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Illustrated

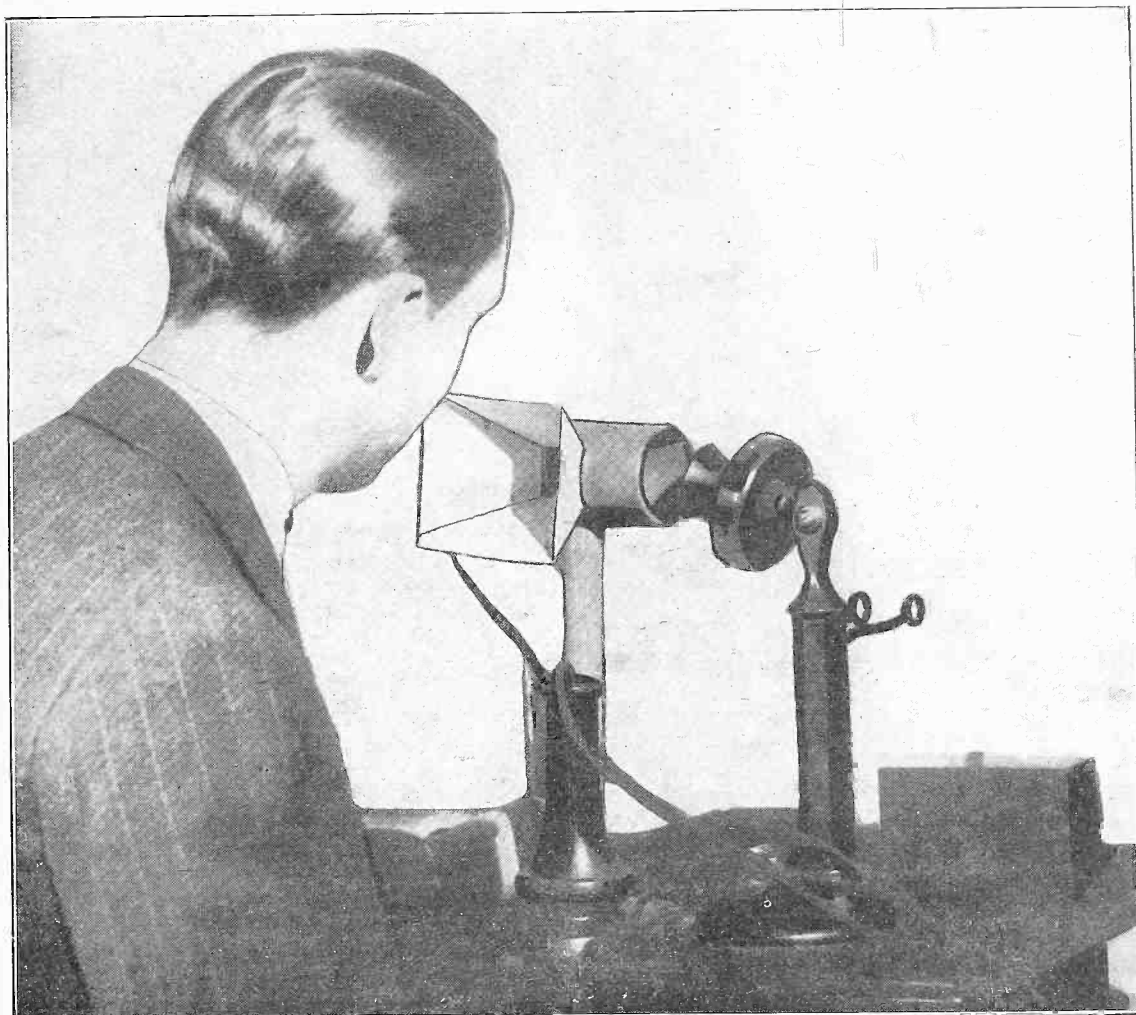
PHASATROL CIRCUIT
BALANCES 3 RF

6 TUBE VICTOREEN GETS
DX EASILY

BERNARD ELECTRIC
OMITS BATTERIES

'PHONE TALK PUT ON SPEAKER

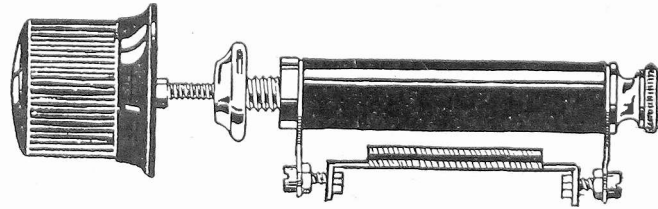
See page 3



(Hayden)

THE VOICES OF BOTH PARTIES to a telephone conversation of the regular household variety may be put on the reproducer of your radio set.

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(Inquiries Invited from the Trade)

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By ARTHUR H. LYNCH

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Mr. Lynch is one of America's leading radio authors and designers. He has done the best job of his life in this comprehensively illustrated series, a digest of which follows:

Dec. 25 Issue—Theoretical and historical discussion of the De Luxe Receiver and the audio channel and B eliminator. Jan. 1—The 2-tube set fully described and illustrated, including wiring and choice of tubes. Jan. 8—The National Lynch Power Amplifier and B Supply (3-stage AF and B and C eliminator, adaptable to any receiver). Many illustrations include picture diagram of wired connections to photographed parts. Jan. 15 and 22—De Luxe reception from lamp socket with latest devices, including trickle chargers and A battery, relay, trickle charger and Abox filter, with picture diagrams of wiring, from antenna to the Acme speaker.

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RADIO WORLD 145 WEST 45th ST. NEW YORK



Court Commercial Photo, Hempstead, L. I.
ARTHUR H. LYNCH, auto speed demon and radio enterpriser extraordinary, about to take a 60-mile-an-hour jog in his car.

[Entered as second-class matter, March, 1922, at the post office at New York, N. Y., under Act of March 3, 1897]

'Phone Talk Put on Speaker Both Voices Heard by Use of Radio Devices

*Audio Channel of Your Broadcast Receiver Picks Up
Both Your Voice and Other Party's Through
Earphones Used As Microphones*

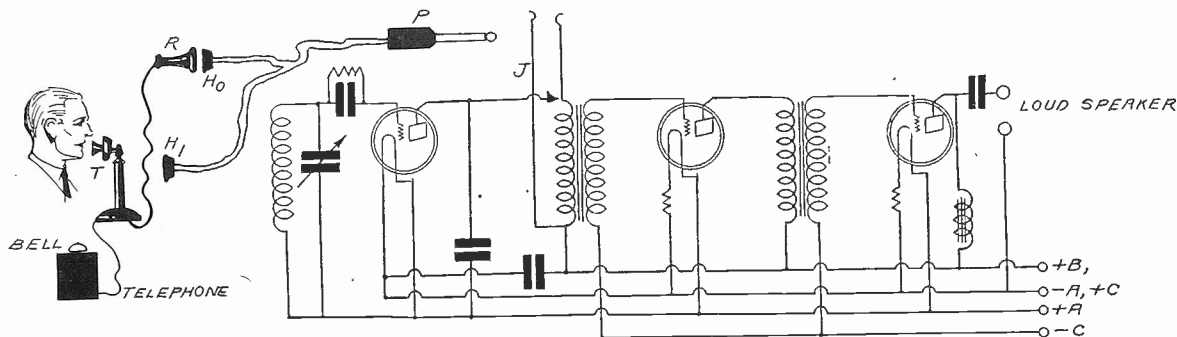


FIG. 1

With the aid of an ordinary headset and the audio frequency amplifier in the radio set a loud speaking telephone system may be contrived. The person telephoning speaks simultaneously into one of the ear pieces of the headset and the mouthpiece of the telephone. The telephone earpiece is made to talk into one of the earpieces of the headset. The headset delivers its output to the primary of a transformer. The amplifier and speaker do the rest.

By Herbert E. Hayden

Photographs by the Author

A TELEPHONE conversation is one-sided so far as persons not a party to it are concerned. Only one of the voices can be heard. But there are many cases in which it is desirable that a whole group of people be able to hear both sides of a conversation, particularly the voice of some mutual friend or relative many miles away.

This can easily be accomplished by a loud-speaking telephone system. Such systems are in daily use for some purposes but the circuit arrangement has to be wired up by the telephone company, because no telephone company allows anyone outside its employ to make any electrical or mechanical attachments to its equipment. Therefore, if an amateur desires to install a loud-speaking telephone in connection with his house telephone it must be done in such a manner that the only coupling between the telephone and his own equipment is by means of air waves. How this may be done in a simple manner will be revealed. The first equipment necessary is a good audio frequency amplifier and a loud-speaker. For this the amplifier and speaker in the radio set may be used, provided the necessary changes are made in the circuit. The changes necessary are very slight and easy. All that is necessary is a double circuit jack in the primary of the first audio frequency transformer. If there already is such a jack in the detector output it will be necessary to reverse its connections so that the outside springs are connected to the primary of the transformer instead of to the plate and battery. The connection is shown

at J in Fig. 1. In this diagram a three-spring jack is used, the fourth spring being unnecessary.

The next part required is an ordinary headset provided with a plug-in the same manner as when used for radio listening. When this plug is inserted into jack J it is automatically connected into the primary of the transformer, while the detector tube is disconnected. If now some one speaks into either or both of the earpieces, H_0 and H_1 of the headset, a voltage will be generated in the windings and a current will flow through the primary of the transformer. This current of course corresponds with the audio frequency vibrations that fall on the headset. The amplifier serves to increase the strength of the audio current until it is loud enough to operate the loud speaker. Hence, the loudspeaker will repeat what is spoken in the head-set.

It does not matter where the sound that operates the head-set comes from, provided it is strong enough. It may be taken from the output of an ordinary telephone ear-piece R. But the sound that comes from the telephone is very weak in comparison with the sound that is spoken into it. In order that it may be strong enough to actuate the electromagnetic pick-up it is necessary to place the earpiece of the telephone very close to the headset earpiece. It is physically possible to clamp the two together, or the headset earpiece may be placed on the table with the diaphragm up and then the telephone earpiece may be placed on top of it. This latter arrangement does not violate the rule that nothing must be attached to the company equipment, while the clamping arrangement does, and it is just as effective. If the receiver R is placed on one of the headset ear-

pieces, as H_0 , the other, H_1 , should be placed so that the person telephoning speaks into it at the same time that he speaks into the telephone transmitter T. In this manner both sides of the conversation will be repeated by the loud-speaker.

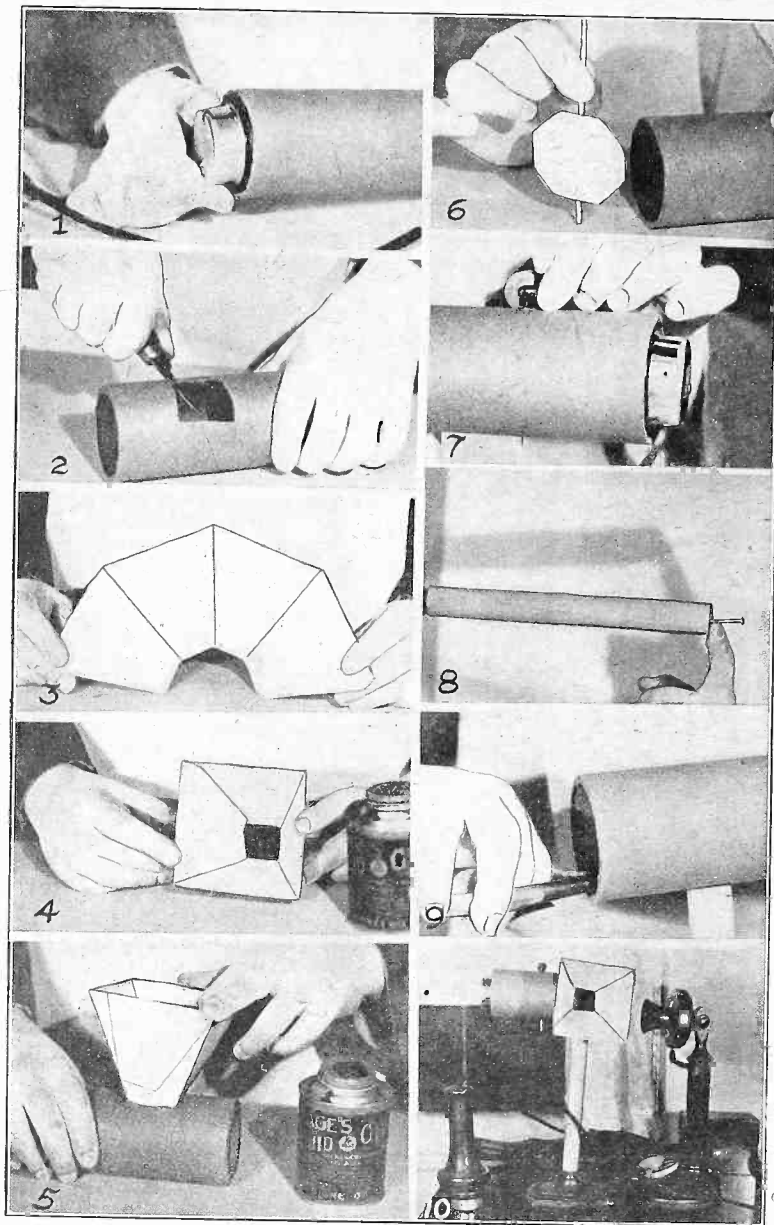
The modus operandi of the system is as follows: When the telephone bell rings the person called takes the receiver R off the hook and places it on top of the earpiece H_0 . His answering "Hello" will be carried to the distant telephone receiver in the usual way. It will also be picked up by H_1 and transmitted to the loudspeaker, where it will ring out loudly. The voice from the distant caller will come over the line and be picked up by H_0 , which will transmit it to the loud-speaker. This voice also will come out loud so that all can hear it. One must not be disappointed if the quality of the voice from the distant caller is not so good as the quality of the voice of the announcer at the radio station. A commercial line used for ordinary telephony is not as good as lines used for broadcast transmission.

Do not forget to hang up the receiver when the conversation is completed.

The voice spoken locally will naturally be more intense than the voice that comes in over the line. If the same amplifier is used for both, the difference will be so great as to make the two-way conversation unpleasantly unbalanced. The adjustment for equal strength may be done in many ways but the simplest is to tone down the pick-up for the earpiece H_1 by the stove-damper method.

If R and H_0 are placed in contact as suggested above, H_1 may be placed a foot or two away from the speaker.

(Photos on next page)



(Hayden)

CONSTRUCTION OF AUDIO PHONE TOLD IN PICTURES

- (1)—Procure a stiff piece of cardboard tubing about 6 inches long and of such a diameter that it just fits snugly over the rubber cap of the earpiece of your headset.
- (2)—Cut a square hole in the side with a pocket knife. This hole may be an inch to an inch and a half on a side.
- (3)—Make a truncated pyramid out of stiff cardboard to fit into the hole. Cut the paper as shown in this figure and make the edges flexible.
- (4)—Glue the truncated pyramid as shown in this picture. It now becomes speaking funnel or horn.
- (5)—Mount the funnel in the hole cut in the cardboard tube and fasten with glue.
- (6)—A sound damper is necessary in the tubing for controlling the volume of sound that gets into the earpiece at the end of the tube. Make this in the same manner as a draft regulator in a stove pipe. A thin wooden dowel will serve admirably for turning the damper.
- (7)—Mount the damper as shown in the photo and put a small knob on the top of the dowel for convenience of turning.
- (8)—A standard of about the same height as the telephone is required. Take the base of an old table lamp or a loud speaker and put a one inch dowel on it. Adjust the length so that the center of the tubing is opposite the center of the mouthpiece of the telephone when the two are placed together on the table. Turn the screw in (as finger indicates), then remove screw. The final embedding of the screw from under the base will then be easy.
- (9)—The cardboard tubing and funnel assembly are next mounted on top of the standard dowel. A wood screw with suitable washers may be used for this purpose. A simpler way of driving the screw home than that depicted is to drill a hole in the top side of the cardboard tubing directly over the head of the screw. A screw driver may then be used. The top hole may then be covered over with paper when the mounting has been done.
- (10)—The finished arrangement is shown in this photo. Note that the telephone receiver is placed on top of the extra earpiece from the headset.

AC and DC on Fuses Confuse Many Persons



(Hayden)

THE NUMBER of amperes that fuses will pass, are stamped on the bottom of the base, as indicated in the upper photo. This information is also given on the metal ring, to which the pencil is pointing in the bottom photo, which surrounds the mica on top.

By Richard Holt

Fuses for electrical circuits come labeled as AC and DC fuses. Some persons wonder why it is necessary to use different fuses for essentially the same function, while others worry about getting the right kind of fuse. There is no difference between AC and DC fuses. They may be used interchangeably, and the labels DC and AC have no significance in this connection.

A fuse is simply a piece of wire or ribbon made of a metallic alloy which has a very low fusing point. That is, it melts at a very low temperature. As current flows through the fuse strip the metal heats up. If too much current flows through, the heat generated is so great as to melt the alloy. The fuse is the weakest part in the line. If the line is overloaded the fuse is the first to melt, and that melts long before any other part of the line gets warm enough to damage the insulation. The fuse serves the same purpose in a radio circuit as the safety valve does on a steam boiler. It protects the entire system by sacrificing itself at the first approach of danger.

But AC and DC fuses are made of the same alloy and they are of the same size for any given rating. The rating indicates at what current the heat generated in the strip is high enough to melt the alloy. There is absolutely no difference in the heating effects of AC and DC of the same amperage.

When Your Set Loses Pep Find Out Why By Elimination Process

*If the Station Is at Fault You Can Determine This By
Comparing With Other Broadcasts—How
to Judge the Batteries*

By J. E. Anderson

Consulting Engineer

MANY fans no doubt have noticed that on some days they cannot receive broadcasts as well as on other days. They wonder why. Is it the fault of the batteries, or of the weather, or of the antenna, or of the broadcasting station, or something else? It is easy enough to ascertain the cause by a little experimenting or just a little thinking.

If it is the fault of the broadcasting station the set should work well on other stations, because it is not likely that the transmission of all the stations will be subnormal at the same time for reasons arising at the station. Hence to eliminate the possibility of poor transmission as a cause of weak signals it is only necessary to swing the tuning dials to some other station and see what the set brings in then.

Perhaps in the greatest number of cases the batteries are suspected as being at fault when the signals are weak, because they are in most instances to blame. But it is a simple matter to correct for this. Test the batteries and see if they are up to "snuff." Or if no voltmeter is available, replace the batteries. If new batteries will bring in the signals in full force then the old batteries were at fault.

A Thought About Batteries

But before going to the trouble of replacing batteries it is well to give the subject a little thought. How long have the batteries been in use? How long should they last, provided they are fresh when they are first installed. If there is a great discrepancy between the time they have been in use and the time they should last, chances are that the batteries are all right and that new ones will not improve reception greatly.

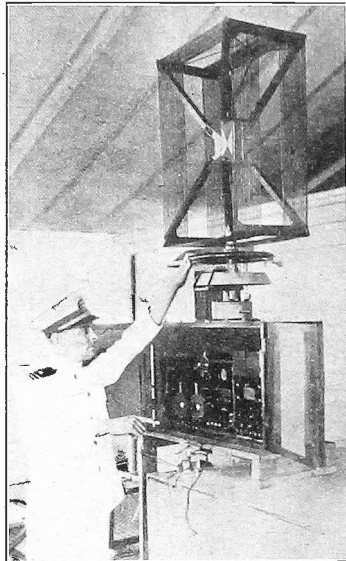
Of course, there is always the possibility that defective batteries were installed and that they did not have enough life in them to last the normal time. Then again it is possible that there is a short or leakage in the set which runs the batteries down faster than normal. Here a meter comes in handy, because the batteries can be tested both when they are first installed and later, when they are suspected of being exhausted. If storage batteries are used they will go dead suddenly and there is hardly ever any doubt as to where the trouble lies. A new charge will restore the set to normal operation.

The antenna is frequently suspected when the signals do not come in as they should, but it is not likely that any serious faults of construction should develop in this part of the receiver. It is either a good antenna from the start or it is not so good.

The Weather's Effect

We now come to a consideration of what effect the weather conditions have on reception. Is the weather suspected as often as it causes variability in signal strength? The weather is never the same two days in succession, or even two hours in succession. It is the most variable

NAVY HUNTS STATIC



(International Newsreel)

THE RADIO static detector aboard the U. S. S. Kitter, with which it is possible to locate the direction of static, being operated by a naval officer of that ship.

factor in radio reception. Moreover it is quite generally known that static is associated with weather but just how it is associated is not accurately known. But the presence of static is not necessarily associated with strong or with weak signals. The weather has another effect on the receiver, which in a large measure determines the DX capabilities of the set.

It is well known that all insulators absorb a certain amount of moisture. The less moisture an insulator absorbs, usually, the better is the insulator for radio purposes. An insulator which has absorbed a great deal of moisture is a high loss insulator. That is, dielectric losses in it are large. Not only will moisture add to the dielectric losses in the insulator but it will also cause it to become a conductor of electricity, and when an insulator is a conductor it is, of course, a poor insulator. It introduces losses just the same as a resistance, and it makes no difference whether the resistance is in parallel or in series with a radio frequency circuit.

Antenna, Indoor and Outdoor

When the humidity of the atmosphere is great, as in rainy and foggy weather, all insulators in a radio set absorb moisture and the insulating properties decrease in efficiency. This is particularly true of such insulators as cotton and silk. Hence in humid weather both tuning coils and condensers will decrease in efficiency. The losses in these parts will increase enormously and consequently signals will be weak. The losses will sometimes be so

great that it is almost impossible to get a regenerative circuit to oscillate. Not only will the signals be weak in moist weather but the selectivity will be impaired to the extent that the tuning system is unable to discriminate between stations of different wave lengths.

If an outdoor antenna is used wet weather is particularly harmful on signal strength and selectivity. Everything in the field of the antenna is wet and is therefore more or less of a conductor. There will be considerable losses both from dielectric absorption of energy and from conductivity from antenna to ground. The way to overcome this is to erect the antenna in such a manner that there is little solid material between the antenna and ground and in the immediate vicinity of the antenna.

Antenna Insulators

The insulators used with the antenna must also be of the highest grade. Some insulators used absorb a great deal of moisture and others collect moisture on the surface. In either case there will be losses of energy and weak signals. Pyrex glass is an insulator which does not collect moisture on the surface and does not absorb. For this reason this is a good insulator for use outdoors in antenna construction. Glazed porcelain is another good insulator under these conditions. Hard rubber absorbs very little moisture and is from this point of view an excellent insulator, but the chief trouble with this is that it has no great mechanical strength, and is likely to break under tension.

If the antenna is erected indoors there is not the same trouble from moisture, nor is the necessity for great mechanical strength a consideration. But even for an indoor antenna there is no reason for using poor insulators.

The Insulation on Wires

What applies to insulation in connection with the antenna also applies to the insulation in the set proper, particularly on the grid side of the tubes. If moisture collects on the insulators or if the insulators absorb moisture, the losses in the set will be greatly increased, and both selectivity and sensitivity will be low.

One place where losses creep into the set as a result of the presence of moisture is the insulation of the wire in the tuning coils. Cotton insulation absorbs a great deal of moisture. Silk introduces some too but not quite so much as cotton. Other insulations should not be considered in a low loss tuner. The fact that cotton absorbs more moisture than silk does not necessarily mean that coils wound with cotton insulated wire are not as good as coils wound with silk insulated wire. The greater spacing of the wires in cotton insulated wire is in favor of this type.

When the set fails to work one day as well as it did the day before, or a couple of days before, it is well to consider the weather as a possible factor in the change. If the humidity is great, the decrease in sensitivity and selectivity is probably due to that.

The Six-Tube DX Victoreen Radio Circuit Uses Power Tubes as Detectors

Amplifier and Oscillator Tubes Put on Separate B Plus Leads, and Results Are Improved On Sensitivity Lines

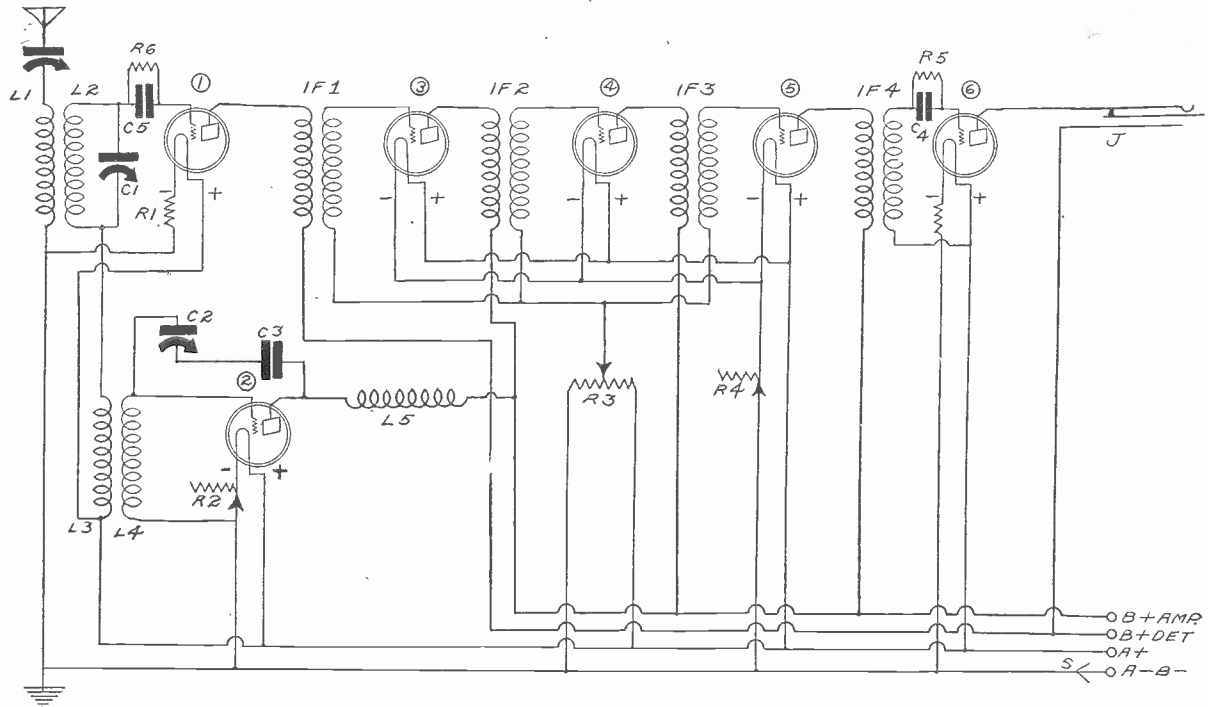


FIG. 1

DIFFERING from familiar Super-Heterodynes only very slightly, this hookup nevertheless affords greater efficiency than some others, and is made to function wholly without body capacity effects, a delight not always afforded by this type of circuit.

