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RADIO WORLD

Reg. U. S. Pat Off.

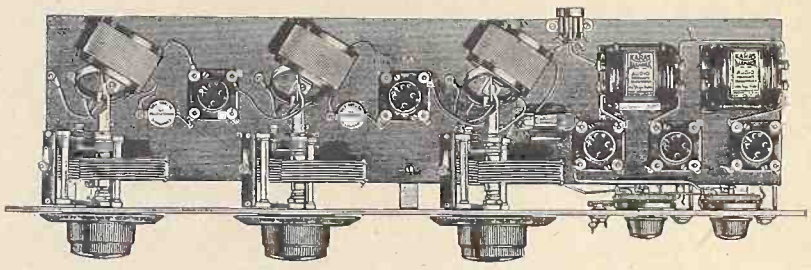
WORLD

America's First and Only National Radio Weekly

KARAS EQUAMATIC

The Five Tube Wonder Circuit that has the Whole Country Talking—Listening—and BUILDING

HOW would you like to build a five tube radio frequency receiver that brings in every station WITH EQUAL VOLUME AND CLEARNESS from one end of the dial to the other?



How would you like to have a receiver that possesses an ALMOST UNBELIEVABLE SELECTIVITY—that enables you to CUT RIGHT THROUGH powerful local stations—to reach out after DX whenever you want to, WITHOUT THE SLIGHTEST POSSIBILITY OF LOCAL INTERFERENCE, and with an entire absence of scratchy, raspy, so-called static noises?

How would you like to own a receiver whose SWEET, CLEAR, PURE, MELLOW TONES were full-rounded, distinct and NATURAL—never fuzzy, blurry or distorted?

You can have such a set in the KARAS EQUAMATIC. You can easily and quickly build this receiver yourself in a remarkably short time. You can possess THE FINEST RADIO RECEIVER in your neighborhood—one which will out-perform any other set regardless of price or size.

The KARAS EQUAMATIC is something NEW in radio—something BETTER—something more PRECISELY ENGINEERED—something INFINITELY MORE EFFICIENT—than ANY OTHER RECEIVER ever before offered to all who know radio and who want THE BEST.

It has been rightly called the KARAS EQUAMATIC FIVE TUBE WONDER CIRCUIT. It's a set the like of which radio fans have never before seen.

Engineers who have examined it—who have studied its principle of operation—who have exhaustively tested its performance under every conceivable condition—have been amazed at the manner in which it has SOLVED THE BIGGEST PROBLEM OF RADIO, in a simple, easily understood, AUTOMATIC manner—and solely through its application of absolutely correct engineering principles. Practically every prominent radio magazine in the country is now featuring this circuit.

Radio fans who have built the KARAS EQUAMATIC FIVE TUBE WONDER SET have also discovered that here at last is something entirely new in their whole radio experience—a new kind of TONE QUALITY—a new demonstration of VOLUME AND SELECTIVITY—plus a new principle of AUTOMATIC TUNING that makes all other systems obsolete because lacking in the very essentials that a radio set should possess to be in keeping with present day knowledge and scientific development.

SUPERB TONE QUALITY—AN EQUAMATIC SENSATION

It was no small feat to design a radio receiver in which ALL OF THE MANY PERPLEXING PROBLEMS OF TUNING have been FINALLY and DEFINITELY solved through the invention of KARAS AUTOMATICALLY TUNED INDUCTANCE COILS and other KARAS parts—but it was a STILL GREATER ACHIEVEMENT to produce in the KARAS EQUAMATIC a TONE QUALITY that is ENTIRELY NEW in the field of radio frequency. THE KARAS EQUAMATIC has a marvelous golden tone that has been both the goal and the despair of radio set manufacturers ever since the era of broadcasting began.

You will find in the KARAS EQUAMATIC a quality of richness, fullness and of true tonal beauty. Its tone is never harsh—it is never coarse—just PURE, CLEAR, SWEET MELODY at every wavelength setting of the dials—for EVERY station.

The remarkable tone of the KARAS EQUAMATIC is due to peak efficiency at all wavelengths and to the scientifically correct mechanical and electrical characteristics of the circuit and to the use of KARAS HARMONIK AUDIO FREQUENCY AMPLIFYING TRANSFORMERS, which amplify all of the many vital harmonics and rich overtones that combine to form what we know as audible musical sounds.

EQUAMATIC SELECTIVITY IS UNSURPASSED

Naturally you want a receiver that has the UTMOST SELECTIVITY. In the KARAS EQUAMATIC you will find a complete realization of all you ever have hoped for in this direction. The entire problem of selectivity has been solved by the EQUAMATIC principle, combined with the use of KARAS ORTHOMETRIC STRAIGHT FREQUENCY LINE VARIABLE CONDENSERS and KARAS MICROMETRIC VERNIER DIALS. Because of this remarkable selectivity there is NO OVER-LAPPING OF STATIONS. Each station comes in clear and sharp and full tone at its proper **place** on the dial.

The selectivity of the circuit is accompanied by a remarkable volume, due to a big gain per each stage of radio frequency and to the employment of the powerful KARAS HARMONIK TRANSFORMERS for the two audio stages.

EASY TO BUILD THIS WONDER SET

Notice in the illustration of the EQUAMATIC RECEIVER how clean cut and easily wired this set actually is. EVEN THOUGH YOU MAY NEVER BEFORE HAVE BUILT A RADIO SET, you can build this one—build it easily and quickly—get from it far better results than you can obtain from the finest and most expensive manufactured set you can buy.

A 16-page manual of simple wiring diagrams and complete instructions for assembling this receiver is packed with each set of KARAS EQUAMATIC INDUCTANCE COILS. In this manual are minutely detailed instructions for the placing of every wire—the making of every connection—the correct positioning of every part. With the aid of this manual and the necessary KARAS parts you can have this wonderful receiver in operation in a remarkably short time. To build the EQUAMATIC RECEIVER you will need the KARAS parts listed on the accompanying coupon, plus other standard parts easily obtainable anywhere.

ORDER TODAY FROM YOUR DEALER OR DIRECT FROM US

Thousands of dealers throughout the country can supply the necessary Karas parts for building this powerful, rich-toned and selective receiver. If your local dealer is not able to fill your order, you can secure your Karas parts direct from us by filling out and mailing the coupon. SEND NO MONEY. Just hand the postman the price of the parts plus a few cents postage.

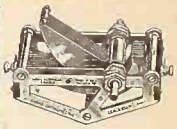
Order your parts from your dealer or from us TODAY. Build one of these sensationally better five tube EQUAMATIC RECEIVERS right away, so that you can enjoy all of the pure, rich, full tone qualities—the remarkable selectivity—and the superb volume that it has to offer you in return for a few hours most pleasantly spent in building this totally satisfactory set.

KARAS ELECTRIC CO.
1147 Association Bldg.
Chicago, Illinois

Essential Parts of the Karas Equamatic Sensation

KARAS EQUAMATIC INDUCTANCE COILS are packed three in a carton, and come to you with complete manual of simple diagrams and instructions, all necessary nuts, screws and binding posts, ready for mounting in your receiver. Price, set of three coils, $12.

KARAS SPECIAL 17 PLATE ORTHOMETRIC CONDENSERS three of which are used in the Equamatic Receiver, have special extended shafts upon which to mount the primary coils of the Inductances. Price, each....$7.00



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KARAS MICROMETRIC DIAL. It has a 63 to 1 vernier and tunes to 1/1000 of an inch. Price $3.50

KARAS ELECTRIC COMPANY,
1147 Association Building, Chicago, Illinois.

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

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Vol. X
No. 7
Whole No. 241
NOVEMBER 6, 1926
15c Per Copy. $6.00 a Year

RADIO WORLD
REG. U.S. PAT. OFF.

A weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 145 W. 45th Street, N. Y., N. Y.

Phones: BRYant 0558 and 0559

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

Variations of Impedances

By J. E. Anderson

Consulting Engineer

IN the October 9 issue of RADIO WORLD I discussed distortion and the oscillation introduced into the output of a radio receiver by the common impedance in the plate circuits of two or more tubes, with particular reference to the resistance of the common B battery. Various methods of minimizing or eliminating any undesired effects produced by the common impedance were suggested briefly. Requests have been made since that appeared for additional facts regarding the various methods that may be employed for reducing any trouble that may be experienced because of an appreciable impedance in common with several plate circuits.

A three tube resistance coupled amplifier is one which is likely to cause trouble when the resistance of the B battery assumes appreciable magnitude, and for that reason that has been chosen as the basis of discussion.

A Remedied Circuit

Such a circuit is shown in Fig. 1, after having been "doctored." It is the alternating current in the plate circuit of the third tube that does the damage when it flows through the resistance of the B battery which is common to all the tubes. Hence in this circuit the tendency to distort and to oscillate may be greatly reduced by preventing the signal current in the last tube from flowing through the common impedance. Two methods of doing this are shown in the figure. In the first place the AC and the DC components of the current in the plate circuit of the last tube are separated by a choke coil L and by a condenser C1. Only AC can flow through the condenser and the loud speaker. Both AC and DC flow through the choke coil, but the AC component is, or may be made, negligibly small. The choke coil is, of course, returned to the positive side of the B battery. Thus the portion of the AC output which flows through the choke coil will flow through the resistance of the battery, and it will cause a certain amount of distortion. But as long as the impedance of the choke coil L is large in comparison with the impedance of the condenser C1 and the speaker unit, this distortion will be negligible because the portion of the total AC output which flows through the coil is very small.

Points of Oscillation

The return lead of the speaker is connected to the negative side of the A battery, so that the larger portion of the AC output does not flow through the common resistance at all. Therefore that part of the AC output produces no distortion whatsoever.

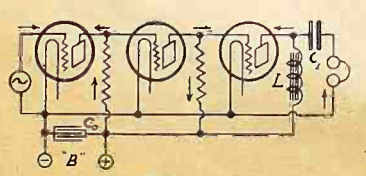

FIG. 1.
A 3-stage resistance coupled audio amplifier, with choke coil-condenser output LC1, nd bypass condenser Co. included

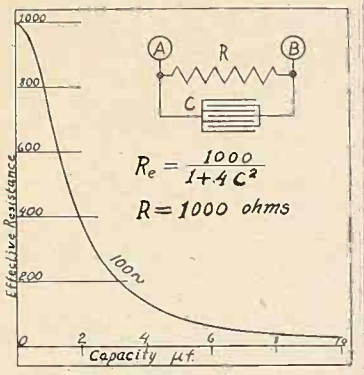

FIG. 2
The change in effective resistance with values of Co from 0 to 10 mfd.

A circuit like that shown in Fig. 1 is most likely to oscillate or distort at low frequencies—very low—for which the condenser C1 is a high impedance and the coil L is a low. This is unfortunate because if this method is to be effective in stopping distortion or oscillation the inductance of the coil and the capacity of the condenser must both be very large. The inductance should not be less than 100 henries and the capacity not less than 5 microfarads. The larger the values of L and C1 are, the more effective will the arrangement be in stopping distortion.

The second method of minimizing the effect of the common impedance (Fig. 1) is the by-pass condenser Co. This is a very large capacity condenser connected in shunt with the common impedance, or across the B battery. This condenser must be very large also if it is to be effective in preventing distortion and oscillation at low frequencies. The action of this condenser is to reduce the effective value of the common resistance. For example, suppose that the resistance of the B battery is 1,000 ohms at a frequency of 100 cycles per second. When a condenser is connected across it part of the AC flows through that (Co in Fig. 1) and less through the resistance. The larger the condenser is the greater will be the portion of the AC that flows through it, and the less through the resistance.

Reduces the Resistance

Thus the effect of the resistance is reduced by the condenser. In Fig. 2 is given an equivalent circuit of a B battery with a condenser across it. B (top right) represents the positive terminal of the B battery and A the negative B terminal, or the negative terminal of the A battery. R is the resistance of the B battery measured with alternating current, and C is the by-pass condenser. Below the circuit is given a formula from which the effective resistance R may be calculated for any value of the condenser capacity when the resistance R of the battery is 1,000 ohms and the frequency is 100 cycles per second. The curve in the figure is the graphical representation of the formula. From the curve it is seen that when the condenser is omitted the effective resistance is just 1,000 ohms. When the condenser across the resistance is 2 microfarads the effective resistance is about 400 ohms, when C = 4 mfd., R_e = 135 ohms, when C = 6, R_e = 65 ohms, when C = 10, R_e = 24.4 ohms. This applies only when the frequency is 100 cycles per second; for lower frequencies the various resistance values will be considerably greater, for higher frequencies very much less. If the resistance of the battery is less than 1,000 ohms, the various effective values of the resistance will be proportionately less.

The circuit shown in Fig. 1 is most likely to oscillate or distort at a frequency considerably less than 100 cycles, so that a condenser much larger than any shown on the curve would have to be employed to make this method effective in reducing effective value of the resistance to a negligible quantity. If this method is chosen the capacity of the condenser must be increased until the oscillation stops and well beyond, in order to reduce the distortion.

Effect at Other Frequencies

Since the effective value of the resistance depends on frequency as well as on the shunt capacity it will be instructive to see how it varies with frequency for selected values of capacity. Fig. 3 shows these curves for C = 1 mfd. and C = 4 mfd., between zero and 500 cycles per second. The C = 1 mfd. condenser does not reduce the effective value of the resistance to any great extent for any frequencies at which the circuit is likely to cause trouble. But the C = 4 mfd. effects a great improvement. At 200 cycles the effective resistance is only 37.6 ohms, which may be considered negligible in the amplifier in question. Below 100 cycles per second, however, the curve rises rapidly, and the 4 mfd. condenser is not very effective. Hence if the circuit oscillates

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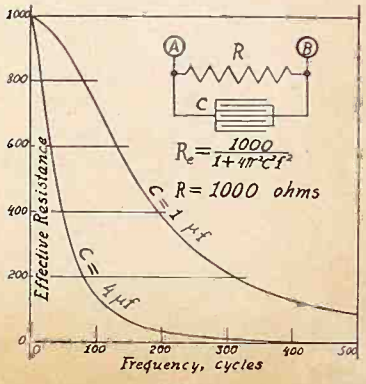


FIG. 3
The effect of frequency upon the resistance

ELIMINATOR OR BATTERY? VEXES MANY

Sets Needing 180 Plate Volts Require Lamp Socket Power for Economy, But Run of Receivers Finds Right Size B Battery Economical

With so many and varied battery substitutes on the market this Fall, the question of whether to use B batteries or socket-power devices is going to assume important proportions in the minds of many radio enthusiasts. Set owners and prospective set owners already are asking whether batteries or house-current attachments are more dependable, more economical, more generally satisfactory for B current supply.

Answer Needs Study

Unfortunately, these questions cannot be answered as promptly and as emphatically now as they may be answered a few years hence. Socket-power devices for B power supply may be vastly improved within the next few years and may be produced at considerbaly smaller costs than those which prevail today. On the other hand, the useful life of dry batteries may be decidedly lengthened by laboratory and manufacturing achievements in the near future. In this connection, it may be well to remember that comparatively recently the process of building dry B batteries in layer cells rather than in cylindrical units, has lengthened battery life, for average use, approximately fifty per cent.

Big Power Requires Socket Device

However, careful comparison of dry-cell B batteries and house-current B power devices as they are today, has brought to light certain general rules which may guide the set owner toward selection of the B power supply which is best suited to the needs of his individual set.

Radio receiving sets must be divided into two general classes, as far as power requirements are concerned — namely, those which consume so much power that dry cell B batteries are inadequate to meet the demand for power, and those which consume so little power that dry cell B batteries can be relied upon to run them economically and dependably. So, after all, the real key to the set owner's solution of the problem of batteries versus eliminators, lies in ascertaining whether his set is within the class which can depend upon eliminators or within the class for which batteries are not only more economical, but also more satisfactory generally.

The Run of Receivers

Of course, at present, the high power sets which must also use eliminators are comparatively few in number. There are some, however, which operate at abnormally high voltage—180 volts or more—and such sets will exhaust the very best of the heavy duty B batteries so rapidly that the upkeep expense becomes burdensome. On such receivers, the comparatively high first-cost of the really dependable socket-power device is fully justified.

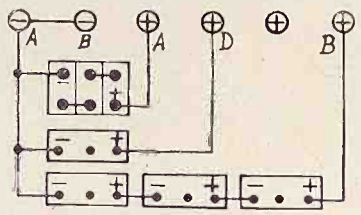


FIG. 4
How to connect batteries for impedance reduction

For the customary types of receivers operating at normal B voltage of 90 or 135 volts, well made, heavy duty B batteries usually are cheaper than any other form of B power supply, are not subject to any of the power interruptions to which any house-current device is subject, and, of course, supply the only pure direct current. The money spent for a good eliminator will keep the average set of this class supplied with heavy duty B batteries for three years or more and unless the eliminator can be used for three years without repairs or replacements, the eliminator will be much more costly than batteries in the long run.

Most of the instances of so-called battery trouble can be traced to the use of the wrong size B battery. Practically all of the receiving sets in use today should be powered with the heavy duty size, rather than the smaller light duty B battery.

Free Medical Aid Radioed to Ships

WASHINGTON

Free medical advice by radio to ships at sea has been instituted by the United Fruit Company, which operates fruit boats between the United States and South America. The service is furnished from hospitals in the various countries of Central America and from the passengers ships. Here is the announcement of the service:

"All passenger ships in the United Fruit Company carry doctors and free medical service may be secured by radio from any of them by addressing a radiogram to 'Ship's Doctor' followed by the name of the steamship. The radio call letters of the steamships in the Company's service can be obtained from either the list of commercial and Government radio stations of the United States, or from the International List of Radio Telegraph Stations.

"This free medical service is maintained primarily for the benefit of ships at sea which do not carry doctors. Should occasion require, however, the doctors of other ships may hold consultation by radio with the United Fruit Company's hospital staff or with doctors on steamships in its service."

Russian Music Is in Demand

LOS ANGELES.

Russian music seems to be in demand over radio at the present time. KNX introduced a new orchestra recently, that made an instant appeal to listeners. It is known as the Balalakia orchestra and is composed of nine pieces. Georgi Shkultetsky, Russian basso, who just completed a long engagement at a local theatre, being featured in a prologue, furnished the singing numbers. Many requests for return appearance were received at the station after this organization has appeared on the air.

DISTORTION REDUCED BY ISOLATED 'B'

Separate Plate Supply for Detector Amounts to Reducing Common Impedance to Zero — RF May be Hooked to Same Source

(*Concluded from page* 3)

or distorts at a frequency below 100 cycles a 4 mfd. condenser will not help much. The capacity must be increased.

Another method of reducing distortion which arises from the common impedance is to use separate B batteries for different parts of the amplifier. This is a very effective method and amounts to reducing the common impedance to zero. In Fig. 4 this method is illustrated, showing a separate battery for the detector tube. This battery may also be used for the radio frequency tubes. The main battery of three 45 volt units are used for the amplified tubes only. This method of avoiding distortion or oscillation is especially applicable to the circuit shown in Fig. 1.

The Common Battery Point

If the circuit had four tubes instead of three it would be better to use the separate battery on the detector and the first audio amplifier than to use it on the detector alone. But a four tube amplifier is usually quite stable with a single B battery even when the resistance of the battery is high.

Observe in Fig. 4 that negative terminals of all the batteries are connected to the same point, that is, to the minus side of the A battery. Sometimes the minus of the B battery is connected to the plus side of the A battery in order to take advantage of the extra 5 volts thus obtainable for the B battery (difference between negative filament and A+). In the interest of stability it is better to connect batteries as shown in Fig. 4, a suggestion made by Herman Bernard, particularly when dry cells are used for heating the filaments.

Sometimes a receiver is very unstable, oscillating readily and distorting frightfully, and it is well nigh impossible to make it behave right. When applying the two methods suggested in Fig. 1 the only apparent effect is to change the pitch of the oscillation by a barely noticeable amount, or to shift the peak of distortion by a like amount. Such a set may not even respond satisfactorily to the use of separate B batteries. If the set oscillates when a common battery is used it merely changes the pitch of the oscillation when two batteries are used, but the change in pitch this time is usually quite great. The remedy in the case is to discard the old B battery for a new one.

AN EXCLUSIVE ARTIST

LOS ANGELES.

Marjorie Dodge, soprano and considered one of California's best, is now an exclusive artist for KNX. Miss Dodge is to be heard between 9 and 10 o'clock every Tuesday evening.

Reduction of Interference

By A. N. Goldsmith

Chief Broadcast Engineer, Radio Corporation of America

Reprinted by permission of the Institute of Radio Engineers from the October "Proceedings."

WHEN, in addition to the desired program, there is released from the loud speaker of the receiving set employed by the broadcaster listener a program or programs emanating from other and undesired stations, it is said that "interference" is present. The relative loudness of the interfering sound, as compared to that of the chosen program, will in part determine the usefulness of the radio receiver to its owner (at that time and for the rendition of desired program). If the interference is extremely slight, it may be tolerable; yet if it is at all noticeable, even during silent pauses in the desired program, it will probably detract from the enjoyment of the listener to such an extent as to spoil his entertainment and the corresponding value of the radio broadcast service. High quality radio service requires inaudible (that is, psychologically non-existent) interference.

The discussion in this paper will be limited to interference caused by undesired broadcasting stations; although it should be kept in mind that the interference from damped wave marine transmitters (for example, of the spark type), harmonics of continuous wave transmitters or irregular variations in their radiation (such as "arc mush"), inductive interference from a number of electrical devices and systems, incidental to human activities, and electrical disturbances of atmosphere origin may all interfere with broadcast reception of feeble signals to a noticeable extent. The reduction of interference primarily involves technical factors, but it also carries the engineer and investigator into the realm of human relations. It is accordingly necessary in the following study of the reduction of interference to consider, as a practical proposition, certain non-technical matters.

Production of Interference

It is assumed that reception is being carried out, at a given frequency, using a vertical effectively non-directional antenna. It is also assumed that the incoming electromagnetic waves, carrying the broadcast program, are vertically polarized. It is also taken for granted (although unfortunately it is not universally the case in practice) that the frequencies of stations on adjacent channels are separated by 10 kilocycles per second and that, in consequence, their carrier waves will produce a practically inaudible beat-note with one another. It is to be noted, however, that the intelligence-carrying side bands of two signals will interfere with each other under such conditions unless the audio frequencies transmitted as carrier modulation from each station are limited to a maximum of 5,000 cycles per second, a value too low for entirely satisfactory reproduction of music or sueech.

(a) **Field Strength**. The more intense or powerful the field of incoming waves, the greater will be their capabilities in the production of inference. It is therefore to be expected that persons in the immediate vicinity of powerful broadcasting stations, which are capable of laying down high field strengths over considerable areas, may experience interference.

(b) **Receiver Selectivity**. Selectivity is that characteristic of a receiver which enables it to discriminate between two incoming signals on neighboring frequencies, passing one and excluding the other. It involves a progressively increasing attenuation of the radio frequency (or intermediate frequency), tuning system toward frequencies increasingly removed from the desired signal frequency.

