MARCH 17
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The First and Only National Radio Weekly

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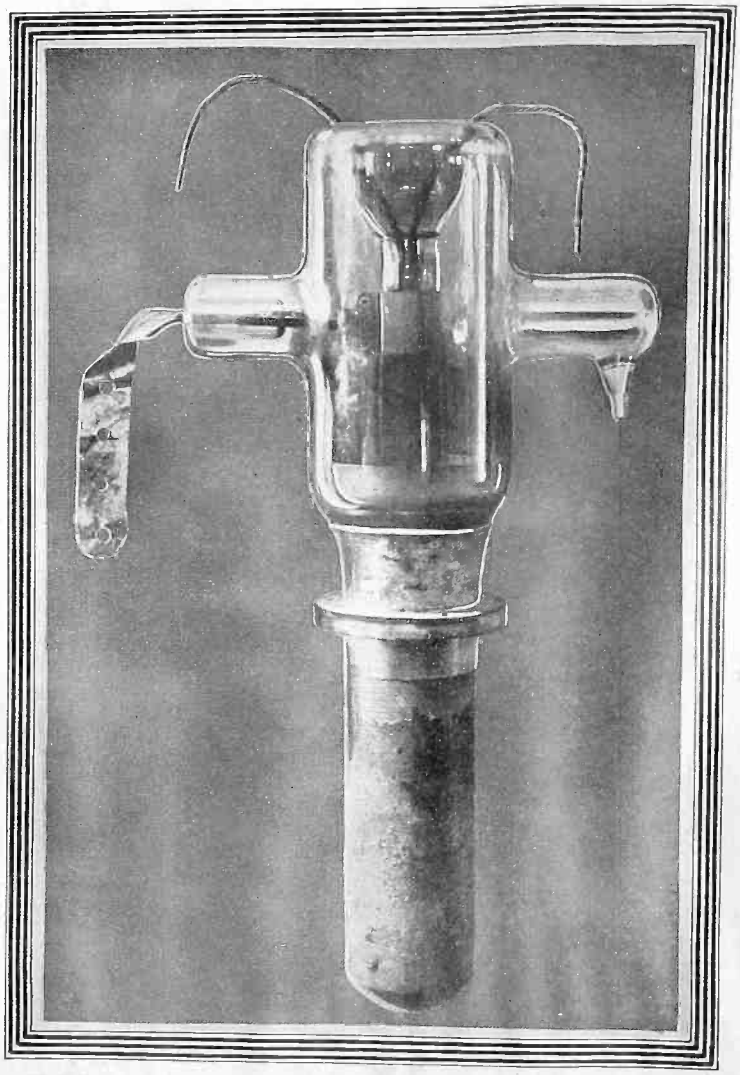

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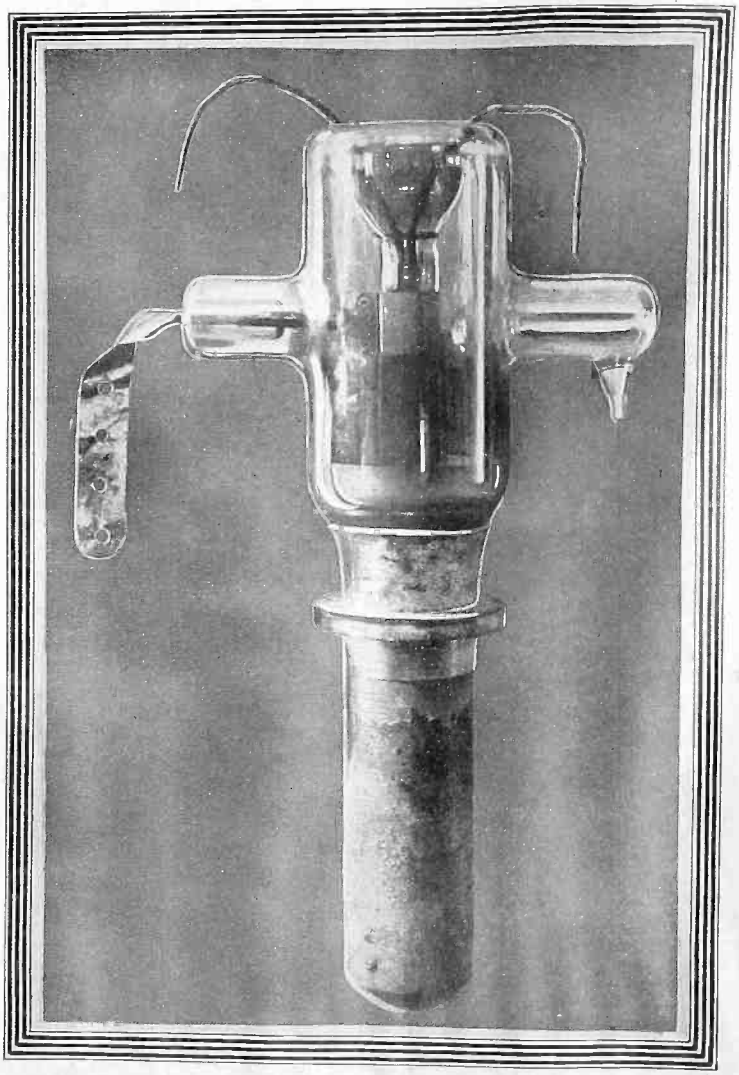

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EVERY FRIDAY at 5.40 P. M. (Eastern Standard Time) Herman Bernard, managing editor of Radio World, broadcasts from WGBS, the Gimbel Bros. station in New York, discussing radio topics.

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A New Plan That Makes
Room for all Stations

Single Short Wave Carrier Will Accommodate all the Broadcasters Now on Air without Discarding Present Band—Existing Receivers Pick up Both, in One Case with Simple Adapter—Double Modulator Used in New Plan and Double Demodulation at Receiving End without Oscillator

A new system of broadcasting and reception, by use of a single short wave (high frequency) carrier by all stations so assigned, is hereby presented in the most complete form in which this idea has ever been worked out publicly. While some suggestions of plans along the same line have been broached from time to time, J. E. Anderson, Technical Editor, applied an original twist to these, and worked out the system in theorem to a complete and wholly practicable form. Herewith is his article, setting forth the explanation.

The idea as developed by Mr. Anderson is fraught with considerable novelty to most readers, and for that reason may not be comprehended in its fullest significance at first. The article is well worth careful study, since it brings to public notice for the first time a complete system with dazzling possibilities.

When one considers that geographical considerations alone limit the number of stations that might use the same short wave carrier, creating less intereference than now exists, and when one realizes that the present broadcast band still would be available for use, so that all the distribution that is needed now is assured, the full significance of this remarkable solution strikes home.

In reading Mr. Anderson's article it is well to bear in mind that present broadcasting equipment would be used, hence no investment is scrapped, and that present receivers would be retained; only in one instance an adapter would be required, so that the modulated short wave carrier could be changed to waves to which the existing broadcast receiver responds.

The fundamentals of the new system are:

(1) A station generates its present assigned frequency, but instead of radiating it, modulates it on a single short wave, say 15 meters (20,000,000 cycles). If the station's regular frequency is 1,000,000 cycles (300 meters) then the radiation is at 21,000,000 cycles, or 19,000,000 cycles, or either or both. Note that radio frequency is modulated on radio frequency.

(2) At the receiving end an adapter, consisting of a single tube circuit tuned permanently but broadly to the short wave, demodulates the carrier, because the circuit is a conventional detector. The primary of the present home receiver is connected in the plate circuit of the adapter tube, and all output frequencies are present there, as in any aperiodic antenna circuit, particularly those frequencies resulting from demodulation of the short wave. Therefore the existing receiver simply tunes in the station desired.

(3) The original difference in assigned frequencies of stations is preserved, but since the stations using the double modulation system of broadcast would not radiate on the present band, that band would still be available for other stations, or some stations might use both.

By J. E. Anderson

Technical Editor

THE ether channels are rapidly being filled up by various radio services. Even now the open channels are overcrowded, particularly those which are held to be especially desirable for broadcast purposes. Hopeful applicants for waves are clamoring for assignments to these, while the present broadcasters are jealously guarding their own assignments. Meanwhile the public is demanding relief from the already overcrowded condition.

Considerable pioneering work is being done in the ultra-broadcast region, from 1,500 kc to 60,000 kc. But even these frequencies are appropriated as soon as they have been subdued, and it will not be long before this entire region is even more crowded than the present broadcast band, unless some means is found for utilizing them more economically.

At present broadcast channels are placed 10 kc apart. This is based on a

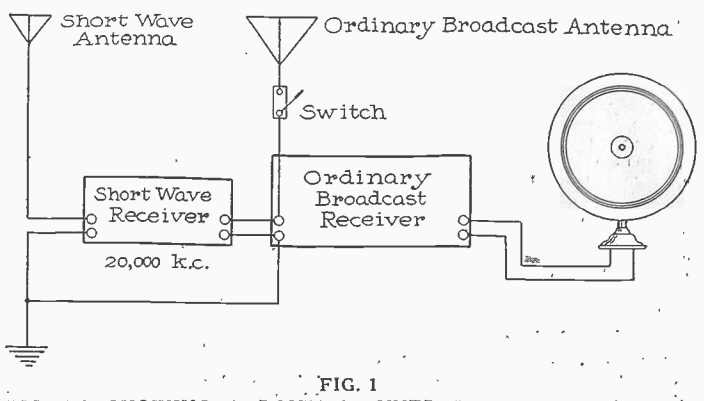


FIG. 1

SCHEMATIC SHOWING A DOUBLY TUNED RECEIVER ADAPTED FOR RECEIVING A DOUBLY MODULATED WAVE ON A BROADCAST RECEIVER.

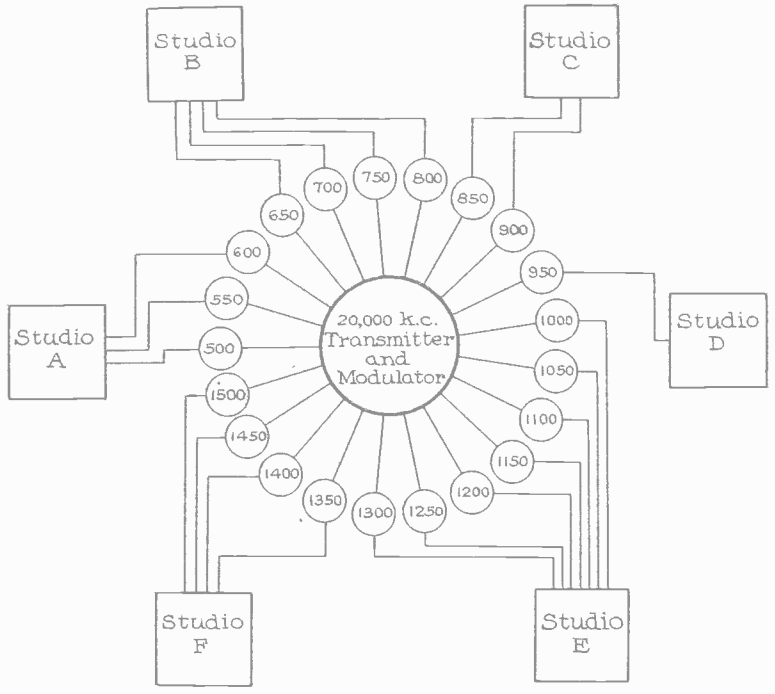


FIG. 2

SCHEMATIC SHOWING HOW DOUBLE MODULATION MAY BE EFFECTED. A WHOLE BROADCAST BAND IS IMPRESSED ON A SINGLE HIGH FREQUENCY CARRIER.

sideband width of 5,000 cycles. This is not wide enough, as at least 10,000 cycles should be allowed for a sideband. This would require that stations be put 20,000 cycles apart, since both the upper and lower sidebands are transmitted under the present system. It would be better if stations could be put 50,000 cycles apart, but at the present state of the art that would be reckless ethereal extravagance.

Ascending the scale

But there is still much room in the ultra-broadcast region. Why should not some of the broadcast applicants be assigned to channels in this sparcely settled region? Because the applicants do not want such assignments. There would be nobody up there to listen to them.

Even now there are many broadcast stations operating on very high frequencies, but they have very few listeners, because the ordinary broadcast receiver will not reach them. If some means could be found whereby the high frequency stations could be received on the ordinary broadcast receiver, then the high frequency channels would become just as valuable as the channels now in the broadcast band.

And the means has been found. It is now only necessary to adopt it generally.

Suppose a certain station is operating on 20,000 kc and that it is desired to receive that station on a broadcast receiver which covers the band 550-1,500 kc. It is possible to rig up an oscillator and tune that to a frequency differing from 20,000 kc by any desired frequency within the range of the broadcast receiver. Let us choose 1,000 kc for convenience. We tune the broadcast receiver carefully to 1,000 kc and then we adjust the oscillator to 20,000—1,000 or 19,000 kc. If the oscillator is coupled to the broadcast receiver in a suitable manner the 20,000 kc signal will come through the broadcast receiver.

This is simply a Super-Heterodyne in which the signal carrier is 20,000 kc and the intermediate frequency is 1,000 kc. The scheme is equally applicable to all types of broadcast receivers.

Ratio of signal to carrier

When a high frequency wave like 20,000 kc is modulated with a voice or musical signal the ratio of the highest signal frequency to the carrier is very small. We may take the highest signal frequency as 10,000 cycles. Then the ratio is .0005. In some Super-Heterodynes the intermediate frequency is 30 kc. This is a carrier of voice and music, and the ratio of highest signal frequency to the carrier is only one-third. Although this is a very low ratio the quality possible is good.

If a ratio of one-third betwen the highest carried frequency to the carrier is possible in a Super-Heterodyne it should also be possible when the carrier frequency is as high as 20,000 kc. One third of 20,000 kc is 6,667 kc. If the 20,000 kc carrier can carry 6,667 kc it can surely carry 1,500 kc, the upper limit of the present broadcast band. Of course it can also carry all the frequencies below 1,500 kc.

In other words, the 20,000 kc carrier can carry as a signal a band as wide as the present broadcast band. And even so the highest carried frequency would not bear as high a ratio to the carrier as the 10,000 cycle frequency bears to the 30 kc intermediate frequency in a Super-Heterodyne. In fact the intermediate frequency would have to be 133,333 cycles before the ratio is the same.

Side bands brought in

If the tuner or filter system is able to bring in the sidebands of the 30 kc voice modulated signal without excessive discrimination, then a single tuner should be able to bring in the sidebands of the 20,000 kc 1,500 kc modulated signal without any appreciable suppression of the side frequencies farthest away from the carrier. A comparatively selective tuned circuit could be used to bring in the 20,000 kc signal with all its sidebands.

Well, what of it? Does that have any-

Both Detection Forms Serve Vital Purposes

By Prof. Paul G. Andres

Chief Engineer, Temple, Inc.

The vacuum tube detector in commercial receivers of today has assumed one of two general forms. The grid condenser-leak type and the C battery type.

The former because of its simplicity and ease of application is the one most commonly used.

An examination of this circuit utilizing the grid condenser and leak, shows that the time constant of the circuit, that is, the product of the capacity and resistance, should be smaller than one-five-thousandths of a second if the device is to allow satisfactory reception for audio frequencies.

High Notes Suffer First

If any frequency discrimination exists the high frequencies are the ones that suffer.

In practice the grid circuit of the detector includes the grid to filament AC resistance which has a value considerably less than 100,000 ohms for a 201A tube when the grid is kept slightly positive.

The time constant of the circuit therefore becomes the product of the capacity times the parallel resistance of the grid-leak and tube resistance. This value is sufficiently small to insure good detection for frequencies well above the audio frequency range.

Affects Resistance

It is vitally necessary that a receiver maintain the detector grid at this positive potential since a slightly negative one causes the AC resistance between the grid and filament to reach high values.

In such cases the time constant of the circuit becomes sufficiently large to introduce a decided falling off in quality.

The use of the low grid-leak resistance or an extremely small value of condenser to obviate this defect is generally insufficient.

With a slightly positive grid the tube input circuit has a broadened resonance curve which further aids in preventing frequency distortion by the circuit.

Both Types Good

In general it may be said that very satisfactory results are obtainable with grid detection under proper conditions of design.

C battery detection as mentioned above has not been used extensively in commercial tests.

The sensitivity of this arrangement is perhaps not as great as that obtained with the first method nor is its application as convenient, but the fact that the power capacity of the detector is greater should recommend itself for certain applications.

The AC Problem

The detector circuit on AC operated sets requires much consideration to insure not only sufficient power capacity, but also freedom from frequency distortion and the introduction of hum.

One of the major problems of a radio set designer centers around the detector and improved methods and circuits are highly desirable to remove its limitations.

—From "The RMA News"

Synopsis of Plan for Short Wave Use

The high frequency, or short wave, field in radio is a vast domain which has so far been explored only in isolated places. But in that domain lies the solution to the present overcrowding of broadcast channels. Not only is there room for the overflow, but there is ample room for many times the number of broadcasting stations now in operation.

And it is not necessary to scrap the present equipment to make copious use of the short waves. One need only set up suitable transmitters and to add an adapter to the present receiving set.

The extension is done by means of double modulation and double tuning, as is explained in detail in the article herewith. Briefly, in the double modulation system the voice and music are first impressed on a high frequency carrier which now falls in the broadcast band, but this is not radiated. Instead this modulated broadcast frequency carrier is impressed on a much higher radio frequency (short wave) and thus radiated.

The receiver in this system has to tune first to the higher radio frequency carrier and then demodulate it to get the frequency which your present receiver can tune in.

thing to do with the present overcrowded condition of the ether lanes? Is there a possible solution in it? There is certainly something in it that deserves careful consideration. We shall now consider modulation and some of its possibilities.

