Radio Mechanics

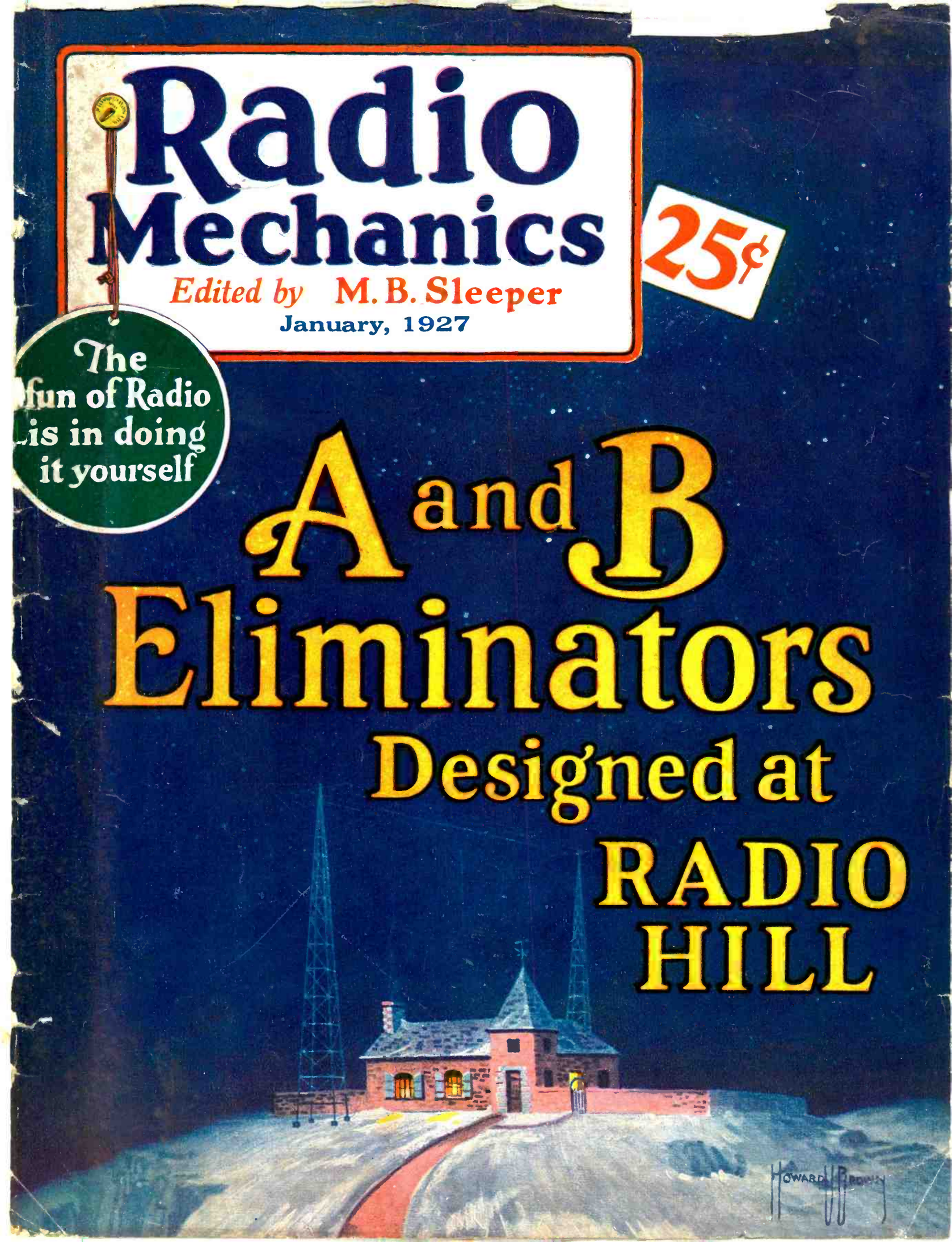
Edited by M. B. Sleeper

January, 1927

25¢

The fun of Radio is in doing it yourself

A and B Eliminators Designed at RADIO HILL



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.

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.

$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.

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.

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

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

$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.

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. Suitt 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!

Clip Coupon Now for FREE BOOK

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!

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Originators of Radio Home Study Training

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.

SEND THIS COUPON

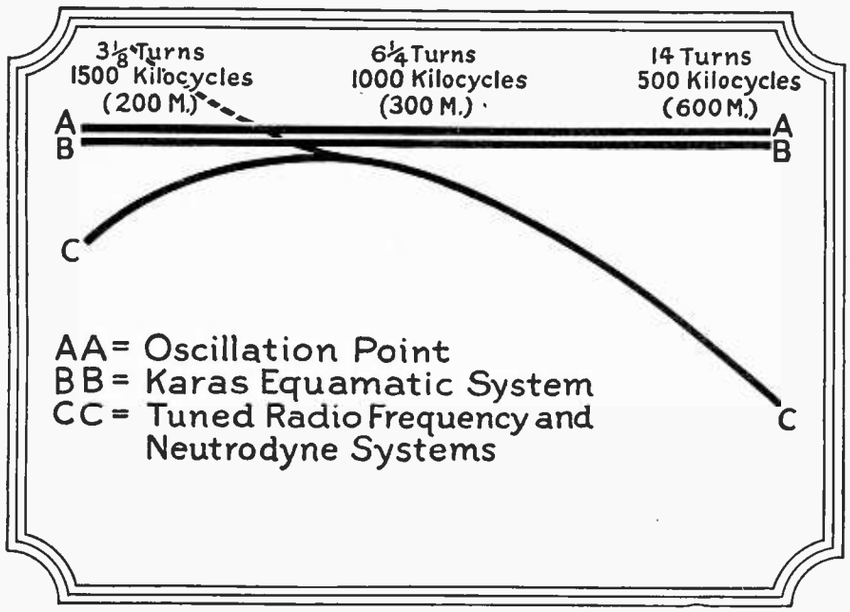
J. E. Smith, President
NATIONAL RADIO INSTITUTE
Dept. AB-7 Washington, D. C.

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.....



Why is the Karas Equamatic the most efficient receiver ever designed?

YOU who have attended the great radio shows in New York and Chicago do not need to be told that the Karas Equamatic Receiver was not only the biggest new thing on exhibition there, but also the most talked about new receiver of either show.

Every visitor at both shows was given a new thrill when he observed how Karas had solved the last and most baffling problem of radio.

All who have heard this sensationally successful receiver—all who have built Karas Equamatics for themselves—have been amazed at its flexibility—its selectivity—its great volume—its remarkable tone, while at the same time marveling at the innate simplicity of the set and the ease with which anyone, without even a particle of radio experience, can quickly build the Equamatic and enjoy the possession of a receiver which is the last word in efficiency.

The Hidden Secret of Equamatic Efficiency

The efficiency of the Karas Equamatic lies in its uncanny ability to maintain the tubes at their very highest point of efficiency—just below the oscillation point. Radio engineers have known for years that this was desirable. but only Karas has been able to design a receiver that accomplishes this—not occasionally—not at certain points of the dials—but AT EVERY WAVE LENGTH SETTING FROM 200 to 600 METERS! You can turn the dials of the Equamatic from one end of the scale to the other and the set will not lose one particle of its efficiency at any point. The tubes positively will not break into oscillation. Yet the slightest change in the rheostat setting will permit them to oscillate.

All of this has been achieved in the Karas Equamatic by providing a continuously equal transfer of energy between the primary and secondary of the inductance coils at all wave length settings of the dials between 200 and 600 meters, and by making this transfer of energy at all times the practical maximum necessary to keep the tubes exactly under their oscillation point. No other set ever did this before. No other set does this now.

Note the Three Lines on the Chart

In the chart shown above the line AA represents the oscillation point of a tube between 200 and 600 meters. The line BB, directly below this, is the point at which the tube will operate at its highest efficiency, and is also the point at which the radio frequency tubes in the Karas Equamatic operate at all wave lengths. The curved line CC indicates the tube efficiency of a tube in an ordinary tuned radio frequency set and in the neutrodyne circuit.

Note that the line CC falls far below the oscillation point at its right hand end, i. e., at low frequencies. Note also that such sets as tuned radio frequency and neutrodyne receivers approach the efficiency of the Karas Equamatic Receiver ***at only one point between 200 and 600 meters*** (this point being where the curve CC almost but not quite touches the line BB.) At this one point in the broadcast wave band, and at this point only, do these sets come anywhere within range of Equamatic efficiency. If various stabilizers and other so-called losser methods of control were not used to keep the tubes from breaking into oscillation when tuned to the shorter wave lengths the curve of these sets would extend far above the lines AA and BB, as indicated by the dotted upper portion of the line CC. Due to these losser methods the tube efficiency of such sets at the shorter wave lengths falls away from the desired optimum line BB, at which the Equamatic System always maintains the Karas Equamatic Receiver.

Note that the left hand end of the line AA represents 200 meters, and the right hand end 600 meters, while the center represents 300 meters. Since the impedance of an inductance varies with the frequency and the amount of energy transferred from primary to secondary varies with the impedance, a primary coil must have much greater inductance to tune to 600 meters than will be needed to tune to 200 meters. Assume that these values are 14 turns of primary for the longer wave and 3⅛ turns for the shorter.

One Hundred Coils in One

The Karas Equamatic Receiver automatically provides the exact number of turns of primary for EVERY WAVE LENGTH SETTING OF THE DIALS—its ingeniously designed Inductance Coils accomplish what could only be done otherwise with a hundred separate inductances, each of the proper value for a certain wave length—and the tubes thus are kept at precisely their proper point for highest efficiency operation—just below their oscillation point. The primary coil is mounted upon the extended shaft of the Karas Orthometric Variable Condenser at an angle of 58 degrees, which gives, in effect, the precise number of turns or parts of a turn needed to furnish the continuously increased inductance for each succeeding longer wave length.

You, Too, Can Build This Great Receiver

Anyone, even without set-building experience, can build this wonder set in a short time. We furnish a complete manual of simple, easily understood assembly instructions with every set of three Karas Equamatic Inductance Coils. We supply every nut, screw, binding post, for mounting all the parts. In addition to the Karas parts listed in the coupon you will need certain other standard parts easily obtainable anywhere. Your dealer can supply these. If he is out of stock you may order Karas parts direct from us by filling out and mailing the coupon below. SEND NO MONEY. Just hand the postman the price of the Karas parts plus a few cents postage. MAIL THE COUPON NOW!

Yes! You can tune to within 1-1000th of an inch with the Karas Micrometric

HOW would you like to be able to secure a vernier action in tuning that was as fine as 1-1000th of an inch? How would you enjoy operating a set with condensers equipped with vernier dials that had not a five to one, nor a ten to one, nor even a twenty to one, but that had a ***63 to 1 ratio*** between the vernier knob and the condenser shaft? Karas Micrometrics offer you this remarkable hair-splitting control. They are the only vernier dials made which do this. And they accomplish it without a particle of backlash. Karas Micrometrics use no cams, or other unreliable friction devices. They never pause, jerk or slip; just a liquid-like smoothness of operation. You should equip your set with Micrometrics. You will be amazed at the ease with which you can bring in stations you could never bring in before.

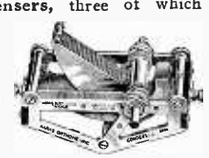
Order them today from your dealer, or if he cannot supply you, order direct from us. Price, each, $3.50.

Equamatic System Licensed under King Patents Pending.

Essential Parts of the Karas Equamatic Sensation

Karas Equamatic Inductance Coils are packed three in a carton, and come to you with complete manual of simple diagrams and instructions, all necessary nuts, screws and binding posts, ready for mounting in your receiver. Price, set of three coils..$12.00

Karas Special 17-Plate Orthometric Condensers, three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the Inductances. Price, ea.$7.00



Karas Harmonik Audio Frequency Amplifying Transformers are essential to the tone quality success of the Equamatic Receiver. Two of these are used for the two stages of Audio frequency amplification. Price, each $7.00

Karas Equamatic Retard Coils, two of which are used, were designed especially for the Equamatic System. Price each $1.00

Karas Equamatic Sub-Panel Brackets. To insure the necessary exact positions of primary and secondary coils these brackets are essential. Price, set of three.....70c

Karas Micrometric Dial. It has a 63 to 1 vernier and tunes to 1/1000 of an inch. Price.....$3.50

KARAS ELECTRIC CO., 1111 Association Bldg., Chicago, Illinois

Please send me set of 3 Equamatic Inductance Coils, $12.00; 3 special Orthometric Condensers with extended shafts, $7.00 each; 3 Micrometric Vernier Dials, $3.50 each; 2 Harmonik Audio Transformers, $7.00 each; 2 Equamatic Retard Coils, $1.00 each; and 3 sub-panel brackets, 70c, for which I will pay postman $60.20, plus postage, upon delivery. It is understood that I have the privilege of returning any of this apparatus for full refund any time within 30 days if it does not prove entirely satisfactory.

Name .....

Address .....

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

(If cash accompanies order we will ship postpaid)

KARAS ELECTRIC CO., 1111 Association Building, Chicago.

THIS MONTH'S FUN

WHAT IT'S ALL ABOUT—FOR JANUARY

OF all the radio engineers who have contributed to the set building activities of American experimenters, there is probably no one as popular as Glenn H. Browning, better known to his associates as Brownie. Endowed with an unusually likable personality, he has a background of education which is essential to the engineer, coupled with an understanding of the requirements of the set builders, gained with long and intimate experience with radio successes and failures. His idea of an eliminator and amplifier is shown in the first article in this month's issue.

WE thought you'd like to see the place where A. H. Ghirardi is teaching New York boys the radio course which is running in Radio Mechanics. Therefore, we got some pictures that show what his radio class room looks like. And now you can see what a wonderful place it is, and understand why his boys are such radio bugs.

THERE is another prize contest this month. Better write out that pet name you have for your own set and see if it will fit the very snappy outfit that has made such a stir in Boston. It may be worth a hundred dollars.

NOT all the good ideas come from the big cities. Sometimes the fellows in the country step out with pretty good things. This applies to the idea of regulating the B eliminator with a glow tube. It came about thru sheer necessity, for the man in the small town who wants to be right up with the times can't get satisfactory results on an eliminator run from a fluctuating line voltage supply. But the 171 Compact eliminator has many points to recommend it to city dwellers, and they can just leave out the glow tube if they do not find it essential to good operation.

BE sure to read about Bill, Bud, and the Bride. There may be some pointers for you in Bud's story, or you may have some friends who will profit by looking it over. When these boys finish school and, with the money they're saving up, open their own radio store, they certainly ought to make a success of it.

SOME additional information on the Junior Broadcaster is given by M. B. Sleeper. Lots of people still don't seem to believe that it's possible to talk by radio telephone over a range of 10 or 15 miles with a little outfit run from B batteries. But it's just as practical and easy to do as operating a broadcast receiver.

LOTS of times a few suggestions will take out all of the trouble from those tricky jobs that are so hard unless you know just how to do them. P. J. Gray seems to have a lot of tricks up his sleeve, some of which he tells about in this issue.

YES, sir, you can run a home made radio set from the light socket. John Grabar presents the method developed at our Radio Hill Laboratory—and the first method ever shown in a radio magazine. Of course, anyone can hook up a B eliminator with a storage battery and trickle charger, but that is a makeshift method, with nothing original about it. The 01-ABC eliminator is new in principle as well as appearance. It can be applied to any kind of set, and, without any extra expense, takes the place of all batteries. Don't wish you had an A. C. operated set. Make one.

HAVE you heard about the tests on short wave radio telephone which are being made from WGY? They are being made with the assistance of radio listeners all over the world. Why not get in on it? Build the little Peanut short wave receiver, and take part in the tests. You can get the details by writing WGY.

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JANUARY, 1927

VOL. 1 No. 4

M. B. SLEEPER, *Editor*
JOHN GRABAR, *Associate Editor*
HOLLIS DE NEEFE, *Managing Editor*

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.

BETWEEN YOU AND ME

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

JANUARY, 1927, sees radio starting off with some brand new things which will have a great effect upon the activities of both set builders and manufacturers alike.

Gradual changes in the attitude of the public and the companies supplying parts as well as complete sets has just about turned radio inside out.

Time was when radio parts were bought by everyone, because everyone had the urge to own something with which he could hear radio broadcasting. But no more.

The grown man who buys radio parts is the one who, still with a boy's heart, loves to play at making things. Before radio came along, he probably just tinkered around the house, finding no better way to express that inborn fondness of every American for the constructive application of his spare time.

The boy who puts away every extra nickel to spend at the radio store is the one who, having exhausted the possibilities of mechanical toys, miniature railroads, and such things develops naturally into a radio bug.

Man or boy, radio has become America's greatest in-door sport. It is not a matter of putting some instruments together to satisfy the incredulous that it really is possible to get music from the air.

"We want to have some fun!" is demand of the set builder or experimenter today. Quality? Yes. Distance? Of course. Selectivity? To be sure.

But those are essential only as they contribute to the fun of radio. Above all those factors is the importance of being able to make radio things which employ designs and methods in advance of commercial practice, if possible, or are at least abreast of it.

That is radio as we, at Radio Hill, are working to present it to the readers of Radio Mechanics—not to make our readers technical experts, but just to help out in having fun from this greatest of in-door sports.

That's why the sets described are not offered as world-beaters in distance or volume. We put all there is in range and quality into our original designs, but we know, and you know, that the man who wants nothing more than music from a radio set should go to a reliable dealer, buy his set, and arrange to have it serviced for him.

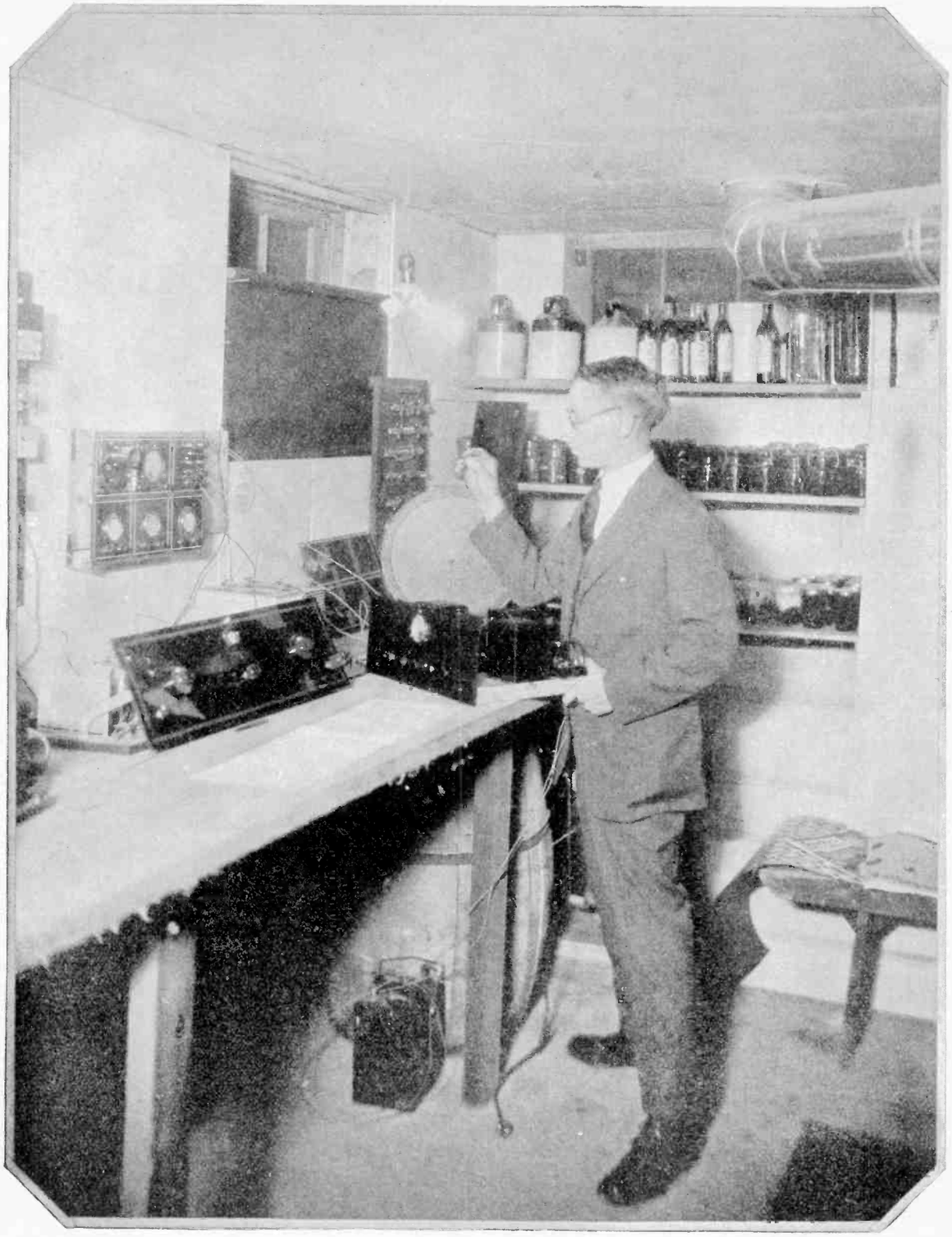
Correspondence from our readers show that a large number of the most enthusiastic home set builders have bought sets for their families because, building up and tearing down all the time, they can't depend upon themselves to provide radio entertainment for the household.

American radio manufacturers, realizing the requirements of the set buyers, are making sets which are years ahead of the equipment to be found anywhere abroad, leading in simplicity of operation, in quality of reproduction, in economy of manufacture, and in service. Considering the time in which the art has developed, the radio-set-dollar wisely spent brings back full value, and more intrinsic value than the same amount spent for parts.

But the fun, and instruction, and recreation that comes free with a kit of parts, assembled in the little shop down cellar or on the kitchen table, can't be bought with money. It has to be experienced!

So we have set out to make Radio Mechanics the magazine that will help you to do interesting things with what you have already, or to do new things which are right up with, or ahead of, the best commercial practice—and to have a good time doing them.

M. B. SLEEPER, *Editor.*



ROMANCE IN THE CELLAR

Give a fellow a chance to sneak off down cellar where he can be by himself, playing with radio, and you won't have to hide his overshoes to keep him in this winter.

RADIO MECHANICS

VOLUME I JANUARY, 1927 NUMBER 4

BROWNING'S ELIMINATOR DISCLOSED

How Glenn Browning, Radio's Most Popular Engineer, Built the B Eliminator and Power Amplifier Which He Uses in His Own Home

HOLLIS DE NEEFE

AS usual, Hallowe'en came along at the tail end of October this year, which means little when applied to radio. However, I was invited to G. H. Browning's new home in Winchester, Mass., for a Hallowe'en party, and this turned out to have a great deal to do with radio.

G. H. Browning, as you probably know, developed the Browning-Drake circuit. Therefore, I was doubly pleased with my invitation to his home: first, because he always provides interesting entertainment; second, because I knew he would have some new and unusual radio outfit or accessory.

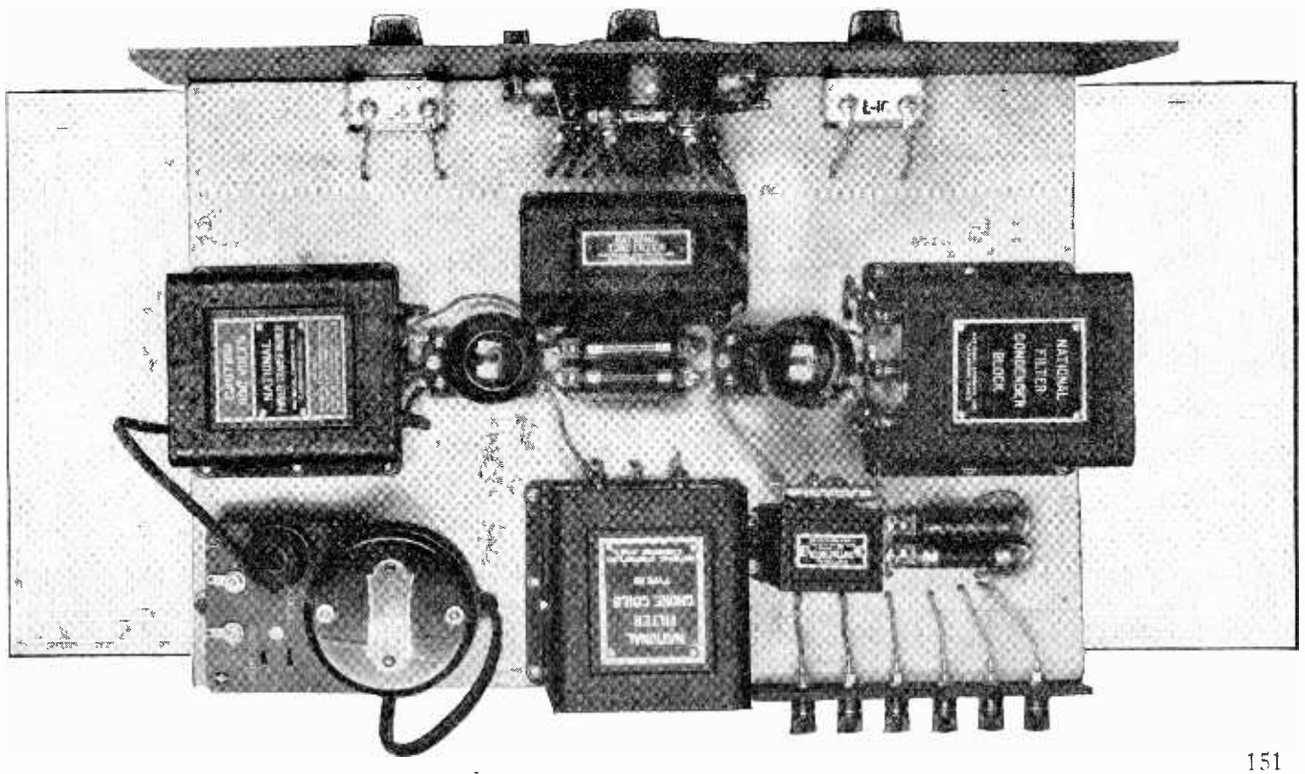
I reached Glenn Browning's home about seven o'clock in the evening, and was greeted at the door by "Brownie" himself, as well as by a flood of beautiful music such as I have seldom heard before.

