

# Radio Mechanics

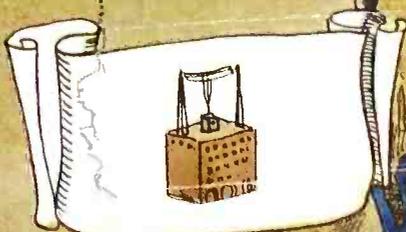
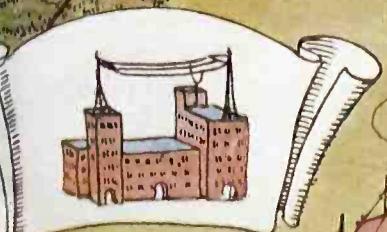
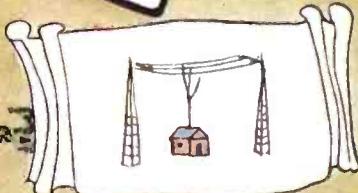
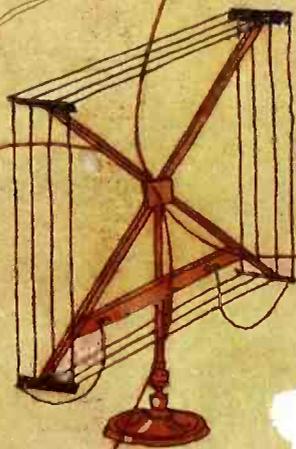
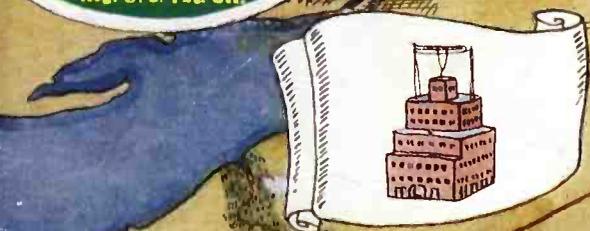
Edited by **M. B. Sleeper**

March, 1927

25¢

The  
Fun of Radio  
is in doing  
it yourself

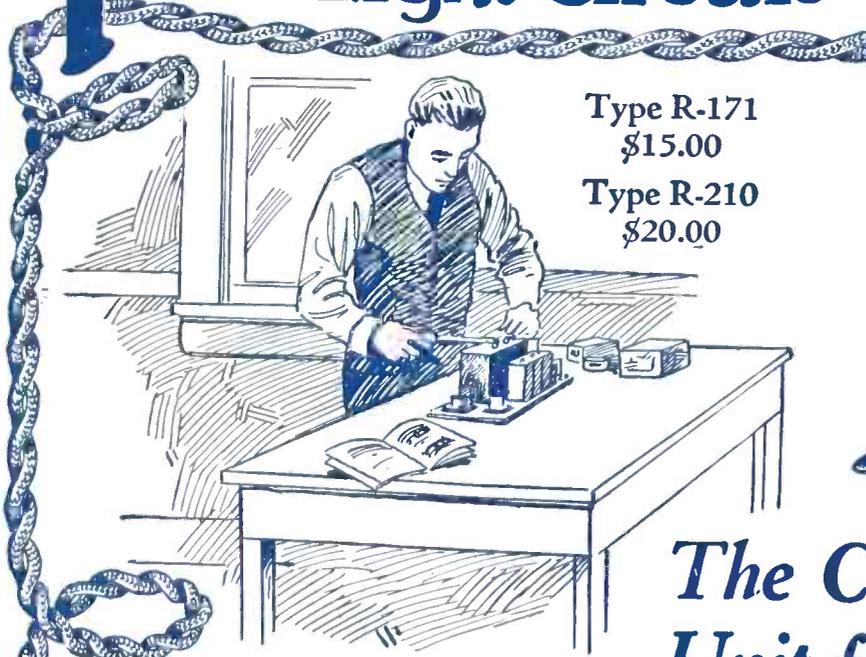
Reg. U. S. Pat. Off.



HOW TO  
REDUCE  
RADIO  
SQUEALS

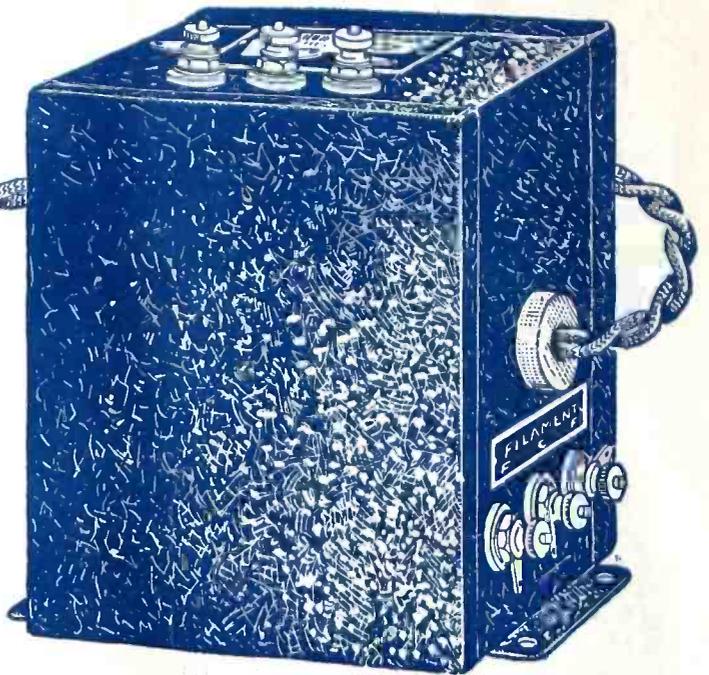


# Power from the Light Circuit



Type R-171  
\$15.00

Type R-210  
\$20.00



## The Complete Foundation Unit for Home Constructed Power Amplifiers

HERE is what you have been waiting for — a silent and efficient power amplifier and B eliminator that will equal anything on the market—one that you can build yourself in less than an hour.

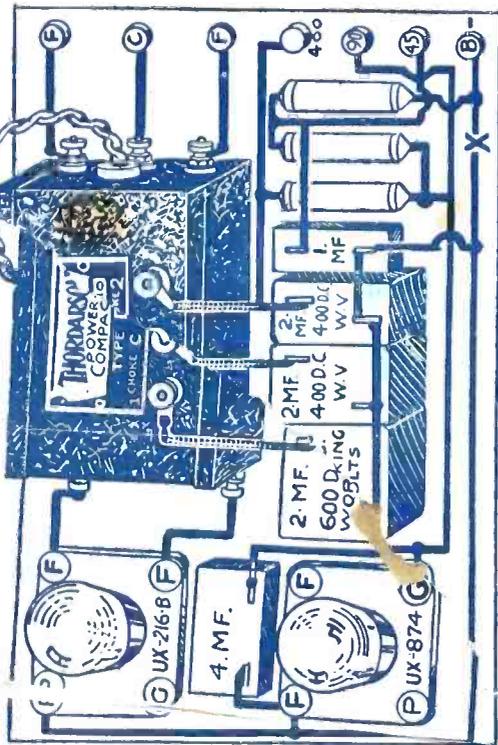
The Thordarson Power Compact is the complete foundation unit for power amplification. It contains: (1) a power supply transformer, (2) two filter choke coils of 30 henries, and (3) a power tube filament supply, tapped at the exact electrical center (an exclusive Thordarson feature), all in one compound filled case.

Two types of Power Compact are available: R-171 is designed for use with power tube UX-171 and Raytheon BH rectifier. Type R-210 is designed for use with power tube UX-210 and UX 216-B rectifier. Each type of compact supplies the proper values of current for maximum efficiency operation of its corresponding power tube.

Packed with each compact is a complete set of instructions which can easily be followed, even by the man with no radio experience.

Remember that when you buy a Thordarson product it is guaranteed and backed by over thirty years' manufacturing of reliable transformers.

*For Sale at Good Dealers Everywhere  
or Direct from Factory*



B-ELIMINATOR AND SUPPLY FOR UX-210 POWER AMPLIFIER -

*This Booklet is Yours  
for the Asking:*

**"POWER FROM THE LIGHT CIRCUIT"**

THORDARSON ELECTRIC MFG. CO.  
500 W. Huron St., Chicago, Ill.  
Gentlemen:

I would greatly appreciate receiving a copy of your new booklet "Power from the Light Circuit."

Name.....

Address.....

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

# THORDARSON POWER COMPACT

**THORDARSON ELECTRIC MANUFACTURING CO.**  
*Transformer specialists since 1895*  
**WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS**  
**Chicago, U.S.A.**

(3449G)

THE ADVERTISERS REQUEST THAT YOU MENTION RADIO MECHANICS



STATION WOC  
DAVENPORT

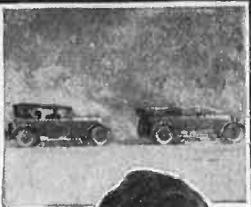
**Now Owns a Radio Store**

"The Radio business is rushing just now. Building many Super Heterodynes, also doing installation and repairing. To your course I owe all my success in the Radio profession." A. J. Ommodt, Bowman, N. Dak.



**Controls First Car by Radio**

"I operate the portable broadcasting station in rear car, driving front car by Radio control. Will operate this car from New York to Frisco—13 months trip. Then we take the car around the world—a three years' tour. I owe it all to you." Leo Paul, New York City.



# You Can Do What These Men Did!

## I Will Train You at Home to Fill a Big-Pay Radio Job

Get into the great new Big-pay Industry—Radio. If you're earning a penny less than \$50 a week, clip coupon now. Send for AMAZING FREE BOOK, "Rich Rewards in Radio." Why go along at \$25 or \$35 or \$45 a week, when you could earn \$50 to \$250 in the same six days, as a Radio Expert? Hundreds of N. R. I. trained men are doing it—why can't you? I'll train you just as I trained them—just as I trained the men whose letters you see on this page. I'll teach you quickly at home in your spare time to be a Radio Expert, and draw down big money for the easiest and most fascinating work in the world.

### \$50 to \$250 a Week as a RADIO EXPERT

It's the trained man, the Radio Expert, who gets the big jobs of this profession—paying \$75, \$100, \$200 a week and up. Free book gives all the facts. Every day N.R.I. trained men are taking good places in the Radio field—men like you—men like those whose stories I show you here. You can prepare just as they did by new practical methods, learn right at home in your spare time. Lack of experience no drawback—common schooling all you need. Our tested clear methods make it easy for you. We guarantee to train you successfully. Big Free Book contains all the proof.

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Most amazing book on Radio ever written—full of facts and pictures—tells all about the great Radio field, how we prepare you and help you start. You can do what others have done—GET THIS BOOK. Send coupon today—no obligation.

**J. E. Smith, Pres. NATIONAL RADIO INSTITUTE Dept. AB-7, Washington, D. C.**

**RADIO NEEDS TRAINED MEN!**

Read the true stories printed in this border—of men who got out of the rut



**Chief Engineer Station WEMC**

"Please communicate with my two junior operators here who want to increase their knowledge of Radio. Being a graduate of your course I know they could do nothing better for themselves than study it for it is the way to success in this profession." John E. Fetzer, Chief Engineer, Station WEMC, Berrien Springs, Michigan.



Photo shows Graduate E. F. Spadoni in his own Radio store at Chicago, Ill. "Your course gets the credit," says Spadoni.

**HERE'S WORK THAT IS ALMOST ROMANCE!**

**These Instruments Given FREE of Extra Cost**

All instruments shown here and others sent to all my students free of extra cost under short time special offer. Clip coupon now—find out all about this big unequalled offer while you still have time to take advantage of it. This training is intensely practical—these instruments help you do the practical work.

**My Radio Training is the "Famous Course That Pays for Itself"**

Make more money quick when you take up this practical course.

I show you how to increase your earnings almost from the start of your course through practical pointers I give you.

**Howard B. Luce of Friedens, Pa., made \$320 in 7 weeks during his spare time. D. H. Sutt of Newport, Ark., writes "While taking the course I earned in spare time work approximately \$900." Earl Wright of Omaha reports making \$400 in a short time while taking his course—working at Radio in his spare time only! Sylvester Senso, 207 Elm St., Kaukana, Wis., made \$500. These records not unusual—these men are a few of hundreds.**

And when you graduate, my big Free Employment Department helps you get the job. You get just the same preparation and assistance toward success we gave C. C. Gielow, Chief Operator of the Great Lakes Radio Telegraph Co., E. W. Novy, Chief Operator of Station WRNY, Erle Chambers, Radio Engineer for Stewart-Warner, J. E. Fetzer, Chief Engineer of Station WEMC. The National Radio Institute, established 1914, today offers you the same opportunity these men had under a bond that guarantees you full satisfaction or money refunded. It's your big chance to get into the great Radio field—mail coupon TODAY for my big Free Book and proof!

**Originators of Radio Home-Study Training**

**\$70 in one Day for T. M. Wilcox**

"I am in business for myself and recently made \$70 in one day. I was an electrician of rich experience and was occupying a splendid position as telephone superintendent when I enrolled with your course believing it would open up greater opportunities—have not been disappointed. Estimate that Radio will be worth tens of thousands of dollars to me in the next few years." T. M. Wilcox, Belle Island, Newfoundland.



**Kimball With WMAQ Chicago**

"Accepted a position with the Chicago Daily News Station WMAQ. My income practically doubled, thanks to your fine course. I handle all consultation also do operating." Keith Kimball, Station WMAQ, Chicago, Ill.



**Promoted to Big Job**

"Just been made Sales Manager of this Radio firm—received a very good increase in pay. Up to present have been getting salary which in 3 months enabled me to purchase a new car." R. Jones Bay City Mich.



**MAIL THIS NOW!**

**J. E. Smith, President NATIONAL RADIO INSTITUTE Dept. AB-7 Washington, D. C.**

Dear Mr. Smith: Without obligating me in anyway, send me your free book "Rich Rewards in Radio" and all information about your practical, home-study Radio course.

Name..... Age.....  
Street Address.....  
Town..... State.....

# T H I S M O N T H ' S F U N

## WHAT IT'S ALL ABOUT—FOR MARCH

**H**OWARD V. BROWN, who makes the cover paintings for RADIO ENGINEERING, is not only an artist of very wide renown, but an enthusiastic radio experimenter. His studio, at 131 West 23rd Street, New York, gives evidence of this. Like all set builders, however, he is always putting together and tearing down, with the result that he seldom has a complete set in operation to provide music as he works at the easel. But Howard Brown, because of his understanding of radio apparatus, is the one artist who can paint a knob that looks as if it's made to turn, or a condenser that has real plates.

**H**OLLIS DE NEEFE, the super hound of Radio Hill, certainly tracked down everything that's worth putting into a super-heterodyne when he designed the Victoreen Socket-Power Super. Whatever you can ask for to make a set ultra-modern to the last detail is in this set. And if you want the last word in design and operation, you can build this set with full confidence that it won't be surpassed for a long, long time.

**Y**OU'D be amazed to know how many men and boys are making sets for mother. Certainly she deserves a first class installation if she's to put up with the mess and noise that most fellows make. A typical outfit is shown on page 255.

**S**ENATOR'S SET is the prize-winning name selected for Maurice Osborne's loop receiver. This outfit, designed for finest quality reception for local stations, is also arranged for the minimum reception of squeals and interfering noises. When you read the details of these combined effects, you will understand why the popularity of the Senator's Set in Boston is extending thruout the country.

**A.** H. GHIRARDI takes us thru another step in radio circuits in the conclusion of the third chapter of the Radio Physics cause. This is in preparation for the fourth chapter, which will appear next month, on the mysteries of the vacuum tube, and explanations of the things it does.

**B**ERT SMITH drew first prize from our readers with his New Day Set, the special design for 15 to 550 meters. Now he has some new dope for using the Loftin-White system on this set—just by changing a few connections. No additions or alterations are necessary in the instruments, yet Bert Smith says the volume, measured as an audibility meter, is 8 to 16 times greater.

**I**MAGINE what it would mean to increase the power of your receiving set 220 times. That's just what you can do, and do very easily if you now have a 201-A tube in the last step of your audio amplifier. No, that doesn't mean 220 times as much volume, but an increase in handling capacity to produce finer quality. When you put the 210 Compact B eliminator and quality amplifier on your set, no matter how pleased you were with your set before, you'll admit that you hadn't heard real radio quality. Of course the 210 Compact operates entirely from the light socket.

**A**T last, Glenn H. Browning and Dr. F. H. Drake have designed their own receiving set to produce the finest results of which the Browning-Drake coils are capable. In doing so they have made several changes in the coils and the hook-up, bringing the Official B-D design right up to the minute. Also, they have settled definitely the question as to whose B-D design is best.

**P**UPPY is a little brother to any big set. Not that there's anything small about results from the Puppy. It's only small in dimensions, following the new fashion of putting big-set methods into compactly-built outfits. The Puppy can be fitted with two 199's and a 120, or a 200-A, 201-A, and a 112. With small tubes, it will operate on a 6-volt storage battery or 6 dry cells without any circuit changes.

**N**EW circuits of the month will be found on page 280. This section will be a regular feature from now on. As much information as possible is given on the diagram, but additional dope can be obtained from the Circuit Editor of Radio Mechanics if you want it. There's no charge as long as you don't ask for special hook-ups to be drawn.

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## RADIO MECHANICS

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Contributions, concerning any application of radio in the home, are solicited from our readers, and will be paid for upon publication. Remember that good photographs are necessary. Have them taken by a professional photographer. The publishers will make an additional payment for photographs. Pictures of installations in homes are particularly solicited. \$10.00 will be paid for each photograph accepted.

RADIO MECHANICS, INC.

Owned and Operated by

M. B. SLEEPER, INC.

# Approved Radio Designs

All M. B. Sleeper Dataprints Are Approved by the Manufacturers of the Equipment Used and Are Recommended by Them for Your Use. Here Is a Complete Selection.

## FOR A. C. OPERATION

**01-ABC:** The only eliminator providing A, B, and C voltages for 201-A tubes and 112 or 171 power tube. Uses S-M and Tobe parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Jan., 1927, for instructions, 25c)

**TC on A. C.:** Famous TC receiver, an exceptionally beautiful design, built for operation from the 01-ABC eliminator. Uses Samson parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Feb., 1927, for instructions, 25c)

**VICTOREEN SOCKET POWER SUPER:** The first A. C. operated, 8-tube, single-dial loop super-heterodyne. The ultimate receiver. Uses Victoreen parts. Runs on 01-ABC eliminator. Complete Dataprints, postpaid.....\$2.00  
(Described in this issue of Radio Mechanics)

## SUPER-HETERODYNE SETS

**ECLIPSE:** A beautiful super built for extra range and sharpness. Uses H. F. L. parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Feb., 1927, for instructions, 25c)

**MAN O' WAR:** The battle-ship super. Uses S-M parts. Complete Dataprints, postpaid.....\$2.00  
(Radio Mechanics, Feb., 1927, for instructions, 25c)

**VICTOREEN:** Described above. Full A. C. operation. Complete Dataprints, postpaid.....\$2.00

## SHORT WAVE SETS

All these sets can be used for broadcasting, also, as they are equipped with plugs-in coils.

**HUSH-HUSH II:** A snappy little set built around S-M parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Oct., 1926, for instructions, 25c)

**BERT SMITH'S:** Special amateur design, good for 10,000 miles. With Quality Amplifier makes beautiful broadcast receiver. Uses Aero coils. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Nov., 1926, for instructions, 25c)

**PEANUT:** A special receiver using Burke's new plate circuit control, built around General Radio parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Jan., 1927, for instructions, 25c)

## ELIMINATORS AND POWER AMPLIFIERS

**R-171:** A Raytheon B supply and 171 amplifier, using Thordarson and Muter parts. Has glow tube to give constant voltage. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Jan., 1927, for instructions, 25c)

**R-210:** 216-B rectifier with glow-tube voltage regulator for B supply. Has 210 amplifier. Uses Thordarson parts. Complete Dataprints, postpaid...\$1.00  
(Described in this issue of Radio Mechanics)

**QUALITY AMPLIFIER:** The most popular of all designs ever shown in Radio Mechanics. An A. C. operated amplifier with 210 tube. Uses AmerTran parts. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Nov., 1926, for instructions, 25c)

## SPECIAL SET DESIGNS

**OFFICIAL BROWNING-DRAKE:** First release on the new, advanced B-D set, o. k.'d by G. H. Browning and Dr. Drake. Complete Dataprints, postpaid...\$2.00  
(Described in this issue of Radio Mechanics)

**SUBMARINE:** Unquestionably the best radio set for the money ever designed. 4 tubes, PDX audio circuit, all latest features. Parts cost less than \$25.00. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Feb., 1927, for instructions, 25c)

**EQUAMATIC:** The famous Karas 5-tube set which operates at peak efficiency at all wave-lengths. Complete Dataprints, postpaid.....\$1.00  
(Radio Mechanics, Oct., 1926, for instructions, 25c)

## RADIO TELEPHONE OUTFIT

Short-wave radio telephone transmitter and receiver, good for telephone communication up to 15 or 20 miles. Runs from B battery. Very low in cost.  
**5-N-1 receiver, Dataprints.....\$1.00**  
**US-76 telephone transmitter, Dataprints.....\$1.00**  
(Radio Mechanics, Dec., 1926, for instructions, 25c)

SEND CASH OR MONEY ORDER TO

**RADIO MECHANICS, Inc.**

Radio Hill

Poughkeepsie, N. Y.

IF YOU HAVE A CHECKING ACCOUNT, SEND NO MONEY. JUST FILL OUT THIS COUPON

Name of your bank

City State

Pay to the order of Radio Mechanics, Inc.

Dollars

Your official signature

Send me the following sets of Dataprints:

.....  
.....  
.....  
.....

Print name.....

Street City State

## B E T W E E N Y O U A N D M E

*M. B.'s own page about radio, having fun, and other important things*

**J**UDGE BEN LINDSEY, discussing the results of present day influences being brought to bear upon the development of our boys and girls, said, "This present civilization is the first of its kind."

Everyone in a position to see the operations of our present civilization recognizes positively the centrifugal force which is hurling our younger generation out into a rarified atmosphere of revolt against conservative mental processes, but only a mild hopefulness is expressed for the coincident development of a counter-acting force to establish again a new condition of well balanced thinking.

What a pity that H. G. Wells is not a radio bug, that he could analyze the influence of this newest germ upon the thought processes of a twelve-year-old boy!

A well-meaning father asks, "Why should I let my boy spend money indiscriminately on radio junk, when he's never going to be a radio engineer, and sitting up nights with that loud squauker, keeping everyone awake, interferes with his school work?"

That father probably misunderstands many other things about his boy. This very question indicates that, by speaking lightly of things his son considers seriously, he has forfeited the boy's confidence. A boy can make himself understood only to those whom he feels instinctively can understand him.

What boy can explain that the energy put into the deft handling of soldering iron would otherwise be spent, right to the equal ounce, in some other way—certainly not less ill-directed?

Can he express in words the genuine love and affection in which he holds those shiny instruments, and the satisfaction which they reflect back to him?

He does not recognize his own appreciation of the beauties of natural phenomena as they disclose themselves in response to his opera-

tion of a condenser, or the adjustment of a rheostat. Yet he is held by that fascination with which nature has always gripped the rudimentary mind.

In every boy is a creative urge totally gratified by the opportunity of owning a workshop, where he can shut himself off, where he can be his own, natural, private self, where he can create active, working things. The raucous notes, the shrill squeals are music to him. His uncritical ear accepts the distorted music. He excuses the howls, for they are incidental to the operations he performs.

The assembly of a radio set involves a sequence of processes, successive causes which must be arranged to produce a series of effects. An error of omission or commission is promptly evidenced, and so perfectly demonstrated to the boy that he discloses to himself precepts which he applies unconsciously in his social relations.

With a little encouragement, nine boys in ten can be interested in playing with radio, and brought under its influence. This is one definite counter-force which the present civilization has developed.

Radio is not a part of the background of our mothers and fathers. They preach and scold because that was the effective discipline of their childhood. The gentlemen who wore the side-burns couldn't make an ally of radio in the mental and social development of our fathers. Why, in their time they attempted to legislate against the manufacture of bath tubs, and the ungodly speed attained by steam locomotives!

Fortunate indeed are the parents of the boy whose worst extravagance is his devotion to his radio workshop, and wise the parents who encourage this new influence of our new civilization.

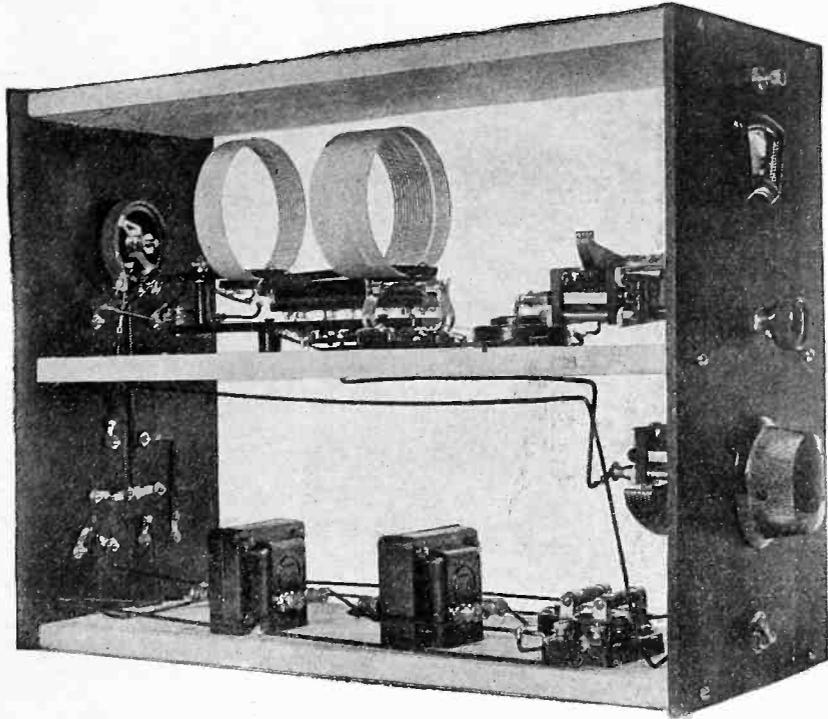
M. B. SLEEPER, *Editor.*

# Boys!

**\$24.10**

**Buy this Kit**

**4 TUBES  
30 to 600 METERS**



## BUILD THE SUBMARINE

*Read about this set which you can build on the kitchen table!*

**C**AN you build a real, high-class radio set? — I should say you can! I don't mean you can if you're a radio expert. I mean that you can do it if you never hooked up a set before.

Will it be right up-to-date in every respect? Good tone quality? Bring the stations in one-two-three? — Absolutely.

How about short waves? Can it receive 10,000 miles at 40 meters? — Yes, sir.

Why, there isn't anything you can ask of this set that it hasn't got. PDX audio amplifier circuit. Set of plug-in coils, air dielectric. Illuminated vernier dial. S. L. F. tuning.— Everything right down to binding posts with non-removable tops. — Everything except a big price.

Now, after you send in your orders, how long must you wait? — There is no such thing as a back order with A. L. Farris. There's no such thing as a part shipment.

Every order goes out the day it is received, and it goes out complete. That is possible because A. L. Farris is concentrating on one kit, and one kit only.

Here is what you get for \$24.10:

- 2—Panels, 7x10 by 3/16 in.
- 3—Wooden decks, cut to size
- 2—Low loss S.L.F. condensers
- 1—Illuminated vernier dial
- 4—UX sockets (take UV tubes also)
- 1—Low loss coil kit
- 1—Plug-in coil mounting
- 2—Bakelite case A.F. transformers
- 1—Resistance coupling unit
- 4—Resistances
- 1—Grid condenser
- 1—Resistance mounting
- 1—Filament switch
- 1—Rheostat
- 1—Knob
- 1—Set of marked binding posts
- 1—Assortment of screws, nuts, wire, etc.
- 1—Set of blue prints
- 1—Instruction book

**All this equipment shipped complete for \$24.10**

### GUARANTEE

Every part sold by A. L. Farris is guaranteed against defects, and will be replaced by return mail, without charge, unless it has been obviously abused.

The business of A. L. Farris is to sell you parts that will work, and work right, to cooperate in every way to help make your set a big success.

**YOU ARE SAFE AND SURE WHEN YOU BUY THE SUBMARINE KIT FROM A. L. FARRIS.**

NOTE: If you want to get the blue prints for the Submarine, they are sold separately at a price of \$1.00.

### RUSH ORDER

Speed up shipment by using this coupon. Print name clearly.

A. L. FARRIS, Arlington, N. Y.	
Rush immediately, prepaid, complete kit for building the SUBMARINE RADIO SET.—\$24.10 enclosed.	
Name.....	
Street.....	
City.....	
State.....	



### BRIGHT AND EARLY

*Leads from the Victoreen can be run to various parts of the house. Here is a little Musicone bringing in the daily dozen before breakfast*

# RADIO MECHANICS

VOLUME I

MARCH, 1927

NUMBER 6

## THIS SET HAS EVERYTHING

*A Super-Heterodyne Circuit with 01-A's and Power Tube, Loop-Operated, Single Control, Working Entirely from A. C. Current Supply*

HOLLIS DE NEEFE

FOR the first time in the history of radio, you can now build a set incorporating every modern feature. Imagine this combination in a set made entirely of standard parts that you can put together in your kitchen table workshop:

- Super-heterodyne circuit.
- 01-A tubes and power tube.
- Loop antenna.
- One-dial tuning.
- Full A. C. operation—no batteries.

And that's what you can get from the Victoreen socket-power super. All the sensitiveness of the super circuit, stable operation with the 01-A tubes, real quality from a 171 in the last stage, just one dial for tuning, repeat points practically eliminated, loop antenna to cut down squeals from interfering transmitters and receivers, and the whole thing absolutely free from batteries, chargers, and all the trouble they involve.

Just turn the light socket switch, point the loop, and set the dial for the station you want.—Certainly this is making radio history!

### WHY THE LOOP IS BECOMING ESSENTIAL

The one thing lacking in this socket-power super is a squeal eliminator. So far, there isn't such a thing and the quantity of squeals and whistles is steadily increasing.

That's why more and more sets are being built for loop antennas.

To explain:

An ordinary antenna picks up broadcasting stations and oscillating receiving sets in all directions. A sensitive set, tuned to WJZ, will bring in western stations on almost the same wavelength strongly enough to cause a steady whistle under the WJZ program.

*The complete equipment, a radio set than which nothing can be more than the Socket-Power Victoreen*

However, with a loop, pointing north and south for WJZ, there is no squeal from the western stations.

Of course, if a station to the north and south were operating right at the wavelength of WJZ, there would be a squeal. But, with the haphazard distribution of stations, this seldom occurs.

The same thing applies to the reduction of interference from squealing receivers when a loop is substituted for an ordinary antenna. Consequently, the Victoreen socket-power super is at least as free from squeals as a set can be made.