THE design of the Super-Heterodyne shown in Fig. 1 is primarily for a console or cabinet-and-table installation. A console is a unit piece of furniture. A cabinet is the regulation housing for the receiver, as we have been accustomed to for years, but it is placed atop of a matched table which contains the audio channel, A supply and B supply. Hence the Super-Heterodyne shown in Fig. 1 may be built for a 7x24 inch front panel and be contained in a cabinet of the same frontal dimensions, the depth being 8 inches or more. It is preferable to use a depth of 9 inches, at least, but be sure that your cabinet will accommodate this. The reason for the greater depth is the avoidance of crowding of inductive parts, particularly near the oscillator coil. Excellent results were obtained by me from the receiver, which was operated from a storage battery and trickle charger, a B battery eliminator and a Western Electric speaker and audio amplifier (No. 14A). The audio-speaker unit has no relationship to the Western Electric cone, but is known as the speaker and power amplifier, and is an old model.

Some Ideas on Body Capacity

The coils used were the Victoreen products, consisting of the antenna coil L1L2, the oscillator coil, L3L4L5, and the inter-

mediate frequency transformers IF1, 2, 3 and 4.

The receiver was relatively simple to tune, with only a modicum of tuning and balancing nicety required for distance stations. Any one familiar with Super-Heterodyne so constructed as to afford a means of regulating sensitivity, enabling the maximum degree for real successful distant reception, knows that oscillation control on the intermediate channel is important indeed. Also absence of body capacity effects on the tuning condensers, C1 and C2, is vital, for if body capacity is present you cannot log the stations accurately. When your hand is on either or both dials it has the effect of adding capacity in parallel with the two tuned circuits so that when you take your hand away you lose the distant station (particularly in regard to the oscillator condenser) because of automatic detuning. You remove that parallel capacity that is contributed by your body through your hand. Hence you would have to figure this in your tuning, getting the distant station first, then turning the condenser plates in a bit to add capacity equal to that which you are about to take away. This condition is not restricted to a poorly constructed Super-Heterodyne but to any receiver affected by body capacity.

The situation is bad enough, because it

makes the set difficult to tune, and particularly so for those members of the family, like the women folk, who just want to turn dials and knobs, to tune in, without being bothered by critically tremendous trifles. Imagine, then, what a nuisance body capacity is when the retuning, for capacity compensation, represents a difficult number of dial divisions at different points on the wavelength scale. Where $1\frac{1}{2}$ divisions are required at 400 meters, only $\frac{1}{4}$ of a division has the same effect at 250 meters, the frequency being much higher at 250 meters and points adjacent, hence the difference due to more or less capacity is much greater in frequency. Therefore confusion is worse confounded, the compensation by retuning is a geometric problem, and the fun is gone. Better indeed that the body capacity effect be gone, and such is the case with the Victoreen as constructed by me, and also by others along slightly different lines.

Two High Potentials

The placement of the oscillator coil a reasonable distance from the back of the front panel is helpful, but the construction of the tuning condenser is even more important. The Hartley oscillator system, as in the Victoreen, gives you a high radio frequency potential at both stator

The Riddle of Body Capacity Solved Completely in Super-Heterodyne

Human Form Likened to An Antenna, With the Arms as Leadins, In Analysis of Common Trouble Source In Many Receiver Types

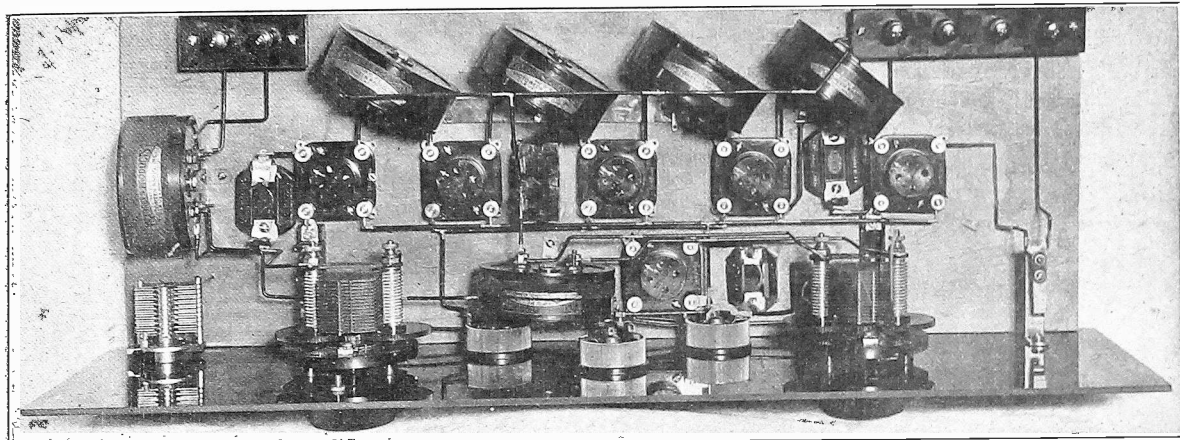


FIG. 2

The antenna coil L1L2, at left, must be very accurately placed, in respect to the nearest coil to it, IF1. The angle of L1L2 as shown in the photograph is one conventionally used, but is not always the best. Turn the coil quarter way to the right as an experiment and note results.

and rotor of the oscillator tuning condenser C2. That is, the potential is high as compared to ground. The potential of your body is somewhere between the two, or, rather, is of different values, although the points of your fingers are of a given value. Where difference exists it is small and depends to some extent whether you are standing or sitting, and also on how tall you are. In other words, there is a potential difference between the tip of your toe and the top of your head, because you are a capacity antenna of the vertical variety. Regarding yourself modestly as merely an antenna, your fingers will be at a potential only slightly less than that of the top of your head, because the leadin is taken from near that important point, e.g., your arm. Now consider your trunk, legs and head as the antenna, with two leadins (your arms), one of which may be dead-ended, the other being connected magnetically and capacitatively to the tuned circuit, by the finger-on-the-dial method.

The body capacity evil was avoided completely by placing the oscillator coil 2 inches from the front panel, correctly setting the antenna coil in position (the solution being obtained experimentally) and by the use of the Remler twin rotor tuning condensers. As an added precaution the flange that is part of the geared wheel mechanism of the condensers was grounded by connection to A minus.

A word about the antenna coil. Not infrequently the first detector tube will oscillate, particularly on lower wavelengths. This may totally prevent reception in some instances. In others it will roughen the signal. The famous double click will be heard when the condenser C1 is turned in one direction or the other. To get rid of this experiment with the angular position of the antenna coil in respect to IF1. Also vary the detector plate voltage.

You will find that the B voltages, both detector and amplifier, are critical, but that when correctly established will need

no further attention, yet maintain the amplification high.

A good plan is to set the potentiometer with the arm completely on the negative side. To do this you will have to watch out, when wiring the set, to determine which is the negative side. If the potentiometer knob has an arrow on it



(Foto Topics)

THE human body is an antenna, says the author, of the vertical type with the high RF potentials at B and C, the leadin being A, while the other arm is often "dead ended."

LIST OF PARTS

- L1, L2—One Victoreen antenna coupler.
- L3, L4, L5—One Victoreen three-winding coil.
- IF1, 2, 3 and 4—Four Victoreen intermediate frequency transformers.
- C—One Precise .0001 mfd. variable condenser (in antenna circuit).
- C1, C2—Two Remler .0005 mfd. Twin Rotor variable condensers.
- C3—One Sangamo .006 mfd. fixed condenser.
- C4, C5—Two Sangamo .00025 mfd. fixed grid condensers.
- R6—One Lynch metallized grid leak, 6 to 10 megohms.
- R5—One Lynch metallized grid leak, 0.5 meg. to 2 meg.
- R1, R6—Two 112 Amperites.
- R2—One Victoreen 20-ohm rheostat.
- R3—One Victoreen 400-ohm potentiometer.
- R4—One Victoreen 6-ohm rheostat.
- J—One Carter double-circuit jack.
- S—One Carter "Imp." switch.
- One 7x24-inch panel.
- One 9x24 or 10x24-inch baseboard.
- Two dials (these come with Remler condensers.)
- Six Benjamin push-type sockets.
- Six Eby binding posts (Ant., Gnd., A—, B+ Det., B+ Amp. and B—).
- Four 1/4-inch tubings, 1-inch high; two strips of bakelite or hard rubber, 1x2 inches and 1x5 inches.

that points to the right you may connect negative A to the right-hand side, and the arrow will point in the direction in which the knob is to be fully turned. Then bring in a weak station and adjust the B plus amplifier voltage. If B batteries are used, this is done by shifting the B plus amplifier lead from set, first on one post, then another, of the B battery block. As a starter try 45 volts. The detector voltage may have to be less.—Herman Bernard.

[Part II next week]

All Batteries Eliminated And Single Switch Controls Everything

*How to Operate a Set from the A C Electric
Light Socket Set Forth, with the Bernard
Receiver as the Model*

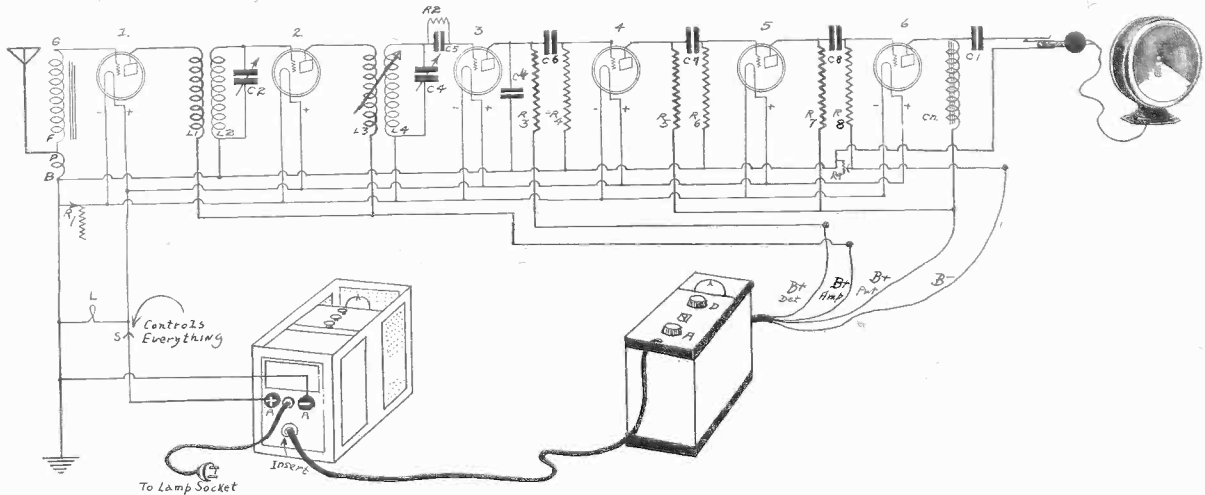


FIG. 1

The Bernard Electric, comprising the Bernard receiver operated without the use of any batteries or chargers whatsoever, and without the necessity of devoting any attention to the eliminators. No tests need be made of them and no distilled water or other solutions, added. One switch on the front panel of the receiver controls everything. The wiring is shown from antenna to Acme re-producer, including pictorial delineation of the connections to Radi-A (the A battery eliminator and charger eliminator at lower left) and the Acme E-1 B eliminator (lower right). R9 is a clarostat, which affords high negative bias for the power tube (6).

By Herman Bernard

Associate, Institute of Radio Engineers

THE elimination of the A battery, by use of some device that is fed from the electric lamp socket, presented difficulties long after an acceptable solution had been found for employment of B battery eliminators for receivers using tubes of high plate current drain. Especially in the alternating current supply models of A battery eliminators was it found difficult to conquer the ripple voltage, so that no hum could be heard. The problem included the subjugation of the hum when the receiver used was of the sort capable of ready self-oscillation, as for instance in the regenerator. However, there then burst upon the radio horizon a few A battery eliminators that met the trying requirements of the day, and to the concerns manufacturing these devices came an earned plenitude of success.

So far as the B battery eliminator went, development quickly reached a satisfactory point, although perfection was not immediately realized. One source of costly trouble was the frailty of the filter condensers, which in the beginning of production of B battery eliminators were tested perhaps solely by the flash method, which gave no assurance of enduring qualities. Today it is the common practice to give these condensers duration tests, and at voltages greatly in excess of those likely to be encountered, even in the case of surges in the line voltage or creation of sudden magnetic fields in the power transformer secondary due to any one or more of a mysterious miscellany of causes. And the buffer condensers are likewise now a hardy lot, too, for their burden is at least as great.

The easier path of the B battery eliminator

was due in no small measure to concentration on the development of a suitable rectifying tube, and in this work the Raytheon laboratories played an important part. Also the largest general tube manufacturers, such as E. T. Cunningham, Inc., and the Radio Corporation of America, while working along different lines, supplied the market with dependable rectifying tubes, both full wave and half wave varieties. Except in the case of the Raytheon Manufacturing Company, the development was largely along the line of the filament tube, but Raytheon adhered to the gas conduction full-wave rectifying tube, which has no filament, and passed from one stage of improvement to another.

The type B Raytheon tube soon found a towering companion in the type BH, which passed 85 milliamperes where the type B passed 65. The improvement lay in the extra current carrying capacity, as it is the tube which will most likely limit the total available current, it being easy enough to wind transformers commercially that will deliver high amperage to the tube.

So the two different fields, each one presenting problems of its own, merged into a successful result whereby today it is possible to take almost any good receiver and "electrify" it, as the saying is.

Making it Perfectly Plain

Speaking now of alternating current supply only, it is safe to say that almost any good receiver can be adequately powered, and not only a "lamp socket" installation achieved, but a totally batteryless installation as well. The difference is that many "lamp socket" receivers resort to the storage A battery, replenished by trickle charging, which eliminates the necessity of periodic charging, since the

charging is done automatically when the set is not in operation, but do not eliminate the A battery. The present discussion concerns actual complete battery elimination. In other words, to make it assuredly clear amid the motley array of confusing expressions surrounding "powerization," the receiver is operated wholly without any battery whatsoever. Not even a C battery is used.

That is exactly what has been done very successfully with the Bernard receiver. The A battery elimination is accomplished by incorporating Radi-A, (110 volts, 50 or 60 cycles), an efficient device manufactured by Briggs & Stratton Corp., of Milwaukee, Wis. This concern, with an old and high reputation in the electrical field, developed the A battery eliminator for alternating current installations to such a high state of satisfaction and efficiency that it found itself superlatively successful, on the basis of this single device, in its first year in the radio field.

The Riddle of B Juice

Radi-A is not only an A battery eliminator but also provides means of so connecting a B eliminator to the electric light line that the A supply switch on the receiver becomes the sole on-and-off control of the tubes in the receiver, the A eliminator, and the B eliminator (if any), restoring that convenience of single switching so long enjoyed in connection with the use of B batteries. The operating cost of Radi-A is about half a cent an hour. It draws about 75 watts from the line.

Novices in radio frequently are perplexed to find that no means is provided for turning off B batteries, as they express it. They do not realize, until it is explained to them, that the B battery circuit is completed only through the space charge inside the vacuum tubes of the

Humless Reception Assured No Charging Or Other Attention Required

*Radi-A, With Automatic Relay, Operated In
Conjunction With Acme B Eliminator That
Uses the Raytheon Tube*

receiver, and that when these tubes are extinguished there is no filament-to-plate circuit and no B current can flow.

However, when B battery eliminators began to make a bid for popularity many persons wrongly supposed that they could treat the B eliminator with the same convenient indifference they used to show toward the B batteries. Hence ever so many B eliminators were turned on and never turned off, until some knowing visitor explained the necessity of turning off the eliminator as an act entirely separate from extinguishing the tubes in the receiver. When the B eliminator is turned on it stays turned on (though unconnected to set), until it is specially turned off, because it is a complete electrical circuit by itself, whereas the B battery is not. The supply of B current to the receiver takes place only when the receiving tube filaments are heated, whether batteries or B eliminator are used, but in the case of the eliminator, the current still flows in it while it may not be flowing in the set.

The Relay Operation

Therefore master control of electrical power devices for supply of voltage and current for operation of the receiver became rather important, and in the design of Radi-A this importance was fully realized. A relay was built into the A eliminator. Turning the switch that causes the tubes to light naturally caused current to flow, and the coil in the relay, magnetically actuated by this current, closes the circuit from the electric lamp socket or outlet. Hence the line is connected to the power transformer, the voltage is stepped down, next is rectified by a Tungar bulb, and after filtration of the ripple voltage by a process that includes a very large capacity electrolytic condenser, is delivered to the output posts of the A eliminator. The voltage at the output is 6 volts, and the wattage rating, without overload, is 10 watts. Hence receivers using tubes that draw a total of 2 amperes at the usual 5 volts are abundantly accommodated, a steady direct current being delivered at an unswerving voltage of 6 volts, which is reduced to 5 by the filament resistor in the receiver itself, for instance the rheostat. Hence, with a .5 ampere power tube in the last stage, and .25 ampere tubes in the others, even a seven-tube set, would get all-sufficient current.

The same action of closing the line circuit for the power transformer of the A eliminator causes exactly the same thing to take place in respect to the B eliminator, if one is used. There is a socket in Radi-A for accepting the B eliminator plug that otherwise would go to the electrolite or wall outlet. And of course when the receiver is turned off, the relay opens the line circuit, and as both A eliminator and B eliminator are connected to the same side of the relay, one operation accomplishes both duties, which adds an attractive degree of convenience. It should be noted that the action is in parallel unison, as distinguished from the diametric action that takes place where a relay is used with a trickle charger, for in that case one circuit is always closed while the other is open, while here both circuits are either closed or open at the same time. It should be noted that Radi-A replaces both the A battery and the charger.

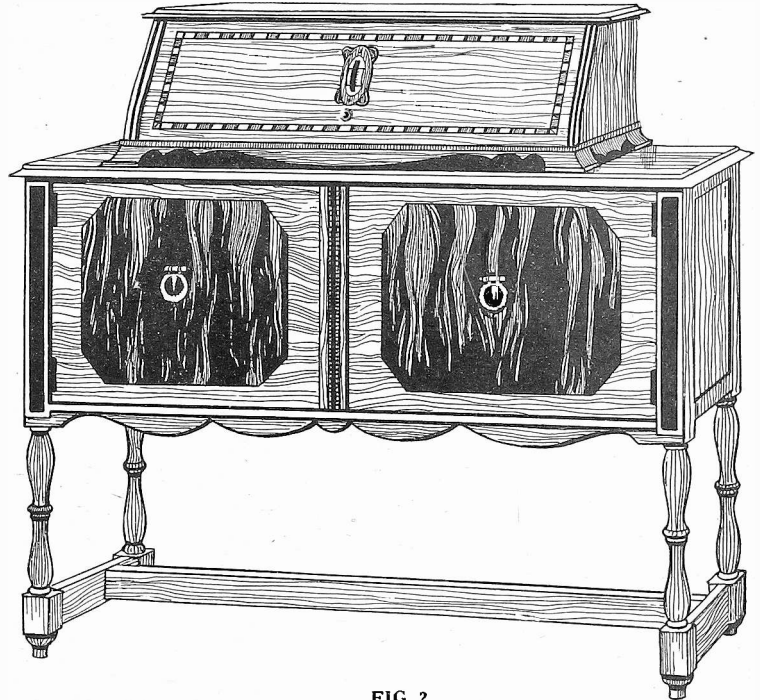


FIG. 2
The Bernard Electric, as it looks when the installation is completed as recommended by the author.

A question would be: If the closing of the filament circuit, causing current flow, closes the switch in the relay, to connect either A eliminator alone, or A and B eliminator to the line, must not that current flow precede the actual connection to the line, and how can the flow take place until the line connection is made? [That sounds like a great lawyer's cross-examination.] A certain amount of electricity is stored in Radi-A, independent of immediate connection to the line, this being a residual supply, and accounted for largely by the electrolytic condenser. Hence for the barest fraction of a moment this current is taken from the residue, and is not the immediate product of line delivery. However, the actual operation of the eliminator as such takes place in about a fifth of a second.

B Eliminator Requirements

Hence it is possible to heat the tubes of a receiver from Radi-A without connection of that eliminator to the line, and precautions should be taken not to permit such operation to continue, since the stored electricity might soon be exhausted, even though a new stock of it would find its way there soon enough. The precaution does not apply where a B eliminator is plugged into the Radi-A relay socket, since you could not get any reception without the B eliminator functioning, and it would not be in operation until connected to the line. The precaution applies only where B batteries are used in conjunction with Radi-A.

Now, the B eliminator to be chosen for any particular receiver should be able to handle the necessary current at the maximum voltage. Really it is a matter that applies more particularly to the tubes in the receiver, rather than to the set itself. Particularly is the tube in the final audio stage to be reckoned with.

If it is any power tube of a grade higher than the 112 it is excellent practice to have a B eliminator that will enable plenty of current to pass at the desired high plate voltage of the power tube. Indeed, if a 112 power tube is used in the last audio stage it is scarcely more than mere convenience to use a B eliminator, since this tube, at 135 plate volts and 9 volts negative grid bias, draws only 6 milliamperes, with a maximum undistorted power output of .12 watt. The other tubes in the receiver will not average more than 3 milliamperes apiece, so you can estimate the total B current drain of a receiver from those figures, granting conventional negative grid bias.

With such tubes—any popular types for radio frequency amplifiers, detector and preliminary audio—B batteries are economical indeed, if wisely chosen. But when you get into the higher powered class, using say a CeCo J-71 or a Cunningham CX-371, with high plate voltage, say 180 volts, B batteries would be utterly uneconomical, because of the heavy current drain.

Large Current and Voltage

The plate current drain is indeed heavy where a 371 is used, for instance, with 180

How to Connect Units That Make Nearly Any Receiver Batteryless

volts on the plate, for it amounts to 20 milliamperes, which is most likely more than the total amount of plate current drawn by all the other tubes in the receiver, even the seven other tubes in an 8-tube Super-Heterodyne. In the Bernard receiver the total plate current drain, where the 371 type tube is used as described, is 35 milliamperes for six tubes. The high voltage on the final audio plate improves volume and tone quality.

Another consideration is that of voltage. This is determined largely by the characteristics of the power transformer, as modified by the choke coils in the filter system, which have appreciable direct current resistance, and by the rectifier. Nevertheless, you have so much voltage at hand, and no more. Now, as it is desired to eliminate all batteries, even the C battery, a resistor will be connected in the common supply lead, that is, one side of the resistor to B minus, the other side to A minus. All the plate current flows through this resistor; hence it must be one well able to stand a heavy load. The current flow causes a voltage drop. As the current is flowing from A minus to B minus, the higher voltage side of the resistor is the one connected to A minus; hence the midtap of the power transformer secondary, otherwise B minus, now becomes C minus. It is convenient for general purposes to use a variable resistor to drop this voltage for C supply, hence a Clarostat suits the bill very nicely.

High Negative Bias

The negative bias will be considerable, too. For 180 plate volts on a 71 tube the negative grid bias should be 40.5 volts. Plainly enough here are 40.5 volts taken out of the available total, so if the eliminator had a maximum of 220.5 volts there would be only 180 left for plate supply. And of course the grid bias would have to be less for lower than 180, hence the Clarostat, being variable, gives you a very desirable voltage range and enables correct adjustment at whatever plate voltage you get or take.

So that suitably high voltage and adequate current be obtainable several B eliminators were tested, and the Acme E-1 (110 volts 60 cycles) was chosen, as this would safely afford all the voltage and current desired, was very compact and produced no hum. It is not necessary to use a Raytheon type BH tube, as the Raytheon type B is quite sufficient. The type B is operated without overload, although the type BH, used in the same B eliminator, allows more current to pass. The point is that the greater capacity of the type BH tube is not required for the Bernard circuit, although it might be for other receivers.

