JULY 23 SIMPLE SINGLE-DIAL 5-TUBE SET 15c

RADIO WORLD

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America's First and Only National Radio Weekly

Why Raytheon BA Needs 200 Mil. Load

Three TRF Stages Readily Neutralized

A 2-Tube Portable

A SUPER FOR YOUR AUTOMOBILE

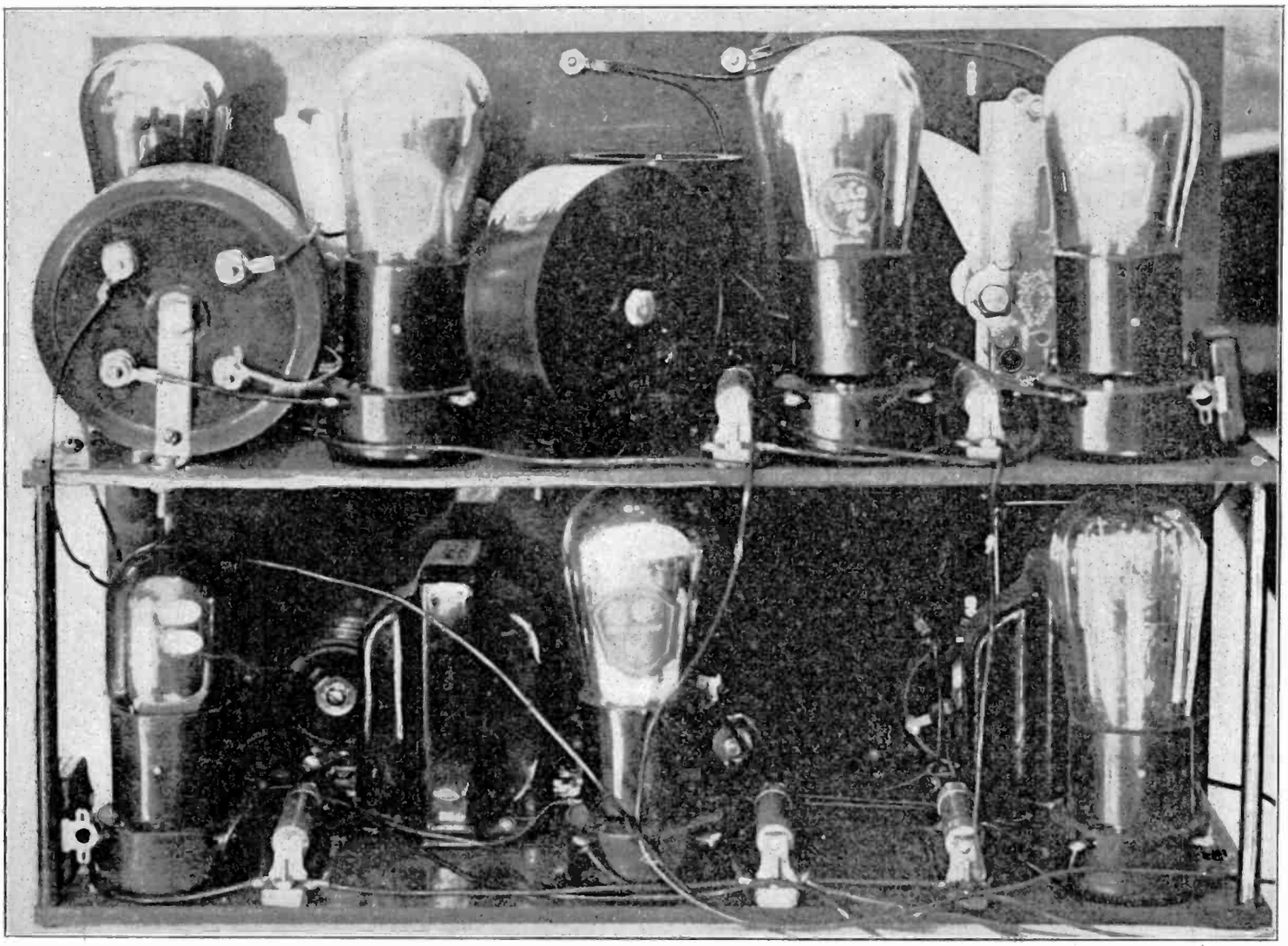

FIG. 1.
THIS SEVEN-TUBE RECEIVER, A SUPER-HETERODYNE, WAS BUILT INTO AN AUTOMOBILE WITH GREAT SUCCESS. SEE ARTICLE ON PAGE 3.

YES You Can Eliminate Hum In AC Tubes By Mid-Tap Filament Connection.

NO Grid Blocking In Motorboating, But Just Low-Frequency Oscillation, a Fact Few Realize

A Great Deal for a Very Little!

Ordinarily This Seems Too Good to Be True, But Here Is An Instance of Complete Verification

The New De Luxe Model Bretwood With Condenser Attached

WHEN you are deciding on what parts are to go into the receiver you are about to build, under no circumstances dismiss the grid leak with only casual consideration. Respect the grid leak as something well worthy of expert choice.

The best course is to select a variable grid leak with an ample resistance range, one that may be mounted on baseboard, sub-panel or front panel, as you prefer.

Such a leak is the BRETWOOD VARIABLE GRID LEAK, which is now on the market in new de luxe model, representing improvements in mechanical strength, electrical efficiency and utility.

Higher Efficiency

You should use a variable grid leak like the BRETWOOD VARIABLE GRID LEAK in a set you are about to build, or should put one in your present receiver, because it will enable you to get highest operating efficiency from the detector tube. As nearly all tubes used as detectors draw grid current, the resistance value of the leak is important for biasing and discharge purposes. Not only can exactly the right degree of flow be established to discard excess electrons, but the grid-to-filament impedance is so affected as to afford best selectivity under the circumstances. Only a variable leak gives this precision choice.

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Note: The Bretwood Leak's range is .25 to 10 meg.

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A Super on Wheels

How to Build a Receiver Into An Auto

By John F. Rider

Member. Institute of Radio Engineers

PART I

IT is said that truth is stranger than fiction. The significance of this statement, however, cannot be appreciated unless one has undergone some peculiar experience which will bring forth the realization that the human mind cannot conceive all the intriguing situations within the powers of Dame Fate.

A short time ago I visited a small resort in the foothills of the Catskills. Though at the off season, this establishment had several guests. An outstanding individual was a somewhat corpulent chap, with a strong penchant for all forms of gambling. One of his pet diversions was the stock market, and his favorite group the oils.

One bright morning at about 10:15 this gentleman received a telephone call advising him that a telegram awaited him at the village telegraph office, and that personal service was not rendered; but, if he so desired, the contents of the telegram would be read to him over the phone. He assented and a message was delivered.

Not So Good

Upon his exit from the booth it was obvious that the message, whatever it was, was unfavorable; as a matter of fact, very unfavorable; so much so, that the coat of tan acquired during his expensive stay was useless. The man appeared as if he had seen a ghost. Questioning brought forth the information that some of his pet stocks had apparently suffered a relapse. To make matters worse, the quotations given over the wire were incoherent. If he had deciphered the figures correctly, according to what he took down over the wire, they indicated sharp decline in the oils. The quotations were so low that the man could not believe them. He forthwith placed a long distance call for his brokers in New York City, to check up on the devastating figures and give his orders to save as much of his investment as possible. If the figures were correct his margin would last but a short time.

After a few minutes he was advised that the call could not be put through, because of a recent fire in one of the conduits carrying the telephone cables through the Harlem section of New York City. He was further informed that it would be necessary to wait at least one hour before the connection could be completed. . . . The man was frantic. With an appreciable amount of money at stake, he was helpless to make a decision. The burnt cable in the city explained the brokers' recourse to the telegram. The fat man had received a phone call every morning, advising him of the opening prices on the Stock Exchange.

Out of Luck

He dispatched a wire to the brokers, requesting additional information, and explaining that the first wire was incoherent. He then called another number in a different part of New York City, hoping to make connection with his brokers through the switchboard in this office. He located the number, but was again advised that connection with the lower part of the city was impossible. Only immediate exchange calls were being made, the upper part of the city being isolated from the lower portion. About ten minutes elapsed. It was now 10:25. Nothing had been accomplished to help the situation. The man's apprehensions were mounting each moment. . . . As a last effort he called the telegraph office and asked a check-up on the previous wire. He was told that the check-up would be made, but that it would take some time.

Just then it occurred to me that WMCA, in New York City, broadcast the stock quotations at 10:30 A. M. A receiver had been installed in our family "chariot" to provide entertainment while on the move and when away from the city. WMCA was within the range of this receiver, and if the stock quotations broadcast could be received, fine and dandy! The service of the receiver was offered and very gratefully accepted.

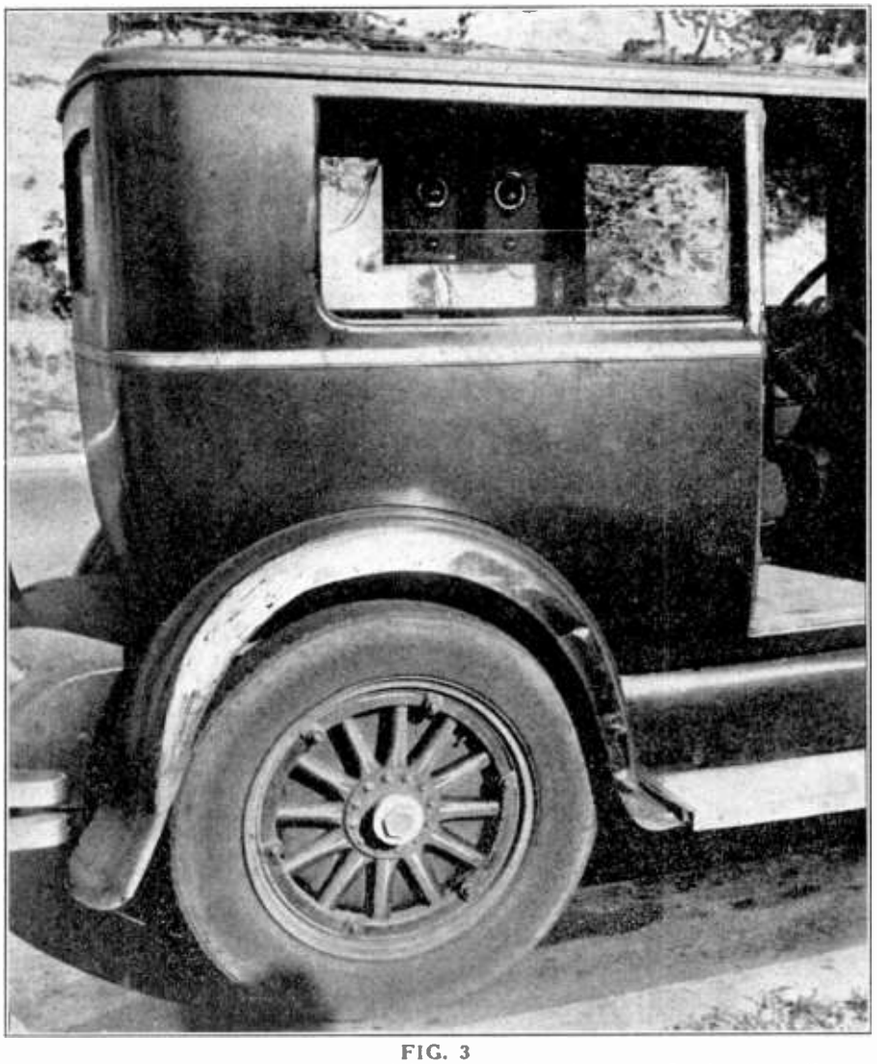


FIG. 3

The set is secured to the automobile just under the top. Stations usually are tuned in when the car is at a standstill. The loop is wound on the top of the car but can barely be seen.

All Set to Tune In

The man approached the car and seated

himself on the running board. Several other individuals staying at the hotel also gathered around the car and waited patiently. WMCA was due on the air in a few minutes. The dials were set to this station's wave. A slight whistle was heard. The carrier was on the air. Another few minutes and the microphone was cut in. The station announcement was heard next. Our friend was trembling. The most unfavorable news, if accurate, would be better than none. Each moment seemed like a year. Anticipation was registered in the eyes of every listener. We all appreciated the situation. The man was well liked, and everyone hoped for the best, but feared the worst.

At last the quotations commenced. Several industrials were mentioned, followed by some rails. He arose and fidgeted. Then the first of the oil quotations were placed upon the air. A puzzled expression appeared on the face of the gambler. Then some more rails and industrials; some more industrials and another oil quotation. The puzzled intensity increased, but with a gradual reduction in fear. Some more industrials, followed by a number of oils. The man commenced to smile, for the first time that morning. Some more oil quotations and complete relief was registered upon his face. Apparently nothing was wrong. A few more stock quotations and the station announced the conclusion of the stock market quotation.

Purpose Well Served

The receiver had served its purpose, if only to allay his apprehensions. Apparently he had misunderstood the telephoned telegraph message, for the quotations as given over the air indicated a stable opening market. Before further explanations could be given he was called to the telephone. Upon the completion of the conversation his face was wreathed in smiles. The brokers confirmed the radio quotations and explained that the quotations sent in the first wire were erroneously read. The market was regular.

The automobile receiver on which the market quotations were received was the one which will be described in this article. Popularity of receivers in automobiles is not very far distant. Soon every car will carry its own radio equipment, if only for the purpose of listening to broadcast programs, just as one does at home.

Is there any reason why one should be without a receiver when away from home? Radio, as a medium of entertainment, has reached the stage where it is within the means of all, whether at home, on heel, awheel or afloat. At the present stage of transmission there are sufficient stations throughout the country to permit daytime reception from practically any part of the country, providing, of course, the receiver possesses a fair degree of sensitivity.

Good Reception Now

At the advent of broadcasting and for a year or two thereafter reception in Summer time often was poor. This situation, however, has been greatly relieved. I feel safe in saying that it no longer exists. The increased power used at the broadcasting stations and the greater number of stations placed into operation are the reasons. Very few populated areas are now isolated, considered from the radio angle. This fact was conclusively demonstrated to me during the past year. Traveling in the eastern part of the country I used the receiver in the car and always brought in a sufficient number of stations. No matter where the car was brought to a standstill, some broadcasting station could be tuned in with satisfactory intensity and quality. In the mountains, at the golf course, at the seashore, no matter where we were located, the receiver performed faithfully.

The selection of a Super-Heterodyne for the car receiver was based upon a year's experiments in many parts of the country. While certain types of tuned radio frequency receivers performed satisfactorily, particularly one utilizing three stages, the Super-Heterodyne was selected as the main receiver because of superior operation under the most adverse conditions.

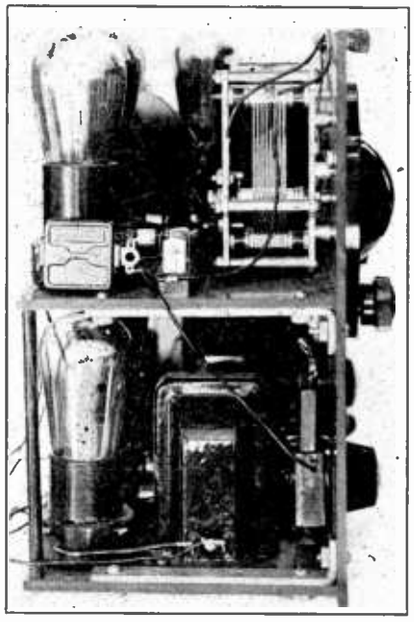


FIG. 2
The brackets are put in reversed. The upper shelf must be cut to allow the condensers to turn the full 180 degrees. Flexible wire is used for connections.

Uses Standard Hookup

The electrical design of this Super-Heterodyne does not differ radically from that of any other, the greatest difference being the use of two stages of intermediate frequency amplification instead of three. But the mechanical design differs greatly from the conventional.

Economy of space being the important consideration, because of limited space in the automobile, it was found necessary to construct the receiver in the form of a square box with a shelf dividing it into two. The mixer tube, oscillator and the two stages of intermediate frequency amplification are mounted upon the upper shelf. The detector and the two stages of transformer coupled audio frequency amplification are mounted upon the lower shelf. In this manner we have a seven-tube Super-Heterodyne in a space of 14x10x5 inches, the smallest dimension being the depth.