"For the love of static!" I said to him, after the formalities of greeting were over, "Did you hire a special orchestra for this occasion?"

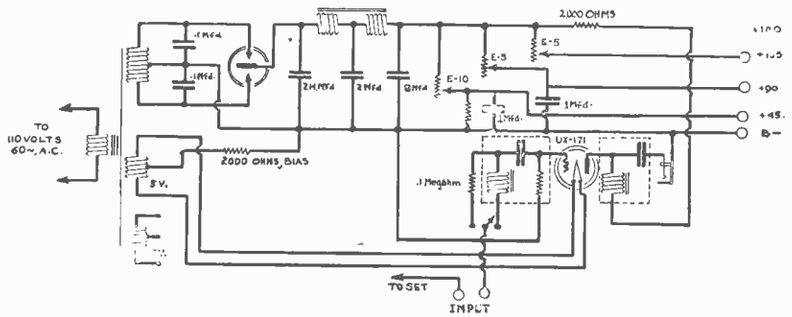
Brownie laughed. "Why," he answered, "that's the radio, and I hear nothing so unusual about tonight's reception. Possibly you hadn't noticed that," and he pointed to a three-foot cone speaker standing in a corner behind the davenport.

"Yes, it's true that I didn't see that," I told him, "and that's one of the best speakers that money can buy. However, the best cone made can't give such performance on a poor set. Where's your receiver?"

Brownie laughed again. "You see," he said, "I wired the house for radio. I plug the loudspeaker in here," and he indicated one of the new base outlets set into the



You, too, can operate a three-foot cone with this unit, or get better volume from your small cone



Schematic diagram of the eliminator and power amplifier as G. H. Browning made it

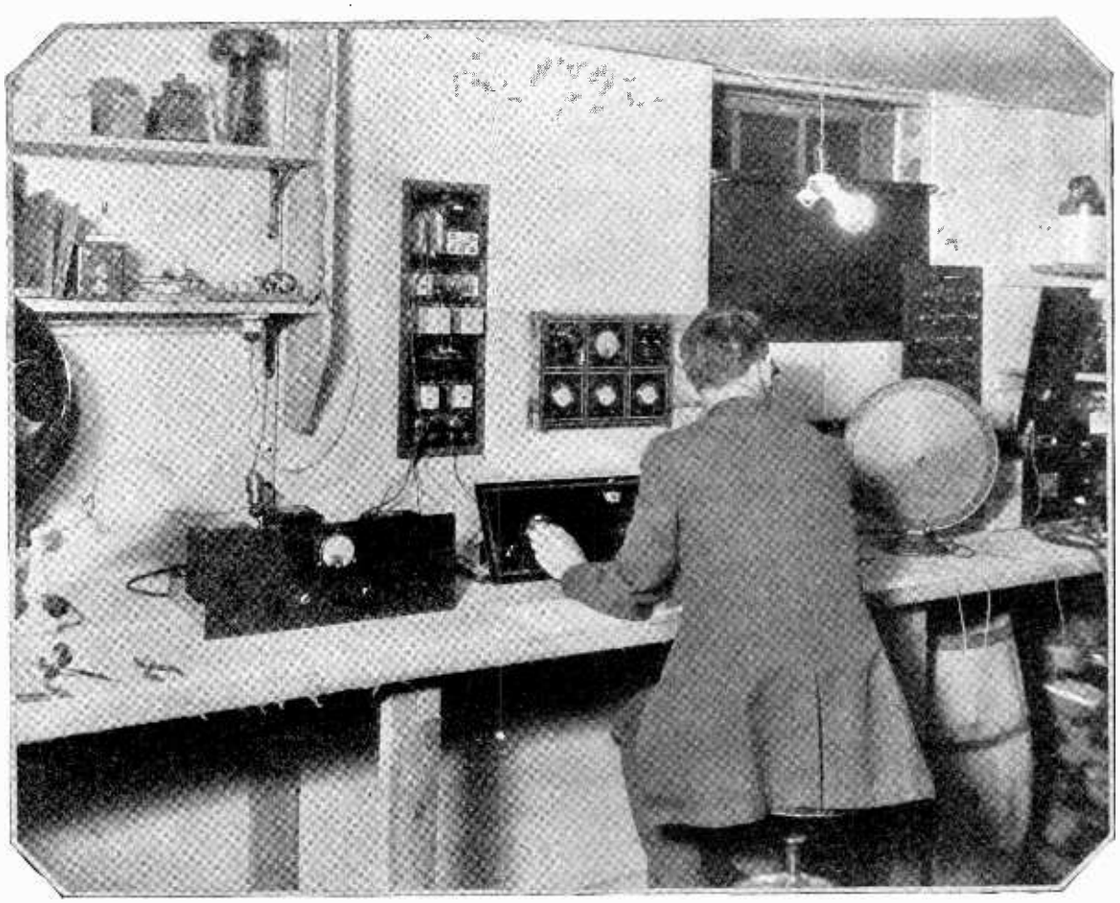
baseboard. "I found it was very annoying, both to my guests and me, to have someone twisting the dials continuously, and jumping from one station to another, so I installed the receiver on the third floor. Now, I pick out the station that is transmitting the best all around entertainment each evening, tune the set to its wave, and there you are."

"But what about controlling the volume, and switching the set on and off?" I asked him. "It seems to me that it must be very inconvenient to climb up and down the stairs everytime you want to listen to the radio, or don't want to, as the case may be."

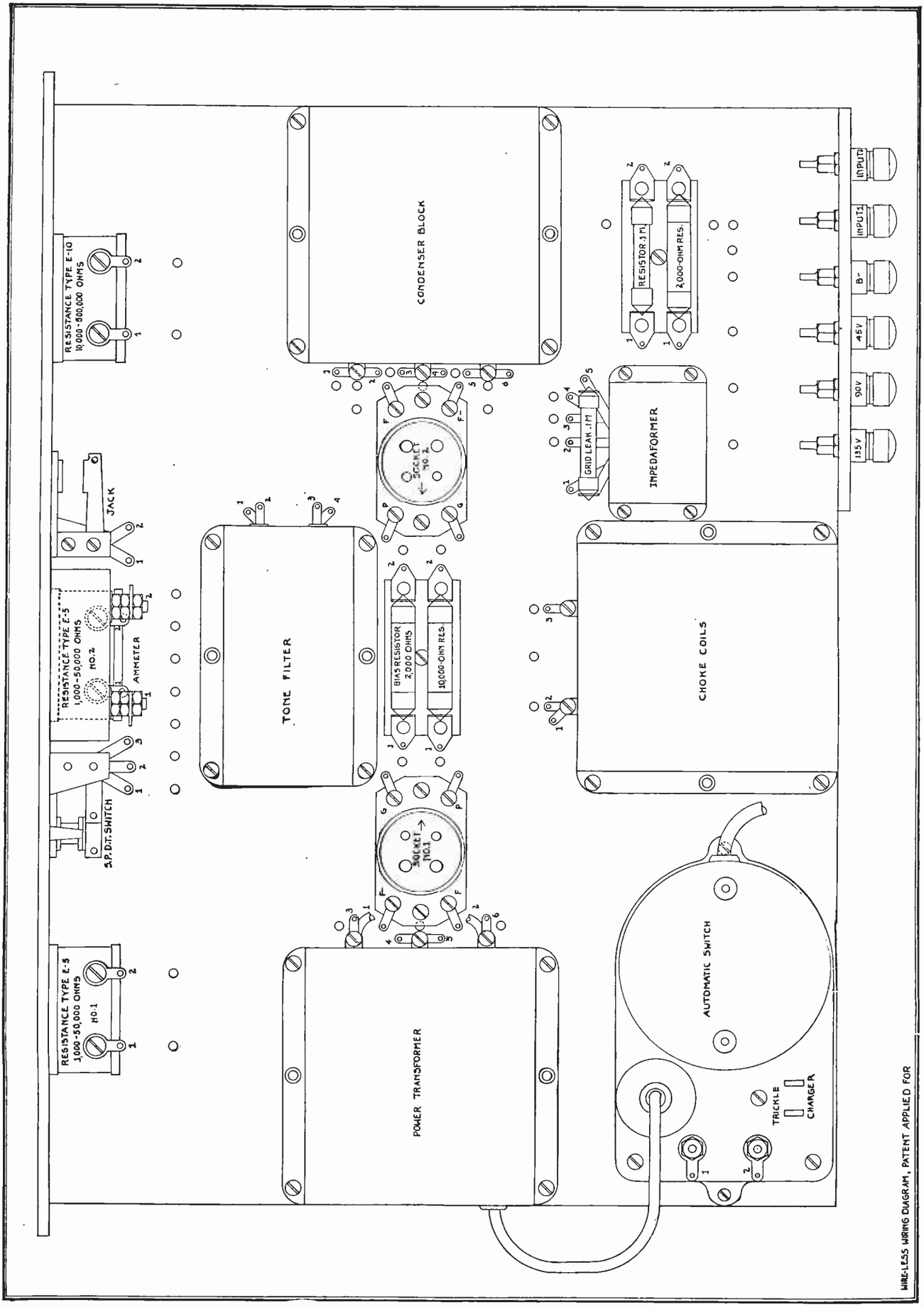
"That part is easy," Brownie explained, "here is the volume control," and he reached down to turn a small knob on the outlet. Instantly, the music was subdued to a soothing whisper. He turned the knob to the other end of its arc, and the whole house was again flooded with music. "For the switch," he said, "I use remote control on one of the new automatic power switches. Come on upstairs and I'll show you."

Despite the fact that I noticed some interesting activities in the dining room, and that I had a ravenous appetite, whetted by a two hundred mile drive, I lost no time in following him. When we reached the third floor, I forgot dinner, and even the fact that I was hungry. Brownie had one of the neatest experimenters' layouts that I had ever seen. It would take too much space here to describe it all, so I will have to skip over the parts which do not relate to this story.

A factory built Browning-Drake



Trying out the quality from the Browning eliminator and power amplifier. Not a trace of hum could be heard


RESISTANCE TYPE E-10
10,000-500,000 OHMS
CONDENSER BLOCK
RESISTOR .1 M.
2,000-OHM RES.
INPUT3
INPUT2
B-
45V
90V
135V
JACK
RESISTANCE TYPE E-5
1,000-50,000 OHMS
NO.2
AMMETER
GRID LEAK .1 M.
IMPEDAFORMER
TONE FILTER
BIAS RESISTOR
2,000 OHMS
10000-OHM RES.
CHOKE COILS
S.P.D.T. SWITCH
SOCKET NO.2
SOCKET NO.1
RESISTANCE TYPE E-5
1,000-50,000 OHMS
NO.1
POWER TRANSFORMER
AUTOMATIC SWITCH
TRICKLE
CHARGER
WIRELESS WIRING DIAGRAM, PATENT APPLIED FOR

receiver occupied a prominent position, as was to be expected. Evidently, as an inspection of its tubes revealed, it was furnishing that wonderful music, which was still clearly audible from downstairs. However, I knew that this receiver employed only three stages of resistance coupled audio, so I made the obvious inquiry.

"Brownie," I said, "what have you discovered that enables you to get such enormous volume from this set? You are holding something back. I think you've got a new one up your sleeve."

"I have a new one, all right," Brownie replied, "but I am not holding it back. In fact, here it is." He pulled one multiple plug from an outlet plate set in the top of his workbench, and inserted another. "Just switching from B eliminator to batteries," he explained. "Now, here is the outfit," and he lifted a neat array of apparatus onto the table.

"I have realized for a long time," Brownie went on, "the shortcomings of a resistance coupled amplifier. While it delivers a practically perfect signal to the speaker, it may be somewhat lacking in power, when used with certain speakers. The new power amplifiers are fine, but you cannot attach one stage of transformer coupled amplification to three steps of resistance, without encountering battery complications. Briefly, what I did was this: I combined a B eliminator with a stage of resistance-coupled power amplification. You have just been listening to the result."

"Great stuff, Brownie," I said, "give me some more technical dope on this outfit, because I know it will be of interest to the readers of RADIO MECHANICS."

Brownie drew out a free hand schematic diagram, and gave me some very interesting, helpful, and valuable suggestions.

As is to be expected from apparatus designed and approved by Glenn Browning, this B eliminator and power amplifier possesses a number of excellent features that have not been incorporated in such equipment before.

The input to the power amplifier stage is resistance coupled, and this can be directly added to the output of any three stage resistance coupled set without difficulty. For instance, this outfit is ideally suited for use with the Browning-Drake Five, as described in the October number of RADIO MECHANICS.

However, there will be a large number of set owners who would like to use this quality amplifier with some other receiver, which may use a different form of amplification. To take care of this need, a stage of impedance coupled audio is also incorporated in the outfit, and the changeover from one type of amplification to the other is readily accomplished by throwing one small switch. The method by which this is done, and the wiring and assembly simplified, is novel, and merits more than passing mention.

The impedaformer, as used here, contains the impedance, coupling condenser, and grid leak in one case. Those of you who are familiar with impedance and resistance coupling, know that the two methods are very similar. In one, the B voltage is applied to the plate of the preceding tube through an impedance, and in the other method, the tube receives this voltage through a resistance. Both are coupled to the grid of the next tube through a condenser, and both employ a grid leak.

In the system used here, the same grid leak and coupling condenser are used for both forms of amplification. One input binding post is connected to one end of the resistance and also to one end of the impedance. The other input binding post is brought to the center of a single pole, double throw switch. When the switch is in one position, the voltage is applied through the impedance, and when the switch is thrown to its other position, the B voltage is applied through the resistance. Simple, isn't it?

Some of you may have tried B battery eliminators on resistance coupled amplifiers, and secured results. A trouble sometimes encountered is known as "steamboating," on account of the chugging sound created in the loud speaker. Space does not permit here a discussion of why this sometimes occurs, but it can be stopped easily. It is merely necessary to connect an additional 4 mfd. filter condenser across the output terminals of the eliminator.

To simplify the operation of the outfit, one of the new automatic power switches has been built into the assembly. This switch automatically controls the eliminator and amplifier from the filament switch on the receiver, and in addition turns on the trickle charger when the set is shut off. Thus it is not necessary to change a lot of connections and plugs whenever the receiver is to be put in operation.

The milliammeter on the front panel serves a double purpose. First, it indicates the amount of B current consumed by the receiver and amplifier; second, it shows when distortion and overloading are present, by the flickering of the needle.

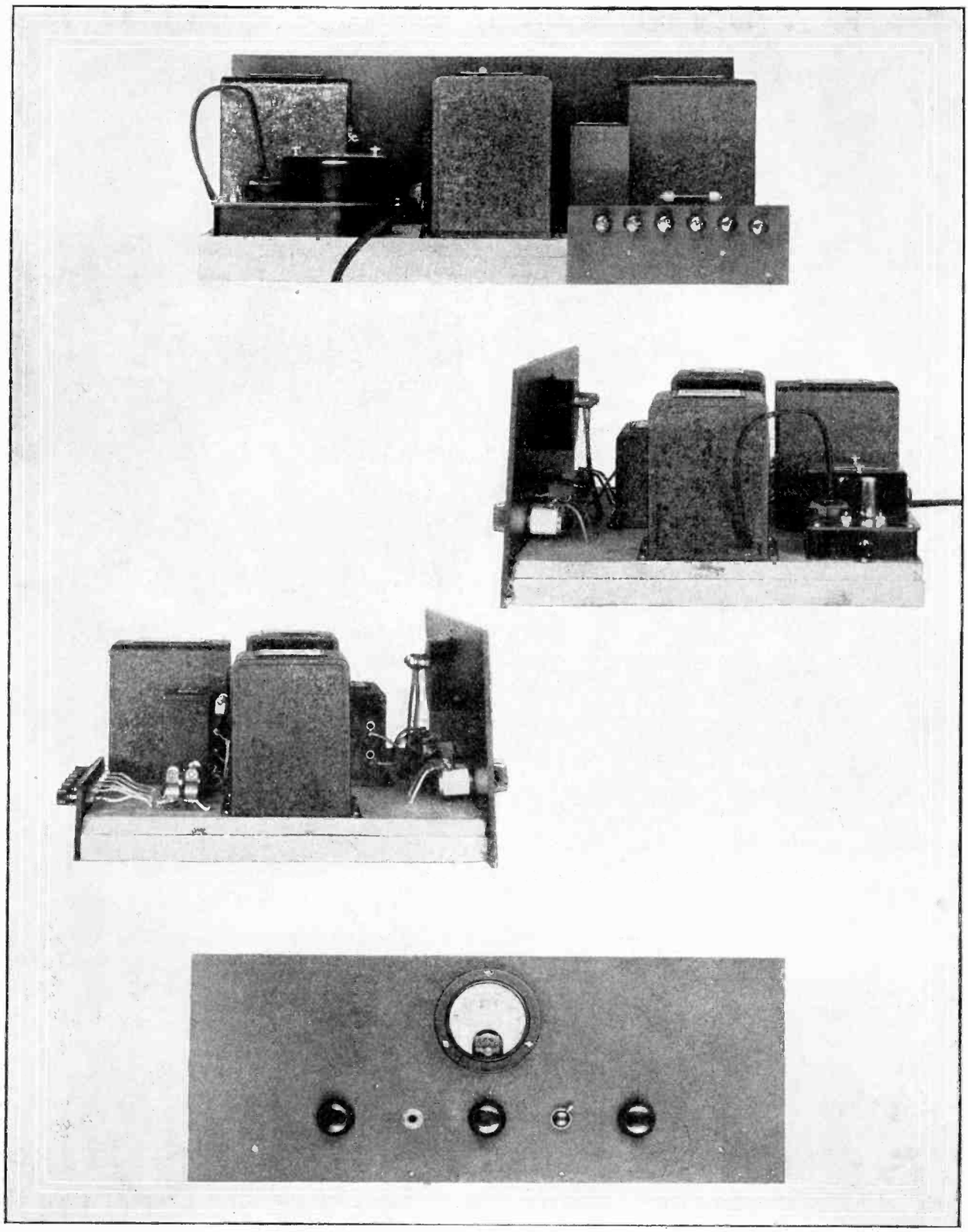
One very important point has been generally overlooked by the designers of B eliminators and power amplifiers which use the new Raytheon BH tube for rectification, and the 171 tube for the power amplifier. The maximum voltage

(*Continued on page* 185)

PARTS LIST FOR THE LABORATORY MODEL

These parts were used in the original 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 Panel 7 by 18 by 3/16 in., Bakelite or hard rubber.
- 1 Base board 12 by 17 by ½ in., wood.
- 1 Power transformer—National Co.
- 1 Choke unit, type 80—National Co.
- 1 Condenser bank—National Co.
- 1 Impedaformer, second or third stage—National Co.
- 1 Tone filter—National Co.
- 2 E-5 Bradleyohms—Allen-Bradley Co.
- 1 E-10 Bradleyohm—Allen-Bradley Co.
- 2 2,000-ohm resistors—Allen-Bradley Co.
- 1 10,000-ohm resistor—Allen-Bradley Co.
- 1 Milliammeter, 0-50, Weston Instrument Co.
- 2 Double resistor mounts—A. H. Lynch.
- 1 0.1 Megohm resistor—A. H. Lynch.
- 1 Automatic power switch—Yaxley Mfg. Co.
- 1 Coil flexible hook-up wire—Belden Mfg. Co.
- 1 Junior jack—Yaxley Mfg. Co.
- 1 Junior switch—Yaxley Mfg. Co.
- 2 UX sockets—Pacent Electric Co.
- 6 Binding posts—Eby Mfg. Co.
- 2 Doz. No. 6, round head, wood screws, ½ in.



IT LOOKED LIKE THIS

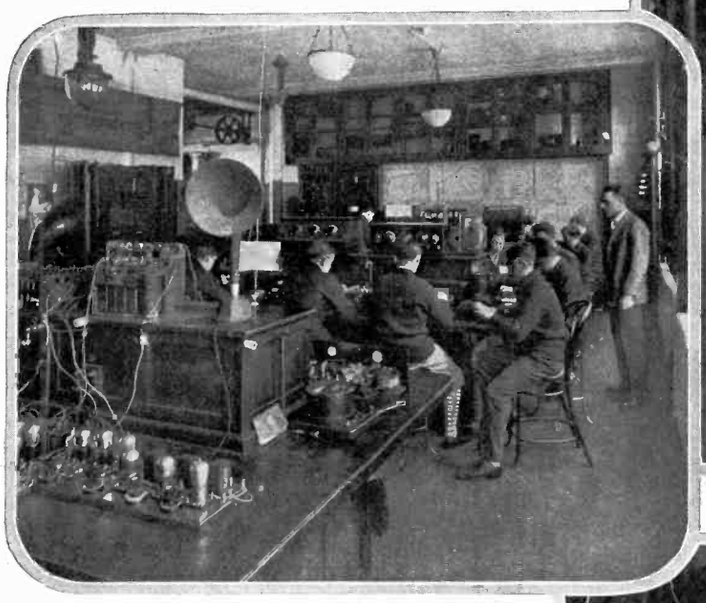
Just as neat and trim as can be, everything in lacquered metal cases. The meter is an important adjunct to correct adjustment

A RADIO BUG FACTORY

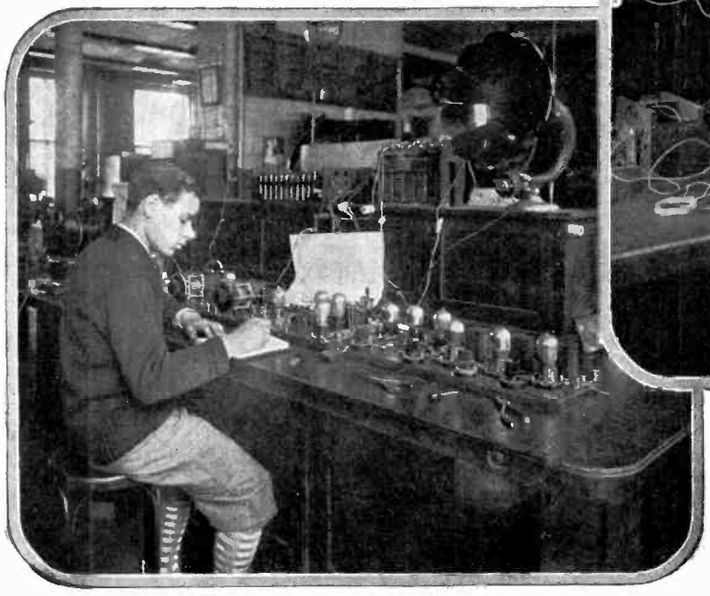
High Schools All Over the Country Are Making Radio Teach Electricity and Physics

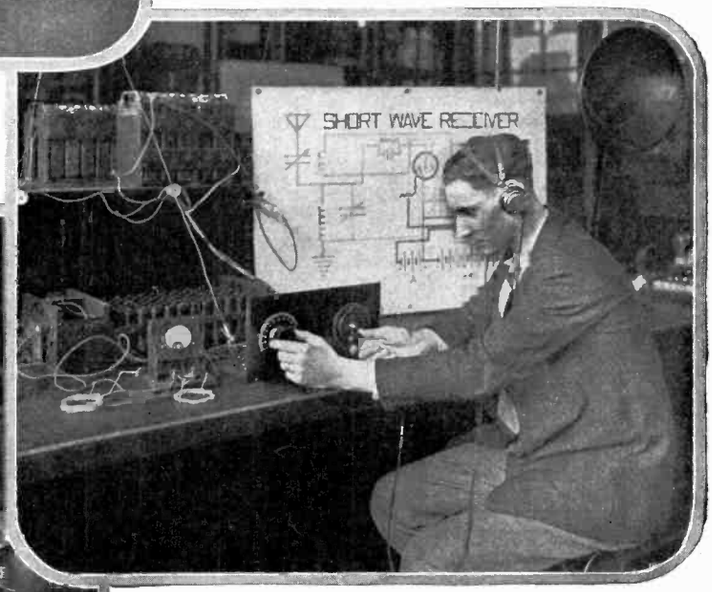
OUR SCHOOL ROOM

"Is it really true," a school teacher wrote us "that the Radio Physics Course in Radio Mechanics is being given in a New York high school?" — "Yes," was our emphatic reply, and here is the school room, even to Mr. Ghirardi himself, standing at the extreme right in the picture below.