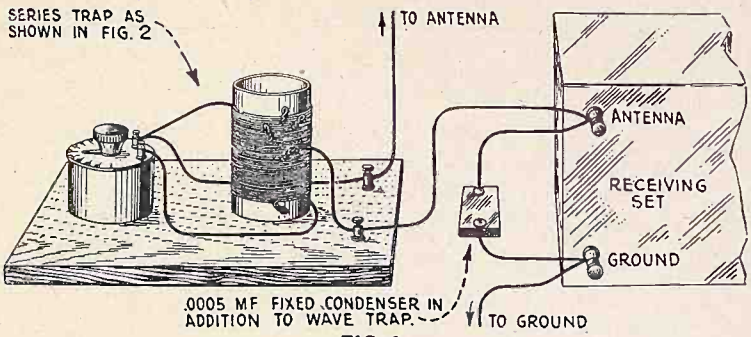


FIG. 1

Picture diagram of a series wave trap, used for eliminating interference. Note the .0005 mfd. fixed condenser across the antenna and ground posts of the set

Sensitivity and Selectivity

It should be noted in this connection that the sensitivity of a receiver will apparently influence its working selectivity. Highly sensitive receivers, which give extremely powerful sounds from the loud speaker when actuated by feeble incoming waves, will correspondingly give an audible response from an interfering signal under circumstances in which a less sensitive receiver, while giving a weaker loud speaker sound, will not seem to produce any interfering signal because the interfering signal has been dropped below the audibility limit. The obvious remedy for interference which accompanies excessively loud signals from weak stations, produced by an ultra-sensitive receiver, is to reduce the receiver sensitivity by volume control manipulation (assuming that the selectivity of the receiver is independent of its sensitivity, which is sometimes not the case).

Of analogous nature is the interference resulting from the use of an antenna or pick-up system of excessive dimensions whereby an inappropriately large signal voltage is impressed upon the receiver, perhaps overloading one or more stages of amplifier tubes. Under such circumstances, even feeble interfering signal voltages will cause an audible response in the loud speaker, and normal signal voltages will cause undesirably loud or distorted signals. In this case the indicated remedy is a reduction in the size of the wave pick-up system.

It is clear that the practical usefulness of feebly selective receivers is limited to locations where there are only weak signals, on considerably separated frequencies. Such signals from distant or low-power stations are generally found exclusively in rural districts under present broadcasting conditions.

By contrast, highly selective receivers have a wider (and in fact, practically universal) sphere of usefulness. They are capable of receiving weak signals from comparatively distant low-power stations without interference even though there are nearby powerful stations in operation.

Listeners Particular

(c) **Psychological Influences**. Interference is astonishingly odious to the average broadcast listener despite the absence of direct financial participation by him in the expense activities of the broadcasting stations which attempt to serve him. A listener may receive eleven stations perfectly, but fail to receive the twelfth because of interference from a thirteenth station. Under these circumstances, the listener-reaction in the extreme case is somewhat as follows: The eleven stations which he can receive become uninteresting to him, and are neglected. The twelfth station which he cannot receive, regardless of its intrinsic merits, becomes the grimly desired goal of his radio ambitions. The thirteenth or interfering station, also regardless of its program merits and tone quality, appears to him as the serpent in what would otherwise be a radio paradise and, unless restrained, he will bruise the head of serpent beneath his heel.

It is also found that the designation given to a broadcasting station makes a great difference to many listeners. The following, for example, is fairly typical: A listener will be located a mile from a one-half kilowatt station, or perhaps three miles from a 5-kilowatt station. He will experience a certain amount of inteference due to the high field strength of the incoming waves, but, since the stations in question seem to be sanctioned by time-honored custom, it will never occur to him to complain of their existence. Other listeners, located say ten miles from a 50-kilowatt station, and experiencing no greater field strengths than the uncomplaining listener just mentioned, will learn to their astonishment that they are only ten miles from a "super-power station." One may also briefly touch on the possible misinterpretation of the purpose of a newly established broadcasting station of considerable power. Radio is a new and completed art, imperfectly understood by the public; and it is a simple matter for the good people of the locality in which an efficient broadcasting station has been established somehow to get the opinion that there is some objectionable motive responsible for the establishment of the station in question. In common with other important elements in broadcasting (censorship, copyright privileges, wave length allocations, operating time, and the like), the location and power of broadcasting stations have controversial aspects.

2. Receiver Selectivity

(a) **Basis of Selectivity**. Essentially all present-day receivers depend for their selectivity on a well-known characteristic of a circuit (or circuits) containing inductance and capacity. Such a circuit shows a minimum reactance (or impedance) at a certain specified frequency, to which frequency it is said to be "tuned." Maxima of voltage or current may be produced in this circuit at this frequency. The reactance of the tuned circuit is greater at frequencies above or below the frequency to which it is tuned, and the increased impedance of the circuit results in a larger attenuation of currents at off-

Neutralization Is Favored

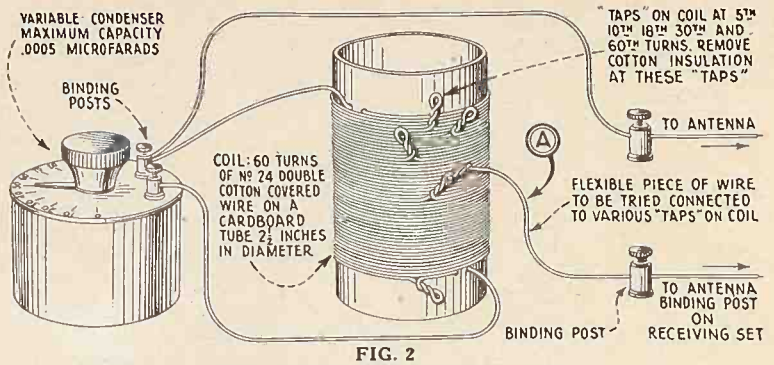


FIG. 2

How a parallel wave trap is connected.

tune, or undesired frequencies. This simple circuit still forms the basis of modern receiver selectivity.

(b) **Improved Selectivity**. In general, the selectivity of a single tuned circuit is insufficient to meet existing broadcast interference problems. While the current response, produced by a given voltage, at an undesired frequency is less than that at a nearby desired frequency, yet the ratio of the undesired current to the desired current is often not so small as is necessary to reduce interference to inaudibility. Among the methods which increase the selectivity of the receiver are the following:

(b-1) A succession of tuned circuits may be coupled to each other, and the desired signal energy, as well as the undesired signal energy may be caused to traverse the successive circuits. The attenuation toward off-tune currents may be considerably increased in this fashion, and the selectivity improved.

Neutralization Needed

(b-2) The incoming signals, both desired and undesired, may be caused to pass through a sequence of tuned circuits each of which is more or less independent of the preceding. Generally such circuits are electrically separated by one-way repeaters of the triode type. It is attempted to reduce the back coupling between successive circuits to a negligible quantity, and this requires in general the neutralization of the effects of inter-electrode capacity in the triode as well as the choice of suitable geometrical configuration for the tuning elements in the successive circuits, and also the adoption of certain expedients. As an ideal, the attenuation toward off-tune currents in a succession of such independent circuits is a summation of the attenuations due to each one of the circuits, so that the overall selectivity of such systems may reach high values.

(b-3) An intermediate frequency selectivity may be utilized, generally in addition to radio frequency selectivity secured according to the preceding methods. This is accomplished in the super-heterodyne receivers. The incoming desired wave is converted to a fixed intermediate frequency by heterodyning with a tunable local oscillator. In the reception of speech or music, a super-audible intermediate frequency is employed. The converted or intermediate frequency is then generally passed through correspondingly tuned amplifiers. Undesired waves are converted to frequencies which are highly attenuated by the intermediate frequency circuits. In view of the considerable ratio of the incoming radio frequency to the intermediate frequency (about 25-to-1 in ordinary broadcast receivers), an ususually sharp cut-off of currents at undesired frequencies close to the desired signal is obtainable.

(c) **Necessary Limitation of Selectivity**. Although the opposite is well known to radio engineers, there has been a widespread public impression that the selectivity of receivers may be indefinitely increased, and that interference can therefore be eliminated by the use of sufficiently selective receivers.

Considering first the ideal case, it may be assumed that the transmission from a radio telephone station of high quality will include the carrier frequency and two side bands extending to frequencies 10 kilocycles above and below the carrier frequency. Such a transmission therefore occupies 20 kilocycles, which is the proper width for a radio channel. Adjacent carrier frequencies should, therefore, be separated by 20 kilocycles. Unfortunately, the urgent pressure applied by prospective broadcasters has necessitated the assignment of broadcasting frequencies only 10 kilocycles apart. At best such a system is a compromise. Under such a regime, however, a receiver should admit, without attenuation, a band of frequencies 10 kilocycles wide. For example, when tuned to 660 kilocycles, all frequencies from 655 to 665 kilocycles should be equally passed through the receiver, whereas all frequencies outside of this band should be weakened to inaudibility even if the external field strength corresponding to them is considerable. The transmission band of such a receiver, being flat-topped, and having sharp cut-offs, will permit reception without quality distortion at radio frequencies (assuming a suitable audio frequency detector, amplifying system, and loud speaker).

Actual receivers do not behave in this fashion. Their admittance curve is sharply peaked in many cases, and their cut-off gradual. As a result, tone quality is injured by selective attenuation within the side bands, and interference from stations on neighboring frequencies is admitted. Without going into further details it may be stated that the further a receiver deviates from the flat-top and abrupt cut-off admission band, the less desirable it is from the standpoint of selectivity and tone quality. As an obvious secondary cousequence, the useable selectivity of receivers is definitely limited.

3. Transmitters and Receivers

It has not yet proved feasible to employ for broadcasting purposes, transmitters emitting a single side band, the other side band and the carrier being eliminated. Nor has multiple transmission (of the same program) on an identical frequency at each of a number of interconnected stations become a part of standardized broadcasting practice. Both of these systems have been experimentally tried, and their practical capabilities willl no doubt be determined by further trial. For the present, however, they need not be considered.

(a) **Transmitter Power.** The power of transmitting sets for broadcasting purposes varies over the wide range of 10,000-to-1. A number of midget transmitters of 5 watts are employed for purely local transmission, and a number of 50-watt sets are also in use to cover certain limited areas. The reliable service range of such transmitters, is, however, too limited for serious consideration in dealing with broadcasting problems of national scope.

It has long been the contention of far-sighted radio engineers that the only range of transmitters deserving real weight is the true "service range." Quantitatively, we cannot exactly define the service range of transmitters because of the somewhat irregular nature of radio transmission. However, a rough idea of what is meant can be gained from the tentative definition that "the service range of a transmitting station is that distance, over which it will produce, by day or night and at all seasons of the year (except during unusually severe atmospheric disturbances), a signal having at least as great a ratio to all disturbing sounds as the music from a high quality phonograph on a well-cut new record bears to the incidental needle scratch."

High Standard

The basis of this definition is the acceptance by the public of high-quality phonographic reproduction as a service of human value. It is to be noted that this type of reproduction is taken as marking a minimum or lower limit of acceptability for radio signals received within the service range. A radio signal which is not so "clean" as the output of a good phonograph is received at a point outside of the service range of the corresponding transmitting station for critical listeners.

To persons accustomed to the ranges secured by professional radio operators and amateurs, with telegraph signals, and under favorable conditions, the limited service ranges secured by broadcasting stations of a given power will come as a shock. It must be remembered that broadcasting stations communicate telephonically. An artistic effect is to be produced, and interference which can be overlooked in telegraphic reception of commercial material would be fatal to the enjoyment of the broadcast listener. Then too, the manipulation of receivers by the public is less skilled than that of the professional radio telegraph operators. Loud speaker operation is demanded in broadcasting in many instances, and extraneous sounds and disturbances in the same room require the loud speaker to deliver an unusually clear and loud signal for satisfactory results.

For these reasons the service range of stations of various powers in the eastern portion of the United States may be estimated as follows:

TABLE 1

Antenna Power.	Service Range.
5 watts	**1 mile**
50 watts	**3 miles**
500 watts	**10 miles**
5,000 watts (5 kilowatts)	**30 miles**
50,000 watts (50 kilowatts)	**100 miles**

These figures are primarily based on

Wave Traps Prove Helpful

analysis of reception data by the Bureau of Standards of the Department of Commerce, and published statements of Secretary of Commerce, Herbert Hoover.

Of course these service ranges will be considerably exceeded many times under favorable conditions. On the other hand, at some points within the service range area where local conditions happen to be unusually unfavorable, good service will not be secured. A typical cause for poor reception in a limited zone, within the general service area, is the radio shadow cast by great masses of steel buildings.

Need Big Field Strength

(b) Field Strengths. The field strengths required for satisfactory broadcasting reception, within the service range, are far beyond those which have been regarded as commercially necessary in marine and transoceanic radio telegraphy, and for the reasons given in the previous discussion. The following table gives a general idea of the type of service, in its relation to disturbing sounds, which is yielded by various field strengths of waves within the broadcasting band:

TABLE 2

Signal Field Strength	Nature of Service
0.1 millivolt per meter	**Poor Service**
1. millivolts per meter	**Fair Service**
10. millivolts per meter	**Very Good Service**
100. millivolts per meter	**Excellent Service**
1,000. millivolts per meter	**Extremely Strong**

The field strength corresponding to the outer boundary of the "service range" lies between 1. and 10. millivolts per meter and, in general, is nearer the latter value than the former.

Experts Explain How to Construct The Wave Traps

[As an appendix to Dr. Goldsmith's article a report of interference investigators is published. These men tackled the problem for WJZ. They gave printed and illustrated suggestions for remedies, as follow:]

"People living very near to a powerful broadcasting station may find that this station comes in loudly enough to interfere with reception of other stations even when the receiving set is most carefully tuned to the station that they want to hear. Particularly is this the case in large cities like New York (which city has no less than twenty-two broadcasting stations, operating on powers up to 5,000 watts and in general with many hundreds of thousands of people living within a few miles of each of these stations.) With a receiver having poor selectivity, it may be that the nearest or most powerful station will be heard no matter how the set is tuned, but with a receiver of very great selectivity, only perhaps two or three stations of very nearly the same wavelength as the local station will be interfered with. Thus the seriousness of the interference depends upon the selectivity of the receiver, the distance from the interfering station, and the power of the latter. In the following the methods of eliminating or greatly reducing such interference at minimum expense and trouble are given.

"Fortunately in most cases the interference may be reduced to a point where it is unobjectionable, by the use of one or more wave traps. These are simple devices that can be bought fairly cheaply, and can be made at home very easily for almost no cost beyond that of a variable condenser.

"In the great majority of cases the interference can be eliminated by the use of what is called a series wave trap.

"The series wave trap has two binding posts, one of which is connected to the antenna post of the receiver, and the other is connected to the antenna. (The antenna is thus disconnected from the set, and the signals to go through the trap to reach the set. This is why it is called a series trap.) See Figure 1, which shows how to connect a series trap. In addition to the wave trap a .0005 mfd. fixed condenser should be connected across the antenna and ground binding posts of the receiving set.

"The series trap offers a very great obstruction to the interfering signal and thus reduces the amount that gets through the set, but offers comparatively little obstruction to the desired signals.

"A satisfactory series trap can be made of the following parts: One .0005 microfarad variable condenser, one cylindrical card board cover off an old dry cell (about 2½ inches in diameter), a spool of Number 24 double-cotton covered wire, a small board to mount the parts on, two binding posts or Fahnestock clips for connecting to antenna and to receiving set. (See Figure 2.) Wind a coil with the wire on the cardboard tube, with the turns close together, about 60 turns. Twist a few loops in the wire for connections at several points, say turns number 5, 10, 18, and 30, and also at the last turn.

"Remove the cotton covering from the wire on the coil at these points, so that connection can be made to any of them by means of the flexible piece of wire marked 'A.' Such places, where connection may be made to certain turns on the coil, are called 'taps.'

"Mount the variable condenser and coil on a wooden board, provided with two binding posts as shown in Figure 2. Connect the first and last turns of the coil to the variable condenser, as shown in the figure. Then connect one of the binding posts on the board to one of the binding posts on the variable condenser, as shown in the figure. To the other binding post connect a piece of flexible wire (the No. 24 cotton covered wire can be used, but a piece of stranded flexible, insulated wire would be better) and remove the insulation from the free end so that it may be connected to one of the 'taps' which were made on the coil, as will be described in the second paragraph below.

Operation.—"Remove the antenna wire from the 'antenna' binding post on your receiving set and connect it to the right-hand binding post on the wave trap, and connect the left-hand binding post on the wave trap to the binding post on your receiver to which the antenna wire previously went (see the figure). Next, connect the .0005 microfarad fixed condenser between the antenna and ground binding posts of the receiving set.

"Now twist the 'flexible' wire connection on the wave trap, around the 'tap' at the 30th turn, being sure to make a good connection. Then start up the receiving set, set the wave trap condenser pointer at zero, and tune for some desired station. This may come in at a different place on the receiver dials from those found previously. If the interfering station is now heard along with the desired one, turn the knob of the wave trap condenser very slowly until the interference disappears.

"If the desired station goes out along with the interfering one, change the flexible connection on the wave trap to the 18th turn, and repeat the operation. If the same thing still occurs, try 10 turns and 5 turns in succession. In each case, before changing the tap connection, try re-tuning or re-adjusting your receiver, to see whether or not the desired station can be brought in, and also re-adjusting the wave trap slightly to keep out the interfering signal. A certain amount of back and forth adjustment between the receiver and wave trap may be necessary.

"If with the tap connection on the 30th turn the interfering signal can still be heard under the desired one, when the wave trap is tuned, to give its maximum reduction of interference, change the tap connection to the 60th turn and repeat the operation described above.

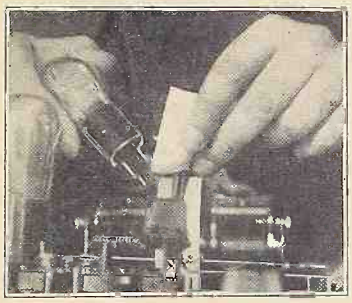
"A certain amount of experimenting will be necessary, in order to learn the effect of the wave trap on the receiver adjustments, and in order to learn how to adjust the wave trap as well as what tap on the coil is best for your particular receiving set and antenna.

"If the trap does not work when first made and connected, inspect it carefully to see that it was made in accordance with the foregoing instructions. Traps such as the one described have actually been made, and have been used successfully with many hundreds of receivers, of the widest variety of manufacture.

Loop Sets.—"Less interference will be found usually when using loop sets because the loop is more selective than an antenna. Also the loop can be turned into a position where the interference is very much reduced. And finally, a wave trap can easily be made that will cause a great decrease in interference, as follows:

"Wind about 20 turns of double-cotton-covered Number 24 wire in a bunch around a regular size 45-volt 'B' battery (which is about 7 inches by 8 inches). Slip the coil off and tie or tape it together to keep from falling apart. Connect it to a variable condenser. Then hold the coil near the loop and adjust condenser to make the interference as little as possible."

CLEAN UP!



(Radio World Staff Photo)

MANY TIMES noisy and erratic reception can be cured by cleaning the tube terminals with some sandpaper, as shown above. The lead coating on the bottom of these terminals ionizes and becomes an insulator instead of a conductor, and therefore causes poor contact.

The Alden-Somerbridge Set

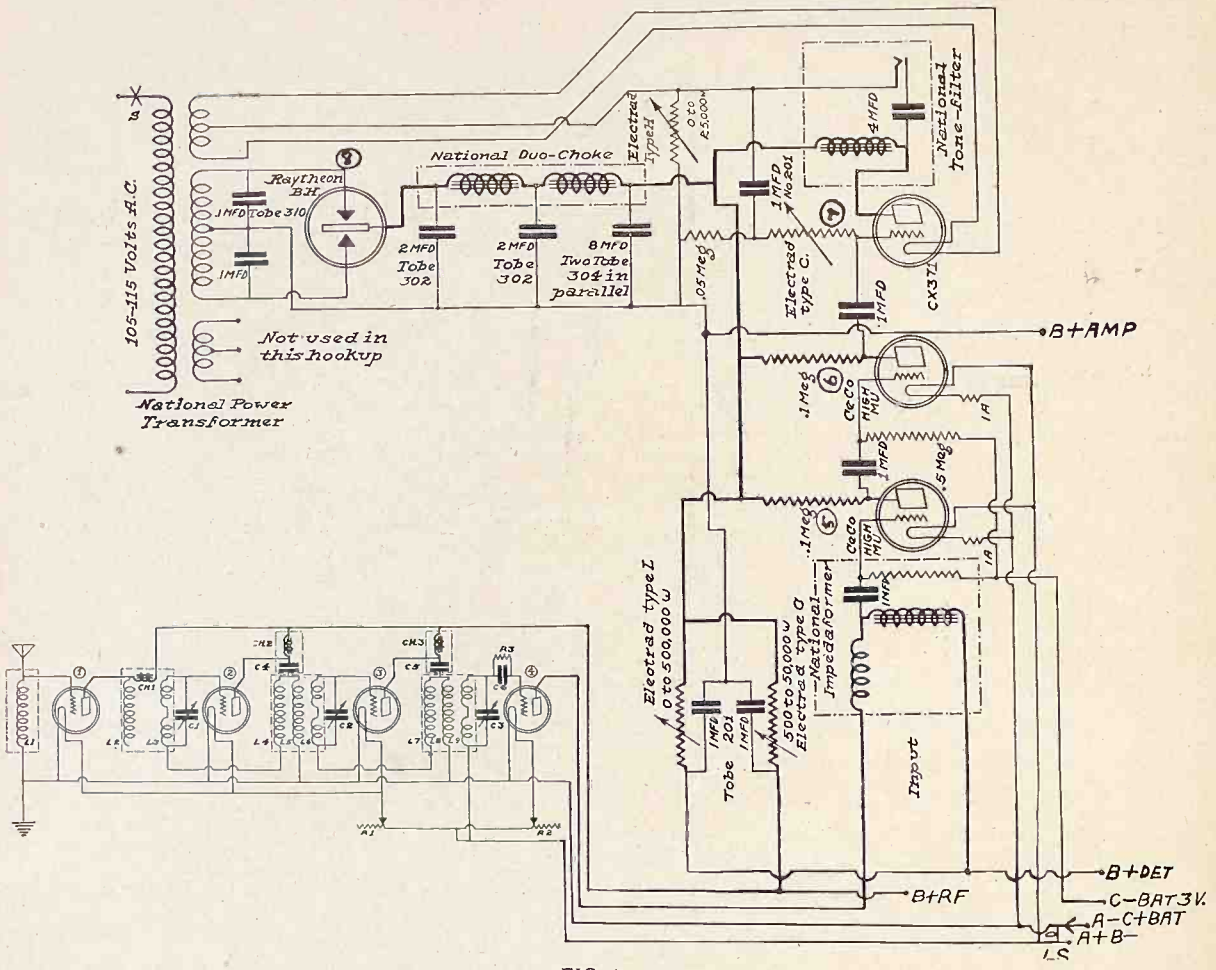


FIG. 4.

How to wire up an Alden-Somerbridge Circuit (lower left) to work in conjunction with the Lynch Lamp Socket Amplifier. Eight tubes are required, including the Raytheon type BH (upper left). The Alden-Somerbridge Circuit is a balanced radio receiver, without audio. The Lynch Lamp Socket Amplifier consists of an eliminator of all B batteries, and A eliminator and C eliminator for the final audio tube, and a splendid tone quality 3-stage audio amplifier.