The selection of the design of the receiver was again controlled by the operating condition. With a receiver of this type we must obtain rigidity, also stability of operation and uniform performance. Hence, the simplest design consistent with satisfactory operation must be used. As the receiver will be used in various parts of the country, the frequency of the intermediate must be of a value which will assure the greatest amount of selectivity under all conditions. For this reason an intermediate frequency of approximately 85 kilocycles was selected. This is approximately the frequency setting of the Victoreen intermediate transformers.

(*Concluded next week*)

LIST OF PARTS

One 14x10x3-16 inch Micarta Panel.
Two 13x5x3-16-inch Micarta Panels.
Three Victoreen No. 170 transformers.
Two General Radio type 285D audio frequency transformers.
Two Amsco .00035 mfd. variable condensers.
One 115A Silver Marshall coil.
One Silver Marshall coil socket.
Seven Amsco tube sockets.
One Electrad Tonatrol.
One Electrad 400-ohm potentiometer.
One Bruno battery light switch.
Two Aerovox .00025 mfd. fixed condensers with clips.
One Aerovox type .001 mfd. fixed condenser.
One Aerovox type .005 mfd. fixed condenser.
One Aerovox 1 mfd. bypass condenser.
Two Kurz Kash dials.
Two Eby binding posts.
Two 112 Amperites.
Four 1A Amperites.
Two Tip Jacks.
Two Electrad grid leaks, 3 meg. each.
Four boxes of Acme Celatsite wire, green, black, red and yellow.
Four brass brackets, ¾x⅜-inch, as shown.
Two Bakelite round rods 6x⅜-inch.
Seven CeCo tubes, e.g., two type H, two type A, two type K, one type F.

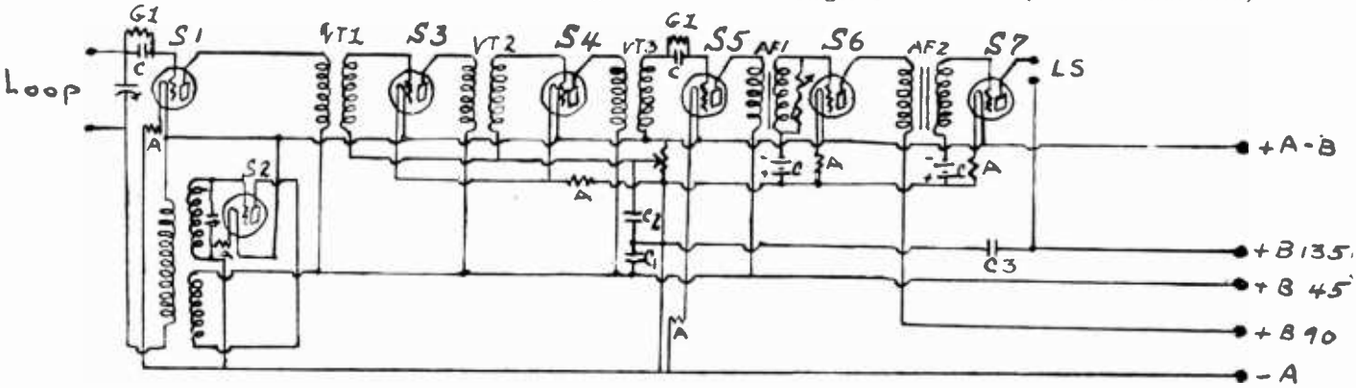


FIG. 3-A
The circuit diagram of the receiver.

Why the BA Needs 200 Mils

That Is Minimum Load in New Raytheon Tube

By A. F. W. Goddard

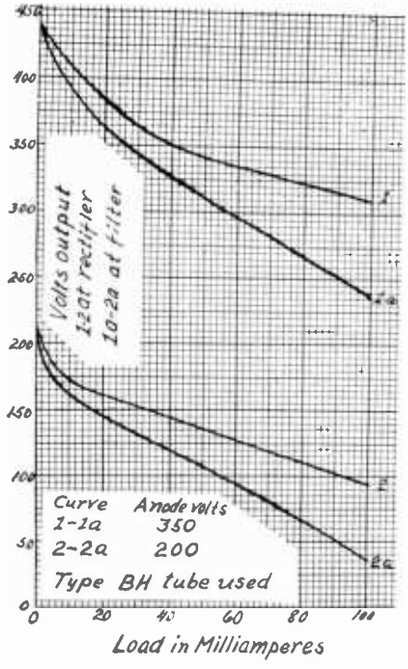


FIG. 1

These curves are the regulation of the Raytheon BH tube and filter for various current loads. Curves 1 and 1a are for an anode voltage of 350 volts and curves 2 and 2a are for an anode voltage of 200 volts. Curves 1 and 2 show the regulation of the rectifier alone while curves 1a and 2a show the regulation for the filter as well.

THE voltage across the output terminals of a rectifier-filter system depends not only on the AC voltage put into the rectifier but also on the current which is drawn from the system. The reason that the output voltage depends on the current is that the rectifier-filter system has considerable resistance, and the output voltage is the difference between the input voltage and the voltage drop in the resistance.

The resistance involved is partly in the secondary of the transformer supplying power to the system, partly in the rectifier device itself, and partly in the choke coils of the filter. Sometimes there are also other resistances in the system which are so arranged as to have a considerable effect on the effective output voltage.

When the difference between the effective output voltage and the input voltage is small for all values of current drain, or when the difference is constant for all values of current drain, the voltage regulation of the system is said to be good.

Resistance Determines Degree

If the effective output voltage varies over wide limits as the current drain is changed, the voltage regulation is said to be poor. It is obvious that the degree of regulation of the voltage depends directly on the amount of resistance in the circuit.

As it is at all times desirable to have a constant voltage on a radio set, a rectifier-filter system having a good regulation is preferred. One condition that must be fulfilled to have good regulation is to have low resistance in the system. This can be effected by using heavy wire in the filter chokes and in the secondary of the supply transformer, and it can be greatly aided by employing a rectifying device which has a low internal resistance. But all of these are limited in practice and the regulation cannot be made as good as desirable by this method of attack.

There are various voltage regulators in use which aid the regulation.

Usually they do so by keeping the current drain constant. Their characteristics are such that as the voltage arises across them the current is rapidly decreased, which in turn drops the voltage by virtue of resistance in the system. Some of these devices hold the voltage to a very constant value. These are usually connected across the output terminals in parallel with the load. Sometimes an ordinary resistance is used for the same purpose in the same way. Some improvement in the regulation can be obtained by means of it.

In the Raytheon BA rectifier a regulating feature has been built into the tube itself. This is so arranged that with a constant input voltage, the output voltage decreases with a decrease in the current drain for low values of current. The output voltage also decreases with an increase in current drain for high values of current. With such a characteristic it is to be expected that there is one current drain which gives the greatest output voltage. In the immediate vicinity of this value of current the regulation is ideal, in that there is no variation in output voltage as the current drain changes. It is not necessary, however, to operate exclusively at that point, since the regulation is satisfactory over wide limits. The minimum recommended load, however, is 200 mils, but the recommended range is from 200 to 350 mils. Below 200 mils the voltage drops sharply.

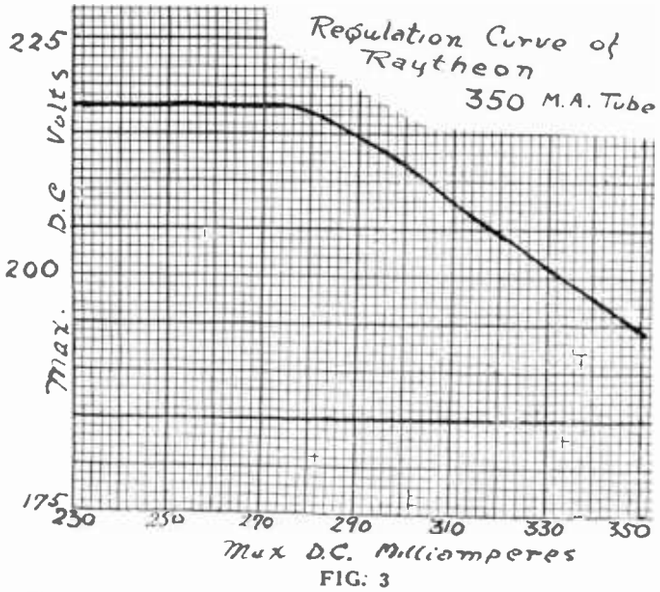


FIG. 3

This shows another regulation curve of the BA type Raytheon.

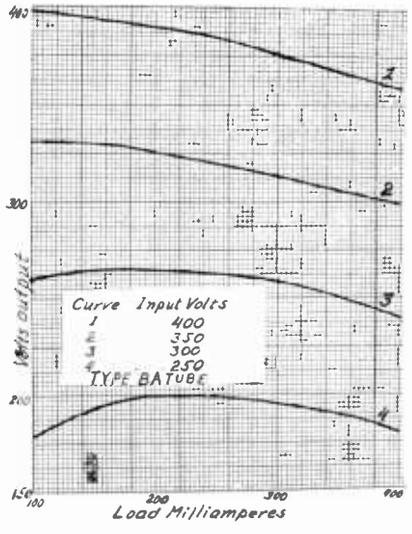


FIG. 2

These curves show the regulation of BA type of Raytheon rectifier between loads of 100 and 400 milliamperes. The four curves are for various anode voltages as shown on the sketch. Curve 4 particularly brings out the fact that no les than 200 mils should be the load, for below 200 mils the voltage drops severely, much faster, for instance, than it does above 200 mils.

Value of a Regulator

The advantage of having a voltage regulator of some kind is apparent. If the voltage regulation is poor the voltage across the filter condensers will fluctuate greatly as the current drain varies. Particularly, as the current is decreased the voltage will mount to high values and there is danger of breaking down the insulation of the condensers. Also if the regulation is poor, as the current rises the effective voltage on the radio set will go down so low as to interfere with proper operation of the receiver.

The manner in which the output voltage varies with the current drain in various tubes can best be shown by means of a set of regulation curves. In Fig. 1 are shown curves for the Raytheon BH tube, in which there is no voltage compensating feature. Note that as the current drain is increased from zero the drop at first is very rapid. As the current increases the rate of fall of the voltage decreases until it becomes nearly constant. That is, the curves are almost straight over a range of current values. For very heavy drain the rate of drop is greater again.

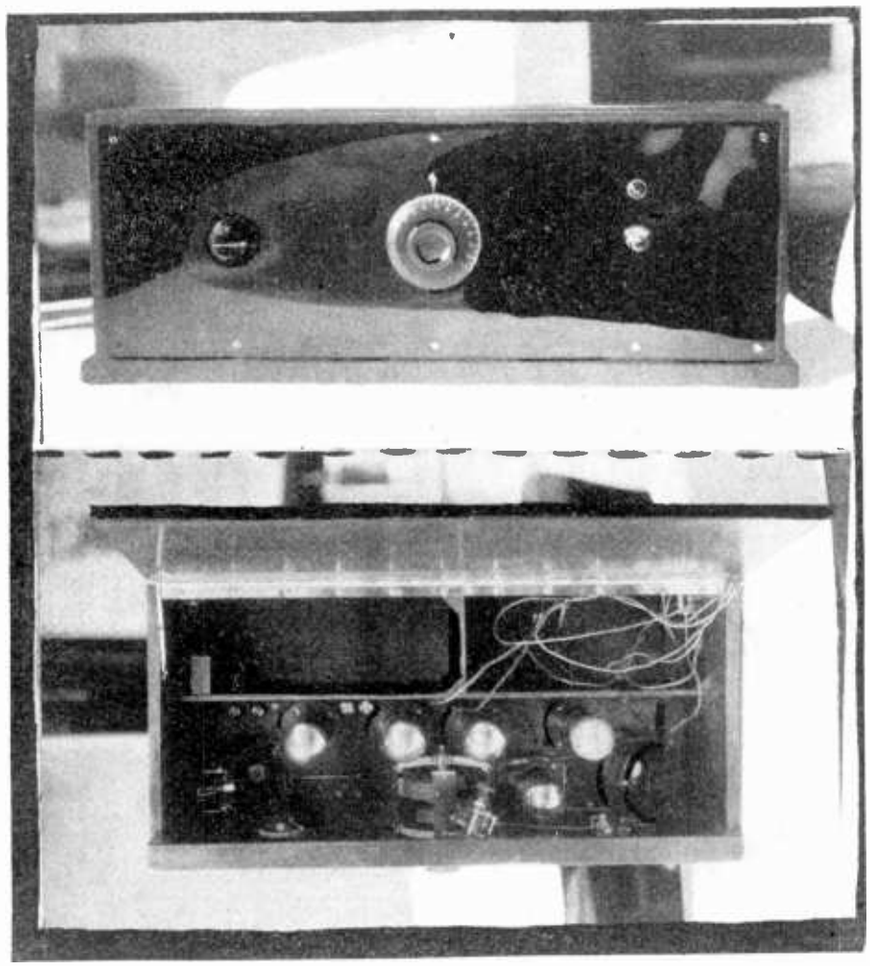
Filter Makes A Difference

Note also the difference between the regulation curves for the rectifier alone and for the rectifier and the filter. For the latter the regulation is poorer. The two curves are together at zero drain and diverge widely at heavy drain.

Single Control Made Easy

Straight Capacity Double Condenser Used

By Herbert E. Hayden



(Hayden)

FIGS. 1 and 2

The panel layout of the one-control receiver and the interior layout, showing the set proper in front and the battery compartment in the rear.

SIMPLICITY of control is very popular in radio receiver design. To have one station after another roll in with full volume by merely turning a single dial is a goal toward which designers have been striving for some time. Not until recently did they reach the goal in a practical way. Now it is possible to tune in accurately all the stations within reach of the receiver, from 200 to 546 meters by a single motion and without the intricacies of a combination lock. And such a set, if properly made, works very well indeed, and is selected enough.

One requirement necessary for making the single control idea a success is to have identical and dependable parts in the tuners. The condensers used must have the same capacity at all settings and the inductances used in the tuned circuits should also have the same values. It is not so difficult to make the inductances equal because they remain constant. But the condensers are more difficult to equalize, since they do not remain constant in value nor in rate of change of capacity. That is, many condensers do not remain the same, but some do, both as to capacity at any one setting and to rate of change of capacity throughout their range.

SLC Type Is Simplest

While the straight line capacity condenser has lost standing, it is the simplest to use in single control receivers. When such condensers are used it is not necessary to adjust the inductances quite so accurately to identical values nor is it necessary to adjust zero setting capacities to the same values. One of the condensers can be set ahead of the other a little bit to compensate for possible differences, or a midget condenser can be connected across one and adjusted so that the two circuits are tuned to resonance with the same frequency. The adjustment will then remain true for other settings of the condenser control. This is not true when other types of condensers are used.

In line with the single control idea there should be only one volume control, independent of the tuner. And this one volume control must be adequate to cover all ranges of field intensity. That is, it must be possible with this volume control to stop down to a whisper the signal from a powerful station a few blocks away and bring out with full volume the signals from a small station many miles away. That is a severe requirement, but it can be met satisfactorily with a rheostat in the filament circuit of the first or radio frequency, tube.

Controls on the Panel

However, if this method of control is to be successful by itself it is necessary to minimize stray coupling between the radio frequency tuner and the detector tuner. Placing the coils at a considerable distance apart in the cabinet of the set will usually suffice. But in some cases it is necessary to shield the coils from each other and to neutralize the plate to grid capacity.

It is also necessary to turn the set on and off from the panel. Hence we have one volume control, one tuning control, and one filament switch on the panel to work, and nothing more. The pilot light is turned on and off by filament switch action.

Fig. 1 shows the panel layout of the single control receiver. The interior layout of the receiver is shown in Fig. 2. The tuning condensers (two on one shaft) are seen in the middle, the two tuning coils in at the extreme ends, the tubes and other parts scattered appropriately in the front half of the cabinet. Note that the coils are placed as far apart as possible in the box in accordance with the requirement laid down previously. The trimmer condenser Co can be seen attached to the front section of the main tuning condenser.

Discussion of the Circuit

The rear half of the cabinet is set apart for batteries. All the B and C batteries can be placed here if desired and even the A battery, if 99-type tubes are used, but if 5-volt tubes are used the storage battery should be placed outside of the cabinet, leads and binding posts being provided for this purpose.