Double modulation

In the present broadcasting system single modulation is used. The signal is impressed on the radio frequency and then the modulated carrier is radiated into space directly.

In the double modulation system the modulated carrier is not radiated but it is used to modulate a still higher frequency, and then the doubly modulated high frequency carrier is radiated. For example, suppose we wish to send out a 1,000 cycle note as a signal. This could be impressed on a radio frequency carrier of 1,000 kc, which would yield a modulated carrier consisting of the carrier of 1,000 kc and the two side frequencies of 900 and 1,100 kc. This complex wave is then used to modulate the high frequency carrier, say one of 20,000 kc.

This would yield a still more complex wave but from which the original 1,000 cycle note could be retrieved.

Receiving Complex Wave

For receiving this complex wave a double tuner would be required as well as a double detector, very much the same as the Super-Heterodyne mentioned above. Fig. 1 shows the essentials of the receiver. At first a short wave receiver, comprising a detector, is tuned to the 20,000 kc signal. Then the output of the detector is put into the ordinary broadcast receiver somewhat as indicated in Fig. 1. The broadcast antenna is opened and the output circuit of the short wave receiver takes its place.

Then the broadcast receiver is tuned to the 1,000 kc frequency and after this signal has passed through the regular detector, the 1,000 cycle note is audible.

Although we picked a signal frequency of 1,000 cycles, we could just as well have chosen any other audible frequency. Hence the system would work on broadcasting.

Note that the receiver indicated in Fig. 1 can be used for ordinary broadcast reception by closing the switch and by turning off the short wave, or 20,000 kc adapter.

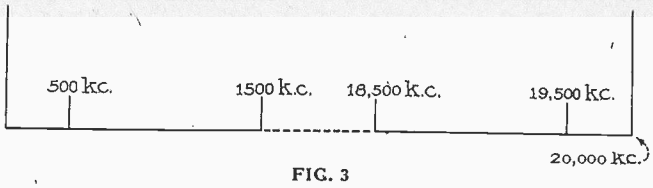


FIG. 3

THIS SHOWS THE LOCATION OF THE LOWER SIDE BAND WITH REFERENCE TO THE 20,000 KC CARRIER, THE SIDE BAND BEING AS WIDE AS THE PRESENT BROADCAST BAND.

We are not limited to modulating the 20,000 kc frequency with one of 1,000 kc. We can modulate it with as many frequencies as there are broadcast channels, and more. We can start at 500 kc and go up in steps of 10 kc to at least 1,500 kc. And each one of these could carry a separate program.

If the broadcast receiver is able to separate two signals 10 kc apart when these signals come in on the antenna, it is also able to separate them if they come from the output of the detector of the short wave set. But suppose we decline to be so crowded and elect to put the signals 50 kc apart. Any good broadcast receiver can separate them. Then suppose that we work from 500 kc to 1,500 kc. The broadcast receiver will cover this range or can be made easily to cover it.

Between 500 kc and 1,500 kc, inclusive of these, there are 21 separate channels with a separation of 50 kc. Thus by the simple expedient of double modulation we have added 21 channels to the receiver, and we have only used one high frequency and only a small part of the possibilities of that frequency.

Fixed Tuning

As long as we wish only to receive the programs carried by the 20,000 kc carrier we do not have to tune the adapter circuit at all, except once. But we have to tune the broadcast receiver as usual even when picking out some of the programs that come in over the high wave.

If we care to extend the tuning range of the broadcast receiver the program possibilities on the 20,000 kc carrier would be greatly increased, for we could go down as low as 30 kc and go up at least to 5,000 kc.

Side Band Elimination

In a system like this there would naturally be some interference between the high frequency channels, if they were put too close together. But the interference could be minimized to a very great extent by eliminating some of the side bands, which could be done without necessitating any changes in the receivers. For example, the upper side bands on the intermediate carriers could be suppressed, as well as the upper side band on each doubly modulated high frequency carrier.

The upper side band of a 1,000 kc voice modulated carrier is from 1,000 to 1,010 kc. This could be eliminated leaving only the lower band from 1,000 to 990 kc to carry on.

Grand Central Modulator

But how could all the intermediate carriers, those corresponding to the present broadcast carriers, be brought to the high frequency modulator?

The intermediate radio frequencies could not be sent to the grand central by radio, for that would cause interference with ordinary broadcasting, and they cannot be sent over telephone lines.

But audio frequencies can be sent over modern specially designed telephone lines with negligible distortion, even over comparatively great distances. Hence no matter where the studio of origin of a certain program may be, the program from it could be transmitted at audio frequency to the grand central modulator.

Once there, it would be used to modulate a radio frequency now within the broadcast range. Then it would be transmitted through a system of amplifiers to the final modulator and radiated on the ultra high radio frequency wave. Of course many other programs would be radiated at the same time.

Fig. 2 shows the idea in schematic form. In studio A three separate programs originate, and these are impressed on the frequencies 500, 550 and 600 kc. After modulation they all go to the central 20,000 kc modulator and transmitter. Studio B sends out four distinct programs, studio C two programs, studio D only one, studio E not less than seven, and finally studio F sends out four. After the first modulation each feeds the central modulator.

A Slice Out of Spectrum

Fig. 3 shows a portion of the frequency spectrum from zero up to 20,000 kc, except for a certain portion in which we are not now interested. The location of the two limits of our new broadcast range, namely 500 and 1,500 kc, is indicated in the drawing. After this band has been impressed on the 20,000 kc frequency the corresponding lower side band extends from 18,500 kc to 19,500 kc, with the 500 kc falling at 19,500 kc. The upper side band, from 20,500 kc to 21,500 kc is omitted since it was assumed that this would be suppressed.

The short wave receiver intended to adapt the broadcast receiver to the high frequency band would have to be broad enough to include the band from 18,500 kc to 20,000 kc. But that is quite feasible. Even if the tuner were a little too sharp the programs could be brought in. It would only be necessary to amplify the signals remote from the carrier more than those lying close to the carrier. For example, it would be necessary to amplify a program carried on the 1,500 kc sub-carrier more than that carried on the 500 kc sub-carrier.

An Advantage

An advantage in this system would be a remarkable uniformity of signal strength of all the carried sub-carriers. If the first tuner is not too sharp all the programs carried by the high frequency carrier would be of the same strength and it would not be necessary to readjust the volume controls on the broadcast receiver when switching from one program to another carried in on the 20,000 kc wave. They would all seem to originate at the same place, as in effect they do.

The high power of the high frequency carrier would hurl the programs everywhere. At times they would go clear around the earth. These programs would probably be the most reliable in all locations, even as compared with the locals.

The programs thus carried would be relatively free from static and other electric disturbances for the high frequencies are not infested with this trouble as the lower radio frequencies are. The greater effective selectivity would also eliminate some of the disturbances.

The broadcast system suggested here has many obvious advantages over the present system. Whether it will be adopted we shall see in the future. But it seems now that it will force its own adoption.

Turkey's Con

By Tim

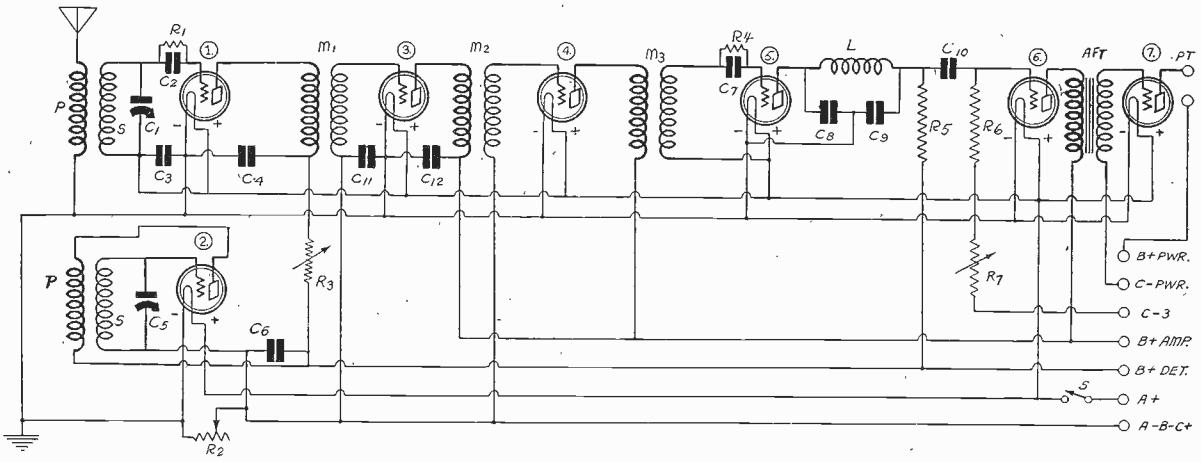


FIG. 1

A SUPER-HETERODYNE, SEVEN TUBES, GOOD PERFORMANCE, DISTANCE, TOO, JUST AS THE AUTHOR BUILT IT. THERE SEEMS TO BE AN UTTER ABSENSE OF COUPLING BETWEEN THE OSCILLATOR (2) AND THE MODULATOR (1). THE AUTHOR REMADE AN EXISTING TRF RECEIVER, USING THE PARTS THEREFROM, AND ADDING A SOCKET, AND THE THREE INTERMEDIATE TRANSFORMERS M1, M2, M3

MANY a person has a five or six tube set and would like to use the parts so that with an extra socket and three intermediate frequency transformers he could turn his set into a Super-Heterodyne. Thus would the sensitivity be increased, the tuning controls limited strictly to two, and ease of operation would be assured. Many TRF sets of the same number of tubes have these advantages, to be sure, but where a fellow feels there's plenty of room for improvement, and he would like to make that improvement at little expense, here's the chance.

The seven tube circuit diagrammed is a Super-Heterodyne of a very simple sort, embodying only a few "novelties," and these well tested and, indeed, previously well known in the engineering world.

Let us see what we have.

What Have We?

First to catch our eye are two coils, marked PS in both instances, at extreme left in the diagram. These are radio frequency transformers, familiar to all, of any sort you may be using in your present receiver, or of any other make or manufacture, with one possible exception. That is the winding P of the lower coil at left, which is the primary of the oscillator coil, may not have sufficient number of turns to produce oscillation. Remedy: add 15 or 20 turns to this winding, or put a fixed condenser across it, of .00025 mfd. or more, or do both. This simple change or addition well may be taken care of last—hence we mention it first.

You have noticed, of course, the glaring error, grievous blunder, sad mistake and fatal mishap, consisting of total omission of any and all forms of coupling between oscillator tube (2) and first detector or modulator tube (1).

What is relied on for coupling? The common resistance of the B supply? The by-pass condensers? (This is a still funnier joke.) No. Nothing like that. Just plain mutual induction, that's all.

Like Phases

And to obtain it, one coil is simply placed next to the other, care being taken, however, to see that the coil terminals, or corresponding lugs leading thereto, are connected in the same order on both coils.

To illustrate: If the G post of the upper coil goes to grid condenser C2, and the F lug of the coil to F plus or A plus (these two are the same lead), then G post of the oscillator coil goes to the grid of the oscillator tube and F post lug goes to A minus. Thus the fields of the two coils are in phase, and not bucking. If they bucked there would be no inductive coupling, only some stray capacity coupling, due to the distributed self-capacity, so you can imagine how small that would be!

You could turn one coil upside down, and then there'd be inductive coupling, or you could reverse the connections of either coil, since they were diverse, and you simply would be making them of the same order in each instance.

All right, there's the coupling for you. And what else, pray?

Anti-Body Capacity

Why, we want to inspect the oscillator. We've heard tell of forms of oscillators that sometimes produce a little body capacity, or an over-rich crop of harmonics, so we'll see what's what in the oscillator herewith and forthwith.

One end of the grid coil, or secondary S in the modulator grid to filament circuit, is connected to grid, and the other end is connected to A minus. The rotor of the condenser goes to A minus. The stator goes to grid. Now, that's familiar—at least in tuned radio frequency sets. These days we're not troubled with body capacity in those sets, so we introduce an oscillator that follows the TRF practice and gives us a grounded rotor connection for the oscillator condenser. The stator goes to grid, but is out of reach of body capacity effects, since the shaft connects to rotor, and our hand gets near the shaft, but not so near the stator.

All's well and a yard wide.

The modulator is conventional, almost Puritanical. It is provided with two bypass condensers, C3 and C4, both .006 mfd. or higher. Both are necessary for maximum smoothness in obtaining distant reception.

In the modulator plate circuit is a volume control, R3, which affects radio frequency levels. This is just to the right of the oscillator tube in the diagram (Fig. 1). On about the same diagram plane, at the opposite side is another volume control, this affecting audio frequency.

In any Super-Heterodyne it is usually well to have double volume control like this, because of danger of overloading the second detector (5) if a volume control does not precede it in the cascaded circuit, and the possibility of overloading the first audio stage in instances where a power tube of great output capabilities is used in socket (7).

Two Intermediate Stages

Returning now to sockets ahead of the first detector, we note a coil M1 couples the first detector to the first intermediate amplifying valve—pardon my spats—while the same sort of coil, labelled M2 in the diagram, couples the first intermediate frequency amplifying tube to the second one. And that's all there are—there isn't any more. Two stages of intermediate frequency amplification.

Yep. Set works fine. Brings in anything East of the Mississippi at New York City almost any night, while the locals are on, and catches Denver and other far, far away stations after the locals sign off and the DX spirit signs on.

Very nice tone, great ease in tuning, mother operates the set with delight, maximum volume from KDKA rattles a good stout cone speaker and the set has been heard two and half blocks from my house on indiscreet occasion when WEAF was on and the window pane was off, due to a windstorm.

Even Mother Complains

The old theory is borne out again, that to get ample volume on distant stations, volume enough to enable you to let the other fellow tell YOU what the call letters are, your set must be capable of more volume on locals than is good for the speaker, the ears, the peace of mind, or continued happy married life.

Even a tolerant mother, much less a good-looking wife, will complain about the maximum volume of this set on locals.

verted Super

Turkey

LIST OF PARTS

PS, PS—Two radio frequency transformers.
C1, C5—Two tuning condensers to match the coils.
C2—One .00025 mfd. grid condenser with clips.
R1—One 2 meg. grid leak.
C3, C4—Two .006 mfd. fixed condensers.
R3—One variable resistor, no particular power rating, at least 0-50,000 ohms or so, or even up to 0-500,000 ohms.
R2—One 6 ohm rheostat of 2 ampere carrying capacity. Most rheostats carry don't carry so much.
C6—One .1 mfd. or higher filter condenser.
C11, C12—Two fixed condensers, .006 mfd. or higher capacity.
M1, M2, M3—Three intermediate frequency transformers.
1, 2, 3, 4, 5, 6, 7—Seven sockets.
R4—One 2 meg. grid leak.
C7—One .00025 mfd. fixed condenser with clips.
L—One radio frequency choke coil.
C8 C9—Two .0005 or .00025 mfd. fixed condensers.
R5—One .1 meg. resistor.
C10—One fixed condenser, .01 mfd. or higher capacity.
R6—One .1 meg. resistor.
R7, S-One 0-500,000 ohms variable ressitor, no particular power rating, but with switch attached. Or switch and resistor may be separate.
AFT—One audio frequency transformer.
One 7 x 21 inch front panel.
One 7 and 8½ inch subpanel or baseboard, 20 x 8½ inches (or deeper, if cabinet permits).
Two dials.
Seven tubes, A. B, C supply, etc.

Terrific is not the word for it. I've looked all through the dictionary and there just isn't any word for it. The KDKA announcer comes in louder than I dare speak in my own right in my own home, and I am some daring on Saturday nights, with the weekly B. R. in the left side pocket of my trousers!

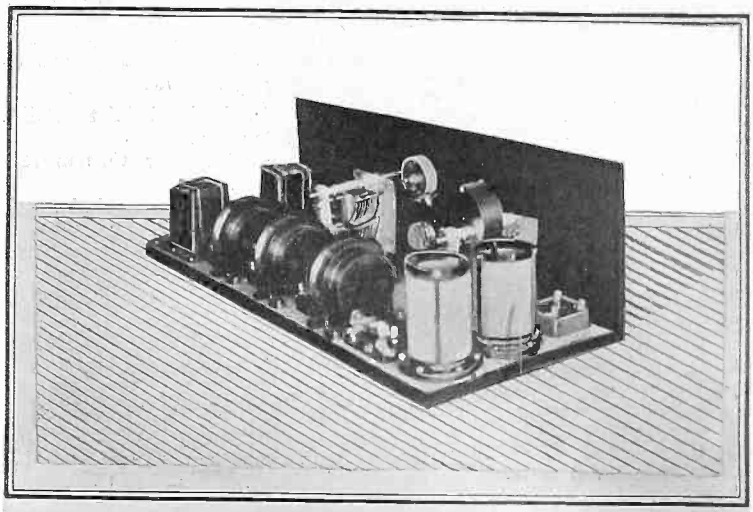
Talking about a B. R., I've heard about the type large enough to choke a horse, but as nature never favored me with any big enough to interfere with a canary's mastication, I simply had to have a Super-Heterodyne to keep up with the Murphys—there are no Joneses in my part of the First Assembly District—and have something to talk about next Summer at the annual picnic and clambake of the Jerry Donovan Association, of which I am the radio repair man and assistant secretary

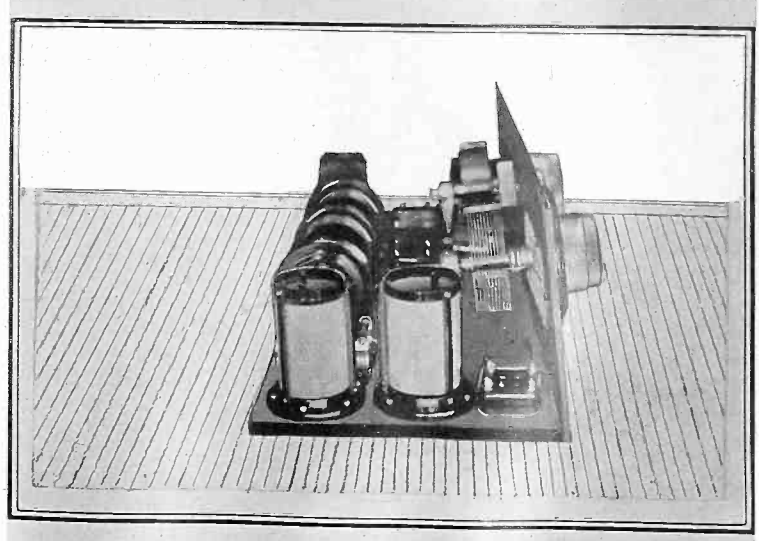
Some day when I become treasurer I may build me a 10-tube job, all new and everything, but here and now I'm telling you what can be done with what you and I have, and a few dollars extra, even assuming that we haven't the extra dollars this being Wednesday, but can "borry" them.

