

HOOVER DROPS RADIO CONTROL

SEE PAGE 3

JULY 24 1926

15 CENTS

RADIO WORLD

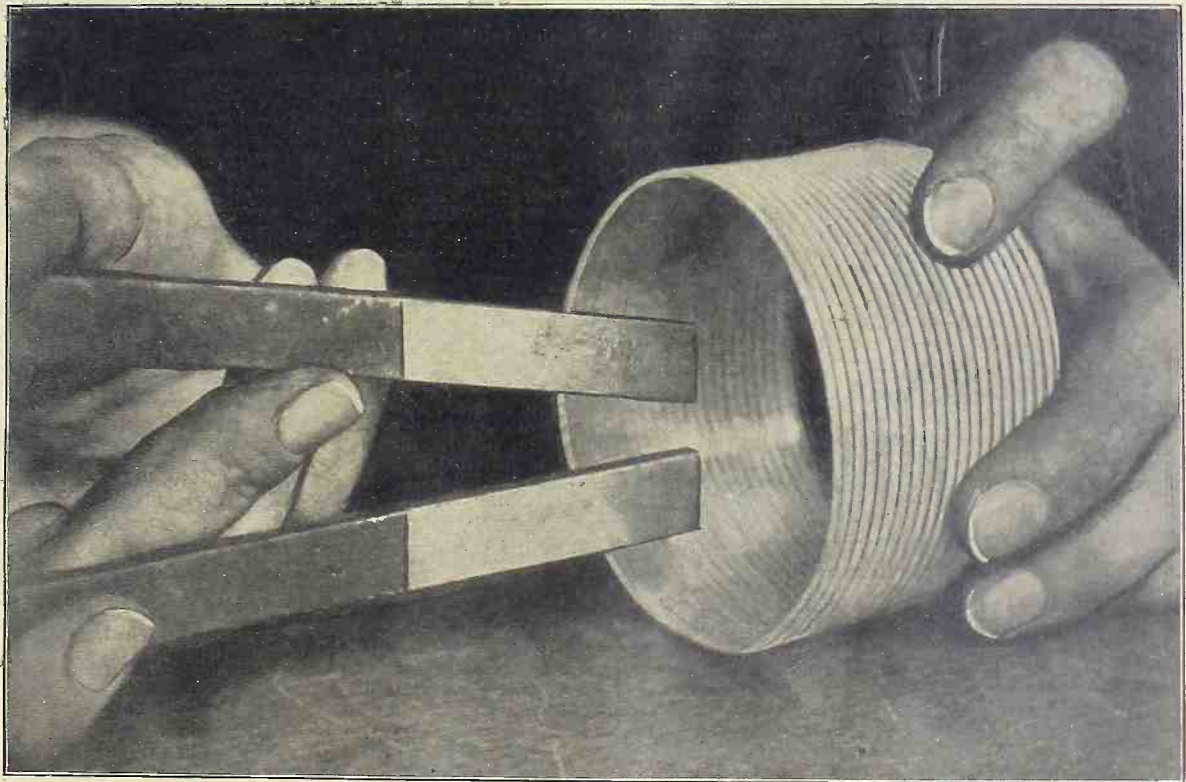
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Vol. 9. No. 18 ILLUSTRATED Every Week

THE CASE IN FAVOR OF
THE SUPER-HETERODYNE

A 135-VOLT ELIMINATOR

A 1-TUBE REFLEX SET



(RADIO WORLD Staff Photo.)

CURRENT may be generated in a coil by moving a magnet inside the core. This is due to electro-magnetic induction, a method of generating electricity. When the magnet is at rest no current flows.

10 COMMANDMENTS FOR SUMMER

Effect of Sun Spots on Reception —By Hugo Gernsback

B BATTERIES DISCARDED TOO SOON

A Study of the Marvelous Electron —By Leon L. Adelman

1927 MODEL

The Newest Up-to-the-Minute Radio Set
—It Has Never Been on a Dealer's Shelf

Sold on a Guarantee of Satisfaction or Money Back

BST-6

Volume Control
180 to 550 Meters
Perfect Calibration



B-Beauty
S-Selectivity
T-Tone purity
6-6 tubes

The BST-6. 2 Feet 4 Inches Long. 9 Inches Inside Depth. 8¾ Inches High.

THIS marvelous six-tube tuned radio frequency receiver is Self-Equalized and built of low-loss materials throughout. Its clear, rich tone of astonishing volume is a revelation. The circuit consists of two stages of tuned radio frequency, tube detector and three stages of balanced audio amplification. Air cooled rheostats and universal sockets are used.

Lubree modified straight line wave variable condensers are employed, insuring separation of the low wave length stations. **PERFECT CALIBRATION—STATIONS ONCE TUNED IN CAN ALWAYS BE LOGGED AT THE SAME DIAL POINT.**

The BST-6 works best with a 75 to 100 foot aerial. 6 volt "A" storage battery, two 45 volt "B" batteries, 4½ volt "C" battery, six 201-A tubes and any good loudspeaker.

Specifications

Bakelite Panel, Walnut Finish—
With Etch-O-Gravure and Gold Decorations—
Bakelite Sub-Base—
Kurz-Kasch Bakelite-Walnut Pointers; Gold-filled, to Match—
Kurz-Kasch Bakelite Gold-filled Rheostat Knobs—
Lubree Straight Line Wave Variable Condensers—
Special Curkoid Coils; Highly Concentrated Field—
Shore Audio Transformers—
Caswell-Runyan Two-tone Walnut-Finished Cabinet.
New Dubilier Grid Condenser

LOG OF BST-6

Taken on a Fifteen-Foot Aerial in One-half Hour by Al. Kraus, 996 Aldus Street, New York City.

| | |
|-----------------------------|----------------------------|
| WSBC, Chicago, Ill.10 | WGY, Schenectady, N.Y..50 |
| WBBR, Rossville, N. Y. .16 | WMAK, Lockport, N.Y..14 |
| WEBB, Chicago, Ill.49 | WMSG, New York City 11 |
| WHT, Deerfield, Ill.55 | WOC, Davenport, Ia.85 |
| WCCO, St. Paul, Minn. .61 | WFAA, Dallas, Texas. .78 |
| WSB, Atlanta, Ga.66 | |

SELECTIVITY

I live within four blocks of WLWL, and since the opening of this station have had great difficulty in choking them off my old set. Even after employing a wave trap I could still hear WLWL around the entire dial and was told by several friends that living so near this powerful station it would be impossible to entirely cut them out with anything less than a super-het. It was a very agreeable surprise, therefore, when I installed my new BST-6, to find that while WLWL came in on 25 I could tune in WRNY on 21 and entirely cut out WLWL. *This is certainly real selectivity.*—F. S. Clark, 350 West 55th Street, New York City.

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

Direct from factory to you
Immediate Delivery

\$40.00

SAFETY FIRST!—Why buy obsolete models, or radio failures at department store "bargain sales" when a BST-6, the latest achievement in radio, can be bought direct from the factory with no department store profit added? Here is a real bargain, sold you with a guarantee of satisfaction or money back.

Send Check or P. O. Money Order to

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141 West 45th Street, New York City

RADIO WORLD Guarantees the Responsibility of This Advertiser

[Entered as second-class matter, March, 1922, at the post office at New York, N. Y., under Act of March 3, 1879]

Hoover Quits Radio Control Following Congress Fiasco

Admits He Has no Authority to Grant or Withhold Licenses, Assign or Refuse Wavelengths or Fix Hours of Broadcasting or Power to Be Used—Stations Free to Use any Wave, except 200 or 300 Meters or 600 to 1,600 Meters.

Following an opinion of the Acting Attorney-General denying the Secretary of Commerce's power to regulate broadcasting, Secretary Hoover has stopped functioning as radio chief of the United States and has put the control problem up to the stations and the industry until legislation is adopted, probably next December or January. The effect is to show up the shortcomings of Congress, which failed to delegate the authority to any branch of the Government.

Specifically, the Department of Commerce is not assigning wavelengths to stations or withholding wavelengths, nor specifying the hours during which stations may broadcast. This leaves the stations free to use any wavelength or time they choose, without hindrance by any branch of the Government, but at their own civil risk and their own risk of punitive consequences when the control agency is inaugurated on the basis of the expected legislation.

The civil risk involved in appropriating a wavelength or time on the air arises from the legal aspect of present possession. A wavelength is deemed to be a vested property right, hence to pirate a station's wave or use one near that wave, so as to cause interference, might constitute an invasion of property rights, rendering the offender liable to money damages.

The stations generally are inclined to keep to their present wavelengths and avoid trouble for themselves and others. WBNY, New York City, assigned to the 210 meter wave, has taken 322.4, the wave used by KOA, Denver, about 1,700 miles away. This is the wave vacated by WJAZ when it took a higher wave, the action that led to a criminal prosecution which the Department of Commerce lost. The case was decided in Chicago.

It was this decision which brought to a head the problem of the radio authority possessed by the Department of Commerce. Secretary Hoover consistently assumed the possession of such power, and exercised it, until now.

He particularly asks stations not to use Canadian wavelengths.

Board Bill Sponsor



(International Newsreel)

SENATOR C. C. DILL, of the State of Washington, introducer of the Dill bill for the creation of an independent board of five to control radio. The bill would strip the Secretary of Commerce of all radio power.

(Special to RADIO WORLD)

WASHINGTON.

Broadcasting is now going on subject to no Government control, following the action of Secretary Hoover in relinquishing all claims to being radio chief of the United States. His absence of authority was declared by a court decision and was followed by an opinion from the Acting Attorney General along the same lines. Congress knew all the facts before it adjourned without passing legislation conferring power to administer radio.

The House had passed the White Bill, giving the Secretary of Commerce power, but the Senate passed an annihilatory amendment, known as the Dill bill, stripping the Secretary of power and conferring it on an independent commission of five.

Adjournment was voted before the two branches could reconcile their differences. Meanwhile the absence of authority vested in any official or board continued; Congress's failure led the Secretary to wash his hands of any attempt to exercise power he did not possess.

Hoover's Explanation

The Department of Commerce issued the following statement:

"The failure of Congress to complete radio regulation and the confusing decisions of the courts on the radio law of 1912 led the Department to request from the Attorney General an opinion on the

Acting Attorney General in Opinion Confirms Chicago Court's Ruling in Zenith Case That Hoover Is Powerless—Stations Changing Present Status Act at Own Risk of Trespassing Property Rights of Others.

whole question of departmental authority.

"The most important feature of the opinion is in respect to the right to assign an authority to enforce or deny the use of particular wavelengths to individual stations. This question is the key to all regulation.

"Since 1923 the Department has been making such assignments. In doing so it has followed the decision of the Court of Appeals of the District of Columbia, rendered in that year. That Court directly held that the Secretary was, by the law of 1912, under the duty to make such assignments for the purpose of preventing interference. Until April of this year this was the only court ruling on the subject.

Old Decision Upset

"The recent decision of the Chicago court, however, cast doubt on this authority, since it adopted a construction of the 1912 Act directly contrary in this respect to the view taken by the court of the District of Columbia.

"The Attorney General now likewise disagrees with the construction of the District Court of Appeals and advises that while under the law each applicant for a license must designate a definite wavelength, outside the band between 600 and 1600 meters, yet he is at liberty to use other wavelengths at his will.

"The Department will, therefore, in accordance with the opinion, not assign wavelengths, but will merely recite on the face of the license the wavelength selected by the applicant as the normal wavelength of the station. Under the Attorney General's opinion, no authority exists in the Department, or elsewhere, to compel adherence to this wavelength, and the Department must issue licenses to each applicant.

"The general effect of this opinion is that regulation has broken down and stations are under no effective restriction as to wavelength or power used. The 1912 Act under these various constructions has failed to confer authority for the preven-

"Be Fair," Is Hoover's Plea

Broadcasters Await Call from Secretary to Confer, But Meanwhile Are Not Changing Their Present Mode of Operation — Only W B N Y Takes New Wave.

tion of interference which was its obvious intent.

Stations Act at Peril

"Persons desiring to construct stations must determine for themselves whether there will be wavelengths available for their use without interference from other stations. They must proceed entirely at their own risk.

"There have always been the most cordial relations between the radio administrations in Canada and in the United States. The Department has refrained from assigning to American stations the wavelengths in use in Canada and the Canadian authorities have reciprocated by avoiding the wavelengths assigned to our stations. A continuance of this policy is a necessity if international confusion is to be avoided.

"The Department most earnestly hopes, whatever may ensue, that the sense of fair play, as well as interest in the protection of the situation as a whole, will prevent any American station from trespassing upon the Canadian assignments.

Part Congress Played

"The orderly conduct of radio communication and the interest of the listener in broadcasting have been possible largely because of voluntary self-regulation by the industry itself, frequently necessitating some individual sacrifice for general good. The Department trusts that this spirit will continue in the future as in the past.

"The legislation which has been long sought from Congress to perfect the 1912 Act reached the stage of passage by both Houses, but insufficient time remained in the session in which to compose conflicts between the House and Senate Bills. The legislation will undoubtedly be perfected early in the session which meets in December. Both bills, however, carry explicit authority to the Government to assign wavelengths, limit power and time, and they both establish in the Government the fundamental property in the air channels. These authorities will undoubtedly be confirmed. While any confusion which may arise pending the next session will certainly be eliminated by the passage of legislation, it will be minimized by just as much as broadcasters avoid interference with other stations."

beyond the jurisdiction of the said State or Territory, except under and in accordance with a license, revocable for cause, in that behalf granted by the Secretary of Commerce (and Labor) upon application therefor; but nothing in this Act shall be construed to apply to the transmission and exchange of radiograms or signals between points situated in the same State; *Provided*, That the effect thereof shall not extend beyond the jurisdiction of the said State or interfere with the reception of radiograms or signals from beyond said jurisdiction * * *

"Violation of this section is declared to be a misdemeanor.

"There is no doubt whatever that radio communication is a proper subject for Federal regulation under the commerce clause of the Constitution. *Pensacola Telegraph Company v. Western Union Telegraph Company*, 96 U. S. 1, 9, 24 Op. 100. And it may be noticed in passing that even purely intrastate transmission of radio waves may fall within the scope of Federal power when it disturbs the air in such a manner as to interfere with interstate communication—a situation recognized and provided for in the Act. *Cf. Minnesota Rate Cases*, 230 U. S. 352.

Basis for License Necessity

"While the Act of 1912 was originally drafted to apply primarily to wireless telegraphy, its language is broad enough to cover wireless telephony as well; and this was clearly the intention of its framers (62nd Cong., 2nd Sess., S. Rept. 698.) Whether the transmission is for profit is immaterial so far as the commerce clause is concerned. *American Express Company v. United States*, 212 U. S. 522; *Caminetti v. United States*, 242 U. S. 470.

"For these reasons I am of the opinion that broadcasting is within the terms of the 1912 Act; that a license must be obtained before a broadcasting station may be lawfully operated; and that the penalties of Section 1 of the Act may be imposed upon any person or corporation who operates such a station without a license.

Where Power Is Not Vested

"Your second question involves three separate problems:

"(a) The assignment of wavelengths
 "(b) The assignment of hour of operation

"(c) The limitation of power.

"(a) As to the assignment of wavelengths, Section 2 of the Act provides:

"That every such license shall be in such form as the Secretary of Commerce (and Labor) shall determine and shall contain the restrictions, pursuant to this Act, on and subject to which the license is granted; * * * shall state the wavelength or the wavelengths authorized for use by the station for the prevention of interference and the hours for which the station is licensed to work. * * * Every such license shall be subject to the regulations contained herein, and such regulations as may be established from time to time by authority of this Act or subsequent Acts and treaties of the United States.

"The power to make general regulations is nowhere granted by specific language to the Secretary. On the contrary, it seems clear from Section 4 of the Act that Congress intended to cover the entire field itself, and that, with minor exceptions, Congress left very little to the discretion of any administrative officer. This fact is made additionally plain by the reports which accompanied the Act in both Houses. 62nd Cong. 2nd

Full Text of Opinion By Attorney General

Legislation Next December the Only Prospect of Solving Muddle—Congress Will Give Radio Bills Preference Then, Having Adjourned Meanwhile After Failing to Agree on Any Control Bill.

(Special to RADIO WORLD)

WASHINGTON.

Following is the opinion of Acting Attorney General Donovan:

"Department of Justice
 "Washington

"July 8, 1926.

"Sir:

"Receipt is acknowledged of your letter of June 4, 1926, in which you ask for a definition of your powers and duties with respect to the regulation of radio broadcasting under the Act of August 13, 1912, c. 287 (37 Stat. 302). Specifically, you request my opinion upon the following five questions:

"(1) Does the 1912 Act require broadcasting stations to obtain licenses, and is the operation of such a station without a license an offense under that Act?

"(2) Has the Secretary of Commerce

authority under the 1912 Act to assign wavelengths and times of operation and limit the power of station?

"(3) Has a station, whose license stipulates a wave length for its use, the right to use any other wave length, and if it does operate on a different wave length, is it in violation of the law and does it become subject to the penalties of the Act?

"(4) If a station, whose license stipulates a period during which only the station may operate and limits its power, transmits at different times, or with excessive power, is it in violation of the Act and does it become subject to the penalties of the Act?

"(5) Has the Secretary of Commerce power to fix the duration of the licenses which he issues or should they be indeterminate, continuing in effect until revoked or until Congress otherwise provides?

Must Get a License

"With respect to the first question, my answer to both its parts is in the affirmative. Section 1 of the Act of 1912 provides:

"That a person, company, or corporation within the jurisdiction of the United States shall not use or operate any apparatus for radio communication as a means of commercial intercourse among the several States, or with foreign nations, or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals the effect of which extends beyond the jurisdiction of the State or Territory in which the same are made, or where interference would be caused thereby with the receipt of messages or signals from

Station Plays a Lone Hand

Sess., S. Rept. 698; *ibid.*, H. R. Rept. 582. Cf. 29 Op. 579.

No Discretion Granted

"The first regulation in Section 4 provides that the station shall be required to designate a definite wavelength, outside of the band between 600 and 1600 meters, (reserved for Government stations), and that ship stations shall be prepared to use 300 and 600 meters.

"The second regulation provides that in addition to the normal sending wavelength, all stations, except as otherwise provided in the regulations, may use other sending wavelengths, again excluding the band from 600 to 1600 meters.

"These two regulations constitute a direct legislative regulation of the use of wavelengths. They preclude the possibility of administrative discretion in the same field. In *Hoover v. Intercity Radio Company*, 286 Fed. 1003, it was held that it was mandatory upon the Secretary under the Act to grant licenses to all applicants complying with its provisions. The Court added in that case these remarks:

"In the present case the duty of naming a wavelength is mandatory upon the Secretary. The only discretionary act is in selecting a wavelength within the limitations prescribed in the statute, which, in his judgment, will result in the least possible interference. The issuing of a license is not dependent upon the fixing of a wavelength. It is a restriction entering into the license. The wavelength named by the Secretary merely measures the extent of the privilege granted to the licensee.

"You have advised me that following this decision you have assumed that you had discretionary authority in assigning wavelengths for the use of particular stations, and have made such assignments to the individual broadcasting stations.

Other Waves Open

"However, in my opinion, these remarks of the Court of Appeals are to be construed as applying only to the normal sending and receiving wavelengths which every station is required to designate under the first regulation. But under the second regulation, any station is at liberty to use other wavelengths at will, provided only that they do not trespass upon the band from 600 to 1,600 meters. This conclusion appears to be in accord with the opinion of the District Court for the Northern District of Illinois in the case (as yet unreported) of *United States v. Zenith Radio Corporation*.

"But it is suggested that under the fifteenth regulation broadcasting stations may not, without special authority from the Secretary, use wavelengths over 200 meters or power exceeding one kilowatt. This regulation is applicable only to private and commercial stations not engaged in the transaction of bona fide commercial business by radio communication. I am of opinion that broadcasting is the transaction of bona fide commercial business. (*Wetmark v. Bamberger*, 291 Fed. 776; *Remick v. American Automobile Accessories Co.*, 298 Fed. 628), and that it is conducted by radio communication. Broadcasting stations, therefore, do not fall within the scope of the fifteenth regulation; and the Secretary is without power to impose on them the restrictions provided therein.

No General Authority

"From the foregoing considerations I am forced to conclude that you have no general authority under the Act to assign wavelengths to broadcasting stations. ex-

Takes New Wavelength



(Radio World Staff Photo)

DR. SIDNEY N. BARUCH, of WBNY, New York City, who has taken the 322.4 meter wavelength, using it instead of the 210 meter wave assigned by the Department of Commerce. He is shown with the xylophone used as the station's "audible trade-mark."

cept for the purpose of designating normal wavelengths under Regulation One.

"(b) As to the assignment of hours of operation.

"The second section of the Act, already quoted, provides that the license shall state the hours for which the station is licensed for work. By the twelfth and thirteenth regulations, the Secretary, on the recommendation of the Department concerned, may designate stations which must refrain from operating during the first 15 minutes of each hour—a period to be reserved in designated localities for Government stations. These two regulations are the only ones in which a division of time is mentioned; and it is to them that the second section of the Act refers. I, therefore, conclude that you have no general authority to fix the times at which broadcasting stations may operate, apart from the limitations of Regulations Twelve and Thirteen.

Powerless on Power, Too

"(c) As to the limitation of power.

"The only provisions concerning this are to be found in Regulation Fourteen, which requires all stations to use the minimum amount of energy necessary to carry out any communication desired. It does not appear that the Secretary is given power to determine in advance what this minimum amount shall be for every case; and I therefore conclude that you have no authority to insert such a determination as a part of any license.

"What I have said above with respect to your second question necessarily serves also as an answer to your third. While a station may not lawfully operate without a license, yet under the decision in the *Intercity Co.* case, and under 29 Op. 579, you are required to issue such a license on request. And while a normal wavelength must be designated under Regulation One, any station is free to operate on other wavelengths under Regulation Two.

The Interference Point

"The same considerations cover your (Concluded on page 6)

WBNY TAKES NEW WAVE AS A TEST

Dr. Baruch, Manager, Denies "Piracy," Saying Formal Application for Use of Channel Was Made Long Ago — WGBS Afraid It Will Suffer Interference.

WBNY, owned by the Baruchrome Corporation, 145 West Forty-fifth Street, New York City, to which a 210-meter wave was assigned more than a year ago by the Department of Commerce, appropriated the 322.4 meter wave following the Secretary of Commerce's announcement. Dr. Sidney N. Baruch, inventor, is in charge of the station. He denied his act was "piracy." He said:

"I have had an application filed at the Department of Commerce since November, 1925, requesting the 322.4 meter wave, which is the only open wavelength in New York City. The nearest station on that wavelength is KOA, the General Electric station at Denver, and we do not expect to interfere with it.

"The Department of Commerce did not act on my application, and now the Department of Justice has ruled that Secretary Hoover cannot refuse an application for a wavelength, so why should we wait for action on the application if there is no one in authority to act upon it?

"WBNY on the 322.4 meter wave will cause no interference with other stations. WGBS, New York, and WAHG, Richmond Hill, both splitting time on the 316-meter wave, are nearest to 322 meters in this section and WGR, Buffalo, on 319 meters, is a trifle closer. However there should be no interference.

"In reference to interference I am mindful of the fact that any station pirating a wavelength so close to another that it will create interference is open to civil action and can be sued for civil rights.

"I note Secretary Hoover's warning in this connection when he said that those who contemplate opening new stations which might cause interference and confusion in the air, are proceeding entirely on their own risk and that there undoubtedly would be adopted early in the December session of Congress legislation which would give the Government full power to 'eliminate' confusion by such regulations as it felt necessary."

When asked if Arthur Batcheller, radio supervisor of the New York District, had granted permission to change the wavelength of WBNY, Dr. Baruch said that Batcheller had not issued a permit or refused one since the application for the new wave had been filed.

"WGBS will remain on 316 meters," said Dailey Paskman, manager of the station. "If WBNY moves to 322 meters, it will be dangerously near to our wave, and I am afraid it will cause interference."

Meanwhile WGBS is carefully checking up the effect on its reception.

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tion of interference which was its obvious intent.

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"But it is suggested that under the fifteenth regulation broadcasting stations may not, without special authority from the Secretary, use wavelengths over 200 meters or power exceeding one kilowatt. This regulation is applicable only to private and commercial stations not engaged in the transaction of bona fide commercial business by radio communication. I am of opinion that broadcasting is the transaction of bona fide commercial business. (*Wetmark v. Bamberger*, 291 Fed. 776; *Remick v. American Automobile Accessories Co.*, 298 Fed. 628), and that it is conducted by radio communication. Broadcasting stations, therefore, do not fall within the scope of the fifteenth regulation; and the Secretary is without power to impose on them the restrictions provided therein.

No General Authority

"From the foregoing considerations I am forced to conclude that you have no general authority under the Act to assign wavelengths to broadcasting stations, ex-

Takes New Wavelength



(Radio World Staff Photo)

DR. SIDNEY N. BARUCH, of WBNY, New York City, who has taken the 322.4 meter wavelength, using it instead of the 210 meter wave assigned by the Department of Commerce. He is shown with the xylophone used as the station's "audible trade-mark."

cept for the purpose of designating normal wavelengths under Regulation One.

"(b) As to the assignment of hours of operation.

"The second section of the Act, already quoted, provides that the license shall state the hours for which the station is licensed for work. By the twelfth and thirteenth regulations, the Secretary, on the recommendation of the Department concerned, may designate stations which must refrain from operating during the first 15 minutes of each hour—a period to be reserved in designated localities for Government stations. These two regulations are the only ones in which a division of time is mentioned; and it is to them that the second section of the Act refers. I, therefore, conclude that you have no general authority to fix the times at which broadcasting stations may operate, apart from the limitations of Regulations Twelve and Thirteen.

