filament switch in addition to the regular variable resistance. The list price of this unit is $2.75, and it is available in various values of maximum resistance ranging from 10,000 to 500,000 ohms.

Carter Rheostat and Filament Switch.

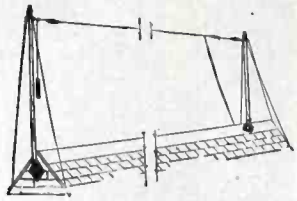
The same company has just announced wall and base board outlets for radio house wiring. These outlets are replicas of the switch and plug outlets commonly used in electrical installations. They are available in several types: with loud speaker jacks, with or without volume control, and with Imp jacks for aerial and ground connections.

Carter is also making a Midget rheostat which uses the same type of filament switch as used in the Hi-Ohm. Turning this rheostat knob to the extreme left side of its arc automatically disconnects the battery.

Mitchell-Taylor

The Mitchell-Taylor Company, 1601 S. Michigan Avenue, Chicago, is marketing the M-T Airmast complete unit, which consists of two five foot poles, two adjustable pole bases, two spearhead pole tops, guy wire, staples, and screws.

This unit is intended for efficient installation of housetop aerials. The list price of the outfit as described is $5.00.



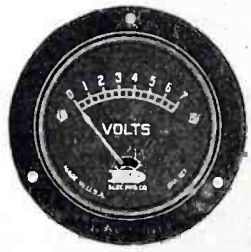
M-T Airmasts.

Dongan

The Dongan Electric Manufacturing Company, 3001 Franklin Street, Detroit, Michigan, has just announced its new type H Audio Transformer, which is of larger and heavier construction than the standard transformers made by the same company. This new job is completely housed in a black enameled case, and is made in ratios of 1-1, 2-1, 3½-1, and 5-1.

In addition to their full line of transformers, which includes power transformers and chokes for B battery eliminators, this company also makes various types of meters, as illustrated.

Dongan further announces the appointment of the Eschner Company of Chicago as exclusive factory representatives.



Dongan Voltmeter.

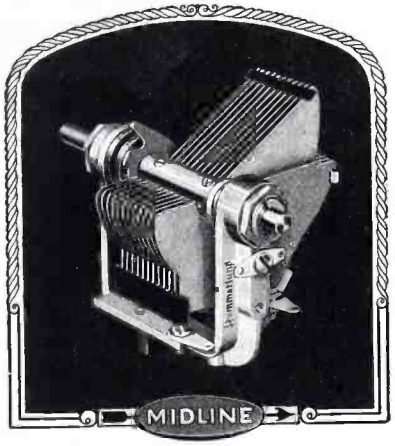
Aerovox

The Aerovox Wireless Corporation, 489 Broome Street, New York City, is making tapped resistance units for B battery eliminators. In addition to the type shown, the line includes Lavite resistances in cartridge form.

This company also makes a full line of fixed, by-pass, and filter condensers.

Aerovox Tapped Resistance Unit.

Hammarlund's New Creation
The "MIDLINE" Condenser



THE new Hammarlund "MIDLINE" Condenser makes its bow with the claim of superiority over any other type ever produced.

Experience is responsible for its many excellent features. Both you and we have learned that the old "Straight-line-capacity" type condenser crowded the low waves; "Straight-line-frequency" crowded the high waves; "Straight-line-wave-length" merely compromised between the two. *But the Hammarlund "Midline" retains the desirable qualities of these earlier types without any of their disadvantages.*

All of the time-tested Hammarlund features are included: soldered, non-corrosive, brass plates with tie bars; rib-reinforced aluminum alloy frame; minimum dielectric; one-hole mounting with anchoring screw; bronze clock-spring pigtail; friction brake. In addition, there have been added ball and cone bearings and a full-floating rotor shaft. This shaft supports no weight; it may be entirely removed and replaced by a longer shaft for coupling to other condensers, or for mounting cams, gears or pulleys for any scheme of single-control multiple condenser operation.

The "MIDLINE" is smaller, more compact and even stronger than previous Hammarlund models. It measures only four inches with plates fully open.

Made in six standard capacities, including short-wave, single, dual and triple models.

For sale by the better dealers

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424-438 W. 33d Street, New York

For Better Radio
Hammarlund
PRECISION
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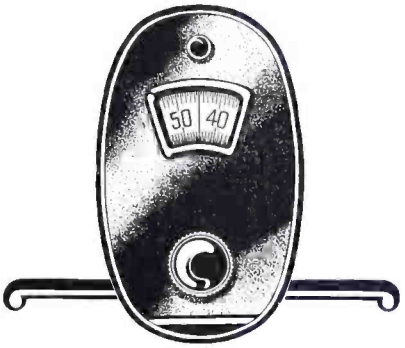


MAR·CO
Illuminated
CONTROLS

... already featured in more than 15 of this season's most popular circuits...

... advertised in 12 leading magazines .. total circulation well over 1,000,000 .. with full page space in color.