[The theory of the Alden-Somerbridge Receiver was discussed in the October 30 issue, wherein also were published a top view of the set with two transformer audio stages, and the schematic diagram of that hookup. This week's illustration shows the circuit in conjunction with the Lynch lamp socket amplifier. This makes a 7-tube set, with the eighth tube a Raytheon type BH. The audio channel consists of one impedance stage and two resistance stages. A B battery eliminator is used. The final audio tube is heated from AC and gets its grid bias from the eliminator. The logical way to build the 6-tube set is on a 7x22 or 7 x 24" panel, with the two audio transformers in the set. Blueprints are available for the 6-tube receiver. The 7-tube model preferably should be built with audio omitted, say on a 7x18" panel, for console installation, the audio and eliminator being placed in the lower part of the console.]

By Wendell Buck

LAST week's article on the Alden-Somerbridge Receiver discussed the underlying theory of the new and original radio frequency amplifying system and stabilization method used in the set. "Theory," says the average experimenter after reading a technical article, "is all very well, but the important thing is: how well does it work out in actual practice?" Circuits and circuit theories come and go. Some are very impressive on paper, but not so impressive when worked out in their final form in the completed receiving set. In the last analysis ten minutes' actual operation of the set is worth more than ten hours of theorizing about its inherent advantages.

Before starting the description of the construction of the Alden-Somerbridge Receiver it will be well to review the actual advantages of the set as they will work out in the operation of the receiver in your living room. Bearing these points in mind, the operator will be able to get the utmost out of the set without experimenting for himself to find out what's what.

1. Constant tone quality, unaffected by bringing the receiver to the resonance point, that is, its point of maximum efficiency. Due to the exact and perfect stabilization of the radio frequency circuits, pure, undistorted tone quality is maintained even when the greatest energy is put into the audio amplifier. In a word, volume varies as you wish it; tone quality remains pure regardless of whether you have a whisper or maximum volume coming from the speaker.
2. The circuit can be brought into full resonance without worry of oscillation or "spilling over" of the tubes.
3. The unique balancing method used in The Alden-Somerbridge Receiver allows great sensitivity without the set being critical or difficult to handle or tune.

LIST OF PARTS

for RF Side of Set

One Alden-Somerbridge RF Transformer, Type No. 1.
One Alden-Somerbridge RF Transformer, Type No. 2.
One Alden-Somerbridge RF Transformer, Type No. 3.
One Alden-Somerbridge Balancer, Type 1A.
One Alden-Somerbridge Balancer, Type 2A.
One Alden-Somerbridge Balancer, Type 3A.
One two-section variable condenser, .00035 mfd. for each section.
One single condenser, .00035 mfd.
Two National Velvet Vernier Type C illuminated dials.
One Lynch grid leak, 2 meg.
One Fixed Condenser, .00025 mfd.
One Fixed Condenser, .002 mfd.
Front panel, subpanel, brackets, binding posts.

It Works On Any Aerial

4. Due to the high efficiency and tremendous amplification on the radio frequency side, distant stations are received with extraordinary volume. During experimental tests with the set. DX station up to 1,000 miles away came in with volume practically equivalent to local reception.

5. The set works with almost equal efficiency on long and short serials. In tests using antennas varying from twenty feet vertical to 200 feet horizontal only a slight difference in sensitivity was noticed. The antenna circuit in the receiver is in no way affected by the length of aerial.

Building the Receiver

Referring now to the radio side of the schematic diagram, Fig. 4, you will notice that the first RF stage is untuned, capacity coupling, rather than straight transformer coupling. This feature in the circuit gives a very high degree of selectivity. The second and third RF stages, also using the Alden-Somerbridge system, are tuned with .00035 mfd. condensers.

Complete stabilization in the radio frequency amplifier is achieved through the special Alden-Somerbridge RF Transformers and Alden-Somerbridge Balancers. These parts are really the heart of the entire circuit. The set cannot be built right without them. Any other equipment in the list may be changed for other apparatus of equivament and identical characteristics.

The circuit has been so well and thoroughly worked out that no adjustments are necessary. The Balancers are fixed, and when once the builder has incorporated them in the set, he can rest assured that his receiver will perform at maximum efficiency without touching or tinkering with the Balancers.

The detector circuit is non-regenerative. There is no reason at all for use of regeneration in circuit, and the non-regenerative feature gives every assurance that the detector will pass on to the audio amplifier the undistorted signal received from the RF side of the set.

Most of the apparatus is mounted on the baseboard, and nicely spaced for short, neat wiring. There is plenty of room to work in. No attempt should be made to crowd the apparatus on an undersized panel and baseboard, with the result that the builder must resort to clever methods to solder certain connections.

Easy to Identify

The Alden-Somerbridge RF Transformers and Balancers are equiped with convenient soldering tabs, making for easy connections.

It may be necessary to use a little spaghetti, but not very much, in the close wiring down near the binding post strip on the rear of the baseboard. (Fig. 1 in October 30 issue.)

The illuminated type dial enhances the appearance of the completed receiver immensely.

In the matter of selecting the audio channel, use good judgment. If you select transformer coupling you can't expect any receiver to give wonderful quality of tone if it has cheap or poorly designed transformers.

Operating the Set

The most satisfactory tube combination you will find for use in the Alden-Somerbridge Set is the following.

Detector socket 200A.

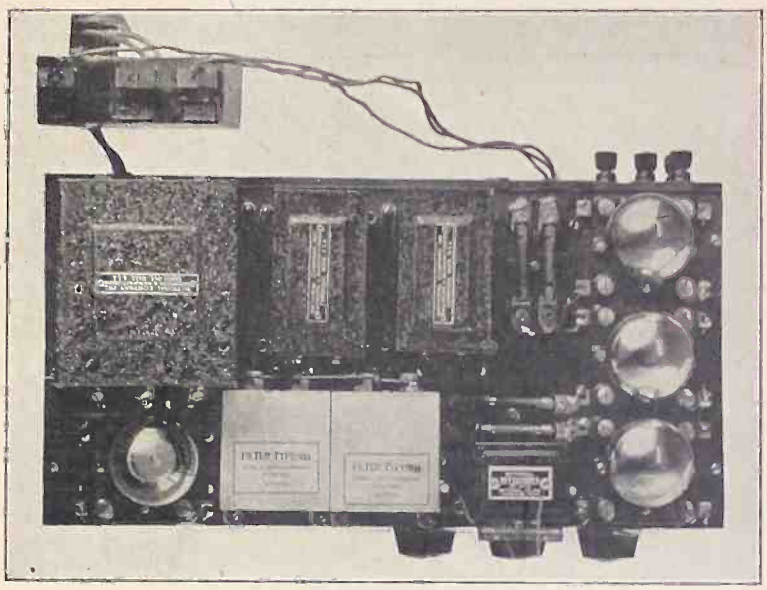


FIG. 5

Top view of the Lynch Lamp Socket Amplifier, which may be used in connection with any receiver. It consists of a B eliminator and a 3-stage audio amplifier, with A eliminator and C eliminator for last audio tube only.

Three RF stages and first AF 201As or CeCo type A.

Second audio stage 112 or CeCo type F.

Use 45 volts B voltage on the detector tube; 90 to 135 volts B on the B plus amplifier post; 7½ volts C bias will be right for the 112 type power tube.

Looking directly at the front panel, the two dials, of course, control the variable condensers tuning the radio frequency stages. The dials operate at the same settings: that is, a station will come in best at 70 and 70 on the dials, or at 55 and 55, not at 60 on one and 45 on the other. Tuning any receiver to the best advantage is largely a matter of getting the knack of it. Rotate the two dials together, slowly, keeping the numbers approximately the same. When a station comes in, adjust the left-hand dial to secure the best volume, then similarly, the right one.

There are two rheostat knobs on the front panel. The left-hand one controls the radio frequency tubes; the right-hand one controls the detector and audio frequency tubes in the 6-tube model, and the detector alone in the 7-tube set.

When you first hook up the set and connect the batteries, turn both rheostats well up and tune in a strong signal from a station nearby. Adjust the condencers to get maximum volume, then slowly turn down the rheostats until there is a real loss in signal strength when you back them off more. The point just before you start to lose volume will be a good permanent setting for the rheostat.

Antenna Lengths

Control the volume of the set with the RF rheostat (left-hand one) and leave the other rheostat alone. The theory of this is that a weak impulse (such as in the RF side) is much easier to control than a strong one, such as in the audio stages.

As mentioned previously, with The Alden-Somerbridge Circuit, antenna length is not of such vital importance. Experiments show that the set has practically the same degree of sensitivity and selectivity on a twenty-foot aerial as on one 200 feet long. You will get very good results from a short indoor aerial strungt around the room.

If you are free and clear, out of town, and away from such disturbances as car lines, power houses, and other forms of local interference, there is a slight advantage in using plenty of aerial.

LIST OF PARTS

For Lynch Socket Amplifier

Two Bakelite panels 2x14x3/16".
One Bakelite subpanel, 7x14x3/16".
Two hard rubber Garfield brackets.
Four Eby push type sockets.
Four Eby binding posts, B—, B+, B+RF, B+Amp.
One National Universal Power Transformer.
One National first stage Impedaformer, Type B.
One National Duo-Choke.
One National Tone Filter.
Two Tobe 4.0 mfd. condensers (304).
Two Tobe 2.0 mfd. condensers (302).
Five Tobe 1.0 mfd. condensers (201).
Two Tobe 0.1 mfd. condensers (310).
Two Lynch double resistor mounts.
One Lynch single resistor mount.
One 0.5 meg. Lynch metallized resistor.
One .05 meg. Lynch metallized resistor.
Two 0.1 meg. Lynch metallized resistors.
Six lengths flexible Acme Celatsite.
Two Electrad Royalty Variable Resistances, Type C, 500-50,000 ohms.
One Electrad Royalty Variable Resistance, Type H, 0-25,000 ohms.
One Electrad Royalty Variable Resistance, Type L, 0-500,000 ohms.
One Electrad single circuit open jack.
One Raytheon BH tube.
One Cunningham CX371 tube.
Two CeCo high mu tubes (type G.)
Two 1-A Amperites.
One Cutler-Hammer toggle switch (S at cross in Fig. 7).
One Eveready 4½-volt C battery.
One jack plug for speaker.

How to Work the Singletrol

[The Singletrol, a 6-tube, single dial receiver, was described in the October 30 issue. The following article discusses solutions of problems of improved efficiency.]

By Herbert E. Hayden

A SINGLE control receiver requires a little more attention to get working properly than a set with individually rotated shafts for tuning the circuits. One of the chief causes of trouble has been avoided in the Singletrol, because each circuit is not sharply tuned, but is permitted to be broad enough to insure utmost quality and to avoid off-resonance with companion circuits.

Any discrepancy due to the condenser capacity not varying exactly like that of two other tuned circuits may be remedied by adjusting the rotor. A setscrew holds each rotor to the shaft and if this screw is loosened a little the rotor may be adjusted to the resonance point and locked. If the rotor plates are "sunk" all the way, hence all occupy the same relative angular position, the condenser will be properly set in nine cases out of ten, without needing adjustment. However, if you find that volume is low on some stations, particularly naturally weaker ones, while it is fine on others, resort to the necessary adjustment, manipulating the setscrews, as indicated by the arrows in Fig. 5.

Curing Self-Oscillation

This is not so great a problem as is the control of oscillations, and to make sure that you have proceeded properly, shift one of the coils, preferably the right-hand one (L5L6) ever so lightly, in case self-oscillation proves a nuisance. The back coupling in such a receiver as this is quite likely to be inductive to a greater extent than capacitative, and the shifting of the relative coil positions is addressed to this particular branch of the problem.

It is assumed, of course, that efforts have been made to control self-oscillation by adjusting the variable resistor R2 in series with the plates of the radio frequency tubes, and that some measure of success has been attained, but not quite enough to satisfy. The neutralization system will balance the receiver properly, but not if there is a vicious inductive feedback. Some slight magnetic coupling even to back stages is permissible, and the system is broad enough to compensate for them, but not if there is fierce coupling.

Success Not Difficult

With efforts combined on the plate resistor and the coil positions, tests being made by very slightly moving other coils as part of the complete checkup, success ought to be achieved easily enough.

Now, besides radio feedback there is a possibility in any receiver of audio feedback. In the Singletrol set this can be checked in most instances by placing a fixed condenser across the secondary of the first audio transformer AFT1. The references here made are to the code used in the schematic diagram published as Fig. 1 in last week's issue.

The capacity of this fixed condenser is a matter of experiment. It can easily be so large as to prevent reception, by passing all the audio frequencies, but this would happen only if the value were higher than, say, 1.0 mfd. It is well to try capacities in the vicinity of .001 mfd.

An Aerial Resistor

One stunt that has not been discussed often, and which works in conjunction with such a set as this, is to supplant the iron-core radio frequency transformer or alternate radio impedance coil in the antenna circuit with a resistance. This may be a variable one, up to about 50,000 ohms, or various values or fixed resistances may be tried. The aerial is connected to one side of the resistor and the ground to the other. The rest of the antenna circuit connections, as in Fig. 1 last week, are not made, but, of course, aerial goes to grid and the ground is connected to minus A. This grounding of minus A was shown in the lower right-hand corner of the circuit diagram.

If a variable resistor is used it may be turned until the self-oscillation tendency also reduced, and the plate resistor may be adjusted concomitantly.

Another thing to try is placing a small capacity fixed condenser across the primary of the first audio transformer. The suggested capacity is .005, although .00025 mfd. will work well, also.

Once the set is properly adjusted for tuning and the balancing problem has been solved—and these are not difficult matters—the receiver will respond splendidly even to very weak signals and will afford a degree of selectivity that enables one to bring in distant stations with a vengeance. And besides, the tone quality is superb.

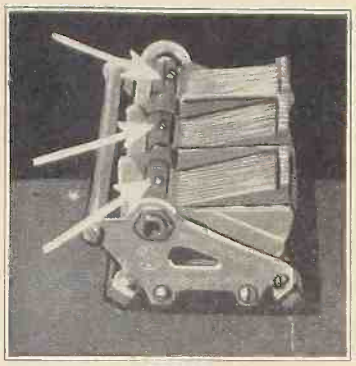


FIG. 5
Arrows indicate condenser set-screws.

LIST OF PARTS

PBGF—One antenna coil (iron core transformer PBGF or a Singletrol radio impedance coil).

L1L2, L3L4, L5L6—Three matched Singletrol radio frequency transformers.

C1, C2, C3—A single shaft .00035 mfd. Continental variable triple condenser.

C5, C6, C7—Three Aerovox .001 mfd. fixed mica condensers; one extra condenser, same capacity, to bypass R2.

C4—One Aerovox .00025 mfd. mica fixed grid condenser, without clips.

AFT1, AFT2—Two Modern Symphony all-stage audio frequency transformers.

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

J—One Electrad single closed circuit jack.

R3—One Electrad 2-ohm power rheostat.

R2—One Centralab 400-ohm potentiometer, used as B rheostat.

LS—One Bruno light switch, less bulb.

R1—One Lynch 2-megohm metallized fixed resistor.

One National Velvet Vernier illuminated dial, type C, with bulb.

One 7x21-inch front panel.

One 9½x20-inch subpanel, hard rubber or bakelite.

Two American Radio Hardware Co. aluminum subpanel brackets.

One Lynch single mounting for grid leak R1.

One C battery.

One Birnbach 6-lead battery cable (A plus, A minus and B minus, C minus, CC minus, B plus det. and B. plus amp).

Ten lengths of stiff Acme Celatsite, vari-colored.

ACCESSORIES

One Swan-Haverstick aerial kit.

One Fil-Ko lightning arrester.

One Vitalitone cone speaker.

Tonsil Removal Changes His Voice

When Hal, of "Harry and Hal," WMAQ's team of veteran football announcers, took his turn at the microphone at Stagg field during the University of Chicago-Florida football game, his voice had the fans guessing.

It wasn't the same voice. There was a question in the minds of many of Hal's big following whether or not they were being "spoofed."

One fan actually wrote to WMAQ, praising the broadcast, but said that he couldn't understand why he failed to recognize Hal's voice.

"I listened to Hal all Summer, broadcasting from the Cubs' park," he wrote, "and it didn't sound like the same bird. What's the mystery?"

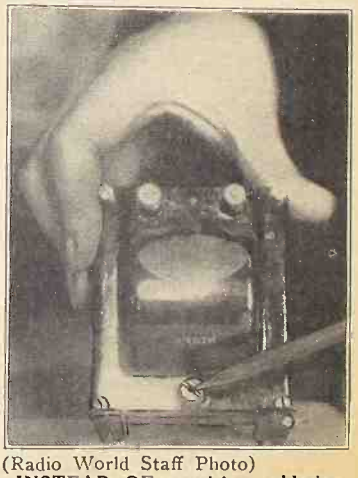
So for the benefit of the fans who failed to recognize Hal's voice, Hal has confession. After the Cubs' last home run, Hal took his vacation, in a hospital, where he had his tonsils removed.

KNX PROUD OF STUDIO

LOS ANGELES.

KNX boasts enlarged quarters now and, as result, are claiming one of the finest appointed studios in the Southland. There are now two broadcasting rooms, a lounging-room for artists and a great deal of added office space. The added broadcasting room is of a more exclusive type and will not be opened for the public.

GROUNDS THE CORE



(Radio World Staff Photo)

INSTEAD OF requiring soldering or making special terminals on the external metal covering of a transformer for grounding purposes to prevent intermagnetic coupling, a transformer manufacturer has made special provision via the binding post, which the pencil is pointing to in the above photograph, for connection to the ground.

Radio University

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

When writing for information give your Radio University subscription number.

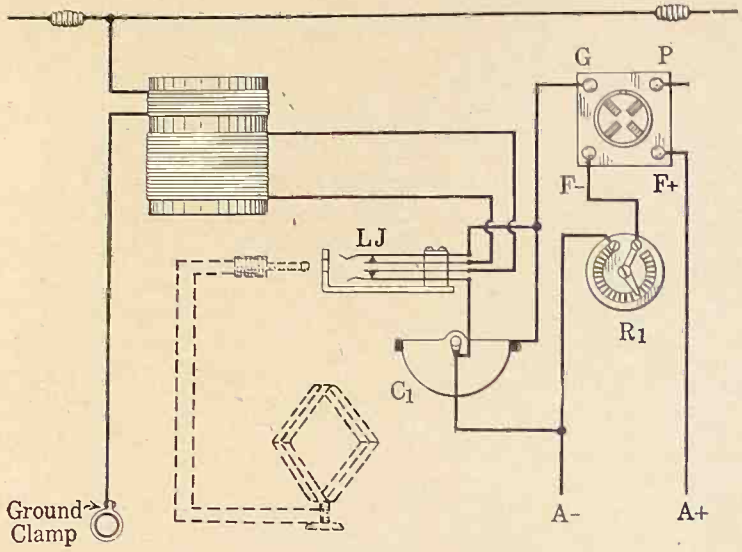


FIG. 452

The picture diagram illustrating the method of connecting up a double circuit jack, so that either a loop or antenna ground may be used.

I HAVE three Samson audio plate chokes, type P and three Samson audio grid chokes, type G. Please give the circuit diagram of a 6-tube receiver, using two stages of tuned radio frequency amplification a non-regenerative detector and the chokes in three stages of audio frequency amplification, stating the constants of the coils, etc. Include a choke coil and condenser in the output, to prevent the DC from entering the windings of a cone speaker, which I contemplate on using. I have three .0005 mfd. variable condensers, which I would like to use. —Clarence Hendricks, Mississippi, Mo.

Fig 453 shows the circuits diagram of this receiver. So that your .0005 mfd. variable condensers may be used, the secondaries, L2, L4 and L6, consist of 55 turns, wound on tubings 2¾" in diameter. The primaries, L1, L3 and L5, consist of 10 turns. Each primary and secondary is wound on a separate tubing, with a ¼" spacing between them. Use No. 22 double cotton covered wire for winding. The condensers are indicated as C1, C2 and C3. The filaments of the RF tubes are controlled by a 10 ohm rheostat, which will pass 1 amperes, while the filaments of the detector and the audio amplifier tubes are controlled by a 6 ohm rheostat, which will pass 2 amperes. The stopping condensers in the AF circuit should be of the 1 mfd. fixed type. The bypass condenser between the A minus and B plus 45 volt post should also be of the 1 mfd. fixed type. C8, also a bypass condenser, may be of the .00025 mfd. fixed type. CH is the choke coil at the output. This may be a Samson output impedance, type O. The condenser in this circuit should be of the 4 mfd. fixed type. The C battery connection in the last AF stage, is for the use of a power tube. That is the reason for the separate B lead, also. The B voltages of the detector and the RF tubes are indicated on the diagram. The voltage for the plate of the amplifier tube is dependent upon the type of AF power tube used. There are two methods to connect the grid leak, if you use the —00 A type tube as a detector, then return run the leak across the condenser. If you use the —01A type tube as a detector, then run the leak to A plus. The —O1A tubes are used in the other sockets. A 3 meghom leak is used. The grid condenser is of the .00025 mfd. fixed type. At the speaker output, binding posts or a single circuit jack may be used.

* * *

I READ with interest the answer to the query submitted by Bob Girshwin, which appeared in the Radio University columns of the Oct. 30 issue of RADIO WORLD, regarding the insertion of a loop in the 6-tube receiver, shown in the Oct. 13 issue. However, I am in doubt as to the exact connections to make using the double circuit jack. A picture diagram, I think, will aid matters.—Jack Barwarden, Pawtucket, R. I.

Fig. 452 illustrates the method of installing a double circuit for loop-antenna operation. LJ is the loop jack. C1 is the variable condenser. R1 is the power rheostat. The loop and the plug is indicated by the dotted line. This diagram differs a bit from the original, in that the beginning and the end of the primary and secondary windings are not connected together. This connection is experimental, depending wholly upon the location of the receiver. That is, if the set is placed in a section where the broadcasting stations are closely crowded, then the joining connection should be left off; if in a less crowded section, this joining connection should be made. Such a method as described and shown in the answer to Clyde Nathan's query in these columns, can be used also for loop-antenna operation in this receiver. Note the beginning and end connections on the coil, e. g., ground connection next to the F minus. The connection of the grid return either to the F minus or A minus, in this receiver is not important. Either way will give equal results.

* * *

I HAVE built the 1-tube reflex, described in the July 24 issue of RADIO WORLD, and have had very satisfactory results. However I would now like to add two stages of transformer coupled audio frequency amplification. I am now using an —O1A tube and contemplate on using two more in the AF stages. Can the AF hookup as diagramed in the Sept. 18 issue, be used?—Henry Wallace, Louisville, Mo.

Yes. The tickler post connection is brought to the end of the primary coil L4.

* * *

IN BUILDING the 5-tube Tabloid Set described in the Aug. 7 issue of RADIO WORLD, I would like to know if it is possible to use solenoid type coils 2" in diameter and 7" long, with .0005 mfd. variable condensers. If so, please state the number of turns necessary to wind to constitute the RFT.—Thomas Ricerton, Hollywood, Cal.

Yes, these coils can be used. The primaries should consist of 10 turns. The secondaries should consist of 95 turns. No space between the primary and secondary need be left. Use No. 24 double cotton-covered wire. The coils can be placed on each end of the baseboard.

* * *

PLEASE GIVE a summarized list of the possible interferences from outside sources.—Robert Fort, Baltimore, Md.