The circuit diagram of the receiver is shown in Fig. 3. The antenna coil L1 is adjustable with respect to the secondary L2. The control for this variation, however, is not brought out on the panel, since only one adjustment is needed. The primary L3 of the second transformer is similar to the winding L1 and the secondary L4 is exactly like winding L2. Since each half of double condenser C1 has a capacity of .00025 mfd. the windings L2 and L4 should be wound to this capacity. Of course, .00035 may be used instead, the coils smaller in inductance. The trimmer condenser Co is connected either across the first or the second section of the main condenser, depending in which

LIST OF PARTS

L1L2, L3L4—Two radio frequency transformers to tune with .00025 mfd. or .00035 condensers.
Co—One midget condenser
C1—One double condenser, .00025 mfd. or .00035 each section
C2—One .00025 mfd. grid condenser
C3, C4, C5—Three .25 mfd. condensers
R1—One 25-ohm rheostat
R2—One 3A Amperite
R3—One 112 Amperite
R4—One 2 megohm grid leak
R5, R7, R9—Three .1 megohm coupling resistors
R6, R8, R10—Three grid leaks of .1 megohm or higher
PTJ—Two phone tip jacks
One filament switch
One pilot light
Eight binding posts
Five UX sockets
One panel 7x21 inches
One cabinet 7x12x10 inches
One baseboard 18x5 inches
A six-lead cable
One 3-inch dial with pointer

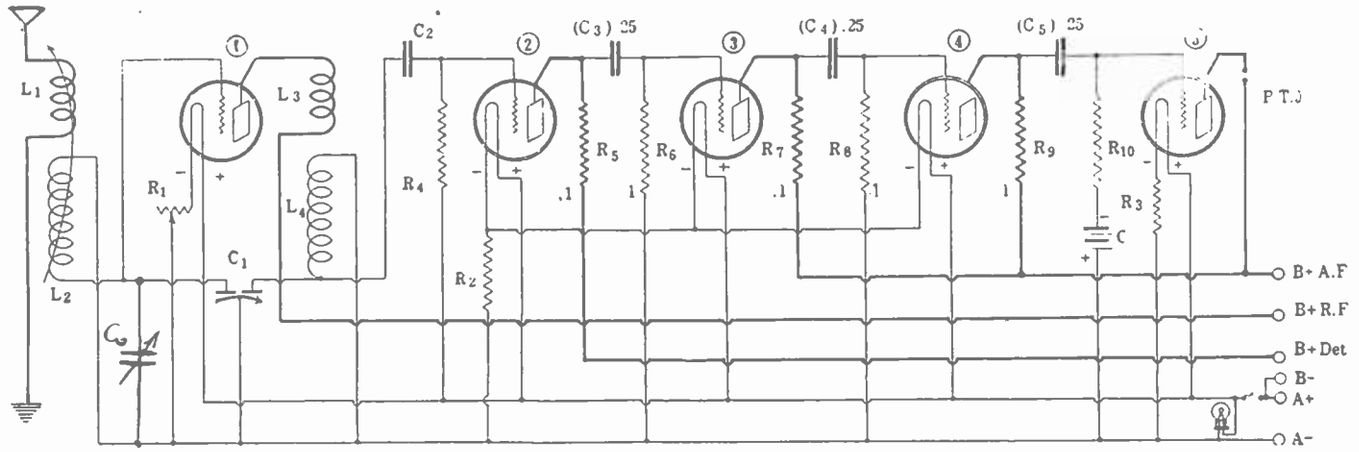


FIG. 2
The circuit diagram of the single control receiver. It comprises one stage of radio frequency amplification, a detector and three stages of resistance coupling.

position it is needed. It is a simple matter to determine the right place by experiment.

While the trimmer condenser Co is variable it is not placed on the panel because its adjustment is made only once. Tuning is greatly simplified if this condenser is left alone after one adjustment.

Constants for Circuit

The required volume control discussed above is represented by rheostat R1 is Fig. 3. This should have a resistance of 25 ohms or somewhat more if the tube is an 01-A. If the tube is of the 99 type the rheostat should have at least 50 ohms with a fixed ballast resistor of equal ohmage in series with it.

C2 is the grid blocking condenser in the detector. Its value should be .00025 mfd. or somewhat less. R4 is the detector grid leak and should have a value of 2 to 5 megohms. Note that this leak is connected directly between the grid and the positive end of the filament. This connection is necessary because of the common shaft of the two condensers.

The audio frequency amplifier is resistance coupled. Each of the three stopping condensers C3, C4 and C5 has a value of .25 mfd., but values may be used down to .006 mfd. Condensers as low as .006 mfd. can be substituted if desired provided that the grid leak resistances be increased in the same proportion that the capacity is decreased. For example, the product of the capacity of a condenser and the resistance of a leak in the same tube should be kept the same.

Effect of Resistors

The value of the coupling resistors R5, R7 and R9, is not critical. The resistors are shown to have a value of .1 megohm. Each one can have any value from that give up to one megohm. The values of the grid leaks also are not very critical. The given values are .1 megohm. This is a bit low for maximum volume but insures stability of operation. If the smaller grid condensers are used, as suggested, the grid leaks should be made at least .5 megohms each.

The grid bias on the first two resistance coupled tubes is obtained from the voltage drop in the ballast resistance R2. It is therefore one volt. This is approximately right for tubes having a mu of 30, (e. g., 340 and 240 types) but if tubes having a lower mu are used (e. g., 201A or 301A) the bias should be boosted 1.5, making 2.5 total, by means of a grid battery. This is particularly necessary on the second audio tube. The last tube is a power tube of the 112 type. Its filament is placed on a separate ballast resistor, R3. The grid bias on this tube must always be greater than that obtainable from the drop in the ballast. A grid battery C should be included and its voltage adjusted according to the requirements of the tube as recommended by the manufacturers.

Motorboating Remedies

The resistor R2 is an Amperite ¾ ampere, since the filament current of three tubes will flow through it, while R3 should be designed for ½ ampere, e. g., 112 Amperite, since only the filament current of the power tube will flow through it.

The output of the receiver is taken from a pair of phone tip jacks PTJ.

As will be seen from the circuit diagram the minus of B is joined with the plus of A. This connection usually gives a little louder signals than when minus B is returned to minus A. The filament switch is placed in the common A plus and B minus lead. The pilot light, of course, is connected across the A line next to the switch.

A receiver of this design might possibly give trouble from motorboating if used with a B eliminator or with dry cell batteries which are not fresh. The usual remedy for this trouble is to reduce the grid leaks on the theory that the trouble is due to blocking. Reducing the grid leaks does stop the trouble but it also cuts down the amplification and the remedy is therefore not recommended. Worse, the reduction of the grid leak undoes what the resistance coupled amplifier does. It cuts out the low notes which the resistance coupled amplifier is supposed to bring out.

First Try This

A better method of stopping the motorboating, if it occurs, should be used. The first thing that should be tried is to connect the B plus Det to B plus A.F., that is, give the detector the same plate voltage as the audio tubes. No harm will result, because of the high value of coupling resistor in the plate circuit of the detector. If necessary this resistor can be increased. Nothing will be lost by so doing and many desirable features may be gained.

Now, if putting the detector and the three audio tubes on the same plate voltage does not stop the motorboating it is time to try cutting down the grid leaks. It is quite probable that putting the four tubes on the same plate voltage stops the motorboating and also that it will start a high frequency squeal or make the output unpleasant. Connect a condenser across the B plus AF and A minus and the noise should stop. The size of this condenser depends on the frequency of the squeal. It should not be less than 1 mfd. and it should never be necessary to use a larger condenser than 10 mfd. Its use, though, is well worth while whether or not a noise develops.

Reisz Surprised by Our Cutoff at 5,000 Cycles

Why European broadcasting has "a more plastic sound" than American is explained by Eugen Reisz, writing from Berlin on his impressions of his recent visit to America. Mr. Riesz is the inventor of the Reisz microphone, the Reisz electrostatic speaker and phones, and the first vacuum tube amplifiers (the Lieben valve).

Mr. Reisz states:

"I was unaware of the fact that the frequencies for musical reproductions are only transmitted up to 5,000 cycles in the United States. In the European stations a line of frequency up to 10,000 is required.

The Plasticity

"As a number of stations are located in the same district in the United States and work simultaneously, their wavelengths not greatly differing from one another, it is necessary to restrict the extension of the frequency at the expense of the quality of broadcasting.

"This furthermore explains the fact that the European stations, especially in the broadcasting of orchestral music, have a more plastic sound and that the different instruments are reproduced with greater individuality.

"Through the courtesy and willingness of American engineers, I had the opportunity of seeing the technical equipment of many stations. All parts of high frequency apparatus and the arrangement of water-cooled transmission tubes of especially high efficiency can be regarded as model in character. Also the switchboards with the amplifiers and the control mechanism are perfect. The acoustic problems in receiving are worked out to the last detail and solved in such manner that good reception is assured.

First-Class Receivers Here

"The receiving apparatus, in mechanical construction, must be rated as first class.

"The high interest with which American people follow all radio developments can be mainly attributed to good and thorough reporting work by trade and daily papers."

Mr. Reisz conveys "the certainty that radio has become and will remain a vital factor throughout the world."

Working Three TRF Stages

Balanced Twin Eight Makes A Good Showing

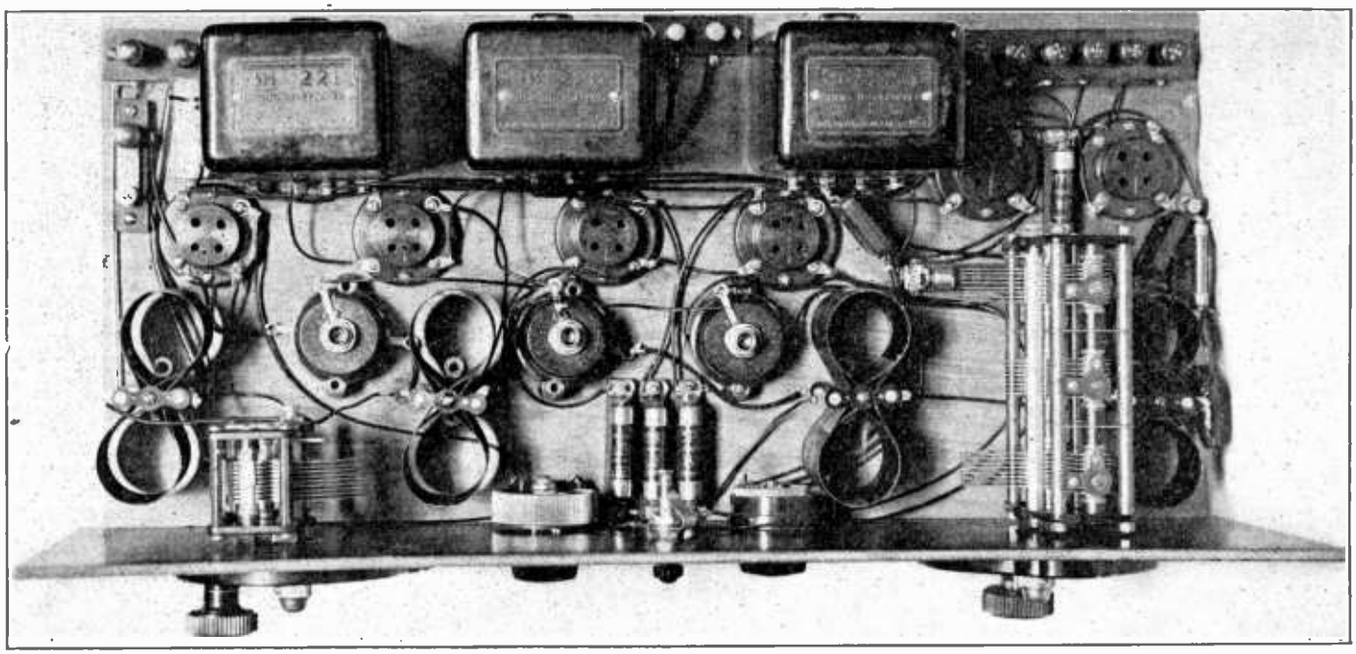


FIG. 1.
A receiver that stood up gratifyingly well in rigid tests in New York City is the one pictured above. It is easy to build and produces results. The neutralizing devices, called Phasatrols, shown between the coils, were invented by the author.

THE receiver which I am about to describe is not a panacea for reception troubles. It is offered as a highly coordinated receiver apropos of the conditions existing in transmission and reception; one which has been constructed by myself, with deep consideration of the parts used to produce a receiver of high merit yet of economy, in order that it find as much favor among many fan constructors as it found in my home.

The receiver possesses many salient features. The major ones are the three stages of tuned radio frequency amplification, employing a new and efficient system of stabilization; two stages of transformer-coupled audio frequency with response characteristics of a nature necessary for the satisfactory reproduction of the broadcast speech and music, considering the type of audio frequency amplification employed at the broadcasting stations; loop operation; two wavelength tuning controls and adaptation for either battery or eliminator operation.

Does Its Work Well

Many receivers have been described and constructed. After completion some disappointment is occasionally encountered. Lack of selectivity in certain territories, lack of sensitivity in others, unsatisfactory operation with a short aerial when a long aerial is not available, poor quality when required selectivity is being obtained, and other complaints of similar nature arise after a while. Considering such faults, what is the ideal receiver? The ideal receiver must possess certain characteristics. Good quality of reproduction, satisfactory selectivity in congested areas, satisfactory sensitivity and amplification, ease of operation and minimum cost are the paramount essentials. With these requirements fulfilled, complete satisfaction at that, is the result.

The design of the receiver shown in Fig. 1 was founded along lines which would fill these requisites. And judging from the performance of the receiver in three different cities, and on the road, the above requisites have been fulfilled.

Being primarily a loop operated receiver, all experimental work was carried out with a loop aerial. In New York City, in a location which is not classified as being the finest for radio reception, the receiver operating from a loop aerial received all the local stations without any background from any stations. During the period of local transmission four out-of-town stations within a 400-mile radius were tuned in without any interference from the locals.

Good Even in a Storm

When the locals signed off fourteen stations within a 1,500-mile radius were tuned in with this receiver on the loop. Changing from the loop to the outdoor aerial showed a deficiency rather than an increase due to the presence of atmospherics and strays.

Operated during a thunderstorm in New York City when operation with an outdoor aerial was exceedingly unsatisfactory, the loop input offered undisturbed reception from all local stations. By undisturbed does not mean complete exclusion of static due to lightning discharges, but minimum crash and grinder static and only occasonal paralysis of the tubes.

The receiver was then placed into an automobile and operated with a permanent fixed aerial placed atop the car. At a distance of eighteen miles air line from the city, twenty-six stations other than those classified as within the metropolitan area were tuned in. These included several stations 1,000 miles distant. Several stations within a radius of 400 miles were heard with excellent volume on the loudspeaker. Which all goes to prove the sensitivity of the receiver with a loop aerial input.

Analysis of Circuit

The receiver utilizes three stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio amplification. Oscillation in the RF stages is controlled by means of three of the Electrad Phasatrols. A careful study of the Phasatrol and the radio frequency transformers to go with them brought selectivity, volume and distance to a point where the set is astonishing, particularly in congested areas.

In the original experiments with tuned radio frequency circuits using oscillation controls of the high resistance series plate circuit type, it was found to be almost impossible to operate satisfactorily three stages of tuned RF. The use of bypass condensers and the RF chokes entered into the problem to such an extent that it was financially out of the question for the average experimenter. By the use of the Phasatrol, perfect control was obtained over the entire broadcasting wavelength band.

What Phasatrol Does

The Phasatrol, brought out by the Electrad Company for the control of RF stages, is fundamentally a phase-shifting device in the plate circuit of the radio frequency amplifying tubes. The Phasatrol circuit is shown within the dotted lines in the wiring diagram. The 90 volts B positive lead is connected to the three Phasatrols and each Phasatrol may be adjusted so that the tube is just below the oscillation point. One Phasatrol should be used for each tube in the RF stages.

The three radio frequency transformers were wound for use with Phasatrols only. The solitary one type (35) is the aerial coil. There are several new features about the coils that are mainly responsible for the sharpness of tuning and the extreme sensitiveness of the receiver to weak signals. There is tight magneitc coupling between primary and secondary windings, to obtain a maximum transfer of energy and an amplification gain per stage as great as possible.

Obviously under ordinary conditions it is desirable to have tight magnetic coupling when considered at least from the angle of amplification, and particularly if the machine is designed with a view of getting distant stations.

How About Selectivity?

The difficulty invariably encountered

when tight coupling is used is that there will be no selectivity on the set, eliminating all possibility of cutting through locals for distance. A peculiar feature of the Phasatrol is that it tends to loosen up the coupling of the RF transformer. When used with coils designed for the Phasatrol it strikes just the correct medium and a combination of selectivity and enormous RF gain, without cutting side bands.