Mr. Ghirardi is not making radio experts of these boys. This course is a part of their study of physics and chemistry, to contribute to their working knowledge of natural phenomena.





"Is radio enthusiasm dying out?" we are asked.— Well, look at Young America in the schools, and see how avidly the boys eat up circuits and their mathematics. They learn and love to when they can see real applications for the things they study.

TAKE ANOTHER SHOT AT THE $100

Here's a Set for You to Name That Has Enough Special Features to Make It Easy to Pick a Good One

WHETHER you like Boston or think it's terrible, if you are familiar with the City and its people, you are sure to sense a particular power of discrimination which, if cold, is highly effective.

And if you are acquainted with the ins and outs of radio there, you know that Boston is typically itself in the matter of radio sets. It has to be, about radio, because there is an interference situation in that section as trying as in centers where there are even more local broadcasting stations. More than that, Boston will have good music or none.

Boston Accepts a New Receiver

Beacon Street, the focal point of New England's discriminatory powers, is noticeably bare of radio antennas, in the past because it has not been able to bring in broadcast entertainment with acceptable quality and freedom from interference, for peanut stands, rock crushers, motor boats, and similar distractions are simply not permitted.

Typically setting standards of its own, Beacon Street has now accepted radio—and still no antennas will be seen, for the set which has met and conquered Boston's interference problem, and measures up to Boston's standard of reproduction, is loop operated.

A Name for This Set

Radio Mechanics is to have the privilege of disclosing for the benefit of everyone this very unusual set, and Radio Mechanics, in turn, invites your assistance in giving it a name. It is one of those unusual designs which in its own locality, has achieved over-night popularity because in design and operation it is without a flaw. It is small, very moderated in cost, easy enough for anyone to tune, and it can be moved around the house, since it uses a loop antenna.

What This Set Does

This new receiver was designed primarily for local reception, for the extreme sensitiveness of a long range circuit is necessarily responsive to extraneous disturbances. Combining loop operation with the circuit used makes the tuning highly selective without being critical. As for the audio amplification—put a cone speaker which is capable of doing justice to accurate amplification on this receiver and you just can't find fault with it.

This outfit is intended for cities where there is trouble from interference, and for outlying districts within a radius of 25 miles from the broadcasting stations. Not that it is incapable of greater range, for sets of this sort have repeatedly covered upward of 1,000 miles, but distant reception is not the purpose of the design.

$100.00

WHEN Boston accepts a new radio circuit as being free from interferenee and capable of bringing in music that measures up to Boston's standards, it deserves the best name that we can find for it.

One hundred dollars in gold will be paid you if you can think up a suitable name for this set. The judges will select as the winning name the one which has that popular, easy-to-remember sound that will help to make this new loop-operated set as widely accepted all over the United States and Canada as it has been in Boston.

A hundred dollars will buy a lot of things you want. And here's your chance to get them. Put on your thinking cap. Read the instructions, send in your names, and watch the March issue of Radio Mechanics *for the results. The prize will be awarded on February 25th.*

How to Select a Name

In the November name contest, the word "super" was used in more than half the names submitted. This word has been used so much in connection with radio that it has lost its real significance. The name which will win the prize will be one which lends itself to popular usage. It is not essential that it be descriptive. It may not suggest the special features of the set at all, or even indicate that it is applied to a radio outfit. The first test of a suitable name is that it is easy to pronounce and easy to remember.

Rules of the Contest

The prize of one hundred dollars in gold will be paid to the person who sends in the name which, in the opinion of the judges, is most suitable for the unusual character of the set for which it is to be used.

In case of a tie, the full amount will be paid to each tying contestant.

Each contestant may send in one, two, or three names. More will not be considered.

Your letter or postcard must be marked "Name Contest," and must bear your name and address printed clearly.

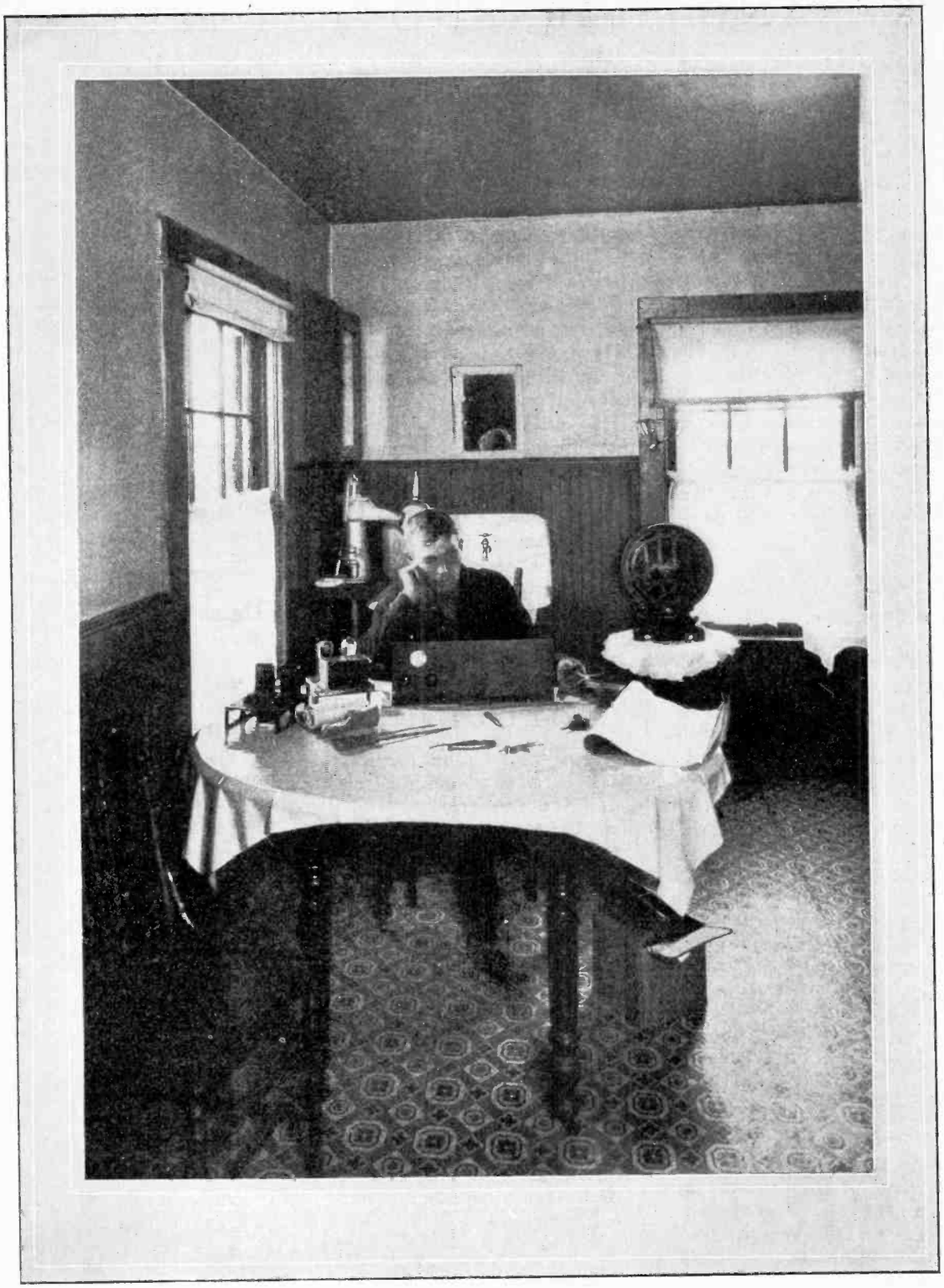
The sheet bearing your suggestions for names must not carry any other correspondence.

Letters must be postmarked before midnight, January 20th. The prize of one hundred dollars in gold will be mailed to the winner on February 25th, and the result of the contest announced in the March issue of Radio Mechanics.

Now — get your mind to work and pick out a name for the new loop-operated set.

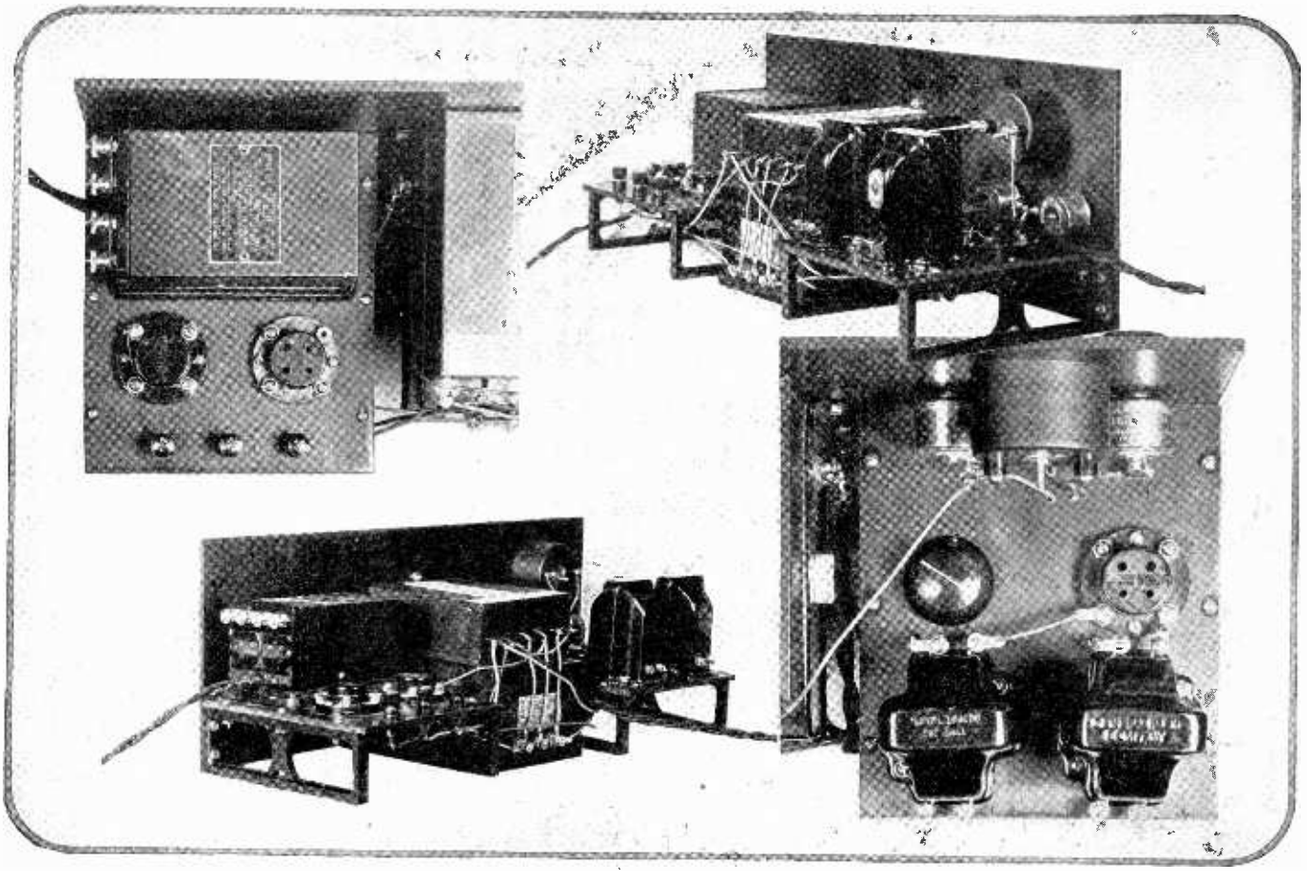
Address your letter or postcard to Name Contest Editor, Radio Mechanics, Radio Hill, Poughkeepsie, N. Y.

SEE PAGE 184 FOR LAST MONTH'S PRIZE ANNOUNCEMENT.



STUDY EACH STEP

It saves time if you check each step of assembly as you go along. Don't try to rush thru the job, for haste always makes trouble for the radio constructor



GLOW TUBE REGULATES RAYTHEON

No More Unsteady B Voltage from Eliminators Since Radio Hill Applies Glow Tube to the Raytheon Circuit

GEORGE LESLIE

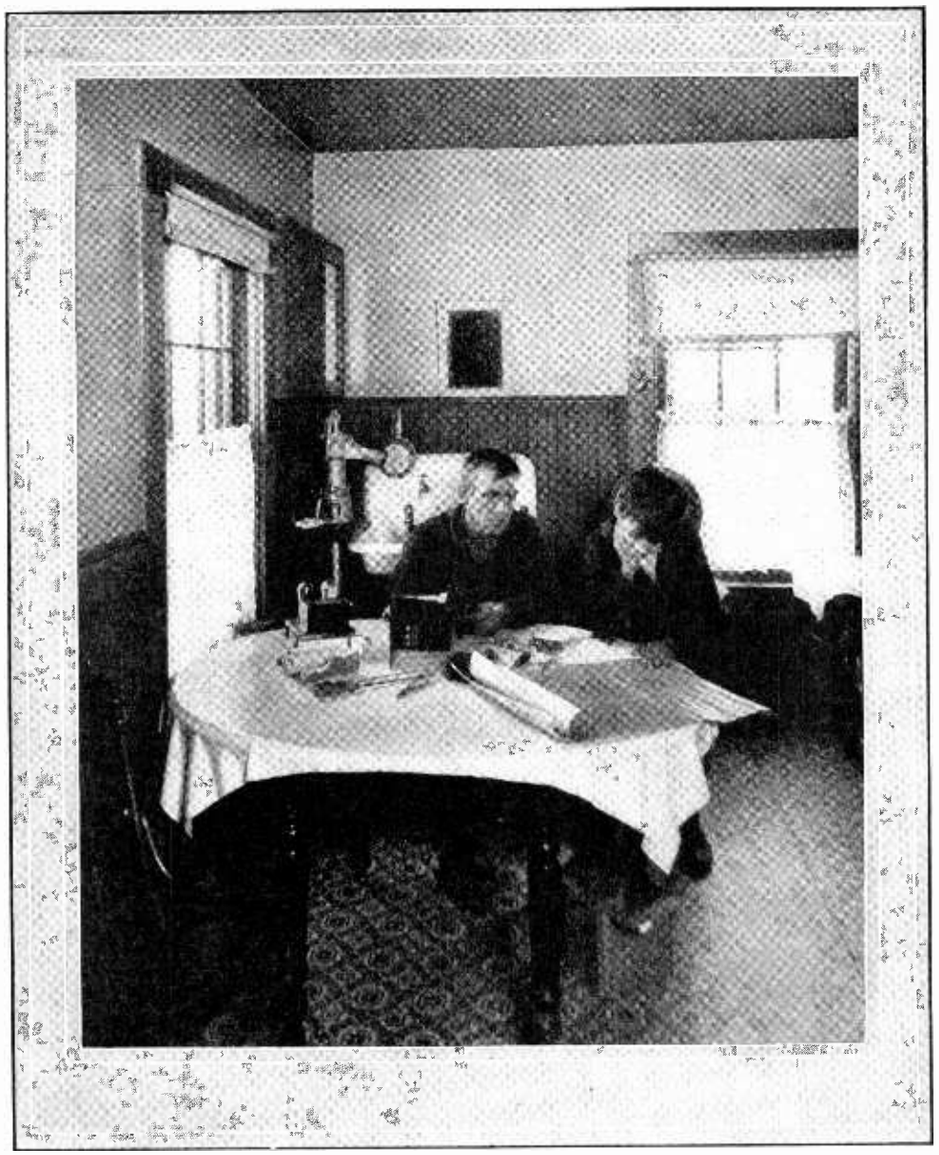
"YE gods and little fishes! Why in the world did I ever discard my B batteries and bother with this pesky eliminator? After spending all my spare time and cash on it, I can't sit down and enjoy even a single selection." You can't blame the poor fellow for this outburst of pent-up feeling. He heard so much about B eliminators that he invested in an expensive outfit, only to find that, when he hooked it up, even the nearest station seemed to fade periodically. Naturally, he suspected the eliminator, but could not locate the cause. However he did notice that when the lights dimmed, the volume decreased and only regained its normal value when the lights were at their former brilliancy.

In some sections of the country the lighting voltage is not constant but varies at times as much as 20 to 25 volts from the nominal value. Particularly in small communities it is nothing unusual to have the lights go dim for fifteen minutes at a time. Of course, with this change fed into the ordinary eliminator, reception is anything but satisfactory.

We have developed in the Radio Mechanics Laboratory at Radio Hill, a B eliminator that gives a steady, fixed output on the 90-volt tap, regardless of the line voltage fluctuations. This is the first design offered to the home constructor which uses a voltage regulator in conjunction with a Raytheon tube to keep the B voltage output constant, regardless of changing voltage in the A. C. line. So excellently has this outfit worked out that we decided to incorporate it into our laboratory power plant. In fact, this model was designed to overcome the difficulty mentioned above. It should prove a great boon to radio fans in small towns where the power companies are not as careful as in the city in controlling the lighting voltage.

But these are not the only merits possessed by this eliminator. There are many other improvements incorporated, which will recommend it to all fans. The whole outfit is built around a unique power compact. As the name indicates, it incorporates within one case all the most necessary parts of a good eliminator. It includes the power transformer, two choke coils, a new kind of filament secondary winding and the two .1-mfd. buffer condensers which must be used with the Raytheon tube.

Of particular interest in the compact is the filament winding. It can be used to light the filament of a power tube direct with A. C., with-



ELIMINATORS NOW A SUCCESS IN THE COUNTRY

The idea of using an 874 glow tube with the Raytheon, originated at the Radio Hill laboratory, now makes it both practical and satisfactory to use the B eliminator in small towns and rural sections where the A. C. current supply is too unsteady to produce dependable B voltage from ordinary eliminators

out rectifying. To do this successfully, it is essential that the exact electrical center of the secondary be connected to the grid return of the power tube. Many methods have been developed by manufacturers to locate this center, but none proved very satisfactory. Here the problem is solved in a very easy and simple manner. Two coils, of exactly the same electrical characteristics are connected together. Their common point is taken as the center tap.

The 171 Compact is not only an eliminator, but a power amplifier as well. Many sets do not make provision for the use of the latest power tubes, such as the UX-171. With this eliminator and power amplifier attached to your old set, you will get volume and quality comparable to the output of any of the latest model receivers. The combination of the voltage-regulated eliminator and the high quality amplifier is hard to beat.

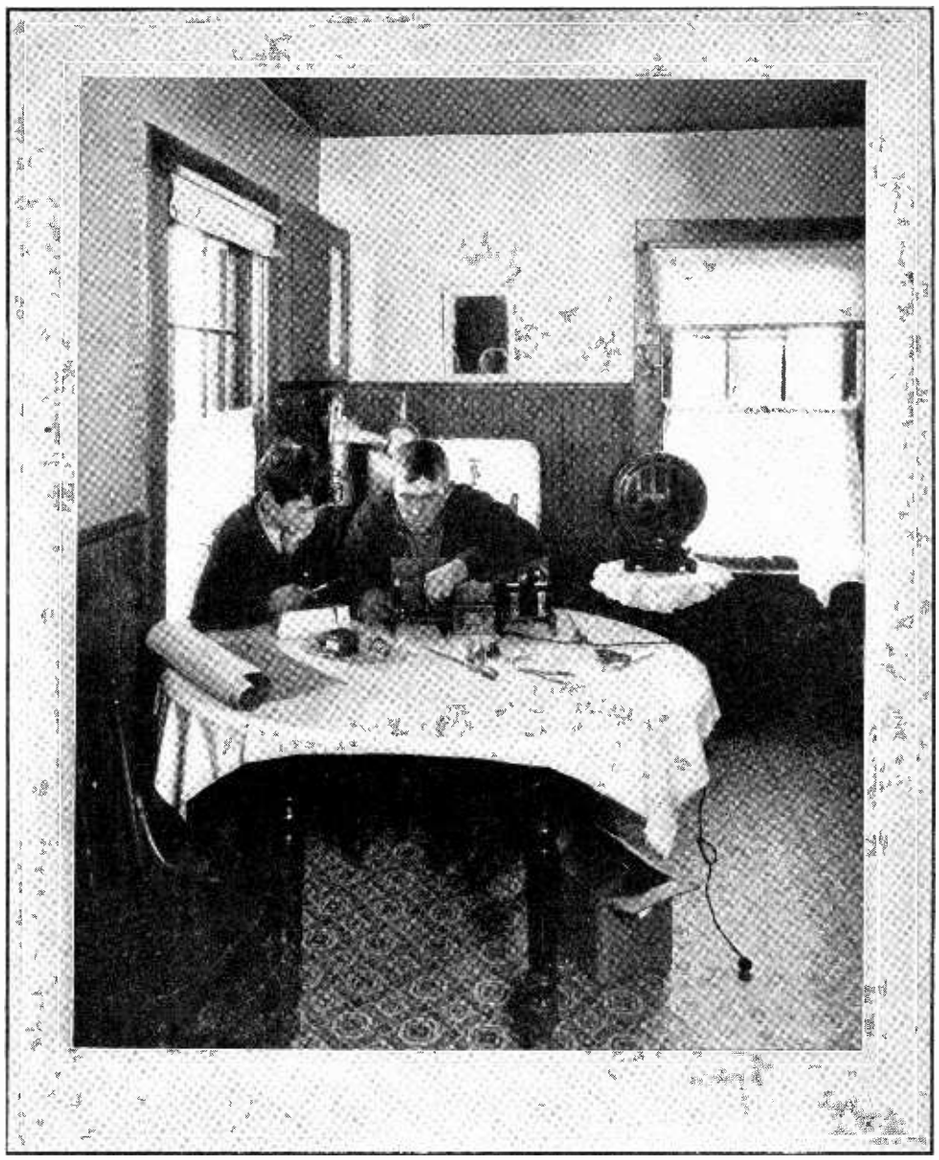
The Eliminator Circuit

The rectifier and filter are connected in the usual manner. A condenser block containing two 2.-mfd., one 8.-mfd., one 1.-mfd., and one .5-mfd. condenser is used in the eliminator circuit. The wiring diagram will show that the 8-mfd. condenser has been placed across the filter output. This added capacity does away with the last trace of hum. In fact I am willing to guarantee that with this eliminator attached to any set, operation will be as quiet and stable as with a set of fresh B batteries. The 1 and the .5-mfd. condensers by-pass the resistances in the eliminator.

The maximum output of this eliminator is 85 mils at 200 volts. Since a power tube is included here, it was deemed sufficient to supply to the receiver only 45 and 90 volts. The detector voltage is variable over a wide range. Now-a-days, a variable 45-volt tap is absolutely necessary. Some circuits will work well with 22 volts on the detector plate, while the majority demand about 40 volts. Then again, the latest type of gaseous detector tube can be used and the voltage adjusted for maximum sensitivity.

The Glow Tube

The voltage regulator is a special tube, having only two elements. It



GIVE THE BOY A CHANCE TO LEARN ABOUT RADIO THINGS

Radio is the greatest instructive influence with which a boy can come in contact. Let your boy get in on set building. Give him a chance at grasping the mechanical and electrical things which radio construction can teach. You'll be surprised to see how quickly he can master them

has been on the market for some time, but very few people have ever heard of it, much less operated one. It would therefore not be amiss to give a brief discription of the construction and operation of this tube. It is an R. C. A. product and sold under the type number UX-874.

The UX-874 has a cylindrical element, with a wire inside this cylinder. The plus side of the eliminator output is connected to the wire and the B— to the cylinder. If these connections are reversed, the tube will not function. A peculiar mixture of gases, under low pressure, fills the tube. When a voltage is applied to the cylinder and the wire, the gases inside the tube ionize and permit a current to flow between the two tube elements. No matter what the current, up to 50 mils, the voltage drop across the tube will remain constant at 90 volts. To start the tube to glow, a D. C. voltage of approximately 125 volts must be applied to it.

Why Regulate the 90-Volt Tap

It is to be expected that some questioning minds will look askance at our claim of a voltage-regulated eliminator, when only the 90-volt tap is maintained constant. You will have to agree that this voltage is probably the most used in the set. The general run of tuned R. F. receivers is designed to operate with that voltage applied to the plates of the radio frequency and the first audio tubes. Assume that you have a set that is very critical in adjustment, as far as the control of oscillations is concerned. You tune in a station, set all the controls to maximum sensitivity—usually the point just below oscillation—and sit back to enjoy the music. Everything is fine for a few minutes. Then several of your neighbors turn on lights at the same time, or someone starts an electric motor, causing a drop in the voltage. At once the critical adjustment on the R. F. tubes is upset and the receiver howls. But with the 90-volt tap regulated, this will not occur.

The other taps have usually only one tube to supply and will therefore have only a slight effect. When the voltage changes, only a fraction of the change is effective on the detector, so that it needs no additional regulation. Again, with about 180 volts on the plate of the power tube, a 5 or even 10-volt change will not

make very much difference in the plate current. Thus it all reduces to a fine regulation of the 90-volt supply.