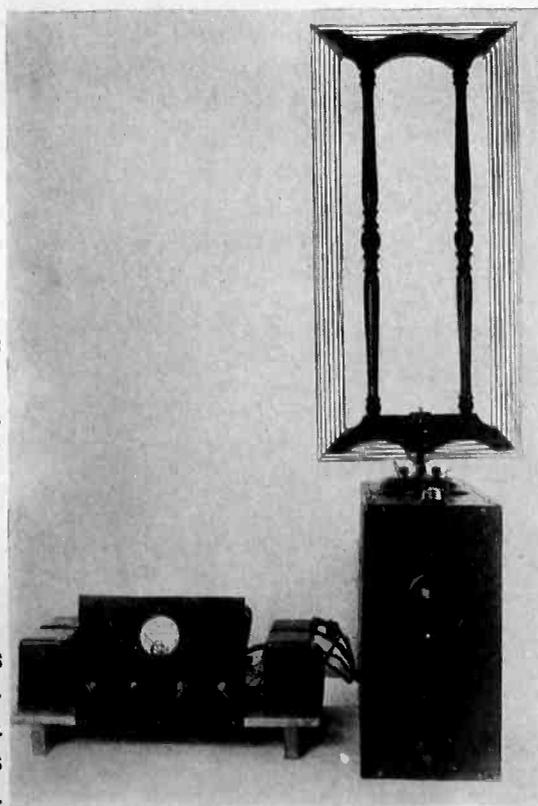
### HOW TO USE THE VICTOREEN

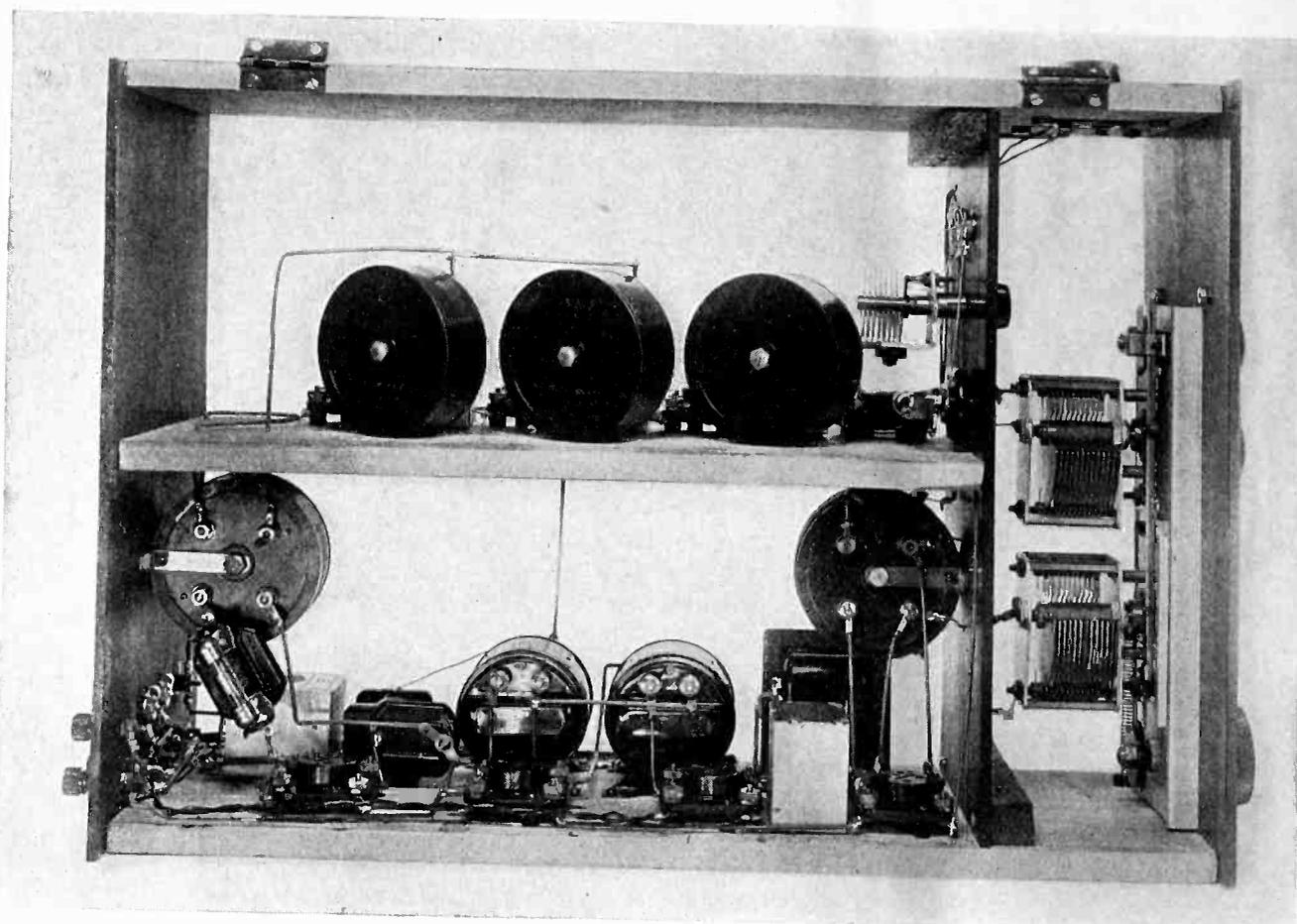
We built this Victoreen on the battleship plan partly to get greater electrical efficiency, and partly to make it suitable for special home installations where the set is tucked away out of sight. The original model was set up in just this way, in a closet. From the set, loud-speaker connections were run to various parts of the house.

At dinner time, it was tuned in for WJZ or WEAf and left there.

If it was needed after mid-night, it was retuned for one of the western stations. Then at bed-time, it was readjusted for WEAf, left in readiness for the morning exercises.—There you have radio entertainment de luxe!

Because of its unobtrusive appearance, it can be tucked away somewhere in any kind of room.





#### THE O1-ABC ELIMINATOR

This outfit is designed to operate from the O1-ABC eliminator.<sup>1</sup> This eliminator is the most perfectly satisfactory unit that we have ever built. Unlike so many special devices which add their own particular tricks to the peculiarities of the set, the O1-ABC acts like a helping hand in smoothing out troubles.

It not only runs this set and the TC on AC<sup>2</sup>, but it is just as good and as well-behaved as the Brown-Ing-Drake, the Aerodyne, or the

<sup>1</sup> Completely described in Radio Mechanics for January, 1927. Dataprints for the O1-ABC and the January issue can be obtained from the Construction Service Department, Radio Mechanics, Inc., Radio Hill, Poughkeepsie, N. Y.

<sup>2</sup> Completely described in Radio Mechanics for February, 1927. Dataprints available.

Silver Shielded Six—in fact, on any set of four to eight tubes.

The O1-ABC can be built for less than seventy-five dollars complete, about the cost of a B eliminator, storage battery, charger, and charging switch.

No changes are necessary in the original design. Just hook it up the regular way and it is ready for operation.

#### WHAT'S IN THE VICTOREEN

When we planned the design of the Victoreen socket-power super, we followed very closely the latest standard circuit data, only changing such things as were necessary for A. C. operation.

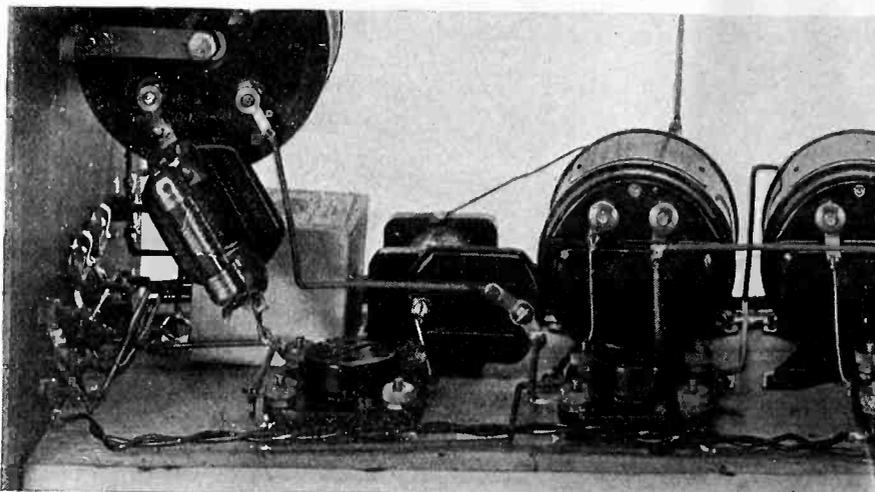
The filaments of all except the power tube are in series. The

power tube is supplied with A. C. by the eliminator. The series filament arrangement simplifies the wiring, and provides the various C biases. We changed the volume control, using a high resistance—100,000-ohm—in the plate circuits of the intermediate tubes.

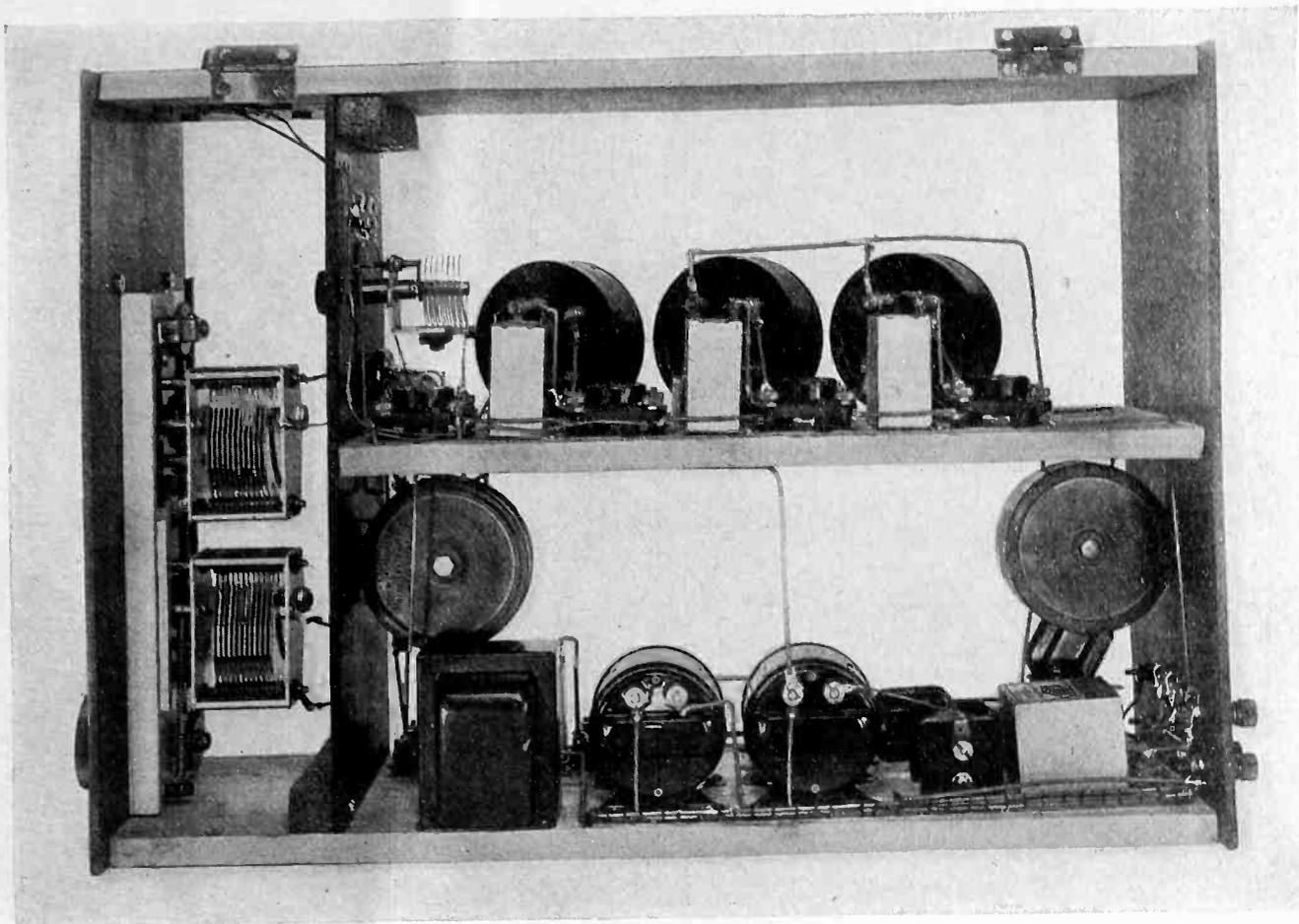
To get maximum efficiency, we decided upon a three-tap loop circuit with a midget condenser to bring the loop circuit right up to regeneration. This adds greatly to the range and volume, bringing in at full strength distant stations which cannot be heard with the plain loop circuit.

You may be surprised to see so many by-pass condensers, but you'll understand their purpose when you hear the difference in the loud-

*Above, the left side of the Socket-Power Victoreen, the first super-heterodyne set using 201-A's and a power tube to be operated entirely from 60 cycles A.C. As you assemble your set, make comparisons with this illustration, for it explains details which*



*may not be clear in the assembly instructions. Below, a close-up of the lower left corner. Note the arrangement of the grid leak and condenser mounted on the R. F. choke, and the twisted leads from the filament of the power tube to the A. C. binding posts*



speaker. All the interacting R. F. currents are kept in their places, with the result that the output is clear of undertone noises which would otherwise spoil the quality. This also makes the tuning less critical.

The audio end has two Karas Harmoniks, and a Thordarson output choke and 2 mfd. condenser to keep the heavy plate current of the 171 tube out of the loudspeaker.

Other details you can see in the wire-less wiring diagrams. This, by the way is drawn exactly one-half size, so that you can scale off dimensions if necessary.

#### HOW TO OPERATE IT

When the set has been completed and hooked up according to the in-

structions which follow, get an approximate adjustment on the eliminator voltage control, put the set in oscillation by regulating the midget condenser and the Hi-ohm at the top of the cabinet, and tune in a station.

Get final settings for the voltages and midget condenser. Take some time for this, and change the tubes around, if necessary, until you get the best results. This is important!

Next get the correct adjustment for the compensator knob at the bottom of the front panel.

All these controls, once set, need no further attention.

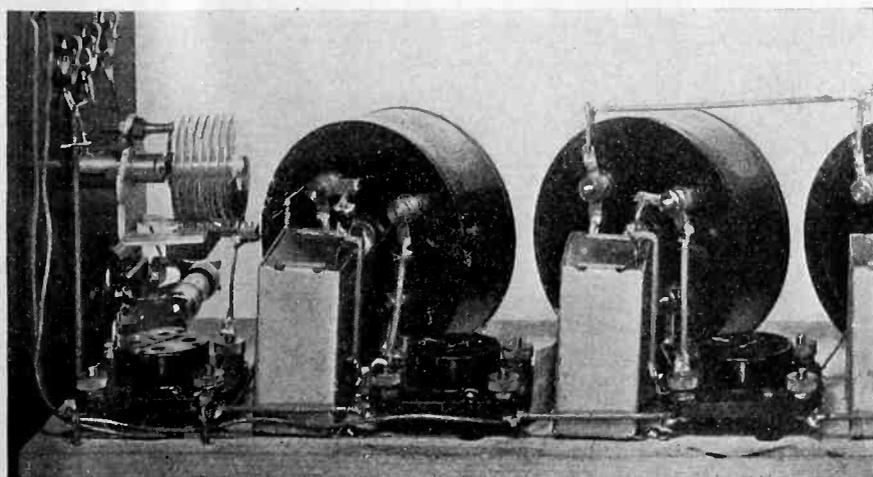
Only the Hi-ohm requires regulation after the set is tuned, for it determines the volume. Then there

is nothing else left by the main tuning dial. The single-control idea applied to a super-heterodyne circuit appears to be more practical than on tuned R. F. sets.

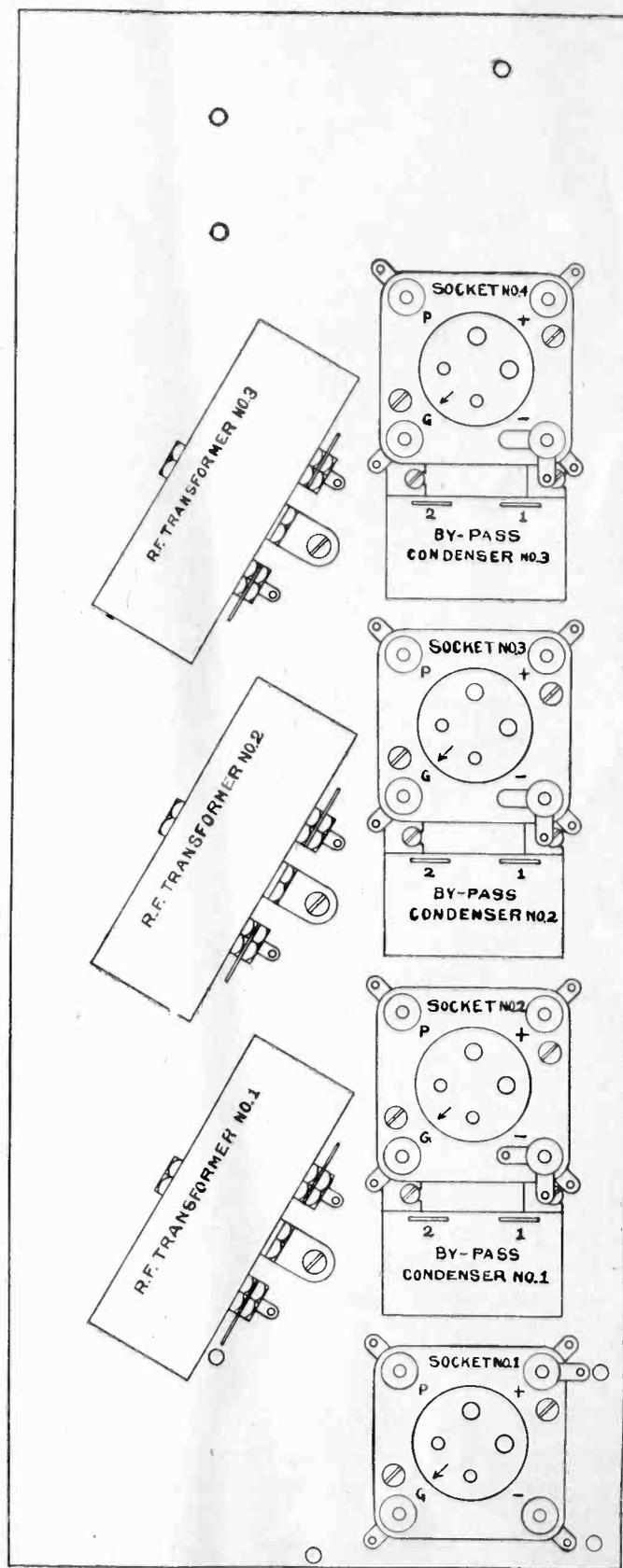
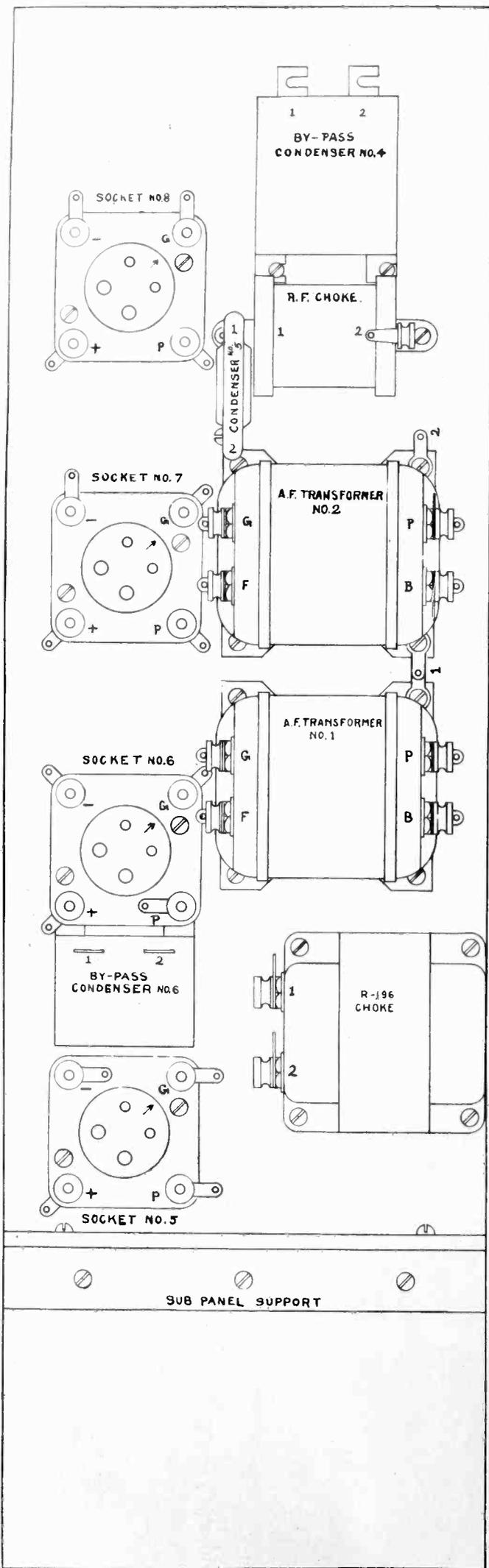
If, for any reason, you want exceptional volume on special occasions, you can operate a 3-ft. Western Electric cone at full capacity by putting a 90-volt B battery in series with the 180-volt lead from the eliminator. In an ordinary home, however, that would make the windows rattle, so it is not recommended. The power tube bias control on the eliminator must be set accordingly.

The Victoreen can operate two or three loudspeakers simultaneously. Try them in series and in parallel, to see which way they work better.

*Above, the right hand side of the set. This shows how the upper variable condenser was moved down, and the mounting plate cut off at the top. The little midget condenser, on the sub-panel, may seem hard to reach, but it is not inconven-*

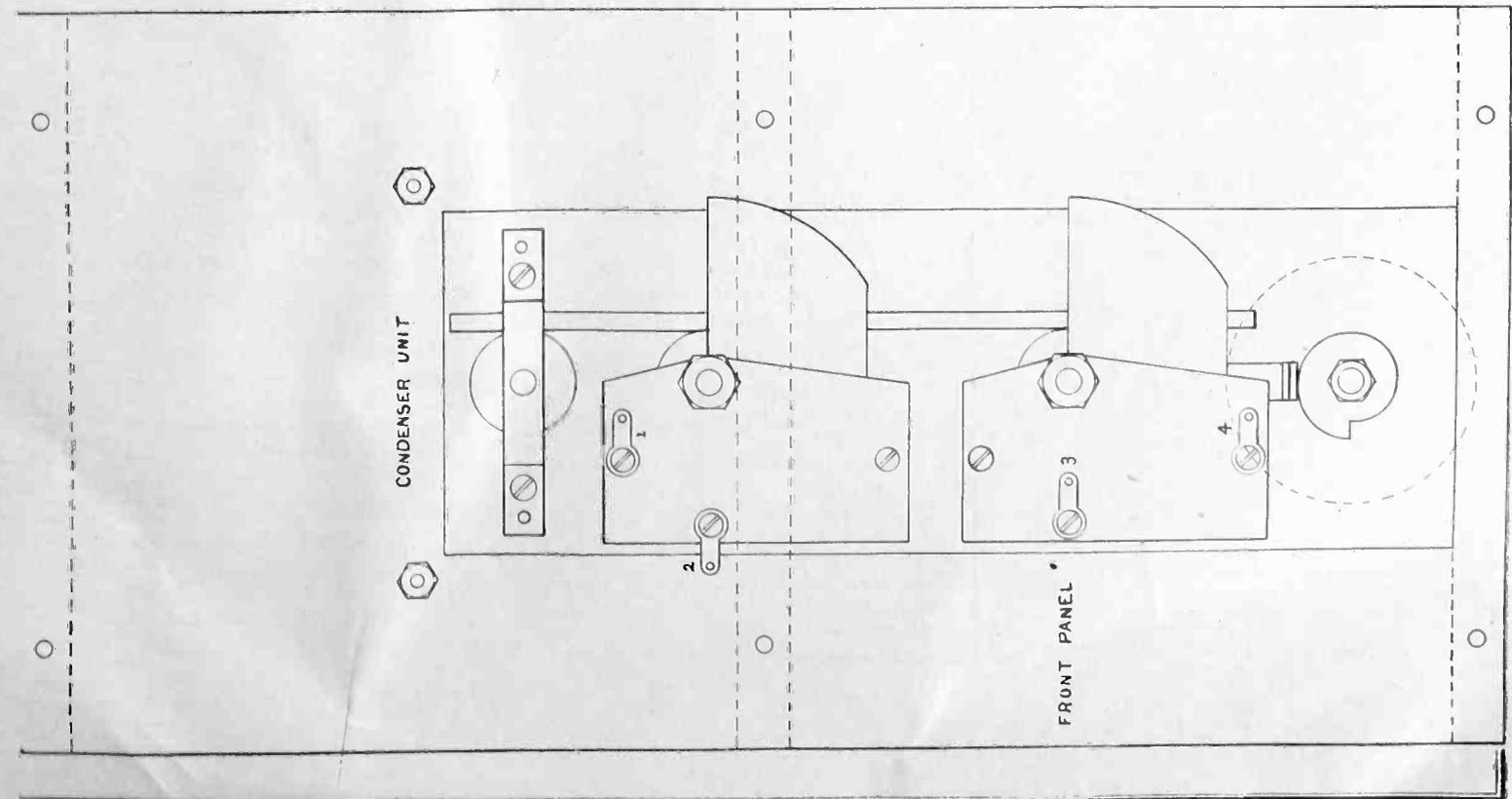
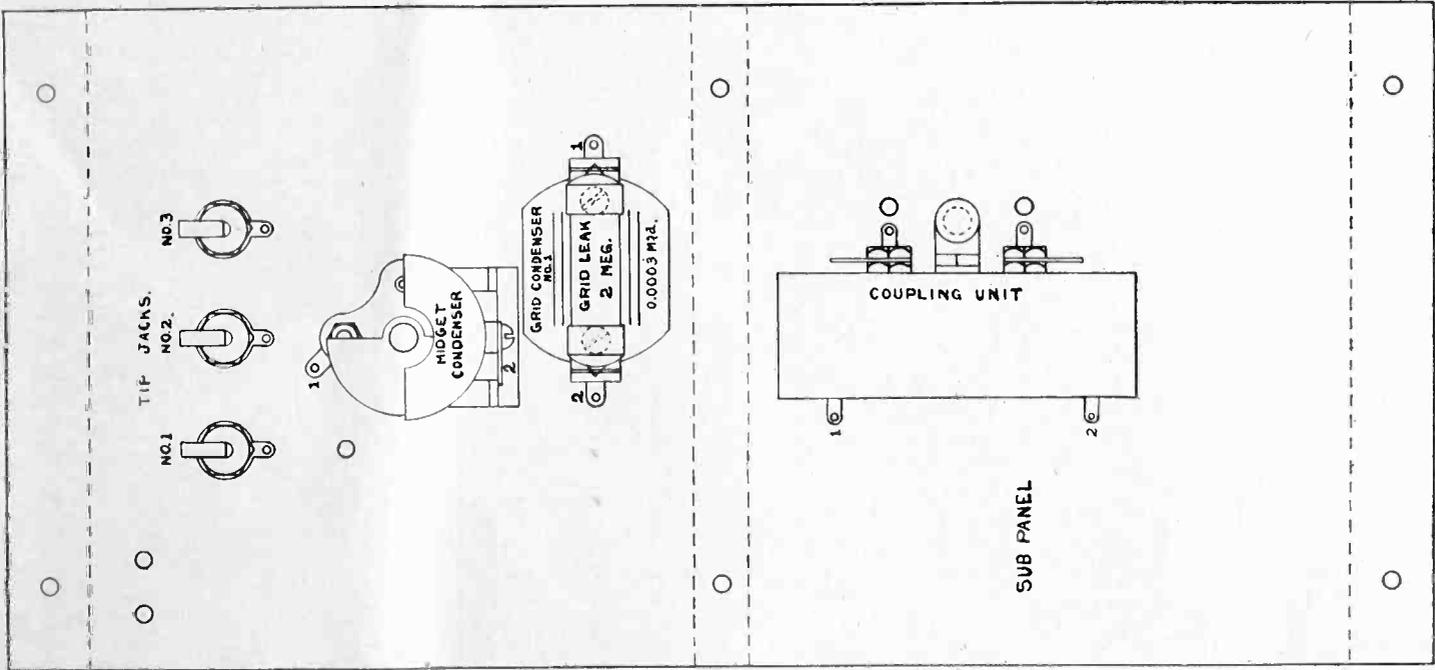
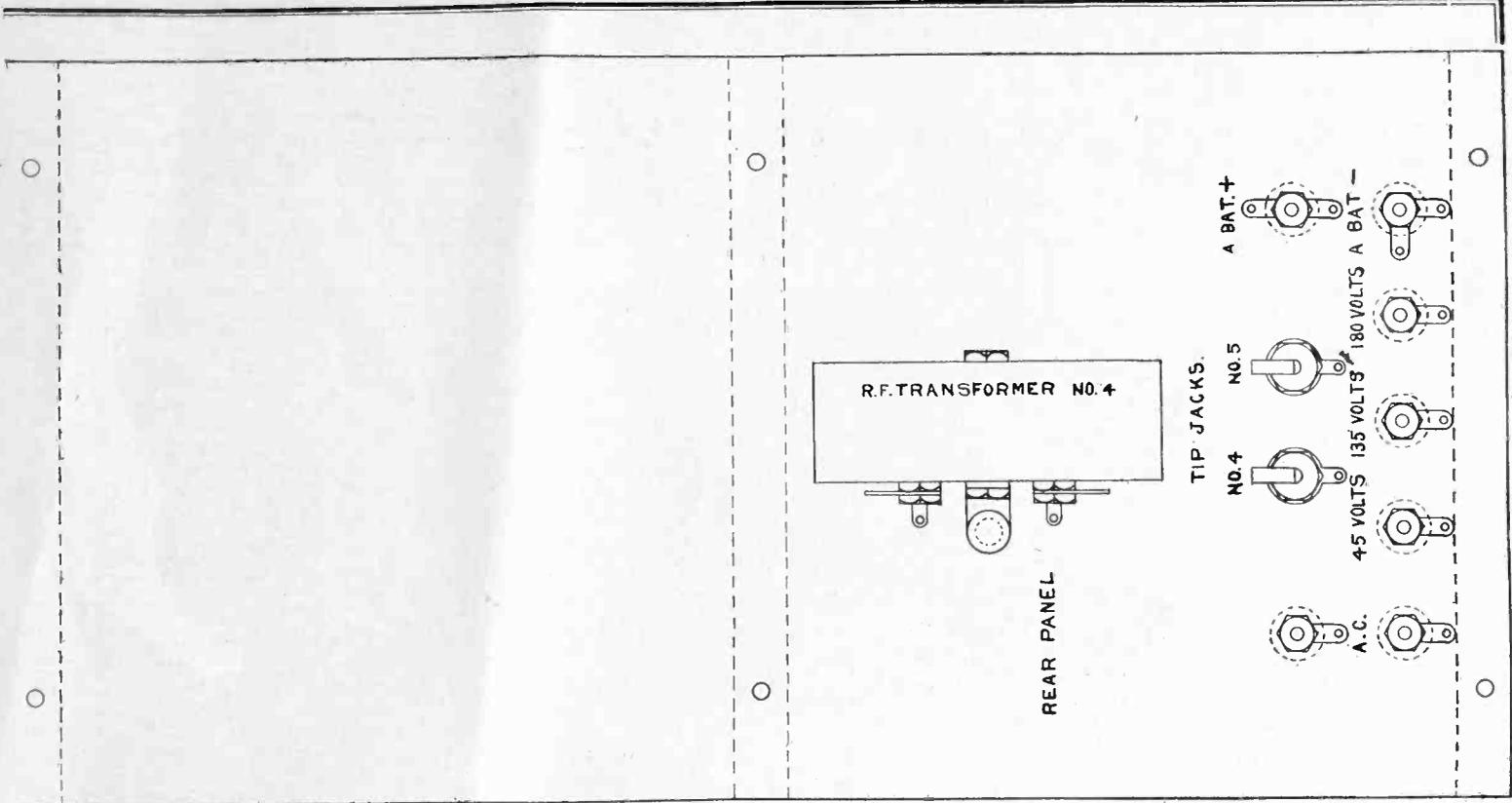


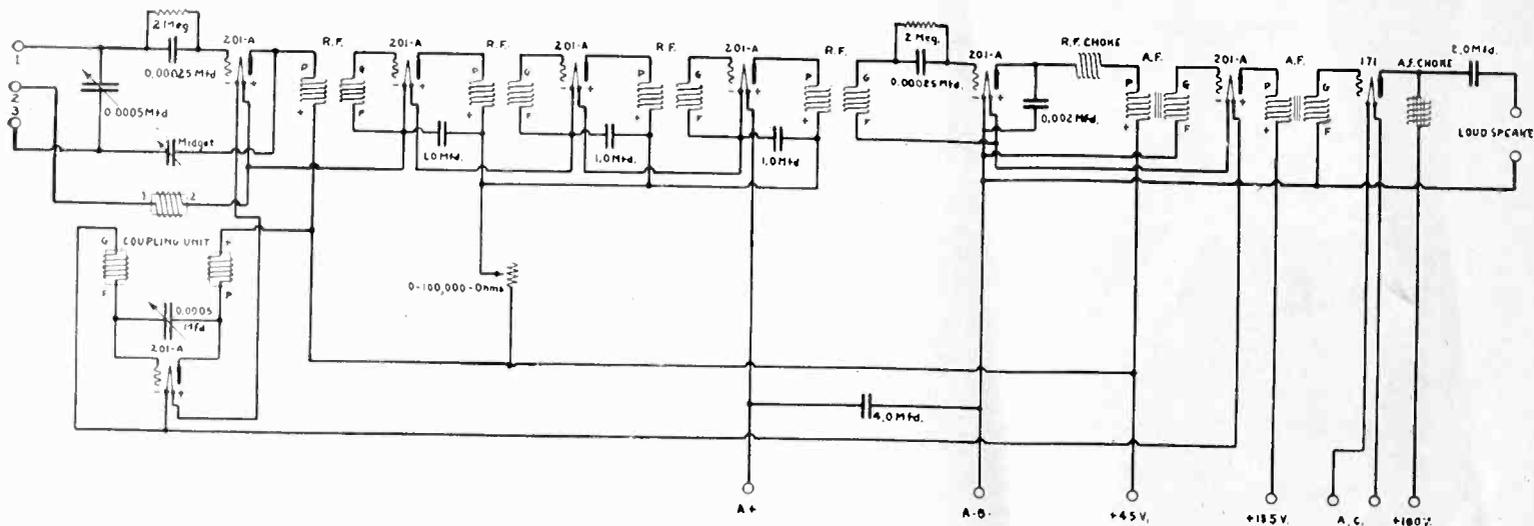
*ient because, once set, it requires no further attention. Below, details of the sub-panel and middle deck parts, showing the loop tip-jacks, grid leak and condenser, and the bypass condensers. These play a vital part in quality reproduction*



VICTOREEN  
 SOCKET-POWER-SUPER.