Filament control of the tubes in the receiver is accomplished by utilizing rheostats and Amperites, (automatic filament control unit). The radio frequency gain is controlled by means of a 20-ohm rheostat. The remaining five tubes are controlled with individual Amperites, one for each tube. This makes possible the use of any type of tube desired by the fan. The method of filament control also serves as an assurance of the longevity of the tube filaments, since the correct filament voltage as specified by the tube manufacturers is applied to the filament. Variations in battery voltage are compensated for in the automatic filament control unit.

The Audio Circuit

The Silver Marshall 220 audio frequency transformers and the 221 output transformers were deliberately selected as coordinating best with the radio frequency amplifying system and with the type of transmission utilized in the majority of the large broadcasting stations in the country.

The frequency response characteristics of these audio frequency transformers differs from that of the majority on the market at present, in that it has a falling characteristic after 1,000 cycles, which is essential in a selective receiver, when tuned to a powerful and efficient broadcaster whose audio frequency transmission is such as to rise above 1,000 cycles, so as to compensate for side band suppression in the radio frequency portion of the receiver. As a certain amount of regeneration is encountered in every audio frequency amplifying system, and which regeneration is increased as the applied frequency is raised, falling characteristics in the individual units will result in a combination of practically ideal characteristics.

Since it is essential to isolate the speaker, from the high DC voltage applied to the output tube, thereby assuring longer life for the speaker magnets and windings, the 221 was selected. This transformer was designed to operate with the 220s and functions in an excellent manner, affording excellent quality of reproduction when a 171 or a 210 is used in the output socket and a good speaker is connected to the output terminals.

Location of Parts

The variable condensers used in the laboratory model were two Amsco .00035 mfd. straight tuning line units. One of them is a single unit for tuning the antenna or loop, and the other is a three-gang unit for tuning the three stages of radio frequency amplification.

A very interesting feature of the Amsco three-gang condenser is found in the micrometer adjustment provided for balancing the individual units when the condenser is placed into the circuit. While the individual sections are checked within 1% of the maximum capacity, the micrometer adjustment allows a variation of from 2 to 10% as required.

This, in addition to the rigid mechanical design and high value of electrical design, guarantees satisfactory operation of the coil-condenser combination. By means of the micrometer adjustment the condensers may be brought in perfect unison with each other. If the wiring is followed closely and the constructional layout not varied a great deal it will be found that these condensers require little or no adjustment as the condensers are equalized in the factory.

Referring to the subpanel layout we note the Phasatrol adjusting screws located between the radio frequency transformers. The Silver Marshall audio frequency transformers are located directly to the rear of the sockets. Looking down on the machine, from the left to the right, the sockets are arranged as follows: first socket on the left is the first radio frequency amplifier, second socket is the second audio frequency amplifier, the third socket towards the right is the second radio frequency amplifier, the fourth socket from the left edge of the subpanel is the first audio frequency amplifier, the fifth socket is the third radio frequency amplifier, the last socket on the right is the detector tube socket. The audio frequency transformers and the output transformer are located adjacent to each other in the following sequence reading from right to left: first audio, second audio and output.

The wiring is very simple.

After the set is wired tubes should be inserted in the sockets and the set turned on ready for operation. Rotate the dials and bring them both together at zero. Now turn the dials very slowly until a station is heard on the low wavelengths. Tune the station in to maximum volume and rotate the first dial back and forth over five degrees, meanwhile turning the adjusting screw on the first Phasatrol on your left, when looking at the set from the front of the panel, slowly to the right until a whistle or squeal is heard.

Now turn the screw in the Phasatrol back slightly until all squeals or whistles disappear entirely. This same operation should be gone through on the same station with the ganged condenser. The second dial should be rotated back and forth over five or six degrees, adjusting the second and third Phasatrols alternately until the whistles are blocked out entirely. It is important that this adjustment be made on the low wavelengths and once the Phasatrols are set they need not be readjusted unless tubes or batteries are replaced.

—John F. Rider.

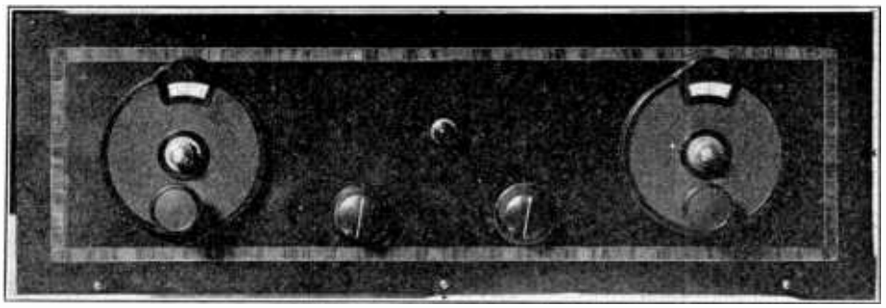


FIG. 2.
A pleasing appearance indeed is presented by the front panel view.

LIST OF PARTS

Three Electrad Phasatrols.
Six Silver Marshall tube sockets.
Two Silver Marshall 220 audio transformers.
One Silver Marshall 221 output transformers.
One Aerovox grid leak mount.
One Aerovox 3 meg. grid leak.
One 112 Amperite.
One Amsco 3-gang condenser (.00035 mfd.)
Four 1-A Amperites.
One Amsco single condenser (.00035 mfd.)
One Electrad 20-ohm rheostat.
One Electrad Royalty resistance type E.
One Bodine T-35 coil.
Three Bodine 135 coils.
One Aerovox 1 mfd. by-pass condenser.
One Aerovox .001 condenser.
One Aerovox .0005 condenser.
One Electrad filament switch.
One 7x21x3/16-inch Lignole panel.
One 9½x20-inch subpanel hard rubber Acme Celatsite Hookup Wire (red, brown, green, black).
Two 4-inch black dials.
One Acme 5-wire cable.
Nine binding posts.

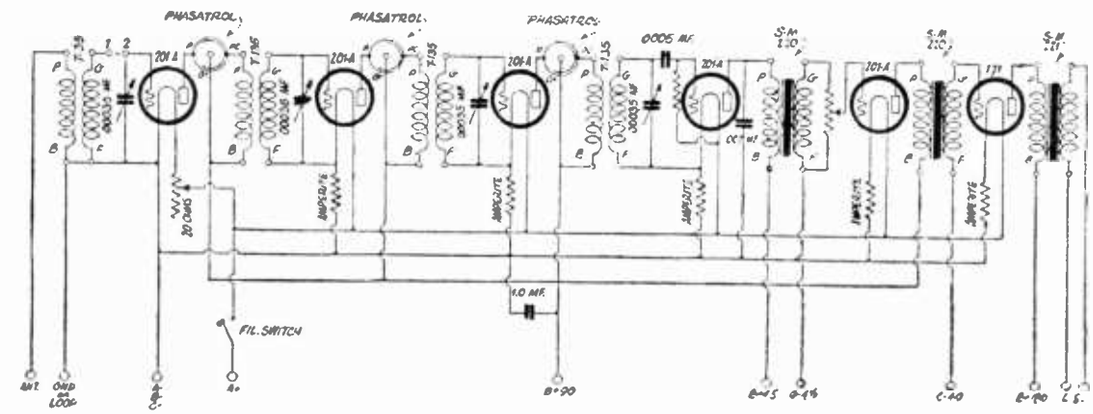


FIG. 3.
The circuit diagram of the six-tube set.

What Motorboating Really Is

Oscillation, Not Grid Blocking, Is the Answer

By J. E. Anderson

IT seems that even in the year 1927 some writers on radio, and even some radio engineers, do not understand what is the phenomenon called "motorboating" and how it is caused. They are wont to attribute it to blocking, that ancient alibi for lack of knowledge. The reason why so-called blocking explains so many things to members of this tribe is that they neither understand what it is supposed to explain nor the phenomenon by which they attempt to explain it. But blocking of the grids has been and to many remains, the explanation for motorboating, notwithstanding that it is untenable after coherent thought.

One scribe says that motorboating and howling are inherently the same and maintains that the difference is a matter of frequency. He places motorboating below 50 cycles per second and howling above that frequency. Certainly he has a good reason for claiming that the two phenomena are the same in kind, and he is within his rights when he places the line of demarcation between the two at 50 cycles per second.

Another scribe takes this one to task for misnaming the two phenomena, claiming that "motorboating" and "howling" are as widely different as zenith and nadir. He claims that motorboating is motorboating and howling is howling, and never the twain shall meet.

Is Motorboating Oscillatory?

He, too, could have had a perfectly good reason for taking this view of the case, if he had chosen to differentiate the two on the ground of cause. But instead of doing something rational and up-to-date he claims that howling is an oscillatory action at audio frequency and motorboating is a limiting or blocking action, and therefore it is non-oscillatory.

He justifies his conclusion on the ground that we cannot hear sound oscillations lower than about 30 cycles while we can hear "motorboating" at a much lower frequency. It cannot be oscillatory if we can hear it! His argument could be extended to prove that no oscillations can exist above 20,000 cycles, since that is one of the limits of audibility, and that we can only have blocking at radio frequencies.

Why does he invoke blocking to explain something he does not understand?

So "motorboating" is not oscillatory! Anybody who will take the trouble to put 'motorboating" on an oscillograph, either mirror or cathode type, will see some of the prettiest sine curves that he ever saw anywhere. And he can see these curves alone, or he can see them riding another wave, or if he wishes he can see other waves ride it. In other words he can see the pure oscillation or the oscillation modulated with other waves either faster or slower than itself. Having seen this he will never again dare stand up and say that "motorboating" is not oscillatory.

The Gentle Kind

It is of course possible to have so severe "motorboating" that the wave form is distorted by the curvature of the tube or tubes producing it. In fact the normal kind of motorboating is distorted in this manner and the wave is far from pure.

The main thing that limits the amplitude of the motorboating wave is distortion. But if the motorboating is gentle the wave will be so nearly perfect that no one can tell the difference. It will look perfect on the oscillograph; and what is more, it can be heard on the loudspeaker even if the frequency is as low as half a cycle per second, or lower. It is not the low frequency oscillation that can be heard but it is the rhythm of the accompanying noise that can be heard, which noise is akin to the noise that a gust of wind makes. In fact it is that kind of noise, and it is a wind that makes it.

When giving blocking as the explanation for "motorboating" the argument always stops when the grid has become so negative as completely to stop the plate current. It has to stop there because it explains nothing further. "Motorboating" is periodic and regular.

Find the Unblocking

If blocking is the explanation there must also be unblocking. But where is it, how is it, and how does that come about so regularly? Here is where the radio frequency signal is brought in. That does it. But that is not the frequency of the blocking. Now that is embarrassing. Well then it is the modulation frequency which causes the unblocking. But that is not regular either. So that will not do at all. Furthermore "motorboating" will occur without the slightest trace of radio frequency present, or intermediate frequency, or other audio frequency, or any variation in the supply voltages.

It will occur in a first-rate audio frequency amplifier fed entirely by storage batteries, provided that there is a large enough resistance in-series with the battery. To make things more steady we can regulate the temperature of the assembly and shield it from all outside influences and use metallic resistors where resistances are required. Yes, that circuit will motorboat, particularly if there are three tubes in it and those tubes are all on the same resistor in the plate battery.

The Low Value Condenser

Now in the blocking explanation the condensers are always blamed for the blocking, as they must be. But an amplifier so constructed as not to have any condensers in the grid circuit will oscillate more readily than one in which condensers are used. There is no blocking at all and yet the circuit motorboats.

You blocking adherents, crack that nut!

One of the best makeshifts for stopping motorboating is to make the stopping condensers small, very small. How small a blocking condenser must be made to the effective in stopping low frequency oscillations depends on how large the grid leak resistance is. The smaller this is, the larger the condenser may be. This effect is not due to any differences in the leakage but is entirely due to amplification. The small condenser stops the low frequencies and there is no amplification. A low value of grid leaks stops all frequencies, but stops the low more than the high, hence a lowering of the grid leak stops the amplification to such an extent that "motorboating" is impossible.

The reason that an inductance leak stops "motorboating" is not that it has a low grid leak value but that it has a low reactance value. It is practically a short-circuit of the grid at the troublesome frequencies. The fact that 200 henry inductances are recommended makes no difference. At one cycle per second a 200 henry coil has an reactance of about 1,270 ohms. Its resistance may be 5,000 ohms. Well, a resistance of that value is sure to stop the motormoating.

At 30 cycles the reactance of the coil is up to 37,700 ohms, which is still too small to have any effect in transferring any appreciable voltage to the tube. The use of an audio choke coil in the grid circuit in place of a resistor stops "motorboating" not because it leaks better but because it short-circuits the input to the tube.

If the grid bias in a resistance coupled amplifier is correctly chosen there will be no leakage current in the grid circuit. Hence there is no tendency to block. But still the circuit "motorboats," and it does so more than when the grid is nearly positive. When the grid is positive a part or all of the cycle there will be no amplification, or practically none. The circuit will be most erratic, but it will not "motorboat."

It is true that radio and audio frequency fluctuations in the supply voltage will aid "motorboating." This they do by a sort of trigger action. But the circuit must already be in an unstable condition if small fluctuations are to start it off "motorboating." When the circuit is just below the oscillating point the fluctuations in the supply voltage will cause the signal to become rough and "gargly."

Effect of RF Regeneration

If it is not near enough for this, there is still likely to be blasting at the frequency where oscillation would occur if the feedback were just a little more intense. Small changes in the signal voltage will have about the same effect as changes in the supply voltage since they affect it directly.

The roughness of the signal referred to above is often noticed when the receiver is regenerative at radio frequency. One reason for this is that the regeneration is most effective in increasing the low frequencies where motorboating occurs.

The reason that resistance coupled amplifiers are more infested by motorboating than any other is that the amplification at low frequencies in these is greater than in any others. Good transformer coupled circuits are also likely to give trouble, and the reason is the same.

In every case of motorboating the trouble is caused by regeneration through the resistance or impedance which is common to the plate circuits, or grid circuits, or both, of the several stages of the amplifier. The common resistance determines mainly the intensity of the oscillation and the inductance and capacity determine the frequency. Of course, they are interrelated so that both the intensity and the frequency depend on resistance, capacity and inductance.

Certainly Not Grid Blocking

Remember that blocking of the grids has no more to do with motorboating than phlogiston has to do with the generation of heat by friction. Both were stepping stones in science which have been discarded for better explanations.

One reason why most amplifiers, and resistance coupled in particular, give trouble with B battery eliminators is that the common resistance is high. First we have the resistance of the rectifier as measured from the output side. Then we have the resistance of the filter chokes, and finally we have the resistance in the output potentiometer. The various condensers connected across the line help to reduce the effective resistance, measuring from the output terminal posts. The last condenser next to the set may be particularly effective. But usually it is not effective enough. It only reduces the effective resistance a little bit, and a vast reduction is necessary if the B battery eliminator is to compare favorably with

(*Concluded on next page*)

A Good Little 2-Tube Set

Suitable for Portable or Home Use, with Phones

By Rodney Vambrisk

A GOOD little receiver for distance, volume, and selectivity is diagrammed in Fig. 1 It is also well suited for portable purposes, since the entire set can be built in a small space, and dry cell tubes, such as the -99 type, may be used. The antenna wire, properly insulated, can be strung up between two trees, while the ground can be made in the moist earth with the aid of a piece of iron pipe.

There are only two controls, the variable condenser C1, which may be a .0005, .00035 or .00025 mfd., and the tickler. The filaments are automatically adjusted with the aid of 4V -199 Amperites, A1 and A2. The coils can be made or purchased. When buying, be careful to select a coil matched to the variable condenser to be used. If the coils are to be made, use 2¾-inch diameter tubing for the primary and secondary windings and 1-inch tubing for the tickler. No. 22 dcc wire can be used for the primary and secondary windings, No. 26 ssc being used for the tickler. L1 consists of ten turns, regardless of which type condenser is used. L2, using the .0005 mfd. condenser, consist of 55 turns. Using the .00035 mfd., it consists of 70 turns. Using the .00025 mfd., it consists of 80. The tickler, with the .0005 mfd., consists of 35 turns. With the .00035 and .00025 mfd., it consists of 40 turns. It will be necessary to wind the wire over itself in these cases. The grid condenser C1 has a capacity of .0001, while the grid leak R1 has a capacity of 6 megohms. The bypass condenser C3 has a capacity of .0001 mfd. Any type of audio frequency transformer can be used, the low ratio type being preferable.

