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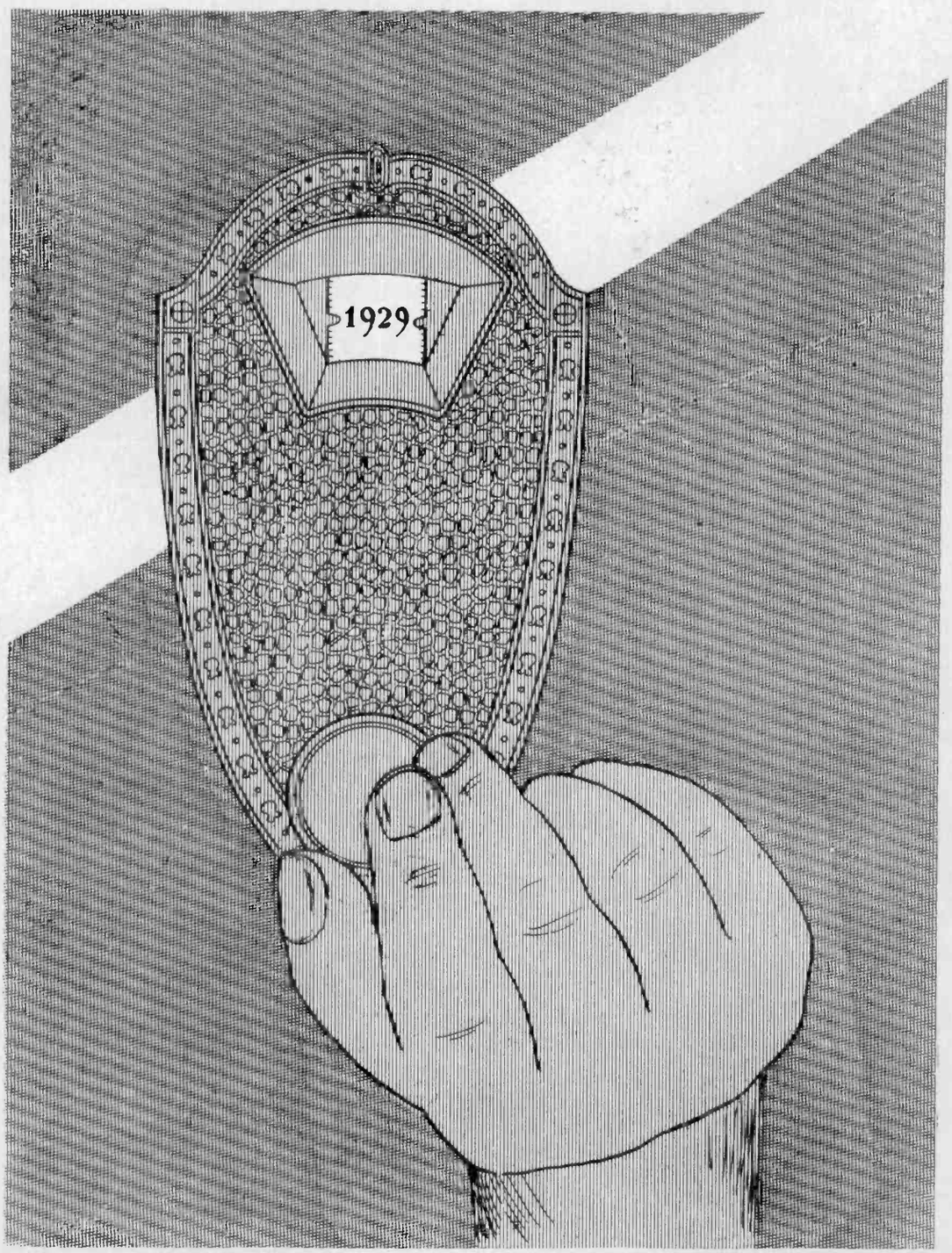

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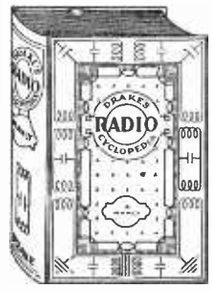

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has been developed to answer the questions of service men, custom set builders and home constructors, of experimenters, students, salesmen and operators of receiving equipment and to allow all these to have instant access to the information they want. The author, Harold P. Manly, has collected and translated into plain English the material formerly obtainable only from dozens of scattered sources.

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(Just East of Broadway)
Phone: BRYant 0558 and 0559

BUSINESS DONE DURING YEAR, $512,000,000

Total radio sales for the year will exceed $512,000,000. This is revealed by an analysis of the radio statistics for the third quarter of 1928, released by the Department of Commerce. These are compiled in cooperation with the Radio Division of the National Electrical Manufacturers Association.

Figures compiled for the third quarter represent returns from 6,766 radio dealers, or 21.4 per cent of the 31,573 queried, and show a total business of $20,508,666.

More Replies

This is an increase of 3.6 per cent over replies received for the July 1 quarter. Assumptively, 100 per cent of the dealers did a total business of $95,834,887 during the quarter.

An estimate of the relative value of each quarter has been prepared by the McGraw-Hill Publishing Company. It shows that the months of July, August and September equal 18.5 per cent of the total radio sales made each year.

Since the October 1st figures are the first to contain total sales, the quarterly business of $95,834,887, on the basis of 18.5 per cent, results in total year's sales of $512,621,010, establishing a new record.

Expect Large Final Quarter

Furthermore, the full force of the season's increasing sales is not adequately reflected in the Summer months of June, July and August and a greater momentum of increase in the last quarter is expected to swell the total somewhat above that indicated.

JOINT RADIO-MUSIC TRADE SHOW

Preliminary plans for the annual conventions and trade shows of the radio and music industries, both meeting in Chicago June 3rd next, have been agreed upon by heads of the respective industries, represented by the Radio Manufacturers Association, the Music Industries Chamber of Commerce, the National Association of Music Merchants, and allied music trade organization.

KFRC AND KHJ TIE IN

The Don Lee stations of California—KHJ, Los Angeles, and KFRC, San Francisco—are now hooked up by permanent telephone line. Alternately programs will be released from both studios and broad cast jointly.

Chains Fight Back; Want More Leeway

Columbia List Jumps from 27 to 49 Stations, Largest Group in the World — N.B.C. Seeks Better Facilities in Iowa, Texas and Ohio — Board's Curb Order, Effective January 31st, Is Opposed — N. E. M. A. Condemns Unwarranted Restriction

Washington.

Demands for severe restriction of chains, so that a greater variety of programs may be tuned in, have brought counter-activity by chain systems and by the Radio Division, National Electrical Manufacturers' Association. The developments were:

1 The Committee on Broadcast Allocation of the N. E. M. A., composed of C. W. Horn, Julius Weinberger, Dr. Alfred N. Goldsmith, Ray H. Manson, Louis B. F. Raycroft and Edgar H. Felix, referred to the wide and increasing use of receivers in all territories as an infallible barometer of broadcasting popularity. The committee therefore condemned the unwarranted restriction of wire-syndicated or chain programs.

2 The Columbia Broadcasting System, which had twenty-seven stations in regular co-operation, announced the enlargement of the "member stations" to forty-nine, effective January 8th, making the chain the largest in the world.

3 Officials of the National Broadcasting Company, which operates two large chains with WEAF and WJZ, New York, as main transmitters, discussed with the Federal Radio Commission the improvement of its chain, particularly to remedy poor reception of chain programs in the State of Iowa, in Fort Worth, Tex., and in Cincinnati.

4 The N. B. C. took a definite stand on the "elective" method of a station's chain program selection by opposing it as "commercially impossible." The elective method, recently adopted by WCCO, Minneapolis-St. Paul, leaves a station free to select which chain it will co-operate with on any occasion instead of ty-

Debtor is Spotted By His Broadcast

Oakland, Calif.

Some years ago, in a foreign country, a young man borrowed some money.

Recently the same young man had occasion to speak over KGO, the Pacific Coast station of the General Electric Co.

A few days later he got a letter from a DX hound nearly a thousand miles from KGO, asking him for the money.

Imagine the embarrassment of the debtor when KGO handed him the letter and the gratitude of the creditor for renewing old acquaintances.

102,000 ROOMS HEAR LESSONS

Preliminary returns assembled from various parts of the country show that at least 102,000 schoolrooms have been equipped with radios for Walter Damrosch's concerts for children, according to J. L. Ray of the Radio Corporation of America, which sponsors the educational hour.

Reports received by the Radio Corporation of America from its local representatives state that Dallas, Texas, has its entire school system equipped with radios for the series, as has also Beaumont, Texas. Kansas City and St. Louis have also prepared themselves on an ambitious scale.

Country as well as city schools are demonstrating an eagerness to hear the series. In Fort Bend County, Texas, every rural school has a radio and the district has installed its own station.

New Orleans reports that thirty percent of its schools are listening in.

A new development is the installation of centralized sets in schools,—that is, many schools are wiring the entire building for reception so that every classroom can listen in. The larger cities particularly are undertaking installation on this scale.

In many instances the cost of installing radios has been borne by individual parents or parent associations, who are moved by a personal desire to have their children benefit by the opportunity for musical education afforded by Mr. Damrosch's concerts.

Chains Start Counter-Drive

ing up with only one chain permanently. Henry A. Bellows, former Federal Radio Commissioner, is manager of WCCO.

Where Opposition Began

The opposition to extensive chain broadcasting first became intense in the Middle West, because the same program was tuned in from different stations, including distant ones. Other parts of the country later voiced complaints. The fact of repetition was not disputed, but the advocates of chain programs cited the much better quality of artists and presentations that the chains offered, and also referred to the economic advantage, since chains help solve the difficult problem of steady revenue production. Leading broadcasters showed that nearly all stations operate at a loss, comparing income with expenses, maintenance and capitalization.

The Federal Radio Commission received great bundles of complaint letters from listeners who said that chain broadcasting was ruining the variety that provided tuning-in with its most fascinating appeal.

The 300-Mile Rule

The Commission did not agree as a unit on the "menace" of chain broadcasts, but did adopt a rule circumscribing chain broadcast activities. This was General Order 43, limiting the broadcasting of chain programs by stations on cleared channels to those more than 300 miles apart. This order was to be effective as of the date of the reallocation, November 11th last, but so many difficult problems arose under the reallocation itself and were made still more knotty by the 300-mile rule, that the effective date was postponed until January 31st, so the Commission and the stations could deal with this problem in the light of experiences under the reallocation. January 31st is the expiration date of the 90-day licenses all stations possess. As not all licenses will be renewed, at least immediately, the 300-mile rule may be affected.