The Acme E-1 B eliminator is a factory-made product, in a shielded casing, with four leads for connection to the receiver, and having a high-low-and-off toggle switch and two variable voltage controls, B plus detector and B plus amplifier. The B plus power lead is not variable, although the voltage all along the line is adjustable by throwing the switch to one or the other operating position (high or low). With the Bernard electric the switch is always "on high", since the relay in the A eliminator takes care of the line connection automatically.

The negative bias for the two radio frequency amplifying tubes and first two audio tubes is about one volt, that is, equals the voltage drop in the rheostat. The detector tube, a CeCo type H special detector, takes a positive grid return. The negative grid bias for the final audio tube, a CeCo J-71, is obtained, as previously explained, from the voltage drop in the Clarostat. The grid return in this instance is connected to the B minus lead

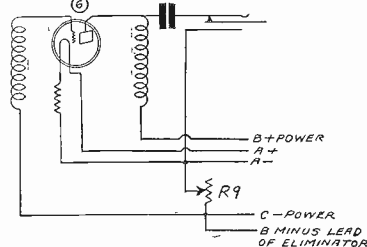


FIG. 3

The negative grid bias for the final audio tube is obtained by utilizing the voltage drop in the Clarostat, R9. It arises from the fact the B minus lead is negative in respect to A minus.

of the Acme E-1. The rest of the leads from this eliminator are connected conventionally. Follow Fig. 1 in this week's issue.

An excellent way to house the entire outfit is to put the eliminators in a Corbett walnut Corbett table, Model S-25, as in Fig. 2. The table model Corbett cabinet, (Model TS, 7 x 21 inches) also walnut, is placed on top of the table, and this combination, in my opinion, affords great aesthetic attraction without putting the radio installation in the chiffonier class as a piece of furniture that disguises the real nature of the installation. Besides, the receiver itself is highly attractive, especially with the Bruno Unitune centered on the inlaid walnut Lignole front panel. The bronze escutcheon plate of the Unitune adds a rich touch to the attractive ensemble and gives rise to the title Bernard Electric Bronze Beauty.

Installation Notes

To equip the Bernard on any other such receiver for batteryless operation along the lines discussed, it is advisable to mount the Clarostat on a small panel, e. g. hard rubber or bakelite, 4 x 4 inches, with a one inch thick baseboard of the same size, used as the base or support of the panel. A hole should be drilled, about one inch in diameter, near the right-hand side of the rear wall of the Corbett table, assuming you are facing the doors of the table. Remove the two leads from the bayonet push plug at the end of the cable of Radi-A by unscrewing, put Radi-A in the table compartment, lengthwise, with binding posts at left, and slip the cable through the hole. Then restore to the plug the two leads you removed. The only object of removing the leads is to enable the plug to be outside the table, at rear, since the plug would require about 1 1/4 inch diameter hole, to pass the plug through directly, and this is larger than any bit you are likely to have. Otherwise of course you may simply drill a hole large enough to pass the plug.

Two small holes are drilled in the rear cabinet wall at left to introduce the aerial leadin and the ground wire. In many installations no outside aerial will be necessary, an Electrad lamp socket antenna serving the purpose. Fortune favors alternating current supply in this respect, as direct current conduits often are grounded shields and vitiate or destroy pickup. A two-way plug is convenient for lamp socket antenna service, the Radi-A plug going into one jack hole and the lamp socket antenna prongs in the other.

Method of Connection

Now connect the leads from the set to the apparatus. A plus and A minus cables from the set go to the marked binding posts of Radi-A. The Acme B eliminator plug is inserted in the socket in Radi-A under the A plus and A minus posts. Now

LIST OF PARTS

C2, C4—Two Bruno .0005 mfd. aluminum straight line frequency variable condensers, which, with two drums, mounting frame, bronze panel plate and screws, constitute the Bruno Unitune, Model 2C.

L1, L2—One Aero fixed primary radio frequency transformer, stock No. WT-40.

L3, L4—One Aero adjustable primary radio frequency transformer, stock No. AX-45.

GFPB—One Acme R3 radio, frequency transformer.

R2, C5—One Lynch metallized 2 meg. grid leak and one Aerovox .00025 fixed condenser with clips.

R3, R5, R7—Three Lynch metallized fixed resistors, 0.1 meg. each.

R4, 6, R8—Three Lynch metallized fixed resistors, respectively 1.0 meg., 0.5 meg. and 0.25 meg.

1, 2, 3, 4, 5, 6—Six Air Gap push type sockets.

C6, C7, C8—Three Electrad 0.25 mfd. fixed condensers.

C1—One Tobe 4 mfd. filter condenser.

Ch—One Acme choke coil (type B2).

R1—One Electrad 2-ohm semi-power rheostat.

R9—One Clarostat.

J—One Electrad single closed circuit jack.

C4—One Aerovox .00025 mfd. fixed condenser.

One 7 x 21" Lignole inlaid walnut front panel drilled and engraved.

One Birnbach 6-lead battery cable, with forked terminals.

Six American Radio Hardware cable tags (one A plus, one A minus, one C minus, for B eliminator B minus lead, one B plus amp., one B plus det. and one B plus power.)

Two American Radio Hardware binding posts (Ant. and Gnd.)

Three Lynch double mountings.

One pair of Bruno adjustable brackets.

Ten lengths of flexible Acme Celatsite (vari-colored).

ACCESSORIES

One 7x21" Corbett cabinet, Model TS, genuine walnut, with 2" slope for panel.

One walnut Corbett radio table, model S-25.

One Electrad lamp socket antenna.

One Acme K-1 reproducer (enclosed double free edge cone, round model).

Six CeCo tubes, consisting of one type J power tube, two type A tubes, two type G tubes and one type F, special detector.

One Centralab modulator plug for volume control.

One Radi-A (consisting of an A battery eliminator and charger eliminator combined; Tungar tube included.)

One Acme E-1 B eliminator (Raytheon tube included).

connect the flexible B minus lead from the B eliminator to one side of the Clarostat and to tube 6 C minus lead from the receiver. The other side of the Clarostat goes to A minus. The B plus detector lead of the B eliminator goes to the corresponding cable of the receiver, the B plus amplifier lead of the eliminator to the plate lead of the two radio frequency tubes, and B plus power of the B eliminator to the audio plate leads of the set. Connect aerial and ground to set and speaker cords to jack and turn on the Bruno light switch. You will hear the click of the relay. All the tubes will light—the six in the receiver, the Tungar in Radi-A and the Raytheon tube in the Acme B eliminator. But the Raytheon lights so dimly that the effect can be noticed merely as a blue glow, and even then only amid surrounding darkness. Re-

(Concluded on page 31)

The Phasatrol Circuit

A Design Using New Neutralizing Device

*Three Stages of Tuned Radio Frequency Amplification
Successfully Operated Without Self Oscillation
and Without Resort to Shielding*

By Capt. Peter V. O'Rourke

WHEN a radio fan gives his specification for a receiver he demands perfection in all the usual characteristics ordinarily regarded as desirable. He wants perfect selectivity, extreme sensitivity, or as he puts, distance, absolute freedom from oscillation, utmost simplicity of control and a quality of reproduction that is on a par with perfection. Very often he is satisfied with something less than what he asks, not because he asks much he may get a little, but because he does not know the difference between what he asks and what he gets. He is especially easily satisfied on the quality demand. Chances are that if he has two receivers, one which has well-nigh perfect quality and another whose quality is like that which he is used to, he will select the latter regardless of the quality. When the fan specifies he asks for the impossible and it is well that he is satisfied with less than he asks.

The skillful designer of radio receivers knows all the capabilities and limitations of radio both in principle and in practice and he designs a receiver which is the best possible compromise that can be effected. When he gets through with his design it satisfies all the desirable characteristics to such a close degree that any departures from the ideal are of more academic interest than practical value. Putting it plainly, the receiver will be so near what the fan demands that he won't know the difference.

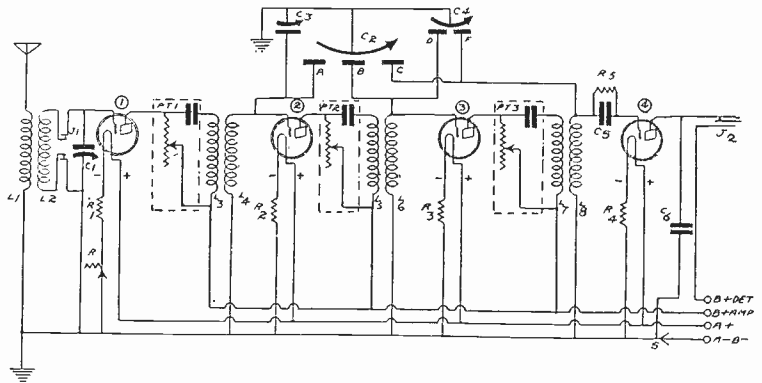
Selectivity Considered

There are several methods of bringing about a satisfactory compromise between the limitations and the capabilities of radio. Just how the problem was solved in the various departments of desirability by one skillful engineer will be shown in the description of the Phasatrol circuit.

Consider first the question of sensitivity,

LIST OF PARTS

- Four Bodine radio frequency transformers, L1I2, L3L4, L5L6, L7L8.
- One single Cardwell .00035 mfd. variable condenser, C1.
- One triple Cardwell variable condenser, each section .00035 mfd., C2ABC.
- One double Cardwell midget balancing condenser, C4DF.
- One single Cardwell midget condenser, C3.
- Three Electrad Phasatrols, PT1, PT2, PT3.
- One Electrad mica grid condenser, .00025 mfd., with clips, C5.
- One Electrad fixed mica condenser, .0005 mfd., C6.
- One Lynch metallized grid leak, 2 megohms, R5.
- Four 1-A Amperites (for 5-volt tubes), R1, R2, R3, R4.
- One Electrad 20-ohm rheostat, R.
- One Electrad double circuit jack, J1.
- One Electrad single closed circuit jack, J2.
- One Electrad filament switch.
- One 7 x 21 inch panel.
- Two National Velvet Vernier type C dials.
- One 8 x 20 inch baseboard.



THE PHASATROL CIRCUIT, embodying the newest design for balancing a receiver against self-oscillation. The neutralizing agency is the combination of variable resistor and fixed condenser in the plate circuit (inside the dotted lines) and is made commercially in a neat unit. The adjustment changes the phase relationship and neutralizes the three RF circuits.

or the distance annihilating quality of a receiver. This may be solved either by using regeneration in one or two stages or by employing several stages of RF amplification without any regeneration. The method employing regeneration is ruled out by a demand for absolute freedom from oscillation in sets. That leaves the RF method. But as the number of stages of RF is increased the tendency for the set to oscillate becomes very great and it is necessary to employ some form of oscillation control. There are many forms in use, some of which are merely lossers which wipe out selectivity. Some are excellent from the point of view of loss but they are not easy to install and adjust. But the choice of the designer of this circuit is the new Phasatrol, which operates in such a manner that it changes the phase of the energy fed back through the internal capacity of the tube so that it is ineffective in producing oscillation. The load on the tube is essentially capacitive for all the frequencies in the broadcast band, instead of the usual inductive load. It is the latter type of load which is responsible, in conjunction with the inter-electrode capacity, for the oscillation. Since the capacitive load has a tendency to reduce the amplification instead of increasing it, an adjustment is necessary so that the tube be operated just below the oscillating point, to make the tube as sensitive as possible.

This adjustment is made by means of a variable resistance in series with the plate supply battery and in shunt with the primary of the RF transformer and a stopping condenser.

The adjustment of this resistance not only changes the plate current supply but it also changes the phase of the energy fed back. There are three of these Phasatrols in the circuit, one for each of the radio frequency tubes. They are shown enclosed by the dotted lines and are labelled PT. These devices in the plate circuits will eliminate all oscillation provided the adjustment has been properly made. The Phasatrol was invented by John F. Rider.

Simplicity of control is attained in this receiver by means of a gang tuning system.

The first condenser C1, which tunes the loop or the antenna coupler, is independent of the rest. This is done so that the set may be used on any antenna and also so that a loop may be substituted for the antenna without making any structural changes in the receiver.

The next three coupling transformers are tuned with the three-section Cardwell gang condenser. The first section, C2A, tunes the coil marked L4, the second section, C2B, tunes L4, and the third section, C2C, tunes L4. Since it is difficult to have a triple condenser so constructed that the three tuned circuits will remain in tune accurately for all settings of the condenser, it is necessary to employ balancing condensers. One double midget balancer, C4DF, takes care of two of the sections at the same time. The remaining section is adjusted by a separate single midget condenser C3.

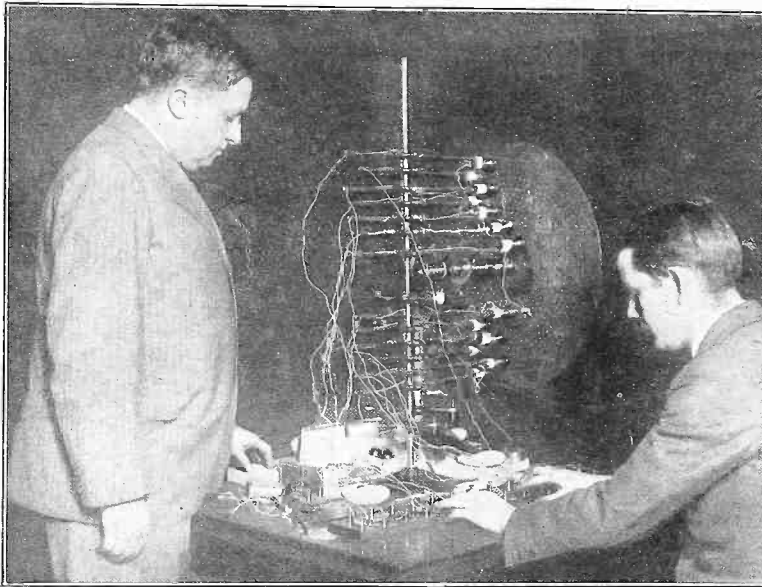
While there are as many controls in this set as there are tuning condenser sections, this does not mean that the tuning of the set becomes as difficult as the solution of a safe combination. In reality there are only two tuning controls to employ and these are the rotors C1 and C2. The manipulation of these two will serve to tune in or out stations without interference and without trouble. The midgets come into play only when the set is first adjusted.

How the Coils Function

The radio frequency coils in this set are of the Bodine astatic type, that is, they are wound in the form of a figure eight. This type minimizes coupling between any two adjacent coils and therefore makes neutralization easier to accomplish. There is an additional advantage in these coils, and that is that they do not pick up energy from space directly like the solenoidal coils do. This makes the effective selectivity of a set equipped with these coils greater than sets equipped with solenoidal.

[This concludes Part I of the two-part article on the construction of the Phasatrol Receiver. The final installment will be published next week, together with photographs.]

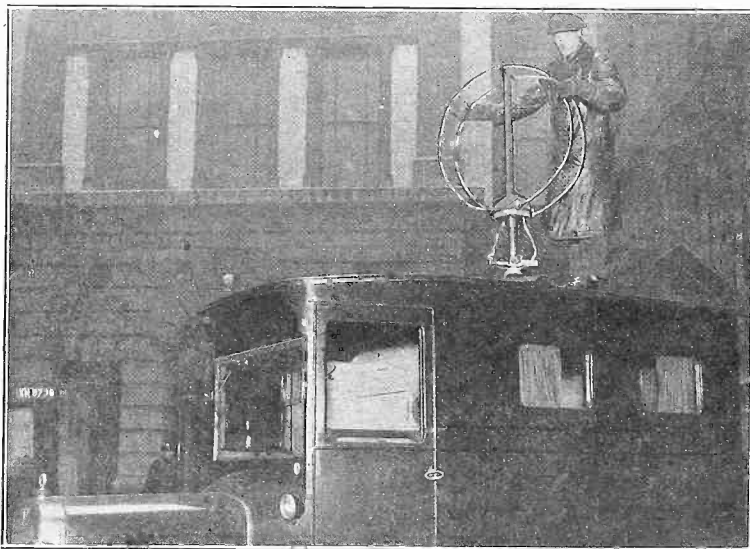
LIGHT WAVES PLAY TUNES



(Underwood & Underwood)

THE PHOTO-ELECTRIC ORGAN, in which light rays are used to play tunes, was demonstrated by its inventors, Dr. Free and Dr. Norman Hilberry of New York University, to members of the New York Electrical Society. Rays of light from small electric lamps pass through small holes in a rotating metal disk. These rays enter a Photo-electric cell, converting them into electric impulses, which are amplified in the same way as such impulses in a radio set. Special loudspeakers, transform them into sound.

BRITISH LION HUNTS "BLOOPERS"



(Wide World).

AN ENGINEER of the General Post Office of London, adjusting an antenna atop of a special car, containing a sensitive receiver, with which it is possible to locate oscillating receivers. The antenna is very directional and aids in tracking the trouble down to within a few feet of its origination.

Lackawanna Radio Club Grows

Scranton, Pa. More than two hundred members of the Lackawanna Radio Club attended the meeting of that organization recently in the Chamber of Commerce auditorium. It was the largest gathering held by the club since its organization. Thirty-seven new members were enrolled. President W. D. Coston presided and announced that memberships for January, 1927, showed an increase of one

hundred per cent., over the amount for the same month in 1926.

R. E. Catherman, official trouble-shooter of the club gave a demonstration of broadcasting using a miniature set. In his report Mr. Catherman stated twenty visits were made by the interference committee since the last meeting. Radio reception is being bettered by degrees and the work will continue until all complaints are investigated and the trouble remedied.

Filtering Is Problem in A Elimination

By Casper Rang

The main problem in making A eliminators is that of obtaining adequate filtering without expensive and bulky apparatus. Both choke coils and condenser used in the filter must be able to stand a heavy current without heating. This requires that the conductors used be very heavy. That is, the wire in the inductance coils must be heavy and the plates in the condensers should likewise be thick. It is comparatively simple to rectify the current. Tungar two-ampere tubes are excellent for the purpose, and two of them may be used in push-pull to obtain double wave rectification. The use of double wave rectification simplifies the filtering problem in that the frequency of the ripple is doubled and at the same time the amount of ripple is reduced.

The use of ordinary by-pass condensers for filtering is not practical because their current carrying capacity is not sufficient for the purpose. But electrolytic condensers may be used with success. The advantage of electrolytic condensers is that a very large capacity may be obtained in a small space. This is especially true where such low voltages as are used in A battery eliminators are to be rectified. The lower the voltage the greater is the capacity for a given surface of condenser plates. And a large capacity is required in order that the choke coils may be kept down to a minimum size.

It is a property of filters that the lower the resistance of the load for a given current drain the easier is the filtering. Since the load on the filter is low the coils need not be so large. This makes it easier to satisfy the condition that the wire in the coils should be large to carry the current. Increasing the size of the wire also decreases the resistance of the coils themselves, and this in turn makes the problem of filtering adequate easier. Hence it is not a waste to use large wire in the filter coils.

It is not necessary to filter the filament supply as thoroughly as the plate supply, and this again makes the problem simpler. Yet in spite of all these simplifications it is hard enough, and few has succeeded in making a thoroughly satisfactory A eliminator.

Norwegian Simplifies Sending of "Stills"

Washington.

An invention recently made by a Norwegian for the broadcasting and reception of pictures comprises a considerable simplification of anything as yet attempted. An experimental plant has recently been established, and this plant is in a position to broadcast pictures at the rate of 125 square centimeters per minute, but the inventor claims that with apparatus especially manufactured for the purpose, a still higher speed in broadcasting can be obtained. The picture material may consist of ordinary handwriting, type-writing, prints, shorthand notes, codes, photographs, drawings, blue prints, etc. The firm A. S. Kopitelegrafen, Oslo, Norway has bought the patent rights and will begin manufacture and distribution of picture receivers during the early part of the coming spring. The price of the receivers will approximately be from \$100 to \$125.

NEW MEXICO CITY STATION

A new broadcasting station in Mexico City has been completed by a large American electrical manufacturing company. The call letters of this station is CYJ, and will be used by "EJ Universal."

Detector Plate Bypass of .001 Mfd. Is Favored

Value Called Excellent Compromise, As Not Attenuating Audio Frequencies Very Much, Yet Properly Detouring Radio Currents

By John F. Rider

Member, Institute of Radio Engineers

In a recent series of experiments conducted in the laboratory of the Aerovox Wireless Corp., some very interesting light was thrown upon the subject of detector plate circuit bypass condensers. This information is of utmost importance to the radio fan constructor, who is desirous of obtaining the best quality of reproduction.

The experiments conducted were divided into two groups. In the first group the objective was to determine how effectively the bypass condenser located in the plate circuit of the detector tube, across the coupling unit, from the plate of the detector tube to the negative filament circuit, bypassed the radio frequency component remaining after rectification. In the second group, the objective was to determine the effect of various values of bypassing capacity upon the audio frequency signal remaining after the process of rectification has been completed.

What Is Correct Capacity?

Every radio fan realizes the need for a bypass condenser, in the detector plate circuit, connected as mentioned in the previous paragraph, across the first coupling unit primary circuit. But apparently every one does not agree upon the correct capacity, values ranging from .00025 mfd. to .006 mfd. being recommended. The figures ascertained in this series of tests will no doubt be of interest to the constructively inclined class of radio fans.

As the greatest interest is in the audio frequency response, the experiments pertaining to the audio frequency signal bypassing were conducted first. The bypass capacities under test ranged from .0005 mfd., to .006 mfd. The method of testing was as follows: An audio signal of known frequency was passed into a vacuum tube to which was coupled an audio frequency transformer with a high primary inductance. The bypassing capacity was connected across the primary inductance, from the plate of the tube to the negative filament. The output circuit of the audio frequency transformer was connected to a calibrated cathode ray oscillograph tube; that is, the deflections on the screen were calibrated in volts. With a uniform input on the various audio frequencies and known values of bypass capacity, the variance in the output as shown on the oscillograph screen, when different values of bypassing capacity are used, is indicative of the bypassing of the audio frequency through the condenser.

Audio Results Tabulated

The frequencies considered were 3,000, 4,000 and 5,000 cycles. The following figures show the degree of bypassing with the various condensers, expressed in the form of a fraction of the original tube output:

3,000 cycles	4,000 cys.	5,000 cys.
.0005 mfd. .05%	.5%	1.75%
.001 mfd. 3.00%	4.00%	6.00%
.002 mfd. 8.00%	11.80%	12.40%
.003 mfd. 11.00%	14.00%	16.40%
.004 mfd. 14.00%	17.00%	20.00%
.005 mfd. 16.00%	20.75%	26.00%
.006 mfd. 19.00%	23.50%	31.00%

The disadvantages accruing through the

use of excessively large bypass capacities in the position mentioned are evident from the table. For example, the .006 mfd. condenser bypasses 31% of the total output of the tube on 5,000 cycles; 23.50% on 4,000 cycles and 19% on 3,000 cycles. The .0005 mfd. condenser, on the other hand, bypasses only 1.75% on 5,000 cycles; .5% on 4,000 cycles and .05% on 3,000 cycles. The figures shown apply not only to the specific case mentioned but to many similar arrangements where a good grade of transformer is coupled to the detector circuit, or where a fairly high value of inductance is used as the plate load in the detector circuit. Summarizing, we find that as far as audio frequency signals are concerned, the bypassing capacity in the detector plate circuit should not be more than .0005 mfd.

The RF Bypassing

The selection of the bypass condenser does not rest solely upon audio frequency considerations. It is also necessary to determine how effectively the bypass condenser will bypass all radio frequency signals remaining in the circuit after rectification. It is essential that the radio frequency component in the detector plate circuit remaining after rectification be bypassed to the negative filament, and so kept out of the audio circuits. If a certain value of bypass condenser will bypass the correct amount of radio frequency current in the detector plate circuit and at the same time not bypass excessively the upper audio register, that value of capacity is best for the purpose. The following figures show the degree of bypass of radio frequency signals using the same audio frequency transformer, but bypass capacities ranging from .0005 mfd. to .002 mfd. and carrier frequencies of 15, 30, 100 and 1,000 kilocycles.

	15 kc	33 kc	100 kc	1000 kc
.00025 mfd.	22%	38%	57%	65%
.0005 mfd.	38%	55%	76%	81%
.0006 mfd.	46%	63%	80%	86%
.00075 mfd.	50%	70%	85%	90%
.0009 mfd.	54%	73%	88%	94%
.001 mfd.	57%	76%	89%	97%
.002 mfd.	60%	87%	97%	100%

Favors .001 Mfd.

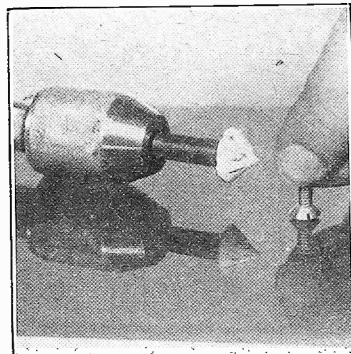
From the above we learn that the .001 mfd. capacity is quite satisfactory for bypassing the radio frequency component remaining in the detector plate circuit after rectification. Since the frequency spectrum encountered in radio broadcast reception lies within the 550 to 1,500 kc band, the values obtained on 1,000 kc may be considered as criterion. As to the extent of audio frequency bypassing, this value of capacity bypasses only 6% at 5,000 cycles. Consequently, the selection and use of a .001 mfd. bypass condenser in the plate circuit is one consistent with sound engineering principles, and represents a fitting compromise of the radio and audio effectiveness of the condenser.