DATA PRINTS NO.  
 2 SHEETS SHEET NO. 1





#### GENERAL INSTRUCTIONS

It is no small job to put the Victoreen set together, but if you will follow the instructions you will avoid many pitfalls. It is far better to proceed in the correct way and have the outfit work the minute you switch on the power than to be careless and spend time in trouble shooting.

Before you start, have on hand all the parts, as itemized in the list. From the Dataprints<sup>3</sup> you can get the exact layout, full-size, for each panel and deck, with the holes accurately marked, and the drill sizes indicated.

Have the decks cut to the exact dimensions—each one is 19½ by 6 by ½ ins. They should be of well-seasoned white wood.

The front and rear panels, of hard rubber or Bakelite, measure 14 by 7 by 3/16 in. while the subpanel is 13 by 6 by 3/16 in. Have all the holes drilled before you start any assembly.

#### WIRING SUGGESTIONS

Only clean metal surfaces can be soldered together. To avoid trouble, use tinned wire—we suggest solid Celatsite which comes in straightened lengths—and tinned lugs. Do not use nickled lugs, for they do not make positive joints.

If you want your set to work and keep on working, use rosin core solder. Pastes and acids invariably cause trouble.

Get a good electric iron, if possible. Keep the point bright and clean by scratching it off frequently with a wire brush, such as is used for cleaning files.

#### THE TOP DECK

The top deck, not shown in the wire-less wiring diagrams,<sup>4</sup> has just a 100,000-ohm Carter Hi-Ohm on the top. A hole 2 ins. in diameter is made thru the deck, with its center 1¾ ins. back from the front edge. Then the Hi-Ohm is mounted at the center of a 3/16 in. piece of hard rubber 2¾ ins. square. Finally, the top of the board is chipped out so that the rubber piece sets down flush, held by flat head screws at the corners. Put a lug on each binding post.

<sup>3</sup> These can be obtained from the Dataprint Department, Radio Mechanics, Radio Hill, Poughkeepsie, N. Y.

<sup>4</sup> Patent applied for. A full-size wire-less wiring diagram is furnished in the Dataprints.

*Schematic of the Socket-Power Victoreen. If you are interested in circuits, check over the filament wiring*

#### ASSEMBLING THE FRONT PANEL

There are extra holes on the frame of the Victoreen variable condenser unit so that the control gear can be moved right down to the stationary condenser. This

#### PARTS LIST FOR THE VICTOREEN SOCKET-POWER SUPER

- 1 Victoreen No. 150 coupling unit.
- 4 Victoreen No. 170 R.F. Transformers.
- 1 Victoreen Master Control Unit.
- 8 Benjamin spring mounted sockets.
- 2 Karas Harmonik Audio Transformers.
- 1 Thordarson choke coil, type R196.
- 1 Hammarlund 11 plate midget condenser.
- 1 Tobe 4 mfd. bypass condenser.
- 1 Tobe 2 mfd. filter condenser.
- 3 Tobe 1 mfd. bypass condensers.
- 2 Sangamo .0003 mfd. fixed condensers, with gridleak clips.
- 1 Sangamo .0015 mfd. fixed condenser.
- 2 Gridleaks, 2 megohms, any good make.
- 1 Kurz-Kasch Aristocrat Vernier port dial.
- 1 Kurz-Kasch standard Rheostat knob.
- 1 Carter Hi-Ohm, 10,000 ohms.
- 5 Union phone tip jacks.
- 7 Eby binding posts, marked as follows: 2 plain, A plus, A minus, B plus 45, B plus 135, B plus 180.
- 1 Samson No. 85 R.F. Choke Coil.
- 35 feet Acme Celatsite wire, yellow insulation.
- 10 feet Acme flexible Celatsite wire, black insulation.
- 2 panels, Bakelite or Hard Rubber, 7 x 14.
- 1 panel, Bakelite or Hard Rubber, 6 x 13.
- 2 boards, ½ x 6 x 19½.
- 1 board ½ x 6 x 15½.
- 2 boards, ½ x 14 x 19½.
- 1 piece Hard Rubber, 2½ inches square.
- 2 pairs small hinges.

is shown in the illustrations. Make this change, cut off the frame, and cut off the extra rack. The wire-less wiring diagram shows this.

Mount the condenser unit, put the dial and the plain knob on the shafts, and make sure you have the condenser soldering lugs in place, as shown in the diagram.

#### ASSEMBLING THE BOTTOM DECK

Mount on the bottom deck the R-196 A. F. choke, two A. F. transformers, No. 85 R. F. choke, and condenser No. 4. Use ⅜-in. No. 6 R. H. wood screws. Screw terminal 1 of the R. F. choke into terminal 1 of condenser No. 5. Check the positions of the terminals against the wire-less wiring diagram as you proceed. Put lugs on the terminals as you mount the parts. Put lugs 1 and 1, 2 on the screws holding the A. F. transformers.

Connect F of A. F. transformer No. 1 to F of A. F. transformer No. 2; connect P of A. F. transformer No. 2 to 2 on the R. F. choke, and solder together the 1 lugs on A. F. transformers Nos. 1 and 2.

Mount condenser No. 6, bending the lugs outward so that they can be fastened to the bottom deck with ⅜-in. R. H. wood screws.

Mount sockets Nos. 5, 6, 7, and 8 with ¾-in. No. 6 R. H. wood screws.

Connect — on socket No. 5 to + on socket No. 7.

Connect P on socket No. 6 to 1 on condenser No. 6. Connect G on socket No. 6 to G on A. F. transformer No. 1.

Connect P on socket No. 7 to P on A. F. transformer No. 1. Connect G on socket No. 7 to G on A. F. transformer No. 2. Connect — on socket No. 7 to 2 on condenser No. 5 and connect — also to + on socket No. 8.

On socket No. 8, connect P to 1 on condenser No. 5; connect — to 1 on condenser No. 4; and connect — also to F on A. F. transformer No. 2.

#### ASSEMBLING THE MIDDLE DECK

Mount R. F. transformers Nos. 1, 2, and 3, and condensers Nos. 1, 2, and 3 on the middle deck, using ⅜-in. No. 6 R. H. wood screws, and mount sockets Nos. 1, 2, 3, and 4 with ¾-in. wood screws. See that the arrows on the sockets point as



### AND IN THE EVENING

*When the locals close down, a readjustment of one dial will bring in the western stations as long as one ought to listen*

shown in the wire-less wiring diagram.

On socket No. 1, connect P to G on R. F. transformer No. 1; connect + to — on socket No. 2.

On socket No. 2, connect — to 1 on condenser No. 1, and also to F on R. F. transformer No. 1; connect G to G on R. F. transformer No. 1; connect P to P on R. F. transformer No. 2; connect + to — on socket No. 3.

On socket No. 3, connect — to 1 on condenser No. 2 and also to F on R. F. transformer No. 2; connect G to G on R. F. transformer No. 2; connect P to P on R. F. transformer No. 3; connect + to — on socket No. 4.

On socket No. 4, connect — to 1 on condenser No. 3 and also to F on R. F. transformer No. 3; connect G to G on R. F. transformer No. 3.

Connect 2 on condenser No. 1 to + on R. F. transformer No. 1; connect 2 on condenser No. 2 to + on R. F. transformer No. 2; connect 2 on condenser No. 3 to + on R. F. transformer No. 3. Connect + on R. F. transformer No. 2 to + on R. F. transformer No. 3.

#### ASSEMBLING TO SUB-PANEL

Mount the three tip-jacks on the sub-panel, the midget condenser, grid condenser No. 1, and the coupling coil unit. Fasten the grid condenser with  $\frac{3}{8}$ -in. 6-32 R. H. screws, and put a lug on the outer screw at the front of the panel.

Connect tip-jack No. 1 to 1 on the midget condenser; connect tip-jack No. 2 to the upper binding post on the outside of the coupling unit; connect tip-jack 3 to 1 grid condenser No. 1.

#### ASSEMBLING THE REAR PANEL

Mount the binding posts and tip jacks on the rear panel, making sure that the lugs point in the directions shown in the wire-less wiring diagram. Mount R. F. transformer No. 4.

#### FIRST INTER-PANEL ASSEMBLY

Fasten the sub-panel bracing strips on the top and bottom decks, using  $1\frac{1}{2}$ -in. No. 6 R. H. wood screws. Be sure to locate these strips accurately. Fasten the rear-panel to the bottom deck with 1-in. No. 6 R. H. wood screws.

Wires to the tip jack No. 4, and binding posts A BAT—, 180 volts +, 135 volts +, and 45 volts + are cabled together with thread.

Connect 45 volts + to B on A. F. transformer No. 2; connect 135 volts + to B of A. F. transformer No. 1; connect 180 volts + to 1 on the R-196 choke; connect A BAT— to 1 on condenser No. 4, and to tip jack No. 5, and to lug 2 on A. F. transformer No. 2; connect A BAT + to 2 on condenser No. 4, connect tip jack No. 4 to 2 on condenser No. 6.

Using strong linen thread, cable together the wires from the binding posts which run along the edge of the bottom deck.

Connect P on socket No. 6 to 2 on the R-196 choke.

Twist two flexible wires together and connect binding posts A. C. 1 and A. C. 2 to — and + on socket No. 6.

### RECOMMENDED ACCESSORIES FOR THE VICTOREEN SOCKET-POWER SUPER

The accessories listed here have been given a thorough test in conjunction with this receiver. They are recommended because they were found to coordinate properly, and the best results from the set were realized when they were used.

- 7—Elektron 201-A type vacuum tubes
- 1—Elektron 171 type power tube
- 1—Best De Luxe cone speaker
- 1—Acme Celatsite battery cable
- 1—Radio Mechanics 01-ABC Eliminator
- 1—Bodine De Luxe loop
- 4—Cunningham CX-316 B rectifying tubes for the 01-ABC Eliminator.

On R. F. transformer No. 4 connect F, to 2 on condenser No. 5. Solder a lug on grid condenser No. 2 (0.00025 mfd., not shown in wire-less wiring diagram) to a lug on the G terminal of R. F. transformer No. 4, and connect the other side of the grid condenser to G of socket No. 8.

#### SECOND INTER-PANEL ASSEMBLY

Fasten the sub-panel to the bottom deck with  $\frac{1}{2}$ -in. No. 6 R. H. wood screws, and use the same size screws to fasten the middle deck to the rear and sub-panels.

Connect + on R. F. transformer No. 3 thru a hole in the middle deck to + on R. F. transformer No. 4. Connect P on socket No. 4 to P on R. F. transformer No. 4. Connect + on socket No. 4 to the A BAT + binding post.

Connect 2 on the midget condenser to P on socket No. 1. Connect 2 of grid condenser No. 1 to G on socket No. 1. Connect + on the coupling unit to + on R. F. transformer No. 1. Connect — on socket No. 1 to + on socket No. 5. Connect + on socket No. 1 to the lower outside terminal on the coupling unit. Connect + on the coupling unit to B on A. F. transformer No. 2.

On the coupling unit connect F to — on socket No. 5; connect G to G on socket No. 5; connect P to P on socket No. 5.

#### THIRD INTER-PANEL ASSEMBLY

Solder 12-in. flexible wires to the terminals of Hi-Ohm on the top deck, and solder 6-in. flexible leads to terminals 3 and 4 on the variable condenser unit.

Fasten the top deck in place, and put on the front panel, using  $\frac{1}{2}$ -in. No. 6, R. H. wood screws.

On the variable condenser, solder the lead from terminal 3 to P on the coupling unit, and 4 to the G terminal on

the coupling unit; connect 2 to 1 on the midget condenser; connect 1 to the lug on the front of the sub-panel on terminal 1 of grid condenser No. 1.

Connect one of the leads from the Hi-Ohm to + on R. F. transformer No. 2, and the other lead to + on R. F. transformer No. 1.

Put a 2.0-megohm grid leak in grid condenser No. 1 and a 3.0-megohm leak in grid condenser No. 2.

That completes the assembly of the Victoreen.

#### SETTING UP THE VICTOREEN

The shape of the socket power super lends itself readily to installations of all sorts. The 01-ABC eliminator can be put right beside the set, or separated by any convenient distance. There is no induction from the coils in the eliminator as they are shielded, and the cases grounded. Leads of any reasonable length will not introduce trouble because all the R. F. currents are by-passed directly to the filaments in the set.

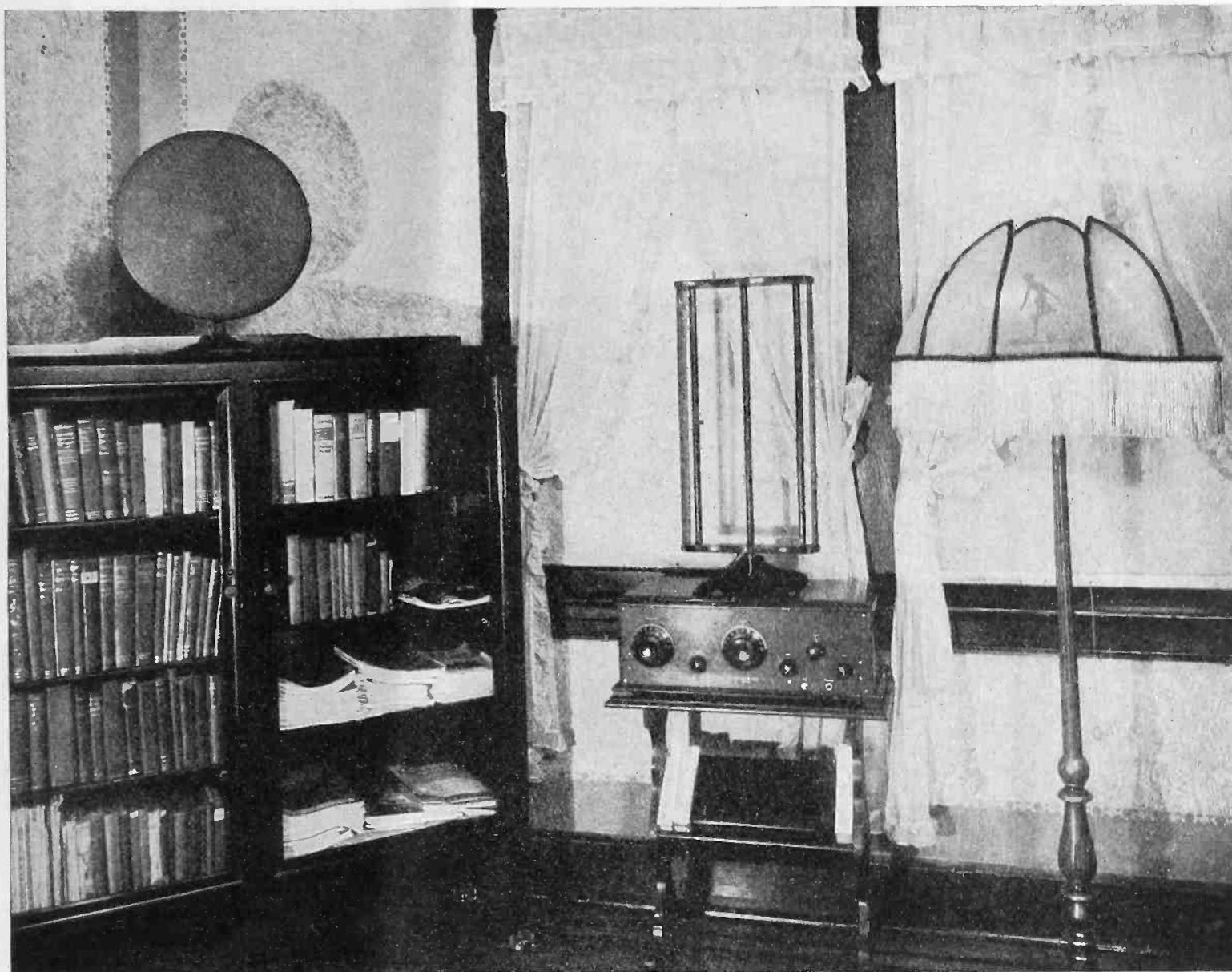
In the original installation, one loudspeaker lead was over 40 ft. long, run out-doors part of the way to get the shortest path from the attic, where the set was located, to the living room. Loudspeaker leads should be twisted, or run close together.

There are no special precautions necessary, as far as we have been able to observe from our experience in the socket power Victoreen. Used in various places, we did not have the slightest trouble. It seems to be just a matter of hooking up, adjusting the voltage controls on the eliminator, and away she goes.

However, there are certain little niceties of adjustment which can be made, and which will permit the best results to be obtained from the receiver. The midget condenser which controls feedback, and consequent regeneration in the loop circuit, should be increased in capacity until the first detector goes into oscillation. This condition will be evidenced by a "plop" in the speaker, and squeals if the master control unit is turned. The midget should then be backed off slightly from this point.

It is well to make this adjustment in connection with the regulation of the resistance on the 01-ABC eliminator which controls the B voltage to the 45 volt tap, and by varying the high resistance volume control which is located on top of the Victoreen chassis. For maximum results, it may be found advisable to increase the B voltage delivered by the 45 volt tap to 60 or 70 volts. It will then be possible to bring the intermediate stages just under the point of oscillation by adjusting the volume control. With this adjustment, the receiver will be very sensitive to distant signals, and the greatest selectivity will be obtained as well.

Super-heterodynes are often very sensitive to correct balance in the audio amplifier. Any tendency of the audio stages to sing or whistle can be cured by shunting the secondary of the first audio transformer with a fixed grid leak of about 2 megohm.



## A SET-BUILDER'S INSTALLATION

*Showing what a Good Job can be Made in a Kitchen Table Work Shop for the Living Room*

E. H. MORAN

LOTS of folks think that the only thing a set builder can turn out is the kind of junk that no one should be allowed to see. I am sending this photograph of my outfit to show the skeptics that it isn't so.

The receiver set, built in my kitchen table work shop, is an 8-tube super-heterodyne. The loop, also, is home made, stained a dark walnut to match the finish of the cabinet.

By way of novelty, the set is mounted on a small table designed to hold books underneath. However, I have put the B battery elimi-

nator where the books ought to be, and disguised it by putting just a couple books at each end.

This is much more attractive in appearance, than having the eliminator mounted horizontally on a plain shelf. At least it answers the problem of putting the eliminator in a place where it will be inconspicuous.

The A battery and charger are down cellar. The filament wires run up through a small hole in the floor. Then the A and B wiring is bunched together out of sight. You can see the 110 voltage line to the eliminator where it is fast-

ened to the upper part of the base board. Off at the right the cord goes to the floor plug.

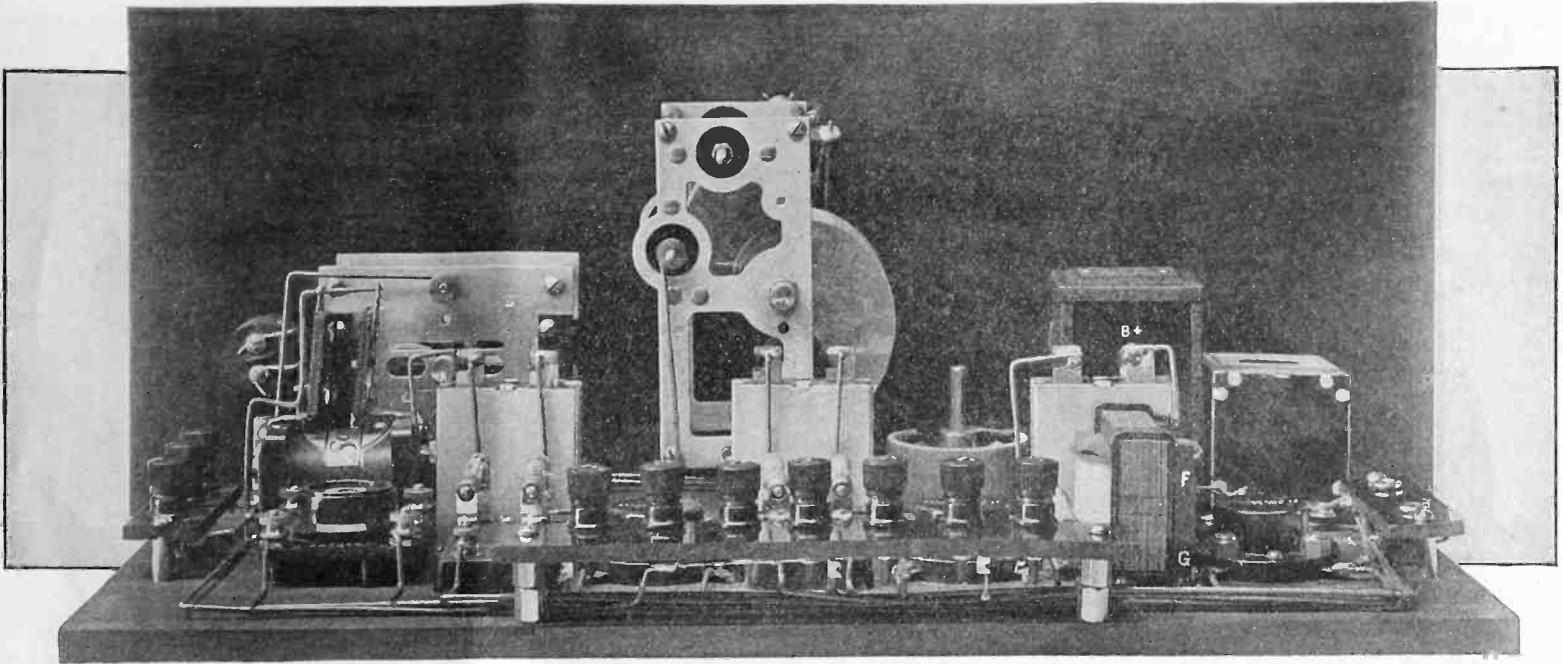
The loud speaker used, a 540 AW Cone, is on top of the book case in the corner of the room. I found that it worked best when it was placed with its back 16 ins. from the corner. This eliminates the echo effect from the wall. In addition, there is a filter in the output of the set which prevents rattling and rasping.

This is a home constructed outfit in every sense, from the loop to the eliminator.



### PASSED BY THE CENSOR

*Here is Maurice Osborne's original model of the Senator's Set, now New England's popular design*



## THIS SET SUITS BOSTON

*Originally Popularized in Boston, the Senator's Set is Winning National Approval for Its Ability to Bring in Perfect Quality Without Noises*

MAURICE OSBORNE

**L**ET me tell you a little story. Once upon a time, not so many years ago, a young fellow came to see me. He said he had a real radio set, one that could receive music by radio. He was so excited about it that, catching his enthusiasm, I went to hear it. He turned it on, tuned it in, and said, "Ah, isn't that wonderful?"

And I said, "It certainly is marvelous. I can't imagine how those innocent looking instruments can make such hideous noises!"

The moment I spoke, I was sorry, for I hadn't meant to hurt his feelings, and I did realize, even at that time, something of the future possibilities of radio if the day should come when radio receivers could produce real music.

The idea of building such a set stayed in the back of my mind. Before long, I had an outfit going in my attic work shop. I made set after set, pursuing that elusive quality reception. Broadcasting improved, new circuits were developed—and more squealing receivers were built around me, so that the net result in the loud speaker was hardly better until I started to work with a loop antenna.

### THE LOOP REDUCES SQUEALS

At that point I showed some improvements. The loop, because of its directional effect, does not pick up squeals unless the interfering receiver is in a line with the broadcasting station.

I tried super-heterodyne circuits on the loop, but they were too sensitive, picking up too much man-made static. That indicated the advisability of using a less sensitive circuit, combined with more audio amplification of specially high quality.

You can imagine how strict were my quality requirements when I tell you that, during all this time, I kept the radio up in the attic, unwilling to admit it to the living room until I could make it produce real music.

But now, with the Senator's Set completed, even under the very trying conditions of radio reception in Boston, I can bring in music that is music, and keep out all interfering noises—and with a set that is as simple in construction as can be.

### CHARACTERISTICS OF THE CIRCUIT

The circuit employs a single regenerative detector, operating without antenna or ground, on a loop. Regeneration is secured by capacity

feed-back, and the detector employs plate rectification—no grid leak or grid condenser is used.

A negative bias is put on the detector grid through the detector rheostat, this being sufficient for satisfactory operation.

The detector output passes through an R. F. filter consisting of an R. F. choke by-passed to ground on each end by a .0001 mfd. fixed condenser.

The audio amplifier consists of three stages of resistance coupling, using two high- $\mu$  tubes and a UX-171 for the power tube. In order to prevent blocking of the power tube grid, for improvement of quality and prevention of motor-boating on certain types of B-eliminators, an impedance grid-leak is employed on the power tube, this being the secondary of the small audio transformer. The power-tube output is through a 4 mfd. condenser, so that all D.C. is kept out of the loud speaker windings for protection and further improvement of quality.

What we have is therefore a detector circuit which, by regeneration, reduces resistance of the loop used for pickup to a very small

value, thereby increasing its pickup and greatly sharpening the tuning. This is followed by an audio amplifier of advanced design, practically independent of frequency, the range of which is limited only by the quality of the station output and the ability of the speaker used to reproduce the highest and lowest notes.

#### ACCESSORIES FOR THE SENATOR'S SET

The Senator's Set uses no tuning coils. In their place a Tobe folding loop is employed. This loop is a vital accessory of the set. It is of exceptionally large size and consequently large pickup. The wire is genuine Litz, with very low R.F. resistance. The taps permit using just the proper number of turns for tuning, and just the proper number of turns for regeneration. The center tap loop is not satisfactory here as it results in too much regeneration and difficulty of control.

The next accessory, equally vital to quality operation on the set, is an absolutely first-quality loud speaker, preferably of the cone type, not less than 18 ins. in diameter, the windings of which have an impedance not greater than 6,000 or 7,000 ohms. The use of a balanced armature unit is recommended, no adjustment being necessary in that case. Too much emphasis cannot be laid on using a good speaker with this set, such as the Western Electric No. 540-AW.

Current for lighting the tube filaments can be furnished from any 6-volt battery, with or without a trickle charger. Plate potential, which must be at least 180 volts for satisfactory results, is furnished

### PARTS LIST FOR THE SENATOR'S SET

Following is a list of parts used in Mr. Osborne's set.

#### LIST OF PARTS

- 1 National Equicycle variable condenser .0005 Mfd.
- 1 National "Equimeter" variable condenser .00025 Mfd.
- 1 National Velvet-Vernier illuminated dial Type C.
- 1 General Radio 30-ohm rheostat with knob for panel mounting.
- 1 General Radio 6-ohm rheostat without knob, to be mounted on baseboard.
- 3 Tobe 0.1 Mfd. filter condensers.
- 1 Tobe output condenser, for power tube output (4 Mfd.).
- 2 Tinytobe .0001 Mfd. fixed condensers.
- 3 Tobe Vacuum Tipon leaks 0.1 meg.
- 2 Double grid-leak clips.
- 1 Single grid-leak clip.
- 1 .25 meg. Tobe Vacuum Tipon leak.
- 1 .5 meg. Tobe Vacuum Tipon leak.
- 1 Samson Radio-frequency choke No. 85.
- 1 National Impedaformer Type A (for feeding plate of power tube).
- 1 Small audio transformer.
- 4 Benjamin UX sockets.
- 1 Filament switch.
- 3 Binding posts and binding post strip, 3½ ins. by 1 in. for loop terminals.
- 2 Tip-jacks and binding-post strip of hard rubber or Bakelite 2½ ins. by 1 in., for loud-speaker cord tips.
- 7 Binding posts, marked as shown on wiring diagram, and hard rubber binding post strip—7 ins. by 1 in.
- 1 Hard rubber or Bakelite front panel—7 ins. by 18 ins.
- 1 Hardwood baseboard—9 by 17 ins. by ½ in. thick.

either with four heavy duty B-batteries in series, or by a B-eliminator capable of delivering 180 volts or more with a current drain of 20 to 25 milliamperes. There will be little danger of motor-boating when operating this resistance amplifier on a B eliminator.

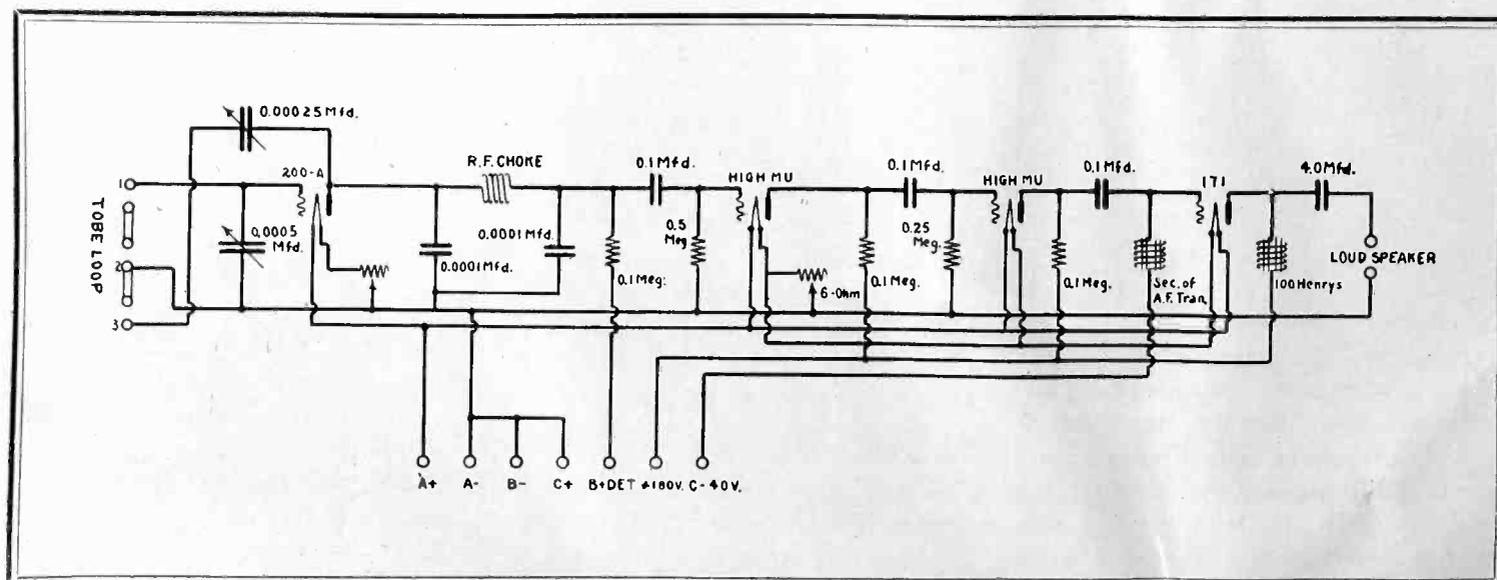
The C battery bias for the power tube is obtained either from a small 45-volt battery or, in the case of some B eliminators, can be secured from the eliminator.