Effect on Radio's Future

That the chain program has an important bearing on the future of radio is admitted on both sides. On some chain programs a single artist has been paid as much as $3,000 for one performance, something unknown to individual station broadcasts. Hence the future excellence of programs is said to depend on the encouragement of chain operation.

The acute aspect of the problem arises in respect to cleared channels, of which there are forty, or eight in each of the five zones into which the United States is divided.

To cite an extreme and theoretical example, if all forty stations were on the air simultaneously some night with the same chain program, all the best and preferential channels, with their far-reaching transmitters, would almost monopolize the dial. Against such possibility is cited the growth of competition among chains. The N. B. C. has been the dominating chain agency, with its two networks, but now Columbia steps out in front, and Pacific Coast chains are growing with other chains under negotiation.

WGY'S TELEVISION SCHEDULE

WGY transmits television signals every Tuesday, Thursday and Friday, from 1:30 p. m. to 2:00 p. m. and every Sunday from 11:15 p. m. to 11:30 p. m., E. S. T., on 379.5 meters and on 21.96 meters. There is another period of television transmission on every Tuesday, 11:30 p. m. to 12:00 midnight, on 379.5 meters and on 31.4 meters. The transmission is developmental and the schedule may be changed or discontinued any time.

N.B.C. Reception Poor In Spots

Washington.

Officials of the National Broadcasting Company, which operates two chains, with WJZ and WEAF as key stations, conferred with the Federal Radio Commission on problems concerning the company's chain broadcasting. Remedies for poor reception of chain programs in Fort Worth, Tex., Cincinnati and various points in Iowa were discussed. Good reception of chain programs in the specified places was impossible, the Board was told.

The N. B. C. officials at the conference were Merlin Hall Aylesworth, president; George F. McClellan, vice president and general manager, and G. W. Payne, commercial engineer of the company.

Mr. Aylesworth also discussed the stand taken by former Radio Commissioner Henry A. Bellows, now manager of WCCO, Minneapolis-St. Paul, in refusing to take all of the National company's program. He told the commission that the situation was "commercially impossible."

LARGEST CHAIN TO BE COLUMBIA

The Columbia Broadcasting System will have the largest regular chain in the world, beginning January 8th. Forty-nine stations will operate regularly as a part of the system.

This announcement was made by the United Independent Broadcasters, through William S. Paley, president. This is the operating company.

The system now has twenty-seven stations and has perfected arrangements to add the other 21.

WOR and WABC, New York City, are key stations of the Columbia system.

The stations of the system, arranged in their respective groups as basic, Southern 1, 2 and 3, Far West and Supplementary, follow:

Basic: WABC, WOR, 2XE (short wave), WEAN, WNAC, WCAU, WFAN, WCAO, WFBL, WMAK, WKBW, WLBW, WJAS, WHK, WADC, WAIU, WSPD, WKRC, WGHP, WOWO, WGL, WMAQ, WBBM, KMOX, KMBC, KOIL, and WMAL.

Southern 1: WRVA, WTAR and WWNC.

Southern 2: WLAC, WDOD, WBRC and WREC.

Southern 3: KFJF, KFH, KRLD, KTSA and KTHS.

Far West: KLZ, KDYL, KYA, KMTR, KTR, KEX and KGA.

Supplementary: WCCO, WISN and WML.

Sweet and Brown New WLW Announcers

Cincinnati.

Two announcers have been added to the staff of WLW..

They are Norman Sweet, former chief announcer of WHAS, Louisville, Ky., and Robert Brown, former chief announcer of WGR, Buffalo, N. Y.

WLW is now using 50,000 watts.

EXPERTS FIND ATTACKS ON CHAIN FALSE

The Radio Division, National Electrical Manufacturers' Association, 420 Lexington Avenue, New York City, released a report of its Committee on Broadcast Allocation, in which the following appears, under the heading "Network Regulations":

"Having as an infallible barometer of broadcasting popularity, the sale of receiving sets in all territories, we condemn any unwarranted restriction of wire syndicated or chain programs.

"We have observed the marked increase of listening audiences in every territory when wire syndicated program service is initiated and regret the agitation against it.

Charge of "Politics"

"This agitation is largely for political effect and it assuredly does not have the support of the vast majority of the inarticulate listening audience.

"We are convinced that wire syndicated programs are independently selected by local outlet stations without contractual compulsion and solely with the program desires of its locality and audience in mind, much as newspapers select material for publication from items supplied them by the various press associations.

Fears Bad Effect

"Any premature compulsory synchronization of stations carrying wire distributed programs, if it is to effect channel conservation, would prevent the economic use of such local outlet stations for any local service programs which now constitutes the great bulk of their programs."

Evacuation Explains Fine Detection Mystery

One of the most frequent causes of distortion in broadcast reception—in fact, probably the most common cause these days—is an overloaded detector tube. In the desire to obtain greater volume, the radio enthusiast is likely to pile on as much plate voltage as possible on the detector, resulting in an overloaded tube and distortion.

The usual detector tube works best at 67½ volts maximum, although good volume is obtained at 45 volts. 22½ volts is generally too low with the usual —01-A or "hard" tube. Ocasionally, a tube is found that works well at 22½ volts and appears to be an exceptional detector. This is due to the fact that the tube is not evacuated as thoroughly as the usual run of —01-A tubes, and is therefore a "soft" tube, or one best adopted for detection.

For maximum volume and sensitivity, together with good tone quality, the detector plate voltage may be adjusted over a wide range. This may be done by inserting a suitable variable resistance, such as the volume control clarostat, shunted by a ½mfd. condenser, in the plate lead to the detector.

BOARD CALLED FAILURE IN ITS PRIME PURPOSE

The report of the Committee on Broadcast Allocation, Radio Division, National Electric Manufacturers' Association, on broadcast conditions as judged from the listeners viewpoint, follows, except for the part dealing with chain programs, published on the opposite page:

The Committee commends the Federal Radio Commission for having reduced the number of stations broadcasting simultaneously with the effect of lessening the prevalence of such disturbing effects as heterodyne whistles and cross-talk, but it regrets that the Commission should have failed to accomplish the prime purpose for which it was organized, to wit, the reduction of the actual number of stations licensed.

Stations Suffer Hardships

While the effect of license revocation is obtained, so far as reducing interference is concerned, by the extensive time sharing and power reduction put into effect by the Commission under the new allocation plan, yet, because of the economic hardships forced upon station managements thereby, the means to accomplish that result reduces the program standards of broadcasting and, therefore, the desirability of ownership of radio receivers.

A powerful station with a large operating staff, compelled to operate half time, is in no better position to expand and improve the character of its service than a skyscraper office building compelled by law to keep half of its offices empty.

When the Department of Commerce relinquished its supposed power to refuse broadcasting station licenses to any and all who applied as a result of an injunction in June, 1926, the number of stations licensed was 534, then considered an entirely excessive number for the broadcast band.

Lauds Cleared Channels

During the period of disorder and unrestricted licensing subsequent to the injunction, that number increased to 733 at the time the Commission took office under the Radio Act of 1927.

The number of stations under the new Allocation Plan is 625, a very minor reduction and even then a figure which does not fully represent the comparative conditions because of the greatly increased average power of the stations over those of 1926, a condition affecting primarily congestion on non-cleared channels.

The Committee urges the Commission to adopt a standard basis for rating of broadcasting stations for the purpose of deciding the relative service of two or more stations.

The Committee commends the Commission for the desirable tendency toward establishing cleared channels which the Committee has made a part of its first general reallocation effective November 11th, which provides for the first time actually cleared channels for night time broadcasting. Further experiment, experience and observation are needed to determine the interfering effect of the "day only" assignments made on many of the cleared channels.

Fifty Cleared Channels Wanted

The Committee reiterates its support of the Engineer's Plan which calls for fifty cleared channels (and originally for sixty).

Gist of Report Of Manufacturers

A review of the present broadcasting situation has been released by the Committee on Broadcast Allocation of the Radio Division, National Electrical Manufacturers Association.

The report of the Committee was summarized as follows:

The Committee feels that the Federal Radio Commission has failed to accomplish the prime purpose for which it was organized—reduction of the actual number of stations licensed.

The Commission is urged to adopt a standard basis for rating stations.

The Committee favors fifty cleared channels, instead of the present forty.

Only the complete repeal of the Davis Amendment will be helpful in the present emergency.

Maximum power should be used on all cleared channels so the greatest number of listeners may be served.

Having as an infallible barometer of broadcasting popularity the sale of radio receiving sets in all territories, the committee condemns any unwarranted restriction of wire syndicated or chain programs.

The Committee is opposed to the publicity given by the Commission to mere experiments in station synchronization.

The adoption of forty cleared channels is a step in the right direction but does not go far enough in making possible complete geographical coverage of the United States by high grade program service.

The Committee recognizes the embarrassment caused the Commission by the pernicious Davis Amendment and warns those considering its modification that only complete repeal will be helpful in the present emergency.

Modifying zoning boundaries and the number of zones, no matter how skillfully done, cannot be a fair basis for equalization, because any zoning plan is certain to discriminate against one zone or another in one or more of the fundamental factors such as total population, density of population, area, type of terrain, geometric shape and economic conditions, each of which has an important bearing upon equitable broadcasting service and differing ratios of national, regional and local services required in each zone, whatever its boundaries.

No zoning basis can be devised which will take adequate cognizance of these various factors so that the number of stations, channels, and powers may be equalized without injustice or inefficiency.

Wants Equality to Rule

An equitable service to all should be the sole basis and specification of the law.

As manufacturers of radio receivers, we urge the use of maximum power on all cleared channels in order that the greatest number of persons may be served.

The use of less than maximum power on cleared channels is a needless waste of the channel space.

The Commission's action in restricting the power on channels shared for simultaneous operation of stations on the same frequency is commended because it reduces the number of points on the dial at which disagreeable heterodynes are heard and makes possible local and regional service of a high character in many localities not served by larger local stations.

However, the restrictions of high power transmission to the twenty-five kilowatt maximum now permitted and the fifty kilowatt limit allowed experimentally, is far from the maximum utilization of the channel facilities involved and below the point that we can make receivers capable of eliminating cross-talk from neighboring channels.

