Sept. 12
1925

SHOW
NUMBER

15 Cents

RADIO WORLD

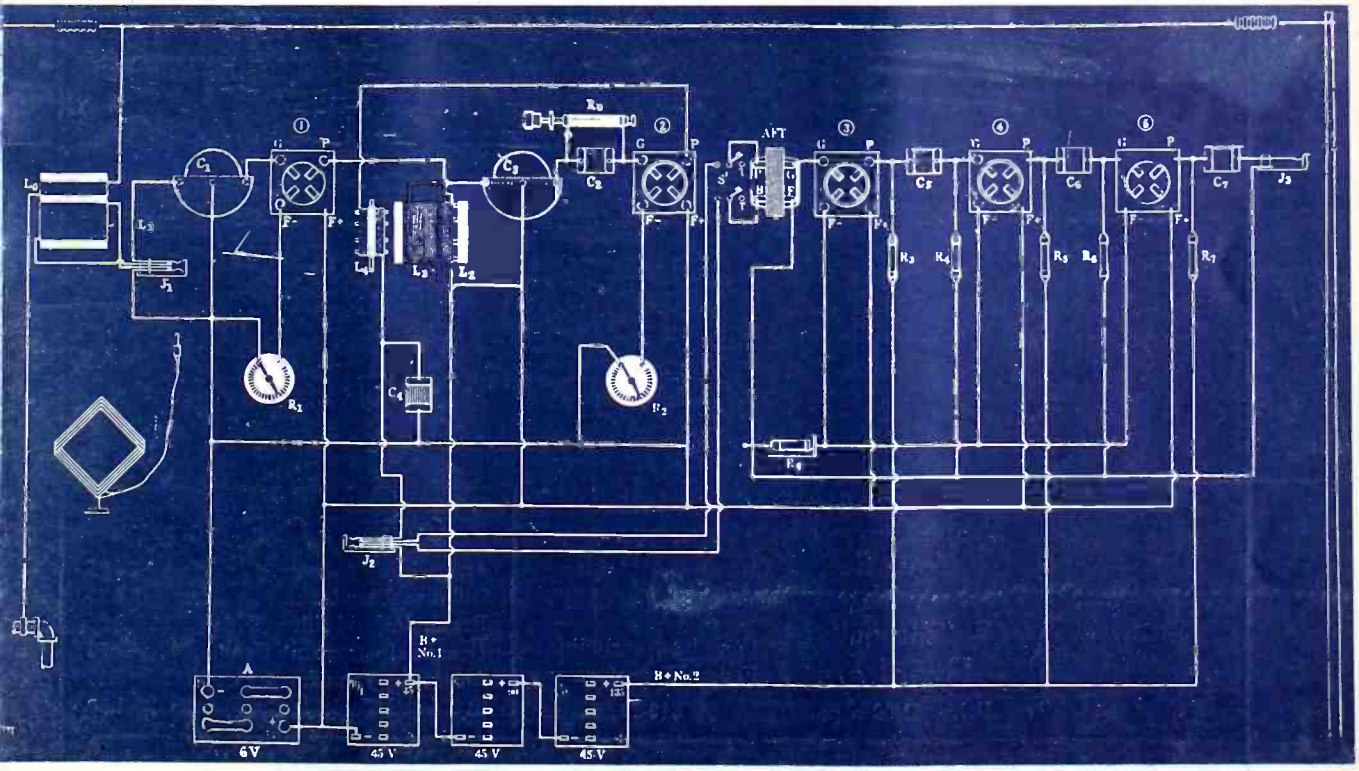
Title Reg. U.S Pat. Off

Vol. 7. No. 25. ILLUSTRATED Every Week

155-181

THE 1926 DIAMOND

By HERMAN BERNARD



ADIO WORLD'S most popular circuit, The Diamond of the Air, shown in blueprint form. This is the 1926 model, embodying the Bernard audio amplifier. See page 5 for article on construction of this receiver.

RADIO WORLD, Vol. VII, No. 25. Whole No. 181, September 12, 1925. 15c. per Copy, $6.00 a Year.
[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under Act of March 3, 1879. A Weekly Paper Dated Saturday and Published by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y.
Phones: Lackawanna 6976 and 2063.]

Five Tubes, Tuned Radio Frequency

RELY UPON EXPERIENCE TO PRODUCE QUALITY AT LOW COST

Sleeper

REG. U. S. PAT. OFF.

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—are better built of better materials to the most exacting specifications by an organization that has engaged exclusively in the manufacture of fine radio equipment since 1919.

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Other Sleeper models:

The Scout, $75.00. The Monotrol, $130.00. The Super-Symphonetic, $150.00.

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The table has a compartment for "A" battery and one for charger with switch for instantaneous change to charger. A better, more convenient radio installation at a remarkably low price.

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SLEEPER RADIO CORPORATION

438 WASHINGTON AVENUE, LONG ISLAND CITY, NEW YORK

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The 1926 Model Diamond

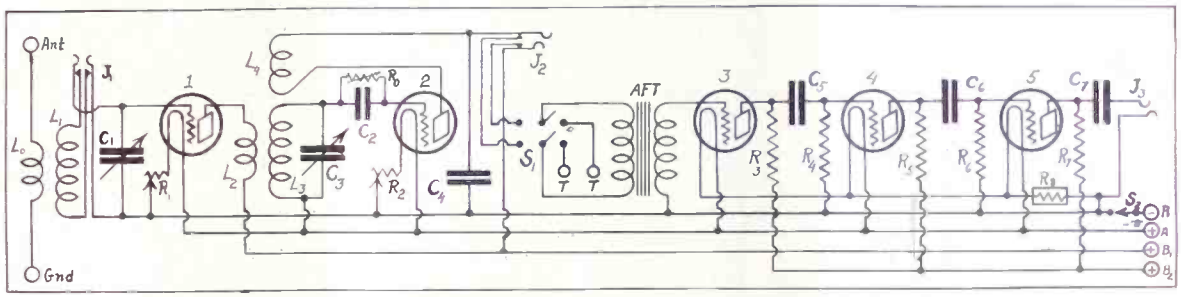


FIG. 1, the wiring diagram of the 1926 Model Diamond of the Air. The improvement is exclusively in the audio circuit and the greater possibilities of using it. The double-pole double-throw switch enables use of the audio hook-up in conjunction with any other set or detector test circuit. The AF consists of one transformer stage and two resistance steps. A novelty exists in the speaker connections, one speaker tip going to A—, the other to one side of a large condenser. This is a quality asset.

By Herman Bernard

Associate, Institute of Radio Engineers

PART I

IT is five months since The Diamond of the Air was first presented to the public. It represented the most that was obtainable from four tubes. The radio-frequency side included a stage of tuned RF and a regenerative detector using a tickler coil. There is nothing I can suggest that would improve the fundamental RF hookup, hence it is the same now as then. A bypass condenser is omitted, because after many tests it was found to be unnecessary. A separate rheostat is now included in the detector tube, instead of hooking up that filament with the audio stages, because the detector may be operated at a lower filament voltage, hence A battery saving is accomplished, but not much.

The improvement lies in the audio circuit, where instead of the two transformer-coupled steps previously used, there now appear one transformer and two resistance stages, with a special manner of connecting the speaker so that virtually no B battery current will flow in it. This accomplishes something worthwhile, provided the condenser C7 is large enough. The difference is particularly notable when the sensitive cone type of speaker is used.

The audio hookup also takes care of the question of grid bias, ignored in most resistance-coupled audio stages when they reach the final tube. If the same B battery voltage is applied to the battery side of the plate resistors, R3 and R5, as at the plate of the last tube, then the actual B battery voltage at the final plate may be twice as high as in the previous resistance steps. This would require a C battery for proper bias of the grid of the last tube to achieve the efficient and economical point, and also cut down distortion. The resistor R7, which is the same as the other plate resistors, serves to bring the same voltage to the final plate and dispenses with a biasing battery.

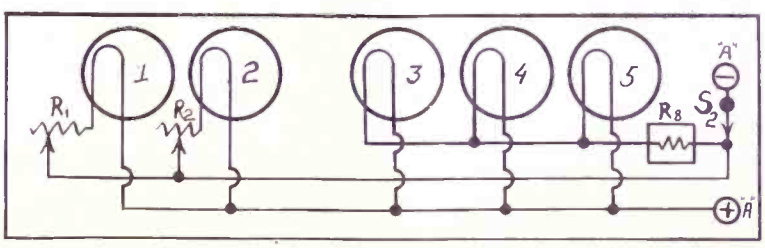
The quality of the received signal will be excellent indeed, even better than that obtainable from two stages where transformers of the very best make are used. Such transformers must necessarily have large windings and be otherwise than very cheap in price. The one transformer used, however, must be among the best, otherwise the attempt to approach perfection in audio amplification is in vain. Federal No. 65, General Radio No. 285, Rauland Lyric, Stromberg-Carlson or other good make should be embodied.

A novelty included in the circuit is a double-pole double-throw switch. As the set is to be made by radio experimenters, naturally they represent a class that is always dabbling in hookups, frequently making detector circuits that they would like an easy opportunity to hear on a speaker. If the audio hookup is so wired (Fig. 1) that a test set may be easily hooked up to it, so much the better. I was much disinclined to remove the plate connections of an audio hookup in a completed set just to make such test, hence had to go build an audio amplifier especially for that single experiment.

Many may desire to compare the audio hookup (Fig. 1) with some other they have on hand or may construct. That may be done with ease by connecting the output of the test receiver to a plug, pushing this into the jack J2. The DPDT switch would be set to include, then to exclude, the AF of The Diamond. These comparisons I invite, for I have made them myself and I rest on the hookup as shown in Fig. 1.

The DPDT switch may be mounted on the baseboard or, if a socket shelf is used, may be placed thereon, to keep it off the panel. The lid of the cabinet would be lifted and the switch thrown to the desired position. As this would not be done often there is no necessity for placing the switch on the panel. Besides, it might not look like very much there.

There are three controls on the panel (Fig. 2), because they are necessary for maximum efficiency. Under no circumstances can the number of controls actually be reduced and yet provide better reception. All methods of control reduction, excepting possibly the double condenser method, if that is properly handled, seem to require some compensating device, either an extra little variable condenser, or some other part with an adjustable function. Then the number of controls really remains the same. The only change is that a major control is reduced to a minor one. If a double condenser is used, provided one of the stages is not required to tune too sharply, and the condenser is of excellent workmanship, real reduction of condenser-tuned controls



DETAIL of the filament wiring of the 1926 Model Diamond of the Air.

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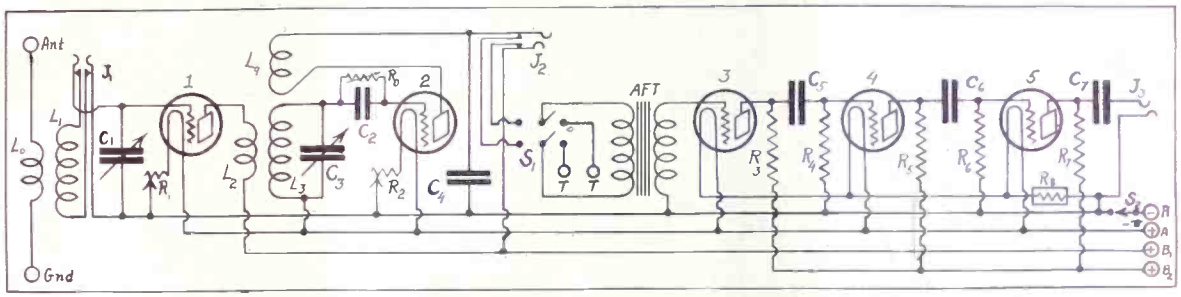

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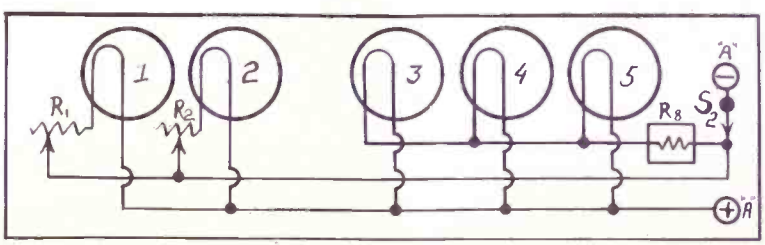


DETAIL of the filament wiring of the 1926 Model Diamond of the Air.

A Novel Idea in Audio Hookups

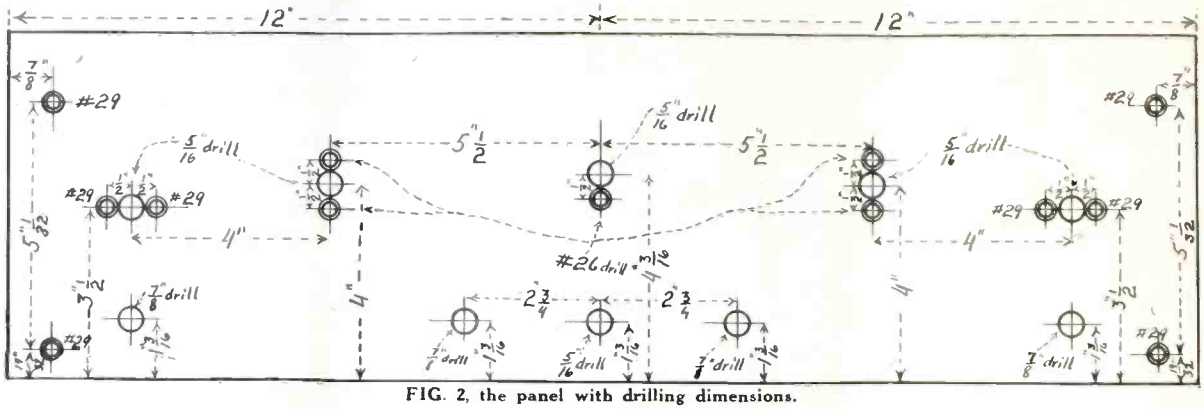


FIG. 2, the panel with drilling dimensions.

may be accomplished. Those who read articles previously published, showing The Diamond with a double condenser, will remember that the idea was presented as one entirely feasible. For those preferring simplicity above all else the double condenser—whereby two stages are tuned with one motion—is indeed attractive. But looking solely from the viewpoint of efficiency, and without regard to the panel consequences, three controls should be used. That does not mean that two are no good, but simply that, as they never can be any better than three, and may be worse, let us have three.

No neutralization is provided for, neither is reflex resorted to, and for the following reasons:

The most common method of neutralization is by the introduction of a variable condenser of very small capacity. It is adjusted to a given setting that will balance the tube capacity and prevent feedback from that source. The neutralization is a failure unless magnetic coupling is avoided, and to this end coils are mounted at angles. Also there must be no stray coupling due to capacities built up in wiring the set. All this works out satisfactorily, if expertness is applied, except in regenerative sets. As The Diamond is regenerative, and as I have tried repeatedly to kill off radiating tendencies by all known methods of neutralization, but failed, except at sacrifice of efficiency. I omit it, on the assumption that most persons would have the same experience. The only neutralization that I achieved was at such a great expense in efficiency on DX reception that I decided it was better to leave it alone. Some who are luckier than I report better success with neutralization of a regenerative set. The constructor should learn how to tune the set, and never use the beat note method for local reception. That will prevent radiation to that extent. On DX work one must usually tune in by the whistle and radiate.

The fundamental circuit of several other circuits, on the RF side, is the same as that of The Diamond. For instance, the Browning-Drake, the Roberts and the B. T. Nameless. All are excellent receivers. The Roberts reflexes the first (transformer) audio stage in the RF tube. As any form of reflex tends to complicate the wiring and enhance the trouble risk, and at tubes are now at a list price of $2.50, personally I see no reason for seeking economy by introducing the reflex principle for only one stage. If three stages were to be reflexed in a set there would be conomical advantage. The Roberts circuit uses a form of the Rice neutralization method, with a reversed plate winding as an adjunct. The Browning-Drake uses the Neutrodyne method and the B. T. Nameless is in the same class.

The fans have had their fill of freak circuits. None of them worked any better, few of them as well, as these standard hookups. The value of the circuits—all of them—has been proven to the utter satisfaction of many thousands of fans. The hookup (Fig. 1) represents all that it is possible to achieve, as to distance reception, tonal quality and volume, up to the audio input, with the possible exception of the Super-Heterodyne.

The Diamond is distinctive in its class because it is constructed for optional loop operation. Why none of the other circuits made any provision for a loop I do not know. Maybe it is because methods of neutralization introduce such losses that loop operation cannot be guaranteed This is not true of The Diamond. It works splendidly on a loop. Every condenser or extra coil required for neutralization causes some losses, and while these may be very small when construction is done by the experts who designed their own particular form of this great general hookup, they may become enormous in others' hands. Nobody is clever enough to make a neutralized set without introducing any losses. If it were not for losses a Neutrodyne would need only one RF stage, instead of the conventional two.

On the audio side there is more room for debate. I use a Western Electric cone speaker at home and I have never been able to get a two-transformer audio hookup that produced satisfactory quality. The volume was wonderful, and the quality very good where transformers with large windings were used. Moreover, some of the transformers made today represent a marked advance over those of a year ago. The curves of the transformer, where amplification is plotted against audible frequency, are decidedly flat, in fact astoundingly so. A year ago one might have said such great results could not be achieved. But I look for better quality. I am still looking for even better quality than that represented by my own audio hookup. But I am showing the audio circuit that dissatisfies me least. It is more expensive in upkeep than the two-transformer type, gives no more volume, but is less expensive in "capital invested." The voltage drop in the plate resistors and the utter absence of any external amplification whatsoever, have caused some to oppose resistance coupling, the quality of which is generally admitted. The amplification characteristic is flat as flat can be.

The only amplifying done in the resistance stages is in the tubes themselves. With the 201A it is about 8 per stage. This isn't much. Therefore a transformer-coupled stage was included, with its external step-up, and once this gain was established (and which I believe cannot be maintained without quality loss in the second stage), the resistance coupling was added, the final volume being quite sufficient.

One way of getting greater amplification is to use tubes that have a higher Mu, so that 15 or 20 may be obtained instead of 8 per stage. Only in the first and second audio stages need these be used (tubes 3 and 4).

All the resistors and leaks used in the set are of the fixed type, excepting the detector grid leak, which is the Bretwood. The other resistors are called such when in the plate circuit but are called leaks when in the grid-to-filament circuit. The products used here were the Veby. The coils were of the solenoid type, wound on 2" diameter stator, and were connected with the low potentials side by side. In Fig. 3, (1) would go to aerial, (2) to ground, (3) to F minus and (4) to grid, where LoL1 is concerned. As for L2L3, the corresponding windings on the stator of the 3-circuit tuning coil, (1) would go to plate, (2) to B plus, (3) to F plus and (4) to grid condenser. This is the correct manner of connection when one desires to preserve utmost efficiency by avoiding putting the current sources side by side. It also keeps the phase correct at the detector output, due to each of the two tubes turning it half way round once (which would constitute utter reversal or no phase change) and each coil turning it around half way round once (which makes it come out at zero phase difference angle). The windings are all in the same direction. In the coils used, which were the Bruno, all windings were in the same direction.

[Part II, describing the winding of the coils and the wiring of the receiver, will be published next week, issue of September 19.]

LIST OF PARTS

One RF transformer, LoL1.
One 3-circuit tuner, L2L3L4.
Two .0005 mfd. variable condensers, C1, C3.
Two 20-ohm rheosfats, R1, R2.
One variable grid leak, Ro.
Two double-circuit jacks, J1, J2.
One single-circuit jack, J3.
One audio-frequency transformer.
Fixed condensers: One .00025 mfd. grid condenser, without clips, C2; one .001 mfd., C4; three 0.25 mfd., C5, C6, C7.
One ¾-ampere ballast resistor, R8.
One double-throw, double-pole switch, S1.
One A battery switch, S2.
Three 0.1 meg. resistors, R3, R5, R7.
Fixed leaks, 1.0 meg., R4; 0.5 meg., R6.
Five sockets.
One baseboard 7x23", or socket shelf with brackets.
Three vernier dials.
One 7x24" panel.
One set of binding posts.

A Low-Loss Skeleton Coil

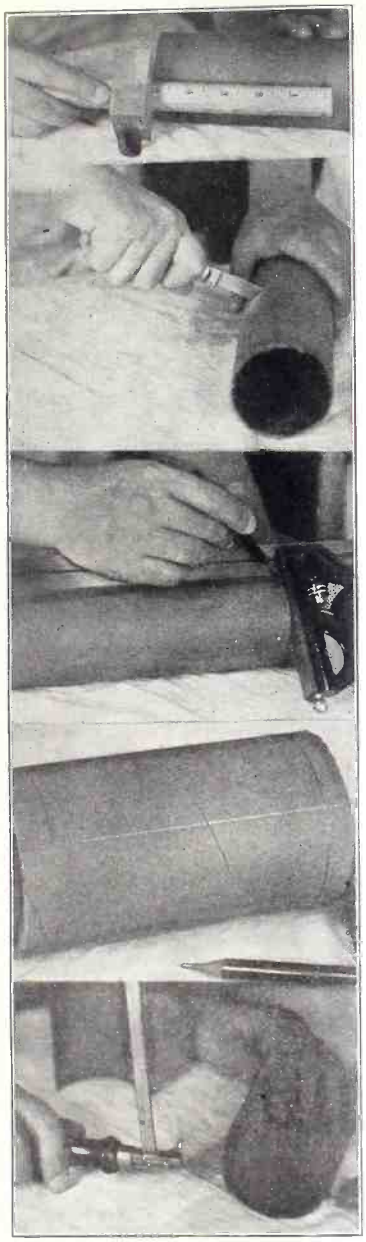


FIG. 1 (top), get a piece of cardboard tubing, 3½" diameter, 6" long or so. Fig. 2 (third from top), a straight line is drawn down the tubing and another line diametrically opposite. Fig. 3. (third from top), two other lines are marked ½" from the natural circumference and from the scratched one. Fig. 4 (second from top), cut the tubing at the drawn circumference 5" from the other one. Fig. 5 (bottom) shows how a scroll saw may be used rather than a knife. L.

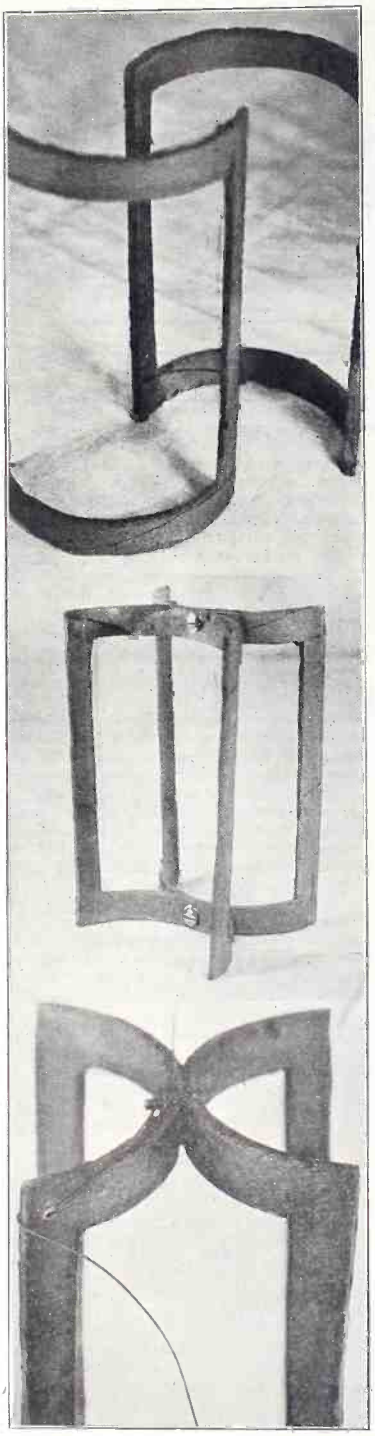


FIG. 6 (top), the two pieces after the tubing has been cut. Fig. 7, reverse the halves and fasten together. Fig. 8, secure the magnet wire (No. 22 DSC) as shown.

A LOW-LOSS coil, space wound for reduction of distributed capacity, may be made in skeleton style by cutting up a cardboard tubing as illustrated. The diameter used was 3½", but less may be employed, even to 1½", since the reversed method of securing the cut forms gives a much larger resulting diameter. If smaller diameters than 3½" are used originally, put on more wire. The coil may be a radio-frequency transformer (Fig. 9) or an impedance coil (Fig. 10). The impedance coil would do nicely to tune a plate circuit. The inductances as described, with 25-turn secondaries, require a .0005 mfd. tuning condenser. For smaller condensers use more turns. This type of coil is excellent where selectivity is desired and also helps a trifle to spread out the lower wave stations on the dial.