The Power Amplifier

No matter how good the loudspeaker or the set in general, it is impossible to obtain good quality and plenty of volume without the use of a power tube. The type 171 is a splendid amplifier and will handle a great deal of undistorted volume. For these reasons it was incorporated into the power pack. If the power tube is used, the design of the audio unit must be adapted to the tube.

A good audio transformer is used, one which contains plenty of iron and has a high inductance, amplifying both high and low notes. The plate voltage applied to the 171 should not exceed 180 volts. Nothing is gained by going above, while the life of the tube is shortened considerably. In many power packs, the maximum output of the eliminator is used on the plate. That means usually about 190 to 200 volts. We have taken care of this situation by inserting a fixed resistance of 2,000 ohms in the B+ lead of the power tube, thus reducing the plate voltage to the right amount.

Even with 180 volts on the plate of the tube, it is rather dangerous to connect the loudspeaker into the plate circuit directly. The windings are liable to be burned out or the insulation between them break down. Therefore, to safeguard the loudspeaker, the output of the plate circuit is fed into an output transformer. The loudspeaker is then connected to the secondary of the transformer.

General Instructions

The entire outfit can be put together in three separate units which can then be assembled. This makes wiring much simpler, since a great many connections can be made before the three units are fastened together. One of these units comprises the front panel and its associated apparatus. Attention is called to the method of mounting the power compact and the condenser block. These are used to support the front panel and the entire eliminator. When lifting the eliminator, take hold of the power compact and condenser block, so that the panel will not buckle.

Dataprints [1] have been prepared which show the complete layout of the front panel and the two sub-panels that are used. The latter are 6 by 7 ins. and can be either Bakelite or hard rubber. These sub-panels are mounted on two brackets each, which in turn are fastened to the front panel. The sub-panels can be assembled individually and a number of connections made on them.

Mounting the Front Panel Parts

The front panel is 7 by 18 ins, of either Bakelite or hard rubber. It holds two Clarostats and a milliammeter, and has fastened to it the power compact and the condenser bank. Place the power compact on the table or work bench with the choke terminals to the rear. Put the front panel flush against it and drill holes to fit the mounting lugs of the power compact. Place the condenser block directly on top of the compact with its terminals to the rear and the label up. This is fastened to the panel with only one screw. Use ½-in. 6-32 round head screws for mounting these parts.

On the left hand side of the front panel mount the two Clarostats, with the milliammeter centered between them. Be sure to fasten the Clarostats high enough on the panel to clear the sub-panel, when the latter is attached.

[1] These can be obtained from the Patterns Department, Radio Mechanics, Radio Hill, Poughkeepsie.

PARTS LIST FOR THE LABORATORY MODEL

These parts were used in the original 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 Power compact, type R-171—Thordarson Elec. Mfg. Co.**
- **1 Audio transformer, type 285—General Radio.**
- **1 Output transformer, type 367—General Radio.**
- **1 Milliammeter, 0-50 mils—Jewell Elec.**
- **1 Rectifier tube, type BH—Raytheon.**
- **1 Automatic switch—Brach.**
- **1 Glow tube, UX-874 or CX 374—**
- **1 UX-171 or CX-371—**
- **2 Clarostats—American Mechanical Labs.**
- **1 Lavite resistance, 10,000 ohms—Aerovox.**
- **1 Lavite resistance, 2,000 ohms—Aerovox.**
- **1 Variable high resistance—Electrad.**
- **4 Radion brackets—Garfield Radio.**
- **3 Binding posts—Eby Mfg.**
- **1 Panel, 7 by 18 in.**
- **1 Sub-panel, 6 by 7 in.**
- **1 Coil hook-up wire—Belden.**
- **1 Doz. ½-in. 6-32, round head, machine screws.**
- **1 Doz. ½-in. 6-32, flat head, screws.**
- **1 Doz. 1-in. 6-32, round head, machine screws.**

Mounting the Sub-Panel Parts

Looking at the eliminator as drawn in the wire-less wiring diagram,[2] from the rear, the right hand sub-panel holds the audio transformer, the output transformer, a double resistor mount, a bias control and a UX socket. The resistor mount is fastened underneath the sub-panel in the right front corner. The audio transformer is placed on the right rear corner, with the secondary facing the front panel. In line with it is the output transformer, with the secondary to the rear of the sub-panel. The UX socket is directly in front of the audio transformer, while the bias control is mounted on the bottom of the sub-panel in front of the output transformer. Two brackets are fastened along the 7-in. edges of the sub-panel.

The other sub-panel contains the automatic eliminator-trickle charger switch. This fastened directly in back of the front panel. The two UX sockets are in back of the switch. Three binding posts are fastened to the rear edge of this sub-panel. Mount two brackets on it as for the other panel described above.

Wiring the Units

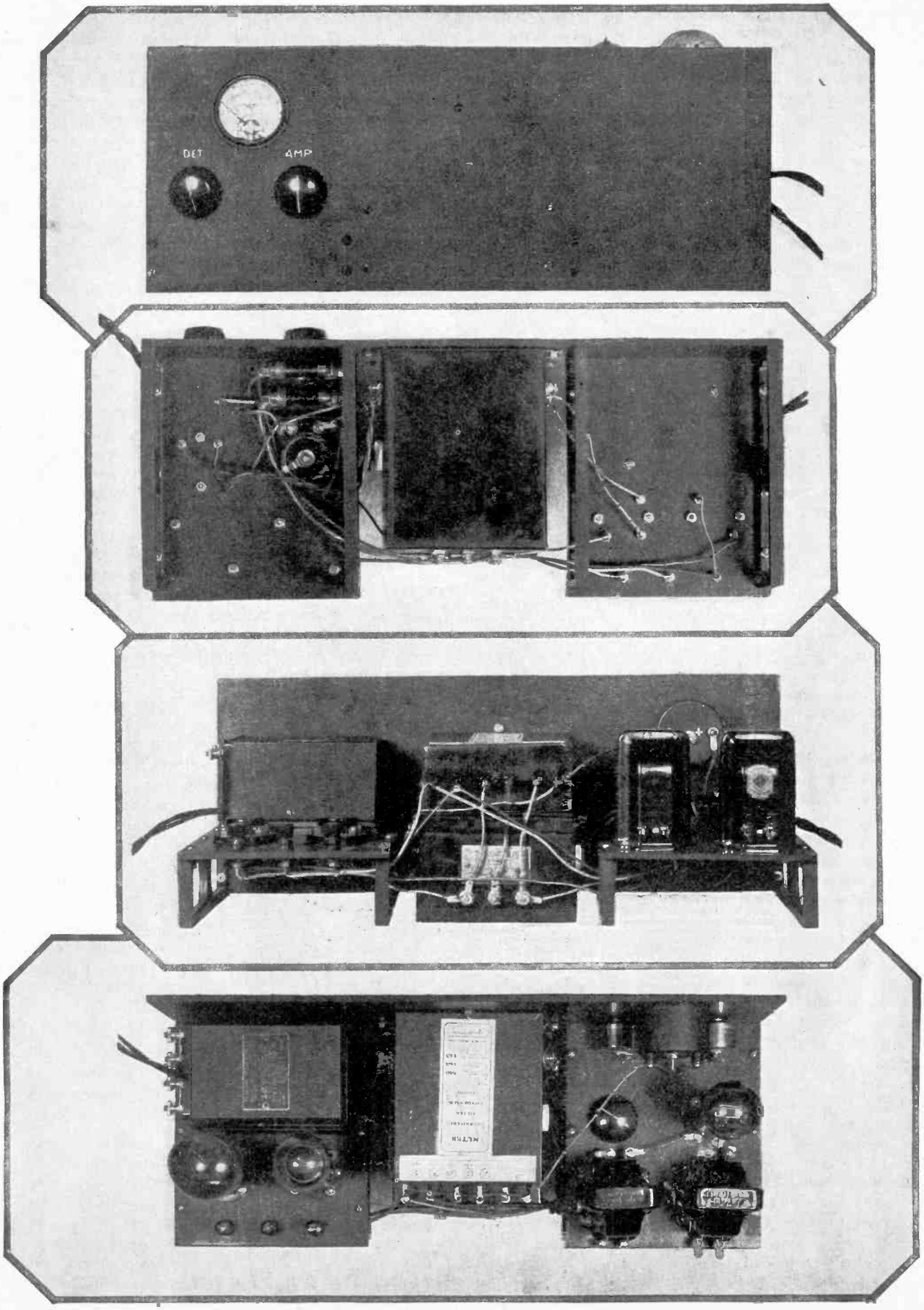
Before attaching the two sub-units to the front panel, the following connections can be made. Connect terminal 3 of the condenser block to choke terminal 1 of the power compact. Connect terminal 4 of the condenser block to choke terminal C of the compact. Connect terminal 5 of the condenser block to choke terminal 2 of the compact.

Connect terminal 1 of the meter to terminal 6 of the condenser block. Connect terminal HC of the compact to terminal 6 of the condenser block.

Connect F+ of socket No. 1 to the B— post. Connect G of socket No. 1 to the 90-volt post. Connect F— of socket No. 1 to P of the same socket.

Connect terminal 2 of the output transformer to P of socket No. 3. Connect G of the audio transformer to G of socket No. 3. Connect F— of the audio transformer to terminal 2 of the bias control. Connect terminal 1 of the output transformer to terminal 1 of the 2,000-ohm resistor.

[2] Patent applied for.


DET
AMP

Connect terminal 1 of the stabilizer to terminal 2 of the bias control.

With these connections made, assemble the three units by fastening the sub-panels to the front panel by means of the holes in the brackets.

Wiring the Assembled Outfit

Connect terminal 1 of the condenser block to the 45-volt post and to terminal 2 of the stabilizer. Connect terminal 2 of the condenser block to the 90-volt post and to terminal 2 of Clarostat No. 1.

Connect choke 2 of the power compact to terminal 2 of the 2,000-ohm resistor. Connect terminal H1 of the compact to F+ of socket No. 2. Connect H2 of the compact to F— of socket No. 2. Connect F1 of the compact to F— of socket No. 3. Connect F2 of the compact to F+ of socket No. 3. Connect FC of the compact to terminal 1 of the bias resistance. Connect P of socket No. 2 to choke 1 of the compact.

Connect terminal 1 of Clarostat No. 1 to terminal 1 of Clarostat No. 2. Connect terminal 1 of Clarostat No. 2 to terminal 2 of the 2,000-ohm resistance. Connect terminal 2 of the Clarostat No. 2 to terminal 2 of the stabilizer. Connect terminal 1 of the stabilizer to the B— post.

Connect terminal 2 of the ammeter to terminal 2 of the bias control.

Operating the Power Pack

To put the eliminator and power amplifier into operation three tubes are necessary, a Raytheon type BH, a glow tube type UX-874 and a power tube, type 171. The glow tube and the Raytheon are inserted into sockets Nos. 1 and 2 respectively, while socket No. 3 holds the 171.

Cut the lamp socket cord on the power compact, leaving enough wire so that the plug will reach the automatic power switch. Insert it into the receptacle marked B battery substitute. The trickle charger plug is inserted into the other receptacle. The twisted cord on the automatic switch is connected to a 110 volt, 60 cycle power line. Follow the instructions given on the switch carefully. Provisions have been made to insert this switch, or relay, in series with the A+ lead. In other words, the A+ of the battery is connected to one side of the relay and the other side of the relay is connected to the A+ post of the set. The A— lead goes directly from the battery to the set.

The power amplifier should be inserted after the first stage of the audio amplifier in the receiver. Plug into that jack and connect the two ends of the cord from the set, to the B+ and P terminals of the audio transformer of the power amplifier. If your receiver is not provided with a jack after the first step of audio, connect a wire from the plate of the first tube after the detector to the P terminal of the audio transformer of the amplifier and connect B+ directly to the 90-volt post of the eliminator.

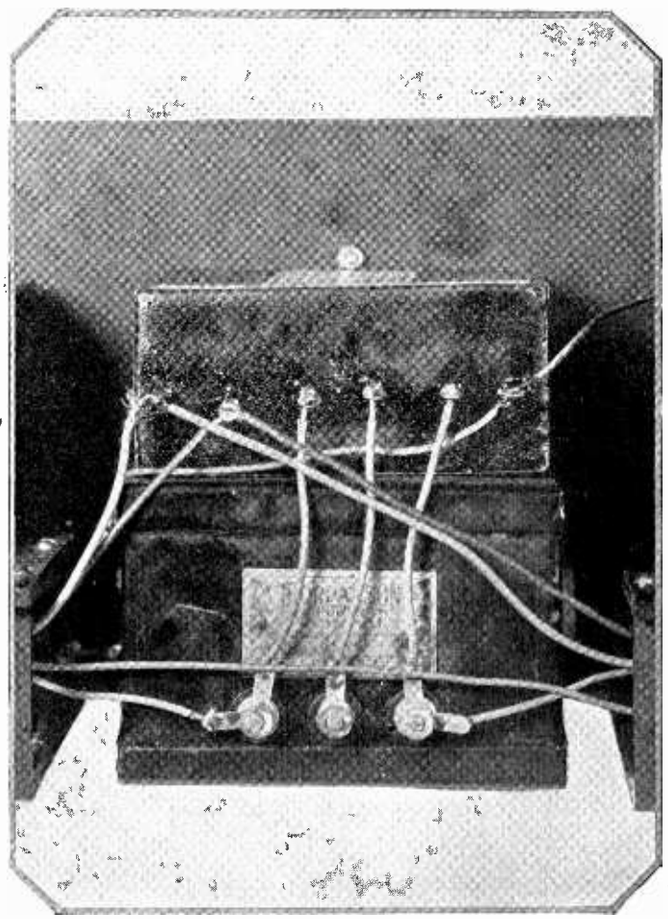
The loudspeaker is connected to terminals 3 and 4 of the output transformer. It was not deemed necessary to use a jack because these terminals are made to take the ordinary phone tips. Usually a loudspeaker will work better connected one way rather than another, but if you reverse the connections of the speaker to the output transformer, no difference will be noticed. This is due to the fact that no direct current flows through the speaker and therefore there is no tendency for any current to magnetize or demagnetize the speaker magnet, another decided advantage of the output transformer.

We have had the eliminator and power amplifier working wonderfully well at Radio Hill. It is a pleasure to listen to a constant, strong signal right thru the afternoon, when the lights start to come, and later, in the evening, when the load drops again. The glow tube can be noticed taking up all the variation in voltage. A word concerning the efficient operation of the UX-874. To set it into operation, turn the right-hand Clarostat in until a glow is noticed in the tube. Then turn the resistance just a fraction farther. This method of operation will give a steady 90-volt tap and increase the life of the tube.

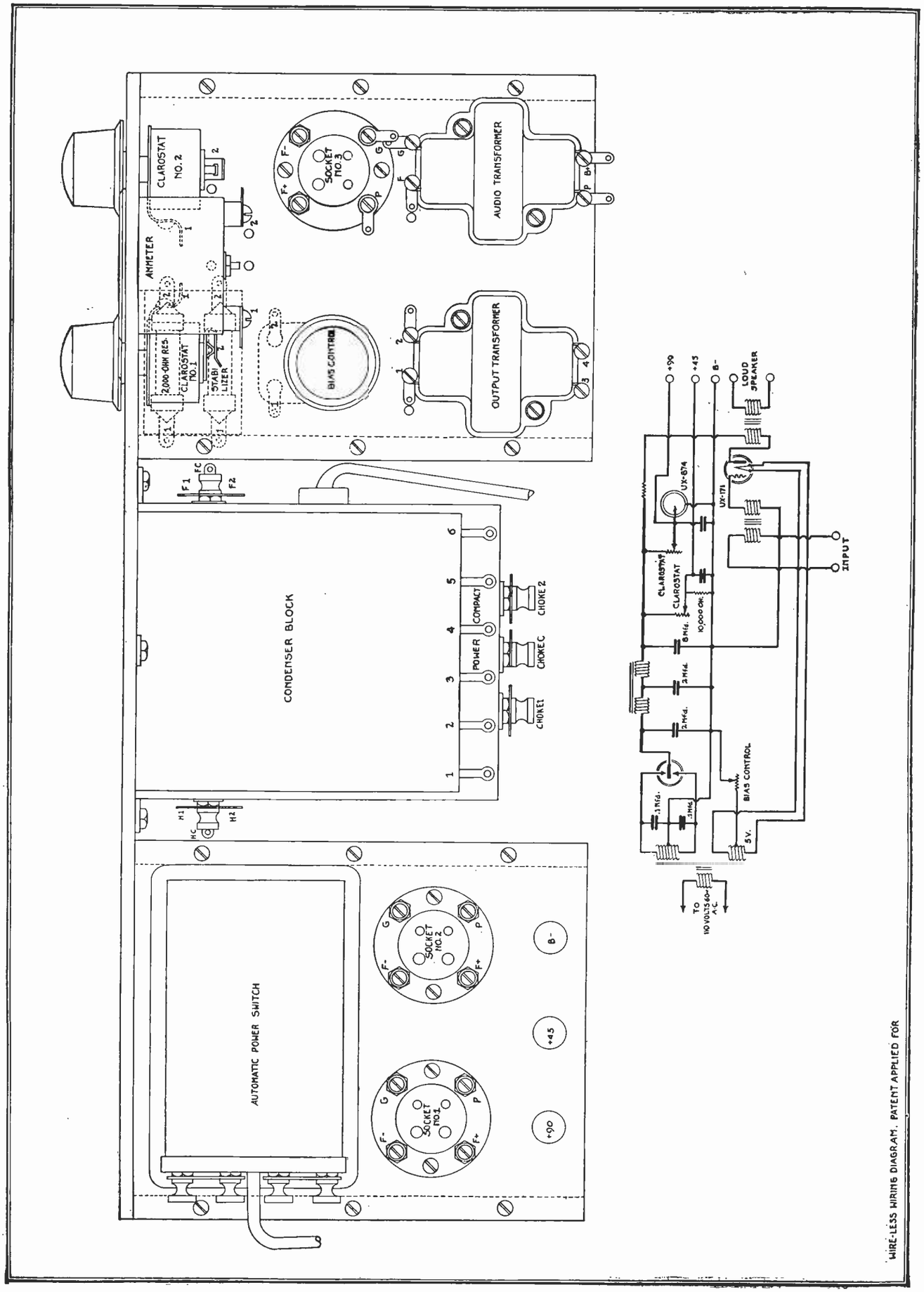
Of course, the operation of the bias resistance is well known. With the outfit working, adjust the C voltage to the point where the clearest and best quality reception is obtained. When the bias voltage is increased, the meter indication will decrease. The size of the resistance has been so chosen that probably the entire amount will have to be inserted for best operation of a 171.

After you have built the power pack you will agree with us that it is one of the neatest and best outfits of its kind.

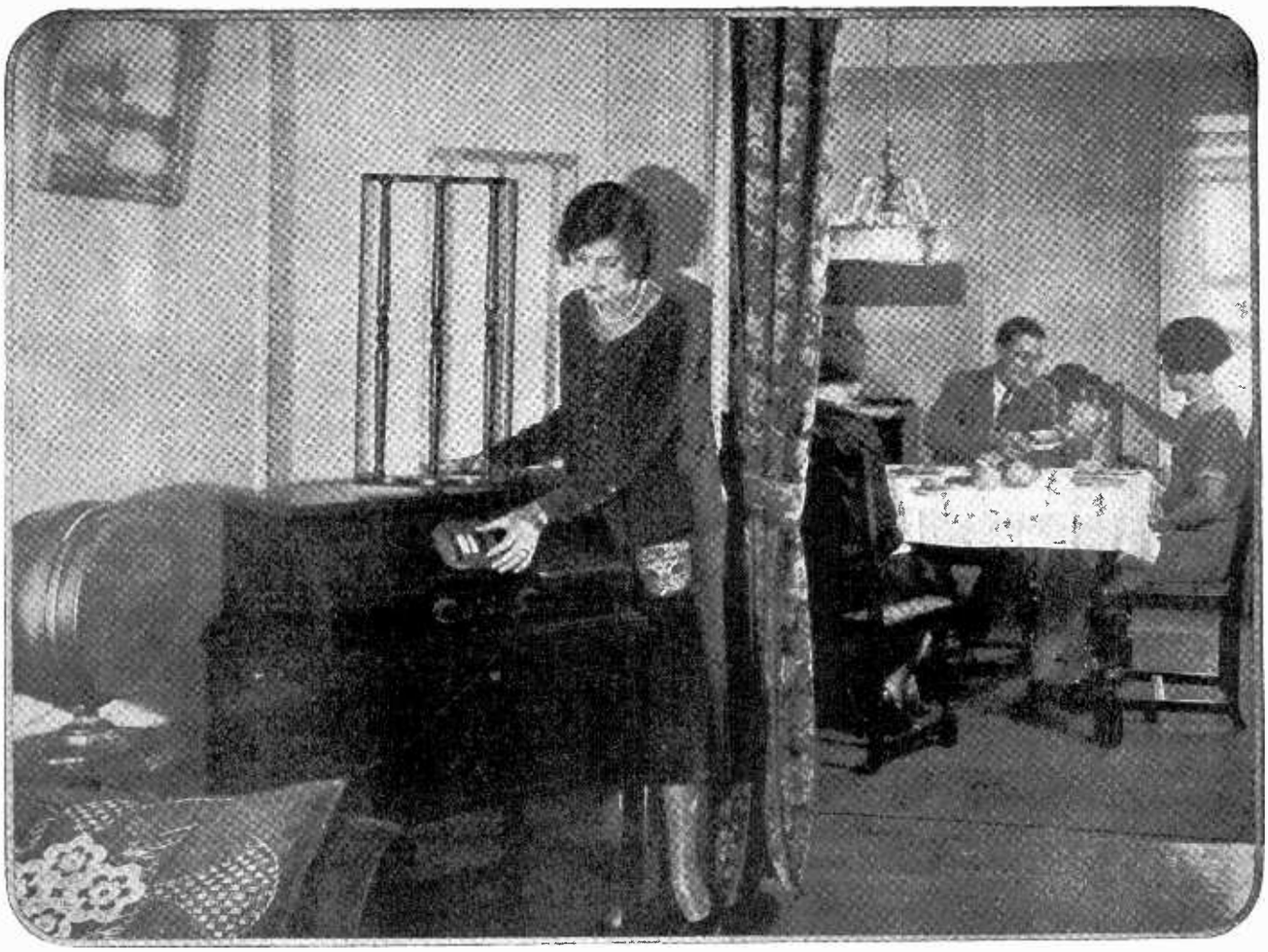
One suggestion.— If you have an eliminator in operation already, try connecting a glow tube from the 90-volt tap to B—, and see if that helps the operation of your set. You will probably be agreeably surprised.



Rear view of condenser unit and power compact, showing simplicity of the connections



WIRE-LESS WIRING DIAGRAM. PATENT APPLIED FOR



BILL, BUD, AND THE BRIDE

In Which Bill and Bud Give the Bride and Groom Some Radio Instruction

BUD—HIMSELF

DEAR Editor: Radio is a lot of fun, isn't it? Gee, we get so many different kinds of jobs that each one is a new experience. Our little account book is making a mighty nice showing this fall, too. I know lots of fellows who have been out of school two years and aren't making as much money as Bill and I do in our spare time after school is over.

We had a great time last week. You know, Mr. Clayton's daughter got married a month ago, and he had us buy him a radio set as part of the new house furnishings he gave them.

I want to tell you that we know how to do that kind of a job, too. We didn't just pick out any set that would work all right. No, indeed! We went to the store where Mr. Clayton bought the furniture for them, and found out from one of the salesmen what sort of cabinet designs would look well with their other things. Then we not only got them a good outfit, but one that would harmonize with the other things in the room where it was to be installed.

We learned about doing that from Mr. Jansen, the decorator here in town, when we put a set in his house. And believe me, when we talk to people about things like that, when we're getting them sets, they get the idea that we're pretty good at this sort of thing.

Well, we got an R. C. A. model 25 because it does the work required, and because, as Mr. Clayton said, it's part of the fun of being a bride to move the furniture around. Since the model 25 has a loop, and carries the batteries right with it, it can be put anywhere.

The outfit was installed and put in perfect working order before the bride and groom returned, but it wasn't long after they got back that we had a call. Bill was off on another job, so I ran up there.

"Did you install this set?" was the rather frigid welcome that I got, making me feel somewhat embarrassed to admit responsibility. "Well, would you be good enough to show us how it can be made to make music?" came next.

Gee, I felt relieved then. I thought she was going to tell me

(*Concluded on page* 189)

RADIO PHYSICS COURSE

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

ALFRED H. GHIRARDI

THE electrostatic lines of force, Fig. 21B, are radial about the conductor, while the magnetic field is concentric about it. The two fields are always at right angles to each other. The strength of the electric field depends upon the charges. In the antenna, when the current ceases to flow at the end of a cycle, the charge is greatest and the electrostatic field around it is maximum.