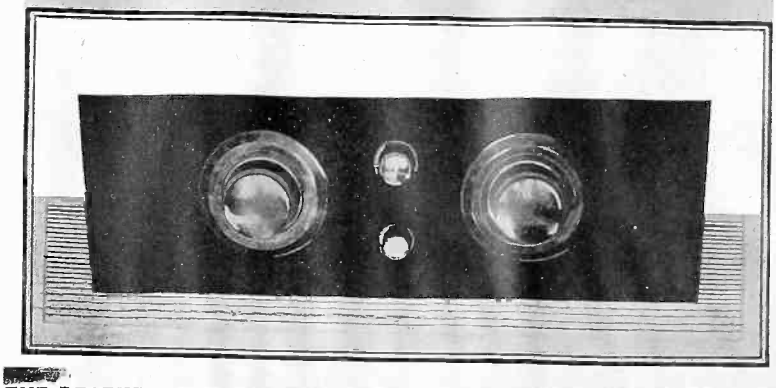
If you know of a good place where this can be done, I DON'T.

All the while I've been browsing amid my personal affairs—and yours—perhaps you've been thinking that I made an awful bull in saying that there are only two intermediate stages in this Super-Heterodyne. But wait and see.

(*Concluded next week, March 24*)







THE RECEIVER FROM A REAR ANGLE IS SHOWN AT TOP. AN OUTPUT DEVICE TO PROTECT HIS SPEAKER ACCOUNTS FOR WHAT LOOKS LIKE A SECOND AUDIO TRANSFORMER. IN THE MIDDLE PHOTOGRAPH THE MODULATOR COIL IS AT LEFT, OSCILLATOR AT RIGHT. THE PANEL VIEW IS AT BOTTOM.

Set Builders Club Idea

By Robert H.

With what fervor the custom set builders are leaping at the idea of forming their own club on a national basis may be determined from a glance at these 286 names representing only half the declarants who sent in a coupon in one week. Mr. McCord outlines some plans for preliminary procedure in the accompanying article, and as soon as details are worked out the club will be inaugurated. Meanwhile Mr. McCord is interviewing parts manufacturers, as they are deeply interested in his original idea.—EDITOR.

THE proposal made in RADIO WORLD that the American professional custom set builders organize into a national club for their mutual benefit has met with a hearty response from every section of the country. The set builders are not only willing but anxious to form such a club. Diverse reasons for their desire have been expressed, all of which are praiseworthy and calculated to lend dignity and recognition to a young profession and to establish a code of ethics for the protection of the customers as well as for the builders themselves.

Some of the objects for the club as expressed by set builders are:

To obtain suitable economic consideration.

To establish better and uniform relations with the customers.

To gain the confidence of the customers.

To establish a source of trustworthy and up-to-date technical information, such as new circuit diagrams, blueprints, technical articles, latest improvements in technique, especially for members.

Dues $1 to $10

Dues of from $1.00 to $10.00 a year have been variously proposed, the majority having suggested the higher figure. This is to cover the running expenses of the club. The figure suggested in any case has been based on service the club would render.

The suggested qualifications are varied. Some have suggested that any person who builds sets for hire be made eligible. Others have proposed to exclude manufacturers and radio shop owners as to admit them would defeat the purpose of the club.

Another suggestion was that no one be allowed to join the club who could not read understandingly a schematic circuit diagram. The question of eligibility will have to be worked out.

The greater the qualifications demanded for membership the smaller will be the number of set builders who can join the club, and the more the successful applicants may have to pay for their service, while the more rigorous the experience requirements, the more representative and effective would the club be.

Qualifications Debated

Another advantage of keeping the qualifications high is that the membership would more easily win and retain the confidence of the public, for the members would know just how to meet service and design problems.

Some say it would be a doubtful policy to exclude the less experienced, for this would lead to a depletion of the ranks of the club. The set builders who now are inexperienced will be the experts of tomorrow, and with the assistance of the information service of the club they would quickly pass into the expert class.

More proposed names for the club should be submitted. These will be published in RADIO WORLD together with the suggested names published herewith, and prospective members will be asked to ballot. The name receiving the greatest number of votes will be chosen. Likewise by ballot will the membership requirements, dues (if any), official organ, etc., be decided.

Local Branches

Benefits will accrue from members associating with one another locally. I suggest that if you are interested in this club project that you write to some of the prospective members who live in your city or State, setting forth your ideas, and discussing the possibility of local branches. All who receive such mail should note contents carefully, answer the writer directly, and then send to me the letter originally received.

All who receive such replies from the addressee should read them carefully and then send the replies to me.

You will note that you do not send me anything you write, under this plan, but only what you receive.

You will find 286 names herewith. Also see names in the February 4, 25 and March 3 issues of RADIO WORLD. All should obtain or retain these copies for reference, as no name is repeated.

Besides the correspondence suggested, please fill out and send in attached coupon, if you haven't done so before.

Names Suggested for Club

Here are a dozen suggestions for a name for a custom set builders' club as sent in by readers:

The Professional Set Builders Club of America.

Society of Master Custom Radio Set Builders.

Custom Set Builders Guild.

Radiotricians, Inc.

The Association of Radio Technicians.

The Custom Set Builders of America.

Custom Radio Builders Club.

The Custom Set Builders of the World.

Nacuset Builders' Association.

Naraset Builders' Association.

American Radiotricians.

Custom Set Builders Club.

Robert H. W. McCord,
c/o RADIO WORLD,
145 West 45th Street, N. Y. City.

I am a custom set builder and would like to join you in the formation of a national organization of custom set builders. Please list my name and address. I am one of the indorsers. This does not obligate me in any way.

Name .....

Address .....

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

Suggestion for Club's Name .....

Joseph Schiller, 375 Grove St., Scranton, Pa.
A. A. Smeltzer, 131 Lafayette Ave., Vandergrift, Pa.
Chas. W. Yeager, 1316 So. Date Ave., Alhambra, Calif.
R. E. Stephens, 630 Whipple Ave., Redwood City, Calif.
Harlan E. Williams, Box 3, Wolcottville, Ind.
George M. Bisihoff, 47 Elm St., Newark, N. J.
G. V. Hunter, Box 791, Ardmore, Okla.
Louis E. Willard, R4-B344, Pine Bluff, Ark.
A. C. Smyer, Leland Cafeteria, Pittsburg, Kansas.
O. A. Flagstad, 3328 10th Ave. So., Minneapolis, Minn.
B. H. Ingalls, 1427 24th Ave., San Francisco, Calif.
W. E. Bates, 1000 East 123d St., Cleveland, Ohio.
Geo. E. Chamberlain, 177 Golden Ave., San Francisco, Calif.
A. N. Dahlgren, 20 Main St., Bradford, Pa.
J. Walter Scott, 128 Magnolia Ave., Magnolia, Mass.
Jerry J. Boa, 614 Ridge Ave., Asbury Park, N. J.
Marius A. Peterson, 34 Taylor Ave., Linwood, Pa.
E. Theman Hyatt, 18 West 27th St., Bayonne, N. J.
Harry Corn, 18 W. Gravers Lane, Chestnut Hill, Philadelphia, Pa.
Richard J. Kassolis, 1 So. Mallory St., Phoebus, Va.
Chas. E. Pettit, 66 Harrison Ave., Cuyahoga Falls, O.
H. K. Prudden, 243 E. State St., Columbus, Ohio.
I. A. Thornton, c/o Federal Reserve Bank, 10th and Grand Ave., Kansas City, Mo.
A. R. Vaughan, 5318 Terry St., Dallas, Texas.
Geo. H. Ramig, 9128 Cadieux Rd., Detroit, Mich.
Arthur W. Montgomery, 2026 Dewey Ave., St. Joseph, Mo.
L. J. Kirk, Box 246, Panhandle, Texas.
A. J. Castendick, East 2707 - 17 Ave., Spokane, Wash.
R. H. Carlton, 231 North Center St., Reno, Nevada.
Wm. D. Smith, 425 E. 135th St., New York City.
Radio Construction & Service, 3627 Dorrance Dr., Toledo, Ohio.
Alexander Solo, 507 Bankers Trust Bldg., Philadelphia, Pa.
Barnet Cherney, 350 South 4th St., Brooklyn, N. Y.
Paul F. Cooper, 2709 Mildred Ave., Chicago, Ill.
R. Alling, Box 41, Sta. C., Atlanta, Ga.
R. M. Samberson, 531 W. Chestnut St., Denison, Texas.
Noah Holliday, 543 Mt. Vernon St., Camden, N. J.
Frank W. Gould, Motor Route A, Fort Wayne, Ind.
L. Glenn McKee, 1110 - 15th St., Belle Plaine, Ia.
Howard Eden, 423 So. Poplar St., Sapulpa, Okla.
G. Ogaord, Lafayette Bldg., Waterloo, Iowa.
Hans Fossetta, 54 Grace St., Jersey City, N. J.
H. S. Mitchell, 1325 Massachusetts Ave., Lawrence, Kansas.
Linwood J. Harden, 632 W. 8th St., Camden, N. J.
C. L. Umberger, 9BCE, 2025 Cumberland Ave., Middlesboro, Ky.
E. R. Parshell, 1210 Elizabeth West, Detroit, Mich.
Walter A. Small, Box 50, Claver House, N. Y.
W. P. Marshall, 2412 Buhl Bldg., Detroit, Mich.
Schacter-Baker, 49 Varet St., Brooklyn, N. Y.
Frank Anderson, 507 Summit Ave., Jersey City, N. J.
Wm. A. Kundegraber, Nevada, Mo.
Ernest Surr, 5853 Dix Ave., Detroit, Mich.
Grover M. Plew, 1219 Eye St., N.W., Washington, D. C.
Albert W. Hubbard, 1106 Russell Road, Willow Grove, Penn.
Fred G. Tresselt, 2419 Jefferson St., Philadelphia, Pa.
Hugh W. Lindsay, Box 405, 526 Rankin St. W., Gastonia, N. C.
Ralph W. Bader, Vaughn St., Middleboro, Mass.
C. R. Carter, 6 Harrison Ave., Amesbury, Mass.
J. Lambour, Bernardsville, N. J.
Carl Houston, 91 W. 32nd St., Bayonne, N. J.

Gets Over with a Bang!