Sing flashes, regenerative receivers, induction coils, atmospheric static, electric street cars, heterodyning of broadcasting stations, defective rail bonds on street

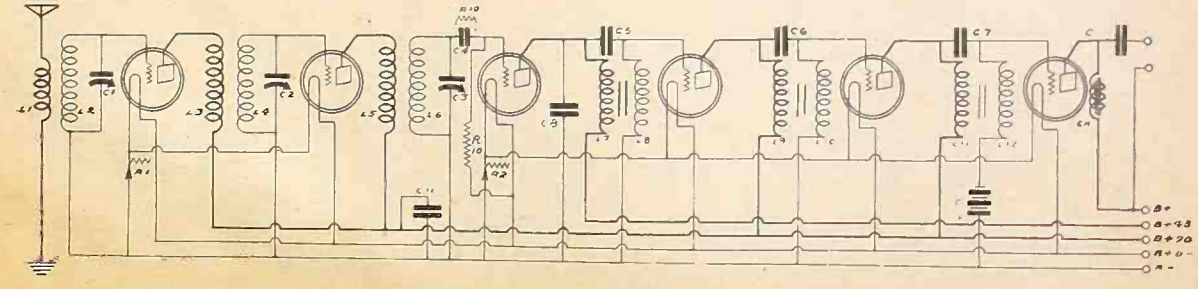


FIG. 453

The circuit diagram of the 6-tube receiver, using double impedance AF coupling.

railway systems, leaking insulators on power circuits, bad contact on high power switches, defective transformers, X-ray machines, static machines, static produced by belts, electrical manufacturing processes, loose street lamp in socket, smoke or dust precipitators, motion picture machines using arc light, motors and generators, electric welding machines, telephone ringers, defective lighting arresters in lighting circuits, and leaking insulators on power lines and in the power house. There are also noises which may come from the same house or in the neighbor's house, such as—ozonators, door bells, buzzers, sewing machine motors, violet ray machines, electrical heating pads using thermostat control, washing machines, battery chargers of the vibrating type and also of the electrolytic type, elevator controllers and motors, bad contacts in the house input switch or fuses or sockets, antenna being to near lines or to electric light wires connecting to lamps or eliminators.

* * *

I AM building the 5-tube receiver, shown on page 15 of the Sept. 11 issue of RADIO WORLD, and I would like to know if it is possible to cut the stage of resistance coupled audio frequency amplification out of the circuit entirely, connecting the output of the detector stage directly to the first audio frequency transformer?—Mary Fallon, 157 St. Anns Ave., N. Y. City.

Yes. Be sure to use the proper ballast resistor to control the filament temperature of the two tubes, e. g., ½ ampere instead of ¾.

* * *

AS TO the circuit diagram of the radio frequency and detector unit which was described in he Oct. 9 issue, Radio University columns. Can a single ballast resistor be used to control the filament temperature of the RF tubes, instead of two as diagramed?—Irving Manrothers, Irving-on-the-Hudson, N. Y.

Yes, of the ½ ampere type.

* * *

PLEASE GIVE the electrical characteristics of the old type Aeriotron 1.1 volt dry cell tube, manufactured by the Westinghouse Mfg Co.—Charles Kessen, Mount Holyoke, Mass.

The normal filament current of this tube was .2 amperes. It had an amplification factor of 6. The plate resistance was 20,000 ohms. When using this tube as a detector, as low as 10 volts B, could be used. The tube could also be used as an amplifier, and in that capacity, about 30 volts B could be used. The grid to plate capacity was 4 mmfds. The plate to filament capacity was 3.5 mmfds.

* * *

I AM constructing the 5-tube, 1-control receiver shown in the June 26 issue of RADIO WORLD, on page 11. Can a ½ ampere ballast resister be installed in series with the negative lead of the filament of the last tube, this being of the power type? Has this anything to do with the wiring of the filament control jack?—H. Mayson Car, Liberty, N. Y.

Yes, this is a very good stunt. However, the B lead for this tube will have to be separate. This necessitates the breaking of the connection of the bottom terminal of FCJ to the B plus 2 post and the connecting of this bottom terminal to a third post. Also the grid return of R6 should be brought to a C minus post. No other wiring change is necessary.

* * *

I WOULD like to have the circuit diagram of a 4-tube receiver, using a tuned radio frequency stage, a non-regenerative and untuned detector stage and two stages of transformer coupled audio frequency amplification. Please give the constants of the coils, condensers, transformers, rheostats, etc. I have two double circuit and one single circuit jacks, a 400 potentiometer and four 20 ohm rheostats. Can these be used? If so, please insert.—Henry Marks, Los Angeles, Cal.

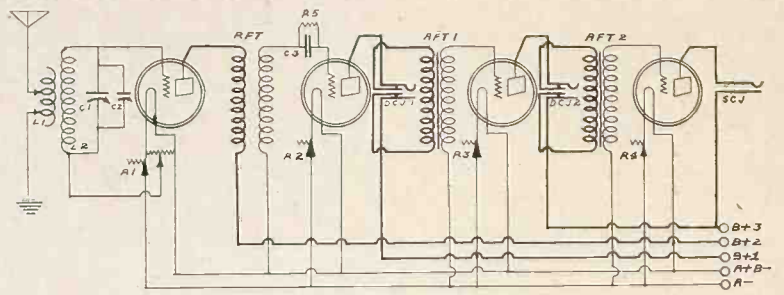


FIG. 454

The circuit diagram of the 4-tube receiver using untuned detector and a tuned detector stage.

Fig. 454 shows the electrical diagram of such a receiver. The primary of the tuned radio frequency coil, L1, consists of 30 turns, tapped at every 5th turn. The secondary consists of 40 turns. Both these windings are made on a 3¼" diameter tubing, using No. 24 double cotton-covered wire. There is a ¼" space left between the windings. C1 is a .0005 mfd. variable condenser. C2 is a .00004 mfd. midget variable condenser used for vernier tuning RFT indicates the untuned RF stage. The filament of each tube is controlled by the 20 ohm rhostats, R1, R2, R3 and R4, respectively. DCJ1 and DCJ2 indicate the double circuit jacks, while SCJ indicates the single circuit jack. The potentiometer is connected in the grid return circuit of the radio frequency amplifier tube. C3 is a .00025 mfd. fixed grid condenser, while R5 is a 3 megohm grid leak. AFT1 and AFT2 are low ratio audio frequency transformers. The —01A tubes should be used throughout this set for best results. This requires the use of a 6-volt A battery, of course. B plus 1 indicates the detector voltage, which should be about 45. B plus 2 indicates the voltage for the radio frequency amplifier, this being about 67½. The plates of the audio amplifiers are fed with 90 volts. The last —01A amplifier tube may be supplanted by a power tube. This will necessitate the use of a separate B lead. Also the connecting of the F post of the last AFT to the minus of a C battery, instead of to A minus. The voltage of the C battery will depend upon the tube used. This may be said of the B voltage, also. The controlling of the detector and the audio amplifier filaments is not the least bit critical, and therefore. if you wish, you may use ballast resistors of the ¼ ampere type. When doing this, you will have to connect a filament switch in series with the A plus lead. Half the turns in the primary coil are connected in the antenna circuit, the other half being connected in the ground circuit, e. g., 15 and 15 or three taps in the antenna and three taps in the ground.

* * *

I HAVE just purchased a 1926 Diamond of the Air blueprint and wish to make my own coils, these being of the space wound type, such as the Hammerlund. Using a 3" diameter, how many turns should be wound to constitute the primary and secondary windings of the RFT and the tuner, also the tickler? Using a 2½" diameter form, how many turns should be wound to constitute the primary and secondary windings of the RFT and tuner, also the tickler?—Gordon A. Harvie, 39 Wilinot Road, Tuckahoe, N. Y.

The primaries for both the 3" and 2½" diameter forms, consist of 10 turns. The secondary, using the 3" diameter form, consists of 44 turns. The secondary, using the 2½" diameter form, consists of 62 turns. The tickler form for the 3" diameter form should be 1¾" in diameter and consist of 36 turns. The tickler form for the 2½" diameter form, should be 1" in diameter and consist of 40 turns. For the primary and secondary windings, use No. 24 double cotton covered wire. For the tickler, use No. 26 single silk covered wire. Allow a ¼" space between the primary and secondary windings on both forms.

* * *

I WOULD be very much obliged, if the following query were answered: Capt. P. V. O'Rourke in the January 24, 1925 issue of RADIO WORLD, described a 1-stube regenerative receiver. I have just finished making this receiver and find that there is no regeneration. How can this be cured?—Herman Benson, 1984 Daly Ave., Bx., N. Y. City.

Be sure that the tube oscillates. Test in another set or tube tester. If it does and the set is wired properly, the fault may lay in the coil-condenser circuit, L3-C2. Either the coil hasn't enough turns or the capacity of the condenser is too low. The best thing to do is to add about 3 turns to the coil. If this don't help, add 5 more, etc. Test the condenser for a short. See that the grid return is made properly, according to the tube used. Try increasing the plate voltage. Try using a 2 megohm fixed leak.

* * *

IN HOOKING up a separate two stage transformer coupled amplifier, to a 2-stage tuned RF and detector unit, is the plate post of the detector tube connected to the P post of the AFT and the B plus detector post connected to the B post on the AFT, also? (2)—Can the same A battery be used for both the AFT unit and the detector-RF unit?—Bob Willett, South Bend, Ind.

(1)—Yes. (2)—Yes.

* * *

I HAVE a standard 5-tube Neutrodyne, employing transformer coupled AF amplification. The filaments of the tubes in AF portion of this set are controlled by a rheostat. I notice, however, that the control here, is not critical. Can I, therefore, supplant it with a 112 type Amperite? I use —01A tubes throughout.—Borris Catler, Denver, Col.

Yes.

* * *

I HAVE a Carter No. 6 jack switch, double pole double throw. Please give a circuit diagram illustrating how to use this jack so that a loop and an antenna-ground system can be alternately switched in and out. Please explain how the connections are made.—Clyde Nathans, Mobile, Ala.

Fig. 455 shows the method of hooking up this jack. The bottom or the first and the fourth springs are brought to the secondary windings of the coil. The bottom spring is brought to the end of the

(*Continued on page 27*)

OFFICIAL LIST OF STATIONS

(Corrected and Revised Up to October 26)

[Herewith is published a complete and corrected list of the broadcasting stations in the United States, with wavelengths given in meters, even unto decimals, and equivalent frequency given in kilocycles.]

Station	Location and Owner	kc	m
KDGE	Barrett, Minn., Jaren Drug Co.	1290	232.4
KDKA	East Pittsburgh, Pa., Westinghouse E. & M. Co.	970	309.1
KDLR	Devils Lake, N. D., Radio Elec. Co.	1300	231
KDYL	Salt Lake City, Utah, Newhouse Hotel	1220	246
KFAB	Lincoln, Neb., Neb. Buick Auto Co.	880	340.7
KFAD	Phoenix, Ariz., Elec. Equip. Co.	1100	273
KFAF	San Jose, Cal., A. E. Fowler	1380	217.3
KFAU	Boise, Idaho, Indep. Sch. Dist. of Boise	1070	280.2
KFBB	Havre, Mont., F. A. Buttrey & Co.	1090	275
KFBC	San Diego, Cal., Union League Club	790	380
KFBL	Everett, Wash., Leese Bros.	1340	224
KFBS	Trinidad, Cal., School District No. 1	1260	238
KFBU	Laramie, Wyo., St. Matthews Cathedral	800	374.8
KFCB	Phoenix, Ariz., Nielson Radio Supply Co.	1260	238
KFDD	Boise, Idaho, St. Michael Cathedral	1090	275.1
KFDM	Beaumont, Tex., Magnolia Petroleum Co.	950	315.6
KFDX	Shreveport, La., First Baptist Church	1270	236.1
KFDY	Brookings, S. D., S. D. State College	980	305.9
KFDZ	Minneapolis, Minn., Harry O. Iverson	1300	231
KFEC	Portland, Ore., Meier & Frank	1210	248
KFEL	Denver, Colo., Eugene P. O'Fallon, Inc.	1180	254.1
KFEQ	Oak, Neb., Scroggin & Co.	1120	268
KFEY	Kellog, Idaho, Bunker Hill & Sullivan	1290	233
KFEP	Moberly, Mo., First Baptist Church	1240	242
KFGQ	Boone, Ia., Crary Hardware Co.	1330	226
KFH	Witchita, Kans., Hotel Lassen	1120	267.7
KFHA	Cunnison, Colo., Western State College of Colo.	1190	252
KFHL	Oskaloosa, Ia., Penn College	1250	240
KFI	Los Angeles, Cal., Earl C. Anthony, Inc.	640	468.5
KFIF	Portland, Ore., Benson Polytechnic Inst.	1210	248
KFIO	Spokane, Wash., North Central High School	1100	272.6
KFIQ	Yakima, Wash., First Methodist Church	1170	256
KFIU	Juneau, Alaska, Alaska Elec. Light & Power Co.	1330	226
KFIZ	Fond Du Lac, Wisc., Fon Du Lac Commonwealth Reporter	1100	273
KFJB	Marshalltown, Ia., Marshall Electric Company	1210	248
KFJC	Junction City, Kans., R. B. Fegan	1370	218.8
KFJF	Oklahoma City, Okla., Nat'l Radio Mfg. Company	1150	261
KFJI	Astoria, Ore., E. E. Marsh	1220	245.8
KFJM	Grand Forks, N. D., Univ. of N. D.	1080	278
KFJR	Portland, Ore., Ashley C. Dixon & Son	1140	263
KFJY	Fort Dodge, Ia., Tunwall Radio Co.	1220	246
KFJZ	Fort Worth, Tex., W. E. Branch	1180	254.1
KFKA	Greeley, Colo., Colo. State Teachers Col.	1100	273
KFKU	Lawrence, Kans., University of Kans.	1090	275
KFKX	Hastings, Neb., Westinghouse, E. & M. Co.	1040	288.3
KFKZ	Kirksville, Mo., Cham. of Com.	1330	225.4
KFLR	Albuquerque, N. M., Univ. of N. M.	1180	254
KFLU	San Benito, Tex., San Benito Radio Club	1270	236
KFLV	Rockford, Ill., Swedish Evangelist Church	1310	229
KFLX	Galveston, Tex., Geo. Roy Clough	1250	240
KFMR	Sioux City, Ia., Morningside College	1150	261
KFMX	Northfield, Minn., Carlton College	890	336.9
KFNF	Shenandoah, Ia., Henry Field Seed Co.	650	461.3
KFOA	Seattle, Wash., Rhodes Department Store	660	454.3
KFOB	Burlingame, Cal., K. F. O. B., Inc.	1330	225.4
KFON	Long Beach, Cal., Echophone Radio Shop	1290	233
KFOO	Salt Lake City, Utah, Latter Day Saints Union	1270	236
KFOR	David City, Neb., Tire & Electric Co.	1330	226
KFOT	Wichita, Kans., College Hill Radio Club	1300	231
KFOX	Omaha, Neb., Technical High School	1210	248
KFOY	St. Paul, Minn., Beacon Radio Service	1190	252
KFPL	Dublin, Tex., C. C. Baxter	1190	252
KFPM	Greenville, Tex., New Furniture Co.	1240	242
KFPR	Los Angeles, Cal., L. A. County Forestry Dept.	1300	231
KFPW	Carterville, Mo., St. John's Methodist Episcopal Church	1160	258
KFPY	Spokane, Wash., Symons Investment Co.	1098	273
KFQA	St. Louis, Mo., The Principa	1150	261
KFQB	Fort Worth, Tex., Searchlight Publishing Co.	593	508.2
KFQD	Anchorage, Alaska, Chovin Supply Co.	1320	227.1
KFQP	Iowa City, Ia., G. S. Carson, Jr.	1340	224
KFQU	Holy City, Cal., W. E. Riker	1300	230.6
KFQW	North Bend, Wash., C. F. Knierim	1390	215.7
KFQZ	Hollywood, Cal., Taft Products Co.	1330	226
KFRB	Beeville, Tex., Hall Brothers	1210	248
KFRC	San Francisco, Cal., City of Paris	1120	268
KFRU	Columbia, Mo., Stephens College	600	499.7
KFRW	Olympia, Wash., Western Broadcasting Co.	1370	218.8
KFSD	San Diego, Cal., Airfan Radio Corporation	1220	245.8
KFSG	Los Angeles, Cal., Echo Park Evangelist Ass'n	1090	275
KFUL	Galveston, Tex., T. Goggan & Brothers	1160	258
KFUM	Colorado Springs, Colo., W. D. Corley	1250	239.9
KFUO	St. Louis, Mo., Concordia Seminary	550	545.1
KFUP	Denver, Col., Fitzsimmons General Hospital	1280	234
KFUR	Ogden, Utah, Peery Building Company, Inc.	1340	224
KFUS	Oakland, Cal., L. L. Sherman	1170	256
KFUT	Salt Lake City, Utah, University of Utah	1150	261
KFUU	Oakland, Cal., H. C. Colburn & E. L. Mathewson	1360	220.4
KFVD	Venice, Cal., C. I. McWhinnie	1460	205.4
KFVE	St. Louis, Mo., Venson Broadcasting Corp.	1250	239.9
KFVG	Independence, Kans., First M. E. Church	1270	236.1
KFVI	Houston, Tex., Headquarters Troop, 56th Calvary	1250	240
KFVN	Fairmont, Minn., Carl E. Bagley	1320	227
KFVR	Denver, Col., Moonlight Ranch	1230	244
KFVS	Cape Girardeau, Mo., Cape Girardeau Battery Station	1340	224
KFVY	Albuquerque, N. M., Radio Supply Co.	1200	250
KFWB	Hollywood, Cal., Warner Brothers Pictures	1190	252
KFWC	San Bernardino, Cal., L. E. Wall	1030	291.1
KFWF	St. Louis, Mo., St. Louis Truth Center	1400	214.2
KFWH	Eureka, Cal., F. Wellington Morse, Jr.	1180	254.1
KFWI	San Francisco, Cal., Radio Entertainments	1201	249.2
KFWM	Oakland, Cal., Oakland Educational Society	950	315.6
KFWO	Avalon, Cal., Lawrence Mott	1420	211.1
KFWU	Pineville, La., Louisiana College	1260	238
KFWV	Portland, Ore., Wilbur Jerman	1410	212.6
KFXB	Big Bear Lake, Cal., Bertram C. Heller	1480	202.6
KFXD	Logan, Utah, Service Radio Company	1460	205.4
KFXF	Colorado Springs, Colo., Pikes Peak Broadcasting Co.	1200	249.9
KFXH	El Paso, Tex., Bledsoe Radio Co.	1240	242
KFXJ	Near Edgewater, Col., R. G. Howell	1390	215.7
KFXR	Oklahoma City, Okla., Classen Film Finishing Co.	1400	214.2
KFXY	Flagstaff, Ariz., Harry M. Costigan	1460	205.4
KFYF	Oxnard, Cal., Carl's Radio Den	1400	214.2
KFYJ	Portable, Tex., Houston Chronicle Publishing Co.	1260	238
KFYO	Texarkana, Tex., Buchanan-Vaughan Co.	1430	209.7
KFYR	Bismark, N. D., Hoskins-Meyer, Inc.	1210	248
KGAR	Tucson, Ariz., Tucson Citizen	1230	243.8
KGBS	Seattle, Wash., A. C. Dailey	1321	227
KGBU	Ketchikan, Alaska, Roy R. Thornton	1310	228.9
KGBW	Joplin, Mo., Martin Brotherson	1050	282.8
KGBX	St. Joseph, Mo., Julius B. Abercrombie	862	347.8
KGBY	Shelby, Neb., Albert C. Dunning	1480	202.6
KGBZ	York, Neb., Federal Live Stock Remedy Co.	900	333.1
KGCA	Decorah, Ia., C. W. Greenle	1070	280.2
KGCB	Oklahoma, Okla., Wallace Radio Institute	905.8	331
KGCG	Newark, Ark., Moore Motor Co.	1280	234.2
KGCH	Wayne, Neb., Wayne Hospital	663.3	450
KGCI	San Antonio, Tex., International Radio Co.	1250	239.9
KGCL	Seattle, Wash., Louis Wasmer	1300	230.6
KGCM	San Antonio, Tex., Robert B. Bridge	1140	263
KGCN	Concordia, Kans., Alva E. Smith	1428	210
KGCR	Brookings, S. D., Cutlers Broadcasting Service	1190	252
KGCX	Vida, Mont., First State Bank	1249	240
KGO	Oakland, Cal., General Electric Co.	830	361.2
KGTT	San Francisco, Cal., Glad Tidings Tabernacle, Inc.	1450	206.8
KGU	Honolulu, T. H., Marion A. Mulrony	1110	270
KGW	Portland, Ore., Morning Oregonian	610	491.5
KGY	Lacey, Wash., St. Martins College	1080	277.6
KHJ	Los Angeles, Cal., Times Mirror Co.	740	405.2
KHQ	Spokane, Wash., Louis Wasmer	760	394.5
KFLZ	Anita, Ia., Atlantic Automobile Co.	1100	272.6
KJBS	San Francisco, Cal., J. Brunton & Sons Co.	1360	220
KJR	Seattle, Wash., Northwest Radio Service Co.	780	384.4
KLDS	Independence, Mo., Reorganized Church of Jesus Christ	680	440.9
KLS	Oakland, Cal., Warner Brothers	1200	250
KLX	Oakland, Cal., Tribune Publishing Co.	590	508.2
KLZ	Denver, Colo., Reynolds Radio Co.	1130	265.3
KMA	Shenandoah, Ia., May Seed & Nursery	650	461.3
KMJ	Fresno, Cal., The Fresno Bee	1280	234.2
KMMJ	Clay Center, Neb., M. M. Johnson Co.	1310	228.9
KMO	Tacoma, Wash., KMO, Inc.	1200	250
KMOX	St. Louis, Mo., Voice of St. Louis	1070	280.2
KMTR	Los Angeles, Cal., Echophone Co.	1260	238
KNRC	Hollywood, Cal., Clarence B. Juneau	1440	208.2
KNX	Los Angeles, Cal., Los Angeles Express	890	336.9
KOA	Denver, Colo., General Electric Co.	930	322.4
KOAC	Corvallis, Ore., Oregon Agriculture College	1070	280.2
KOB	State College, N. M., New Mexico College of Agri.	860	348.6
KOCH	Omaha, Neb., Omaha Central High School	1160	258
KOCW	Chickashia, Okla., Oklahoma College for Women	1190	252
KOIL	Council Bluffs, Ia., Mona Motor Co.	980	305.9
KOIN	Portland, Ore., KOIN, Inc.	940	319
KOMO	Seattle, Wash., Birt F. Fisher	980	305.9
KOWW	Walla Walla, Wash., Frank A. Moore	1052	285
KPO	San Francisco, Cal., Hale Brothers, Inc.	700	428.3
KPJM	Prescott, Ariz., Wilburn Radio Service	1395	215
KPPC	Pasadena, Cal., Pasadena Presbyterian Church	1310	229
KPRC	Houston, Tex., Houston Printing Co.	1010	296.9
KPSN	Pasadena Star-News, Pasadena, Cal	950	315.6
KQW	San Jose, Cal., First Baptist Church	900	333.1
KQV	Pittsburgh, Pa., Doubleday Hill Electric Co.	1090	275
KRE	Berkeley, Cal., Berkeley Daily Gazette	1170	256
KSAC	Manhattan, Kans., Kansas State Agricultural College	880	340.7
KSBA	Shreveport, La., W. G. Paterson	960	312.6
KSD	St. Louis, Mo., Pulitzer Publishing Co.	550	545.1
KSEI	Pocatello, Ida., KSSEI Broadcasting Co.	1150	260.7
KSL	Salt Lake City, Utah, Radio Service Corporation	1000	299.8
KSMR	Santa Maria, Cal., Santa Maria Valley RR.	1430	209.7
KSO	Clarinda, Ia., A. A. Berry Seed Co.	1240	242
KTAB	Oakland, Cal., Associated Broadcasters	990	302.8
KTBI	Los Angeles, Cal., Bible Institute	1020	293.9
KTBR	Portland, Ore., M. E. Brown	1140	263
KTHS	Hot Springs, Ark., New Arlington Hotel	800	374.8
KTNT	Muscatine, Ia., Norman Baker	900	333.1
KTUE	Houston, Tex., Uhalt Electric	1140	263
KTW	Seattle, Wash., First Presbyterian Church	660	454.3
KUOA	Fayetteville, Ark., University of Ark.	1000	299.8
KUOM	Missoula, Mont., University of Mont.	1230	243.8
KUSD	Vermillion, S. D., University of S. D.	1080	278
KUT	Austin, Tex., University of Tex.	1300	231
KVOO	Bristow, Okla., Voice of Okla.	800	374.8
KWCR	Cedar Rapids, Ia., H. F. Parr	1080	278
KWG	Stockton, Cal., Portable Wireless Telegraph Co.	1210	248
KWKC	Kansas City, Mo., Wilson Duncan Studios	1270	236
KWKH	Shreveport, La., The W. K. Henderson Iron Works and Supply Co.	960	312.3
KWSC	Pullman, Wash., State College of Wash.	850	348.6
KWUC	Lemars, Ia., Western Union College	1190	252
KWWG	Brownsville, Tex., City of Brownsville	1080	278
KYW	Chicago, Ill., Westinghouse E. & M. Co.	560	535.4
KXRO	Seattle, Wash., Brott Lab.	1249	240
KZM	Oakland, Cal., Preston D. Allen	1250	240
WAAD	Cincinnati, O., Ohio Mechanical Institute	1160	258
WAAF	Chicago, Ill., Daily Drovers Journal	1080	277.6
WAAM	Newark, N. J., Isaiah R. Nelson	1140	263
WAAW	Omaha, Neb., Omaha Grain Exchange	780	384.4
WABB	Harrisburg, Pa., Harrisburg Radio Co.	1470	204
WABC	Asheville, N. C., Asheville Battery Co.	1180	254
WABI	Bangor, Me., First Universalist Church	1250	240