STATION LINKED TO TELEGRAPH

Washington.

A contract providing for connection between the radio station of the Guatemala Government, situated at the Capital, and the system of the Tropical Radio Telegraph company, has been signed.

COUNTERSINKING



(Hayden) SOMETIMES AN obstruction behind the panel prevents you from inserting a screw through a drilled hole for testing how deep you should countersink. In such a case, reverse the screw, countersinking until the bottom of the screw head comes flush with the front panel.

Engineers Risk Lives to Place Microphones

The task of broadcasting the carillon of the Park Avenue Baptist Church by WJZ at 7:00 o'clock on Sunday nights involves considerable risk by the engineers. This set of bells is located in a tower several hundred feet above the level of the street and several microphones have to be placed in the tower proper and on roofs of adjacent buildings. In summer the task of placing these microphones is by no means an easy one, but during the Winter months when cold, wind and ice add to the hazards undergone by the engineers, the problem becomes exceedingly risky for those connected with the engineering feat of broadcasting this set of bells, the largest of its kind in the world. The engineers are often forced to creep along narrow ledges covered with ice and in the teeth of biting gales carry the delicate microphone to the position best suited for the pick-up. The trip across these ledges involves a risk of falling several hundred feet to the street below and upon arrival at the spot selected for the microphone placement, it is necessary for the engineer to remove his gloves, lash the microphone in place, make the necessary connections and return to a spot slightly less precarious. Upon the conclusion of the broadcast this procedure has to be reversed and all the microphones taken in because these instruments are exceedingly delicate and exposure to the elements for a protracted length of time would bring about their ruination. When you sit in the solid comfort of your home and enjoy these weekly carillon broadcasts think of the hardships and the dangers faced by the radio engineers to make this pleasure possible for you.

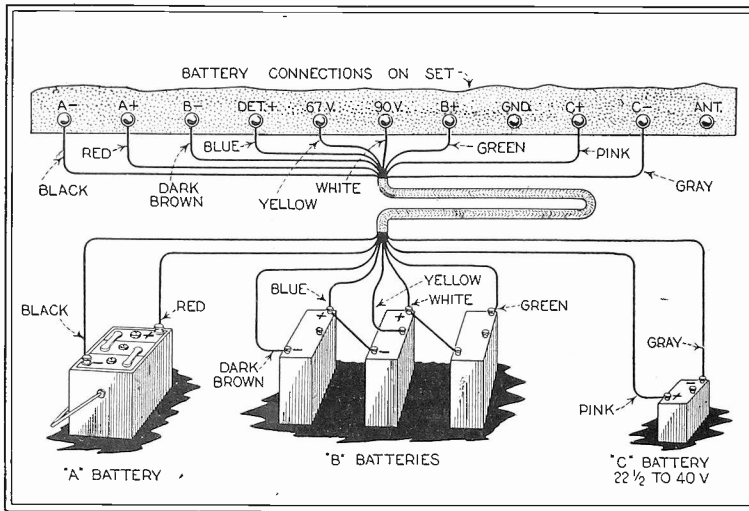
Institute Organizes Branch in Detroit

Detroit.

A Detroit section of the Institute of Radio Engineers has been organized with Thomas E. Clark as its chairman, according to an announcement by Walter R. Hoffman, secretary and treasurer. Earl R. Glatsel is vice-chairman.

A radius of 60 miles from Detroit constitutes the area allotted to the Detroit section. As soon as formation of this body is approved by the national organization, all members of the I. R. E.; living within this radius automatically become members of the Detroit section.

The Harkness KH-27 Receiver Operates on Batteries or House Current



THE BATTERY connections for the KH-27 Receiver.

[Parts I and II of this series of articles on the Harkness KH-27 Receiver were published in the issues of January 29 and February 5.]

By **Kenneth Harkness**

Consulting Radio Engineer
Noted Designer of the Harkness Reflex and the Harkness Counterflex Circuits

PART III

IN the preceding articles of this series the construction of the KH-27 receiver has been explained in detail.

When the set has been completely assembled and wired, it is ready for installation. Any 7x26-inch cabinet may be used to house the set. The front must be upright (not slanting) and the depth not less than nine inches. The Blandin cabinet is suited for housing the KH-27.

The receiver may be operated with ordinary A and B batteries or on the house current by means of eliminators, the switch on the set being used to turn all power on and off. Both types of installation will be described in this article.

When ordinary A and B batteries are used, the following accessories are required:

- Aerial and ground equipment.
- 1 Six volt storage battery.
- 3 45-Volt heavy duty B batteries.
- 1 22½ Volt C battery (see note below).
- 4 CeCo type A tubes.
- 1 CeCo type H detector tube.
- 1 CeCo type J71 tube (see note below).
- 1 Birnbach 9-conductor battery cable.
- 1 Western Electric cone speaker.

Battery Connections

In this list of accessories the CeCo type J71 tube is recommended for use in the last stage of audio. If less volume (without distortion) is desired, a type F (similar to the 112 tube) or a type A may be used instead of a type J71. If the type A is used in the output stage, no C battery need be used.

To obtain the best results the exact accessories specified above should be used. It was pointed out in the first article of this series that realistic, undistorted tone quality depends upon the harmonious combination of the receiving set and its accessories. In the accessories, this par-

ticularly applies to the tubes and the loud speaker.

When the set has been installed in its cabinet and all the accessories obtained, connect the batteries to the set with the battery cable as shown in Fig. 1. This diagram shows exactly how to connect the batteries to each other and to the set.

Then connect the antenna and ground wires to the binding posts provided for the purpose.

The aerial need not be more than 100 feet long, including lead-in. The set will operate very satisfactorily with a shorter aerial, if necessary, or with an indoor antenna if it is impossible to erect an outside aerial. Be sure to make a good, clean ground connection, preferably to the water-pipe, with a ground clamp. Do not twist the aerial and ground leads together. Keep them clear from each other at all points. Keep the aerial lead-in wire away from the battery cable.

Then insert two of the type A tubes in the first two stages of radio frequency amplification (tubes nearest the front

panel), the type H tube in the detector socket (at the extreme right when looking down into the set), two type A tubes in the first two stages of audio amplification and the type J71 in the last stage of audio, at the extreme left.

The set is then ready to be neutralized, after which it may be operated without further attention. Before describing the process of neutralizing, however, we will describe how to install the set with a B eliminator and trickle charger, operating entirely from the house current with a relay switch to change over from the trickle charger to the B eliminator. With this installation, it is not necessary to renew the B batteries from time to time and the storage A battery is always maintained at full charge. The relay switch is operated by the filament switch on the front panel of the set. To turn the set on and off it is merely necessary to turn this switch. This installation is more costly than the one first described but the upkeep cost is lower and the set always operates under the best conditions.

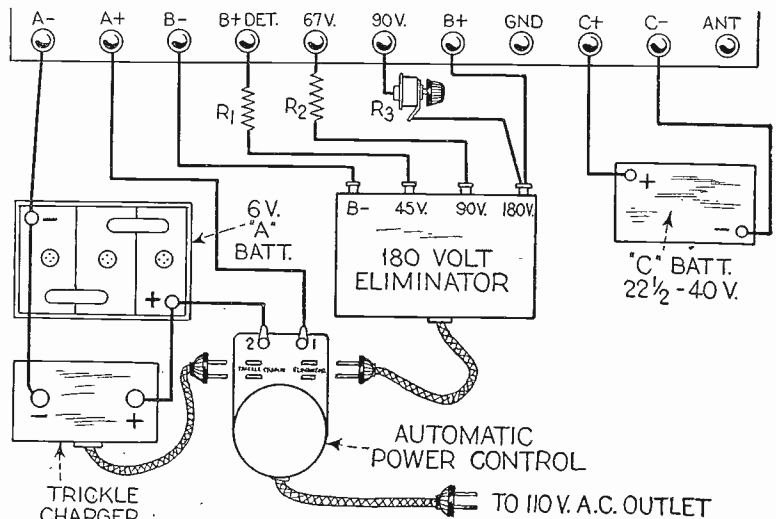
Power Accessories

The accessories required for the power installation are the same as those specified for the ordinary A and B battery installation except that a 180 volt B battery eliminator is substituted for the three 45-volt B batteries and the C battery should be variable from 22½ to 40½ volts. In addition to the accessories specified, the following are required:

- One A Battery trickle charger.
- One Yaxley or Brach Automatic Power Control Switch, series type.
- The B eliminator must be one which is designed for use with a 171 tube in the last stage of the set. The Filtrex B eliminator and the General Radio type 405 are examples. Of course, if a type 71 tube is not used in the output, an ordinary 135-volt eliminator can be used. The tone quality, however, is much better when a type 71 tube is employed. The B eliminator must then be capable of supplying about 60 milliamperes at 180 volts. Both types mentioned above are capable of supplying this current at the specified voltage.

Some B eliminators supply a variable C Battery voltage, in which case the C

(Concluded on page 27)



USE of a B eliminator and trickle charger.

Freak Results on 32.79 Meters Inaudible Nearby, Loud At 11,400 Miles

RADIO signals on 32.79 meters, inaudible 200 miles away, were heard and copied with 100 percent accuracy by a listener in Australia, 11,400 miles from the transmitter.

This fact is brought out in the report of engineers of the General Electric Company, following a series of propagation tests on modulated or voice signals and telegraph signals, on the following wavelengths: 32.79, 65.16, 109 and 140 meters.

There has been considerable investigation noon until midnight. Comparative reception records were made on voice modulated and heretofore as to the phenomena of short wave behavior over great distances but, until this investigation, nothing has been done to chart tendencies of short wave signals over the transmitter.

It was the purpose of the engineers of the General Electric Company, under the direction of M. L. Prescott, to conduct a series of tests and chart the signal strength and intelligibility at different distances. In making the tests four observers were stationed at intervals of 50 miles from the transmitters and each man made simultaneous observations of all test transmissions.

The schedule for each of four wavelengths lasted two weeks. During the first week the stations were on the air from midnight until noon of the same day and during the next week the observations were made from 12 noon until midnight. Comparative reception records were made on voice modulated and telegraph signals. Power outputs of 150, 500 and 2,000 watts were used successively to obtain a direct comparison between the reliability of the received signal and the power of the transmitter.

Prior to the test it was realized that 32.79 meters would not be a suitable wavelength for covering the short distances under observations. This belief was held because of the so-called "skip-distance" characteristic of wavelengths shorter than about 45 meters. This signal remained weak or entirely inaudible until 250 or 300 miles had been covered, and the signal audibility reported by a listener in Australia was several times greater than that observed by the men at the four stations, at fifty mile intervals.

Much higher intelligibility percentages were obtained on the tests of the 65.16 meter transmitter, due to the almost total disappearance of the "skip-distance" region. Between 50 and 100 miles from the transmitter there was much better reception during the day than at night. This rather unexpected result was brought about by fading which was more pronounced during the hours of darkness than during daylight. Beyond these distances—50 and 100 miles—night transmissions were better than those during the day.

Tests on the 109 meter transmitter indicated that the performance at 50 and 100 miles was similar to that for 65.16 meters. However, it was found that for points near the transmitter troublesome effects of fading were more pronounced on the shorter wavelength.

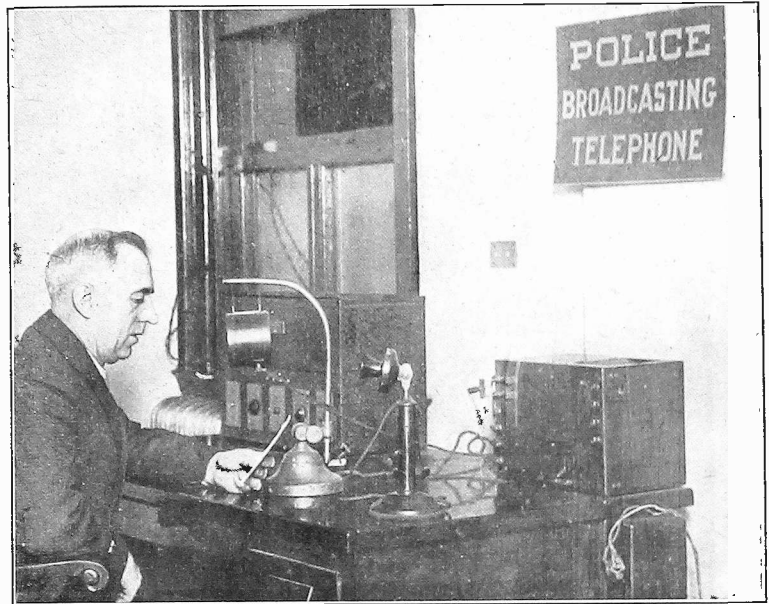
Bad fading was noted at night at 50 and 100 miles on the 140 meter transmissions, the signals being more intelligible during the day at these distances. At 150 and 200 miles this effect was reversed better reception being possible at night than during the day.

The conclusions reached by Mr. Prescott are:

Channels comprising wavelengths shorter than those of the 66.3 to 75 meter channel will not give economical service at points within 100 miles of the transmitter.

The 66.3 to 75 meter channel, the 85.7 to 105 meter channel, and the 133 to 150 meter channel are capable of rendering economical

N. Y. POLICE USE SETS FOR ALARMS



(International Newsreel).

CAPT. GEORGE LUDWIG of the Police Telegraph Bureau testing out a model of the batch of special receivers, which will be installed in every police station in Greater New York, to receive crime alarms, and general crime news dispatches, broadcast by WNYC, the municipal station. Each set will be tuned to the wavelength of this station and locked.

Every police station and the booths on bridges and in outlying districts will be equipped with radio receiving sets in the near future, Police Commissioner George V. McLaughlin of New York City announced. The sets will be tuned to 526 meters, which will confine their reception to WNYC, from which important official business will be broadcast in experiments to determine the practicability of radio in

police work, the Commissioner said.

Commissioner McLaughlin said he wanted it clearly understood that a former Police Commissioner contracted for the purchase of 100 receiving sets, which were delivered to the city April 6, 1925, at a cost of \$23,474. Since the sets had been paid for, he said, he felt the department might as well experiment with them.

service at points within 100 miles of the transmitter.

For daylight communication at distances not greater than 90 miles from the transmitter, the 133 to 150 meter channel will give better service than the 85.7 to 105 meter channel. Similarly the 85.7 meter channel will give better service than that which can

be obtained under the same conditions using the 66.3 to 75 meter channel.

The above conditions are reversed when distances between 90 and 200 miles are considered. In this case the 66.3 to 75 meter channel will give better service during daylight than the 85.7 to 105 or 133 to 150 meter channel.

Choke Filters When Resistance Is Low

In designing filters it is well to remember that a choke coil is not very effective in smoothing out the ripple unless the resistance of the coil itself or of the circuit in series with it is very low. This fact is very often lost sight of in inserting radio and audio frequency choke coils in receivers. In many instances the choke is connected in series with a practically infinite resistance, as in the grid circuit, and then it is expected to choke out some frequencies. It has no choking effect whatsoever.

The error of connecting choke coils in series with the grid to suppress high frequencies no doubt arose from the fact that similar coils are so used in very high frequency circuits for preventing oscillations at still higher frequencies. But in this case they perform their true function of choking because the coils are in series

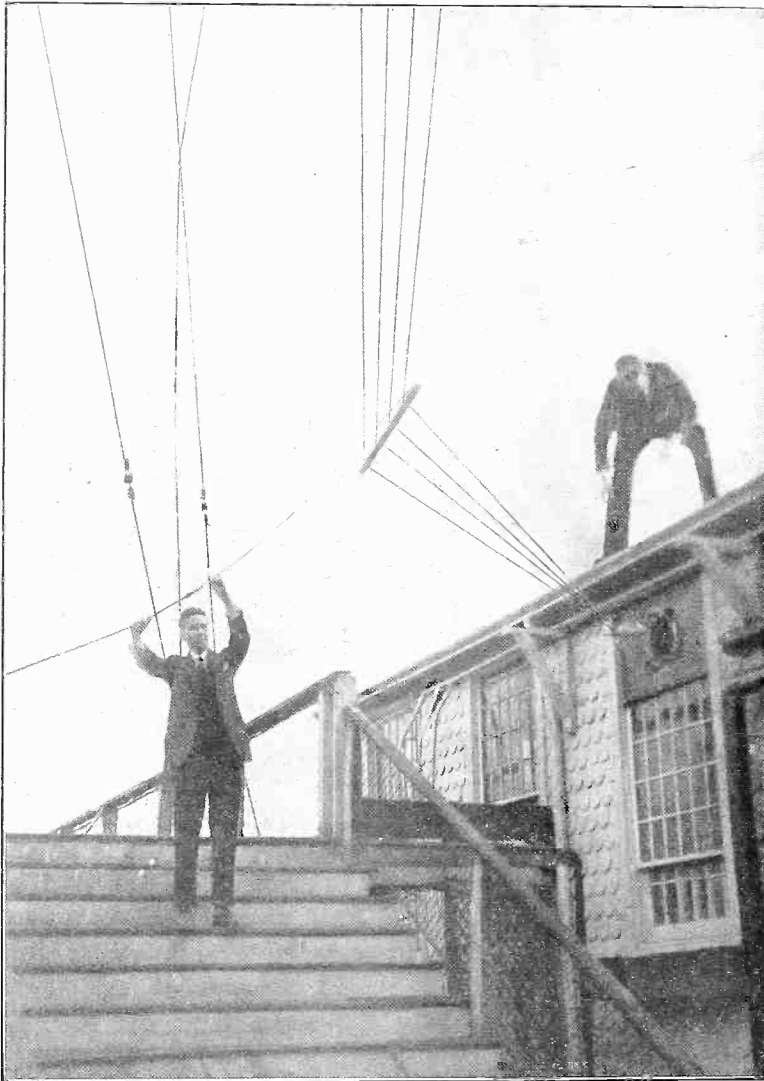
with a condenser. That is a different story.

New Musical Hour Alternate Sundays

A series of high class Sunday afternoon musical broadcasts, sponsored by Powel Crosley, Jr., was put on the air over the WEAf chain beginning February 6. The hour alternate Sundays will be from 5:30 to 6:30 o'clock, Eastern Standard Time.

This special feature will be broadcast over the whole WEAf network, including the four Southern stations in Louisville, Nashville, Atlanta and Memphis. The complete list of the stations which will broadcast the program follows: WEAf, WEEI, WJAR, WTAG, WGR, WFI, WRC, WCSH, WCAE, WTAM, WWJ, WSAI, KSD, WOC, WDAF, WGY, WHAS, WSM, WSB, WMC, and WLW.

TWO MORE NEW YORK STATIONS JOIN THE MERRY T



(Herbert Photos, Inc.)

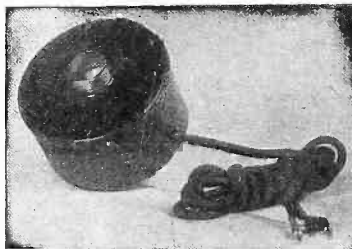
THE LEADIN system of station WGL, atop of the Hotel Majestic, New York City. Note the peculiar massive glass insulators, which resemble the tops of giant coffee percolators. The antenna is of the four-wire T type. The station recently went on the air.

MUSICAL EAR

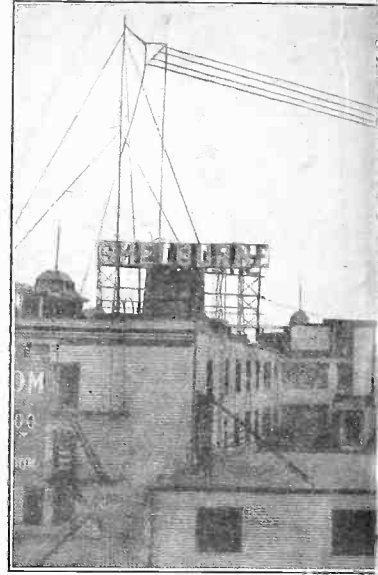


(Keystone)
DOROTHY AREY REUX, who controls the modulation panel at WLS, Chicago, is a pianist, and well suited to the operation of this panel with which signal intensity is varied.

SNUGNESS



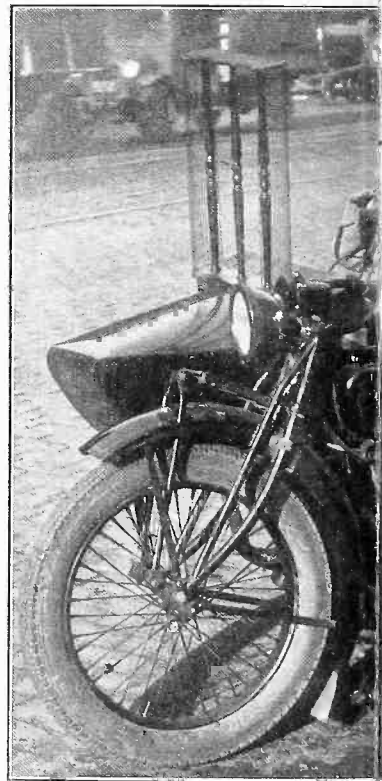
A TELEPHONE UNIT does not necessarily fit the tone arm of all phonographs. If the unit's opening is too big, rubber hose, 1½ inches long, may be rolled onto its exterior, and pushed into the tone arm at the other end. This method may be worked vice versa if the unit opening is too small. Also, these methods prevent rattling or distortion of signals.



(Herbert Photos, Inc.)

THE ANTENNA system of WARS, the of the Hotel Shelburne, Brighton Beach, and operates on a wavelength of 295.1 m instead of

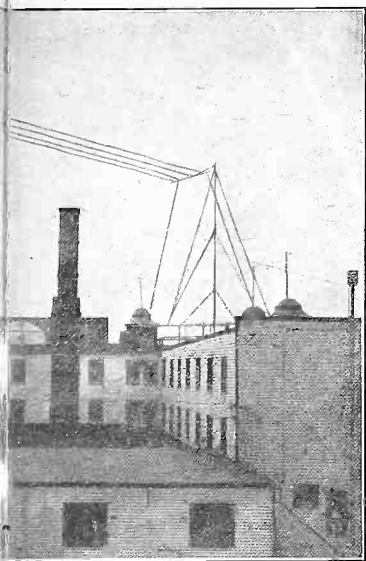
RECEIVER TRACKS



(Herbert Photos, Inc.)

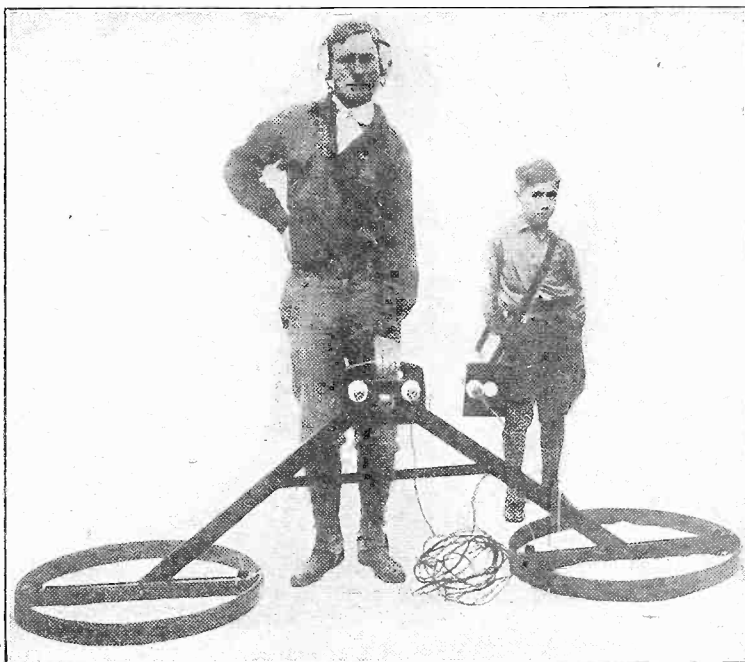
JESSIE DAYNE (driving), and Mary P of a receiver on a motorcycle. Members set in tracking down interference from stations, etc. Regular broadcasts can be this determination th

RONG



...broadcasting station located on the roof of the building. The station uses 500 watts of power. Note the counterpoise, which is used to ground the antenna.