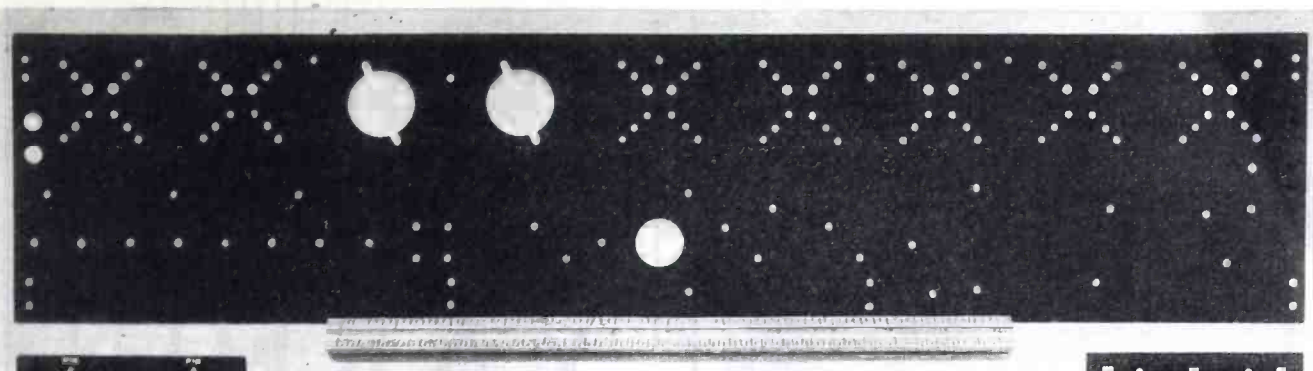
A new profit-maker has hit the parts field—the MAR-CO illuminated control. Instantly, it has been acclaimed by the leading technical authorities. Already, it is as big a sensation as the MAR-CO dial was last year.

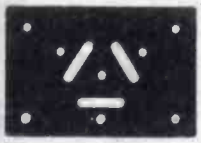
Be sure to get your supply in early. A handsome display case supplied FREE—with your first order of 20 controls. Martin-Copeland Company, Providence, R. I.

MAR-CO illuminated Controls, complete with template, bezel and MAZDA lamp—List $3.50

MAR-CO vernier Dials, 180 degree or 360 degree, in nickel, list $2.50; in gold, list $2.75

MAR-CO rheostat Dials, list $.75





Bakelite Laminated *makes feasible many difficult designs*

"The fact that Bakelite laminated may be successfully punched in irregular shapes, and with large numbers of holes makes feasible many designs otherwise out of the question because of manufacturing costs," is the statement of the Universal Insulation Co., Newark, N. J.

Of the several Bakelite laminated pieces shown here, the large 23½" x 5½" panel with 141 holes is most interesting. These panels are produced at the rate of 200 per hour.

It is the economy of Bakelite laminated, as well as its high insulation value, rigid strength, resistance to moisture, temperature changes, oil and fumes, and its permanent color and finish, that has made Bakelite the preferred insulation for radio equipment.

Bakelite laminated may be obtained under any of the following trade-names:

Micarta PHENOLITE Spaulding

Fibroc FORMICA Made from Anhydrous Bakelite Resins SHEETS TUBES RODS **Dilecto** CELORON

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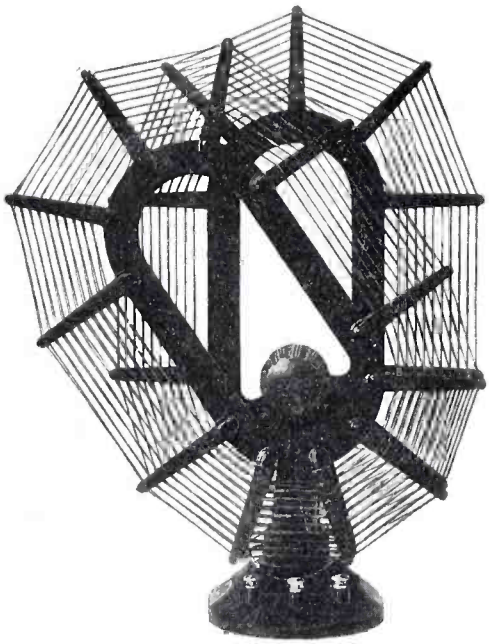
PATENT PENDING

English-Whitman coneless and hornless speaker, using a double compound unit, a different principle in speaker construction and action.



English-Whitman Tun-A-Loop, all wave, tunes to the peak, something no other Loop on the market today will do. Moulded of genuine Bakelite. Will cut out second harmonic, a feature possessed by no other Loop or Aerial. A Loop eventually, why not the best?

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A. C. OPERATED RECEIVER

NOW The Varion A. C. Operated Receiver is ready for you! Months of preparation and planning are over. Morison's has complete parts in stock for this marvelous new batteryless set. It offers complete light socket operation at a new low price!

There are many new refinements in design which every experimenter and builder will be quick to appreciate. These new features, plus specially designed parts, give the Varion Receiver operating efficiency of the highest order. In tone quality the Varion is fully up to that high standard which the radio builder of to-day rightfully demands.

Endorsed by 11 Leading Radio Manufacturers.

Eleven of the country's leading manufacturers endorse the A. C. Operated Varion Receiver. They have given their time, their thought, their engineering skill, and their money to its development. You have their assurance that the Varion Receiver is a set of exceptional merit.

Complete parts for the A.C. Operated Varion Receiver, and A. B. C. Eliminator for use with it. $138.50

Write for detailed price list and descriptive literature.