Powerless on Power, Too

"(c) As to the limitation of power.

"The only provisions concerning this are to be found in Regulation Fourteen, which requires all stations to use the minimum amount of energy necessary to carry out any communication desired. It does not appear that the Secretary is given power to determine in advance what this minimum amount shall be for every case; and I therefore conclude that you have no authority to insert such a determination as a part of any license.

"What I have said above with respect to your second question necessarily serves also as an answer to your third. While a station may not lawfully operate without a license, yet under the decision in the *Intercity Co.* case, and under 29 Op. 579, you are required to issue such a license on request. And while a normal wavelength must be designated under Regulation One, any station is free to operate on other wavelengths under Regulation Two.

The Interference Point

"The same considerations cover your (Concluded on page 6)

WBNY TAKES NEW WAVE AS A TEST

Dr. Baruch, Manager, Denies "Piracy," Saying Formal Application for Use of Channel Was Made Long Ago — WGBS Afraid It Will Suffer Interference.

WBNY, owned by the Baruchrome Corporation, 145 West Forty-fifth Street, New York City, to which a 210-meter wave was assigned more than a year ago by the Department of Commerce, appropriated the 322.4 meter wave following the Secretary of Commerce's announcement. Dr. Sidney N. Baruch, inventor, is in charge of the station. He denied his act was "piracy." He said:

"I have had an application filed at the Department of Commerce since November, 1925, requesting the 322.4 meter wave, which is the only open wavelength in New York City. The nearest station on that wavelength is KOA, the General Electric station at Denver, and we do not expect to interfere with it.

"The Department of Commerce did not act on my application, and now the Department of Justice has ruled that Secretary Hoover cannot refuse an application for a wavelength, so why should we wait for action on the application if there is no one in authority to act upon it?

"WBNY on the 322.4 meter wave will cause no interference with other stations. WGBS, New York, and WAHG, Richmond Hill, both splitting time on the 316-meter wave, are nearest to 322 meters in this section and WGR, Buffalo, on 319 meters, is a trifle closer. However there should be no interference.

"In reference to interference I am mindful of the fact that any station pirating a wavelength so close to another that it will create interference is open to civil action and can be sued for civil rights.

"I note Secretary Hoover's warning in this connection when he said that those who contemplate opening new stations which might cause interference and confusion in the air, are proceeding entirely on their own risk and that there undoubtedly would be adopted early in the December session of Congress legislation which would give the Government full power to 'eliminate' confusion by such regulations as it felt necessary."

When asked if Arthur Batcheller, radio supervisor of the New York District, had granted permission to change the wavelength of WBNY, Dr. Baruch said that Batcheller had not issued a permit or refused one since the application for the new wave had been filed.

"WGBS will remain on 316 meters," said Dailey Paskman, manager of the station. "If WBNY moves to 322 meters, it will be dangerously near to our wave, and I am afraid it will cause interference."

Meanwhile WGBS is carefully checking up the effect on its reception.

Monkey Talk Prevents Law Bills to Get Preference, Due to Crisis in the Air

Two Senators Caused Delay of Dill Bill, So That Its Passage Came Too Late for Compromise With Representatives — Evolution Issue Raised by Blease.

By Thomas Stevenson

WASHINGTON.

Hopes were high among the supporters of radio legislation almost until the last minute that a bill could be pushed through before adjournment.

Sponsored by Senator C. C. Dill, of Washington, an effort was made to push a bill through the Senate which, if it had been successful, might have resulted in the enactment of legislation.

Evolution Crops Up

This effort, however, was blocked by Senators Cole L. Blease, Democrat, of South Carolina, and Robert B. Howell, Republican, of Nebraska.

Senator Blease's objection was based on his fear that the Commission might not have the necessary religious qualifications and his fear that they might censure the broadcasting of the theory that "men came from monkeys."

The objections of Senators Blease and Howell prevented final action on the bill on that day and it was carried over until the next afternoon, when passage in the Senate was accomplished without a record vote.

The bill went to conference between the Senate and House. An effort was made to smooth out the difference between the Dill bill and the White bill in time for approval by the two Houses before adjournment. Because of the limited time, this proved impossible.

Bills Will Get Preference

The radio bills will occupy a preferred position at the beginning of the next session in December and the view is that

it may be possible to enact legislation before the first of the year.

While the Senate bill as at present written is considered unacceptable to the House, and the House bill equally unacceptable to the Senate, it is thought that the Conference can decide on a measure acceptable to both Houses.

The principal point of contention between the House and Senate is the independent Commission. Standing with the President, the House is against the creation of additional commissions independent of executive authority, while the Senate is opposed to permitting Secretary Hoover or his department to have anything to do with the regulation of radio.

Court Review Provided

Prior to passage of the bill by the Senate a number of amendments were adopted while at the same time considerable objection was expressed to several features of the bill with the hope that they would be eliminated in conference.

One of the amendments accepted provided that there should be no discrimination on the part of stations toward candidates for public office.

Under the interpretation placed on this amendment, it would not be necessary for a station to grant time to any candidate, but if the privilege were extended to one, it must be to all alike.

Another important amendment was that by Senator Robinson, of Arkansas, providing for a court review of the decisions of the commission.

A number of amendments were voted down, among which was that by Senator Blease which would have made it unlawful to teach evolution by radio or to broadcast anything pertaining to it.

* * *

White Bill Amendments Passed by Senate Vote

1. The President is empowered to designate an officer of the Army and an officer of the Navy to sit as additional members of the commission, without pay, for the purpose of allocating bands of wavelengths for military needs.

2. (a) In regard to advertising, broad-

casters are allowed to discriminate as to who shall use the station for advertising purposes, but shall make no discrimination as to charges, terms or service.

(b) If a candidate or candidates for any public office be allowed to use the station, all other candidates for the same office may use the station, and the broadcaster shall have no power to censor the material, and is exempted from any criminal or civil action by reason of any of the uncensored utterances thus broadcast.

3. Provision is made that all stations must give absolute priority to signals of vessels in distress, in accordance with the International London agreement.

4. Provision to transfer the present appropriation for Radio Administration by the Department of Commerce to the use of the commission in case this Act becomes law.

5. Provision for appeal to courts over the decisions of the commission.

6. Provision for dividing country into five zones, with a commissioner from each zone.

7. The salaries of commissioners reduced from \$12,000, to \$10,000, and that of the Secretary of the commission reduced from \$7,500 to \$5,000.

* * *

License Limit Bill Dies Amid Excitement

Senators Watson, of Indiana; Cummins, of Iowa, and Dill, of Washington, were appointed as the Senate conferees, and Congressmen White, of Maine; Scott, of Michigan; Davis, of Tennessee; Lazaro, of Louisiana, and Lehlbach, of New Jersey, were appointed for the House, as the joint committee on radio legislation. This committee went into conference and labored late into the evening in an effort to compromise the Dill and White bills so that both houses might pass such a compromise measure before adjournment.

While much progress was made, it was found too great a task to complete in a hurried manner, and the committee decided to let it go over until the December session, thereby allowing more deliberate consideration of the many points involved.

The Committee drafted the following resolution:—

"Resolved, That until otherwise provided by law, no original license for the operation of any radio broadcasting station and no renewal of a license of an existing broadcasting station shall be granted for longer periods than ninety days, and no original license for the operation of any other class of radio station and no renewal of the license for an existing station of any other class than a broadcasting station, shall be granted for longer periods than two years, and that no original radio license or the renewal of an existing license shall be granted after the date of the passage of this resolution unless the applicant therefor shall execute in writing a waiver of any right or of any claim to any right, as against the United States, to any wavelength or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof."

This resolution was reported to both houses and passed just before adjournment. In some way in the confusion of the last few minutes of the session, however, it failed to reach President Coolidge for signature, and therefore did not become law.

Attorney General Denies License Limit Power

(Concluded from page 5)

fourth question. Since the Act confers upon you no general authority to fix hours of operation or to limit power, any station may with impunity operate at hours and with powers other than those fixed in its license, subject only to Regulations Twelve and Thirteen, and to the penalties against malicious interference contained in Section five.

"With respect to your fifth question, I can find no authority in the Act for the issuance of licenses of limited duration.

"It is apparent from the answers contained in this opinion that the present

legislation is inadequate to cover the art of broadcasting, which has been almost entirely developed since the passage of the 1912 Act. If the present situation requires control, I can only suggest that it be sought in new legislation, carefully adapted to meet the needs of both the present and the future.

"Respectfully,

"WILLIAM J. DONOVAN,

"Acting Attorney General.

"The Honorable.

"The Secretary of Commerce,

"Washington, D. C."

Broadcasting Called Risk

No Stampede Danger; Stations Too Costly

Action Was Foretold
Just a Month Ago

Many Now Operating Are Losing Money Fast, But Charge That to Publicity

WASHINGTON.

Experienced observers say that the danger of chaos and confusion following Secretary Hoover's action is small indeed and there will be no stampede on the part of existing broadcasters or those who wish to put up a station.

The construction of a broadcasting station costs many thousands of dollars, to say nothing of the operating cost. Contrary to the altruistic statements of present owners of stations, broadcasting is a commercial proposition pure and simple and its value in dollars and cents is well calculated in advance of station construction. This is not true of all stations, of course, but it does apply to better than 90 per cent of them.

To many of the present owners of stations there is no direct monetary return from broadcasting, but the advertising value is considered to more than offset any expense incurred either in the construction or operation of the plant. In addition, a number of stations are owned and operated by the manufacturers of radio sets and equipment who feel that they add to the demand for their products by broadcasting.

If satisfactory wavelengths free from interference were available, there could be no doubt that the number of broadcasting stations would greatly increase. But to put it in the words of an experienced observer, here is just what the situation offers to those who want to enter the field:

"The construction and operation of a broadcasting station at the present time is a bigger gamble than most people would care to undertake. There are no wavelengths available which can be used for satisfactory operation. It is safe to say that a new station could not give

good service except possibly in its local community, and there is no guarantee even of that. There is no promise that there will be wavelengths available for a number of years. Furthermore, Congress is sure to pass a law early next session, and the new stations probably would not fare so well under its provisions. I do not believe there are many people who will want to spend thousands of dollars for the doubtful privilege of putting up a station which may never be of the slightest value."

New Agency Is Barkis in the Control Business

ATLANTIC CITY, N. J.

The newly-formed Radio League of America, Inc., will attempt to regulate radio broadcasting, a job which has been abandoned by the United States Government, according to a statement here today by C. Wood Arthur, who said he was Secretary of the new league. Its offices, he said, are in Room 610, Peoples Life Building, Washington, D. C.

The Government has no authority to regulate radio broadcasting. Secretary of Commerce Herbert J. Hoover announced a few days ago, after an opinion by Attorney General Sargent. Secretary Hoover predicted the industry would be thrown into chaos unless it regulated itself.

Mr. Arthur said there were 600 unlicensed broadcasting stations which want permits to broadcast with the air already crowded.

"In this situation," he said, "Secretary Hoover appealed to the radio industry to regulate itself, and this league was incorporated as a result. We will have in it the 530 broadcasters, all of the manufacturers and dealers, and 11,000,000 of the listening public."

Officers are to be elected this month. It is planned to offer membership in the league to listeners for a \$5 annual fee. Mr. Arthur said he was once connected with the Radio Corporation of America.

Legislators Indorse Action Hoover Took

WASHINGTON.

Members of the House and Senate who are still in Washington express themselves in thorough accord with the decision of Secretary Hoover that he will not make any further attempt to regulate the wavelengths, time of operation or power of broadcasting stations. The consensus of Senators and Representatives interviewed follows:

"The decision of the Department of Justice removes any doubt of the authority of Secretary Hoover's authority in regulating broadcasting. While it would be most desirable for Mr. Hoover to continue in the role of broadcasting regulator until a law is passed by Congress, it does

not seem as if he is justified in doing so.

"Congress has had adequate time to pass upon radio legislation and its importance was sufficiently understood. However, because of lack of interest or rather due to greater interest in other matters, Congress failed to pass the required radio law.

"The owners of new or existing stations would undoubtedly carry the matters to court if the Secretary did not attempt to exercise authority, and the Department of Justice has indicated he has not a leg to stand on. It is also probable that whatever chaos or confusion may result will be sufficiently impressive to guarantee a radio law early next session."

In its June 19 issue, RADIO WORLD published a special despatch from Washington under a three-column head reading "Hoover Considers Dropping Regulation of Broadcasts." This article accurately foretold what would happen and was based on information from most authoritative sources. It was the first publication of this important news in any medium of national circulation and was fittingly featured, including a headline on the front cover.

At the time that article was written Congress still was in the throes of confusion over radio legislation.

The leading editorial in that issue captioned "Congress and Chaos," discussed the Secretary's intention to drop radio control and gave a full insight into the underlying causes.

On Friday, June 18, in his weekly 7 P. M. broadcast from WGBS, New York City, Herman Bernard, managing editor of RADIO WORLD, devoted his 10-minute period to a discussion of the radio legislation situation and prophesied that Congress would adjourn without enacting any radio bill. Meanwhile correspondents in Washington were sending to their newspapers and magazines despatches of contrary tenor. As is well known now, no legislation was enacted.

Stations Await Call By Hoover to Confer

Paul B. Klugh, president of the National Broadcasters' Association, representing 200 stations, said:

"The broadcasters are intent upon regulating themselves so that there will be no chaos in the air. We are heartily in sympathy with Secretary Hoover's reported plan to call a meeting of the radio industry, and we will cooperate to the end that the public will be safeguarded in a program service.

"The annual meeting of the National Broadcasters' Association will be held in New York in the week of Sept. 12, and at that time a plan will be worked out to relieve the situation, but if Secretary Hoover believes a meeting should be called before that time we pledge ourselves to back up the Department of Commerce 100 per cent.

"My opinion is that broadcasters should regulate themselves to meet the situation until legislation can be enacted, and there is no doubt, according to reports from Washington, that proper laws will be enacted as soon as Congress meets in December."

License Is Deferred Till Station Is Up

WASHINGTON.

Under the new policy of the Department of Commerce, licenses for stations will only be issued after the erection of the station, according to a statement by Acting Secretary Stephen Davis. In other words, licenses will not be issued immediately to the 600 applicants who have filed applications with the Department of Commerce. In the event of actual station construction, however, a license will be granted immediately but without any attempt to regulate wavelength, power or time of operation.

Why a Super-Heterodyne?

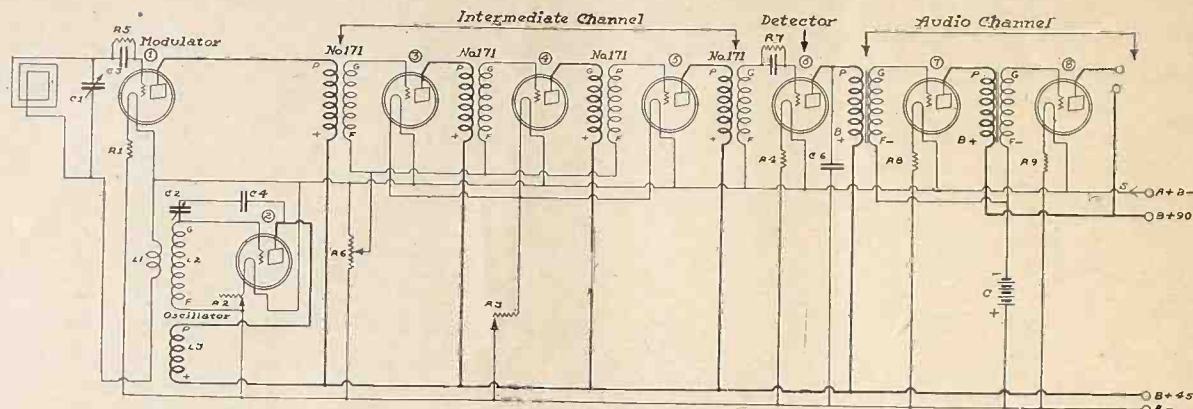


FIG. 1

Circuit diagram of a standard 8-tube Super-Heterodyne, using the Hartley oscillating system. This is the Victoreen set.

"Best Type of Circuit for Broadcast Reception So Far Developed," Says Bernard—While Not So Selective As to Injure Quality, It Is the Most Sensitive of All Sets.

By Herman Bernard

Associate, Institute of Radio Engineers

A LABORATORY is a very friendly and informative institution. Even a simple one, established in your home, will answer questions that otherwise confound you.

When, for instance, you desire to have the oracle tell you which type of radio receiver is best, it does not send you to the "wooden walls," or otherwise tease you with ambiguity, but gives you a firm answer with scientific accuracy.

The laboratory tells you that the Super-Heterodyne is the best type of circuit for broadcast reception so far developed, judged by the normal standards—sensitivity, selectivity, volume and quality. The fifth consideration, ease of operation, is something requiring no appeal to the laboratory.

The Circuit's Heart

The heart of the Super-Heterodyne is the intermediate frequency amplifier, for here both the sensitivity and the selectivity, the main considerations for purposes of appraisal, are mostly obtained.

As the received signal is of one frequency, and the oscillator frequency must be of a different one. The result of mixing the two, or modulating the one upon the other, is to obtain the intermediate frequency.

Hence intermediate stages may be added, affording greater amplification at the medium frequency, while the number of controls remains always two. There is an adventitious tuning effect in the intermediate channel, because of the relatively narrow band of frequencies that is well amplified. Hence suppression of conflicting frequencies is accomplished, and this of course is in the category of selectivity.

Can Be Too Selective

The sensitivity of the Super-Heterodyne

is obvious even from a rough test of tuning the modulator dial, noting its relative broadness, then tuning the oscillator dial. Despite the apparent broadness of the first circuit, the second one, in conjunction with the intermediate channel, makes for selectivity of about as high an order as is safe.

It must be remembered that selectivity may be carried to a finer point than is represented in any of the receivers in general use to-day, but there are certain definite limits created by the important requirement of quality.

When selectivity is pressed beyond a certain point the side bands are mutilated and this creates distortion.

The side bands represent the amplitude of the modulated wave—the original audio frequencies, the voice and the music—as these appear when they are "radioized."

That is, the radio wave is sent out with the audio component impressed upon it, but in the process the audio characteristic is lost, for there is only one kind of wave left, and that is a radio wave.

Cause of Distortion

Hence to impair the original wave form is to distort it and when the rectification takes place in the receiver, the thing rectified is not nearly the same as that transmitted. The object, then, is to make the rectified component in the set as near like the original broadcast wave modulation, or side bands, as is electrically possible.

Therefore one judges the Super-Heterodyne circuit as a whole, not each circuit component individually.

The selectivity is measurable in terms of the degree of amplification in respect to the frequency, and these ratings may be plotted in the form of a curve. The sharper the peak, the greater the selectivity, for the amplification is greatest within more strictly limited confines.

The Super-Heterodyne, therefore, is as selective as ordinary needs require, since its resonance curve shows that very plainly, and possessors of extraordinary needs will satisfy them by heaping on greater amplification.

Two, Three or Four Stages?

In the most popular forms of the Super-Heterodyne it is customary to use a 3-stage intermediate amplifier. A set entirely serviceable is obtainable with only two such stages.

Greater amplification results if four

On Reception of Weak Signals, Even With a Loop, It Far Excels the 4-Tube Set Consisting of Tuned RF, Regenerative Detector and Audio.

stages are used, instead of three, but the question of stability arises.

A potentiometer often is employed for controlling the over-oscillatory tendency or self-regeneration of the intermediate channel. Ordinarily this adjustment is not very critical, but with four stages it is likely to be so.

Broadcast listeners whose sheer delight is the reception of distant stations will turn perhaps to the fourth stage or will have tuned radio frequency amplification precede the modulator.

Indeed, besides this, even regeneration may be incorporated in the tuned RF step.

Such methods do bring up the amplification very considerably, but the safeguards against squealing and easy control are sacrificed in favor of this distance-getting hunger.

Use of Tuned RF First

Tuned RF alone, ahead of the conventional Super-Heterodyne, rids one of some problems, such as cutting out a powerful broadcaster that is close at hand, and its use is not to be discouraged, where one has made up his mind as to the definite purpose the addition is to serve.

The sensitivity and the selectivity of the Super-Heterodyne compare at about equal ratio with those advantages in other receivers.

That is, if the Super-Heterodyne is twice as sensitive it is likely to be about twice as selective as the other, although in some circuit forms used as objects of comparison this will not hold true.

Especially on weak signals does the Super-Heterodyne exceed other circuits.

It will pick up on a loop, with good volume, stations barely audible on a regulation 5-tube tuned RF set that uses an outdoor antenna of considerable length.

The King of Volume

Considerations of volume show the

A Quest for "the Best Set"

All Distant Reception Is Badly Distorted on Any Set, Says Author — Shows How Super-Heterodyne Tends to Level the Volume of Locals and DX.

Super-Heterodyne to be far in the lead. Assuming an 8-tube Super-Heterodyne, it will give more volume consistent with quality than any other type of 8-tube receiver.

One can not imagine five stages of tuned RF, tube detector and two transformer audio stages comprising a workable receiver, because of absence of means of stabilizing the circuit, but the Super-Heterodyne would give greater volume, because of the losses incurred in the stabilization of the tuned RF stages and in the stray inductive coupling or imperitive shielding.

The volume is so great on the Super-Heterodyne that the local stations will be heard well on the speaker with only one stage of transformer audio.

There is no need for modification of this statement. The only requirement is that a Super-Heterodyne of excellent design and construction be made the basis of the test.

The Source of Volume

Almost every one who has a Super-Heterodyne has had a receiver of another type and has operated it in the same location, hence can make the comparison.

If any other receiver, using two transformer audio stages, or the equivalent amplification with more audio stages, operated a speaker satisfactorily, and the Super-Heterodyne does not do as well on one stage of transformer coupled audio, with $3\frac{1}{2}$ -to-1 ratio, or greater, then there is something wrong with the Super-Heterodyne.

The volume is built up as much in the intermediate channel as in a single audio stage.

This is due to the location of the intermediate amplifier ahead of the detector, sometimes called the second detector.

The output of this tube is the square of the input.

The high degree of radio frequency amplification in the intermediate channel naturally builds up the voltage very considerably, and as the intermediate wave is the one affected, side bands and all the queer component represented by the erstwhile audio frequencies is built up just as much as the other part of the wave.

Source of Quality

In point of fact, the wave is several waves, but of slightly different frequencies, due to the effect of the audio imprint upon the carrier.

Hence as all are amplified together at radio frequencies, first at the signal frequency and next at the intermediate frequency, the built-up voltage asserts itself in audio form after rectification in the receiver.

Also, if selectivity in the tuning and other channel has not been pressed too far, you get what is tantamount to audio frequency amplification accomplished through radio frequency amplification, and with fine, pure tone, unaffected by

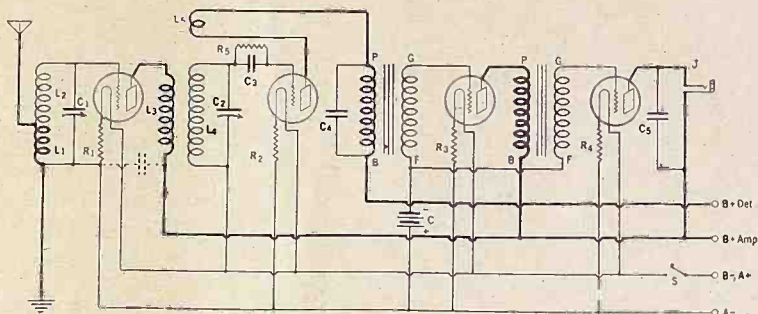


FIG. 2

A 4-tube set, using one stage of tuned RF, regenerative detector and two audio stages.

any limitations of audio transformers as to evenness of amplification at various audible frequencies or alteration of the audio wave form.

The Work of a Receiver

The object of any receiver is merely to pick up a modulated carrier wave and get rid of the carrier, leaving only the modulation component, and if in doing this the amplification is carried on very successfully at radio frequencies, the consequent audio benefit is highly attractive.

Moreover, the lack of necessity for the second audio transformer further enhances the quality appeal, as the grid that is called upon to handle the heaviest load is the one in the final audio tube.

Yet every Super-Heterodyne should have a second audio stage, so that distant stations may be heard with comfortable volume. One of the great points in favor of this system of a spare audio stage is that distant stations are put on more nearly the same volume level as locals.

Evening-up Process

In most sets two stages of audio are preceding the speaker at all times, so that while a local station may blast the horn or cone, the distant station is audible only on earphones, or only barely so on the speaker.

To add a third transformer stage does not solve the problem, for again the stability consideration asserts itself. Unless low ratio transformers of special design are used, three transformer audio stages are out of the question in any receiver.

The combined sensitivity and selectivity of the Super-Heterodyne, enabling excellent results from loop operation, have made the receiver an attractive one in large cities, where facilities for erecting outdoor aerials are not always the best, particularly in apartment houses with roofs crowded with antenna wires.

Cutting Through Locals

In such locations there are likely to be many local broadcasting stations, and the question naturally arises as to how well one may cut through the locals to penetrate the far reaches characterized by the precious code word, DX.

A general answer is not safe, since virtually everything depends on the location, and conditions will vary.

For instance, with a broadcast station only a block away, emitting 1,000 watts on 400 meters, how could one expect to tune in a weak distant station on 405 meters?

It may be done under some exception-

How Audio Amplification Is Obtained at Radio Frequencies, So That Detector Output of Super-Heterodyne Is Stronger Than That of Any Other Set.

al conditions, but certainly it must not be expected.

Super-Heterodynes in operation in New York City have found strong local stations preventing the reception of distant ones on wavelengths somewhere near the locals. In that city there are so many stations—the district has nearly 30—that sneaking in between locals to get DX is solely a question as to how strong the local comes in.