SET LOCATES METAL IN GROUND



(Underwood & Underwood)

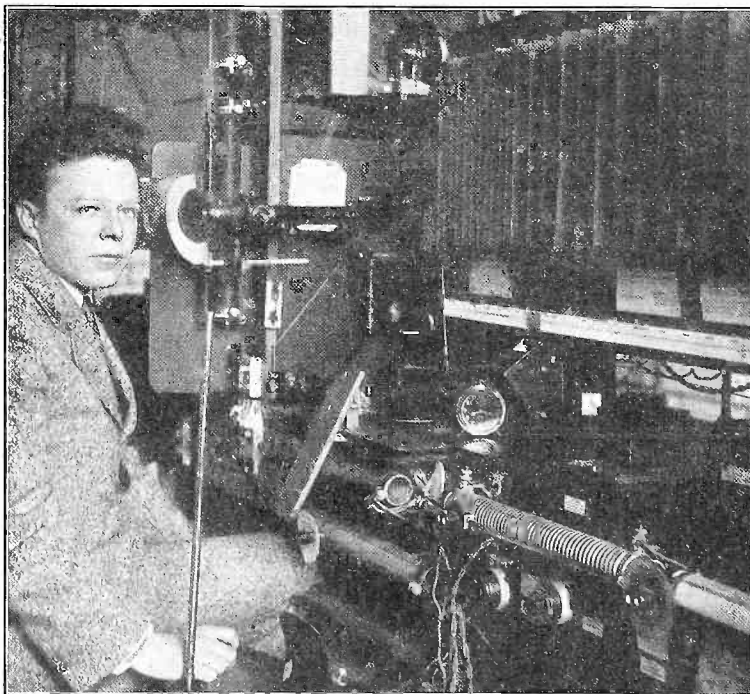
G. O. MAHER, of Baton Rouge, La., with his special radio receiver, which detects the presence of non-magnetic metals in the earth, the loudest sound being heard when the set is over the metallic spot. This instrument was responsible for the finding of hiding places of the treasures seized by Jean Lafitte, Barataria buccaneer, at the base of an oak tree, near the beach of the Gulf of Mexico. According to the inventor, the set can detect metals present nine feet beneath the earth's surface.

DOWN VOICES



... (with earphones), tested the efficiency of the electrical and radio societies will use the special lines, receivers and broadcasting apparatus, too, and when the two girls reached the end of their "research" ended.

WAVES OF COLORS MEASURED



(Underwood & Underwood)

IRWIN PRIEST, of the Bureau of Standards staff, at Washington, with the special apparatus, used for determining the wavelengths of the various colors in the spectrum as well as the purity and strength. This instrument will prove valuable in finding out which colors are most useful in the transmission of photos.

A THOUGHT FOR THE WEEK

Some persons started knocking the new radio bill before they know what its terms really were. It seems some stations face trouble because they have not been behaving decently and want to start the alibi early.

RADIO WORLD

The First and Only National Radio Weekly

Radio World's Slogan: "A radio set for every home."

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Entered as second-class matter March 23, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

Junkin Started His Air Career As Aviator

One of the most popular announcers is George Junkin of KMOX, "The Voice of St. Louis." Mr. Junkin is a graduate of Penn State College. He took up agriculture for a short while. During the World War he won distinction as an aviator. He was next attracted to the screen, where he was quite successful, having played in casts with Shirley Mason and Madge Kennedy.

He then joined the Drama League of America, where he acted as a field organizer. He left this organization to take up radio. His first connection with radio was through the series of plays written by him and produced at several Chicago stations. He became director of station WSWs, Chicago, but soon after came to KMOX, where he is a director-announcer.



GEORGE JUNKIN

Nation-wide Broadcasting of Opera Is a Huge Feat

Chicago Company's Rendition of Garden Scene from "Faust," First Sample Given to America, Propagated Amid Nervous Tension

By J. T. W. Martin

When Milton J. Cross, National Broadcasting Company announcer, faced a microphone in Chicago recently, preliminary to the first nationwide transmission of grand opera from any stage, an audience numbered in millions heard his voice. His words carried into mansions and hovels from Maine to California, from Texas to Canada, but they probably encountered surroundings no more vividly contrasted than they found at their source and in the studios of WJZ and WEAf in New York City.

Many of the music critics of the leading Metropolitan dailies had gathered in the studios of the two New York stations to form their opinions of the great event. In quiet, luxurious surroundings, they sat at their ease while Mr. Cross's voice was reproduced in loud speakers connected with the station's monitor systems.

At the Chicago terminus of the wire line, however, no such atmosphere prevailed. Around the control board clustered many of the artists who were to take part in the broadcast, officials of the Chicago Civic Opera Company and of the Brunswick-Balke Collender Company which was sponsoring the program. All of them had a personal interest in the outcome, and most of them were showing signs of nervousness over their parts in the making of broadcasting history.

Mr. Cross had planned to make his announcements through a microphone located close to the control board, but as the time for the opening of the second act of "Faust" drew near, he found that the nervous tension was affecting him, and he determined to be alone when he went on the air. Accordingly, he searched for a quiet spot and discovered a small room underneath the stage, not far from the control board. The announcer's microphone and a buzzer were quickly installed in this room and Cross locked himself in.

Experts Combined Efforts

Telephone engineers had completed the details of linking 26 stations into the special chain, and the telephone circuits had been tested to make certain that they would transmit without distortion the tones included in the wide frequency range involved. At the Chicago end of the circuit, the mixing panel developed and installed under the supervision of Eugene F. Grossman, Assistant Manager of the Operation and Engineering Department of the National Broadcasting Company, was ready to blend the various elements of the music absorbed by the 15 separate microphone channels in the Auditorium into a smooth, well balanced unit in which every portion would possess proper emphasis. Presiding over the special mixing panel was Mr. Grossman.

Posted at an advantageous point in the auditorium proper was Gerald Chatfield, National Broadcasting Company Director of Programs, with a telephone connecting with the mixing panel and a diagram of the Auditorium stage as set for the opera, with the location of all the microphones designated by numbers.

To Messrs. Grossman and Chatfield, the "first night" of the nation-wide broadcasting of grand opera came as the climax of weeks of planning and ten days of intensive effort of gruelling, hard work, proving that the thing could be done. While four or five microphones had been used in picking

up orchestral concerts on former occasions, no one had ever attempted to combine the output of 15 microphones until the experimental work was begun in preparation for the transmission of the Chicago Civic Opera Company's production of "Faust."

For over a week, Chatfield and Grossman had attended rehearsals and performances of the Civic Opera, monitoring the music on their pick-up system, the most elaborate ever used in radio broadcasting. They had listened to the results with headphones and loud speakers, consulted with musicians as to the manner in which the output of the pick-up instruments should be blended. They had constantly shifted the positions of the microphones on the stage, in the orchestra pit, the proscenium arch, over the heads of the audience in the Auditorium, in the wings and backstage.

The Fun Begins

They had tried every possible combination of microphones, and musicians who had listened to the music over the monitor system had helped them with the fine points of amplifying and combining the separate portions of the music. They had experimented for hours on end to insure that shifting from one combination of microphones to another would not result in a noticeable break in the continuity of the music, but that the melody would flow smoothly from one set of instruments to the next. They had paid particular attention to the location of the artists on the stage and their movements during the performances.

The first act of "Faust" was finished several minutes before the management of the opera had expected, necessitating a longer intermission between Acts I and II than had been surmised. Twenty-six broadcast programs had been arranged to start the transmission of the second act at 10:30 P. M., Eastern Standard Time, and the act could not begin until after Mr. Cross had made his preliminary announcement.

At exactly 10:30, Philips Carlin, in the studio of WEAf, greeted the radio audience of the 26 stations and told the listeners what was about to take place. As he finished, Mr. Grossman touched Mr. Cross's buzzer and the announcer, locked in the room, opened his microphone and in the shortened time allotted him on account of the long intermission, set the invisible stage for the loud speaker audience.

Mr. Cross finished his remarks, and another signal was given from the control board. The house lights were dimmed and went out, the footlights glowed and the orchestra started the overture. The footlights brightened, the curtain rose on the famous "Garden Scene," disclosing Irene Pavloska in the costume of Siebel, the boy, picking a bouquet to lay on Marguerite's doorstep. "Faust" was on the air through one of the largest chains of stations ever linked together for a broadcast event, and the United States was listening in.

Through the telephone, Mr. Chatfield directed the switching of the various microphones from the control board, and at the mixing panel Mr. Grossman manipulated the control. By his side, listening to the pick-up, was the Assistant Conductor of the Civic Opera Company orchestra, indicating minor changes in the amplification of certain microphone channels which were being combined as his musically trained ear told him they were necessary for the best balance.

Air Unscrambling Under Way

House Votes Approval of Compromise Bill

Commission of Five Created, With Right to Fix Wavelengths, Power and Time on the Air, Thus Enjoying the Authority No One Possessed—After First Year Commerce Secretary Assumes Most of Duties

WASHINGTON.

The compromise radio bill, as drafted by the conference committee, consisting of Senators and Representatives, is on the way to complete enactment, having been adopted by the House. It represents an agreement reached on those points where the House bill of last year (the White measure) differed from the Dill bill that the Senate passed shortly afterward.

The compromise bill creates a commission of five, to serve for one year, at \$10,000 salary each, with original jurisdiction over station licenses, time on the air, power, etc. With this authority the Commission will be able to control the congestion of the air, by limiting stations in their time and power. New station licenses are to run for three years.

The Commission, after the first year, becomes of secondary importance, the Secretary of Commerce assuming the major part of the authority. The Commissioners are to get \$30 a day when in session after the first year.

As for appeals, during the first year the appeal is taken to the courts. After the first year, when the Secretary of Commerce is functioning, his decisions are appealable to the Commission, from whose decision the next step is to appeal to the courts.

Terms of New Bill

The House managers who had charge of the compromise negotiations on behalf of their branch of the Congress made public the following analysis of the compromise bill:

The amendment of the Senate struck out all after the enacting clause of the House bill and substituted therefore a new bill.

The House bill continued original jurisdiction over radio communication in the Department of Commerce, but set up a commission of five members to be appointed by the President and confirmed by the Senate, to which the Secretary of Commerce was authorized to refer any matter the determination of which was vested in him by the bill, and to which any person interested in or aggrieved by any decision of the Secretary might appeal. The Senate bill also created a commission but gave to it original jurisdiction and complete control over radio regulation.

A Task of Drafting

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This section is substantially the same as the corresponding sections in the House bill and in the Senate amendment.

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Section 2 divides the United States for the purposes of the act into five zones. This section is identical with the corresponding sections of the House bill and the Senate amendment.

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By the House bill the commissioners were to receive a per diem of \$25, and there was a limitation upon the number of days' pay they might receive in each year. The corresponding provision of the Senate amendment provides a salary of \$10,000 a year.

The agreement here presented provides a compensation of \$10,000 for the first year's service and thereafter a compensation of \$30 a day. It is, perhaps, important to note also that the term of the commissioners as fixed by the House bill was seven years, as fixed by the Senate amendment five years, and as fixed in this report six years.

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The jurisdiction conferred in this paragraph is substantially the same as the jurisdiction conferred upon the commission by Section 1 (c) of the Senate amendment. The important change from the provision of the Senate amendment is that while under the Senate bill this original jurisdiction was vested permanently in the commission the jurisdiction is by this compromise, as agreed upon, limited to one year in time.

Secretary to Take Over Authority.

Section 5 of the bill, as agreed upon, permits the Secretary of Commerce after one year to exercise all the original powers and authority vested in the commission by the preceding section except the power of revocation of licenses subject to reference, protest and appeal to the commission. It provides that after one year's time the Secretary shall refer to the commission for its action applications for station licenses or for the renewal or modification of existing station licenses as to the granting of which controversy arises or against the granting of which protest is filed by any party in interest, and any application which the applicant himself requests be transferred to the commission.

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Terms of Bill, Digested by House Members, Disclose Station Licenses Limited to Three Years and Vested Rights to Wavelengths Declared Non-Existent—Public Awaits Results of Legislation With Much Eagerness

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In addition to the powers conferred upon the Secretary of Commerce with respect to station licenses section 5 vests in the Secretary of Commerce various administrative duties. The section also confers upon the Secretary control over station operators.

A provision is found in section 5 which, in substance, forbids the issuance of a station license either by the Secretary or the commission until the applicant therefor has executed a waiver of any claim as against the regulatory power of the United States. This is a modification of a provision carried in the Senate amendment.

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Section 8 follows sections of the same general purpose in the House bill and in the Senate amendment.

Section 9 authorizes the issuance of licenses if public convenience, interest, or necessity will be served thereby. The same test or guide for the licensing authority is laid down in both the House bill and in the Senate amendment.

It provides also for the distribution of stations, wavelengths, periods of time for operation and of power among the different States and communities so as to give equitable radio service throughout the United States. A similar provision is in the House bill and in the Senate amendment.

The section also provides that the term of the licenses for broadcasting stations shall not be for longer than three years and that the term for any other class of station license shall not be longer than five years. This is a compromise provision.

Authority for Licenses.

The House bill placed a limitation of five years upon licenses without regard to their character. The Senate amendment placed a limitation of two years upon all licenses. The section carries a privilege for renewal of the licenses as did both the original House bill and the Senate amendment.

Section 10 embodies no substantial change from the corresponding provision

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RADIO WORLD

The First and Only National Radio Weekly

Radio World's Slogan: "A radio set for every home."

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Nation-wide Broadcasting of Opera Is a Huge Feat

Chicago Company's Rendition of Garden Scene from "Faust," First Sample Given to America, Propagated Amid Nervous Tension

By J. T. W. Martin

When Milton J. Cross, National Broadcasting Company announcer, faced a microphone in Chicago recently, preliminary to the first nationwide transmission of grand opera from any stage, an audience numbered in millions heard his voice. His words carried into mansions and hovels from Maine to California, from Texas to Canada, but they probably encountered surroundings no more vividly contrasted than they found at their source and in the studios of WJZ and WEAJ in New York City.

Many of the music critics of the leading Metropolitan dailies had gathered in the studios of the two New York stations to form their opinions of the great event. In quiet, luxurious surroundings, they sat at their ease while Mr. Cross's voice was reproduced in loud speakers connected with the station's monitor systems.

At the Chicago terminus of the wire line, however, no such atmosphere prevailed. Around the control board clustered many of the artists who were to take part in the broadcast, officials of the Chicago Civic Opera Company and of the Brunswick-Balke Collender Company which was sponsoring the program. All of them had a personal interest in the outcome, and most of them were showing signs of nervousness over their parts in the making of broadcasting history.

Mr. Cross had planned to make his announcements through a microphone located close to the control board, but as the time for the opening of the second act of "Faust" drew near, he found that the nervous tension was affecting him, and he determined to be alone when he went on the air. Accordingly, he searched for a quiet spot and discovered a small room underneath the stage, not far from the control board. The announcer's microphone and a buzzer were quickly installed in this room and Cross locked himself in.

Experts Combined Efforts

Telephone engineers had completed the details of linking 26 stations into the special chain, and the telephone circuits had been tested to make certain that they would transmit without distortion the tones included in the wide frequency range involved. At the Chicago end of the circuit, the mixing panel developed and installed under the supervision of Eugene F. Grossman, Assistant Manager of the Operation and Engineering Department of the National Broadcasting Company, was ready to blend the various elements of the music absorbed by the 15 separate microphone channels in the Auditorium into a smooth, well balanced unit in which every portion would possess proper emphasis. Presiding over the special mixing panel was Mr. Grossman.

Posted at an advantageous point in the auditorium proper was Gerald Chatfield, National Broadcasting Company Director of Programs, with a telephone connecting with the mixing panel and a diagram of the Auditorium stage as set for the opera, with the location of all the microphones designated by numbers.

To Messrs. Grossman and Chatfield, the "first night" of the nation-wide broadcasting of grand opera came as the climax of weeks of planning and ten days of intensive effort of grueling, hard work, proving that the thing could be done. While four or five microphones had been used in picking

up orchestral concerts on former occasions, no one had ever attempted to combine the output of 15 microphones and the experimental work was begun in preparation for the transmission of the Chicago Civic Opera Company's production of "Faust."

For over a week, Chatfield and Grossman had attended rehearsals and performances of the Civic Opera monitoring the music on their pick-up system the most elaborate ever used in radio broadcasting. They had listened to the results with headphones and loud speakers consulted with musicians as to the manner in which the output of the pick-up instruments should be blended. They had constantly shifted the positions of the microphones on the stage in the orchestra pit, the proscenium arch, over the heads of the audience in the Auditorium, in the wings and backstage.

The Fun Begins

They had tried every possible combination of microphones, and musicians who had listened to the music over the monitor system had helped them with the fine points of amplifying and combining the separate portions of the music. They had experimented for hours on end to insure that shifting from one combination of microphones to another would not result in a noticeable break in the continuity of the music, but that the melody would flow smoothly from one set of instruments to the next. They had paid particular attention to the location of the artists on the stage and their movements during the performances.

The first act of "Faust" was finished several minutes before the management of the opera had expected, necessitating a longer intermission between Acts I and II than had been surmised. Twenty-six broadcast programs had been arranged to start the transmission of the second act at 10:30 P. M., Eastern Standard Time, and the act could not begin until after Mr. Cross had made his preliminary announcement.

At exactly 10:30, Philips Carlin, in the studio of WEAJ, greeted the radio audience of the 26 stations and told the listeners what was about to take place. As he finished, Mr. Grossman touched Mr. Cross's buzzer and the announcer, locked in the room, opened his microphone and in the shortened time allotted him on account of the long intermission, set the invisible stage for the loud speaker audience.

Mr. Cross finished his remarks, and another signal was given from the control board. The house lights were dimmed and went out, the footlights glowed and the orchestra started the overture. The footlights brightened, the curtain rose on the famous "Garden Scene," disclosing Irene Pavloska in the costume of Siebel, the boy, picking a bouquet to lay on Marguerite's doorstep. "Faust" was on the air through one of the largest chains of stations ever linked together for a broadcast event, and the United States was listening in.

Through the telephone, Mr. Chatfield directed the switching of the various microphones from the control board, and at the mixing panel Mr. Grossman manipulated the control. By his side, listening to the pick-up, was the Assistant Conductor of the Civic Opera Company orchestra, indicating minor changes in the amplification of certain microphone channels which were being combined as his musically trained ear told him they were necessary for the best balance.

Junkin Started His Air Career As Aviator

One of the most popular announcers is George Junkin of KMOX, "The Voice of St. Louis." Mr. Junkin is a graduate of Penn State College.



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He then joined the Drama League of America, where he acted as a field organizer. He left this organization to take up radio. His first connection with radio was through the series of plays written by him and produced at several Chicago stations. He became director of station WWSW, Chicago, but soon after came to KMOX, where he is a director-announcer.

Air Unscrambling Under Way

House Votes Approval of Compromise Bill

Commission of Five Created, With Right to Fix Wavelengths, Power and Time on the Air, Thus Enjoying the Authority No One Possessed—After First Year Commerce Secretary Assumes Most of Duties

WASHINGTON.

The compromise radio bill, as drafted by the conference committee, consisting of Senators and Representatives, is on the way to complete enactment, having been adopted by the House. It represents an agreement reached on those points where the House bill of last year (the White measure) differed from the Dill bill that the Senate passed shortly afterward.

The compromise bill creates a commission of five, to serve for one year, at \$10,000 salary each, with original jurisdiction over station licenses, time on the air, power, etc. With this authority the Commission will be able to control the congestion of the air, by limiting stations in their time and power. New station licenses are to run for three years.

The Commission, after the first year, becomes of secondary importance, the Secretary of Commerce assuming the major part of the authority. The Commissioners are to get \$30 a day when in session after the first year.

As for appeals, during the first year the appeal is taken to the courts. After the first year, when the Secretary of Commerce is functioning, his decisions are appealable to the Commission, from whose decision the next step is to appeal to the courts.

Terms of New Bill

The House managers who had charge of the compromise negotiations on behalf of their branch of the Congress made public the following analysis of the compromise bill:

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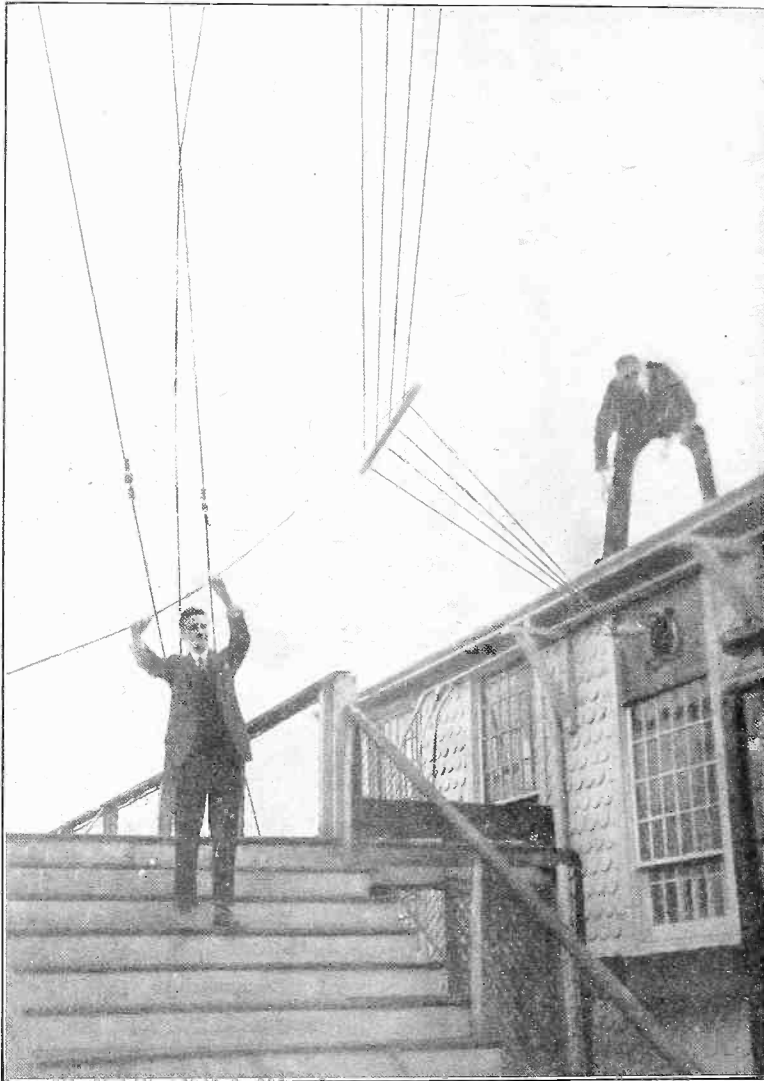
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(Concluded on page 25)

TWO MORE NEW YORK STATIONS JOIN THE MERRY T



(Herbert Photos, Inc.)

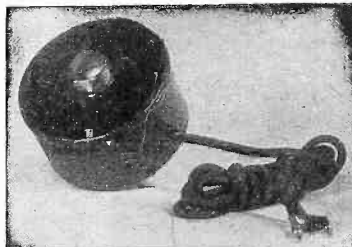
THE LEADIN system of station WGL, atop of the Hotel Majestic, New York City. Note the peculiar massive glass insulators, which resemble the tops of giant coffee percolators. The antenna is of the four-wire T type. The station recently went on the air.

MUSICAL EAR

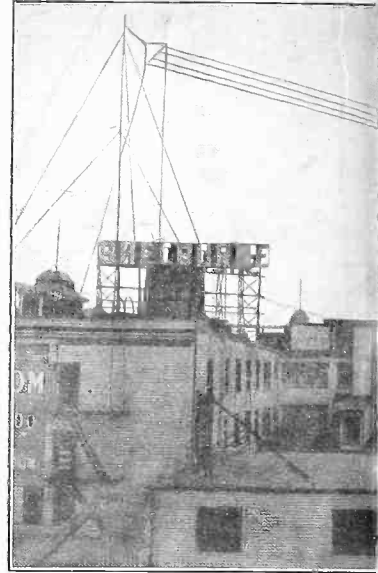


(Keystone)
DOROTHY AREY REUX, who controls the modulation panel at WLS, Chicago, is a pianist, and well suited to the operation of this panel with which signal intensity is varied.

SNUGNESS



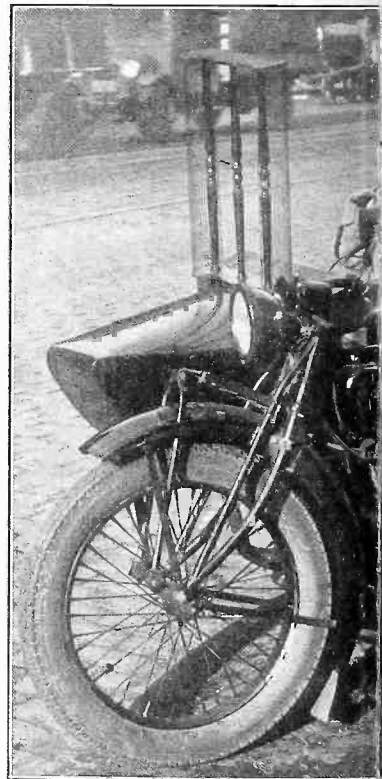
A TELEPHONE UNIT does not necessarily fit the tone arm of all phonographs. If the unit's opening is too big, rubber hose, 1½ inches long, may be rolled onto its exterior, and pushed into the tone arm at the other end. This method may be worked vice versa if the unit opening is too small. Also, these methods prevent rattling or distortion of signals.



(Herbert Photos, Inc.)

THE ANTENNA system of WARS, the of the Hotel Shelburne, Brighton Beach, and operates on a wavelength of 295.1 m instead of

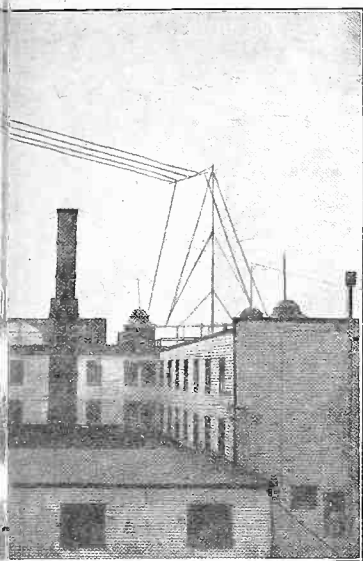
RECEIVER TRAC



(Herbert Photos, Inc.)