(Continued from page 13)

WABO—Rochester, N. Y., Hickson Electric Co., Inc. 1080 278
WABQ—Haverford, Pa., Haverford College Radio Club 1150 261
WABR—Toledo, O., Scott High School.. 1140 263
WABW—Wooster, O., The College of Wooster 1450 206.8
WABX—Mount Clemens, Mich., Henry B. Joy 1220 246
WABY—Philadelphia, Pa., John Magaldi Jr. 1240 242
WABZ—New Orleans, La., Colis Place Baptist Church 1090 275.1
WADC—Akron, O., Allen T. Simmons.. 1160 258
WAFD—Port Huron, Mich., Albert B. Parfet 1090 275
WAGM—Royal Oak, Mich., Robert L. Miller 1330 275
WAHG—Richmond Hill, N. Y., A. H. Grebe 950 315.6
WAIT—Taunton, Mass., A. H. Waite & Co. 1310 229
WAIU—Columbus, O., American Insurance Union 1020 293.9
WAMD—Minneapolis, Minn., Raddison Radio Corporation 1230 243.8
WAPI—Auburn, Ala., Alabama Polytechnic Institute 650 461.3
WARC—Medford, Mass., American Radio & Research 1150 261
WASH.—Grand Rapids, Mich., Baxter Launderers & Cleaners 1170 256.3
WATT—Portable-First District, Edison Electric, Ill. 1230 243.8
WBAA—W. Lafayette, Ind., Purdue University 1100 273
WBAK—Harrisburg, Pa., Pennsylvania State Police 1090 275
WBAL—Baltimore, Md., Consolidated Gas & Power Co. 1220 245.8
WBAC—Decatur, Ill., James Miliken University 1110 270.1
WBAP—Forth Worth, Tex., Wortham Carter Publishing Co. 630 475.9
WBAW—Nashville, Tenn., Braid Elec. Co. & Waldrum Drug Co..... 1270 236.1
WBAX—Wilkes Barre, Pa., J. H. Stenger Jr. 1170 256
WBBC—Brooklyn, N. Y., Peter J. Testan 1200 249.9
WBBL—Richmond, Va., Grace Covenant Presbyterian Church 1310 228.9
WBBM—Chicago, Ill., Atlass Investment 1330 226
WBBP—Petoskey, Mich., Petoskey High School 1260 238
WBBR—Rossville, N. Y., Peoples Pulpit Ass'n 720 416.4
WBBS—New Orleans, La., First Baptist Church 1190 252
WBBW—Norfolk, Va., Ruffner Junior High School 1350 222
WBBY—Charlestwo, S. C., Washington Light Infantry 1120 268
WBBZ—Portable. Ill., C. L. Carrell.... 1390 215
WBCN—Chicago, Ill., Foster & McDonnell 1130 266
WBDY—Tilton, N. H., Booth Radio Lab.. 821 365
WBES—Takoma Park, Md., Bliss Electrical School 1350 222
WBMS—North Bergen, N. J., Geo. J. Schwerer 1340 223.7
WBNY—New York, N. Y., Baruchrome Corporation 930 322.4
WBOQ—Richmond Hill, N. Y., A. H. Grebe & Co., Inc. 1270 236
WBRC—Birmingham, Ala., Birmingham Broadcasting Co. 1210 248
WBRE—Wilkes Barre, Pa., Baltimore Radio Exchange 1300 231
WBRS—Brooklyn, N. Y., Universal Radio Mfg. Co. 761 394
WBT—Charlotte, N. C., Charlotte Cham. of Com. 1090 275
WBZ—Springfield, Mass., Westinghouse E. & M. Co. 900 333.1
WBZA—Boston, Mass., Westinghouse E. & M. Co. 900 333.1
WCAC—Mansfield, Conn., Conn., Agricul. College 1090 275
WCAD—Canton, N. Y., St. Lawrence University 1140 263
WCAE—Pitsburgh, Pa., Kaufman & Baer Co. 650 461.3
WCAH—Columbus, Ohio, Entrekin Elec. Co. 1130 265.3
WCAJ—University Place,. Neb.,. Neb. Wesleyan University 1180 254
WCAL—Northfield, Minn., St. Olaf College 890 336.9
WCAM—Camden, N. J., City of Camden 1270 236.1
WCAO—Baltimore, Md., Brager of Baltimore 1090 275
WCAP—Washington, D. C., Chesapeake and Pot. Telephone Co. 640 468.5
WCAR—San. Antonio,. Tex.,. Southern Radio Corporation 1140 263
WCAT—Rapid City, S. D., School of Mines 1250 240
WCAU—Philadelphia, Pa., Universal Broadcasting Co. 1080 278
WCAX—Burlington, Vt., University of Vermont 1200 250
WCAZ—Carthage, Ill., Carthage Coll 1220 245.8
WCBA—Allentown, Pa., Charles W. Heimbach 1180 254
WCBD—Zion, Ill., Wilber Glenn Voliva 870 344.6
WCBE—New Orleans, La., Uhalt Radio Co. 1140 263
WCBH—Oxford, Miss., University of Miss. 1240 242
WCBM—Baltimore, Mr., Hotel Chateau 1310 229
WCBR—Portable, R. I., C. H. Mosster 1430 209.7
WCES—Portable-First District, H. L. Dewing & H. Meester 1239 242
WCCO—Anoka, Minn., Washburn Crosby Co. 720 416.4
WCFL—Chicago, Ill., Chicago Fed. of Labor 610 491.5
WCFT—Tullahoma, Tenn., Knights of Pythias Home 1190 250.2
WCLO—Camp Lake, Wis., C. E. Whitmore 1300 231
WCLS—Joliet, Ill., H. M. Couch 1400 214
WCMA—Culver, Ind., Culver Military Academy 1160 258.5
WCOA—Pensacola, Fla., City of Pensacola 1350 222.1
WCRW—Chicago, Ill., C. R. White 720 416.4
WCSH—Portland, Me., H. R. Rines 600 499.7
WCSO—Springfield, O., Wittonberg College 1210 248
WCWK—Fort Wayne, Ind., Chester W. Keen 1280 234.2
WCWS—Portable, Mass., C. W. Selen.... 1430 209.7
WCX—Pontiac, Mich., Detroit Free Press 580 516.9
WJR—Pontiac, Mich., Jewett Radio & Phonograph Co. 580 516.9
WDAD—Nashville, Tenn., Dads Automobile Accessories, Inc. 1330 226
WDAE—Tampa, Fla., Tampa Daily Times 1100 273
WDAF—Kansas City, Mo., Kansas City Star 820 365.6
WDAG—Amarillo, Tex., J. Laurence Martin 1140 263
WDAH—El Paso, Tex., Trinity Methodist Church 1120 267.7
WDAY—Fargo, N. D., Radio Equipment Corp. 1150 260.7
WDBE—Atlanta, Ga., Gilham Schoen Electrical Co. 1120 270
WDBJ—Roanoke, Va., Richardson Wayland land Elec. Corp. 1310 228.9
WDBK—Cleveland, O., M. F. Broz.... 1320 227
WDBO—Winter Park, Fla., Rollins College 1250 240
WDBZ—Kingston, N. Y., Kingston Radio Club 1290 232.4
WDEL—Wilmington, Del., Wilmington Electric Spec. Co. 1130 265.3
WDGY—Minneapolis, Minn., Dr. George W. Young 1140 263
WDOD—Chattanooga, Tenn., Chattanooga Radio Co., Inc. 1170 256
WDRC—New Haven, Conn., Doolittle Radio Corporation 1120 268
WDWF—Cranston, R. I., Dutee Wilcox Flint Inc. 680 440.9
WDXL—Detroit, Mich. DXL Radio Corp. 1010 296.9
WDZ—Tuscola, Ill., James L. Bush.... 1080 278
WEAF—N. Y. City, Broadcasting Company of America, Inc. 610 491.5
WEAI—Ithaca, N. Y., Cornell University 1180 254
WEAM—North Plainfield, N. J., Borough of N. Plainfield 1150 261
WEAN—Providence, R. I., The Shepard Co. 817 367
WEAO—Columbus, O., Ohio State University 1020 293.9
WEAR—Cleveland, O., Willard Storage Battery Co. 770 389.4
WEAU—Sioux City, Ia., Davidson Bros. Co. 1090 275
WEBC—Superior, Wisc., W. C. Bridges 1240 242
WEBH—Chicago, Ill., Edgewater Beach Hotel 810 370.2
WEBJ—New York, N. Y.,Third Avenue R. R. Co. 1100 273
WEBL—Portable, R. C. A. Show..... 1330 226
WEBQ—Harrisburgh, Ill., Tate Radio Co. 1330 226
WEBR—Buffalo, N. Y., H. H. Howell.. 1230 244
WEBW—Beloit, Wisc., Beloit College... 1120 258
WEBZ—Savannah, Ga., Savannah Radio Radio Corporation 1140 263
WEDC—Chicago, Ill., Emil Denemark Co. 710 422.3
WEEI—Boston, Mass., Edison Electric Illuminating Co. 860 348.6
WEHS—Chicago, Ill., O. G. Fordham.. 1480 202.6
WEMC—Berrien Springs, Mich., Emanuel Miss. College 950 315.6
WENR—Chicago, Ill.,All-American Radio Corp. 1130 266
WEW—St. Louis., Mo., St. Louis University 832.8 360
WFAA—Dallas, Tex., Dallas News & Dallas Journal 630 475.9
WFAM—St. Cloud, Minn., Times Publishing Co. 1100 273
WFAV—Lincoln, Neb., University of Neb. 1090 275
WFBC—Knoxville, Tenn., First Baptist Church 1200 250
WFBE—Seymour, Ind., J. V. De Welle 1330 226
WFBG—Altoona, Pa., W. F. Gable Co.... 1080 278
WFBH—N.Y.C., Concourse Radio Corp. 1100 273
WFBJ—Collegeville, Minn., St. John's University 1270 236
WFBL—Syracuse, N. Y., Onondaga Hotel 1190 252
WFBM—Indianapolis, Ind., Merchant H. L. Co. 1120 268
WFBR—Baltimore, Md., Fifth Infantry, National Guard 1180 254
WFBZ—Galesburg, Ill., Knox College.. 1180 254
WFCI—Pawtucket, R. I., Frank Crook, Inc. 1309 229
WFDF—Flint, Mich., Frank D. Fallain 1280 234
WFL—Philadelphia, Pa., Strawbridge & Clothier 760 394.5
WFKB—Chicago, Ill., Vesta Battery Co. 1380 217.3
WFRL—Brooklyn, N. Y., Robert Morrison Lacey 1460 205.4
WGAL—Lancaster, Pa., Lancaster Electric Supply and Construction Co... 1210 248
WGBB—Freeport, N. Y., H. C. Carman 1230 243.8
WCBC—Memphis, Tenn., First Baptist Church 1080 278
WGBS—Evansville, Ind., Finke Furniture Co. 1270 236.1
WGBL—Scranton, Pa., Scranton Broadcasters, Inc.. ..... 1250 239.9
WGBR—Marshfield, Wisc., G. S. Ives.. 1310 229
WGBS—Astoria, L. I., N. Y., Gimbel Brothers 950 315.6
WGBU—Fulford-by-the-Sea, Fla., Florida Cities Finance Co. 1080 278
WCBX—Oreno, Me., University of Me... 1280 234.2
WGCP—Newark, N. J., May Radio Broadcasting Corp. 1190 252
WGES—Chicago, Ill., Oak Leaves Broadcasting Corp. 950 315.6
WGHB—Clearwater, Fla., Fort. Harrison Hotel 1130 265.3
WGHP—Detroit, Mich., George Harrison Phelps, Inc. 1110 270
WGM—Jeanette, Pa., Verne & Elton Spencer 806 372
WGMU—Portable, N. Y., A. H. Grebe & Co. 1270 236
WGN—Chicago, Ill., Chicago Tribune... 990 302.8
WGR—Buffalo, N. Y., Federal Tel. & Tel. Co. 940 319
WGST—Atlanta, Ga., School of Tech..... 1110 270
WGY—Schenectady, N. Y., G. E. Co.... 790 379.5
WHA—Madison, Wisc., University of Wis. 560 535.4
WHAD—Milwaukee, Wisc., Marquette University 1090 275
WHAM—Rochester, N. Y.,Eastman School of Music 1080 278
WHAP—New York, N. Y., Wm. H. Taylor Finance Corp. 695.6 431
WHAR—Atlantic City, N. J., F. D. Cooks Sons 1090 275
WHAS—Louisville, Ky., Courier Journal & Louisville Times 750 399.8
WHAZ—Troy, N. Y., Rensselaer Polytechnic Inst. 790 379.5
WHB—Kansas City, Mo., Sweeney School Co. 820 365.6
WHBA—Oil City, Pa., C. C. Shaffer.... 1200 250
WHBC—Canton, O., Rev. E. P. Graham 1180 254
WHBD—Bellefontaine, O., Chamber of Commerce 1350 222.1
WHBF—Rock Island, Ill., Beardsley Spc. Co. 1350 222
WHBG—Harrisburg, Pa. John S. Skane 1300 231
WHBL—Portable, Ninth District, C. L. Carrell 1390 215
WHBM—Portable, Ninth District, C. L. Carrell 1390 215.7
WHBN—St. Petersburg, Fla., First Avenue M. E. Church 1260 238
WHBP—Johnstown, Pa., Johnstown Automobile Co. 1170 256
WHBQ—Memphis, Tenn., St. Johns M. E. Church 1290 233
WHBU—Anderson, Ind., Riviera Theatre & Bings Clothing 1370 218.8
WHBW—Philadelphia, Pa., D. R. Kienzle 1390 215.7
WHBY—West De Pere, Wisc., St. Norberts College 1200 249.9
WHDI—Minneapolis, Minn., W. H. Dunwoody Institute 1080 278
WHEC—Rochester, N. Y., Hickson Electric Co., Inc. 1160 258
WHFC—Chicago, Ill., Hotel Flanders.. 1160 258.5
WHK—Cleveland, O., Radio Air Service Corporation 1100 272.6
WHN—New York, N. Y., Geo. Schubel 830 361.2
WHO—Des Moines, Ia., Bankers Life Co. 570 526
WHT—Deerfield, Ill., Radiophone Broadcasting Corp. 1260 238
WIAD—Philadelphia, Pa., Howard R. Miller 1200 250
WIAS—Burlington, Ia., Home Electric 1180 254
WIBA—Madison, Wisc., Capital Times-Strand Theatre 1270 236.1
WIBG—Elkins Park, Pa., St. Paul's Protestant Episcopal Church 1350 222
WIBH—New Bedford, Mass., Elite Radio Stores 1430 209.7
WIBI—Flushing, L. I., N. Y., F. B. Zittell, Jr. 1370 218.8
WIBJ—Portable, Ill., C. L. Carrell.... 1390 215.7
WIBM—Portable, Ill., B. Maine..... 1390 215.7
WIBO—Chicago, Ill., Nelson Brothers.. 1330 226
WIBR—Weirton, W. Va., Thurman A. Owings 1220 246
WIBS—Elizabeth, N. J., Thos. F. Hunter 1480 202.6
WIBU—Poynette, Wisc., The Electric Farm 1350 222
WIBW—Logansport, Ind., Dr. L. L. Dill 1360 220
WIBX—Utica, N. Y., WIBX, Inc..... 1280 234.2
WIEZ—Montgomery, Ala., A. D. Trum 1300 230.6
WIL—St. Louis, Mo., Benson Radio Co. 1160 258
WIOD—Miami, Fla., Carl G. Fisher Co. 1210 247.8
WIP—Philadelphia, Pa., Gimbel Bros. 590 508.2
WJAD—Waco, Tex., Jackson's Radio Engineering Laboratories 850 352.7
WJAF—Ferndale, Mich., J. A. Fernberg Radio Co. 749.6 400
WJAG—Norfolk, Neb., Norfolk Daily News 1110 270
WJAK—Kokomo, Ind., Kokomo Tribune 1180 254
WJAM—Cedar Rapids, Ia., D. M. Perham 1120 268
WJAR—Providence, R. I., The Outlet Co. 980 305.7
WJAS—Pittsburgh, Pa., Pittsburgh Radio Supply House 1090 27
WJAX—Jacksonville, Fla., City of Jacksonville 890 336.9
WJAZ—Mount Prospect, Ill., Zenith Radio Corp. 930 322.4
WJBA—Joliet, Ill., D. H. Lentz, Jr. 1450 206.8
WJBB—St. Petersburg, Fla., Financial Journal 1180 254.1
WJBC—La Salle, Ill., Hummer Furniture Co. 1280 234
WJBI—Red Bank, N. J., Robert S. Johnson 1370 218.8
WJBK—Ypsilanti, Mich., E. F. Goodwin 1290 233
WJBL—Decatur, Ill., Wm. Gushard Dry Goods Co. 1110 27
WJBO—New Orleans, La., V. Jenson 1120 267.7
WJBR—Omro, Wisc., Omro Drug Stores 1320 227.1
WJBT—Chicago, Ill., John S. Boyd..... 1260 238
WJBU—Lewisburg, Pa., Bucknell University 1420 211.1

WJBV—Woodhaven, N. Y., Union Course Club 1040 288.3
WJBW—New Orleans, La., C. Carlson, Jr. 1110 270.1
WJBX—Osterville, Mass., Renderson & Ross 1071 280
WJBY—Gadsden, Ala., Elec. Construction Co. 1110 270.1
WJJD—Mooseheart, Ill., Loyal Order of Moose 810 370.2
WJR—Pontiac, Mich., Jewett Radio & Phonograph Co. and The Detroit Free Press 580 516.9
WJUG—New York City, U. B. Ross.... 580 516.9
WJY—New York, N. Y., R. C. A..... 740 405.2
WJZ—Bound Brook, N. J., R. C. A.... 660 454.3
WKAF—Milwaukee, Wisc., WKAF Broadcasting Corp. 1150 261
WKAQ—San Juan, P. R., Radio Corporation of Porto Rico 880 340.7
WKAR—East Lansing, Mich., Michigan State College 1050 285.8
WKAV—Laconia, N. H., Laconia Radio Club 1340 223.7
WKBA—Chicago, Ill., Arrow Battery Co. 1430 209.7
WKBB—Joliet, Ill., Sanders Brothers.. 1060 282.8
WKBC—Birmingham, Ala., H. L. Ansley 1330 225
WKBD—Jersey City., N. J., Frank V. Bremer 1276 235
WKBE—Webster, Mass., K. & B. Electric Co. 1110 270.1
WKBF—Indianapolis, Ind., Noble D. Watson 1229 244
WKBG—Portable, Ill., C. L. Carrell..... 1390 215.7
WKBK—La Crosse, Wisc., Callaway Music 1200 249.9
WKBI—Chicago, Ill., Fred L. Schoenwolf 1360 220.4
WKBJ—St. Petersburg, Fla., Gospel Tabernacle, Inc. 1071 280
WKBL—Monroe, Mich., Monrona Radio Mfg. Co. 1190 252
WKBM—Youngstown, O., Radio Elec. Service Co. 959 312.6
WKBO—Jersey City, N. J., Camith Corp. 970 309.1
WKBP—Battle Crek, Mich., Enquirer & News 1131 265
WKBQ—New York City, Starlight Amusement Park 1052 285
WKBR—Auburn, N. Y., Chas. J. Hesiser.. 1133 256.3
WKBS—Galesurg, Ill., P. N. Nelson..... 830 361.2
WKBV—Brookville, Ind., Knox Battery & Electric Co. 1270 236.1
WKDR—Kenosha, Wisc., Edward A. Dato 700 428.3
WKJC—Lancaster, Pa., Kirk Johnson & Co. 1160 258.5
WKRC—Cincinnati, O., The Kodel Radio Corp. 710 422.3
WKY—Oklahoma City, Okla., R. C. Hull & N. S. Richards 1090 275
WLAL—Tulsa, Okla., First Christian Church 1200 250
WLAP—Louisville, Ky., W. V. Jordan 1090 275
WLB—Minneapolis, Minn., University of Minnesota 1080 278
WLBL—Stevens Point, Wisc., Wisc. Department of Markets 1080 278
WLIB—Elgin, Ill., Liberty Weekly, Inc. 990 302.8
WLIT—Philadelphia, Pa., Lit Brothers. 760 394.5
WLS—Crete, Ill., Sears Roebuck Co..... 870 344.5
WLSL—Cranston, R. I., The Lincoln Studies, Inc. 680 440.9
WLTS—Chicago, Ill., Lane Technical High School 1160 258
WLW—Harrison, O., The Crosley Radio Corp. 710 422.3
WLWL—N. Y. C., Paulist Fathers..... 780 384.4
WMAC—Cazenovia, N. Y., C. B. Meredith 1090 275
WMAF—Dartmouth, Mass., Round Hills Radio Corp. 680 440.9
WMAK—Lockport, N. Y., Norton Laboratories 1130 266
WMAL—Washington, D. C., M. A. Leese Optical Co. 1410 212.6
WMAN—Columbus, O., Haskett Radio Station 1080 278
WMAQ—Chicago, Ill., Chicago Daily News 670 447.5
WMAY—St. Louis, Mo., Kings Highway Presb. Ch. 1210 243
WMAZ—Macon, Ga., Mercer University 1150 261
WMBB—Chicago, Ill., American Bond & Mortgage Co. 1200 250
WMBC—Detroit, Mich., Michigan Broadcasting Co., Inc. 1170 256.3
WMBF—Miami Beach, Fla., Fleetwood Hotel Corp. 780 384.4