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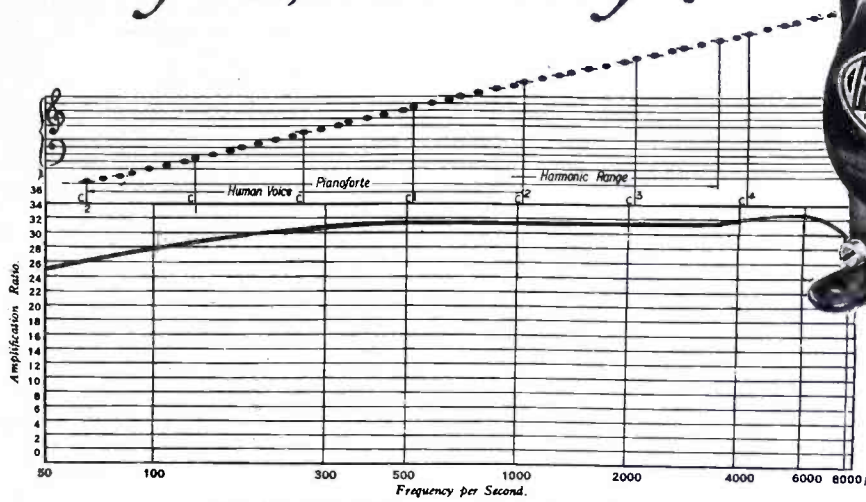
supreme —yes, but why?



AMPLIFICATION CURVE. (BASED ON A MUSICAL SCALE.)

Audio Frequency Transformer
A. F. 3 $12

This graph is drawn on the musical scale — the only accurate way of showing the full value of each tone which your set receives. Note that the evenness and fullness of amplification extends throughout the range of the organ, the cello, and the human voice. The unattainably perfect curve would be a straight line. Note how much nearer than any other transformer the Ferranti approaches this characteristic of perfection. That is why it is called "nearly perfect."

FERRANTI TRANSFORMERS

Ferranti Transformers are the result of research conducted to produce a transformer of low self-capacity and high amplification ratio with flat curve over a frequency range of 50 to 8000 cycles.

The Ferranti Transformer is at present manufactured in England by Ferranti Limited, engineers and electrical manufacturers with forty years' experience in the design and manufacture of high grade electrical equipment. Extensive experience in the winding of coils of fine wire for electrical instruments and meters has paved the way to the production of this nearly perfect transformer.

Ten tests are made on each transformer after assembly to establish its condition.

The amplification ratio of each transformer is tested with a tube. All transformers which do not come within five per cent of the accepted standard are rejected.

All transformers are tested at 1000 volts between primary and secondary and between primary and secondary and ground.

Ferranti Transformers, even under the extreme climatic conditions of the Tropics, have been found to stand up to the most severe conditions of service.

Use the Ferranti after the new detector tubes, and before new amplifier tubes, and you will have efficiency that cannot be approached by the old-time transformers and tubes.

To convince yourself, *put a Ferranti in one of your sets*, taking care to observe the installation directions and *note the difference*. Facts speak clearly and loudly as to the supremacy of Ferranti when put to the acid test.

We are trading through bona fide wholesalers with a minimum quantity shipment of 12 transformers. We are preparing to supply two transformers and two only to any retailer who sends cash with order and the name of his jobber. If you should be a dealer or jobber and are interested in handling Ferranti Transformers, please write immediately and we shall supply you with information in regard to discounts and general company policy.

No Better Transformer Is Available At Any Price

FERRANTI, INC.

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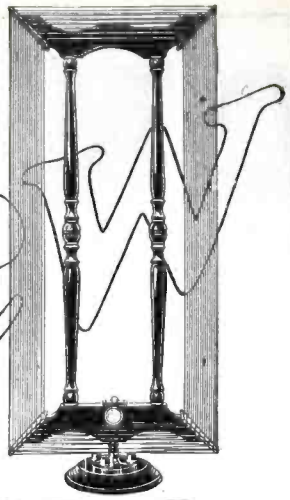
THE NEARLY PERFECT TRANSFORMER

New

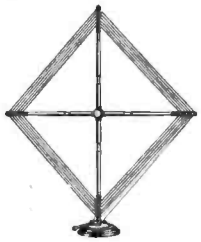


The BODINE DeLuxe Loop

The artistically balanced, hand rubbed, solid walnut frame and lustrous silk winding of this beautiful loop harmonize with the finest furniture. It is very compact, yet highly efficient for its size. Equipped with jack which may be mounted in top of cabinet, to eliminate all exposed connecting wires. Overall size only 12 x 26 inches.

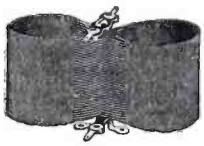
Improves tone quality by tuning out interfering stations. Designed for regular loop sets, but can be used with many aerial sets with slight changes. Write for directions for converting aerial sets into loop sets. Ask your dealer to show you the beautiful Bodine DeLuxe Loop.

Bodine Basket Weave Folding Loop



Very popular because of its remarkable ability to pick up long distance signals. Basket-weave method of winding makes this loop unusually sensitive. Folds very compactly — ideal for camping. Calibrated dial permits logging. Special models meet requirements of all loop sets. Ask your dealer about the Bodine Basket-Weave Folding Loop, the loop that is different.