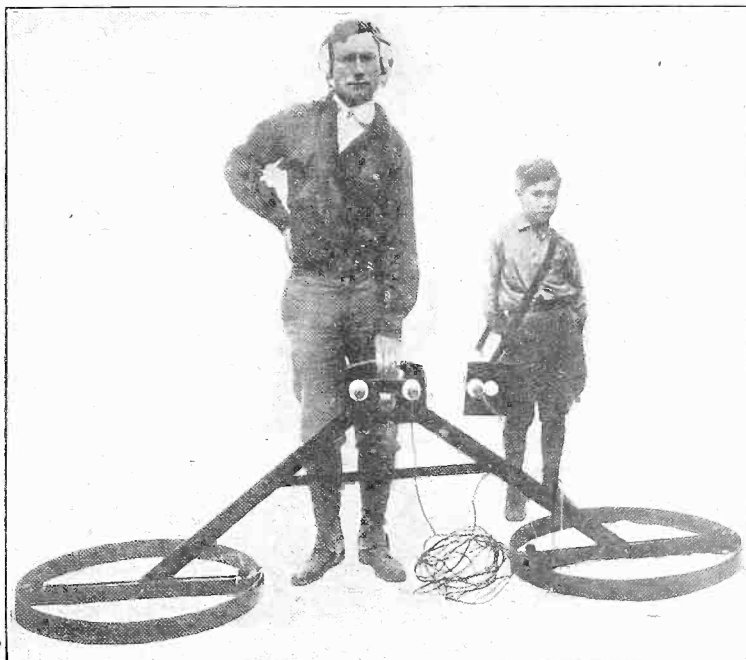
JESSIE DAYNE (driving), and Mary P of a receiver on a motorcycle. Members set in tracking down interference from stations, etc. Regular broadcasts can be this determination th

RONG



broadcasting station located on the roof
Y. The station uses 500 watts of power
E. Note the counterpoise, which is used
ground.

SET LOCATES METAL IN GROUND



(Underwood & Underwood)

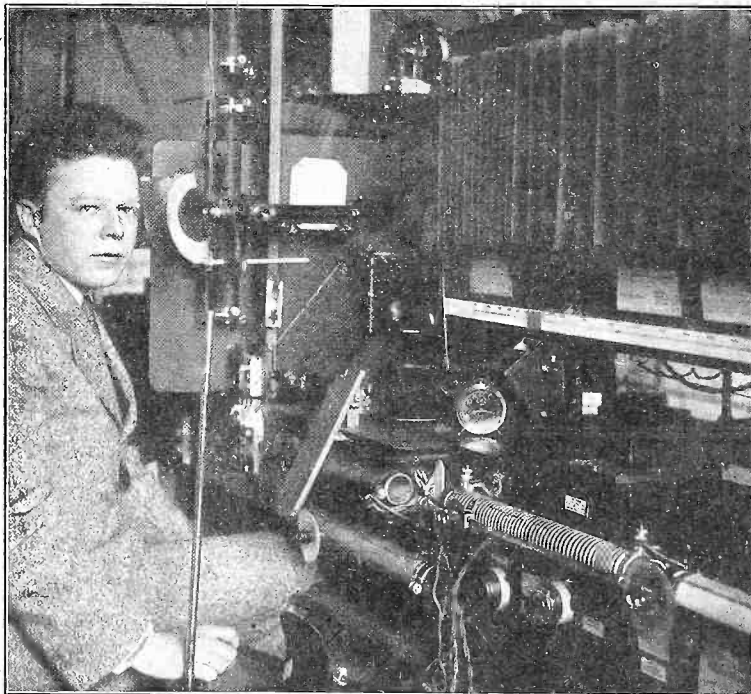
G. O. MAHER, of Baton Rouge, La., with his special radio receiver, which detects the presence of non-magnetic metals in the earth, the loudest sound being heard when the set is over the metallic spot. This instrument was responsible for the finding of hiding places of the treasures seized by Jean Lafitte, Barataria buccaneer, at the base of an oak tree, near the beach of the Gulf of Mexico. According to the inventor, the set can detect metals present nine feet beneath the earth's surface.

S DOWN VOICES



ps (with earphones), tested the efficiency
electrical and radio societies will use the
trical lines, receivers and broadcasting
rd, too, and when the two girls reached
"research" ended.

WAVES OF COLORS MEASURED



(Underwood & Underwood)

IRWIN PRIEST, of the Bureau of Standards staff, at Washington, with the special apparatus, used for determining the wavelengths of the various colors in the spectrum as well as the purity and strength. This instrument will prove valuable in finding which colors are most useful in the transmission of photos.

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He then joined the Drama League of America, where he acted as a field organizer. He left this organization to take up radio. His first connection with radio was through the series of plays written by him and produced at several Chicago stations. He became director of station WSWs, Chicago, but soon after came to KMOX, where he is a director-announcer.



GEORGE JUNKIN

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Telephone engineers had completed the details of linking 26 stations into the special chain, and the telephone circuits had been tested to make certain that they would transmit without distortion the tones included in the wide frequency range involved. At the Chicago end of the circuit, the mixing panel developed and installed under the supervision of Eugene F. Grossman, Assistant Manager of the Operation and Engineering Department of the National Broadcasting Company, was ready to blend the various elements of the music absorbed by the 15 separate microphone channels in the Auditorium into a smooth, well balanced unit in which every portion would possess proper emphasis. Presiding over the special mixing panel was Mr. Grossman.

Posted at an advantageous point in the auditorium proper was Gerald Chatfield, National Broadcasting Company Director of Programs, with a telephone connecting with the mixing panel and a diagram of the Auditorium stage as set for the opera, with the location of all the microphones designated by numbers.

To Messrs. Grossman and Chatfield, the "first night" of the nation-wide broadcasting of grand opera came as the climax of weeks of planning and ten days of intensive effort of gruelling, hard work, proving that the thing could be done. While four or five microphones had been used in picking

up orchestral concerts on former occasions, no one had ever attempted to combine the output of 15 microphones until the experimental work was begun in preparation for the transmission of the Chicago Civic Opera Company's production of "Faust."

For over a week, Chatfield and Grossman had attended rehearsals and performances of the Civic Opera, monitoring the music on their rack-up system, the most elaborate ever used in radio broadcasting. They had listened to the results with headphones and loud speakers, consulted with musicians as to the manner in which the output of the pick-up instruments should be blended. They had constantly shifted the positions of the microphones on the stage, in the orchestra pit, the proscenium arch, over the heads of the audience in the Auditorium, in the wings and backstage.

The Fun Begins

They had tried every possible combination of microphones, and musicians who had listened to the music over the monitor system had helped them with the fine points of amplifying and combining the separate portions of the music. They had experimented for hours on end to insure that shifting from one combination of microphones to another would not result in a noticeable break in the continuity of the music, but that the melody would flow smoothly from one set of instruments to the next. They had paid particular attention to the location of the artists on the stage and their movements during the performances.

The first act of "Faust" was finished several minutes before the management of the opera had expected, necessitating a longer intermission between Acts I and II than had been surmised. Twenty-six broadcast programs had been arranged to start the transmission of the second act at 10:30 P. M., Eastern Standard Time, and the act could not begin until after Mr. Cross had made his preliminary announcement.

At exactly 10:30, Philips Carlin, in the studio of WEAf, greeted the radio audience of the 26 stations and told the listeners what was about to take place. As he finished, Mr. Grossman touched Mr. Cross's buzzer and the announcer, locked in the room, opened his microphone and in the shortened time allotted him on account of the long intermission, set the invisible stage for the loud speaker audience.

Mr. Cross finished his remarks, and another signal was given from the control board. The house lights were dimmed and went out, the footlights glowed and the orchestra started the overture. The footlights brightened, the curtain rose on the famous "Garden Scene," disclosing Irene Pavloska in the costume of Siebel, the boy, picking a bouquet to lay on Marguerite's doorstep. "Faust" was on the air through one of the largest chains of stations ever linked together for a broadcast event, and the United States was listening in.

Through the telephone, Mr. Chatfield directed the switching of the various microphones from the control board, and at the mixing panel Mr. Grossman manipulated the control. By his side, listening to the pick-up, was the Assistant Conductor of the Civic Opera Company orchestra, indicating minor changes in the amplification of certain microphone channels which were being combined as his musically trained ear told him they were necessary for the best balance.

Air Unscrambling Under Way

House Votes Approval of Compromise Bill

Commission of Five Created, With Right to Fix Wavelengths, Power and Time on the Air, Thus Enjoying the Authority No One Possessed—After First Year Commerce Secretary Assumes Most of Duties

WASHINGTON.

The compromise radio bill, as drafted by the conference committee, consisting of Senators and Representatives, is on the way to complete enactment, having been adopted by the House. It represents an agreement reached on those points where the House bill of last year (the White measure) differed from the Dill bill that the Senate passed shortly afterward.

The compromise bill creates a commission of five, to serve for one year, at \$10,000 salary each, with original jurisdiction over station licenses, time on the air, power, etc. With this authority the Commission will be able to control the congestion of the air, by limiting stations in their time and power. New station licenses are to run for three years.

The Commission, after the first year, becomes of secondary importance, the Secretary of Commerce assuming the major part of the authority. The Commissioners are to get \$30 a day when in session after the first year.

As for appeals, during the first year the appeal is taken to the courts. After the first year, when the Secretary of Commerce is functioning, his decisions are appealable to the Commission, from whose decision the next step is to appeal to the courts.

Terms of New Bill

The House managers who had charge of the compromise negotiations on behalf of their branch of the Congress made public the following analysis of the compromise bill:

The amendment of the Senate struck out all after the enacting clause of the House bill and substituted therefore a new bill.

The House bill continued original jurisdiction over radio communication in the Department of Commerce, but set up a commission of five members to be appointed by the President and confirmed by the Senate, to which the Secretary of Commerce was authorized to refer any matter the determination of which was vested in him by the bill, and to which any person interested in or aggrieved by any decision of the Secretary might appeal. The Senate bill also created a commission but gave to it original jurisdiction and complete control over radio regulation.

A Task of Drafting

Except for necessary changes chargeable to this difference in authority many of the sections in the House bill and in the Senate amendment were the same and an agreement between the conferees concerning the authority of the commission and of the Secretary of Commerce carried with it an agreement as to most of the provisions in the bill. The task of the conferees then as to such matters became one of drafting.

Section 1 of the bill asserts by way of

preamble the intent of the legislation. It then specifically forbids the use or operation of any apparatus for the transmission of energy or communications by radio in interstate or foreign commerce except under and in accordance with the act and with a license granted under the provisions of the act.

This section is substantially the same as the corresponding sections in the House bill and in the Senate amendment.

Five Radio Zones.

Section 2 divides the United States for the purposes of the act into five zones. This section is identical with the corresponding sections of the House bill and the Senate amendment.

Section 3 establishes the Federal radio commission of five members of whom no more than one shall be appointed from any zone.

By the House bill the commissioners were to receive a per diem of \$25, and there was a limitation upon the number of days' pay they might receive in each year. The corresponding provision of the Senate amendment provides a salary of \$10,000 a year.

The agreement here presented provides a compensation of \$10,000 for the first year's service and thereafter a compensation of \$30 a day. It is, perhaps, important to note also that the term of the commissioners as fixed by the House bill was seven years, as fixed by the Senate amendment five years, and as fixed in this report six years.

Commission's Jurisdiction

Section 4 of the bill vests in the commission generally original jurisdiction over all radio stations. It gives to the commissions much the same authority as was vested originally in the Secretary of Commerce by Section 1 (B) of the House bill.

The jurisdiction conferred in this paragraph is substantially the same as the jurisdiction conferred upon the commission by Section 1 (c) of the Senate amendment. The important change from the provision of the Senate amendment is that while under the Senate bill this original jurisdiction was vested permanently in the commission the jurisdiction is by this compromise, as agreed upon, limited to one year in time.

Secretary to Take Over Authority.

Section 5 of the bill, as agreed upon, permits the Secretary of Commerce after one year to exercise all the original powers and authority vested in the commission by the preceding section except the power of revocation of licenses subject to reference, protest and appeal to the commission. It provides that after one year's time the Secretary shall refer to the commission for its action applications for station licenses or for the renewal or modification of existing station licenses as to the granting of which controversy arises or against the granting of which protest is filed by any party in interest, and any application which the applicant himself requests be transferred to the commission.

The section also authorizes the Secretary to refer to the commission any matter concerning which he has authority. It also provides for an appeal to the commission from any decision of the Secretary by any person aggrieved or whose interests are adversely affected thereby. In these instances the commission is to hear the matter so brought

Terms of Bill, Digested by House Members, Disclose Station Licenses Limited to Three Years and Vested Rights to Wavelengths Declared Non-Existent—Public Awaits Results of Legislation With Much Eagerness

before it de novo and its decisions are to be final, subject to court review only.

Waiver of Claims.

In addition to the powers conferred upon the Secretary of Commerce with respect to station licenses section 5 vests in the Secretary of Commerce various administrative duties. The section also confers upon the Secretary control over station operators.

A provision is found in section 5 which, in substance, forbids the issuance of a station license either by the Secretary or the commission until the applicant therefor has executed a waiver of any claim as against the regulatory power of the United States. This is a modification of a provision carried in the Senate amendment.

Section 6 is substantially the same as sections dealing with the same matter in the House bill and in the Senate amendment. It defines the status of Government stations, it authorizes the President in proper cases to close or to take over the use or the control of all private stations within the United States.

Compensation for Seizure

Section 7 provides for the ascertainment of the just compensations to be paid for the taking of private stations under the authority of the preceding section. It is taken from the Senate amendment to the House bill.

Section 8 follows sections of the same general purpose in the House bill and in the Senate amendment.

Section 9 authorizes the issuance of licenses if public convenience, interest, or necessity will be served thereby. The same test or guide for the licensing authority is laid down in both the House bill and in the Senate amendment.

It provides also for the distribution of stations, wavelengths, periods of time for operation and of power among the different States and communities so as to give equitable radio service throughout the United States. A similar provision is in the House bill and in the Senate amendment.

The section also provides that the term of the licenses for broadcasting stations shall not be for longer than three years and that the term for any other class of station license shall not be longer than five years. This is a compromise provision.

Authority for Licenses.

The House bill placed a limitation of five years upon licenses without regard to their character. The Senate amendment placed a limitation of two years upon all licenses. The section carries a privilege for renewal of the licenses as did both the original House bill and the Senate amendment.

Section 10 embodies no substantial change from the corresponding provision

(Concluded on page 25)

Radio University

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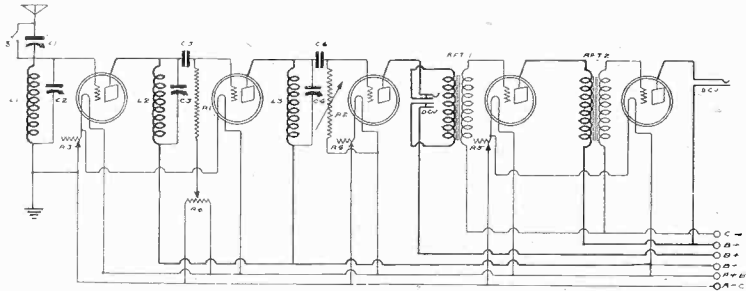


FIG. 513

The circuit diagram of the five-tube impedance coupled receiver requested by Mark Landau.

I HAVE three .0005 mfd. variable condensers; a variable and a two megohm grid leak; a four hundred ohm potentiometer; two fifteen and one twenty-five ohm rheostat and a couple of five to one ratio audio frequency transformers. Please give me the circuit diagram of a five-tube set, using these parts, with the impedance system of coupling the radio frequency amplifying stages, stating how to wind the coils, etc.—Mark Landau, Brooklyn, N. Y.

Fig. 513 shows the circuit diagram of such a set. The three variable condensers are used to tune forty-five turn windings, wound on three-inch diameter tubings, which have been wound with No. 22 double cotton covered wire. A .0005 mfd. fixed condenser is used to couple the first radio stage to the second stage. The two megohm leak is used in the grid circuit of the second radio stage. This leak has one terminal connected to the grid post of the second socket, while the other is brought to the arm of the potentiometer. The resistance posts of this instrument are connected across the A line. The second stage is coupled to the detector stage by a .00025 mfd. fixed condenser, which also acts as a grid condenser. The variable grid leak is here used, one terminal being connected to the G post of the third or detector tube socket, while the other is brought to the F plus or A plus post. One of the low resistance rheostats, fifteen ohms (R3), is used to control the filaments of both radio frequency tubes. The filaments of the audio frequency amplifying tubes are controlled by another fifteen ohm rheostat, R5. The filament of the detector tube is controlled by the twenty-five ohm rheostat R4. All these filament controls are placed in the negative legs of the A battery. So that you may listen to the output of the detector stage, a double circuit jack, DCJ, is connected up. The variable condenser in the antenna system increases the selectivity value of the set, should you be troubled by interference. The switch is of the ordinary filament type, while the condenser should have maximum a capacity of about .0005 mfd. AFT1 and 2 indicate the positions of the two audio transformers. A single B and C voltage is used in these circuits, the B being from 90 to 135 volts, and the C from four and one-half to nine volts. SCJ is a single circuit jack. The detector B voltage is about forty-five. The B voltage for the radio frequency tubes is about sixty-seven and one-half. A filament switch may be connected in series with the positive leg of the A battery. Do not mount the coils

very close to each other in a parallel position. Place each coil at right angles, at a distance of about four inches, at least. Keep the low potential and the high potential leads of these coils away from each other and from the panel.

I HAVE built the three-tube regenerative-quality receiver shown and described in the Radio University columns of the May 8 issue of Radio World. The set works great. However, there is not much kick in the set. Could I change the audio amplification system, so as to use two steps of resistance coupled AF amplification and then a stage of transformer coupled AF amplification. That is, the resistance stages should come first and then the transformer stage. I wish to use a rheostat, having a resistance of ten ohms to control the filaments of the first two audio tubes and a 112 Amperite in the filament circuit of the last tube, which is to be of the power type, (171 type), the first two being of the -O1A type. Please describe how this should be done.—Leonard Wilson, Washington, D. C.

The plate resistors should be of the .1 megohm type. The first grid resistor should be of the 1 megohm type, while the second grid resistor should be of the .5 megohm type. The ten-ohm rheostat can be used to control the filaments of the first two audio tubes. Run the grid returns of the grid resistors in both stages to the minus post of a four and one-half volt C battery, not to the minus A post. The F post of the transformer used in the last stage is also brought to the minus post of a C battery, this one being of the nine volt or higher, according to voltage used. All the filament controls should be connected in the negative leg of the filaments. The wiring of the filament switch need not be changed. The stopping condensers in the resistance coupled stages should have a capacity of .5 mfd., and should be of a very high grade. If you are going to use a cone speaker, be sure to install a choke coil and condenser in the plate output circuit to prevent the direct current from being applied to the windings, and a consequent burn out. The choke can be of the common type used in B eliminators, (thirty henries), while the condenser should be the 4 mfd. fixed type.

REFERRING TO the combination receiver and transmitter, described in the June 5th issue of Radio World. (1)—Can a commercial radio frequency choke coil such as the Rabco, be used, instead of the one specified, which has to be made at

home? (2)—Can power tubes, such as the 112 or 171 be used, instead of the -O1A's specified in the transmitter? (3)—Can another stage of transformer coupled AF amplification be added to the receiver, using a three to one AFT?—John Merrill, St. Louis, Mo.

(1)—Yes, very successfully. (2)—Yes. Be sure to use the proper B and C voltages. Use a two ohm, one and one-half ampere rheostat. (3)—Yes. Use another automatic filament control. The plate post of the last socket is brought to the P post of the new AFT. The B post is brought to the B plus post. You can either use a single B or separate B for both tubes.

* * *

I AM going to use the Twin-Antenna stunt suggested in the Dec. 18 issue of Radio World. However, I would like to use a .0005 mfd variable condenser instead of the .001 mfd. How many turns should I wind?—Stanley Virther, Mineola, L. I., N. Y.

Increase the number of turns on the three and one-half inch stationary form to sixty-five.

* * *

IN REGARD to the three-tube reflex set shown in the Radio University columns of the Jan. 22 issue of Radio World. (1)—Can the variable grid leak be supplanted by a three megohm leak? (2)—Can I use a twenty ohm rheostat to control the filament of the detector tube? (3)—The circuit diagram illustrates the radio frequency choke with lines running through the center. Does this mean that this choke should have iron? (4)—Can another stage of transformer coupled audio frequency amplification be added? (4)—What ratio AFT would be best to use?—Silvin Mathews, Atlantic City, N. J.

(1)—Yes. (2)—Yes. (3)—No. (4)—Yes. (5)—About three to one.

* * *

I HAVE a two, four and eight mfd. fixed condenser. Can these be used as C1, C2 and C3 respectively, in the DC eliminator described in the Dec. 4 issue of Radio World? (2)—Can 1 mfd. fixed condensers be used, as C4, C5 and C6, instead of the .5 mfd fixed condensers?—George Lenteley, Atlanta, Ga.

(1 and 2)—This arrangement is excellent if you have a very poor input line. The voltage will be a bit lower, though. Under average conditions, the capacities stated in the text, will suffice.

* * *

I HAVE heard that stations WHO, KFRU, WOC, WTIC, WMAQ, KLDS, KPO and WLW, are all listed as constant frequency stations. Is that true? (2)—What system do they use?—Frank Jarvin, Los Angeles, Calif.

(1)—Yes. (2)—KFRU, WMAQ, KLDS and KPO all use a frequency indicator. WHO, WOC, and WTIC all use a Piezo oscillator.

* * *

WHEN WAS the Fourth National Radio Conference held and where?—Harry Morton, Passaic, N. J.

It was held in Washington, D. C., on November 9, 1925.

* * *

WHAT METHOD is used by Dr. Alexandersen, to increase the number of scanning lines per inch, per unit of time in his television machine?—Charles McDonald, Los Angeles, Cal.

The method used for increasing the number of scanning lines per inch per unit of time is to use seven photo-electric cells and to run seven scanning lines simultaneously side by side. This makes it possible to increase the speed forty-nine times with the same light intensity. The seven scanning units require seven transmission channels, seven receivers, seven oscillographs, and seven projecting beams of light at the receiver. This part of the process is not so complicated as

it sounds. The secret of sending motion pictures by wire or radio is to send at least sixteen still pictures per second with sufficient definition to make the reproduced picture worth looking at. The secret seems to be on the way to solution.

WHO WAS assigned by the National Broadcasting Company, to take charge of the new addition to their chain of station, KFKX?—Marie Junno, Kansas City, Kans.

Frank E. Mullen, it is announced, has been assigned by the National Broadcasting Company to take charge of Station KFKX and develop a special agricultural program. Mr. Mullen is a graduate of the Iowa State College, with extensive training in agricultural as well as general journalism. He instituted the farmer's service by radio over Station KDKA at Pittsburgh, recognized by the government as the most thorough and comprehensive market and weather service in the country.

SHOULD THE leads in a battery cable be quite short? Why?—Manuel Strong.

The leads in a cable should be cut as short as is practical to make them. Measure the distance to batteries from set and cut the cables at the set end. If the leads are made of heavy wire the voltage drop will not be so great, and then somewhat greater length is allowable. Also if the two A wires are twisted the pickup by these is reduced somewhat. That is, there is a lesser tendency for them to act as a miniature antenna. If they must be long they should be made of very heavy wire and they should be both twisted together and shielded with a grounded lead sheath.

DID SENATOR Marconi recently celebrate the twenty-fifth anniversary of the practical invention of the radio receiver and transmitter? (2)—Did he make any remarks regarding the future of radio? If so, what were they?—George Kelley, Pittsburgh, Pa.

(1)—Yes. (2)—Yes. He predicted that during the next twenty-five years, the developments that would occur in the radio field would be so startling that a description of their probability at the present moment, would seem improbable as the mystifying instruments employed by Jules Verne in his spectacular volumes at that time. Directional radio, transmission of power, and television were among some of the developments predicted. However, he stressed that at the present moment, one can only leave the great things to be developed to your imaginative powers.

PLEASE GIVE me the circuit diagram of a one-tube receiver, which can be used for receiving local programs with good volume, as well as quality and still be selective. Give the circuit data.—Lawrence Harris, Newark, N. J.