W. McCord

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H. Seidenstricker, 2089 Holly St., Denver, Colo.
Carl A. Kellerman, Box 194, Huron St., Oakland Beach, R. I.
B. B. Blome, 6543 Woodlawn Ave., Chicago, Ill.
John Feiker, 807 East Edenton St., Raleigh, N. C.
H. C. Hett, 131 State St., Boston, Mass.
L. J. Persohn, 1011 Chestnut St., N.S., Pittsburgh, Pa.
Chas. F. Masa, 4780 Rockwood Ave., Cleveland, Ohio.
Paul L. Krichbaum, 126 Central St., Battle Creek, Mich.
H. W. Swartz, 617 Kirtland St., Homewood Sta., Pittsburgh, Pa.
William P. Scott, 2230 Lutz Ave., Pittsburgh, Pa.
Mr. Philip Newman, Box 144, Beaumont, Texas.
Carl Sabo, 511 Garden St., Warren, Ohio
Brayton V. Dunn, 246 S. 10th St., Reading, Pa.
Owen T. Briscoe, New London, Mo.
Harry Good Child, 902 Saville Ave., Eddystone, Pa.
L. L. Parker, 265 N. Pastner St., New Bern, N. C.
S. J. Flake, Box 195, Clark Mills, N. Y.
Chas. T. Mellen, 220-11 94 Drive, Queens Village, N. Y.
Irving E. Horn, 1009 Washington St., Freeland, Pa.
Riley Aumann, 711 S. Illinois St., Indianapolis, Ind.
E. K. Wilson, 666 Winchester Ave., New Haven, Conn.
Harold F. Holbrook, 305 W. State, Sharon, Pa.
M. E. Windner, 928 Ambia St., Toledo, Ohio.
I. Broscins, 1748 West Chestnut St., Shamokin, Pa.
Will Weimor, Box 324, Moline, Ill.
Wm. G. Dowling, 42 West 64th St., New York City.
Michael Zass, 533 - 4th Ave., Wauwatosa, Wis.
E. A. Smith, 3248 N. 15th St., Philadelphia, Pa.
Oscar Pick, 1510 E. 172nd St., New York City.
A. Gruetzmacher, 2038 Central Ave., Dubuque, Iowa.
William H. Dunn, 56 East 104th St., New York City.
Charles J. Kuriger, Jr., 1202 Woodbourne Ave., Brookline, Pittsburgh, Pa.
L. Frank Fox, 24 Williamson Ave., Youngstown, Ohio.
Ralph Demiany, 534 Winchester Ave., New Haven, Conn.
John C. Heine, 643 E. Allenglove St., Philadelphia, Pa.
W. G. Woodworth, 117 Bond St., Hartford, Conn.
Benjamin H. Crosley, 48 Geant Ave., Cranston, R. I.
F. M. Meixuer, 821 Moss Ave., Peoria, Ill.
Ralph F. Stotz. Brownstown, Ind.
Albram Radio Serv., Fred Brammer, 172 Golden Hill St., Bridgeport, Conn.
G. W. Benson, Easton, Maryland.
W. A. Barth, 6114 Commonwealth Ave., Detroit, Mich.
Edward E. Mayhew, 416 Lafayette Bldg., Detroit, Mich.
A. E. Winter, Columbia, Conn.
Fred Doty, 14317 Spruce St., Philadelphia, Pa.
John A. Rubens, 155 Carlton Ave., Brooklyn, N. Y.
John E. Stearns, Box 76, Green Lane, Pa.
L. J. Miller, 32 North 6th St., Newark, N. J.
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Elmer R. Boyer, 339 S. Pine St., York, Pa.
George A. Holly, Station E. Box 2067. Cleveland, Ohio
W. O. Trimmer, Bensley's, Virginia.
R. E. Bryans, 113 Wayne St., Jersey City, N. J.
Paul S. Digner, 2119 4th St., Springfield, Ill.
E. Williams Fries, No. 16 North 56th St., Philadelphia, Pa.
V. T. Holland, 60 South Main Ave., Albany, N. Y.
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George Hamer, 408 Fulton St., St. Paul, Minn.
David J. Myers, 440 N. Queen St.
Marvin C. William, Box 353, Rantoul, Ill.
Mitchell Ross, 1974 Grand Ave., New York, N. Y.
G. H. Allen. South Bend, RR3 Box 132D, Ind.
Christie E. Hayne, 250 Adelphi Street, Brooklyn, N. Y.
Leslie D. Gordon, Shreveport Radio Shop, 1443 W. Kirby, Shreveport, La.
W. L. Gwyer, 310 First St., Monessen, Pa.
J. G. Koselnack, 1917 Wharton St., Pittsburgh, Pa.
Chas. C. Peugh, 54 Linden St., Schenectady, N. Y.
A. G. Hantsch, 2020 Leland Ave., Chicago, Ill.
O. Matero, 717 47th St., Brooklyn, N. Y.
Frank G. Erbeck, 87-85 115th St., Richmond Hill, N. Y.
Elbert L. West, 8 Main Ave., Somerville, Mass.
Geo. J. Brazeau, 12919 Trinity St., Detroit, Mich.
W. J. Harbert, 1534 East Alder St., Walla Walla, Wash.
F. J. Cosgrove, 436 7th St., Havre, Mont.
Louis Weiss, c/o Shalet, 341 Crimmins Ave., Bronx, N. Y. C.
K. G. Silverwood, 502 Jefferson St., Port Clinton, Ohio.
V. T. Holland, 60 South Main Ave., Albany, N. Y.
G. B. Gray, 3822 Belair Road, Baltimore, Md.
Werner F. Benecke, 169 West 80th St., New York City.
Henry S. Lathrop, 1826 Page St., San Francisco, Calif.
Basil V. Hughes, Hillsdale, Michigan.
Clark R. Kemp, Hillsdale, Michigan.
Fred C. Shivers, Lexington, Nebraska.
D. F. Cray, 500 West 73rd St., New York City.
L. R. Cole, Fort Sill, Okla.
C. A. Lynch, 6683 Fischer Ave., Detroit, Mich.
B. D. Tedford, 403 E. Fifth St., Flora, Ill.
Marvin C. Williams, Box 353, Rantoul, Ill.
Thos. Bossignol, 13 Sherburne St., Sanford, Me.
John Zimmer, 1891 Francis Ave., Troy, N. Y.
Ernest F. Gratoon, 88 Mann Ave., Troy, N. Y.
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Chas. C. Cushman, 13374 Whetcomb Ave., Detroit, Mich.
Art. S. Kemmerer, 218½ So. St. Cloud St., Allentown, Penn.
Norman C. Schultz, 809 Ohio St., Michigan City, Ind.
S. J. McGuire, 73 Chicago Ave., Hinsdale, Ill.
J. V. Lawler, 522 Ocean Ave., Brooklyn, N. Y.
Julian J. Schaefer, 81 Linden St., Brooklyn, N. Y.
Paul C. Hersey, 450 Nieport St., Dorchester, Mass.
Anton P. Sloger, Station Hospital, Ft. Riley, Kansas.
J. W. Maddox, 501 Tyler, Topeka, Kansas.
Ernest F. Prucha, Howells, Nebraska.
Hugh J. Pace, 53 Odgegard Ave., West Brighton, S. I., New York
L. A. Dowd, 728 Chestnut St., Oakland, Calif
A. C. Stewart, Waterloo. Iowa.
William H. Moore, 104-17 202nd St., Hollis, N. Y.
Robert Watson, 1st St., Central Nyack, N. Y.
John Headley, 105-10 Jamaica Ave., Richmond Hill, L. I., N. Y.
Lee B. Forte, 317 St. Johns St., Neosho, Mo.
D. K. Holmes, Fremont, Ohio.
Earl E. Bowen, R. F. D. No. 1, Medina, N. Y.
Wm. Kidd, 219 Manchester St., Battle Creek, Mich.
Paul S. Digner, 2119 S. 4th St., Springfield, Ill.
F. L. Pilgrim, Box 39, Aylmer East, Quebec.
Henry M. Luke, Box 314 Awl St., W. Medway, Mass.
W. P. Sommers, Box 298, Metamora, Ill.
James R. Donovan, Box 545, Columbus, Miss.
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Kenneth Petitt, Thebes, Ill.
Salvador Scocca, 1375 Leland Ave., Bronx, N. Y.
G. E. Harris, 13th floor, Cosden Bldg., Tulsa, Okla.
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Samuel M. Falk, 7422 17th Ave., Brooklyn, N. Y.
Cody Patterson, 3025 Colerain Ave., Cincinnati, Ohio.
I. F. White, 801 W. 7th St., St. Charles, Ill.
Paul W. Rhodes, 100 East 42nd St., New York, N. Y.
Daniel Gerone, 391 George St., New Haven, Conn.
Don R. Skinner, 1223 East Jean St., Tampa, Fla.
E. H. Vetter, Golden Valley, N. Dak.
Robert E. Sterry, 4132 Quitman St., Denver, Colo.
T. H. Leonard, 309 West 8th St., Dubuque, Iowa.
R. L. Monroe, 2514 Isabella St., Sioux City, Iowa.
Eugene Barker, 149 Dakota Ave., Columbus, Ohio.
Na. G. Gasten, 1132 Maison Blanche Bldg., New Orleans, La.
R. S. Keegan, 338 Davenport Road, Toronto-5, Ont., Canada.
W. C. Robinson, 119 W. 1st St., Duluth, Minn.
Peter J. Bach, 7227 N. Paulina St., Chicago, Ill.
C. A. Sonnen, 574 Rice St., St. Paul, Minn.
Paul Peyton, 77 N. Milton St., St. Paul, Minn.
Stanley J. Urbanski, 990 E. Jessamine St., St. Paul, Minn.
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J. L. Robinson, 5506 Bryan Parkway, Dallas, Texas.
G. E. Hills, R. F. D. 3, Fort Edward, N. Y.
William M. Carroll, 1 Minto St., Toronto (8), Ont., Canada.
Jos. Siemeitkoski, 134 Kenilworth St., Philadelphia, Pa.
Jas. E. Sutton, 3213 Walnut St., Chicago, Ill.
C. L. Umberger, 2025 Cumberland Ave., Middlesboro, Ky.
Michael J. Curley, 202 Bergenline Ave., Union City, N. J.
W. Tighe O'Neal, Radio Serv., P. O. Box 1122, Fort Worth, Texas.
Julius Homa, 82 Stratford Place, Newark, N. J.
George Hamer, 408 Fulton St., St. Paul, Minn.
A. Schmidt, P. O. Box 293, Hayward, Calif.
J. L. Ewing, Box 157, Grand Junction, Colo.
W. George Hurt, Town Tall, Belleville, N. J.
M. W. Newell, 3518 Garfield Ave., Minneapolis, Minn.
A. Walder, 5203 Wayne Ave., Chicago, Ill.
Russell M. Shattuck, 38 Dartmouth St., Watertown, Mass.
Kenrick E. Cain, 3405 Humphrey St., St. Louis, Mo.
Carlos A. Mathias, 2317 Coyner Ave., Indianapolis, Ind.
Joseph Cummins, 2019 Nedro Ave., Germantown, Phila., Pa.
Joseph C. Mink, 2466 Thompson Ave., Cincinnati, Ohio.
Frank L. Sylvester, 208 W. 3rd St., Carrollton, Mo.
Terrence McGowan, 112 Beadel St., Brooklyn, N. Y.
B. L. Melang, Firland Sanatorium, Richmond Highlands, Wash.
G. E. Travis, Schnevus, New York.
David J. Myers, 440 N. Queen St., Lancaster, Pa.
Richard P. Roberts, 6335 Marsden St., Philadelphia, Pa.
Andrew Peterson, 52 Town Hill St., W. Quincy, Mass.
Henry G. Bulitta, 130-17 148th St., So. Ozone Park, L. I., N. Y.
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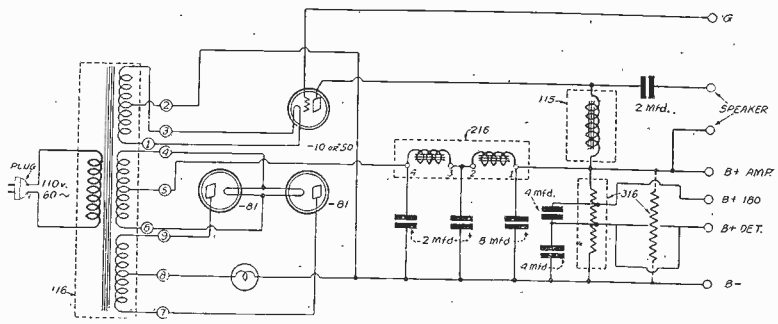
Emil Gaspard, 459 E. 115 St., Cleveland, Ohio.
Leo M. Kraker, 925 Prairie Ave., Joliet, Ill.
Oscar Tasse, 776 De L'Eppee Ave., Outremont, Que., Can.
O. W. Jones, 2115 Rosedale Ave., Oakland, Calif.
J. Harold Hart, 22 Morningside Ave., New York City.
David B. Coolidge, 268 School St., Athol, Mass.
Frank Fay, 466 W. 150 St., New York City.
S. E. Carrigan, Winthrop, Minn.
R. C. Jones, 1732 Bluff St., Des Moines, Iowa.
W. J. Hoadley, 3160 Liberty Ave., Fresno, Calif.
Jno. P. Harvey, Metamora, Ill.
Lewis Dickensheets, 1520 East 42nd St., Kansas City, Mo.
Felix L. Sobocinski, 259 Strauss Str., Buffalo, N. Y.
Walter Christensen, 6149 Greenwood Ave., Chicago, Ill.
Roy M. Beyer, 1999 Madison St., Saginaw, Mich.
Fred Berhley, 3411 Astoria Ave., Astoria, L. I., N. Y.
Clarence Bean. 1182 W. Elm St., Scranton, Pa.
John A. McCullough, 3 Salem St., Hartford, Conn.
Albert W. Yetter, 1407 Emerick St., Philadelphia, Pa.
L. H. Rossiter, Jr., 109 Asylum St., New Haven, Conn.
A. B. Caudle, 725 Post Place, East St. Louis, Ill.
Eugene J. Stutz, 1714 Park View Ave., Bronx, N. Y.
Chas. P. Keim, Newport, Pa.
Arthur H. Miller, R. No. 1 Box 13, Robbinsdale, Minn.
W. J. Gould, 24 Alsace Ave., Buffalo, N. Y.
Clyde D. Kiebach, 1429 Moss St., Reading, Pa.
W. Ross Gemmill, 715 E. Philadelphia, At., York, Pa.
Francis R. Harris, 24 Marcy Place, New York City.
C. L. Nolen, 637 West 20th St., Houston, Texas.
F. B. Wallace, 318 Chicago Blvd., San Antonio, Texas.
F. A. Warner, 6232 Julian Ave., St. Louis, Mo.
J. H. Hetherington, 1728 North 25th St., Kansas City, Kansas.
James A. Bucci, 236 E. Mine, Hazleton, Pa.
O. A. Kinch, 109 W. Van Buren St., Battle Creek, Mich.
Albert Wignot, 4 Home St., Worcester, Mass.
Dale Slack, Wellington, Kansas.
W. J. Pollock, 1052 E. Thomas St., Seattle, Wash.
Charles J. Sims, Hotel Somerset, New York City.

The Victoreen B Supply



THE CIRCUIT DIAGRAM OF THE VICTOREEN POWER SUPPLY

THE importance of having an adequate power supply is not fully realized until trouble for lack of power is experienced.

And it is queer that in cases of such trouble the real cause is the last to be suspected.

Tuning condensers and coils are tested if the signal is distorted and the cause of the distortion is not obvious. Grid leaks are changed and coupling and by-pass condensers are moved about or exchanged for others in the hope that the trouble may be cleared up. New tubes are obtained with a similar hope, or the old tubes are rejuvenated. The loop is suspected, inspected, and rejected for another without any improvement in the quality.

Another Guess

Finally the B power supply is tested and found to be without fault. That is, it is found to deliver the current and voltage that it was designed to deliver. But when it is taken back to the receiver it fails to improve the quality.

The owner of the eliminator recalls that when he worked it on another set the performance was satisfactory. Hence he has much evidence on which to acquit the B supply as the source of the trouble. He defends it against any suggestions that it may be at fault. The eliminator is all right, he contends, and it must therefore be the new radio receiver which is at fault.

The Voltage Is Willing

But where does the trouble lie? Both the set and the power supply could be tested separately and found perfect, yet the combination of the two does not produce the right results.

So it is the combination of the two that is at fault. And who should be blamed for that? The makers of the power supply or the makers of the receiver?

Neither.

Wrong Combination

The fault lies with the radio fan who joined the two. The probability is that it is his own concoction. The maker of the power supply stated what the practical working range of his product was. The maker of the receiver stated the power requirements. There must have been a wide discrepancy which the fan disregarded.

The voltage of the power device may seem high enough to meet the requirements of the receiver, but the power output is not sufficient. The power supply device must not be rated by voltage alone, but by voltage and current, that is, by the watts output. In the inadequate power supply the voltage is willing but the current is weak.

If the power supply cannot maintain the required voltage when a heavy current is drawn, the quality of the output of the receiver will not be good. Hence the solution to the distortion problem in this case is to get a power supply which can maintain the voltage when maximum current is drawn and still leave a wide margin of safety.

Power in Reserve

Such a power supply will naturally cost more than a small B battery eliminator of the type that was in vogue a year or two ago. But these old eliminators, in fact nearly all factory-made products today, are not designed to drive a heavy-duty set, and that is the reason they are obtainable for almost nothing. They are of no value to the radio fan with the modern high power, high quality outfit, although they may still serve the medium and small sets which have not yet been displaced.

It is better to buy a power supply that is much oversized for present needs than to buy one which supplies just enough power. The one that is just large enough now will not be adequate tomorrow when the next model receiver is installed, but the one that is oversized now will probably be able to handle the future set as well as it handles the set of today, for we have just about reached the practical limit of home volume. Power in reserve is inducive to good quality.

What Many Draw

There are many multitube receivers now which require a total of 50 to 100 milliamperes plate current at a maximum plate voltage of 180 volts. A power supply designed for 2½ times the current at the rated voltage should be provided for a receiver of this type.

There are several power supply units on the market which are designed for both high voltage and large current, and one of these is recommended for the multitube and high quality receiver. For example the Victoreen power supply described in the March 10 issue of RADIO WORLD is one of these heavy duty outfits. A circuit diagram of this eliminator is published herewith for the benefit of those who wish to wire up one of them.

Power Tube Built in

In this power supply full wave rectification is employed, making use of two half wave types—81 rectifiers. These are used because they stand higher voltages than the full wave rectifier and also more current can be drawn from them without seriously dropping the voltage. The filter chokes have also been designed with special regard for the heavy current which may be required, and they are wound to a low resistance so that the voltage drop in them is always low. Thus the regulation of the outfit is very good and the voltage fluctuations due to variable current drain are negligible.

The power amplifier, which is an integral part of the assembly, is designed for a —10 power tube with a plate voltage of about 450 volts. This power tube and high voltage insure faithful reproduction of the signal impressed on this amplifier, and to get a good output it is only necessary to insure that the amplifier ahead of this stage is faithful to the signal. This can be done by using a stage of transformer coupling with two transformers of modern design or three stages of impedance or resistance coupled amplification. The plate power for this amplifier can be taken from the suitable tap on the output potentiometer on the eliminator.

Beacon Guides 'Planes On Two Test Flights

Washington.

The Aeronautics Branch of the Department of Commerce reported that excellent signals from the College Park radio direction beacon have been obtained in two flights of 135 miles each made from College Park, Md., to Bellefonte, Pa., by planes engaged for experimental purposes.

No difficulty was experienced, it was stated, in identifying and keeping on the radio course. The indicator was found to be of practical use in navigating in conditions of low visibility.

"Success on these flights," it was said, "has made it desirable to install more reliable means of modulating the radio beacon current at the frequencies required for this indicator. Flights have been discontinued until these alterations have been completed at the College Park station.

"Two flights were made from Bellefonte with the radio telephone transmitting set operating at frequencies near those allotted for this service by the International Radio Conference. Thoroughly satisfactory radio reception up to 100 miles, the greatest distance tried.

"The results indicated that these frequencies are somewhat better adapted to telephony from ground to aircraft than the higher frequencies previously used in the Bureau's experimental work."

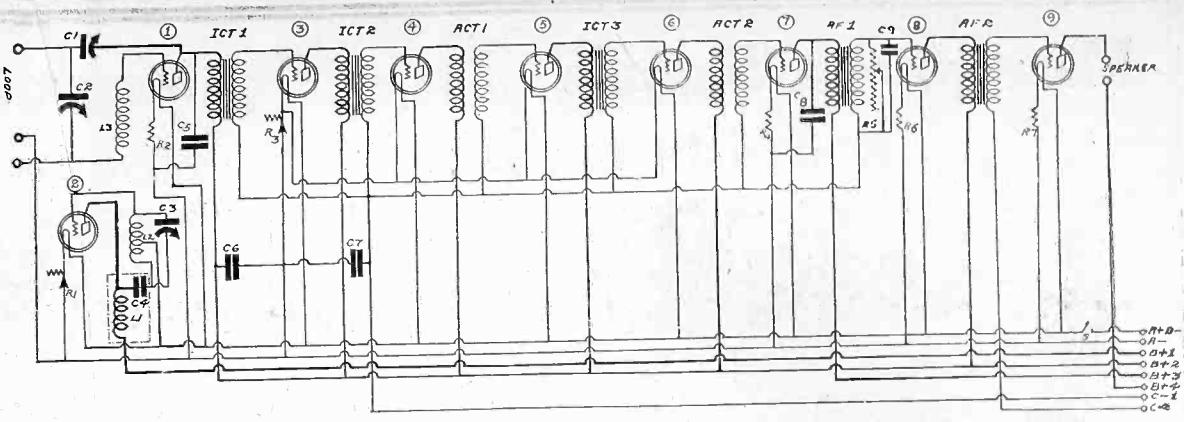


FIG. 605
THE CIRCUIT REQUESTED BY WILSON B. SHOEMAKER.

Radio University

A FREE Question and Answer Department conducted by RADIO WORLD for its yearly subscribers only, by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., New York City.

When writing for information give your Radio University subscription number.

WHAT IS meant by matching of intermediate frequency transformers in Super-Heterodynes?

(2)—What is meant by matching of tubes for the intermediate frequency amplifier?

(3)—I want to build a "One Spot" Super-Heterodyne. Can you explain how it is done?

(4)—Is it possible to omit the oscillator tube from the Super-Heterodyne?

OLE HANSON,
Minneapolis, Minn..

(1)—When all the intermediate frequency transformers are tuned to the same frequency they are said to be matched. This tuning is done in the factory.

(2)—Tubes for an intermediate frequency amplifier are said to be matched when they have the same grid to filament capacity. Since this capacity adds to the capacity across the secondary of the transformer connected to the tube, the transformer matching would be upset if the tubes were not matched as well.

(3)—See page 6, March 10 issue of RADIO WORLD for a full discussion.

(4)—No, the oscillator cannot be omitted, for it is the heart of the circuit. When the heart is still the receiver is dead.

* * *

IS IT SAFE to operate a loudspeaker on a —71A type without an output filter? I want to improve the quality of my set by using the power tube but I do not wish to buy an output filter.

(2)—If an output filter is necessary, which is the better, the output transformer or the choke and condenser combination?

(3)—Can the 112A tube be operated without the output filter?

(4)—I have been using a B battery eliminator for the past two years with fair results. Can I use this eliminator with the —71A tube as well, and will it give as good tone?

THORVALD FJELD,
Seattle, Wash.

(1)—It is not safe to the speaker to be operated on a —71A without a filter between the tube and the speaker.

(2)—It depends somewhat on the speaker used, as well as on the design of the output devices. Usually it is somewhat better to use a condenser and choke combination.

(3)—Yes.

(4)—It is highly probable that the eliminator you have will not satisfactorily operate the circuit when you use a —71A tube.

* * *

WHERE CAN I buy neon lamps for television experiments?

WILLIAM A. DAVIS, JR.,
Memphis, Tenn.