Locals Keep Out DX

Nearly always some local will drown a DX station, just as a shout drowns a whisper. The yearning to have a receiver that will pierce through the locals like a bayonet through jelly, and strike the DX wave with faultless accuracy, is one founded rather on hope than on science. For to be able to do that at all necessarily means a super-selective receiver, one that mutilates the received wave very badly. There is little harm in this distortion so far as it pertains to distant stations, for all distant signals are badly distorted, whether we desire to admit the fact or not.

The Real Problem

The problem is to have a receiver that admits the side bands sufficiently to retain real quality, and yet which reaches out under conditions suitable for distant reception. You may have to wait until the locals sign off, if you are in a great city, but if you live in some place not strictly urban you will find the Super-Heterodyne reaches out marvelously.

Take a receiver consisting of a stage of tuned radio frequency amplification, a regenerative detector, and a suitable audio channel, say, two transformer coupled stages (Fig. 2). For reception of local stations you will get about as much from this set as from a Super-Heterodyne using seven tubes (last audio omitted).

Two Important Reasons

Hence, if one likes local programs and cares little or nothing for distance, why have a Super-Heterodyne?

Two main reasons suggest themselves: (Concluded on page 10)

A 1-Tube Reflex Receiver

DX, Earphone Volume and Good Tone Quality Obtainable from This Simple Receiver—Choke Coil Helps Keep RF Out of the Audio Transformer, Placed at Point X in Fig. 1.

By Hector A. Reed

QUANTITY, volume and DX are all obtained with the 1-tube reflex set built from the circuit diagram shown in Fig. 1. The radio frequency tube, it will be noted, employs a 3-circuit tuner and is regenerative. This same tube also acts as an AF amplifier, making it a double duty tube, e. g., an RF and AF amplifier. A crystal detector is used. Here the quality is preserved.

As to the manner in which the signal is passed from coil to tube, etc., until the output is reached, the radio frequency waves are impressed upon the antenna. They then travel to the primary L1. By mutual induction this energy is passed on to the secondary L2. The variable condenser, C1, tunes to the desired frequency. This signal is now amplified at radio frequency by the tube. The signal is strengthened by the tickler coil, which introduces a feedback of energy from the plate to the grid. This radio output current is then impressed onto the primary L4. Again by mutual induction, the signal is impressed upon the secondary L4. Condenser C2 tunes this circuit to resonance. This detector is now rectified by the crystal signal, the output of which is connected to the primary of the AFT.

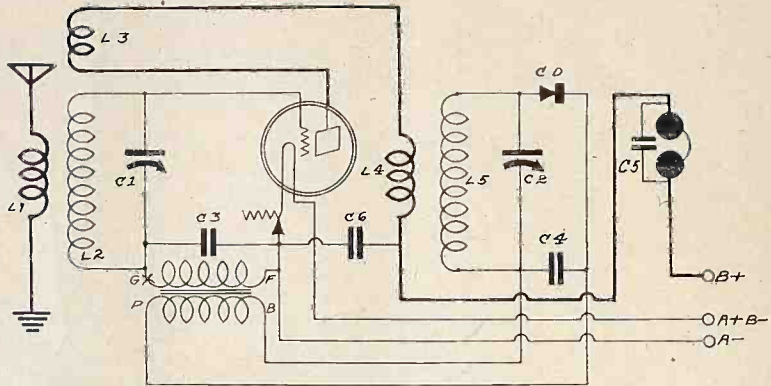


FIG. 1

The circuit diagram of the 1-tube quality, volume and DX receiver.

LIST OF PARTS

- One 3-circuit tuner, L1L2L3.
- One RFT, L4L5.
- One 10-ohm rheostat.
- One AFT, high ratio (6-to-1).
- Two .00025 mfd. fixed condensers, C3, C4.
- Two .0005 mfd. fixed condensers, C5, C6.
- One crystal detector, CD.
- Two .0005 mfd. variable condensers, C1C2.
- One socket.
- Two 4" dials.
- One knob for tickler.
- Accessories: Phones, batteries, tube, binding posts, connecting wire.

The signal is fed back into the RF tube and amplified at audio frequencies. The output of this stage is then taken from the primary L4. The primary

inductances L1 and L3 consist of 8 turns wound on tubings, 3 ins. in diameter. The secondaries, L2 and L4, consist of 47 turns wound on the same tubings as the respective primaries. No. 22 or 24 double cotton covered wire is used. C1 and C2, which shunt the secondaries, are of the .0005 mfd. variable type. The tickler L3 consist of 36 turns of No. 26 single silk covered wire, wound on a tubing 2¼ ins. in diameter. This fits inside of the primary-secondary tubing, L1L2, and is placed near the secondary winding. C3 and C4 are .00025 mfd. while C6 and C5 are .005 or .001 mfd. fixed condensers, used for by-passing radio frequency currents.

CD is the crystal detector, which may be of the fixed or variable type.

May Use a Ballast

The audio frequency transformer employed is of the high ratio type, with a fairly large primary. At the point marked X, an RF choke may be inserted to prevent RF currents from entering the AF circuit, during the reflexing, causing distortion and poor amplification. This choke consists of 200 turns of No. 30 enameled wire, wound on a tubing 1 in. in diameter. It is placed between the G post of the AFT and the L2C1C3 lead.

A rheostat is used to control the filament temperature of the tube.

The tickler knob is critical and should be adjusted with care. The filament control is not so. As a matter of fact, a ballast resistor may be substituted here. Any type tube may be used, the -01A being preferable. If this tube is used, then the plate voltage should be about 67½.

Crystal Connection

When connecting the crystal detector it may be advisable to see that the high potential point is connected to the stationary plates of the variable condenser, with the low potential point going through the primary winding of the transformer to the rotary plate connection of the same condenser. Reverse secondary connections as a test.

This complete set may be mounted in a 7x12 in. cabinet.

An extra stage of audio frequency amplification may be added to this set with ease. This will provide loud speaker volume. Shunt the primary of the transformer across the phone tips. Connect the other terminals in standard fashion. No. C battery will be needed, unless it is desired, for experimental purposes, to use a power tube.

Some Locals Are Weak; How to Get Them Loud

(Concluded from page 9)

(1) Some locals may deliver a weak signal wave to one's antenna or loop, due to shielding, absorption, or any one of a number of unfathomed causes, and the Super-Heterodyne will build up this signal to a magnitude not possible in the other set.

(2) The Super-Heterodyne controls are only two, while the other set has three, one of which is a tickler knob or dial, not the easiest thing in the world to handle.

Super-Heterodyne Excels

Therefore, if one knows in advance that all the locals one desires to receive may be received well, he need not have a Super-Heterodyne for the reception of locals.

Moreover, when the locals have signed off, his 4-tube receiver will give a good account of itself, as to DX, but not in a manner to compare with the Super-Heterodyne.

This is true, no matter what receiver comparisons may lead one to believe, when such comparisons are made "on the air."

The 4-tube set that brought in certain stations at one time that a Super-Hetero-

dyne could not bring in at some other time still has a degree of sensitivity not one-tenth that of the Super-Heterodyne.

The laboratory is very truthful, while the comparison of receivers by the broadcast reception test under conditions inevitably different is very deceptive.

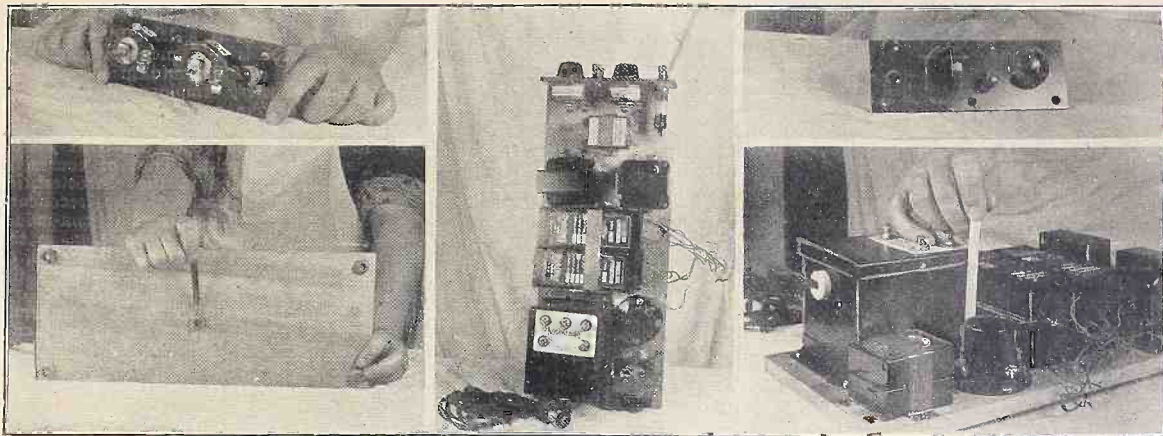
The Cost Item

On the subject of cost, the Super-Heterodyne is more expensive as a capital expenditure and likewise has a higher upkeep cost, although Super-Heterodynes may be designed so as to consume very little milliamperage in the plate circuits. Indeed, less than 20 milliamperes, which is less than most 4-tube sets consume, will suffice in many instances, provided the plate voltages are suitably low, say, 22½ in the intermediate channel.

As for the A battery, naturally that will be drained proportionately faster by seven or eight tubes than by four, hence one may assume that twice as much filament juice is used.

Even so, that means charging your A battery at intervals of half those applicable to the other type of set. Hence even on the 8-tube set, given average use, heavy duty B batteries would last seven or eight months.

A 135-Volt Eliminator



(Hayden)

FIG. 2

Photos illustrating the placing of the parts for the B eliminator. In the upper left-hand corner the back view of the panel is seen. In the extreme right-hand corner the panel view is shown. In the lower left-hand corner the rubber feet, as mounted on the bottom of the baseboard, are seen. In the center the complete layout of the parts is clearly viewed, while in the lower right-hand corner the position of the transformer, fixed condensers and socket is shown.

**Raytheon Tube Is Used
And Potential Is Obtained
at 40 Milliamperes—Power Supply Is
Easy to Construct.**

By Dennis J. Gallagher

FOR experimenters the B eliminator layout shown is ideal. A stock size 6x14" baseboard is used to mount the condensers, chokes, transformer and socket, while a 4x6" panel is used for mounting the resistances and binding posts.

Fig. 1 shows the schematic diagram of the eliminator, which, it will be noted, is that of the popular Raytheon combination. Thordarson chokes and transformers, Dubilier fixed condensers and American Mechanical Laboratories resistors were employed.

The panel layout is first attended to. The variable resistors are mounted to the right, while the fixed resistor is mounted to the left. The front and back views of this panel are shown in the left and right-hand upper corners of Fig. 2.

Before the heavy parts are placed on the board, it is best to mount rubber feet on the bottom so that even if it is placed on a good table (the usual kitchen laboratory table) no scratching will take place. The parts are then mounted. The step-up transformer is placed at the rear, with the two 0.1 mfd. fixed condensers shunted across the secondary, placed directly adjacent.

The socket is also placed next to the transformer. The position of the transformer, fixed condenser and socket is best shown in the photo in the lower right-hand corner. The large fixed condensers are then stacked up. An aluminum bracket is then bent over these condensers and bolted to the board.

The chokes are next placed, one to the left and one to the right of the board. The fixed condenser in the detector cir-

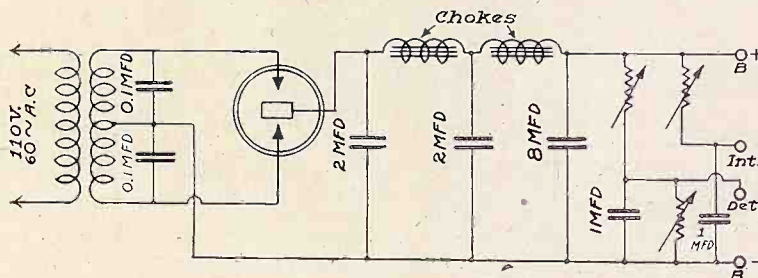


FIG. 1

THE ELECTRICAL diagram of the B eliminator, using the Raytheon tube as the rectifier. It gives an output of 135 volts at 40 milliamperes.

uit is then placed in between the two chokes, but in no way touching the chokes, or the variable resistors, when the panel is mounted.

It will be noted that the AC portion of the circuit is kept from the filtering side. The fixed condensers are supplied with flexible wire. The entire wiring of the eliminator may be wired with flexible wire. Care must be taken that the AC wires are kept from the DC wires (after rectification).

The flexible cord from the transformer should not be allowed to sag over the filter condensers, etc. The variable resistances in the output have a range of from 10,000 to 100,000 ohms or thereabouts.

LIST OF PARTS

One Thordarson B Eliminator Transformer, Type R-195.

Two Thordarson B Eliminator chokes, Type R-196.

One Dubilier B Block (2 mfd., 2 mfd. and 8 mfd.), old type, or B Block containing all the condensers needed in the filter circuit, Type PL 90, new type.

Two American Mechanical Laboratory variable resistors.

One American Mechanical Laboratory fixed resistance, 10,000 ohms.

One Dubilier, type PL91, fixed condenser block, two 1 mfd. condensers.

Binding posts, wire panel, aluminum stripping, baseboard, etc.

Iron Core Increases Inductance of Coil

Self-inductance does not depend upon the current which is flowing, except when iron is present. By coiling up a portion of wire in many turns and placing it into a circuit, the inductance of the circuit may be greatly increased. Here we say that the inductance is concentrated. The self-inductance is measured in units called henries. However in practice, smaller quantities are used, such as the millihenry, which equals one-thousandth of a henry; the microhenry, which equals one-

millionth of a henry, and the centimeter of inductance, which is equal to one-thousandth of a microhenry.

A solenoid coil wound on a hard rubber tubing, approximately 5" in diameter and about 10" long, with a 150-turn winding, is equal to an inductance of a little more than one millihenry. If a small piece of wire is connected to a post of a dry cell, the other terminal being tapped to post of battery, a tiny spark will be seen. Iron in center will cause larger spark.

The Super-Zenith Receiver

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 47th St., N. Y. City.

When writing for information give your Radio University subscription number.

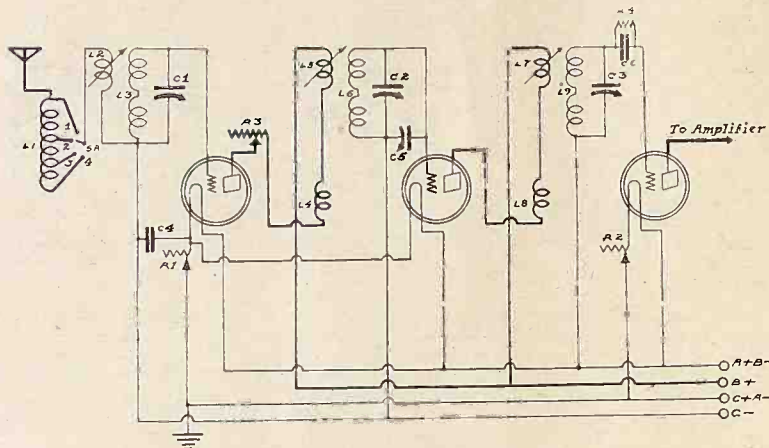


FIG. 381

The fundamental electrical diagram of the Super-Zenith receiver.

I WOULD like to have the fundamental circuit diagram of the Super-Zenith receiver, using two steps of tuned radio frequency amplification and the detector.—William Brunters, Raymond, Ga.

Fig. 381 shows the electrical diagram of this receiver. This set requires care to get working properly after completion. The three variable condensers, C1, C2 and C3, all of which have a capacity of .00035 mfd., are controlled by one knob. On the shafts of these condensers, the coils, L2, L5 and L7 are mounted. They therefore are adjusted at the same time as the condensers. L2 consists of 3 turns. L5 consists of 4 turns. L7 consists of 5 turns. These are wound on separate tubings, each $2\frac{1}{2}$ " in diameter, using No. 26 double cotton covered wire. L3, L6 and L9 consist of 61 turns wound on a 3" tubing, using No. 22 double cotton covered wire. L4 and L8 are wound on the tubing holding the L6 and L9 secondary windings, but spaced $\frac{1}{4}$ ". L4 consists of 10 turns, while L8 consists of 7 turns. Wind coils tightly. This is to prevent possible oscillation on some of the wavelengths. R3 is a 2,000 ohm non-inductive resistance. This resistance controls any possible regeneration in the first tube. L1 consists of 20 turns and is wound on the same tubing as the secondary winding, L3, with a $\frac{1}{4}$ " separation between the two. No. 22 double cotton covered wire is used. This 20 turn coil is tapped at the 5th and 12 turns. If a short antenna is used, then the aerial connection is made to the 20th turn portion of the coil. For a longer antenna, connection is made to the 12th turn, etc. R1 is a 10 ohm rheostat, being able to pass $\frac{1}{2}$ amperes. R2, which controls the filament of the detector tube, is of the 20 ohm type, being able to pass $\frac{1}{4}$ ampere. In this set, the -01A type of tube is used exclusively. C5, the compensating condenser, is of the .00004 mfd. variable type. This is used to make up for any difference in dial readings which may exist, when the three secondaries are tuned by the gang condensers. Good results may be had if the .00035 mfd.

variable condensers are individual. In this case no compensating condenser will

Circuit Adopted from the Garod Neutrodyne

I HAVE three .0003 mfd. variable condensers which I would like to use in a receiver, employing a circuit such as used in the Garod Neutrodyne. I wish to use one stage of transformer coupled audio frequency amplification only, as I have a low ratio AFT. The -01A tubes are to be used throughout.—Dudley Trent, Geneva, Ida.

Fig. 382 shows the electrical diagram of this receiver. The primaries, L1, L3 and L5, are all fit inside of the secondaries, L2, L4 and L6. For winding the secondaries, tubings 3" in diameter are used. For winding the primaries, tubings $2\frac{3}{4}$ " in diameter are employed. The primary, L1, consists of $7\frac{1}{2}$ turns. The secondary consists of 70 turns. L3 and L5 consist of $4\frac{1}{2}$ turns. L4 and L6 consist of 65 turns. These secondary windings are tapped at the 22nd turn

be needed. C4 is a 1.0 mfd. fixed condenser. R4 is a 2 megohm grid leak, while C6 is a .00025 mfd. grid condenser. The C battery employed in the grid circuits of the radio frequency amplifiers may be of the $1\frac{1}{2}$ volt flashlight type. Raising the voltage of this battery may give better results. This, of course, is experimental, due to the characteristics of the tube. Each of the secondary windings should be placed in non-inductive relation to each other, e. g., in the same fashion as the Neutrodyne coils, or the center coil perpendicular and the other two coils at angles pointing in opposite directions. A stage of transformer coupled audio frequency amplification may be added to this set, the plate post of the transformer going to the plate post of the detector tube socket and the B post of the AFT going to the B plus 45 volt post. A C battery inserted in series with the F minus post of the AFT will increase the quality of the reception, as well as reduce the drain on the B battery. Either a rheostat or a ballast resistor may be employed for filament control of this tube. The tube used here may be either of the -01A type or a power type, such as the 112 or 171. Both of these tubes require an abundant amount of C voltage and B voltage. With this extra stage of audio, very loud signals will be obtained. As a matter of fact, only on exceptionally distant signals, which can just about be heard on the phones, will a second stage of audio frequency amplification be needed.

from the filament end of the secondary winding. The secondary winding of the first RFT is tapped at the 35th turn, or exactly in the center. No. 24 double cotton covered wire is used throughout. All the coils should be wound in the same direction. The beginning and the end of the primary windings may be brought to lugs or binding posts on the secondary tubing. When doing this, care should be exercised so as to keep the low potential terminals together. The coils are mounted at angles to each other, so that no magnetic fields exist between them. R1 and R2 are both 250,000 ohm fixed resistors. C5 and C6 are both 1.0 mfd. fixed condensers. C7 is a 1.0 mfd. condenser also. C11 and C12 are both small neutralizing condensers, having a capacity of about .00004 mfd. R4 is a 10 ohm rheostat, $\frac{1}{2}$ ampere type. R5 and R6 are both 30 ohm rheostats, although the rheostat controlling the filament of the last audio tube may have a lower resistance. In fact, it may be a ballast resistor, of the $\frac{1}{4}$ or $\frac{1}{2}$ ampere, depend-

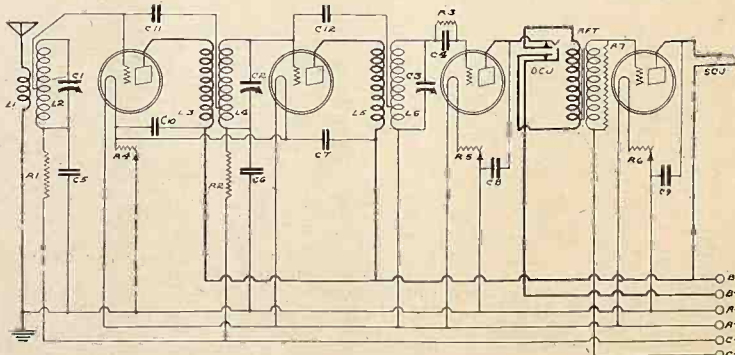


FIG. 382

THE ELECTRICAL diagram of the Garod Neutrodyne, with transformer coupled audio frequency amplification.

Pure Tone Characterizes Set

ing upon the type of tube used. C8 and C9 are both .006 mfd. fixed condensers, used for by passing radio frequency currents. R3 may be a variable or fixed grid leak. About 2 megohms will be the correct value for a fixed leak. The grid condenser, C4, is of the .00025 mfd. fixed type. A double circuit jack, DCJ, is used at the output of the detector, while a single circuit jack, SCJ, is used at the amplifier output. The resistance across the secondary of the AFT reduces the volume, but in doing so produces wonderful quality. As per your request, you will note that the grid return of the detector tube is brought to the plus A, due to the use of the -01A type tube. If you use the 200 tube, you will have to bring this return to the minus A. The resistance and condenser combination in the grid circuits of the RF tubes may be made as one unit. When this set is operating properly, the stations will all come in on the same setting on the three dials, without the slightest whistle of any kind. Squealing indicates poor neutralization, which can be fixed by varying the neutralizing condensers. This point is difficult to find. By reversing the connections on the primary and secondary windings of the second neutroformer, it may be found that neutralization will be easier to obtain. This will put the fields of these coils opposite to the fields of the first and third neutroformers. The grids of the RF tubes receive a 6 volt negative bias (C minus 2), through the resistance and condenser. The grid of the AF tube, provided a -01A type tube is used, receives 4.5 volts, at 90 volts B. The filament controlling of the detector or RF tubes is not critical. If it is found that the volume is comparatively low, remove the resistance, R7. An excessive amount of C voltage might also increase the possibility of neutralizing the RF tubes with greater ease.

Open Circuit Causes

High-Pitched Whistle

I HAVE constructed the 1926 Model Diamond of the Air. When I listen in on the last stage I receive nothing but a high-pitched whistle. This is not due to batteries or tubes, as I have tested both. How can I kill this annoyance?—Edwin Rudman, Box 623, Azusa, Cal.

You have an open circuited plate resistor in one of the stages, or an open circuited fixed condenser in these stages. Test with a small 1½ volt battery and phones.

How to Get Oscillation

On Higher Wavelengths

I HAVE built the Diamond, but cannot get it to oscillate on the higher wavelengths. I have tried different B voltages, but to no avail. My antenna is 125 feet long, including the leadin. On account of the restricted space, this is the longest antenna that I can employ. How can I rectify the trouble?—William J. Luggie, 1151 Main St., Buffalo, N. Y.

Connect a .001 mfd. fixed condenser from B+ det. to A minus, in the set, or add 5 turns to the tickler.

5-Tube Set Using

Resistance for Audio

I WOULD like to have the circuit diagram of a 5-tube receiver, employing

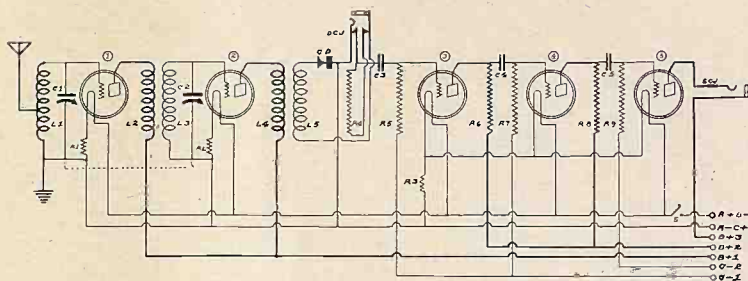


FIG. 383

THE ELECTRICAL diagram of the 5-tube receiver requested by Henry Calumn.

two stages of tuned radio frequency amplification, a crystal detector and three stages of resistance coupled amplification. The transformer used to couple the RF and the detector unit should be of the fixed type. The filaments of the two RF tubes should each be controlled by separate ballast resistors, while the filaments of the three audio tubes should be controlled by a single ballast resistor. A DC jack should be inserted in the detector output, while a SC jack should be placed at the amplifier output. Hi- μ tubes are to be used in the first two stages of AF and a lo- μ tube is to be used in the last stage of AF amplification.—Henry Calumn, North Sudbury, Mass.