625 STATIONS FAR TOO MANY, REPORT HOLDS

Receivers More Selective

There has been marked improvement in the selectivity of most receivers manufactured during the last one or two years.

The power of broadcasting stations should be sufficient to enable them to cover their service areas with a high quality signal. The Committee urges that the Commission encourage the use of powers greater than 50 kilowatts for regular service.

The Committee feels that these interests of the listener should be carefully safeguarded and the broadcasting of television and still picture signals, being of a disagreeable character when reproduced through the loudspeaker, should not be permitted to intrude at any time upon the listener's regular tone entertainment service.

Furthermore, the Committee fully acquainted with the present technical status of television, definitely states that with our present knowledge of the art, television of commercial quality positively can not be accomplished in the broadcast band within the maximum permissible five kilocycle modulation.

Should Retrict Stills

While this objection does not apply to still picture transmission, nevertheless picture transmission should be restricted to obscure hours which will not sacrifice the entertainment value of radio receivers.

The Committee is opposed to the publicity given by the Commission to mere experiments in station synchronization in advance of the time that the technical and practical problems of such synchronization are solved.

Such premature publicity encourages station managements and prospective broadcasters to believe that there is early prospect of great increase in the number of stations which may operate simultaneously through the actual application of carrier synchronization.

Since the number of channels now covering large areas has been greatly increased and selectivity of receivers improved, the prime need for carrier synchronization, namely, limited program choice in rural areas remote from any station, has been largely removed.

Largest Wire Tie-in Effected in Canada

The longest east to west tie-in on this continent, requiring over 10,000 miles of telegraph and telephone wires to hook up fourteen broadcasting stations in the five time zones of Canada, from tidewater to tidewater, was effected by the Radio Department of the Canadian National Railways when Sir Henry Thornton, President and Chairman of the Canadian National system, spoke recently to the 100,000 employes of the road.

The Canadian National Railways maintain eleven broadcasting stations operating between Halifax on the Atlantic and Vancouver on the Pacific. All of these, with three outside stations, were utilized in the tie-in.

STATIONS STILL TOO NUMEROUS, SAYS LAFOUNT

By Harold A. Lafount

Federal Radio Commissioner

I said six months ago that there were too many broadcasting stations in this country. I am still of that opinion and sincerely believe that the character of reception the public wants, and should have, can not be secured until the number of broadcasting stations is greatly reduced. This can be accomplished by the denying or revoking of licenses, or the consolidation of stations.

The Commission will, without doubt, be very strict in the future in requiring stations to operate on their assigned frequency, and to use only the power allocated; also stations failing to observe any General Orders may expect their application for renewal license to be denied.

Records Are "Personal"

Hundreds of letters from Fifth Zone listeners express indignation over stations using records and failing to so announce. Thousands of other letters quote sales talks, prices, etc., given over the radio by many stations. My opinion is that such broadcasting will be considered as "personal business," not public interest, convenience or necessity.

Short wave broadcasting is not likely to be permanently licensed. It is considered still to be in the experimental stage, and stations broadcasting on short waves are doing so under their experimental licenses. When a permanent service evolves, it is likely to be limited to the relaying of programs to great distances.

Limited Supply

Station owners should not ask their listeners to write to the Commission in support of applications or concessions such as more time, increased power, change of frequency, etc.

The listening public generally are not advised, and therefore do not know, that what you may be applying for cannot be given without being taken from someone else. The general opinion is that the supply is limitless, but the facts are that the opposite is true.

More than a hundred broadcasters have been heard by the Commission in Washington during the past one-hundred days.

Every Station is "Best"

I have learned by attending these hearings that every station owner is positive his station is the best, every one of them gives so much time to agriculture, religion, charities, etc,, etc., and all seemed sincere in the belief that they were doing a better job than the other fellow.

General Order No. 7 permits a deviation of one-half kilocycle from the assigned frequency of a station. My opinion is that this allowable deviation will soon be greatly reduced.

An amended order regulating chain broadcasting is contemplated.

It is very probable that the Commission will shortly require all broadcasting stations to install and use a dummy antenna for use during warming-up period.

R.M.A. to Report On Reallocation

The Radio Manufacturers Association, comprising virtually all prominent manufacturers and representing about 98 per cent. of the total distribution of radio products, is obtaining the data and views of its members on results of the reallocation and asking suggestions for measures which may better broadcasting reception.

Questionnaires are being sent to all of its nearly 300 members concerning the local and national results of the new radio set-up.

The tabulated results will be presented to the Board of Directors at their next meeting, January 11th and 12th, at Briarcliff Lodge, New York.

KENT PRIZES ARE AWARDED

The final contest in the second annual Atwater Kent Foundation National Radio Audition was held recently in the studio of the National Broadcasting Company, New York, and broadcast over a nation-wide hook-up of stations.

The winners of first places were Miss Hazel Cecilia Arth of Washington, D. C., and Donald Novis, of Passadena, Calif. Each of these was awarded a cash prize of $5,000, a gold decoration, and a two-year scholarship at a leading American conservatory.

The second prize winners were Miss Dove Irene Kilgore, of Oakland, Calif., and Kenneth D. Hines, of Buffalo, New York. Each of these was awarded a cash prize of $2,000 and a one-year scholarship.

The two third prizes of $1,000 in cash and a one-year scholarship were awarded to Miss Anna Mae Chandler, of Fayetteville, Ark., and Wilfred A. Engelman, of Detroit, Mich.

The two fourth prizes of $500 were won by Miss Gladys Morrison Ball, of Kansas City, Mo., and Patrick H. Wilson, Jr., of Galveston, Texas. The two fifth prizes of $250 in cash were won by Miss Carmen Rosell and Ernest P. Ferrata, both of New Orleans, La.

The judges of the contest were Madame Louise Homer, Metropolitan Opera contralto; Dr. Willem Mengelberg, conductor of the Philharmonic Symphony Orchestra; Dr. T. Tertius Noble, composer, organist, and choir master at St. Thomas's Episcopal Church; Giovanni Martinelli, tenor of the Metropolitan Opera; Pierre V. R. Key, editor of the Musical Digest; Yeatman Griffith and George Ferguson, New York singing teachers.

All Station Licenses Expire January 31st

Washington.

The licenses of all broadcasting stations will expire on January 31st. Stations must file renewal applications before that time.

Stations formally accused of violating orders of the Federal Radio Commission will be denied a renewal, pending decision on the counts after a hearing.

Already numerous stations have submitted their applications for license renewals, some asking for improved facilities. Hearings will be held by the Federal Radio Commission.

WLS REQUESTS 100,000 WATTS AND 119 HOURS

Washington.

An application to increase its present 5,000 watt power to 100,000 watts, which would make it the highest powered broadcasting station in the country, was sent by WLS to the Federal Radio Commission. WLS is operated by the Agricultural Broadcasting Co., Chicago.

The station now has five-sevenths time on the 870-kilocycle channel, with the other two-sevenths time assigned to WENR, operated by the Great Lakes Broadcasting Co., a subsidiary of public utility interests. WENR recently applied for full-time and an increase in power on the 870-kilocycle channel, which application is under consideration by the Commission at this time.

Wants 119 Hours Weekly

The WLS application cites that the station now broadcasts 71 hours and 30 minutes per week. "If construction permit is granted we would operate our station as many hours as the Radio Commission will grant us between 7 a. m. and 12 p. m.," it states.

It is also shown by the application that 51 per cent of the stock of the Agricultural Broadcasting Co. is owned by the Prairie Farmer Publishing Co., and the remaining 49 per cent is owned by Sears, Roebuck & Co.

Board Has Contrary Rule

Construction of the new 100-kilowatt transmitter would be commenced immediately upon completion of a study of available equipment to determine what apparatus is best suited to the station's needs, should the construction permit be granted.

The Commission has a standing rule limiting power to 25,000 watts, with an extra 25,000 for experimental purposes.

"Hi-Q" Shields Useful for Many Circuits

Among the products that are in great demand, of the famous Hammarlund line of precision parts, is the "Hi-Q" Shield. This shield is ruggedly constructed of heavy sheet-aluminum sides which slide into grooved aluminum posts and are held firmly together by screws. While this shield was designed especially for the hammarlund-Roberts "Hi-Q," the home constructor and custom set builder will find it useful for practically any circuit. The HQS Shield has two compartments, 3¼ x3½x5¼" high, inside measurements. The HQS-1 Shield has one compartment of the same inside measurements. Both of these shields are supplied knockdown and are very easily assembled. A complete catalog of the Hammarlund parts may be had from the Hammarlund Manufacturing Co., Inc., 424 West 33rd Street, New York City. Mention RADIO WORLD. —J' H. C.

DIFFICULTIES TO GROW, SAYS BOARD REPORT

Washington.

Increase in radio problems is predicted in the annual report of the Federal Radio Commission to Congress.

"Because of the rapid developments which are taking place in radio communication, a large number of subjects have had to be covered," the report states. "The likelihood is that as the art progresses, radio problems will increase rather than decrease. The possibilities of the high-frequency spectrum are almost without limit.

"The future of such matters as radio-television, picture and fascimile transmission and relay broadcasting can only be matters for speculation. How soon and to what extent the frequency spectrum above 23,000 kilocycles will be developed for practical use is also a matter of guesswork.

Future Uncertain

"To what extent future advances will make possible an increasing number of channels and the accommodation of a larger number of stations is unknown.

"The Commission is convinced, however, that Congress acted wisely in providing for its standard that of public interest, convenience, or necessity and it is endeavoring to apply this standard to each new set of problems in a manner consistent with the best interest of the entire public, both present and future."

The report discusses the steps leading up to the reallocation of broadcasting facilities which became effective November 11th.

One of the great problems, it says, was in endeavoring to achieve better radio reception and at the same time to work toward the "fair, efficient and equitable radio service" as between the different States and communities as required by the Davis amendment to the Radio Act of 1927.

Members Differed

Moreover, says the report, there was a difference of opinion as to the intention of Congress with regard to the method of putting the amendment into force.

"A majority of the Commission has construed the amendment as requiring an immediate reallocation of broadcasting facilities so as to attain the prescribed equality," the report sets forth. "Commissioner Robinson (Ira E. Robinson, chairman) has construed the amendment as indicating a policy to be followed in the future by the Commission in gradual steps without calling for any general rearrangement of stations immediately, and that the equalization was to be accomplished 'when and in so far as there are applications.'"

The total number of stations was reduced from approximately 690 on June 30, 1928, to approximately 620.