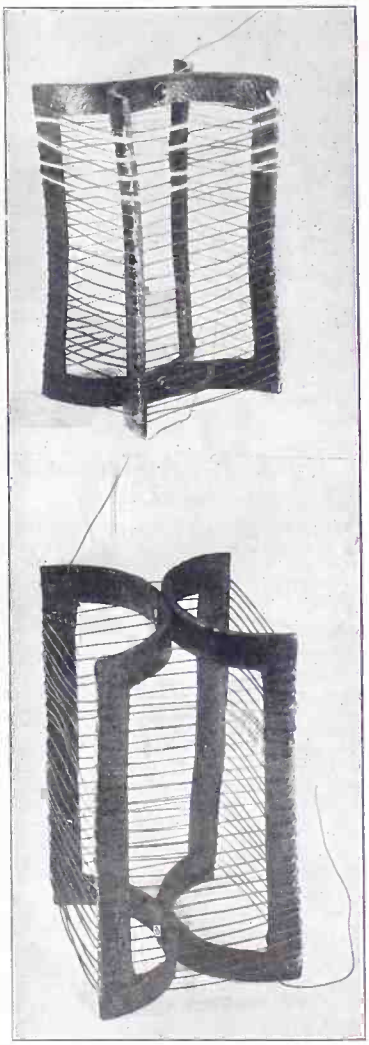
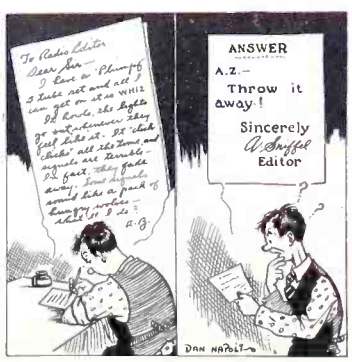


FIG. 9 (top) shows an RF transformer, 4 turns No. 18 DCC wire for primary, 25 turns No. 22 DSC wire for secondary. Fig. 10 is an impedance coil. (Hayden Photos)

One Thing We Don't Do

Service Is Our Motto



An Oscillating Wavemeter

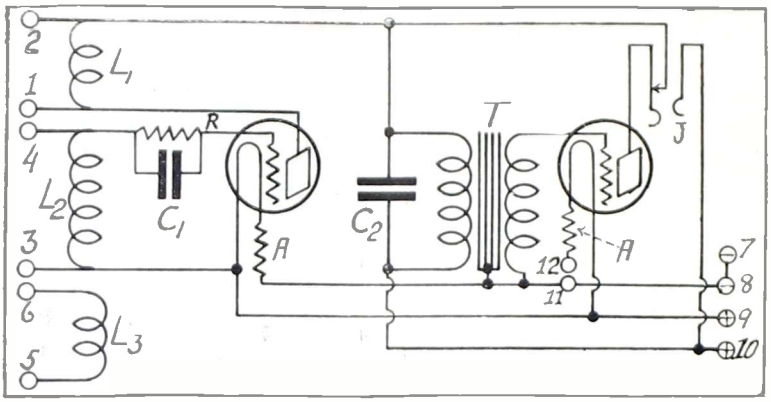


FIG. 1, the wiring of Anderson's oscillating wavemeter.

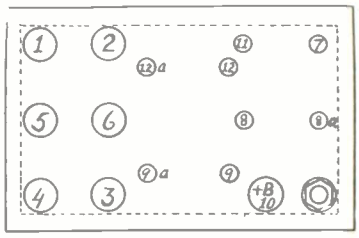


FIG. 2, the panel layout for the wavemeter.

By J. E. Anderson

Consulting Engineer

EVERY radio experimenter who does considerable testing of receivers often feels the need of a source of radio-frequency current, both straight CW and modulated CW, of known wavelength, which is more reliable and convenient of application than the waves emitted by broadcasting stations, and with which he can carry out reliable calibrations of tuners and perform various measurements. I have found such a source an almost daily necessity.

The set was assembled out of parts which had been salvaged out of dismantled antiquated receivers and therefore it involved no new outlay. But even if all the parts have to be purchased especially for it, the entire cost, exclusive of the tuning condenser, should not exceed $5. The tuning condenser is a General Radio type 247-E, which is metal-encased and calibrated, and may be used for many other purposes. Nearly all experimenters have provided themselves with one of this or a similar condenser.

The circuit was primarily built to furnish a modulated high-frequency wave of known length, but it was found that by simply bringing out a few binding posts that it could be used for a great number of purposes, many of which are more important than that of furnishing the modulated wave. By looking over Fig. 1, which shows a diagram some of the things it may be used for will be seen.

At first sight it appears to be a standard regenerative receiver with one stage of audio-frequency amplification, in which L1 is the tickler, L2 the secondary tuning coil, and L3 the primary, or input coil, and in which binding posts have been provided for an external tuning condenser. And that is just what it is, but only when a telephone plug is inserted in Jack J. When nothing is in this jack the circuit is two oscillators, one radio-frequency and one audio-frequency, and these two are so connected that the output of the audio oscillator modulates the output of the radio-frequency oscillator according to the Heising system of modulation. The modulated output may be obtained from the coil L3 from the terminals 5 and 6, or with the aid of an external coupling coil.

But it may be that straight CW is desired and then it is not necessary to keep the second tube burning. To break the filament circuit of the second tube, two binding posts (11 and 12) have been provided, across which a strap may be connected or not according to whether it is desired to keep the tube burning or not. (Fig. 2). When this is open straight CW radio-frequency current will be generated in the first tube, and this may be obtained in the same manner as the modulated current (at terminals 5 and 6) or with the aid of an external coil.

It is as a source of known frequency, unmodulated current that the circuit is most useful. It may be used as a driver in measurements in which a radio-frequency current is needed, and it also may be used to calibrate wavemeters and tuners. One of the most frequent uses to which I put the set is the oscillator in experimental Super-Heterodynes. It may be used for this purpose both when a separate oscillator is employed and when the autodyne method is used. In the former case coil L3 is connected to the modulator tube or crystal, but in the latter case the primary of the first intermediate-frequency transformer or filter is connected between terminal 10 and the positive terminal of the B batterv.

Another use for the circuit is a standby receiver for both broadcast and amateur transmission. While it is not particularly recommended for broadcast reception on account of its oscillating propensities, very good results may be obtained with it in the hands of a skillful and considerate operator, without causing interference. For the reception of short waves in the amateur range it is excellent. When used as a receivr, the telephones are plugged into the jack, the strap across terminals 11 and 12 is connected, the antenna is connected to 5 and the ground to 6, while the tuning condenser is either connected across L1 or L2 according to the wavelength it is desired to receive. Oscillations may be very nicely controlled by connecting a variometer across the terminals 1 and 2 or 3 and 4, which then are not used for the condenser. This variometer acts as a bypass around L1 and thus limits the feedback, or if connected across L2 it reduces the input, and the effect is similar. The set is not so efficient, however, when the variometer is across L2, but there is no particular need for controlling oscillations when low waves are received. In order that the variometer control be effective for the short waves, when connected across 1 and 2, it is necessary that the minimum inductance of the variometer be rather low.

The coils L1, L2, L3 are all wound on a hard rubber tubing 2" in diameter. L1 consists of 39.5 turns of No. 24 double silk covered wire, and L2 of 59.5 turns of the same kind of wire. (See exception further on). L3 consists of 14 turns of flexible wire equivalent to No. 28. L3 is wound directly over the silk winding, in the middle of the tubing.

When the General Radio condenser is connected across the tuning coil L2 the range is from 550 to 180 meters, as will be seen from the calibration chart. (Fig. 3). This shows that KSD (546 meters) comes in at 95.2 and that the second harmonic of WHN (180 meters) comes in at 2.9 on the dial There still are a few effective divisions at either end of the dial so that the 550 mark will be safely reached, and it appears that the set might tune as low as 170. But it would be better to have a somewhat larger margin at the upper end in case the tuning condenser used had a lower maximum capacity, or in case the distributed capacity happens to be less

(*Continued on page 32*)

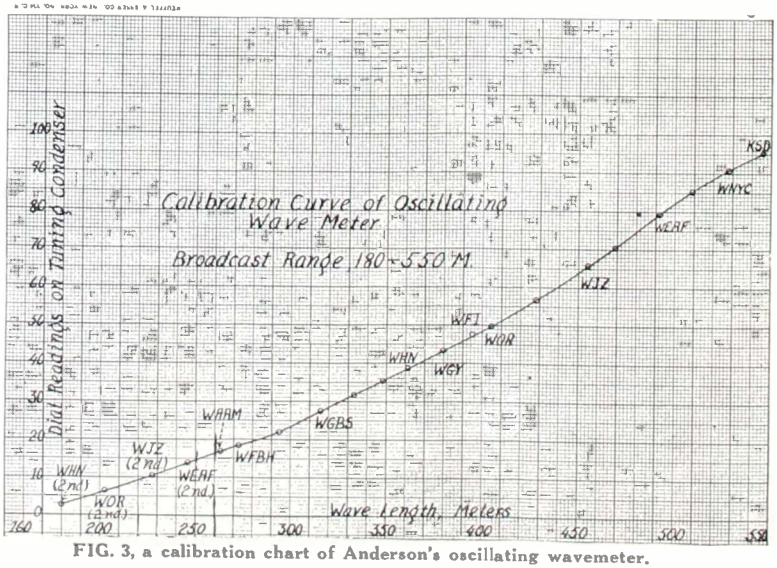


FIG. 3, a calibration chart of Anderson's oscillating wavemeter.

Powertone Trouble-Shooting

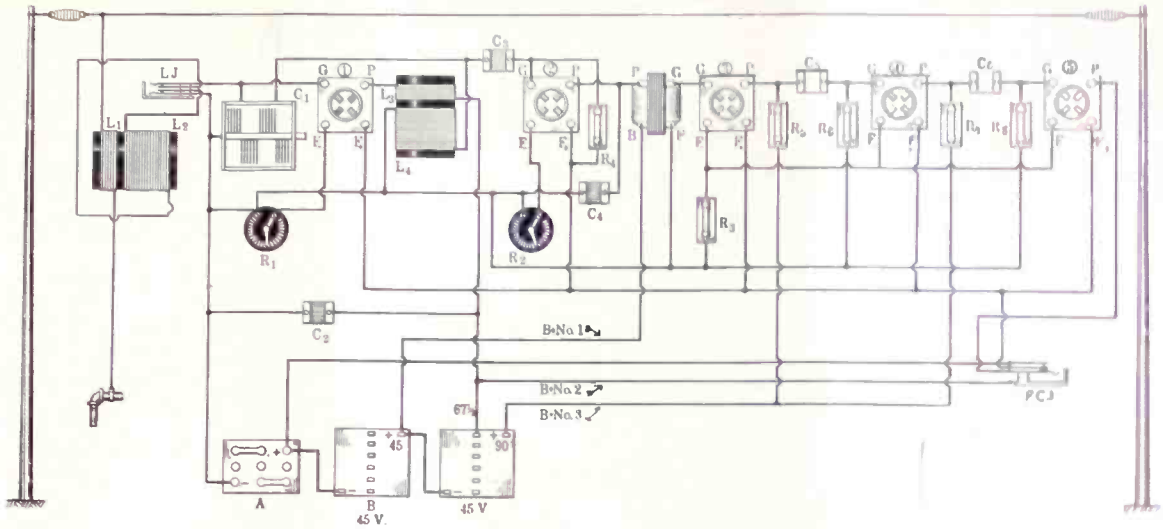


FIG. 1, the wiring diagram of The Powertone in picture form. The coils L1L2 and L3L4 are wound in the same direction. If a 2½" diameter is used, with No. 24 silk covered cotton wire, then 10 turn primaries and 49-turn secondaries may be employed, with a double condenser of .0005 mfd. capacity in each section. The range covered is 180 to 555 meters. R1 and R2 are 20-ohm rheostats, R3 a ¾-ampere ballast resistator. LJ is the loop jack, a double-circuit affair, while FCJ is the filament control jack. R4 is a grid leak, C3 a grid condenser. R5 and R7 are 100,000 ohms each, R6 is 1.0 meg. and R8 is 0.5 meg. B plus No. 1 is exclusively for the detector plate. B plus No. 2 is for the RF plate and the final audio plate, while B plus No. 3 goes to the first and second audio plates. More than 9 volts, even up to 180, could be used for the B plus No. 3 lead with a possibility of volume increase.

By Herbert E. Hayden

FOR proper functioning of a receiver that has only one stage of tuned radio-frequency amplification ahead of a non-regenerative tube detector it is necessary to have the RF tube very sensitive. Otherwise the desired selectivity may be lacking and volume as well. The achievement of the correct condition is simple. The only requirements are that you have a readily oscillating RF tube and that you use sufficient plate voltage thereon. It is assumed that the set is correctly wired and that coil terminals are connected with due respect to the advantages of proper polarities. These matters, too, I will discuss in this article.

HERBERT E. HAYDEN

From the trouble-shooting viewpoint it is surprising how great a difference in performance will result from the observance of the rules. As the set has only one control, C1, a double condenser which tunes both secondaries with one motion, the most likely sources of trouble would be:

(1) Failure of synchronization on the dial setting.
(2) A slight failure of selectivity.
(3) Not quite enough volume.

But when the set is working properly the volume will be great, the selectivity all that it need be, and the synchronization very good.

The Plate Voltage

The more B battery voltage applied to the plate of the RF tube, the greater the oscillating tendency of the tube, until it reaches a saturation point, when the tube will take on a semblance of paralysis, due to excessive B voltage. This point affects both synchronization failure, selectivity and volume, since an inefficient RF stage makes one section of the condenser tune very broadly and puts almost the whole selectivity burden on the section tuning the detector input.

Therefore the diagram, Fig. 1, is especially helpful, in that it shows how one B plus lead is common to the RF plate and to the final audio output. If greater B battery voltage than 67½ is necessary to induce oscillation in the RF tube it may be obtained by tapping at a higher voltage post. Likewise, if there is over-oscillation less B voltage may be tried.

The Oscillation Control

The rheostat R1 will control oscillations satisfactorily not only because of the variation in filament heating but also on account of the varied grid bias. There is about 1 volt maximum negative bias on the RF grid, due to the grid being connected to minus A, which is 6, and the negative filament being minus 5, 1 volt being dropped in the rheostat, energy dissipated in the form in heat. As all reckoning must be from minus filament, the difference is 1 volt, the maximum negative bias. This is obtained only when the full volt is dropped, which is true usually when the rheostat is turned up ¼ of the way, a point that must be reached, anyway, to light the tube sufficiently.

The detector tube also plays a part in this oscillation control, under some conditions. The detector tube should be lighted only to a brilliancy that enables one to get oscillation on the higher waves. Usually the detector tube may be left that way and only the RF rheostat manipulated. However, once in a while it will be found that local stations come in with too great volume and rattle the speaker. One may turn the RF rheostat lower, but still some trace of a rattle may persist, that is, there is still excessive volume. The detector tube may not respond properly if turned lower, because only greater oscillation would be induced. The solution, obviously, is to turn the detector rheostat up, burning that tube more brightly. But when one returns to normal reception, embodying stations that do not come in with tremendous power, the detector rheostat should assume its previous condition. The example cited is a rarity, of course, but the situation should be understood so that if the problem arises the solution is at hand.

The RF rheostat is also a volume control, since the proper tube condition, just below the saturation or over-oscillating point, governs volume as well as selectivity.

The Synchronization Problem

There is one more reason that may defeat synchronization, which means the representation of the same wavelength or frequency by the same dial setting. If the coils are not properly matched, then one may expect that some stations will come in at two different dial settings, infrequently at the upper readings, but more particularly on the lower wavelengths. It is usually easy to determine which secondary is "off," because that point where the signal comes in louder will represent the interstage secondary, L4, since it is the detector input. Therefore suppose a station is heard at 15 on the dial and also at 17, the 17 setting being louder. The natural period of the L2C1 combination therefore is higher than that of L4C1. Whatever coil represents a higher dial reading has a lower inductance, let us say, because it requires greater capacity, i.e., higher dial setting, to reach the same wavelength. Hence if the detector requires 17 and the RF only 15, the higher setting indicates a deficiency in inductive value for L4. The system of reckoning is therefore reverse. If the number is too high the coil is too low.

The difficulty often may be solved even without touching the secondaries. Much depends on the separation between primary and secondary in the RF coil. If L1 and L2 are ¼" apart, and it is found that the louder signal (detector) comes in at a lower reading than the other, then increase the separation. The closer L1 is to L2 the greater contribution of the aerial antenna system's capacity to the secondary L2. Very tight coupling has the effect of introducing much of the antenna capacity in parallel with L2, while L1 may be moved sufficiently far away to preserve independence of L2 in respect to the antenna capacity. But the separation

Efficiency of Powertone Is Lauded by Hayden

must not be so great that instability will result or that volume will drop, due to insufficient transfer of energy from L1 to L2. The apparent resistance of the antenna system is helpful in introducing a stabilizing element, for it is theoretically possible to create feedback to such a marked degree that even a negative resistance results. A certain amount of resistance is necessary in every set and it is foolhardy to go below that practical minimum. The instability factor need not be expected to arise in this receiver. The separation may safely be varied from ¼" to 1", or even 1½" under excellent antenna conditions.

Also, one may reduce turns on the coil that has too great a period, that is, the coil that shows up as requiring the lower dial setting. Remove half a turn at a time. Either of these two methods should work, and if not, use both methods.

Suppose that the trouble is not remedied even yet. The trouble then will lie in the tuning condenser. If it is a precision instrument the capacity variations will be varied in step with all-sufficient exactness. If you have a condenser defective in that there is a lead and lag as between respective sections, the remedy would be the connection of a midget variable condenser, one side of that tiny instrument going to one of the stators and the other side to the remaining stator of the two-section tuning condenser C1. The setting of the midget instrument would be varied until synchronization results. The midget condenser method is a sheer makeshift to avoid purchasing another tuning condenser. If you bought wisely and well in the first instance the other methods would solve your problem.

The Polarity Question

The discussion up to this point covers the three classifications: synchronization, selectivity and volume. It was assumed that the set was wired correctly, including polarity orthodoxy. Fig. 1 shows the correct coil terminal connections. Aerial goes to beginning of L1, ground to the end of L1, while the terminal of L2 that adjoins the ground side of L1 goes to the jack lead that joins to minus A, the remaining secondary connection being made to the jack spring that connects to the RF grid. Hence the potential sources or "high" sides of each coil (aerial and grid) are as far apart as possible, to avoid leakage loss, while the low potentials, ground and battery, are side by side. Batteries always are "low" potential. In this case the coils all are wound in the same direction and this refers also to L3L4. If the primary L1 were reverse-wound a different condition would exist, but the unidirectional method of winding, with connections making up for the resulting phase change, is simpler. The interstage coupler is connected with the beginning of L3 to plate, the end of L3 to B plus, the terminal of L4 adjoining the battery connection to L3 going to A minus and the remaining end of L4 to one side of the grid condenser. This method is in keeping with that employed in the case of L1L2. The low loss potentials, both batteries, are together, while the potential sources or "high" sides of the coils, plate and grid, are as far apart as possible. One may now recall with some understanding why experts long have been advising against running plate and grid wires in parallel or near to each other. The capacity effect that would result in the mere internal wiring of the set would also be present if the plate and grid connections to L4 were side by side. This is an obnoxious form of coupling and loss.

As the object is also to have the detector output in phase, to avoid losses due usually to voltage leading the amperage, the double reversal of phase in the coils, that is, one reversal in L1L2, another in L3L4, is made up by the reversal taking place in each tube. One complete turn reversal of 180 degrees takes place in any RF or detector tube, hence where two tubes are used on the RF side, as here, one balances the other, and the coils should be wound or connected accordingly. As for the audio circuit, it makes little or no difference.

The Audio Plate Voltage

The same voltage should not be used on the final audio plate as on the other two audio plates, because the two others have 100,000-ohm resistors in the circuit, cutting down the voltage perhaps 70 per cent. (including the plate resistance of the tube, figured at 30,000 ohms for the 201A). The final audio plate resistance and the speaker resistance, combined, are less than 35,000 ohms, hence 67½ volts on the final audio plate is all-sufficient for audio purposes, although if the RF tube requires more it is all right to include extra voltage.

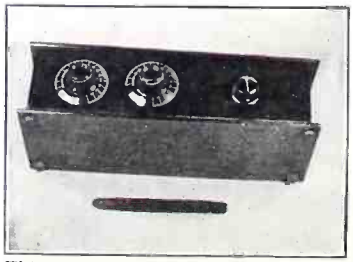
An Efficient Set

The Powertone need not be expected to develop all the troubles I have outlined, for I made a set for the sole purpose of introducing as many points of misfortune as was possible, then analyzed each, on the assumption that only one trouble might develop in a few sets and I wanted to be sure that I had covered that one. In point of fact the Powertone is a very efficient receiver and its performance will astound many who up to a week or so ago assumed that, if no tickler were present in a set, at least two stages of RF would be necessary for proper sensitivity, selectivity and volume.

The Powertone is one of the most efficient 1-control sets that can be constructed. Whenever one desires to make a 1-dial set of course he must make some little sacrifice in favor of the attained simplification. The set will give great volume and bring in stations 1,000 miles or more away on the speaker, under favorable conditions, that much having been achieved even in mid-August, in the greatly congested area of New York City.

Even loop operation is successful, although not much DX need be expected on a loop. Moreover, the loop must be matched with L4, and that is most easily done with a semi-collapsible loop designed to be tuned with a .0005 mfd. variable condenser. Tune in a local station on the aerial. Plug in the loop at LJ. Maybe no signal will be heard. Then slowly press down the loop, so that it becomes more "squat," until the signal comes in loud. The inductance of such a loop is reduced when the frame is collapsed. The Werner loop embodies this plan.

[*The construction of the Powertone was described in the August 29 and September 5 issues of* RADIO WORLD].



This 3-tube set is only twice as long as a cigar.

Super-Power No Panacea

WASHINGTON.

Three important conclusions have been reached by the Bureau of Standards as the result of an analysis of higher or super-power broadcasting during this summer. In the order of their importance, they are:

Super-power will not prevent fading.

Super-power will not cause excessive interference or blanketing of smaller stations.

While materially increasing the service range of a station, super-power will not overcome static on reception at great distances.

Summer Tests

Throughout the summer a number of stations have increased their power to 5 kilowatts as a result of the recommendations of the last radio conference. Last week WGY used 50 kilowatts on three evenings for test purposes. After measurement of the signals, the following report is made by the Bureau of Standards:

"The past summer has witnessed a 10-fold increase of power used in many of the broadcasting stations, as well as experiments on still higher powers, running up to 50 kilowatts. Measurements on the actual signals delivered by these stations have been made by the Bureau of Standards, Department of Commerce and co-operating laboratories. These measurements culminated in special observations on the alternating 50 and 2½ kilowatt transmission of WGY on August 22, 24, and 25. Some surprising conclusions can be announced.

No Great Intensity

"The results are remarkable for some things that did not happen as well as for some that did. First and foremost, high power has not resulted in signals of overwhelming intensity. Even the 50-kilowatt transmissions reached many listeners with an intensity which was not noticeably greater than that of many other stations on moderate power. Excessive interference or blanketing of lower power stations is another element of the popular picture of 'superpower' which has failed to materialize. These results, from the viewpoint of scientific investigation, are regarded as important verification of the calculations of radio engineers, who have consistently maintained that the apprehensions of stifling effects of higher power were wholly unfounded.

"The most startling conclusions are in reference to fading, or signal fluctuation. At all distances greater than about 50 miles from a station, actual tests show that the received wave intensity is continually fluctuating, the variation from maximum to minimum being as great as 100 to 1. The ear is notoriously insensitive to intensity changes, otherwise the reception of distant broadcast programs would be quite unacceptable. Increasing the power was found to affect no improvement in the degree of fluctuation. It can therefore be definitely stated that high power is not the solution of the fading problem.

Not a Great DX Boon

"For still another reason, the distance over which a broadcast station gives highly satisfactory, dependable service is quite limited. This is the omnipresent background of static and all sorts of electrical disturbance, which requires that the radio wave have more than a certain minimum intensity in order to assure reception free from interference."

The Rush to the Dial's Rescue

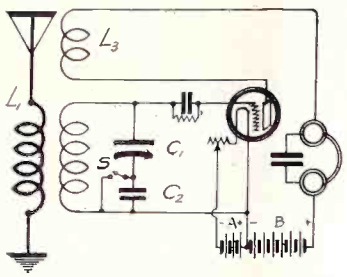


FIG. 1, a fixed condenser in series with C1, a switch S being used for cutting out this condenser by the short-circuiting method.

Analysis of Methods of Uncrowding the Lower Capacity Settings, to Facilitate Tuning — Straight-line Frequency Dials the Newest Addition to the Ranks.

By Capt. P. V. O'Rourke

THE most practical present way of separating low-wave stations on the dial is by employing a straight-line frequency or a spiral condenser. We all know that when listening-in to low wavelength stations on a set which employs some other type of condenser that the stations are jammed together on the lower end. This is illustrated in daily practice.

CAPT. PETER V. O'ROURKE

If you use a straight-line wavelength condenser the stations still will be crowded a little, but at equal points, either on high waves or on low waves. This is because the stations may be only 6 meters apart, whether on high or low waves.

If you use an SL capacity condenser (circular plate), somewhat the same effect is obtainable as in the SL wavelength condenser type. The stations are more crowded at the lower end.

Advantages of SLF Condenser

The SLF condenser solves the problem. Channels are separated by 10 kilocycles by the Department of Commerce. The higher the frequency, the lower the wavelength (1,000 kcy.=300 meters). The lower the frequency the higher the wavelength (500 kcy.=600 meters). As we reach the high wavelengths on the frequency condenser, the numbers get closer together, while on the lower wavelengths (upper end of dial), the numbers are spaced more. Frequency condensers should have dials that turn clockwise. I believe, that in the future, condensers will be made so that the low-wave stations will be separated even more than on the SLF type, and maybe the high wave stations brought still closer. The spiral condenser fulfills the first part of this idea.

Low waves are coming fast. Signals on low wavelengths are much better in volume and less power accomplishes more than on high waves. High power cannot

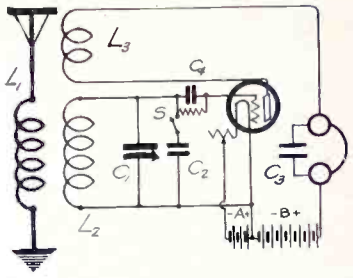


FIG. 2, a fixed condenser switched on for parallel connection with C1.