Bodine Twin Eight R. F. Transformer



The dream of set builders. Amplification is much greater than is possible with toroidal or other closed field coils. Readily improves tuned radio frequency circuits. Makes them sensitive and selective. Improves tone quality. Small and compact. Easily installed in the set. Write for data on Bodine Twin-Eight Hookup which utilizes Twin-Eight Coils.

Price, $2.00 per coil
3 matched coils, $6.00

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Kindly mail FREE circular describing:
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☐ How to use a loop with aerial receivers.
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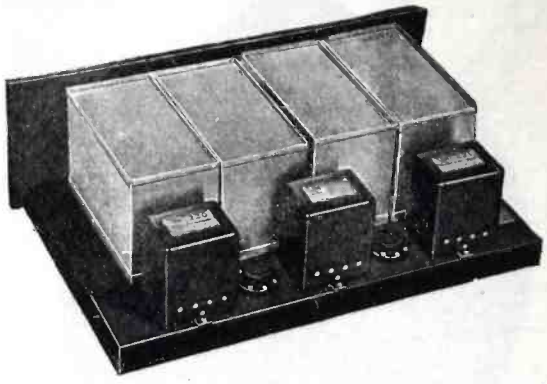


SHIELDED SIX

The Shielded Six is one of the highest types of broadcast receivers. It embodies complete shielding of all radio frequency and detector circuits. The quality of reproduction is real — true to the ear.

Behind the Shielded Six is competent engineering. It is sensitive. Day in and day out it will get distance — on the speaker. It is selective. Local stations in the most crowded areas separate completely — yet there are but two dials to tune.

These features — its all-metal chassis and panel, its ease of assembly, and many others — put it in the small class of ultra fine factory built sets, priced at several timest he Six's cost.

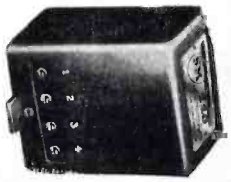
The S-M 630 Shielded Six Kit — including all specified, matched and measured parts to build this remarkable receiver — price $95.00.

The 633 Essential Kit — contains 4 condensers, 4 R. F. transformers, 4 coil sockets, 4 stage shields and the link motion — all laboratory matched — price $45.00.

Clear and complete instructions, prepared by S-M engineers, go with each kit — or will be mailed separately for 50c.

The Shielded Six has been approved by Citizens Radio Call Book, Radio Broadcast and other prominent publications and newspapers.

220 and 221 AUDIO TRANSFORMERS



S-M 220 — the big, husky audio transformer you hear in the finest sets — the only transformer with the *rising* low note characteristic that means real quality — not only on paper — but when you hear it. It is a power job — yet this finest of audio amplifying devices is sold, with a guarantee for but $6.00.

The S-M 221 is an output transformer that will bring out the low notes on your present set. It should be used between the last audio tube and the loud speaker — it eliminates blasting and will increase speaker capacity for handling strong signals without distortion, $6.00.

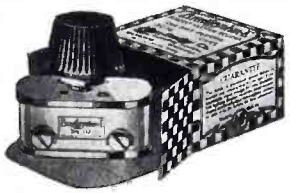
SILVER-MARSHALL, Inc.

854 W. JACKSON BLDG.
CHICAGO, U. S. A.

All prices 10% higher west of the Rockies.

Are You Building A B-Eliminator?

IF SO, follow the example of leading radio engineers and use the Bradleyohm-E and Bradleyunit-A for your voltage control.



Bradleyohm-E is a new and enlarged Bradleyohm designed expressly for B-Eliminator service. The extra long columns of scientifically-treated graphite discs insure perfect voltage control, even after long usage.

Bradleyunit-A is a solid molded resistor that is heat-treated and accurately calibrated. It can be soldered without affecting its calibration. Ask your dealer for Bradleyohm-E and Bradleyunit-A for your B-Eliminator.

Allen-Bradley Co.

288 Greenfield Avenue - - Milwaukee, Wis.

Use Allen-Bradley Perfect Radio Devices

None other *than high quality radio products can give good steady results—*

All Benjamin Radio Products are of the same high standard as the far-famed Cle-Ra-Tone Sockets—

There are just three characteristics which have gained popularity for Benjamin Radio Parts: the best possible quality in material; the highest perfection in technical construction; and absolute permanence in cooperating with other radio parts to give perfect radio reception.

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Proved through exhaustive and comparative tests to be the most efficient coil for modern radio sets.

2¼" Diameter Transformer

Compact. Especially desirable for crowded assembly. Eliminates interfering "pickup."

3" Diameter Transformer

Capacity coupling reduced to lowest degree. For use with .00035 Mfd. Condensers.

Push Type Cle-Ra-Tone Sockets

Spring Supported. Shock Absorbing. Stop Tube Noises. Greatest aid to non-noisy operation. Contacts always clean.

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Quick, positive, clean-cut make and break. When it's "in" it's "off," eliminating danger of wasteful use of battery.

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No crowding of stations. Adjustable turning tension. Low loss characteristics give a definite and distinct radio reception. Beautiful in appearance. Finished in dull silver. Made in three sizes:

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"Lekeless" Transformers

Uniform high inductance, low distributed capacity and low resistance. The external field is so slight that it permits placing coils close together without appreciable interaction.