NEW CORPORATIONS

Hadley Process, Inc., radio supplies—Atty., C. R. Freeman, N. Y. City.

Rockaway Radio Corp.—Atty., M. Feldman, Far Rockaway, N. Y. City.

Morosco Radio Corp.—Atty., I. W. Levitas, 1,170 Broadway, N. Y. City.

Allied Broadcasting Companies, radio presentations—Atty., M. Chopnick, 17 E. 42d St., N. Y. City.

Marsh Radio Laboratories—Atty., C. A. Conner, 261 Broadway, N. Y. City.

Wave Wanderlust Upsets Reception

By GEORGE K. BURGESS
Director, Bureau of Standards

Irregularities of radio reception have been found to be in part due to the fact that the waves sometimes follow a multiplicity of paths in going from the transmitting to the receiving station because of varying ionization and other conditions of the atmosphere.

Conditions at the transmitting station have little effect on the wave behavior. Fading occurs at much shorter distances than commonly supposed, being appreciable as close as eight miles to a broadcasting station. Direction shifts studied in connection with a radio beacon are due to the horizontal component of the downcoming waves. An antenna for air planes free from the action of this horizontal component has been developed.

RADIO BOOSTS RECORDS' SALE

The influence of radio upon the musical interests of the country is revealed in statistics just made public by the U. S. Census Bureau, covering the production of musical instruments.

The organ alone has retained its popularity in spite of the inroads of radio into the American home. The production of organs last year shows an increase of 31 per cent over 1925. The value of the output at the factory was $14,262,688.

Organ music lends itself readily to broadcasting and some of the outstanding makers have regularly broadcast organ recitals. Pianos, on the other hand, fell off 29 per cent, last year, over the preceding census of manufacture.

The outstanding barometer of radio influence is shown to be the phonograph record. As was true with the publication of sheet music, records show an enormous increase. Last year the American public apparently spent more than $50,000,000 for records. The Census report shows more than 100,000,000 records were manufactured—an increase of 28 per cent over the year 1925.

This appreciation is attributed to the growing popularity of the outstanding musical artists on the air. Thus the world famous singers of the opera and concert stage, regularly broadcasting each Sunday night in the Atwater Kent Radio Hour, over a network of twenty-nine stations, are said to have an audience running into the millions. Their radio introduction into the homes of the phonograph has resulted in an increased demand for their phonograph records.

Except for the piano and organ statistics above, the report shows a 45% music instrument sales decrease.

A THOUGHT FOR THE WEEK

Did you listen in on that half-hour the other night when somebody played on the organ the melodies of several popular songs of recent years and then rendered the classic originals from which they were stolen? It was a pretty clear example of a convincing deadly parallel on the keyboard. But whither does it lead? Does it mean a better understanding of music or does it merely upset undeveloped musical minds and lead them to suppose that most modern modern composers of the lighter forms of music are out-and-out pilferers of the genius of others? Does it enlighten or merely muddle? What say you?

PROHIBIT JAZZ ON SUNDAY, IS ALLIANCE PLEA

Washington.

Limitation of Sunday broadcasts to programs of a spiritual and uplifting nature was requested of the Federal Radio Commission by the Lord's Day Alliance. Broadcasting of jazz, popular songs generally, and anything not of a lofty and inspiring nature should be prohibited, the Alliance holds.

Objective Explained

The Rev. H. W. Bowlby, secretary of the Alliance, explained the objective as follows:

"We want to see the Sunday radio carry only programs which will be helpful and spiritually uplifting. We want to see everything eliminated which would be detrimental to good morals or an insult to the day.

"We couldn't very well get this into our program of legislation by stations, as it is more properly a matter for Federal regulation."

Would Ban Sponsorship

Sponsored programs, it was said, should be prohibited on Sunday, because it is contrary to the rule that the Lord's Day shall not be commercialized.

The Alliance is composed of members of twenty church denominations, these churches having a membership said to be 20,000,000.

Pat Kiley Adds Thermatrol to Lines

Pat Kiley has added the well-known Thermatrol family to his other lines of radioapparatus. These appliances are manufactured by one of the oldest and best-known makers of electrical devices and automatic heat controls in the country.

The Thermatrol family consists of the Therm-a-trol Voltage Control, Lightning Arrestor and the Automatic Speaker Control. The line voltage control gives full protection to AC tubes, eliminators, etc., is thoroughly insulated and heat-proof and is adaptable to differing AC voltages and frequencies. The lightning arrester is full-glazed and waterproof, finished in beautiful color. Heavy terminals insure ample current carrying capacity.

It is the non-air gap type, with carborundum resistor block preventing shorts, and each arrester sold carries $100 insurance guarantee against damage, effective when the card in the box is signed and returned to the maker. The automatic speaker control is for use with AC sets using separate dynamic speakers. It automatically turns on and off the speaker when the set switch is operated and requires no extra wiring. Terms and full information may be had from Pat Kiley, 140 Liberty Street, New York City, for the asking. Mention RADIO WORLD.—J. H. C.

HERTZ BACKED MAXWELL

Maxwell took two experimental facts about electricity and magnetism and manipulated them by formal mathematics. He concluded that radio waves existed. The world scoffed, except Heinrich Hertz, who set up a tiny radio transmitter.

EXPERTS BALK AT IDEA MOON ECHOED SIGNAL

The observations of Jorgen Hals, a Norwegian radio experimenter, of long-time radio echoes, as reported by Professor Carl Stormer of Oslo University in a recent lecture before the Academy of Science, in Copenhagen, Denmark, have created an intense scientific interest among radio men throughout the world.

Most of the interest shown is speculative, as it must be, since the only echoes previously observed were of short duration, or about a quarter of a second.

Professor Stormer reports echoes occurring from 3 to 15 seconds after the arrival of the direct radio signal. This means that the signals must have traveled an effective distance up to about 1,000,000 miles and back.

If the signals left the earth they must have traversed the Heaviside layer twice, a layer of ionized gas from 100 to 400 miles above the earth, which had been regarded as an impenetrable barrier to radio waves used for signaling.

What Experts Think

If it is admitted that the waves did penetrate the layer both going and coming, a reflecting layer out in space must exist which threw them back to earth. What is this layer? Is it the surface of the moon? Perhaps, for the 3-second echoes. From one of the planets? Not likely, for the nearest planet is many times farther away than the distance indicated by the 15-second echo.

Dr. Lee De Forest is not willing to assume there exists an ionized layer some hundred of thousands of miles above the sea level but is one of the few inclined to look to the moon as the reflecting surface.

Dr. A. Hoyt Taylor, U. S. Naval Research Laboratory, reports that many studies of echo signals have been made at the laboratories and that echoes having traveled 50,000 miles, that is, twice around the earth, have been detected. The retardation of the echo was about .28 of a second.

He also states that a deliberate attempt had been made to shoot at the moon with a 20,000 kc transmitter with the hope of receiving the reflected signals. Although the receiving apparatus was of a sensitivity which would just have been able to detect the reflected wave, no echo was observed.

However, he is not convinced that the echoes do not exist, and he believes it possible with more sensitive receivers that the echoes may be detected. Dr. Taylor believes with Prof. Stormer that the long-time echoes could not have been due to signals traveling many times around the earth, and agrees that the evidence points to reflecting layers in space.

Hulburt's Supposition

E. O. Hulburt of the U. S. Naval Research Laboratory says that there is a mathematical possibility that the ionic density in the Kennelly-Heaviside layer may be, under certain conditions, such as to retard very greatly a wireless ray entering the layer before sending the ray back to earth again. It is possible that a ray travels up to the layer in one thousandth of a second, travels in the layer for about 10 second, and then comes back to earth with its usual high speed.

Mr. Hulburt also suggests that the reflecting layer in space may be the region of the Zodiacal light. This is a region extending about a million miles outside the orbit of the earth which is believed to contain meteoric dust and molecules. But the density of material in this region is so small that it does not seem sufficient to reflect a ray, according to Mr. Hulburt. Furthermore, the Zodiacal light region is fairly permanent and therefore the long time echoes would be of common occurrence, whereas the evidence is that long time echoes are rare.

"Remote Possibility"

Dr. J. Barton Hoag, of the University of Chicago, accepts the suggestion of Professor Stormer that the echoes were reflected from regions in space only as a remote possibility. But he suggests that the long-time echoes may be due to signals passing through the earth at a velocity considerably less than their usual velocity.

Dr. Hoag further calls attention to the effect of the long-time echoes on commercial transmission of messages. Any echo of dots and dashes arriving after the main signal confuses the operator, making the signals unintelligible. In television such echoes would produce ghost images or irregular blotches. Such effects in television have been observed already.

Disturbing echoes are observed only on short waves from about 30 meters down, which for the most part are below the range of waves used at present.

GREAT COLLEGE OF AIR NEARING ITS FIRST NIGHT

Projects for the establishment of a great "University of the Air," whereby carefully arranged courses of study will be available for radio listeners everywhere, are being consistently pushed forward, with the cooperation of all the important radio interests, according to Graham McNamee, who sums up the educational scheme in an article in "The American Magazine." A special committee headed by Dr. E. A. Alderman, president of the University of Virginia, is working on the plan. The committee membership includes Owen D. Young, Charles E. Hughes, Elihu Root and Julius Rosenwald.

The new University of the Air plans to bring the culture of the world to our people as vividly and as perfectly as radio now brings a prize fight, a political convention, or a world's series.

A Start Has Been Made

Mr. McNamee explains:

We have had a number of experiments in radio teaching. The schools in Schenectady have done some work along this line. Over our own broadcasting station we have had a course in Phonetics by Dr. William Tilly of Columbia University. Professor Phillip Molt has given a course in French which was most successful. Beyond doubt, the radio will lend itself admirably to the teaching of languages. Dr. John B. Watson has given a course of lectures in Psychology. We have had other lectures on various subjects.

"But all this has been unorganized. Radio instruction will work out its own technique in the field of science and literature just as in the field of music.

Education for Adults

"In the past it has not been possible to have a great musical authority give lectures in a school accompanied by a magnificent symphony orchestra. And for the very good reason that the cost would be too great. But the radio enables the school to do what American business is doing—adopt the benefits of mass communication.

"Of course, people's education does not end when they leave school. In fact, it is only then when the opportunity and the capacity for real culture begins. And so these gentlemen have recognized the need for making this University of the Air useful to the adult listener in."