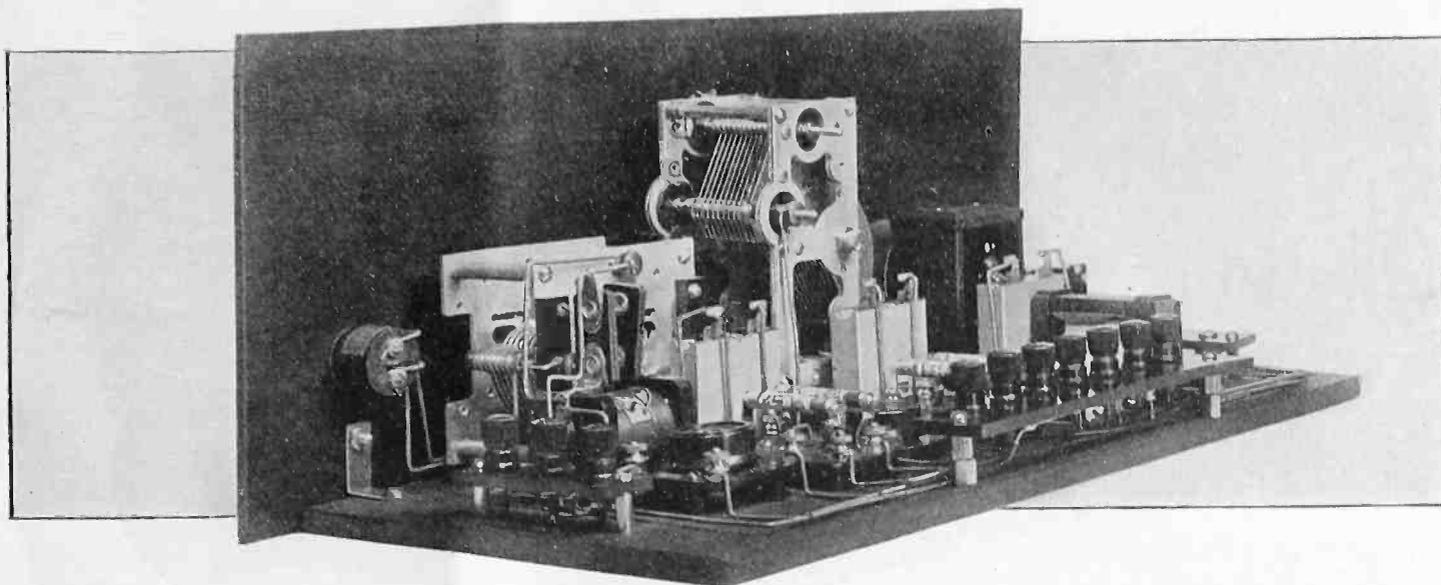
#### SUGGESTION ABOUT THE TUBES

1. Detector. While a 201-A tube is thoroughly satisfactory for a detector on local signals, it is recommended that a UX-200-A, Cleartron, or Red Top will show slightly better selectivity than any other, in addition to extreme sensitiveness.
2. The first two audio tubes should be high-mu tubes. Excellent high-mu tubes, for 5-volt operation are made by Ken-Rad, Cico, Cleartron or Ureco. Do not use a high-mu tube made for 6-volts on the filament. This set requires a 5-volt tube. The Ken-Rad Tube has a mu of nearly 40 as compared to about 20 for the others mentioned, and will give considerably more amplification.
3. The Power tube should be a UX-171. Owing to the tremendous volume that can be produced by this set, the 171 is necessary if freedom from distortion on loud notes is desired.

#### HOW TO TUNE THE SET

Tuning is done with the center and dial. Regeneration is controlled by the right-hand knob. The more the regeneration condenser is meshed, the more the regen-





eration. In general this regeneration should be kept at a minimum for the desired clearness of signal and selectivity. The left-hand knob adjusts the brightness of the filament of the detector tube. It will be found that this is only reasonably critical, but it will pay to set it very carefully for extremely distant signals and it is surprising how signal strength can be increased on distance by careful manipulation of the three controls. Of course on local signals, tuning can be done entirely with the center dial.

Selectivity is still further improved by turning the loop and the loop may also be used as a volume control on local signals by turning it to the point where the signal is of the desired loudness.

#### POSSIBLE DIFFICULTIES IN GETTING THE SET RUNNING

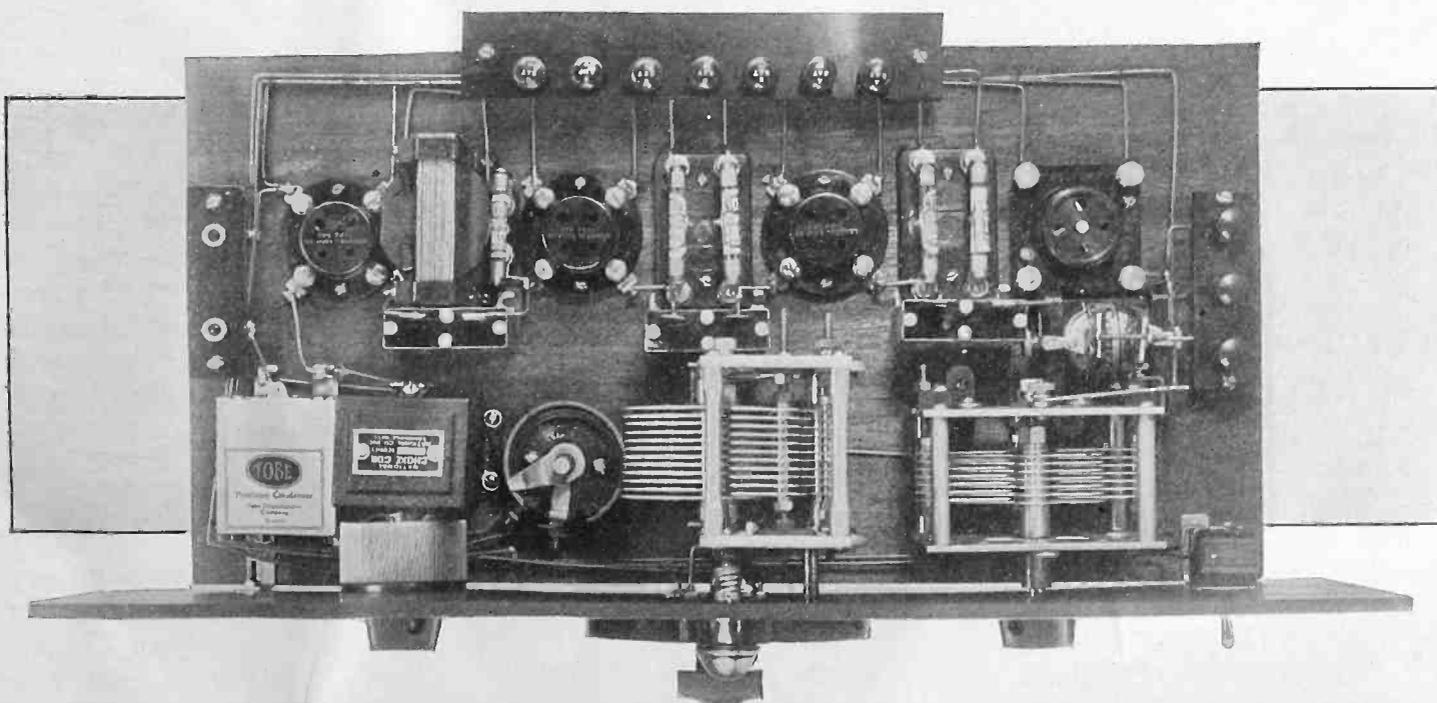
The name "motor-boating" is not very clearly understood at present. In its true meaning it denotes the noise produced by certain radio sets when connected to B-eliminators and is caused by feed-back through the plate leads to the eliminator.

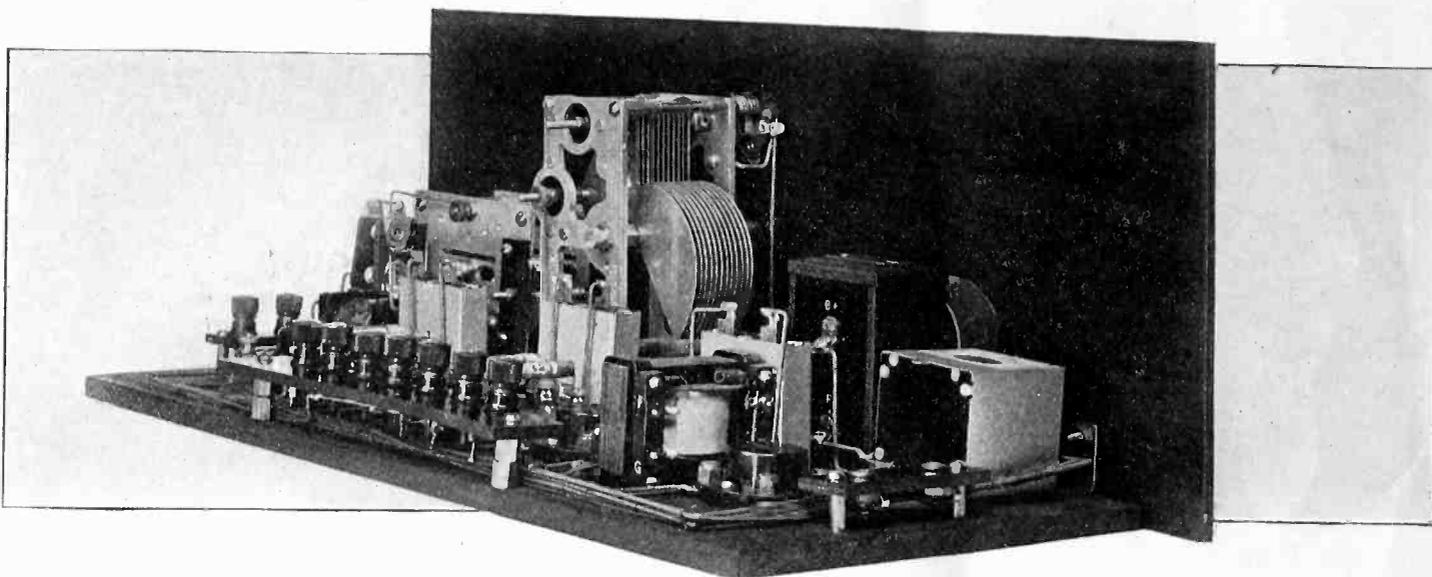
An almost identical noise is produced by an open grid on any one of the tubes in a resistance-coupled audio amplifier, or by blocking of grids where the grid-leaks are of

too high resistance. The grid-leak on the power tube in this four-tube loop-set is an impedance, (secondary of audio transformer). If the winding on the secondary is good and it is properly connected, there will be no difficulty from this source, and, in fact, this impedance leak on the power tube will be fairly complete insurance against true motor-boating. If in operating the set there is still a noise like motor-boating, investigate the grid-leaks on the first two audio tubes, which may have higher resistances than are marked on them, or the connections of which to the wiring may be poor. Sometimes using a slightly lower resistance will cure the difficulty.

As the voltage of the A-battery

*Rear and top of the Senator's set, and a mighty attractive layout, too. You can see how, by persistent design and redesign, Mr. Osbane has developed this quality set*





runs down, the quality of output will not remain at the top notch. Be sure the A-battery is kept charged.

It will be found in operating the set that with the proper brightness of filament on the detector, the set will go in and out of oscillation very smoothly. Distant stations are picked up by oscillating the set slightly and getting in the center of the squeal, then backing off the regeneration in the usual manner to a point where the signal is loudest and clearest. If the set will not oscillate over the broadcast range, increase the detector B voltage until it does. The operator need have no fear of disturbing others, as the loop is so small that it will not radiate sufficient energy to disturb even a next-door neighbor.

The owner of the Four-Tube Loop-Set need have no fear of using telephones for picking up extremely distant stations, as all of the high voltage is kept out of the speaker or phone windings by the tone-filter.

## NOTES ON THE SUBMARINE SET

The Submarine Set, described last month in Radio Mechanics, has called forth repeated requests for the parts list. This four-tube job, built on the battleship plan, is equipped with four plug-in coils wound on a film of celluloid, making them practically free from all dielectric losses. As a result of the

*The output end. The A. F. transformer secondary is connected as an impedance grid leak on the last tube, to prevent motor boating*

efficiency of the coils and the circuit, the Submarine is capable of receiving up to 10,000 miles on short waves. The original model, now operating on a farm in New York State, brings in Chicago and other western stations over 1,000 miles at good loud-speaker volume.

Here is the parts list:

- 1 Complete Twin Coupler coil kit.
- 1 0.0005 mfd. Pilot S. L. F. condenser.
- 1 0.001 mfd. Pilot S. L. F. condenser.
- 1 Illuminated Pilot vernier dial.
- 4 Leaks—2, 1, 1/10, 1/4 meg.
- 1 Grid condenser, 0.00025 mfd.
- 1 Coupling condenser, 0.006 mfd.
- 4 Pilot universal sockets.
- 1 Filament switch.
- 1 Plain knob, 1/4-in. hole.
- 1 6-ohm rheostat.
- 1 Set of marked binding posts.
- 2 Hard rubber panels, 7 by 12 by 3/16 in.
- 3 Wooden decks, 6 by 15 1/2 by 3/8 in.
- 1 Muter resistance coupling unit.
- 1 Muter single resistance mounting.
- 2 Pilot A. F. transformers.
- 1 Roll of wire.
- 1 Package of 50 tinned lugs.
- 1 Package of wood screws.

One complaint has been received about the operation of the set—trouble from howling has been experienced. That is due to excessive voltage on the plate of the detector tube, or the omission of the resistance across the secondary of the first A. F. transformer. The detector should have between 22 1/2 and 45 volts on the plate. If this adjustment does not stop the howl, change the value of the resistance across the transformer. Be sure not to turn the filament rheostat too high. That reduces the life of the tubes and makes the circuit unstable.

A remarkable thing about the operation of the Submarine is its approach to single-control tuning. It is actually much nearer to single-control than many one-dial sets which require two or three vernier adjustments.

The wavelength setting of the Submarine is controlled by the illuminated dial. The lower knob regulates the regeneration, but it is not critical even when the circuit is right up at maximum signal strength.

Only one setting of the lower knob is required from 0 to 50 on the dial. Then it must be reset for best signals from 50 to 100. There are no verniers.

This outfit, by the way, is splendid for use in the western part of the country for receiving the short wave broadcasting from KDKA and WGY. Down around 80 meters and below, the receiving range is practically unlimited.

# RADIO PHYSICS COURSE

## Chapter 3 — Concluded: Describing Some of the Peculiarities of Radio Transmission Effects

ALFRED H. GHIRARDI

IT is evident that the circuit of Fig. 30 A will respond to waves from any station, provided enough current is induced in the antenna circuit by these waves, to operate the phones. This suggests at once the two important drawbacks of this arrangement. Since it will respond only to waves of comparatively great strength, its receiving range is limited to 5 to 25 miles, depending on conditions. As there are hundreds of broadcasting stations, many of them in the same city, if several of them transmit at the same time with enough power to permit of reception by the crystal set, they will be received at once,

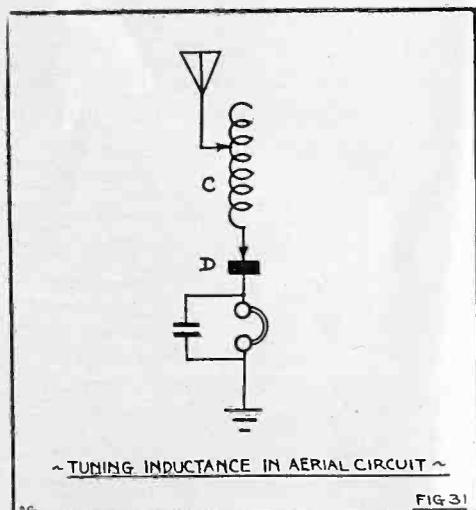


Fig. 31. A semi-tuned receiving circuit

creating interference, and reception would be anything but pleasant.

These facts make it evident that if programs from distant stations are to be heard, some form of amplifying device must be employed to strengthen the currents induced in the antenna circuit. This will be considered later. Since it is desired to hear only one station at a time, some provision must also be made for selecting the program of any one station to the exclusion of all others. This is accomplished by having all the stations in the same locality operate with carrier currents of different frequencies or wave lengths. Thus in New York City station W E A F transmits with a carrier wave frequency of 610 kilocycles, 492 meters, W J Z

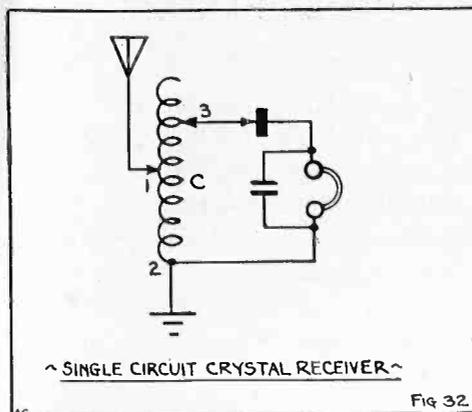


Fig. 32. The historic double-slide tuner circuit, not so long ago the pinnacle of radio achievement

with 660 K. C., 454 meters, W O R with 740 K. C., 405 meters, etc. These frequencies are supposed to be assigned to the stations by the government when their transmitting licenses are taken out. Some stations in the same city as W A H G and W G B S are assigned the same frequencies but they do not broadcast simultaneously.

In order to select the station desired and exclude all others which may be transmitting at the time, some means must be provided for excluding the induced currents of the frequencies of the stations not wanted, and allow the currents of the frequency of the station desired to flow through the receiving apparatus. The ability of a receiving set to do this satisfactorily is a measure of its selectivity. This is called tuning and the process is commonly spoken of as tuning in a station. All tuning in radio sets at the present time is accomplished by making use of the resonance effect of alternating currents explained in Chapter 1.

The circuit of Fig. 30 A can be roughly tuned to any frequency by the introduction of an inductance coil C, Fig. 31, consisting of a number of turns of insulated wire wound on a cylindrical form. A sliding contact is arranged to make connection with any number of turns of the coil. The inductance is increased or decreased by increasing or decreasing the number of turns respectively. By moving the

slider, more or less inductance can be inserted in series with the antenna thereby changing the frequency to which the circuit will respond most strongly, and the station it will receive.

This receiver is not selective enough for present day use. Since the crystal detector and phones have a high resistance and they are in the path of the antenna circuit the tuning is very broad and the volume is poor.

The tuning can be sharpened considerably by removing the detector and phone resistance from the antenna circuit and putting them in a

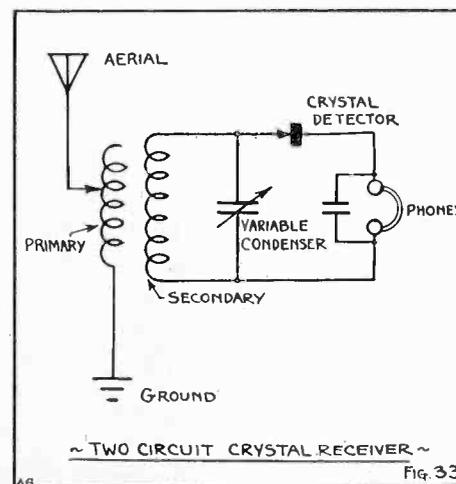


Fig. 33. Here is the diagram of the famous loose coupler

circuit by themselves as in Fig. 32. Coil C has two sliding contacts. The antenna circuit includes all the turns of wire between 1 and 2 while the secondary circuit containing the crystal detector and receivers includes the turns between 2 and 3. It is thus possible to tune both the antenna and secondary circuit to the proper frequency. This is known as the single circuit receiver.

The single circuit crystal receiver is not usually selective enough in congested districts where many stations are operating at once on frequencies which are close. As will be explained later, in order to get maximum response and maximum selectivity it is important to keep the resistance of the antenna and

(Concluded on page 282)

# NOTES ON THE ECLIPSE SUPER-HET

*Additional Information for Set Builders on 9-Tube Eclipse DX Receiver*

GEORGE LESLIE

WHEN we give you the full constructional details of a receiver one month, and then, in answer to popular demand, we give you some more dope on it in the following issue, you can make up your mind that the set must be pretty good. So it is with the Eclipse super, first described in the February issue of RADIO MECHANICS.

The Eclipse is undoubtedly an ideal set for the man who wants distant reception regardless of how many local stations surround him. In fact, the Eclipse is fully capable of penetrating most severe local interference. A slight turn of both dials, and nearby stations are tuned out with uncanny ease. Tested in the congested broadcast areas of New York and Chicago, this receiver has nightly brought in dozens of distant stations through a barrage of interference considered impenetrable by the owners of many sets.

Many receivers incorporating H. F. L. units have been built, and favorable reports on these sets have been coming in from all sides. The design is so sound, and the performance has been so excellent, that several manufacturers have combined to put out a kit of parts for the complete receiver. The purchase of this kit greatly facilitates the assembly of the set by the constructor, for the panels are all drilled and engraved, and a lot of measuring and labor is saved by their use.

The arrangement of parts used in the new layout, which is known as the Nine-in-Line, is somewhat

different from that employed in our original model. However, the circuit used is exactly the same. We have given both designs a thorough test, and have found the performance to be equally satisfactory.

Some of the parts are of different make from those used in the original Eclipse. For your convenience, a list of the ones used in the new model, shown in the accompanying photograph, is given here.

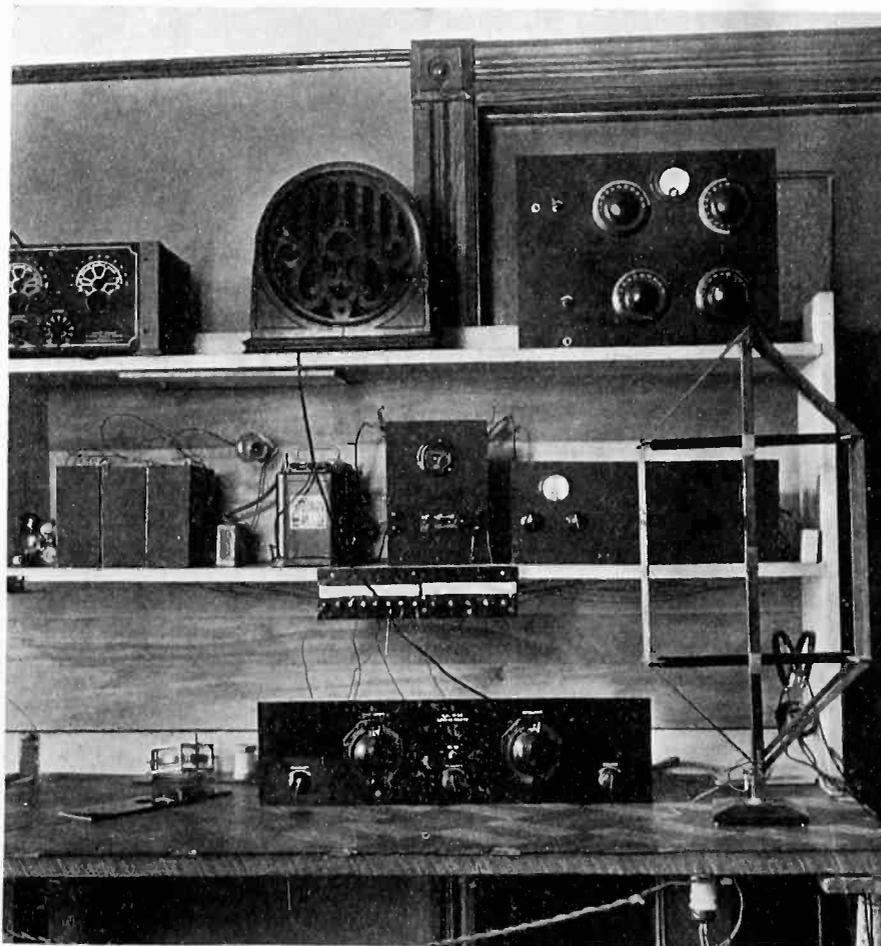
- 1—Quali-tone loop
- 3—H. F. L. H.210 transformers
- 2—H. F. L. H.215 transformers
- 2—H. F. L. F.320 transformers
- 1—H. F. L. L.425 radio frequency choke unit
- 1—H. F. L. L.430 radio frequency transformer
- 9—Benjamin sockets for sub panel mounting
- 1—Pair Benjamin sub panel mounting brackets
- 1—Yaxley cable connector complete

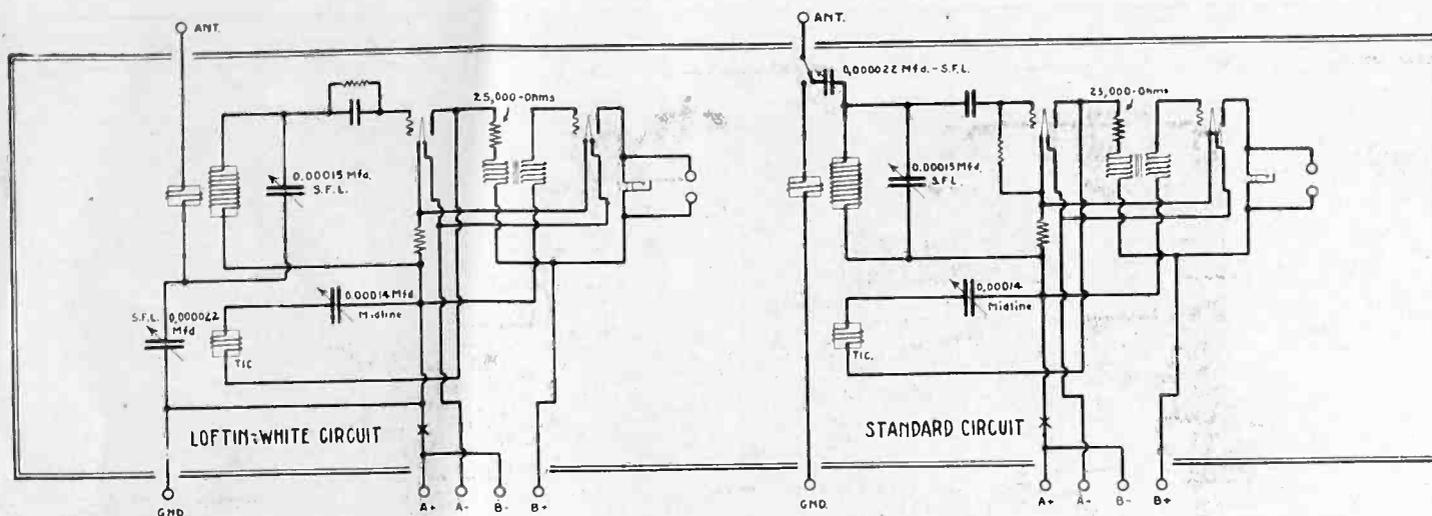
*Testing set-up at Radio Hill for the standard Eclipse Kit design*

- 1—Yaxley filament switch
- 1—Yaxley 6-ohm rheostat
- 1—Yaxley 25 ohm rheostat
- 5—Yaxley pup jacks
- 1—Celeron 7 x 26 front panel, drilled and engraved
- 1—Celeron 7 x 24 sub panel, drilled
- 2—Remler .0005 mfd. S. L. F. variable condensers
- 1—Sangamo .002 mfd. fixed condenser
- 2—Sangamo .0005 mfd. fixed condensers
- 2—Sangamo 1. mfd. bypass condensers
- 1—Centralab 500,000 ohm modulator
- 2—Kurz-Krasch Aristocrat vernier port dials, 0-200
- 1—Chelton .000045 mfd. variable midget condenser

With these parts and the panels drilled and engraved for them, you can build the equivalent of the Eclipse, without having to do the special work called for in the Eclipse design shown in RADIO MECHANICS for February.

The use of the 360 degree variable condensers recommended is a decided advantage with the Eclipse. The tuning is so exceptionally sharp that the utmost care must be exercised when the dials are tuned on 180 degree condensers. Otherwise, even nearby stations will be passed over unnoticed. The condensers specified for this design possess an additional advantage. That is, both sets of plates are insulated from the rotor shaft, and there is thus no danger of body capacity. This advantage will be more readily appreciated when one stops to consider that both sides of the oscillator and loop condensers are above ground potential and that a grounded rotor condenser causes hand capacity effects.





## IMPROVING THE 10,000-MILE SET

*Bert Smith's Famous Set for Short Waves and Broadcasting Can Be Further Improved by an Adaptation of the New Loftin-White High Efficiency Circuit*

**T**ABULATED records show that Bert Smith's short wave receiver, shown in *RADIO MECHANICS* for November, 1926,<sup>1</sup> is the most popular design that we have published, and Dataprint orders for this outfit have exceeded all other designs. Capable of bringing in short wave stations 10,000 miles away, and broadcasting stations over a great range, its efficiency can be increased still more by an adaptation of the Loftin-White circuit.

Space does not permit here a full discussion of the Loftin-White system, and its description necessarily would be so technical that the average reader would have difficulty in understanding it. However, its action and effects can be described briefly.

Without putting on any new controls or parts, this system automatically adds capacitive coupling between the antenna and the grid of the detector tube but it maintains, at the same time, the amount of inductive coupling necessary for operation on the short waves. When this method is used, the gain in sensitivity is very marked, particularly on the upper end of each band. In fact, comparative operation, using

an audibility meter, shows an increase in signal strength of from eight to sixteen times on the longer waves, according to Bert Smith's report. Surely this gain is worth while, and you will be amply rewarded for the slight working involved in making the changes.

The application of the Loftin-White system to the New Day Set is simplicity itself. No extra parts are required beyond those used in the original outfit. A schematic diagram is given here, and will suffice for the information of the experienced constructor. However, for the benefit of those who are not sufficiently familiar with schematics to work from them, we give here the details of the necessary changes.

The layout is the same as that used in the November number of *RADIO MECHANICS*. Reference to the wire-less wiring diagram in that issue will enable the novice to make these changes easily.

First, connect the antenna to the end of the primary coil furthest from the socket, and connect the other end of the primary coil to the stator of the three-plate condenser, and to the rotor of the tuning condenser. The rotor of the tuning condenser must be removed from all other connections. One side of the A battery, and the frame of the

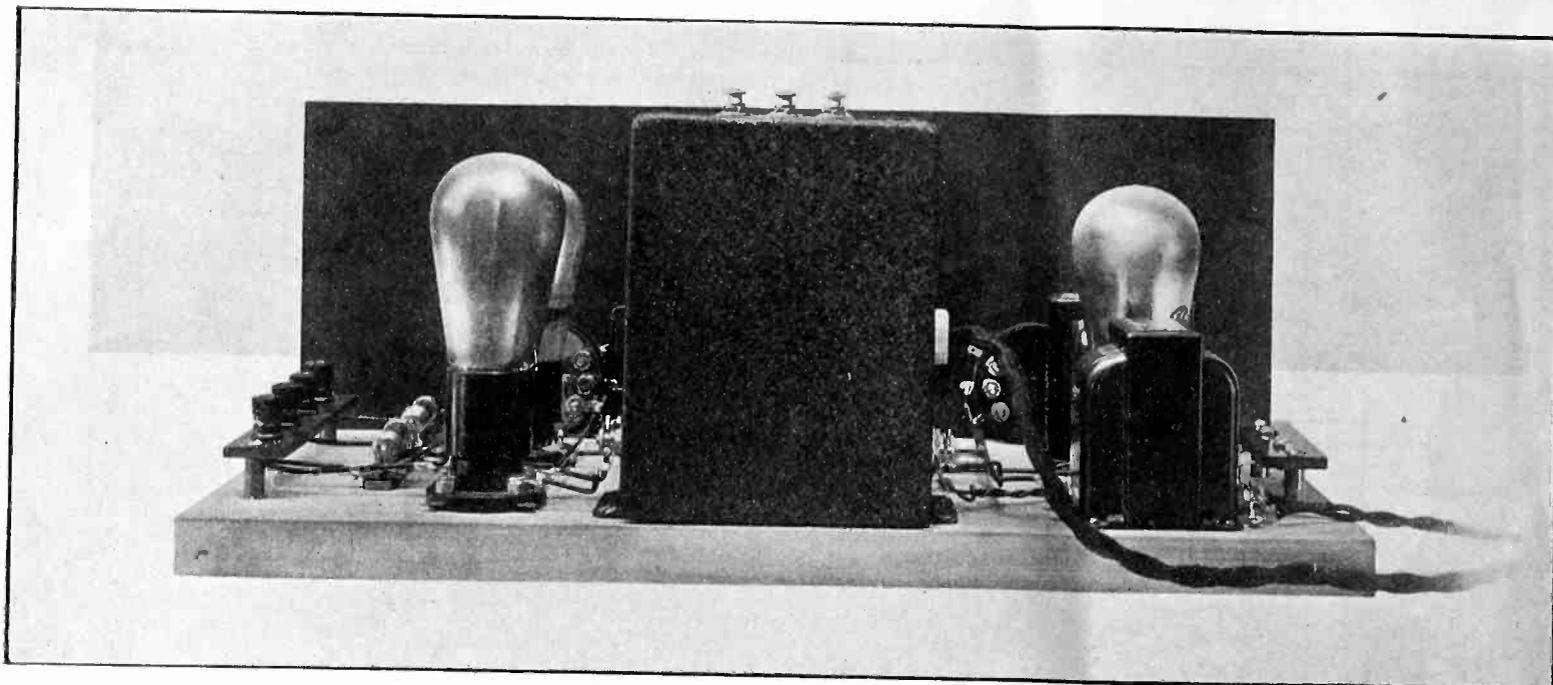
three-plate condenser, must be grounded.