A cabinet which is 6 inches high, 10 inches long and about a foot deep can be used to house the parts and the batteries. Only about 5 inches of the space will be found necessary to house the tuning elements. C batteries should be used for filament supply, while for B supply, three small 22½ batteries should be used. Place the coil and condenser as far apart as possible. The sockets should be placed with the F posts to the panel. The filament switch should be placed in between the tickler and condenser controls.

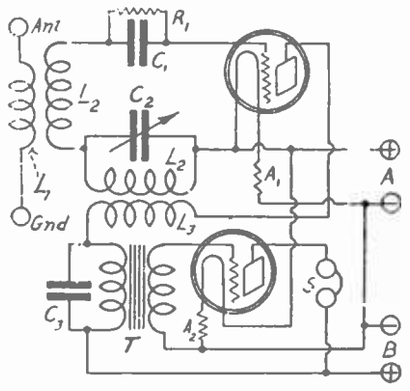


FIG. 1

The circuit diagram of a 2-tube receiver, which is excellent for home or portable use. The break in the A+ lead indicates where the filament switch is connected.

Although L2 in the circuit diagram is drawn as if it were two separate coils, it is only one continuous winding. It was drawn that way to indicate the mutual inductance relationship between the tickler (plate) and the grid winding.

When using the set in the city, it will be found quite practical to use a speaker. The antenna should be about 75 feet in length. Either hard drawn bare No. 14 copper or insulated wire should be used. The leadin should be soldered onto the antenna wire, while the ends of the wire securely attached to the insulators in the home, so that it is only necessary to hook the insulators onto screws in the tree when in the country. Try to choose a tree which has the least amount of leaves and is in the direction of least amount of trees.

It will be found that good results may also be had by driving a large nail in the tree and tieing the bare end of the antenna wire to this nail. The highest portion of the the should be used. Use the main trunk of the tree if possible.

Tides and Ferry Time Sent Nightly by WNYC

The municipal broadcasting station of New York City, WNYC, located atop the Municipal building, recently celebrated its third anniversary. The station has been on the air for more than 5,100 hours, according to Albert Goldman, Commissioner of the Department of Plants and Structures.

Last year, more than 1,718 hours of entertainment, news, etc., were radiated. About 900 of these hours were devoted to vocal and instrumental music. Since July 8, 1926, more than 316 hours were devoted to programs which originated from outside points.

The anniversary address was delivered by Comissioner Goldman, who outlined the progress of WNYC. A new feature of the station, he said, was the nightly announcement of the tide-table for the following day, which is of interest to the fisherman, bathers and shipping interests. The schedules of the ferry lines operated by the Department of Plants and Structures are also given nightly, he said.

INJUNCTION SUITS WITHDRAWN

Washington.

Injunction suits brought against the Federal Radio Commission by station owners to test the constitutionality of the radio act have been withdrawn. The stations will appeal to the District Court of Appeals from decisions rendered by the Commision, instead of attacking the validity of the law.

Extra AF Stage Often Stops Motorboating

(*Concluded from preceding page*)

storage B battery or even with a dry cell battery. Something like 200 microfarads capacity across the line next the set would have to be used to make the effective resistances comparable at a frequency of about 5 cycles per second. Such a condenser is never found in any eliminator unless an electrolytic condenser is used.

May Be of Any Frequency

While resistance coupled amplifiers of odd plate circuits on the same common resistance motorboat very readily at low frequencies, a similar amplifier having four plate circuits on the common impedance will not give any trouble at low frequencies while it may oscillate at a high frequency. By high in this case may mean anything from 500 cycles upward. But oscillation of this frequency can be stopped very readily by means of a by-pass condenser of moderate capacity.

As can be inferred from the above, motorboating is not confined to low frequencies. It is likely to occur at any frequency just as a vacuum tube oscillator can be made to oscillate at any frequency. It makes no difference in the action whether the oscillator is intentional or accidental. The frequency of oscillation in either case is determined by inductance, capacity and to some extent by resistance. Whether we call it motorboating while the frequency is low and howling while it is high makes very little difference.

Apropos of howling, there is another regenerative phenomenon which has long been called howling, and it would be well to restrict the term to that type of oscillation. If the receiver of an ordinary telephone be placed in front of a carbon type microphone, both being in the same line, and the leads properly connected as to phase, a howling will be set up. This is caused by the feedback of energy into the microphone and the negative resistance characteristic of the carbon microphone. Air forms the coupling medium between the transmitter and the receiver.

The Microphonic Howl

We have a similar phenomenon in a radio amplifier. If the loudspeaker be placed too too close to the first tube in an audio amplifier, the phase relations being right, the circuit will set up a howl. The speaker hits the air, the air hits the tube, the tube starts to vibrate and the vibration is sent to the loudspeaker via regular channels. The increased vibration of the speaker increases the intensity of the vibration of the tube, and finally the system oscillates freely and howls loudly. Air is the coupling medium between the loudspeaker and the microphone, which in this case is the frail tube. This action is identical with that which has for long been called howling, and it is well to retain the terminology. If we restrict the term "howling" to this phenomenon we will have to speak of high frequency and low frequency "motorboating" when we refer to the oscillatory phenomenon caused by regeneration through the common impedance in the plate and grid circuits.

DISTRIBUTES MAJESTIC LINE

The Specialty Service Corporation, Brooklyn, N. Y., has been appointed distributors of Majestic Eliminators. They are also distributors of Raytheon tubes.

Air Advertisers Aid Listeners, Says Rice

Radio advertising as a natural development of broadcasting was discussed by Martin P. Rice, director of broadcasting for the General Electric Company, in the course of a talk delivered recently from station KOMO, of Seattle, Washington. While in the west Mr. Rice inspected stations KOA and KGO, of Denver, Colo., and Oakland, Calif., respectively, both of which are operated under his supervision. In the course of his talk on radio advertising Mr. Rice said:

"The use of radio for advertising is a perfectly natural development. With the invention of a new means of communication capable of reaching every home in the United States simultaneously with an assured audience already numbered in millions and rapidly increasing, what should be more logical than the proper employment of the new medium by advertisers?

Listeners Indebted

"The advance of broadcasting to its present status has, indeed, been more dependent on advertisers than most of us realize. Service to humanity and the lure of scientific achievement have been important motives in radio development, but in every step which they have pointed out and made possible, advertising has followed promptly. Not the kind of advertising which has commodities to sell at quoted prices, but the kind that is building good will for an institution, creating a market for a product, setting forth the virtues of a religion, the advantages of a system of education, or cultivating the friendship and regard of the public.

"All of these objects may be termed advertising in the broad sense and if you look over the long list of broadcasting stations on the air today, you will find very few of them which are not advertising something. The almost universal desire to broadcast today springs from the desire to advertise. It is an age of publicity and advertising.

"Broadcasting began in a humble way. The first cost of a fifty-watt station five years ago was next to nothing and the technical operator who was fortunate enough to have a few talented friends was never at a loss for program material. If he lacked the talent, there was the ever present phonograph, with a good selection of records.

Calls for Big Investment

"All this has changed. The typical first-class broadcasting station with its duplicate and triplicate sound deadened studios, its antenna system removed from the center of dense population, its wire connections with other stations, its highly technical equipment, and its administrative offices, now represents an investment in the hundreds of thousands of dollars. Public appreciation and discrimination have increased and have necessitated rapid evolution in broadcast programs. Amateur performers have been dropped and the public has demanded the best in music, drama, science, religion, and statesmanship.

"Here is where advertising entered the picture. By contributing to the cost of broadcasting, it has made possible the rapid development and maintenance of a great public service which makes weather, market and stock reports, music, entertainment, education, religion, and the addresses of statesmen available to everybody, everywhere, without tax, cost or expense.

Mere Fraction of Cost

"There is nothing incongruous about it and nothing shocking. Probably everyone who reads a national magazine or buys a newspaper replete with the latest telegraphic reports from all over the world does not stop to consider that his purchase price is only a fraction of the publisher's cost and he may not know that the advertisers make up the difference. There can be no misunderstanding about a commercial broadcast program because the announcer always states frankly the name of the advertiser who sponsors it.

"General Electric and associated companies studied broadcasting carefully and saw in its development the opportunity for a great public service. They also saw the hopelessness of a financial plan which would insure the future of broadcasting without advertising. Late last year they organized the National Broadcasting Company to put broadcasting on a sound commercial basis.

"The American Telephone and Telegraph Company which had operated WEAF and a chain of stations successfully, sold its key station and its broadcasting rights to the new company wishing to retain only the business of furnishing telephone circuits for broadcasting.

Four Chains in Five Months

"The Broadcasting Company in five months has established four chains of stations; the red and blue chains in the East and middle West, the green chain in the South, and the orange chain on the Pacific coast. It is not yet making money, or even paying expenses, but it is doing well for a new enterprise and is establishing commercial broadcasting. Working in close co-operation with magazine and newspaper publishers and without diverting a single penny from the pages of printed advertising it has demonstrated the value of advertising by radio to the eminent satisfaction of many national advertisers, and while it has done all this it has rendered the radio public a real service by providing programs which would be beyond the resources of any single station.

"All the programs are carefully prepared with the prime requisite of pleasing the public. The artists and performers are the best of their kind available. They are invariably rehearsed until satisfactory performance is assured and the announcements are never obtrusive.

Produced Good Results

"It is difficult to refer to the results of broadcast advertising without mentioning specific cases which might be undesirable, but ample evidence of its efficiency is available. The manufacturer of a tooth paste, whose product sold side by side with that of competitors, put on a radio 'hour.' He could not fail to notice that in districts covered by the broadcasting his sales increased many fold, while in other districts they remained about the same.

"Similar results have been had in radio receiving sets and in other lines."

TAKE IT EASY

It's Summer.
Keep Cool.
Tune in.
Stay Put.

MOTHER'S SET

(Underwood & Underwood)

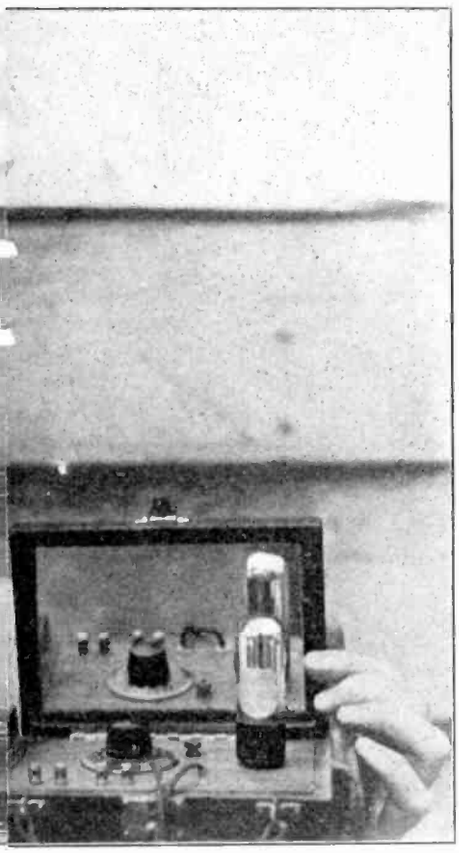
CURTIS HILLYERM, JR., 14-year-o one-tube set which he constructed in a batteries furn

SETS HELP MAKE

(Underwood & Underwood)

The elaborate transmitting and receivir terton, one of the trawlers of the fish landic coast. This enables the skipper fl

IN VANITY CASE



ld boy of San Diego, California, with the vanity case for his mother. Tiny flashlight ish the A power.

TRAWLING EASIER

g apparatus installed aboard the Lord Win- ing fleets in the North Sea and off Ice- o communicate with other trawlers in the et.

Heflin Wants Debates of Congress Truly Aired

Washington.

Whether the sessions of the Senate and the House should be broadcast has again become one of the widely discussed topics in the Capitol. Senator Thomas Heflin of Alabama started the discussion anew. He suggests that when Congress meets again such provision should be made.

The Senator has just returned from a tour of the country. He was surprised to learn of the extreme ignorance of the majority of the people as to the happenings in Washington. This caused him to make the radio suggestion, since he thinks that the newspapers give more space to divorce, crime and other spectacular news than to Government news.

Much trouble would be encountered as to the time allotted for broadcasting, Mr. Heflin was told, since only in the evening could a very large audience be obtained, whereas most of the sessions are held in daytime.

The suggestion was not met with much enthusiasm by the Democrats, who stated that at the last convention, in Madison Square Garden, broadcasting did much to drive votes away from the Democrats at the election. This fact is being stressed to such a point that at the next convention, it is possible that only such portions of the convention that are of vital importance will be sent out.

Many are of the opinion that the public will not take to graciously to the suggestion, if the provision will include the broadcasting of even the filibuster speeches.

Longitude Right at Last; Corrected in Radio Tests

Recent world longitude observations by radio to establish a common astronomical basis and to improve the time observations at leading observatories in more than 25 countries have rendered a service of "immense value to the entire world," E. J. Brown, a lieutenant engaged in the field work of the Coast and Geodetic Survey, reported.

He called attention incidentally to the peculiarity of radio reception in Hawaii, where atmospheric and probably geographical and geological conditions make certain localities "dead spots." He said:

"The radio art, in making possible the accomplishment of the recent world longitude observations, has rendered a service of immense value to the entire world. These observations, performed to establish a common astronomical basis and improve the time observations at the principal observatories, have resulted in a world-encircling net of longitude determinations of great precision.

"Longitude as determined by modern methods is not an absolute determination but a difference measured from some other point. The longitude difference between two points is the difference in the local sidereal times of two points, and is best measured by providing some means of noting the time at the different points at the same instant. Previous to the advent of radio this 'instant' was provided by a signal over a telegraph line. The limitations of such a method are obvious and it was not until wireless transmission was developed that longitude surveys of large extent could be made."

Says Programs Need of Tie-up Advertising

Broadcasting reaches its highest efficiency when supplemented by a liberal use of newspaper advertising, according to Henry Obermeyer, of the Consolidated Gas Company of New York. Mr. Obermeyer speaks with the knowledge of actual broadcasting done by the gas companies of Greater New York City, who have spent at least 50 per cent of the radio appropriations in paid newspaper advertising to assure the success of the programs.

"A total of more than 31,000 letters was received from gas company customers following a program totaling four and one-half hours of broadcasting a radio course of home making," says Mr. Obermeyer. "The increasing use of broadcasting will not only stimulate the sale and use of utility services, but will also improve the morale of gas company employees, who under such circumstances feel the public is watching their work more closely."

A grand opera star or a world's heavyweight champion is not necessary to attract a radio audience, is his advice to broadcasters.

"A talk on oven-cooked meals will appeal to a limited group, but may give you much for your money," he added.

Building New Stations Discouraged by Board

Washington.

In a letter sent out to all persons or organizations making applications for construction permits to erect new stations, the Federal Radio Commission announced its intention to encourage consolidation of stations and the reduction than the increase of the number already operating.

It goes on to say that money can be saved by renting time from or purchasing an interest in an existing station, instead of building a new one. The Commission states that they will even issue separate call letters to the one or more tenants of a station upon application.

How to Wind Coils For .00035 and .00025 Mfd.

The coils for .00025 or .00035 mfd. condensers may be wound on three-inch diameter tubing with some No. 24 double cotton covered wire or double silk covered. When using the .00035 mfd. variable condensers, the secondaries should consist of 59 turns. When using the .00025 mfd. variable condensers the secondaries should consist of 65 turns.

The primaries in all the coils, whether for .00035 or .00025 mfd. variable condensers, have 12 turns each.

Single Control Gives Little Less Sensitivity

Common tuning control is the radio style of today, and the style may last as long as radio. It is a most desirable feature in any radio receiver. But many practical difficulties are associated with no less than convenience.

The main difficulty is that the various tuned circuits controlled cannot be made identical throughout the range of the control. Inductances of the various coils differ in value. The distributed capacities of the various circuits are not the same. The effective rates of change of capacity are not the same for all the circuits controlled by the common mechanism.

The success with which the common control idea can be worked depends largely on what type of condenser is used, that is, straight line capacity, straight line wavelength, straight line frequency, or some other law of capacity change.

Product Must Be Same

The condition that must be maintained in the various circuits for successful single control systems is that the product of the inductance and the capacity be the same for each circuit at all settings of the control, that is, for all frequencies to which the receiver may be tuned. This requires that the rate of change of the capacity be the same for all circuits which are controlled by the common device and also that the various circuits be adjusted to equality at one setting.

In adjusting the receiver we may start by making the effective inductances the same in all the tuned circuits. This requires careful adjustment and careful construction. When the inductances are equal in value the problem of common control narrows down to equality of capacity.