When the current has its maximum value, the electric field around the antenna is zero, since at this time the rate of change of the current is a minimum. When the charges are at rest on a conductor, the electric lines of force are also at rest and extend out radially from it. These lines are supposed to have a certain amount of inertia or resistance to any changes that may take place, so that if the charges on the conductor change rapidly from a condition of movement to one of rest, as is the case in a high frequency alternating current, the lines lag behind and they behave as if they were detached from the antenna, and start to travel away from it at a speed of 186,300 miles per second. This is the radiated electrostatic field which plays the important part in transmission.

Just as the motion of a charge, with its associated electrostatic field, sets up a magnetic induction field around the conductor carrying it, so the motion of the radiated electrostatic field travelling away from the antenna sets up its own magnetic field as it travels. When the radiated electrostatic field is at its maximum value, the magnetic field which it creates is also at its maximum value. It is important to keep clearly in mind the fact that the radiated magnetic field which is produced wholly by the moving radiated electric field is entirely distinct from the magnetic field of induction which is produced by the antenna current, and which does not travel any great distance from the antenna. The radiated magnetic field and radiated electrostatic field are closely related. We cannot have the first without the latter.

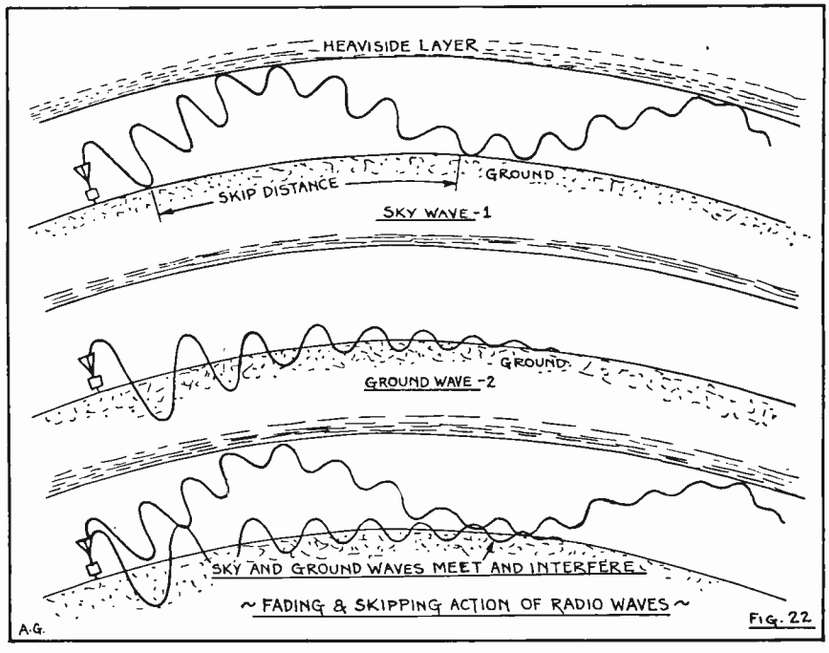
The two radiated fields move outward from the antenna at all times perpendicular to each other, the magnetic field being parallel to the ground and the electrostatic field being perpendicular to it. At the same time, both fields are at right angles to the direction of propagation of the waves. At great distances from the antenna, the electric waves would be exactly perpendicular to the earth, if the earth were a perfect conductor. Actually the resistance of the earth's surface causes the waves to tip forward somewhat as shown in Fig. 17B.

Possibly the following description by Dr. Fleming will serve to make this clear.

"If we can imagine a being endowed with a kind of vision enabling him to see the lines of electric strain and magnetic flux in space, he, standing at any spot on the earth's surface, would see, when the antenna was in action, bunches or groups of electric strain fly past. Near the earth's surface these strain lines would be vertical. Alternate groups of lines of strain would be oppositely directed, and the spectator would also see groups of magnetic flux fly past, directed in a horizontal direction or parallel to the earth's surface. The strain and flux lines would move with the velocity of light, 186,300 miles per second or 300,000,000 meters per second, and the distance between two successive maxima of electric strain, directed in the same direction, would be the wavelength of the wave."

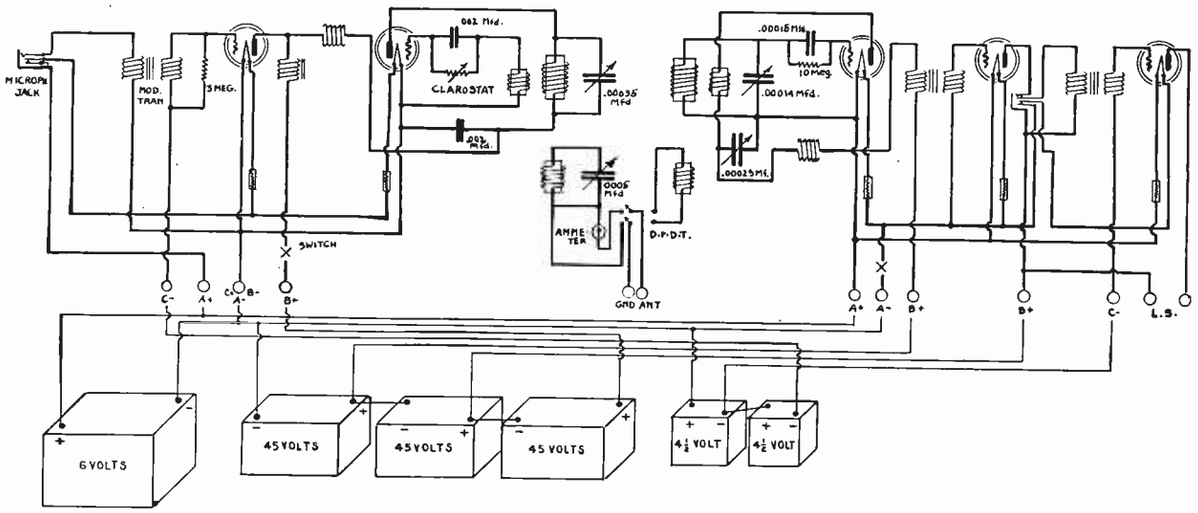
At the receiving station the antenna may take the form of an open wire or a loop. In either case the radiated waves from the transmitter striking across it, cause currents of electricity to flow in the receiving circuit. This will be studied in detail later.

FIG. 22. *This illustrates the accepted theories of skipping and fading, which are so puzzling to most B. C. L's*



FADING OF SIGNALS: In some localities the signals from certain stations seem to fade in and out in an irregular manner. This usually is more marked at night than in the daytime. The accepted explanation of this curious phenomenon is that as the

(*Concl'd on p.* 185)



Complete hook-up for B battery operated short wave telephone transmitter and receiver

PHONE FRIENDS BY RADIO

Further Details of the Short Wave Radio Telephone for Local Calls. Gives Better Speech Than Line Phone

M. B. SLEEPER

A MONTH ago, there was very little to hear except code signals on the short waves, below 100 meters, but, judging from the flood of correspondence which has followed the publication of the construction data on the Junior Broadcasting transmitter and receiver, operating from B batteries, there is plenty to hear now.

Never has the publication of new data met with such immediate response. From all over the country have come comments, suggestions, and requests for additional information, and all indicating a feverish haste to get on the air.

More material on this subject is in preparation at Radio Hill, for the data in the December issue has apparently whetted a new appetite for information.

The schematic wiring diagram and battery connections, omitted for lack of space, are given on this page. This shows the transmitter at the right, and the receiver on the left. The same set of batteries is used for both parts of the installation.

Under actual operating conditions, it has been found most satisfactory to tune the transmitter just the least bit below the wavelength of the receiver. Then both can be left in operation all the time. At the end of a conversation, the antenna switch is thrown to the other side, as is customary practice when the same antenna is used for both transmitting and receiving.

This is, however, rather wasteful. Two alternatives are available. The antenna switch can be fitted with an auxiliary contact to close the plate circuit of the transmitter when the switch is thrown to that side, or the switch on the transmitter panel can be turned off when the set is not in use. There is a chance for you to use your own ingenuity in working out a switching device.

Again, if you are not concerned about battery economy, you can send and receive simultaneously, leaving the batteries connected to both units, if you have two antennas. They should be slightly different in length, and run at right angles to each other, or as nearly so as is possible. The same ground can be used for both the transmitter, but if counterpoises are employed, each antenna must have its own counterpoise.

About the microphone—not all microphones are suitable for the modulation system specified. Some are of very low resistance, while others run very high, depending upon the battery voltage with which they are intended to be used. Do not pick up some second hand mike and expect it to give the right results, as it may be entirely unsuited for this outfit. Good quality starts at the microphone.

The Junior Broadcaster calls for a microphone designed to operate on 6 volts. There are several good ones available for this purpose.

Type 112 tubes are recommended for this outfit, operated at 135 volts. This combination gives ample range for local calls. Increasing the B voltage will make very little difference in the range, and will cut down the life of the batteries considerably. If you use other tubes, note carefully the C battery bias specified for the voltage you use. This is necessary not only to preserve the quality of speech but to make the batteries last as long as possible.

The hot-wire ammeter is the indicator of efficiency. If you make changes, the meter will show you whether or not the operation is improved, except for quality. That you will have to determine by listening in on a receiving set. There are all kinds of experiments to make with antennas, ground connections, and counterpoises that can be gauged by the reading of the meter.

HINTS ON RADIO CONSTRUCTION

When You Understand the Fundamentals, You Can Do As Well As Any Expert Set Builder

P. J. GRAY

IF your radio equipment doesn't show those little finishing touches that characterize expert workmanship, don't tell yourself that it would be wonderful if you could do that way. Just spend a little time studying out those fine points, and see just where the difference lies.

Of course, you must have the right tools—not a big assortment, but a few good ones, and the right ones. Generally the thing that shows up most is the details of assembly and wiring. When you build the next set, keep these little stunts in mind:

When you have a long lead, instead of leaving it loose and flapping, put a Lastite on some convenient screw, not connected to any other part of the circuit, and support the wire by soldering it to the end of the Lastite.

If you are using soldering lugs, use all of the same shape—not two or three different kinds.

The new solid or flexible wire that has smooth colored insulation can make or spoil the appearance of your set. The proper way to remove the insulation is to cut around the wire with a razor blade, using very light pressure, so as not to get into the wire. Then you can remove the outer coating and the inner wrapping without leaving any frayed ends.

Generally, the stiff wire is better, except for connections between parts on the front and sub panels, where it is wiser to use the flexible conductor. In either case, plan your wires in such a way that the low voltage wires can be tied together neatly. Look at the back of a telephone switchboard the next time you have a chance, and you will see just how it is done.

You can save time and preclude the development of loose connections if you use Spintites on hex nuts and round thumb nuts. They are handier than working with pliers, and are much more positive in action. This is illustrated by the accompanying photographs.

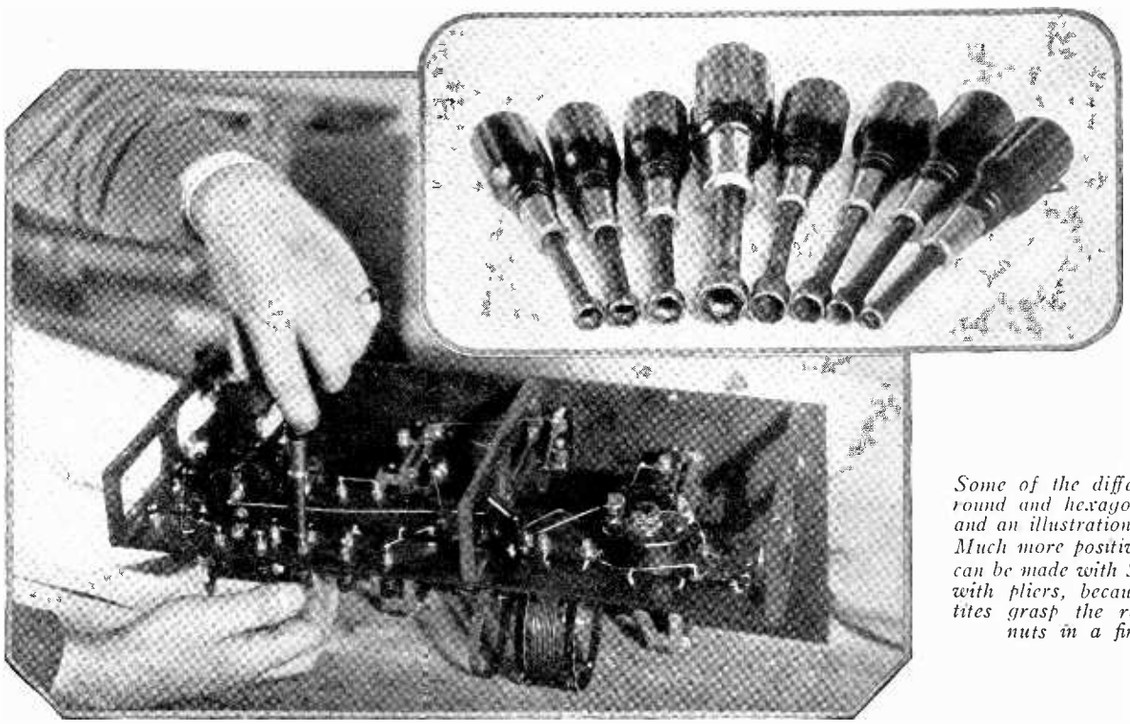
Use the same size of nuts thruout, all of brass or all of nickel.

Big lumps of solder always indicate careless workmanship. Use just as little as possible. Keep a little piece of fine emery cloth or a fine file handy, and wipe off any discoloration on the metal parts you are going to solder. Then you will need only a touch of the iron to melt a dot of solder.

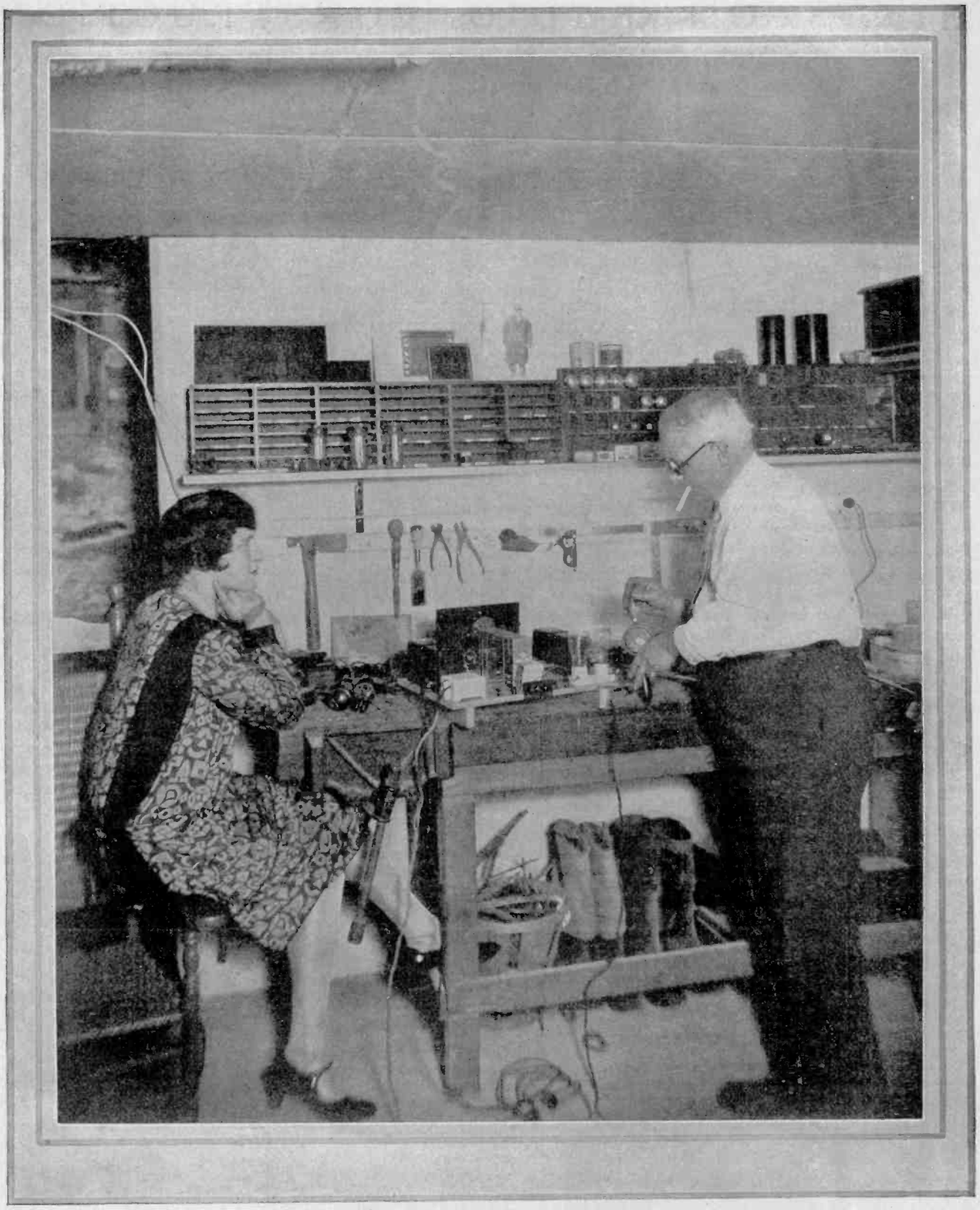
Do not use acids or paste. They form rings around each joint, and spatter around on the parts. Then, in a few days, you will notice that dust has collected on the greasy spots. Rosin core solder or plain soft solder with a flux made by dissolving rosin in alcohol are the only proper materials for radio work. Anyone who has worked for the Telephone Company will tell you that they consider it an almost criminal offense for a man working on a switchboard to use any flux other than rosin.

Don't try to make your wiring with all right-angle bends. Use the direct point-to-point method, and a little discretion, and you will get better results.

If you use solid wire, keep it straight if it comes that way, or straighten it if it doesn't. That can be done by stretching it. A ten-foot length should stretch six to twelve inches in the process.



Some of the different sizes of round and hexagonal Spintites, and an illustration of their use. Much more positive connections can be made with Spintites than with pliers, because the Spintites grasp the round or hex nuts in a firm grip



WHAT ARE YOU DOING?

You know, this business of making things isn't so dull, and if it's something for the family radio set, it's a good idea to act interested once in a while

ALL BATTERIES NOW ELIMINATED

New Combination Circuit Developed at Radio Hill Introduces First Practical A, B, C Eliminator Method for All Sets

JOHN GRABAR

"HOW can I square myself with my wife?" was the question asked in one of the first letters written to RADIO MECHANICS. "She says I can do all the tinkering I want if I will make her a set as good as one of her friends has, but it's one of those expensive outfits, that runs from the light socket, and I don't know how to build anything like that, and she won't be satisfied with anything less. If you can't help me out, I shall have to quit my little work shop or my wife."

Now, dear reader, what would you do in a case like that? Perhaps you have such a situation in your own home. Certainly an appeal of this sort should meet with sympathetic response, and there is no doubt that everywhere an insistent demand for real A. C. operation exists.

WHAT WE DID ABOUT IT

Starting fresh on the A. C. supply problem, we had no precedents to direct us, so we did the very reasonable thing. We knew that no equipment is now available for making an A battery eliminator suitable for operation with ordinary kinds of radio sets, so we decided to make an A eliminator—which also supplies B and C—and then change the ordinary methods of set design to fit the eliminator*.

The result is that RADIO MECHANICS presents this month the first practical A, B, C eliminator for the regular type A tubes, and the receiving set to go with it will be shown next month. In fact, most of our sets will be designed in the future for either eliminator or battery operation, so that you can take your choice.

YOU CAN'T BUY IT BUT YOU CAN BUILD IT

You can't buy a set of this sort, because they aren't made yet, but you can make it, have the fun of doing it, and at the same time have an outfit that is miles ahead of anything anyone else has.

Of course you want to know if it's so easy to do. Absolutely! We saw to it that all the kinks were taken out before we made the final design. Not only is the A, B, C eliminator of standard design, but not a single part has been used that cannot be obtained at your radio dealer's.

No doubt you will be anxious by now to discover what there is actually in this device. As a whole, it consists of two distinct eliminator units, each one an exact duplicate of the other. These units each use two 216-B rectifier tubes in conjunction with a transformer, chokes, and necessary condensers. The output of the two units is connected in parallel and fed to the receiver. We have in all four 216-B tubes, two transformers and two filter systems.

Tests at Radio Hill have shown that as much as 0.3 ampere of current could be obtained from this 01-ABC eliminator. This is more than enough to supply any average set. The tubes, when connected in series, in accordance with the new method, only draw ¼ ampere, leaving an ample margin for the plate current.

A word concerning the cost of the complete 01-ABC eliminator. From the parts list to be found in these columns, it can be seen that the price for the outfit will range around seventy dollars. At first glance this seems excessive. But let us consider what we are accomplishing with the 01-A eliminator. We do away with the storage battery completely, including all the necessary auxiliaries, such as the trickle charger or high rate charger, the hydrometer, distilled water and a great deal of irksome labor. At the same time we have included a B battery eliminator, which must be purchased either separately, or dry batteries must be used. Any eliminator of good make is expensive, and will at least cost half as much as the 01-A. Not every B eliminator provides C bias. This means the purchase of separate accessories or dry C batteries. Therefore, in counting the cost of this outfit, we must remember that what we are really getting is an A

PARTS LIST FOR THE LABORATORY MODEL OF THE ELIMINATOR

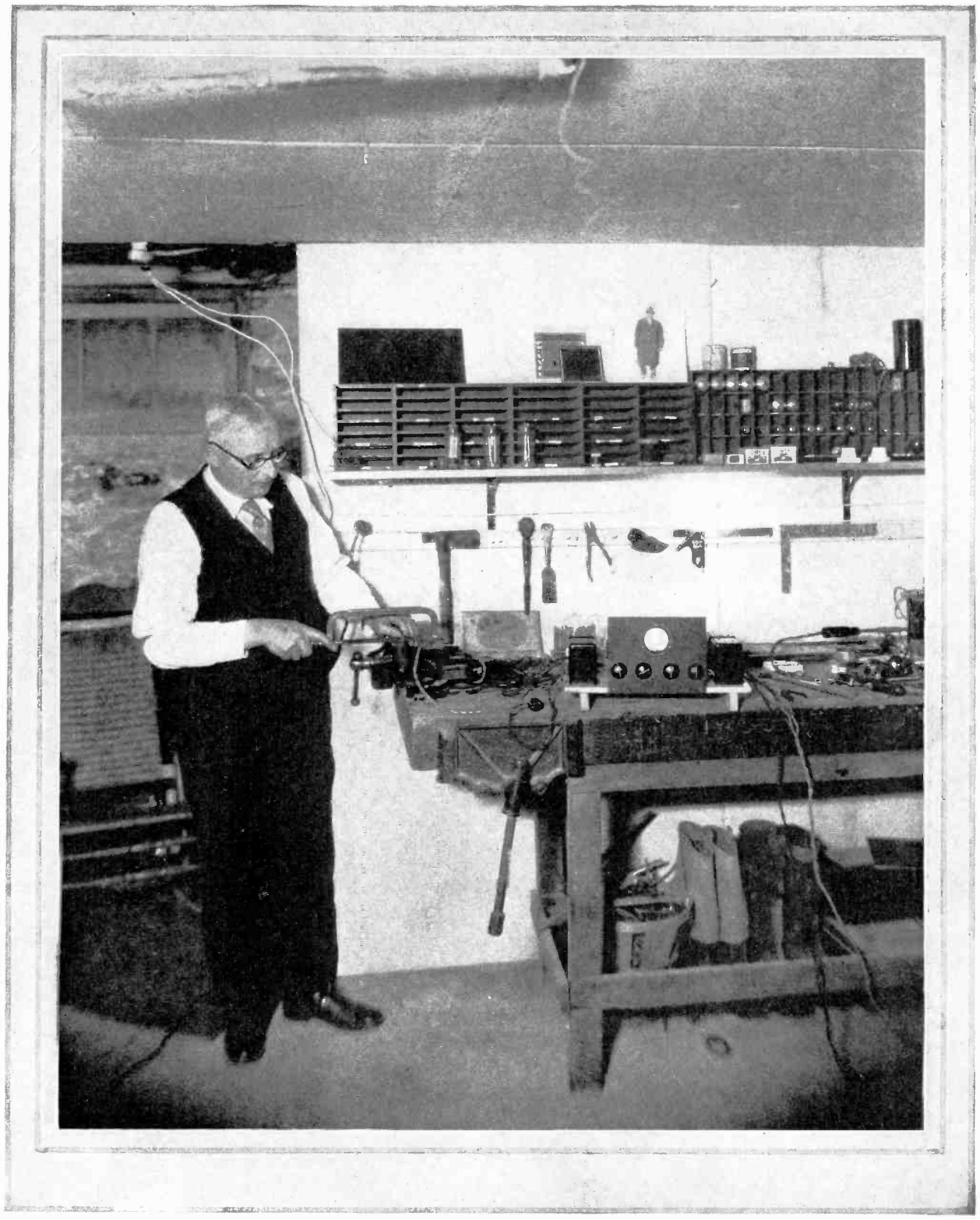
These parts were used in the original model described in this article. It is recommended that the novice follow this list, but the experienced constructor may be able to make substitutions which are of equivalent mechanical and electrical characteristics.