Write to National Research Council, Washington, D. C., for this information. They can direct you to the companies which make or sell neon lamps.

* * *

I HAVE a commercial B battery eliminator with the lowest voltage 45 volts. Is there any way of getting 22½ volts from this without rebuilding the eliminator? I want the lower voltage for a screen grid tube.

(2)—Can I use a 5-to-1 transformer between the detector and the first audio in the screen grid Diamond published Feb. 4 and a 3-to-1 in the second stage?

ORMOND BACH,
Cleveland, Ohio.

(1)—Yes. See article and diagram in next week's issue.

(2)—Yes, but it would be better to put the 3-to-1 first.

* * *

I PLAN to build a receiver which takes all its power from the 110 volt DC line. The diagram shows two —99 tube filaments in parallel with a variable resistor across them, a 112A tube filament in series, a small 6 volt, ¼ ampere lamp in series as well as a 50 watt light in series. What should the resistance across the two —99s be to give these two tubes the correct current when the pilot light and the 50 watt light each gets ¼ ampere?

(2)—What rheostat, if any, should I connect in series with this line to make the current through the circuit ¼ ampere?

CARL TENNEY,
Detroit, Mich.

(1)—The voltage drop across the —99s should be 3 volts and the sum of the filament current is .12 ampere. The rheostat across them should take the difference between ¼ ampere and .12 ampere. Since the voltage across the rheostat is 3 volts the resistance should be 3/.13, or 23 ohms.

(2)—The voltage drop in the 50 watt lamp with ¼ ampere flowing through it is 60.5 volts. The sum of the drops in the tubes is 8 volts. Hence a rheostat must be inserted into the line which will drop the difference between 110 and 68.5 volts when ¼ ampere flows. That means 166 ohms. To provide against excess line voltage the rheostat should be variable between that figure and about 200 ohms.

* * *

WILL YOU kindly publish a diagram of a 9-tube Super-Heterodyne suitable for a portable receiver? I would prefer one in which the first detector is regenerative. It must be a loop operated circuit.

WILSON B. SHOEMAKER,
Augusta, Me.

See Fig. 605.

Microphone Signals Autoists to Safety

(International Newsreel)

A TRAFFIC OFFICER EXPLAINED TO A BALTIMORE MOTORIST THE WORKINGS OF A NEW TRAFFIC AID INVENTED BY CHARLES ADLER. THE BOX ON THE POLE CONTAINS A MICROPHONE LIKE THAT USED IN A BROADCASTING STUDIO. WHEN THE MOTORIST SOUNDS HIS HORN THE MICROPHONE RESPONDS AND TURNS ON A GREEN LIGHT AND HOLDS IT LONG ENOUGH FOR THE MOTORIST TO PASS.

EXPONENTIAL HORNS TO THE FORE

(Henry Miller)

SERGIUS P. GRACE, GENERAL COMMERCIAL ENGINEER OF THE BELL TELEPHONE LABORATORIES, SPEAKING INTO THE FIRST TELEPHONE EVER MADE, AND THE LATEST EXPONENTIAL HORN LOUDSPEAKER, WHICH IS VERY POPULAR JUST NOW FOR ITS FIDELITY OF REPRODUCTION. THE CROSS SECTIONAL AREA OF AN EXPONENTIAL HORN INCREASES ACCORDING TO THE SAME LAW AS THE AMOUNT IN COMPOUND INTEREST.

Sydney's 2L(Sent Ou

(Seaward Alwyn Sand)

WELLINGTON MUIR, LOCKPORT, N. SET WITH WHICH HE RECEIVED 2F CIENT INTENSITY AND CLEARNESS WMAK, A WESTERN

A super radio receiver built and operated by Wellington Muir of Lockport, N. Y., recently picked up signals from station 2FC, Sydney, Australia, with sufficient clearness and intensity to enable the retransmission of the programs by WMAK.

The program from the antipodes consisted of orchestra selections, tenor, contralto and violin solos.

The same set also picked up, via Syd-

Window Pan By Res

By John

It has often been said that if one could ascertain the fundamental frequency of a great building, produce this frequency with some instrument and cause the building to vibrate in sympathy, the structure would crumble. Such is possible, but the specification of power must be included. The building could be made to vibrate sufficiently to disrupt joints and to crash, but one cannot even conceive the amount of power necessary.

A phenomenon of this type, although of much smaller magnitude, was recently encountered in the laboratory of the Air-Chrome Studios.

Audio Oscillator Used

While testing speakers with a variable frequency audio oscillator, a sympathetic vibration was noted at one frequency. Investigation of the speakers did not show any unit which could be the source of this vibration. In the effort to locate this annoyance, the oscillator power output was greatly increased.

By applying greater power, it was hoped that the part responding in sympathy

Pickup By WMAK

TUNING IN HIS SUPER RADIO IDNEY, AUSTRALIA WITH SUFFI- REBROADCAST IT OVER STATION W YORK STATION.

y, a program originating in London m station 2L0. This was also rebroad- t by WMAK. During this feature Big n, chorus, and organ selections, "God ve the King," and announcements were arly heard.

Plans are in progress to rebroadcast ough the Muir receiver and station MAK programs from Paris, Berlin and ier continental stations.

Much interest is being shown.

Smashed nant Power

Rider

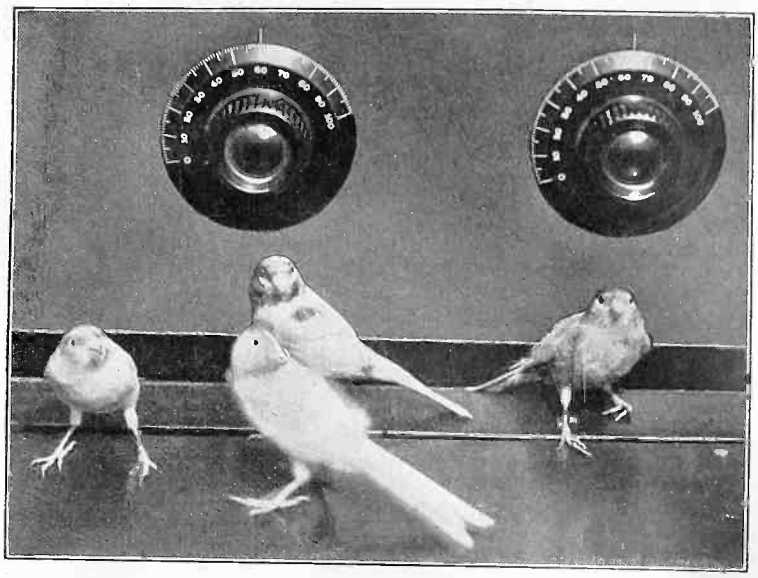
the applied frequency would vibrate at amplitude sufficient to show its position to permanently injure it, by changing alignment with respect to the other rts of the speaker. The injured part uld mar the operation of the speaker. Starting at a low value, the frequency l the power, were gradually increased. one frequency in the upper audio ister, this sympathetic vibration was ain heard. The power was increased; vibration became louder and its loca- n was discovered.

Pane Was Loose

t was a loose pane of glass in a show- e. The power input to the speaker was ain increased. The window vibrated re violently. How much more could withstand without shattering? The wer was increased until more than 100 tts was being obtained from the output e. The oscillator was retuned with re accuracy. The window vibrated h a great clatter and then suddenly cked.

All were surprised.

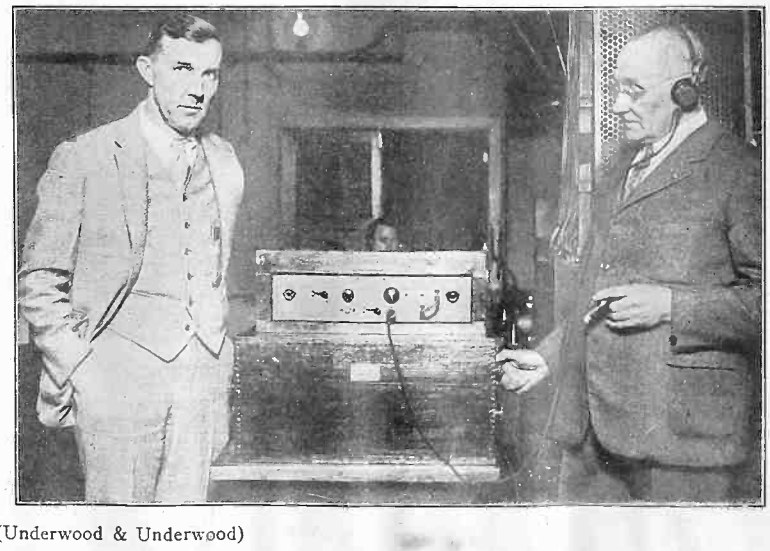
Listening-In Cure Taken By Canaries



(Metropolitan Photo Service)

CANARIES ARE PLAYING A MORE IMPORTANT PART IN RADIO DAILY. NOT ONLY DO THEY SING WITH MANY ORCHESTRAS BUT NON-SINGERS, PARTICULARLY MOULTERS, ARE HELPED BACK TO SONG BY LISTENING IN. THESE FOUR FINGER-TAMED BIRDS DO THEIR LISTENING IN CLOSE-UP FASHION

FOREIGN NOISES DOMESTICATED



(Underwood & Underwood)

WILLIAM J. SCOTT (RIGHT), FOR MANY YEARS A NAVAL RADIO OPERATOR, INVENTOR OF THE CLARIPHONE, EXPLAINING TO LT. COMMANDER J. M. ASHLEY, COMMUNICATION OFFICER AT THE RADIO CENTRAL OF THE NAVY, THE OPERATION OF THE NEW DEVICE. THE CLARIPHONE IS SUPPOSED TO ELIMINATE STATIC AND ALL FOREIGN NOISES FROM A SIGNAL, PERMITTING TELEGRAPH CODE TO BE COPIED UNDER THE WORST CONDITIONS, AND OFFERING POSSIBILITIES ALSO FOR USE IN BROADCAST RECEPTION

BOARD DID LITTLE, SAY LAWMAKERS

The outstanding developments in the debate in Congress on the radio bill follow:

In a speech before the House the following was stated by Representative Celler: There are 680 stations; 126 share time and wavelengths. The Southern (Third) Zone has the largest population, and the smallest total power, but rightfully so, since their farmers own few sets, and large stations in other zones reach them. In New Jersey 52% of the farmers have sets; in Mississippi, 1%.

The House Committee, in favorably reporting the amendment, said: "The present Commission on its assumption of authority found conditions not much different than they are now."

Representative Davis (Tennessee) answered Commissioner Caldwell's attack on the amendment which Davis sponsored by citing examples of alleged favoritism by the Commission and charging failure to comply with Congress' direction that power, wavelengths and time on the air be equitably apportioned.

The National Association of Broadcasters, Inc., through L. S. Baker, opposed the amendment on the ground it limited maximum power to 1,000 watts, confining the service area of maximum-powered stations to 50 to 75 miles, so that one-third of all sets would not be able to bring in even the highest-powered stations.

* * *

Washington.

The House Committee on Merchant Marine and Fisheries, reporting favorably on the amendment to the radio bill to equalize total power and wavelengths by zones, said:

"Prior to the present radio law there was no authority to control the location of stations. It does no violence to truth to say that prior to March, 1927, stations were built whenever and wherever applicants desired and that there was no legal power to control either the use of wavelengths or power.

"The present Commission on its assumption of authority found conditions not much different than they now are. It is perhaps idle to consider whether the Commission during the past year could or should have brought about a redistribution."

"This amendment looks to the future. It declares in terms the duty of the licensing authority to make an equal allocation among the five zones, of broadcasting licenses, of wavelengths and of station power and provides that within each zone there shall be an equitable allocation among the States thereof in proportion to population and power."

Cases of Favoritism Cited Against Board

The attack on the equal license clause, made by Orestes H. Caldwell, Federal Radio Commissioner (New York), wherein he charged that the provision would "wreck" the regulation of radio, was answered by Representative Davis, Tullahoma, Tenn., at whose instance a House committee favorably reported the amendment. Mr. Davis said:

The intemperate attack upon the distribution clause contained in the Radio Bill favorably reported by the House Committee on the Merchant Marine and Fisheries given to the press by Commissioner O. H. Caldwell shows conclusively that such a clause is necessary to insure relief from the present unfair and discriminatory distribution.

The Radio Act passed by the last Congress authorizes an equitable distribution and indicated to the Commission that Congress desired such a distribution. However, this provision was wholly ignored by the Commission. The amendment in question directs what the Committee conceived to be a proper distribution.

The existing law divides the country into five zones, the first four zones being of substantially equal population, and the fifth zone being of considerably less population but much larger geographical area.

Zones Listed

According to the present set-up the number of broadcasting licenses and the station power they are authorized to employ are as follows:

None Number Stations Total Stations Power in Watts Percentage of Station Power			
1	138	213,055	35.30
2	115	116,805	19.34
3	102	47,105	7.80
4	215	164,870	27.31
5	131	61,785	10.24
	701	603,620	100

The Third Zone, with the largest population of any of the zones and by far the largest area except the Fifth Zone, is granted but 7.8 per cent of the total station power.

Charges Gross Discrimination

The second Zone with but 40,000 less population and a much larger area, and embracing the cities of Philadelphia, Pittsburgh, Detroit, Cleveland, Cincinnati and Louisville, has but little more than half of the station power authorized in the First Zone.

The six New England States, with nearly a third of the population of the First Zone, have less than an eighth of the power. In the Fourth Zone, Illinois, with about a fourth of the population of that zone, has more than half of the power granted the stations in the 10 States for that zone.

Instances of such gross discriminations could be extended indefinitely.

Commissioner Caldwell proceeds upon the false premise that the zones with stations and power in excess of their quota must be reduced to the basis of the Third Zone, which has the smallest number of stations and power.

Surely Mr. Caldwell knew that the provision required no such thing; it simply provides for an equalization as between the zones. The equalization could be brought about by an increase of power in the zones now so deficient in power or by both reductions and increases. Manifestly such a course should be followed.

Members of the Radio Commission have been credited with the statement that there should be a substantial reduction in the present number of stations, particularly in the congested areas. Stations for elimination have ben placed as high as 300. Mr. Caldwell indicated at the hearings that he favored the elimination of about half that number.

It is recognized by those familiar with the situation that there are too many broadcasting stations in certain congested areas, and there is much complaint from the listeners in such areas. The air is cluttered up and reception frequently very unsatisfactory not to speak of the fact that the citizens in such areas are unable to get reception from outside stations with any degree of satisfaction.

Denied Just Rights

Consequently, such a situation is not only unsatisfactory from a local standpoint, but it deprives neglected sections of the country of wavelengths and power to which they are justly entitled.

Proceeding upon his false premise, Mr. Caldwell undertakes to show the havoc that would be played in New Jersey, and in order to magnify his argument he very improperly charges to New Jersey the Radio Corporation Station WJZ with 30,000 watt power, which is a New York station with its broadcasting apparatus in New Jersey.

As a matter of fact, under the present frame-up New Jersey has less than one-twelfth of the station power accorded that zone, although it has over one-eighth of the population. Of course, all of his conclusions based upon a false premise are likewise incorrect.

Amendment Cited

The amendment in question is as follows:

"The licensing authority shall make an equal allocation to each of the five zones established in Section 2 of this act of broadcasting licenses, of wave lengths, and of station power; and within each zone shall make a fair and equitable allocation among the different States thereof in proportion to population and area."

Of course this provision would be administered in connection with all the other provisions of the act, including the provision in the same paragraph and immediately preceding the distribution clause, which is as follows:

"The licensing authority, if public convenience, interest, or necessity will be served thereby, subject to the limitations of this Act, shall grant to any applicant therefor a station license provided for by this Act."

Entitled to Equal Consideration

We take the position that the citizens in one section of this country are entitled to the same consideration as a like number in another section.

Mr. Caldwell pretends to be concerned in the interest of the listeners, but his words and actions do not so indicate.

He makes a specious and misleading argument with respect to the ownership of radio receiving sets.

According to the estimates of a responsible radio magazine, such sets in the United States are distributed among the different zones in the following proportion: 24.2 per cent in the First Zone; 21.04 per cent in the Second Zone; 15.97

(*Concluded on next page*)

1/3 OF SETS IN DANGER SAYS BAKER

By L. S. Baker

Managing Director, National Association of Broadcasters, Inc.

Besides unjustly and unfairly disregarding the request of others to be heard on the subject of amendments to the Radio Law beyond the extension of the life of the Commission, the House Merchant Marine and Fisheries Committee with utter disregard for all known radio principles has favorably reported a proposal, which if it became law and was enforced by the Radio Commission under present conditions, would render useless or obsolete practically one-third of the radio sets of the country, or approximately $230,000,000 worth of equipment purchased by listeners.

The proposal states in plain language that one-fifth of all the licenses, wavelengths and the total amount of power shall be allocated and reserved for each zone set up by the present Radio Act, without regard to population or area in the zones. A second part of the provision requires an equitable distribution of this one-fifth, according to population and area, to the several states within each zone—but the population and area measure in the second provision has no bearing upon the first.

1,000 Watts Would be Limit

Surveying the stations as they are now located in the terms of this provision indicates that the Commission would have to scale down the power and readjust the allocations in such a way that the highest powered station in the country could only utilize 1,000 watts—meaning that the largest dependable service area of any station would be a radius of between 50 and 75 miles—and this would not be entirely dependable.

The committee entirely disregards the fact that approximately one-third of the receiving sets in use in the United States today are located beyond a fifty-mile radius from any station. According, under the terms of this provision, fully one-third of the listeners could obtain dependable service from no radio station in existence today.

It is well known to anyone having an elementary knowledge of broadcasting requirements that artists and entertainers of the highest class in numbers sufficient to make continuous programs of acceptable quality are only available in the larger centers.