The operation of the set is the same as before, with one exception. The three-plate condenser is used at maximum capacity for all wavelengths above one hundred meters. In order to reach stations using wavelengths above five hundred meters, it may be found necessary to shunt the three-plate condenser with a 0.0001 mfd. fixed condenser. When it is desired to receive the shorter wave stations, this fixed condenser should be removed.

It is further advisable to shunt the grid leak across the grid condenser, in the usual manner, when using this new system. In the original model, the grid leak returned directly to the filament.

The New Day Set, incorporating the Loftin-White system, makes an excellent all-wave receiver. These changes afford such an increase in signal strength, particularly on the upper edge of the broadcast band, that reliable loud speaker reception of distant broadcasting stations can be achieved when a power amplifier is attached to the output. In this connection, the Quality Amplifier also described in the November, 1926, issue of *Radio Mechanics* makes an ideal combination when used with the New Day Set.

<sup>1</sup> This copy and Dataprints for the set can be obtained from Radio Mechanics, Radio Hill, Poughkeepsie, N. Y.



## 2 2 0 T I M E S M O R E P O W E R

*That's What You Get When You Put This 210 Eliminator and Amplifier Compact on an Ordinary Set*

THOMAS LEAHEY

**Y**ES, sir, two hundred and twenty times greater is the handling capacity of the 210 amplifier tube than the ordinary 201-A.

Every time I drop in to see friends of mine who have radio sets, they want me to listen to "quality." Why most of them don't know what quality is. "Now," they say, "you never heard better quality than that!"

Haven't I? Well I should say I have. A well-designed set does give good reproduction with a 201-A tube in the last A. F. stage, but no set so equipped does any-

thing to justify a man's sticking out his chest over it.

Yet there are lots of people who think a power tube just couldn't improve their sets.

### A COMPARISON OF THE TUBES

Did you ever ride in a Ford at forty miles an hour? You know how the over-taxed engine shivers and shakes as if it were trying to get loose from itself? And have you glided along, as if through the air, in a Lincoln going seventy-five miles an hour, with the car acting as tho it didn't have an engine?

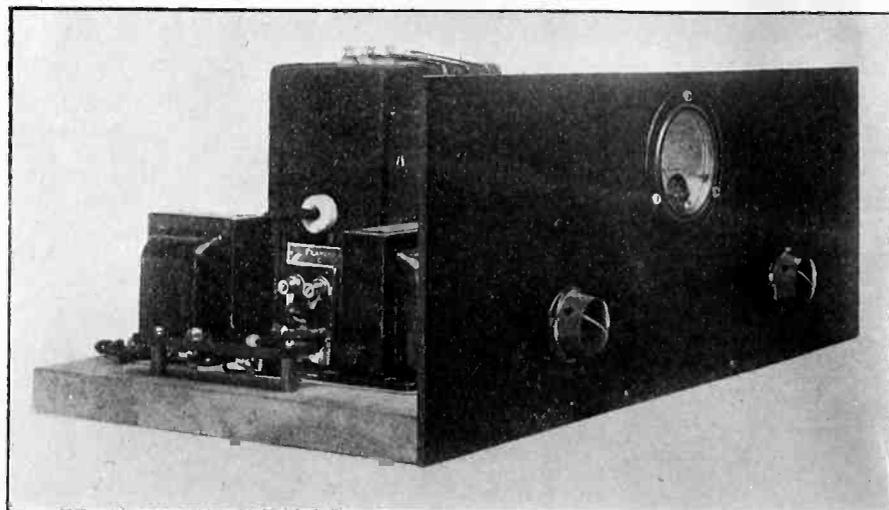
Now consider that the undistorted output of a 210 tube is just 220 times that of the 201-A! Then you'll have some idea of the difference in performance of the two tubes. Multiply the Ford engine by 220, and think what a power plant you'd have.

The two tubes are as different as a battery motor with loose bearings, shivering itself to pieces at 1,500 R.P.M. and a steam turbine purring away at 40,000 R.P.M.

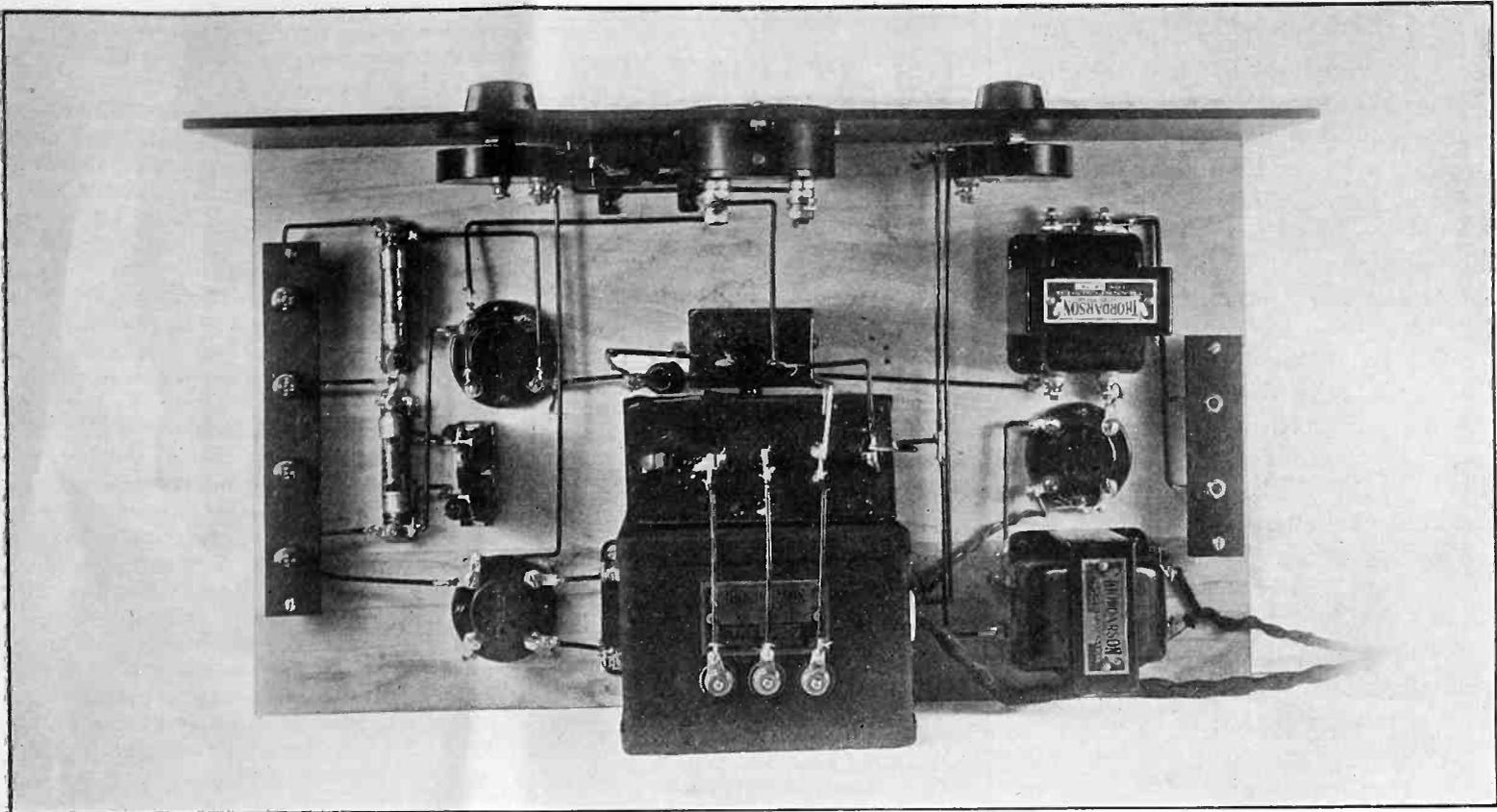
### QUALITY—NOT VOLUME

People who say they are satisfied

*Bring your set right up to date! Put on a power amplifier. The perfection of broadcasting station equipment has progressed far beyond receiving set design. Practically perfect speech and music is coming into your antenna. Why not use it? That's why the new tubes*



*were developed so that you can get the new kind of quality from the air that is being put into it. But you can't do it with a 201-A in the last amplifying stage. Use the 210 Compact quality amplifier run from the house current, and take your B supply from it, too*



with 201-A quality usually mean that they are satisfied with the volume. But a 210 amplifier isn't used for more volume, necessarily. It's real purpose is to give quality reproduction. Also, since 210 amplifiers are always designed to operate from the A.C. lighting supply, they are very simple to install and require no attention.

As an added convenience, this 210 Compact is made to furnish B voltage for all the tubes in the radio set. Nor is this 210 Compact to be confused with ordinary B eliminators.

**THE PURPOSE OF VOLTAGE REGULATION**

The ordinary B eliminator de-

livers approximately the voltage indicated on the terminals. That's the trouble. It isn't necessary to get exactly 90 volts from the 90-volt binding post, but whatever it is, a few volts above or below, it must not vary the slightest bit while the set is in use.

However, if you have used an ordinary B eliminator you know how your set frequently, and for no apparent reason, pops into oscillation. If you have made measurements on B eliminators, you know that, from minute to minute, the 90-volt tap gives a varying voltage which may range from 86 to 94. If you adjust your set right on the nose when the eliminator is giving 88 volts, and, because of fluctuation in the A.

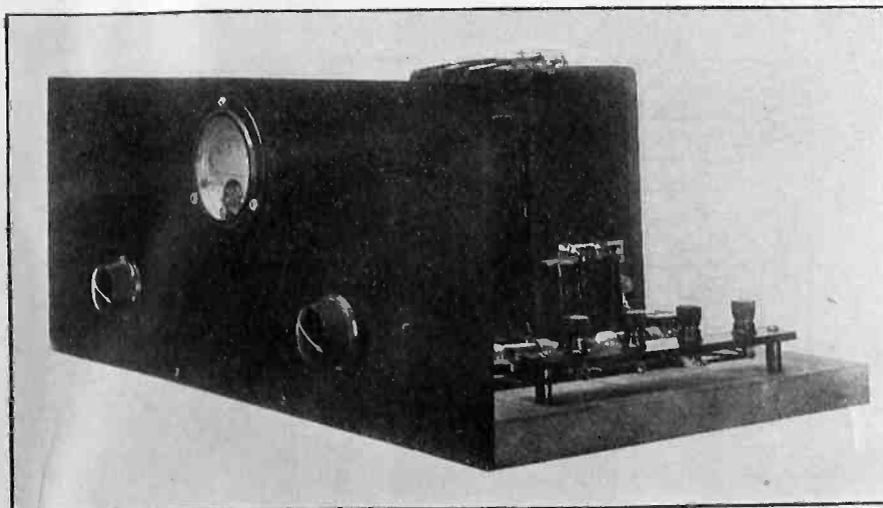
C. line voltage, the voltage goes up to 92, the set will suddenly break into oscillation.

On the other hand, if you tuned in with 90 volts on your tubes, and the B eliminator drops to 84, the signals will fade.

But not when you use the 210 Compact. This unit has a glow tube, type 874 or 374, to absorb any changes due to variations in the line voltage.<sup>1</sup> By this means the bugbear of eliminators is eliminated. You can't tell the difference, without looking, when a set run from batteries is shifted to the 210 Compact.

<sup>1</sup> For technical data, see Feb., 1927, issue of Radio Engineering, published by Radio Engineering, Inc., Radio Hill, Poughkeepsie, N. Y.

*Above, a top view of the 210 Compact unit. The filter circuit is contained entirely in the two big cases at the rear of the panel. On the right are the input transformer and output impedance. The three sockets are for the rectifier and amplifier tubes and the*



*glow tube voltage regulator. When the line voltage goes up, a greater amount of current is by-passed thru the glow tube, thus keeping the 90-volt tap constant. In operation, a pink light appears around the elements in the glow tube*

## THE SIMPLEST CONSTRUCTION JOB

Don't be afraid to build the 210 unit. There are just a few simple parts to put together, and very little wiring. By combining all the important parts in one case—the big one at the rear of the base board—and putting most of the condensers in another box next to it, half the wiring is done for you.

The front panel is of hard rubber or Bakelite, 3/16 in. thick, 7 by 18 ins. The base board, of well-seasoned white wood, measures 10 by 18 by 1/2 in. thick. Then there are two terminal strips of 3/16 in. hard rubber, on 6 1/2 by 1 in., and another 4 by 1 in. They are held off the base board by brass pillars.

Dataprints<sup>2</sup> have been prepared for this unit. They include full-sized panel patterns, a full-size wireless wiring diagram,<sup>3</sup> parts list, and special information.

All the holes should be drilled in the front panel before any assembly is started. The hole for the meter must be made with a fly-cutter. Try the fly-cutter on a piece of scrap panel for this tool usually makes a bigger hole than that for which it is set.

## ASSEMBLY AND WIRING

With the panel pattern and the wireless wiring diagram as a guide, mount the parts, putting on lugs as you go, and fasten the front panel to the base panel. Also compare your connections in the diagram as page 267.

For wiring use stiff Celatsite, and make the joints with rosin core solder. Run the wires as directly as possible. This can be seen in the photos of the original model.

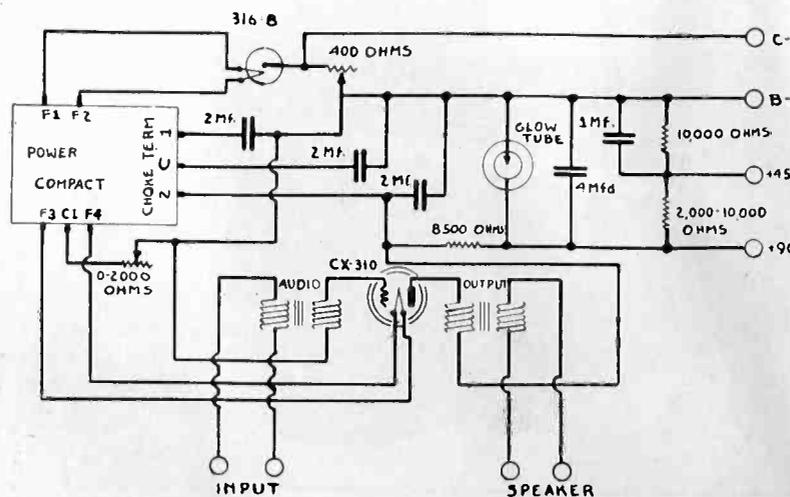
On the R-210 Power Compact, connect F2 to F— on the 316-B socket, and connect F1 to F+ on the 316-B socket; connect 1 to 1 and 2 on the high-voltage condenser block. 1 and 2 on the condenser are the two 1-mfd. lugs. The two 0.1-mfd. lugs are not used. Connect C to 3 on the condenser block, and 2 to 4 on the condenser block; connect F3 to F— on the 310 socket, connect F4 to F+ on the 310 sockets and C1 to 2, the lower terminal of the 0-2,000-ohm resistance.

Connect 1 on the 0-2,000-ohm resistance to 5 on the condenser block and to F on the audio transformer. Connect G on the audio transformer to G on the 310 socket. Connect P

## LIST OF PARTS FOR POWER AMPLIFIER AND B SUPPLY—

- 1—Thordarson Power Compact, type, R-210
- 1—Thordarson Audio Transformer, type R-200
- 1—Thordarson Speaker Coupling Transformer, type R-76
- 1—Muter High Voltage Condenser Block, tapped at 0, 2, 2, 1, 1, .1, mfd.
- 1—Muter 4. mfd condenser, working voltage 160 DC
- 2—Muter 1. mfd bypass condensers
- 1—Centralab Heavy Duty Potentiometer, 2,000 ohms
- 1—Centralab Potentiometer, 400 ohms
- 1—Weston Milliammeter, 0-50 milliamperes
- 3—Silver-Marshall 511 Tube Sockets
- 2—Amsco Resistors, 10,000 ohms
- 1—Amsco Resistor, 2,000 ohms
- 3—Resistor Mounts
- 1—Ward-Leonard Vitrohm Resistor, 5,000 ohms
- 1—Ward-Leonard Vitrohm Resistor, 3,500 ohms
- 2—Carter Tip Jacks
- 1—Loud Speaker Cord
- 4—Eby binding posts: 90 volts+, 45 volts+, B—, and C—
- 4—Brass pillars, 5/16 in. diameter by 3/4 in. long
- 1—Hard rubber binding post strip, 1 in. by 7 in.
- 1—Hard rubber strip, 1 in by 4 in.
- 1—Bakelite or Hard Rubber front panel, 7 in. by 18 in.
- 20—Feet Acme Celatsite Wire
- 4—Doz. tinned soldering lugs
- 1—Wooden baseboard, 7/8 in. by 10 in. by 18 in.
- 4—Doz. No. 4, 3/4-in. round-head wood screws
- 4—No. 6, 3/4-in., flat-head wood screws
- Rosin core solder
- 1—CX-316-B rectifying tube
- 1—CX-210 Power Amplifier
- 1—CX-374 Glow tube

Schematic diagram of the 210 Compact unit. All constants are given so that this hook-up can be compared with the wire-less wiring diagram



on the 310 socket to P on the output transformer, and connect F and G to tip jacks L.S. 1 and L.S. 2.

Connect B on the output transformer to 1 on resistance No. 3. This resistance, made up of two Ward-Leonard units of 5,000 ohms and 3,500 ohms placed end on end, is held at the bottom by a screw projecting from the base board, and fitting in to the hole in the lower resistor. The two are held together by a wire soldered to the adjacent lugs, 2 and 3. Lug 1 on resistor No. 3 also goes to 4 on the condenser block.

Connect P on the 316-B socket to the C— binding post, and also 1, the lower terminal on the 400-ohm potentiometer.

On the glow tube socket connect F— to P, connect G to 2 on resistance No. 2, and also to 4 on resistance No. 3, connect F+ to 2 on resistance No. 1 and also to 1 on the milliammeter. Connect 2 on the milliammeter 5 on the condenser block, and connect 2 on the meter to 2 on the 400-ohm potentiometer.

Connect B— to 1 on resistance No. 1, and connect the 3 on resistance No. 1 to 3 on resistance No. 2. Connect +45 to 3 on resistance No. 1 and connect this 3 terminal to 1 on the 1-mfd. by-pass condenser. Connect 2 on the 1-mfd. condenser to 2 on resistance No. 1.

Connect +90 to 1 on resistance No. 2. Connect 1 on the 4 mfd. by-pass condenser to 4 on resistance No. 3, and connect 2 on the condenser to 1 on the milliammeter.

Connect 1 on the 2-mfd. by-pass condenser to 1 on the 400-ohm potentiometer, and connect 2 on the condenser to 1 on the milliammeter.

Finally, solder the ends of a double cord to P and B on the audio transformer, and put tips on the other ends to fit in a phone plug.

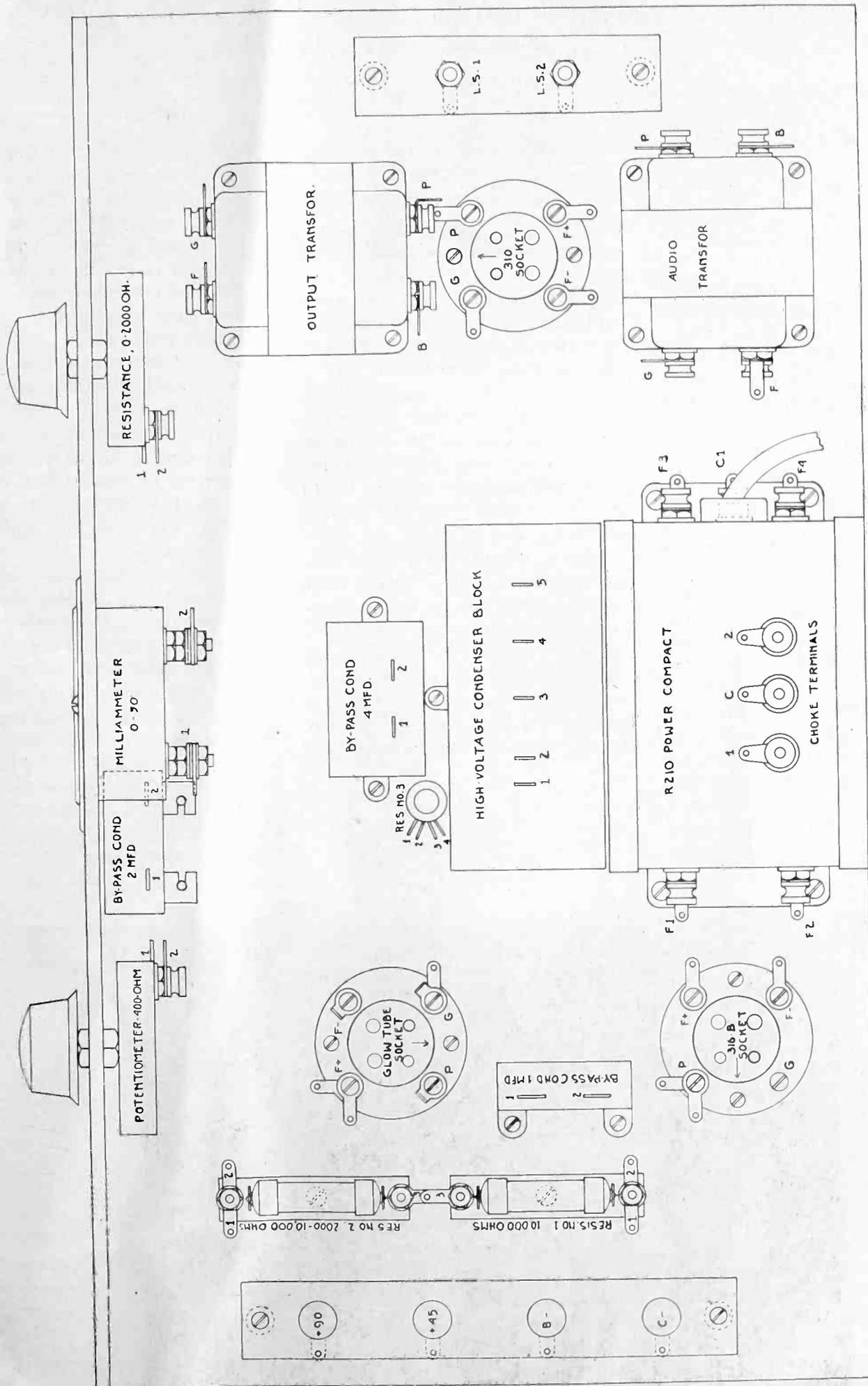
## OPERATING THE 310 AMPLIFIER

If you are going to supply only three tubes or less from the 90-volt tap, insert a 10,000 ohm resistor for resistor No. 2. A greater number of tubes drawing from the 90-volt supply requires about 2,000 ohms for resistor No. 2. Resistor No. 1 is a 10,000 ohm resistance and remains fixed.

To operate the outfit, insert the tubes in the right sockets. Connect the cord from the primary of the audio transformer to the output of the first audio work of your set. Do not attempt to work the two stage amplifier in conjunction with the 310 amplifier. It will not work!

The left-hand control on the front panel adjusts the bias for the CX-310 tube. The value of this resistance is such that the knob should be turned completely to the right. The right hand knob is for regulating the C bias for the set. It should be adjusted for best quality while the set is running.

<sup>2</sup> These can be obtained from the Dataprint Dept., Radio Mechanics, Inc., Radio Hill, Poughkeepsie, N. Y.  
<sup>3</sup> Patent applied for.



# BROWNING DESIGNS A B-D RECEIVER

*The Official Browning-Drake Design for Set Builders, as Developed  
by G. H. Browning and Dr. F. H. Drake*

G. H. BROWNING

YOU probably know some of the history of the Browning-Drake circuit. Dr. Drake and I did considerable research on tuned radio frequency transformers, and finally found how to construct them so that they would perform as the mathematical theory indicated they should.

The tuned radio frequency transformer so evolved was incorporated in a circuit differing somewhat from other circuits then used, but employing well-known engineering principles. The system of tuning the antenna, I believe, had not been written up before, at least to any great extent, but it was a method commonly employed by the engineers who were studying communication at Harvard University.

A great deal of experimenting on various antenna tuning systems showed that the one chosen was extremely good, especially on a short antenna. As you probably know, a short antenna picks up considerably less static and interference for a given signal strength. It possesses the added advantage of convenience, so that probably the time will come when it is used almost altogether.

## MISUNDERSTANDINGS FROM NEW NAMES

The chief purpose of this article, however, is not to set forth a discussion of the Browning-Drake circuit. I want to settle the argument, once and for all, as to which of the various layouts of this circuit is best for the home constructor to build. As you may know, a somewhat unfortunate condition has arisen, due to the popularity of the Browning-Drake sets. That is, many different designs have been offered to the public, and some of these have even been presented as "improved Browning-Drakes."

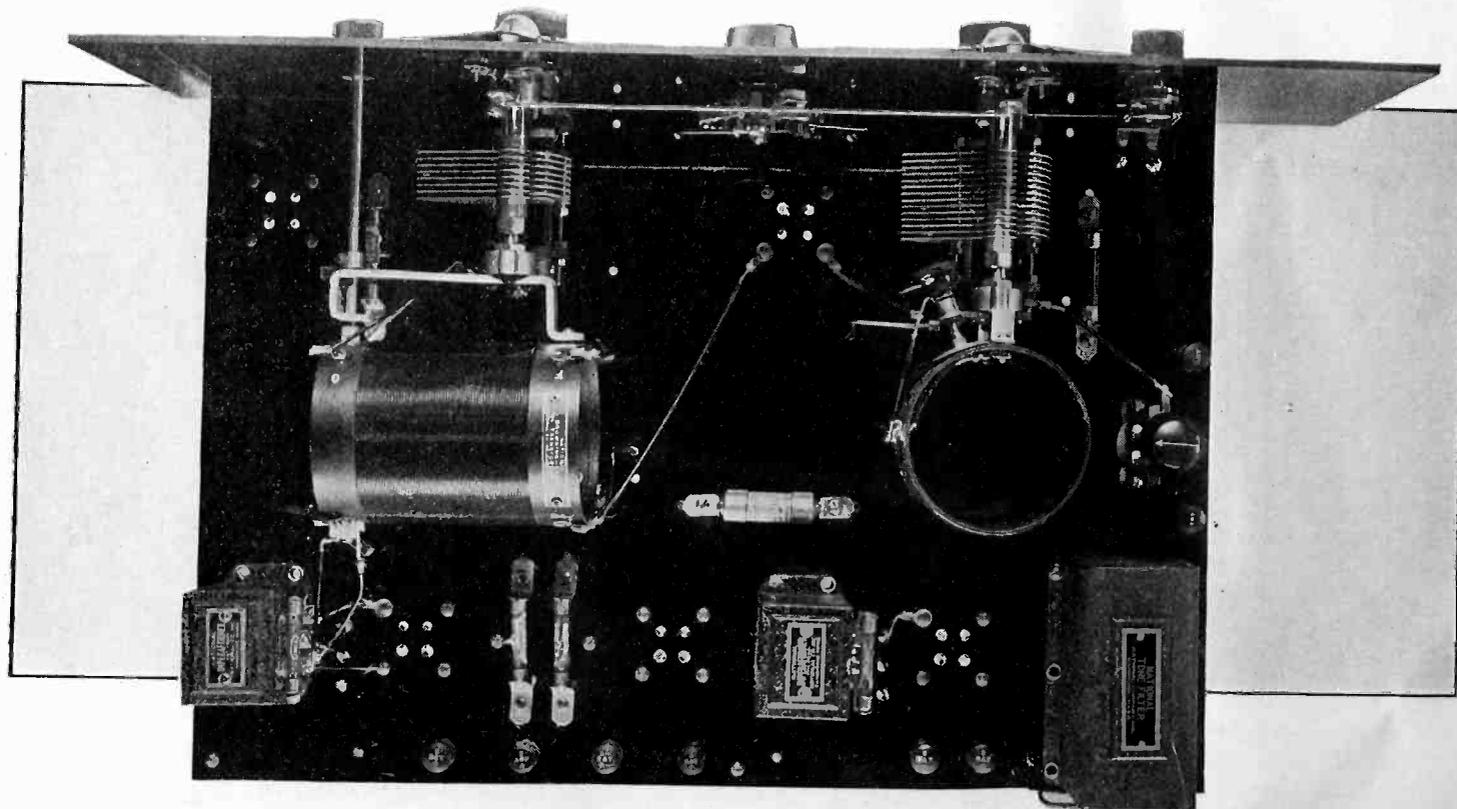
As a matter of fact, no real improvement was made in any of these designs. In each case the standard Browning-Drake circuit was used, and different audio amplifiers of every conceivable type and circuit were attached to it. This situation bothered me considerably for many people thought their Browning-

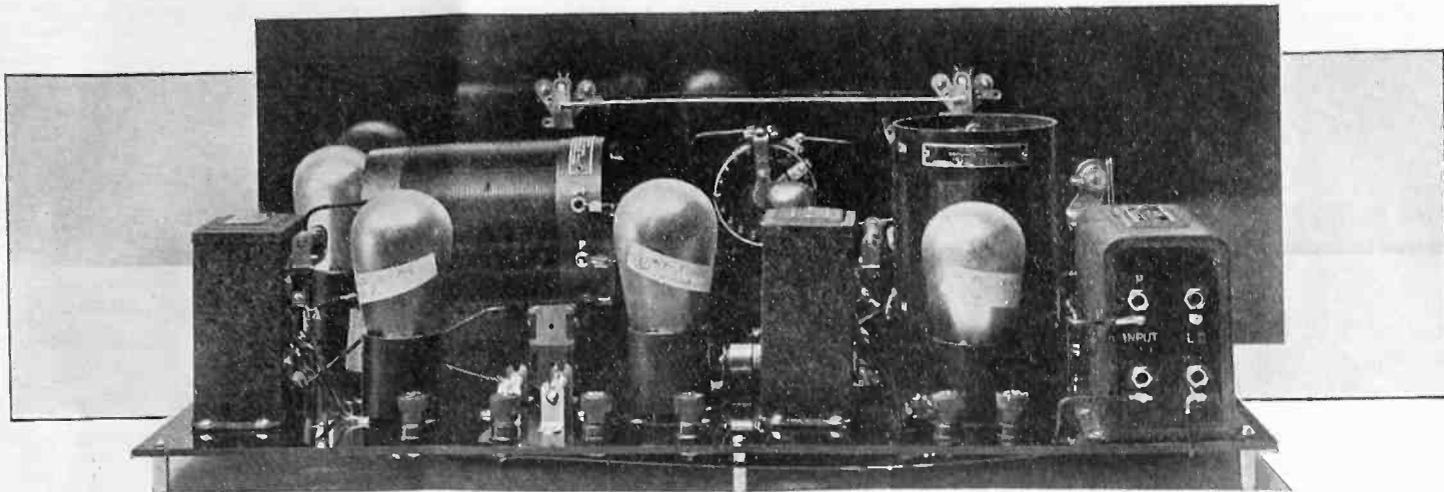
Drake sets had become obsolete just because this writer and that added a different type audio amplifier after the detector, with the standard Browning-Drake circuit in front, and called it an "improved model," or presented the set under a new name altogether.

It always seemed to me that service to fellow amateurs and humanity in general could be given in the radio game, just as in any other. Consequently, when there was nothing new in the way of real improvement, it seemed best not to mix up the set builder by describing the standard outfit by fancy names.

Particularly in recent months, this situation has become more and more serious. Practically every radio publication in the country sponsored its own Browning-Drake design. Naturally, with so many layouts to choose from, the constructor was at a loss to know which of the various ones to select. I finally decided to make certain modifications and improvements in the circuit itself, and then to standardize upon one design and layout, which

*Every detail, right down to the correct location of each part has been determined accurately in the laboratory*





could be accepted by the set builder as the official design, and the safest one to follow. In the wiring instructions and diagrams which accompany this article, the full constructional details of the new Browning-Drake design are given for the first time.