- 1 Panel 7 by 9 in., Bakelite or hard rubber.
- 2 Power transformers—Silver Marshall, type 330.
- 2 Unichokes, type 331—Silver Marshall.
- 2 4-mfd. filter condensers, 400 volts—Tobe Deutschmann Co.
- 4 2-mfd. filter condensers, 400 volts—Tobe Duetschmann Co.
- 4 1-mfd. by-pass condensers—Tobe Deutschmann Co.
- 4 UX sockets—Alden Mfg. Co.
- 1 Variable high resistance, type L—Electrad, Inc.
- 1 Variable high resistance, type F—Electrad, Inc.
- 1 Variable high resistance, type C—Electrad, Inc.
- 1 400-ohm potentiometer—Carter Radio Mfg.
- 1 10,000-ohm resistance—Aerovox.
- 1 5,000-ohm resistance—Aerovox.
- 1 10-watt bell ringing transformer—Thordarson Elec. Mfg. Co.
- 4 UX-216-B or CX-316-B rectifying tubes.
- 1 Milliammeter, 0-500—Jewell Electric Co.
- 1 Coil flexible hook-up wire—Belden Mfg. Co.
- 1 Base board 12 by 17 by ½ in., wood.
- 2 Doz. ½-in. No. 6, round head, wood screws.
- 6 1-in. No. 6, round head, wood screws.
- 2 1½-in. No. 10, round bead, wood screws.

*Technical data on the 01-ABC is presented in Radio Engineering, Dec. 1926.

WE TRIED IT OUT CAREFULLY

Checking up the operation of the final model at Radio Hill, to make sure that everything was exactly as it should be in each detail.



SO YOU'D MAKE NO MISTAKES

Now, when you make your A, B, C eliminator from these instructions, you know that it will operate your set like a million dollars

supply, a B eliminator, a C eliminator, and the elimination of what was previously wasted effort.

The beauty of the 01-A is its proof against abuse and misuse. It is practically impossible to harm the receiver tubes. Should you connect the high voltage B-leads to the filament terminals, not enough current will be drawn to harm the tubes. If one of the rectifying tubes is left out of the circuit or should become defective, the meter indication will drop, and the trouble will be indicated by a humming in the loud speaker. Should one unit of the device fail to function, the set will fail to operate properly, and it will not affect the other. Thus no matter what may happen to the 01-ABC eliminator, no harm will come to either tubes or set.

To operate your set with the 01-ABC eliminator, just a few simple changes in the ordinary circuit will be necessary. These are illustrated in Figs. 1 and 2. In Fig. 1 is shown the old, parallel method of connecting the filaments of the tubes. Fig. 2 indicates the new series connection. You will agree that it looks much simpler and easier to handle. For the sake of simplicity and ease of wiring, always connect the A- filament supply first to one side of the detector. This is followed by the R.F. tube and the audio tube in the order named.

Polarities have been indicated in Fig. 2. It would be well to keep these in mind when changing the wiring of the set. If a 201-A is used for the detector, the grid return should be made to the plus side of that tube.

The R.F. tubes usually do not require any bias and the grid return should be made to the negative filament of the tube. On the other hand, the first audio operates better with about 5 volts negative bias on the grid. This can be easily obtained by connecting the F lead from the first audio transformer to the negative side of the preceding tube. After a little experience, you will be surprised at the versatility of the series method of connecting filaments.

The 01-ABC Circuit

As has been mentioned before, the eliminator consists of two individual, yet similar units. Thus a description of one will serve for the other as well. The rectified A.C. is passed thru a choke coil of two sections. The capacities in the filter comprise two 2-mfd. and one 4-mfd. condensers. These capacities, in conjunction with the choke, smooth out all hum.

At times eliminators have a tendency to steamboat. This is recognized as a low, steady, rumbling sound. To avoid any such occurrence, two 1.0-mfd. by-pass condensers are used in the detector circuit of the receiver. They have been incorporated in the eliminator, since most sets do not make any provision for them.

A 10-watt bell ringing transformer, having a 5-volt secondary, supplies the power tube with filament current. Since no center tap is provided, a 400-ohm potentiometer is placed across the filament, with the center terminal connected to the B-. It is important that the 171 be operated with the right C voltage on the grid. With 180 volts on the plate, 40 volts of bias are needed. To obtain this, a 2,000-ohm variable resistance is placed in series with the center tap of the potentiometer and the B- lead.

Some people prefer to use the 112 type power tube. This draws the same filament current, but requires a smaller plate voltage, which is secured by placing a fixed resistance of about 5,000 ohms in series with the B output. Variable resistances have been used for the detector and 90-volt taps. It is good practice to have these voltages variable in order to adjust them to the requirements of the receiver. All of these resistances have been by-passed with 1.0-mfd. condensers.

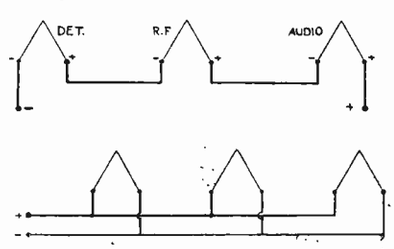


Fig. 1. Below: Parallel filaments. Fig. 2. Above: The new series method.

All this wiring is condensed into simple form in the actual eliminator

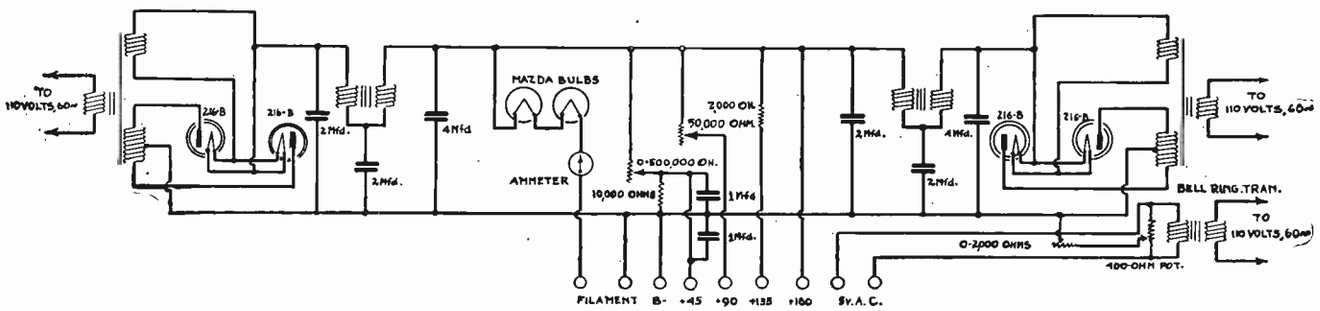
General Instructions

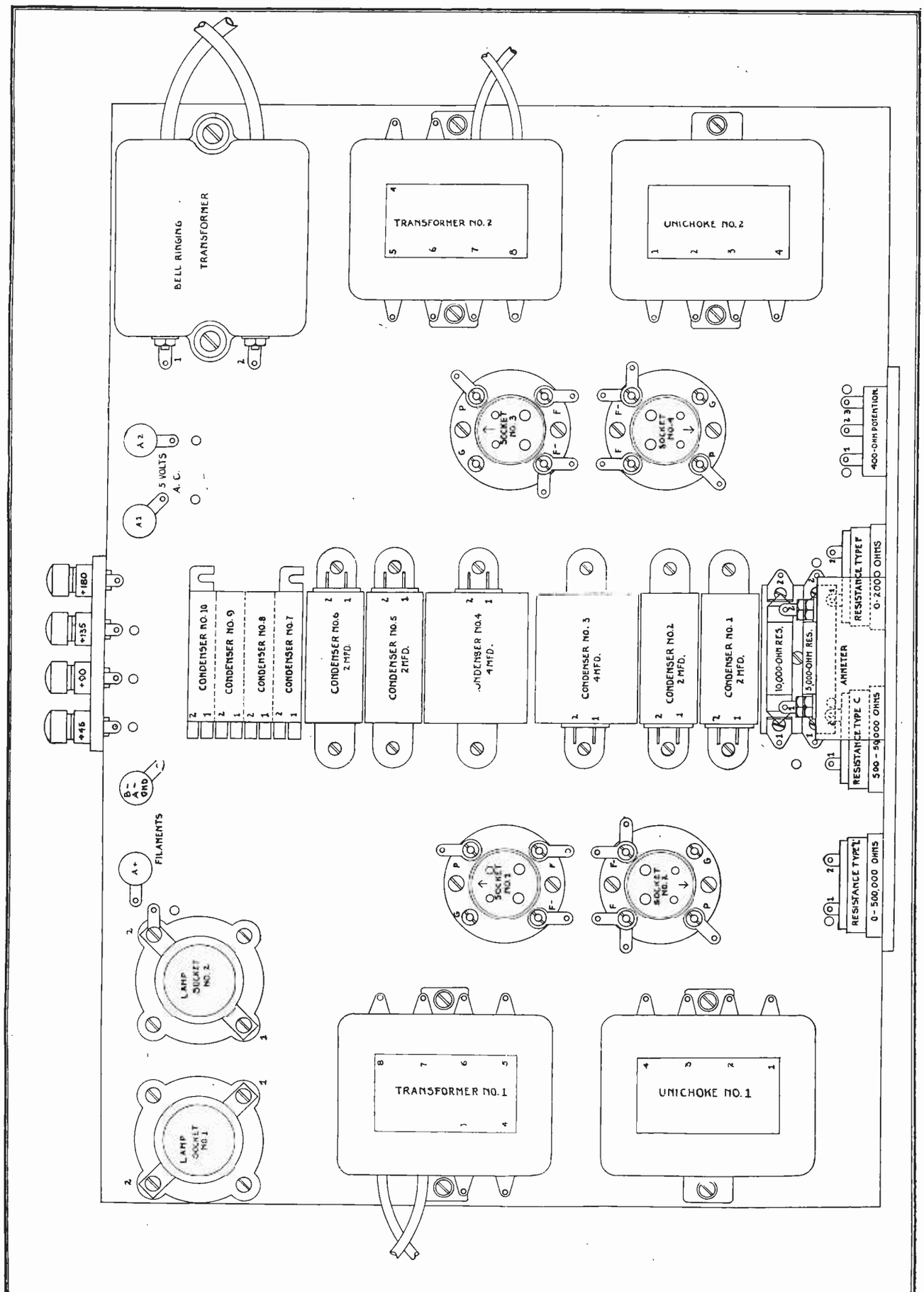
For ease of assembly, a wooden base board, 12 by 17 ins., is used. This is supported by two cleats, each 12 by 1¾ by ¾ in. Considering one of the 17-in. edges of the board as the front edge, the cleats are placed 2 ins. from the right and left edges respectively, parallel to these edges. The narrow side of the cleat is in contact with the base board. Two 1-in. No. 10 flat head wood screws are used in each cleat, the heads being on top of the base board. All the screws are well countersunk. The wire-less wiring diagram[1] shows the exact location of each individual piece of apparatus. But, to simplify the construction further, Dataprints[2] have been prepared giving in addition to the full size wire-less wiring diagram, a base-board and a panel pattern. With these on hand, the construction of the 01-ABC eliminator will be easy and a pleasant evening's work.

Mounting the Base Board Parts

The following parts are located on the base board: two power transformers,

[1] Patent applied for.
[2] These can be obtained from the Patterns Department, Radio Mechanics, Inc., Radio Hill, Poughkeepsie, N. Y.




BELL RINGING TRANSFORMER
TRANSFORMER NO. 2
UNICHOKE NO. 2
SOCKET NO. 3
SOCKET NO. 4
400-OHM POTENTIOM.
A2
5 VOLTS A.C.
A1
+180
+135
+90
+45
B-
A-
GND
FILAMENTS
A+
CONDENSER NO. 10
CONDENSER NO. 9
CONDENSER NO. 8
CONDENSER NO. 7
CONDENSER NO. 6 2 MFD.
CONDENSER NO. 5 2 MFD.
CONDENSER NO. 4 4 MFD.
CONDENSER NO. 3 4 MFD.
CONDENSER NO. 2 2 MFD.
CONDENSER NO. 1 2 MFD.
10,000-OHM RES.
5,000-OHM RES.
AMMETER
RESISTANCE TYPE F
0-2000 OHMS
RESISTANCE TYPE C
500-50000 OHMS
RESISTANCE TYPE L
0-500,000 OHMS
SOCKET NO. 1
SOCKET NO. 2
LAMP SOCKET NO. 2
LAMP SOCKET NO. 1
TRANSFORMER NO. 1
UNICHOKE NO. 1

two unichokes, the filter and by-pass condensers, the bell ringing transformer, four UX sockets, two porcelain Mazda bulb sockets, four binding posts, a double resistor mount and a binding post strip. Before mounting any of the parts, draw a pencil line on the board parallel to the 12-in. edges, dividing it into two equal parts.

All of the condensers are mounted along the line drawn. Starting from the front edge of the base board and four inches back, mount one of the 2-mfd. condensers with the terminals turned to the left. The other condensers are placed directly behind these, first the 2.0-mfd. and then the 4.0-mfd. The fourth condenser is another 4.0-mfd., but is placed with its terminals to the right. Two 2.0-mfd. condensers are placed behind this one, having their terminals in the same direction. Leave about ¼-in. space between the two 4.0-mfd. condensers to permit wires to pass between them.

Behind this row of condensers are stacked up four 1.0-mfd. by-pass condensers. All the terminals are turned to the left. You will find that each one has a small lug extending from the case. Take two condensers, place them so that these lugs touch, and solder them together. You now have two sets of condensers consisting of two 1.0-mfd. capacities each. These in turn, can be joined together by soldering four of the mounting lugs. This method of forming them into a single block will become obvious, when you have the condensers before you. The stack is fastened directly to the base board with two ½-in., No. 6 round head wood screws.

At the left hand side, about an inch from the front edge, mount one of the unichokes. The terminals should face the center of the board. Next to it, but toward the rear, mount a power transformer, with the lamp cord extending to the left edge. About one inch of space should be left between these two parts. Similar parts are mounted directly opposite, in the same manner, but the cord of the power transformer extends to the right.

Mount the bell ringing transformer in the rear, right corner of the base board. The secondary or bell side is facing toward the left. Directly in front of the first 2-mfd. condenser and parallel with the front edge of the base board, fasten the double resistor mount.

The sockets are spaced on either side of the condenser bank in front of the transformers and the chokes. The arrows are to point as indicated in the wireless wiring diagram.

The two lamp sockets are fastened to the base board in the rear, left corner. For this purpose use four 1-in. No. 6 round head wood screws. The location of the binding posts and the binding post strip is clearly indicated in the wireless wiring diagram.

Mounting the Panel Parts

The front panel holds the variable resistances, a potentiometer and a 0-500 milliammeter. Care should be taken in mounting this meter. First try the fly cutter on a scrap of hard rubber or a piece of wood to make sure that the meter fits snugly into the hole. Looking at the front of the panel, the resistances, from left to right are—0-500,000, 500-50,000, 0-2,000 and the 400-ohm potentiometer.

Wiring the Base Board

Practically all the wiring can be done before the front panel is attached to the board. It is good practise to wire first one of the units, then the other. If you attempt to do both at the same time, there is a possibility of omitting connections or making wrong ones. With this in mind, the following wiring directions are given first for the left hand unit, then the right hand one and finally the connections joining the two.

Connect terminal 7 of transformer No. 1 to P of socket No. 1. Connect terminal 6 of transformer No. 1 to terminal 1 of condenser No. 2. Connect terminal 5 of transformer No. 1 to P socket of No. 2. Connect terminal 3 of transformer No. 1 to F of socket No. 1. Connect terminal 4 of transformer No. 1 to F of socket No. 2. Connect terminal 8 of transformer No. 1 to the A-filament post.

Connect F- of socket No. 1 to F of socket No. 2. Connect F of socket No. 1 to F- of socket No. 2.

Connect F of socket No. 2 to terminal 1 of unichoke No. 1. Connect F- of socket No. 2 to terminal 2 of condenser No. 2.

Connect terminal 4 of unichoke No. 1 to terminal 2 of lamp socket No. 1, also to terminal 2 of condenser No. 3. Connect terminals 2 and 3 of the choke together. Connect terminal 2 of the unichoke No. 1 to terminal 2 of condenser No. 1.

Connect terminal 5 of transformer No. 2 to P of socket No. 3. Connect terminal 6 of transformer No. 2 to terminal 1 of condenser No. 5. Connect terminal 7 of transformer No. 2 to P of socket No. 4. Connect terminal 3 of transformer No. 2 to F- of socket No. 3. Connect terminal 4 of transformer No. 2 to F of socket No. 3. Connect terminal 8 of transformer No. 2 to terminal 1 of condenser No. 4.

Connect F- of socket No. 3 to F of socket No. 4. Connect F of socket No. 3 to F- of socket No. 4.

Connect terminal 1 of unichoke No. 2 to F- of socket No. 4. Connect terminal 2 of unichoke No. 2 to terminal 2 of condenser No. 5. Connect terminals 2 and 3 of unichoke No. 2 together. Connect terminal 4 of unichoke No. 2 to terminal 2 of condenser No. 4.

Connect terminal 2 of the bell ringing transformer to the A1 A.C. post. Connect terminal 1 of the bell ringing transformer to the A2 A.C. post.

Solder together the right hand side mounting lugs of all the large condensers. This will connect their cases together. Connect the mounting lug on condenser No. 1 to terminal 1 of condenser No. 1. This puts all the condenser cases at ground potential.

Connect together the No. 1 terminals of condensers Nos. 1, 2, and 3. Connect terminal 1 of condenser No. 1 to terminal 1 of the 10,000-ohm resistor.

Connect terminal 1 of condenser No. 3 to terminal 1 of condenser No. 4. Connect terminal 1 of condenser No. 3 to the A- filament post. Connect terminal 2 of condenser No. 3 to terminal 2 of condenser No. 4. Connect terminal 2 of condenser No. 3 to terminal 1 of the 5,000-ohm resistor.

Connect terminal 1 of lamp socket No. 1 to terminal 1 of lamp socket No. 2.

Connect together the No. 1 terminals of condensers Nos. 4, 5 and 6. These are the lower terminals of the condensers.

Connect terminal 2 of condenser No. 4 to the 180-volt binding post.

Connect terminal 1 of condenser No. 10 to terminal 1 of condenser No. 9. Condenser Nos. 7 to 10 refer to the 1-mfd. by-pass capacities, with the lowest one numbered No. 7 and the top being No. 10. Connect terminal 1 of condenser No. 8 to terminal 2 of condenser No. 9. Connect terminal 1 of condenser No. 9 to the 180-volt post.

Connect terminal 2 of condenser No. 10 to the 90-volt post.

Connect terminal 1 of condenser No. 7 to the 45-volt post. Connect terminal 2 of condenser No 7 to the A+ filament post.

Connect terminal 2 of condenser No. 8 to the A- filament post.

Connect terminal 2 of condenser No. 6 to F- socket No. 3.

Connect terminal 2 of lamp socket No. 2 thru a hole in the base board, to terminal 1 of the milliammeter. Connect terminal 2 of the meter, thru a hole, to the A+ filament post.

Before attaching the panel to the base board make the following panel connections: connect terminal 2 of the type L resistance to terminal 1 of the type C. Connect terminal 2 of the type F resistance to terminal 2 of the potentiometer.

The following wires are run underneath the base board and brought to the terminals specified, thru No. 18 holes. Connect terminal 2 of the C type resistance to the 90-volt post.

Connect terminal 2 of the 5,000-ohm resistor to the 135-volt post.

Connect terminal 1 of the potentiometer to the A1 A.C. post. Connect terminal 3 of the potentiometer to the A2 A.C. post.

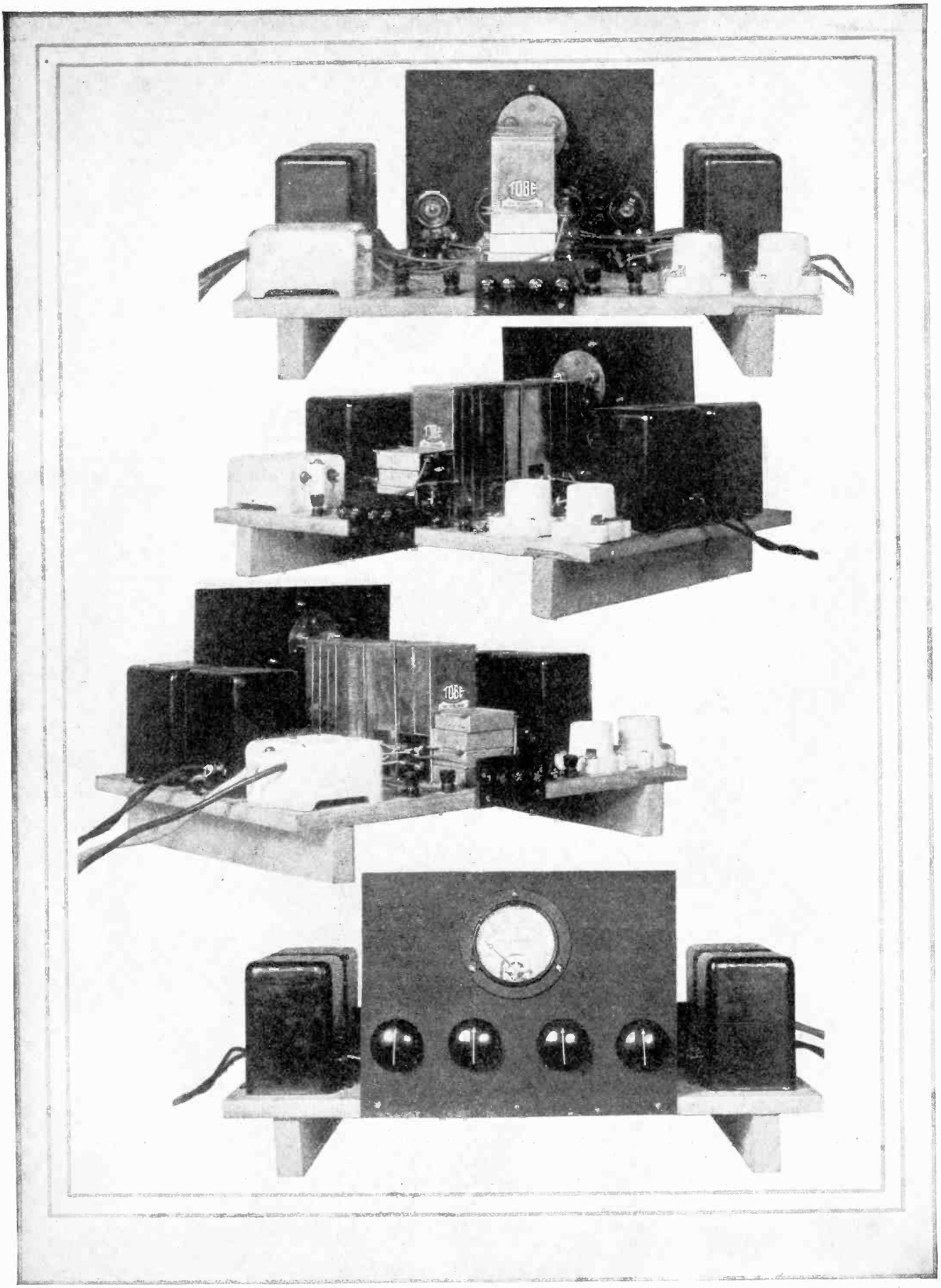
Connect terminal 1 of type L resistance to the 45-volt post.

The final connections are: Connect terminal 1 of the type L resistance to terminal 2 of the 10,000-ohm resistor. Connect terminal 1 of the type C resistance to terminal 1 of the 5,000-ohm resistor.

Connect terminal 1 of the type F resistance to terminal 1 of condenser No. 2.

Putting the '01-ABC Into Operation

There are three light socket cords on the outfit, one from each power transformer and a third from the bell ringing transformer. To simplify matters, connect all three cords together. Bring the cords to the back of the base board and cut them off, leaving sufficient wire to connect them. Take one wire from each cord, scrape it and clean it and twist the three together. Now take one of


TOBE
TOBE

the cut-off portions of cord, preferably one from the power transformers, and connect one of its wires to the three that have been joined. In all there will be four wires, which should be soldered together. Wind the joint with friction tape. Do the same with the three remaining wires on the eliminator and the second wire of the cut cord. Finally tape both joints together. Thus, with the insertion of a single plug, both units of the eliminator will be placed into operation and the power tube will be supplied with filament current.

It is rather difficult to state exactly the size of Mazda bulb to be inserted into the lamp sockets, since that will depend upon the number of tubes being operated in series. However, it is advisable to put two 15-watt lamps into the sockets and then connect the filaments of the receiver to the filament output. In all probability, the meter will indicate less than 250 mils. Insert a next larger size of bulb, say a 25-watt one, into one of the sockets and determine the current flowing. To illustrate. At Radio Hill we started with two 15-watt lamps on a four tube set, using three 201-A's in series. This gave an ammeter reading of about 200 mils. A 25-watt bulb was substituted in one of the sockets, but this raised the current to only 230 mils. Finally it was found that a 15 and a 40-watt bulb were just right.