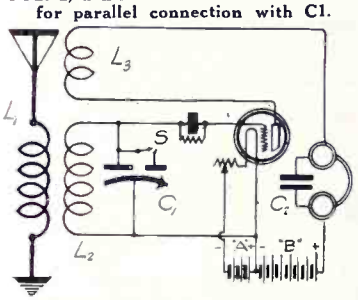


FIG. 3, how a double condenser is used, one stator being cut in by S in parallel with the other stator, or only one stator (at left) being used alone.

successfully be used on low wavelengths due to the low amount of capacity and inductance required for good transmission. A station having an output of 500 watts on a low wavelength can be heard twice as far as a station having 1,000 watts on a high wavelength. The recent Super-power tests tend to confirm this.

During this winter all these facts will be proved anew. High power will be used for retransmission work. Several broadcasters will be putting out programs on short waves or ultra-frequencies. Short waves must not be confused with low (broadcast band) waves.

Condenser Law

When you connect condensers in series you have to apply the reciprocal law: the capacity of the condenser equals one over one over the condenser plus one over the other condenser.

$$C = \frac{1}{\frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3}}$$

Therefore when we connect condensers in series the total capacity is reduced and if the three components are of the same value the total capacity is one-third the capacity of any one.

Condensers in parallel add up the respective capacities. If two .001 mfd. condensers are connected in parallel, the total capacity is .002.

In Fig. 1 C2 is connected in series with C1. C1 is connected in shunt with the secondary. A condenser connected as is C1 increases the fundamental wavelength of the set. However, it is here used as a tuning element and not as a loading unit. By inserting C2 we decrease the wavelength of the set. This in turn allows us to listen to lower wavelengths. It spreads out the lower wavelengths and jams the high wavelengths on the dials or misses some of them. Let us say that C1 has a capacity of .0005 mfd. and C2 a capacity of .0005 mfd. also. The total capacity of this bank is .00025 mfd.

The second method is shown in Fig. 2. Here C2 is connected in shunt with C1 (i.e., in parallel). Condensers in parallel

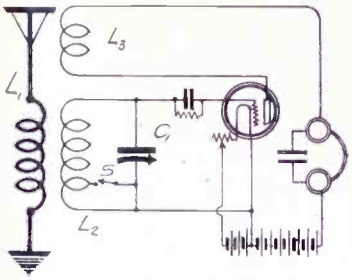


FIG. 4, a tapped secondary, with switch to short-circuit the otherwise dead end.

are added. Let us say that C1 and C2 each has a capacity of .0005 mfd. The two will then total .001 mfd. With C2 in the circuit say we can listen to the low wavelength stations. There is not very much of a spread-out on the dials. The ratio of the spread-out with the condenser C2 in, compared with it out of the circuit, is about 2.5 to 1 between the wavelengths of 200 to 400 meters, while between 300 and 350 meters the ratio is 4 to 1. This is some improvement.

Other Methods

The next method tried is shown in Fig. 3. Here we used a double condenser. The manner of connecting the condenser is the same as in Fig. 2. We do not have the peculiar spreading out of low wave stations, though. From 200 to 400 meters the separation between stations is a 4-to-1 ratio throughout. Thus far this is the best method, but a little expensive.

Fig. 4 shows another method. In this scheme the inductance was varied instead of the capacity. By decreasing the number of turns we could tune in the low-wave stations but with no ease. This was one of the worst of the methods tried. As a matter of fact the stations were more crowded than with just plain capacity tuning.

The next method and one which is one of the most difficult is illustrated in Fig. 5. We have a 2-tube receiver, one tuned radio-frequency amplifier and a regenerative detector. The secondaries of both coils are tuned by one condenser, C1. L0 and L2 were tapped at the 22nd turn (each turn had 44 turns). This tap was connected to the stator of C1. The tap was varied on both coils (10th turn on L0 and L2, 15th turn on L0 and L2, etc.) so as to bring in the low wavelength stations with a spread-out effect on the dial. This was not successful. Stations on the lower end were quite jammed (ratio about 1.5 to 1).

The last inductance method tried is given in Fig. 6. I never thought that a variometer ought to have a straight-line frequency effect, but it certainly needs one. I tried about nine-tenths of all the manufactured variometers on the market. The low wavelengths could be tuned in, but oh, what jamming! It was worse than the circular plate condenser. To get the high wavelengths six load coils were used. The high wavelength stations were spread out. In other words the present commercial variometers are impractical as easy tuning elements, especially as secondaries. There are a few exceptions.

Summarizing all these data we find that the method in Fig. 2 is the best makeshift. This method is very simple. A remarkably good effect obtained with this scheme.

They all point to the SLF or spiral condenser. All, I trust, are familiar with the SLF condensers, such as Amsco, Pacent, Karas, General Instrument and the like, at least as to the theory. The Amsco is accurate on frequency variation to 1/10 of

Spreading Out the Lower Wave

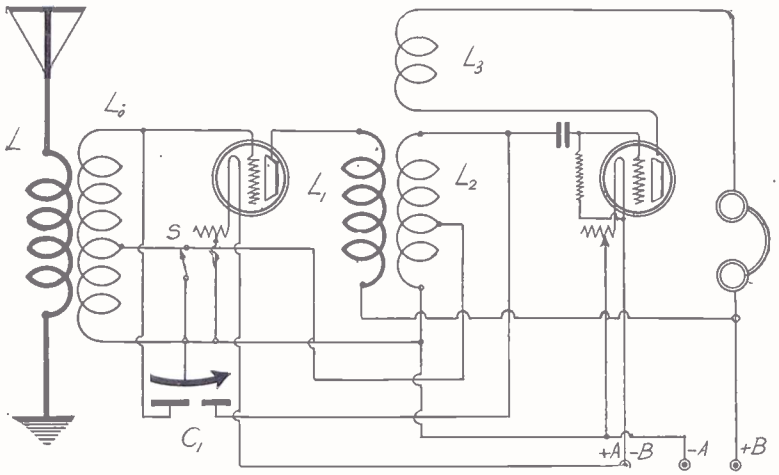


FIG. 5, a double condenser, C1, used to tune two stages at once, the switch S tapping each secondary at the same relative point.

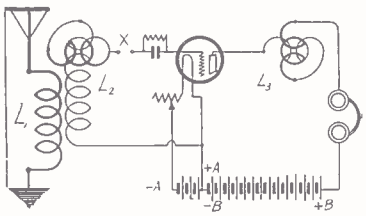


FIG. 6, a variometer used as a tuned secondary. The break at X is for a loading coil.

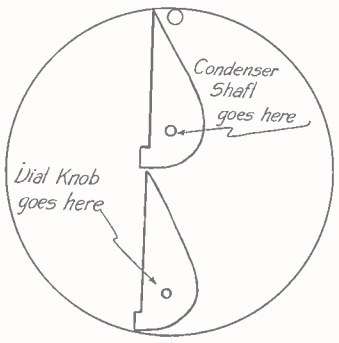


FIG. 7, the fundamental idea of a straight-line frequency dial.

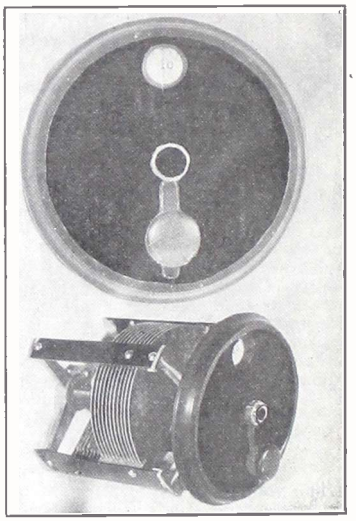


FIG. 9 (top), the front of the dial, with the dial reading visible through the window. The slot is in plain view, with the travelling dial knob in it. The center circle is a decorative knob behind which is a bushing with thread and screw for engaging the condenser shaft.

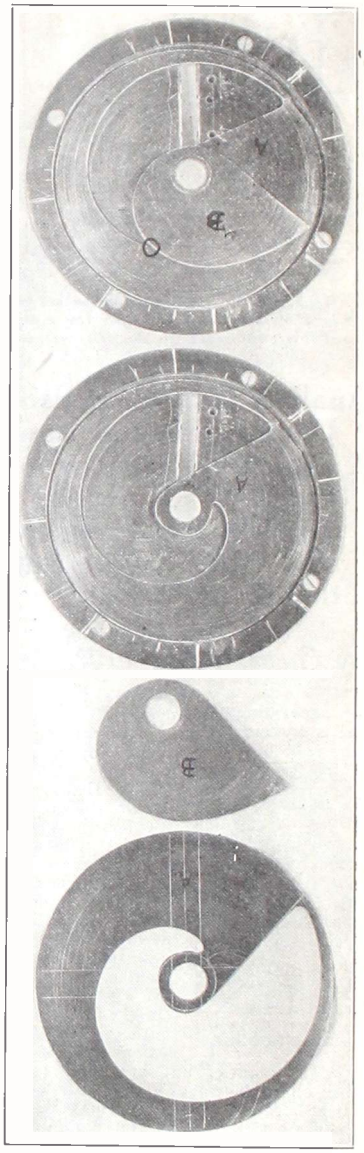


FIG. 8, the cams of an SLF dial. They are A and B. When B is superimposed on A an angle O is developed. In the slot (under shaft hole) a pinion moves up and down, depending on how you turn the dial knob attached to the pinion. The slot is toothed. If point O is brought down to the slot the pinion will move the circumference of A evenly, for dial readings, but, due to the shaped cam B, will introduce slow motion, or much slighter capacity change, on the lower waves.

1% and others are accurate, too. The special condenser is something new and rather startling. The rotor plates enter the stator field by a special or screw-line motion, without touching, of course! The effect is the same as if another type of condenser gradually engaged one plate at a time, instead of all at once. The spread-out is marvelous. For a .0005 mfd. type it is 540 divisions of a 100-division dial which is made to revolve at about 5-to-1 ratio. An indicator on the special dial shows up the revolution numbers, i.e., 1, 2, 3, etc. The dial divisions are 100 for 360 degrees, which in itself is a 2-to-1 ratio. On top of that the extremely slow motion of the engaging rotor more than doubles the spreadout, so that 0 to 270 covers from 200 to 400 meters with the proper inductance. The dial indicator reads "2" and the dial itself "70," i.e., 270. The condenser is known as the Kapaciton.

Then aside from coils and condensers a frequency effect dial was tried. The turning knob moved in a slot, actuating a cam, which moved aonther cam. The fundamental theory is exemplified in Fig. 7. The dial is moved by one cam (either one), and the condenser by the other. Thus by shaping the plates of the dial, i.e., the cams, a SLF effect is obtained, akin to that of the SLF condenser, although a round-plate (SLC) condenser was used. The Fig. 7 scheme is not practical for commercial production because both cams have to be large, and probably need gearing, traction being unable to induce motion of sufficient strength at all points. The dial would have to be 5" for any safety margin, even with gears.

A better plan is shown in Figs. 8 and 9. Here there is a circular cam for greater strength of motion, and a smaller shaped cam, the large one moving the dial, for the numbers are on the reverse side of the large cam. The other cam moves the condenser, so that slow motion (20-to-1 vernier) exists on the low waves, and gradually diminishes, until when the upper waves are reached it is almost only 1-to-1. For mechanical reasons even this may not produce exactly SLF motion, only something better than SLW. However, take an SLW condenser, use a frequency-type dial and you get as good a separation as with a SLF condenser. Use a dial like this on a SLF condenser and you almost overdo it! This type of dial will serve an excellent purpose in affording tuning ease for possessors of circular-plate condensers. Soon there will be several on the market: Radiall, Walbert, Bruno, Rathbun, etc. This type probably will lead the dial market, while SLF condensers will be sold much more than the other condensers before November.

The Official List of Stations

Corrected and Revised Up to September 2

Station	Owner and Location	Meters
KDKA	Westinghouse E. & M. Co., E. Pittsburgh, Pa.	309
KDLR	Radio Elec. Co., Devils Lake, N. D.,	231
KDPM	Westinghouse E. & M. Co., Cleveland, Ohio	250
KDYL	Newhouse Hotel, Salt Lake City, Utah	250
KDZB	F. E. Seifert, Bakersfield, Cal.	210
KFAB	Nebraska Buick Auto Co., Lincoln Neb.	240
KFAD	McArthur Bros. Merc. Co., Phoenix Ariz.	360
KFAE	State College, Pullman, Wash.	349
KFAF	Western Radio Corp., Denver, Colo.	278
KFAJ	University of Colorado, Boulder, Colo.	261
KFAN	University of Idaho, Moscow, Idaho.	231
KFAU	Boise High School, Boise, Idaho	275
KFAW	Radio Den, Santa Ana, Cal.	214
KFBB	F. A. Buttrey Co., Havre, Mont.	275
KFBC	W. K. Azbill, San Diego, Cal.	278
KFBG	1st Presbyterian Church, Tacoma, Wash.	250
KFBK	Kimball Upson So., Sacramento, Cal.	248
KFBL	Leese Bros., Everett, Wash.	224
KFBS	School District No. 1, Trinidad, Col.	238
KFBU	Bishop N. S. Thomas, Laramie, Wyo.	270
KFCB	Nielson Radio Co., Phoenix, Ariz.	238
KFCC	1st Congregational Church, Helena, Mont.	248
KFCF	F. A. Moore, Walla Walla, Wash.	256
KFCY	Western Union College, Lemars, Iowa	252
KFCZ	Central High School, Omaha, Neb.	258
KFDD	St. Michael's Cathedral, Boise, Idaho	275
KFDH	University of Arizona, Tuscon, Ariz.	268
KFDJ	Oregon Agricultural College, Corvallis, Ore.	254
KFDM	Magnolia Petroleum Co., Beaumont, Texas	316
KFDX	1st Baptist Church, Shreveport, La.	250
KFDY	State College of Agriculture, Brookings, S. D.	273
KFDZ	H. O. Iverson, Minneapolis, Minn.	231
KFEC	Meier & Frank Co., Portland, Ore.	248
KFEL	Winner Radio Corp., Denver, Colo.	254
KFEQ	J. L. Scroggin, Oak, Neb.	268
KFEY	Bunker Hill & Sullivan, Kellog, Idaho	233
KFFP	1st Baptist Church, Moberly, Mo.	266
KFFV	Graceland College, Lamoni, Iowa	250
KFGC	Louisiana State University, Baton Rouge, La.	268
KFGD	College for Women, Chickasha, Okla.	252
KFGH	Leland Stanford Junior University, Stanford University, Cal.	270
KFGQ	Crary Co., Boone, Iowa	226
KFGX	1st Presbyterian Church, Orange, Texas	250
KFHA	Western State College, Gunnison, Colo.	252
KFHL	Penn College, Oskaloosa, Iowa	240
KFI	E. C. Anthony, Inc., Los Angeles, Cal.	469
KFIF	Benson Institute, Portland, Ore.	243
KFIO	North Central High School, Spokane, Wash.	265
KFIQ	1st Methodist Church, Yakima, Wash.	256
KFIU	Alaska Elec. Co., Juneau, Alaska	226
KFIZ	Daily Commonwealth, Fond du Lac, Wis.	273
KFJB	Marshall Elec. Co., Marshalltown, Ia.	248
KFJC	R. B. Fegan, Junction City, Kan.	219
KFJF	National Radio Co., Oklahoma City, Okla.	261
KFJI	Liberty Theatre, Astoria, Ore.	246
KFJM	University of N. D., Grand Forks, N. D.	278
KFJR	Ashley C. Dixon & Son, Portland, Ore.	263
KFJX	State Teachers College, Cedar Falls, Ia.	258
KFJY	Tunwall Radio Co., Ft. Dodge, Iowa.	246
KFJZ	W. E. Branch, Ft. Worth, Tex.	254
KFKA	State Teachers College, Greeley, Colo.	273
KFKQ	Conway Radio Laboratory, Conway, Ark.	250
KFKU	University of Kansas, Lawrence, Kans.	275
KFKX	Westinghouse E. & M. Co., Hastings, Neb.	288
KFLP	Everette M. Foster, Cedar Rapids, Ia.	256
KFLR	University of N. M., Albuquerque, N. M.	254
KFLU	Rio Grande Radio Sup. Co., San Benito, Texas	236
KFLV	Swedish Evangelist Church, Rockford, Ill.	270
KFLX	George R. Clough, Galveston, Texas	240
KFLZ	Atlantic Auto Co., Atlantic, Iowa.	273
KFMB	Christian Churches of Little Rock, Little Rock, Ark.	254
KFMO	University of Ark., Fayetteville, Ark.	300
KFMR	Morningside College, Sioux City, Iowa	261
KFMT	Dr. G. W. Young, Minneapolis, Minn.	263
KFMX	Carleton College, Northfield, Minn.	337
KFNF	Henry Field Seed Co., Shenandoah, Iowa	266
KFNG	Wooten Radio Shop, Coldwater, Miss.	254
KFNL	Union High School, Paso Robles, Cal.	240
KFNV	L. A. Drake, Santa Rosa, Cal.	277
KFOA	Rhodes Company, Seattle, Wash.	455
KFOL	L. M. Schafbuch, Marengo, Iowa.	234
KFON	Echophone Radio Shop, Long Beach, Cal.	234
KFOO	Latter Day Saints University, Salt Lake City, Utah	261
KFOR	David City Tire & Elec. Co., David City, Neb.	226
KFOT	College Hill Radio Club, Wichita, Kan.	231
KFOX	Technical High School, Omaha, Neb.	243
KFOY	Beacon Radio Service, St. Paul, Minn.	252
KFPG	Oliver S. Garretson, Los Angeles, Cal.	238
KFPL	C. C. Baxter, Dublin, Texas	252
KFPM	New Furniture Co., Greenville, Texas	242
KFPR	Forestry Department, Los Angeles, Cal.	231
KFPW	St. John's Church, Carterville, Mo.	268
KFPY	Symonds Investment Co., Spokane, Wash.	266
KFQA	The Principia, St. Louis, Mo.	261
KFQB	Searchlight Publishing Co., Ft. Worth, Texas	254
KFQC	Kidd Bros., Taft, Cal.	231
KFQH	Radio Service Co., Burlingame, Cal.	231
KFQP	G. S. Carson, Jr., Iowa City, Ia.	224
KFQT	National Guard, Denison, Tex.	252
KFQU	W. Riker, Holy City, Cal.	234
KFQW	F. C. Knierim, North Bend, Wash.	216
KFQA	Farmers State Bank, Belden, Neb.	273
KFQZ	Taft Radio Co., Hollywood, Cal.	226
KFRB	Hall Bros., Beevile, Texas	249
KFRC	Paris Dry Goods Co., San Francisco.	268
KFRI	Men's Club, Grand Forks, N. D.	240
KFRU	Etherical Studio, Bristow, Okla.	395
KFRW	United Churches, Olympia, Wash.	220
KFRX	J. G. Klemgard, Pullman, Wash.	217
KFRY	College of Agriculture, State College, N. M.	256
KFRR	College of Agriculture, State College, N. M.	266
KFRZ	The Electric Shop, Hartington, Neb.	222
KFSG	Echo Park Evangelistic Ass'n, Los Angeles, Cal.	278
KFSY	The Van Blaricom Co., Helena, Mont.	243
KFUJ	Hoppert P. and H. Co., Breckenridge, Minn.	242
KFUL	T. Goggan & Bro., Galveston, Tex.	258
KFUM	W. D. Corley, Colorado Springs, Colo.	242
KFUO	Concordia Theo. Seminary, St. Louis, Mo.	545
KFUP	Fitzsimmons General Hospital, Denver, Colo.	234
KFUR	H. W. Peery and R. Redfield, Ogden, Utah	224
KFUS	Louis L. Sherman, Oakland, Cal.	233
KFUT	University of Utah, Salt Lake City, Utah	261
KFUU	Colburn Radio Laboratories, San Leandro, Cal.	224
KFUV	G. P. Ward, Springfield, Mo.	252
KFUZ	Y. M. C. A., Virginia, Minn.	248
KFVD	Chas. & W. J. McWhinnie, San Pedro, Cal.	205
KFVE	Film Corp., St. Louis, Mo.	240
KFVF	Clarence B. Juneau, Hollywood, Cal.	208
KFVG	1st Meth-Epis. Church, Independence, Kan.	236
KFVH	Herbert Whan, Manhattan, Kans.	219
KFVI	56th Cav. Brigade, Houston, Tex.	248
KFVO	F. M. Henry, Kirksville, Mo.	226
KFVR	Moonlight Ranch, Denver, Col.	246
KFVS	Cape Girardeau Battery Station, Cape Girardeau, Mo.	224
KFVU	The Radio Shop, Eureka, Cal.	210
KFVW	Airfan Radio Corp., San Diego, Cal.	246
KFVX	Radio Shop, Bentonville, Ark.	236
KFVY	Radio Supply Co., Abuquerque, N. M.	250
KFVZ	Glad Tidings Tabernacle, Inc., San Francisco, Cal.	234
KFWA	Browning Bros. Co., Ogden, Utah	214
KFWB	Warner Bros. Pictures, Inc., Hollywood, Cal.	252
KFWC	L. E. Wall & C. S. Myers, Upland, Cal.	211
KFWD	Ark Light Co., Arkadelphia, Ark.	266
KFWF	St. Louis Truth Center, St. Louis, Mo.	214
KFWH	F. Wellington Morse, Jr., Chico, Cal.	254
KFWO	Lawrence Mott, Avalon, Cal.	211
KFWP	Rio Grande Radio Supply House, Bronsville, Texas	214
KFWI	Radio Entertainers, Inc., South San Francisco, Cal.	220
KFWU	Louisiana College, Pineville, La.	238
KFYN	Carl E. Bagley, Welcome, Minn.	277
KGB	The Ledger, Tacoma, Wash.	250
KGO	General Electric Company, Oakland, Cal.	361
KGU	M. A. Mulrony, Honolulu, Hawaii	270
KGW	The Oregonian, Portland, Ore.	492
KGY	St. Martin's College, Lacey, Wash.	246
KHJ	The Times, Los Angeles, Cal.	405
KHO	Louis Wasmer, Seattle, Wash.	273
KJBS	J. Brunton & Sons Co., San Francisco, Cal.	236
KJR	Northwest Radio Co., Seattle, Wash.	484
KJS	Bible Institute, Los Angeles, Cal.	294
KLDS	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo.	441
KLS	Warner Bros. Radio Co., Oakland, Cal.	242
KLX	Tribune, Oakland, Cal.	508
KLZ	Reynolds Radio Co., Denver, Col.	266
KMA	May Seed & Nursery Co., Shenandoah, Ia.	252
KMJ	San Joaquin Corp., Fresno, Cal.	254
KMO	Love Elec. Co., Tacoma, Wash.	250
KNX	Express, Hollywood, Cal.	337
KOA	General Electric Co., Denver, Col.	322
KOB	College of Agri., State College, N. M.	349
KOIL	Monarch Manufacturing Co., Council Bluffs, Ia.	278
KOP	Detroit Police Department, Detroit Mich.	273
KPO	Hale Brothers, San Francisco, Cal.	429
KPPC	Pasadena Presbyterian Church, Pasadena, Cal.	229
KPRC	Houston Print Co., Houston, Tex.	297
KQP	Apple City Radio Club, Hood River, Ore.	270
KQV	Doubleday Hill Elec. Co., Pittsburgh, Pa.	275
KRE	Gazette, Berkeley, Cal.	258
KSAC	Kansas State Agricultural College, Manhattan, Kans.	341
KSD	Post Dispatch, St. Louis, Mo.	545
KSL	Radio Service Corp., Salt Lake City, Utah	308
KTAB	Tenth Ave. Baptist Church, Oakland, Cal.	216
KTCL	American Radio Tel. Co., Inc., Seattle, Wash.	306
KTHS	New Arlington Hotel, Hot Springs, Ark.	375
KTW	1st Presbyterian Church, Seattle, Wash.	454
KUO	Examiner, San Francisco, Cal.	246
KUOM	State University of Montana, Missoula, Mont.	245
KUPR	Union Pacific R. R. Co., Omaha, Neb.	270
KWG	Portable Wireless Tel. Co., Stockton, Cal.	298
KWWG	City of Brownsville, Brownsville, Tex.	278
KYW	Westinghouse E. & M. Co., Chicago, Ill.	535
KZKZ	Electric Supply Co., Manila, P. I.	270
KZM	Western Radio Inst., Oakland, Cal.	241
KZRQ	Far Eastern Radio, Inc., Manila, P. I.	222
WAAB	V. Jensen, New Orleans, La.	273
WAAC	Tulane University, New Orleans, La.	275
WAAD	Ohio Mech. Institute, Cincinnati, O.	250
WAAF	Drovers Journal, Chicago, Ill.	273
WAAM	I. R. Nelson Co., Newark, N. J.	263
WAAW	Omaha Grain Exchange, Omaha, Neb.	334
WABA	Lake Forest University, Lake Forest, Ill.	227
WABB	Harrisburg Sporting Goods Co., Harisburg, Pa.	266
WABC	Asheville Battery Co., Inc., Asheville, N. C.	254
WABI	Bangor Ry. & Elec. Co., Bangor, Me.	240
WABL	Agricultural College, Storrs, Conn.	275
WABO	Lake Avenue Baptist Church, Rochester, N. Y.	273
WABQ	Haverford College Radio Club, Haverford, Pa.	261
WABR	Scott High School, Toledo, O.	263
WABW	College of Wooster, Wooster, O.	207
WABX	H. B. Joy, Mt. Clemens, Mich.	254
WABY	John Magaldi, Philadelphia, Pa.	242
WABZ	Coliseum Place Baptist Church, New Orleans, La.	275
WADC	Allen Theatre, Akron, Ohio.	258
WAFD	A. B. Parfet Co., Port Huron, Mich.	256
WAHG	A. H. Grebe Co., Richmond Hill, N. Y.	316
WAIT	A. H. Waite & Co., Taunton, Mass.	229
WAMD	Hubbard & Co., Minneapolis, Minn.	244
WARC	American Radio Res. Corp., Medford Hillside, Mass.	261
WBAA	Purdue University, West Lafayette, Ind.	273
WBAK	State Police, Harrisburg, Pa.	276
WBAO	James Millikia University, Decatur, Ill.	263
WBAP	Star Telegram, Fort Worth, Tex.	476
WBAV	Erner Hopkins Co., Columbus, O.	294
WBAX	J. H. Stenger, Jr., Wilkes-Barre, Pa.	256
WBBA	Plymouth Congregational Church, Newark, O.	236
WBBG	I. Vermilya, Mattapoisett, Mass.	240
WBBL	Grace Covenant Presbyterian Church, Richmond, Va.	229
WBBM	H. L. Atlass, Chicago, Ill.	226
WBBP	Petoskey High School, Petoskey, Mich.	238
WBBR	Peoples Pulpit Ass'n., Rossville, N. Y.	273
WBBS	1st Baptist Church, New Orleans, La.	252
WBBU	Jenks Motor Sales Co., Monmouth, Ill.	234
WBBW	Ruffner City High School, Norfolk, Va.	222
WBBY	Washington Light Infantry, Charleston, S. C.	268
WBCN	Southtown Economist, Chicago, Ill.	266
WBDC	Baxter Laundry Co., Grand Rapids, Mich.	256
WBES	Bliss Electrical School, Takoma Park, Md.	222
WBOQ	A. H. Grebe & Co., Richmond Hill, N. Y.	236
WBR	State Police, Butler, Pa.	203
WBRC	McDonald Radio Co., (portable), Joliet, Ill.	216
WBRE	Baltimore Radio Ex., Wilkes-Barre, Pa.	231
WBS	D. W. May, Inc., Newark, N. J.	252
WBT	Southern Radio Co., Charlotte, N. C.	275
WBZ	Westinghouse E. & M. Co., Springfield, Mass.	333