**THE NEW OFFICIAL DESIGN**

The results obtained from the new receiver are considerably better. The selectivity of the outfit has been very much improved. The condensers and coils have been re-designed, and certain modifications have been made in the tuning circuits. Of course, Dr. Drake and I have experimented a great deal on various modifications. However, those which were too complicated to be incorporated in a set constructed by the average set builder were disregarded, as well as those which necessitated very costly apparatus.

*Changes in the circuit and the method of neutralizing give much sharper tuning than in previous designs*

The chief problem which confronted us was that of obtaining satisfactory operation from a B eliminator, and of preserving fine quality of tone at the same time.

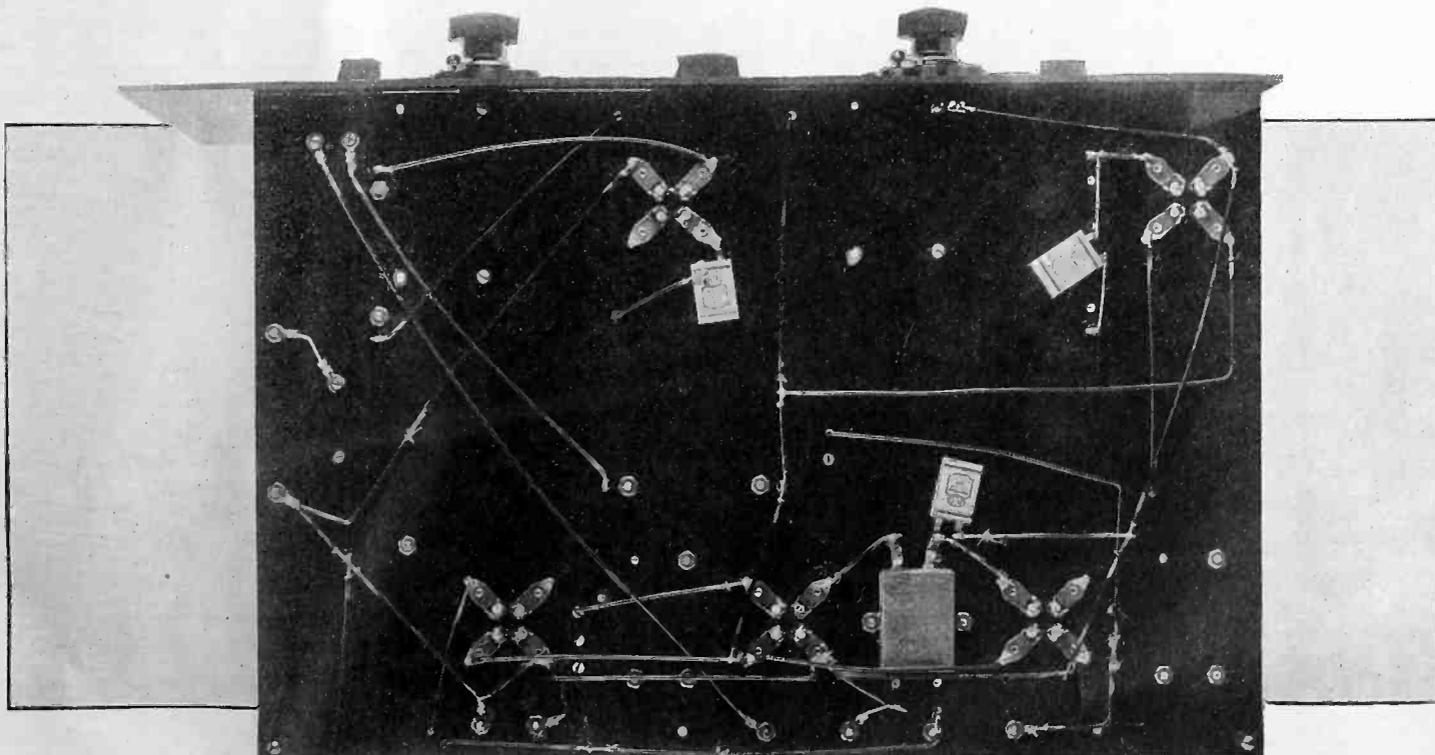
Recent suggestions by several people helped to solve the problem. From Mr. W. A. Ready came the suggestion of an impedance grid leak in the last stage of audio in order to cure the tendency of the resistance amplifier to steamboat on a B eliminator.

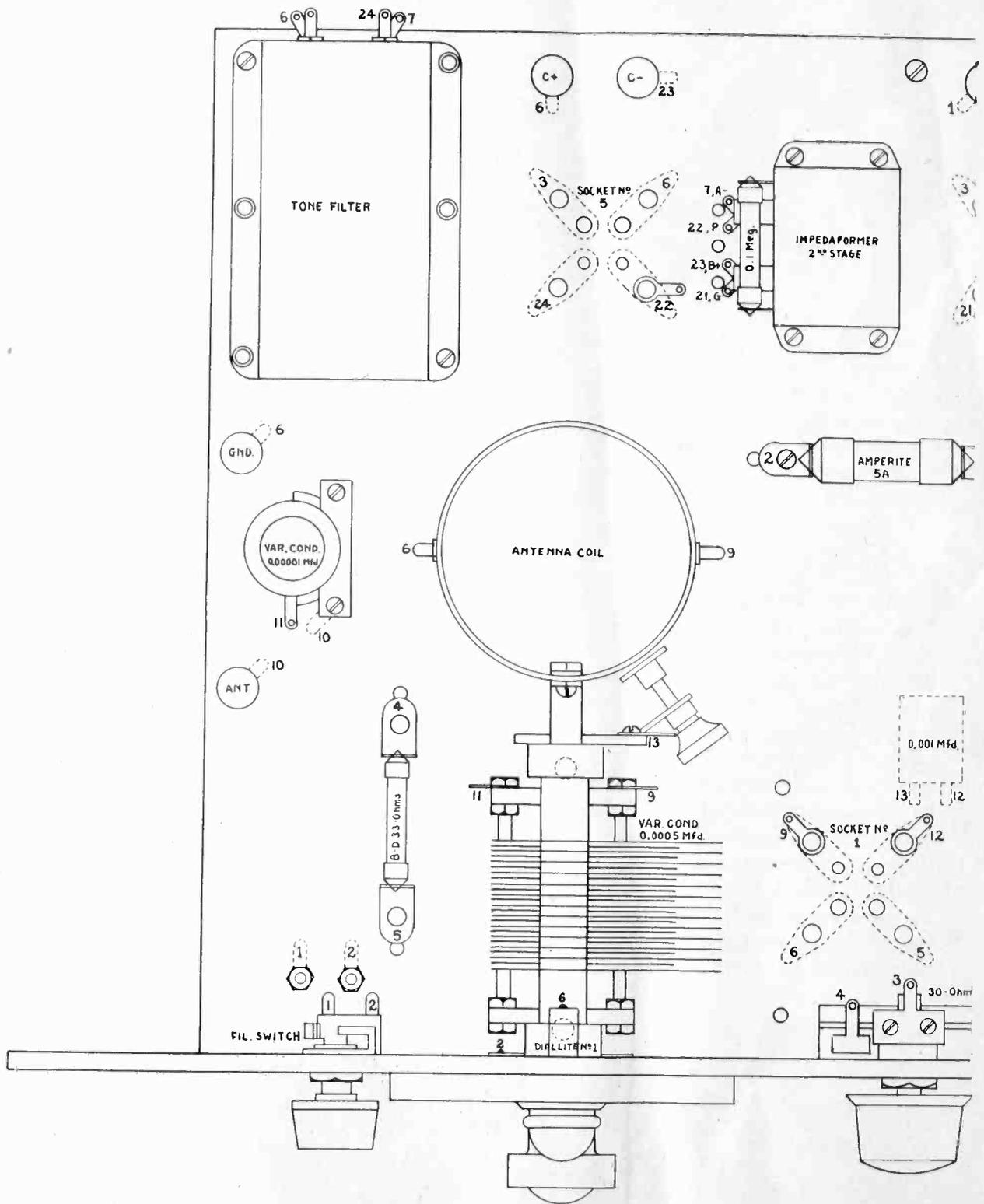
Later, it was found that Professor Field and Mr. Richard Purinton

*The base panel can be purchased with the holes drilled and the socket springs eyeletted in place, and also the front panel drilled and decorated*

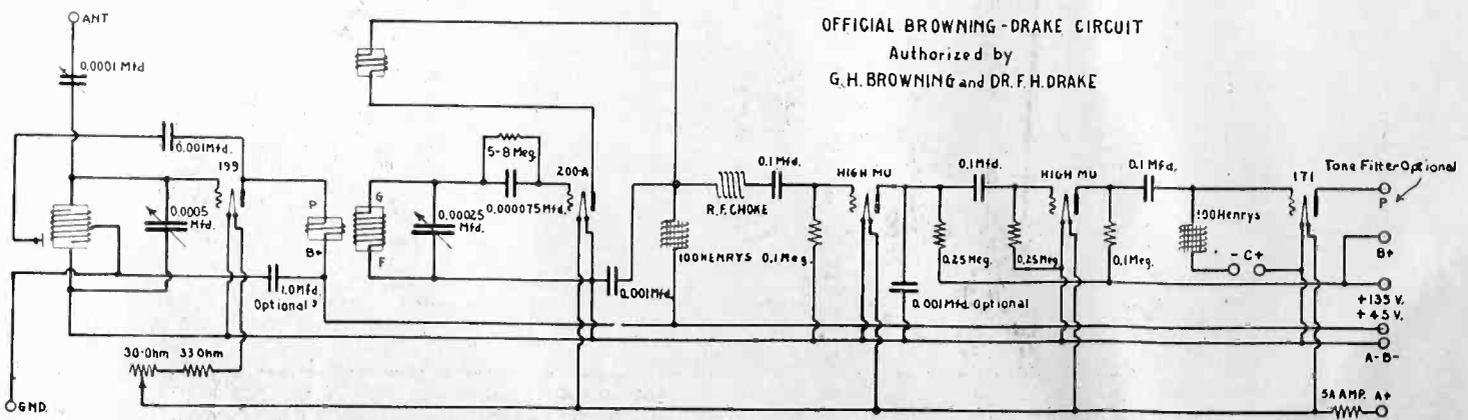
had been working in the same problem at Cruft Laboratory, Harvard, and had reached much the same solution. The .001 mfd. fixed condenser, shown in the diagram from the plate of the first audio tube to the minus filament, also helps out, for it bypasses any R. F. current which may get by the R. F. choke coil.

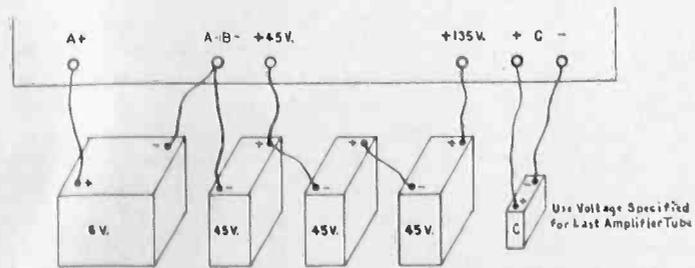
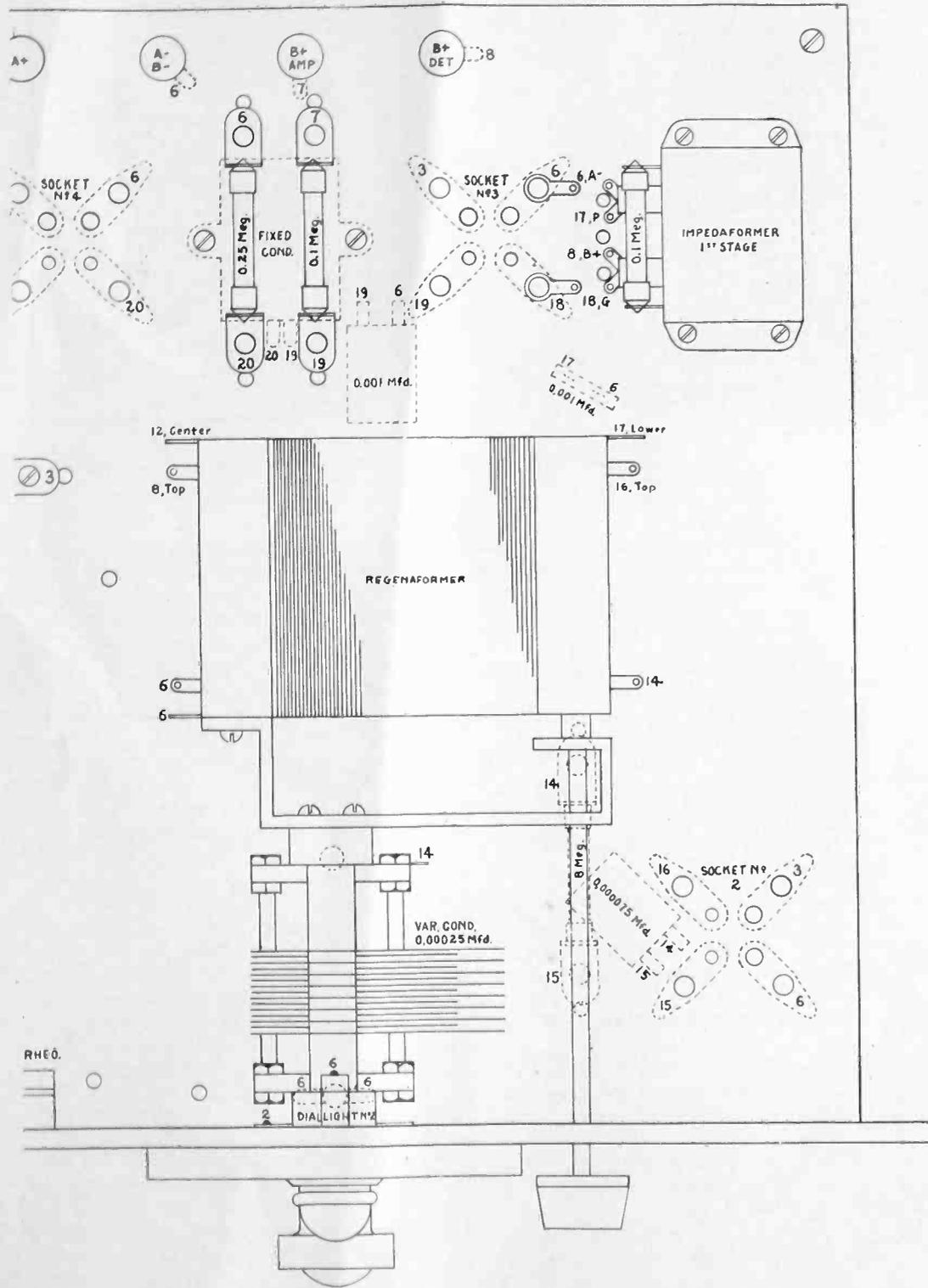
Thus, with combined efforts, an audio amplifier was constructed which gives very fine tone quality and, at the same time, eliminates most of the difficulties. The R. F. choke shown in the diagram is built in as part of the first stage Impedaformer. It is an important factor, for it keeps the radio frequency current from entering the audio amplifier. A little different layout of parts has been decided upon, for it makes an excellent appearance and preserves all of the good electrical features.

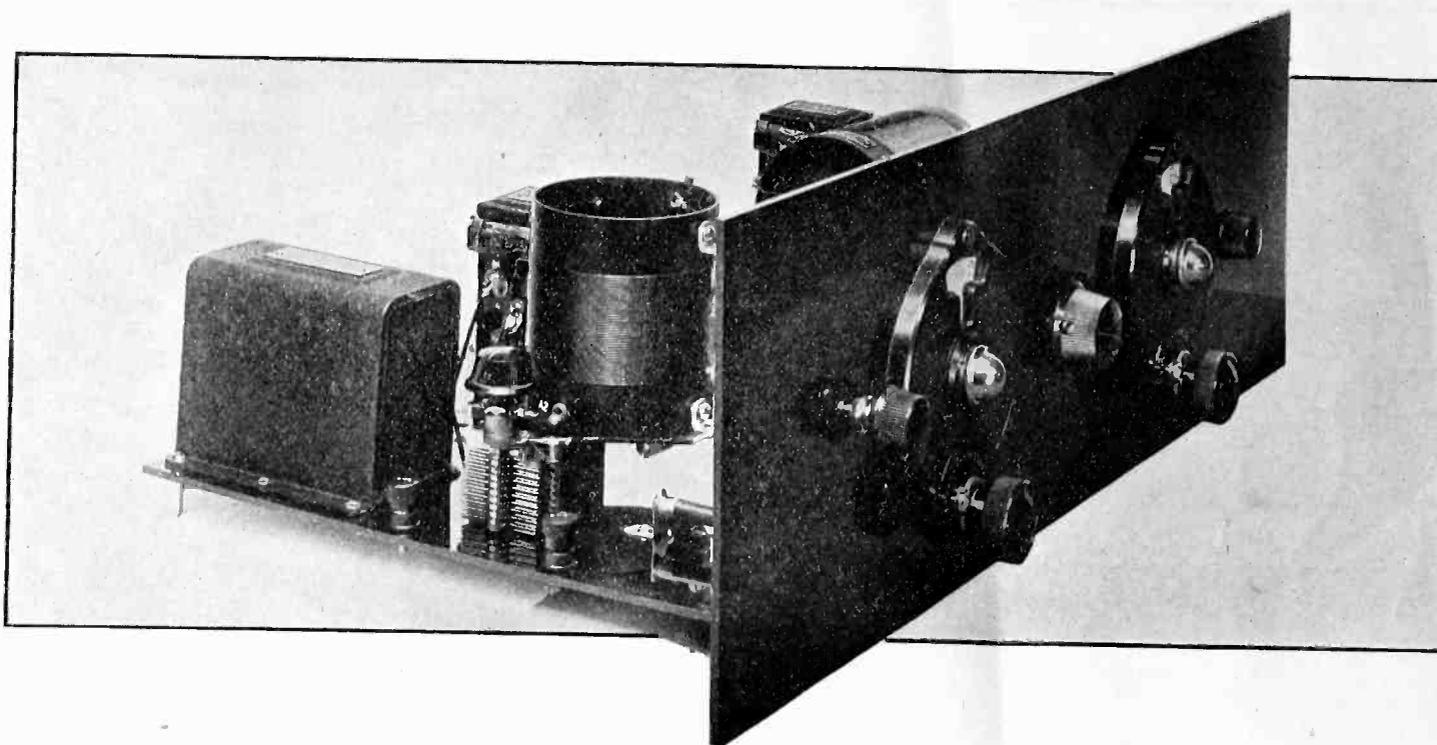




OFFICIAL BROWNING-DRAKE CIRCUIT  
 Authorized by  
 G. H. BROWNING and DR. F. H. DRAKE







*The little variable condenser regulates the selectivity, making the new set adaptable for city or country operation*

Here, then, is the official and authorized Browning-Drake design. The builder of this receiver is assured of excellent results, for a vast amount of experimenting has been done in order to make the outfit as nearly perfect as possible. The rest of this article, devoted to the actual construction and wiring of the receiver, I am turning over to John Grabar, who will describe these operations for you.

#### GENERAL INSTRUCTIONS

**T**HE assembly of the Browning-Drake parts is simplicity itself. The Foundation Unit, consisting essentially of drilled and engraved front and base panels, with sub-panel sockets, resistor clips, and soldering lugs mounted in place, can be obtained from your dealer, or you can do this work from the full-size panel patterns included with the Dataprints<sup>1</sup> which have been prepared. These are drawn full size, and the exact spacing and location of each part is shown. With these at hand, you will have no difficulty in assembling this receiver.

#### MOUNTING THE FRONT PANEL PARTS

First, mount all the parts on the front panel. Looking at the panel from the front, the filament switch is mounted at the extreme left. Next comes the first tuning unit, consisting of the .0005 mfd. variable condenser and the antenna coil. The rheostat is mounted in the center, and the second tuning unit, consisting of the regenerative transformer and the .00025 mfd. variable condenser, is mounted at the right hand end.

The front panel can now be set aside,

<sup>1</sup> These can be obtained from the Radio Patterns Dept., Radio Mechanics, Radio Hill, Poughkeepsie, N. Y.

<sup>2</sup> Patent applied for.

and the parts assembled on the sub-panel. If you get the Foundation Unit, the sockets will be correctly located, but if you mount your own, it is necessary to observe certain precautions. Looking at the base panel from the front, that is, with the battery binding posts along the edge furthest from you, the sockets are mounted as follows:

#### MOUNTING THE SUB PANEL PARTS

Socket No. 1 is mounted with the filament terminals nearest the front panel; socket No. 2 has its filament terminals nearest the right hand edge; sockets No. 3, 4, and 5 are mounted with their filament terminals nearest the rear edge of the sub-panel. Still looking at the sub panel from the front, the Impedaformer marked 1st Stage is mounted to the right of socket No. 3, and the Impedaformer marked 2nd or 3d Stage is mounted between sockets Nos. 4 and 5.

When all the parts have been mounted on the sub-panel, following carefully the layout as shown on the wire-less wiring diagram<sup>2</sup>, the sub panel and front panel can be fastened together. The heavy frames of the variable condensers are used for this purpose. There is plenty of spacing between the various parts, so that no difficulty will be experienced in wiring the set after the two panels are joined. The Tinytobe fixed condensers are not mounted until the set is wired, for they are supported by the Celatsite connection wire.

#### WIRING THE BROWNING-DRAKE

When this has been done, you are ready to start the actual wiring. In the original model, stiff Celatsite was used, for it is easy to bend, is stiff enough to hold its shape and to support the fixed condensers,

and has ample insulation to guard against possible short circuits. If desired, a flexible insulated wire can be used, for it is more easily handled by the novice.

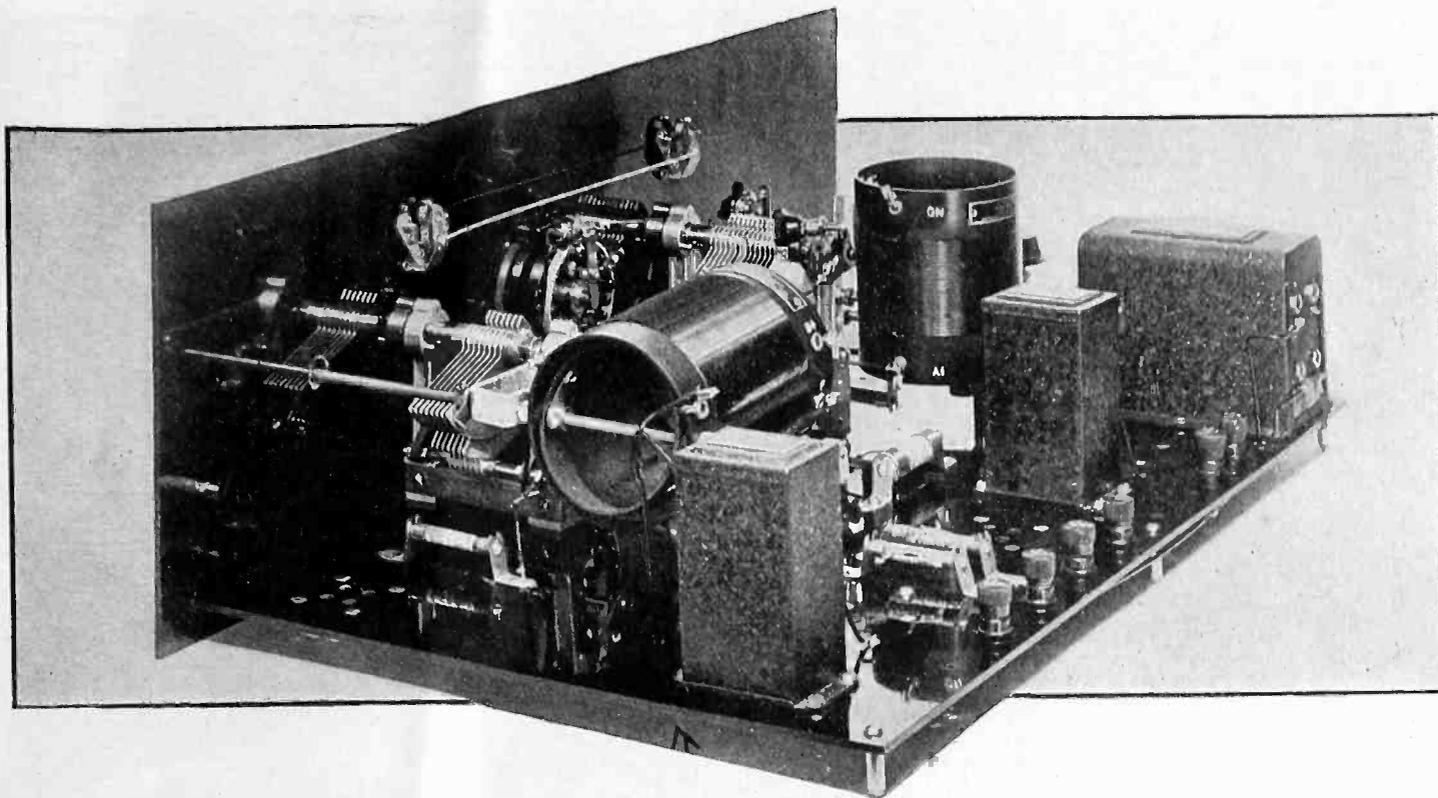
Starting with binding post marked A+, you will notice that the lug on this post is marked with the number 1 on the wire-less wiring diagram, and that one terminal of the switch is also No. 1. You connect these two points together with a wire, which completes that part of the circuit. Now, starting with No. 2, you connect 2 on the switch to 2 on dial light No. 1, to 2 on dial light No. 2, to 2 on the 5-A Amperite.

Do you get the idea? Simple, isn't it? The whole receiver is wired in this manner, that is, all terminals marked with the same number on the wire-less diagram are connected together. You simply can't go wrong, especially if you draw in each wire as you solder it in place. Here's another thing; the numbers are so arranged that the wiring is done in the easiest way. Start by wiring all the 1's together, then all the 2's, then the 3's and so on. When you have finished with the last number, which is 24 in this case, you can rest assured that your set will work as soon as you connect antenna, ground, and batteries.

#### PUTTING THE BROWNING-DRAKE INTO OPERATION

In order to realize the excellent results of which this receiver is capable, it is essential that you use good accessories. We have made a careful test of these various items in connection with this set, and recommend the following:

Insert an Archatron UX-190 in socket No. 1. Be sure that you have the Browning-Drake 33-ohm resistance cartridge in its proper place, as shown on the wire-less wiring diagram. Put a Cunningham CX-300-A tube in socket No. 2. Insert an Archatron UX-100-A in socket No. 3, and another Archatron UX-100-A in socket No. 4. In socket No. 5, use a



Cunningham CX-371. We found this combination of tubes to work perfectly.

Now for the batteries. If you are going to use dry B batteries, get a set of four Eveready Layerbilts. These may be more expensive to start with, but they will prove to be the cheapest in the end. Don't forget that you are using a 171 power tube in the last stage, and that this tube alone draws over 20 milliamperes of plate current.

If you prefer, you can use a B eliminator with this set. Browning's Eliminator, as described in the January number of RADIO MECHANICS, will work perfectly with this receiver. In case you build this eliminator you can omit the power amplifier feature, for the power amplifier is built right into the receiver. Browning's Eliminator and the Browning-Drake receiver make an ideal combination, for a Yaxley automatic switch is built right into the B supply. Then, when you connect a good trickle charger, such as the Balkite, to your storage battery and plug the charger into the Yaxley relay, the filament switch on the set automatically controls everything.

One of the most important accessories, particularly for this Browning-Drake set, is the loud speaker. This receiver has an excellent audio amplifier, capable of reproducing with fidelity every note passed by the detector. However, you cannot expect the best of amplifiers to perform well on a poor speaker. There are many excellent cone speakers on the market today, and by purchasing one of these for this set, you will be assured of the utmost possible satisfaction with your Browning-Drake set.

#### SPECIAL NOTES

This official B-D design has been worked out with a high degree of mechanical precision. It is particularly fortunate that the design of the coils, except for the recent change in the antenna coil, has been kept the same over a period of years so that the collective experiences

*You will understand G. H. Browning's preference for the impedance-resistance amplifier when you hear this set in operation*

#### PARTS LIST FOR THE LABORATORY MODEL

The following parts are specified for the Official Browning-Drake receiver. In order to reproduce exactly the mechanical and electrical design, G. H. Browning and Dr. F. H. Drake strongly advise against substitutions.

- 1 Browning-Drake kit of coils and condensers.
- 1 Browning-Drake Foundation Unit.
- 1 National Impedaformer (1st stage).
- 1 National Impedaformer (3rd stage only).
- 1 0.1 Tobe condenser, special type.
- 3 .001 Tinytobe fixed condensers.
- 1 00007 Tinytobe fixed grid condenser.
- 1 Yaxley filament switch.
- 1 Yaxley 30-ohm rheostat.
- 8 Eby binding posts (ANT, GND, A+, A-B, B+ DET., B+ AMP., C+, C-).
- 1 Precise Midget .0001-mfd. variable condenser.
- 1 Browning-Drake 33-ohm resistance cartridge.
- 3 Electrad or Lynch resistances 0.1 meg., 0.25 meg., 8.0 meg.
- 1 Browning-Drake balancing device.
- 1 Amperite, type 5-A.
- 2 Yaxley pup jacks (If tone filter is not used).
- 1 National tone filter (optional).
- 1 1 Mfd. Tobe condenser (optional).

of experimenters could be studied, and advantage taken of their reports.

It is as a result of these letters from B-D builders that the antenna coil and the method of neutralization or balancing has been altered. While the old system met most interference situations in the large cities, the new one will overcome practically any extreme condition.

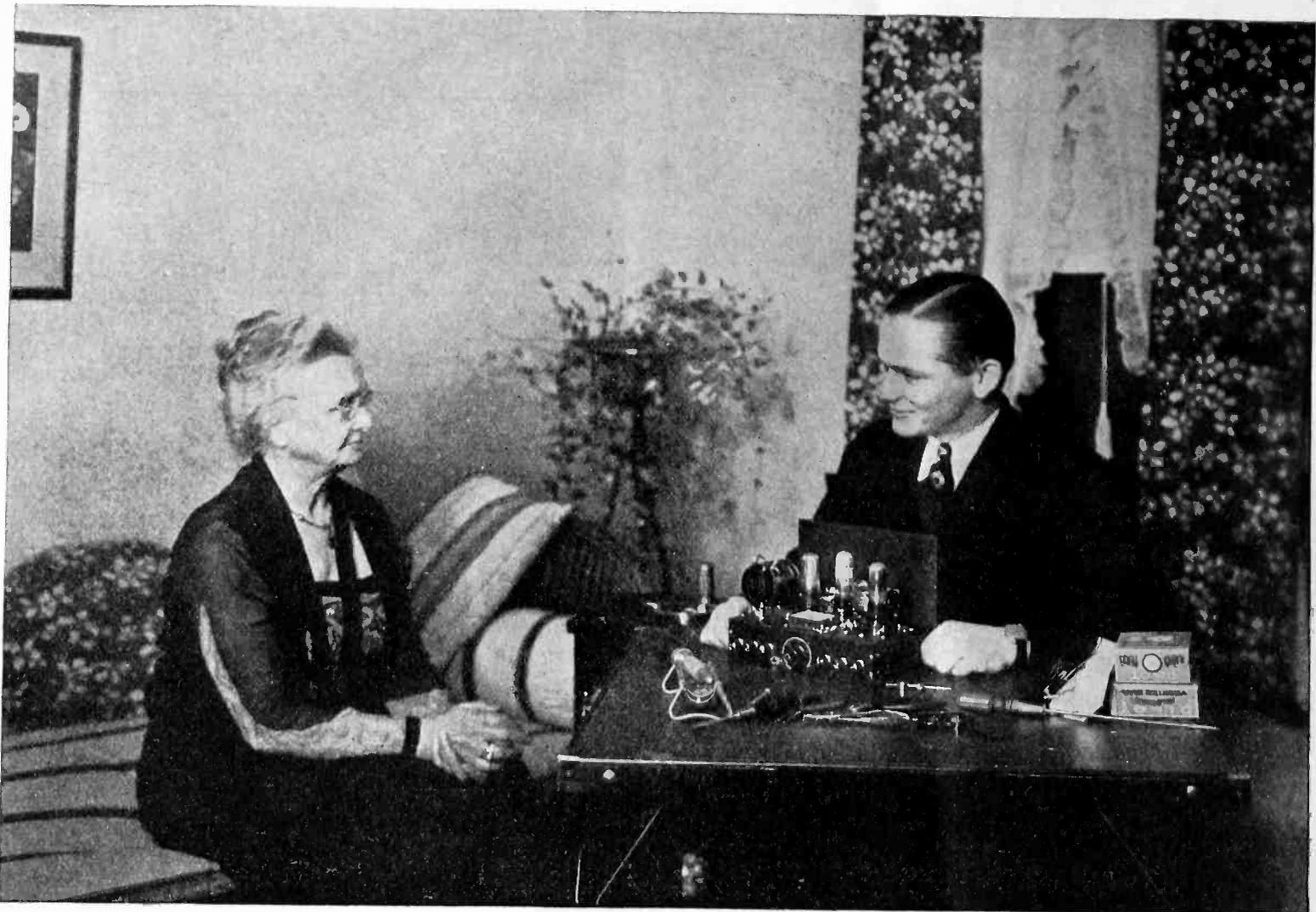
However, it has been found, according to G. H. Browning, that in almost every case of trouble reported, the mechanical design was at fault. This was determined from subsequent letters from those who had experienced trouble.