Fig. 514 *shows the circuit diagram of such a set. A regenerative radio frequency tube, followed by a crystal detector is used. L1 consists of fifty turns, tapped at the tenth turn from the beginning, wound on a three inch diameter tubing, using No. 22 double cotton covered wire. L2 is a thirty-six turn coil, wound on a two and one half inch diameter tubing, with No. 26 single silk covered wire. This coil is placed inside of the coil just described, at that portion of the winding, which is to be connected to the grid post of the socket, e.g., end of winding. The fifty-turn winding is tuned by a .0005 mfd. variable condenser C1. L3 is a ten turn winding, wound on a three inch diameter tubing, using No. 22 double cotton covered wire. L4 is a forty-five turn winding, wound on this same tubing, spaced about one quarter inch, using

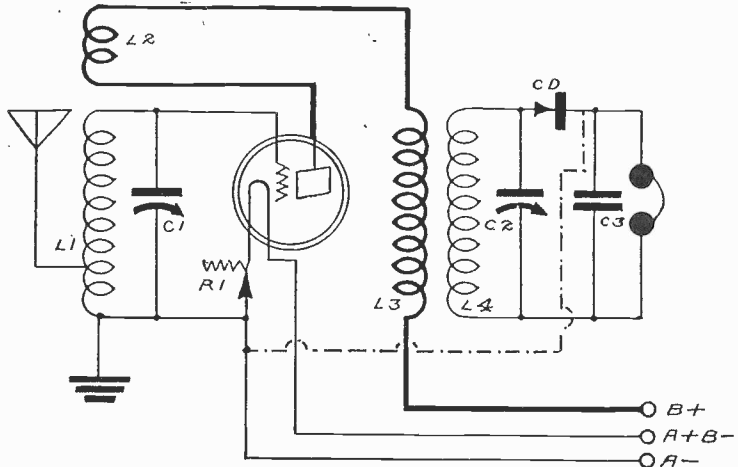


FIG. 514 The circuit diagram of the one tube receiver, desired by Lawrence Harris.

the same wire as for the smaller winding. This larger winding is also shunted by a .0005 mfd. variable condenser C2. A fixed crystal detector is used in this circuit. C3 is a .0005 mfd. fixed condenser shunted across the phones or output. The dotted line indicates connections which may be tried for obtaining louder signals. The plate of the radio frequency tube is connected to the sixty-seven and one-half volt plus post of a forty-five and twenty-two and one-half volt B battery. A twenty ohm rheostat is used in the filament circuit of the radio frequency tube. Note that the minus A post is connected to the ground also. Should you find that the radio tube oscillates beyond control, reduce the number of turns on the tickler to thirty and also the B voltage. Any kind of audio frequency amplification can be added if you wish to listen to the output on a speaker. The complete set can be built in a seven by fourteen inch cabinet. Place the two coils as far away from each other as possible. Use flexible wire in wiring up this set. When connecting the tickler coil up, be sure that if braided or litz wire is used, no individual wire is broken. Should this be the case, scratchy noises will be heard. They will be difficult to locate. It would therefore, pay to test out the continuity of the leads first and see that it is O. K. Be sure all contacts are solid.

WHAT DID Greenleaf W. Pickard,

the well-known authority on fading, erratic reception, due to earth conditions, recently say about the effect of the sun or sun spots, on reception?—Leonard Kissler, St. Louis, Mo.

He said that during periods of poor reception in Boston it was found that parts of the surface of the sun were in great eruption, and that when these sun spots faced the earth radio reception was nearly paralyzed. By using a delicate measuring device and the waves of a standard signal, Mr. Pickard found that the signal strength varied not only in proportion to the intensity of the disturbances, but also with the position these disturbances occupied on the sun.

HOW MANY meters does FL, the Eiffel Tower station in Paris, operate on? (2)—How much power do they use? (3)—Are there stations in Holland? (4)—If so, what is their wavelength and how much power do they use?—Leonard Merks, Jersey City, N. J.

(1)—2650 meters. (2)—5,000 watts. (3)—Yes. There are three stations, according to the latest reports. (4)—One station is located in De Bilt, operating on 1100 meters. Unknown power or call letters. Another station is located in Hilversum, calls HDO, operating on 1050 meters, using 5000 watts. The other is located in Bloemendaal, operating on 566 meters using 40 watts. Unknown call letters.

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"WEB" Wave Trap Is Selling Fast

A great help to the fan troubled with too much interference, as many are nowadays, is the new "WEB" Wave trap, now being manufactured and marketed by the Walter E. Bathgate Company, 65 West Broadway, New York City. This little wave trap is a really scientific piece of apparatus, sturdily built, having a solenoid winding of the most approved type of green silk-covered wire on a Bakelite tube, being enclosed on the ends with genuine Bakelite panels neatly engraved. An approved knob controls the variable condenser housed inside the tubing and connected in shunt to the solenoid winding. Full operating instructions are enclosed with every wave trap and each bears a label showing that it has been tested and is fully guaranteed in every respect. Mr. Walter E. Bathgate, executive head of the company, proudly displays the many enthusiastic letters of recommendation, which are open for inspection to anyone, and many of which say that the "WEB" does even more than the manufacturer claims for it. The trap is said not only to eliminate interference, but also improves the tone of any set, increases volume considerably, adds to the distance range, while not changing the log, and has a helpful effect on the reduction of static. The Venus Radio Corporation, 136 Liberty Street, New York City, is the national distributor. Literature will be sent upon application to the manufacturer above.

Booklet Issued By Bruno Corp.

The Bruno Radio Corporation, 40 Paynter Avenue, Long Island City, New York, has just brought out a very helpful and interesting booklet on how to build Bruno Drum Control receivers. This booklet is well printed on good stock, profusely and handsomely illustrated and will prove a welcome addition to the library of the up-to-date fan. It covers, among other things, the "Brunola" 3-tube regenerative receiver; the "Brunola" 4-tube Brownings-Drake receiver; the 5-tube improved "Diamond of the Air" receiver and the "Brunola Grand 6 receiver." All of these have pictorial diagrams. By virtue of an agreement with the Clapp-Eastham Co. and the Westinghouse Electric Mfg. Co., owners of the Armstrong patents, the Bruno Radio Corporation has obtained the right to merchandise regenerative kits. The parts used in the Bruno Drum Control receivers are made by twenty of the leading radio manufacturers. The booklet is sold for 25 cents.

K. W. RADIO CO. BECOME MAJESTIC DISTRIBUTORS

The K. W. Radio Co., 98 Park Place, well-known distributors of high-class parts and appliances, has just been appointed exclusive distributors of the Majestic line of B Eliminators for lower Manhattan. They will carry in stock at all times a complete line of models of this excellent eliminator. This includes the Majestic super B which provides full voltage for up to 10 tubes. Due to quantity production, this model has been recently reduced in price. Judging from their continued success with other lines and the wide distribution achieved in this territory by this house on their Ce-Co tube campaign, they will do well with the Majestic line.

American Firm Wins Chinese Station Bid

Louisville, Ky.

The contract for a two-kilowatt broadcasting station, with wavelength of 250 to 550 meters, for installation at Mukden, has been awarded to a French firm, states a report from Vice Consul Angus I. Ward, Mukden, China, made public by the Louisville office of the Department of Commerce recently. An American firm has received the contract for the installation of a one-kilowatt station, with similar wavelength in Harbin.

These two stations should be in operation early in 1927, it is said, and a new market for receiving sets will be opened as the installation and operation of radio receiving sets was previously prohibited, except for military purposes, in Manchuria outside of the South Manchuria Railway zone.

Receiving sets will be taxed and licensed according to type and size; the license fee for crystal sets to be approximately \$3 a year, tube sets \$6 a year and a tax of 10 per cent ad valorem in addition to the regular customs duties, will be imposed on imported sets. Dealers in radio receiving sets will be licensed, a deposit of approximately \$5 will be required of all dealers prior to the issuance of the license.

NEW CORPORATIONS

The H. H. Eby Manufacturing Company, Inc., Philadelphia, Pa., \$250,000, Hugh H. Eby, Nobe Vista. (Incorporated under the laws of Pennsylvania.)

Western Radiola Electric Company, Oklahoma City, Okla., \$15,000; John Connolly, Sr., John Connolly, Jr., Charles W. Johnson, all of Oklahoma City. (Incorporated under the laws of Pennsylvania.)

Everett Radio Supply Company, Everett, Ore., \$10,000; Gerald B. Smith, Leslie Smith, and Edward Lee. (Incorporated under the laws of Oregon.)

Bethlehem Radio Corp., radio telephone and telegraph, \$100,000; J. M. Frere, Wilmington, Del. (Incorporated under the laws of Delaware.)

North American Radio Corp., N. Y. City, radio, auto and airplane supplies, \$125,000; S. Goldman, B. and A. Meyer (Atty.), S. D. Cohen, 8 West 40th St., N. Y. City.)

Trilling Specialty Co., Inc., 2012 South State St., Chicago, Ill., engage in the retail and wholesale auto supply, tire and radio business, \$10,000; Henry Trilling, Albert Trilling, Joseph Trilling (Atty.), 10 South LaSalle St., suite 938, Chicago, Ill.)

Sensirad Corporation, Jacksonville, Fla., deal in radio, electrical instruments, 100 shares, no par, 100 shares, par value, 100 each, A. H. Seager, president and treasurer; J. H. Oden, vice-president; William R. Petticrew, secretary. (Incorporated under the laws of Florida.)

Z. & R. Radio Co., Atlantic City, N. J., \$3,000; Alexander Zable, Theodore Rommerade, Abe Zable, Atlantic City, (Atty.), W. L. Gallagher, Atlantic City, N. J.)

Kinsbridge Radio Shop, Bronx, N. Y. City, \$10,000; F. R. Harris, W. Bonyne, M. L. Cohen (Atty.), M. A. Harris, 1451 Broadway, N. Y. City.)

Village Radio & Auto Supply Co., N. Y. City, \$20,000; S. Sisenwein, P. Danziger, L. Silver (Atty.), J. A. Levee, 1440 Broadway, N. Y. City.)

Radio Home Builders, Perth Amboy, N. J., \$5,000; Hal B. Alston, Rahway; Fred G. Pfeiffer, East Orange; Henry Kuntz, Brooklyn, N. Y. (Harry S. Medints, Perth Amboy, N. J.)

Custombilt Radio Corp., N. Y. City, \$10,000; D. Fishman, L. Harris. (Atty.), L. W. Beilin, 1440 Broadway, N. Y. City.)

Cicenia & Higgins, N. Y., radios, \$25,000; William Cicenia, William M. Higgins, August C. Ulrich, Newark, N. J. (Attys., Lintott, Kahrs & Young, Newark, N. J.)

Vicco Radio and Phonograph Co., Bronx, N. Y., \$10,000; V. and R. Lichtenberg, A. Waldmann (Atty.), H. A. Steinback, 250 West 57th St., N. Y. City, N. Y.)

Artercraft Radio-Ship Corporation, N. Y. City, radio parts, \$100,000; L. N. Field, B. Modell, G. Josephs. (Atty.), M. Rosenthal, 645 East Tremont Ave., N. Y. City, N. Y.)

Indiana Radio & Service Corporation of Terre Haute, Inc., Terre Haute, Ind., \$10,000; deal in radios and electrical appliances; Noel C. Whitney, Charles C. Newlin, Andrew C. Allison. (Incorporated under the laws of Indiana.)

NAME CHANGES

Automotive and Radio Mfg. Corp., N. Y. City to Armco Mfg. Co.

Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

RADIO WORLD,
145 West 45th St., N. Y. City.

I desire to receive radio literature

Name

Address

City or town

State

Arthur J. Barron, 309 S. Pennsylvania Ave., Shawnee, Okla.

William Boehm, 882 Sedgewick St., Brooklyn, N. Y.

Roy H. Hutchinson, 4453 Lake Park Ave., Chicago, Ill.

Albert Baker, 1938 Wolf St., Philadelphia, Pa.

C. C. Cook, 130 1st St., Watsonville, Calif.

Marvel Radio Co., 32 Saratoga St., Springfield, Mass.

J. M. Cain, 537 North Lime St., Lancaster, Pa.

Harry W. Dohler, 816 East Lombard St., Baltimore, Md.

R. H. Kapsinow, 1608 Atlantic Ave., Atlantic City, N. J.

Paul E. Thornton, 2002 Avenue N, Galveston, Texas.

Joseph Nobile, 282 First St., Jersey City, N. J.

Martin Stojan, 404 First St., College Point, L. I., N. Y.

O. Heartberg, 2028 Davidson Ave., New York City, N. Y.

Harold Francis, 47 Crocker Ave., Johnson City, N. Y.

Grantwood Radio Works, 730 Palisade Ave., Grantwood, N. J.

Daniel F. Buckley, 3712 Falls Road, Baltimore, Md.

James R. Stewart, Catawaba, N. C.

John H. Spang, 3505 Liberty Ave., Fresno, Calif.

Joe G. Highfill, 3204 Mantica Ave., Philadelphia, Pa.

R. R. Laranger, 5725 Osage Ave., Philadelphia, Pa.

A. V. Petersoa, 201 West Ave., Pitman, N. J.

A. W. Schwarz, 434 West Grand St., Elizabeth, N. J.

E. H. Dyson, 216 Virginia Ave., Mt. Washington, Pittsburgh, Pa.

Roy White, 1410 Stevens Ave., Minneapolis, Minn.

W. H. Biddurant, 1756 Page Ave., East Cleveland, O.

W. B. Riggs & Co., 848 East Park Ave., Winter Park, Fla.

D. L. Cunningham, Box 1025, Burkburnett, Tex.

I. E. White, 4711 North 11th St., Boise, Idaho.

C. Teretsky, 724 Blake Ave., Brooklyn, N. Y.

Fred Martin, 1216 24th Ave., Meridan, Mass.

Harold E. Rice, 227 Hollandt St., Somerville, Mass.

O. R. R. Stri-ly, Box 25, Syracuse, Ind.

Fred J. Merklein, 321 Marion St., Brooklyn, N. Y.

Allen Horenstein, 236 Blake Ave., Brooklyn, N. Y.

Arthur Giles, 125 Sherman St., Brooklyn, N. Y.

Fred Corbett, 12 East Mineola Ave., Valley Stream, L. I., N. Y.

C. A. Lane, 1407 9th St., Altoona, Pa.

Apex Radio Laboratories, 313 Third Ave., New York City.

William Rossman, 1828 North 17th St., Philadelphia, Pa.

John H. Dunlap, 4 B Dover St., North Cambridge, Mass.

Ralph Weller, 322 Bird Ave., Buffalo, N. Y.

George J. Beith, 1008 Virginia St., Martin's Ferry, O.

Lake Stores, Mosherville, Mich.

N. T. Gilbert, Box 654 Grand Rapids, Mich.

Harold N. Weberm, 8521-114th St., Richmond Hill, Long Island, N. Y.

Arthur E. Blood, 2006 No. 8th St., Terre Haute, Ind.

J. R. Coffey, 310 E. 43rd St., Austin, Texas.

Clarence Klinger, 108 N. 11th St., Coshocton, Ohio.

Earl Parrott, 135 So. Grand Ave., Los Angeles, Calif.

Geo. E. Sleeman, 6 Gore St., Toronto, Ontario, Can.

Robert A. Hediger, 213 Douglas St., Centralia, Ill.

C. C. Dibrell, 803 C St. N. W., Ardmore, Okla.

Paul G. Archer, Waynesburg, Pa.

C. A. Punched, 273 Jackson St., Hempstead, N. Y.

Dollar Nadeau, 919 Ontario E., Montreal, Canada.

Aaron Michel, 15 West 38th St., New York, N. Y.

Fred J. Merklein, 321 Marion St., Brooklyn, N. Y.

R. Cisick, 60 Guilford Ave., Buffalo, N. Y.

M. E. Kuhn, 501 East Liberty St., Chambersburg, Pa.

F. J. Benert, 367 75th St., Brooklyn, N. Y.

Karl Petersen, 1575 Maccomb's Rd., Bronx, N. Y.

Harry Wright, 920 Prospect Ave., Bronx, N. Y.

TRADE NOTES

Atlanta, Ga.

W. A. Loveland, formerly connected with the Sterchi Furniture Company, has formed the Central Radio Service, located in the Wellhouse Building, for the purpose of servicing and repairing all types of radio receivers.

V. Avis McCorvey has joined the new company.

* * *

Dallas, Tex.

The radio show recently held in Dallas, under the sponsorship of the Dallas News-Journal, was a tremendous success. It is estimated that about 40,000 fans attended. WFAA, the News and Journal station, broadcasted every night from a temporary studio, erected in the exposition building. Stations KRLD and WRR, co-operated in disseminating entertainment, on two nights of the week.

* * *

New Orleans, La.

B. V. Redmond & Son, 108-114 North Peters St., have been appointed distributors for the Elkton trickle charger.

* * *

New Orleans, La.

Louis Rose, of the Rose Radio & Electrical Supply Shop at 129 Camp Street, has enlarged his store, due to the increase in sales. Mr. Rose has built a mezzanine floor over the supply room of his store in order to extend the display room and to make space for a sound-proof demonstration room. The repair and service department is in the rear of the store.

* * *

Oklahoma, Okla.

The Western Radiola Electric Company has recently been organized in Oklahoma

City with C. W. Johnson as its head. Johnson was formerly sales manager for the Paige Motor Car Company. Associated with him in the radio shop is John Connally Jr., son of the state fire marshal. The new company is located at 416 North Robinson Avenue.

* * *

Peekskill, N. Y.

Peekskill's new radio center, No. 9 Union Avenue, recently opened where all the latest in sets and accessories are displayed. In charge of the store is Willis LeClair.

* * *

Tarentum, Pa.

The Radio Association of Hanover met recently in the Elk's club rooms, with Wm. R. Carter in the chair. The meeting was well attended, and reports from various committees were very encouraging. The Association now has about 125 members.

At the meeting the following were elected to serve on a board of directors: H. M.

Folmer, E. J. J. Gobrecht, F. G. Kintzing, A. S. Ruth, Dr. C. E. Stine and J. E. Flickinger.

* * *

Chattanooga, Tenn.

J. M. Brown, well-known in radio circles, has been placed in charge of the radio department of Sterchi Bros. & Fowler, retailers of the A. C. Dayton five and seven-tube sets. The department also handles the Radio Corporation of America radiola, as well as a full stock of tubes, batteries and other accessories.



FREE RADIO CATALOG & GUIDE of 1927 ideas in 164 pages of special book-ups with illustrations. Shows savings up to 50% on standard radio parts, sets, kits. Be sure to get this thrifty book before you buy. Also please send address of another radio fan. Write letter or postal NOV BARAWIK CO., 560 Monroe St., CHICAGO, U. S. A.

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Mass production will enable this company to put this six-tube wonder on the market at a price to the ultimate consumer defying competition, and returning a handsome profit to the shareholders.

Mr. Bernard needs no introduction to the readers of the Radio World and radio fans in general. For years he has occupied a foremost position as radio expert, inventor, and broadcaster over the radio on all matters pertaining to radios and their installation.

The fact that Mr. Bernard has given his name to this latest creation is sufficient guarantee of its success.

The Bernard Radio Corporation is capitalized under the laws of Delaware for fifty thousand shares of no par value. The first offering of these shares will be at ten dollars per share. Each subscription will be limited to a maximum of fifty shares. You may subscribe to any amount up to that number.

Sign and detach request below for further information

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Vitalitone Radio Corporation 88-RW University Place, N. Y.

Minneapolis Proposes Own Control of the Air

License Fee Proposed and Even Stations Outside the City Would Be Taxed, If Studio or Equipment Used Were Inside the Municipal Limits

Minneapolis, Minn. Broadcasting stations would be licensed by the city council and restricted as to capacity, which would mean that all commercial stations in excess of 50 watts would have to move outside the city limits, under terms of an ordinance which was submitted to the council ordinances

and legislation committee at its public hearing recently.

A license fee of \$50 a year would be required for commercial stations and \$10 a year for noncommercial, such as educational institutions and churches.

Under terms of this ordinance:

- (1) No station shall operate with more than 50 watt capacity, except in the day time, when stations may use 250 watt capacity.
- (2) Noncommercial stations would be prevented from operating from 6 p. m. to midnight.

(3) The city council would retain control of stations located outside the city, where the studio or any equipment was inside the city limits, such stations to pay the regular license fee.

(4) A "blooper" clause, prohibiting any listener from using a set which causes "high frequency electromagnetic or electrostatic waves to radiate from the antenna."

(5) Violation is punishable by a fine of not more than \$100 or 90 days in the workhouse.

The ordinance, prepared by the city legal department, is based on a survey by J. C. Vincent, assistant engineer, and Oscar M. Frykman, chief electrical inspector in the building department.

In their report to the committee, they recommend that in order to reduce the "field intensity" to proper strength, stations with 100,000 watt capacity must be located at least 25 miles from the nearest city limits; with 50,000 watt capacity, 15 miles; 25,000 watt capacity 12½ miles; 10,000 watt capacity, 10 miles; 5,000 watt capacity, 2 miles and 250 watts 1 mile.

These provisions also are embodied in the ordinance which is the subject of considerable debate.

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Midget Antenna Switch65

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

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Chicago, Ill.

Joint Board Acts Fast on Interference Cases

San Francisco.

The campaign to reduce radio interference in San Francisco now being waged by a joint committee representing the Pacific Gas and Electric Company, the Great Western Power Company and the Pacific Radio Trades Association, is well under way and proving successful, according to a recent report of the radio association for the month of December.

According to this report a total of twenty-two complaints were received from

local listeners during the month, and in the majority of instances were investigated by the association's technical expert the same day received or the next day. An average of seven and one-half hours were spent on each complaint demonstrating that the tracing of interference causes is one which takes time.

Due to the intermittent feature of the interference the report points out that in several instances the immediate causes have not yet been determined, but with the cooperation of listeners concerned in immediately notifying the association's expert when the interference again arises it is hoped in the very near future to determine the exact cause and, if possible, to eliminate it.

An interesting feature of the report is the fact that in only two instances were disturbances traceable to power lines.

"For Better Tone-Quality—use CeCo"

Says Kenneth Harkness in his description of the KH-27 Receiver—See page 14, this issue



"The Tubes of Longer Life"

You'll see the difference in tone, volume and distance. Just be SURE you get the genuine CeCo Tubes. There is no "just as good".

Two New Members of the **CeCo** Family



Type AX

Storage Battery
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Price \$2.00

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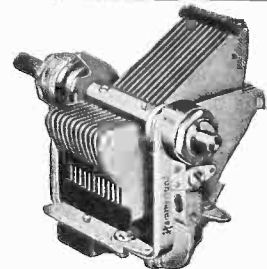
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For Better Radio
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PRECISION
PRODUCTS

Radio Bill's Provisions Outlined By Framers

(Concluded from page 19)

of either the House bill or the Senate amendment.

Section 11 authorizes the licensing authority which means the commission or the Secretary of Commerce depending upon whether the application is filed within one year or after one year, to issue licenses upon examination of the application if it determines that public interest, convenience, or necessity would be served by the granting thereof.

It provides, however, that in the event the licensing authority upon examination of an application does not reach such decision with respect thereto, it shall then notify the applicant and fix and give notice of a time and place of hearing on the application.

The section also provides that licenses shall carry notice to the holder, of certain conditions to which the license is subject. This provision is substantially the same as a similar provision in the House bill and in the Senate amendment.

There is carried also in this section during the first year in which the commission has original jurisdiction on, authority to the Secretary of Commerce to act in cases of emergency when the commission is not in session, but with the provision that any action of the Secretary authorized under the paragraph shall continue in force and effect only until the commission acts on the matter.

Section 12 is substantially the same as a corresponding section in the House bill and in the Senate amendment.

Sections 13, 14 and 15 are substantially the same as comparable provisions in the House bill and in the Senate amendment dealing with the same subjects.

Section 16 provides for appeals and is a compromise between the views of the two Houses. By the terms of the House bill all appeals were to the Court of Appeals of the District of Columbia. Under this provision all appeals except as to revocation of licenses go to the Court of Appeals of the District of Columbia.

Appeals upon questions of revocation may be taken either to the Court of Appeals of the District of Columbia or to the District Court of the United States in the district in which the station and apparatus covered by the license is located. This latter provision appeared in the Senate amendment.

Section 17 is identical with the corresponding provision in the House bill and in the Senate amendment.

Section 18 was not embodied in the House bill. It is a modification of one of the sections of the Senate amendment. It provides in substance that if any licensee shall permit a legally qualified candidate for public office to use a broadcasting station the licensee shall afford equal opportunities to all other candidates for the same office to use the station.

Section 19 is substantially the same as the corresponding provision of the House bill and the Senate amendment.

Section 20 appeared in the House bill. Section 21 provides for the issuance of construction permits and is the same as the provision dealing with the same subject matter in the House bill.

Sections 22, 23, 24, 25, 26, 27, and 28 are found in both the House bill and in the Senate amendment.

Section 29. That part of section 29 which refers to the power of censorship and to the freedom of speech is taken from the Senate amendment, there being no similar provision in the House bill.

Section 30 deals with the use of Government stations in commercial business. There was no similar provisions in the House bill. Authority to use Government stations for the transmission of press messages and commercial messages was given by a joint resolution of Congress approved June 5, 1920, as amended. The section which appears in this bill is the resolution of June 5, 1920, as amended, with very slight change therein.

Sections 31, 32, 33, 34, 35 and 36 are substantially the same as corresponding provisions of the House bill and the Senate amendment.

Section 37 aims to make available for

the purposes of this act funds heretofore appropriated for radio purposes and gives authority for like appropriations hereafter.

Section 38 is similar to a corresponding provision in the House bill and the Senate amendment.

Section 39 repeals previous legislation with respect to radio which is either in conflict with or is superseded by the present bill.

Section 40 provides that the act shall take effect immediately but that for a period of 60 days no holder of a license or an extension thereof under the act of 1912 shall be subject to the penalties provided in this act for operating a station without the license herein required.

Section 41 authorizes the act to be cited as the radio act of 1927.

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Managers on the part of the House.