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An aid to simplification in set construction. Supports sub-panel with room underneath for accessories and wiring. Plain and adjustable.

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A contest for new and original circuits. Write our nearest office for full details.

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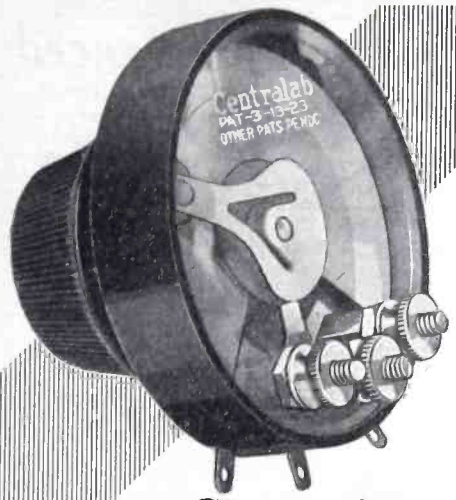

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A panel mounted unit for ideal tone volume control. Used in the Henry Lyford Circuit and specified by Thordarson, Samson, and other manufacturers of quality amplifiers. Used with impedance, transformer, or resistance coupling, gives gradual. noiseless control of tone volume with a single turn of the knob. Sells at $2.00.

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Provides positive control of oscillation in radio frequency amplifiers. Stepless control. No sliding contacts. Full resistance variation with single turn of knob. Non-inductive. Permanently noiseless. Works particularly well in the grid or plate circuit, and is so used by many set manufacturers. Maintains exact resistance values as adjusted. Bakelite base and knob. Single hole mounting. Resistances 3,000, 25,000, 50,000, 100,000, 200,000, 500,000 ohms. Sells at $2.00.

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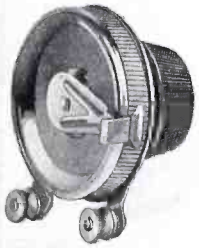

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Makers of variable resistances for 69 makers of leading standard sets

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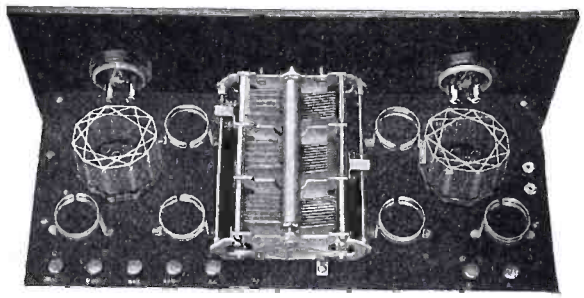
Complete Assembly for a SIX TUBE RESISTANCE-COUPLED SINGLE DIAL RECEIVER



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Pierce-Airo Complete Assembly with a 7 x 18 Processed Bakelite Panel, Ready for Wiring . . **$42.50**

Install the Pierce-Airo Complete Assembly and save time and expense of manufacturing. Pierce-Airo is a mechanically and electrically perfect product, perfected by United Scientific Engineers, assuring distortionless amplification combined with single dial control—the two big features in demand this season. Let us quote on your requirements.

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SANGAMO
Mica Condensers

in the

Stromberg-Carlson
RECEIVER

RADIO enthusiasts sat up and listened when the opportunity came to hear the Stromberg-Carlson receiver. That firm's name means *quality*. Their set won a leading place immediately in a market that seemed over-crowded with good makes. No claims are made of revolutionary ideas in new circuits, but every part is made with scientific precision.

Sangamo Mica Condensers are used in the Stromberg-Carlson because they are permanently accurate. Sangamo condensers are solidly molded in bakelite. All edges are sealed tight; no moisture can creep in to change the capacity. Their accuracy is guaranteed to be within 10 per cent and to remain unchanged. Distinctive in appearance, too; completely enclosed in velvet-smooth brown bakelite; all corners rounded to prevent chipping; reinforcing ribs for mechanical strength.

Experiment with "world-beater" circuits if you will—but remember that accurate Sangamo Mica Condensers will improve the tone and range of any set. You can fit your set exactly—there are 34 capacities to choose from.

***Tried* SANGAMO BY-PASS CONDENSERS?**
They stand the surges without breaking down.

SANGAMO *Accurate* Radio Parts

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6332-8 **Springfield, Illinois**

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Deliberately Unbalanced!

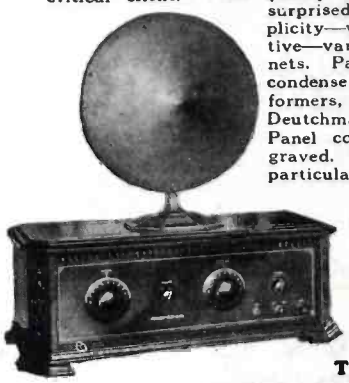
RADIO authorities for years have said it could not be done. Yet the Henry-Lyford Receiver is **deliberately unbalanced!** This very principle is the foundation for its supersensitiveness; its knife-like selectivity; and its fool-proof simplicity. By-passing the grid and plate circuits gives beautiful tone quality.

The Henry-Lyford Receiver is not a freak. It's the answer to the radio fans' demand—a sound, logical circuit that performs as near the "perfect receiver" as any receiver to date can perform. In design it is so simple that any novice can put it together in an evening.