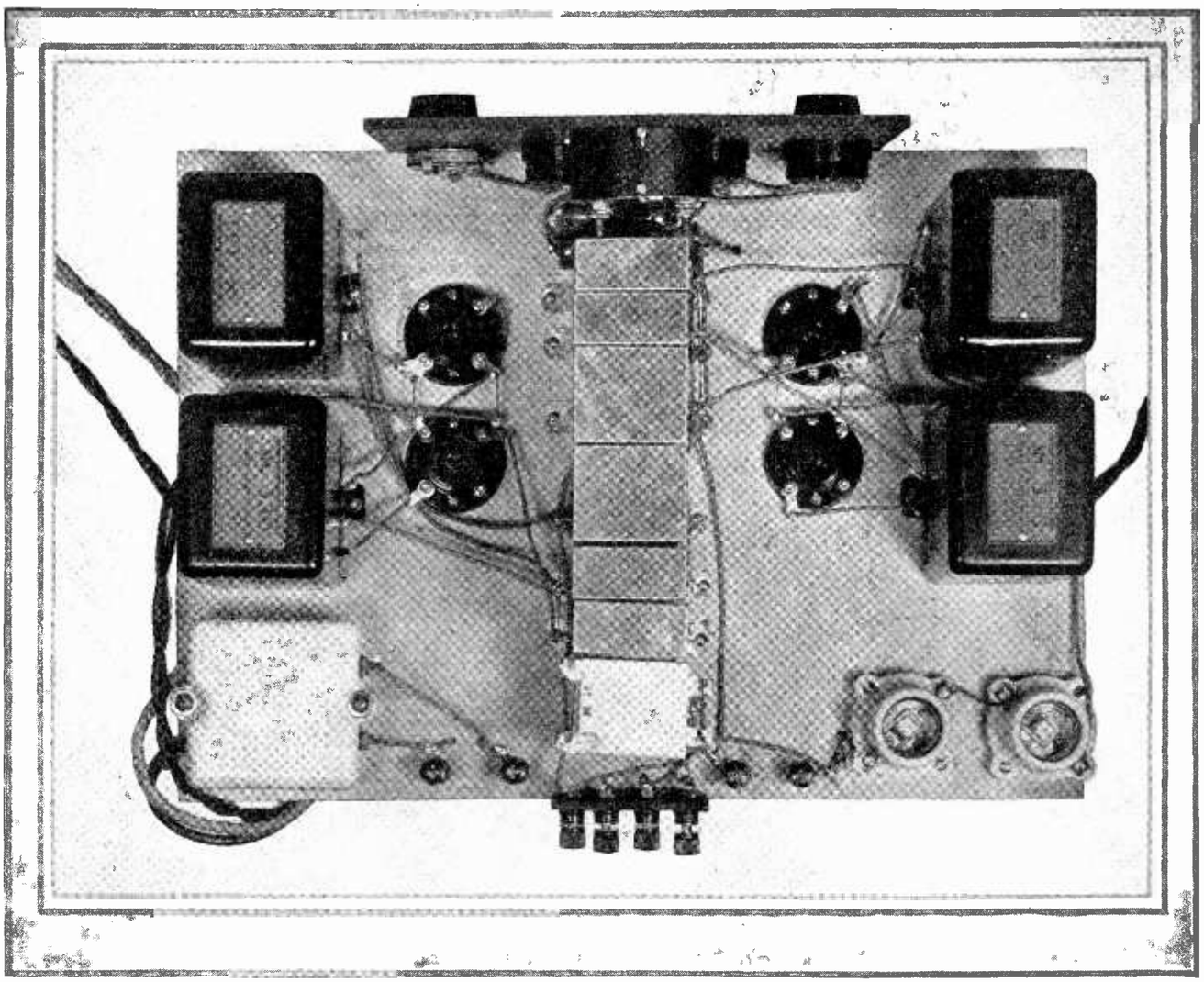
It is not necessary to obtain exactly 250 mils thru the tube filaments. A good 201-A will give just as excellent results with only .24 amperes. No difference in the operation will be found. For this reason we have not attempted to insert a variable control in the filament circuit for fine adjustment.

To operate both a receiver and the eliminator satisfactorily, the A- filament post should be grounded. To eliminate all possibility of hum, the cases of the condensers as well as the electrostatic shields of the power transformers have been grounded to the A- filament post.

From time to time RADIO MECHANICS will publish articles on sets using this eliminator. In an early issue we will present the four tube receiver mentioned. Excellent results have been obtained with it in both quality and DX.

It should be understood that, in presenting the design of the O1-ABC eliminator we are not offering it as a final design, nor does it represent the ultimate development of A. C. operation, for there are changes, particularly in the power circuit. Possibly, therefore, new equipment will be brought out by manufacturers designed specifically for this purpose. In the meantime, you can build this unit with full assurance that it will do the work, and do it in first class shape.

An important point is that the tubes are run well within their rated output. They can produce more than the 260 mils for which they are made, but as you know from running A type tubes on storage batteries, it is not necessary to use the full 250 mils on the filaments. Consequently, the eliminator can be operated at less than the normal load. This provides an ample factor of safety, and gives more satisfactory results than when rectifier tubes are run right up to the limit of their capacity.



Bird's eye view of the A, B, C units, capable of operating anything up to ten tubes, or more if you have them

PEANUT SET RECEIVES WGY TESTS

This Special Short Wave Receiver Is Particularly Adapted for the Short Wave Telephone Tests

C. T. BURKE

THE short wave Peanut set is designed for B.C.L's. and experimenters all over the United States and Canada who want to listen in for the short wave transmission tests transmitted each night during regular broadcasting hours from WGY, Schenectady, New York.*

You will not find a single freak in the set. No trick circuit is used, no tricky apparatus is employed. Short waves offer such a large possibility of fun and entertainment that the broadcast fans are beginning to wonder what there really is to it. If you are one of them and want something that is easy to construct, inexpensive to make, and that gives satisfactory results, build the Peanut.

Fundamentally, the set consists of a regenerative detector and one step of transformer coupled audio amplification. The regenerative control, always important, is especially so with short waves. At the high frequencies used, it is quite possible that a circuit designed for broadcast reception will fail entirely on amateur waves. To insure a smooth and continuous control of regeneration, a Clarostat is used in series with the tickler. Usually the resistance is connected across the plate and tickler. The latter arrangement is known as parallel control. However, the series has one decided advantage, because it does not require a choke coil to prevent the R.F. current from entering the audio side of the receiver. It is usually difficult to obtain regeneration on the higher wavelengths with a choke coil in the plate circuit.

There might be some question about the use of only one stage of audio, but it has been found sufficient in receiving WGY even at distances of several thousand miles. A great many amateurs claim that if short wave signals can't be read with two tubes, a third will not make them readable.

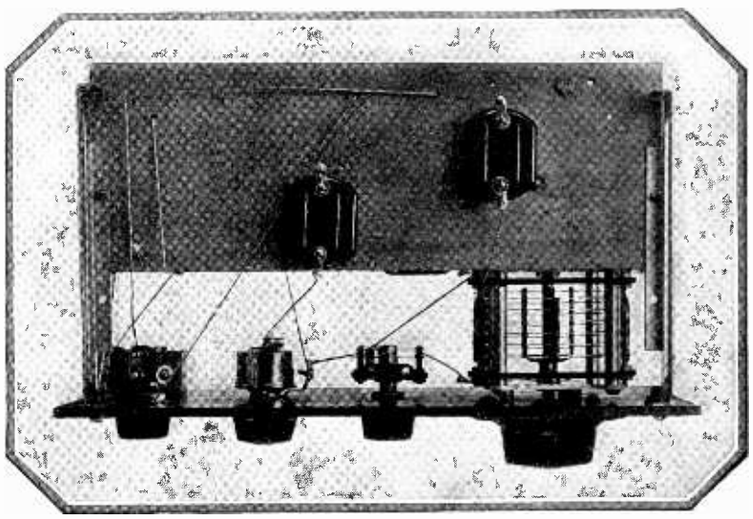
Anyone having worked with low waves will admit that the ordinary variable condenser makes tuning a most difficult job. A given coil covers only a relatively small wavelength band. Thus, on an ordinary condenser, for example, the 20 to 40-meter band might be crowded within 10 degrees on the dial. This is entirely too close for good reception. Not only does it make tuning unpleasant, but it leads to bad reception, since a swinging signal cannot be followed. Double precautions have been taken in the design of the Peanut, to overcome these defects.

First of all, a variable condenser of especially low minimum capacity is used. To secure this, the plates are double spaced. With this condenser the wave-band mentioned above will spread out over at least 20 degrees of the dial. In addition, a two-plate midget condenser is connected in parallel with the larger condenser. The midget has only a variation of 1 to 2 micromicrofarads of capacity, which in the usual terms indicates .000001 to .000002 mfd. Such a capacity acts as a fine vernier and permits you to follow a swinging signal with ease.

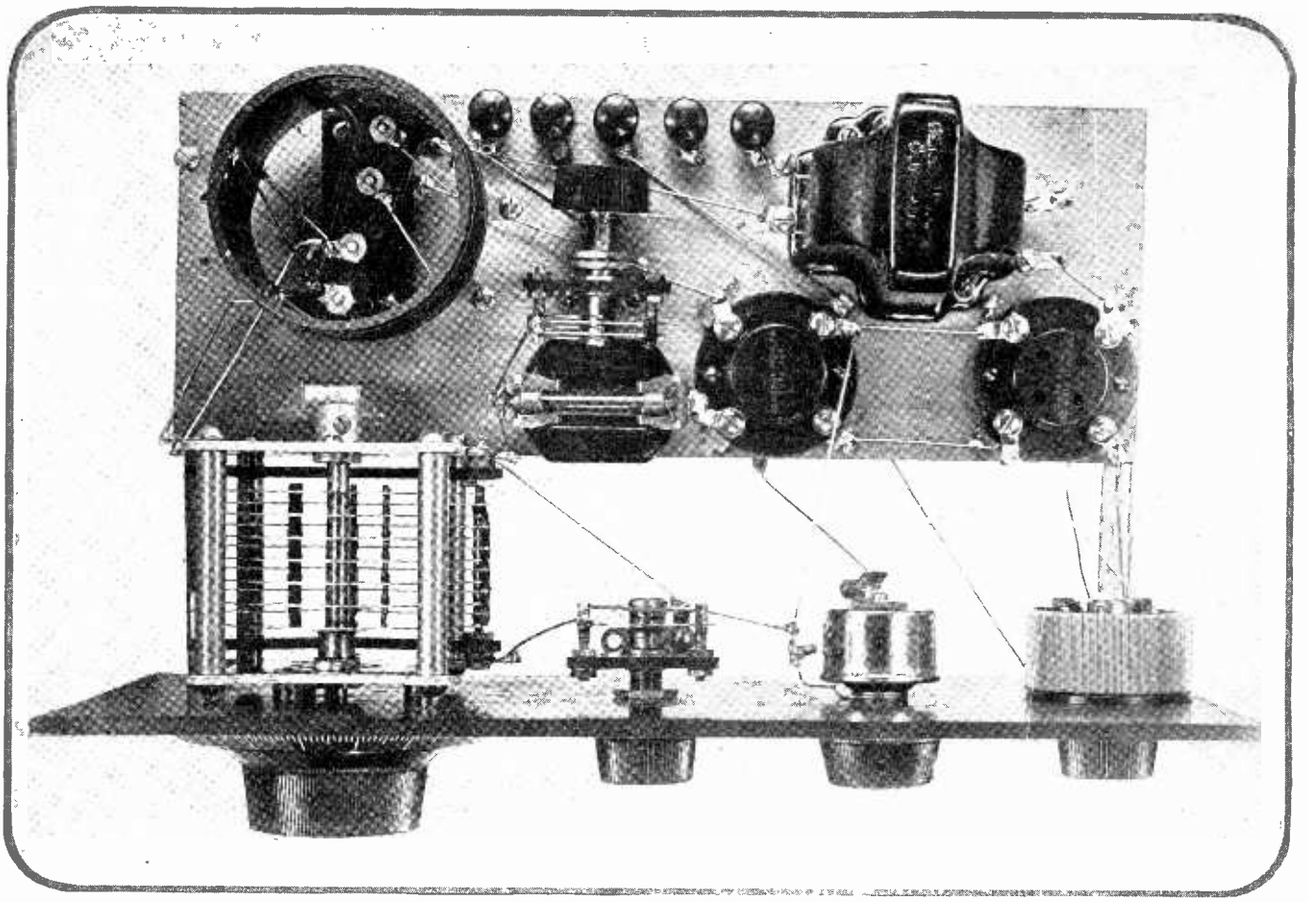
In the past, objections have been raised against the use of a separate condenser for vernier control, the contention being that it upset the logging of stations. No such concern need be felt here. The vernier capacity is so small that it will not vary the dial setting over one division. Stations can then be logged regardless of the setting of the 2-plate condenser.

A very desirable feature of the Peanut is the use of plug-in coils. This lends an added flexibility to it which makes the receiver practically an all-wave outfit. The coils are wound on 2¾-in. bakelite forms with either No. 18 or No. 22 wire. They can be constructed at home. Should you want to make your own, here are some winding details. For 17 to 25 meters use No. 18 wire on a 2¾-in. bakelite tube, using four

* Details of these tests are given in Radio Engineering, Dec., 1926.



Bottom detail view of the Peanut, about the simplest design you can find for a short wave receiver. It can be used on broadcast reception since it uses plug-in coils, but it is intended for picking up the regular schedule of short wave broadcast tests transmitted from WGY. These tests have the regular programs, sent out at the same time that the usual entertainment is on the air



turns for the grid coil and three turns for the tickler. Similarly, for the 30 to 45-meter band, use seven turns for the grid coil and five turns for the tickler. To reach up to 100 meters use No. 22 wire with nineteen turns for the grid coil, and six turns for the tickler.

Of course, you will have to work out a scheme for mounting the coil plugs on the tubing. These plugs can be obtained in any radio store. Probably in the end you will find that it more convenient to purchase these coils ready-made.

General Instructions

The Peanut is so simple in construction and design that even the beginner will experience no difficulty in building it. However, to help you in the layout of the base-board and drilling of the panel, we have prepared Dataprints[1] which give you the exact location of every part and every hole. These prints also include the wire-less wiring diagram.[2] The latter shows the location of every piece of apparatus on the base-board and the front panel.

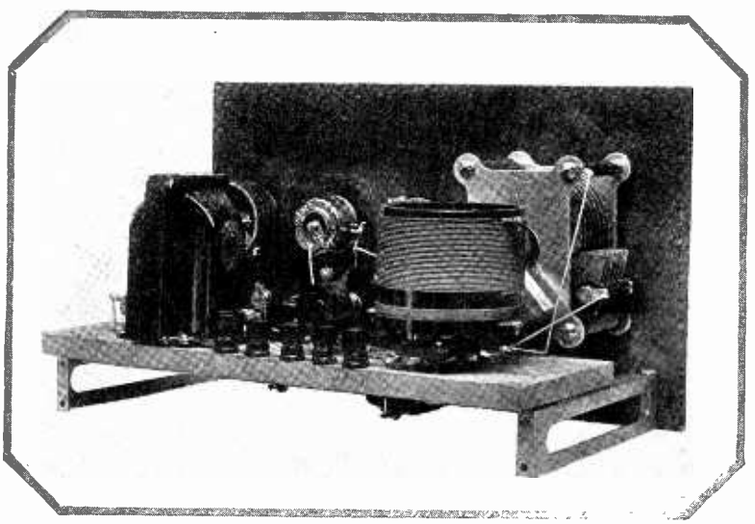
The small vernier condenser has to be made from a five-plate midget. This is easily done by removing all the rotor plates except the nearest one to the panel and the inner stator plate. The spacing between the two remaining plates will be about ¼ in.

Mounting the Front Panel Parts

The front panel can be of Bakelite or

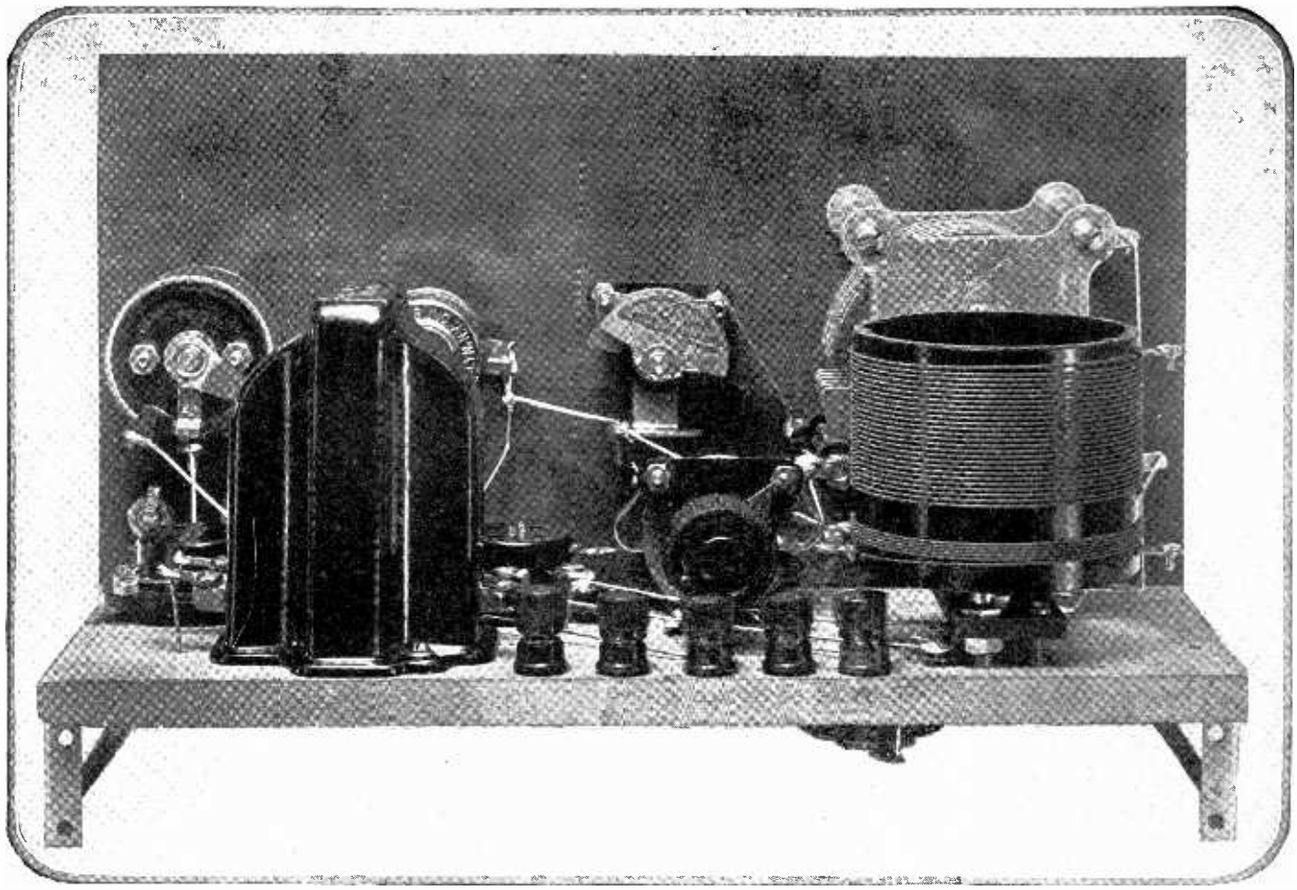
[1] These can be obtained from Pattern Dept., Radio Mechanics, Rad'o Hill, Poughkeepsie, N. Y.

[2] Patent applied for.



You can't imagine the efficiency, at short waves, packed into this little set, so small that it is built in a panel 7 ins. high by 12 ins. long

Any one can put it together, for all the parts are readily accessible, and you don't need to worry about operating it, for it's easier to tune than most broadcast receivers



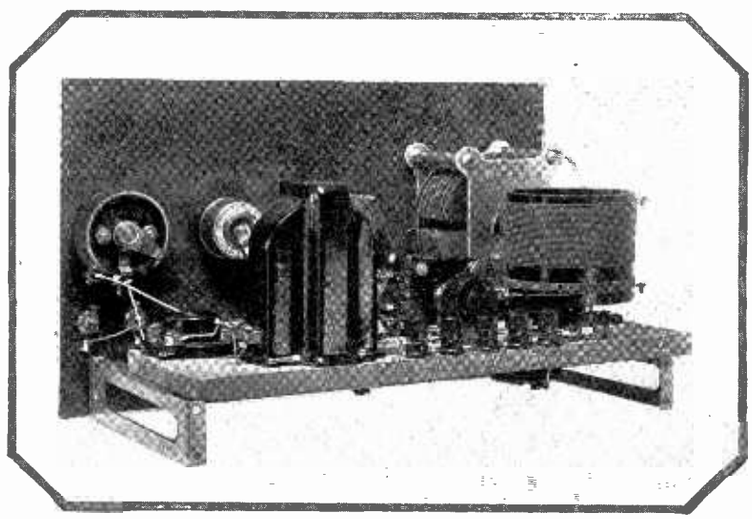
hard rubber, 7 by 12 ins. The following parts are fastened to it—rheostat, Clarostat, vernier condenser, variable condenser and pin jacks. The wire-less wiring diagram shows the location of the individual parts, looking at the set from the rear. Mount the variable condenser with the stator downward. Fasten the vernier to the panel with the mounting bracket down. This bracket serves as one terminal of the condenser. Insert a ¼-in., 6-32 round head screw into the hole on the left and fasten a lug to the bracket.

Mounting the Base-Board Parts

A base board of white wood is used measuring 4 by 11 by ⅜-in. The board is fastened to the top of two brackets so that the rear edge of the wood extends ½-in. beyond the rear edge of the bracket. Use two ¼-in. No. 6 round head wood screws and insert them on the bottom side of the base-board.

The base-board holds two UX sockets, an audio transformer, a grid leak and condenser, a midget condenser, the coil mount and five binding posts. Two .001 mfd. by-pass condensers are held in place on the bottom of the base-board by the wiring. All of the apparatus is fastened to the base-board with ½-in. No. 6 round head wood screws, with the exception of the coil-jack mount. This is secured by drilling two holes through the board and passing 1¼-in. 6-32 round head machine screws through them.

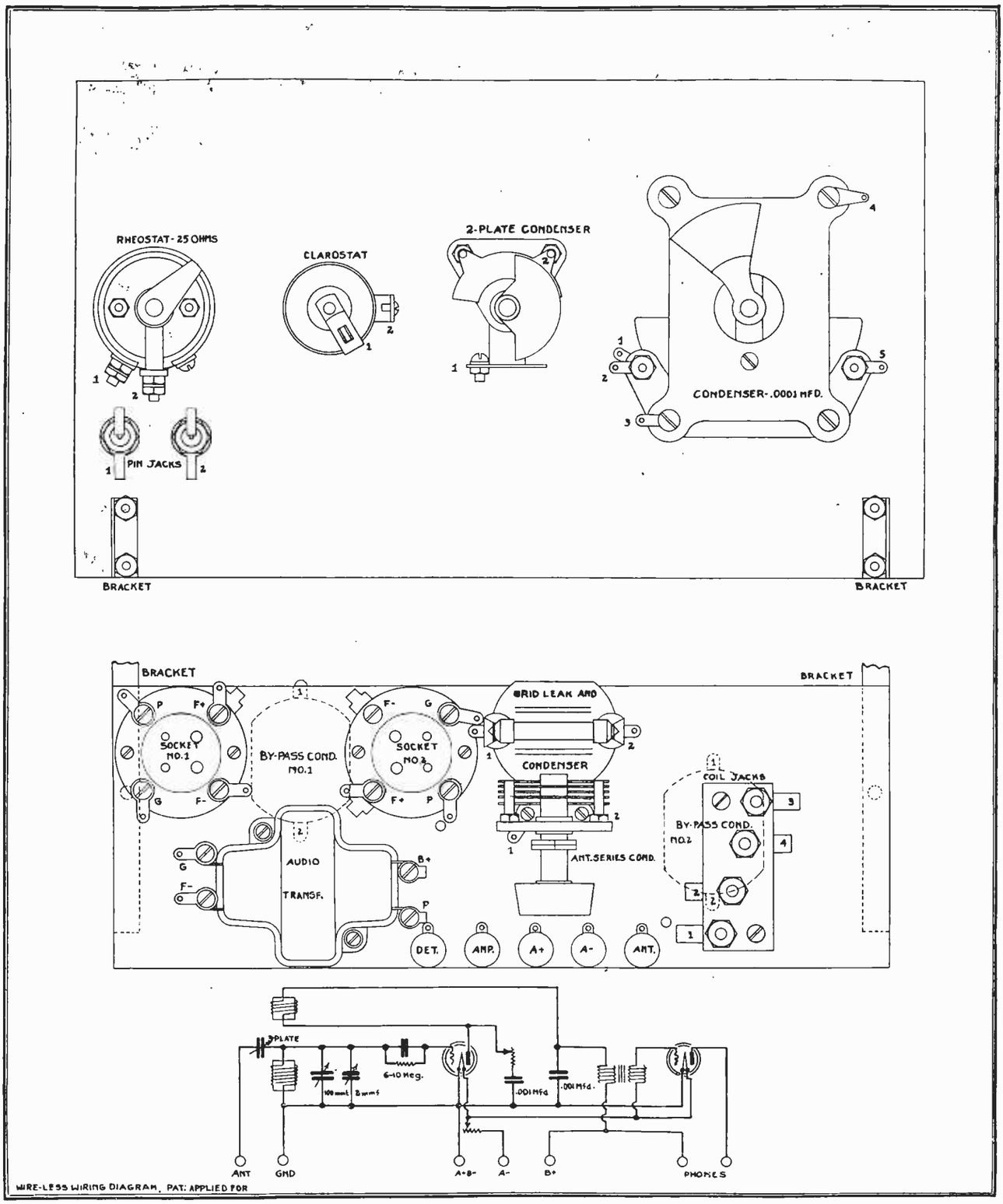
Before proceeding to the actual wiring, the plug-in coil terminals should be connected to the plugs. These coils have four terminals each, two on one side of the bottom of the coil and two on the other side, one above the other. Holding the coil in your hand with the two ad-



The two upper photographs are one-half size, so you can see what a little fellow the Peanut is

There is nothing complicated about the wiring. In fact, you can almost do that part from what you can see in the pictures

Be exceedingly careful about the soldered joints. Use rosin core solder, for any paste will spread around and make low-resistance paths for the high frequency currents



Wire-less wiring diagram and schematic of the Peanut receiver

jacent terminals to the left, connect these to the two front plugs inside the coil. You will notice that lugs have been provided for this purpose. The other two plugs are connected to the right hand terminals of the coil.