WMBI—Chicago, Ill., Moody Bible Institute 1040 288.3
WMC—Memphis, Tenn., Commercial Publishing Co. 600 499.7
WMCA—Hoboken, N. J., Greely Square Hotel Co. 880 340.7
WMRJ—Jamaica, N. Y., Peter J. Prinz 1320 227.1
WMSG—N. Y. C., Madison Square Garden Broadcasting Corp. 990 302.8
WNAB—Boston, Mass., The Shepard Stores 1070 280.2
WNAC—Boston, Mass., The Shepard Stores 697 430.1
WNAD—Norman, Okla., University of Okla. 1180 254
WNAL—Omaha, Neb., Omaha Central High School 1160 258
WNAT—Philadelphia, Pa., Lennig Brothers Co. 1200 250
WNAX—Yankton, S. D., Dakote Radio Apparatus Co. 1230 244
WNBH—New Bedford, Mass., New Bedford Hotel 1210 247.8
WNJ—Newark, N. J., Radio Shop of Newark 1190 252
WNOX—Knoxville, Tenn., Peoples Tel. & Tel. Co. 1120 267.7
WNRC—Greensboro, N. C., Wayne M. Nelson 1340 223.7
WNYC—New York, N. Y., Department of Plants & Structures 570 526
WOAI—San Antonio, Tex., Southern Equipment Co. 760 394.5
WOAN—Lawrenceburg, Tenn., J. D. Vaughn 1060 282.8
WOAW—Omaha, Neb., Woodmen of the World 570 526
WOAX—Trenton, N. J., Franklyn J. Wood 1250 240
WOBB—Chicago, Ill., Longacre Engrg. Const'n Co. 540 555.2
WOC—Davenport, Ia., Palmer School of Chiropractic 620 483.6
WOCB—Orlando Bdcstg. Co.,Orlando, Fla. 1021 293.7
WOCL—Jamestown, N. Y., A. B. Newton 1090 275.1
WODA—Patterson, N. J., O'Dea Temple of Music 767 390.9
WOI—Ames, Ia., Iowa State College.. 1110 270
WOK—Homewood, Ill., Neutrowound Radio Mfg. Co. 1380 217.3
WOKO—Peekskill, N. Y., Harold E. Smith 1290 232.4
WOO—Philadelphia, Pa., John Wanamaker 590 508.2
WOOD—Grand Rapids, Mich., Grand Radio Co. 1240 241.8
WOQ—Kansas City, Mo., Unity School.. 1080 278
WOR—Newark, N. J., L. Bamberger & Co. 740 405.2
WORD—Batavia, Ill., Peoples Pulpit Association 1090 275
WOS—Jefferson City, Mo., State Marketing Bureau 680 440.9
WOWO—Fort Wayne, Ind., Main Automobile Supply Co. 1320 227
WPAK—Agricultural College, N. D., N. D. Agricultural College 1090 275
WPAP—Cliffside, N. J., (See WQAO).... 830 361.2
WPCC—Chicago, Ill., North Shore Congregational Ch. 1160 258
WPDQ—Buffalo, N. Y., Hiram L. Turner 1460 205.4
WPG—Atlantic City., N. J., Municipality of Atlantic City 1000 299.8
WPRC—Harrisburg, Pa., Wilson Printing & Radio Co. 1390 215.7
WPSC—State College, Pa., Pennsylvania State College 1050 261
WQAA—Parkersburg, Pa., H. A. Beale Jr. 1360 220
WQAC—Amarillo, Tex., Gish Radio Service 1280 234
WQAE—Springfield, Vt., Moore Radio News Station 1220 246
WQAM—Miami, Fla., Electrical Equipment Co. 1050 285.5
WQAN—Scranton, Pa., Scranton Times 1200 250
WQAO—Cliffside, N. J., Calvary Baptist Church (WPAP used when Palisade Amusement Park Program is on) 830 361
WQJ—Chicago, Il., Calumet Co. 670 447.5
WRAF—Laporte, Ind., Radio Club, Inc. 1340 224
WRAH—Providence, R. I., Stanley N. Real 1276 235
WRAK—Escanoba, Mich., Economy Light Co. 1170 256
WRAM—Galesburg, Ill., Lombard College 1230 244
WRAW—Reading, Pa., Avenue Radio & Electric Shop 1260 238

WRAX—Philadelphia, Pa., Beracah Ch. Inc. 1120 267.7
WRBC—Valparaiso, Ind., Immanuel Lutheran Church 1080 278
WRC—Washington, D. C., R. C. A..... 640 468.5
WRCO—Raleigh, N. C., Wayne Radio Co. 1190 252
WREC—Coldwater, Miss., Wooten's Radio Shop 1180 254
WREO—Lansing, Mich., Reo Motor Car Co. 1060 225.5
WRHF—Washington, D. C., Washington Radio Hospital Fund 1170 256
WRHM—Minneapolis, Minn., Rosedale Hospital 1190 252
WRK—Hamilton, O., Doron Brothers Electric Co. 1110 270
WRM—Urbana, Ill., University of Ill. 1100 273
WRMU—Motor Yacht "MU-1," A. H. Grebe & Co. 1270 236
WRNY—N. Y. C., Experimenter Publishing Co. 792 378.8
WRR—Dallas, Tex., City of Dallas..... 1220 246
WRST—Bay Shore, N. Y., Radiotel Manufacturing Co., Inc. 1390 215.7
WRVA—Richmond, Va., Larus & Bro. Co., Inc. 1170 256
WSAI—Cincinnati, O., United States Playing Card Co. 920 325.9
WSAJ—Grove City, Pa., Grove City College 1310 229
WSAN—Allentown, Pa., Allentown Call Publishing Co., Inc. 1310 229
WSAR—Fall River, Mass., Doughty & Welch Electric Co. 1180 254.1
WSAV—Houston, Tex., Clifford W. Vick 1210 247.8
WSAX—Chicago, Ill., Zenith Radio Corporation 1120 268
WSAZ—Pomeroy, O., Chas. Electric Shop 1230 244
WSB—Atlanta, Ga., Atlanta Journal Co. 700 428.3
WSBC—Chicago, Ill., World Battery Co. 1040 288.3
WSBF—St. Louis, Mo., Stix Baer & Fuller 1100 273
WSBT—South Bend, Ind., South Bend Tribune 950 315
WSDA—N. Y. C., Seventh Day Adventist Church 1140 263
WSKC—Bay City, Mich., World's Star Knitting Co. 1150 261
WSM—Nashville, Tenn., National Life & Accident Insurance Co. 1060 282.8
WSMZ—New Orleans, La., Sasnger Amusement Co. & Maison Blanche Co. 940 319
WSMH—Owosso, Mich., Shattuck Music House 1250 240
WSMK—Dayton, O.,S. M. K. Radio Corp. 1090 275
WSOE—Milwaukee, Wisc., School of Engineering of Milwaukee 1220 246
WSRO—Hamilton, O., Harry W. Fahlander 1190 252
WSSH—Boston, Mass., Tremont Temple Baptist Church 1150 260.7
WSUI—Iowa City, Iowa, State University of Ia. 620 483.6
WSVS—Buffalo, N. Y., Seneca Vocational School 1370 218.8
WSWS—Woodale, Ill., Illinois Broadcasting Corporation 1090 275.1
WTAB—Fall River, Mass., Fall River Daily 1130 266
WTAD—Carthage, Ill., Robert E. Compton 1270 236
WTAG—Worcester, Mass., Worcester Telegram 550 545.1
WTAL—Toledo, O., Toledo Radio & Electric Co. 1190 252
WTAM—Cleveland, O., Willard Storage Battery Co. 770 389.4
WYAQ—Eau Clairo, Wisc., C. S. Van Gordan 1180 254.1
WTAR—Norfolk, Va., Reliance Electric Co. 1150 261
WTAW—College Station, Tex., Agricultural & Mechanical College of Texas 110 270
WTAX—Streator, Ill., Williams Hardware Co. 1300 231
WTAZ—Lambertville, N. J., Thomas J. McGuire ..... 1150 261.
WTIC—Hartford, Conn., Travelers Insurance Co. 630 475.9
WTRC—New York City, 20th Dist. Rep. Club 1250 239.9
WWAE—Plainfield, Ill., Electric Park.. 780 384.4
WWJ—Detroit, Mich., Evening News Association (Detroit News) 850 352.7
WWL—New Orleans, La., Loyola University 1090 275
WWRL—Woodside. N. Y., Woodside Radio Laboratories 1160 258.5

List of Stations In Canada, Cuba and in Mexico

CANADA

Call	Owner and Location	Meters	Watts
CFAF	Calgary Herald, Calgary, Alberta	434.5	750
CFCA	Star Pub. & Printing Co., Toronto, Ont.	356.9	500
CFCF	Canadian Marconi Co., Montreal, Que.	410.7	1.650
CFCN	W. W. Grant Radio Ltd., Calgary, Alberta	434.5	750
CFCT	G. W. Deaville Victoria, B. C.	329.5	500
CFCU	J. V. Elliott, Ltd., Hamilton, Ont.	340.7	500
CFRC	Queens University, Kingston, Ont.	267.7	500
CFQC	The Electric Shop, Saskatoon, Sask.	329.5	500
CFYC	Radio Corp. of Vancouver, Vancouver, B. C.	410.7	500
CHYC	Northern Elec. Co., Montreal, Quebec	410.7	850
CJCA	Edmonton Journal, Edmonton, Alberta	516.9	500
CKAC	La Presse Pub. Co., Montreal, Quebec	410.7	1,200
CKCD	Daily Province Vancouver, B. C.	410.7	1,000
CKCK	Leader Pub. Co., Regina, Sask.	312.3	500
CKCL	Dominion Battery Co., Toronto. Ont.	356.9	500
CKNC	Toronto Research Laboratory, Toronto. Ont.	356.9	500
CKNT	Canadian National Carbon Co., Toronto. Ont.	356.9	500
CKY	Manitoba Telephone System, Winnipeg, Man.	384.4	500
CNRA	Canadian National Railways, Montcon, N. B.	312.3	500
CNRO	Canadian National Railways, Ottawa, Ont.	434.5	500
CNRV	Canadian National Railways, Vancouver, B. C.	291.1	500

CUBA

PWX	Cuban Telephone Co. Cienfuegos, Cuba	400	500
2OL	Oscar Collado Orta, Habana..	300	100
6BY	Jose Ganduxe, Habana.....	260	200
6JK	Frank Jones, Santa Clara....	275	100
6KW	Frank Jones, Santa Clara....	340	500
8BY	Alberto Ravelo, Santiago....	250	100

MEXICO

CYA	Elfrian R. Gomez, Mexico City	300	500
CYB	Jose J. Reynosa, Mexico City	275	500
CYL	Raoul Azcarraga. Mexico City	400	500
CYX	El Excelsior, Mexico City.	325	500
CZE	Departmento de Educacion. Mexico City	350	500
FAM	Federal Military Command, Guadalajara	490	1,000

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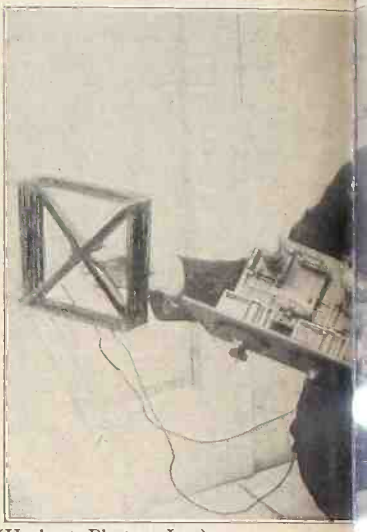

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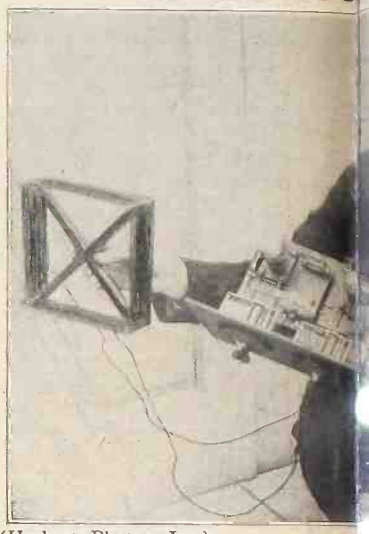

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RADIO WORLD

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The First and Only National Radio Weekly

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

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PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATION CORPORATION
145 WEST 45th STREET, NEW YORK, N. Y.
(Just East of Broadway)
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
European Representatives: The International News Co Breams Bldgs., Chancery Lane, London, Eng.
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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 ten cents per word, $1.00 minimum.

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

Catches the Eye

HERE is a view of the Bernard receiver, showing it operating an R. F. I. balanced oval cone speaker, which is of bronzed exterior.

Lese Majesty

QUEEN MARIE of Rumania is a very charming person and it was very gracious of her to visit our hectic shores, hear the 60-cycle hum and jest mildly about the dry climate in the midst of rain that afflicted her with the grip. She might have swum the channel, for all the heartiness of the welcome afforded her. Nobody offered her a vaudeville engagement, although there may have been a reason. It is vital that vaudeville artists kept their appointments with their audiences. The Queen by some majestic mixup, when all the United States and a third of Canada were waiting to hear her speak, alas was not there! Oh, yes, she had the gift of language and a voice of great enchantment. But it was her presence that was a lacking. An imposing chain was supposed to send out her message from her own lips to the American public. But David Sarnoff, vice-president of the Radio Corporation of America, had to apologize for her absence. She had come half an hour too soon, due to some inexplicable mistake, and could not wait for the actual broadcasting time, because of conflicting engagements. Mr. Sarnoff remarked that it was too bad that the stations could not have been informed in advance, and that was a diplomatic piece of frankness in respect to visiting royalty, leaving the blame where the words unerringly placed it! Ordinary persons who have engagements with microphones know enough to keep them punctually. Self-preservation compels it.

The Set Beautiful

GREATER beauty marks the radio receivers month by month. Soon the heights of aesthetic accomplishments will be reached. Artists, famous ones, gifted ones, geniuses who wear four-in-hands and stiff collars, will be cabinet and front panel consulting engineers. Like "body by Fisher" in the automobile business, you may come to hear "panel by Cornwell" in radio. If Dean Cornwell is good enough for England's House of Parliament, why isn't he good enough for America's front panel?

The trend toward the beautiful and the still more beautiful is not wholly without reason. Manufacturers know quite well that much more than half of the factory-made receivers are selected by the women folk, and women choose with an eye toward beauty. It is the woman of the house who has "made" the console. The set in a wooden shoebox suits Papa, but, alas, Mamma wants something elite, de luxe, creme de la creme! And why not? Who said there was any law compelling receivers to look as ugly as they did three years ago?

The house beautiful is now an American institution, and the women of this nation—or any other nation so conceived and so dedicated—will suffer no undermining of their institutions. Radio must live up to the high standard that womanhood commands and deserves, and while it did so rather reluctantly in the beginning, it is achieving beauty at this time even beyond the expectation, and sometimes the pocketbook, of the instigator.

Rules For Eliminators

THE making of B battery eliminators, both by the technically and mechanically inclined in their homes, and, let us hope, by the same type in factories, makes it imperative that all due precautions be taken for convenience and safety. The sooner that a code is definitely adopted, the better. There is nothing alarming about the eliminator. It is safer than automobiles, bicycles and roller skates. Sensible codification simply will make easier a compliance with standards rendered valuable largely because they represent common agreement. And, besides, the public likes to have its electrical apparatus of the "approved" kind, even if it be a humble lightning arrester. It is encouraging to see that the Radio Manufacturers Association has recognized the necessity for action, and has done much toward reaching agreement with the Board of Fire Underwriters, which has uttered a firm hope that the matter will be settled by April next.

More Reading Matter

WHEN Congress reconvenes next month we shall be treated to another scramble for the enactment of radio legislation. But this time the industry will present itself to Congress with some semblance of united action. One of the deterring factors in other years was that Congress could not ascertain authentically from the industry just what it did want.

INDUSTRIAL BOARD ASKS LEGISLATION

Co-ordinating Committee Formed—Necessity for Speedy Enactment of Radio Law Stressed—White and Dill Bills Called Reconcilable

The criticism that the radio industry could not agree on what kind of legislation it wanted was voiced in Congress, but at the new session, next month, a more or less united front will be offered by the industry. A Co-ordinating Committee of the Radio Industry has been formed. It consists of the following: National Association of Broadcasters, Radio Manufacturer's Association, Federated Radio Trade Association, American Manufacturer's Electrical Supplies, Radio Magazine Publishers Association, American Newspaper Publishers Association, National Association of Radio Writers, American Radio Relay League and National Institute of Radio Engineers.

This committee, L. S. Baker, Executive Secretary, met at the Congress Hotel, Chicago, and outlined a campaign for bringing pressure to bear upon Congress to pass adequate legislation governing radio broadcasting so that the public may enjoy good radio reception without interference and have the benefit and enjoyment of the fine programs to be broadcast this Winter.

Statement in Full

A statement issued by the Co-ordinating Committee follows:

"Legislation, which will establish Federal control over broadcasting is of paramount importance at this time if the interests of 20,000,000 listeners throughout the United States are to be properly safeguarded. The necessity of speedily securing enactment of a law is apparent to all branches of the radio industry including the broadcasters, manufacturers, dealers, radio magazine publishers and the newspapers engaged in rendering public service through broadcasting.

"Accordingly these various branches of the radio industry have authorized the establishment of a Co-ordinating Committee of the Radio Industry, which has formulated a program for throwing as much light as possible on the present condition of the radio industry, in order that Congress may realize the urgent necessity of establishing control over radio.

"The Co-ordinating Committee of the Radio Industry is of the opinion that the differences between the White and Dill bills, now in conference committee, can be straightened out to the satisfaction of the listener, the broadcaster and the manufacturer, thus giving to Congress a measure acceptable to both houses.

Will Meet Nov. 15

"Representatives of the Radio Industry will be in Washington after November 15 to aid, in any manner possible, the conference committee or any other group of interested Congressmen in gaining an adequate view of conditions which have pertained in the industry and particularly in broadcasting in recent years.

"The objective of the Co-ordinating Committee of the Radio Industry is to secure enactment of radio control legislation before Congress recesses for the Christmas holidays. If this is accomplished, the current radio season will be hailed as the greatest of all seasons in volume of business, in public interest and in the high character of broadcast programs—expressions of an affirmed confidence in the fundamental soundness of the Radio Industry."

The statement was signed by Paul B. Klugh, Executive Manager, Nat'l Ass'n. of Broadcasters; A. T. Haugh, President Radio Manufacturers Association; Harold J. Wrape, president, Federated Radio Trade Association; A. M. DeMott, president, Radio Magazine Publishers Association; Wm. S. Hedges, representing Walter A. Strong, Chairman, Radio Committee, American Newspaper Publishers Association.

ANTI-MONOPOLY FIGHT RENEWED

Representative Davis, of Tennessee, Demands White Bill Be Amended So That Any Station Violating Law Loses Its License

By Thomas Stevenson

WASHINGTON

The recent purchase of WEAF, New York, and WCAP, Washington, by the Radio Corporation of America from the American Telephone and Telegraph Company will provide the basis for a new attack on radio bills pending in Congress.

Representative Ewin L. Davis, Democrat, of Tennessee, and leader of the fight against the White Bill in the House, announces that he will not only try to force an investigation into the affairs of the large radio corporations but that he will also seek legislation which will curb their activities.

Believing that a monopoly exists, Mr. Davis wants to incorporate in the radio bills drastic anti-monopoly clauses. He hopes an investigation of the Radio Corporation will uncover sufficient facts to justify his views.

"The White radio bill contains many excellent provisions," says Mr. Davis. "I approve most of its provisions, but in my opinion it does not adequately meet the requirements. After an investigation, the Federal Trade Commission upon its own initiative filed a complaint against eight corporations, charging monopoly in radio apparatus and communication, and that such companies were violating the law against unfair competition in trade to the prejudice to the public.

"The anti-monopoly provisions in the White bill do not meet the situation.

"The bill should be amended so as to provide that a license shall be refused an applicant for broadcasting purposes when it clearly appears that such applicant is violating the laws of the United States. Applicants should be required to come with clean hands before the government throws the mantle of protection around them.

"Is it fair to the public, is it fair to the hundreds of applicants for broadcasting station licenses, for violators of the law to be granted licenses or renewals thereof and law-abiding applicants refused licenses because there are not enough wave lengths to go around?

"I favor a permanent and effective radio commission in order that it may be determined whether applicants for licenses are violating such laws, and if so, to refuse them a license and also to perform various functions which could only be appropriately performed by such a quasi-judicial tribunal. Of course, such applicant should be accorded a full hearing before the commission and should have a right to appeal to the courts if dissatisfied with the decisions of the commission.

"The broadcasting field holds untold potentialities in a political and propoganda way. Its future use in this respect will undoubtedly be extensive and effective.

"There is nothing in the White bill to prevent a broadcasting station from permitting one party or one candidate or the advocate of a measure or a program or the opponent thereof, to employ its service and refuse to accord the same right to the opposing side. The broadcasting station might even contract to permit one candidate on one side of a controversy to broadcast exclusively upon the agreement that the opposing side should not be accorded a like privilege.

"We naturally object to even governmental censorship, and yet under the existing law and practice we have something far worse—a censorship exercised by the broadcasting station. There is nothing in the White bill to prevent or regulate that.

"Broadcasting has become too important to this country for any single person or group to place themselves in the position where they can censor the material which shall be broadcast to the public."

(Strauss-Peyton)

MARY DUNCAN, who plays the role Poppy in "The Shanghai Gesture" at a New York Theatre, broadcast an psychological analysis of her role from WBNY.

STANDARD NEEDED FOR SOCKET UNITS

Great Growth of Eliminator Production Speeds up Conferences With Underwriters—R. M. A. Report Shows Agreement Is Near

The subject of agreed safeguards and standards applicable to socket power units is greatly interesting the trade, because of the popularity of A, B and C eliminators. The double desire is to have these products perfectly safe and also to achieve this safety in such manner as to satisfy the Board of Fire Underwriters.

The power equipment standards committee of the Radio Manufacturers Association has gone into the subject and a report has been issued by the committee, of which C. A. Malliet is chairman. This report sets forth that "the underwriters at present have not adopted any definite standard, but would like to have it passed as quickly as possible."