Station	Owner and Location	Meters
WCAD	St. Lawrence University, Canton, N. Y.	263
WCAE	Kaufman & Baer, Pittsburgh, Pa.	461
WCAH	Entrekin Electric Co., Columbus, O.	266
WCAJ	Nebraska Wesleyan University, University Place, Neb.	275
WCAL	St. Olaf College, Northfield, Minn.	337
WCAO	Sanders & Stayman, Baltimore, Md.	275
WCAP	C. & P. Tel. Co., Washington, D. C.	469
WCAR	Southern Radio Corp., San Antonio, Texas.	263
WCAT	School of Mines, Rapids City, S. D.	240
WCAU	Durham & Co., Philadelphia, Pa.	278
WCAX	University of Vermont, Burlington, Vt.	250
WCAZ	Carthage College, Carthage, Ill.	246
WCBA	Queen City Radio, Allentown, Pa.	254
WCBC	University of Michigan, Ann Arbor, Mich.	229
WCBD	W. G. Voliva, Zion, Ill.	345
WCBE	Uhalt Radio Co., New Orleans, La.	263
WCBG	H. S. Williams, Mayleld, Ky.	268
WCBH	University of Mississippi, Oxford, Miss.	242
WCBM	Hotel Chateau, Baltimore, Md.	229
WCBQ	1st Baptist Church, Nashville, Tenn.	242
WCBR	C. H. Messter (Portable), Providence, R. I.	205
WCBU	Arnold Wireless Co., Arnold, Pa.	220
WCBY	Forks Electrical Shop, Buck Hill Falls, Pa.	231
WCBZ	Neutrowound Radio Mfg. Co., Chicago Heights, Ill.	217
WCCO	Washburn Crosby Co., Minneapolis, Minn.	416
WCEE	C. E. Erbstein, Elgin, Ill.	275
WCK	Stix Baer & Fuller Co., St. Louis, Mo.	273
WCLO	C. W. Whitmore, Camp Lake, Wis.	231
WCM	Texas Market Department, Austin, Texas	268
WCSH	Henry P. Rines, Portland, Me.	256
WCSO	Wittenberg College, Springfield, Ohio.	248
WCTS	C. T. Sherer Co., Worcester, Mass.	268
WCUW	Clark University, Worcester, Mass.	238
WCX	Detroit Free Press, Detroit, Mich.	517
WDAE	Tampa Daily News, Tampa, Fla.	273
WDAF	Kansas City Star, Kansas City, Mo.	336
WDAG	J. L. Martin, Amarillo, Tex.	263
WDAY	Radio Equipment Corp., Fargo, N. D.	244
WDBC	Kirk, Johnson & Co., Lancaster, Pa.	258
WDBE	Gilham-Schoen Elec. Co., Atlanta, Ga.	278
WDBF	R. G. Phillips, Youngstown, O.	222
WDBJ	Richardson Wayland Elec. Co., Roanoke, Va.	229
WDBK	M. F. Broz, Furn., Cleveland, O.	227
WDBL	Department of Markets, Stevens Point, Wis.	278
WDBO	Rollins College, Winter Park, Fla.	240
WDBQ	Morton Radio Supply Co., Salem, N. J.	234
WDBR	Tremont Temple Baptist Church, Boston, Mass.	261
WDBS	S. M. K. Radio Corp., Dayton, O.	275
WDBX	Dyckman Radio Shop, New York, N. Y.	233
WDBY	North Shore Congregational Church, Chicago, Ill.	258
WDBZ	Boy Scouts of America, Kingston, N. Y.	233
WDOD	Chattanooga Radio Co., Chattanooga, Tenn.	256
WDRC	Doolittle Radio Corp., New Haven, Conn.	268
WDWF	Dutee Wilcox Flint, Inc., Cranston, R. I.	441
WDZ	J. L. Bush, Tuscola, Ill.	278
WEAA	F. D. Fallain, Flint, Mich.	234
WEAF	A. T. & T. Co., New York, N. Y.	492
WEAH	Wichita Board of Trade, Wichita, Kans.	268
WEAI	Cornell University, Ithaca, N. Y.	254
WEAJ	University of South Dakota, Vermillion, S. D.	278
WEAM	Borough of North Plainfield, N. Plainfield, N. J.	261
WEAN	Shepard Co., Providence, R. I.	270
WEAO	Ohio State University, Columbus, O.	294
WEAR	Goodyear T. and R. Co., Cleveland, O.	390
WEAU	Davidson Bros. Co., Sioux City, Ia.	275
WEAY	Iris Theatre, Houston, Texas	270
WEBA	The Electric Shop, Highland Park, N. J.	233
WEBC	W. C. Bridges, Superior, Wisc.	242
WEBD	Elec. Equipment & Service Co., Anderson, Ind.	246
WEBE	Roy W. Waller, Cambridge, Ohio.	234
WEBH	Edgewater Beach Hotel, Chicago, Ill.	370
WEBJ	Third Avenue R. R. Co., New York, N. Y.	273
WEBK	Grand Rapids Radio Co., Grand Rapids, Mich.	242
WEBL	Radio Corp. of Ama. (Portable)	226
WEBM	Radio Corp. of Ama., Portable Mobile Station	226
WEBP	E. B. Peddicord, New Orleans, La.	280
WEBQ	Tate Radio Co., Harrisburg, Ill.	226
WEBR	H. H. Howell, Buffalo, N. Y.	240
WEBT	Dayton High School, Dayton, Ohio.	256
WERW	Beloit College, Beloit, Wisc.	268
WEBZ	Savannah Radio Corp., Savannah, Ga.	234
WEEI	Edison Electric Illuminating Co., Boston, Mass.	476
WEHS	Robert E. Hughes, Evanston, Ill.	205
WEMC	Emm. Missionary College, Berrien Springs, Mich.	286
WENR	All-Amer. Radio Corp., Chicago, Ill.	266
WEW	St. Louis University, St. Louis, Mo.	248
WFAA	Dallas News & Journal, Dallas, Texas	476
WFAM	The Times, St. Cloud, Minn.	273
WFAV	University of Nebr., Lincoln, Nebr.	275
WFBB	Eureka College, Eureka, Ill.	240
WFBC	1st Baptist Church, Knoxville, Tenn.	250
WFBE	J. V. De Walle, Seymour, Ind.	226
WFBG	W. F. Gable Co., Altoona, Pa.	278
WFBH	Concourse Radio Corp., New York, N. Y.	273
WFBI	Galvin Radio Supply Co., Camden, N. J.	236
WFBJ	St. Johns University, Collegeville, Minn.	236
WFBL	Onondaga Hotel, Syracuse, N. Y.	252
WFBM	Merchants Lighting Co., Indianapolis, Ind.	268
WFBQ	Wynne Radio Co., Raleigh, N. C.	252
WFBR	Maryland National Guard, Baltimore, Md.	254
WFBY	Signal Corps, Ft. Ben Harrison, Ind.	258
WFBZ	Knox College, Galesburg, Ill.	254
WFI	Strawbridge & Clothier, Philadelphia, Pa.	395
WFBK	Francis K. Bridgman, Chicago, Ill.	217
WGAL	Lancaster Elec. Supply Co., Lancaster, Pa.	248
WGAQ	W. G. Patterson, Shreveport, La.	263
WGAZ	The Tribune, South Bend, Ind.	275
WGBA	Jones Elec. & Radio Co., Baltimore, Md.	254
WGBB	H. H. Carman, Freeport, N. Y.	244
WGBC	1st Baptist Church, Memphis, Tenn.	266
WGBF	The Finke Furniture Co., Evansville, Ind.	217
WGBG	Breitenbach's Radio Shop, Thrifton, Va.	226
WGBI	Frank S. Megargee, Scranton, Pa.	240
WGBK	L. W. Campbell, Johnstown, Pa.	248
WGBL	Elyria Radio Assn., Elyria, Ohio.	227
WGBM	T. N. Saaty, Providence, R. I.	234
WGBN	Hub Radio Shop, La Salle, Ill.	256
WGBO	Dr. Roses Artlan, San Juan, P. R.	275
WGBQ	Stout Institute, Menomonie, Wis.	234
WGBU	Florida Cities Finance Co., Fulford By-the-Sea, Fla.	278
WGBR	Marshfield Broadcasting Association, Marshfield, Wis.	229
WGBS	Gimbel Brothers, New York, N. Y.	316
WGBT	Furman University, Greenville, S. C.	236
WGBX	University of Maine, Orono, Maine.	252
WGN	The Tribune, Chicago, Ill.	370
WGMU	A. H. Grebe & Co., Inc., Richmond Hill, N. Y.	236
WGNP	George H. Phelps, Inc., Detroit, Mich.	270
WGCP	Grand Central Palace, N. Y. City.	273
WGR	Federal Telephone Mfg. Co., Buffalo, N. Y.	319
WGST	Ga. School of Tech., Atlanta, Ga.	270
WGY	General Elec. Co., Schenectady, N. Y.	380
WHA	University of Wisconsin, Madison, Wis.	525
WHAD	Marquette University, Milwaukee, Wis.	275
WHAG	University of Cincinnati, Cincinnati, Ohio	233
WHAM	University of Rochester, Rochester, N. Y.	278
WHAP	Wm. H. Taylor Finance Corp., Brooklyn, N. Y.	240
WHAR	F. P. Cooks Sons, Atlantic City, N. J.	275
WHAS	The Courier Journal-Times, Louisville, Ky.	400
WHAV	Wilmington Elc. Spec. Co., Wilmington, Del.	266
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	280
WHB	Sweeney School Co., Kansas City, Mo.	366
WHBA	Shaffer Music House, Oil City, Pa.	250
WHBB	Hebal's Store, Stevens Point, Wis.	240
WHBC	Rev. E. P. Graham, Canton, Ohio.	254
WHBD	Charles W. Howard, Bellefontaine, Ohio	222
WHBF	Beardsley Specialty Co., Rock Island, Ill.	222
WHBG	John S. Skane, Harrisburg, Pa.	231
WHBH	Culver Military Academy, Culver, Ind.	222
WHBJ	Laver Auto Co., Ft. Wayne, Ind.	234
WHBK	Franklin St. Garage, Ellsworth, Me.	231
WHBL	J. H. Slusser, Logansport, Ind.	220
WHBM	C. L. Carroll (Portable), Chicago, Ill.	233
WHBN	1st Ave. Methodist Church, St. Petersburg, Fla.	258
WHBO	Y. M. C. A., Providence, R. I.	231
WHBP	Johnstown Auto Co., Johnstown, Pa.	256
WHBQ	St. John's M. E. Church, Memphis, Tenn.	233
WHBR	Scientific E. & M. Co., Cincinnati, O.	216
WHBS	F. W. Loche, Mechanicsburg, Ohio.	208
WHBU	B. L. Bing's Sons, Anderson, Ind.	219
WHBW	D. R. Kienzle, Philadelphia, Pa.	216
WHBY	St. Norbert's Coll., West DePere, Wis.	250
WHDI	Wm. Hood Dunwoody Ind. Inst., Minneapolis, Minn.	278
WHEC	Hickson Elec. Co., Rochester, N. Y.	258
WHK	Radiovox Company, Cleveland, Ohio.	273
WHN	George Schubel, New York, N. Y.	361
WHO	Bankers Life Co., Des Moines, Ia.	526
WHT	Radiophone Corp., Deerfield, Ill.	238
WIAD	H. R. Miller, Philadelphia, Pa.	250
WIAS	Home Elc. Co., Burlington, Iowa	254
WIBA	Capital Times, Madison, Wis.	236
WIBC	L. M. Tate Post, V. F. W., St. Petersburg, Fla.	222
WIBH	Elite Radio, New Bedford, Mass.	210
WIBI	Fredk. B. Zittell, Flushing, N. Y.	219
WIBJ	C. L. Carrell, Chicago (portable)	216
WIBK	Univ. of Toledo, Toledo, O.	205
WIBO	Nelson Bros., Chicago, Ill.	226
WIBN	Flite Radio Stores, New Bedford, Mass.	210
WIBM	Billy Maine, Chicago, Ill.	216
WIBP	First Presbyterian Church, Meridian, Miss.	210
WIBO	F. M. Schmidt, Farina, Ill.	205
WIBR	Thurman A. Owings, Weirton, W. Va.	246
WIBS	N. J. National Guard, Elizabeth, N. J.	203
WIBT	Orlando E. Miller Portable Station, N. Y.	211
WIBU	The Electric Farm, Paynette, Wis.	222
WIBW	Dr. L. L. Dill, Logansport, Ind.	220
WIBX	Grid-Leak, Inc., Utica, N. Y.	205
WIBZ	Powell Electric Co., Montgomery, Ala.	231
WIL	Benson Radio Co., St. Louis, Mo.	273
WIP	Gimbel Brothers, Philadelphia, Pa.	508
WJAD	Jackson's Radio Elec. Co., Waco, Tex.	353
WJAG	Norfolk Daily News, Norfolk, Nebr.	270
WJAK	Rev. C. L. White Greentown, Ind.	254
WJAM	D. M. Perham, Cedar Rapids, Ia.	258
WJAR	The Outlet Co., Providence, R. I.	306
WJAS	Pittsburgh Radio Supply House, Pittsburgh, Pa.	275
WJAZ	Zenith Radio Corp., Chicago, Ill.	268
WJBA	D. H. Lentz, Jr., Joliet, Ill.	207
WJBB	L. W. McClung, St. Petersburg, Fla.	207
WJBI	H. M. Couch, Joliet, Ill.	214
WJBC	Hummer Furniture Co., 2nd and Joliet Sts., La Salle, Ill.	234
WJBD	Ashland Broadcasting Committee, Ashland, Wis.	233
WJBI	R. S. Johnson, Red Bank, N. J.	219
WJD	Dennison University, Granville, O.	217
WJJD	Loyal Order of Moose, Mooseheart, Ill.	303
WJY	Radio Corp. of Ama., New York, N. Y.	405
WJZ	Radio Corp. of Ama., New York, N. Y.	455
WKAA	H. F. Paar, Cedar Rapids, Iowa.	278
WKAF	WKAF Broadcasting Co., Milwaukee, Wis.	261
WKAP	D. W. Flint, Cranston, R. I.	234
WKAQ	Radio Corp. of Porto Rico, San Juan, P. R.	341
WKAR	Mich. Agricultural College, Lansing, Mich.	285
WKAV	Laconia Radio Club, Laconia, N. H.	210
WKBE	K. & B. Electric Co., Webster, Mass.	231
WKBG	C. L. Carrell, (Portable) Chicago, Ill.	216
WKRC	Kodel Radio Corp., Cincinnati, O.	326
WKY	WKY Radio Shop, Oklahoma City, Okla.	275
WLAL	1st Presbyterian Church, Tulsa, Okla.	250
WLAP	W. V. Jordan, Louisville, Ky.	275
WLAX	Greencastle Commun. Broad. Sta., Greencastle, Ind.	231
WLB	University of Minneapolis, Minneapolis, Minn.	278
WLBL	Wisconsin Department of Markets, Stevens Point, Wis.	278
WLIT	Lit Brothers, Philadelphia, Pa.	395
WLS	Sears Roebuck Co., Chicago, Ill.	345
WLTS	Lane Technical High School, Chicago, Ill.	258
WLW	Crosley Radio Corp., Cincinnati, O.	422
WLWL	Missionary Society of St. Paul the Apostle, N. Y. City.	288
WMAC	C. B. Meredith, Cazenovia, N. Y.	275
WMAF	Round Hills Radio Corp., Dartmouth, Mass.	360
WMAK	Norton Laboratory, Lockport, N. Y.	266
WMAN	1st Baptist Church, Columbus, Ohio	278
WMAQ	Chicago Daily News, Chicago, Ill.	448
WMAY	Kings Highway Presbyterian Church, St. Louis, Mo.	248
WMAZ	Mercer University, Macon, Ga.	261
WMBB	Trianon Ball Room, Chicago, Ill.	250
WMBF	Fleetwood Hotel, Miami Beach, Fla.	384
WMC	The Commercial Appeal, Memphis, Tenn.	500
WMCA	Hotel McAlpin, N. Y. C.	341
WNAB	Shepard Stores, Boston, Mass.	250
WNAC	Shepard Stores, Boston, Mass.	280
WNAD	University of Okla., Norman, Okla.	254
WNAL	Omaha Central High School, Omaha, Nebr.	258
WNAP	Wittenberg College, Springfield, O.	248
WNAR	1st Christian Church, Butler, Mo.	231
WNAT	Lenning Bros. Co., Philadelphia, Pa.	250
WNAX	Dakota Radio App. Co., Yankton, S. D.	244
WNJ	Radio Shop, Newark, N. J.	233
WNOX	Peoples Tel. & Tel. Co., Knoxville, Tenn.	268
WNYC	Municipal Station, New York, N. Y.	526
WOAC	Page Organ Co., Lima, Ohio.	261
WOAI	South East Equipment Co., San Antonio, Texas	395
WOAN	Vaughan Con. of Music, Lawrenceburg, Tenn.	283
WOAW	Woodmen of the World, Omaha, Neb.	526
WOAX	F. J. Wolff, Trenton, N. J.	240
WOC	Palmer School of Chiro, Davenport, Ia.	484
WODA	Odea Radio, Paterson, N. J.	203
WOCL	Hotel Jamestown, Jamestown, N. Y.	275
WOCG	Triple Alliance Radio Station, Sycamore, Ill.	205
WOI	Iowa State College, Ames, Iowa.	270
WOK	Neutrowound Radio Mfg. Co., Homewood, Ill.	217
WOO	John Wanamaker, Philadelphia, Pa.	508
WOQ	Unity School of Christianity, Kansas City, Mo.	278
WOR	L. Bamberger & Co., Newark, N. J.	405
WORD	Peoples Pulpit Assn., Batavia, Ill.	275
WOS	Mo. State Marketing Bureau, Jefferson City, Mo.	441
WOWO	Main Auto Supply Co., Ft. Wayne, Ind.	227
WPAK	N. D. Agricultural College, Agricultural College, N. D.	285
WPAZ	Dr. John R. Koch, Charleston, W. Va.	268
WPG	Municipality, Atlantic City, N. J.	300
WPSC	Penn State College, State College, Pa.	261
WOAA	H. A. Beale, Jr., Parkersburg, Pa.	220
WOAC	Gish Radio Service, Amarillo, Texas	234
WQAE	Moore Radio News Station, Springfield, Vermont	246
WQAM	Electric Equipment Co., Miami, Fla.	268
WQAN	The Scranton Times, Scranton, Pa.	250
WQAO	Calvary Baptist Church, New York, N. Y.	360

A 25-to-110-Meter Receiver

By Sidney E. Finklestein

Associate, Institute of Radio Engineers.

THE 3-circuit tuner, if the inductance used is small, will make a very satisfactory short-wave set. It will be possible to tune from about 25 to 110 meters, using a .00025 mfd. variable condenser. It is advisable to employ the straight-line frequency type of variable condenser, as the tuning is made easier thereby.

SIDNEY E. FINKELSTEIN

The hookup is shown in Fig. 1. It is a regulation 3-circuit tuner, to which is added one stage of resistance-coupled audio-frequency amplification, so that the signals will be made louder. This to some extent increases the audible range. Transformer coupling AF is pretty good in such a set, too, but there is always a little danger of magnetic feedback and accentuated body capacity effects.

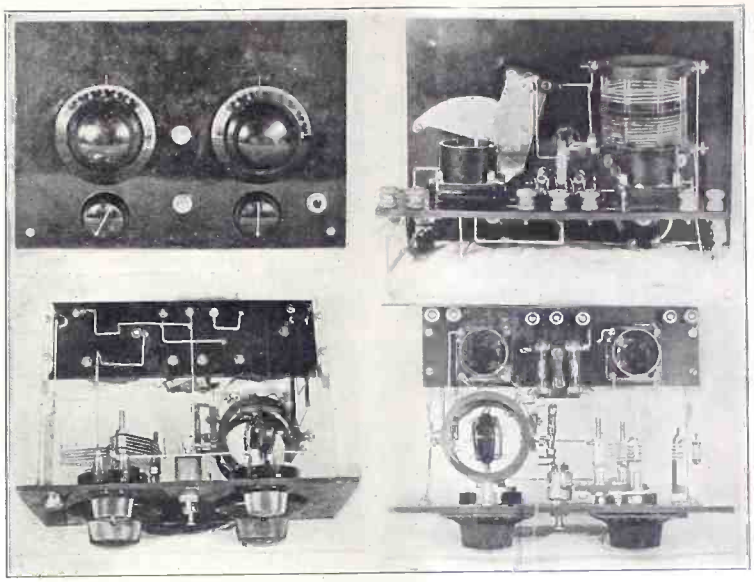


FIG. 2, top, left, the panel view of the set. Fig. 3, bottom, left, the bottom view. Fig. 4 (top, right) rear view, and Fig. 5, the top view.

(Hayden Photos.)

The form used had a stator 2" mean diameter, 2½" high. Between two insulation rings were quartzite glass rods and on these rods the wire was wound. A commercial coupler was used, with 4 turns on the primary, L1, ¼" space, and a secondary of 12 turns, the wire being flat aluminum for primary and flat copper for secondary. The tickler form is 1" diameter, 1" high and has 13 turns of No. 26 silk covered wire.

Flattened space-wound wire was used in making the coils shown in the photographs because of the lesser distributed capacity. No. 20 DCC wire may be used, but should be space-wound. The distributed capacity will be a trifle higher. Especially on short-wave work it is sometimes desirable to have this distributed coil capacity at the very minimum, because of its relative effect on tuning, as would be shown by a characteristic curve, and because of resistance losses. The SLF type condenser aids in overcoming the effect of this distributed capacity, so far as tuning is concerned, but the winding alone can account for avoiding excessive losses.

In either case the tickler would be the same. The finer wire used here makes little comparative difference in resistance, a mere fragment of the 30,000 ohms resistance in the plate of the tube (201A).

The tuning of the set under most conditions will have to be done by the beat note method. There is not much to object to when this is done on short waves.

In building a short-wave set it is most important to keep the grid and plate leads short and not run them parallel. In fact, all leads should be short. Then there will be less likelihood of uncontrollable whistles and body capacity effects.

The same B battery voltage is applied at the source, and this is quite proper. The voltage may be up to 135, but 90 will suffice. This does not mean putting 90 volts on the detector plate, because there is a large voltage drop, about 75 per cent., in the resistor R3 and the plate of the tube. Rating the applied gross voltage at 96, if a 6-volt storage battery is used and B— connected to A+, then the actual net effective voltage at the plate is 24. The audio-tube has about 60 volts, when the votlage drop due to resistance in the plate is deducted.

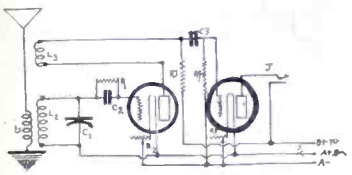


FIG. 1, the wiring diagram of the short-wave set.

The set will work well with other types of tubes, too, including the 199, but the 201A gave very satisfactory service.

LIST OF PARTS

One short-wave 3-circuit coupler, L1L2L3.
One .00025 mfd. SLF variable condenser, C1.
One .00025 mfd. fixed condenser, C2.
One .006 mfd. fixed condenser, C3.
One 2-meg. grid leak, R1.
One 20-ohm rheostat, R2.
One 20-ohm rheostat, R5.
One 0.1 meg. resistor, R3.
One 1.0 meg. resistor (leak), R4.
One push-pull switch, S.
One single-circuit jack, J.
Two sockets.
One socket strip with brackets, or baseboard, 7x9".
One panel, 7x10".
Two 3" dials.

(Cut this part out and paste it on page 14 for permanent record.)