The Speech Inverter

Scrambles Sound into Unintelligibility, Then Restores It

By St. John Fallodon

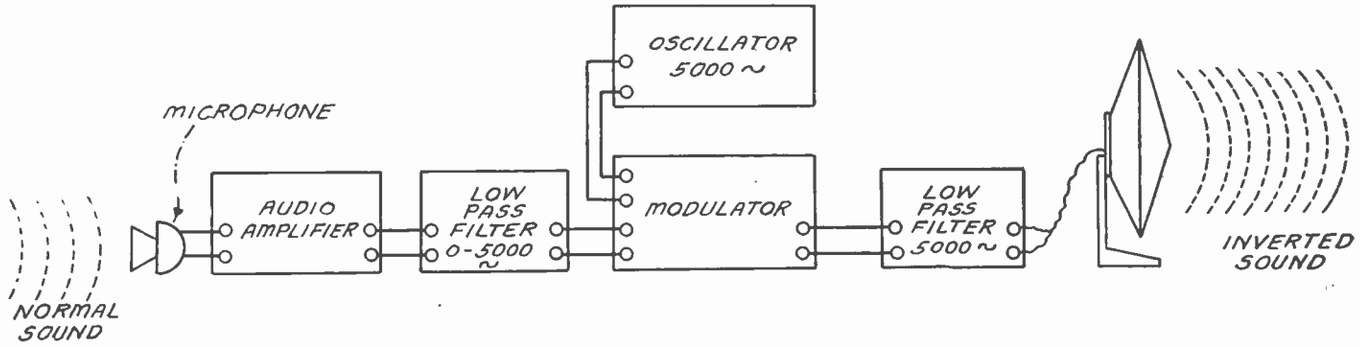


FIG. 1
THIS DRAWING INDICATES THE NECESSARY UNITS FOR A S PEECH INVERSION CIRCUIT

SWIFT communication is a necessity in conducting a war. But this communication must be conducted so that the enemy cannot eavesdrop. It must be secret, or the signals, whether voice or telegraph must be quickly intelligible to the persons for whom intended and unintelligible to the enemy.

To effect the secrecy many difficult codes have been invented, but most of these are decipherable by the enemy and all that is gained by the use of the code is a little time.

Since radio has been used, the necessity for secret codes has been greater than when wire lines were used. When telephony is used codes are difficult because a special jargon would have to be developed, and this would be difficult both to transmit and to receive.

There are cases when a secret method of voice transmission is very desirable when neither party to a conversation could be expected to use a code.

Many schemes for secret radio telephony have been proposed and tried. Some of them offer a certain exclusiveness as it requires special apparatus to make the signals intelligible once they have been transmitted.

Voice Inversion

One of the simplest of these methods is that of voice inversion. In this the voice is turned upside down. The low notes or sounds are made high and the high are made low. This is done twice, once at the transmitter and once at the receiver. The parties to the conversation are not aware of the double conversion, but anyone trying to listen in would be unable to understand any of the noises.

For wartime communication this method is not secret enough for the enemy could equip himself with the same inverting apparatus and he could very quickly discover the key to the code. In fact, he could record the unintelligible noise on a phonograph record and decode it. Again he would only lose a little time. But for ordinary radio conversations the method is suitable, as very few persons would go to the trouble of setting up the inverting equipment or of recording the noises. But even in peacetime there may be conversations of sufficient importance to warrant some one to listen in even under the most difficult conditions.

At present inverted speech is used mainly to entertain audiences and to impress laymen with the wonders of science. As a means of entertainment the idea has certain value, both for the stage and the home. The required apparatus is not much more complex than a radio receiver, and it contains exactly the same components—tubes, condensers, coils and resistors.

Simple in Principle

The principle on which speech is inverted is based simple. It is used in every Super-Heterodyne. In the Super the inverted signal is not selected, and in those circuits in which is is so selected, it is reinverted so that the signal comes out right side up.

The inverter is simply an oscillator and a modulator. The frequency of the oscillator is chosen suitably low. When this frequency is mixed with the normal signal two sidebands are produced, as in all cases of modulation. One of these sidebands is inverted and the other is right side up. The inverted sideband is selected and the other is suppressed.

A scheme which might be of use is indicated in Fig. 1. First we have a microphone on which the normal signal falls. Then follows a speech amplifier which is of the same structure as the audio amplifier in a radio receiver. Following the amplifier is a low pass filter which suppresses all frequencies in the signal above a chosen value. For example, this might suppress all frequencies above 5,000 cycles and let through only those which are of lower pitch.

The output of the speech amplifier is impressed on a modulator, or detector. This corresponds to the first detector in a Super-Heterodyne. On the same modulator is impressed the output of a low frequency oscillator. For example, this may have a fixed frequency of 5,000 cycles, one sideband ranging from zero up to 5,000 cycles and one from 5,000 up to 10,000 cycles.

The sideband from 5,000 up to 10,000 cycles is right side up but it is unintelligible because 5,000 cicles have been added to every signal frequency. The sideband from zero to 5,000 cycles is inverted and is unintelligible for that reason. To prevent the upper sideband from interfering with the lower, a low pass filter is put between the output of the modulator and the loudspeaker. This filter might have a cutoff at 5,000 cycles. Thus only the inverted sideband reaches the speaker.

Numerical Example

The lower and inverted sideband in the above assumed case is 5,000—F, where F is any one frequency in the normal signal. Suppose F is 5,000 cycles, the highest note that the first low pass filter let through. This frequency will be represented in the output of the modulator, and hence in the loudspeaker, by zero. Of course that cannot be heard. Suppose F is 30 cycles, the lowest audible frequency in the signal. This is represented in the output of the modulator by 5,000 less 30, or by 4,970 cycles. Thus the high notes have become low and the low notes have become high. Since the lowest note than can be heard is about 30 cycles, the highest note which will be audibly inverted is 4,970 cycles.

The only note which is not inverted is that which has the mean frequency between zero and 5,000 cycles, that is 2,500 cycles. The frequency of the oscillator might be called the frequency of inversion. It is not at all necessary to make this 5,000 cycles. It may be 3,500 or 10,000 cycles, for example. The filters should be chosen according to the frequency of inversion. But the cutoff frequencies do not have to be the same as the inversion frequency.

Automatic Interpreter

The object of the scheme indicated in Fig. 1 is to make the signals unintelligible. If the system is to be useful there must be a device which reinverts the signal, or a device which automatically interprets the jargon. This device is simply another oscillator and another modulator just like the first. The frequency of reinversion must be the same as the frequency of inversion. If it is not, the tones in the interpreted signal will be either higher or lower than the original tones. And what is ruinous to music is that the tones would not bear the same relation to each other. This would result in dissonance.

The fact that the frequency of inversion can be varied suggests a possible way of increasing the difficulty of interpretation, or of making the transmission more secret. Suppose the frequency of the oscillator varied at definite intervals by definite and prearranged amounts. The frequency of the receiving oscillator would change at the same time and by the same amount. This would make it very difficult for any eavesdropper to find the combination. This variation might be controlled by two machines running at the same speeds. Or the variation in the inversion and reinversion frequency might be continuous and controlled by other oscillators of slow period. This would add the difficulty of synchronization to the communication.

We Don't Hear Straight

That's One Big Obstacle to Standard Radio Receiver

By Knollys Satterwhite

MAN being a creature of habit, he can get used to hearing a certain form of distortion to the point of regarding the absence of such distortion as being itself distortion. This seems strange, in print, but since it actually happens so often in life it is well to reckon on this condition in respect to receiver and speaker construction.

The question naturally arises whether it it worth while reforming some one who is quite happy in his state of ignorance and harmless vice. It seems a pity to disturb his equanimity. Like the father spanking the child who erred in judgment, the inflicter of the punishment may be making the bigger mistake. So the doctrine of *caveat emptor* applies, and he who knows that another's acoustical bliss is built on foundations of sand may wisely prefer to hold his own peace.

Personally I am more iconoclastic than that. My only condition is that I should have more than a bowing acquaintance with the person whose acoustical taste I feel impelled to reform. Strangers had better be left alone, therefore dealers will prefer to give a man—and particularly a woman—what he or she wants, be it indifferent, poor or bad.

Some Do Reform

The benevolent acoustical expert, with no commercial motive, no necessity for making a curtsey, may tilt his lance toward the erring listener, knowing there is a chance for reform.

The same habitual condition that makes a man enjoy a certain form of distortion may be overcome by the habit of listening to distortionless radio—a privilege which, by the way, is not enjoyed by so many as imaginative surveys might lead one to suppose.

An example comes to mind—a man who had a special fondness for low notes. He cultivated this taste in fine style, by introducing every device suggested to him. It was this misinformed fellow's idea that, since low notes are the hardest ones to bring out, the solution was to accentuate the low notes in such a manner as to turn the situation around. He fancied that, since low notes (as he had read somewhere) need special emphasis to be realistic in reproduction, therefore the high notes were overstressed, and if he cut them down, the lows would come out much better, which they did, but that the middles and the rest would be exactly as they should be.

Attacked the Highs

He introduced a large condenser across the speaker terminals, which put an effective quietus upon the highs. He had a very selective receiver, he used regenerating audio couplers that favored the lower register, and the result was what he called "music with great body to it," but which any system of metered measurements would show to be gross preponderance of low notes, somewhat overstressed middle register, and sadly attenuated highs.

It is just as bad an example to distortion to have the lows overdone as it is to have the highs or any others. An entire register is favored. Absence of favoritism in the actual reproduction is what constitutes realism.

This man was surprised to be told that his receiver was distorting. It was like taking a piece of candy away from a delighted child with the incomprehensible explanation that it was not pure. This business of breaking the sad news to Low Note Sam hurt. He did not believe it, and besides he was sore about the accusation and, indeed, the deprivation that came to pass.

The Great Experiment

Without telling him that I was using him as an experiment, I contrived to get his receiver away from him and have him use my own instead. My excuse was that I desired to make some tests and measurements of his own receiver and the work could be done only in my laboratory, where the audibility meters, frequency testers, amplification testers and automatic response curve runners were located. All these instruments were truly in the accredited place, but I was not so keen about testing his receiver as I was about him testing mine in his own way.

The first few days he wanted to know how soon I was going to return his own distortionless receiver, and take away that noise contraption that I had loaned him in its place.

"Pretty soon," I encouraged him, although I knew it was not yet time for the restoration, since he was as far from being won over as a man could be who simply wasn't.