Drop us a card. Let us tell you all about this unusual receiver.

A Sales-Getter for the Professional Set-Builder

A few minutes' demonstration will sell the most critical client. Tone quality you yourself will be surprised at. Fool-proof simplicity—very sensitive—selective—varied selection of cabinets. Parts include Precise condensers, Thordarson transformers, Carter jacks, Tobe Deutchmann fixed condensers. Panel comes drilled and engraved. Write us for full particulars.



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THE NEW
HENRY-LYFORD
RECEIVER

No Change in Wiring ~ with the adapted Mogul 5VCX Power Tube

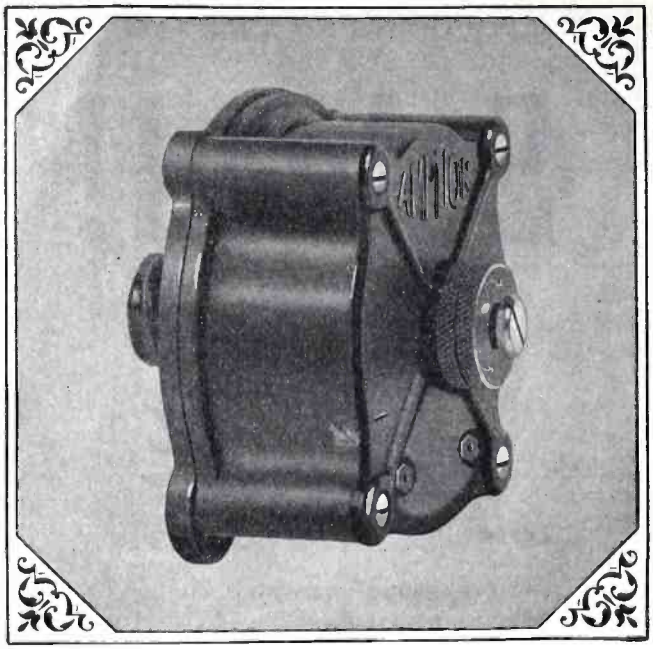
No other power tube has the patented adapter that makes changes in set wiring unnecessary—a feature that increases power tube sales.

No other tube franchise offers to dealers and jobbers such an unusual tube with such little sales resistance.

Further information on the complete Van Horne line of Selected and Certified tubes, that will be sent you on request, will clearly show you the advantages of a Van Horne franchise.

THE VAN HORNE COMPANY, INC.

802 Center Street **Franklin, Ohio**



Match the impedance of the speaker unit with your set

REAL quality reception can only be secured when the impedance of the speaker unit matches the impedance of the tube in the last audio stage.

So that your sets with enclosed loud speakers will give the utmost in quality reception, have Amplion engineers confer with you on your speaker problem.

Amplion principle of reproduction represents the cumulative experience of thirty-nine years devoted exclusively to the design of loud speaking devices by "The House of Graham."

Many of the leading makes of sets known for their quality of reproduction, are Amplion equipped.

A letter indicating your interest involves no obligation and secures the immediate cooperation of our engineers.

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Greater Distance Finer Selectivity Greater Power

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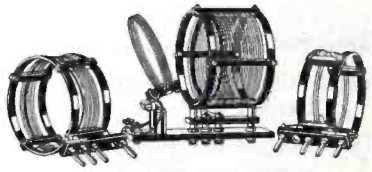
AERO COIL
SUPER-SENSITIVE
INDUCTANCE UNITS

Tuned Radio Frequency Kit
Price $12.00

The Aero Coil Tuned Radio Frequency Kit illustrated above will positively improve the performance of any receiver. Patented Aero Coil construction eliminates radio frequency losses and brings tremendous improvement to volume, tone and selectivity.

Kit consists of three matched units. The antenna coupler has variable primary. Uses .00035 condenser. 8 page color circuit layout and instruction sheet for building the supersensitive 5 tube Aero-Dyne receiver packed with each kit. Extra copies, 75c each.



Low Wave Tuner Kit
Price $12.50

Completely interchangeable. Adapted by experts and amateurs. Range 15 to 130 meters. Includes three coils and base mounting, covering U. S. bands, 20, 40 and 80 meters. You can increase the range of this short wave tuner by securing coils No. 4 and 5. Combined range of 125 to 550 meters. Both interchangeable coils fit same base supplied with short wave kit and use the same condensers. Coil No. 4 price $4.00; Coil No. 5 price $4.00.

These Aero Coils are available at your dealers. Get yours today!

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INSULATION is a relative term descriptive of a dielectric designed to prevent loss of current by leakage. All so-called molded insulations look more-or-less alike. But their dielectric characteristics vary *widely*. RADION stands supreme in its field. All electrical tests emphasize that fact. Whatever insulating parts you employ in the circuit which may be made by moulding, stamping or machining can probably be made better out of RADION. We welcome investigations and comparisons and are glad to submit samples and prices.

New Crackle Surface Finish

now available on

ACE QUALITY HARD RUBBER PANELS

You will be interested in the new Crackle Surface—a decided departure in Ace Quality Hard Rubber Panels. It closely resembles high grade leather and

will distinctly dress up the set. Now ready in stock panel sizes or cut-to-order in quantity.