Report of Committee

The committee report continues:

"In order to avoid a multiplicity of references to power devices a name covering the entire range of these devices adopted by another organization and apparently covering the subject very well is recommended for adoption by this Association, with the following: A Socket Power Unit is any device supplying A, B and or C battery voltage to a radio set from the house lighting supply. The letters A, B and (or) C should be prefixed to the name to indicate the class.

"The Committee feel that it would be very beneficial to have all output terminal markings of socket power devices standardized as to marking. The present numercial marking of output terminals is not very satisfactory and the recommendation is made that the Standardization Committee take up with the set manufacturers the standardization of cable markings, so that socket power devices could be all marked in one way.

"As paper condensers enter largely into most of the socket power devices, the Committee feel that it would be a great economy and convenience to manufacturers and also to the suppliers of materials entering into the manufacture of condensers, if standard sizes could be adopted by the condenser manufacturers. Three of the large manufacturers of condensers have been approached on this subject and all express a desire for such standardization, as have also the manufacturers of foil and paper. E. F. Potter was asked to furnish the Committee with definite recommendation on this subject after conferring with other manufacturers.

Condenser Tests

"There is also apparently no satisfactory standard method of testing condensers, this being a highly specialized subject and one of vital importance to the manufacturer of AC power devices. It is recommended the condenser manufacturers hold a conference and advise the Association regarding the best methods of testing for general practice.

"It is also recommended that the R. M. A. have on hand sizes of the different socket power devices, and that set manufacturers and cabinet manufacturers take into consideration space necessary for incorporation of these devices, when building their cabinets, with the idea that eventually a definite size space allowance can be made covering the majority of these products.

"It was also unanimously decided that a six foot primary cord equipped with standard attachment plugs be used as standard on all socket power devices.

"Where the cord is equipped with a feed through switch, it is recommended that the general standardization committee put a standard on the location of this switch on the cord. This would be of advantage to the cabinet and set manufacturers in design, so that the switch could be in the most convenient place."

Underwriters' Report

A report issued by the underwriters, simply as something that may be the basis of discussion, is then quoted in full, and is published in full herewith.

1. Note: The following requirements have been prepared for the guidance of laboratories' engineers in investigating devices of this class. They comprise a summary of the laboratories' ruling on such appliances as submitted for examination and test. They are not intended as a standard and are subject to revision as may be necessary on account of further development and standardization.

2. These requirements cover radio appliances for non-commercial use, designed to be operated from lighting or power circuits.

3. Under this classification are included battery substitutes or power supply devices, battery chargers with or without batteries; battery units with switches and connections, designed particularly for radio use; and radio receiving devices incorporating any of the above-mentioned appliances.

4. Battery chargers, either portable or for permanent installation and not intended for use with radio appliances, are classed as rectifiers and are not covered by these requirements.

5. The following specification applies to devices designed to be operated from alternating current circuits.

6. Features not covered by these requirements, and to which none of the laboratories' standards may be directly applied, or new developments which may subsequently be made in radio appliances, shall be made the subject of special investigation and shall be judged accordingly.

Construction

7. The device throughout shall employ materials which are suitable for the particular use, and shall be made and finished with the degree of uniformity and grade of workmanship practicable in well equipped factories, fabricating materials and devices similar to those employed in this product.

Enclosure

8. The enclosing case of cabinet shall enclose all current-carrying parts of the device except primary leads and secondary terminals. The device may be so designed that tubes may be replaced without opening the case; but the current-carrying part of the sockets for such tubes shall be enclosed.

9. The enclosing case shall be of substantial construction and provide the necessary mechanical strength to protect the various parts from physical injury. The case, if of cast-iron, shall be not less than 1-8 in. in thickness; and if of sheet-metal, shall be sufficiently rigid and of material not less than No. 22 U. S. gauge (No. 22 gauge sheet metal will probably be found not rigid enough in areas over 25 sq. in. unless ribbed or reinforced).

10. Wooden cabinets are acceptable for power supply devices or radio sets; but in such appliances, individual units such as transformers, inductances and condensers which are conductively connected to a light or power circuit shall be separately enclosed in metal.

11. Metal enclosures shall be enameled or otherwise suitably protected against corrosion.

12. The cabinet or enclosing case may be ventilated, in which case holes shall be either not larger than 1-4 in. in diameter so located or protected that the average small tool or the operator's hand cannot be inserted and come in contact with current-carrying parts of the secondary circuit involving potentials exceeding 200 volts maximum.

Supply Circuit

13. Component parts of the device, such as flexible cord, attachment plug, snap switch, lamp holder, attachment plug receptacle or cut-out base, shall be standard appliances.

14. Where a flexible cord passes into the enclosing case, it shall be protected by an insulating bushing with smoothly rounded edges. Suitable strain relief shall be provided in the flexible cord.

15. The type of portable cord required shall depend upon the nature of the device with which it is supplied.

16. The conductors of the supply cord shall preferably be soldered directly to the primary windings; but one pair of screw terminals may be considered acceptable, when such terminals are provided with upturned lugs or the equivalent and protected by suitable strain relief in the cord.

17. Material for the mountings of current-carrying parts shall be of standard phenolic composition, standard cold moulded material or the equivalent. Hard fiber may be used for insulating washers, separators and barriers, but not as the sole support for current-carrying parts.

Transformer

18. Transformers connected to the lighting or power circuit shall have the primary insulated from the core and case and secondary winding.

19. All materials entering into the construction of transformers, except insulation, shall be non-combustible. The amount of combustible material employed for insulation shall be as small as consistent with the design of a device having high insulation.

20. Transformers shall be of thoroughly substantial design. The coils shall be wound in a workmanlike manner and impregnated or otherwise enclosed to exclude moisture.

21. Taps may be put on the primary windings for factory adjustment, but shall not be arranged to facilitate the user varying the number of primary turns. If a primary control or multi-point switch is employed to change the number of turns on the primary winding, the complete device shall be capable of successfully withstanding the prescribed tests with the switch in any position, in-

cluding the most severe condition possible in actual operation.

Condensers

22. Condensers shall employ such materials and shall be so constructed that they will not constitute an undue fire hazard. They shall not be injuriously affected by the temperature attained by the device under the most severe conditions of normal use. Paper condensers shall be impregnated or otherwise suitably enclosed to exclude moisture.

Interior Wiring

23. All wires which are accessible when alive shall be insulated, and the insulation shall be suitable for the voltages involved and the temperatures attained under any conditions of actual use. Wires of special type (i. e., other than standard listed insulated wire), shall be made the subject of a special investigation with respect to their intended use and shall be judged accordingly.

24. No terminals or other live parts shall come into contact with a wooden cabinet or enclosing case.

Voltage Limitations in Secondary Circuits

25. No special protection against accidental contact need be provided for live parts in secondary or output circuits involving potentials not exceeding 200 volts.

26. Live parts in circuits involving potentials in excess of 200 volts shall be wholly inaccessibe or the opening of the enclosing case shall cut off this high voltage. The device or arrangement whereby this result is obtained shall be positive in action and such as not to nullify its purpose.

Spacings

27. A spacing of not less than 1-2 in. over surface or through air shall be maintained between primary input terminals and between live metal parts of the primary or supply circuit and the case.

Secondary Terminals

28. Outside (exposed) secondary terminals shall be provided with insulated nuts.

29. The maximum open circuit voltage between any two outside (exposed) terminals, shall not exceed 200 volts.

30. If permanent secondary leads are supplied, outside (exposed) terminals shall be eliminated. In such case a suitable strain relief shall be provided and the cord or cords shall be properly bushed where they pass through the wall of the cabinet or enclosing case.

Fuses

31. A device including a storage battery shall be protected by a fuse or circuit breaker in the battery leads. Such fuse or circuit breaker shall be rated at not more than 15 amperes.

32. Fuses if used in primary circuits shall not be readily accessible.

33. Fuses wherever used shall be standard and suitable for the voltage involved.

Marking

34. Secondary terminals shal lbe properly identified.

35. The device shall be plainly marked where it may be readily seen. Secondary output ratings shall be clearly indicated on the device or in the accompanying instructions.

36. A connection diagram or instructions shall accompany the device if the connections and method of operation are such that there may be any question regarding same.

Tests

Current Consumption

37. Each device shall be tested to determine the current consumption on a supply circuit, the primary voltage of which corresponds to the primary rating of the device.

38. The current consumption test shall be made with (1) with no load on the secondary output, (2) with full load on the secondary output.

Temperature

39. Temperature tests shall be made at full load with the device connected to a supply circuit whose voltage corresponds to the primary rating of the device, and such tests shall be continued until constant temperatures are reached.

40. When the cabinet or enclosing case is of metal, temperatures shall be noted at various points on the exterior surface of the device. When the cabinet or enclosing case is of wood, temperatures shall be noted at various points within the cabinet.

41. In this test temperatures obtained on the exterior surfaces of metal cabinets or enclosing cases or temperatures on the interior surfaces of wooden cabinets shall not exceed 90 degrees C. (194 degrees F.). Temperatures attained at any point on or within the device shall not be sufficiently high so as to injuriously affect any material used in the construction of the device.

Voltages

42. Each device shall be tested to determine the terminal output voltage and the highest obtainable secondary voltage. Limits of these potentials, have already been given in paragraphs 25 and 26.

Dielectric Strength

General

43. The insulation and spacing of the device shall be capable of withstanding the applied potentials, specified below, for a period of one minute without breakdown.

44. With the device still hot after the full load temperature test, a potential of 900 volts AC shall be applied between current-carrying parts of the primary circuit, and the core of the transformer, between current-carrying parts of the primary circuit and the enclosing case, and between the current-carrying parts of the primary and secondary circuits.

45. With the device still hot after the full load temperature test a potential of twice the highest (primary or secondary) open circuit voltage plus 1000 volts AC shall be applied between the primary and secondary windings, with the transformer disconnected.

46. The insulation of all current-carrying parts of the secondary circuit operating at a difference of potential from the transformer core, case or any other part shall be subjected to a potential test of twice the highest peak voltage to which the parts are subjected under any condition of actual use.

Condensers

47. Condensers shall be tested for breakdowns by the application of a DC potential equal to twice the highest peak voltage to which they are subjected under any conditions of actual use. This requirement does not apply to electrolitic condensers.

Maximum Input Test

48. During this test there shall be no ommission of flame or of molten metal from (a) the metal case enclosing a device as a whole or (b) the separate units within an enclosing case or cabinet of wood or other inflammable material.

49. Devices having secondary output terminals shall be tested with the input leads connected to a circuit of rated voltage and frequency and with the secondary output terminals connected to give maximum primary input and shall be operated until constant temperature is reached or until burnout occurs.

50. When the enclosing case or cabinet is of metal, the temperatures reached in this test shall be such that cheese cloth placed in contact with the outside of the case shall not be ignited. When the enclosing case or cabinet is of wood or other inflammable material, the temperatures reached shall be such that no charring of the case occurs.

Changes Suggested

After quoting the above suggestions of the underwriters, the R. M. A. committee suggested changes as follow:

"Paragraph 3—Suggested that the words 'or without' be omitted, so as not to include chargers already on the market, to be used for other purposes than radio.

"Paragraph 8—Suggested that the following be added after the words 'secondary terminals'—'except where the potential is less than twenty-five volts, and the primary input does not exceed two hundred and fifty watts when such secondary terminals are short-circuited.'

"Paragraph 10—Suggested that the words 'combustible' be substituted for the word 'wooden,' and that the word 'non-combustible' be substituted for the word 'metal.' This suggestion is made so that the cabinets could be made of some other heat resisting insulating material than metal.

"Paragraph 24—Suggested that the following be added—'unless the case is made of a suitable insulating material.'

"Paragraph 25—Recommended that the limit of 200 volts be increased, and that as the commercial sockets present a much greater shock hazard than secondary circuits of radio devices it should be allowable to build the apparatus to at least as high voltage, namely, the peak voltage encountered in a 250 A C circuit. This would maintain throughout the specifications where reference is made to 200 volts.

"Paragraph 28—Sugested that the following be added—'except where the potential is less than twenty-five volts and the primary input does not exceed 250 watts when such secondary terminals are short circuited.'

"Paragraphs 34 and 35—Suggested that in the case of a complete power unit and radio set where a cable is attached directly and becomes a part of the radio set, the other end being equipped with a keyed multi-conductor plug, that it should not be necessary to mark the secondary terminals of either the socket power supply device or the plug.

"Paragraph 37 — Suggested that paragraph read as follows—each device shall be tested to determine the current consumption on a supply circuit, the voltage and frequency of which corresponds to the primary rating of the device."

FIVE NEW U. S. STATIONS

WASHINGTON

Five new stations have been licensed by the Department of Commerce while five stations have changed their wave lengths.

NEW STATIONS

KXRO—Broto Laboratories, Seattle, Wash.	249	1,249
WDXL—DXL Radio Corp. Detroit, Mich.	236.9	1,010
WEDC—Emil Denemark, Chicago, Ill.	422.3	710
KGCX—First State Bank, Vida, Montana	249	1,249
KSEI—KSEI Broadcasting Assn., Pocatello, Idaho	249.7	1,150

CHANGES

WRNY, New York from 374.8 meters to 373.8; KFWC, San Bernardino, Calif., from 211.1 to 291.1 meters; KFQB Fort Worth, from 263 to 508.2 meters; WEMC Berrien Springs, Mich., from 285.5 to 315.6 meters, and WGES, Chicago, from 249.9 to 315.6 meters.

Lynch Handles All Airgap Sales

Arthur H. Lynch, president of the corporation bearing his name, announced that an agreement between his company and the Airgap Products Co. of Newark, N. J., has been reached in which the entire sales of the latter company for the United States has been turned over to Arthur H. Lynch, Inc. Mr. Lynch said:

"We have for some time been studying the vacuum tube socket situation and our experimental work has resulted in the finding that the Airgap socket is a particularly satisfactory device from both a mechanical and electrical standpoint. Because of its rather unique design, by which capacities and losses are reduced to a minimum, it lends itself particularly to radio frequency circuits of the neutralized type in which the larger storage battery tube such as the CeCo type A or the 201A tubes are used. Within a short time we believe that a very large national market may be developed for this socket and we feel that it is the kind of a product supported by a real organization which we can reasonably get behind and push aggressively."

In commenting on the action taken by the Airgap Company, Carl Saenger, president, said:

"We believe we have a particularly fine socket and we have the facilities for turning it out in large quantities. For some little time we have been watching with a great deal of interest the merchandising activity of Arthur H. Lynch, Inc. and believe that this corporation has done a more progressive selling job in the short time it has been in business than any other organization to which we might go in an effort to procure national distribution in a short time. Mr. Lynch has an enviable reputation and it is a pleasure for us to announce to the trade that we have concluded an arrangement with him whereby the sales organization of his corporation will handle the sale of our products in the United States. We feel that by having made this arrangement we have put ourselves in a position to render our distributors and dealers a most satisfactory service and it is our object to exert every means to carry out this proposition accordingly."

Trade Associations

G. W. Missig, Akron Times-Press, Akron, Ohio.
Buffalo Radio Trade Ass'n., Pres. Thos. White, Wholesale Radio Equip. Co., Buffalo, New York.
Canton Radio Association, Howard M. Dine, Chairman, Line-Dewees Co., Canton, Ohio.
Chicago Radio Rep. Association. (M. G. Siedman, Sec'y.), Room 1104, Masonic Temple, 32 West Randolph St., Chicago, Ill.
Radio Dealers Ass'n. of America, Pres. A. C. Stewart, 155 N. Clark St., Chicago, Ill.
Cincinnati Radio Club, M. Fisher, Fisher Radio Co., 40 E. 6th St., Cincinnati, Ohio.
Columbus Radio Trades Ass'n., Columbus, Ohio.
Dayton Radio Dealers Ass'n., Pres. Joe Saum, Dayton, Ohio.
Denver Radio Jobber's Assn., G. P. Hopkins, Pres., Denver, Colorado.
Des Moines Radio Merchants Assn., H. Blish, Sec'y., 10th and Mulberry, Des Moines, Iowa.
Radio Manufacturer's Rep. of the Rocky Mountain Territory, J. W. VanDe Grift, 629 Charles Bldg., Denver, Colorado.
Michigan Radio Trade Association, At: A. M. Edwards, Sec'y., 4464 Cass Ave., Detroit, Michigan.
Pacific Northwest Radio Trade Ass'n., Att: O. V. Humrick, 2042 Onyx Ave., Eugene, Oregon.
Southwestern Radio Jobbers Ass'n., L. F. Philo, Sec'y., Tel-Electric Co., Houston, Texas.
Indiana Radio Trade Ass'n., H. C. Wall, Ures., 1324 S. Calhoun St., Ft. Wayne, Ind.
Jamestown Radio Trade Ass'n., W. J. Steinel, Steinel Stor. Bat. Co., 338 East Third St., Jamestown, New York.
Kansas City Electric Club, G. W. Weston, Sec'y. 819 Gloyd Bldg., Kansas City, Mo.
Radio Trades Ass'n. of So. California, Commercial Ex. Bldg., Los Angeles, Calif.
Tennessee Radio Trade Ass'n., R. S. Dimmock, Orgil Bros., Memphis, Tenn.
Wisconsin Radio Trade Ass'n., N. C. Beerends, Mgr., P. O. Box 1005, Milwaukee, Wis.
Northwest Radio Trade Ass'n., H. H. Cory, Sec'y., 301 Tribune Annex, Minneapolis, Minn.
New Orleans Radio Ass'n., Robert H. Cone, Jr., Pres., New Orleans, La.
New York Radio Dealers, Inc., J. Modell, Pres., 36 Cortlandt St., New York, N. Y.
Radio Trade Assn., L. A. Nixon, Sec'y., 1113 Broadway, New York.
Talking Machine & Radio Men, Inc., Irwin Kurtz, Pres., 141 Bway, N. Y.
Oklahoma City Radio Jobbers & Retailers Ass'n., Oklahoma Ctiy, Okla.
Omaha Rado iTrade Ass'n, Att: Chas. A. Franke, Omaha, Aud., Omaha, Bebr.
Radio Council of the C. of C., G. Brown Hill, Chairman, care Doubleday-Hill Co., Pittsburgh, Pa.
Omaha Radio Trade Assn. Att.; Chas. A. Fran-301 Journal Bldg., Portland, Oregon.
R. F. Clark, Superior Engineering Co., 422 First Ave., Pittsburgh, Pa.
The Richmond Radio Dealer Club, R. A. Frayser, Pres., Richmond, Va.
Rochester Radio Ass'n., Thos. B. Shearer, Pres., care Chapin-Owen Co., Rochester, N. Y.
Rockfard Radio Trade Ass'n., R. A. Roberts, Pres., Rockford, Ill.
Mountain States Radio Trade Ass'n., H. S. Jennings, Sec'y., 221 S. West Temple, Salt Lake City, Utah.
San Antonio Radio Trade Ass'n., San Antonio, Texas., G. C. Blanchard, Pres., Blanchard Radio Shop.
Pacific Radio Trade Ass'n., New Chroncle Bldg., 905 Mission St., San Francisco, Cal.
St. Louis Radio Trade Ass'n., H. J. Wrape, Pres., Binwood-Linz Co., 1830-32 Wash. Ave., St. Louis, Mo.; Wm. P. Mackle, 1207 Syndicate Trust Bldg., St. Louis, Mo.
Seattle Radio Trades Ass'n., L. C. Warner, Pres., Seattle, Washington.
Utica Radio Ass'n., M. H. Johnson, 100 Genessee St., Utica, N. Y.
Radio Merchants Ass'n., Inc., J. Fred Huber, Pres., 233 Woodward Bldg., Washington, D. C.
Bertrand H. Farr. Wyomissing, Pa.

Final Decree Signed In Feedback War

PHILADELPHIA

A final decree was signed by Federal Judge J. W. Thompson invalidating, voiding and cancelling twelve claims of the Armstrong feedback patent assigned to the Westinghouse Electric and Manufacturing Company, defendant, and decreeing that Lee de Forest was the first and original inventor of this device. It was further ordered that the De Forest Radio Company, plaintiff in the action, recover from the defendant, its costs to be taxed.

The Westinghouse interests were given three months within which to file an appeal to the Third Circuit Court of Appeals.

S. E. Darby, Jr., chief patent counsel for the De Forest Radio Company, declared that the de Forest invention that had been assigned to his client was the second most valuable patent in the history of the radio art, a value that could only be computed in millions, and that the Armstrong device was now in infringing use in over one-half of the radio sets in the United States.

"Further than that, under licenses from the Westinghouse Electric and Manufacturing Company more than a dozen of the most prominent radio manufacturers in the United States are affected, as the feedback regenerative circuit is essential to the successful operation of their receiving instruments. With this decree these licenses are terminated with the Armstrong patent's invalidation and cancellation. These former licensees become independent manufacturers whose product, by reason of their statement that they are operating under such Westinghouse-Armstrong licenses, make them infringers of the de Forest patents who may be immediately enjoined from further manufacture of their regenerative equipment.

Much litigation now pending in numerous actions brought by the Westinghouse interests against alleged infringers of their Armstrong patent is affected by Judge Thompson's decree, Mr. Darby further stated. Among those recently filed are suits against the Stewart Warner Speedometer Corporation of New York, of Illinois, of Virginia, and Herbert & Huesgen of New York,

Barawik Growth Reflects Industry

Despite what Thomas A. Edison says, the real stability and growth of the radio industry is strikingly brought home to anyone who may be skeptical about its future progress, through the strides made by the Barawik Co., one of the pioneer radio institutions. Years ago this firm startled the radio world by the publication of a small 5 x 8 catalog of 24 pages, assembling therein the better known merchandise for the convenience of the fact-hungry fans the world over who desired to keep up to date on the new industry. The radio business was then in such a chaotic state that no one thought it possible to stabilize it. But the Barawik plan worked out so well that today their Buyer's Guide consists of 164 full size pages, or nearly ten times the former size. The business has increased by leaps and bounds and a service instituted whereby fans the world over are given the same opportunities to keep up to date on radio's newest wrinkles as those who live in the big cities.

"It is surprising," says W. C. Johnson, director of out-of-town sales for the company, "how eagerly each issue of the 'Guide' is awaited, and really pitiful to note how helpless are many of the fans outside of the big centers. Many who write us tell us that they are unable to secure what they want locally, and that our 'Guide' keeps them right up to date and in the circle of real fans."

The Barawik Co. states that its 1927 plans include the manufacture of a complete line of radio receivers, from the simplest 5-tube RF table set to the most advanced single and dual control sets of 6 to 10 tubes in period consoles.

HOW TO BUILD THE BERNARD, the beautiful 6-tube thumb-tuning set, fully described and illustrated in the Oct. 16 issue. Send 15c for a copy. Namepieces for affixing to front panel free trial on special request. Radio World, 145 W. 45th St., N. Y. City.

DID YOU GET A COPY OF RADIO WORLD'S VACATION NUMBER DATED JUNE 12? This issue is full of information for summer vacationists. Some of the features are: The Light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin, The Importance of C Batteries, by John F. Rider, etc. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Big Financiers Attracted to Radio

BY O. C. KYLE
Financial Editor

In spite of their denials of many rumors, large financial interests in New York and Chicago, supposed to be identified with a movement to obtain control of some of the largest radio corporations in America, with the purpose of consolidating them, are paying a great deal of attention to the buying side of radio on every slight reaction.