For perfect results, the center of the antenna coil winding must be on a line with the axis of the regenaformer coil, and this axis line should pass thru the axis of the antenna coil.

Also, the center of the regenaformer coil should be separated from the axis of the antenna coil by 9 to 10 ins. This gives the proper relation between the magnetic fields of the two coils. If the diameters and lengths of the coils were changed, this distance would change too. But the design of the coils calls for the 9 to 10-in. spacing.

Set builders have sometimes changed this spacing, or have followed plans of designers who were unaware of the importance of this matter—always to the detriment of the operating characteristics.

Now, about the 199 tube in the first stage—that has been another source of unnecessary trouble, due entirely to the fact that it is so frequently operated far beyond its rated filament voltage. Everyone knows now-a-days the importance of keeping 201-A's down to 5 volts, but the 199 is treated with little consideration. The official design is proof against that fault, for a fixed resistance keeps the voltage down to 3, with the rheostat to reduce it further as a volume control.



## PUPPY—LITTLE BROTHER OF THE BIG SET

*New Features for Fine Local Reception. Use the Puppy Alone, or to Save the Big Receiver*

NICHOLS N. DYMES

**S**LICK and snappy—a smooth little piece of mechanism—that's the Puppy. It's the neat kind of a job that you can't resist building, and it costs so little that you ought to do it.

Works on dry cells or storage battery, uses two 199's and a 120 or a 200-A, 201-A, and 112 if you want a lot of first class volume.

If you haven't a set, it's just the thing to start on. If you have a big one already, why not build the Puppy and use it for ordinary local reception, to economize on tubes and batteries.

All the parts required will not cost more than twelve dollars, yet the Puppy has most everything that you'll find in an expensive set.

### SPECIAL FEATURES OF THE PUPPY

After a little experience with Burke's plate circuit control,<sup>1</sup> I liked it so well that I tried it on the Puppy. Instead of using the rotating coil of the three-circuit tuner for regeneration, I used that coil for the antenna coupling, to give adjustable selectivity, while the fixed antenna coil is connected as a tickler. This arrangement, with the Adjustograd in the plate circuit, gives the smoothest regeneration you ever saw—entirely different and far better than any tickler.

Now, if you are troubled by interference, just turn the rotor at the end of the secondary coil, and you

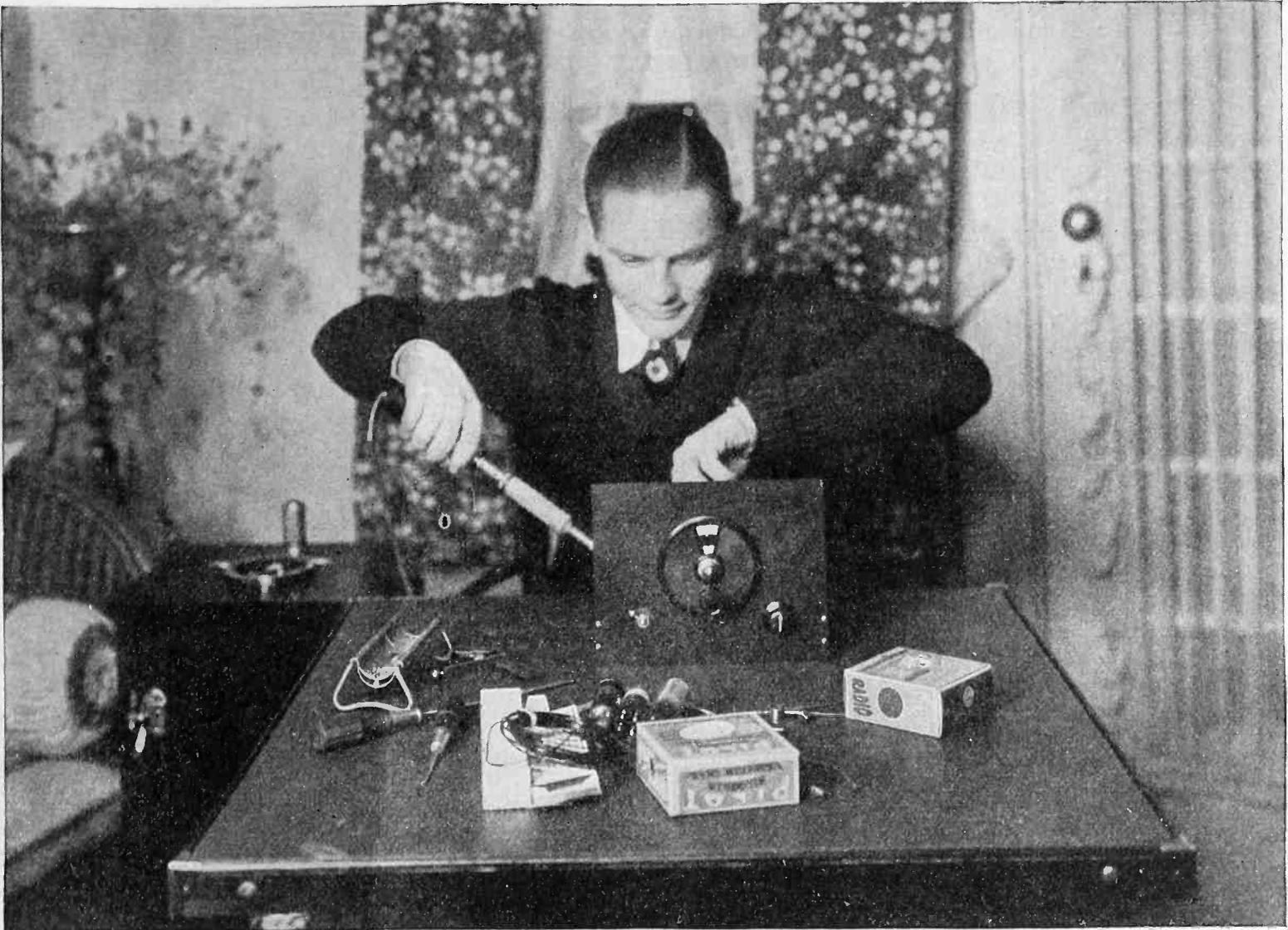
will have very sharp tuning. For long distance, however, the coupling must be close.

There is a trick filament circuit in the Puppy, for use with dry cell tubes. The 199's are in parallel, and they, in turn, are in series with the 120. Thus the set can be run from six dry cells in series, or from a regular 6-volt storage battery. The wire-less wiring diagram<sup>2</sup> shows schematics for both kinds of tubes, but the assembly instructions are for 199's and a 120. Remember to use the correct C battery on the last tube.

This outfit has S. L. F. tuning, a by-pass condenser to keep R. F.

<sup>1</sup> Shown originally in the Peanut Short wave set, Radio Mechanics, Jan., 1927

<sup>2</sup> Patent applied for. A full-size wire-less wiring diagram is furnished with the Data-prints.



currents out of the A. F. amplifier, and is arranged for a power tube in the last stage to give big volume, without distortion, on local stations. There's most everything good in the Puppy.

**SMALL SETS NOW POPULAR**

Of course, the assembly might be easier if the set had not been condensed into a small space, but at least in my part of the country, around Detroit, it's quite the thing to have a little set, built like a big one, but made just as compact as possible.

And it's a lot of fun, too, making small sets, for they have an appearance distinctively their own, and different from the big ones.

**GENERAL INSTRUCTIONS**

The Puppy is an easy outfit to assemble, even tho it looks somewhat complicated because of the way it was necessary to draw the wire-less wiring diagram. When you get right to it, however, the scheme unfolds itself readily.

To save yourself trouble, do these things: Drill all the holes in the

*There's a hundred dollars' worth of fun in building this little outfit, and you'll be delighted with its performance*

panels before you start the wiring. Use only tinned lugs and rosin core solder. Make all connections with

flexible tinned wire. Tighten all nuts with Spintite wrenches.

Full-size panel patterns, showing the location and sizes of all holes, are provided with the Dataprints.<sup>3</sup> They can be used as a drilling template.

The front panel measures 7 by 9 ins., the base panel 4 by 9 ins., and the sub-panel 2 by 9 ins., all 3/16-in. hard rubber. All three pieces can be cut from a 7 by 18-in. panel.

**FRONT PANEL ASSEMBLY**

Mount the Resistograd, variable condenser, and switch on the front panel. Put on the dial, and test the clamping screw to make sure that it does not make the shaft bind. Put on the lugs as you mount the parts.

Thread one terminal of condenser No. 1 on the center screw of the Resistograd.

Connect 1, on the front metal plate of the variable condenser to 1.

<sup>3</sup> Dataprints can be obtained from the Construction Service Dept., Radio Mechanics, Inc., Radio Hill, Poughkeepsie, N. Y.

**RECOMMENDED ACCESSORIES FOR THE PUPPY SET**

The accessories listed here have been given a thorough test in conjunction with this receiver. They are recommended because they were found to coordinate properly, and the best results from the set were realized when they were used.

- 2—Volutron UX 199 tubes
- 1—Volutron UX 120 power tube, or
- 1—Volutron 201-A tube
- 1—Volutron 200-A detector
- 1—Volutron 112 power tube
- 6—Royal 1½ volt dry cells, or
- 1—Kresge storage battery, 6 volts
- 1—Crosley Musicone loudspeaker
- 3—Royal 45-volt B batteries.

on condenser No. 1. Solder lug 1 on condenser No. 1 to lug 1 on condenser No. 2.

#### BASE PANEL ASSEMBLY

Mount the A. F. transformer under the base panel, using  $\frac{3}{8}$ -in. 6-32 F. H. screws.

Put screws pointing upward, carrying lugs and nuts, on the following socket terminals: Socket No. 1, +, —; socket No. 2, G, +, —; socket No. 3, +, —.

On the remaining terminals, except G on socket No. 1, put  $\frac{3}{8}$ -in. 6-32 R. H. screws, pointing down, and held by two nuts each.

Fasten the sockets to the base panel with the  $\frac{3}{8}$ -in. 6-32 R. H. screws, threaded into the base panel. Where the terminal screws go thru the base panel, put a lug and nut on each one, under the panel.

On terminal G, socket No. 1, put a  $\frac{1}{2}$ -in. 6-32 R. H. screw thru the spring, thru two nuts, the base panel, and finally into a terminal of the grid condenser.

Mount the tuning coil unit, the by-pass condenser, and tip jacks.

On socket No. 1, connect P to 1, the upper left hand terminal of the coil; connect + with a wire run under the base panel and up thru a hole to — on socket No. 3; connect — to — on socket No. 2.

On socket No. 2, connect G to G on transformer No. 1; connect P to P on transformer No. 2; connect + to — on socket No. 3 and also to 1 of condenser No. 3.

#### PARTS LIST FOR THE LABORATORY MODEL

These parts were used in the original laboratory model described in this article. It is recommended that the novice follow this list, but the experienced constructor may be able to make substitutions which are of equivalent mechanical and electrical characteristics.

- 1 Hard rubber front panel, 7 by 9 ins.
- 1 Hard rubber sub panel, 4 by 9 ins.
- 1 Bakelite or hard rubber back panel, 2 $\frac{1}{4}$  by 9 ins.
- 3 Pilot UX sockets.
- 1 Pilot variable condenser, .0005 mfd. S. L. F.
- 1 Pilot Resistograd.
- 1 Pilot filament switch.
- 2 Pilot audio transformers.
- 1 Twin coupler 3-circuit tuner.
- 1 Pair Pilot Bakelite brackets.
- 1 Pilot fixed condenser, .001 mfd.
- 2 Pilot fixed condensers, .00025 mfd.
- 1 Vernier dial.
- 1 Polymet gridleak, 2 megohms.
- 1 Polymet bypass condenser, .25 mfd.
- 1 Pilot rheostat, 30 ohms.
- 6 Binding posts, marked as follows:—  
A—, A +, B + Det, B + Amp, B + Amp, C —.
- 3 Doz.  $\frac{3}{4}$  in., 6/32 R. H. machine screws, with nuts.
- 2 Doz. soldering lugs, tinned.
- 1 Coil rosin core solder.
- 1 Pair tip jacks.
- 2 Rolls of Flexibus wire.

*Just the same care was put into this ten-dollar outfit as into the most expensive design*

On socket No. 3, connect G to G of transformer No. 2; connect P to tip jack No. 1.

Connect 2, the lower left hand terminal of the coil thru a hole in the base panel to P on transformer No. 1.

#### SUB-PANEL ASSEMBLY

Mount the rheostat and binding posts on the sub-panel. Have the binding posts on the rheostat at the right, looking at the rear of the sub-panel.

Connect the upper rheostat terminal to A + BAT binding post.

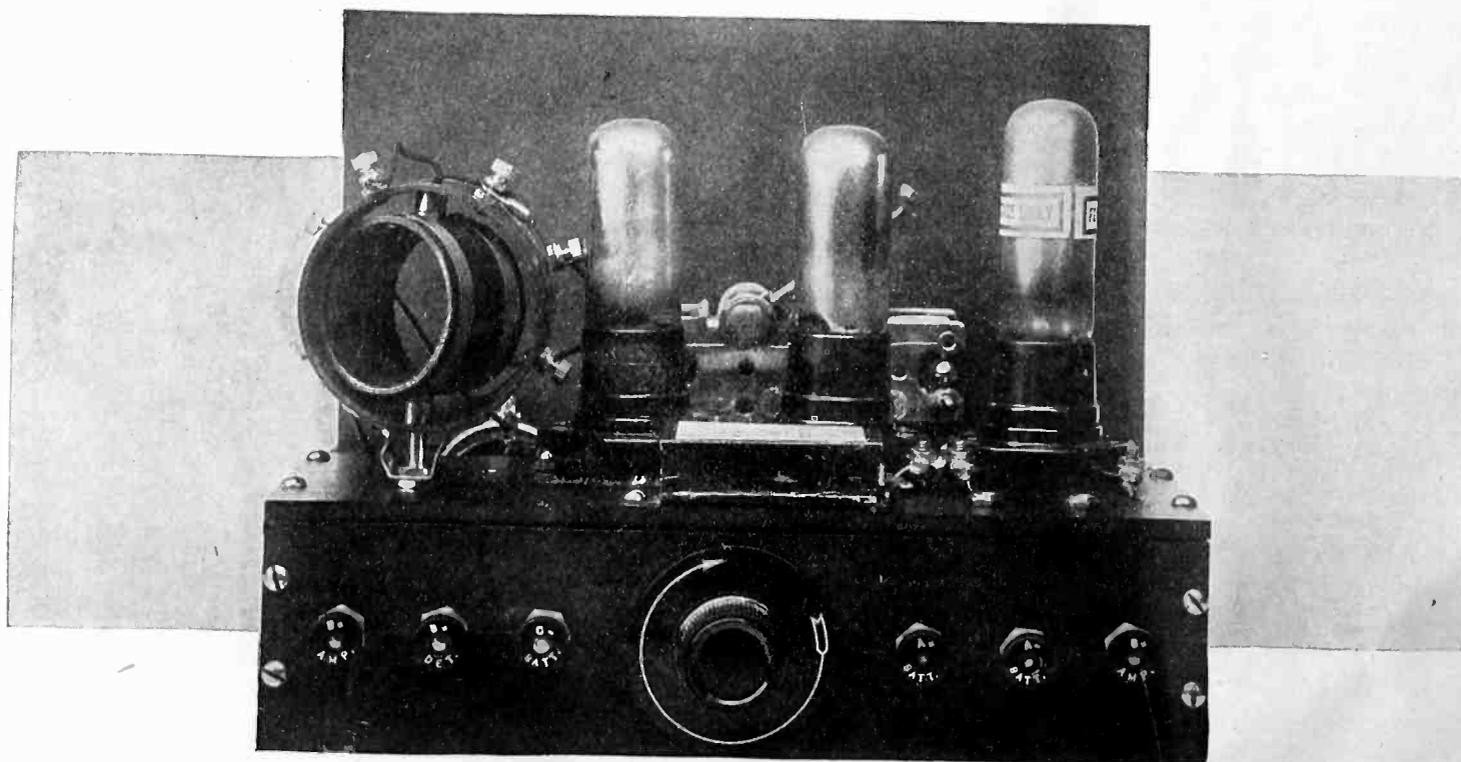
#### FIRST INTER-PANEL ASSEMBLY

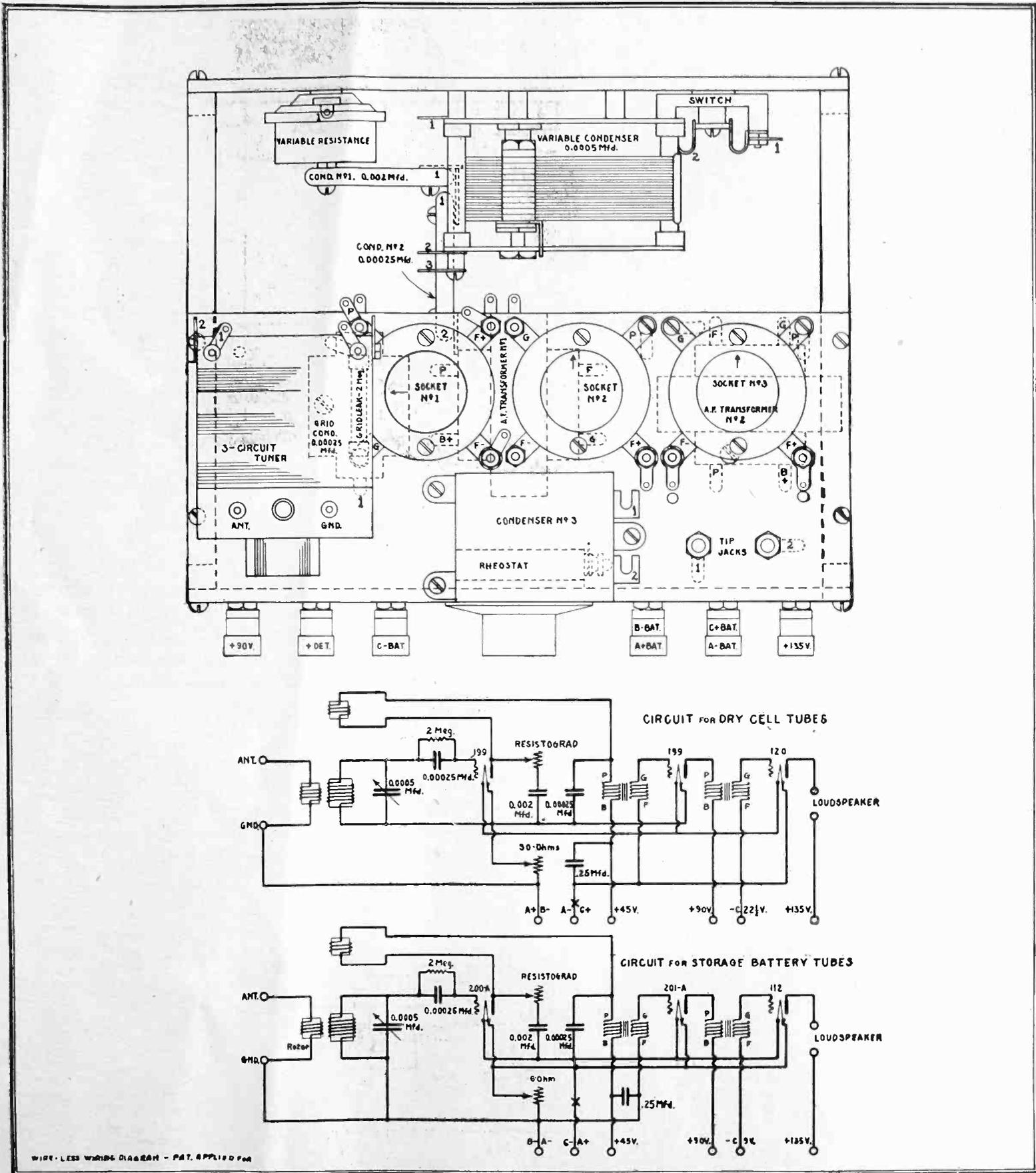
Fasten the sub and base panels to the brackets with  $\frac{3}{4}$ -in. 6-32 R. H. screws and nuts.

Connect B + 90 V. to B + on transformer No. 2; connect B + DET to B + on transformer No. 1, and also the 2 on condenser No. 3. Connect C—BAT to F on transformer No. 2. Connect the upper terminal of the rheostat to F — on socket No. 1. Connect A—BAT to F on transformer No. 1, and also to 2 on the switch. Connect B + 135 V. to tip jack No. 2.

#### SECOND INTER-PANEL ASSEMBLY

Connect 1 on the variable resistance to P on socket No. 1. This is the lug fastened beneath the panel to the socket terminal. Connect the upper right hand terminal of the coil, going to the secondary, to 2, on the frame of the variable condenser, and connect this lug also to F + on socket No. 1.





Connect 3, on the stator of the variable condenser, to the lower right hand terminal of the coil, going to the secondary, and connect it also to the forward lug on the grid condenser.

Solder a lug on terminal 2 of condenser No. 2 to the P post on transformer No. 1.

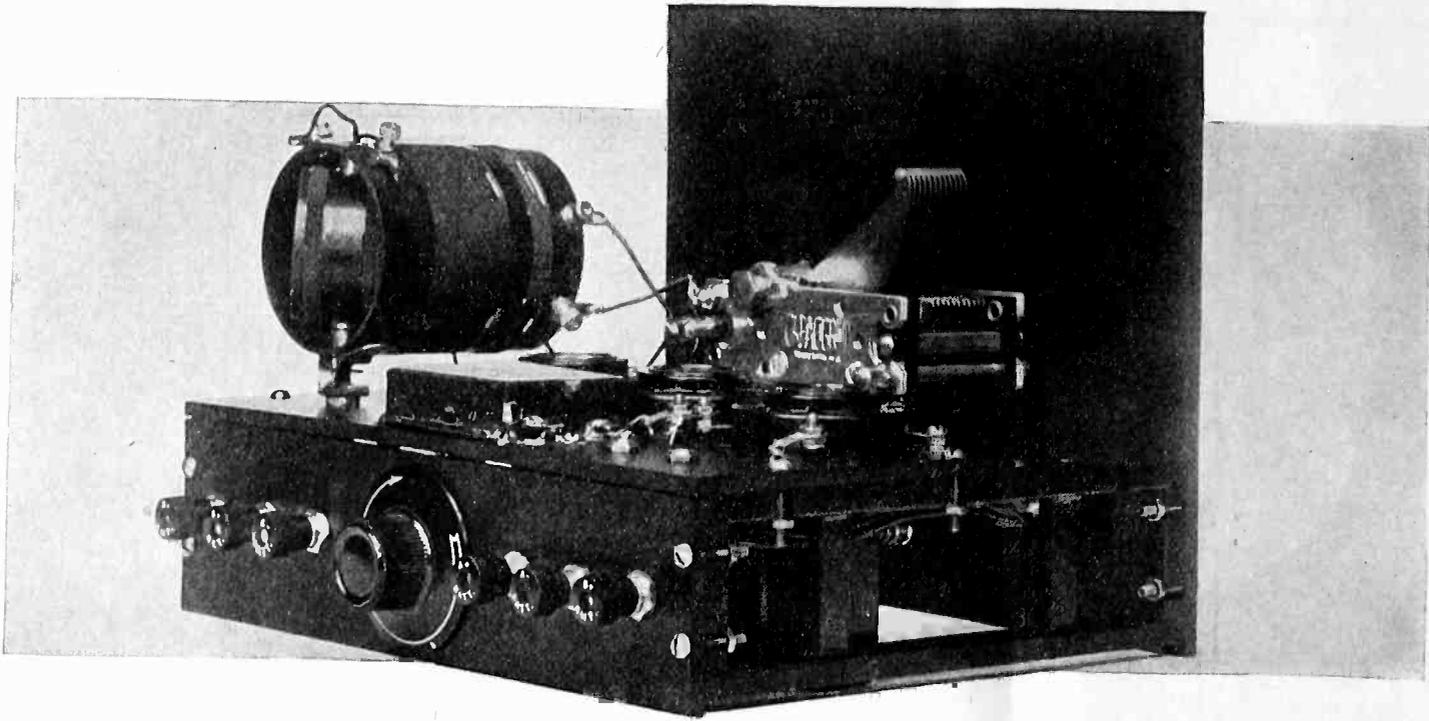
Connect 1 on the switch to F + on socket No. 3.

*Wire-less wiring diagram and schematics for the use of dry cell or storage battery tubes*

**TESTING AND OPERATING**

Remember this about the 199's and 120: They are strong, sturdy, and altogether satisfactory tubes as long as the filaments are not overloaded. With these tubes in the

Puppy, run on a 6-volt storage battery, they will last indefinitely. As for volume, the amplification constant of the 199 is 6.25 as compared with 8 for the 201-A, while the 120 is 3.3 against 7.9 for the 112. This gives a total amplification of 20.6 for the dry cell combination against 63.2 for the storage battery tubes. This shows that the former is suitable for local reception, and the



latter for DX. If you use dry cells, you should measure the voltage across the filament terminal, from F—on socket No. 1 to the A—BAT binding post. This should show exactly 6 volts for the 199 and 120 combination. Do not use more voltage than that.

If the detector does not regenerate properly, it is due to a defective variable resistance or, more likely, the fixed condensers. They

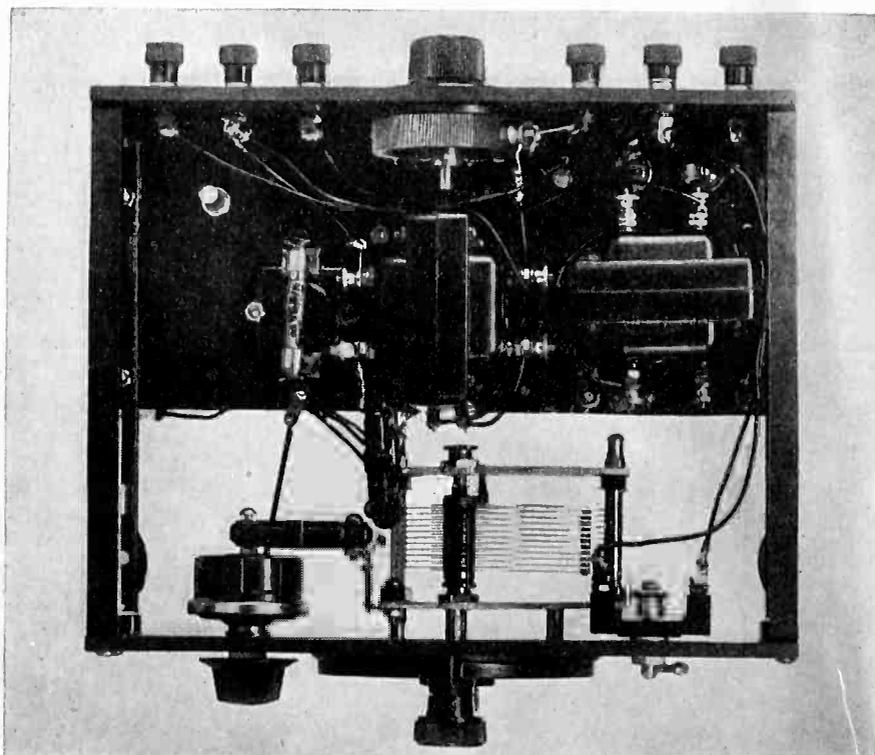
must be accurate as to capacity, for the values are critical.

The C battery on the last amplifier tube is of great importance, not only as concerns quality and volume but the life of the tube as well. Particularly on the 120, the full  $22\frac{1}{2}$ -volt C bias must be used. This prevents the excessive flow of current which occurs without the C battery. Otherwise, with 135 volts on the plate of the 120, the

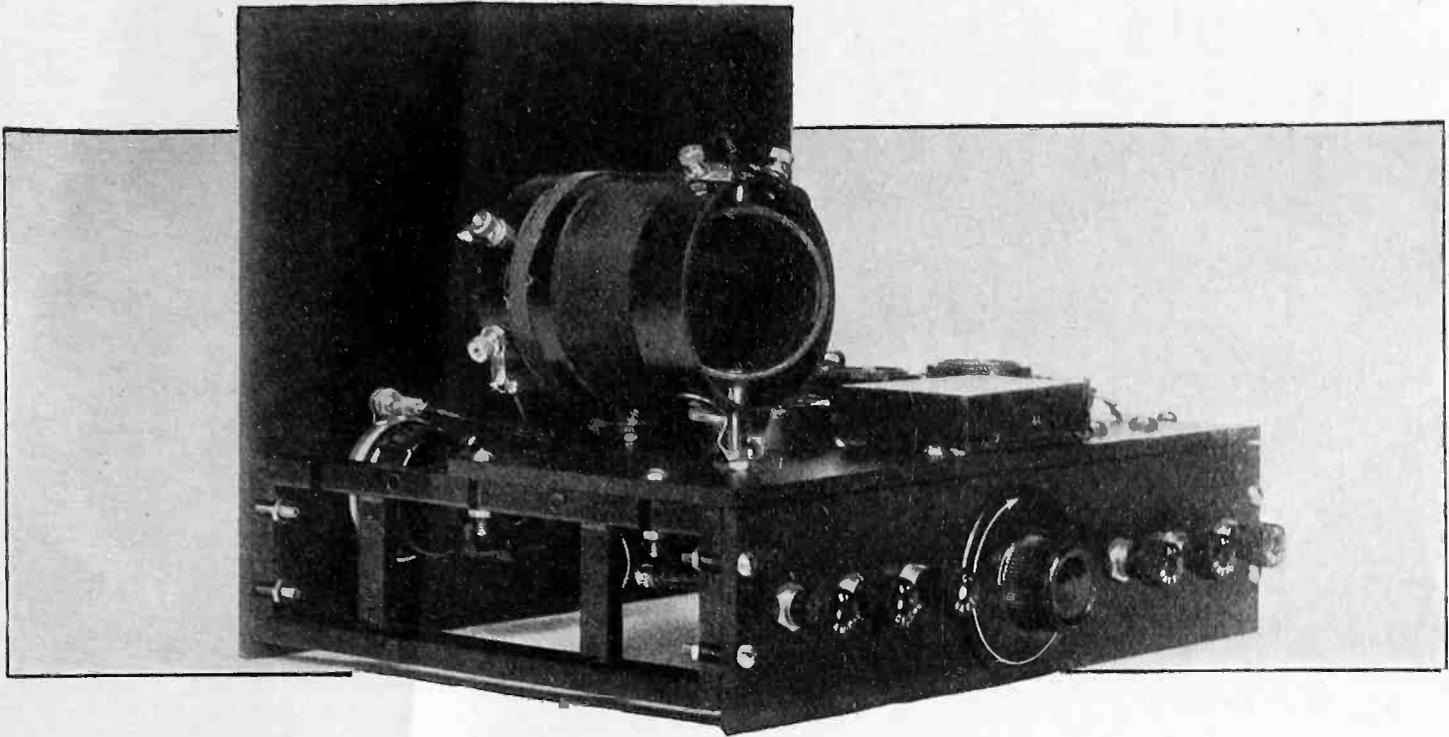
filament disintegrates rapidly as a result of the heavy plate current. Then the tube would appear to burn out quickly, when it is not due to the filament current at all but to the plate current.