Station	Owner and Location	Meters
WQJ	Calumet Rainbo Broadcasting Co., Chicago, Ill.	448
WRAF	Radio Club, Inc., Laporte, Ind.	224
WRAK	Economy Light Co., Escanaba, Mich.	256
WRAM	Lombard College, Galesburg, Ill.	244
WRAV	Antioch College, Yellow Springs, O.	263
WRAW	Avenue Radio Shop, Reading, Pa.	238
WRAX	Flexon's Garage, Gloucester City, N. J.	268
WRBC	Immanuel Lutheran Church, Valpariaso, Ind.	278
WRC	Radio Corp. of Ama., Washington, D. C.	469
WREO	Reo Motor Co., Lansing, Mich.	286
WRHF	Radio Hospital Fund, Washington, D. C.	256
WRK	Doron Bros. Elec. Co., Hamilton, O.	270
WRNY	Experimenter Publishing Co., (Radio News) N. Y. City	258
WRM	University of Illinois, Urbana, Ill.	273
WRMU	A. H. Grebe & Co., Inc., Motor Yacht Mu-l, N. Y. City	236
WRW	Tarrytown Research Laboratory, Tarrytown, N. Y.	273
WSAC	Clemson Agricultural College, Clemson College, S. C.	337
WSAI	U. S. Playing Card Co., Cincinnati, O.	326
WSAJ	Grove City College, Grove City, Pa.	229
WSAN	Allentown Call, Allentown, Pa.	229
WSAP	City Temple, New York, N. Y.	263
WSAR	Doughty & Welch Elec. Co., Fall River, Mass.	254
WSAU	Camp Marenfeed, Chepham, N. H.	229
WSAV	C. W. Vick Radio Construction Co., Houston, Tex.	248
WSAZ	Chase Electric Shop, Pomeroy, Ohio.	244
WSB	The Atlanta Journal, Atlanta, Ga.	428
WSBC	World Battery Co. Chicago, Ill.	200
WSKC	World's Star Knitting Co., Bay City, Mich.	261
WSMB	Saenger Amuse. Co., New Orleans, La.	319
WSOE	School of Engineering, Milwaukee, Wisc.	246
WSRF	Harden Sales & Service Co., Broadlands, Ill.	233
WSRO	Radio Co., Hamilton, Ohio	251
WSUI	State University of Iowa, Iowa City, Iowa	484
WSY	Alabama Polytechnic Institute, Auburn, Ala.	250
WTAB	Fall River Daily Herald, Fall River, Mass.	266
WTAC	Penna. Traffic Co., Johnstown, Pa.	268
WTAL	Toledo Radio & Elc. Co., Toledo, O.	252
WTAM	Willard Storage Battery Co., Cleveland, Ohio	389
WTAP	Cambridge Radio Elec. Co., Cambridge, Ill.	242
WTAQ	S. Van Gordon & Son, Osseo, Wis.	254
WTAR	Reliance Radio & Elec. Co., Norfolk, Va.	261
WTAS	Charles E. Erbstein, Elgin, Ill.	303
WTAT	Edison Elec. Ill. Co. (Portable), Boston, Mass.	244
WTAW	Agricultural & Mech. College, College Station, Tex.	270
WTAX	Williams Hardware Mfg. Co., Streator, Ill.	231
WTAY	Oak Leaves Broadcasting Assn., Oak Park, Ill.	250
WTAZ	T. J. McGuire, Lambertville, N. J.	261
WTG	Kansas State Agricultural College, Manhattan, Kas.	273
WTIC	Travelers Insurance Co., Hartford, Conn.	347
WWAD	Wright & Wright, Inc., Philadelphia, Pa.	250
WWAE	Alama Ballroom, Joliet, Ill.	242
WWGL	Radio Engineering Corp., Richmond Hill, N. Y.	213
WWI	Ford Motor Co., Dearborn, Mich.	266
WWJ	Detroit News, Detroit, Mich.	517
WWL	Loyola University, New Orleans, La.	275

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A. B. C. stands for American Broadcast Club, an organization of fans banded together to promote the welfare of radio. There are no dues, no obligations. Address A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City. The names and addresses of new members follow:

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Edward Lembart, 2122 Park Ave., Chicago, Ill.

Adolph Souchek, Bladen, Neb.

C. V. Slack, 747 17th St. Niagara Falls N. Y.

A THOUGHT FOR THE WEEK

Official radio expositions may come and go, but there is a perennial radio show in every radio store for the pudgy-nosed, eager little chaps who stand more or less disconsolately on the outside looking in.

RADIO WORLD

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

TELEPHONES: LACKAWANNA 6976 and 2063
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
(Putnam Bldg., Times Square and 43rd Street)
European Representatives: The International News Co., Breams Bldgs., Chancery Lane, London, Eng.
Paris, France, Brentano's, 38 Avenue de l'Opera.
San Francisco, Loyd B. Chappell, 656 O'Farrell St.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

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.

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General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	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

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52 consecutive issues	20%
26 times consecutively or E. O. W. one year	15%
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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, 50 cents a line; minimum, $1.00.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.

SEPTEMBER 12, 1925

Radio's Greatest Season

THE 1926 season is under way, auspiciously begun. It started earlier than in any previous year. First to feel this gratifying effect was the retail trade, with breath somewhat taken away. The commotion immediately spread to the jobbers, distributors, authorized agents and manufacturers. The effect was cumulative and reciprocal. Orders started to arrive in quantity nearly two weeks ago and a sudden upward trend even followed upon that gratifying start. Now come two great radio shows, the Fourth Annual, at Grand Central Palace, and the Radio World's Fair, at the 258th Field Artillery Armory, both in New York City.

Opinions vary as to the advisability of having two simultaneous shows. As was to be expected, much competition and some open hostility existed between the two groups. The radio trade and the public at large will await the result, to determine whether the two-at-a-time plan is a good thing for radio. It may be.

Exhibitors fell into a highly co-operative mood in respect to both shows, and there is no apparent reason why both should not be a success, even though the managers of one may cast glowering eyes on the managers of the other.

The outstanding features of the shows no doubt are enhanced simplicity of control in radio sets, particularly the single-dial idea, and the great advances in beautification. When one looks back upon the sets of yesteryear one feels that long strides indeed have been made upon the aesthetic path of radio. The prophesied revolution has not arrived and perhaps never will.

RADIO WORLD'S Survey Bureau has completed a canvass of manufacturing and sales conditions. On the basis of data that are decidedly weighty, both physically and intellectually, it is unquestionable that this will be by far and wide the greatest sales season in radio's history. Simply tremendous will be the success of the leaders in the respective filds, with sets showing a greater percentage of gain than the parts business, but with parts representing a larger total financial volume. Sales resistance is gone at this moment, the hot days happily over and brisk business actually a fact. Perhaps coming years will see the beginning of the radio season in early August, instead of near the close of that month, and radio tradefolk will be the happier for it. This Summer, all told, was no worse than others, and it is comforting to think of how lively will be the radio days from now until after the holidays.

The post-Yuletide slump may be offset somewhat next year because of the wise selection of the date for International Radio Week (January 24). Keen interest will be displayed in this all over the world.

What could be happier in radio than this great wealth of healthy activity and wisely proportioned action?

RESULTS

RESULTS EDITOR:

I have just finished building Lewis Winner's 4-Tube Marconi Feedback set, described in the August 15 issue of RADIO WORLD, and it certainly works fine. I can sit about 65 feet from the set and hear the program from KTHS, Hot Springs, Arkansas, loud and clear. I have built most of your sets from "The One Dial Set That Gets DX" to the famous Diamond, but this is the best of them all by far.

My attention was recently called to the "sin and shame" letter, in which the 1-tube Rofpatkin Reflex (Nov. 21 issue) was criticized. Out of curiosity I built it and it worked so well that I built two more for friends. One of them liked it better than his Superdyne. I believe that if Mr. Hancock would have more patience he could make his set work well. I have been interested in radio for five years and have learned that patience is necessary if one desires a good set.—Frank Vebber, Jr., 694 Cramer St., Milwaukee, Wis.

A 1-CONTROL PORTABLE by Capt. P. V. O'Rourke; A Baby Super-Heterodyne, by J. E. Anderson; A More Powerful Diamond, Still only 4 tubes, by Herman Bernard. Other features in RADIO WORLD, dated July 11, 1925, 15c a copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

World Will Enjoy His Scheme of Radio Movies, Says Collegian

IMAGINE tuning in your radio set and seeing a complete moving picture flashed on the screen! This is not a fairy tale, for according to reports from Madison, Wis., a young college student, Douglas W. F. Coffee, of that city, has invented such a machine. He has successfully transmitted moving pictures by radio over a distance of seven miles, he says, and claims it is the first time that any such feat has been accomplished.

DOUGLAS W. F. COFFEE

Although complete data on the operation of the receiver and transmitter is not known, the following is a brief description of what happens. A small light is played upon a rotating movie film strip. It is then transferred into electrical vibrations. This is then sent by a specially devised radio transmitter, neither microphone or key being used. At the receiving end it is transferred into light waves and then transferred on the screen. The receiver used is also especially made, and a 20-foot indoor antenna is used to pick up the energy.

It will not be very long before radio moving pictures, with the personages in the film talking instead of the captions being played upon the screen, will be an established and recognized fact, says coffee. At present, the invention is in its experimental stage.

INTERFERENCE PROTECTION

The time is not far distant when we must determine just how much right to protection from inductive interference the user of an ultra-sensitive receiving set is entitled to. If, in any community, we succeed in lowering the interference level to a given point the users of sensitive receivers immediately increase the amount of amplification in use until the same interference level exists in his mind, as before, and the same problem arises again.

My experience in the radio communication field has led me to the conclusion that there is no other field where the need of co-operative effort directed towards the solution of common problems is greater.

—*Prof. C. M. Jansky.*

Tapped Variometers Used

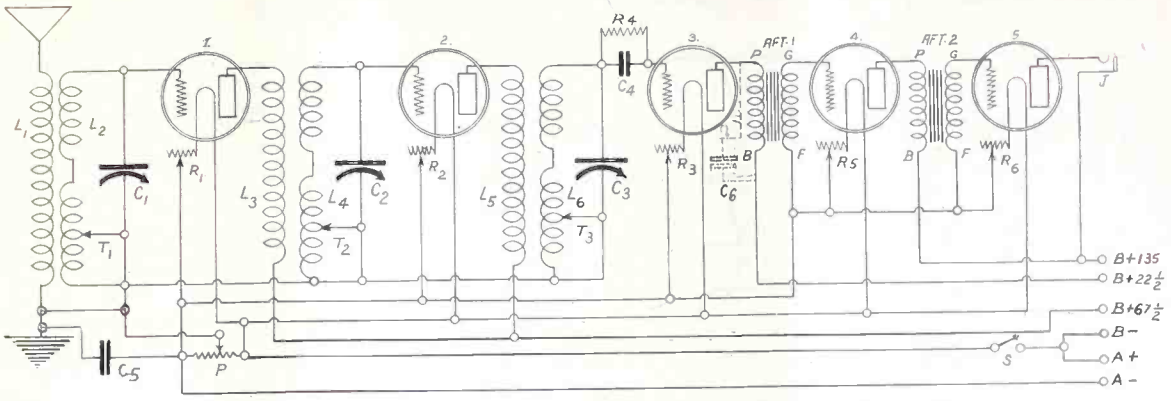


FIG. 3, showing the electrical wiring of the 5-Tube Inductively-coupled receiver.

[Part I of this article on making a geared receiver was published last week. Part II, the conclusion, follows.]

By Lewis Winner

Associate Institute of Radio Engineers

THE rack should be 28" long. Fit this on the coil pinions. Take off the rack and lay it aside. In the same line as the other pinions, place a small tack on the piece of wood located near to the first coil. Again mount the rack. About ¼" from this point make a bend of about (45 degrees). At the right-hand end screw 45 degrees in a brass angle.

Drop some solder on the piece of wood. In the center of the wood run the end of the rack through. This part of the rack should be 4" long. Drop some solder on the shaft, each side of the piece of wood. Through the piece of wood on the extreme left hand side pass the rack. A hole 3/16" in diameter will pass the rack very easily. On the other end of the rack, put on another piece of wood. Put the rack through this wood, the length of the rack being 4". Drop some solder on each side of the tubing for holding purposes. Now pass the tubing through the hole in the piece of wood on the extreme end. Midway between the first and the second coils mount a piece of 2" square wood, 4½" high. Do the same midway between the other coils. Cut out a slot ½" in length and ½" from the top. Now get a pair of small rollers (¼" in diameter). Run a screw through the slot and mount the rollers on this screw. Do the same with the other piece of wood. This roller should rest on the rack. Set the rack on the pinions. It will nearly fall off. Push the roller down on the rack until the rack revolves smoothly on the pinion. Screw the screw tight and you are all set.

The variable condensers are now placed in back of the coils, with a ½" separation. Each condenser is placed opposite a coil. These condensers should be mounted on the baseboard with brass angles if baseboard provision for mounting on the actual condenser does not exist.

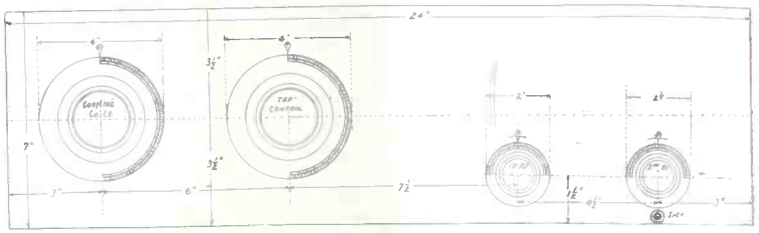


FIG. 4, showing the panel view.

Placement of Parts

As usual, place the sockets as close as possible to the respective tuning instruments of the electron tube elements, viz., Tube No. 1, near L1, L2, C, etc.

The audio-frequency transformers are

(Continued on page 35)

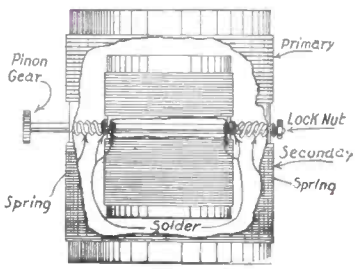


FIG. 5, the coil used.

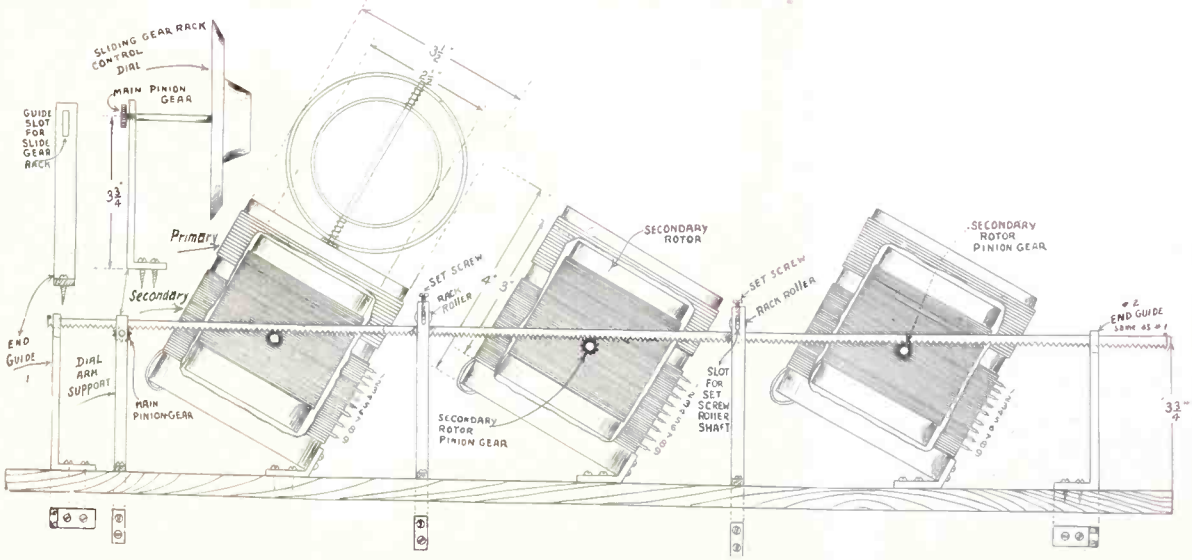


FIG 6, showing the picture diagram of how the coil looks when completed.

THE RADIO UNIVERSITY

A QUESTION and Answer Department conducted by RADIO WORLD for its Readers by its staff of Experts. Address Letters to The Radio University, RADIO WORLD, 1493 Broadway, New York City.

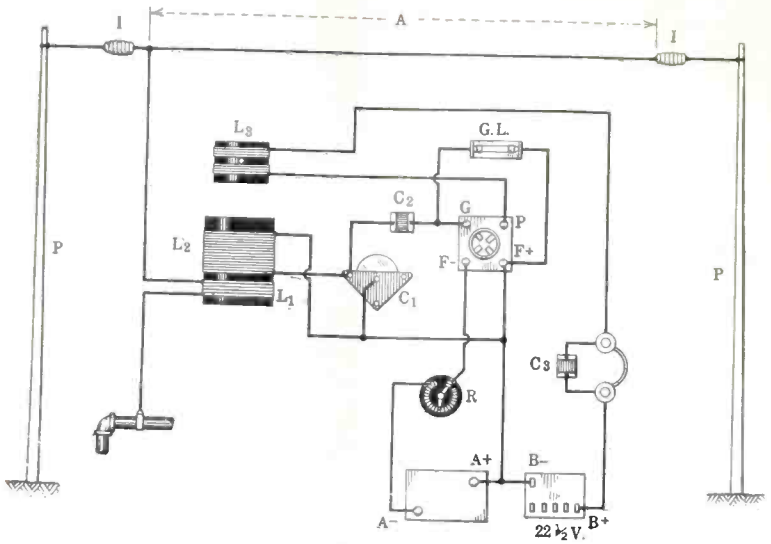


FIG. 199, showing a picture diagram of a 1-tube regenerative receiver. L1L2L3 is a 3- circuit tuner. L1 has 10 turns, wound on a tubing 3½" in diameter, with No. 22 DCC wire. L2 has 45 turns and wound on the same tubing with same kind of wire. L3 has 35 turns, wound on a tubing 2" in diameter, 2" high, using same kind of wire as for L1L2. C1 is a .0005 mfd. variable air condenser. C2 is a .00025 mfd. grid condenser. GL is the grid leak having a resistance of 2 megohms. C3 is a .001 mfd. fixed condenser. R is a 10-ohm rheostat. A UV200 or UV201A tube may be used.

WILL YOU please give a picture diagram of a 1-tube Regenerative receiver?—T. B. Lock, Portsmonton, N. D.

See Fig. 199.

* * *

I HAVE a 5-tube tuned radio-frequency set. When a local station is broadcasting, it can be heard practically all over the three dials. Disconnecting the antenna seems to make very little difference. This being true, can I hope, by the introduction of a wave-trap, to eliminate the undesired station?—F. M. Padelford, 126 June Street, Fall River, Mass.

Try disconnecting your ground. Leave your antenna connected. A wave-trap will help. The coil should have 50 turns and wound on a 3½" tubing, with No. 22 DCC wire. Across this coil shunt a .005 mfd. variable condenser. Place the coil in inductive relation to the antenna lead-in.

* * *

IN REGARD to Tim Turkey's Silk Hat Circuit for Dress Occasions, published in the Jan. 3 issue of RADIO WORLD. (1) Is this circuit sensitive and clear and is it free from disturbing noises on DX stations? (2) To how low and how high a wavelength will this circuit tune?—Calvin Martin, 518 24th St., Oakland, Calif.

(1) Yes. If there is no static prevalent, the stations will all come in, without distortion. The set itself is a non-distorting one. (2) From 150 to 600 meters, using a 100-foot antenna (including lead-in) and a 10-foot ground (from ground to set). Watch A & B wiring carefully. Do not connect B+ with A— or B—.

* * *

I HAVE several 23-plate variable condensers rated at .0005 mfd. I want to make a .0004 mfd. variable. How many plates will I have to take out?—W. H. Johnson, Box 605, Hilo, Hawaii.

You cannot determine the capacity of a condenser by the number of plates. A condenser having 25 or 26 plates may have a capacity of .0005 mfd. The only way to determine the actual capacity of a condenser is by calculating the area of the surface of the plates, the thickness of the material used, the spacing between the plates, and employ these data in a formula. This formula is found in the Bureau of Standards circular on Radio Instruments and Measurements, obtainable from the Superintendent of Documents, Washington, D. C., for $.60. A better way to reduce the capacity of your condenser is to put a condenser on series with the one you have. A .00075 mfd. will be just right.

* * *

CAN YOU kindly furnish information that will enable me to use the waveband of 200 to 600 meters on the following receiver set—Tuning unit of .0005 variable condenser, a commercial coil (3-circuit type), coil is on Bakelite form 3 in. by 3 in. primary, 15 turns, secondary, 45. Tickler is one 2½ in. by 1½ in., and has about 28 turns. Can get Pittsburgh Post station, which is on 463 meters, on phones, clear, but weak, with the condenser ½ engaged and tickler zero. When the tickler is opened, signals are shut out with whistles ¾ way around. 2—Is the Diamond of the Air as shown in May 23rd issue of RADIO WORLD, as efficient as the circuit in Aug. 15. 3—Can I use Robert's 3-circuit tuner and R. F. T. (basket weave), in the Diamond of the Air? If so, how will I use the neutralizing coil that goes with the R. F. T. It has same number of turns as the R. F. T. primary.—J. C. Reid, 12 Powell Ave., Evansville, Ind.

(1)—Insert a .0005 mfd. variable condenser in series with aerial. Put a switch across this condenser, so that you may cut it in and out of the circuit. (2)—Yes. (3)—Yes., Disregard it.

* * *

WILL THE "3-Circuit Tuner You Can Log" get DX? (2)—What does Percy Warren mean when he says the B.C.L. may omit the coils L5, L6 in the Marconi Broadcast Receiver in the July 18 issue of RADIO WORLD? Will this set get DX stations?—Joseph Hacker, 1021 N. Castle St., Baltimore, Md.

(1)—Yes. (2)—They are not required for use by the Broadcast Listener. (3)—Yes.

* * *

IN REGARD to the home-made Toroidal coil as described by George Hostetter in August 22 issue of RADIO WORLD, how many turns of wire will I have to wind on or take off the coil so I can use it with a .0005 mfd. variable condenser.—Teddy Damm, Rolla, Mo.

Add on 20 turns.

* * *

PLEASE GIVE the electrical of a 3-tube set, using a 3-circuit tuner with 2 steps of AF amplification using transformers for coupling.—P. Long, Pittsfield, Mass.

See Fig. 200.

* * *

MY ANTENNA is strong between two trees, the height on one end is about 50 feet, the other end is about 75 or 80 feet. I have dropped back 3 feet from the lower end for my lead-in. Is this correct or should I have a continuous or center lead-in. I have insulated twice on each end. Antenna is 80 feet long. Used on a

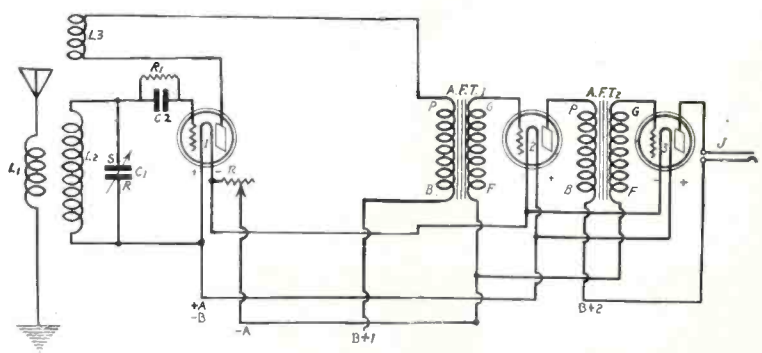


FIG. 200, showing the electrical diagram of a 3-tube set. The constants for the coil are the same as in the coil of Fig. 199. C1 is a .0005 mfd. variable condenser. C2 is the .00025 grid condenser. R1 is a 2 megohm grid leak resistance. A 6-ohm resistance is used to control the filaments of the UV201A tubes. The new UX tubes may be used here also. AFT 1 and 2 are both of the low ratio type.

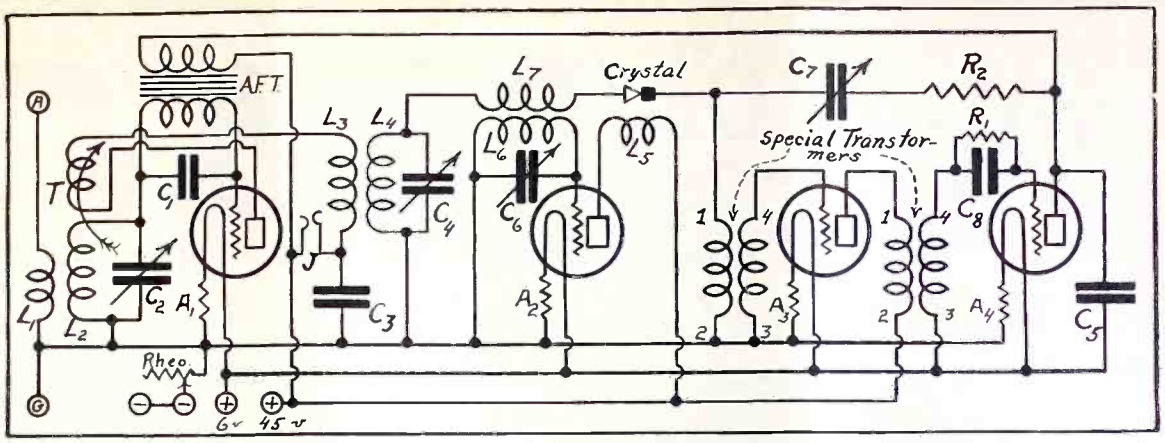


FIG. 201, showing the 4-Tube Super-Heterodyne. L1L2 is wound on tubing 3" in diameter with No. 22 DSC wire. Primary contains 10 turns and the secondary 43 turns. There is a separation of about ¼" between the two windings. T is wound on a 2" tubing, 2" high, with 40 turns of No. 36 DCC wire. L3L4 is wound on a spool 1" in diameter and 1" long. Primary consists of 20 turns and is wound next to the core. Over the primary are two layers of heavy wrapping. Over this, wind the secondary. There are 93 turns here. C2 and C4 are a double condenser (common rotor) with a capacity of .0005 mfd. L6 is the oscillating coil, which contains 43 turns of No. 24 DSC wire wound on a 3" tubing. L5 is wound on the same form, with the same size wire, 35 turns being used. L7 is wound on tubing 1½" in diameter with 50 turns of No. 36 DCC wire. The Inter-Frequency coils are wound on spools 1" long and 2" in diameter. The primary consists of 180 turns of No. 36 DCC wire. Over the primary are two layers of cloth. The secondary consists of 760 turns of same size wire as the primary. C6 is a .0005 mfd. variable condenser. C8 is a .00025 mfd. grid condenser. C1 is a .0005 mfd. condenser. C3 is a .001 mfd. condenser. C9 is a .0005 mfd. condenser. C7 is a midget variable condenser.