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CLAROSTAT

THE UNIVERSAL RANGE VARIABLE RESISTOR

$2.25

"THE GATEWAY TO BETTER RADIO," a 32-page book, which gives accurate instructions for the use of CLAROSTAT in every conceivable type of circuit, is now available. It covers all the popular types of receivers, B eliminators, and power amplifiers. Price 25c. May we send you a copy?

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CLAROSTAT has a universal resistance range of from practically 0 to 5,000,000 ohms—a current carrying capacity of 20 watts—is absolutely noiseless in operation—and mounts in one hole.

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—For POWER SUPPLY!

MANUFACTURERS AND JOBBERS

who want complete eliminators made up under their own name—who need special eliminator parts made to specification

Communicate, **now**, with

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64 University Place — **New York City**

Build Your Own Big 3 Foot Cone Speaker

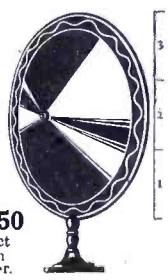
Radio Show Sensation

Unit developed and speaker designed by Clyde J. Fitch, noted radio engineer. Results guaranteed equal to the finest factory-built speaker or your money back if you wish it. Easily assembled; operates from any receiver that will work a speaker; wonderful tone quality at any volume even with power tubes.

Tunbar *Cone Speaker* **UNIT**

FREE Blue Print

Famous Tun Bar Unit sent prepaid on receipt of $7.50, or C. O. D. charges collect, if you prefer. Free blue print with each order for unit; blue print alone, $1.



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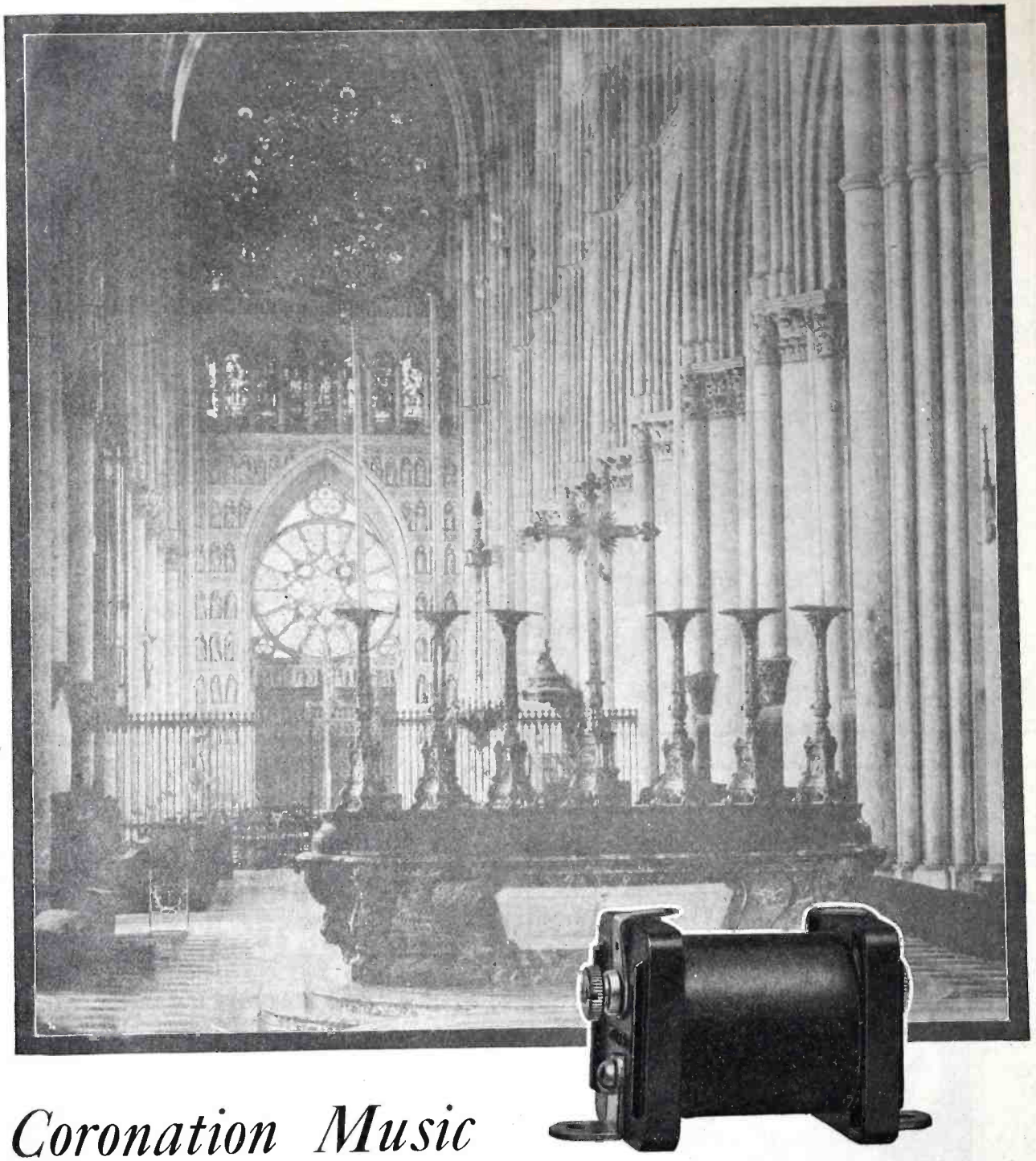

Coronation Music in Reims Cathedral was Never More Majestic

than the Radio Melody that floods your home till the very walls seem to sway to its rhythm, and each note hushes to enchantment all present as it wells forth full and true. Then the sense of listening ceases and you are in the great artist's presence. This is radio reception from sets made of Samson parts.