Affects Quality of Talent

They are not equally distributed in the five zones and the provision would make first-class programs impossible to produce and maintain in some zones, while on others many desirable artists and entertainers would be crowded out. Apparently the House Committee either has no regard for this fact, or knows nothing about the quantity and quality of artists necessary to place before the microphone to keep a station on the air.

Again, complete ignorance of the exceptionally large capital requirements necessary to build, equip and operate high-class stations capable of being used as centers of program distribution has been shown by the House Committee.

Such capital requirements are not equally divided in all zones, and probably could never be found in some zones. Experience has shown that even some whole States do not possess such requirements, and no applications have ever been received from these districts, notwithstanding the fact that both the Department of Commerce and the Federal Radio Commission in turn have stated that undoubtedly such applications would be granted if ever received.

Question of Power

The House Committee took no cognizance whatever of the proven laws of radio regarding power requirements. It is perfectly well known that in thickly populated and well-built up sections of the country, the absorption characteristics are exceedingly high, and moreover, other natural phenomena make necessary high power.

On the converse, in the sparsely settled districts where distances are great and building not concentrated, lower power serves adequately, and sometimes much better. Nevertheless, the provision referred to would necessitate cutting the power and handicapping the service where the concentration of listeners exists, with no material gain in service in the other districts.

Davis Attacks Board

(*Concluded from preceding page*)

per cent in the Third Zone; 25.01 per cent in the Fourth Zone; 13.11 per cent in the Fifth Zone.

If better treatment is accorded stations in the Third Zone, so that the citizens therein can get decent reception, there will be a large and immediate increase in receiving sets in that zone. Commsisioner Lafount has just had changes made in 70 stations to improve reception in his, the Fifth Zone.

Listeners Want Wide Choice

We are dealing with the subject from the standpoint of the public generally and the listeners in particular. The public is certainly not concerned alone in a few high-powered monopoly stations. They are also interested in sectional, State, and local stations.

We want such a distribution of stations, wavelengths and power that the listeners can satisfactorily hear any stations they desire, and not be compelled to listen only to a few favored stations as is now the case.

Mr. Caldwell states that the enactment "of this abominable redistribution clause" will wreck "our present wonderful radio broadcasting structure."

It may wreck the plans of a few high-powered monopoly stations and their affiliated chain stations to preempt the broadcasting field, but it will vastly improve the broadcasting structure from the public standpoint.

Hint of Favoritism

The Radio Commission has cleared 25 channels or wavelengths between the range of 600 and 1,000 kilocycles, decidedly the most valuable range.

On 24 of these channels they have placed chain stations, including the high powered monopoly stations; on these 24 cleared channels they have placed a total of 31 chain stations.

They have granted to the stations on these wave lengths more station power than is granted to the remaining stations, approximately 624 in number, which are crowded together on the remaining 64 less desirable wavelengths.

Get 213,000 Watts

The broadcasting stations owned by the General Electric, Westinghouse, Radio Corporation of America, and the National Broadcasting Company which is owned by the said three companies, are given an aggregate station power of 213,000 watts.

SURVIVAL OF BEST IN AIR MIXUP

By R. H. Manson

Chief Engineer, Stromberg-Carlson Company

Radio broadcasting is seven years old. At the start the half-dozen broadcasting stations operated on one channel, 360 meters.

There were very few listeners and interference did not count. Within that year, however, it was found necessary to open up another channel, 400 meters, and to allocate the broadcast transmitters to these two channels.

At the present time there are ninety-six channels available for broadcasting in the North American continent, and there are at least 690 broadcasting stations operating on these channels.

An Attempt to Clear Channels

To avoid interference on all channels the Federal Radio Commission is attempting to clear up at least thirty of these channels so that only one broadcast transmitter will be operating at any one time on the cleared channels.

Instead of clearing channels or cutting down the number of broadcasters the Federal Radio Commission allowed a number of broadcasters to operate on each channel.

With improved reception, heterodyne whistles increased, also actual crosstalk or overlapping of programs.

Instead of having a number of channels which were clear from this type of interference and which would allow rural listeners to get clear programs, practically all programs available to people located outside of the large cities were found to be spoilt by heterodyne and cross talk interference.

This condition finally forced the Federal Radio Commission into clearing a certain number of channels, and already the general reception conditions for the whole country have been improved.

In general, the attitude of the Federal Radio Commission is to allow the broadcasters to fight out their own battles, and in the end it will be a survival of the fittest.

The more powerful broadcasting stations must serve programs which include items of national interest on an equal basis with items of local interest.

New Numbering Plan

For example, the network hook-up allows metropolitan features to be brought into smaller communities and distributed locally along with the home programs on the same basis that the large news associations feed the local papers with national events or expensive syndicated features along with the local news and local features.

It is interesting to note the efforts on the part of radio manufacturers to get away from kilocycles and wavelengths in meters and to adopt channel numbering. The first proposition was to number channels from 1 to 96, starting with 550 kilocycles.

Latest Proposal

The latest proposal, and one which may go through, is to number the channels from 55 to 150, these numbers being arrived at by omitting the last digit from the kilocycle numberings.

The advantage of this scheme is that additional channels on both ends of the broadcast band can be added without upsetting the plan.

DILL CALLS COMMISSION DO-NOTHING

Washington.

The Federal Radio Commission was charged with negligence and failure to perform its prescribed duties by Senator Dill (Dem.) of Washington, before the Senate.

Alluding to a statement by Commissioner O. H. Caldwell, of the Radio Commission, that if pending radio legislation providing for equal allocation of wavelengths and power to stations throughout the country was passed it would "ruin" the industry, Senator Dill said that the Commission has shown "an absolute disregard for wavelengths." He added:

"The Radio Commission sits here and refuses to do anything. I don't know whether they lack the ability or are plain cowards, but I do know that they don't earn their salt."

45,000 Watts in South

Senator Dill said that the Southern States have only about 45,000 watts of power allocated them for broadcasting while in the East, particularly in New York and Pittsburgh, single stations are permitted that much power alone.

"No station west of Pittsburgh and south of New York has more than 15,000 watts," he declared, "while New York, Pittsburgh, Schenectady, and other eastern cities have stations of 45,000 watts each.

Again referring to the statement by Commissioner Caldwell, Senator Dill asserted that he likewise did not favor the equal allocation legislation because he felt it was "unworkable," but that he saw no reason for the existing conditions, when the Radio Commission was set up for the express purpose of alleviating them.

"I don't know whether Caldwell has any leanings toward the Westinghouse, Radio Corporation, or other large radio corporations," he declared, "but I do know that they get most anything they want.

Lauds Lafount

"I don't know whether the Commission is afraid to act or whether they don't know what to do. There is only one of the Commissioners who is any good and that is Lafount (Harold A. Lafount), who was recently appointed."

When the Radio Commission came into being, Senator Dill said, most of the stations in the New York, Boston, Pittsburgh and Schenectady area had wide ranges. This, he said, was logical, and the Commission "should have fixed it," but to date has not.

McKeown Threatens R. C. A. Investigation

Washington.

Representative McKeown (Dem.), of Ado, Oklahoma, stated in the House that he had served notice on the members of the Committee that if the "equitable distribution" amendment was not adopted by the House, that he would offer a resolution to investigate the alleged radio broadcasting monopoly.

"The radio trust now is being investigated by the Senate Committee on Patents," said Mr. McKeown, "and there is evidence that the Radio Corporation of America and its affiliated concerns are running things pretty much their own way in the broadcasting field. However, if we can get legislation that will assure the South more power and more stations I might forego offering my resolution."

The Power Situation Digested by Celler

Washington.

The equal license amendment to the radio bill was attacked in the House by Representative Emanuel Celler (Dem.), New York, who backed up Commissioner Caldwell's opposition. Mr. Celler said:

The Committee on Merchant Marine and Fisheries has reported a bill amending Section 9 of the Radio Act requiring equitable distributions of wavelength and station power among the different States in proportion to population and area.

Fears Wreck

The present act provides for equal distribution of radio service. This amendment, if passed, will undoubtedly wreck radio broadcasting and plunge us back to the unsatisfactory conditions that existed prior to the Radio Act of 1927. At this time there are 680 stations; 126 of them share time and wavelengths:

There are thus 544 stations broadcasting simultaneously. The population, number of stations and station power of the five zones are as follows:

Zone	Population	Sta.	Power
First	23,000,000	95	202,000
Second	24,000,000	93	103,700
Third	25,000,000	88	45,570
Fourth	25,000,000	166	139,000
Fifth	9,213,920	112	60,620
Total	105,000,000	554	551,00

While it is true, for example, that Zone 3, which takes in the Southern States, has the greatest population and fewest stations, it must be remembered that it hasn't the greatest listening population. Forty per cent of its population are negroes. Most of these negroes are without sets.

Farms in South

Complaint is made that the farm population of the South is inadequately served because Zone 3 has the fewest stations. That does not square with the facts, because all the largest stations like WEAF, WJZ and WOR, actually serve the South as well as the North.

But the farmers of the South have comparatively fewer radio sets. In Mississippi, only 1 per cent of the farmers have radio sets; in Louisiana 2 per cent; in Alabama 3 per cent; in North Carolina 3 per cent; in Tennessee 4 per cent; in South Carolina 5 per cent.

A Contrast

It is quite a contrast to note that the farmers in other sections have a greater proportion of radio sets. In New Jersey, 52 per cent of the farmers have radios; in New York 32 per cent; in Nebraska 53 per cent; in Montana 40 per cent; in Kansas 33 per cent; in Colorado 32 per cent. Yet this amendment would take away stations from farm populations in the North, East, and West that have a high percentage of radio sets and give those stations to the South that have a very low percentage of radio sets. There is nothing fair about that.

There would be three ways of executing the amendment proposed whereby you would have an equal division of stations.

1. Increasing the stations in all zones to the maximum of any zone. This cannot be done because we have already reached the saturation point. The radio spectrum cannot be added to. The bucket, as it were, is filled and in fact is spilling over.

2. By leaving the stations in all the zones as they are and as stations drop out in the oversupplied zones, let their wavelengths and power be assigned to the southern zone. Three hundred stations can be taken off the air "for cause" that is, for jumping wavelengths, failing to split time and for violations of regulations. Their wavelengths and power could be given to the sections that are now complaining. If the amendment would prescribe this procedure, I would be satisfied, but the amendment lays down a hard and fast rule. It goes into effect immediately upon its passage and then the Commission must do its duty and cut and slash off those stations in the first, second, fourth and fifth zones and turn them over to the third zone.

Third Way

3. The third method is the method that the amendment actually prescribes. All zones must be scaled down to the minimum in acordance with area and population. The amendment admits of no other construction otherwise I do not know how to read the English language. The cut in number and power of broadcasting stations imposed by the so-called equal license amendment in some of the States is as follows:

	Watts Present	Watts Proposed
New Jersey	49,000	3,200
New York	119,000	11,000
Massachusetts	19,000	3,750
Pennsylvania	57,000	12,000
Ohio	23,000	8,000
Illinois	55,000	8,000
New Mexico	5,050	2,200
Washington	10,700	2,200
California	26,000	9,000

	Number of Stations Present	Number of Stations Proposed
New Jersey	25	7
New York	67	20
Massachusetts	18	2
Pennsylvania	35	24
Ohio	25	18
Illinois	70	15
New Mexico	3	4
Washington.	19	4
California	50	17

Furthermore, this admendment will imperil the use and efficacy of one-third of the 7,000,000 sets now in use. The Commission would have to scale down the power of stations in such a way that the high powered station would not be above 1,000 watts. This would mean that service from a station would be dependable only within a radius of between 50 and 75 miles.

One-Third Jeoparded

Approximately, one-third of the receiving sets on the main, are located more than 50 miles from any station. If the station cannot dependably broadcast more than from 50 to 75 miles radius most of the receiving sets would become useless. Furthermore, it is notorious that the best programs are given over those stations located in the cities in proximity to available high class artists, musicians, and orchestras of distinction. You cannot procure good programs when the studio is located at Painted Post or Squedunk.

Next Week:
5-Tube Screen Grid Set!

New Tube Does Marvels

By W. T. Meenam

Bakes Apple, Fries Egg and Roasts "Hot Dog" on Antenna—Warms Blood of Those Near It and May Have Medical as Well as Other Marvelous Possibilities—Arcs Like Ball of Fire

AN incandescent lamp, pulled from its carton for the first time, lights to full brilliancy without wires or socket; a copper bar lying on the floor, blisters the hand that picks it up, though the metal is cold; a neon tube suddenly floods the room with its lurid red glow when merely touched by a spectator—these and many other real freaks are produced by a new high-frequency radio tube recently developed by engineers of the General Electric Company laboratories at Schenectady, N. Y.

Meters in adjacent rooms run wild, and delicate measuring instruments are twisted or broken, so that all accurate scientific work in the vicinity is impossible.

Investigators, coming too close to the new apparatus, suddenly feel a comfortable warm glow reminiscent of prohibited stimulants, and then increasing pain in limbs and joints.

Rats Become Greatly Animated

Rats in a cage placed close to the radiating wire become excessively animated for a time, but if exposed too long, they die.

These and many less spectacular effects are incidents in the operating tests of the new high power short-wave radio tube, which members of the General Electric staff are at present conducting.

The cause of all these remarkable phenomena is an innocuous looking vacuum tube, five inches in diameter and about two feet long, set down in a wooden cage, and surrounded by a network of wires, condensers, and electric meters.

The tube operates as a self-excited oscillator on a wavelength of six meters, and is capable of radiating from ten to fifteen kilowatts of high-frequency power—probably fifty times as much as any short-wave tube heretofore produced.

The tube is connected through a coupling system to a copper bar approximately three meters long, which constitutes the tuned aerial circuit, and is able to radiate into space the full 15 kilowatts generated by the oscillator.

High Power on High Frequency

"This 6-meter tube has nothing new in principle," said H. J. Nolte, actively engaged in high-power vacuum tube development. "Very short radio waves have always been easy to produce at low power. Also very high power has for some time been available at the longer wavelengths.

"This is the first time, however, that we have been able to combine the two, so as to get relatively large power outputs on the short wavelengths.

"This new tube is a step in the development of short-wave radio transmission, on which we have been intensively engaged for several years. At present we can generate the power, but we have not yet devised a method of controlling its frequency within the close limits necessary for commercial operation."

Worth Investigating

When asked what plans were under way for the future of the high-power short-wave investigation, L. A. Hawkins, executive engineer of the Research Laboratory, said:

"We have no definite plans for this investigation. The proposition was to build a high-power tube of this type, and our time has so far been taken entirely with the development of the apparatus itself.

Vacuum tube technique had to be improved considerably before it was possible to design and produce an oscillator which would give the large power output we were seeking.

"We have not studied the applications of the new tube at all, except to make a record of the interesting sidelights which its operation has brought out.

"The demonstrations indicate that many of the high-frequency phenomena may be worth investigating, and it is likely that in the future applications will suggest themselves as they always do when a new field is entered."

Physiological Effects

Several interesting physiological effects have already been noted in connection with the new high-frequency tube. Fruit flies and rats have been studied with reference to the effects of the field, and experiments with cats are now under way.

At a frequency of about 50 million cycles, a salt solution can be heated in a glass tube placed very close to the high-frequency generator, and at approximately this frequency the solution corresponding in strength to blood serum is heated most.

Men working near the apparatus have noticed warming effects, increasing as they approached closer to the generator.

Medical observations were made of several men placed near enough to the radiating antenna to make measurements of changes in bodily temperature possible. It was found that the blood temperature rose to nearly 100 degrees F. in about fifteen minutes, after which period the experiment was stopped.

"No one can safely predict or promise a utility of such new things," said Dr. W. R. Whitney, director of the Research Laboratory, "but it is clear that further experiments must be carried out.

"It may be assumed that if we had a perfectly harmless method for warming the blood it might have value, because fevers are sometimes artificially produced in order to start convalescence, and it may well be, as asserted, that raised blood temperature, or fever, is one of nature's factors in recovery from infectious diseases."

Among the "stunts" demonstrated with the high-frequency apparatus was "radio cooking." A wire was suspended over a table at some distance from the radiating aerial, and parallel to it. A sausage placed in a glass tube, was hung from the end of this receiving aerial, and in a few minutes it began to steam.

Edibles Cooked

On being removed, the "weanie" was found to have been beautifully cooked by the high-frequency currents induced in it, although no flames or other visible means of heating were applied.

A fry-less fried egg was also prepared in the glass tube, and served hot to the spectators, but since the egg was an inexpensive one obtained for experimental purposes, no one offered to test its excellence.

An apple was impaled upon the end of the receiving aerial, and in a short time was baked to the core.

With a slightly different set-up cookies were baked and water boiled by the induced currents received through space. The fact that only a small fraction of the 20 horsepower delivered by the radiating system went into this cooking detracted not at all from the novelty of it.

Most striking of the short-wave effects was the standing electric arc, a close imitation of the famous ball of fire reputed to accompany tropical thunderstorms.

The operator touched the end of the radiating aerial with a metal tipped pole, and immediately a greenish white arc arose to a height of a foot or more. When the pole was removed the arc remained, like a plume of fire, sputtering and sending molten copper in all directions until blown out.

By skillful manipulation as many as three of these arcs were established simultaneously along the aerial, giving the appearance of a row of flaming gas jets.

No more extraordinary sights could be imagined than a powerful electric arc, representing thousands of volts, standing entirely by itself on the end of a wire without visible return circuit.

(Photograph on front cover)

'Socket Power' Defined; Also 'Electric Set'

A committee of the Radio Manufacturers Association prescribed definitions for "socket power" radio operation and outlined improved merchandising policies.