Crosley Super-Trirdyn.—Frank R. Thompson, Houston, Tex.

You should have a continuous lead-in.

* * *

A DIAGRAM of a 4-Tube Super-Heterodyne is requested.—D. T. Larksons, Chico, Cal.

See Fig. 201.

* * *

PLEASE answer these questions: (1) What is the difference between a grid condenser and a grid leak condenser? Which one of these should be used in the "1-Tube DX Set for the Novice," described by Percy Warren in May 23 issue of RADIO WORLD? I am going to use a Bretwood variable grid leak. (2) If when I stop operating the set, shall I disconnect the headsets or leave them inserted? (3) What wavelength will this set tune in?—John Sporna, Box 24, Escatawpa, Ala.

(1) They are both the same article. The Bretwood is O. K. (2) No. (3) 150 to 600 meters.

* * *

I AM about to build the Diamond of the Air, and intend using Bruno coils as I have two .005 low-loss condensers. (1) Can I use them with the above named coils, or will I have to change the coils to suit the condensers?—John M. Birmingham, 676 Myrtle Ave., Brooklyn, N. Y.

(1) It is advisable to change your condensers. They have too high a capacity.

* * *

WILL YOU please publish size of wire, diameter of coil and number of turns for Toroidal coil to be tuned by a .0005 mfd. condenser.—C. S. Gilbert, Box 3, Hollywood, Florida.

Use No. 24 DCC wire. Wind on a 1¼" tubing, 9" long. There are 195 turns wound. See August 22 issue of RADIO WORLD for complete toroidal coil data.

* * *

REFERENCE is made to "Byrt C. Caldwell's Reflex" wiring diagram of which was printed in June 14 issue of RADIO WORLD. (1) Can the following parts, as is, be used effciently: Fodu variocoupler, two tri-coil RF transformers and three DV3 tubes. The coupler having 7 single and 7-10's taps? (2) Should a connection to A— be indicated between the secondary of the first AFT and the primary of the second RFT? (3) Will the set operate with a loop by inserting an appropriate jack between the .005 condenser and secondary of the coupler? (4) Could this hook-up be built on a 13½"x6" panel, 5" baseboard, and work efficiently as a portable set?—William H. Jenkins, 146 West Louden St., Germantown, Philadelphia, Pa.

(1) Yes. (2) No. (3) Yes. (4) Yes.

* * *

IN REFERENCE to the Diamond of the Air in the August 29 issue of RADIO WORLD, would you be kind enough to tell me the proper ohmage of the rheostat controlling the detector and the audio-frequency tubes? (2) What is the voltage of the 2 C batteries?—Robert A. Masson, 13 Meade St., West Orange, N. J.

(1) This rheostat has a resistance of 6 ohms. (2) 4.5 volts apiece.

* * *

I AM contemplating the construction of Hayden's Handsome Portable as described in July 4 issue of RADIO WORLD. Without a doubt, condenser C1, is of .0005 capacity, but inasmuch as the Bruno condensers included in the kit for constructing the set have three capacities, I am uncertain of what capacity C2 should be.—Charles V. Ruden, Dallas, Texas.

C1 and C2 are both .0005 mfd. variable condensers.

IN THE August 29 issue of RADIO WORLD, there was published in the Radio University the "Freedom Reflex." The "Freedom Reflex," as was printed previous in the July 4 issue of RADIO WORLD, shows a .0001 mfd. capacity and the one in the University at .001 mfd capacity. Which is correct? (2) Can Freshman Masterpiece radio frequency tuning units be used in this hook-up?—A. W. Gustafson, 1075 Jessie St., St. Paul, Minn.

(1) C4 being a .001 mfd. condenser is correct. (2) Yes.

* * *

I AM going to build the Diamond. (1) How many feet and of what size wire should I use in constructing a loop for same? (2) Can I use an Amperite on the RF tube?—R. W. Deck, 406 Center St., Sandusky, O.

(1) 90 feet of No. 22 DCC wire. (2) Yes.

* * *

IN THE August 22 issue of RADIO WORLD a circuit called the "Electrostatic Regenerator," by Percy Warren, was published. Wiring the set according to the diagram in Fig. I, I get an open circuit hum, unless I connect the ground with the A+ and B— post, which connection is not shown on the diagram. Is this O. K.?—Milton M. Schuman, 575 N. Gay St., Baltimore, Md.

(1)—That is O. K.

"Bruno"
PATENT PENDING

MAG

Makes Any Circular-Plate Condenser Tur

A New Member of the Bru

The Bruno 1-Dial
Licensed Under the

The Lowest-Price Quality 5-Tube Set That Is Tuned by Only One Control!

"It Has a Soul for Music"

THE BRUNO MAGIC DIAL—MOULDED BAKELITE

Again has the genius of William A. Bruno triumphed. The noted radio engineer has designed a dial that widely separates the low-wavelength stations, so exasperatingly crowded on other dials, while maintaining wide separation on the high waves.

Tuning is made really simple on any set if the Bruno Magic Dial is used. The circular-plate (straight-line capacity) condensers thus are magically endowed with all the virtues of the straight-line frequency condensers!

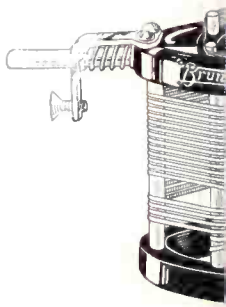
Instantly attachable to any condenser shaft — the lowest-price, highest quality and handsomest frequency type dial made!

$2.50

Dealers, Write for Terms on Dial, Powertone Set, Boxed Powertone Kit, Etc.

"77" Broadcast Tuner

This "Bruno" coil is wound on quartzite glass rods in the improved BRUNO method, as prescribed and used by the Bureau of Standards. When tuned with a .0005 condenser the coil gives a range of from 200 to 575 meters. The newly designed BRUNO pancake tickler allows regeneration to come on gradually without the usual howls and squeals. The BRUNO "77" mounts with a single screw and has a pleasing appearance, as the secondary winding is brilliant orange and the primary and tickler windings are deep green.....$5.50



Bruno Short W

This coil is the latest word in tuners for short-wave reception method of winding the primary copper and aluminum wire, which thus eliminating to a great ex pacity losses. When tuned with from 20 to 110 meters is obtai tener to receive the benefits of C.W. reception. A special featu the tickler which enables the re out any noticeable loss of the de

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IC DIAL

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The Kit for the 1-Dial Powertone
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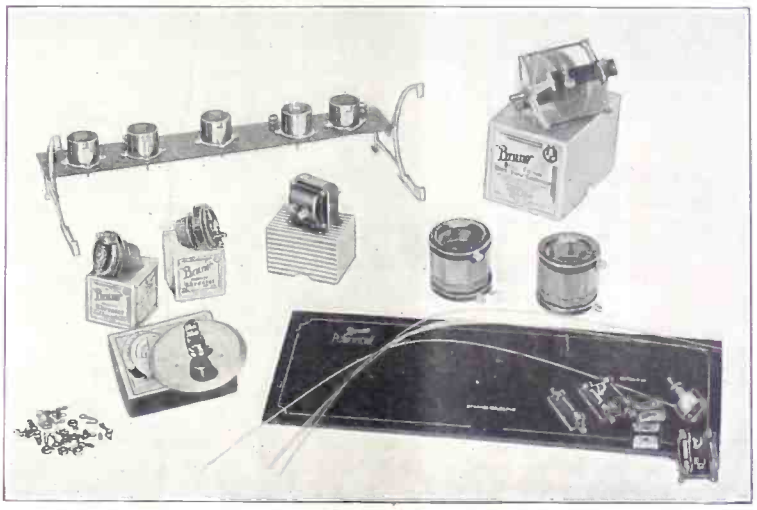
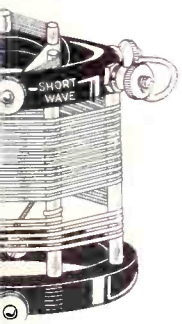


Two Bruno 99 RF transformers.
One Bruno No. 21 Ultra-Vario condenser.
One 7x18" drilled and engraved panel.
Two 20-ohm Bruno rheostats.
One Veby ballast resistor, ¾ amp.
Two .1 megohm Veby resistors.
Three Veby grid leaks: 2 meg., 1 meg., 5 meg.

Five fixed condensers.
One 4" vernier dial.
One AF transformer.
One filament-control jack.
One 5-gang Bruno socket strip.
Five sockets.
One pair of Bruno brackets.
Binding posts, lugs, bus bar.

$29.50



e Coil

low-loss design of 3-circuit
The special feature is the
secondary with flat rolled
spaced by a special method,
detrimental distributed ca-
00025 condenser a range of
which will enable the lis-
h regular transmission and
f this coil is the design of
ation to be controlled with-
wavelength.....$5.50

Bruno "55" Radio Frequency Transformer

This coil is matched with the BRUNO "77" so as to synchronize with the dial settings, thus permitting use of a single condenser to tune the both secondaries. The BRUNO method of winding on quartzite glass rods is used in this transformer which can be mounted in any position desired due to the brackets that come with each one..... $3.00

Bruno "99" Broadcast Tuner

This 3-circuit tuner is designed to cover the entire broadcast range of from 200 to 575 meters when tuned with a .0005 condenser but is smaller than the BRUNO "77" coil. This feature enables its use in portable sets and other receivers where the conservation of space is a necessary feature. The BRUNO quartzite glass method of winding is employed, which minimizes the losses. This tuner mounts with but one screw which is placed through the panel.....$5.50

CORPORATION
N STREET NEW YORK CITY

Meet Us at Booth 83, Grand Central Palace, and Get a Cardboard Bruno Log Dial FREE!

Fourth Annual Show Starts the 1926 Season

IRA GODING

J. C. JOHNSON

The Fourth Annual National Radio Exposition, Sept. 12 to 19, at Grand Central Palace, New York City, according to Harold Bolster, director of the exposition, opens the 1926 radio season. Mr. Bolster stated that the demand for tickets was nearly double that of last year.

All branches of the industry took great interest in the event. Thousands of retailers, manufacturers and radio fans will mingle to witness the great spectacle of radio progress spread before their eyes on three floors of the immense exposition building.

A Proving Ground

The National Radio Exposition assumed added significance because of the public's great interest in the simplification of receiving sets and their operation. Manufacturers exhibit for the first time many new devices at the exposition, and the public's approval or disapproval will determine the policy of the manufacturer in offering new equipment. The exposition will be a proving ground for the manufacturer, where he will be able to determine with a fair degree of accuracy what types of sets and apparatus will prove popular during the coming season.

Program of Features

Remarkable demonstrations of the use of radio will be made daily. On Sept. 12 (Saturday) the exposition will be opened by a message broadcast from London by the Duke of Sutherland, which will be picked up and made audible to the visitors at the exposition. The Duke of Sutherland is president of the Radio Association of Great Britain. If weather conditions are favorable the message will be picked up by fans in general.

Other novel demonstrations of the growing uses of radio will emphasize the great progress being made. A radio-controlled automobile will wind its way about the third floor; a radio-controlled airplane will hover over the exposition building; motion pictures that speak as well as move will be exhibited; the photograph of a prominent public official speaking in Washington will unfold itself upon a huge screen through the agency of radio as the words of the speaker are picked out of the air and made audible to the visitors at the exposition.

Radio Fashion Show

An outstanding feature of the exposition will be the broadcasting of 1926 fashions that will be exhibited daily on the third floor an hour in the afternoon and an hour in the evening. Leading importers, as well as domestic style creators, are taking part in the affair. Beautiful mannequins, artists' models and film stars will appear in the style pageant. It is expected that thousands of women in the metropolitan and surrounding territory will tune in to hear the last word in style trends.

A large stage was constructed on the third floor of the exposition building in the form of a huge radio set, 60 feet long. The models emerge from a huge speaker and walk upon the set.

Women's Clubs to Participate

Miss Anne Morgan and Miss Robinson Smith, officers of the American Woman's Association, which is planning to construct a $5,000,000 clubhouse, will broadcast on Thursday, Sept. 17, messages telling about the growing importance of radio in the home. Other prominent members of the woman's association will appear on Thursday, which will be known as Woman's Day. Marie Dressler, the commedienne, and Vaughn de Leath will be on the program.

Many other civic and social organizations are co-operating to furnish an elaborate program of entertainment at the exposition. The Boy Scouts will stage drills and other demonstrations and prominent stage and screen stars, as well as radio artists and announcers, will take part in entertainments.

Educational Exhibits

In addition to the many exhibits of manufacturers displaying their latest designs and models educational exhibits will be placed on the third floor to acquaint the public with some of the mysteries of radio transmission. A complete sending station will be set up and the transmission of a radio program will be demonstrated to the public. The intricate control devices will be placed in full view, with an attendant in charge to explain their operation.

Public Interest

The National Radio Exposition is a leading event in radio circles. With the approach of Fall, renewed interest in radio is springing up and because of the central location of Grand Central Palace, it is expected that the immense exposition building will be jammed throughout the eight days the exposition is in session.

Radio fans in New York are focusing their attention on amateur events to be staged at the exposition, to be held under the auspices of the Second District Executive Radio Council, which comprises in its membership the chief amateur clubs in the second broadcasting district. Hundreds of dollars in cash, silver cups and radio sets will be distributed to the participants in the contests.

Industry's Support

The industry is co-operating to make the exposition a grand success. The leading New York newspapers and radio magazines, took booths and planned to run special radio sections during the exposition. Local broadcasting stations will send out the features of the program to thousands of listeners-in. Practically all the leading radio manufacturers have reserved space at the exposition.

The show is being run by the American Radio Exposition Co., Inc., J. C. Johnson, general manager, and Ira Goding, sales manager.

DATE FOR CHEMICAL SHOW

The tenth exposition of Chemical Industries, with a special radio display, will be held in Grand Central Palace, New York City, September 28 to October 3. Eismer & Amend, Third Avenue and 18th Street, New York City, will have a specially fine display.

BATTERY MAKERS TO MEET

The September meeting of the National Battery Manufacturers' Association will be held on Friday and Saturday, September 18 and 19, at the Hotel Roosevelt, New York City.

WHAT'S NEW THIS FALL IN PRODUCTS

By P. E. Edelman

Electrical Engineer

What is new this Fall in radio? Not basically so much, perhaps, but there are many refinements. Touching some of the high spots after looking in at the laboratories and factories of some of the best-known factors in the industry, here is a summarized outline of improvements:

Sets

This is expected to be a year of 6-tube sets. Some will run to eight tubes, because tubes are lower priced. Appearance is the main concern of many this Fall. There will be an absence of panels marred by machine screws and plenty of fancy panels with beautiful controls, including some with photo-engraved gold design and dial etchings. Cabinets run to handsome furniture, even in models ranging below $100 list. Circuits are basically the same with improved stabilization control. Sets are on a production basis, with several models using stamped bus wiring, riveted fastenings, and press work products. The loft factory days of radio are passing. Price range is decidedly lower, some lists reading like jobbers' net cash prices 18 months ago. A few sets will have impedance audio amplification and some resistance amplification stages. Many sets will have straight-line frequency condensers exclusively. A few will have balancers to make up for variations in tubes.

Tubes

Several new names will appear on the tube market and the big group will bring out a few new models. Increasing use of the new base will follow. The AC tube may be a factor, especially if improved The greatest need of radio today is more uniform standardized tubes. Lists are expected to settle at $2 50 per tube.

Batteries

Chemical improvements increasing shelf life and improved discharge rate are noticed in dry cells. One maker is offering a battery assembled with flat type plates. Storage battery makers are bringing out small ampere hour sizes for use with low rate or trickle type chargers.

Condensers

Straight-line types have the run this Fall. One novelty is a cam spiral control condenser using square plates. Condensers are made with balancer plate to assist matching radio stage tuning and make up for coil differences. Two and three gang types with single dial control are being made in quantities.

Eliminators

There are numerous B eliminators offered, also a few A and B eliminators. These run somewhat high in list price. Eliminator kits are also offered for home assemblers. This is an eliminator year.

Loops

Several refined loops appear, some with basket and banked windings.

ZBINDEN WITH GLEASON CORP.

H. J. Zbinden has severed connections with the Barawik Co. to take charge of production for the Gleason Corp. 559 West Monroe St., Chicago, manufacturers of straight-line frequency and midget condensers.

What the Show Will Reveal in Design and Style of Sets

By J. C. Johnson

General Manager Fourth Annual National Radio Exposition

The principle in radio development that has received major attention from radio engineers during the last twelve months is termed in engineering circles acoustic synchronization. The inflections of the human voice, it is explained, and the vibrations of the musical scale, occupy an acoustical frequency of from 16 to 10,000 vibrations per second. The transmission of speech or music from the broadcasting station, on the other hand, is within a frequency of 140 to 6,900 vibrations per second. The task of co-ordinating or synchronizing the acoustical elements at the transmitting and receiving ends of the radio circuit has been accomplished this year to a remarkable degree.

Loudspeakers Up to $250

The result of these developments is that leading radio manufacturers of the Uniten States are bringing out loudspeaker units in some cases almost as elaborate as the sets themselves. One of the new loudspeakers to be shown at the exposition includes transformers, filters, chokes, rectifier tubes and amplifier tubes. When used in connection with a certain type of set it may be employed also to energize the grid, plate and filament circuits, thus constituting a complete AC operated set.

So amazing have been the results attained in acoustical synchronization that for the first time the feat will have been achieved this year of reproducing in the home an orchestra or a concert with the original volume and yet without the least distortion. Because of the extraordinary volume thus obtainable some of the loudspeakers will be furnished with long cords, of as much as fifty feet, so that the loudspeaker may be placed at this distance from the receiver.

Vacuum Tubes

A new super-power amplifier tube, designed for AC lighting mains, will attract a large amount of technical and popular attention at the Fourth Annual National Radio Exposition. Intensive research, it is said, has developed the fact that the employment of a powerful amplifying tube in the last audio stage will result in revolutionary improvement in volume and in the quality of reproduction.

Other tubes, designed in some cases for storage battery operation and in other cases for dry battery use will result in a remarkable improvement in reception this year, it is claimed.

Sets Operate Off Main

Notwithstanding the progress made in meeting the problem of utilizing alternating house current in the operation of radio receivers there is no immediate sign that either storage or dry batteries are likely to be displaced to a very large extent. Some of the larger radio manufacturers who have been developing radio receivers which would require no batteries whatsoever will this year for the first time place sets on the market that will operate on AC current, and which, it is declared, will be free from all hum characteristic of house current. One set will include a glow lamp and a ballast lamp in its circuit which will automatically control filament and plate current and also the fluctuations of the AC lighting current. These sets are necessarily in the higher price ranges.

Single Control Sets

Many leading manufacturers this year will place on the market uni-controlled sets. In most of these cases the tuning condensers in the first three radio frequency stages are operated by one control knob, thus enabling one station after another to be reproduced merely by moving the control throughout its scale. For extremely long distance reception there is an added regeneration control whereby the additional sensitivity and selectivity provided by regeneration is brought into play.

Other Features

New and improved styles of battery eliminators designed to provide plate voltages for any type of radio receiver will be brought out this year. There is practically no unit in radio receiving sets that will not be represented by new designs at the exposition. Grid leaks have been made airtight so that they are free from the influence of moisture; a new special steel has been utilized in making condenser coils, and new design in battery construction will make them more efficient and of longer life.

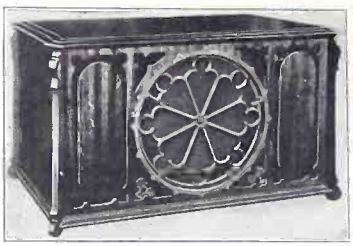
In the Home

The place that radio is expected to occupy in the home this year is reflected in the many beautiful cabinet designs that will be shown for the first time. A leading manufacturer of the Neutrodyne group will show a five-tube set in a cylindrical cabinet, little larger than a clock.

A SET manufacturer's plant these days is an imposing looking place, reflecting the enormity of the industry. The photo shows workers assembling condensers. Radio gives employment to many thousands of such workers. (Fotograms).

NO DIALS ON THE NEW L-3 ULTRADYNE

By M. L. Muhleman



The L3 Ultradyne.

R. E. Lacault, chief engineer of the Phenix Radio Corporation, has designed a set conspicuous for its absence of knobs and dials and prominent for its absence of mechanical appearance.

The photograph shows a front view of this new set, the Model L3 Ultradyne. The circular grill conceals the speaker horn, which is directly behind it, and serves as a scaling for the two station finders that run along its periphery.

These station finders, the only tuning controls, are levers with small handles at their ends. You cannot see the levers but the small handles are visible near the top of the grilling.

All one has to do to tune the set is to grasp these two handles and move them upwards or downwards until he hears the station he wants. The periphery is calibrated.

Nature of Controls

There is a volume control, operated by a small knob, just to the right of the grill so that one can have his program rendered soft, medium or loud, as he may wish. When this knob is turned full to the left the A battery circuit is opened, thus the set is placed out of operation.

A small jack mounted to the left of the grill serves as a head phone connection and when a plug is inserted the loud speaker is automatically disconnected.

The cabinet is made of 5-ply mahogany veneer and is a rich brown color. It is 24 inches long, 14 inches high and 14 inches deep.

This set utilizes six vacuum tubes of the storage battery type. Three of them function as radio-frequency amplifiers, one as the detector and two as the audio-frequency amplifiers. The filaments of the tubes are controlled automatically.

Two of the radio-frequency stages are tuned and the third is fixed. A resistance system of tube stabilization is employed, which prevents these circuits from oscillating at resonance points.

Use SLW Condensers

The "bunching" of stations of low wavelength within a small area on the scales, has been eliminated by the use of the Ultra Low-loss variable condensers which have a straight-line wavelength curve. The wavelengths are evenly distributed over the entire scale readings.

The speaker unit is specially designed to have the same impedance value as that of the audio-frequency stages. This electrical matching eliminates distortion and at the same time increases the output volume.

Either an indoor or an outdoor aerial can be used with the new Ultradyne, in fact a wire run around the moulding of a room is highly satisfactory for average purposes.

Second Radio World's Fair Opens Monday With a Bang

The second great Radio World's Fair opens Monday, September 14, in the 258th Field Artillery Armory, New York City, the largest auditorium on earth.

The second Radio World's Fair pays testimony and tribute also to the interest now displayed by the women of the country, in fact, in all lands, in radio. They now look upon radio as an indispensable factor in their homes, for the entertainment and information that comes through the other and, as amply demonstrated by the competition to determine the Radio Diana, are experts in tuning in far distant stations and writing their impressions of what radio means to them and to mankind as a whole.

A contest to select the Radio Diana will be determined. This has proven the most popular ever conducted in connection with the new science and the winners of first, second and third prizes will win national and international honors. The winner will come to New York to be presented with a silver cup by Gov. Alfred E. Smith, who will open the exposition on the evening of Sept. 14, on behalf of the management and the radio fans of the United States.

Gov. Smith's address will deal with radio's contribution to the cause of good government and general enlightenment. It will be broadcast.

Much Broadcasting

The second Radio World's Fair will be notable for the broadcasting of special features. The metropolitan stations will participate in this, the most elaborate program of its kind ever arranged by a radio show. The immense size of the armory permits each station to have a studio and reception room where well-known announcers and artists will meet their hitherto invisible friends.

In the center of the armory will be a glass enclosed broadcasting studio, in use at all hours, that everyone may see as well as hear the artists and speakers. J. Andrew White will be director of broadcasting.

The second Radio World's Fair is the official show of the Radio Manufacturers' Association, 300 members of which will participate in the conferences and discussions at the exhibition. They will meet nearly 5000 dealers and jobbers, who have accepted invitations to attend the fair. Some will come from west of the Mississippi.

Industry Lends a Hand

Executives and employes of radio factories and salesmen from a thousand stores will also participate. One hundred large industrial concerns are distributing tickets among their employes.

The usual set-building contests for amateurs, code competitions for the "hams," and the other regular features of a radio show are on the program.

The amateur operator who heard the MacMillan Expedition most times will be presented with a silver cup on Sept. 18. Nightly communication will be maintained with MacMillan from the fair.

Probably on opening night Graham McNamee, popular announcer, will be awarded a gold cup emblematic of 1925 honors he won in a contest.

The 258th Field Artillery Armory is located at Kingsbridge Road and Jerome Avenue.