Fig. 383 shows the electrical diagram of this receiver. Although the method you suggest as to the coupling of the RF output with detector input is satisfactory, better results will be obtained if a tuned RFT is used here. Both methods will be described. The antenna coupler, L1, consists of 48 turns of No. 22 or 24 double cotton covered wire, wound on a tubing 3¼" in diameter. This coil is tapped at the 6th turn. The construction of the RFT, which may be used to couple the RF and detector stages is the same as that used for coupling the two RF stages. The primaries, L2 and L4, consist of 10 turns. The secondaries, L3 and L5, consist of 45 turns wound on a tubing 3¼" in diameter, using No. 22 or 24 double cotton covered wire. Condensers having a capacity of .0005 mfd. (C1, C2 and C3) shunt these secondaries. The dotted line indicates that these two condensers may be ganged if the fixed RFT is used in the RF-Det. coupling portion. If a tuned RFT is used, then the condenser in the second RF stage and in the detector unit may be ganged, leaving C1 tune the antenna circuit, since there is always a variation in the antenna-ground characteristics, as to inductance and capacity, etc. A ¼" space should be left between the primary and the secondary windings of the two RFT. CD is the crystal detector, which may be fixed or variable. R4, R5, R6, R8 and R9 are all .1 megohm resistors. R7 is a .5 megohm resistor. They are all fixed. C3, C4 and C5 are all .25 mfd fixed condensers. DCJ indicates a double circuit jack, while SCJ indicates a single circuit jack. R1 and R2 are the ¼ ampere resistors, controlling the filaments of the RF tubes. R3 is a 1 ampere ballast resistor controlling the filaments of the three audio tubes. The tapped portion of the antenna coupler, L1, is connected to the antenna post. The end of this 6 turn winding is brought to the ground post. This leaves the 42 turn portion in the grid circuit. Across

the ground and the grid, the variable condenser, C1, is shunted. The ballast resistors are placed in the negative legs of the filaments. The low potential point of the crystal detector is brought to the A minus post. This is experimental. To obtain louder signals, you might try placing .001 mfd. fixed condensers from the plates of the RF tubes to the A minus post. Be sure that this latter connection is not brought to the F minus post on the socket. Keep the rotary plate connections on the low potential side of the coils at all times. A violation of this will cause body capacity to prevail. The high potential point of the crystal detector is brought to the stationary plate connection of the condenser if such is used here. If the untuned RFT is used here, this same connection is made to the G post on the RFT, while the F post is brought to the bottom terminal of the double circuit jack. The plates of the two audio tubes should receive about 112½ volts, while the last one should receive 135 volts. The C bias for the first AF tubes is 6 volts, while for the last tube is 9. The plates of the RF tubes should receive from 67½ to 90 volts. A switch is inserted in the A plus lead.

Hints on How to Keep Oscillation in Check

WHAT ARE the simplest methods to pursue to control oscillations in a 5-tube TRF receiver?—James Donaldson, Meansville, Ga.

The coils should be placed at right angles to each other. Otherwise uncontrollable oscillations will take place. Even with the coils at right angles, it may be found that the oscillatory action of the tubes will be difficult to control. In that case place a 2,000-ohm resistance in series with the grid returns of the RF tubes. That is, one terminal of this resistance will go to the grid return of the RF tubes, while the other terminal will go to the A minus terminal.

A 4-Tube Receiver Suitable as Portable

I WOULD appreciate having a diagram of a 4-tube set, which can be mounted on a 7x14" panel and used as a portable. I wish to make my own coils. I do not wish to use a loop, a reel antenna to be substituted. I am a novice.—Leonard Willoughby, Metcalf, Ga.

Fig. 384 shows the electrical diagram of such a receiver. It is a reflex, you will note.—A loop can be used when listening to local stations. The strength of distant signals, when using this loop,

4-Tube Set for 7x14" Panel

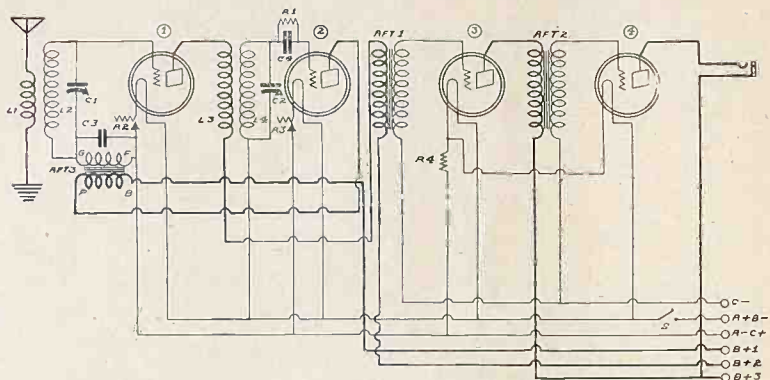


FIG. 384

THE ELECTRICAL diagram of a 4-tube receiver, requested by Leonard Wiloughby. This complete set may be mounted on a 7x14" panel, by placing the RF-AF and detector sockets on one shelf and another shelf with the two AF sockets, mounted below. There are three stages of audio.

will not be great. The use of a reel antenna as an aerial is very practical. The first tube acts as a radio frequency and an audio frequency amplifier, while second tube is a non-regenerative detector. The two stages of audio frequency amplification are of the transformer coupled type. Although you state you wish to wind your own coils, it is possible, if you should change your mind, to purchase them, as they are standard tuned RFT. The primary L1 consists of 6 turns, wound on a tubing 3" in diameter. The secondaries L2 and L4 are wound on the same tubings as their respective primaries, with a 1/4" separation between the windings. These windings consist of 45 turns, in case a .0005 mfd. variable is used; 60 turns in case a .00035 mfd. variable is used and 70 turns if a .00025 mfd. variable condenser is used. The primary L3 consists of 10 turns, wound on the same tubing as L4, with a 1/4" separation. No. 22 or 24 double cotton covered wire may be used. C1 and C2 are the .0005, .00035 or .00025 mfd. variable condensers. C3 is a .001 mfd. fixed condenser. The AFT used in the reflexed stage is of the high ratio (6 to 1) variety, while the AFT used in the regular stages are of the low ratio variety. The filaments of the RF-AF and detector tubes are each controlled by 10 ohm rheostats, R2 and R3, respectively. The filaments of the two amplifier tubes are controlled by a ballast resistor of the 1/2 ampere type, e. g., Amperite 112. C4, the grid condenser, has a capacity of .00025 mfd., while R1, the grid condenser, has a resistance of 2 megohms. The —0A1 tubes may be used, if the set is to be used at home, a storage battery being required to light the filaments. However, when this set is used as a portable, the —99 type tubes will work satisfactorily. Also the small C batteries can be used as a means of supplying the filament voltage. The B voltages, as stated, are approximations, they depending upon the exact character of the tubes used. B plus 1, which is connected to the detector plate, equals about 45 volts; B plus 2, which is connected to the plate of the RF-AF tube, equals about 67 1/2 volts, while B plus 3, which is connected to the plate of the AF tubes, equals about 90 volts. The C battery voltage, when using the —01A type tubes and 90 volts, is 4.5. When using these tubes with a 112 1/2 V battery, the C battery voltage is 6. However, when using the —99 type tubes, the C

voltage remains 4.5. SCJ indicates the single circuit jack. A few wiring hints: The beginning of the primary L1 is brought to the antenna post. The end

Single Control Set With Three AF Steps

I READ with interest the description of the 4-tube major single control receiver in the Radio University columns of the June 19 issue of RADIO WORLD. A detailed description of the layout using a 7x12" panel and cabinet would be appreciated. It seems that if three stages of transformer coupled AF amplification are used, reducing the number of batteries and consequently the weight, the complete set can be placed in a 7x24" cabinet and used as a portable. If this is possible, such a description and hints as to operation are also desired.—Hiram Gunther, Alpha, Idaho.

Your suggestion is very good. A 7x12" panel and cabinet to fit can be used to mount the parts. The variable condenser is placed in the center of the panel, 6" from the left and the right hand edge and 3 1/2" from the top and the bottom. The potentiometer is placed to the left of the condenser or 2" from the right hand edge and 2" from the bottom. The rheostat is placed 2" from the left and 2" from the bottom. The switch is placed directly underneath the condenser. The jack is placed at the extreme left hand corner, 1" from the bottom and 1" from the edge. The coils are mounted directly in back of the condenser, with about a 1/2" separation between them. It may be mounted at right angles to the condenser or parallel. When mounted parallel, however, it should be at least 4" from the condenser. The sockets AFT, resistors and fixed condensers, etc., should be mounted according to your liking, there being no particular position for obtaining the best results. A battery cable or a terminal strip may be used. The variable condenser acts as the tuner, while the potentiometer controls the volume and the regeneration. The —01A type tubes should be used, although the —99 type tubes may be used with entire satisfaction. A 6-volt C battery should be employed. When this set is used, as a portable, the —99 type tubes are used and the resistance stages are substituted by two stages of transformer coupled AF, the transformers being of a very low ratio. A 7x24" panel and cabinet may be em-

ployed in this case. The panel is so placed that a 4" portion is left at one end and a 8" portion is left at the other. The 4" portion is for the loud speaker. A loud speaker unit with a miniature horn is used to make up the loud speaker. The batteries are placed in the other portion. A reel antenna and the ground wire can either be placed in back of the cabinet or in the loud speaker partition. A handle may be placed at the top of the cabinet for carrying. The terminals from the battery can be brought out to the front if so desired, to binding posts on the panel. Wooden partitions should be placed between the set and the batteries and the horn, so that when carrying the entire set around, the batteries or the horn will not be thrown about.

A large hole should be drilled in that portion of the panel where the opening of the horn will appear. Clamps may be placed around the neck and base of the speaker for a more secure hold.

* * *

Two Dry Cell Battery Types Are Distinguished

I WOULD appreciate a brief discussion of the Camacho and the Upward batteries.—King Wendell, Hoxie, Ark.

These two batteries are illustrated in Figs. 379 and 380. Fig. 379 shows the arrangement for the Camacho battery. In this battery, Electropon Fluid is used as the depolarizer and active solution. The carbon plate is negative, while the mixed zinc is the positive plate. The carbon, as will be seen in fig., is placed in a cup which is porous, wherein loose carbon granules are packed. A is the carbon plate and B is the zinc plate. The solution is delivered from cell to cell by means of a siphon. Fig. 380 shows a diagrammatical sketch of an Upward battery. This is a very elaborate affair. The positive plate, is in the center and called Z in the fig. This is composed of a solid piece of zinc, of the highest quality. B is the cup with a porous outer layer. The zinc, it will be noted, is placed in a special solution inside of this cup. C are the carbon plates, which are solid and pure. Between the outer surfaces of the water cup and the surfaces of the carbon rods, finely powdered carbon is placed. A pipe is inserted into the

How to Use Trickle Charger

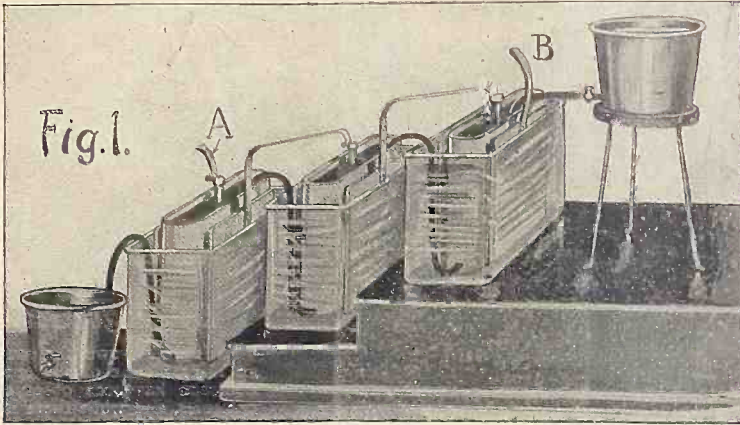


FIG. 379
The Camacho battery.

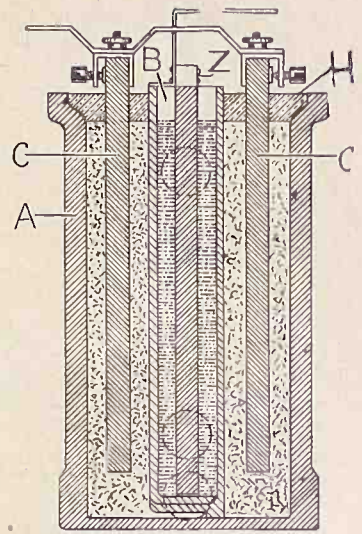


FIG. 380
The Upward battery.

powdered carbon. Through this pipe, chlorine gas is fed. The chlorine gas feeds its way through the carbon. It goes through the porous cup and therefore dissolves in the water. Since it dissolves in the water, the zinc, which is inserted in this portion is attacked. When the two combine, zinc chloride is formed. A constant supply of this gas can always be had, from a chlorine generating source. Both these batteries can be made in the amateur chemical laboratory with the aid of few materials and chemicals. Great care must be taken, when the Upward battery is made, as the chlorine is a very dangerous gas. A complete discussion of these and other types of batteries was given in the Jan. 23 issue of RADIO WORLD.

Fig. 1 represents Fig. 379. Fig. 380 is at right. These are in line with the data in this discussion.

The figure number placed directly on photo should therefore be ignored.

Ballast Resistor Facts for the 1926 Diamond

I AM building the 1926 Model Diamond of the Air. (1) Is R1 a 1/2 ampere ballast resistor or a 1/4 ampere ballast resistor? (2) What value is R2?—George W. Seabeck, Highland Road, South Euclid, O.

(1) R1 is a 1/4 ampere ballast resistor. (2) R2 is a 1/2 ampere ballast resistor and is inserted in series with the negative filament leads of the first and the second audio tubes.

How to Tell Wavelength of Flat Top Antenna

WHAT SIMPLE method can I employ to find the wavelength of a flat top, 2 wire antenna from its dimensions?—Clarence Jans, Fort Worth, Tex.

If the antenna wires are spaced not more than three feet apart, multiply the total length of the antenna by 4.7. If the total length of the antenna from the earth to the free end is 100 feet, the wavelength is 100 times 4.7 or 470 feet. One meter equals 3.25 feet. Therefore divide 470 by 3.25, which equals about 145 meters. The total length of the antenna multiplied by the factor 1.44 gives the wavelength in meters. This does not include any antenna inductance or capacity in this circuit.

For Use of CW the Tube Must Be Oscillating

WHEN OPERATING a combination CW and phone transmitter, is it necessary to have the tube oscillating, so as to use phone or pure CW?—Ned Smert, Los Angeles, Cal.

Yes. When using phone you impress a modulated wave upon the continuous wave. If no radio frequency wave is being generated, this being caused by the oscillatory action of the tube, the DX range will be cut down. As a matter of fact it will be nearly nil, unless a tremendous amount of power amplification is used. When using CW, the tube must be in an oscillatory state. Otherwise, nothing will be transmitted. What is actually done when using CW is that the radio frequency wave of continuous character is interrupted, by the key, so as to make up groups of distinguished letters.

Watch Batteries Closely for Best Charging Results

IS IT necessary, when using a trickle charger, to keep close watch, or will the condition of the battery automatically be adjusted by the charger? How often should a battery be tested so that the

user may be well within the margin of scientific safety?—Edward Tyrone, Monmouth, N. J.

It is just as important to check up the condition of the battery, when using the trickle charger as when using the other type of charger. As a matter of fact, more attention should be paid when using the trickle charger. The rules given herewith may seem to be too strict, but they are worth obeying. Always test the battery at the end of each day's use. Although used, it might be practically full, a night's charge injuring the plates. Look at the solution every few days. Make sure that no water spills over during the charge. This can be prevented by placing water only about 1/2" above the tops of the plates. Do not keep the caps on tight. This, of course, will necessitate more frequent addition of water, but it will prevent gas accumulating during the charge and expansion of the gas. Never bring matches near the cell to see how the charge is getting along. Never go away from home for a couple of days and allow the battery to be connected to the main.

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Have your name entered on our subscription and University lists by special number. Put this number on the outside of the forwarding envelope (not the enclosed return envelope) and also put at the head of your queries. If already a subscriber, send \$6 for renewal from close of present subscription and your name will be entered in Radio University.

[In sending in your queries to the University Department please paragraph them so that the reply can be written under or alongside of each query. Write on one side of sheet only. Always give your university number.]

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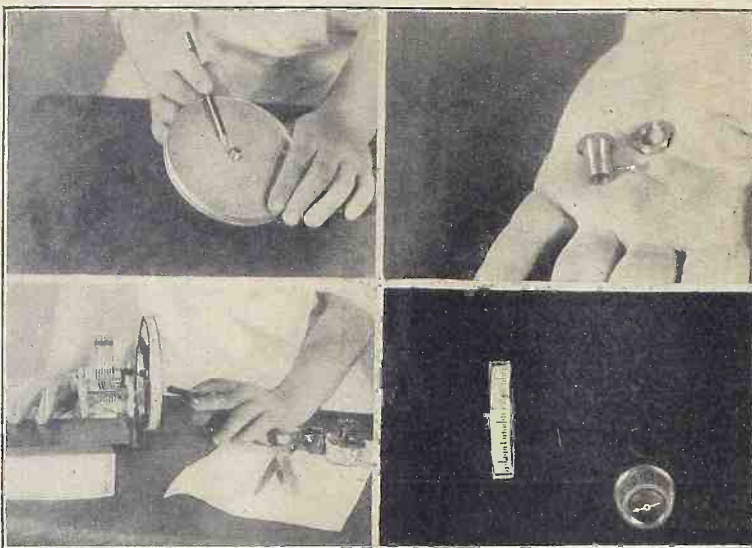
Enclosed find \$6.00 for RADIO WORLD for one year (52 Nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for 52 ensuing weeks, and send me my number indicating membership.

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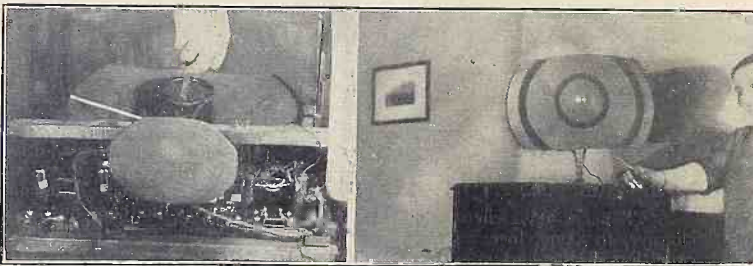
Drum Type Dial Made from a Hoop



(Hayden)

A HANDSOME drum type dial may be made with the aid of a 5" embroidery hoop. The circumference of the hoop is lined with felt. This felt is taken out, leaving you a grooved circumference. File or scrape this groove down to a smooth surface. Now place the hoop over a heavy piece of cardboard. Describe the circle on the cardboard. Cut out this circular piece of cardboard and place it in the hoop. Drill a hole in the center of the cardboard. Procure a threaded bushing with a $\frac{1}{4}$ " shaft and a lock nut (upper right). Run the bushing through the hole in the cardboard (upper left). Drill a $\frac{1}{8}$ " hole through the bushing threads, so that a $\frac{1}{8}$ " screw will hold tightly. Insert dial on shaft of condenser (lower left). Tighten small screw, so as to anchor condenser shaft. Tighten the lock nut on bushing. Place white paper or cloth over circumference of the hoop and mark the scale. The completed drum dial, mounted on the panel, is shown in the lower right-hand photo.

Shears Fit Free Edge Cone in Console



(Hayden)

THE AVERAGE console model cabinet will not accommodate a cone shaped speaker in the space allotted. With the aid of a pair of shears this problem can be solved on a free edge cone. Place the speaker in the space assigned, measuring off the protruding portions, at the top and bottom (left). Cut these pieces off.

Coolidge Often Tunes In At Camp On His Vacation

(Special to RADIO WORLD)

PAUL SMITHS, N. Y.

President Coolidge, at White Pine Camp, in the Adirondacks, tunes in on his host's radio set almost nightly. The President enjoyed programs from WGY, WEAJ and WBZ. He has most of the stations within steady range recorded in log style and he turns the dials with celerity. The nights are cold here and the President spends most of them in-

doors. And that means radio for Coolidge!

The President and Mrs. Coolidge are spending their vacation at the camp. Mrs. Coolidge likes the radio as much as her husband does, but she "lets" him do most of the tuning-in.

The President is fond of interesting and instructive talks, favoring them to jazz, although good music strongly attracts him.

How Sun Spots Reception

Increase in Electro-Magnetic Waves from the Variable Star Tends to Ionize Our Atmosphere and Vitiates Broadcast Waves

By Hugo Gernsback

As is well known, the sun goes through an 11-year cycle of sun spots. This phenomenon has been observed for several centuries, and while there is also a major cycle, the minor 11-year cycle seems to be pretty well proved by the observations of many generations of investigators.

The sun, according to the latest researches, is composed of a molten interior and a gaseous envelope. This gaseous envelope, composed of heated gases, much hotter than anything we have here on earth, is not a uniform envelope at all times, but occasionally rifts appear in it which, seen through a powerful telescope, have the appearance of dark holes.

They are, in fact, vortexes of swirling gases and volatilized metals, making it possible for us to see the underlying surface of the sun's sphere. These holes are called sun spots, and can be observed at the present time with the naked eye by using darkened glasses.

Sun's Heat Varies

The sun itself is known to be a variable star. That is, it does not give out the same heat at all times. At periodic times it gives off about 3 per cent. more heat than at other times; thus at the maximum of the sun spot cycle the earth receives more heat than at the minimum cycle.

We are now approaching the maximum of the cycle and 1928 will witness such maximum. In about 1933 there will be minimum.

One would think at first that when the sun sends us more heat it should be hotter on earth. The reverse is actually true. When the sun sends us more heat there is faster evaporation of the waters of our planet, which naturally gives rise to more clouds, and more clouds mean rain weather and a lowering of the temperature on the planet.

When Weather Is Cooler

For that reason, at the height of the sun spot cycle the weather on the earth is usually appreciably cooler than at the minimum of the sun spot cycle. The next two years probably will witness cooler and more rainy weather, if previous experiences may be taken as a guide.

There is also a popular misconception that we receive heat rays from the sun. No such thing happens. It has been definitely proved that between the sun and the earth there is no appreciable atmosphere.

The two sides along with the rest of the universe, are in a pretty good vacuum. Now we know that heat rays can not be transmitted through a vacuum, otherwise we would not have the principle of the thermos bottle. No heat can be sent across a vacuum.

The sun, however, does send us electro-

Spots Affect of Programs

magnetic waves, and we do receive light from the sun, but no heat is actually received until the light rays strike the earth's atmosphere. where, by impact, the light rays undergo a certain change, with a result that makes itself perceptible as heat.

Why Aviators Feel Cold

Another phenomenon takes place at the same time, and that is the retention of heat by the atmosphere, which acts as a storage reservoir for the heat thus generated.

An aviator going up to about seven miles above the surface of the earth must be wrapped in furs and must take heat along with him if he does not wish to freeze, even on the hottest Summer day, although only seven miles above the surface of the earth.

The sun is still shining there and the rays are still striking the airplane, but there is no heat, because the atmosphere is so thin and attenuated that no heat can be stored by the sun's light rays.

But the light rays of the sun are really electro-magnetic waves, as demonstrated by Clerk Maxwell.

All ether waves that we know of are electro-magnetic, whether they be light waves, X-ray waves or radio waves. The rays differ in frequency, that is, in the length of the waves.

They are all of the same family. So when there is increased solar activity, as at present, the effect makes itself felt on earth, not only in the resultant weather changes, but in various other ways, and these various ways will make themselves felt more as scientific progress goes on.

Sun Spots Affect Radio

Before the advent of radio broadcasting there was no known effect on radio due to sun spots. Today there is. It makes itself felt in poor radio reception, particularly as to long distance reception.

In 1922, at the minimum of the sun spot cycle, it will be remembered that a 1-tube regenerative receiver had no trouble in picking up signals from 1,000 to 1,500 miles distant. This was an everyday occurrence. Today when we are going towards the sun spot maximum, radio reception is extraordinarily poor, and only very seldom may conditions be called fair for DX (long distance) radio reception.

In 1922 such radio reception was good, Summer and Winter, when the usual static did not interfere too much. Now reception, even in the Winter, is notoriously bad, as witness the last international radio tests in February, which were most disappointing for this reason.

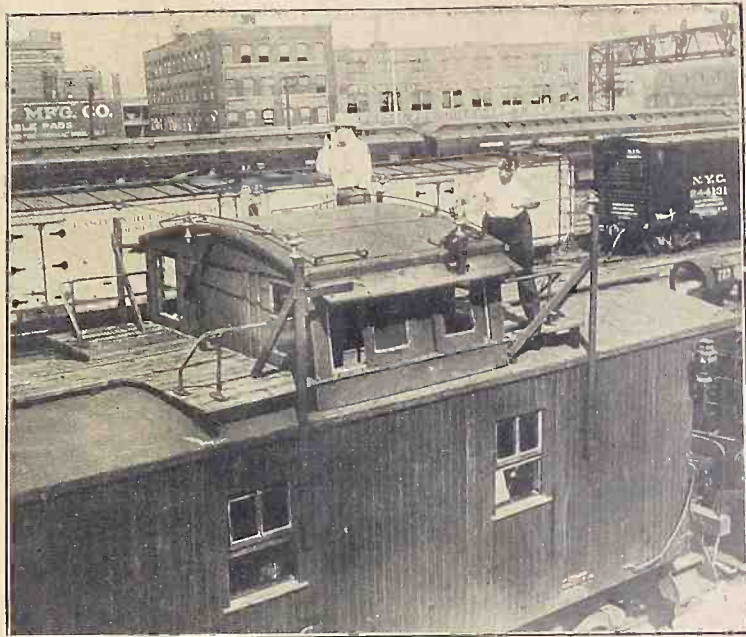
Atmosphere Ionized

The explanation lies in the fact that the increased solar activity, by sending us more electro-magnetic waves, tends to ionize the atmosphere on our planet to such a degree that it amounts to something akin to a short circuit.

The atmosphere through which the radio waves must pass is now of such high conductivity that the waves soon become absorbed and consequently do not travel as far as they do when the air is less ionized. This is the present accepted theory, and if this theory is correct we should not have really excellent radio reception again until 1933. The maximum of atmospheric conductivity is supposed to be 1928, after which conditions probably will slowly improve again.