Here is where the difficulty comes in. The distributed capacities of the coils differ, even when they are constructed identically, because they are placed differently with respect to other objects in the set. The capacities of the leads of the various tubes are also different. These are added to the distributed capacities of the coils. The result may be either greater or less divergence in the capacities of the various circuits.

Even "Zero" Differs

The zero setting capacities of the various condenser sections also differ, which may increase the divergence from equality. The main difficulty, however, is that the rate of change of capacity as the control is turned is not the same for all the circuits. This may be due to slight differences in the structure of the condensers or to slightly different location relative to other conductors in the set.

Now it is quite easy to adjust the different circuits in the set so that they are all exactly in tune with some frequency. This is usually done with midget condensers connected in parallel with the tuning condenser sections, and it is done at a frequency in the middle of the tuning range of the receiver. But the adjustment made at one frequency does not necessarily hold for other frequencies.

When Upset Occurs

As soon as the control is turned the adjustment may be upset due to differences in the rate of change in the capacities of the various condenser sections. The choice of a frequency for adjustment in the middle of the tuning range prevents a too great divergence anywhere within the range.

The degree of success of common controlled receivers depends on the ratio of inductance to capacity to a great extent. If the capacity used is large any small deviations from equality will represent a small percentage deviation from synchronism, whereas if the capacity is small the same absolute deviation will represent a large deviation from synchronism, assuming of course that tuning is done by varying the capacity in the tuned circuits. Since a high ratio of inductance to capacity is desired for sensivity it is apparent that from this point of view the use of common control necessitates a little sacrifice in sensitivity.

HE DIRECTS 50 PIECES

(J. Anthony Bill)

WILLIAM J. KOPP, formerly assistant conductor and first trumpet of the Cincinnati Symphony orchestra, who is directing a 50-piece orchestra which plays daily at the Cincinnati Zoo. The orchestra broadcasts each Saturday evening and Sunday afternoon over station WLW.

Lynch Wins Auto Race; Silver's Luck Tank Leaks

One of the features designed to entertain the radio manufacturers who assembled at their annual convention at Chicago recently was the automobile race between McMurdo Silver and Arthur H. Lynch.

The race came about as a result of a wager between the two manufacturers at the convention held at Atlantic City last year. Silver drove in from Chicago, where he is in business, and saw Lynch with a second-hand roadster of which Lynch seemed unduly proud. Silver bet he could ride rings around Lynch and a date was made for the Chicago convention.

Lynch drove his car to Chicago and arrangements were made for the race to be run over a 30-mile course, on the Higgins Road, from the outskirts of Chicago to St. Charles, Ill.

Lynch Over the Top

As soon as Leonard Lynn, who is one of Chicago's leading radio jobbers and also an auto enthusiast, heard about the race, he said he would pilot his specially geared Wills-St. Claire roadster to victory against the other pair. Silver had the latest model Cadillac, all tuned up and rearing to go. Lynch uses a Marmon of the vintage of 1922.

The men showed up for the race three different mornings but had to call it off because of adverse weather conditions. Silver and Lynn jollied Lynch so much about his "blimp" that he stayed over until the Wednesday following the convention.

All the cars were in tune that morning and at dawn they sailed from the starting point and sailed is the correct word. Lynch jumped into the lead with Silver running second and Lynn bringing up the rear. At the five-mile mark, Lynn passed Silver but he could not gain on Lynch who kept increasing his lead, mile after mile. Lynn said, after the race: "Every time I got to the top of a hill, I saw Lynch just going over the crest of another."

Silver's Mishap

Both Lynch and Lynn said Silver's car went blooey and both have agreed to meet him again. Evidently Lynch followed Jim Kennedy's advice and had monkey glands put in his old Marmon, because Lynn was doing 85 to 88 miles an hour for the entire distance. Lynch had no speedometer, but in order to beat Lynn by a mile and a half he had to do somewhat better than 90 most of the way.

Since Lynch holds the championship the boys who want to take a crack at his title will have to do their riding in the east. There is some talk about a race on the Atlantic City Speedway. Lynch says they will have to get faster cars if they really want a crack at his clown and he says he'll stack his Marmon up against any stock job owned by anyone in the radio game.

Canton, China, Pays $75,000 For Station

Washington.

The final touches on the new powerful station in Canton, China, with call letters XNA, were recently concluded. The station costs about $75,000. It was built by Carlowitz and Company of Canton, who obtained the equipment from the Lorenz Company in Germany. The steel masts are 100 feet high, 4½ feet square, and 600 feet apart. The waves used are 2,600, 3,090 and 4,385 meters.

In testing, the station was heard at 10 o'clock in the morning in Java, and at the United Station at Gavite, Philippine Islands.

Fifth Station Added To Portuguese Beamers

Washington.

The new beam radio station at Lourenco Marques, Portugal, was recently opened with an exchange of messages between the Governor-General and the Minister of Colonies at Lisbon.

There are five stations hooked up in this beam system, it being known as the Portugese chain. They are located in Lisbon, Madiera, Azores, Cape Verde and Loanda.

How to Face the East When Speaker Goes West

Sometimes a loudspeaker which has been giving good service a long time ceases to do its work properly. This may be due to corrosion of the wires in the windings, to an actual burnout of the windings, to a short-circuit, or to a failure of the magnet to maintain its magnetization.

Corrosion and consequent failure will happen when a corrosive solder has been used in soldering any part of the winding. It takes very little to eat through the fine wire, and as soon as one open has developed in the circuit no more signals will be heard on that speaker until the windings have been repaired.

Actual burnout will not occur very often but is experienced when No. 40 or finer wire is used in the windings and when power tubes are used without filtering out the direct current.

Insulation Melts Away

What actually burns out is not the wire but the insulation on the wire. The enamel which is ordinarily used does not stand continuously a much higher temperature than 250 degrees F. If the heating of the wire is so great and the radiation so low that the temperature will be exceeded, the insulation will soften and short-circuits will occur. At first this will be noticed as a scratchy type of signal, much resembling static, but worse. This scratchiness is due to arcing through the insulation where it has been softened and thinned. The sparking increases the heat and in a very short time the short-circuit is complete. A very weak signal or none at all will be the result, depending on where the short has occurred.

A short-circuit may also be caused by mechanical vibrations and chaffing. The result is the same as when it happens by virtue of heating.

Loss of Magnetization

A common trouble which occurs in cheap loudspeakers is loss in the magnetization of the field magnet. This can be caused by excessive heat, although this is not likely to be the case in a loudspeaker. It can also be caused by a severe jar or by a series of jars. This is a most likely cause of demagnetization, since the speaker is being jarred continuously when in operation. It may also be caused by an excessive amount of current through the winding in such a direction as to oppose the permanent field. This is a likely cause.

A good magnet, well magnetized, will not lose its magnetism while the loudspeaker is in normal operation. But many magnets are very poor. They have been made of a cheap grade of magnet steel, they have not been properly heat treated, and they may even have been annealed to simplify some machine operation. Then again the magnet's shape may be such that it exercises a demagnetizing effect on itself.

Slowly the Loss Takes Place

The loss in strength of the magnet is usually gradual, and is not noticed from day to day. The blame is laid on the weather, the broadcasting station or some other innocent bystander.

If the magnet has become weakened it can be remagnetized at a small cost. It will become as strong as it ever was, provided that the magnetizing electromagnet is strong enough to saturate the magnet. If the magnet loses its magnetization a second time in a short time it will pay to get a new magnet, a good one.

SPOT VIOLATORS

(Wide World)

CHECKING up on Broadcasters' Frequencies

The personnel of the United States' Radio inspection service is always on the lookout for any violation of the radio law. Broadcasters and other radio transmitting stations are required to keep closely on their assigned frequencies. Any deviations are immediately detected by the ever-watchful inspectors. The stations are warned to keep on their frequencies and if they do not comply they are in danger of losing their licenses.

In the photo Henry L. Bogardus, Acting Supervisor of Radio in the New York district, and Charles L. Manning, Radio Inspector, are checking up on the frequencies of New York broadcasting stations at their listening post in the Supervisors office in the Sub-Treasury Building.

The Grid Return in AC Tube Sets

When AC is used for heating the filaments of tubes there is no so-called negative end of the filament. The two ends take turns at being negative. It is obvious therefore that the grid return cannot be connected to either end.

If it is connected to one end the voltage drop in half the filament will be added to the signal and a decided hum will be the result. If a grid bias is used to insure that the bias on the grid is negative all the time, the actual grid bias will vary as a result of the fluctuations in half of the filament. The situation will not be one whit better than before.

Furthermore the wobbling might give rise to frequency distortion, particularly if the mu of the tube is high.

Most tubes which are intended for AC heating are designed to operate on a low filament voltage so that this effect be reduced as much as possible.

Since neither end can be regarded as negative it is customary to regard the midpoint of the filament as the negative point. When the grid return is connected to this point no appreciable hum will be introduced into the signal by the varying filament current. This point remains at the same potential all the time. When the midpoint is used as the return point the grid bias applied should be greater by the amount of the voltage drop in one half the filament than the bias for the same tube and plate voltage when the filament is heated with DC.

Four Commissioners Inspect Their Zones

Washington.

Four of the five members of the Radio Commission recently left Washington to inspect radio operating conditions in their various zones. Due to illness, Commissioner Dillon was unable to make the tour. He returned to his home in California.

Commissioner Caldwell visited the New York area and New England states. Both these sections are embraced within the first radio zone in the Radio Act of 1927. Rear Admiral William H. G. Bullard, chairman of the Commission, visited the States in the second zone, which takes in Pennsylvania, Virginia, West Virginia, Ohio, Michigan and Kentucky. Commissioner E. O. Sykes visited the third zone, taking in the Southern States. Commissioner H. A. Bellows visited the fourth zone, which comprises Central and Middle Western States, as well as the Chicago area. Other arrangements are being made for inspection to the fifth zones, which includes territory in the Rocky Mountains and the Pacific Coast.

Browning-Drake Moves

The Browning-Drake Corporation of Brighton, Mass., announced its removal to larger quarters across the river in Cambridge. Considerably greater floor space will be available for increased production during the coming season. Professor Glenn A. Browning announced recently the termination of his connection with the National Company. Henceforth all of his research will be devoted to the Browning-Drake Corporation.

Philharmonic Group Put on WJZ Network

WJZ and its associated stations for the remainder of this month and during August will broadcast between 8:30 and 10:30 P.M., each Thursday and Sunday night, the concert of the New York Philharmonic Orchestra, which will be given in the Lewisohn Stadium of the College of the City of New York. Hooked up with WJZ will be WBZ, WBZA, KDKA, KYW and WEBH. WJR and KSD will send out the program from 9 to 10 P.M., while WBAL, will transmit it from 8:30 to 10 P.M.

Willem van Hoogstraten will for the sixth consecutive year lead the orchestra.

Thirteen Stations Get Frequency Bouquet

Thirteen stations were listed in the May issue of the U. S. Radio Service Bulletin as possessing constant frequencies. They are:

WBAL, Baltimore; NSS, (U. S. Naval Academy) Annapolis, Md.; WCL, Tuckerton, N. J.; WSS, Rocky Point, N. Y.; WII, New Brunswick, N. J.; WVA, (U. S. Army) Annapolis, Md.; WEAF, N. Y. City; WRC, Washington, D. C.; WJZ, Bound Brook, N. J.; NAA, (U. S. Navy) Washington, D. C.; WGY, Schenectady, N. Y.; WBZ, Springfield, Mass., and KDKA, Pittsburgh, Pa.

NEW CORPORATIONS

Radio Booking Bureau, N. Y. City, $10,000 preferred, 200 shares common. (Atty. M. Casper, 299 Broadway, N. Y. City).

RADIO WORLD

The First and Only National Radio Weekly

Member, Radio Publishers Association

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

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SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months. Add $1.00 a year extra for foreign postage. Canada, 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address; also state whether subscription is new or a renewal.

ADVERTISING RATES

General Advertising

1	Page, 7¼"x11"	462 lines	$300.00
½	Page, 7¼"x5½"	231 lines	150.00
½	Page, 3¼" D. C.	231 lines	150.00
¼	Page, 4½" D. C.	115 lines	75.00
1	Column, 2¼"x11"	154 lines	100.00
1	Inch		10.00
Per Agate Line			.75

Time Discount

52 consecutive issues	20%
26 times consecutively or E. O. W. one year	15%
4 consecutive issues	10%

WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

CLASSIFIED ADVERTISEMENTS

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

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

YOU DON'T SAY SO—BUT I DO

By TIM TURKEY

One flag, one wife, and one dial.

* * *

Nobody minds distortion unless it's in the other fellow's set.

* * *

Own a portable and leave it home when you go countryward. Then hop, skip or die.

* * *

Better business bureau ought to show some radio manufacturers how.

* * *

Don't say that radio broadcasting isn't the show business. Otherwise how account for the weather's effect?

* * *

If you don't know, tune in and find out.

WSM Wave 340.7 Meters

WSM, the National Life and Accident Insurance Company station in Nashville, Tenn., received a special order changing its frequency of 940 kilocycles (319 meters) to 880 kilocycles (340.7 meters). The station also was authorized to use 5,000 watts of power, instead of 2,000 watts. This change should be made by all possessors of the list of stations published in the July 2 issue of RADIO WORLD.

Boy Treated on Shi by Doctors 1,500 Miles Off

Los Angeles.

Although 1,500 miles away from their patient, two Los Angeles doctors recently saved the life of an 8-year-old boy suffering from intestinal trouble aboard the tramp steamer Nora, on its way from Panama to San Pedro.

The SOS sent by the operator of Nora was received by the operator at Los Angeles and read:

"SOS, Steamer Nora, 1,500 miles south of Wilmington, north bound from Balboa. Boy eight, sick. No doctor on ship."

Police Surgeon Sebastian and Dr. J. B. Renfrew were immediately notified. They requested more information as to the child's condition. After this was received, they diagnosed the case and sent out complete instructions for treatment. Both physicians stood on watch the entire night, until they were notified of the boy's improvement.

Two Nebraskans Put On WGY's Wavelength

Washington.

The transfer of two Nebraska stations to the frequency of 790 kilocycles (379.5 meters), previously exclusively occupied by WGY, the high-powered broadcasting station operated by the General Electric Company at Schenectady, N. Y., on which it shared several hours a week with WHAZ, owned by Rensselaer Polytechnic Institute, at Troy, N. Y., was ordered by the Federal Radio Commission.

The special order set forth:

"To promote public convenience or interest, or to serve public necessity, it is hereby ordered that Station KMMJ, the M. M. Johnson Company, Clay Center, Nebraska, be changed from operating on a frequency of 1,310 kilocycles to a frequency of 790 kilocycles, with a power output of 500 watts, sharing time on this channel with Station WCAJ.

"It is also ordered that Station WCAJ, Nebraska Weselyan University, University Place, Lincoln, Neb., be changed from operating on a frequency of 860 kilocycles, to a frequency of 790 kilocycles, with a power output of 500 watts, sharing time on this channel with Station KMMJ."

$3,800 Job Is Open In U. S. Radio Service

The United States Civil Service Commission announces a vacancy in the position of chief of radio service of the Department of Agriculture, Washington, D. C. Applications for the position will be received by the Commission until August 9. The entrance salary is $3,800 a year. Advancement depends upon individual efficiency, increased usefulness, and the occurrence of vacancies in higher positions. The duties will be to supervise the distribution by radio of educational information from the Department of Agriculture.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C., or from the secretary of the United States Civil Service Board of Examiners at the post office or customhouse in any city.

Denmark's Receivers Up 60% In a Year

There are 60 per cent. more receivers in Denmark as there were in 1926, the Department of Commerce recently was informed by Ellis A. Johnson, American Vice Consul at Copenhagen. The statement in full follows:

"Official statistics show that on April 1, 1927, there were 130,805 radio receiving sets in Denmark, 66,439 being tube, and 64,366 being crystal. Corresponding figures for April, 1926, were 80,046: 39,284 being tube, and 40,762 being crystal.

WHAP Seeks Funds For a Remote Aerial

Several thousand letters appealing for funds, with which to construct a new broadcasting station outside of the New York City limits, were recently sent out by Franklin Ford, manager of station WHAP, to friends of the station. Mr. Ford contemplates moving the station to some point in New Jersey, with the studios still remaining in New York.

"We now face a new obstacle," said Mr. Ford. "The Federal Radio Commission has ordered us to use the channel of 236.1 meters. On this wave our present transmitting plant on West Thirty-first Street, on the roof of a fifteen-story building, is ineffective, although it was satisfactory on our former high wave. The steel building absorbs so much of the power on the new wave that we cannot be heard except in a few districts. This means that WHAP must build a new station outside of New York. We must purchase land, erect new towers, build a new concrete plant and move our transmitter to the new site. WHAP must raise $25,000 for its new building.