Cured by Habit

I did not tell him that the receiver I had loaned him, plus the speaker that I had sent along with it, constituted about as fine a frequency responder as had ever been concocted, and that in tests in several laboratories it had been decreed a realistic combination by any test applied to it, including bare human ears, which are very poor indicating devices.

Toward the end of the week his insistence had worn down. After two weeks he seemed almost able to tolerate listening to my receiver. At the end of a month I had to sell him my set—he didn't like his own when he heard it going in my laboratory.

But I took his set over to his home, and switched quickly from one to the other when receiving a station. I succeeded merely in increasing his disgust with the receiver he had once proclaimed the best of them all. He had been cured by habit, just as he had been afflicted originally by habit with the penchant for hearing the bass overdone.

Sensitive About Ears

All of us like to fancy that what we think we hear is what is really sounded, and indeed we do not know any different except when our hearing is tested scientifically.

We think nothing of getting our eyes examined. We have a headache now and then and attribute it to eye strain. We read for a few hours and our eyes water and get tired. So we suppose there must be something the matter with our eyes.

We get them examined by an optometrist and he tells us we have myopic astigmatism. We do not feel insulted when he says so, nor when we are ordered to wear glasses with lenses in them ground to certain dimensions and coutours to help correct our affliction. Imagine, however, how a man would feel if you even mildly suggested to him that he really ought to have his ears examined!

In the first place he might feel you were questioning his personal cleanliness.

Even if he sensed you were referring to his hearing qualities alone, he might take offense, although had you said the same thing about his eyes he would have regarded you as extremely considerate of his welfare.

Ear a Poor Measurer

This lack of ear examination, therefore, is responsible for our own ignorance of how our ears are behaving. We are satisfied if our ears give us the precious asset of hearing, and I am sure we care nothing much whether we hear some frequencies distorted or not. We are like the man who did not pretend to be an art critic, but he knew what he liked. Without half knowing it, so greatly do we enjoy the sense of hearing, that we do not care much how faithfully we hear any notes or ranges, but are glad we hear them so unfailingly.

Constantly we use our ears as measuring devices, although the human ear is a very poor measuring instrument. It deceives us into saying that one note is "twice as loud" as another, whereas actual measurement proves it to be a hundred times as loud. We listen to some speaker and say it is marvelous—how faithful—what realism—but it happens to be a poor speaker, let us say, and it merely favors the form of distortion we enjoy best. To many of us the only kind of real tone quality is distortion, either wave form or frequency distortion, or both, and we have our own peculiarities of taste in hearing just as we have in eating.

Relative Deafness

In some aspects relative degrees of deafness are the cause. A person may be stone deaf, he may be deaf to certain frequencies and sounded as to others. Indeed, we need only realize that a canary can hear notes much higher than most adult human beings can, to realize that all of us are deaf to certain frequencies. The range of human hearing, roughly is from 25 cycles to 10,000 cycles. As to the 24 integral frequencies below the minimum, and the infinite number above, all of us are stone deaf.

Therefore it is easier to realize that even in the frequency range to which one's ear responds, that response may not be a straight line. It may have crests and gulleys in it, like the curve of a poor audio transformer before the advertising expert subjected it to corrective analysis.

Therefore we are acutely responsive to notes where the curve runs high, while in the dips and valleys we are relatively insensitive. We may remain that way incurably.

Aural Hygiene?

Perhaps the day will come when ear doctors will provide necessary examination and corrective appliances so that those who hear crooked can hear straight, and know what a delight there is in correct hearing—as in correct seeing or correct eating.

But the new delight will wear off fast, and man, creature of habit, will get no more enjoyment out of hearing straight than out of hearing crooked. But at least he will hear straight, and that's something. If ears could be standardized in response, as eyes can be standardized, we could work more rapidly and successfully toward standardized radio and audio circuit to produce the results the ears really demand. Now we produce the results that meters and other indicating devices demand. The sets are made for meters to test rather than for ears to hear! That is what makes the goal so hard and brings indictment of fine receivers and groundless praise of poor ones.

Radio as a Hobby

Plays an Important Part in Making Life Worth While

By James H. Carroll

Contributing Editor

MEDICAL men the world over, no matter how much they may disagree on diagnoses, symptoms, treatments, etc., unanimously agree on one vital truth and that is, that the man with a hobby is better off than he who has none.

And that is true on many counts, health vitality and nerves are always on a higher par, reactions of all kinds are quicker and more accurate, powers of perception are keener and judgment is sound and sure in the man with the hobby over the business slave. Reasoning along these lines, we might jump to the conclusion that those engaged in the radio industry enjoy better health than those engaged in others. However, while this is not the premise we are endeavoring to reach, there may be a lot of truth in it.

Comparing the men we know in radio, they are certainly more "alive" than the people we know engaged in other lines and our observations lead us to believe that radio men and newspaper men are the most alert, keen class of any. They live the fullest lives and get the most out of life, so to speak.

Attractive to the Brainy

We set out, however, to show the advantages of radio as a hobby over all other hobbies and how much more one gets out of it for the time and money spent thereon.

The deductions set forth above do not necessarily prove that these men owe their vitality to these professions, but it may be that the most vital and brainy men are drawn to them.

It certainly takes brains to be a good radio man or to make a success in the other profession mentioned. However, the fact remains, no matter what the pro or con that we gain a good argument from the facts presented in favor of radio as a hobby.

When we speak of radio as a hobby, we must necessarily draw the line decisively between fads and hobbies. A fad is a temporary state, evanescent in its grip, doing the faddee very little, if any good, and sometimes some harm, while a good healthy, heman's hobby lasts a lifetime, stays with one like a good friend and returns big dividends in happiness, amusement and education.

Several Kinds

When we enter into the field of hobbies, we find that there are several kinds and classifications. There are only two main kinds and of these the oldest known to man is that of collection. One might say it started with the beginning of creation when Eve started collecting apples, and way back in and through the dawn of history, men were collectors, and even among the most primitive, had hobbies.

In ancient China at the time of Kung-Fu Tze, or Confucius, there were collectors of butterflies, precious gems and stones. In ancient Greece and Rome, there were coin collectors and among the Patricians there were those who had collections of pottery and virtue, not to mention the collectors of armor, swords and daggers. Collecting as a hobby, however, is expensive and does not teach its practiser very much except in the case of our present day coin and stamp collectors who gain a wide knowledge of geography and history in their pastimes.

Touching on the mercenary side, many of them make money; but these are chiefly among the professionals, the amateurs are seldom in on the big money and spend more than they ever gain.

Radio Gives More Than It Takes

Among radio hobbyists, however, there are thousands that make money and they are not confined to the custom-set builders' class by any means. They are people whose hobby is radio and who build sets for their friends, incidentally charging for their time and labor. It was more our purpose to show what radio as a hobby gave in return on the mental, spiritual and physical plane and not the rewards in filthy lucre but as long as we got to this point, we might as well mention the more material dividends.

Let us see what radio does for one who practises it as a hobby. In the first place it undoubtedly quickens the mental faculties; for the nervous, it gives poise and soothes the nerves, steadiness of hand and keenness of eye together with a wide education in electricity, physics, geography and kindred things, not otherwise attained, as well as acoustical training and appreciation and education in good music. Skill with tools is acquired by the tyro and self-confidence is born and strengthened in the timid soul who otherwise would labor through life with the handicap of an inferiority complex.

Stop and think for a moment and show us any other hobby which repays with all these blessings the time, money and thought spent on it. What is the cost of a radio hobby? some one asks. The answer is, all the time one wants to give to it, and very little money in comparison with other hobbies.

Known by Company It Keeps

It gives also the joys that accrue to the collector class of hobbyists, for one can soon accumulate a collection of first-class receivers built and made to function by one's own hands. When the collection grows out of bounds, the fellow with limited means can find a market, the fellow with a long purse can find an unlimited outlet for the work of his hands; there are thousands of wounded veterans whose lives would be lengthened and lightened by the gift of a radio; there are poverty stricken homes, shut-ins, homes for the aged where radio would bring joy and comfort.

Where then, is there another hobby which gives such joy to the practiser and his beneficiaries?

Radio as a hobby intrigues all classes of people and has in its ranks more distinguished people than any other hobby of any time or period. This is partly due to its fascination.

In building a circuit and making it work, one feels that he has created a living mechanism, and drawing music and words from the air makes him participate in the feelings of a magician who has achieved a great feat of legerdemain. When he gets so that he can build amplifiers and makes and matches up a few speakers, he in truth has accomplished greater things than the fabled Djinn of the "Arabian Nights," for while some of them could fly on magic carpets, none of them is reputed to have drawn speech from around the world; they just didn't have the apparatus.

Diplomats receive surcease from radio; doctors and surgeons get relaxation from the building of circuits and apparatus (we know one distinguished surgeon who has built every new circuit and is now waiting eagerly for the new Victoreen parts so he can start on his AC Victoreen) new verve and skill resulting to the benefit of their patients and classes. A hobby to do one good should be entirely different from his regular business so that men in every class of life can derive benefit from the pursuit of it as one. There is only one exception to this rule, that we know of, and that is ourselves, our occupation is radio and our hobby is radio, we live radio for eighteen hours a day, and like it more each day.

Not Slavery

No man should be a slave to his hobby, he can play golf and pursue other pastimes as well; three or four nights a week in radio will keep him on a good edge, alive, keen and vibrant and up-to-date on all its phases.

Many radio hobbyists, however, are so interested that they find it hard to limit themselves to this period of time. Unlike other hobbies, though, it will not harm any one who devotes too much time to it. It is one that a fellow's relatives can conscientiously encourage him in, knowing that it works to his interests, also that he will have something to show for his efforts and something that will give them pleasure and entertainment as well.

Therefore, no man's better half should be a wet blanket where radio is concerned—many a wandering boy is to be found at home nights since he became interested in radio. And this pertains to husbands as well as boys, for every radio hobbyist is more or less a boy at heart. It also has the quality of keeping one young. To the man in a rut, it provides a fresh interest that soon brings him out and back into the whirl of life again. To the boy of eight as well as the boy of eighty, radio has the same appeal and makes them kin in the zest and enjoyment of life.

Oh, yes, we know several boys of eighty, seventy and sixty and thereabouts that practice the hobby of radio which is adding years to their lives to the delight of their friends and families.

The future and advancement of radio, and that includes any offshoot such as television, depends on the radio fan, amateur and hobbyist.