(Broadcast from WRNY)

Radio Finds New Field in Train Signaling



(International Newsreel)

CONDUCTOR and engineer, a mile apart on one of those interminable freight trains that often distress motorists delayed at crossings, carry on conversations by radio telephony now. This enables faster service. The photograph shows antenna being installed on a caboose.

Sesquicentennial Show Depicts Art's Progress

"Ancient," Recent and Present-Day Sets to Be Exhibited, Together With the Most Fascinating of Up-to-Date Designs and Contrivances in Radio.

PHILADELPHIA.

One of the most comprehensive displays ever assembled to show the advancement made in radio will be on display at the Sesquicentennial Exposition, according to the Commerce Department's Bureau of Navigation.

The display includes the ancient transmitter and receiver, the transmitter and receiver of a few years ago, which are rapidly being discarded and replaced by modern apparatus, and the strictly modern apparatus as used today.

There will be shown a receiver capable of receiving any type of radio wave on any wavelength.

These receivers represent modern means of reception of radiograms and broadcasting on both ship and shore stations.

Big Loop to Be Shown

In addition there will be displayed a direction finder used for locating interference of various descriptions.

An enormous loop antenna which has

been used underground in successful reception of foreign stations and which has been developed by a Hyattsville, Maryland, scientist, will also be on display.

Meters of every description used by the radio inspectors of the Department of Commerce in their work of checking every kind of radio station, on any of the wavelengths, and using any power, will be shown.

With these instruments it is possible to measure potentials of a small fraction of a volt and currents of less than a thousandth of an ampere.

With this display there is shown the advancement of the art in steps; the means of transmitting and receiving different types of radiograms, the means of adjusting the transmitters and receivers to their wavelengths, and the methods of measuring the power consumed by the transmitter and the small amount of energy consumed by the receiver.

Will Show Methods

The method by which a transmitter is kept in operation in emergencies when the power plant of a ship is placed out of commission will be demonstrated, as well as the method of locating by radio the position of a ship sending distress signals. The location by radio of other types of energy, such as leaky power lines, poorly bonded rails on electric lines, tree grounds caused by limbs of trees, rubbing the insulation from power lines and grounding, sparking generators and other electrical equipment, being radiated, will be shown.

Most Persons Discard B Batteries Too Soon

"Expert" Tells Doctor to Replenish His After Six Months, But Benevolent Trick Remedies the Bad Advice—Janitor Bought No Battery in Three Years

Many radio users seem to labor under the delusion that after a set of B batteries has been in service several months it is time to expect poorer results from them.

A night or two of poor reception due to atmospheric conditions frequently solidify the set owner's preconceived idea that his batteries are about done for, and out they go, usually with many weeks or even months of useful service still remaining in them. Sometimes the "trouble is purely imaginary.

An amusing incident of this nature recently came to light in a mid-western city. A prominent physician was the proud possessor of a Super-Heterodyne, made especially for him by a local radio expert. He powered it with heavy duty B batteries, which, under normal conditions of use, should have run that particular receiver about nine months.

After he had used the set six months, he began to imagine it wasn't working as well as it used to, so he called his friend on the telephone and tried to explain the trouble.

When the expert learned that he was still using the original B batteries, he immediately told the physician that he needed new ones. The trouble was surely due to run-down B batteries—so the "expert" said.

A Profitable Trick

This physician has a friend who is connected with a large battery manufacturer in that city, and who had furnished the original B batteries for the set. The battery friend was told of the sup-

posed death of his batteries and was requested to come around with a new set. Knowing the tendency of the average set owner to throw his B batteries away too soon, the battery man tried to convince his friend that his batteries were not at fault, but to no avail.

The "expert" had diagnosed the trouble (by telephone) and the remedy was clearly indicated—new batteries. So new batteries it had to be.

The battery man was still unconvinced, and to prove his point, he worked a sleight-of-hand trick on his friend. Instead of connecting the new batteries to the set, he re-connected the old ones, and then asked the doctor to tune in and see how the set worked. He was delighted with the performance.

All the "trouble" had been cleared up, and the "expert" was vindicated.

The physician was left under the impression that he was using new B bat-

teries, and his satisfaction was complete. Not until three months afterward was he obliged to get new ones. When the hoax was explained to him, he was cured.

Hereafter he will not blame all his trouble indiscriminately on his B batteries.

The Lucky Janitor

Another case illustrating the fact that broadcast listeners are prone to throw away their B batteries too soon is that of a young amateur in Central Michigan, who recently built a battery operated transmitter. His funds were exhausted by the purchase of the parts, leaving nothing for the B battery to run the set.

He accumulated a supply from batteries discarded by his friends who owned receivers, and with these supposedly "dead" batteries he established communication with a fellow amateur in California.

There is a janitor in a large New York apartment house who has had a receiving set for over three years, and in all that time he has never bought a B battery!

He gets his power supply from the dumbwaiter-batteries thrown away as "dead" by the tenants upstairs. They are throwing their B batteries away too soon, which is fine for the janitor, but hard on their pocketbooks.

U. S. and Australia Swap Messages on Schedule

Amateurs Prove That Accurate and Reliable Traffic May Be Handled on Short Waves

SYDNEY, AUSTRALIA.

The reliability of short waves for long-distance communication purposes has been definitely established with the completion of a series of tests between American and Australian amateur stations, the Wireless Institute of Australia announced in a radiogram filed to the American Radio Relay League, of Hartford, Conn.

Commenting on the regularity and accuracy with which 500-word messages were passed back and forth between this

country and the United States, the Australian report says in part: "These tests have definitely proved that amateurs can handle bulk traffic with absolute accuracy across the Pacific, a fact that has not until now been admitted by other than amateur wireless interests."

The trials just held are the result of arrangements started last March between the American Radio Relay League, representing the American amateurs, and the Wireless Institute of Australia, acting for the Australian enthusiasts. Casual radio contacts by the hundreds have been effected during the last two years between the amateurs of the two countries, but no attempt had been made to handle large amounts of traffic on a regular schedule basis.

Test Lasts Two Weeks

It was therefore planned to see what could be done with this in mind, and a two weeks' test period was recently set aside in which approximately 100 messages, of 500 words each, were transmitted by picked stations in each country to picked receiving stations in the other. In spite of Summer weather, with resultant increased static and an undue amount of fading, message after message was sent and received with 100 per cent. accuracy—a wonderful demonstration of the abilities of low-power transmitters when operated on short wavelengths.

The star American performer was station 8GZ, owned and operated by L. G. Windom, of Columbus, Ohio, which handled a total of nine of the long messages, in addition to dozens of shorter ones. All of these were handled without a single error. Another prominent American station was 5HE, G. N. Witting, at San Antonio, Texas, who was reported as being a consistent performer on 40 meters.

All Done by Radio

A noteworthy feature of the tests was that with the exception of one letter from Australia, all arrangements from both the Australian and American ends were effected through messages transmitted and received by amateur radio.

Heretofore it has been necessary to complete arrangements by letter and make reports by cable, but both post and cable services were unnecessary in the tests. Amateur radio proved sufficient.

Towers of WJZ Guide Air Mail Fliers to Field

Night Illumination Obtained From Reflector of Searchlight Beams—When Juice is on, Towers Are Dangerous to Touch, Though Grounded

The 300-foot antenna towers of WJZ's transmission plant at Bound Brook are doubly useful. In addition to supporting the 6-wire T type cage antenna used in broadcasting from this station, they also serve as towers of light to guide the United States Air Mail fliers to their landing field, a few miles distant from the transmitter.

Before the erection of the transmitter at Bound Brook the officials of Hadly Air

Mail Field were forced to use makeshift guide posts to lead the planes "home," but as soon as they discovered the two 300-foot structural steel towers rising into the atmosphere they immediately arranged to convert a possible air menace into a guide pylon by day and an aerial lighthouse by night.

Certain difficulties had to be overcome. The towers are of steel, and to prevent absorption are insulated at the base. They acquire a heavy charge of radio frequency currents when the station is in operation. This charge is so great that even when the base insulators are shorted to ground the towers a severe high frequency burn may be received by touching them.

The task of placing markers to distinguish the towers in daylight was simple, but no lights or wiring could be placed upon the structures for night service. Instead, red reflectors were placed in such a manner on each tower to reflect the beam of searchlights located on the ground sending rays of red light into the evening heavens.

Tiny Electron Big Creditor On Books of the Radio Art

It Is the Basis of Electricity In All Its Forms—Inconceivably Small, Yet It Has Been Weighed and Measured.

By **Leon L. Adelman**

The Chas. Freshman Co., Inc.

Matter and electricity are synonymous. They are correlated due to the fact that the smallest particle of electricity has been found common to both.

It was the illustrious Professor J. J. Thomson who in 1897 undertook a series of extensive experiments the outcome of which was the discovery of the electron. His remarkable work has been augmented by that of Dr. Robert A. Millikan, winner of the 1924 Nobel Prize in physics, and as a result, scientific progress has been greatly enhanced.

The electron is inconceivably small. If we were to take a baseball and an electron and magnify them until the baseball was as large as the earth, the electron would still be so small that even the most powerful microscope could not reveal it. To have been able to verify the existence of such an infinitesimal particle is the glorious achievement of our scientists.

Electrons Are Universal

Where there is matter, or electricity, there are electrons. All forms of energy have some relationship to electrons.

The change from one form of energy to another involves a change in their electronic state. Thus, in the change from electrical to chemical energy and vice-versa, there can be manifest such things as light, heat, lack of heat or other phenomena.

These can be accounted for by a change in position and number of the electrons surrounding the positive masses or nuclei known as protons. Countless millions and billions and trillions of electrons may be involved in the change, yet it is entirely possible to account for every single electron.

We can realize the significance of the statement that a certain star in our stellar system is 1,000 or 2,000 light-years away from our earth. Such a tremendous distance, although holding much awe for us, is not incomprehensible.

Number Too Big

However, if we were to try to read the gigantic string of numbers which would result if we attempted to count the electrons emitted from the filament of a radio tube in one hour, we would find ourselves in difficulties. Numbers would have no meaning.

To the electron we are responsible for the operation of all electrical apparatus, e. g., the motor and generator, the tungsar rectifier and X-ray tube, the telephone and the radio, and a thousand and one other invaluable electrical devices.

The photo-electric effect, one of the most important in the realm of the electrical field, is entirely dependent upon the electrons set free by the bombardment of light upon a metallic screen.

Heart of Radio Tube

The vacuum tube which we use in our receiving sets depends upon the stream

of electrons which issues forth from its incandescent filament. The stream of electrons represents a flow of electricity at an enormous velocity.

The manifestation of a flow of electrons takes place in many of the domestic appliances. The electric iron, heater, curling iron, toaster, heating pad, and other electrical labor-saving devices created by man's ingenuity are actuated by a steady stream of electrons. We little realize what wonders these small ever-ready and potential electrons are capable of doing at the snap of a switch.

When we speak of electricity, many of us fail to think of its manifestation as the result of the flow of these tiny particles. And if one can imagine that the lighting company supplies so many countless numbers of them at a cost of less than one ten-thousandth part of one cent per second to light an ordinary bulb, then it is high time that we considered the problem of electric transmission in another light!

The Electron Defined

The question arises, "What is the electron?" To the scientist it is the smallest particle of negative electricity which can exist. It is a necessary part of every atom, the smallest particle which makes up matter as we know it.

To the layman, the word electron has no other significance than perhaps that it is a new entity that is known only to the scientists.

But electrons are more common than many would believe. They are forever present in the food we eat, in the tools we handle, in the magazine we read, and in fact everything that is recognized as

matter in any of its forms—gaseous, liquid, or solid.

Is the electron electricity or matter? It is the smallest particle of electricity that could be recognized to exist. However, it has been weighed, not a single one, to be sure, but its weight has been ascertained in more than one way. This then would lead us to believe that the electron has mass and this contention has also been conclusively proved.

Electricity Is Matter

Why, then, should we say that the electron is electricity, when in reality it is matter?

To answer this, we must realize that matter is composed of a central mass, called a positive nucleus and a surrounding group of one or more electrons.

If the positive nucleus loses one or more of its electrons, it becomes what is recognized as a positively charged body, while, if one or more electrons are added to it, it becomes negatively charged. Thus again, we must look at matter as being electricity. Hence what objection can there be to calling electricity matter?

The charge of an individual electron is so small that it takes millions of electrons to give the faintest perceptible charge to the most sensitive electrical instruments. Thus, while it should appear that a charged body should weigh more than one in an uncharged condition, it must be taken into consideration that weight is entirely a matter of number rather than of electrical charge.

To discover the existence, find the mass, size and charge of the individual electron, has been one of the greatest feats in the history of science. It required years of research and effort, but the well-planned investigation has borne rich rewards. Without the knowledge concerning the nature and behavior of the electron, we would be at a distinct loss. Many of the finest inventions would still be problematical and the progress of science would be seriously handicapped.

Indirect Plate Coupling Protects Loudspeaker

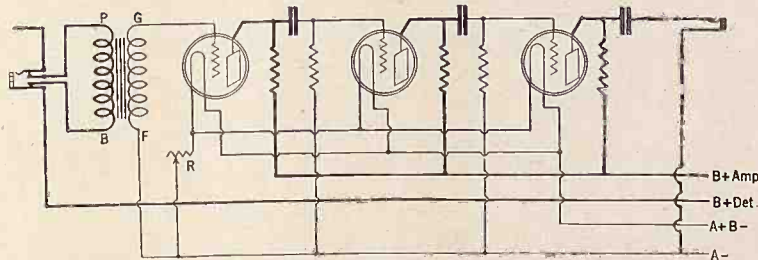


FIG. 1

RESISTOR in the plate circuit of the final audio tube reduces volume.

The use of some form of impedance in the plate circuit of the final audio tube is growing in popularity, as in this manner it is easier to match the impedance of the output with that of the speaker being used, particularly a cone speaker. Usually a choke coil is employed. The B battery direct current is supplied through this coil. To couple the output to the speaker a fixed condenser of a high capacity, say from 1.0 mfd. up, is used, 4.0 mfd. being the most popular and giving better results.

The choke coil gives greater volume than does a resistor in the plate circuit in this hookup. Fig. 1 shows the resistor connections. It is not advisable to use this method. Note, however, that

one speaker terminal goes to one side of the fixed condenser and the other speaker terminal to A minus. This is a novelty, but it is an excellent method of connection for any of the hookups that keep the plate DC feed out of the speaker. However, the connection may be made to B plus instead.

The speaker windings are safeguarded when a choke coil is used as described, and this is especially valuable when high plate voltages are used. The speaker windings are tenderer than those of the choke and would be in danger of burnout under voltages above 150. This applies particularly to the new 171 tube for the last audio stage, which requires very high voltage.

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"Expert" Tells Doctor to Replenish His After Six Months, But Benevolent Trick Remedies the Bad Advice—Janitor Bought No Battery in Three Years

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Tiny Electron Big Creditor On Books of the Radio Art

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By **Leon L. Adelman**

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These can be accounted for by a change in position and number of the electrons surrounding the positive masses or nuclei known as protons. Countless millions and billions and trillions of electrons may be involved in the change, yet it is entirely possible to account for every single electron.

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of electrons which issues forth from its incandescent filament. The stream of electrons represents a flow of electricity at an enormous velocity.

The manifestation of a flow of electrons takes place in many of the domestic appliances. The electric iron, heater, curling iron, toaster, heating pad, and other electrical labor-saving devices created by man's ingenuity are actuated by a steady stream of electrons. We little realize what wonders these small ever-ready and potential electrons are capable of doing at the snap of a switch.

When we speak of electricity, many of us fail to think of its manifestation as the result of the flow of these tiny particles. And if one can imagine that the lighting company supplies so many countless numbers of them at a cost of less than one ten-thousandth part of one cent per second to light an ordinary bulb, then it is high time that we considered the problem of electric transmission in another light!

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Why, then, should we say that the electron is electricity, when in reality it is matter?

To answer this, we must realize that matter is composed of a central mass, called a positive nucleus and a surrounding group of one or more electrons.

If the positive nucleus loses one or more of its electrons, it becomes what is recognized as a positively charged body, while, if one or more electrons are added to it, it becomes negatively charged. Thus again, we must look at matter as being electricity. Hence what objection can there be to calling electricity matter?

The charge of an individual electron is so small that it takes millions of electrons to give the faintest perceptible charge to the most sensitive electrical instruments. Thus, while it should appear that a charged body should weigh more than one in an uncharged condition, it must be taken into consideration that weight is entirely a matter of number rather than of electrical charge.

To discover the existence, find the mass, size and charge of the individual electron, has been one of the greatest feats in the history of science. It required years of research and effort, but the well-planned investigation has borne rich rewards. Without the knowledge concerning the nature and behavior of the electron, we would be at a distinct loss. Many of the finest inventions would still be problematical and the progress of science would be seriously handicapped.

Indirect Plate Coupling Protects Loudspeaker

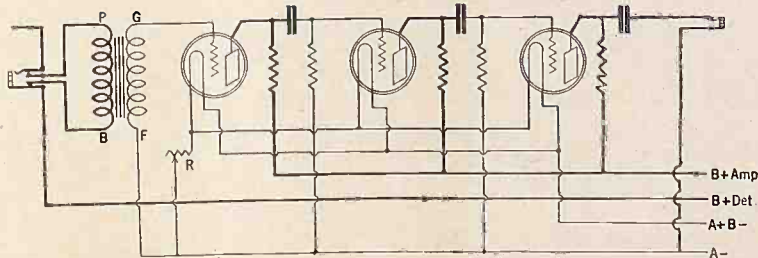


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The choke coil gives greater volume than does a resistor in the plate circuit in this hookup. Fig. 1 shows the resistor connections. It is not advisable to use this method. Note, however, that

one speaker terminal goes to one side of the fixed condenser and the other speaker terminal to A minus. This is a novelty, but it is an excellent method of connection for any of the hookups that keep the plate DC feed out of the speaker. However, the connection may be made to B plus instead.

The speaker windings are safeguarded when a choke coil is used as described, and this is especially valuable when high plate voltages are used. The speaker windings are tenderer than those of the choke and would be in danger of burnout under voltages above 150. This applies particularly to the new 171 tube for the last audio stage, which requires very high voltage.

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A night or two of poor reception due to atmospheric conditions frequently solidify the set owner's preconceived idea that his batteries are about done for, and out they go, usually with many weeks or even months of useful service still remaining in them. Sometimes the "trouble is purely imaginary.

An amusing incident of this nature recently came to light in a mid-western city. A prominent physician was the proud possessor of a Super-Heterodyne, made especially for him by a local radio expert.

He powered it with heavy duty B batteries, which, under normal conditions of use, should have run that particular receiver about nine months.

After he had used the set six months, he began to imagine it wasn't working as well as it used to, so he called his friend on the telephone and tried to explain the trouble.

When the expert learned that he was still using the original B batteries, he immediately told the physician that he needed new ones. The trouble was surely due to run-down B batteries—so the "expert" said.

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This physician has a friend who is connected with a large battery manufacturer in that city, and who had furnished the original B batteries for the set.

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posed death of his batteries and was requested to come around with a new set. Knowing the tendency of the average set owner to throw his B batteries away too soon, the battery man tried to convince his friend that his batteries were not at fault, but to no avail.

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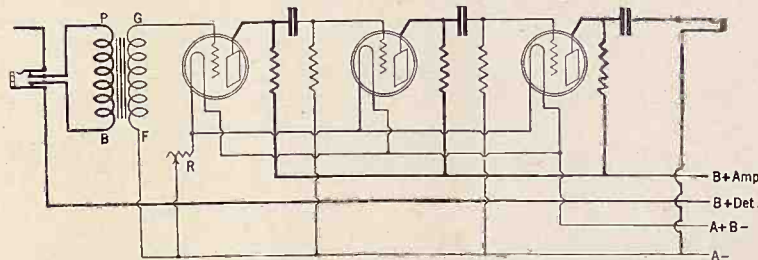


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Number Too Big

However, if we were to try to read the gigantic string of numbers which would result if we attempted to count the electrons emitted from the filament of a radio tube in one hour, we would find ourselves in difficulties. Numbers would have no meaning.

To the electron we are responsible for the operation of all electrical apparatus, e. g., the motor and generator, the tungsten rectifier and X-ray tube, the telephone and the radio, and a thousand and one other invaluable electrical devices.

The photo-electric effect, one of the most important in the realm of the electrical field, is entirely dependent upon the electrons set free by the bombardment of light upon a metallic screen.

Heart of Radio Tube

The vacuum tube which we use in our receiving sets depends upon the stream

of electrons which issues forth from its incandescent filament. The stream of electrons represents a flow of electricity at an enormous velocity.

The manifestation of a flow of electrons takes place in many of the domestic appliances. The electric iron, heater, curling iron, toaster, heating pad, and other electrical labor-saving devices created by man's ingenuity are actuated by a steady stream of electrons. We little realize what wonders these small ever-ready and potential electrons are capable of doing at the snap of a switch.

When we speak of electricity, many of us fail to think of its manifestation as the result of the flow of these tiny particles. And if one can imagine that the lighting company supplies so many countless numbers of them at a cost of less than one ten-thousandth part of one cent per second to light an ordinary bulb, then it is high time that we considered the problem of electric transmission in another light!

The Electron Defined

The question arises, "What is the electron?" To the scientist it is the smallest particle of negative electricity which can exist. It is a necessary part of every atom, the smallest particle which makes up matter as we know it.

To the layman, the word electron has no other significance than perhaps that it is a new entity that is known only to the scientists.

But electrons are more common than many would believe. They are forever present in the food we eat, in the tools we handle, in the magazine we read, and in fact everything that is recognized as

matter in any of its forms—gaseous, liquid, or solid.

Is the electron electricity or matter? It is the smallest particle of electricity that could be recognized to exist. However, it has been weighed, not a single one, to be sure, but its weight has been ascertained in more than one way. This then would lead us to believe that the electron has mass and this contention has also been conclusively proved.

Electricity Is Matter

Why, then, should we say that the electron is electricity, when in reality it is matter?

To answer this, we must realize that matter is composed of a central mass, called a positive nucleus and a surrounding group of one or more electrons.

If the positive nucleus loses one or more of its electrons, it becomes what is recognized as a positively charged body, while, if one or more electrons are added to it, it becomes negatively charged. Thus again, we must look at matter as being electricity. Hence what objection can there be to calling electricity matter?

The charge of an individual electron is so small that it takes millions of electrons to give the faintest perceptible charge to the most sensitive electrical instruments. Thus, while it should appear that a charged body should weigh more than one in an uncharged condition, it must be taken into consideration that weight is entirely a matter of number rather than of electrical charge.

To discover the existence, find the mass, size and charge of the individual electron, has been one of the greatest feats in the history of science. It required years of research and effort, but the well-planned investigation has borne rich rewards. Without the knowledge concerning the nature and behavior of the electron, we would be at a distinct loss. Many of the finest inventions would still be problematical and the progress of science would be seriously handicapped.

Indirect Plate Coupling Protects Loudspeaker

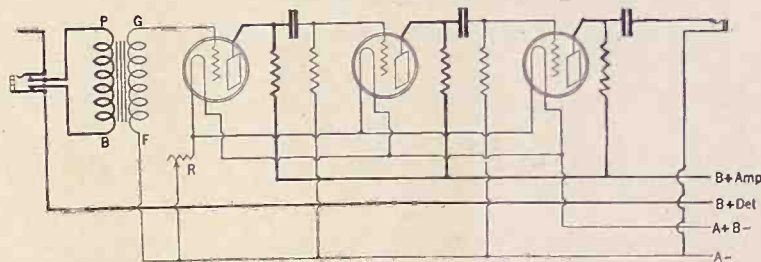


FIG. 1

RESISTOR in the plate circuit of the final audio tube reduces volume.

The use of some form of impedance in the plate circuit of the final audio tube is growing in popularity, as in this manner it is easier to match the impedance of the output with that of the speaker being used, particularly a cone speaker. Usually a choke coil is employed. The B battery direct current is supplied through this coil. To couple the output to the speaker a fixed condenser of a high capacity, say from 1.0 mfd. up, is used, 4.0 mfd. being the most popular and giving better results.

The choke coil gives greater volume than does a resistor in the plate circuit in this hookup. Fig. 1 shows the resistor connections. It is not advisable to use this method. Note, however, that

one speaker terminal goes to one side of the fixed condenser and the other speaker terminal to A minus. This is a novelty, but it is an excellent method of connection for any of the hookups that keep the plate DC feed out of the speaker. However, the connection may be made to B plus instead.

The speaker windings are safeguarded when a choke coil is used as described, and this is especially valuable when high plate voltages are used. The speaker windings are tenderer than those of the choke and would be in danger of burnout under voltages above 150. This applies particularly to the new 171 tube for the last audio stage, which requires very high voltage.

A THOUGHT FOR THE WEEK
MEMBERS of the Senate have until next December to ponder over why they did not enact radio legislation in time to permit it becoming law. A third of a year, however, is a relatively short time for great discoveries.

RADIO WORLD

REG. U.S. PAT. OFF.

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

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

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JULY 24, 1926

Educational Programs Offer Big Opportunity

W. E. Harkness, of the American Telephone & Telegraph Co., said of radio programs:

"So far the so-called educational program features have been merely individual experiments. There has been no systematic planning by the broadcasters and educators. Much remains to be done individually and collectively before satisfactory results are obtained. The educator should study the broadcaster's problem and considering the limitations of radio, for it has limitations, assist the broadcasters in developing and presenting programs of sound educational value to the child as well as the adult."

LOOP TIP ON WJZ RECEPTION

If you are using a loop antenna and listening to Station WJZ, do not forget that the loop setting for that station is not the same as the other New York stations. Move it around, and probably you will be able to cut down on your volume control and eliminate static entirely. This station is so powerful that unless the static is extremely heavy, the station will override it easily.