Like most fine things this is not an accident but the result of years of painstaking research and manufacturing effort by Samson scientists and engineers.

For supreme quality of reproduction and the elimination of howling, "motor boating" and other disturbing noises radio and audio frequency currents must be kept where they belong. For this purpose Samson Chokes cannot be approached because their patented helical winding prevents the choke acting as a by-pass condenser at certain frequencies and reduces distributed capacitance effect to a negligible minimum. These chokes have no pronounced self resonant points. Special bulletins on the uses of these chokes are available.

No. 85	Samson R. F. Choke (85 millihenries)	$1.50
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Our book—"Audio Amplification"—already accepted as a manual of audio design by many radio engineers—contains much original information of greatest practical value to those interested in bettering the quality of their reproduction. Sent upon receipt of 25c.

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Approved B-Power Parts

for all

Accepted Types of Eliminators

The New A B C Eliminator Units

Specify DONGAN No. 2568

for Raytheon B H Tube No. 2568 unit consists of one No. 2561 Transformer and two No. 1591 Chokes.

Eliminates all batteries and assures consistent, economical reception of greatly improved quality.

List $17.50 Price

Manufacturers and individual set builders who are keeping pace with the modern trend of radio can secure approved Transformers and Chokes, designed and built by Dongan, for all the accepted eliminators—at moderate prices made possible by Dongan's large production. Special units for manufacturers can be worked out in our laboratories. Fans can build complete eliminators of all types from Dongan diagrams.

Prompt deliveries assured—write or wire for information

For the U.S.-76 Power Supply Unit, to operate the U.S.-76 Short Wave Telephone Transmitter, use the No. 1591 Dongan choke and the No. 537 Dongan power transformer.

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Type H

Remarkable performance assured by this Super Transformer. Designed to meet present day wave length conditions. Smoothness and power on all wave lengths feature Type H.

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List $4.50

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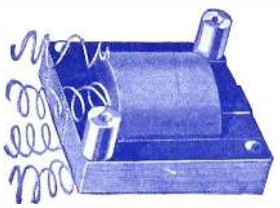
Unmounted types for all requirements for Set Mfr's. As a source of supply Dongan is noted for prompt deliveries as well as uniformity of quality.

Mfr's.—Get quotations at once—on any type.



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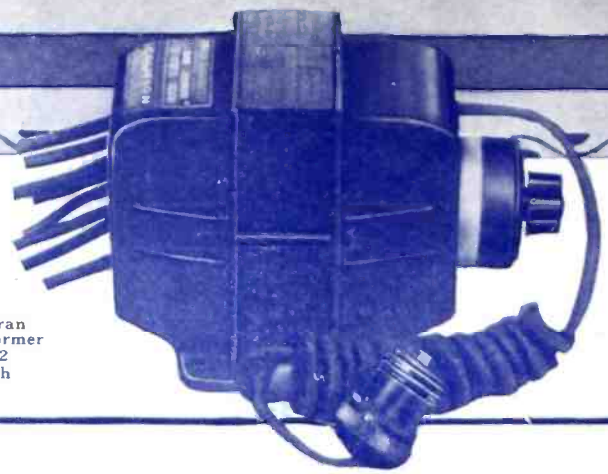

The AmerTran
Power Transformer
Type PF 52
$18.00 Each

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A Real Power Transformer

Perfected on the firm foundation of twenty-five years' successful experience in transformer building, AmerTran Radio Products enjoy a reputation second to none in their respective fields. Their continued selection by leading engineers and experimenters gives ample proof of their high efficiency and dependable performance.

Of particular interest is the AmerTran Power Transformer Type P. F. 52—*the* transformer for real "honest-to-goodness" power supply. This transformer is intended for use on the standard 110 volt, 60 cycle house-lighting circuit, and can be depended on to give and maintain satisfaction.

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Type 854

This is a scientifically designed impedance or choke coil of general utility, designed primarily for use in filter circuits. As an output impedance for by-passing direct current from the loudspeaker it is both efficient and economical. Price

$6.00 each

The AmerTran
De Luxe Audio
Transformer

This new transformer sets an entirely new standard of Audio Amplification. It makes possible a transformer coupled amplifier that excels all other forms of amplifiers. Made in two types for first and second stages. Price

$10.00 each

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"Transformer Builders for over twenty-five years"

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AmerTran Heater Transformer Type H-28 (for A.C. tubes)—$10.00

We shall be very glad to send you upon request a copy of our booklet "Improving the Audio Amplifier" together with other interesting and constructional data.

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Types AF-7 and AF-6

AmerTran Audio Transformers, types AF-7 and AF-6, have been considered for years among the leaders in audio amplification. These popular and efficient models are made in two types: AF-7 (ratio 3½:1); AF-6 (ratio 5:1)

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