A "socket power" definition, which is expected to guide the public as well as the industry was agreed upon by a Committee of the Radio Manufacturers Association, Engineering Division, of which H. B. Richmond of the General Radio Co., Cambridge, Mass., is director. The meeting was presided over by Walter C. Holland of Philadelphia. The definitions:

"'Socket Powered,' as applied to a receiving set, includes any set operated from a light socket or an alternating current, a direct current, or with a self-charging battery compartment.

"The term 'electric set' to include only those sets operated from a light socket without the use of A or B batteries or wet cells of any description."

These trade standard terms are advanced by the R. M. A. to prevent future public and industry confusion in connection with the new developments in radio. The "socket power" term was adopted officially in lieu of other suggested substitutes which have not met with favor from the public or the press.

A THOUGHT FOR THE WEEK

RECENTLY the cables brought us from London the thrilling news that King George had remarked that his radio was out of order and that he couldn't get something or other over the air. On that same day Lindbergh flew to Cuba; Trotsky sent out a message to his adherents; Turkey was flirting with one of the Central powers, and there was a new story as to what really was said when the Governor of South Carolina and the Governor of North Carolina met—but King George merely remarked that his radio was out of order, dash the bally old thing!

SIXTH YEAR

RADIO WORLD

The First and Only National Radio Weekly

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

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Ten cents per word. Minimum 10 words. Cash with order. Business Opportunities, ten cents per word. $1.00 minimum.

FIRST AID TO DX

An aid to the DX fan is the new Popco Distance Finding Radio Chart, published by William C. Popper, 114 Worth Street, New York City. It was compiled by Julian J. Proskauer and is arranged according to channels. Beginning with all those stations broadcasting on 550 kilocycles which are allotted channel number 1, the locations of the other stations are found by giving their positions in relation to those allocations in the broadcast band which lie between 1500 and 550 kilocycles. The chart comprises four pages approximately 10 to 16 inches, including a dummy dial marked by channel numbers, graphs of stations showing their position in the band and a complete list of stations by wavelength and also by frequency. Further information may be had from Julian J. Proskauer, care of the above concern by mentioning RADIO WORLD.—J. H. C.

Airplane Speaker Delights the Critical

The most interesting part of the radio receiver is the loudspeaker. This has gripped the public fancy more than any other phase of radio. Everybody with a radio receiver is forever on the quest of the perfect speaker. The horn of diverse shapes first claimed the attention. Then for a while the drum or cylinder asked to be heard. No doubt this would have been given a hearing had not the cone speaker swept the field almost completely.

The cone held the field for a long time, and is still holding its own. But now there are many serious competitors. For a while the exponential horn was its only rival. Now that contraption with the graceful curves is going strong.

How the public taste changes! Now this sounds fine, now something else does. All the above speakers, properly driven, with the exception of the old horns of the hybrid curves, were capable of fine quality. But was any one capable of the best quality, the most realistic? That is a question which few can answer by ear test.

Must Know Conditions

It is difficult for the acoustic engineer to answer it even when he is equipped with the most elaborate measuring apparatus. Before he will give an answer he wants to know what is meant by perfect quality. With that agreed upon he can give a precise answer under given conditions.

What are some of these conditions? Well, he wants to know with what tube and at what voltage the speaker is to work. He wants to know where the speaker is to function. Will it be enclosed in a room with reflecting walls, or with sound-absorbing walls? Will it be placed near a wall or away from it? Is the loudspeaker to work out doors or near an open window or door? All these things affect the tone of a loudspeaker.

Just recently a new type of loudspeaker has made its appearance. It is made like a box kite out of plain lumber and airplane cloth. The cloth is treated with a special compound to make it take hold of the air. And what are the special virtues of the device?

If one said realistic reproduction and equal response to the high and low notes, one would merely be saying what has been said of other speakers. It would not mean much.

Little Else to Be Desired

The writer has heard many speakers made of airplane cloth and dope and lumber. When one of these speakers is driven by a good radio set and a first rate audio amplifier, with adequate power, there is little else to be desired in the line of improvement of quality.

One such combination that came within the writer's observation was as near perfection as it seems possible to approach it. The man who had effected the combination had tried everything that has come out in radio during the last seven years, and not until he got that combination was he satisfied.

His satisfying combination is a push-pull audio amplifier following a quite ordinary tuner and detector and an airplane loudspeaker.

Why is the airplane loudspeaker, like the HBH speaker described in the March 3 issue, capable of following the signal so faithfully? Because it is light in weight, because it is stretched taut, because its surface is large enough to take hold of the air and shake it, because it has no marked resonance peaks, because the special dope used helps to dampen free vibrations and rattles.

$8,478,320 in Profits, R. C. A. Reports for Year

A gross income from operations of $65,082,074.48 and a net income of $11,799,650.28 for the year 1927 were shown in the annual report of the Radio Corporation of America for the fiscal year. Of the net income from operations, $2,371,330 has been set aside as reserve for Federal income taxes and amortization of patents, and $950,000 as general reserve and as reserve against foreign investments and for the employees' pension fund, leaving a net amount of $8,478,320 to be transferred to surplus account.

The Radio Corporation's financial position is sumamrized in the report as follows:

Current assets have increased $6,595,185 and exceed the current liabilities by $22,469,297, the ratio of current assets to current liabilities being slightly more than three to one. The corporation has no bonded debt on notes outstanding.

Plant and equipment, less reserves amounting to $7,683,634 now stands at $6,541,612. This is after the provision of a special additional reserve of $4,500,000 for this year, out of surplus account.

No Excessive Dividends

The reserve for amortization of patents, after charging off patents expired and an additional reserve of $1,000,000 provided out of surplus account, amounts to $7,155,641, reducing the book value of the patents to $5,515,543.

The policy of the partly owned subsidaries of the Corporation, the report declared, is to avoid either the accumulation of an excessive surplus or the payment of excessive dividends.

The granting of licenses under the tuned radio frequency patents of the Radio Corporation of America to twenty-five manufacturers of radio receiving sets had done much to stabilize the radio industry and to put it on a sound and permanent basis, the report points out. No licenses have been granted under the Super-Heterodyne patents, the exclusive right to produce and sell this type of receiver having been retained by the R. C. A.

Cites Two Cases

The outstanding achievements of the year in the merchandise sales field according to the report, were the introduction of the new AC tubes, the filaments of which operate from the alternating electric current, and the Radiola 17, operating directly from the electric light circuit without batteries.

The report states that the regulations of the Federal Radio Commission have materially improved the reception of broadcasting in all sections.

88 DX Stations Cited For 11-Hour Reception

EDITOR RADIO WORLD:

I have read with a great deal of interest J. E. Anderson's extraordinary presentation of the merits of the Magnaformer Super Receiver. My own opinion of the Magnaformer dovetails to a dot with Mr. Anderson's opinion.

I have been the proud possessor of a Magnaformer Receiver for quite a long time. The performance of this set runs circles around the performance of any other set I have ever owned or heard.

By way of corroboration of Mr. Anderson's findings in regard to the performance of the Magnaformer, I think you will likely be more or less interested in a recent achievement of mine with my own Magnaformer.

As you are probably aware, the Chicago district is known as "the broadcasting jungle" on account of the many high powered stations in this district. There are more than 50 stations in the district, nearly half high-powered babies of 1,000 watts or more. So I can appreciate that the Magnaformer performance is truly phenomenal. And in my opinion it likely will be a long time before any other receiver is developed that will equal the performance of the Magnaformer.

I have alway been a staunch supporter of the Super Heterodyne Circuit. In fact, I have ignored all other types during the last four years because of the belief that there never has been and probably never will be a circuit that will excel a well-designed and well-built Super.

A couple of years ago, when there wasn't so many broadcasting stations and interference wasn't the problem that it is today, here in Chicago a man by the name of Johnson submitted a DX record to one of the local papers in which a total of 76 DX stations had been heard during a single night.

To the best of my belief, Mr. Johnson's record of 76 stations in a single night had stood as an unbeaten record for two years past. And since the set that Mr. Johnson used two years ago to make his record wasn't of the Super variety, it occurred to me that it would never do for me to let that record stand.

I selected the afternoon and night of January 14 to make my own DX fishing trip. I am appending hereto my log of 88 long distance stations, 16 of which are Pacific Coast stations. I think this Magnaformer record should unquestionably establish the superiority of the Super here in Chicago.

This log of mine of 88 DX stations in one night is by no means the limit I could bring in. I am positive that I can obtain a larger total number of stations if it is necessary to do so to establish a greater record.

My reason for believing that I can beat this record is because I know my Magnaformer will tune out all locals from 275 meters up to 545 meters. I have never tested out the channels below 275 meters. But I am confident that the Magnaformer selectivity on the low waves will prove no more difficult than the wavelengths higher up.

I live two blocks from WEBH. Most sets in the neighborhood of WEBH get WEBH and not much else all over the dials. But with my Magnaformer I can tune out WEBH, operating on 820 kilocycles, and bring in WSAI, broadcasting on 830 kilocycles with a silent spot in between—a clean 10 kilocycle separation. The set that can accomplish this feat must be a truly remarkable one.

My log is given herewith. I am citing the time at which I brought in the station, the call letters of the station, the city in which the station is located and the wave length of the station.

In conclusion let me add that the tone quality of my Magnaformer is a great improvement over the tone quality of any other set that I have ever built myself or have heard. The volume with which distant stations come in is often so great and so noiseless that even I, myself, am of the opinion that I have a local station, only to find out on announcement that it is some station 1,000 or 1,500 miles away. As a long distance getter I think the Magnaformer is distinctly in a class all by itself. I'd like to see any other receiver that will tie my log of long distance reception.

Again assuring you of my appreciation for Mr. Anderson's unusually informative and splendidly written article about a real receiver, believe me

H. R. ARNOLD,
5445 Winthrop Ave.,
Chicago, Illinois.

Arnold's Chronology of Day's DX Reception

Here is a complete list of H. R. Arnold's reception test:

Time P.M.	Station	City	Wavelength
3:12	WOW	Omaha	508
3:17	WHO	Des Moines	535
3.41	WEAF	New York City	492
3:48	WRC	Washington	469
3:51	KFNF	Shenandoah	361
4:03	WCCO	Minneapolis	405
4:08	WSAI	Cincinnati	461
4:14	WTMJ	Milwaukee	294
4:40	WJZ	New York City	454
4:42	WCX	Detroit	441
4:50	CFCA	Toronto	357
4:56	WHAS	Louisville	322
5:01	KDKA	Pittsburgh	316
5:03	WGR	Buffalo	303
5:07	WBAP	Fort Worth	500
5:12	WTAM	Cleveland	400
5:14	WSB	Atlanta	476
5:16	KMA	Shenandoah	395
5:21	WGY	Schenectady	380
5:31	WABC	New York City	326
5:38	CKYC	Toronto	291
5:45	WBAL	Baltimore	286
5:51	KFXF	Denver	283
5:53	WPG	Atlantic City	273
5:57	WEAN	Providence	...
6:09	WJAS	Pittsburgh	270
6:14	WMAK	Lockport	545
6:22	WLW	Cincinnati	428
6:25	WOR	Newark	422
6:30	WJR	Detroit	441
6:32	WLWL	New York City	370
6:33	WDAF	Kansas City	370
6:40	WWJ	Detroit	353
6:44	WJAX	Jacksonville	337
6:46	WSM	Nashville	341
6:48	WBZ	Springfield	333
6:54	WRNY	New York City	326
6:58	KFAB	Lincoln	319
7:01	KOIL	Council Bluffs	319
7:15	KLZ	Denver	297
7:23	KWKH	Shreveport	395
7:29	WOC	Davenport	375
7:39	KUOA	Fayetteville	297
7:48	WFBM	Indianapolis	278
7:59	WBT	Charlotte	258
8:02	WRHM	Minneapolis	261
8:28	WSUN	Florida	517
8:33	WRR	Dallas	461
8:46	WSMB	New Orleans	297
8:54	WGCP	Newark	280
9:17	KRLD	Dallas	461
9:35	WHAM	Rochester	278
9:51	WRRS	Racine	...
9:59	WTAR	Norfolk	236
10:07	WCBS	Springfield	210
10:12	KVOO	Bristow	349
10:23	KFQB	Fort Worth	333
10:39	WWNC	Asheville	297
10:57	KNBC	Kansas City	270
11:07	KWUC	Lemars	244
11:15	KMTR	Hollywood	526
11:21	WWVA	Wheeling	517
11:28	KFI	Los Angeles	469
11:31	KFSD	San Diego	441
11:41	KFRC	San Francisco	454
11:45	KPO	San Francisco	422
12:01	WSYR	Syracuse	297

Time A.M.	Station	City	Wavelength
12:14	WSKC	Bay City	273
12:29	KOW	Denver	248
12:32	KFH	Witchita	246
12:37	KWCR	Cedar Rapids	240
12:44	WJKS	Gary	232
12:52	KFWI	San Francisco	268
12:56	KGW	Portland	492
12:57	KUSD	Vermilion	484
1:00	KHJ	Los Angeles	417
1:06	CKCD	Vancouver	411
1:10	KNX	Hollywood	337
1:13	KSEI	Pocatello	333
1:16	KOIN	Portland	319
1:18	KOMO	Seattle	306
1:23	WSMK	Dayton	297
1:40	WREN	Lawrence	254
1:49	KFON	Long Beach	242
1:59	KEX	Portland	240
2:04	KGEW	Fort Morgan	219
2:09	KGDP	Pueblo	224
2:11	KHQ	Spokane	370

Radio Reaches Out to Remote Places

In a few short years radio has spread into regions of the earth. The frigid poles and the torrid steaming jungle lands have listened by radio to the outside world and have sent forth their messages of progress in exploration and conquest. From the depths of the mine or subterranean cave to the dizzy heights of an airplane hovering over a high mountain peak come messages through the silent ether. Both the multitudes in the congested cities and the aborigines in desolate lands have heard the spoken word and musical entertainment over the radio set.

Close on the heels of the radio set has followed its accessories, so that even at the edge of the desert, the post of the fur trader or the river trading station in darkest Africa can be found merchants who carry sets and tubes besides catalogues of worthwhile parts.

Next to the market for tubes is a demand for the hand or self-adjusting rheostat, Amperite.

Corn Borer Attacked By U.S. over 25 Stations

Radio stations in twenty-five states are joining with other information agencies in putting before farmers the facts about new farm problems growing out of the ravages of the European corn borer.

Cooperating stations will broadcast for farm listeners one 10-minute program each week, prepared by the Radio Service of the United States Department of Agriculture, in collaboration with the information section of the corn borer control campaign organization. The program, which began March 5, will continue for eight weeks, to May 1.

The radio talks will emphasize the necessity of adapting farm practices to corn borer conditions. Two series will be supplied; one, "Living with the Corn Borer," for broadcast in states invaded by the insect, and a second, "If the Corn Borer Comes," for farm listeners in important corn-growing states not yet reached by the pest.

Farmers like these broadcasts.

Graham Amplion Ltd. Adopts Equamatic

Louis G. King, inventor of the Equamatic System, returned from a four-months' visit to Europe and announced he had obtained patent protection on the system in Great Britain and France. Patents are pending in the United States and other countries.

Recently he entered into an agreement with Graham Amplion, Ltd., for the production of the system in the British Isles.

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers, jobbers, dealers and mail order houses 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 .....

E. Haynes, 203 Underhill Ave., Brooklyn, N. Y.
J. W. Chew, 42 Ellison Ave., Bronxville, N. Y.
Cyrus W. Wells, 429 No. Lawrence, Wichita, Kansas.
P. C. Murphy, 4832 East 18th, Kansas City, Missouri.
Schachter-Baker, 49 Varet St., Brooklyn, N. Y.
M. Longmire, City Hotel, Andalusia, Ala.
T. A. Korst 1772 W. Willis St., Detroit, Mich.
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Alfred Petersen, 711 6th Ave., Brooklyn, N. Y.
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John E. Cox, P. O. Box 362, Station H., Montreal, Can.
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Harry Johnson, Route 2, Box 46, Ortonville, Minnesota.
Arnold D. Zuelsdorf, 427 42d St., Milwaukee, Wis.
Carl A. Hage, 2215 17th Ave., San Francisco, Calif.
Miles Taylor, 1451 Lyon St., Des Moines, Ia.
Mott Johnson, Clay Center, Nebr.
R. Hartmann, 2109 Lathan St., Rockford, Ill.
Frank B. Jones, R.F.D. No. 12 Box 191
D. Turgeon, 4537 Rivard St., Montreal, Canada
H. W. Conner, 1773 College View Place, Los Angeles, Calif.
Frank N. French, 95 South St., Boston, Mass.
D. L. Calmes, 121 Edgewood Drive, Baton Rouge, La.
Jos. L. Albright, State Road, South Eula, Eula, Penna.
Henry Steinberg, 3096 Meadowbrook Blvd., Cleveland, Ohio
Clayt Norwood, 47 Beacon St., Gloucester, Mass.
Marvin Wolff, 132 Mapes Ave., Newark, N. J.
H. M. Andrews, 640 Kerckhoff Bldg., Los Angeles, Calif.
Thomas J. Byron, 711 W. 56th St., Los Angeles, Calif.
Harry F. Cook, Jr., 165 Carlisle Rd., Audubon, N. J.
Fred Spille, 315 S. Webb St., Webb City, Mo.
E. S. Brooks, 1206 So. 25th, Temple, Texas.
J. J. Schott, 227 Naples Terrace, New York, N. Y.
A. C. Wagner, Dalton, Pa.
Albert G. Zinman, 221 E. 30th St., New York, N. Y.
Gustave Simmons, 288 Wyoming Ave., Billings, Mont.
John E. Dorfmeister, 317 W. Michigan, Jackson, Mich.
Arthur R. DuHaime, 551 W. 204th St., New York, N. Y.
Arthur Unger, 2086 Ryer Ave., New York, N. Y.
Clarence J. Smith, 2806 S. Jefferson Ave., St. Louis, Mo.
Wayne A. Lindsey, 711 R. A. Long Bldg., Kansas City, Mo.
B. F. Zinser, P. O. Box 245, Chillicothe, Illinois.
H. C. Hathe, 762 E. Burnside St., Portland, Ore.
J. Carl Austin, 23 Marsh Road, Wilmington, Delaware.
Cyril B. Cluff, Price, Utah.
Chas. C. Peugh, 54 Linden St., Schenectady, N. Y.
Ray Laker, P. O. Box 163, Ottawa, Ont., Canada.
"Clayt" Norwood, 47 Beacon St., Gloucester, Mass.
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D. Turgeon, 4551 Rivard St., Montreal, Quebec, Canada.
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Roy E. Guard, Falls Church, Va.
G. A. Prodger, Pall Mall No. 575, London, Ont., Canada.
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Frank E. Henry, 107-109 W. 96th St., New York City.
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L. E. Courtoise, 1650 11th Ave., Oakland, Calif.
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H. Weiler, Dumitrescu Radio Lab., 306 W. 44th St., N. Y. C.
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H. L. Thomas, Box 201, Asheville, N. C.
Northern Radio Laboratories, C/o R. C. Richards, Clyde, Ohio.
O. Hackelton, 224 Upsun St., Washington, D. C.
Harry L. Thomas, P. O. Box 201, Ashville, N. C.
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W. R. Dioze, 635 N. 32 St., Philadelphia, Pa.
Thomas Miller, 2520 North B St., Elwood, Ind.
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H. G. Bulitta, 130-17 148 St., South Ozone Pk., New York.
W. R. Hauenstein, 235 McKinley Ave., Wauseon, Ohio.
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71A Is a Good RF Tube With Skinny Primary

The primary of many radio frequency transformers has inadequate impedance to take full advantage of the amplification power of the tube preceding it. When such is the case a stage of radio frequency actually introduces a loss instead of a gain.