It is and has been the money spent by these people that has enabled the radio industry to reach its present great plane. If it is to advance, it needs the continued aid of these people and it is therefore the plain and bounden duty of all who have the interest of radio at heart to promulgate and encourage the use of radio as a hobby. In other words to make more radio hobbyists.

Parents Should Aid

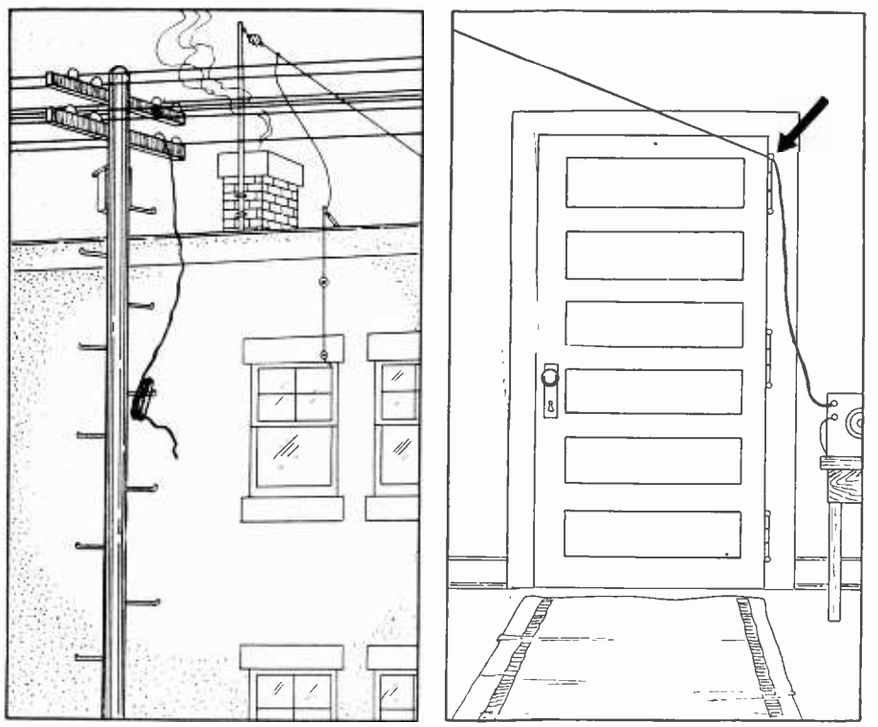
Every amateur, every fan, every man whose hobby is radio and all the radio industry should get behind a movement to achieve this end. On it rests the future, the expansion and the growth of radio as an art and as an industry.

Mothers and fathers should encourage their boys in the practice of radio as a hobby and as a means of education. They will be trained mechanically, pick up a full knowledge of the use of tools and working in metals, wood and paper, gaining also a knowledge of physics, electricity, acoustics and chemistry as well as a broad training in music and the arts.

Odd Causes of Trouble

Often Hard to Tell Why a Set Does Not Work

By Gerald Mohawk



AT LEFT IS SHOWN A COMBINATION OF ELECTRICAL CIRCUMSTANCES FULL OF POTENTIAL NOISE IN THE RECEIVER INSIDE. AT RIGHT IS SHOWN A CARELESS RADIO INSTALLATION WHICH MIGHT RESULT IN NOISY RECEPTION.

OF the many millions of radio sets in this country there are no two which work exactly alike, and no two which are subject to the same disturbances. Thus every set owner has a unique problem, a problem which in some respect is not like the problem of any other set owner. Yet nearly all requests for help in solving the problem fall in one class. They read something like this:

"My set does not work right. Why?"

How lovely things would be for radio fans if there were only one satisfactory answer! How lovely it would be for the service man whose business it is to put troublesome sets into a quietly receptive mood! And how simple radio would be!

For every radio set there must be 100 various other electrical appliances and appurtenances. And every one of these is a potential troublemaker. It is obvious that no two sets are similarly located with respect to other electrical apparatus. Hence no two can operate the same way. And in the category of electrical apparatus it is necessary to include the various broadcasting stations the signals of which the receiver in question is expected to pickup.

Miniature Spark Stations

Most of the disturbances heard in a receiver are of the spark variety and are due to miniature broadcasting stations. Some of these are not supposed to be radio broadcasters. They have no license to radiate, yet they are legitimate devices. At least they are within the law in most of the communities in the United States.

Some day, perhaps, the question will arise whether the Federal Radio Commission has jurisdiction over these trouble makers. Can the Commission regulate legally the radiation of crackles, whistles, hums, sizzlings, pops and whirrs, when these come from legitimate electrical devices and when they interfere with interstate reception of radio signals? Most of these noises originate from little radio transmitters which operate in violation of all the rules and regulations laid down for the orderly use of the ether.

These little stations operate under disguised names, and for that and other reasons have escaped general regulatory attention.

When radio as a means of public entertainment and education is a little older it will demand more of the older branches of electrical science, and all electrical devices will have to be constructed so that they will not contribute to the ethereal din which they now create. And when all so-called man-made static has been cleared up there will be fewer things to worry about.

Put Your Set in Order

But the first step in tackling the problem of reducing the man-made noise is to set one's own receiver in order. It is surprising how many little spark stations may be located right in the receiver. And the locations of the spark stations may be at the least expected places.

As an example we might mention a case which ruined reception for a long period. The receiver was electrified with B battery eliminator and trickle charger. There were occasional crackles, pops, and groans in the receiver. Somewhere there was a loose connection, that was evident. But where? Testing did not reveal the location. It was concluded that the trouble was of external origin.

Another trouble with this set was that the volume would wax and wane. This was not like fading for the disturbance was more irregular. At first a probable cause of this was the tuning in of a receiver nearby, one with antenna closely coupled to the antenna of the defective set. But this possibility was eliminated when the set misbehaved at a time of the night after the neighbors were known to have signed off.

Still there may have been some in the electrical wiring supplying the house with power. There was a new line being strung at the time on the poles in the street.

External Origin Apparent

A test was made to determine whether the disturbance came in over the antenna. When the antenna was removed the disturbance ceased. The antenna was gone over to eliminate that as a possibility. It seemed certain that the trouble was not in the set.

What, if anything, did the removal of the antenna from the set prove? Nothing much in this case. As soon as it was removed the signals ceased as well as the fading disturbance. Hence there was no way of telling whether the condition causing the fading was removed with the antenna or whether it remained inert in the set.

The crackling also disappeared when the antenna was removed. That would indicate that that also was caused by an external condition.

But the crackling and sparking could have been caused by a defective contact in the set which became active when the contact was jarred by the sound waves from the speaker. This proved to be the case. The trouble, both of the fading and the crackling types, was located in the line leading from the outlet in the wall to the power transformer. One of the conductors had become broken, and that at a point in the line where such a defect was least expected. Mending the break cleared up the reception.

Similar Case

In another receiver the second tuner seemed to have no effect on the reception. Signals were weak and the circuit oscillated when the volume control was turned up. Inspection of the set, and particularly of the tuned circuit which seemed to be at fault, did not reveal the cause of the trouble. A test with a circuit tester showed that all was well with the plate and filament circuits. It would seem, therefore, that the trouble was either in the tuning condenser which was in the primary, or in the grid circuit. The condenser was acquitted by continuity tests at the contacts and by open tests across the plates.

A minute inspection of the secondary winding showed no defect. But a continuity test with a battery and a voltmeter showed that it was open. The wire had become broken but the winding was held together by the silk insulation. When this break was mended the circuit worked well.

"That transformer on the pole" used to be suspected whenever radio trouble developed in its vicinity. There is no good reason for suspecting a transformer just because it is on a pole. In modern radio receivers there are one or more transformers.

(Continued on next page)

Is a Choke a Condenser?

Often Is, Says Author, and States Reason Why

By F. X. Gallagher

WHEN is a choke coil a condenser? This question is no riddle, but is a question that arises often in the design of radio circuits. If the answer is not known the circuit resulting has not been designed. It has merely been guessed at. And if the set is intended for very short waves as well as for medium waves the guess is wrong half of the time. The choke may be a condenser for some of the waves and a choke for the others. And if it is a condenser the circuit may be very non-operative.

But how can a choke coil be a condenser? Well, it cannot be a pure condenser but it can be a resistance with a condenser in series with it, which amounts to the same thing when it is supposed to be an inductance coil with a resistance in series with that.

When a Choke is a Condenser

The reason why a device supposed to be a choke coil may be condenser is that every physical choke coil has a distributed capacity. This enters into every coil no matter what its inductance may be. In a radio frequency tuning coil about three inches in diameter the distributed capacity is about 10 mmfd. In larger coils, such as are used for radio frequency choke coils, the distributed capacity may be many times larger. This distributed capacity is across the coil just as a tuning condenser is put across a coil in a radio tuner. Let us see under what conditions the choke is a condenser.

When the impedance Z of a physical choke consisting of a pure inductance L, a resistance R and a distributed capacity C, is measured at various frequencies it will be found that the impedance at first rises rapidly as the frequency increases until it comes to a certain frequency. Then the coil suddenly behaves like a condenser. The line of demarcation is very sharp. It behaves as a very large inductance coil at one frequency and at a little higher frequency it behaves as a very small condenser. And as the frequency increases still further, the condenser appears to increase in size until the capacity approaches the distributed capacity of the coil.

Point of Conversion

If the point of conversion from a choke coil to a condenser takes place in the frequency range which the receiver is supposed to cover the circuit may not work. For example, the tickler may no longer be effectice in causing oscillation.

It is not to be supposed that this is a rare occurence in common receivers. Let us assume that the coil put in the plate circuit of a tube has a pure inductance of 250 millihenries and a distributed capacity of 10 mmfd. This size of coil is often used, and the capacity assumed is no larger than that in an ordinary radio tuning coil.

The frequency of change from a choke coil to a condenser takes place very nearly at the point where the pure inductance resonates with the distributed capacity. In our assumed case the capacity is 10 mmfd and the inductance is .25 henry. These two resonate at about 100,000 cycles. Thus the 250 millihenry choke coil having a 10 mmfd. distributed capacity is a condenser for all short waves, all broadcast waves and for waves up to 3,000 meters. Obviously the coil does not function as a choke but as a bypass condenser.

Now let us assume an 85 millihenry coil with the same distributed capacity. In this case the resonance frequency is below 200,000 cycles. So this coil would not be suitable for choking purposes in the short wave and broadcast bands.