The big fair will be open to the general public from 1 to 11 P. M. daily and, as in 1924, the exclusive "jobbers and dealers' hours" will be from 11 A. M. to 1 P. M. daily.

The Army and the Navy will have elaborate exhibits of apparatus, old and new.

Diplomatic and consular representatives of thirty nations will be guests, and many of them will take special pride in exhibits from their own countries. Stage and screen stars will be present at all sessions.

It is due to the far-seeing and painstaking efforts of U. J. Herrmann, managing director, and his associates in various capacities, that such a splendid opportunity is given to the public to see all that is new and much that made previous history in radio. Closely identified with Mr. Hermann was an experienced show director, James F. Kerr, whose death last June stunned friends from one end of the country to the other. On August 1 Clay Irwin was appointed general manager to fill the vacancy. Mr. Irwin has become a partner of Mr. Herrmann in the management of the annual Radio World's Fair and the Chicago Radio Exposition, the fourth of which will be held in November.

Clarostat and Clarotuner

When you've been in the radio game for quite a long time, and you've become pretty much hardened to "new" devices, and you suddenly run across a little instrument that makes you sit right up and take notice—well, that's worth a story. Hence this tale about the Clarostat and its cousin the Clarotuner, both products of the American Mechanical Laboratories of Brooklyn, N. Y.

The first stop on the tour through the factory was at a unique demonstration board. Meters are so rigged on this testing machine that the comparative functioning of a Clarostat and any other variable resistance is seen at a glance. A portion of this board is reserved for the same kind of visual test of the Clarotuner in competition with any other similar tuning device. It's all very simple after you get the hand of the thing.

To make a long story short, the Clarotuner brought the circuit right up to the oscillation point, right up to within a very shade of it, and held it there. No trouble at all—but just the same the other tuning units sort of put their tails between their legs and gave it up for a bad job. The Clarostat did its job like a man, too. The dials showed a remarkably gradual resistance change when the knob was turned. Other resistance devices were noticeably jerky.

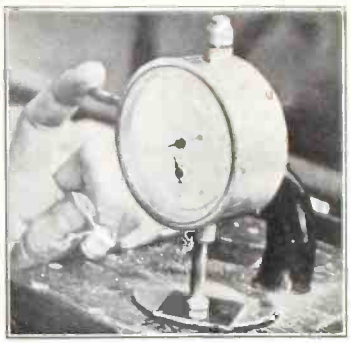
The reason for the results just noted became obvious at the next stop, where a Clarostat had been opened up and its parts scattered about on a display board. The precision manufacture apparent in all the parts, from the main spindle to the smallest stamping, would do credit to a watch. It all just goes to show that, even in radio, it's worth doing things well.

Tested and Approved by RADIO WORLD Laboratories

C. S. ANDERSON IN NEW POST

C. S. Anderson, managing editor of the first radio magazine in this country, "The Wireless Age," has accepted a similar position with the Waverly Co., 45 Rose Street, New York City, since the consolidation of "Wireless Age" with "Popular Radio." Mr. Anderson in his new field of activity manages a service intended to help publishers and advertisers in their publishing and printing requirements.

Condenser Test



WHEN a mica fixed condenser is carefully made the thickness of the mica is measured with a meter and voltage is applied for electrical test.
(International Newsreel)

WORLD BATTERY STATION READY TO OPEN UP

Making its maiden bow and bid for popular favor is the 1000-watt broadcast transmitter sponsored by the World Battery Company of Chicago, operating under station call letters WSBC, on 210 meters, and constructed by the engineers of that concern. The World Battery Company Transmitter, as the new outfit is officially designated, is novel in many respects. The power for the operation is supplied entirely by storage batteries, made up of identically the same materials as are used in the standard, stock batteries supplied to radio users for the operation of receiving sets. The B or tube plate supply of 2,400 volts is furnished by the equivalent of over 400 ordinary receiving 6-volt A batteries made up of the same parts that are used in the unit familiar to all radio fans. By an ingenious switch arrangement these can be connected in straight series to operate the set or in series parallel for charging.

The C or biasing batteries as well as those used for the microphone circuits are made up of the parts used in the standard 24-volt units such as are used for the B supply in receiving sets.

The new station will be located on the roof garden of the New Southern Hotel, 13th Street and South Michigan Avenue, Chicago, and will be on the air every night beginning September 15.

THE RADIO TRADE

Exports More Than Double For the First Half of the Year

WASHINGTON.

Exports of radio equipment from the United States during January to June, 1925, inclusive, totalled $4,068,442, an increase of $2,242,196 over the total of $1,826,246 for the same months of 1924, according to the Electrical Equipment Division of the Department of Commerce. The marked growth which is taking place in the exports of radio apparatus from the United States is further evidenced by a comparison of shipments of $6,050,914 during the entire year of 1924 with those of the first six months of the current year which amounted to $4,068,442. Thus radio exports for the first half of 1925 reached approximately 68 per cent of the 1924 total.

Although exports of radio apparatus for each of the first six months of 1925 have not always exceeded those of the preceding month, they have consistently been considerably in excess of the shipments made during the same month of 1924. The largest increase during the same months of 1924 and 1925 occurred in April, exports totalling $229,903 and $853,148 respectively. Average monthly exports for the first six months of 1925 are $678,074, an increase of $373,700 over the monthly average of $304,374 for the corresponding period of 1924.

During the first six months of 1925, Europe and Canada maintained their position as the most important foreign markets for radio apparatus of American origin. Shipments to Europe during the first six months of the current year totalled $674,571, an increase of $429,038 over the corresponding period of 1924 and an increase of $146,419 over the entire year of 1924.

Great Britain and Spain were the leading European markets during the first half of the current year, while for 1924, Great Britain ranked first and Sweden second. Exports of radio apparatus to Great Britain during the first six months of 1925 were almost twice those made during the entire year 1924, due largely to the lifting of the radio ban in that country on January 1, 1925. Shipments to Spain during the first half of 1925 were also almost twice those of the entire preceding year. This volume of business has been built up by American radio manufacturers and exporters through the sale of quality goods, and although European radio manufacturers have been competing in this market, the purchasers have consistently preferred sets and parts of American origin.

Coming Events

SEPT. 12 to 19—Fourth Annual National Radio Exposition, Grand Central Palace, N. Y. C. Write American Radio Exp. Co., 522 Fifth Ave., N. Y. C.

SEPT. 14 to 19—Second Radio World's Fair, 258th Field Artillery Armory, Kingsbridge Road and Jerome Ave., N. Y. C. Write Radio World's Fair, Times Bldg., N. Y. C.

SEPT. 14 to 19—Pittsburgh Radio Show, Motor Square Garden. Write J. A. Simpson, 420 Bessemer Bldg., Pittsburgh, Pa.

SEPT. 14 to 19—Radio Show, Winnipeg, Can., Canadian Expos. Co.

SEPT. 21 to 26—First Annual Radio Expos., Broadcast Listeners' Association, Cadle Tabernacle, Indianapolis, Ind. Write Claude S. Wallin, Hotel Severin.

SEPT. 21 to 29—International Radio Exposition, Steel Pier, Atlantic City, N. J.

SEPT. 28 to Oct. 3—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearnborn St., Chicago, Ill.

SEPT. 28 to OCT. 3—Midwest Radio Week.

OCT. 3 to 10—Radio Exposition, Arena, 46th and Market Streets, Philadelphia, Pa., G. B. Bodenhof, manager, auspices Philadelphia Public Ledger.

OCT. 5 to 10—Second Annual Nortbwest Radio Exposition, Auditorium, St. Paul, Minn. Write 515 Tribune Annex.

OCT. 5 to 11—Second Annual Radio Show, Convention Hall, Washington, D. C. Write Radio Merchants' Association, 233 Woodward Bldg.

OCT. 10 to 16—National Radio Show, City Auditorium, Denver, Colo.

OCT. 12 to 15—Radio exposition, Post-Dispatch (KPRC), Houston, Tex.

OCT. 12 to 17—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

OCT. 12 to 17—St. Louis Radio Show, Coliseum. Write Thos. P. Convey, manager, 737 Frisco Bldg., St. Louis, Mo.

OCT. 12 to 17—Radio Show, Montreal, Can., Canadian Expos. Co.

OCT. 17 to 24—Brooklyn Radio Show, 23d Regt. Armory. Write Jos. O'Malley, 1157 Atlantic Ave., Brooklyn, N. Y.

OCT. 19 to 25—Second Annual Cincinnati Radio Exposition, Music Hall. Write to G. B. Bodenhof, care Cincinnati Enquirer.

OCT. 26 to 31—First Annual Rochester Times-Union Radio Exposition, Convention Hall, Rochester, N. Y. Write Howard H. Smith, care Times-Union.

NOV. 2 to 7—Radio Show, Toronto, Can., Canadian Expos. Co.

NOV. 3 to 8—Radio Trade Association Exposition, Arena Gardens, Detroit. Write Robt. J. Kirschner, chairman.

NOV. 19 to 25—Milwaukee Radio Exp., Civic Auditorium. Write Sidney Neu, of J. Andrae & Sons, Milwaukee, Wis.

NOV. 17 to 22—4th Annual Chicago Radio Exp., Coliseum. Write Herrmann & Kerr, Cort Theatre Bldg., Chicago, Ill.

Literature Wanted

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

Trade Service Editor,
RADIO WORLD,
1493 Broadway, New York City.

I desire to receive radio literature.

Name .....

City or town.....

State .....

Are you a dealer?.....

If not who is your dealer?

His Name .....

His Address .....

S. W. Sullivan, Erie, Pa.
W. M. Dodd, 274 N. 24th St., Portland, Ore.
W. A. Schulze, 582 20th St., Milwaukee, Wis.
Nelson Greer, Lake Wood Park, Lake View, Ia.
Ralph N. Chambers, 619 5th St., Albion, Neb.
J. D. Boyd, Fayetteville, N. C.
Lavex Chemical Co., Kansas City, Mo. (Dealer).
Edward A. Lambert, 2122 Park Ave., Chicago, Ill.
John Hartl, 1910 South K St., Tacoma, Wash.
R. F. Scheibeck, 244 Locust St., Chillicothe, O. (Dealer).
Edwin J. Wall, 917 Gates Ave., Brooklyn, N. Y.
H. Younger, Weseyville, Pa.
Frank Adams, 1830 Post St., Jacksonville, Fla.
V. J. Stolte, South Amboy, N. J.
Thomas E. Jackson, 820 Harrison St., Indianapolis, Ind.
H. A. Worden, 10 W. 3rd St., Tulsa, Okla.
Adolph Souchek, Bladen, Neb. (Dealer).

A 1926 Show Planned

The International Radio Exposition, which is to be a brand new type of industrial exhibition, is scheduled to take place in New York City early next year under the management of Calvin Harris, who recently resigned as Publicity Director of the second Radio World's Fair and the fourth Annual Chicago Radio Show. The dates will be January 25 to 30, 1926, but the location has not yet been selected. If satisfactory arrangements can be made the show will take place in the Ringling-Rickard Garden now under construction.

The new enterprise primarily will be devoted to the interests of the general public. There will be twelve selected manufacturers' exhibits.

NEW CORPORATIONS

Mackenzie Radio Corp., N. Y. City, $50,000; P. B. Klugh, I. C. Gaverick, M. E. Schafer. (Attys., Bash & Kulkin, 1,265 B'way, N. Y. City).

Walcome Radio Mfg. Co., N. Y. City, $10,000; H. Weedenbaum, M. J. Kanin, G. Weiss. (Atty., G. F. Frankel, 19 West 44th St., N. Y. City).

Rexco Corp., radio, N. Y. City, 200 shares, $10 each; 200 common, no par; I. F. Seigler, A. N. Feinberg, W. R. Lightfoot. (Attys., Jones & Weuberger. 115 B'way, N. Y. City).

Radio Grand Corp., N. Y. City, radio, $10,000; B. J. Greenbaum, M. W. Weintraub, L. W. Graham. (Atty., M. Neufield, 291 B'way, N. Y. City.)

McPhilbeen Radio Corp., Jamaica, N. Y., 750 shares, $11 each, to 1000 common, no par, and 700, $100 each.

THE KEY TO THE AIR

KEY

Abbreviations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard Time; DS, Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the list published herewith. See what time division the station is under (EST, CST, etc.); then consult the table below. Add to or subtract, as directed from the time as given on the PROGRAM. The result will be the same BY YOUR CLOCK that you should tune in, unless daylight saving time intervenes, as explained below.—The table:

If you are in	*And want station in*	*Subtract*	*Add*
EST	CST	..	1 hr.
EST	MST	..	2 hrs.
EST	PST	..	3 hrs.
CST	EST	1 hr.	..
CST	MST	..	1 hr.
CST	PST	..	2 hrs.
MST	EST	2 hrs.	..
MST	CST	1 hr.	..
MST	PST	..	1 hr.
PST	EST	3 hrs.	..
PST	CST	2 hrs.	..
PST	DST	1 hr.	..

If you are under DST and the station you want is under that time, too, or if both are under ST, the above table will hold.

If you are under DST, and the station operates under ST, add one hour to the table result.

If the station uses DST, and you are under ST, subtract one hour from the table result.

FRIDAY, SEPTEMBER 11

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 to 1:05 PM; 8 to 12 PM.
WAMD, Minneapolis, Minn., 243.8 (SCT)—12 to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 to 10 PM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—7:30 PM to 11:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 10.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 to 7 M; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 8 to 11.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—9 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 11.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15; 8 to 11.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8:30 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—12:30 PM to 1; 2:15 to 5; 7 to 11; 12 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7 PM to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:50; 6 to 7.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 10:30.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 AM.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15; 1:30 PM to 2:30.
WMCA, New York City, 341 (ESTDS)—11 AM to 12M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:45 PM to 4:45; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1; 5:45 to 7:10; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 12.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 8:30; 10 to 12.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WRC, Washington, D. C., 469 (EST)—4:30 PM to 5; 6:45 to 12.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:45.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10; 12 PM to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:20 PM; 1:30 to 3:20; 3:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFDY, Brookings, S. D., 273 (MST)—8 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 10.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:10 AM to 1 PM; 1:30 to 3; 4 to 7.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:30 PM; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—10:30 AM to 11:30 AM; 1 PM to 6:30; 8:30 to 11.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 8:45; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7:30 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—4 PM to 5.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:20 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 AM.
CNRA, Moncton, Canada, 313 (EST)—8:30 PM to 10:30.
CNRE, Edmonton, Canada, 516.9 (MST)—8:30 PM to 10:30.
CNRS, Saskatoon, Canada, 400 (MST)—2:30 PM to 3.
CNRT, Toronto, Canada, 357 (EST)—6:30 PM to 11.

SATURDAY, SEPTEMBER 12

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 to 2 AM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 1 AM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—10:45 AM to 12M; 3 PM to 4; 6:30 to 7:30.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12:30 PM; 2:30 to 5; 6 to 10.
WEAF, New York City 492 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7 AM.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEMC, Berrien Springs, Mich., 286 (CST)—11 AM to 12:30 PM; 8:15 to 11.
WFAA, Dallas, Texas, 475.9 (CST)—12:30 PM to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 AM.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 12.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—8:45 to 10:15 PM, U. S. Army Band.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:30 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 7:30 to 10.
WHO, Des Moines, Iowa, 526 (CST)—11 AM to 12:30 PM; 4 to 5:30; 7:30 to 8:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30.
WJY, New York City, 405 (ESTDS)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (ESTDS)—9 AM to 12:30 PM; 2:30 to 4; 7 to 10.
WKRC, Cincinnati, O., 326 (EST)—10 to 12 M.
WLWC, Cincinnati, O., 422.3 (EST)—9:30 AM to 12:30 PM; 7:30 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—10:25 AM to 12:30 PM.
WMCA, New York City, 341 (ESTDS)—3 to 5 PM; 6:30 to 2.
WNYC, New York City, 526 (ESTDS)—1 to 3 PM; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—10 AM to 1; 2:15 to 4; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 5:45 to 7:10; 9 to 12.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30; 8 to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WPG, Atlantic City, N. J., 299.8 (CST)—7 PM to 12.
WRC, Washington, D. C., 469 (EST)—4:30 to 5:30 PM; 6:45 to 12.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 12.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:30; 12 M to 1 AM.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 3 to 4; 5 to 6; 10:45 to 12.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10; 11:55 to 1:30 PM; 3 to 4.
KDKA, Pittsburgh, Pa., 309 (EST)—10 AM to 12:30 PM; 1:30 to 6:30; 8:45 to 10.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 268 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10:30.
KFOA, Seattle, Wash., 455 (PST)—Silent.
KGO, Oakland, Cal., 361.2 (PST)—11 AM to 12:30 PM; 3:30 to 5:45; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 6 to 7; 10 to 11.
KHJ, Los Angeles, Cal., 405.2 (ESTDS)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
KJR, Seattle, Wash., 484.4 (PST)—1 PM to 2:45; 6 to 6:30; 8:30 to 10.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 6:30 to 2 AM.
KOA, Denver, Colo., 322.4 (MST)—11:30 AM to 1 PM; 7 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—8 AM to 12M; 2 PM to 3; 6 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 8:30.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CSTDS)—11 AM to 12:30 PM; 4 to 5; 7 to 8.
CKAC, Montreal, Canada, 411 (EST)—4:30 PM to 5:30.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7:30 PM to 10.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, SEPTEMBER 13

WBBM, Chicago, Ill., 226 (CST)—4 PM to 6; 8 to 10.
WBBR, New York City, 272.6 (ESTDS)—10 AM to 12 M; 9 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—11 AM to 12:30 PM; 4:10 to 5:10; 7:30 to 10.
WDAF, Kansas City, Kansas, 365.6 (CST)—4 PM to 5:30.
WEAF, New York City, 492 (ESTDS)—3 PM to 5; 7:20 to 10:15.
WEAR, Cleveland, O., 390 (EST)—3:30 PM to 5; 7 to 8; 9 to 10.
WFBH, New York City, 272.6 (ESTDS)—5 PM to 7.
WGBS, New York City, 316 (ESTDS)—3:30 PM to 4:30; 9:30 to 10:30.
WGCP, New York City, 252 (ESTDS)—8 PM to 11.
WGN, Chicago, Ill., 370 (CST)—11 AM to 12:45 PM; 2:30 to 5; 9 to 10.
WGR, Buffalo, N. Y., 319.5 (EST)—9:30 AM; 7:15 to 8 PM.
WGY, Schenectady, N. Y., 379.5 (EST)—9:30 AM to 12:30 PM; 2:35 to 3:45; 6:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—3:15 PM to 4:15.
WHN, New York City, 360 (ESTDS)—1 PM to 1:30; 3 to 6; 10 to 12.
WHT, Chicago, Ill., 238 (CSTDS)—9:30 AM to 1:15 PM; 5 to 9.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—10:45 AM to 12:30 PM; 4:15 to 5:30.
WKRC, Cincinnati, O., 326 (EST)—6:45 PM to 11.
WMCA, New York City, 341 (ESTDS)—11 AM to 12:15 PM; 7 to 7:30.
WNYC, New York City, 526 (ESTDS)—9 PM to 11.
WOCL, Jamestown, N. Y., 275.1 (EST)—9 PM to 11.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—10:45 AM to 12:30 PM; 2:30 to 4.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—3:15 PM to 5; 9 to 11.
WQJ, Chicago, Ill., 448 (CST)—10:30 AM to 12:30 PM; 3 PM to 4; 8 to 10.
WREO, Lansing, Michigan, 285.5 (EST)—10 AM to 11.
WRNY, New York City, 258.5 (ESTDS)—3 PM to 5; 7:59 to 10.
WSBF, St. Louis, Mo., 273 (CST)—9 to 11 PM.
WWJ, Detroit, Mich., 352.7 (EST)—11 AM to 12:30 PM; 2 to 4; 6:20 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 10:30; 11:55 to 12 M; 2:30 PM to 5:30; 7 to 11.
KFNF, Shenandoah, Iowa, 266 (CST)—10:45 AM to 12:30 PM; 2:30 to 4:30; 6:30 to 10.
KOA, Denver, Col., 322.4 (MST)—10:55 AM to 1 PM; 4 PM to 5:30; 7:45 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—11 AM to 12:30 PM; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—10:30 AM to 12:30 PM; 6 to 9.
KHJ, Los Angeles, Cal., 405.2 (ESTDS)—10 AM to 12:30 PM; 6 to 9.
KJR, Seattle, Wash., 384.4 (PST)—11 AM to 12:30 PM; 3 to 4:30; 7:15 to 9.
KTHS, Hot Springs, Ark., 374.8 (CST)—11 AM to 12:30 PM; 2:30 to 3:40; 8:40 to 11.

MONDAY, SEPTEMBER 14

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.

WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 M to 1:05 PM; 8 to 2 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—10 PM to 12.
WBBM, Chicago, Ill., 226 (CST)—6 PM to 7.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM 11:30.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 12.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 11:30.
WEAR, Cleveland, O., 300 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (EST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:18; 8 to 10:45.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:30 PM; 2:30 to 4:30; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 8:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:15 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30, 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 1; 2 to 3; 4:30 to 6; 7:30 to 11:30.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—8 PM to 12.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:15 PM to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 to 4; 6:15 to 11:30.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:30 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10:30; 12 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:45 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—9 AM to 10:30; 11:30 AM to 1 PM; 1:30 to 6; 6:45 to 7; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 10.
KJR, Seattle, Wash., 384.4 (PST)—1 PM to 2:45; 6 to 6:30; 7 to 11.
KNX, Hollywood, Cal., 337 (PST)—12 M to 1 PM; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 10.
KPO, San Francisco, Cal., 429 (PST)—10:30 AM to 12 M; 1 PM to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7:30 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10.

With
IRVING HOFFMAN
at

WMCA

Hotel McAlpin, New York, N. Y.

AV. LLUFRIO CHIEF ANNOUNCER AND STUDIO DIRECTOR.


SNEDDEN WEIR, ANNOUNCER, WAS FORMERLY WITH ROXY AND HIS GANG.


RALPH C. POWELL, CHIEF OPERATOR FORMERLY WROTE FOR RADIO WORLD.


MISS HELEN A. MORRIS, HOSTESS AND ACCOMPANIST, HAS A FINE SOPRANO VOICE.


JOSEPH WEBER, A SPLENDID SINGER AND ALL-AROUND PERFORMER.

MISS LINA LANZA, POSSESSOR OF A MOST BEAUTIFUL VOICE.


MARY MOODY, MISS LANZA'S TEACHER IS A MASTER OF PIANO TONE AND TECHNIQUE.

KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 3:30; 6:02 to 7.

TUESDAY, SEPTEMBER 15

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 PM to 1:05 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 12.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 10.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 7 to 10; 10 to 11.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 1 PM to 2; 6:30 to 10.
WFAA, Dallas, Texas, 457.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 11:30.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—11 AM to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—11 PM to 2:30; 5:30 to 7:30; 9:15 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—12:30 PM to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 1 PM to 2; 3 to 4:30; 6 to 11.
WJY, New York City, 405 (ESTDS)—7:30 PM to 1:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6 PM to 12.
WLIT, Philadelphia, Pa., 395 (EST)—11 AM to 12:30 PM; 2 to 3; 4:30 to 7.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 1 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:45 PM to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—4:30 PM to 5:30; 6:45 to 11.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 4:30 to 5; 8 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 10; 11:30 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 PM to 12 M; 1:30 PM to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFMQ, Fayettville, Ark., 299.8 (CST)—9 PM to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20 PM; 5:30 to 11.
KJR, Seattle, Wash., 384.4 (PST)—9 AM to 6:30 PM; 8:30 to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—9 AM to 10; 1 PM to 2; 4 to 5; 6:30 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.

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Features of the Week

FRIDAY, SEPTEMBER 11

WHT, Chicago, Ill., 238 (CSTDS)—8:45 to 10:15 PM, Elmer Kaiser's Review Park Ballroom orch.

WGBS, New York City, 315.6 (ESTDS)—7 PM to 7:10, Herman Bernard, "Your Radio Problem."

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4 "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

SATURDAY, SEPTEMBER 12

WEAF, New York City, 492 (ESTDS)—11 PM to 12 PM. Vincent Lopez orch.

KGW, Portland, Ore., 491.5 (PST)—10 PM to 12 PM. dance music from Portland Hotel by Jackie Souders' orch.

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4 "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

SUNDAY, SEPTEMBER 13

WBBM, Chicago, Ill., 226 (CST)—12 PM to 2 AM—Sunday, Midnight Nut Club Feature. Sanovar Orch.

MONDAY, SEPTEMBER 14

WEAF, New York City, 492 (ESTDS)—9:15 PM to 10:15, Goldman Band concert; 11 to 12, Jack Alben and his Hotel Bossert orchestra.

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

TUESDAY, SEPTEMBER 15

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4 "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

WEAF, New York City, 492 (ESTDS)—9 PM to 10. "Everday Hour,"; 11 to 12 PM Vincent Lopez Hotel Pennsylvania orchestra.

WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

WEEI, Boston, Mass., 476 (ESTDS)—10 PM to 11—From New York, WEAF Grand Opera Company.

WEDNESDAY, SEPTEMBER 16

WHO, Des Moines, Ia., 526 (CST)—10 to 11:30 PM—The Barret-Philbreck Orch.

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4. "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

THURSDAY, SEPTEMBER 17

WEAF, New York City, 492 (ESTDS)—11 PM to 12 PM. Vincent Lopez Hotel Pennsylvania orch.

WGR, Buffalo, N. Y., 319 (ESTDS)—8 to 11 PM—Joint broadcasting with WEAF, N. Y. City, Atwater Kent Radio Artists, and Goodrich Silvertown Chord Orch.