"Funds were not solicited at first Mr. Ford continued. "Small donations began to come in from various unrecognized sources; finally we started this campaign to finance a new station, which we hope will be entirely self-supporting through donations. If so, it will be, as far as I know, the first station to be directly supported by its listeners. WHAP sells no time on the air. We have received more than $13.000 since June 1 and more than $25,000 since Jan. 1."

More Time Signals To Be Sent by NAA

The United States Naval Observatory at Washington will inaugurate on August 1 additional time correction signals by radio from Arlington, Va., at noon and 10 p. m., E. S. T., on 24.9 and 37.4 meters, the Superintendent of the Observatory, Capt Edwin T. Pollock, announced.

"The Communications Office of the Navy," said Captain Pollock, "has been working for several years on the development of an apparatus for sending short wave length signals. The work has progressed to such a point that we have a short-wave apparatus for practical use. Accordingly, on August 1 the time signals from the Naval Observatory will be sent out at noon and at 10 p. m. on 24.9 and 37.4 meters as well as on the previous wave lengths of 74.7, 435 and 2,650 meters."

INTERNATIONAL MOVES

The International Resistance Company, manufacturers of the Durham metallized resistors, announce a change of address from the Perry Bldg., Philadelphia, to 2½ South 20th Street, Philadelphia.

Colonel Hears Much on Little

Colonel Clair Foster, radio amateur, of Carmel, California, has just set a record for his fellow members of that exclusive amateur club known as WAC—"worked all continents"—to shoot at.

Colonel Foster on June 10, communicated from California with an amateur station in South Africa, working with only a standard broadcast listener's receiving tube as a transmitter and with B battery power. It has just become known that on the same day Foster successfully worked with Shanghai, China.

By establishing communications with South Africa and China, Colonel Foster has now worked all of the continents, in each case accomplishing communication by means of the ordinary receiving tube and B batteries. The conversation in Africa was carried on with fo1SR, J. M. Davidson, Salisbury, Rhodesia and in China with ac8HB, P. O. Box 266, Shanghai.

Regarding his record-making talks with these two continents, Mr. Foster says: "This makes all continents worked with my litle transmitter with the same identical 201A tube and Eveready batteries."

All the foreign stations were worked on 38.2 meters, or near it, except eg5HS, in England, on 20.2 meters.

Mr. Foster's accomplishment is believed to set a record for long distance communication with low power. In the California to Africa conversation, a distance of 14,000 miles were traversed.

Parts Business Slow Indeed In India

Baltimore.

India—vast, mysterious, full of the magic of the Far East—has not as yet absorbed the magic of radio which has assumed so important a place in the everyday lives of millions of people residing in neighboring countries and far across the sea, according to P. J. Ryan, of Punjab, India, who recently called at the WBAL studios to see Frederick R. Huber, director. Mr. Ryan had never been in this country before, having spent 45 years of his life in India, where he has been engaged under the British Government as bandmaster of the Police Band in Punjab, a post he held for over a quarter of a century.

"We have no radio broadcasting stations or studios in India, and as far as I know, there aren't any radio sets or radio fans in that country," Mr. Ryan said. "However, I suppose that can be accounted for by the fact that India is such a vast place, there being miles and miles of territory practically uninhabited. Of courses, the Government uses the wireless and there are wireless stations at various points throughout the country, but these are used almost exclusively for Governmental, and not entertainment, purposes."

WLW in Blue Chain Early in September

Announcement was made by the National Broadcasting Company that Powell Crosley, Jr., president of the Crosley Radio Corporation of Cincinnati, has purchased the programs of the Blue Chain for broadcast through the Crosley station, WLW.

The Blue Chain programs will be brought to Cincinnati after the first week in September. They will go on from 8:00 o'clock to 10:00 o'clock on Wednesday and Friday nights with the possibility of the addition of Collier's hour from 9:30 to 10:30 on Sunday nights.

R. C. A. Wins Patent Suit Aimed at Atwater Kent

The Radio Corporation of America won a suit against E. J. Edmond & Co., the Atwater Kent distributor in New York, for infringement of the Alexanderson tuned radio frequency patent. Judge Thatcher in the Federal District Court handed down the decision. The patent, No. 1,173,079, is controlled by the R. C. A.

A statement issued by the R. C. A. set forth:

"The Alexanderson patent has been upheld by the courts in New Jersey and in Canada in previous suits. The Radio Corporation has licensed a number of important manufacturers in the United States of tuned radio frequency receivers for use in the home, but the Atwater Kent Manufacturing Company has not been licensed.

"This decision means that the distributor of Atwater Kent apparatus is liable to the Radio Corporation for damages and profits because of the sale of the Atwater Kent sets which were the subject of the suit."

Kent Holds Out

All of the other very large set manufacturers are licensed by the R. C. A., the payment being reported as 7½ per cent. of the gross current business, plus a cash payment where any special prior infringements are to be taken care of. Crosley was the most recent addition to the licensee list. But Atwater Kent has turned down overtures looking toward the issue to him of a license under this patent and the other patents of the R. C. A., Westinghouse, American Telegraph & Telephone Co. and associates. Each license carries a franchise under the whole group of radio patents affecting receivers (but not Super Heterodyne).

"This clears up the tuned radio frequency question as far as I know," said Pierre Boucheron of the Radio Corporation.

The Alexanderson patent is said to be the broadest of all those governing the manufacture of tuned radio frequency sets. It will not expire until Feb. 22, 1933. It is practically impossible to build a receiver of this type without employing the principles it covers.

A Broad Patent

Eleven radio manufacturers are now licensed under the receiver patents of the Radio Corporation of America. Agreements have been made with four others, for which the papers are expected to be signed in the near future.

Such official announcement is awaited.

Raytheon Charges Eleven Infringe Its Patents

The Raytheon Manufacturing Company of Cambridge, Mass., announce that they have undertaken to enforce their patent rights to protect their products as well as the interests of their licensees and the radio public. The company states:

"Notice of patent infringement has been served on eleven manufacturers of gaseous rectifier tubes. Eliminator manufacturers have been warned that the use of infringing tubes in their radio power units will be considered as constituting a contributory infringement, and that users of such tubes will be held liable as contributory infringers. Jobbers and dealers have also been served with notice that the handling of infringing rectifying tubes renders the merchandiser liable as a contributory infringer.

"The well-known Raytheon rectifiers, produced solely by the Raytheon Manufacturing Company, are the result of seven years of experimental and developmental work. The organization maintains a large and fully equipped laboratory devoted exclusively to the development of gaseous rectifier tubes and associated circuits, as well as to the testing and checking of Raytheon-approved radio power devices. Raytheon rectifiers are covered by U. S. Patents Nos. 1,545,207, and 1,617,171 to 1,617,181, inclusive.

"As Raytheon rectifiers are supplied for use only in Raytheon-approved units specifically designed for these rectifiers, the use of other tubes of varying characteristics can only lead to unsatisfactory results. Hence the protection of the ultimate public is the final aim of the present action undertaken by the Raytheon organization."

The Q. R. S. reply is printed below.

* * *

Q. R. S. Retorts With Guarantee

T. M. Pletcher, president of the Q. R. S. Co., manufacturers of radio tubes, including gaseous rectifiers, issued the following statement shortly after the Raytheon warning was broadcast:

"Rather a time-worn method of attacking a newcomer in any competitive field of inventive endeavor is to claim infringement of patent in an effort to scare off patronage.

"In the radio tube field the newcomer who presumes to enter into competition is promptly discredited with the stigma of bootlegger without investigation as to whether it is either unjust or perhaps slanderous.

"We have been in business over a quarter of a century without being guilty of stealing anything except precious moments from old Father Time, which is common knowledge among the 9,000 dealers we serve, and they know we are on the job early and late to do so.

"We are advised by able patent attorneys who are thoroughly familiar with the radio art that we are not infringing any patents.

"We therefore guarantee anyone using our product against any expense or damage in connection with patent litigation on our rectifier tubes.

"Dun or Bradstreet will advise you that we are financially able to carry out this guarantee.

"We are prepared to supply our 400 miliampere rectifier tubes as well as 85 or 60 milliamperes.

"We have incorporated in our rectifier tube originally delivering 300 mills an ionizing device, increasing the output up to a safe maximum load of 400 mills at 300 volts."

Radio University

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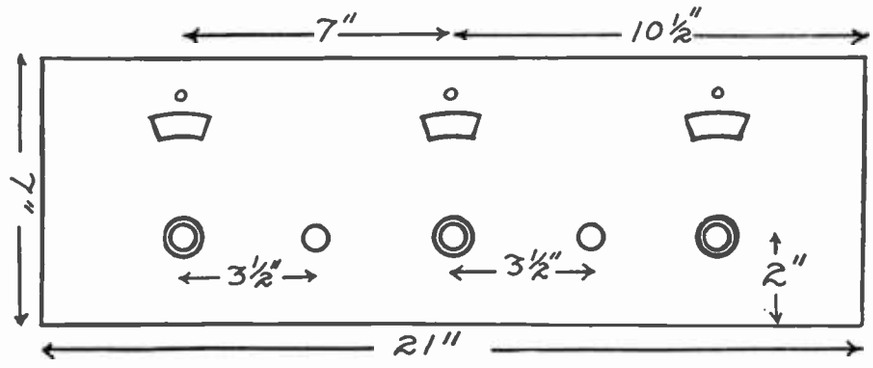

FIG. 552
The panel layout of a five-tube tuned RF receiver requested by Nicholas Casozetti.

IN THE March 5 issue of RADIO WORLD on page 15, there appeared a circuit diagram of a crystal receiver. I would like to have some information regarding it.

(1)—Can a coil consisting of a twenty-five turn variable primary and a fifty-two turn secondary, the primary being wound on a two-inch diameter tubing and the secondary on a three and one-quarter inch tubing, with No. 22 dcc wire being used in both cases, be employed?

(2)—What capacity variable condensers would you advise?

(3)—Is it possible to use transformer audio frequency coupling? — FRANK WILSON, Atlanta, Ga.

(1)—Yes. This should work very well.

(2)—Use a .0005 mfd. variable condenser.

(3)—Yes.

* * *

I WOULD like to have the following queries answered regarding hookups which appeared in the March 26 issue of RADIO WORLD, on page 21:

(1)—Is it possible to hook the circuit shown in A, which resembles a regular RF stage, to the circuit shown in B, which resembles a regenerative detector circuit?

(2)—How could this be done?

(3)—I have a basketweave RF and three-circuit coil. In both cases, a three inch form is used, with No. 24 silk over cotton wire. The primaries consist of twelve turns. The secondaries consist of sixty-six turns. Each primary and secondary is, of course, wound on a separate form. The primary is wound in between the secondary, beginning at the twenty-seventh turn and ending up at the thirty-ninth turn. The tickler of the tuner is also wound on a basket weave form, two and one-half inches in diameter, using No. 26 single silk covered wire. There are thirty-five turns. In all cases, the turns are brought under two and over two spokes, there being thirteen spokes in the larger tubings, and eight in the smaller tubing. Can these be used?

(4)—What capacity variable condensers should be used?

(5)—Could a .0001 mfd. fixed condenser and five megohm grid leak be used?

(6)—Are the phones to be hooked in at the output of the detector circuit e.g. end of tickler winding and B plus post?

(7)—Are the filaments controlled by Amperites of the 1A type, using —01A tubes?

(8)—Is the condenser coming from the end of the tickler winding to the plus A post, a bypass condenser? If so, what is the value?—MERLIN FECHTER, St. Louis, Mo.

(1, 2 and 3)—Yes. The beginning of the primary winding of the RFT is brought to the antenna, the end going to the ground. The beginning of the primary of the tuner coil is brought to the plate post of the first tube socket. The end of this winding is brought to the B plus sixty-seven and one-half volt post.

(4)—Use .00037 mfd. variable condensers. The beginning of the secondary winding of the RFT is brought to the rotary plate of one of the condensers and to the minus A post, not to the plus A post. The end of this winding is brought to the stationary plate post of the condenser and to the G post on the socket. The beginning of the secondary winding of the tuner, is brought to the rotary plate post of the other variable condenser and to the plus A post, as diagrammed. The end of this winding is brought to the stationary plate post of the condenser and to one terminal of the grid leak and condenser.

(5)—Yes.

(6)—Yes. You can add any type of audio frequency amplification you desire. The resistance shown in the diagram, would be the plate resistor, if a resistance coupled amplifier is to be used.

(7)—Yes. One terminal of each ballast is brought to the minus F post on each socket. The other terminals of these ballasts are then brought to the minus A post. Insert a filament switch in series with the plus A post, B minus post.

(8)—Yes, it has a capacity of .001 mfd.

* * *

IN THE Oct. 16, 1926, issue of RADIO WORLD, on page 13, there appeared a circuit diagram of a five-tube receiver using two stages of tuned RF amplification, a crystal detector and three stages of resistance coupled audio frequency amplification. I built this set and am pleased with it. However, the crystal burns out quite frequently. I would, therefore, like to do away with it. A friend of mine told me, that I would get good results, if I placed the second RF tube in a detector circuit, this tube taking the place of the crystal. This would give me a single stage of radio frequency amplification, with a tube detector. How would it work out?—ROGER HUNTINGTON, Troy, N. Y.

The results would be very satisfactory.

* * *

I HAVE a six-tube receiver. Three stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification are used. In the RF and detector stages, tuned transformers, with separate condensers are used, this making the set a four control one. There are too many controls on the set and it squeals terrifically. Would it be advisable to cut out a stage or two of RF amplification?

(2)—Would I get good results using a three condensers hooked up to a drum type control?—ARTHUR CHURCH, Baton Rouge, La.

(1 and 2)—Suggest you cut out one RF stage, and use the drum method you suggest. Take about four turns off the primaries. Spread apart the primaries and secondaries. Be sure that the coil fields are not interacting.

* * *

A FRIEND recently asked me to build him a five-tube tuned RF receiver, I would like to have a panel layout. Three Mar-Co Illuminated Controls, a rheostat and a filament switch should appear on a seven-inch high and twenty-one inch long panel. —NICHOLAS CASOZETTI, Spokane, Wash.

In Fig. 552 the layout, with the proper spacing between the controls, etc., is given. The switch is placed between the extreme left hand and central control. The rheostat is placed between the central control and the extreme right hand control.

* * *

WHERE COULD I obtain a circuit diagram, showing how to hook up a choke coil and condenser in the output of a power tube?—HARRIS M. JONES, Albany, N. Y.

See page 7, of the July 16 issue of RADIO WORLD.

* * *

I CAN get the carrier waves of distant stations on my single tube, regenerative receiver which uses a three circuit tuner and a —01A tube, but no actual signals. I have tried varying the plate and filament voltage, tickler, etc., but to no advantage. A friend of mine suggested that I try a high resistance grid leak. I am now using a two megohm grid leak. Would this help me out?—G. DAVE ROBERTS, Newport, Vt.

Yes, try a eight or nine megohm leak. A forty-five turn coil wound on a three inch diameter tubing using No. 22 double cotton covered wire, shunted by a .0005 mfd. variable condenser and inserted in series with the antenna, may also help.

* * *

WOULD IT be more advisable to build a two-tube set, using a regenerative detector and a stage of transformer coupled audio frequency amplification, than a one-tube reflex, using a regeneration RF-AF amplifier and a crystal detector?

(2)—In building the two-tuber, what is the least amount of space one should allow between the coils?—PHILLIP N. CANROW, Croton, N. Y.

(1)—Yes.

(2)—Four inches, and then they should be placed so that there is no coupling between them. This can be done either by mounting them at angles, or at right angles to each other. Shields can also be used.

* * *

I AM somewhat puzzled as to the manner of hooking up of a C battery as shown in Figs. 1 and 2, page 11, June 11 issue of RADIO WORLD. In both cases, the plus A post is brought to the plus C. Shouldn't the plus C post go to the minus A post?

(2)—Is the efficiency of the receiver decreased if the C batteries are placed close to the coils, condensers, etc., in the set?—ARTHUR SHUTZER, Cedar Grove, Ind.

(1)—Yes.

(2)—No. Just keep the battery leads away from high RF potential points.