After Us the Deluge

CONGRESS took an adjournment until next December without enacting any radio legislation. This was what Congress was expected to do, for it merely followed its course in previous years. The necessity for legislation to cure the ailing condition under which the Department of Commerce operated as radio administrator was obvious. It was accentuated by recent court decisions holding that the Department had no legal power to grant or withhold wavelengths. All power over radio flows from the Law of 1912, enacted nine years before the first broadcast program went on the air, hence one scarcely can quarrel with the law. Those who made it were not prophets.

Secretary Hoover has been very patient in performing his benevolent duties as radio chief of the United States, but the most recent failure of Congress to grant him the authority he sought obviously has exhausted his patience. He asked the Attorney General for an opinion as to his powers over broadcasting and was politely informed he had none. This was rather corroborative than informative, since the courts have been verifying Hoover's absence of power with annoying regularity.

Either the Secretary would cast the industry upon its own resources, to make the best of a bad situation, or he would continue a helpful superintendence of radio, by uniting the industry in a move to obtain voluntary consent to be governed from Washington. The voluntary method makes for the least discomfort, since it incorporates the assisting hand of the sensible Secretary. It is the equivalent of the industry appointing a Landis, only this time the Landis is a Government official.

But it is a method that plays too much into the hands of a happy-go-lucky Congress. To teach Congress a lesson one must avoid toadying.

The impasse that followed Congressional adjournment was due in no small measure to the greatness of Hoover himself. While the House of Representatives adopted the White bill, giving the Secretary the legal power he requested, the Senate, prompted largely by politics, rejected the White bill, amending it so that the new form, known as the Dill bill, bore no resemblance to the former bill. The Senate measure stripped Hoover of all power concerning radio and vested this authority in an independent Commission of five. The Senate, just before adjournment, passed the Dill bill, but, fortunately perhaps, it was too late to have Senators and Representatives in joint committee compromise on the divergent features.

The Senate's stubbornness no doubt was due less to the much-aided fear of one-man control resulting in Czarism than to jealousy over the Secretary's ample mental proportions and the political availability that his stirring record in public office has given him.

Words Without Lineage

RADIO makes up its own vocabulary as it goes along. It borrows, with no guarantee of repayment, but that is the way with all science, and besides the creditor is out nothing.

Several attempts have been made to bring radio terminology within the pale of etymology, but all have failed. Even the modest effort to make the coined word "radiocast" replace the popularized "broadcast" made little and merely ephemeral progress.

Many words used in radio have a special significance, wholly at variance with their import in the original setting. For instance, "vernier" means a finely adjustable instrument, for instance, a 25-

to-1 ratio on a dial, although in the field of measurements from which it was taken it refers to the use of units to designate smaller units and fractions.

"Variometer" has roused much ire, although needlessly. It is a tuning inductor, with stationary and rotary forms, each supporting a winding, and the two coils series-connected. It is not a meter in any sense.

One might take heaping examples of radio having played fast and loose with definitions and didactically proclaim the art's employment of the words an abuse, and harangue the public to vote for the Etymological Ticket. But what is the sense or the use?

Words mean what the public want them to mean, and eventually the public's slang or false syntax works its way into the respectable pages of certified dictionaries and almost deified grammar books. Against the irresistible sea it is not only impractical to offer opposition, but not quite justifiable. The words that are weeds to-day are utilized nevertheless, and besides, they are roses to-morrow.

Let's make greater circuits, finer sets, better tubes, and take the words in radio, like the roads and detours, as we find them.

Summer vs. Winter

ACKNOWLEDGED ignorance lends a fascination to all branches of science. What the world knows not leads it on, like a lure to the imagination, and makes dreamers and scientists commingle in their efforts to penetrate the unknown. Short waves in radio, indeed wave phenomena in general, constitute sufficient to keep the radio scientist busy for a long while. Dr. Alfred N. Goldsmith says that wave vagaries present the greatest problem in radio to-day. A. F. W. Anderson, by his activities, seems to agree with him.

The problem concerns the broadcast listener, too, because his reception is affected by radio wave phenomena. Even the child at the dials, unable to repeat the reception obtained on a previous day, may wonder at it, although expressing this perplexity rather by a show of impatience, more natural to the child mind than the meditative emotion.

Reception last Winter was poor. Distant stations were harder to get. This excited the interest of scientists, and the sun spot theory was advanced. Hugo Gernsback, in the present issue of **RADIO WORLD**, discusses the sun spot theory very enlighteningly.

By all the tokens there should be little improvement in reception until at least two more years elapse. Contrasted with this speculation is the fact that reception late last month and during the first half of this month was better, in respect to distant stations, than it was last January and February. Sets in New York City that could not bring in Chicago stations with any regularity during those Winter months are now accomplishing this. So while Dr. Goldsmith asks us not to expect much in the way of distance in Summer we can wring at least some joy out of the fact that we are doing better now in that direction than we did last Winter.

Destroyers Equipped With Short Wave Sets

WASHINGTON.

According to the Engineering Division of the Navy Department, vessels of Destroyer Division No. 25, which have been ordered to Europe to relieve similar vessels, are being fitted with high frequency receivers and material for construction of high frequency transmitters. It is expected that communications with the ships in European waters will be greatly improved due to this destroyer installation.

The Ten Commandments For Summer Listeners

Be Content With Local Stations, as Distance Is Hard to Get in Warm Weather, Says Dr. Goldsmith—Tells How to Bring in Other Stations Than a Super - Power Neighbor

By Dr. A. N. Goldsmith

Chief Broadcast Engineer, Radio Corporation of America

While excellent radio reception is frequently possible during the Summer months, the best long distance records come in the Winter. Signals are not quite so loud in the Summer, and electrical disturbances, such as lightning storms, are naturally more common in the Summer and interfere occasionally with concerts, particularly those received from distant points.

A reasonable attitude will help particularly the listener here. He should remember that he cannot expect every act in even the best vaudeville performance to be tremendously amusing and just what he wants, nor can he expect the weather every day to be clear and pleasant.

Similarly he must not expect every day to be just right for long distance radio reception. Now and then a Summer storm may interfere with both picnics and radio.

The listener should become acquainted with his local stations or with the nearest super-power stations and enjoy them during the Summer, and be satisfied with the long distance records he has made or will make in the Winter.

In other words, he should get the best there is in radio during all seasons, and above all he should be reasonable.

The Distant Listener

If the listener lives rather far away from all radio broadcasting stations of a power of a few kilowatts or less, which he wants to hear, there are several things he can do. He can lengthen his aerial wires and increase their height from the ground. Both of these measures make the signals louder as a general rule.

He can add audio amplifier unless, of course, he already has this instrument.

He can also increase the voltage of his B battery or plate battery up to 90, 112 or even 135 volts (that is, to four, five or six of the usual 22½-volt units or blocks).

He can use a more sensitive loud-speaker, or content himself with headset operation.

He should also tune more carefully so as to get the very loudest signal which his set is capable of giving.

If there is a tickler adjustment on his set, he should learn how to use it so as to get full volume of signals.

And he should remember that the good results he will then get are going to be even better results in the Winter.

If the listener is very near a powerful broadcasting station he may get excessively loud signals from that station and have difficulty in picking up other stations when the station nearby is in operation, particularly if his receiver is not very selective.

In extreme cases it is not possible to

get the distant station at all under such circumstances any more than it is possible to hear a whisper from a distance when someone else is shouting nearby. Still a good deal can be accomplished by some of the following measures, which should be tried.

The listener can cut down the size of his antenna or use a small indoor antenna having a length of between a few feet and say 30 to 50 feet. A few trials may be necessary to find the best length of indoor antenna in such cases.

When an antenna less than 30 feet in length is used a fixed condenser of .0005 mfd. should be connected between the aerial and ground binding posts or terminals of his set.

This will permit the reception of signals of the same wavelength as is possible with an outdoor antenna. Or he may use a large antenna and add to his set any of the better wave traps now available, which will greatly aid in cutting out an undesired station.

The listener should experiment until he gets the best signals and the greatest ease of choice of one station or another. A little patience is required to get the desired results in some cases.

Takes Time to Learn

It should be remembered that no one ever learned in five minutes to run an automobile skilfully through heavy traffic. Sometimes the "traffic" in the ether is heavy, and it may not be easy at first to pilot signals through the receiver. Paderewski took quite a little time to learn to play the piano, but it was worth while. So is time spent in mastering the capabilities of the receiving set.

You will also find it a good idea to concentrate Summertime reception, on the higher power stations or those nearest to you. It is best to take their programs (which will probably be every bit as good as those of most distant stations) and which come to your clearly, rather than to "fish" all evening among static-battered signals from weak distant stations.

Sometimes delightful Summertime reception may be obtained by taking the loudspeaker out on the porch or even on the lawn, using an appropriately longer cord to connect to the receiving set. Radio concerts gain from appropriate surroundings.

The Ten Commandments

There are ten good rules for broadcast listeners:

1. Don't try to hear ordinary broadcasting from Australia in mid-Summer. Be satisfied to enjoy the good programs from the nearer stations most of the time.
2. Don't be disappointed if an occasional disobliging storm interferes with your Summer radio evening. There are many fine concerts coming. You can't expect to find a pearl in every oyster nor to receive a record-breaking concert every night.
3. If you want louder signals, use a longer aerial, more tubes, higher plate voltage, more sensitive loud-speakers and more careful tickler and receiver adjustment.
4. A pleasant signal filling a moderate sized room should be enough to give satisfaction. Musically, such a signal is ideal. It is not worth while producing signals which deafen the neighbors. It is wasteful to insist on tremendous signals which are

Chain Station Contralto



JOY SWEET, contralto of the WEAFLight Opera Company, heard through WEAFL, WOAP, WJAR, WEEI, WTAG, WCAE, WCSH, and KSD every Wednesday evening at 10, during the presentations by the Light Opera Company.

generally less pleasant than moderate signals, particularly during the Summer.

5. If your local station comes in too loudly and drowns others out, a smaller aerial will help in tuning it out, with a small condenser connected between aerial and ground. Or a simple wave trap may do the trick. And if all measures to get rid of the local station fail, why not enjoy his concerts? Broadcast stations have to be closer to some people than to others.
6. In selecting your evening program try for the higher powered broadcasting stations. They were designed to give better Summertime service, and you will generally find that they do.
7. A little patience in learning to handle your receiver yields rich returns in satisfaction from fine signals. Remember that "Rome wasn't built in a day," and keep on getting more and more familiar with your set and how it works.
8. It is a good idea to read the radio column of a newspaper or a good radio magazine or two. It helps you to know how your set works and keeps you up-to-date in radio. Information of this sort is an aid in getting the concerts loud and clear.
9. Ask your radio dealer for advice; he can probably tell you what you want to know and will be glad to do so. The manufacturer of your set is also willing to help you get the desired results from its use.
10. Do not throw away the direction sheets or booklet that came with your set and with the tubes. Read all such material carefully now and then, and follow the suggestions which are given. If you have lost the direction sheets write to the dealer or manufacturer for another copy. The direction sheets answer most of the questions which have been puzzling you and preventing you from getting the best out of your set.

From Aerial to Speaker Tips

Diagrams Show Coupling Methods and Receivers

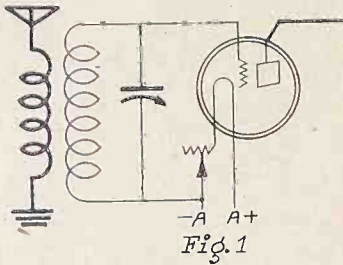


Fig. 1

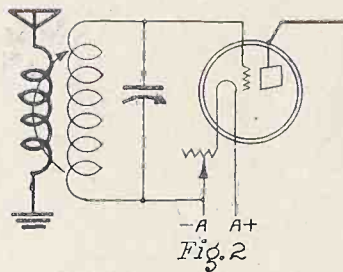


Fig. 2

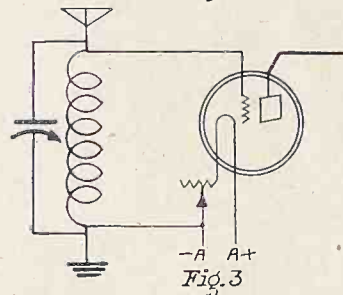


Fig. 3

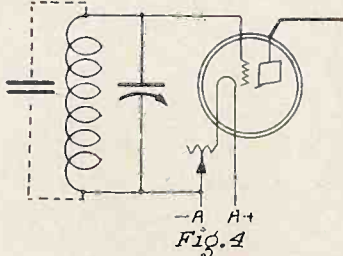
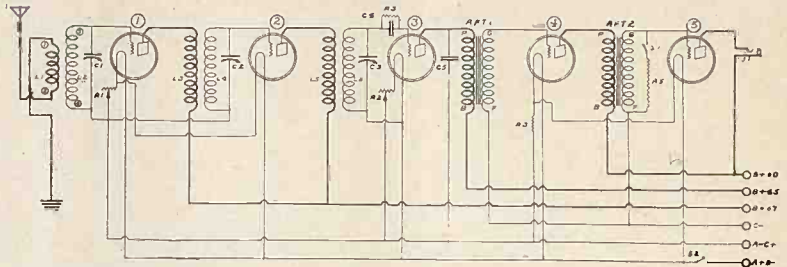
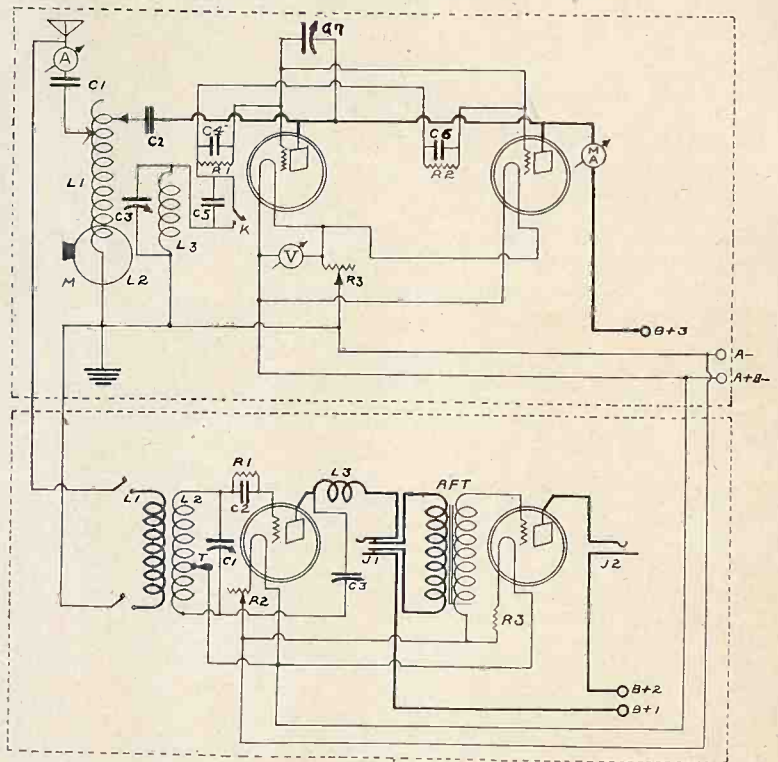


Fig. 4

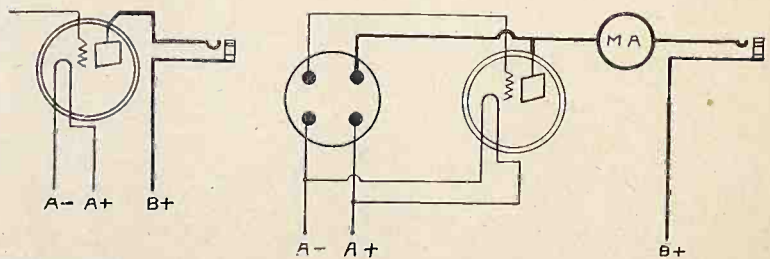
THREE METHODS of coupling the antenna are illustrated above. In Fig. 1 we have the most popular method, having a tuned radio frequency transformer, consisting of a small primary coil in inductive relationship to a large secondary coil. Fig. 2 is the same system, except that a variable primary is used. This enables variation of the selectivity. In Fig. 3 we have the tuned impedance method. This system requires a large variable condenser, due to added capacity of the antenna-ground (as shown in dotted lines, Fig. 4), which decreases the wavelength band so that even .0005 mfd. is not large enough, without tapping the coil. However, with the tuned impedance method very loud signals may be obtained with lessened selectivity. The nature of the aerial input coupling should depend on the characteristics of the remaining tubes on the radio side of the circuit.



THE SCHEMATIC diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. A high resistance is shunted across the secondary windings of the last stage AF transformer, to control the volume, a switch being provided, so as to cut it out if so desired.



THE CIRCUIT diagrams of a combination CW and phone transmitter and 2-tube receiver, employing a regenerative detector and a stage of transformer coupled AF amplification. Complete data on the coils, condensers, as well as wiring directions, were given in the July 5 issue of RADIO WORLD. Both sets can be built in single cabinet.



BY TAKING the base of an old tube and wiring it as shown in the diagram to the right (single circle with four large dots), a successful tube tester may be made. That is, the dummy tube socket is inserted in a socket of the set, while that tube taken from the set is inserted in the socket of the tester. MA stands for milliammeter.

THE RADIO TRADE

COMING EVENTS

Aug. 21-28 Pacific Radio Exposition, Civic Auditorium, San Francisco. Pacific Radio Trade Association, 905 Mission St., San Francisco, Cal.
 Sept. 5-11 Los Angeles Radio Exposition, Ambassador Auditorium, Auspices Radio Trades Association of Southern California. A. G. Faruharson, Secretary, 515 Commercial Exchange Building, Los Angeles, Cal.
 Sept. 6-11 Omaha Radio Exposition, City Auditorium, Auspices Omaha Radio Trade Association, F. R. King, Secretary, Hotel Fontenelle, Omaha, Neb.
 Sept. 13-18 Third Annual Radio World's Fair, New Madison Square Garden, New York City. Radio Manufacturers' Show Association, 1800 Times Building, New York City.
 Sept. 15-18 Akron Radio Show, Auspices Radio Dealers Association and "Times-Press," George Missig, Secretary, "Times-Press," Akron, O.
 Sept. 20-25 Pacific Northwest Radio Exposition, Public Auditorium, George J. Thompson, Jr., Secretary, 411 Journal Building, Portland, Ore.
 Sept. 20-26 Cleveland Second Annual Radio Exposition, Public Auditorium, G. B. Boden-hoff, Manager, 511 Guarantee Title Building, Cleveland, O., Room 817.
 Sept. 25-29 Fourth Wisconsin Radio Exposition, Municipal Auditorium, Milwaukee, N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.
 Sept. 27-Oct. 2 Second Allied Radio Congress and National Radio Exposition, Exposition Hall, Hotel Sherman, Chicago. Milo E. Westbrooke, Manager, 608 South Dearborn Street, Chicago, Ill.

Sept. 27-Oct. 2 Boston Radio Exposition, Mechanics Building, Sheldon Fairbanks, Manager, 209 Massachusetts Avenue, Boston, Mass.
 Sept. 27-Oct. 2 Northwest Radio Exposition, Kenwood Armory and Coliseum, Minneapolis. Harry H. Cory, Executive Secretary, 301 Tribune Annex, Minneapolis, Minn.
 Sept. 28-Oct. 1 Utica Radio Show, State Armory, Auspices Utica Radio Association, H. Benner, Manager, "Observer-Dispatch," Utica, N. Y.
 Oct. 2-9 Salt Lake Radio Exposition, Manufacturers Building, State Fair Grounds, Auspices Mountain States Radio Trades Association, H. S. Jennings, Secretary, 221 South West Temple, Salt Lake City, Utah.
 Oct. 4-9 Pittsburgh Radio Show, James A. Simpson, Managing Director, 420 Bessemer Building, Pittsburgh, Pa.
 Oct. 11-16 Rochester Radio Show, Convention Hall, Auspices Rochester Radio Dealers Association, Rochester, N. Y.
 Oct. 11-17 Fifth Annual Chicago Radio Show, Coliseum, Radio Manufacturers Show Association, 127 North Dearborn Street, Chicago, Ill.
 Oct. 18-23 Second Southwest National Radio Show, New Coliseum, St. Louis, Auspices St. Louis Radio Trades Association, William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.
 Oct. 25-30 Second Annual Indianapolis Radio Exposition, State Fair Grounds, Auspices Broadcast Listeners' Association, A. J. Allen, Secretary, 1406 Merchants' Bank, Indianapolis, Ind.
 Oct. 25-31 Detroit Radio Show, Convention Hall, Sponsored by the Radio Trade Association of Michigan, A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.
 Oct. 25-30 New Orleans Radio Exposition, Auspices Radio Trade Association and "The States," P. K. Ewing, Manager, States Building, New Orleans, La.
 Oct. 26-29 Sioux Falls Radio Show, Coliseum, Auspices Civic Club, Roger S. Brown, Secretary, care "Argus Leader," Sioux Falls, S. D.
 Oct. 30-Nov. 6 Third annual Brooklyn Radio Exposition, 23rd Regiment Armory, Stephen T. Rogers, Managing Director, Suite 513, Albee Building, Brooklyn, N. Y.

Conventions

Sept. 21-22 Cleveland First Annual Radio Convention, Hollenden Hotel, Jobbers and Dealers, Warren Cox, Chairman, Radio Apparatus Co., Cleveland, O.
 Sept. 27-28 Wisconsin Radio Trade Convention, Auditorium, Milwaukee, N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.
 Oct. 18-23 Jobbers and Dealers Convention, Southwestern states, Auspices St. Louis Radio Trades Association, William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.
 Oct. 25-31 State Radio Dealer Convention, Auspices Radio Trade Association of Michigan, Convention Hall, Detroit, A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.
 Canadian Trade Shows
 Sept. 13-18 Winnipeg Radio Show, Royal Alexandria Hotel, Auspices Canadian Exhibition Co., 204 King Street, East, Toronto, Canada.
 Oct. 4-9 Montreal Radio Show, Windsor Hotel, Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.
 Oct. 25-30 Toronto Radio Show, Coliseum, Canadian National Exhibition Grounds, Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.

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 Geo. Strauss, 200 E. 98th St., N. Y. City.

NEW CORPORATIONS

Consolidated Research Laboratories, Newark, N. J., radio supplies, etc., \$100,000; George E. Blizions, Ralph W. Appelby, Newark, N. J.; Ed. J. Malone, Jr., Montclair, N. J. (Atty., Seymour J. Solomon, Newark, N. J.); Horton Radio Corp., N. Y. City, \$20,000; C. Horton, C. Moscovitz, D. Schlesinger, (Atty., S. Sweetbaum, 291 B'way, N. Y. City).
 World Radio Corp., Wilmington, Del., manufacture, \$100,000. (Colonial Charter Co., Del.)

CAPITAL INCREASES

Amplion Corporation of America, N. Y. City, \$100,000 to \$200,000.

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[Other trade news in pages 26 and 27]

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AUTOMOTIVE ELECTRICAL RADIO and repairing station, doing wonderful business, desires partner, experienced, steady; rare opportunity. Sheephead 3318.

From Aerial to Speaker Tips

Diagrams Show Coupling Methods and Receivers

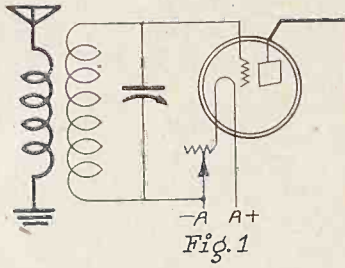


Fig. 1

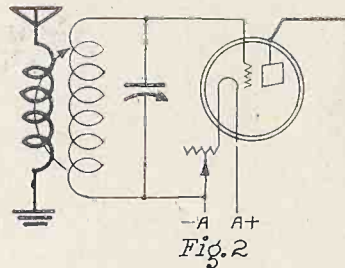


Fig. 2

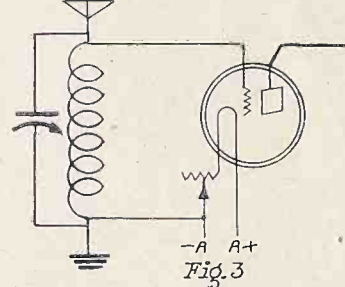


Fig. 3

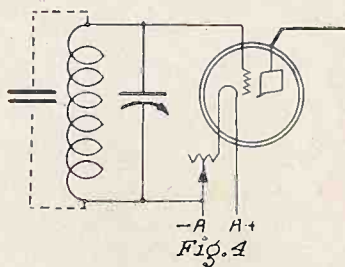
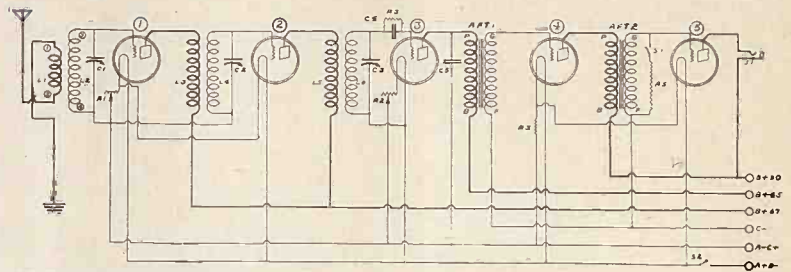
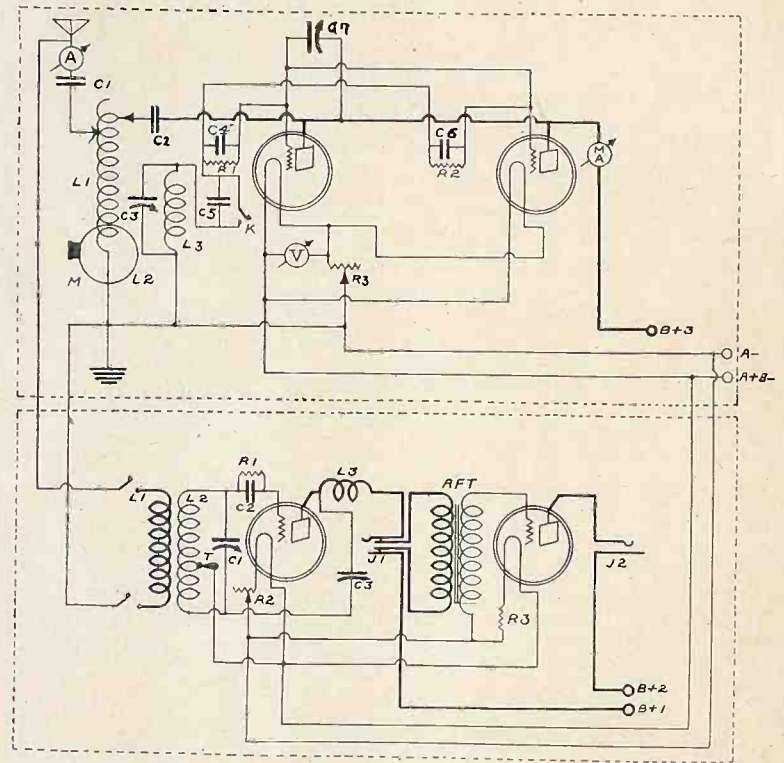


Fig. 4

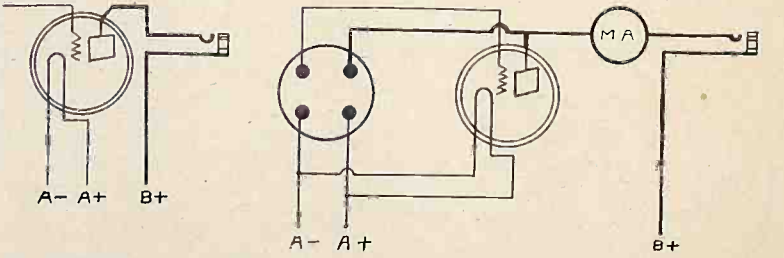
THREE METHODS of coupling the antenna are illustrated above. In Fig. 1 we have the most popular method, having a tuned radio frequency transformer, consisting of a small primary coil in inductive relationship to a large secondary coil. Fig. 2 is the same system, except that a variable primary is used. This enables variation of the selectivity. In Fig. 3 we have the tuned impedance method. This system requires a large variable condenser, due to added capacity of the antenna-ground (as shown in dotted lines, Fig. 4), which decreases the wavelength band so that even .0005 mfd. is not large enough, without tapping the coil. However, with the tuned impedance method very loud signals may be obtained with lessened selectivity. The nature of the aerial input coupling should depend on the characteristics of the remaining tubes on the radio side of the circuit.