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1 K.H.-27 Kit of Essential Parts, \$35.00;
8 Hammarlund 17-plate condensers (Mid-line of S.L.F.); 1 Yaxley Rheostat, 10 ohms; 1 Yaxley Fixed Resistance, 2 ohms; 1 Yaxley Battery Switch, Midget Type; 1 Yaxley Pilot Light Bracket; 1 Yaxley Open Circuit Jack, Junior type; 1 Yaxley Antenna Switch, Double circuit, Junior type; 1 Micamold Grid condenser, .00025 M.F. with G.L.

mounting; 1 Micamold fixed condenser, .001 M. F.; 2 Micamold fixed condenser, .002 M.P.; 1 Micamold grid leak mounting; 1 Micamold grid leak, 2 or 3 megohms; 2 Dublitor 1 MFD Condensers; 2 X-L Variometers Type G 1 (.0001 Max.); 4 Amperites (3 Type 1A and 1 Type 112); 2 Aristocrat Variable Port Dials; 11 Eby Binding Posts, engraved; 1 8 Volt Lamp for Pilot Light.

Total Cost.....\$65.00

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- The National Power Amplifier, Dec. 25, Jan. 8, 15, 22, 1927. 4 copies 60c.
- The Bernard, Oct. 16, 23, 1926. 2 copies 30c.
- The Antennaless Receiver, Nov. 27, Dec. 4, 1926. 2 copies, 30c.
- The Regenerative Equamatic, Dec. 4, 1926. 15c per copy.
- The Equamatic, Oct. 2, 9, 16, 23, 1926. 4 copies, 60c.
- The Lincoln Super-Heterodyne, Dec. 4, 1926. 15c per copy.
- The 3-Tube Karas, Dec. 11 and 18, 1926. 2 copies, 30c.
- The Lynch Amplifier, Jan. 1, 8, 15 and 22, 1926. 4 copies, 60c.

Or send \$6.00 for yearly subscription and get as a premium any one set of circuit copies noted above. No other premium with this offer.

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MICALMOLD RADIO CORPORATION
1089 Flushing Avenue Brooklyn, N. Y.

Neutralizing the KH-27

(Concluded from page 14)

battery specified is not required. However, this battery lasts indefinitely as the current consumption is very small.

When all the accessories for the power installation have been obtained, connect them to each other and to the set as shown in Fig. 2. The automatic relay switch plugs into the house current. The B eliminator and the trickle charger both plug into the relay switch.

In this diagram of Fig. 2 it will be noted that resistances are shown in series with the B eliminator leads. These resistances are not always necessary but are usually required to eliminate "fluttering" or "motor-boating." This audio frequency oscillation is caused by the common plate resistance of the B eliminator and can be eliminated by the resistances shown. The resistances R1 and R2 are 5,000 or 10,000 ohm Ward Leonard or Tobe Veritas resistors. R3 is a Clarostat. All three may not be needed. The Clarostat (R3) may be sufficient to eliminate motor-boating. If a Blandin cabinet is used to house the set these resistors can be mounted on the rear of the sub-panel.

Change Amperites

When this power installation is used the Amperites in the KH-27 Receiver itself *must* be changed. The resistance of the relay switch is connected in series with the filament circuit and reduces the voltage impressed across the A battery binding posts of the set. Distortion will result if the Amperites are not changed as the full 5 volts are not impressed across each tube. Change the type 1A Amperites to type 112 and change the type 112, in the last stage, to a type 1. The aerial and ground are connected in the usual manner, as previously described, and the tubes inserted in their sockets.

How to Neutralize the Set

When the set has been installed with either of the outfits described above, it must be neutralized before it is ready for steady operation.

Turn on the battery switch, turn the rheostat volume control to its maximum position and plug in your loudspeaker. Turn antenna switch to the left.

Then take the second radio frequency amplifier tube out of its socket. Wrap some paper round one of the filament prongs and replace the tube in its socket so that it does not light. Then tune in some local station and adjust the capacity of the second neutralizing con-

denser (Variodenser) with an insulated screw driver. At a certain value of capacity the signal will be practically inaudible. If the capacity is increased or decreased the signal again becomes audible. Set the neutralizing condenser at the point at which the signal is inaudible. Then remove the paper from the filament prong and replace the tube in its socket.

Perform the same operation, as described above, with the first radio frequency amplifying tube, adjusting the first neutralizing condenser until the signal is inaudible or at minimum audibility. Remove the paper and replace tube. The set should now be neutralized. If it oscillates when the tuning dials are turned in unison, adjust the neutralizing condensers slightly until the oscillations disappear.

If your antenna is unusually long and you want to increase selectivity, insert a fixed condenser (about .0001 mfd.) in series with the antenna.

The writer of this series of articles will be glad to answer any questions concerning the KH-27 receiver if they are addressed to him in care of RADIO WORLD, 145 West 45th Street, New York.

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[Newsdealers or radio dealers, order the booklets with blueprints included, in quantity, direct from American News Co. or branches.]

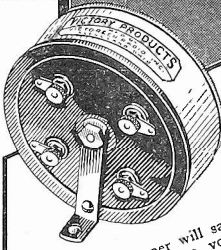
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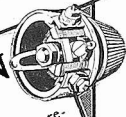
The heart of the Victoreen circuit is found in the four Victoreen RF Transformers and the Victoreen Coupling Unit used with them.

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They make the Victoreen a Super Set without an equal.

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35 Stations Will Send Speech by Coolidge

Record Number, From Coast to Coast, a Geographical Scope Never Before Achieved, Will Transmit Washington's Birthday Address

For the first time since his inaugural, the people of the United States will have the opportunity to listen to President Coolidge through a nationwide broadcasting of his address. Before a joint session of Congress at 12:30 P. M. on Washington's Birthday, February 22, the President will face a microphone connected to thirty-five broadcasting stations located in a like number of cities in the United States, from the Atlantic to the Pacific. This is a record tie-up for such a broadcasting feature. The National Broadcasting Company, through its President, Merlin Hall Aylesworth, upon the invitation of the United States Commission for the Celebration of the Two Hundredth Anniversary of the Birthday of George Washington, has tendered the

government its facilities for the interconnection of these stations, thereby permitting the simultaneous broadcasting of the President's address throughout the entire country.

The largest chain ever used before for this purpose was on the occasion of President Coolidge's inaugural, March 4, 1924, when twenty-seven radio stations comprised a coast-to-coast hook-up.

Following is a list of broadcasting stations which will participate: WEAJ and WJZ, New York; WEEI, Boston; WJAR, Providence; WTAG, Worcester; WCSH, Portland, (Me.); WTIC, Hartford; WGY, Schenectady; WGR, Buffalo; WBZ, Springfield, (Mass.); WLIT, or WFL, Philadelphia; WRC, Washington, D. C.; KDKA and WCAE, Pittsburgh; WTAM, Cleveland; WWJ, Detroit; WSAI, Cincinnati; WLIB or WGN and KYW, Chicago; KSD, St. Louis; WOC, Davenport; WCCO, Minneapolis-St. Paul; WDAF, Kansas City (Mo.); WHAS, Louisville; WSM, Nashville; WSB, Atlanta; WMC, Memphis; KOA, Denver; KPO, San Francisco; KGO, Oakland, (Cal.); KFI, Los Angeles; KGW, Portland (Ore.); KOMO and KFOA, Seattle, and KHQ, Spokane.

Speaking in the House of Representatives, President Coolidge's voice will be "picked up" by microphone and brought by special telephone circuits to New York City, where it will enter the National Broadcasting Company's "speech input" apparatus located in the company's head-

quarters at 195 Broadway. From these a local circuit will transport it to WEAF's transmitter at 463 West Street. Another local circuit from 195 Broadway takes it to 24 Walker Street, also in New York City, where it joins the distributing lines of the Bell System, which carry the voice to the various stations participating. Approximately 25,000 miles of wire will be utilized in bringing the President's address to every city, village, mountain-side hill and valley in the United States.

WGY, the General Electric Company's broadcasting station at Schenectady, N. Y., and KDKA of the Westinghouse Electric and Manufacturing Company will in all probability broadcast this event on both long and short wavelengths in addition to their regular broadcasting waves. Providing the atmospheric conditions does not interfere, there is no doubt but that the President's voice will be heard in both Europe and South America.

Radio Club Elects Officers for Year

The Radio Club of America has elected officers for 1927 as follows: Ernest V. Amy, president; C. R. Runyon, Jr., vice president; Thomas J. Styles, corresponding secretary; Joseph Stantley, treasurer; David S. Brown, recording secretary.

The following directors, to serve during 1927, were elected by the membership:

Edwin H. Armstrong, George J. Eltz, Jr., Louis G. Pacent, George E. Burghard, John F. Grinan, Pierre Boucheron, Lewis M. Clement.

QUIP ABOUT DRINK 'PHONED Washington.

Greetings of the Institute of Radio Engineers were conveyed to A. H. Shaughnessy, director of Radio of the British Post Office, by Dr. J. H. Dellinger, chief of the Bureau of Standards Radio Laboratory, over the recently inaugurated wireless telephone service between New York and London. During the conversation Dr. Dellinger expressed a hope that Mr. Shaughnessy would be in Washington for the international conference next Fall and that he would have dinner with him one evening.

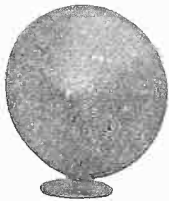
"Fine," replied Mr. Shaughnessy. "But what will you have to drink?"



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The Bernard Electric

Bronze Beauty

is described in this week's issue (February 12) by Herman Bernard. This installation consists of the Bernard 6-tube receiver, a combination eliminator of A battery and of charger, B battery eliminator and a method of eliminating the C battery. The A supply switch on the front panel controls everything. No accessory or part requires any attention, not even so much as adding a drop of water. And remember that positively no battery of any kind is used. The design is for alternating current supply. Even the aerial may be taken off the line. In the February 19 issue a DC eliminator will be discussed as well as the construction of a B eliminator for AC. Send 15 cents for the February 19 issue, to have series complete, as it is sure to be a sell out as soon as it is learned that the problem of total elimination of all batteries and chargers has been solved.

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What! No Volume Left When Using Power Tube?

Something Wrong Somewhere, and It Isn't in the Claims Made for the Valve—Remedies Set Forth—Why Speaker Armature Sticks Against Pole Pieces

By Cromwell Forrest

The advent of the high power output tubes has brought a few perplexities to the fans. They have been told that the power tube will increase the volume of their set and also improve the quality. They get one and put it in the last socket. The volume may not be nearly as great as the volume they had with the smaller tube. The quality is not improved. The first reaction is that they have been misled, and they proceed to express themselves.

Now, the trouble is not that the claims for the tube are wrong or misleading, but that the fan is putting new wine in old bottles. If the fan took time to read the claims for the tubes he would find that they set forth that the performance under the circumstances would be just what they have found. They also explicitly state what must be done to get the increased volume and better quality out of them.

Now, what are the claims for the power tubes, such as the CX-371? The first is that the plate voltage should be 135 to 180 volts. Perhaps the receiver is wired for 90 volts on the plate of the tube. Another condition imposed by the power tubes is that the grid voltage should be rather high. On the 371 it is 27 for 135 plate volts and 40.5 for 180. Possibly no provision at all has been made for a grid bias in the receiver. This factor alone would preclude all improvements in the performance of the set, until the wiring change is made.

Needs More Filament Current

There is still another change that must be made in the circuit to adapt it to the power tube. The smaller tubes require only .25 ampere on the filament; the power tube takes twice that amount. Now if the set has been designed for the use

of small tubes such as the UV-201-A or CX-301-A there may be a rheostat or a filament ballast which admits of only one quarter ampere, although rheostats commonly pass an ampere without heating. When a power tube is inserted into the last socket either the rheostat must be adjusted to admit just half ampere or else a new ballast resistor must be used, e. g., 112 Amperite. It is necessary for proper operation of this type of power tube that the filament current be one-half ampere.

There is still more to be done to get the most out of the power tube, and that has reference to the speaker used with it. Many people still use phones and speakers which were especially designed for crystal sets and single tubers. These phones are sensitive and have high impedances. They are not suitable for power tubes at all. In the first place the impedance of the power tube is such that it does not at all match the old style speaker. It was sensitive on crystal sets and single tube sets but not so sensitive on power tubes. This counts against the volume obtainable with the power tube. Although the volume is not as great as was expected it is much greater than the speaker can stand. Blasting occurs on all but the very weakest passages in a program. The pole pieces are too close to the armature in these speakers, and the slightest overload will cause the armature to strike against the poles. A disagreeable buzzing is all

that can be heard under such cases. Of course the tube is blamed for this because the fan knows that "the unit is all right." It worked fine on the crystal set!

The Armature Sticks

One of the main reasons why the armature strikes the pole pieces when a high impedance speaker is used with a power tube is the direct current component of the plate current. This is very much greater for the power tube than it is for any of the smaller tube. The direct current unsets the balance of the armature and permanently holds it nearer one pole piece than the other. In fact, in some cases it not only holds it nearer one pole piece but actually holds it firmly against it. In such cases the signal is efficiently stopped. The weak signals cannot budge the armature from the pole piece, and the very strongest signals can only wrest it away a little bit. The power tube was not intended for improvised loud speakers but for loud speakers able to handle the wattage that the tubes put out.

One recommendation which must be complied with before the power tubes will perform safely and most efficiently is the separation of the AC and the DC components of the plate circuit. There are two methods of doing this. One is to use an output transformer between the tube and the speaker. The direct current stays in the primary. The AC component goes over into the secondary and thence into the speaker. The other method is to put a large condenser in series with the speaker and to supply the plate voltage to the tube through a large audio frequency inductance coil. The condenser in series with the speaker should not be smaller than 4 mfd. and the choke coil should not be smaller than about 50 henrys. Doubling the size of each will do no harm at all, in fact will improve the quality. One of these methods should be employed no matter what speaker is being used.

The Amplification

When using the choke coil and condenser method one side of the speaker should be connected to the negative end of the filament and the other should be connected to the condenser. The opposite side of the condenser should be connected to the plate of the tube and to one side of the choke coil. The second terminal of the choke coil of course goes to the source of B voltage.

There is a misunderstanding prevalent (Concluded on page 30)

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Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in recent issues of RADIO WORLD: 1926:

- June 5—Five-Tube Compact Receiver, by J. E. Anderson. A Tester for Tube Circuits, by Spencer Hoel. Problems of Portables, by Hugo Bernsbach.
- June 19—Selectivity's Amazing Coll., by J. E. Anderson. The Light 5-Tube Portable Set, by Herman Bernard.
- July 3—Set with a 1-Turn Primary, by Herman Bernard. Part 2 of the Victoreen Portable, by H. Bernard. Trouble Shooting Article for The Light 5-Tube Portable.
- July 10—A Rub in Single Control, by Herman Bernard. A DX Double Regenerator, by Capt. P. V. O'Rourke. A 2-Tube Dry Cell Receiver, by Samuel Schmalz.
- July 17—A Double Duty Loop Aerial, by J. E. Anderson. How to Measure Coupling, by John Rider. A 1-Control Crystal Set, by Smedley Lyons.
- July 24—Why the Super-Heterodyne Is the Best Set, by Herman Bernard. A 1-Tube Reflex Receiver, by H. A. Reed.
- July 31—What's Best in an AF Amplifier, by Herman Bernard. A 5-Tube Reversed Feedback Set, by K. E. Humphrey.
- Aug. 7—The 5-tube Pabod, by A. Irving Witt. The wiring of Double Jack, by Samuel Lager.
- Aug. 14—The Improved Browning-Drake, by Herman Bernard (Part 1). Storage Batteries, by John A. White.
- Aug. 21—A New Stabilized Circuit, by E. H. Loftin and S. Y. White (Part 1). The Browning-Drake by Herman Bernard (Part 2).
- Aug. 28—The Constant Coupling, by E. H. Loftin and S. Y. White (Part 2). The Browning-Drake, by Herman Bernard (Part 3).
- Sept. 4—The Four Rectifier Types, by K. E. Humphrey. A Simple Battery Charger, by J. E. Anderson.
- Sept. 11—The Beacon (3-tubes), by James H. Carroll. The 1927 Model Victoreen, by Herman Bernard.
- Sept. 18—The 1927 Victoreen, by Arthur H. Lynch. Eliminator in a Cash Box, by Paul R. Fernald.
- Sept. 25—The Lynch Lamp Socket Amplifier, by Arthur H. Lynch. Wiring up the Victoreen, by Herman Bernard.
- Oct. 2—The Victoreen (Continued), by Herman Bernard. New Equamatic System, by Capt. P. V. O'Rourke.
- Oct. 9—A Practical "A" Eliminator, by Arthur H. Lynch. Building the Equamatic, by Capt. P. V. O'Rourke.
- Oct. 16—The Bernard, by Herman Bernard. How to Box an "A" Supply, by Herbert E. Hayden.
- Oct. 23—The 5-tube P. C. Samson, by Capt. P. V. O'Rourke. Getting DX on the Bernard, by Lewis Winner.
- Oct. 30—The Singletrot Receiver, by Herbert E. Hayden. How to Get Rid of Squeals, by Herman Bernard.
- Nov. 6—Reduction of Interference, by A. N. Goldsmith. Variations of Impedances, by J. E. Anderson.
- Nov. 13—The 4-tube Hi-Power Set, by Herbert E. Hayden. A Study of Eliminators, by Herman Bernard.
- Nov. 20—Vital Pointers About Tubes, by Capt. P. V. O'Rourke. The 4-tube Diamond of the Air, by Herman Bernard.
- Nov. 27—The Antennalness Receiver, by Dr. Louis B. Blan (Part 1). Short Waves Yield Secrets, by L. H. Prescott.
- Dec. 4—The Regenerative 5-Tube Set, by Capt. P. V. O'Rourke. The 8-tube Lincoln Super, by Sidney Stack. The Antennalness Receiver, by Dr. Louis B. Blan (Part 2). Winner's DC Eliminator, by Lewis Winner.
- Dec. 11—The Universal Victoreen, by Ralph G. Hurd. Some Common Fallacies, by J. E. Anderson.
- Dec. 18—Selectivity on One Tube, by Edgar Spears. Eliminating Interference, by J. E. Anderson. The Victoreen Universal, by Ralph G. Hurd (Concluding Part).
- Dec. 25—A New Coupling Device, by J. E. Anderson. Functions of Eliminators, by Herman Bernard.
- Jan. 1, 1927—The 2-Tube DeLuxe Receiver, by Arthur H. Lynch. The Twin-Choke Amplifier, by Kenneth Hartness.
- Jan. 8—Tuning Out Powerful Locals, by J. E. Anderson. A Choice Superheterodyne, by Brunsten Bruns. The 2-Tube De-Luxe Receiver, by Arthur H. Lynch (Part 3).
- Jan. 15—The DeLuxe Receiver, by Arthur H. Lynch (Part 3). The Simple Meter Test Circuit, by Herbert E. Hayden. The Super-Heterodyne Modulator Analyzed, by J. E. Anderson.

Any copy, 15c. Any 7 copies, \$1.00. All these 31 copies for \$4.25, or start subscription with any issue. RADIO WORLD, 145 West 45th Street, New York City.

Getting Best Results From Power Tube

(Continued from page 29)

about the volume which the power tube will deliver. It is thought that they will amplify the signal more than any other tubes. The fact is that the power tube will not amplify as much as some of the other tubes. The amplification constant of a CX-299 is about 6, that of a CX-301-A about 8, and that of a 112 about the same. The power tube CX-371 will only amplify 3 times. This means that if the power tube is to give its maximum output the voltage input to that tube must be very much greater than that required for the other tubes, with the exception that the lower plate impedance makes up for the low mu somewhat. But its undistorted output when it is operated correctly is many times greater than the undistorted output of the smaller tubes. That is the meaning of power in this case—great volume of undistorted power, provided that the input is great enough.

Correct English Taught By Woman from WGN

A class of more than 1,500 listeners are busy learning correct English over WGN, Chicago. Colletta M. Deignan, a teacher in the Chicago schools and a graduate of Chicago Normal College, is in charge of the radio class. Lesson sheets are sent out every week to the listener-students so that they can follow the work of the course. One lesson is broadcast each Monday afternoon at 5 o'clock.

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COMPLETE DATA on "How to Build a DC A and B Eliminator," were given in the Dec. 4 issue of RADIO WORLD, by Lewis Winner. Lucid photos and diagrams accompanied this excellent article. Either send 15c for this copy, or begin your subscription with this issue. RADIO WORLD, 145 West 45th St., N. Y. City, N. Y.

Henry Kost a Hit As Emotional Tenor

Henry Kost, tenor, who has been heard from WJZ, WHN, WGBS, and other New York stations, is an artist in two respects.



HENRY KOST

He draws and paints beautiful pictures and he sings emotionally and giftedly with fine tenor voice. A musical voice runs in the family, as his mother was a charming singer, and still can warble some. Henry has been engaged for commercial programs on the strength of his notable radio renditions.

Radio Dealers Gather To Set Service Charges

Allentown, Pa. A number of radio dealers of Bethlehem and vicinity gathered recently at the Hotel Bethlehem and effected an organization to be known as the Bethlehem Radio Dealer's Association. Charles E. Goodenough was elected president of the association, the members of which adopted a schedule of uniform radio service charges. Arthur W. Hill was named secretary and treasurer, and Charles C. Turck was elected publicity secretary.

The uniform schedule of service charges will include a \$10 charge for erecting an aerial. A demonstration charge of \$10 on all radios will also be made, this to be refunded on the purchase of any set. Three days will be allowed for demonstration.

St. Louis, Mo. The Robert Bennett Co., Syndicate Trust Building, has become factory representative for Archatron radio tubes.

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How to Make Adjustments for Right Voltages

(Concluded from page 10)

ception is proof that the Raytheon tube is functioning.

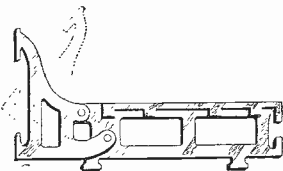
If a screech is heard, but no programs, reverse the A leads to Radi-A, as you have transposed the binding posts and switched the polarities.

Adjust knob A on the B eliminator, and also knob D, until the receiver tunes in low wavelength stations without oscillation. For correct negative grid bias on the power tube, adjust the Clarostat until the tone is purest, rather than merely loudest, and thereafter leave everything alone except the Bruno switch that controls everything.

Thus beauty of appearance and of audible tone are accomplished, as well as simplicity, while utter convenience is finely served, too, at completion of the installation. From the easy-working set to the simple adoption of eliminators the cycle is complete. And one can sit back and view with pride his radio possession. He can turn "the whole works" on or off by a twist of the Bruno light switch, and he can tune the receiver with one finger. And there is not a battery—no, not one!

The only thing one need be very careful about, lest he spoil an otherwise fine piece of work, is to select a good speaker. There are several very excellent ones, including the Acme double free-edge cone (Fig. 1). This booms out the low notes with fascinating realism and fullness of power, without sacrificing the delicacy of the high notes of even those sopranos produce faithfully. The receiver itself is true to tone values—due in no small measure to the use of resistance coupled audio amplification, with Lynch resistors—but it does need a good speaker, even as the best of men needs a good helpmeet, or his noblest works may be in vain.

[While Radi-A is a factory-made device, and can scarcely be duplicated by the home constructor, it is very easy for him to build the Acme B eliminator circuit of the same parts as are used in the factory model E-1. Therefore the construction of the Acme eliminator will be discussed next week, as well as battery elimination for DC supply.]



THE BRUNO adjustable brackets, used in the Bernard Electric Bronze Beauty. Any slope up to 45° may be obtained, or a perpendicular panel accommodated.

Inter-Planet Talk Called Bold Idea by Engineer

To forecast communication between planets is extremely daring, C. L. Farrand, New York radio engineer, points out in commenting on recent statements attributed to Dr. Michael I. Pupin.

"The history of science," Mr. Farrand said, "has been a series of contradictions—the upset of theory after theory."

Commenting on the idea that rational beings of the identity of inhabitants of the World would be found on other planets in the solar system, as was recently suggested by a prominent scientist who also commented on Dr. Pupin's address in Philadelphia, Mr. Farrand said:

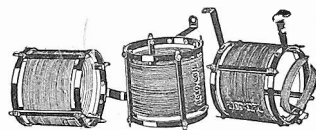
"That the planets are inhabited by people similar to ourselves is difficult to believe because of the atmospheric and other conditions that exist, yet to say that beings do not exist on these planets in some form dissimilar to ours is a statement that can neither be supported or

denied by fact." He, like Pupin, thinks it likely that the static interference experienced in broadcast receivers is due to activity of the sun, and its influence on the earth, Mr. Farrand declined to comment on reports of recent "communications" from Mars and other planets.

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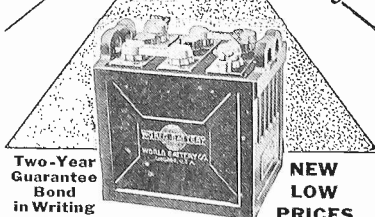
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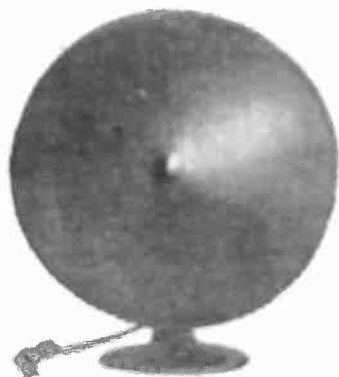
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