* * *

I HAVE a five-tube set, which consists of two tuned radio frequency stages, crystal detector and three resistance stages. I cannot hear any signals either at the detector or any of the audio output circuits. Could it be due to a poor crystal? I have checked up on the wiring, and parts with the familiar battery and phones and can find nothing wrong.—RONALD MECHENBERG, Lockwood, W. Va.

Undoubtedly, this is the trouble. Be sure that there are no opens in the resis-

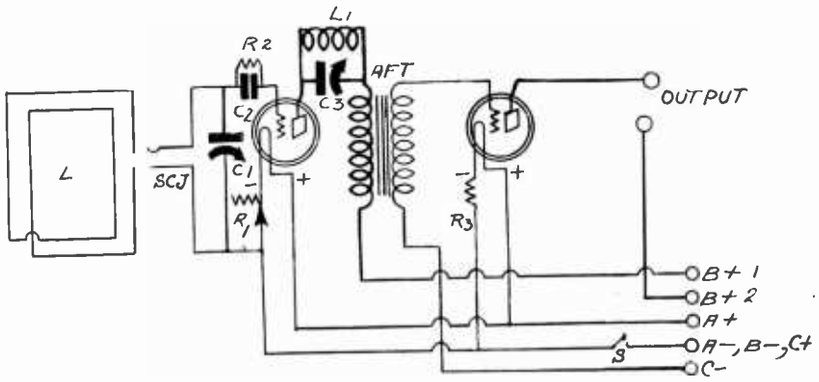

FIG. 553

The circuit diagram of the two-tube regenerative portable receiver requested by George Medbring.

tances used in the AF coupler, or in the blocking condensers. Check up the contacts on the sockets and tubes.

* * *

I HAVE a .0005 mfd. and a .00025 mfd. variable condenser, a three-foot loop, containing twelve turns of No. 20 double cotton covered wire, and a two-to-one ratio audio frequency transformer. Please give me the circuit diagram of a two-tube regenerative receiver using these parts. I intend using this set as a portable with —99 type tubes.—GEORGE MEDBRING, Los Angeles, Calif.

The circuit diagram of this set is shown in Fig. 553. L is the loop. SCJ is a single circuit jack. This may be supplanted with a pair of binding posts. C1 is the .0005 mfd. variable condenser. C3 is the .00025 mfd. variable condenser. L1, the coil across which this condenser is shunted consists of thirty-five turns of No. 24 double cotton covered wire, wound on a three inch diameter tubing. R2 is the two megohm grid leak. C2 is a .00025 mfd. fixed condenser. R1 is a twenty ohm rheostat. R3 is a No. 4V-199 Amperite. To the plate of the detector tube, e.g., B plus 1, apply forty-five volts. To the plate of the audio tube, e.g., B plus 2, apply ninety volts. Use a four and one-half volt C battery. In series with the minus A, a filament switch S is inserted. The entire set may be placed in a seven by fourteen inch cabinet. Should you desire to change the set into one for home use, and employ the larger tubes, such as the —01As, it is only necessary to change the battery voltage and the ballast resistor, R3. That is, you will have to use a 1A Amperite; six volts, of course, on the filaments, and one hundred and thirty-five volts on the audio plate, with a nine and one-half volt C battery.

* * *

I WOULD like to build the six-tube Neutrodyne shown on page 22 of the April 24, 1926, issue of RADIO WORLD.. Will you help me out? I wish to use —01A tubes throughout.

(1)—Could coils having fifteen-turn primaries and forty-seven turn secondaries, wound on three-inch diameter air form tubings, with No. 24 double silk covered wire, be used? There is no spacing between the windings. Where should the coils be tapped?

(2)—What capacity condensers should be used?

(3)—Could I use one 3A Amperite in the filament circuit of the RF and detector circuits and one 3A Amperite in the filament circuit of the audio tubes?

(4)—Are N, the neutralizing condensers? How would the .00004 mfd. type work?

(5)—Is it all right to use a standard three stage resistance coupled AF amplifier?

(6)—Could all the appartus be placed on a eighty by twenty-two inch baseboard, this to be placed in a seven by twenty-six cabinet?

(7)—Could a combination pilot light and filament switch be used?

(8)—Could a loop be used? How? I have a two and one-half foot diamond shaped loop, containing eighteen turns of No. 18 enameled wire, spaced one-quarter inch.—FOREST MANNERS, Houston, Texas.

(1)—Yes. Reduce the number of turns on the primaries to ten. Tap the secondaries of the second and third coil at the twelfth turn from the beginning.

(2)—Use .0005 mfd. variables.

(3, 4, 5, 6 and 7)—Yes. The switch is connected in series with one A lead. One terminal of the pilot light is connected to A lead. The other is connected to the switch, so that when the switch is closed, the light is lit.

(8)—Yes. One terminal of the loop is connected to the G post and the other to the minus A post. Suggest you see the Radio University columns of the July 9 issue of RADIO WORLD..

(*Concluded on page 22*)

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THE RADIO TRADE

Best Season Since 1923 Is Seen in the Offing

By James H. Carroll

Contributing Editor

Radio was never in a better position than it occupies today. Broadcasting was never better and is improving. To those who carp, let me say that they are getting so much good entertainment that it has a tendency to make them too critical, especially as they are getting it for nothing. If they were paying for it at, let us say, the rate of $5 per night, they could not praise it enough. And if they were paying as much as $10 per night, they would not get any better entertainment, amusement or education. The air lanes are clear, Radio Commissioners having done a splendid job. Tests made in the most congested districts show a decided improvement and unmarred radio reception is now at the call of everyone who has a radio receiver.

There are 16,000,000 homes without radio and the one great reason that this situation obtains is, or rather was, lack of confidence on the part of the buying public. Another reason was the belief that something radically new was about to develop. The ominous clouds have passed and the selling skies are clear for the new season. Another great drawback existed in the patent situation.

The larger manufacturers have straightened things out now to their own and to public satisfaction.

Dealers and jobbers likewise feel that they have a solid foundation for sales efforts. The loudspeaker situation is no longer in the muddle that prevailed. Sound reproduction has taken giant strides since last year and loudspeaker sales should reach a record mark. It looks very auspicious for an effort to sell those 16,000,000 homes the radio sets that they lack, also the speakers, tubes, batteries, loops, etc. All that is needed is a concerted effort and wisely directed means of reaching those prospects.

For the parts manufacturer, the prospect is equally favorable. If there are 16,000,000 homes to be sold sets, there is easily a market for the parts to build a couple of million receivers, which will in no way conflict with the sale of the manufactured sets. If one should judge from the inquiries received daily as to new circuits that are to come out, when due, etc., there are easily that many eager fans awaiting at the bench. The field for power units of all kinds is illimitable; dry batteries, both A and B, will still find an enormous field of their own; literally billions of tubes should find a market, as replacements among average set owners, as accessories to the new sets sold and by far the greater volume among the technically inclined real radio fans who know their radio. The demand for accessories of every description will be increased and carried along with the general tide.

All in all, then, the prospects are bright, brighter than we have witnessed them for four years past. All that is needed is concerted and harmonious effort.

Nine-in-Line Super

Described in the issues dated April 2, 9, 16 and 23 in such a clear manner that the veriest novice can learn all about it. This circuit has proved its worth in distance, selectivity, volume and tone quality. Send 60c for these issues or send in your subscription for one year and get these copies as a premium. RADIO WORLD, 145 West 45th St., New York City.

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Be sure to take RADIO WORLD along with you on your vacation, or read it while you are at your summer home so that you will not miss a copy; send $1.50 for three months subscription and RADIO WORLD will be sent to you all summer. RADIO WORLD, 145 W. 45th St., N. Y. C.

Building Hints for Nine-in-Line

(The construction of this sensitive Super-Heterodyne was described last week, July 16 issue, by James H. Carroll.)

A good, durable cowhide suitcase was used, a full 28 inches wide to accommodate the 26-inch panel. A pair of iron brackets may be procured at any hardware store to which the Benjamin brackets are securely bolted. The batteries are fimly fastened at the bottom, the Yaxley cable connector terminals fastened thereto. The connector plate is plugged in and the set is ready for operation. An Ensco roll speaker, 19 inches long, operated by the Ensco unit, is fitted in the right-hand side of the cover; a Bodine deluxe loop was carried by the party. When the loop was not in use it was fitted under the roll speaker.

This set performs wonderfully for those who know their radio, in other words those who have mastered the art of tuning. It will perform beautifully on all counts if operated right. Lack of results will be due to lack of knowledge.

Note the Karas Micrometric dials which were chosen because of the fine gradation they give in tuning. This circuit is as sharp as a needle.

Built right, this set is one of the neatest and pleasing jobs any fan ever delighted in. Note the graceful swing of the new Benjamin variable condensers in this picture.

These condensers work like a charm in this circuit. They give a beautiful separation of stations. Code as low as 180 meters and good broadcast all the way up the scale to 545 may be tuned in. The lowest wavelength music brought in is as clear, sweet and fully rounded as the highest.

When the vacation trip is over the set may be installed in a Corbett cabinet which is set on top of a Sonora Console containing all the operating equipment

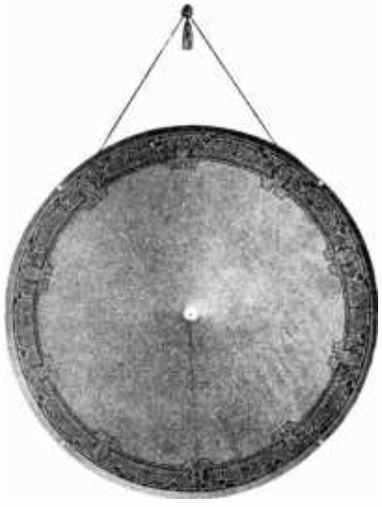
WHAM Joins Chain

WHAM, owned and operated by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., joined the National Broadcasting Company's Blue Network. While the addition of WHAM, to the N.B.C. chain will prove extremely helpful in coverage and consistent reception in and around Rochester during the Summer months, installation has already begun for the erection of a new 5 kw. transmitter, the latest model of the Western Electric Company. This will replace the old set in September. The N.B.C. presentations will be distributed via WHAM six house hours a week.

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

Artistic Decoration Devised For 3-Ft. Cone

The Engineers Service Co., designers of the Ensco three-foot Cone Kit, have developed a distinctive design printed in harmonious color tone on the genuine faced Alhambra cone material now furnished with Ensco kits.



THE Ensco decorated cone

The design gives the cone builder a most beautiful wall type of pedestal speaker that will blend in with any scheme of decoration, any period type of furniture, and prove an ornament to any home. The beauty of this design cannot be fully appreciated from a picture. A large print showing this design in detail will be sent to those applying to the Engineers' Service Co., 25 Church Street, New York City, together with full information on kit, hardwood wall frames and pedestals for this type speaker.—J. H. C.

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufactures, 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.

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Address .....

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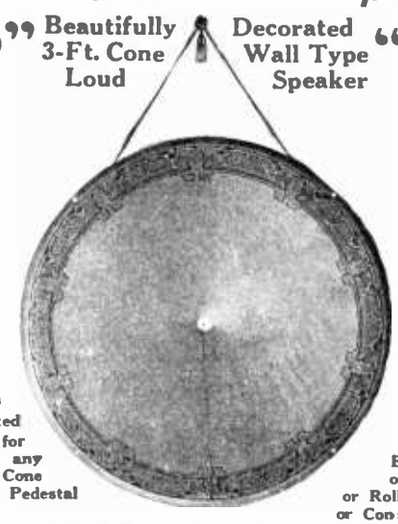
L. H. Dodson, 3127 Locust St., St. Louis, Mo.
M. D. Jones, Jr., 208 Hines Terrace, Macon, Ga.
Edward A. Waite, 7219 Frankstown Ave., Pittsburgh, Pa.
W. L. Thurman, 6609 Elizabeth St., Tampa, Fla.
Morgan Spielman, 7909½ Madiera St., Pittsburgh, Pa.
O. M. Evans, 535—16th St., Merced, Calif.



RADIO UNIVERSITY

(*Concluded from page* 19)

ABOUT SIX months ago I built a five-tube receiver, employing two tuned radio frequency stages, using impedance coupling, a non-regenerative detector also coupled in impedance style, and two stages of transformer coupled audio frequency amplification.

The grid return of the second tube is brought to the arm of a four hundred ohm potentiometer. A two megohm grid leak is used in the grid circuit of the second RF tube. I find it quite difficult to control oscillations. which I think occur mostly in the second RF tube. Would the results be improved any if I inserted a regular RF coil in the second RF and detector circuits? In all the circuits, .00035 mfd. variable condensers are used.

(2)—Should the potentiometer be taken out?

(3)—I have a variable grid leak. Should I keep on using it?—JESS L. HENRY, Peekskill, N. Y.

(1 and 2)—The results will be improved greatly if this is done. Three-inch diameter tubings with No. 22 double cotton covered wire should be used. On each tubing a ten-turn primary and fifty-nine secondary should be wound, with a quarter-inch space between them. The potentiometer should be taken out. The grid return of the RF tube in this, as well as the first circuit, should be brought to the minus A post. The grid return of the detector tube should be brought to the plus A post. You now have the grid leak connected from the G post of the detector tube socket to the plus A. This arrangement can be kept, or the leak can be shunted across the condenser. Either will give satisfaction.

(3)—Yes.

* * *

I WISH to build the two-tube set, using the neutralized RF stage and regenerative detector described in the Radio University columns of the April 23, 1927 issue of RADIO WORLD. There are several things about which I am, however, doubtful.

(1)—Shouldn't there be a switch inserted, so as to cut off the A supply?

(2)—Could any type three-circuit tuner be used?

(3)—I have a RF coil, which is matched to the tuner coil. Could that be used instead of the tapped coil specified?

(4)—I assume there are no changes necessary if audio amplification is to be added. Am I right?

(5)—Could wet storage B batteries be used?—LEWIS MAGNATE, Jamestown, Va.

(1, 2, 3 and 4)—Yes. Insert the switch in series with either of the A leads.

* * *

I HAVE a four-tube receiver, consisting of a stage of tuned radio-frequency amplification, a regenerative detector, using a three circuit tuner, and two stages of transformer coupled audio-frequency amplification. There is not much kick to the set. The parts all test up all rgiht. The detector tube oscillates well. The tubes have been tried in other sets with excellent results. (1)—Could this all be due to poorly balanced circuits? If so, should I use individual condensers? I don't wish to tamper with the coils.

(2)—I intend purchasing a cone type speaker. Would it be advisable to insert a thirty henry choke coil and four mfd. condenser in the output of the last audio tube?—IAN LEONOFF, Sanchez, N. M.

(1)—The single condensers would improve the results.

(2)—Yes.

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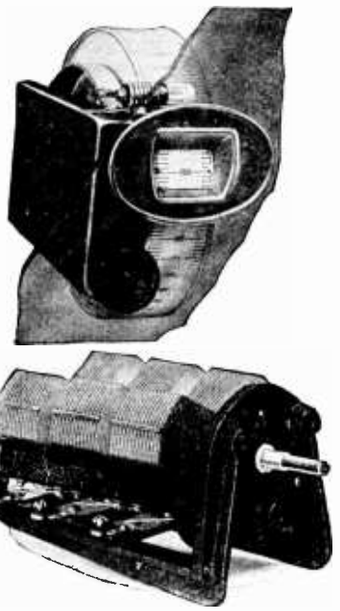

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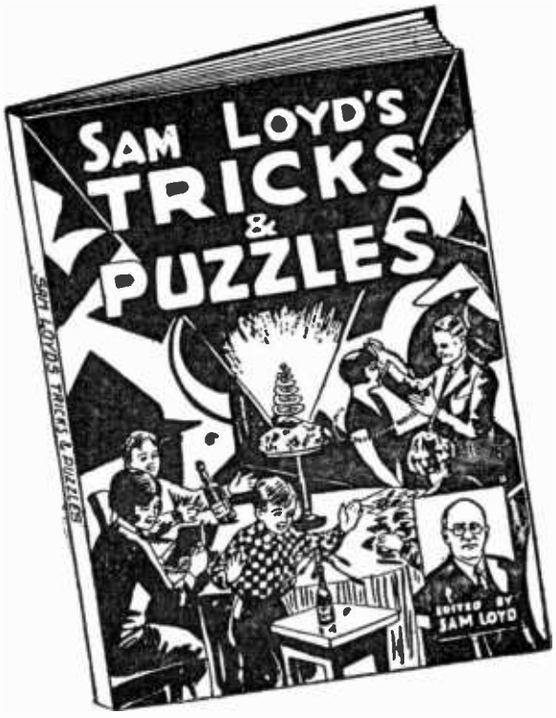

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