Wiring the Front Panel

Before fastening the brackets to the front panel, the following connections should be made. Connect terminal 2 of the Clarostat to terminal 1 of the 2-plate condenser. Connect terminal 2 of the 2-plate condenser to terminal 1 of the variable condenser. This terminal is on the rear stator rod, next to the front panel. Connect terminal 1 of the 2-plate condenser to terminal 3 of the variable condenser.

Wiring the Base Board

Connect G of socket No. 1 to G of the audio transformer. Connect F + of socket No. 1 to F — of socket No. 2. Connect F — of socket No. 1 to F + of socket No. 2. Connect F + of socket No. 1 thru hole in base-board to F — of the audio transformer.

Connect B + of the audio transformer to coil jack No. 1. Connect P of socket

(*Continued on page* 184)

No. 2 to terminal 2 of by-pass condenser No. 1. Connect G of socket No. 2 to terminal 1 of the grid leak and condenser. Connect P of the audio transformer to the DET. post. Connect coil-jack No. 2 to P of socket No. 2.

Connect terminal 1 of the ANT series condenser to the ANT binding post. Terminal 1 of this condenser is on the mounting bracket. Connect terminal 2 of the ANT series condenser to terminal 2 of the grid leak and condenser.

Connect F+ of socket No. 2 to the A plus binding post.

Connect coil jack 1 to terminal 2 of by-pass condenser No. 2.

With this wiring completed fasten the base-board and front panel together.

Final Connections

Connect pin-jack No. 1 to P of socket No. 1. Connect F+ of socket No. 1 to terminal 1 of the rheostat.

Connect pin jack No. 2 to the AMP binding post. Connect the A— binding post to terminal 2 of the rheostat.

Connect terminal 1 of the Clarostat to terminal 1 of by-pass condenser No. 1. Connect terminal 2 of the Clarostat to F+ of socket No. 2.

Connect terminal 2 of the variable condenser to terminal 2 of the grid leak and condenser. Connect terminal 3 of the variable condenser to terminal 1 of by-pass condenser No. 2. Connect terminal 4 of the variable condenser to coil jack 3. Connect terminal 5 of the variable condenser to coil jack 4.

This completes the wiring of the Peanut.

Operating the Receiver

The Peanut can be operated with 199 or 201-A tubes. Probably the latter are preferable and therefore the battery values are given for UX-201-A's. The AMP binding post should be connected to a 90-volt plate voltage source. It supplies the audio amplifier tube. The detector plate voltage may vary according to the characteristics of the tube. Usually 45 volts work very well. B— and A+ should be connected together and the ground wire attached to A+.

Select the coil covering the wave-band in which you want to receive and plug it into the coil jacks. Be sure to hold the coil so that the plugs connected to the shorter winding fit into coil jacks 1 and 2. Set the antenna series condenser at about one-half of its capacity. In all probability it can remain there permanently for any given wave-band. Plug the tips of a pair of head phones into the pin-jacks, and turn the Clarostat until the receiver oscillates. Tune in a station and clear up the signal by a further adjustment of the Clarostat. This procedure is simple and very easy to carry out.

Of course, there are limitations to every receiver. If we say that transcontinental reception is easily possible, we refer to short waves Nevertheless, this small outfit is just as efficient on broadcast wavelengths, although you must not expect to pull in the coast at the first trial. There is nothing that I enjoy more, than spending an evening with the Peanut. If locals are going full blast and interference is too bad, I wander down to the low waves and listen to amateurs and short-wave broadcasting stations.

For a confirmed DX hound, there is nothing like the Peanut. With a pair of phones it is possible to operate it late into the night without disturbing a single soul.

If you haven't made the acquaintance of the short waves, let the Peanut introduce you to them.

Prize Winning Super Name

FROM the hundreds of names submitted for the Super Name Contest, the name ECLIPSE, submitted by Don A. Morris, 2329 S. Lambert Street, Philadelphia, Pa., has been selected for the special receiver to be described in Radio Mechanics for February.

We were so pleased at the large number of entries from those whose names were preceded by Mrs. or Miss that we wished very much that the award might have gone to one of them, but in fairness to everybody, we had to make the decision regardless of that consideration.

Battleship Radio Set Design

SEVERAL competitors in the name contest submitted "Man 'O War." This name had been given already to the first set to be designed in accordance with the new battleship plan. Man 'O War will be shown also in the February issue.

Among other things, it turns regular design practice just about inside out, for the front panel is higher than it is wide, the set is quite deep, and is built around a three-deck plan, in contrast to the ordinary single sub panel.

You will be greatly surprised to see what a difference this arrangement makes, and how beautifully it works out. It is applicable to many types of sets.

RADIO PHYSICS COURSE

(*Continued from page* 167)

waves travel outward from the transmitting antenna, they may be considered as taking the form of ground waves and sky waves. The ground wave is greatly weakened as it travels thru obstructions like frameworks of steel buildings, etc. The sky wave apparently goes up into the air perhaps fifty or a hundred miles and is reflected so that it comes down again to combine with the other wave which has travelled along the earth. The two waves arriving at the receiving aerial combine to produce the resulting wave which affects the receiving apparatus. Since the sky waves travel a much longer distance than the ground waves Fig. 22, it is possible that the two are not in phase with each other when they meet. When they are both in the same phase at the time of meeting, the resultant signal is strong; when they differ in phase the resulting signal is weak. The constant variation in distance travelled changes the phase relation with consequent fading or swinging of the signal. The reflecting action on the sky wave is explained by a theory advanced by Sir Oliver Heaviside.

Fifty or a hundred miles up, the atmosphere surrounding the earth is very rare. The molecules, consisting of equal positive and negative electrical charges, are split up—ionized— into positive and negative portions by the ultra-violet light from the sun during the day. This ionized layer of atmosphere is a conductor, and is known as the Heaviside layer. During the day the layer comes closer to the earth because of additional ionization of the molecules by the sun. At night, during the absence of the sun, the positive and negative portions of a part of the molecules reunite, and the layer rises from the earth. During the day the sky wave is very materially reduced by absorption from the conducting Heaviside layer, and so practically all of the energy comes thru the ground waves, to all but those receiving stations located close to the transmitting station. At night, both the ground and sky waves are stronger so the received signal is much stronger.

SKIPPING: The Heaviside layer is always present then, but at varying heights. Due to the varying height and possible uneven surface at places, the angle of reflection of the sky wave is constantly changing so that the phase relation between the ground and sky wave changes with the consequent fading. With very high frequency, low wavelengths, this effect of the Heaviside layer is so marked that the radio waves appear to skip over certain localities entirely, and reception in those places is impossible. That is, the intensity of received signals first decreases as the distance from the transmitter is increased, reaching a value too low to be observed at a distance of 100 miles or so. As the distance is further increased, the signals become readable again. It has been found, for instance, that a wavelength of 16 meters jumps approximately 1300 miles; 21 meters skips 700 miles, 40 meters skips 175 miles etc., the amount of skip decreasing as the wavelength is increased. Above about 150 meters the skip effect is negligible.

(*Continued from page* 154)

that should be applied to the plate of a 171 type tube is 180 volts. Any increase of this value merely shortens the life of the tube, and affords no greater volume nor bettered quality. However, the output

JANUARY RADIO MECHANICS WILL BE A SUPER - HETERODYNE ISSUE.

of the Raytheon BH is considerably in excess of 200 volts, at current drains normally drawn from this rectifier. Despite this fact, it is not uncommon to see a design in which the full output of the rectifier is applied to the 171 tube.

Therefore, in this design, a fixed resistor is employed to reduce the maximum voltage to its proper value. This feature is vitally important, and should not be overlooked.

General Instruction

Practically all the apparatus is mounted on a base board, 12 by 17 ins. A Bakelite front panel, 7 by 18 ins. carries the variable resistances, an ammeter, a jack and a switch. Before proceeding to the actual mounting of the parts, attach four wooden cleats to the base board. Two of these cleats are 1⅝ by ¾ by 12 ins. These are fastened along the 12-in. edges, with the 1⅝-in. face against the base board. Use 1-in. No. 10 flat head wood screws and insert them from the cleat side. Be sure to counter sink them sufficiently so that the heads will be well below the surface of the wood. The other two cleats are 1⅝ by ¾ by 13¾ ins. They are placed parallel with the front and back edges of the base board. All cleats are flush with the base board edges.

Mounting the Base Board Parts

Before mounting any of the parts on the base board, study the wire-less wiring diagram[1]. The exact location of each part is given so that no difficulty should be encountered on that score. In addition Dataprints[2] have been drawn full scale, showing where each part is mounted, the size of each hole, etc.

The following parts are mounted on the base board: power transformer filter condenser block, choke coils, tone filter, impedaformer, automatic switch, two sockets and two double resistor mounts.

Place the board before you so that the 17-in. edge is in front. This will be called the front edge, since the panel is finally fastened to it.

Put all the apparatus mentioned above on the base board and locate them as in the wire-less wiring diagram. The terminal side of the filter condenser block faces toward the center of the board. while the back edge of the block is flush with the left hand side of the base board. The front mounting screws of the condenser block are about 3¾ ins. from the front panel. Use four ½-in. No. 6 round head wood screws for mounting the block.

Directly opposite the condenser block and in line with it, is the power transformer. Its terminals face toward the center of the board and the back is flush with the latter's right hand egde. Four ½-in. No. 6 round head wood screws will hold this in place.

In the center, and flush with the rear edge of the base board, is mounted the filter choke, so that the terminals face the front panel. The two sockets are mounted in front of the terminals of the condenser block and the power transformer. The arrows on the sockets point toward the center of the base board.

Between the two sockets, and in line with them, is fastened one of the double resistor mounts. To fasten the sockets and the resistor mount, use ¾-in. No. 6 flat head wood screws.

The tone filter goes in front of the double resistor mount, with its terminals to the left. The automatic switch is mounted in the right, rear corner of the base board. On the opposits side of the choke coil is mounted the impedaformer and the second double resistor mount. The impedaformer is placed with its terminals facing the front, while the resistor mount is to the left of it and parallel with the rear edge.

A binding post strip of 2 by 6-in. Bakelite, carries six binding posts. It is attached to the rear left edge of the base board.

Mounting the Panel Parts

The panel is very simple to lay out and to drill. It holds three variable resistances, a short jack, a single-pole, double-throw switch, and a 0-50 milliammeter. The meter requires a 2 11/16-in. hole, which must be cut with a fly cutter. Looking at the front of the panel, the parts are mounted as follows, from left to right—variable resistance E-10, the jack, resistance E-5, the switch and finally another E-5 resistance. The ammeter is mounted directly above the first E-5 resistance.

Wiring the Eliminator

Before proceeding to the wiring instructions a correction must be made on the wire-less wiring diagram. This was noticed too late to correct, but the Dataprints have been drawn correctly. The error referred to is found in the lettering of the binding posts. They should read. from left to right, B—, 45, 90, 135, Input 1, Input 2. The input posts are marked correctly.

The power transformer has three rows of terminals. The upper one is not used. The middle set of terminals is the secondary for lighting the filament of the power tube. The three bottom terminals are the primary, with the flexible leads numbered 1 and 2 and the center terminal 5.

Connect terminal 1 of the power transformer to F— of socket No. 1. Connect terminal 2 of the power transformer to F of socket No. 1. Connect terminal 5, lower center, of the power transformer to terminal 2 of the ammeter.

Connect terminal 4, middle center, of the power transformer to terminal 1 of the 2,000 ohm bias resistor.

Terminals 3 and 6 on the power transformer are directly above the flexible leads. Twist together a pair of leads and connect them, through holes in the base board, to terminals 3 and 6 of the power

[1] Patent applied for.

[2] These can be obtained from the Pattern Department, Radio Mechanics, Radio Hill, Poughkeepsie, N. Y.

transformer. The other ends of the twisted wires are connected to F and F— of the socket No. 2.

Connect P of socket No. 1 to terminal 1 of the choke coils. Terminals 1 and 2 of the choke are two lugs on the lower left hand terminal. Terminal 3 is the lower right hand one, and is connected to terminal 6 of the condenser block. Terminals 1, 3, and 5 are the upper ones on the condenser block, while the lower ones have been marked 2, 4 and 6.

Connect terminal 2 of the choke coil to terminal 2 of the condenser block. The two upper terminals of the choke are connected together and a wire run from this connection to terminal 1 of the condenser block.

Connect terminal 3 of the condenser block to terminal 1 of the No. 2 E-5 resistor. Connect terminal 4 of the condenser block to the B— post. Connect terminal 5 of this block to the 45-volt post.

Connect terminal 6 of the condenser block to terminal 2 of the 2,000-ohm resistance, and also to the terminal 2 of the E-10 resistance.

Connect terminal 2 of the E-10 resistance to terminal 2 of No. 2 E-5 and to terminal 2 of the No. 1 E-5 resistance.

Connect terminal 1 of the No. 2 E-5 resistance to the 90-volt post. Connect terminal 1 of the No. 1 E-5 resistance to the 135-volt post.

Connect terminal 1 of the impedaformer, marked G, to G on socket No. 2. Connect terminal 2, marked B+, of the impedaformer to terminal 1 of the switch.

Connect terminal 3, marked A—, of the impedaformer to the B— post. Connect terminal 4, marked P, of the impedaformer, to terminal 1 of the 0.1-megohm resistor. Connect terminal 5. also on the P terminal of the impedaformer to Input No. 2.

Connect terminal 1 of the tone filter to terminal 1 of the jack. Connect terminal 2 of the tone filter to 2 of the jack. Connect terminal 3, marked P, of the tone filter to P of socket No. 2. Connect terminal 4, marked B+, of the tone filter to terminal 1 of the 2,000-ohm resistor. Connect terminal 2, marked F, of tone filter to terminal 4, lower center, of the condenser block.

Connect terminal 2 of the 0.1-megohm resistor to terminal 3 of the switch. This is the top terminal.

Connect terminal 1 of the E-10 resistance to the 45-volt post. Connect terminal 2 of the 10,000-ohm resistance to the 45-volt post. Connect terminal 1 of the stabilizer to the B— post. Connect terminal 1 of the ammeter to B—. Connect terminal 2 of the switch to Input 1.

Connect terminal 2 of the bias resistance to B— post.

Put a 1-in. No. 6 round head machine screw thrue one of the mounting holes of the power transformer and put a Lastite on the bottom of it. Similarly put a screw through the base board and mounting holes on the choke coils and the condenser block and put Lastites on the screws. Connect all these Lastites together and run a wire from one of them to the B— post. This is to ground the cases.

Operating the Eliminator

Insert the Raytheon tube and a type 171 power tube in the sockets, No. 1 and No. 2 respectively. If only B power is desired, omit the 171 tube and make no connections to the input posts. For operating the stage of power amplification it is advisible to plug in after the first step of audio on your receiver. This is done by inserting the tips of a loudspeaker cord into a plug, and connecting the other two ends of the cord to the binding posts marked Input. The loudspeaker is plugged into the jack on the front panel.

The switch on the front panel has been so connected that, thrown to the left, resistance coupling is used for the power tube and thrown to the right, impedance is put into the coupling circuit. If you are operating from a resistance coupled amplifier in your receiver, results will be more satisfactory if two or even the entire three stages of amplification are used in front of the power stage. The switch must then be thrown to the left.

To use the amplifier in conjunction with a transformer coupled audio system, the quality will be greatly improved if the impedance is used. Try switching from one to the other and notice the difference in quality and volume. The voltage controls on the front panel, from left to right are, detector, 90 and 135 volts.

Before connecting the eliminator and the set, it is advisable to turn the knobs as far to the left as possible. The output of the eliminator is about 200 to 250 volts. If this entire voltage is applied to a 201-A, the tube will be paralized and become inoperative. Turning the knobs to the left cuts down the voltage.

The E-10 resistance, which is on the extreme left of the panel, controls the detector voltage. The two E-5 resistances are, from left to right, 90 and 135 volts respectively.

The easiest way to connect the receiving set to the input of the power amplifier is to buy a 5-ft. loudspeaker cord. Insert the tips into a plug as usual and connect the other two ends to the Input transformer posts. If your receiver is not provided with a jack after the first audio stage, connect one end of a wire to the plate of the first audio tube. Connect the other end to one of the output transformer posts. The second output post is then connected to the 90 volt binding post on the set.

It is not advisable to try any other type but the 171 in the power tube socket. First, the resistance in series with the power tube plate voltage has been chosen to give about 180 volts. Then again, the bias resistor will give the exact C voltage for the 171 only.

To do justice to both your set and this eliminator, a good loudspeaker must be used. To-day the market offers a variety of reliable speakers at reasonable prices. With this outfit and a good speaker you can sit back and be content to know that for years to come you have a combination to rival any of the best receivers.

(*Continued from page* 166)

that I had let the soldering iron burn a hole in one of her rugs, or something. Just to set things right I tuned in one of the Chicago stations right away. Luckily I knew there was a specially good program on at WLS. Say, you should have seen their faces change. Says she, "How did you do that?" very much surprised..

They were a little more friendly then, so I sat down and told them how to operate the set in the way that I knew they would want to hear the set work. I talked to them as if they had a music box instead of a radio set. Like this:

"Get your evening paper and see from the programs what is on that you want to hear. See this list of local stations I made in the front of your log book when I installed the set? All right. When you decide what station you want, turn both dials together so that they are on the right numbers"—and I showed them how to move the dials —"like this," and I tuned in another station.

As I did that they watched me in amazement. Guess they hadn't seen a real radio set since the days when a fellow almost had to have an engineer's license to run one, and they hadn't taken any interest much in theirs because they thought a radio set was just one dial twist after another.—You see, I didn't teach them how to tune in everything. I only showed them how to get the locals that would come in with good quality.

A couple of days ago I ran into Mr. Clayton on the street, and asked him if he had heard the new set. "Boy," he said, "it's the most remarkable thing the way my daughter can handle that set. Why she can tune 'em in right on the nose, and such music as she can get out of it. I'll tell you something else, too. She has sense enough to tune in a good station and then leave it alone. All my friends spoil the programs by everlastingly twisting the dials just in the middle of a good program."

Which was a good joke, but I didn't want to tell him that the reason his daughter handled the set so much to his liking was that she didn't know enough about the set to do anything else!

Are You a Super-Hound?

If you aren't, you will be when you see
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An eight-tube super-heterodyne which introduces the "Battleship" type of mechanical design, an original development from Radio Hill Man O' War, built around Silver-Marshall equipment, produces such quality as you can seldom hear from other supers.

(Dataprints now available. Price, postpaid, $2.00)

THE HUNDRED DOLLAR NAME

Mystery still surrounds the details of this extraordinary super. We can't even tell you the name of it, for which a $100.00 prize was paid. But get the dope about it in February RADIO MECHANICS. It's the kind of a set for the man who has always wanted a real, high-power super-heterodyne, but never quite dared to tackle such a job. This set is designed in such a way that, with a little assistance, the parts just fall together.

(Dataprints now available. Price, postpaid, $1.00)

TC ON A. C.

The best way for a man to assure himself of peaceful pursuit of his radio hobby is to first provide the family with the best receiving set he can make for them. Such an outfit is the TC receiver. For two years it has demonstrated its capabilities as a radio set. Now it is presented as a thoroughly house-broken type of receiver for full A, B, and C operation on the A.C. current supply.—No batteries or chargers are required for this set.

You can't buy a set like this at any price, but you can build it for less than the cost of an ordinary, factory-built outfit and accessories.

(Dataprints now available. Price, postpaid, $1.00)

UP OUR SLEEVE

We can't tell you all the other things that we are getting ready to show you how much fun it is to play with radio, but you always know that M. B. Sleeper is the man who can find them for you. There's the Atwater Kent set that runs entirely from A.C., Boston's new loop set, more about short waves, new kinks about installing complete sets, and no end of things to make life interesting—Don't let yourself miss them—USE THIS COUPON

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Radio Hill, Poughkeepsie, N. Y.

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Sold in complete kit form, including Raytheon BH Tube and every accessory and piece of wire required (except audio tubes). Easily assembled in an evening. Price $85.00.

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Moulded Bakelite case with insulated adjusting screw.
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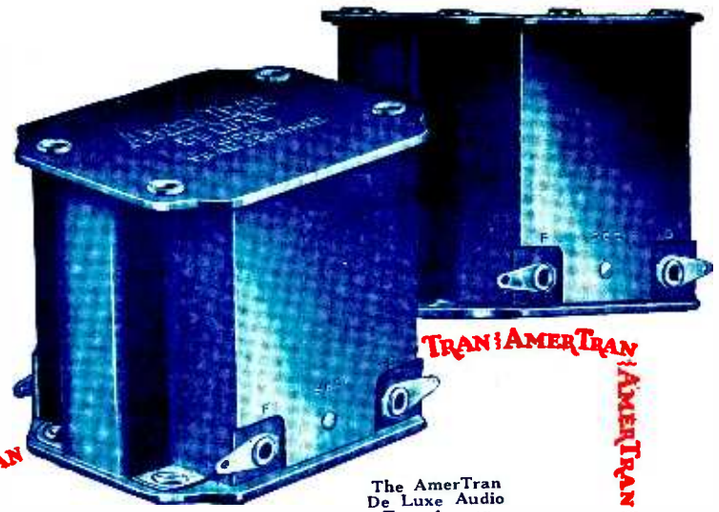

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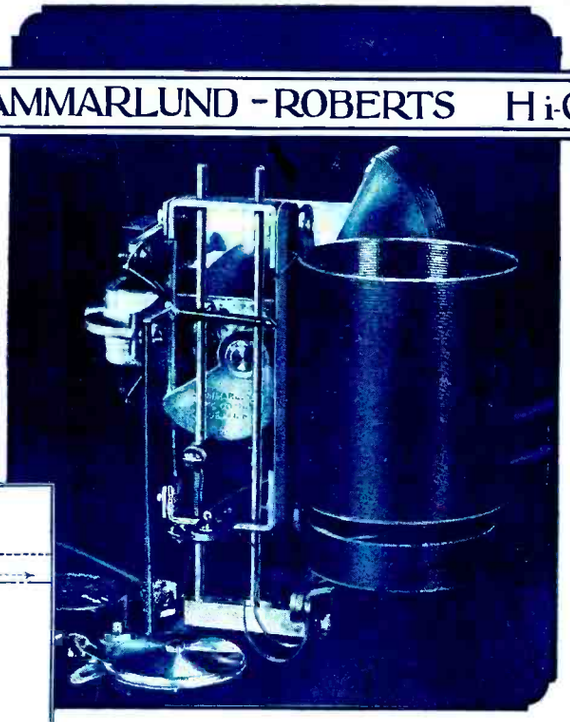
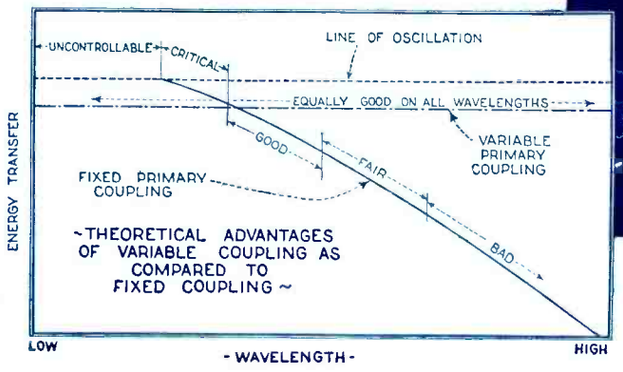


Chart shows effect of Automatic Variable Coupling over entire tuning range



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