WIP, Philadelphia, Pa., 508.2 (ESTDS)—3 PM to 4 "Song of the Surf,"—surf sounds of Atlantic Ocean, picked up by special microphone, underneath the breakers of Steel Pier at Atlantic City, N. J.

WOO, Philadelphia, Pa., 508.2 (ESTDS)—7:30 PM to 8:30, dinner music by the Hotel Adelphia Roof Garden orch.

THE KEY TO THE AIR

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CNRR, Regina, Saskatchewan, Canada—8 PM to 11.

WEDNESDAY, SEPTEMBER 16

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12 M to 1:05 PM; 8 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Kansas, 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (ESTDS)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 7; 10:30 to 1 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 (ESTDS)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.

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WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.

WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WOJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM
KFMQ, Fayetteville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

THURSDAY, SEPTEMBER 17

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 PM to 1:05.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12 M.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11:45.
WCAE, Pittsburgh, Pa., 461.3 (CSTDS)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:50 to 10.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—10:30 AM to 12:10 PM; 3:30 to 4:15; 7 to 11.
WEEI, Boston, Mass., 467 (ESTDS)—6:45 AM to 7:45; 1 PM to 2; 2:30 to 10.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 1 AM.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 7:30.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CSTDS)—5 PM to 8; 10:30 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 11:30; 6 PM to 7:15; 8:30 to 11.

(Continued on next page)

Attention, Readers and Newsdealers!

READERS: If you are going away on your vacation, and wish to have a complete file of RADIO WORLD, be sure to tell your newsdealer to put aside a copy of each issue until you return.

NEWSDEALERS: Your regular RADIO WORLD customers will undoubtedly want for file copies that they have missed while away on their vacations. The publisher suggests that each week you put aside copies of RADIO WORLD for these customers. They will consider this service.

Readers and newsdealers can get back numbers of any issue for the summer of 1925 at our regular price; or a subscription can be started with any back number published during the summer.

Circulation Manager, RADIO WORLD, 1493 Broadway, New York City.

THE KEY TO THE AIR

(Continued from preceding page)

WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 2 to 4; 7:30 to 11.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAS, Louisville, Ky., 399.6 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7:30 PM to 9; 11 to 12.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 12 M.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 8:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:40 AM to 12:15 PM; 1:30 to 5; 6 to 8; 10 to 11.
WMAK, Lockport, N. Y., 265.5 (EST)—11 PM to 1 AM.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:15 PM to 4:15; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 AM to 2 PM; 3 to 3:30; 4 to 7:10; 8 to 9.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 4 to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 9:45; 10 to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 AM to 2 PM; 7:39 to 10.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 12:15 PM; 2:30 to 3:30; 5:30 to 10:15.
KFAE, State College of Washington, 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 to 1:15 PM; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 7.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 7:15 to 10
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—11 AM to 12:05 PM; 4 to 5; 6 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—8:30 PM to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 4; 6:02 to 11:30.
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.
CNRA, Calgary, Alberta, Canada, 435.8 (MST)—9 PM to 11

How to Make the Coil Right for Anderson's Wavemeter

(*Continued from page 8*)

than in this case. Hence it is advisable to use about 61.5 turns on L2.

Now when the tuning condenser is connected across L1, the tickler, the dial setting for a given wavelength is about twice that when it is connected across L2, that is, the inductance of the tickler is one-half that of the secondary. Hence the range is about from 390 meters to 120 meters when tuning condenser is across L1. It would be desirable to reach lower wavelengths, and this, of course, may be done by reducing the number of turns on the tickler. Two or three turns may be removed without affecting the efficiency of the set as an oscillator. The set has not yet been calibrated for the short-wave range, but for the broadcast range a point has been accurately located for nearly every broadcasting station now operating. Not all of these points are shown in Fig. 3 in the accompanying chart.

So that the calibration be definite it is necessary to use the oscillator in exactly the same way in which it was calibrated. For this reason the filament and plate batteries are always placed in the same position with respect to the set, and leads of fixed lengths are used. The same applies to the tuning condenser, in which case bus-bar leads of fixed length are always used. It is also important when the coil L3 is used for taking off the radio-frequency oscillations that no appreciable current flows in this coil which might alter the effective inductance of the tuning coil, or that the distributed capacity does not change appreciably. The set is remarkably consistent with respect to the calibration.

The grid condenser C1 has the usual value of 250 micro-microfarads (.00025 mfd.), but the grid leak R is lower than the usual value in a receiving circuit. It should not be greater than 0.5 megohm, or blocking might occur when the circuit is oscillating.

Two amperites A are used in the filament circuits to limit the heating current. Even with these in the circuit the set operates satisfactorily with only 3 volts across the terminals 7 and 9 and 22.5 volts on the plates. A couple of UV199 tubes are used.

The transformer T is a 3.5 to 1 ratio instrument. This was used because it was available, but if one is bought especially for the purpose it is better to get a lower ratio transformer. This is desirable because the higher ratio will cause the audio-frequency tube to oscillate too violently and may kill off the oscillations in the first tube. If this occurs there are several ways in which the amplitude of the audio-frequency oscillations may be reduced. The natural frequency of the oscillator may be reduced by increasing the value of condenser C2; the input to the audio tube may be reduced by connecting a resistance across the secondary terminals; or an external rheostat may be inserted between the terminals 11 and 12. In some cases the by-pass condenser C2

(*Continued on next page*)

Explanation of the Parts Used in the Oscillating Meter

(Continued from preceding page)

may not be necessary for radio-frequency oscillation in the first tube, but it is usually desirable in order to lower the frequency of the audio oscillations, as these are likely to be several octaves too high for pleasant listening.

All the apparatus that make up the circuit, exclusive of the tuning condenser, batteries, and phones, are mounted on a hard rubber panel 4.5x7", and enclosed in a box having inside dimensions 3¾" wide, 6¼" long and 3 5/16" deep. The binding posts on the panel are arranged as shown in Fig. 2. The mounting screws used for holding the parts are also used for binding posts where ever this is practicable, and this shortens the leads and makes the compact assembly possible. The tuning coils are supported by the binding posts 1 to 4, being held away from the panel by four pieces of stiff bus-bar wire. The two Amperites are supported by the two binding posts 5 and 6, which are also used for the terminals of the coupling coil L3. The radio-frequency tube is supported by 9 and 9a, and the audio-frequency tube by 12 and 12a. The tubes are mounted upside down. The transformer is supported by 7, 8, 8a, and 11. Only those marked (a) are not used for binding posts. The somewhat irregular arrangement of the battery binding posts, or course, is due to the double use of the mounting screws. The large binding posts are a small-sized Eby, and the small are merely 6-32 machine screws with knurled thumb nuts.

The jack required in this circuit is a three-spring jack which opens one contact as the plug is inserted. In the set constructed a Pacent 63 was used, which is a double circuit jack, but one of the springs was left dead.

CORDELL IN NEW POST

Peter C. Cordell, formerly manager of general assembly and production for the Erla Manufacturing Co., Chicago, has become associated with Aero Products, Inc., 1772 Wilson Ave., Chicago.

January 24 is Date Set for International Week

The Committee on Arrangements for International Radio Week held a joint luncheon meeting at the Commodore Hotel, New York City.

Leo Potter, of the Thermiodyne Radio Corporation, who was responsible for the calling of this meeting is the Chairman of the Committee.

The following also were present: H. S. Fraine, "Radio Broadcast," secretary; Paul West, National Carbon Co.; C. C. Hartzell, Hartzell Sales Co.; Lewis Winner, RADIO WORLD. Others on the committee are: C. P. Belden, Belden Mfg. Co.; L. M. Staunton, C. Brandes, Inc.; Heckert L. Parker, Pacific Coast Radio Trade Association; Chas. Porter, Radio Manufacturers' Association.

The important question discussed was the date for the International Radio Week. To create a greater export radio business by a change in the wavelengths of the European and other foreign receivers to those used by the United States stations was advocated.

The radio tests will be of no value unless our signals are receivable by European listeners, who can not "get" them with their present type of sets, as the wavelengths used by the broadcasting stations over there are very high as compared with those used by the stations here.

An effort will be made to get Secretary Hoover to advocate a pact with European stations to change their wavelengths. The American stations will be asked to use high power during International Week. Receivers which employ any direct method of obtaining regeneration should not be used during these tests. Last year radiation was one of the main reasons for the failure of the International tests.

The date for International Radio Week was set for January 24. This week was selected because of the following reasons: (1) After the Christmas holidays there is a lull in the radio trade. A radio week will keep the public interest awake. (2) It takes three or four weeks fully to learn how to operate the receivers purchased during the holidays. Distant stations can only be tuned in by an operator who has had experience with his receiver. (3) Radio reception is very good during this time of the year. (4) Business conditions are not fully settled until this part of the year. That is, in order to obtain, the full interest in the week all other obstacles must be put out of the way.

The Weekly Rebus

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM

AGENTS WANTED
SELLS FOR $9.75—Prints ad on wrapping paper, envelopes, etc. $4.00 commission. Send 10c for sample work. Automatic Ad-Stamper, Joplin, Mo.

A LIFE TIME TROUBLE PROOF "B" BATTERY. Made from genuine largest size Edison elements. Complete parts for 48-volt unit. $7.00 postpaid. Send 15c for sample cell, "dope" sheet, and price list. Chas. Snively, Woodburn, Ore.

DISSATISFIED WITH YOUR SET? A stage of tuned radio-frequency will improve it. No change of wiring. Write on panel. Good parts. Postpaid, complete with tube, $6.50. Specify type tube. Albert Beybom, 452 E. 136 St., New York City.

ANDERSON'S 6-TUBE SUPER-HETERODYNE, by J. E. Anderson; the 3-Tube Marconi Broadcast receiver, by Percy Warren; How to Make a Good Battery Connector; other features in RADIO WORLD, July 18, 1925. 15c a copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

AGENTS WANTED TO SELL standard radio apparatus. Write us at once if interested. Radio Development and Engineering Co., 180 Broadway, New York.

NEW WONDERFUL SELLER. Cost 10c, profit $1.40, monogramming autos. Experience unnecessary. Free samples. Worcester Monograms, B132, Worcester, Mass.

MAKE $100 WEEKLY in spare time. Sell what the public wants—long-distance radio receiving sets. Two sales weekly pays $100 profit. No big investment, no canvasing. Sharpe of Colorado made $955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. Ozarka, Inc., 126 West Austin Ave., Chicago, Ill.

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RADIO PUBLICATIONS—Send stamp for Bulletin E651. Smith, Box 1032, Rockford, Illinois.

RADIO HOSPITAL—Specialists in Neutrodynes and Super-Heterodynes. Dept. 4, Abilene, Kansas.

A 1-CONTROL PORTABLE by Capt. P. V. O'Rourke; A Baby Super-Heterodyne, by J. E. Anderson; A More Powerful Diamond, Still only 4 Tubes, by Herman Bernard. Other features in RADIO WORLD, dated July 11, 1925, 15c a copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

$12 AN HOUR actually earned selling the new Double-Wear Work Shoe. $5.00 value selling at only $2.95. A world-beater. Liberal commission. Write quick. The Double-Wear Shoe Company, Dept. H, East Lake St., Minneapolis, Minn.

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RADIUMART REMOVES Warts, Moles, Superfluous Hair, Coal Powder and Tattoo Marks. Particulars sent free. Radiumart Co., 1416 Cadwallader St., Philadelphia, Pa.

A DYNAMIC SET, Enormous Power on 3 Tubes, by P. E. Edelman. An Anti-Radiation Toroid Set, by Capt. P. V. O'Rourke. Four Crystal Hook-ups, by Lewis Winner. Other features in RADIO WORLD dated July 25, 1925. 15c a copy, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

RECENT BACK NUMBERS of Radio World, 15c each. RADIO WORLD, 1493 Broadway, New York City.

"HOW TO MAKE—"

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

Sept. 6, 1924—A simplified Neutrodyne with Grid-Biased Detector, by J. E. Anderson. A Low-Loss Wave Trap, by Brewster Lee.
Sept. 27—A 1-Tube No Crystal Reflex.
Nov. 15—A Sturdy Low-Loss Coil, by Lieut. P. V. O'Rourke. An Ultra 2-Tube Receiver, by Byrt C. Caldwell.
Dec. 13—The World's Simplest Tube Set, by Lieut. P. V. O'Rourke.
Dec. 20—A 1-Tube DX Wonder, Rich in Tone, by Herman Bernard. An Interchangeable Detector, by Chas. M. White.
Dec. 27—A 2-Tube Variometer Set, by Lieut. P. V. O'Rourke. Gelula's Super Flex.
Jan. 3, 1925—A 3-Tube Portable That Needs No Outdoor Aerial, by Abner J. Gelula.
Jan. 10—A Low-Loss DX Inductance, by Herbert E. Hayden.
Jan. 17—A $25 1-Tube DX Wonder, by Abner J. Gelula.
Jan. 24—A Selective $15 Crystal Set, by Brewster Lee. A Variometer-Tuned Reflex, by Abner J. Gelula. An $18 1-Tube DX Circuit for the Beginner, by Feodor Rofpatkin.
Jan. 31—A Regenerative Neutrodyne for More DX, by Abner J. Gelula. A Transcontinental 2-Tube Set, by H. E. Wright. An Experimental Reflex, by Lieut. P. V. O'Rourke.
Feb. 14—A Super-Sensitive Receiver, by Chas. H. M. White. A Honeycomb RFT for DX, by Herbert E. Hayden.
Feb. 21—A 1-Tube Reflex for the Novice, by Feodor Rofpatkin. A Set for Professional Folk, by Lieut. P. V. O'Rourke. A Honeycomb Crystal Receiver, by Raymond B. Walles.
Feb. 28—A Set That Does the Most Possible, With 6 Tubes, by Thomas W. Benson. Three Resistance Stages of AF on the 3-Circuit Tuner, by Albert Edwin Sonn.
March 7—Storage B Battery, by Herbert E. Hayden. Benson's Super-Heterodyne. Ideal Coils for Best Circuits, by J. E. Anderson.
March 14—The Refixed 3-Circuit Tuner That You Can Log, by Herman Bernard. The Right Way to Put Coils and Condensers in a Set, By Byrt C. Caldwell.
March 21—A Variable Leak, by Herbert E. Hayden. A 4-Tube, 3-Control Set That Gets the Most DX, by Lieut. P. V. O'Rourke.
March 28—The Improved DX Dandy Set, by Herbert E. Hayden. A 3-Tube Reflex for the Novice, by Feodor Rofpatkin.
April 18—The Diamond of the Air (Part 3), by Herman Bernard. The 7-Tube Pressley Super-Heterodyne (Part 1), by Thomas W. Benson. An Easy D Coil, by Jack Norwood.
April 25—A 3-Tube, 2-Control DX Reflex, by Brewster Lee. Trouble Shooting Article on Diamond of the Air, by Herman Bernard. Wiring the Pressley Set (Part 2), by Thomas W. Benson.
May 2—The Twinplex, by J. E. Anderson.
May 9—A Set to Cut Static, by Feodor Rofpatkin. Toroid Circuit with Resistance AF, by E. I. Sidney. A Push-Pull AF Amplifier, by Lt. Peter V. O'Rourke.
May 16—A 3-Tube Refixed Neutrodyne, by Percy Warren. The Baby Portable, by Herbert E. Hayden. One Tube More for Quality, by Brewster Lee.
June 6—The Smokestack Portable, by Neal Fitzalan. A and B Battery Eliminators, Using DC (Part 1), by P. E. Edelman. A Wavemeter, by Lewis Winner. Full List Broadcasting Stations.
June 13—Simple Short-Wave Circuits, by Herbert E. Hayden. A Simple Push-Pull Rheostat, by A. C. G. Force. A and B Battery Eliminators Using AC (Part 2), by P. E. Edelman. A Portable Super-Heterodyne, by Wainwright Astor.
June 20—The Diamond as a Reflex, by Herman Bernard. A 2-Tube Portable Reflex, by Herbert E. Hayden. A Reflex for 99 Type Tubes, by L. R. Barbley.
June 27—The Pocketbook Portable, by Burton Lindheim. The Power House Set, by John L. Munson. Lesson on Learning the Code.
July 4—The Handsome Portable, by Herbert E. Hayden. The Freedom Reflex, by Capt. P. V. O'Rourke. 8-Tube Super-Heterodyne, by Abner J. Gelula.
July 11—The Baby "Super," by J. E. Anderson. A 1-Dial Portable Receiver, by Capt. P. V. O'Rourke.
July 18—Anderson's 6-Tube Super-Heterodyne. The 3-Tube Marconi Receiver, by Percy Warren. A Good Battery Connector, by Herbert E. Hayden.
July 25—A Dynamic Radio Amplifier, by P. E. Edelman. An Anti-Radiation Toroid Set, by Capt. P. V. O'Rourke. Crystal Sets for Work Today, by Lewis Winner. Construction of the Diamond Described for the Novice, by Herman Bernard.
Aug. 1—Enormous Volume on DX Stations, by Sidney E. Finkelstein. The Metropolitan Local Set, by J. E. Anderson. 4-Tube DX Divided Circuit, by Herbert E. Hayden. Series and Parallel Effects, by Herman Bernard.
Aug. 8—The Evolution Reflex, by Capt. P. V. O'Rourke. The Midget—A 3-Tube Set in Sewing Machine Cabinet, by Herbert E. Hayden. How to Build Your First Set, by Herman Bernard. 2-Year-Old Wins DX Stake, by Lewis Winner.
Aug. 15—A 2-Tube Speaker Reflex, by Brewster Lee. Capt. P. V. O'Rourke's Favorite Audio Amplifier. A Set That Taxes Ingenuity, by Lewis Winner. The Loop Jack in The Diamond, by Herman Brnard.
Aug. 22—The 5-Tube Diamond, by Sidney E. Finkelstein. A Home-Made Todoidal Coil, by George B. Hostetter. The Electrostatic Regenerator, by Percy Warren. Crystal Sets That You Can Log, by Herman Bernard.
Aug. 29—The 1-Dial Powertone, by Herman Bernard. A Set a Baby Can Build, by Herbert E. Hayden. A Fine Meter Switchboard, by Lewis Winner. A Powerful 1-Tube Set, by Percy Warren.

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Winner's Set

(Continued from page 17)

placed to the extreme right of the baseboard and near the two audio-frequency amplifying tubes.

Rack Mounting

Now for the panel mounting the tap switch rack. Procure a rack 16" in length. One inch from both ends make angle turns (45 degrees) of the tubing itself. Now procure some stock brass tubing 16" in length. The diameter of all the brass tubing used is 3/16". Make 45-degree angle turns 1" from both ends on the tubing or the same as you did with the rack. With a steel drill bore a hole in the rack angle and in the shaft (tubing) angle. In order to perform this act with ease, put plenty of oil on the drill and take your time. It is not very simple to drill through metal. Before drilling the tubing it is a good idea to flatten the whole of the tubing from one end to the other with a hammer, so that you will have an even surface to drill through. It is easier to drill than the usual flat stretch of brass. Perform the same operation of drilling on the other end of the rack.

At any hardware store buy a pair of movable slot holders, 5" in length, with a slot 4" length and ½" high. These usually have angles on the ends with holes for mounting. Mount one of these at each end of the rack.

The tap switch holders should be 3" in circumference. Mount these on the panel, leaving a ½" separation between them. Get another piece of brass tubing, 1" in length. Insert in dial shaft hole. Pass through the panel. Mount the rack, by inserting set screws in the holes on the ends of panel, already provided for. Solder a pinion on the end of the brass dial tubing. This should fit snugly on the rack. On the shafts of all the individual tap holders solder on a pinion. These pinions should also fit snugly on the rack. Now move the rack back and forth using the dial. The arm of the tap switch should revolve smoothly on the taps, and all at the same time, viz., all arms hitting same tap at same time.

When performing all these mechanical acts, refer to the diagrams Fig. 2 and 5, at all times, otherwise you will be stuck,

HOOK-UPS

A lot of them, some of which are sure to suit your purpose, appeared in RADIO WORLD dated August 15. 15c a copy, or start your subscription with that number.
RADIO WORLD, 1493 Broadway, New York City

(Continued from preceding page)

as it is no cinch to make these devices operate successfully.

The concluding material that is to be mounted consists of the rheostats, the terminal strip, and the jack.

Bring the beginning of L1 to the antenna and the end to the ground. Bring the ground post to one terminal of C5 and to the arm of R1.

Bring the other end of C5 to the resistance wire (left hand side of P). The top of L2 (rotor winding) goes to the grid. The tap post T, goes to the end terminal of L2 (stator winding) and to the left off terminal of C5. This same connection also goes to the arm of the potentiometer. Still the same connection goes to the tap arms T2 and T3. T2 is connected to end of L4 (stator winding). T3 is connected to end of L6 (stator winding). The stator plates of C1 goes to the top rotor winding of L2 and to the grid post of tube No. 1. The rotor plates go to the arm T1. The top of L3 goes to the plate post on tube No. 1, the end going to the end of L5 and to the B+ 67½ volts post. The stator of C2 goes to the beginning of the rotor winding and to the grid post on tube No. 2. The rotary plates go to tap arm T2. The top of L5 goes to the plate post on tube No. 2. The rotor (beginning) winding of L6 goes to the stator plates of C3, to one terminal of C4 and to one terminal of R4. The other terminals of R4 and C4 go to the grid post on tube No. 3. The rotor of C3 goes to T3.

Connect the taps from the stator winding of L2 to the tap switch. There are nine taps. The same is done with the taps of L4 and L6.

The resistance wire of R1 goes to F— post on tube No. 1. The arm of R1 goes to the resistance of P (same side as C5 goes). The other resistance side of P goes to the F+ on socket of tube No. 1. The other rheostats R2 and R3 are connected in like fashion to that of R1. The rheostat side of the resistance wire of P goes to the A minus post, while the other resistance wire side of P goes to A plus. The audio-frequency stages are connected up in standard fashion and I don't think there is any necessity of special detail being made. There is no C battery used in this set. This is due to negative grid bias on all the tubes, which comes from the action of the potentiometer (P).

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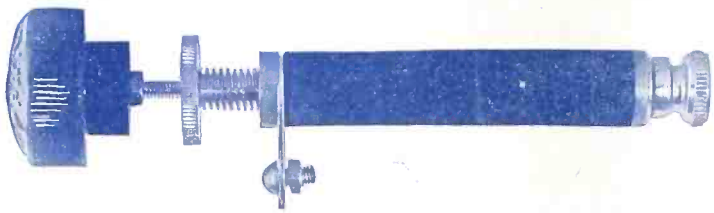

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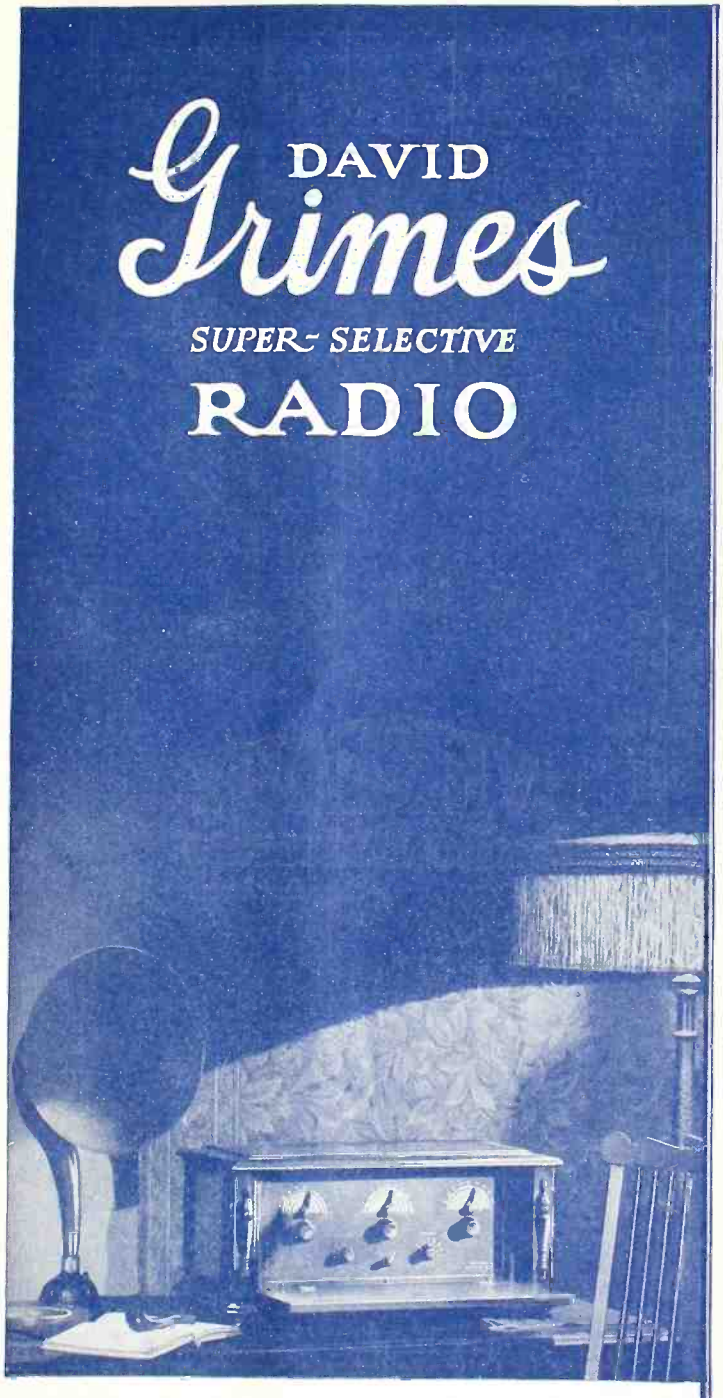

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