Not alone have these interests seemingly been most eager in their desire to accumulate shares of the more active radios traded in on the exchanges but only other rumors now have it that ere long, another combination of the biggest financial interests of the East and West, who have been quietly looking into the merits of a new radio invented by a well known expert, have accepted this new invention and will very shortly introduce it on the market.

Two of the financiers whose names are linked in the rumor with this new organization are men whose names are those of families recognized in the banking and industrial progress of America for the greater part of the last century. When approached on the subject they requested that they be not quoted, for the present at least. Rumor has it that the Western interests comprise some of the largest banking houses, one of which has been identified for many years as the financial representative of one of the largest producers of a food commodity used in this country and abroad, headquarters in Chicago.

To the readers of tape and others who are market-wise, it has been very evident for some time, and more particularly during the slump of the last several weeks, that something was doing for the constructive side of radio shares, for as regularly noted in this publication for the last few weeks, these shares more than held their own in resisting every effort of the bear crowd to depress them.

Another noticeable and equally favorable consideration has been the fact that while heretofore the public have been sceptical about this class of security, they are now ready to invest their funds in any radio corporation of merit, whether it may be a new offering or in the shares of the regularly listed stocks on the exchanges. With the rapidly improving conditions in the radio industry the financial and moral support of America's leading financiers to be considered, the industry is destined in the near future to take its place as one of the world's largest. It is now eighth.

The plan of combining the several radio corporations, according to the rumors, would be somewhat on the order of consolidation followed by General Motors and United States Steel. If carried to a successful issue it would more readily eliminate the fast declining objectionable features of the radio industry and give to it unit as well as collective stabilization on account of mass production.

Sayres Devises New House Organ for Lynch Dealers

Instead of the conventional house magazine for dealers, Ralph Sayres, vice president of Arthur H. Lynch, Inc., has initiated a novel form of sales help for Lynch dealers. Mr. Sayres does not believe in the usual, cut-and-dried dealer "organ" which he says is usually filled with little real sales help for the dealer.

The Lynch "Advance Information" Bulletins tell the dealer, in ample time for him to act upon them, just what the leading radio editors and designers are describing in forthcoming issues. For example, a new, practical, easy-to-construct power unit or receiver or amplifier for home builders is about to appear in one of the leading journals. Condensers, transformers, inductances, chokes, dials, sockets, etc. of certain electrical characteristics and physical dimensions are found by the designer of the circuit, to prove most desirable. The article breaks into print; the "fans" rush from radio shop to radio store to buy this value of impedance or that size of resistor. The dealer, caught unawares, has few, if any, of the products specified. The "fan" sends mail orders to the various manufacturers and the dealer has lost a handsome profit. The Lynch "Advance Information" Bulletins keep Lynch dealers posted on all new, worthwhile developments that mean sales. The service is a broad gauged one, and tells the wide-awake dealer what to stock to meet the demand, not only for the Lynch products, but for the apparatus of the other manufacturers whose products are specified.

Mr. Sayres, in commenting upon the "parts" business, says: "Over-exploitation of 'trick' circuits two or three years ago gave the parts' business a bad set-back, but the soldering-iron variety of radio enthusiast, to judge from our sales, is again on the increase. The desire for better tone and batteryless operation of receivers already installed has added hordes to the vast army of amateur manufacturers. There will always be a parts' business, and the wise dealer does not overlook the trade and friendship of the attic manufacturer and 'DX hound.' This class of radio buyer, in addition to giving the dealer his own patronage, sends in many live prospects for complete receivers and accessories because he is regarded as the local radio genius whose word on radio is infallible."

Arthur H. Lynch, Inc., manufactures the Lynch Metallized Resistor. Its offices are in the Fisk Building, 250 West 57th Street, New York City. The "Advance Information" Service is free, upon request, to recognized dealers in radio.

B Battery Unit

The See Jay Battery Company, well known as pioneers in the wet cell B battery field and makers of good, upstanding batteries of this type, have perfected and placed on the market a new power unit denominated the Type S-1 Power Unit, a device that removes all B battery troubles and that will also uphold the reputation of their other products. This new outfit consists of a reliable See Jay B battery set in a handsome cabinet combined with a trickle charger of novel design. This is equipped with an eight foot cord which is plugged into the light socket; the current is turned on and the battery is on charge. The charger is the durable Foerste trickel and operates from 110-120 volts A. C., charging at the rate of 20 to 30 milliamperes. It charges up to 150 volts of B battery in series without grouping, keeping B battery fully charged at all times. It uses an ordinary 201A type tube for rectification. It stands up under heavy drain and is especially recommended for Neutrodynes and Supers requiring heavy current consumption. This outfit assures a practically even flow of B current with the elimination of all B battery troubles. This company has just issued a handsome booklet entitled "Batteries of Character," containing valuable information to the radio fan and layman. This will be sent free on application to all interested. Mention RADIO WORLD.

Perfects New Unit

After long and arduous experimentation, the experts of the Engineers' Service laboratories have developed and perfected a new unit for the three foot cone kit marketed by this well-known company. The original unit was designed by the inventor of the Tropadyne and was a remarkably fine accoustical product; however, the engineers are untiringly working along toward perfection and the new unit is the result of many months careful research. This unit is entirely different in appearance and construction from the one shown by James H Carroll in his article in the August 28 issue of RADIO WORLD, and while it costs more to make, the Engineers' Service Co. is sending it out without any advance in price to customers. This unit has been shipped with all orders received since September 1st. Old customers who wish to change their units for the new one may do so at a slight additional charge to cover the cost of packing, mailing and manufacture. Descriptive literature on this remarkable three-foot cone may be had on application to the Engineers' Service Co., 25 Church street, New York City, Mention RADIO WORLD.

Literature Wanted

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

RADIO WORLD,
145 West 45th St., N. Y. City.
I desire to receive radio literature

Name .....

Address .....

City or town.....

State .....

G. Leibscher, 9333 212th Place, Queens, N. Y.
Herbert Ohlssen, 2426 Grand Ave., Bronx, N. Y.
Louis A. Whitehair, Box 423, Dewey, Okla.
W. Y. Nagle, Wharton, N. J.
Ralph H. Dissell, 392 Sharp Ave., Apt. 1, Galesburg, Ill.
Augustus J. Bertram, 1013 Young St., Sault St. Marie, Michigan.
Chas. J. Piever, 65 Garfield St., Natrona, Pa.
Harold A. Nickle, 234 Couma Ave., Long Beach, Cal.
L. E. Northrop, Collinsville, Cal.
H. Koonz, Box 284, Hyatsvile, Md. (Dealer).

UNIVERSITY

(Continued from page 12)

winding or to that portion of the winding adjacent to the ground connection on the primary winding. The second spring from the bottom is brought to the rotary plate connection of the variable condenser and to the A minus. The third terminal spring from the bottom is brought to one binding post for the loop. The fourth spring from the bottom is brought to the beginning of the secondary winding, or that portion of the winding next to the antenna connection on the primary. The fifth terminal from the bottom is connected to the stationary plate connection of the variable condenser. The top spring is brought to the other binding post, for the loop.

* * *

I READ with interest the article by Herman Bernard in the October 16 issue on how to build the Bernard, and paid particular attention to the Bernard system of neutralization as used in this hookup. (1) Is it necessary to adopt the negative grid bias for the first RF tube, since this is an untuned stage and not likely to oscillate? (2) What method is used for controlling the oscillatory tendency of the detector tube? (3) Will this set work with a B battery eliminator, as I understand that B eliminators are not particularly adaptable where resistance coupled audio amplification is employed, as in the Bernard. (4) Need the untuned transformer in the first stage actually be a transformer, or may an impedance coil be used?—Alfred Brahn, Jackson, Miss.

(1) It is necessary to include the first RF tube in the neutralized chain, even though it is untuned. It may be stated as a general rule that the lower the RF stage in point of numerical sequence the greater the tendency toward self-oscilation. This is because the back coupling is greatest. The greater the number of succeeding stages of RF, the greater the back coupling. The fact that the first stage is

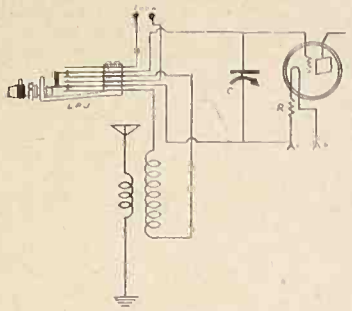


FIG. 455

The circuit diagram, illustrating how to hookup a Carter No. 6 jack switch, for loop-antenna switching.

untuned has a slight tendency to reduce the average likelihood of self-oscilliation, but not enough so to make it desirable or safe to omit the first stage from the chain of neutralization. (2) Nothing special is done about preventing the detector tube from self-oscillation, as it is unnecessary. This tube has merely the plate 0.1 meg. Lynch resistor in the plate circuit, hence no coil which would be the only inducement toward self-oscillation, other than too-high detector plate voltage. While the greater the plate voltage, the greater the volume, there is a limit, and this limit will vary in different receivers and in different locations. Hence try different plate voltages. About 45 will work satisfactorily in most instances, but no resistancy need be felt toward reducing this to 22½ or even less. As a point of information, the Bernard receiver has been operated satisfactory in RADIO WORLD's laboratories with only 6 volts positive on the plate, this voltage being supplied by the A battery. To accomplish this it is necessary to make the common battery connection B minus and A minus. As a 6-volt storage battery is used the connection of the B plus detector cable to the positive 6-volt post of the A battery gives you about 6 volts positive on the detector plate, discounting the slight drop in the rheostat. The coupling between primary and secondary of the detector input coil system may

(Concluded on page 28)

(*Concluded from page 27*)

be tightened for support of volume. (3) Yes, the set has been operated for several weeks in conjunction with a B eliminator, but the detector voltage post of the eliminator must be variable or, if fixed, should preferably afford only a low value of voltage, about 22½ or less, or the 6-volt system of detector plate voltage from the A battery may be tried. This keeps the impedance of the eliminator out of the detector circuit. The theoretical considerations that prompt high plate voltage at one end of the detector resistor may be disregarded. (4) An RF impedance coil may be used. On a 1" core, filled with soft iron filings, sealed at the core ends with wax, wind 80 feet of No. 28 wire, SSC or SS over enamel covered.

* * *

I NOTED with interest the photos and descriptive data on the Butterfly Loud Speaker published in the October 30 issue of RADIO WORLD and have already began construction. So as to make the butterfly realistic, I was thinking of placing the regular antennaes or feelers on it. How can this be done?—James Connel, Newark N. J.

Pipe cleaning strips can be used, as shown in Fig. 456. Adhesive or any type of tape may be used to hold the strips, which is quite stiff and will stay erect. You may twine some wire around each feeler and use as leads for the speaker.

FIG. 456

The photo illustrating the method of placing feelers on the butterfly used in making the Butterfly Loud Speaker.

WHAT IS the station slogan of Station WCBD, located in Zion, Ill., and operating on a wavelength of 345 meters? (2)—What is the closing salutation of this station?—Robert Marks, Washington, D. C.

(1)—"Where God Rules Man Prospers." (2)—"Peace Be Unto You."

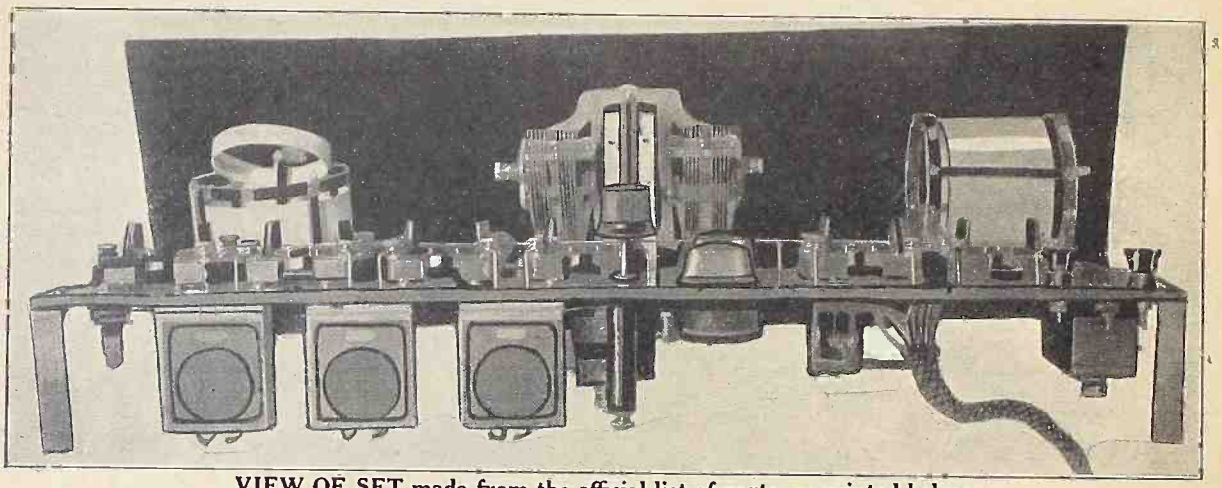
* * *

WHAT IS the pitch range of the piano, in frequency? (2)—Approximately what is middle C equal to?—Max Zunter, Brooklyn, N. Y.

(1)—From 27 to 4096 cycles. (2)—256 cycles.

FOR ONLY 15 CENTS get full directions how to build the Bernard. Radio World, 145 W. 45 St., N. Y. C.

A New Note of Beauty!
The Bernard 6-Tube Kit Makes the Handsomest Set



VIEW OF SET made from the official list of parts, as printed below.
You Tune This Set With One Finger!

OFFICIAL LIST OF PARTS

Exactly as Specified by Herman Bernard and Bearing His Personal Endorsement

C2, C4—Two Bruno .00035 mfd. straight line frequency variable condensers, which, with two drums, mounting frame, panel plate and screws constitute the Bruno Unitune, Model 2CB.

LS—One Bruno light switch, bronze type, special for this kit.

L1L2—One Aero fixed primary radio frequency transformer, stock No. WT-40.

L3L4—One Aero adjustable primary radio frequency transformer, stock No. AX-45.

PB—One Singletrol radio impedance coil or an R3 transformer.

C3, S1, C6—3 Aerovox .00025 mfd.

R2, C5—One Bretwood variable Grid Leak with grid condenser, .00025 mfd.

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

R4, R6, R8—Three Lynch metallized fixed resistors, respectively 1.0 meg., 0.5 meg. and 0.25 meg.

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

R1—One Electrad Royalty variable high resistance, Type F, range 0 to 2,000 ohms (or lesser maximum.).

C7, C8, C9 — Three Electrad 0.25 mfd. fixed condensers.

R9—One Electrad 2-ohm rheostat.

J—One Electrad single closed circuit jack.

One pair Bruno adjustable brackets.

One 7x21" Lignole inlaid walnut front panel, drilled and engraved.

One 20x4" drilled socket strip.

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

Nine American Radio Hardware Company cable tags (one A plus, one A minus, one C plus, one B minus, three C minus, one B plus amp. and one B plus det.)

Two C. A. L. binding posts (Ant. and Grd.).

Three Lynch double mountings.

10 lengths stiff Acme Celatsite.

ACCESSORIES

One 7x21" Polly cabinet, genuine walnut, with 2" slope for panel.

One Electrad Lamp Socket Antenna.

One R.F.I. Balanced Oval Cone Speaker.

Five CeCo Tubes (two F, two A, two G.)

One Centralab Modulator Plug.

SHEER Beauty, Plus Electrical Efficiency and Utter Simplicity, mark the Bernard set, designed by Herman Bernard, Managing Editor of RADIO WORLD. Its tone is entrancingly full and true, with distortion absent alike in the radio and audio channels. The radio side is stabilized by six points of balance, so that the set will not squeal at any wavelength. This is just the kind of set you want to build.

The manufacturers whose parts are used in this receiver follow:

Bruno Radio Corp., 40 Payntar Ave., L. I. City, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Powertone Electric Co., 221 Fulton St., N. Y. City
Electrad, Inc., 428 Broadway, N. Y. City
North American Bretwood Co., 143 W. 45th St., N. Y. C.
Arthur H. Lynch, Inc., Fisk Bldg., N. Y. City
Airgap Products Co., 10 Campbell St., Newark, N. J.
Aerovox Wireless Corp., 489 Broome St., N. Y. City
Lignole Corporation of America, 508 South Dearborn St., Chicago, Ill.
Birnbach Radio Co., 370 Seventh Ave., N. Y. City.
American Radio Hardware Co., 203 Lafayette St., N. Y. C.
Acme Wire Co., New Haven, Conn.

The manufacturers whose products are recommended as accessories are:

Polly Cabinet Co., 57 Dey Street, N. Y. City
Radio Foundation, Inc., 25 West Broadway, N. Y.
C. E. Mfg. Co., Providence, R. I.
Central Radio Laboratories, 13 Keefe Ave., Milwaukee, Wisc.

GREAT ATLANTIC RADIO COMPANY

International Distributors to the Trade

223 FULTON STREET **NEW YORK CITY**

Telephone: COR tlandt 6209

B S T-5 POWERFUL—SELECTIVE—SENSITIVE

A $75 Set Direct From Factory at $40

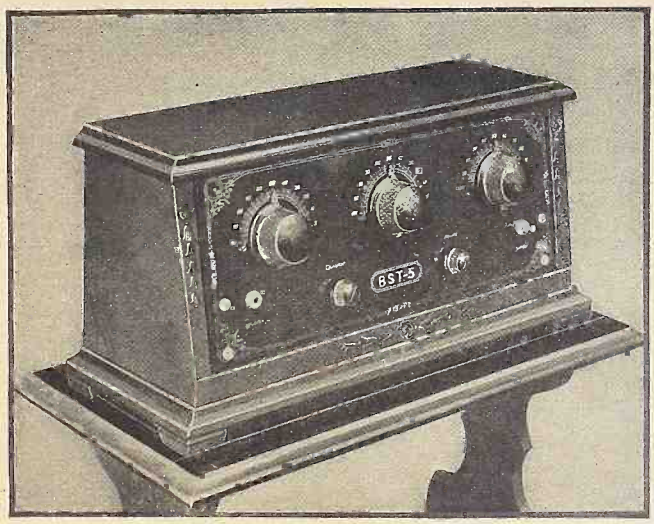
It Gets Certificate of Merit

from RADIO NEWS and RADIO WORLD

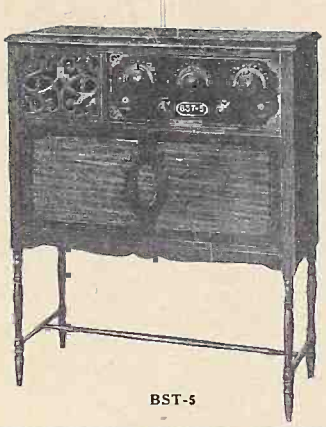
SATISFACTION GUARANTEED

or Money Back

You Save Half Your Money by Buying This B S T-5 Direct from Factory.



New model cabinet, Du Pont Duco finish; base 21" long by 8" wide, height 9½", top 21" by 6" Five-ply walnut veneer piano finish.



BST-5

RENAISSANCE MODEL CONSOLE

With built-in Utah Unit Loud Speaker and commodious compartment in which there is ample room for batteries, charger, eliminators, etc.

COMPLETE—
BST-5 RECEIVER,
Loud Speaker and Console } **$57.00**

THIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six-tube sets and consumes less current.

28 Stations in 3½ Hours

Mr. E. H. Thiery, Tax Collector, New Hartford, Conn., writes: "I am well pleased with my BST. In three hours and a half last night I got the following stations: WTIC, WJZ, WGY, WBZ, WPG, WNAC, WMSG, WEEI, KDKA, WAAM, WEAN, WSAR, WJBI, WMAC, WLWL, WJAR, WAHG, WBNY, WEAF, WNJ, WCSH, WSAN, WHK, WMCA, WRVA, WHN, WHAR, WWJ.

GUARANTEE

Satisfaction or Money Back

Each receiver is tested and retested, boxed and inspected before leaving factory, and guaranteed to reach you direct in perfect condition.

Workmanship throughout guaranteed the best. Assembled by experts.

Immediate Delivery

$40.00

BST-5 in Console - $57.00

Send Check or P. O. Money Order

GUARANTY RADIO GOODS CO., 145 West 45th St., New York, N. Y.

RADIO WORLD Guarantees the Responsibility of This Advertiser

Many will Start — But Few can Finish

IN the development of the radio industry, many have started but only those will finish who are building on a foundation of service which will stand.

IT is one thing to sell a radio instrument but quite a different matter to keep that instrument working perfectly in your home. Any new radio should deliver satisfaction but only trained service will keep it doing so—

In the rapid development of the radio industry the demand has been, in the past, generally more than the supply. It is only natural that little, if any, attention should have been paid to the one most vital requirement—trained service.

Four years ago Ozarka Inc. recognized the necessity of service—trained service, with the result, that now we have a trained service organization of 4364 men. One of these men is near you, ready and willing to deliver Ozarka service.

These men are not radio wonders who know all about all radio instruments. They make no claim to be able to service any radio instrument but they do know the Ozarka perfectly.

Radio is no different to any other mechanical device—sometimes little things will go wrong, serious to the owner, but very easily and quickly repaired by a trained service man who knows that instrument as he should.

In the mad rush of selling radio very little, if any, attention has been paid to service. A trained service organization requires time to develop and train—it has taken us four years to train 4364 men, who today constitute the Ozarka service organization.

Ozarka instruments are only sold by these trained service men by demonstration in your home—the only place where you can decide what a radio should do.

The Ozarka representative will gladly set up an Ozarka in your home. He will not operate it but let you do all the tuning. Only in this manner can you decide if its tone, volume and ease of tuning is what you expect of a radio. Bring in station after station until you satisfy yourself of what it will do for distance, then discuss with him the most important matter of all—service—trained radio service.

OZARKA
INCORPORATED

120 Austin Avenue E CHICAGO, ILL.

OZARKA
TRADE MARK REGISTERED

$132.50 F. O. B. Chicago. Ozarka Senior 5 Tube Model complete with Loud Speaker and all accessories.
Also built in a 7 Tube Model

$100 F. O. B. Chicago. Ozarka Junior 5 Tube Model complete with built-in speaker and all accessories.

$215 F. O. B. Chicago. Ozarka Console 5 Tube Model, solid walnut cabinet, complete with all accessories.
Also built in a 7 Tube Model

We have a few Openings for the Right Men

WHILE there are today 4364 Ozarka representatives, some territory is still open. We want men who believe in the future of radio—men who are tired of working for some one else—men who would like to add to their present income by devoting their evenings to Ozarka.

At the start you can keep your present position. Later on, after you have proven what you can do, then you will give us all your time because it will pay far more than your present position.

The man we want may not have much money but he is not broke. He has lived in his community for some time—he has a reputation that his word is good. He may not have made any startling success but he has never "put over something" just to make money. He may know nothing about radio or salesmanship but he will be successful if he is willing to study what we are willing to teach him, without cost.

The field in radio is wide open for the trained man. The success of the 4364 Ozarka representatives proves what men can do. If you are interested, ask for a copy of the Ozarka Plan, a 100 page book which tells a true story of how big money and a permanent business can be built in radio. It is a story of life: of why some men fail while others succeed. This book has shown many men how to start making extra money immediately and within a very short time establish a business of their own.