THE SCHEMATIC diagram of a 5-tube receiver employing two stages of tuned radio frequency amplification, a non-regenerative detector and two stages of transformer coupled audio frequency amplification. A high resistance is shunted across the secondary windings of the last stage AF transformer, to control the volume, a switch being provided, so as to cut it out if so desired.



THE CIRCUIT diagrams of a combination CW and phone transmitter and 2-tube receiver, employing a regenerative detector and a stage of transformer coupled AF amplification. Complete data on the coils, condensers, as well as wiring directions, were given in the July 5 issue of RADIO WORLD. Both sets can be built in single cabinet.



BY TAKING the base of an old tube and wiring it as shown in the diagram to the right (single circle with four large dots), a successful tube tester may be made. That is, the dummy tube socket is inserted in a socket of the set, while that tube taken from the set is inserted in the socket of the tester. MA stands for milliammeter.

THE RADIO TRADE

COMING EVENTS

Aug. 21-28. Pacific Radio Exposition, Civic Auditorium, San Francisco. Pacific Radio Trade Association, 505 Mission St., San Francisco, Cal.
 Sept. 3-11. Los Angeles Radio Exposition, Ambassador Auditorium, Auspices Radio Trades Association of Southern California. A. G. Faruhamon, Secretary, 515 Commercial Exchange Building, Los Angeles, Cal.
 Sept. 6-11. Omaha Radio Exposition, City Auditorium, Auspices Omaha Radio Trade Association, F. R. King, Secretary, Hotel Fontenelle, Omaha, Neb.
 Sept. 13-18. Third Annual Radio World's Fair, New Madison Square Garden, New York City. Radio Manufacturers' Show Association, 1800 Times Building, New York City.
 Sept. 15-18. Akron Radio Show, Auspices Radio Dealers Association and "Times-Press," Akron, O.
 Sept. 20-25. Pacific Northwest Radio Exposition, Public Auditorium, George J. Thompson, Jr., Secretary, 411 Journal Building, Portland, Ore.
 Sept. 20-26. Cleveland Second Annual Radio Exposition, Public Auditorium, G. B. Boden-hoff, Manager, 511 Guarantee Title Building, Cleveland, O., Room 317.
 Sept. 25-29. Fourth Wisconsin Radio Exposition, Municipal Auditorium, Milwaukee, N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.
 Sept. 27-Oct. 2. Second Allied Radio Congress and National Radio Exposition, Exposition Hall, Hotel Sherman, Chicago. Milo E. Westbrooke, Manager, 608 South Dearborn Street, Chicago, Ill.

Sept. 27-Oct. 2. Boston Radio Exposition, Mechanics Building, Sheldon Fairbanks, Manager, 209 Massachusetts Avenue, Boston, Mass.
 Sept. 27-Oct. 2. Northwest Radio Exposition, Kenwood Armory and Coliseum, Minneapolis. Harry H. Cory, Executive Secretary, 301 Tribune Annex, Minneapolis, Minn.
 Sept. 28-Oct. 1. Utica Radio Show, Staib Armory, Auspices Utica Radio Association, H. Benner, Manager, "Observer-Dispatch," Utica, N. Y.
 Oct. 2-9. Salt Lake Radio Exposition, Manufacturers Building, State Fair Grounds, Auspices Mountain States Radio Trades Association, H. S. Jennings, Secretary, 221 South West Temple, Salt Lake City, Utah.
 Oct. 4-9. Pittsburgh Radio Show, James A. Simpson, Managing Director, 420 Bessemer Building, Pittsburgh, Pa.
 Oct. 11-16. Rochester Radio Show, Convention Hall, Auspices Rochester Radio Dealers Association, Rochester, N. Y.
 Oct. 11-17. Fifth Annual Chicago Radio Show, Coliseum, Radio Manufacturers Show Association, 127 North Dearborn Street, Chicago, Ill.
 Oct. 18-23. Second Southwest National Radio Show, New Coliseum, St. Louis. Auspices St. Louis Radio Trades Association, William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.
 Oct. 25-30. Second Annual Indianapolis Radio Exposition, State Fair Grounds, Auspices Broadcast Listeners' Association, A. J. Allen, Secretary, 1405 Merchants' Bank, Indianapolis, Ind.
 Oct. 25-31. Detroit Radio Show, Convention Hall, Sponsored by the Radio Trade Association of Michigan, A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.
 Oct. 25-30. New Orleans Radio Exposition, Auspices Radio Trade Association and "The States," P. K. Ewing, Manager, States Building, New Orleans, La.
 Oct. 26-29. Sioux Falls Radio Show, Coliseum, Auspices Civic Club, Roger Brown, Secretary, care "Argus-Leader," Sioux Falls, S. D.
 Oct. 30-Nov. 6. Third annual Brooklyn Radio Exposition, 23rd Regiment Armory, Steplein T. Rogers, Managing Director, Suite 513, Albee Building, Brooklyn, N. Y.

Conventions

Sept. 21-22. Cleveland First Annual Radio Convention, Hollenden Hotel, Jobbers and Dealers, Warren Cox, Chairman, Radio Apparatus Co., Cleveland, O.
 Sept. 27-28. Wisconsin Radio Trade Convention, Auditorium, Milwaukee, N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.
 Oct. 18-23. Jobbers and Dealers Convention, Southwestern states, Auspices St. Louis Radio Trades Association, William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.
 Oct. 25-31. State Radio Dealer Convention, Auspices Radio Trade Association of Michigan, Convention Hall, Detroit, A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.
Canadian Trade Shows
 Sept. 13-18. Winnipeg Radio Show, Royal Alexandra Hotel, Auspices Canadian Exhibition Co., 204 King Street, East Toronto, Canada.
 Oct. 4-9. Montreal Radio Show, Windsor Hotel, Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.
 Oct. 25-30. Toronto Radio Show, Coliseum, Canadian National Exhibition Grounds, Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.
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BARAWIK COMPANY, 102-140 So. Canal St., Chicago.

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Made especially for Resistance Coupled Amplifiers. Now you can get more volume with greater clarity.

A.F. 20 for 1st and 2nd Stage.....\$3.00
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 47-51 Morris Avenue Newark, N. J.

Literature Wanted

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

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

I desire to receive radio literature

Name

City or town

State

Are you a dealer?

If not, who is your dealer?

His Name

His Address

Edgar M. Knepper, Martland, Mo. (Dealer).
 H. D. Seveck, Granite, Col.
 H. R. Manteb, 988 Hayes St., San Francisco, Cal.
 Geo. Strass, 200 E. 98th St., N. Y. City.

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 BY-PASS CONDENSERS
 "B" BLOCKS RESISTORS
 AND GRID LEADS

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Bring in Europe on a
Victoreen "Super"
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Just off the press! Our second catalog for 1926. 100 pages of parts, accessories, kits and sets—all the best and the latest. A copy is yours for the asking. Just drop us a line—do it today!

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CHICAGO SALVAGE STOCK STORE
 509 S. State Street, Chicago, U. S. A.

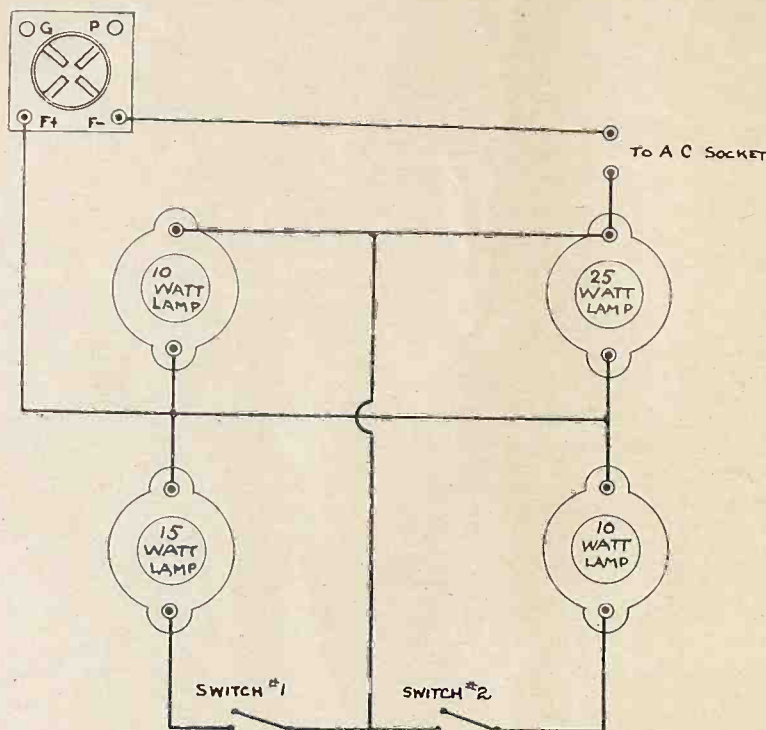
Business Opportunities
 Radio and Electrical

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AUTOMOTIVE ELECTRICAL RADIO and repairing station, doing wonderful business, desires partner, experienced, steady; rare opportunity. Sheephead 3318.

Simple Tube Reviver Any Fan Can Construct



Picture diagram of the tube reactivator that operates from the AC main.

By B. W. Matthews, M. E.

Those who would like to build their own tube reactivator will find the Fig. 1 method efficient. Procure a piece of soft wood 10" by 12" and 1/2" or more thick. Also procure the following material:

- Four porcelain lamp sockets.
- One universal radio tube socket.
- Two single pole, single throw switches.
- Two 10 watt lamps.
- One 15 watt lamp.
- One 25 watt lamp.

Mount these parts on the baseboard as shown in Fig. 1 and screw in lamps in their respective sockets. An additional refinement is to mount another lamp receptacle opposite the tube socket and wire the input wires to the receptacle. Connection to the AC line can be made by

using a cord and plug.

After connecting up the reviver to the AC line, open both switches, 1 and 2. Insert tube to be reactivated in the socket and turn on the current. Then close both switches and time the closed circuit for 1 minute and 30 seconds. Open switch 2. Allow tube to burn with switch 1 closed and switch 2 open for 5 minutes. At the expiration of 5 minutes, open switch 1. Allow tube to burn from 30 to 60 minutes with

both switches open. If the tube was not ionized before reactivating, you will have revived it, so that it will be like new.

Roxy Back on the Air to Lead Marine Band

S. L. Rothafel, known throughout radio as Roxy, returned to the air to lead the U. S. Marine Band at Washington, D. C. The entire program was broadcast through WEAJ, New York; WCAP, Washington, D. C. and relay stations.

Roxy had not been heard on the air since last February, when his gang gave their final program till the Roxy Theatre opens early next year. It was announced at that time that Roxy found the strain of combining both his radio and motion picture duties too strenuous, and was obliged to devote all his time to his new film enterprise, the most ambitious undertaking of his career.

In Quantico, Virginia, Roxy spent two weeks training the Marines on orders received from Colonel David P. Porter, Commanding Officer of the Eastern District at Philadelphia. He is a member of the service, having joined the Marines "to see the world" when he was sixteen.

He served as corporal with the famous United States Marine Corps, went through the Boxer Rebellion in China, and after the adventurous period of seven years was discharged from the service, carrying with him a medal as a decoration for his distinguished work. The title of major, U. S. M. C., was personally conferred upon him by Major General John A. Lejeune.

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KEEPS HARMFUL CURRENT
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Brings the Entertainer Into Your Room!



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Matches Tube Impedance to All Speakers
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- SCIENCE AND INVENTION or
- BOYS' LIFE or
- RADIO DEALER or
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- Send \$6.00 today for RADIO WORLD
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- for 52 numbers)
- and select any one of the other
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City and State

Ice-Bound Missionaries Tune In Home Stations

Lonely Priests and Lay Brothers North of Hudson Bay Get Set as Present and Establish Their Only Contact With Civilization.

MONTREAL.

Evidence multiplies daily regarding the useful service rendered by radio to the people of Canada who live far from the populous centers. The most recent testimonial of this character comes from Chesterfield Inlet in the North of Hudson Bay.

In that remote area priests and lay brothers of the Oblate Order labor among the scattered peoples, and ordinarily these missionaries have few contacts with more advanced civilization—and such contacts are separated by long intervals of time. Now modern science through the medium of radio is bridging these spaces and how this is done is best told in a letter which has been forwarded to A. R. McEwan, Director of Radio, Canadian National Railways.

The writer of the letter is Brother

Pigeon. In acknowledging reception of a program from CNRO, Ottawa, he says: "A charitable person gave us a receiving apparatus so that we can better enjoy our dreadful solitude in these ice deserts."

"We heartily thank that person who so generously furnished the missionaries with a little bit of the joys of the civilized world. Here are a few results from the radio apparatus. We heard many a time Ottawa and Montreal."

"What a joy for us all in hearing of our homes. We knew the results of the last Federal elections as soon as you did yourself."

"We also gathered a message sent to the Hudson Bay Company asking for help for the Eskimos living in Southampton Island who were threatened by famine because the boat could not reach them with food last Summer."

"Could we have a few items of news from your locality? We would indeed be pleased if you would broadcast them. Since we can pick up your station it is a delightful pleasure to hear voices from home."

Arrangements have now been made to answer the request of the distant missionaries and CNRO will furnish them with items of interest.

CNRO has been very successful in reaching a wide area from Ottawa and has furnished programs of news and entertainment over a vast territory throughout the North. The station has now resumed broadcasting after a fortnight during which time new apparatus was installed, making the station the most modern in Canada.

48 Compass Stations Give 180,000 Bearings

WASHINGTON.

An increase in the naval radio compass service for the past year is reported by the Director of Naval Communi-

cations. Over 78,000 merchant ships and 5,889 naval vessels were given bearings during the year. This was an increase of approximately 28% over the preceding year.

With 48 radio compass stations now operated by the Navy, over 180,000 bearings were furnished to vessels requesting them, which was an increase in this service of over 33% over the previous twelve months.

Although the radio beacon service has been greatly extended during the past two years, Naval Communications report that the number of compass bearings requested are steadily increasing both in actual numbers and the number per station.

RESULTS

RESULTS EDITOR:

I built the Fenway Super-Heterodyne as described in RADIO WORLD. I have been in the radio game for several years, having built many circuits, and three Super-Hets before the Fenway. I must say that the Fenway is in a class by itself. The tone is wonderful, the selectivity the best. I am located in the center of the United States and work coast to coast. The Fenway was one set that did everything claimed for it!

I am enclosing a note about some trouble had with C Battery circuit shorting, if you can help me out in this by personal letter, will sure appreciate it.

Yours very truly,

F. J. DAILING,
Logan, Kans.

RESULTS EDITOR:

For three years I have been looking for the perfect radio receiver that incorporated all the four essential requirements, viz, extreme sensitivity, selectivity, good quality and good volume. I have found it in the 8-tube Victoreen Super-Heterodyne. I am using a 2 ft. loop. I have added regeneration.

I can frankly say that Victoreen Super is the best set I have ever seen or heard of. If you don't get results it's your own fault. Thanking you for your clear constructional data.

FRED C. SHIVERS,
Lexington, Nebr.

"RAMBLER-SIX"

THE ONLY REAL PORTABLE

\$90

without tubes or batteries

Satisfaction Guaranteed

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American Interstate Radio Service

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CHANGES OF ADDRESS

should be sent to Subscription Department at least two weeks in advance of publication in order to insure early and proper attention. RADIO WORLD'S subscription list is so large that it is necessary that changes be sent in as requested. Address, Subscription Department, RADIO WORLD, 145 W. 45th St., New York.

Get Your Share of DX!

DX Means the Reception of Programs from Distant Stations, and that in Turn Means Pure Joy for Many Thousands of Fans. Better Distant Reception is Being Accomplished Right Now Than Was Possible Last Winter!

THE TRICK LIES IN KNOWING WHAT TO DO TO GET DX!

ALL THE INSIDE FACTS AT YOUR COMMAND FOR 50c!

CAN YOU ANSWER THESE TEN QUESTIONS?

- (1) How does the tuning in of DX stations differ from the tuning in of locals?
- (2) How can you make your antenna pick up more energy without adding any wire to it or making any change in your set?
- (3) If low wavelength stations are too loud and high wavelength stations not loud enough, how can you make them all as loud as desired?
- (4) What is the easiest way to improve selectivity?
- (5) How can you reduce the antenna resistance to get highest voltage?
- (6) How should coils be placed to avoid losses?
- (7) What effect has audio amplification on ability to get DX?
- (8) Where should by-pass condensers be placed to improve DX?
- (9) How should tubes be connected and operated for maximum efficiency?
- (10) Does the grid leak setting affect DX, and if so, how?

These and many other questions affecting DX are answered in articles by Capt. Peter V. O'Rourke, J. E. Anderson and John F. Rider, published in the April 3, 10 and 24 and May 29 issues of RADIO WORLD. All four copies sent on receipt of 50c., or given free with a year's subscription (52 numbers, \$6.00).

RADIO WORLD, 145 West 45th Street, NEW YORK CITY

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SEND NO MONEY Just state number of batteries wanted and we will ship day order is received. Extra offer: 4 batteries in series (96 volts), \$10.50. Pay 65¢ cashman after examining batteries. 5¢ per cent discount for cash with order. Mail your order now!

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Dept. 82 Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. \$11.35; 120 Amp. \$13.25; 140 Amp. \$14.00.
All equipped with Solid Rubber Case.

World STORAGE BATTERIES

Get your Radio Dial at 210 meters for the new 1000 watt World Storage Battery Station, WSB-C, Chicago. Watch for announcements.

WDA-WFA-WGN-WJS-2KH-KGO-KPAC-WJY-KOP

THE AERO ALL-WAVE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 24 and May 1. Sent on receipt of 30c. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c. or start sub. with that number, RADIO WORLD, 145 W. 45th St., N. Y. C.

How the Manufacturer Should Handle Dealers

Capital, Advertising and Good Management Necessary for Success — Price of Article Most Important, but Prestige is Close Second—Co-operative Profit-Sharing an Asset in Sales

By J. B. Perlman

Sales Manager, Hartford Battery Mfg. Co.

To the average manufacturer, the dealer problem to-day is not really a very serious one. There are in fact only two real points of consideration as regards the dealer—how to get him, and how to hold him and keep him satisfied.

There are undoubtedly many different opinions and also many different ways regarding the proper manner to accomplish the above results. The speaker is most familiar with the practices of his own Company, and inasmuch as these have been reasonably successful, they are being outlined to you in the hope that they may be of equal value.

How to get the dealer, simple as it may seem, is nevertheless a most difficult problem. On the other hand, difficult as it is, it is nevertheless an equally simple problem. These two statements may appear absolutely contradictory, yet, both are true. If you have ample capital for what you wish to accomplish and the right proposition throughout (quality, price, advertising, cooperation, etc.) you can get the dealer. Without them—or with only a portion of the necessary qualifications — the task becomes most difficult.

A Plan That Failed

Some years ago a personal friend, who was also a competitor, was discussing with me his plans of marketing a new battery. These assumed an immediate initial production and sale of 500 batteries a day. When questioned as to how he would obtain this volume of business, he stated it was quite simple, and could be accomplished as follows:

He, or a representative, could go over the country, and should certainly be able to obtain one account in each state, providing the exclusive sale for the state was given. These state distributors, on their part, should certainly be able to sell a minimum of 10 batteries each in their entire territory per day which would therefore procure a total of 480 batteries under the poorest conditions. My only reply was that despite the fact that his claims were modest enough and appeared simple to accomplish, I was sure that he could not do it, and events have proven I was correct.

On the other hand, one of our most prominent makes of batteries, the manufacture of which was started not so many years ago, began with an initial production and

sale exceeding this amount. Why did the one man succeed and the other fail? The answer is very simple.

The Contrasted Cases

One concern had unlimited capital, and, therefore every advantage that goes with it. It had a competent organization, with many years of previous practical experience which insured quality in the manufacturing end, and efficiency in the sales department. It knew when to advertise and where to advertise as well as the best methods of doing it. It had, in short, every necessary qualification for success and, therefore, was able to attain it.

The other man with limited means, a small organization of not much experience, has learned that although a distributor for the state of New York or Massachusetts is not hard to obtain, getting one in Montana or Idaho is another matter, and that, although these distributors, when obtained can readily sell 10 batteries in one day—once—it is more difficult for them to maintain this record 300 working days per year.

To-day there appear to be two prime requisites for the opening of new accounts—price, which is slightly more important, and prestige which comes next.

Economy of Advertising

Although formerly increased prestige permitted the manufacturer an increased price, this condition no longer holds good, and today the best advertised batteries are among the cheapest of the recognized standard brands. Please note, in this regard, my restriction of recognized standard brands. It is, and always will be, impossible for any manufacturer of standing and responsibility—who knows his cost and pays his bills—to meet the quotations made by other manufacturers (so-called) whose businesses are not conducted in general in the same manner as those of our membership.

As regards prestige, we are today concentrating more in endeavoring to impress our name in the minds of the consumer than the dealer. The major portion of our advertising is directed to the car or radio owner, and although it is, of course, read by the dealer, the copy is not written for the purpose of sales to him.

The same feature by which the dealer is obtained are of value, if not essential, in

holding him. The average battery manufacturer, as soon as he obtains a new account, desires to have a service station sign displayed over the door. This sign, immediately that it is put up, is the signal for the onslaught of competitors' salesmen.

The Onslaught Begins

Each and everyone of these will give his reason why his own line should be substituted, and although the arguments put forward all vary, there is one basic principle on which they all agree. That is that the line represented by the sign should be eliminated in favor of some other make.

With full realization that our representatives are continually solicited by other manufacturers (just as those of other manufacturers are continuously solicited to join the Hartford ranks) we attempt at all times to make our service as efficient as possible. The satisfied dealer never has as much time to listen to the competitor's siren as has the one who is looking for something better. Therefore, to our mind the best method of holding an account is to keep him satisfied, although we admit that many a manufacturer has on his books accounts which have been threatening to quit for many years past, but that always turn up each month with additional orders.

Customer Is Right

I have just mentioned that the satisfied customer is the one most easily held. Under the policy adopted by our company the customer is right unless it is most obviously apparent that his claims are very unreasonable. Frequently, a battery is returned for adjustment, the condition of which indicates that it is inoperative due to abuse rather than defect. Although it would be perfectly proper to refuse adjustments in cases like this, we often offer one as a matter of policy, at the same time pointing out that the battery in question was not defective.

In the matter of accounts, although this (Concluded on page 27)

LYNCH
METALLIZED
LYNCH
FIXED RESISTORS

FENWAY
—for DX

Winter or Summer the Fenway is a consistent DX-getter. Naturally, you want to own one of these super-sensitive receivers. Fenway Blueprints show you how to build a laboratory set.

PRICE OF COMPLETE SET OF BLUEPRINTS—\$3.00 Postpaid
Others Give Their Radio Prints Away FREE!—Fenway Prints Cost You \$3.00—WHY?
Guaranty Radio Goods Co.
147 West 45th Street New York City

“Look Up Down”
FOR SERVICE
A Complete Line of Radio Parts of the better kind for all popular Circuits.
Official Factory Service for
RADIOLA R. C. A. OPERADIO
CHAS. W. DOWN
711 EIGHTH AVE. NEW YORK CITY

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 145 West 45th Street, New York City (Just East of Broadway)

Please send me RADIO WORLD for..... months, for which

please find enclosed \$4.....