These reasons are not familiar to many set builders and B. C. L.'s who, tho they know from the instructions how the tubes should be used, discount the importance of following them—always to their own embarrassment.

*You just can't help liking the Puppy Set, forerunner of the new vogue in small receiving sets. Notice the arrangement of the three-circuit tuner, mounted on the base panel. The fixed winding, toward the front, was intended to be connected as the antenna coil. In the Puppy, it serves as the fixed tickler, for this hook-up has Burke's*



*system of regeneration control. This allows the rotating coil, designed as the tickler, to be used for the antenna. Broad tuning is obtained when the winding on the rotor is parallel with the stator winding. Turning the coil sharpens the tuning, making the set well suited for reception in congested centers*



**THE VOGUE OF LITTLE SETS**

Among set builders in the mid-west, the new idea is to build for big results from little sets, and a lot of fun it is, too. For the man or boy who wants a specific problem to tackle, the small set offers all kinds of opportunities for skill and cleverness without requiring a large outlay for parts, as is the case when one works for distance regardless of cost.

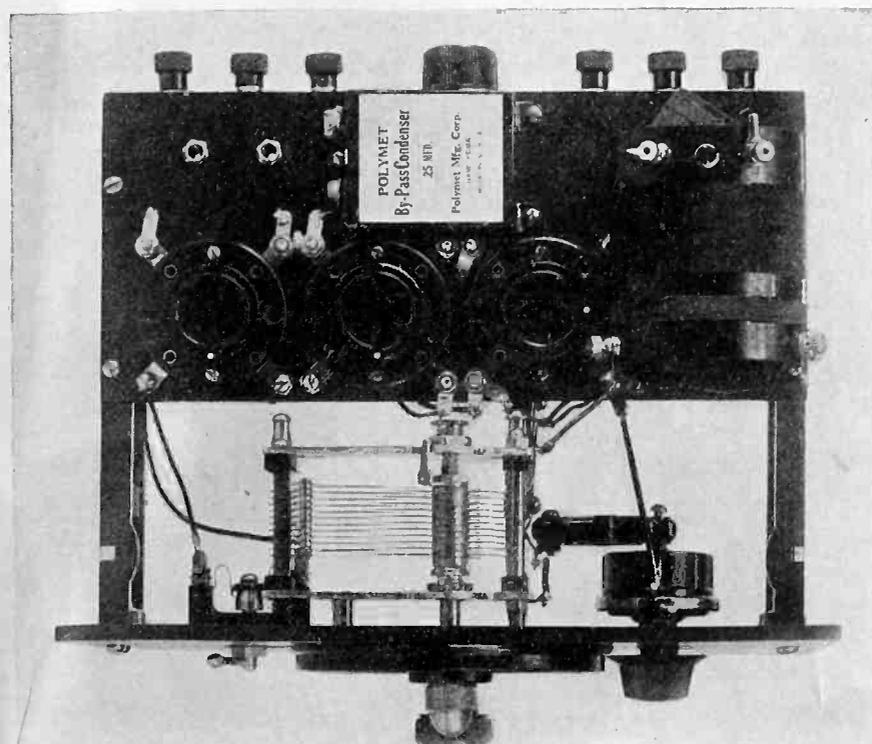
For my own part, I have had more fun with the several sets which preceded the Puppy set than from the over-grown profanidynes I used to make. I call them profanidynes because—well, you know what it's like to hook up a big set and find that it's full of trouble!

The small set, on the other hand, is always sure to work. Then, with some kind of results to start on, a fellow can get somewhere.

If you tackle this small set idea, I'd like to suggest from my own experience that you don't make it freakish. Use good standard parts, follow acceptable design practice, modifying it to meet the conditions, and by all means put your very best workmanship into your sets.

Then, as you proceed, you will not only be more successful but the work you do will be worth while.

*The rheostat is at the back, away from meddling fingers which might be tempted to turn up the filaments. When the Puppy is used with 199's and a 120 on a 6-volt storage battery, the rheostat can be turned all the way back. The series-parallel connections on the filaments takes the full 6 volts. So solid and substantial*



*is the construction of the Puppy that it is proof against all ordinary kinds of abuse. There is a growing practice among set builders, and a very commendable one, of putting Shakeproof lock-washers under the nuts. These little washers have a whole set of teeth which dig right into screws or nuts and hold them tightly*



## ACME FLEXIBLE CELATSITE

Flexible, stranded wire for point-to-point and sub-panel wiring. Non-inflammable "spaghetti" covering. In black, yellow, green, red and brown; a color for each circuit. Put up in 25-foot coils.



### The Original Celatsite

—a tinned, copper bus bar wire with non-inflammable "spaghetti" covering, for hook-ups. 5 colors; 30-inch lengths.

### Celatsite Battery Cable

—a silk-covered cable of vari-colored Flexible Celatsite wires, for connecting batteries to set.

Prevents "blowing" of tubes; gives your set an orderly appearance.

We also offer the highest grade of "spaghetti" tubing for Nos. 10 to 18 wires. 5 colors; 30-inch lengths.

### Stranded Enameled Antenna

Best outdoor antenna you can buy. 7 strands of enameled copper wire; maximum surface for reception. Prevents corrosion and consequent weak signals.

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AEROVOX products are used as standard equipment by over 200 manufacturers of Radio Receivers and "B" Eliminators.

AEROVOX WIRELESS CORP. 60-72 Washington St., Brooklyn, N.Y.

## APPARATUS RECEIVED THIS MONTH

Manufacturers are invited to submit samples of their most interesting items to us, and we will give in these columns the results of our tests on their products. However, we assume no responsibility for the return of these parts, for we have no facilities for handling and despatching the packing cases involved.

### SILVER-MARSHAL

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

A shielded Six receiver was submitted by Silver-Marshall Inc., 846 W. Jackson Blv'd, Chicago. This set comes in knock down, or kit form, and is designed to be assembled by the home constructor.

Practically the entire receiver is metal. The steel sub base and metal panel are drilled correctly for the mounting of the component units. Each coil, condenser, and tube socket in the R. F. end is completely enclosed in an aluminum box, the cover of which is removable so as to permit easy wiring.

The circuit consists of 3 stages of tuned radio frequency, stabilized and shielded so that the receiver does not oscillate, a non-regenerative detector, and two stages of transformer coupled audio frequency amplification. Three condensers are linked to one dial, so that only two tuning controls are required.

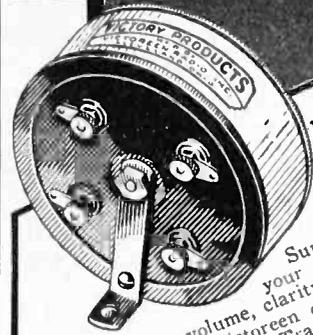
Tested under adverse conditions, this receiver performed in a remarkable fashion. Using an antenna less than 50 feet long, many stations over a thousand miles distant were brought in with local loud speaker volume. The quality of reproduction delivered by the set is splendid.

### AMPLION

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

The Amplion Corporation of America, New York City, submitted an Amplion Patrician cabinet speaker. This instrument is housed in an attractive and well made cabinet, and is very pleasing in appearance. The tone quality of the model is excellent, and leaves little to be desired when attached to a good audio amplifier.

## VICTOREEN A Super Set Without an Equal! Build it with VICTOREEN Parts



### VICTOREEN TRANSFORMERS

The Victoreen Super will satisfy your craving for a set that has range, volume, clarity and selectivity. The heart of the Victoreen circuit is found in the four Victoreen R.F. Transformers and the Victoreen Coupling Unit used with them. These units are precision instruments—tuned to a guaranteed precision within 1/3 of 1%—a Victoreen feature. They make the Victoreen a Super Set without an equal. (No. 171 for dry cell tubes) \$7.00 each  
No. 170 Victoreen R.F. Transformer. 5.50 each  
No. 150 Victoreen Coupling Unit. 3.50 each  
No. 160 Victoreen Antenna Coupler. (For outside aerial only)

### VICTOREEN RHEOSTAT

Zero temperature coefficient—resistance remains absolutely constant; double the number of turns of wire used on ordinary rheostats. Three terminals simplify wiring.

Fire resistance—2, 6, 10, 20, 30 ohms. \$1.20  
Victoreen Potentiometers—200 and 400 ohms resistances, \$1.50.



### VICTOREEN MASTER CONTROL UNITS

A completely assembled unit with one dial reading controlled by a compensator on the Vernier dial which compensates for any difference in the capacities of your condensers within 20 points on the dial. Used in circuits employing two or more condensers of the same capacity. Easy to mount—no change of wiring necessary.

Victoreen Master Control Unit 2  
Condenser type, \$19.50. Extra  
condenser, \$4.50.

## Pioneer Builders of Super Set Radio Parts

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The GEO. W. WALKER CO.  
6528 Carnegie Ave. Cleveland, Ohio  
Merchandise of  
Victoreen Radio Parts



wherever a  
variable re-  
sistance is  
specified

Pin your faith on

**CLAROSTAT**

Manufactured by  
American Mech. Lab., Brooklyn, N. Y. Dp. RM

### 3 DECKS BELOW

ON A BATTLESHIP IN THE PACIFIC placed among a maze of electric lines and under a big air circulating motor, this wonderful NEW

### HENRY-LYFORD

RECEIVER

With the Deliberately Unbalanced Circuit

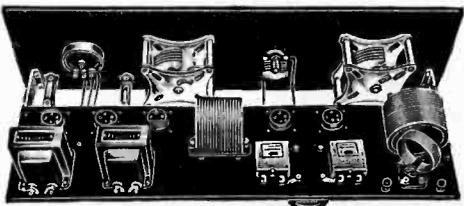
Brought in these stations clear as a bell—

KGW KSL  
KDKA KOMO  
WEBB KTAB  
C NRY KMDX  
and others

Build This Outstanding  
Circuit of the Year

Endorsed by every worthwhile Radio magazine published—because the endorsement is deserved

Were a manufacturer to build this set, with labor, overhead and selling costs, which, of necessity must be added to material, it would easily come within the \$300 class of receiver.



Complete construction article in  
October Radio Mechanics.

Write for free 8 page Reprints and Free Book "A Plug-in Coil Receiver with a Deliberately Unbalanced Circuit."

Complete parts carefully packed—  
fully guaranteed. \$69.50.

University Radio Mfg. Corp.  
50 Park Pl. Dept. R.M. New York

### RADIO PHYSICS COURSE

(Continued from page 261)

tuned circuits to a minimum, provided this does not have an unsatisfactory effect on the receiver as a whole in some other way. To do this with a crystal receiver, the crystal and phones are placed in a secondary tuned circuit, coupled in some way to the aerial circuit, the latter responding to the maximum degree to the incoming signals. Such a circuit is shown in Fig. 33, and is known as a two circuit receiver. The primary and secondary coils of the inductance  $L$  are wound near each other, usually on the same form so that the magnetic field produced by the antenna current flowing through the primary coil links and unlinks with the turns of wire of the secondary and induces a similar current in it. The variable condenser  $C$  connected across the secondary coil, tunes the coil and produces resonance in the circuit. This sets up strong currents in the circuit  $LC$ , which impress stronger voltages across the detector and phones than if the condition of resonance were not present, resulting in increased volume. The primary circuit can be tuned independently by the slider which varies the number of turns included in the aerial-ground circuit. By varying the settings of the slider and variable condenser, the circuit will respond to any desired frequency within the range for which the coil and condenser have been designed.

This gives us a system of radio reception in which the volume of sound produced depends entirely on the strength of the received waves. Since the amount of energy decreases very rapidly as the distance from the transmitting station is increased, it is evident that simple crystal sets cannot be used for long distance reception, because the received currents are not strong enough to operate the earphones.

The use of earphones is becoming unpopular, as people desire to hear their programs in comfort, with loudspeakers which produce enough volume to fill good sized rooms. Loudspeakers require a stronger operating current than do ordinary earphones, so amplifiers have been developed for amplifying the received radio currents to make loud-

speaker operation possible. Those employ vacuum tubes in their operation. The crystal detector while producing remarkable clarity of reception, is unable to handle either very weak or very strong impulses of current satisfactorily. Crystal detectors have been superseded almost entirely by vacuum tube detectors, due to their greater sensitivity, ease of adjustment, and property of not only rectifying but amplifying at the same time. The rectifying ability of a crystal is an inherent property of the crystal and cannot be altered or improved. The point of best sensitivity must be determined by trial by moving the catwhisker over the surface of the crystal. In most cases, this point is never located. The adjustment is not permanent, and heavy currents such as those received from powerful nearby broadcasting stations may make the detector inoperative by setting up a comparatively great amount of heat at the contact point and thus oxidizing the catwhisker.

### CENTRAL RADIO LABORATORIES

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

The Central Radio Laboratories, Milwaukee, Wisconsin, submitted samples of their variable high resistances and volume controls. The modulator made by this company is a potentiometer of 500,000 ohms resistance, and is designed to be shunted across the secondary of an amplifying unit, with the center tap connected to the grid of the following tube. With the control wired in this manner, the volume can be varied from a whisper to maximum, and none of the characteristics of the signal are changed.

This modulator is also made in a switch type. By means of a separate contact, the filament circuit is automatically opened when the control is set at minimum.

### CARDWELL

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

The Allen D. Cardwell Manufacturing Corp., Brooklyn, N. Y., submitted samples of the new Cardwell Balancet. This is a midget variable condenser, made in several capacities.

The Balancet can be used for many purposes, such as balancing

# If You Are in the Radio Business and If You Have Two Friends Who Are Also in the Radio Business—

## YOU HAVE TO DO IT

**R**IGHT now the radio manufacturers and engineers are turning radio sets, kits, parts, and accessories inside out in preparation for next season's business.

This applies not only to radio companies but also concerns supplying radio manufacturers. Have RADIO ENGINEERING keep you posted each month. There is the interference problem to meet.—Will sets be made with less radio pick-up and greater audio amplification?

This is the first full season for designing power tubes into sets.—What tubes are to be used, and what about new tubes?

Full A. C. operation is scheduled to be widely employed in new sets.—But what systems will be used?

Loop antennas are coming in strong.—What about the uni-directional loop for reducing interference?

Many new-comers will appear in the set business.—What have they to offer?

The parts business is changing rapidly.—What about new kits, and what channels of sales distribution will be employed?

# RADIO ENGINEERING

*The Technical Magazine of the Radio Industry*  
Edited by M. B. SLEEPER

RADIO HILL, POUGHKEEPSIE, NEW YORK

**I**F you are in the radio business you must get advance dope on these things. You have to do it! Otherwise you will wake up to find that it has cost you real money to have let these things slip by.

Remember that the new season starts in June, with the R. M. A. Trade Show in Chicago.

**R**ADIO ENGINEERING, the technical magazine of the radio industry, is the only source of this advance information. It is sold only by subscription. But to get it each month costs only \$2.00 a year.

And if you will send the coupon below with your check we will send RADIO ENGINEERING for six-months FREE to any two friends of yours who are connected with the radio business.

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Radio Hill, Poughkeepsie, N. Y.  
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Name ..... St. ....  
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Send Radio Engineering FREE for 6 months to my two friends who are also in the radio business.

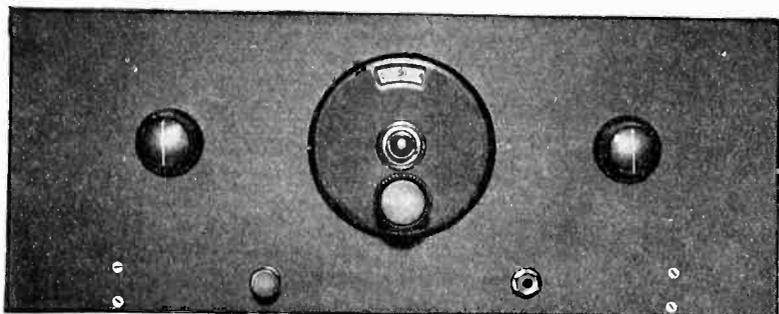
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# Cardwell Condensers USED IN



## Bert Smith's Set

Described in the November issue of "Radio Mechanics". A booklet describing its construction will be mailed on receipt of 10c in stamps to cover postage.

### Also used in

- Sargent's "Infradyne"
- Brennan's "Radio Broadcast 'Lab'"
- Marco's "Aerodyne"
- Sleeper's "Man-O-War"
- Casem's "Power's Casem"
- Cockaday's "Univalve"
- Morrison's "Varion"
- and many others

"THE STANDARD OF COMPARISON"

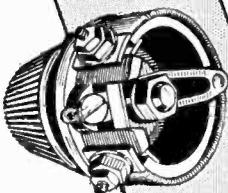
The Allen D. Cardwell Mfg. Corp. 81 PROSPECT STREET  
Brooklyn, New York

# VICTOREEN

in Super Sets Means Volume  
Selectivity and Satisfaction.

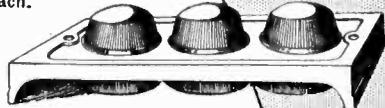
A Victoreen Super is the last word in radio. If you have never built a set using the Victoreen Universal Circuit, you have missed one of the greatest pleasures in radio.

Ask your dealer or send to us for blue print and folder giving complete information.



Victoreen Rheostat

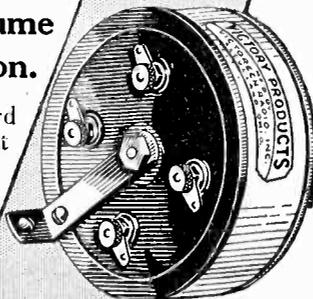
Zero temperature coefficient. Increased number of turns of wire. Third terminal to simplify wiring. Five resistances—2, 6, 10, 20, 30 ohms—\$1.20 each. Victoreen Potentiometers—200, 400 ohms—\$1.50 each.



Audio Control Unit

Permits minimum number of panel controls and consists of 3 rheostats of proper ohmage mounted on the Bakelite base. Controls the second detector and audio tubes.

Use Type 3-R for 201 A tubes. Use Type 3-R-1 for power tube. Price—\$4.50 each



Victoreen R-F Transformers

Tuned to a precision within one-third of one per cent—made by a pioneer radio manufacturer. Two types—No. 170 for use with regular tubes; No. 171 for dry cell tubes. Price \$7.00



Master Control Unit

This one dial unit has been so constructed that by means of compensator controlling the antenna condenser, adjustment is permitted up to a 20 degree variability in capacity, with a 300 degree vernier motion. Used in circuits employing two or more condensers of the same capacity. Easy to mount—no change in wiring necessary. Two condenser type—Price \$19.50. Each additional condenser, Price \$4.50.

## The George W. Walker Co.

6528 Carnegie Avenue

Cleveland, Ohio

Merchandisers of Victoreen Radio Products

ganged condensers, neutralization, regeneration, and the like. The split stator model consist of one set of rotor plates and two sets of stator plates insulated from each other.

### ALLEN-BRADLEY

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

The Allen-Bradley Co., Milwaukee, Wisconsin, submitted samples of Bradleyunits, Bradleyometers, and Bradleyohms.

The Bradleyohms are variable high resistances, and were found to afford excellent control of the voltage on B eliminators and power amplifiers. The Bradleyunits are fixed resistors of high current carrying capacity, and can be used in B eliminator circuits where fixed resistances are suitable for non-critical voltage controls. The Bradleyometers are potentiometers of the carbon pile compression type, and afford that fineness of grid bias control so essential in superheterodynes and other sensitive receivers.

### GENERAL RADIO

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

We have found considerable improvement in reception from the 200-A detector when the new General Radio high-impedance transformer is used in the first stage instead of the ordinary transformer designed for 201-A tubes. This is due to the fact that the 200-A has an exceedingly high plate impedance. The General Radio Company is located at Cambridge, Mass.

### ALDEN MANUFACTURING COMPANY

For further information write to the New Apparatus Dept. of RADIO MECHANICS.

From the Alden Mfg. Company, Springfield, Mass., we have received a set of Truphonics, a very extraordinary type of amplifying transformers which do not act like transformers at all. In fact, they seem to have very different characteristics all their own. The quality of reproduction from them is remarkable, and they seem to be proof against overloading.

Being very small in size, and fitted with moveable mounting feet, they are splendid for fitting into set designs. The manufacturers recommend three stages of Truphonics, although big volume can be obtained from two steps.

# BEST CONOIDAL SPEAKER

**De Luxe**  
17½ inches high  
**\$25.00**  
Complete

**Standard Type**  
14½ inches high  
**\$16.50**  
Complete

**Conoidal, Jr.**  
12½ inches high  
**\$10.00**

SELECTED by  
Radio Mechanics  
for use with  
the A. C.  
VICTOREEN



A musical masterpiece—as supreme in performance as in pleasing decorative appearance. Note the mahogany sounding board on this De Luxe type. Combined with the Conoidal seamless diaphragm, this results in increased volume, and richer, fuller tone quality. The exclusively designed balanced armature unit is the scientific peak in sound reproduction apparatus. It is impervious to climatic conditions.

Ask your dealer or write.

**Best Manufacturing Company**

1200 Grove St., Dept. M., Irvington, Newark, N. J.

## Save Money on This \$3.00 A. C. Combination

*Here's the way to save three dollars*

01-ABC Eliminator Dataprints.....	\$1.00
Victoreen Socket Power Super.....	2.00
Year's single copies of Radio Mechanics.....	3.00

Total cost ..... **\$6.00**

Send the coupon below with \$3.00, and this \$6.00 combination will be sent to you.

**DON'T WAIT, FOR THIS OFFER IS GOOD ONLY UNTIL APRIL 10, 1927**

Radio Mechanics, Inc.  
Radio Hill, Poughkeepsie, N. Y.  
Enclosed are \$3.00 for which send me:  
01-ABC Dataprints.  
Victoreen Socket Power Super Dataprints.  
Year's subscription (11 numbers) to Radio Mechanics.

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# USE THESE COILS AND IMPROVE ANY RADIO RECEIVER!

**AERO COIL**  
SUPER-SENSITIVE

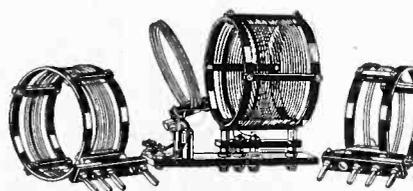
INDUCTANCE UNITS



TUNED RADIO FREQUENCY KIT

**\$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 in 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 FREE with each kit. Extra copies, 75c each. Instructions include insert showing how to wire up for a power tube if desired.



LOW WAVE TUNER KIT

**\$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 Nos. 4 and 5. Combined range of 15 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.

*Get these coils from your nearest dealer. If he should be out of stock, order direct from the factory.*

**AERO PRODUCTS, INC.**

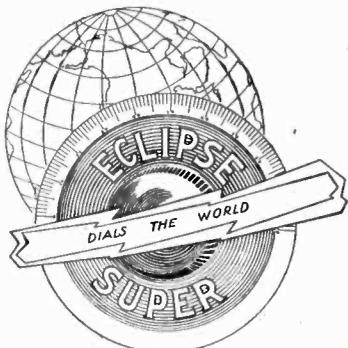
Dept. 114, 1772 Wilson Avenue  
Chicago, Ill.

# Radio Mechanics Specifies



## Transformers

FOR THE



### BECAUSE

H. F. L. Transformers are laboratory-built instruments that are unconditionally guaranteed to surpass any transformer on the market for power, selectivity and purity of tone. Write for circulars describing H. F. L. Units and their marvelous performance.

H.210 Iron core transformer. Carries laboratory calibration. Range 32,000 to 42,000 cycles. Price .....\$8.00

H.215 Air core transformer. Each unit carries laboratory calibration. Price.....\$8.00

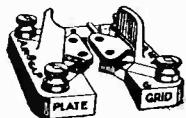
F.320 Audio frequency transformers. These units are the result of an entirely new principle in transformer construction. Price \$8.00

L.425 Radio Frequency Choke Unit. Price .....\$5.50

L.430 Low Loss Radio Frequency Transformer. Price .....\$5.50

Get H. F. L. Units at any reliable radio dealers.

**High Frequency Labs.,**  
131-B N. Wells Street,  
CHICAGO



### The AIRGAP SOCKET

*"It gets that last mile"*

Selected for the New Day Circuit (this issue) on account of its low capacity, due to the gap.

At dealers or direct postpaid  
UX or Standard Type, 60c each

**AIRGAP PRODUCTS CO.**  
19 Campbell St., Newark, N. J.

**MAR-CO Illuminated**  
back-panel controls  
set the 1927 style

## PRIZE WINNERS

WE are very glad to make the following announcements for the prize contests in the December and January issues of Radio Mechanics.

### Suggestion Contest Winner:

A. P. STEVENS  
Aeolian Hall, N. Y. C.

### Loop Set Name Contest Winner:

C. L. FERRIS  
Taylor St., Fort Worth, Texas

The prize-winning suggestion for an article or series of articles was that we publish from month to month the diagrams of special circuits and particularly circuits adapted for A. C. operation. Practically any of the popular hook-ups can be changed from storage battery to A. C. supply, altho few set builders know how to do it because of the tricks involved in obtaining correct grid returns and grid biases. Therefore, the series of A. C. hook-ups will enable every set builder to make his outfit right up to date. This is especially important in view of the big tube developments coming this fall.

Senator's Set was the name chosen for Maurice Osborne's receiver. It must have been a little difficult to think up names for this outfit, for there were dozens and dozens of "Back Bay's" and "Colonials." The Senator's Set seemed to indicate most accurately the idea behind the design.

## ADVANCE DATA

Have you been waiting for a "Perfect" B eliminator design?

Well, it's ready for you now—the

### Glo-Liminator

A constant voltage supply at 45 and 90 volts, and a built-in 171 amplifier which has a constant voltage at 180. It's entirely new to radio.

DATAPRINTS \$1.00

To be described in April R. M.

## RADIO MECHANICS

Radio Hill, Poughkeepsie, N.Y.

# IMPORTANT



## -as the TUBE Itself

Amperite alone can supply automatically, the self-adjusting filament control your tubes require for perfect rheostat regulation under all varying conditions. Insist upon Amperite, and accept nothing else. Simplifies wiring. Eliminates hand rheostats. Specified by leading engineers in every popular circuit. Types for all tubes. Price \$1.10 mounted (in U.S.A.) At all dealers.

**Radial Company**  
50 FRANKLIN ST., NEW YORK



FREE Write for Hook-ups to Dept. RM3

## AMPERITE

The "SELF-ADJUSTING" Rheostat

# YAXLEY

APPROVED RADIO PRODUCTS



Selected for New Browning-Drake Receiver

An unbeatable combination exists when approved radio parts are used with tested and tried circuits. That is why Yaxley Approved Radio Parts are usually selected for the leading radio hook-ups, such as the New Browning-Drake Receiver. Yaxley Products enjoy a long life—even after years of wear they are found in service giving the same good results all the while. Order these parts for your Browning-Drake Receiver and be sure of good results:

Rheostat—No. 130K—30 Ohm.....\$1.35  
Pup Jack—No. 416......15  
Filament Switch—No. 10......50

For the man who has a set with binding posts the No. 670 Cable Connector at \$4.00, will prove a real joy—all battery wires are here confined in one, neat cable with Bakelite plug and receptacle. The No. 660 Cable Connector Plug, at \$3.50, will handle the wire connections efficiently and correctly; and is conveniently installed when building your set.

At your dealer's. If he cannot supply you send his name with your order to

**Yaxley Mfg. Co.**  
Dept. O—9 So. Clinton St.,  
Chicago, Ill.

A NEW  
A. C. OPERATED SET  
See  
RADIO MECHANICS  
MAY ISSUE

### Bill's Postscript

Bill and Bud are always on the trail of things they can put on complete sets, which they install for their customers, that will improve operation or make it easier for the owners to keep their sets running.

Here's the latest thing they have come across, and what they are doing with it:

P. S. We've had lots of calls for installing B battery eliminators and trickle chargers lately. But for all the instructions we've given them, people keep calling us up about this or that that they have managed to discombobulate.

Since we came across the Brach Controlit, we've found it a regular life-saver. It's a little box, small enough to hold in your hand, that has two receptacles and a cord and plug coming out of it.

We put the Controlit out of the way in the battery compartment of the cabinet. Then we disconnect the positive lead from the set to the A battery and put it on one binding post of the Controlit, and run a wire from the other binding post on the Controlit to the positive post of the storage battery. That is the only change in the wiring of the set.

Finally, we put the plug from the B eliminator into one receptacle of the Controlit, the plug from the trickle charger into the other receptacle of the Controlit, and plug the cord from the Controlit into the light socket.

Then each time the filament switch of the set is turned on, the trickle charger is disconnected and the B eliminator turned on. When the filament switch is turned off, the charger is put onto the storage battery and the eliminator cut out.

Thereafter, the set owner never has to think of his battery, for it is always charged, and the eliminator is put on or off automatically.—And we have no more complaints to adjust.

Yours for less trouble,  
BILL

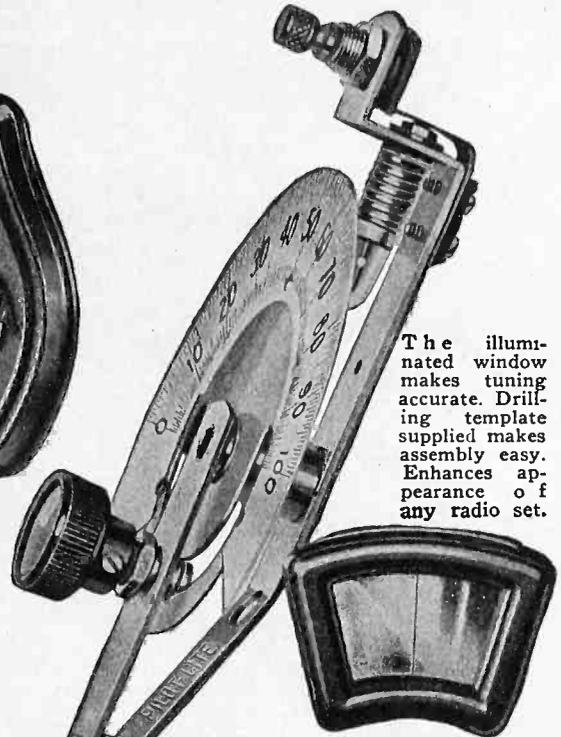
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APRIL ISSUE



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The high primary impedance of the 220 audio (19,000 ohms at 30 cycles, 626,000 ohms at 1000 cycles) means that better low note amplification will result with 220's than with any other known transformer. Price \$0.00.

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Do you know that S-M Audio Transformers are found in more of this season's receiver designs than any others—that independent testing laboratories everywhere prove them to be superior—that less than one in every four thousand of these transformers comes back to the factory for refund? Yet each is guaranteed to give more satisfying qualities than any other amplifying devices that the market offers!

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S-M audio transformers, output transformers, coils or power units have been selected for the following receivers—and in many form the basis of the design. In this list are included the most popular recent designs.

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Radio Broadcast Super  
Radio Age Super  
Radio Broadcast Local  
LC-27 Junior Power Pack  
Citizens Call Book Mono-  
tune Receiver  
Call Book Power Pack  
Callies Super  
Radio Mechanics "A", "B"  
and "C" Eliminator  
Radio Engineering "A",  
"B" and "C" Eliminator  
Radio Mechanics Man-O-  
War Super  
Lincoln Super  
Best's Short Wave Set

Hush-Hush II Short Wave  
Set  
Popular Mechanics Super  
Christian Science Monitor  
6 tube Browning Drake  
Radio Engineering Short  
Wave Set  
New York Sun "B" and  
"C" Eliminator for Re-  
sistance Amplifier  
Chicago American Short  
Wave Set  
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plifier  
Best's New Super  
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## ELEKTRONS Give Better Reception

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form internal ca-  
pacities for the  
most satisfactory  
operation of  
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other multi-tube  
sets.



TYPES  
200A  
201A  
112  
171  
Hi-mu 30  
199V  
199X  
199A  
120

In these days of congested wave bands and pirating stations, QUALITY tubes are essential to good radio reception. That NECESSARY quality is found in each and every ELEKTRON.

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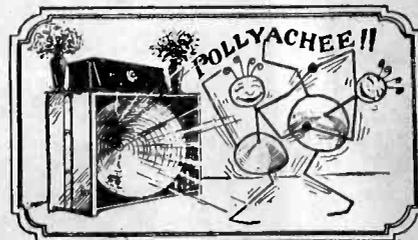
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