A loud signal may sometimes be obtained by substituting a —71A power tube for the —01A amplifier tube.

This seems strange, since the power tube has an amplification factor of only three, whereas the other tube has a factor of eight.

The reason for the improvement lies in the plate impedances of the two tubes. The matching of the small primary to the impedance of the —71A is much better than in the case of the —01A. It is the mutual conductance of the two tubes which counts, and that of the —71A is the higher.

If the primary is too small the volume can be increased by doubling the number of turns.

EVERY FRIDAY at 5.40 P. M. (Eastern Standard Time) Herman Bernard, managing editor of Radio World, broadcasts from WGBS, the Gimbel Bros. station in New York, discussing radio topics.

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FORTY TIMES as Much Amplification!

The New Shielded Grid

4-TUBE DIAMOND OF THE AIR

Designed by H. B. HERMAN and described by him in the February 4, 11 and 18 issues of RADIO WORLD.

The favorite four-tube design, simple as can be, takes a great step forward, so that home constructors of radio receivers, and custom set builders, can build a distance-getting and voluminous set, the parts for which list remarkably low.

The new shielded grid tube is used as the radio frequency amplifier. That is why the amplification is boosted forty times over and above what it would be if an —01A tube were used instead.

Such simplicity of construction marks the receiver that it can be completely wired, skillfully and painstakingly, in two and a half hours.

All you have to do is to follow the official blueprint, and lo! a new world of radio achievement is before you! Distant stations that four-tube sets otherwise miss come in, and come in strong. No tuning difficulty is occasioned by the introduction of this new, extra powerful, startling tube, but, in fact, the tuning is simplified, because the signal strength is so much greater.

When you work from the official wiring diagram you find everything so delightfully simple that you marvel at the speed at which you get the entire receiver masterfully finished. And then when you tune in—more marvels! 'Way, 'way up, somewhere around the clouds, instead of only roof high, will you find the amplification!

You'll be overjoyed. But you should place every part in exactly the right position. Stick to the constants given, and, above all, wire according to the blueprint!

Front Panel, Subpanel and Wiring Clearly Shown

When you work from this blueprint you find that every part is shown in correct position and every wire is shown going to its correct destination by the ACTUAL ROUTE taken in the practical wiring itself. Mr. Herman's personal set was used as the model. This is a matter-of-fact blueprint, with solid black lines showing wiring that is above the subpanel, and dotted lines that show how some of the wiring is done underneath.

Everything is actual size.

Not only is the actual size of the panel holes and instruments given, but the dimensions are given numerically. Besides, it is one of those delightful blueprints that novice and professional admire so much—one of those oh-so-clear and can't-go-wrong blueprints.

Be one of the first to send for this new blueprint, by all means, and build yourself this outstanding four-tube receiver, with its easy control, fine volume, tone quality, selectivity and utter economy. It gives more than you ever expected you could get on four tubes—and the parts are well within the range of anybody's purse.

The circuit consists of a stage of tuned RF shielded grid tube amplification, a regenerative detector, and two transformer coupled audio stages.

What a receiver!

$1.00 for 27" x 27" Blueprint,

Send your order today!

.....

RADIO WORLD,
145 West 45th St., N. Y. City.
Enclosed please find:

☐ $1.00, for which send me at once one official blueprint of the Four-Tube Shielded Grid Diamond of the Air, as designed by H. B. Herman, and described by him in the February 4, 11 and 18 issues of Radio World.

45 cents extra for Feb. 4th, 11th, 18th issues.

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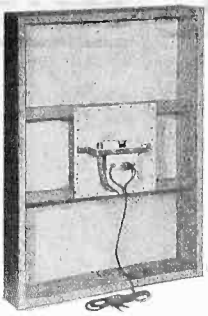

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FENCO AIRPLANE CLOTH SPEAKER

Kit consists of wood frame, first quality Airplane Cloth, Genuine Fenco Master Unit, 10 feet phone cord, U. S. specification Airplane dope and unit support, nails. Ready to assemble. **$7.50**

Nothing else to buy.

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57 MURRAY STREET NEW YORK CITY

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RECENT ISSUES of Radio World, 15c each. Be sure to give date of issue when writing. Radio World, 145 West 45th Street, New York City.

SIXTH ANNIVERSARY NUMBER of RADIO WORLD

Dated March 31, 1928, will be an Outstanding Issue

(Forms close Noon, Wednesday, March 21. See Editorial Page (18) for Advertising Rates)

EXTRA SIZE! EXTRA CIRCULATION! EXTRA FEATURES!

Editorial Features Will Include:

First Presentation of a Remarkable Short Wave Receiver, by J. E. Anderson, Technical Editor.

A New Method of Oscillator Coupling and Volume Control, by H. B. Herman.

How to Build a Sensitive Set in an Automobile, by Brunsten Brunn.

A Unipac for the New —50 Tube, by Brewster Lee.

Improvements I Made in My Set Without Any Cost, by Billy Honduras.

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145 WEST 45th STREET NEW YORK CITY
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Offer Good Until

April 15, 1928

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Composers' Society Sues WDGY on Song

Minneapolis.

Gene Buck, of New York, president of the American Society of Composers, Authors and Publishers, has filed suit in the Federal court against Dr. George W. Young, an optometrist and jeweler and operator of station WDGY of Minneapolis asking an injunction against the practice of broadcasting copyright songs controlled by the society and demanding damages of $250 dollars for broadcasting without authority the song "My Blue Heaven."

Before and after the broadcasting of the song, the complaint contends, the announcer is alleged to have said: "This is station WDGY, operated by Dr. Young's jewelry store. Dr. Young will save you 20 per cent. at his store." The society contends that the use of copyright music in an advertising program was an infringement which tends to destroy the value of the copyright.

EVERY FRIDAY at 5.40 P. M. (Eastern Standard Time) Herman Bernard, managing editor of Radio World, broadcasts from WGBS, the Gimbel Bros. station in New York, discussing radio topics.

THE A C KARAS EQUAMATIC—Full description, analytical article, in Feb. 11th and 18th issues. Send 30c for these isues and get free blueprint. Radio World, 145 West 45th St., N. Y. City.

RECENT ISSUES of Radio World, 15c each. Be sure to give date of issue when writing. Radio World, 145 West 45th Street, New York City.

Quick Action Classified Ads

Radio World's Speedy Medium for Enterprise and Sales

10 cents a word — 10 words minimum — Cash with Order

AIRPLANE CLOTH SPEAKER SUPPLIES—Genuine cloth, 24"x24" at 70c; 18"x18" at 50c. Dope, $1.00. Can apexes, 30c. Units, $3.50 and $5.00. Jefferson Mail Service, Box 184, Maplewood, N. J.

FREE POUND SOLDER with 110V. iron, $1.59. Guaranteed. Oravec, 1240 N. Keeler, Chicago.

OLD 4 OR 5-TUBE DIAMOND—easily changed to Shielded Grid Diamond. Send $1.00 for blueprint showing old and new hookups, with changes emphasized. A. Bashen, 520 Jerome St., Brooklyn, N. Y.

"RADIO THEORY AND OPERATING," by Mary Texanna Loomis, member Institute of Radio Engineers, Lecturer on radio, Loomis Radio College. Thorough text and reference book; 886 pages, 700 illustrations. Price $3.50, postage paid. Used by Radio Schools, Technical Colleges, Universities, Dept. of Commerce, Gov't Schools and Engineers. At bookdealers, or sent on receipt check or money order. Loomis Publishing Company, Dept. RW, 405 9th St., Washington, D. C.

RADIO FURNITURE, direct from factory to you. Receiving set cabinets, any size. Consoles and tables. Free catalogue on request. Fulbright Cabinet Co., Hickory, North Carolina. W-2-18

WANTED—MEN to work with National Radio Service Organization. No selling scheme. Cooperative Radio Doctors, Dept. W, 131 Essex St., Salem, Mass.

TELEGRAPHY—Both Morse and Wireless taught thoroughly. Big salaries. Wonderful opportunities. Expenses low; chance to earn part. School established fifty years. Catalog free. Mention Radio World. Dodge's Institute, Cour St., Valparaiso, Ind.

RADIO SETS built to order. Sets repaired. Superhets a specialty. Sweeney Radio Shop, Dept. RW, Pearsall, Texas.

LARGE MANUFACTURER of popular priced Radio Cabinets wants representatives selling radio dealers. Models listing at $13 and up. Well made in large modern plant. Quantity sellers. Straight commission basis. For full details, address Drawer RW 10, Boonville, N. Y.

DISCOUNT ANYTHING radio. Mention wants. Write RADIOMAN, LAKE, NEW YORK.

NEW SHIELDED GRID TUBES for Diamond, S-M Six or Laboratory Super, Tyrman 70. Price $5 each. Philip Cohen, 236 Varet St., Brooklyn, N. Y.

EVERY FRIDAY at 5.40 P. M. (Eastern Standard Time) Herman Bernard, managing editor of Radio World, broadcasts from WGBS, the Gimbel Bros. station in New York, discussing radio topics.

MAKE YOUR RECEIVER do all the manufacturer claims it can! The answer is a practical, proven fact—Scott's Single Pole Tuned Radio Antenna—no trick—description FREE. Scott, Dept. RW, 719 1st St., New Orleans, La.

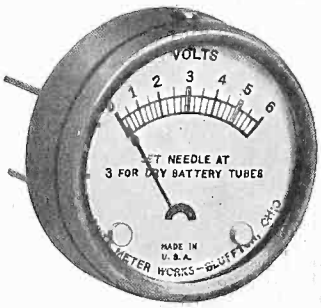
ELECTRIC FUN! Seventy stunts, 110 volts, $1. Cooperco, Campbell, Calif.

MAGNAVOX M7 cone speaker, List $15, A1 condition, used two weeks. Fine tone. Price, including baffle, $9. Send M. O. on 5-day money back guarantee. I. Andersen, 118 Goodrich St., Astoria, N. Y. City.

"Double R" Meters Improve Your Set

Use Them to Maintain Accurate Voltages and Currents So That Maximum Reception Efficiency is Assured

Pin Jack 0-6 Voltmeter for A Battery Measurement



This 0-6 voltmeter, No. 306, is especially useful for the No. 25 and No. 28 Radiolas, because it is equipped with pin jacks which fit into the plugs with which those sets are provided. The meters may be used in any home-constructed set, too, where the builder desires to place tip jacks on the front panel, so the meter can be plugged in for obtaining reading. The meter may be kept permanently in circuit, if desired.

No. 306, 0-6 volts DC..... **$2.50**

Also Track Down Trouble in a Jiffy and Permanently Cure It with the Aid of These Fine Meters

It is absolutely necessary to use a high resistance voltmeter in measuring the voltage of B eliminators, either across the total output or at any intermediate voltage. A low resistance meter at least partly short-circuits the eliminator and causes the voltage reading to be away off. Sometimes the reading is as little as 25 per cent of the total actual voltage.

All "Double R" meters are accurate to 2½ per cent, plus or minus, and all, except the ammeters Nos. 1 and 338, may be kept permanently in circuit.

Panel meters take 2 5/64-inch hole.

Our Complete Meter Catalogue is contained in this advertisement.

High Resistance Meters for B Eliminators

Here is the meter you've been wishing for! A 0-300 DC voltmeter with a very high resistance. Specially made that way so it will test the output voltages, from maximum to any intermediate voltage, of any B eliminator or grid biasing resistor. It also makes all the measurements of any other meter of its voltage range, hence will give correct readings of B batteries, C batteries, cells, or any other DC voltage source not exceeding 300 volts. Full nickel finish. Portable type (fits in sack coat pocket easily). Accurate to 2½ per cent, plus or minus. Fully guaranteed. Requires 35 different dyes to make. Furnished with long connecting cords and convenient tips. May be kept permanently in circuit. **$4.50**

No. 346 .....

[Note: 0-500 volts, instead of 0-300 volts, is No. 347. Tests ALL power packs—Price $5.50.]

PANEL VOLTMETER FOR A BATTERIES

One of the most popular meters, the 0-6 panel voltmeter, DC. May be kept permanently in circuit. Panel model.

$1.65

No. 326 .....

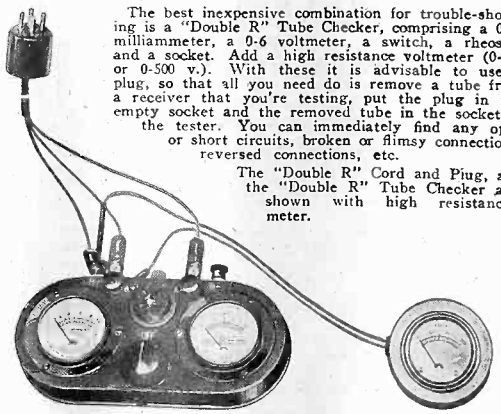
MULTI-TUBE SET MILLIAMMETER

Panel model. Recommended for sets having six tubes or more, particularly if a -71, -10 or -50 tube is used as the output. May be kept permanently in circuit. For DC measurements 0-100 milliamperes.

$1.65

No. 390 .....

TROUBLE-SHOOTING TEST SET



The best inexpensive combination for trouble-shooting is a "Double R" Tube Checker, comprising a 0-10 milliammeter, a 0-6 voltmeter, a switch, a rheostat and a socket. Add a high resistance voltmeter (0-300 or 0-500 v.). With these it is advisable to use a plug, so that all you need do is remove a tube from a receiver that you're testing, put the plug in the empty socket and the removed tube in the socket of the tester. You can immediately find any open or short circuits, broken or flimsy connections, reversed connections, etc.

The "Double R" Cord and Plug, and the "Double R" Tube Checker are shown with high resistance meter.

SERVICE MEN!

No. 210 Tube Checker, consists of 0-6 volts DC Voltmeter, 0-10 DC Milliammeter, Grid Bias Switch, Rheostat, Socket, Binding Posts (with instruction sheet).....$6.50

No. 21, cord and plug. For connecting meters in A and B leads of a receiver without any disconnections. Terminals correspond with posts on No. 210 tube checker.....$1.85

No. 346 DC Voltmeter (high resistance).....$4.50

No. 347 DC Voltmeter (high resistance).....$5.50

The cord terminals of the plug leads correspond with the binding posts of the tube checker.

Now connect the 0-300 or 0-500 volts high resistance voltmeter from A+ to B+ posts and you get all necessary readings. You can test plate voltage from B eliminators, or any other B supply. DC plate current and DC filament voltage, as well as the efficacy of the tube, by throwing the grid bias switch, for the plate current should change within given limits, depending on the type of tube.

Equip your testing outfit with the indispensable combination that constitutes the Trouble Shooting Test Set and Time-Saver. You quickly locate trouble while others flounder about.

Complete Combination Nos. 21 and 210 (with 0-300 Voltmeter, No. 346)..$12.00
Complete Combination Nos. 21 and 210 (with 0-500 Voltmeter, No. 347)..$13.00

POCKET AMMETER

No. 1 For testing dry cells, 0-40 ampere DC scale pocket meter.$1.50

POCKET AND PORTABLE VOLTMETERS

No. 8 For testing A batteries, dry or storage, 0-8 volts DC scale $1.65
No. 10 For testing A batteries, dry or storage, 0-10 volts DC scale 1.65
No. 13 For testing A batteries, dry or storage, 0-16 volts DC scale 1.65
No. 50 For testing B batteries, dry or storage, but not for B eliminators, 0-50 volts DC scale 1.65
No. 39 For testing B batteries, dry or storage, but not for B eliminators, 0-100 volts DC scale 1.85
No. 40 For testing A and B batteries, dry or storage, but not for B eliminators; double reading, 0-8 volts and 0-100 volts DC scale..... 2.25
No. 42 For testing B batteries, dry or storage, but not for B eliminators; 0-150 volts DC scale 2.00
No. 348 For testing AC current supply line, portable, 0-150 volts 4.50

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