SUBSCRIPTION RATES:
Single Copy..... \$ 15
Three Months..... 1.50
Six Months..... 3.00
One Year, 52 Issues..... 6.00
Add \$1.00 a Year for Foreign Postage; 50c for Canadian Postage.

S. HAMMER RADIO CO.
303 Atkins Avenue, Brooklyn, N. Y.
Please send me FREE, Your NEW
RADIO CATALOG

Name.....
Address.....
City..... State.....

FILL OUT AND MAIL

belongs primarily in the credit rather than the sales department, much can be done in the building up of good-will.

Many dealers are delinquent in payments due to inability to pay rather than unwillingness, and in such cases, where we feel a dealer is making an honest effort, we afford every possible extension.

There are, of course, certain dealers who continue to buy as long as they receive credit, but stop upon being asked to make a payment. These, we will all admit, are better lost than retained, and the fortunate manufacturer is the one who loses them quickly.

A complete line is another important factor in a manufacturer's retention of his dealers. By having available every possible type of battery for which the dealer may have a call, the necessity of seeking this battery from another source is eliminated.

Each month our company issues a certificate to those dealers who qualify, representing the number of batteries they have purchased during the month. At the end of the year a certain percentage of our company's net profits is set aside for the purpose of distribution to the holders of these certificates.

A unit sum per battery is derived by the division of the number of batteries represented in outstanding certificates into the total sum available, and for the present year, we have gone on record as guaranteeing that this will be not less than 25c per battery.

In addition to the first year's rebate, the dealer will also receive for five years following, yearly dividends covering the batteries represented by the certificates in his possession. These dividends, we hope to be able to pay on a minimum basis of 6% so that the purchase of a Hartford Battery by the dealer would net him for five years and in addition to his first year's rebate, an income equivalent to that which he would receive had he set aside one dollar in a sound investment earning 6%.

Leipzig Fair Promises Startling Inventions

Static Eliminator, Product of German Laboratory, to Be Exhibited—Other Designs Relate to Improved Tone Quality and Simplified Set Construction.

The largest radio show ever held in Europe is being assembled at the Leipzig Trade Fair, which opens on August 29, lasting until September 4. Among the 13,000 exhibitors from 44 different countries there are 300 manufacturers of radio appliances.

Germany has been hard at work in her university laboratories on a number of special problems and is expected to send some surprising exhibits to the Fair.

The efforts of her radio engineers, it is reported, have been concentrated upon the elimination of static, in designing simpler receiving apparatus, and the improvement of tonal production in general.

Will Have Own Station

A super sending station is being built for the Fair and attempts will be made with new apparatus to greatly extend the radius both for sending and receiving.

The German Government exercises a rigid control over radio in marked contrast to the American practice. Today there are over 1,000,000 receiving sets in Germany, for the most part in the larger cities. The owner of every set pays the equivalent of fifty cents a month, which is regularly collected by the local postman. The money collected is divided between the Government and the broadcasting stations. At present there are only twelve big stations in Germany, but these are elaborately equipped with soloists, orchestras, and even opera companies. Complete symphonies and operas, lasting for several hours, are often put on the air. There has been a tendency

of late, however, to copy the American method of radio programs and even introducing jazz.

American Buyers Invited

One of the novelties of the radio show this year will be a giant tower standing in a public square, from which radio programs will be sent, thrown out by a series of eight loudspeaking devices.

All foreign countries are invited to exhibit radio apparatus at the Leipzig Fair on equal terms with Germany. A number of buyers and radio engineers from America will attend the Fair. The cheapness of German radio sets, owing to the low cost of labor, and the favorable exchange, is reported to make German prices so inviting that the latest German products may be seen next fall on the American market.

The Fair has New York headquarters at 630 Fifth Avenue.

Quest for "Miss Radio" Will End on Aug. 15

Owing to the large number of entries and in order that the program for the entertainment of the winner may be worked out well in advance, the competition among the feminine broadcast listeners of the United States to determine who is entitled to the distinction of being named "Miss Radio, 1926-7" will end August 15.

"Miss Radio" will be a guest of honor at the Radio World's Fair and will be introduced to the visible and invisible audience at the opening ceremonies on the night of September 13 in New Madison Square Garden. She will also be guest for a week at entertainments, receptions and theatre parties arranged by women's clubs, radio organizations and other associations. All expenses, including transportation to and from New York, will be allowed "Miss Radio."

The present holder of the title is Rena Jane Frew of Beaver, Pa. When a student in Geneva College she won the 1925 contest.

The winner will be judged on skill in operating a receiving set to bring in long distance stations and for the best essay on "What Radio Is Doing for Women," or a kindred topic. The log will be judged with respect to kind of set used, location and other factors. Women in the Middle West, for instance, send in records that outshine those on the Atlantic and Pacific Coasts, and 10-tube Super-Heterodynes naturally will bring in more stations than a 1-tube outfit, although last year an invalid woman reported 250 stations received on a single tube receiver.

Logs and letters, with a photograph, should be sent to G. Clayton Irwin, Jr., general manager of the Radio World's Fair, at 1475 Broadway, New York City. Cups will be awarded to "Miss Radio" and the winners of second and third prizes. In the event of a tie an equal award goes to all who are tied.

Professionals, by which is meant people who directly or indirectly earn a living from radio, are barred from the test.

VERNIER DIAL **\$1.25**



The Bruna Vernier Dial, 24-to-1 ratio. Smooth in operation, accurate and dependable. Beautifies any panel. Made of moulded Bakelite.

STREAMLINE FREQUENCY CONDENSERS .0005, .00035 or .00025 mfd. **\$1.95**

ELECTRIC SOLDERING IRON **95c**

CRESCENT AUDIO TRANS. 3-to-1 or 2-to-1... **\$2.00**

M. LERNER

Room 1214

143 West 45th Street, New York City



UX POWER TUBES installed in any set without rewiring by Na-Ald Adapters and Connectorals. For full information write Alden Manufacturing Co., Dept. S-15, Springfield, Mass.

THE VICTOREEN

How to build this 8-tube Super-Heterodyne described in February 20, 27, March 6 and 13 issues of RADIO WORLD. Send 60c for all four copies. Send \$6 for year's subscription and get these four copies FREE!

RADIO WORLD

145 W. 45th St. New York City

IF YOU ARE GOING AWAY ON YOUR VACATION

Tell your newsdealer to save a copy of RADIO WORLD for you each week. In this way, you will have a complete file—as sometimes it is difficult to get back numbers.

Or send us \$1.00 and we will save you a copy of each week's issue until September 15, 1926, and mail them to you at whatever date you specify.

Circulation Manager, RADIO WORLD, 145 West 45th Street, N. Y. City

No Sleep, Much Company, Farmers' Radio Lament

Radio on the farm is yielding more dollars and cents return on the investment, developing a more prosperous American agriculture and bringing about a better contented, understanding class of farmers than any other single scientific contribution of the age, Sam Pickard, Chief of Radio, United States Department of Agriculture, told the convention of agricultural college editors at East Lansing, Michigan.

After visiting the principal radio stations and approximately 600 farmers on a farm radio survey tour through twenty agricultural states, Mr. Pickard stated that both college and commercial broadcasters are making an intelligent effort to anticipate the farmer's problem with interesting, helpful programs, and are winning large and faithful audiences of the most enterprising class of farmers.

Isolated Farmers Aided

Concrete examples of how practical application of information gained through radio is helping the farmers' bank balance were cited. In districts sixty miles from a railroad he discovered farmers who had changed their farming to more profitable lines suggested by authoritative radio talks.

"The farm fan," he said, "has two chief criticisms of radio. The one most often voiced is the curse of not getting enough sleep. Most of them admit they sit up with their sets late into the night. Many others say that while they like to be neighborly they tire of the entire community dropping in every winter evening and then forgetting to go home."

A plea was made for the college to dramatize informational programs, inject-

ing into them greater interest and more humor.

Old Oratory Is N. G.

"I know of no field into which educational agencies have entered that offers keener competition than that of radio. The day has passed when the mediocre speaker can hold a radio audience. The lecture of long, difficult words and sentences must give way to more friendly, natural dialogue presented by effective radio voices.

"Until educational institutions value the effectiveness of radio instruction highly enough to adequately finance a competent staff, trained in the technique of broadcasting, they cannot expect successfully to utilize this new invention, probably the greatest boon to education since the printing press was invented."

The United States Department of Agriculture's new policy of providing a staff of feature writers to weave timely information into dialogue material to be broadcast by trained announcers was commended to the college editors.

WATCH RECTIFIER TUBE BASE

If the rectifier tube in your charger, doesn't light, don't think it is blown. The filament base contact may have become poor, this being due to vibration of the tube, during charging process.

FREE BOOKLET FOR INVENTORS

IF YOUR INVENTION is new and useful it is patentable. Send me your sketch.

Z. H. POLACHEK, 70 Wall St., New York

Reg. Patent Attorney-Engineer

Station News from KOA

Features of Colorado's semi-centennial celebration will be broadcast by KOA, Denver, Tuesday, August 3.

It is expected that President Coolidge will deliver a special message to Coloradans.

* * *

In addition to the open-air concert by the Denver municipal band Sunday evening, August 1, KOA will broadcast an early evening studio concert by the station choristers; an afternoon organ recital from the First Baptist Church, Denver, played by Oliver W. Gushee, and the morning service of First Baptist Church.

* * *

As a studio offering, Wednesday evening, Aug. 4, KOA will present a program beginning at 8:15 o'clock, arranged by the Chamber of Commerce at Estes Park, in the heart of the Rocky Mountain National park.

* * *

Band music will be KOA's ethereal menu again Friday evening, Aug. 6. The program is slated for 8 o'clock, mountain standard time, and will be played by Denver's forty-piece municipal band, under direction of Henry E. Sachs.

Your Radio Set
DESERVES
Good Condensers

The Trade-Mark

TOBE

Insures What It Deserves.

Tobe Deutschmann Company
Cambridge Mass.

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS.

10 CENTS A WORD. 10 WORDS MINIMUM. CASH WITH ORDER.

GETTING MAXIMUM RESULTS with Super-Heterodynes by Herman Bernard appeared in RADIO WORLD dated May 15th. 15c per copy, or start your subscription with that issue, RADIO WORLD, 145 West 45th St., N. Y. City.

A DISCUSSION ON SELECTIVITY, by J. E. Anderson appeared in RADIO WORLD dated June 19. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

THE GREAT AID OF BY-PASS CONDENSERS, by John F. Rider, appeared in RADIO WORLD dated May 8. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

DETAILS OF WIRING THE DC B ELIMINATOR, Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

HOW TO USE AERIALS IN GROUND AND WATER, by Lewis Winner, appeared in RADIO WORLD, dated May 29. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

BLUE PRINT FOR 1926 DIAMOND OF THE AIR sent on receipt of 50c. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

CASH PAID FOR Dental Gold, False Teeth, Discarded Jewelry, Diamonds, Platinum. Mail, Florida Gold Refining Co., 21 Adams, Jacksonville, Fla.

"LIBERTY AFLAME" and other verses, by Roland Burke Hennessy. Handsomely bound in cloth; sent postpaid for \$1.00. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

THE BERNARD PORTABLE SUPER-HET-ERODYNE appeared in RADIO WORLD dated April 3, 10, 17 and 24. Sent on receipt of 60c, or start your subscription with April 3 issue. RADIO WORLD, 145 West 45th St., N. Y. City.

TABLE FOR CONVERSION OF FREQUENCIES AND METERS appeared in RADIO WORLD dated May 1, 1925. Sent on receipt of 15c, or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

CONFESSIONS OF A SUPER BUG, by James H. Carroll, appeared in RADIO WORLD dated May 22. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

SELL AND INSTALL RADIO SETS. With a \$25 capital we can put you in the radio business and show you how to earn a hundred or two a week. For full details write Guaranty Radio Goods Co., 145 West 45th Street, New York City.

THE VACATION NUMBER OF RADIO WORLD DATED JUNE 12 contained many great features. 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. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

TO KEEP YOUR FILES COMPLETE, you can order your newsdealer to put a copy aside for you each week while on your vacation. Or, send \$1.00 for RADIO WORLD from now until the end of August, and in this way you will not miss any copies. SUBSCRIPTION DEPT., RADIO WORLD, 145 W. 45th St., N. Y. C.

THE NEW 1-DIAL POWERTONE SET, by Capt. P. V. O'Rourke, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Female Help Wanted

WANTED—HOME WORKERS. Can earn \$4.25 cash or big premiums. Write for particulars. Household Supply Co., 715 Baltimore Bldg., Chicago, Ill.

TEAR OFF AND MAIL TODAY

8 Week's Trial Subscription, \$1.00

KEEP ABREAST OF THE LATEST
RADIO DEVELOPMENTS

RADIO WORLD
145 WEST 45TH ST. NEW YORK CITY

Announcers on Vacations Make Admirers Anxious

So many anxious inquiries were received by WEA F regarding the absence of Philip Carlin, one of its popular announcers, who was away on his vacation for two weeks, that WEA F decided to notify the radio audience in advance when the announcers depart for their vacations. "Phil's" familiar voice was missed in connection with such programs as Ipana Troubadours, Goodrich Silver-ton Cord Orchastra and the Hotel Bostert Orchestra and as a consequence many letters were received asking if he were ill.

Last Sunday another of WEA F's popular announcers departed on his vacation. He was Leslie Joy, who is usually associated with the announcing of The Gold Dust Twins' program on Tuesday evenings. Mr. Joy departed for the wide open spaces of Maine, there to forget the cares of a radio announcer while fishing

and swimming. Next Sunday Graham McNamee, one of WEA F's best known announcers, and Gerald Chatfield, director of programs, leave on their vacations.

Goldman Concerts Saturday Features

Saturday the opening strains of music rendered by the Goldman Band will be heard by the listeners of WEA F, WGR and WWJ. The Goldman Band concerts which come to the radio audiences of these stations from the Campus of New York University, are an extremely popular Saturday evening feature. The Goldman Band is under the direction of Edwin Franko Goldman, whose name is known to music lovers from coast to coast.

Mr. Goldman was born in Louisville Kentucky, and came to New York City at the age of eight. His parents were both musical, and although his father did not follow music as a profession, his mother was known both as a pianist and a violinist. Mr. Goldman received his entire musical education in America. At about eight years of age he began the study of the cornet and at fourteen was awarded a free scholarship at the National Conservatory of Music in New York City, which was at that time under the direction of Antonin Dvorak. At 17 he became the cornetist of the Metropolitan Opera House Orchestra, where he remained for ten years. Since his ten years at the Metropolitan he has become famous as a teacher, author, conductor and composer. Audiences ranging from 20,000 to 40,000 attend these concerts each evening and their appreciative ap-

plause is heard by the radio audience after the rendition of each selection.

Author to Read From His Most Recent Novel

On Saturday at the conclusion of the hour's concert of Dinner Music from the Rose Room of the Hotel Waldorf-Astoria, WEA F'S studio program will be opened with the appearance before the microphone of the young author, David Freedman, who will read from his own book, "Mendel Marantz."

The novel, which was recently issued, is one which contains many choice witticisms and quaint philosophy. The story itself centers about the character, Mendel Marantz, who is a personification of laziness and faces all his problems with an affable, witty philosophy and pays the landlord with jokes. The novel also brings in his wife, son and daughter and gives a familiar sketch of their quarrels, love affairs and the various other family complications which make up the everyday realities of life. The book has received enthusiastic comment from many of the noted literary critics and Freedman himself is placed in the front ranks of young writers.

This book is full of amusing sayings of the character, Mendel, of which such quotations as these are excellent samples:

"What is a wife?" "A shadow who can't leave you."

"What is laziness?" "An invention which saves work."

NAVY SHORT WAVE AID WASHINGTON.

More reliable weather and plane movement reports for aircraft by radio are expected by the Navy Department upon the completion of installation of new motor generators for the high frequency transmitters. Increased success and smoothness of operation in this branch is being gained and material kinks eliminated with experience, according to experts of the Navy Department.

GEM TUBE

A Guaranteed Radio Tube Within Reach of All

Every tube guaranteed. A tube for a dollar of \$2 value. A trial order will convince you as it has thousands of others. Send your orders at once. Orders sent C.O.D. parcel post.

Type 200 **1.00**
Type 201-A
Type 199
Type 199-A with Standard Base Each
Dealers, Write for Discounts

GEM TUBE CO.

Dept. W, 200 B'way, N. Y. C.
220 So. State St., Chicago, Ill.
Lafayette Bldg., Detroit, Mich.



THE DIAMOND A BADGE OF MERIT

Join the Happy Thousands Who Triumphantly Built This 5-Tube Set!

Real **A Great Summer** Easy to
Know **Receiver** Tune, Easy
Quality! **to Build!**

Herman Bernard, designer of this wonder circuit, has written an illustrated booklet on "How to Build RADIO WORLD'S 1926 Model Diamond of the Air." Send 50c and get this booklet, including a full-sized wiring blueprint and free nameplate.

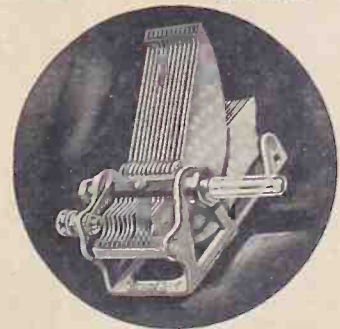
Outstanding Features of Set: (1) Fans, charmed by tone quality, sensitivity and selectivity, report speaker reception of far-distant stations with great volume. (2) A 2-tube earphone set, a 5-tube speaker set, and a separate 3-stage audio-amplifier for immediate use with any tuner, are combined in one. (3) No rheostats are used. (4) The set is inexpensive to construct and maintain. (5) The set works from outdoor aerial or loop, hence no aerial problems present themselves, in city or country.

Send \$6 for year's subscription and get booklet, blueprint and nameplate FREE.

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

Radio World, 145 West 45th St., New York City
Nameplates Free to All

"Bruno" Bakelite Shaft Condenser



The most important feature of this new condenser is the elimination of all insulating material between the frame and the stator plates. This is accomplished by using as a shaft a rod of new insulating material. The shaft is the only insulation used in the condenser, therefore body capacity is reduced to a minimum.

| PRICES | |
|---------------------------|--------|
| .00025MF (13 plates)..... | \$3.50 |
| .00035MF (17 plates)..... | 3.75 |
| .0005MF (23 plates)..... | 4.00 |

B. C. L.
Vernier
Dial

50c



B. C. L. RADIO SERVICE
223 FULTON ST. N. Y. C.

WHAT USERS OF THE **BRETWOOD** Variable Grid Leak say:

The Bretwood Grid Leak came with today's mail. It is now exactly 9:00 P.M. and the leak was installed about a half hour ago. This note is not only an expression of appreciation but also an attestation of the truth of your advertising. During the past half hour I have tuned in stations "ALL OVER THE DIALS" at leisure, and can adjust reception with the leak almost equal to a variable condenser.

I feel constrained to add that while waiting for reply and then receipt of leak from you, there has been on the set a fixed leak and condenser of well known and thoroughly reliable make, and fairly good reception has been enjoyed, but during this half-hour-only test thus far the results are inexpressibly beyond expectation.

Have been a radio fan only about four years, but feel I have sufficient knowledge and experience to recognize a good thing upon fair trial. Your promptness and desire to satisfy your trade, in this case has won for you another "BRETWOOD BOOSTER." Thank you.
The Rev. WALTER G. BARLOW,
Bishopville, Md.

Very many thanks for your kind letter of the 21st ult. and for the grid leak, which works perfectly. I have tried four different makes of grid leaks. The Bretwood "has 'em beat"

M. SAWYER,
Box 238, Los Gatos, Calif.

Received your grid leak and wish to say that none can compare with it when it comes to clearing up reception.

JOHN A. BLACKBURN,
5328 Warren Ave., Norwood, Ohio.

Enclosed find P. O. money-order for \$3.00. Please send me two of your Variable Grid Leaks. I am using one and it works fine. Please mail them as soon as possible.

W. H. PERRY,
119 Congress St., Buffalo, N. Y.

Received your grid leak and many thanks. It is the best \$1.50 that I have spent for radio equipment.

ED. JENKINS,
703 E. Main St., Louisville, Ky.

Enclosed herewith find check for \$1.50 for one Bretwood Grid Leak. I am using your leak and find it far superior to any others. This is my third Bretwood.

J. C. WHITE,
422 W. Wooster St., Bowling Green, Ohio.

Will you please send me by return mail two Bretwood Variable-Grid Leaks. I enclose herewith check for \$3.25, the 25c. being for a special handling stamp, as these leaks are needed at once. The leaks are the only satisfactory instrument on the market. I find them absolutely essential in the construction and operation of sensitive experimental receivers.

ED. J. WHITTIER,
The American Appraisal Co.,
Milwaukee, Wis.

I want to thank you for your leak, it makes the set 100% better. I was going to have a Diamond of the Air built, but since I have added your leak to my set I am now down in the dining room of the first floor and the set is on the second floor. I can hear the set just as plainly as if I were up there. I can hear every player in any band of music which is on air. The first night I gave the leak a very good test, and I got four stations in Chicago, one in Detroit, one in Canada, one in Atlanta, Ga., and several others without any noise. All were good and clear. It is going to make me spend more money, as I will have to get a good loud speaker. The horn I have now is a Manhattan Jr., and is good and clear, but as soon as your leak is installed the howling present when using three tubes is immediately stopped.

LEON E. COLE,
5816 Tilbert St., Philadelphia, Pa.

Grid Leak received and tested out, and find it is the only variable leak I ever used that is really variable. Enclosed find \$1.50, for which please send me another one.

F. E. STAYTON,
Box 240, Ardmore, Okla.

Thank you for introducing me to the Bretwood Variable Grid Leak! I have installed one in my Three-Circuit Tuner, according to your instructions, and find that it does all you said it would—and more. I am now recommending the Bretwood to all my friends, and those who have used this wonder grid leak have nothing but high praise for it. The fact that it can be adapted for any hookup makes it invaluable to the experimenter.

Although I have only used the Bretwood leak for three weeks I have pulled in several of the weaker stations which were inaudible before, and the microphonic noises which were decidedly pronounced before have entirely disappeared. Please accept my best wishes for your continued success and also for the Bretwood Grid Leak.

S. R. HUBBS,
180 Quincy St., Brooklyn, N. Y.

Let me say that the Bretwood Grid Leak improves the set 100%.

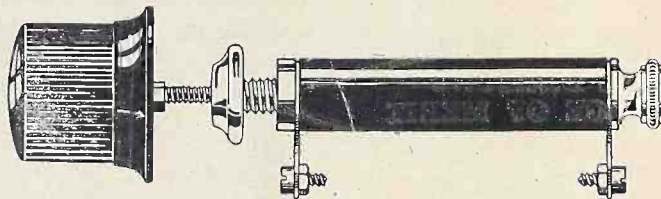
J. E. MCGINNISS,
27 Lenox Rd., Brooklyn, N. Y.

I wish to take this occasion to thank you for your courtesy in furnishing me with your very excellent Grid Leaks. I have installed one with your Condenser on my own personal radio set, and am delighted with the results.

R. W. DEMOTT,
Experimenter Pub. Co.,
53 Park Place, N. Y. C.

I have received the Grid Leak you sent me and it is perfect. It is surely wonderful the way it works. Please send me another by return mail for a friend.

J. F. COOPER,
1029 Courtlandt St.,
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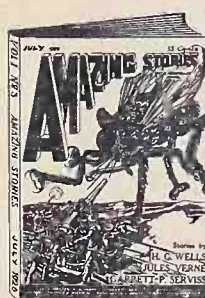
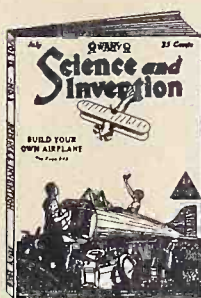
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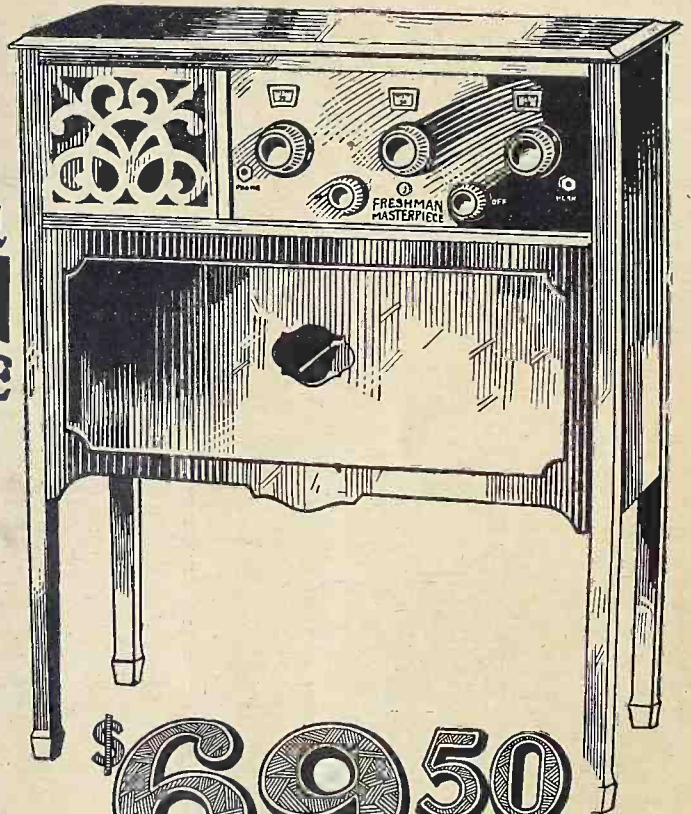
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