But we may have chosen the distributed capacity higher than it actually is in commercial coils, because these coils are wound so as to reduce the distributed capacity to the lowest possible value. One company reports that the coils do not have a capacity greater than 4 mfd. One of these coils has an inductance of 60 millihenries. Thus the frequency of resonance is about 320,000 cycles. Still it falls below the broadcast band and is not suitable for short wave circuits. It may possibly be used for broadcast circuits.

There is another coil available which has an inductance of 8 millihenries and a capacity of not more than 4 mmfd. We assume that it is not less. The frequency of resonance of this coil is about 900,000 cycles. That falls in the middle of the broadcast band and hence the coil is suitable for circuits for broadcast reception. It is possible, though, that the coil will by-pass enough of the higher broadcast frequencies to require a larger tickler for oscillation. We refer particularly to that type of feed-back circuit which is used in the majority of the short wave receivers.

Impedance at 15 Meters

What is the impedance of an 85 millihenry coil having a distributed of 4 mmfd. at a frequency corresponding to 15 meters? This is about the highest frequency for which short wave receivers and adapters are made. At this high frequency, 20,000 kc., the inductance plays little part and the impedance is that of the distributed capacity. This is about 2,000 ohms approximately, which is low enough to cut down the feedback considerably and possibly enough to stop oscillation.

A choke coil is very often a condenser in practice.

Insulate the Entrance of the Aerial

(*Continued from preceding page*)

Any one of these may cause more trouble in the receiver it serves than the transformer on the pole causes in its immediate vicinity. Yet the transformer in the set is not suspected. And there is little reason why it should be.

But open lines near the antenna, such as trolley wires and other power lines, are open to suspicion. The picture at the left in the figure herewith shows a very good possibility of trouble. Leave the little transformer out of consideration and confine attention to the insulators. There are eight lines and eight insulators. There may be a defect at any one of these which can cause much noise in receivers nearby.

There is also a number of insulators on the antenna shown. If the lead-in wire is bare there is much room for trouble. First there is the point where the wire enters the room. The entrance should be through an insulating bushing. But in many cases this precaution is not taken. There are also two insulators on the wall to which the lead-in is attached. There is not much danger there except in wet weather.

A little higher up the lead-in is attached to a piece of wood and another insulator. The object of the wood is to keep the wire from the coping or the metal gutter. Countless are the cases in which the wire actually touches the metal gutter or just the coping. Perhaps there is no more frequent source of trouble than this thing.

At the top of the lead-in wire where it joins the flat portion there seems to be a good insulator. Not much trouble should be experienced at that point. But the insulator is too close to the pole, and the installation would be much better if there were two insulators in series between the pole and the antenna.

The antenna is at right angles to the power lines. This applies to both the lead-in and the horizontal portions. This is a decided point in favor of the installation. Perhaps the antenna could not have been put up in any other way conveniently.

At the right in the figure herewith is shown a portion of the interior part of a radio installation. An indoor antenna is used. The arrow points to a potential source of trouble. Although the hinge is insulated, if the bare wire scrapes against the metal there will be a "static" noise in the set. And it is not necessary that the door be opened or closed in order for the wire to scrape. The sound from the loudspeaker may be sufficient to cause scratching, or walking around the room, or a waft of wind may be sufficient.

Although the ground connection is not shown in the figure the careless installation of the antenna would lead to the suspicion that it has been wrapped around the radiator cap.

A list of all possible sources of interference would be as long as a complete glossary of all electrical devices used, with as many again to take in those which are not devices but electrical vices.

Aviation is Asked to Unite on Radio

Washington.

Coordination of the radio needs of aviation, so that this subject may be treated as a single entity by the Federal Radio Commission in the allocation of wavelengths, is suggested to the National Advisory Committee for Aeronautics by Commissioner O. H. Caldwell in a letter.

Commissioner Caldwell said that civil aviation groups have as yet no coordinated idea as to their requirements for radio communication. He expressed the view that the committee "might well be in a position" to appear before the Radio Commission as to the needs of aviation for radio communicatins.

New Acoustical Ideas

Microphones Compared and Transformer Described

A Review of the December Issue of "Proceedings of the Institute of Radio Engineers."

Stuart Ballantine, of Radio Frequency Laboratories, Inc., discusses the effect of the reflection of sound waves by the microphone on the response of the instrument, in the December "Proceedings of the Institute of Radio Engineers." He shows a condenser microphone of the conventional type mounted in a spherical container in such a manner that the vibrating diaphragm lies as nearly as possible on the surface of the sphere. This construction is amenable to mathematical treatment.

A formula is given which expresses the ratio of the actual sound pressure on the diaphragm to the sound pressure of the wave as it would exist in the absence of the microphone. This ratio has been computed as a function of frequency up to 10,000 cycles and is shown to vary from unity for low frequencies to 2 for high frequencies.

The microphone in the spherical mounting can be used as a standard of comparison for calibration of microphones which are shaped so that they are not amenable to mathematical treatment.

* * *

"The Receiving System for Long-Wave Trans-Atlantic Radio Telephony" is a paper by Austin Bailey, S. W. Dean, and W. T. Wintringham, of the Department of Research, American Telephone and Telegraph Co., which is an interesting discussion of the receiving equipment for the single sideband, double de-modulation telephone system in Maine used in trans-Atlantic telephone communication. It is in the same issue of "Proceedings." Subjects discussed are: Choice of Frequency, Selection of Satisfactory Receiving Location, Choice of Receiving Antenna Systems, The Wave-Antenna, The Radio Receiver, Wave Tilt and Ground Conductivity. While the paper is largely mathematical it can be read profitably by those who have no mathematical training.

* * *

Keith B. Eller, of the Research Department of Western Union Telegraph Company, contributes a paper on the frequency stability of vacuum tube oscillators, deriving expressions for the frequencies generated by tuned plate and tuned grid oscillators, involving the effects of plate, grid and filament voltages, the grid and plate resistances, the amplification constant, and the "reflex factor," which is a constant which bears the same relation to the grid circuit that the amplification constant does to the plate circuit. Of course, the inductance, capacity and the resistance in the tuned circuit are also involved.

Various experimental curves are given which verify the theory. It is shown that the most stable oscillator with respect to frequency at a frequency about 1,000 cycles, with a tube of the —01A type, is one of the tuned plate type with grid leak and condenser, having a plate battery voltage of 100 volts, a grid battery voltage of minus 4 volts, a filament current of .25 ampere (rated), a grid condenser of .025 mfd., and a grid leak of .5 megohm. The constancy is greater when the inductance is small and the capacity large than when a comparatively larger inductance and smaller capacity are used.

* * *

"Sound Measurements and Loudspeaker Characteristics," by Irving Wolff, of the Technical and Test Department, Radio Corporation of America, contains some plain facts about loudspeakers. These facts are expressed both by plain English and by experimental curves so that no one reading the article could fail to learn about speakers.

The paper shows why a small horn sounds metallic and thin, why some speakers sound boomy, why some pleasing and others displeasing, and why some speakers sound mellow. The effects of cavity resonance, room resonance, tube overloading, and of directional radiation of sound are discussed.

The paper concludes by plotting the response curves of an old horn and a modern speaker on the same graph to show that a very great improvement has been effected during the past few years. The horn radiates irregularly between the limits 300 and 3,500 cycles whereas the modern speaker radiates with fair regularity between 30 and 8,000 cycles.

The paper introduces the idea of frequency balance as a means of making a loudspeaker sound pleasant even when the radiation as a whole is not satisfactory. This idea is that if there is a high response peak at a high frequency there should be another response peak at a low frequency, the two peaks being located with respect to 1,000 cycles so that the geometric mean of the two peak frequencies is equal to about 1,000 cycles. Thus if the high peak is raised in frequency the low peak must be lowered to maintain the balance. The mean frequency appears to be that at which the human ear is most sensitive. The paper shows by curves that the early speaker designers, although they knew nothing of response curves and designed by ear alone, independently achieved frequency balance.

* * *

Glenn Koehler, Electrical Laboratory, University of Wisconsin, contributes a paper entitled "The Design of Transformers for Audio-Frequency Amplifiers with Preassigned Characteristics." The paper first treats the subject mathematically and then adduces experimental curves to verify the theory. The most interesting and practical phase of this paper is the design information given to build transformers according to the theory and the experiments. A new idea in the design is the introduction of a third winding on the transformer for a current which will balance out the effect of the direct component of the plate current in the primary. The effect on the characteristic of this winding is very marked. The amplification is greatly increased at low frequencies and slightly decreased at high frequencies.

* * *

V. D. Landon, of the Westinghouse Electric & Manufacturing Co., gives a scheme for measuring the inductance of coils while passing direct current.

KYW Will Employ Twin Transmitter

Washington.

The Federal Radio Commission has granted Westinghouse Electric and Manufacturing Company a permit to construct a 3,000 to 5,000 watt transmitter just outside the residential district in Chicago, and five miles from KYW, also owned by the Westinghouse Company. The two stations will be operated simultaneously on the same frequency and they will carry the same programs. A wire line connecting the two stations will be used to synchronize the frequencies.

C. W. Horn, radio superintendent of the Westinghouse Company, appeared before the Commission in behalf of the application for the new station.

Extreme care will be taken to effect synchronization, so that there will be no interference. If deviation existed in either instance, one wave from the other, an audible note would result, and this would be tuned in as interference.

NEW CORPORATIONS

Rosla Mfg. Co., radio devices.—Atty, B. Levine, 2 Lafayette St., New York, N. Y.

Angus Radio Corp. of America.—Corp. Trust Co. of America, Wilmington, Del.

Radio Construction Corp.—Corp. Trust Co. of America, Wilmington, Del.

Whitehall Radio Corp.—Walthals, 233 Spring St., New York, N. Y.

Scripps-Howard Wireless, Inc. — Corp. Trust Co. of America, Wilmington, Del.

Loux Radio and Appliance Co., Dover, N. J.—Capital Trust Co. of Delaware.

United States Radio and Television Corp. —Corporation Trust Co. of America, Wilmington, Del.

City Radio Stores, Inc.—Corp. Trust Co. of America, Wilmington, Del.

Pay Service Radio Corp., Dover, N. J.— United States Corp. Co., Wilmington, Del.

Auto Coin Radio Corp., Dover, N. J.— United States Corp. Co., Wilmington, Del.

Waltham Radio Co., Inc., Newark, N. J.— Atty., Alfred B. Nathan, New York, N. Y.

Jenkins Television Stock is For Sale

Stock of the new Jenkins Television Corporation is being offered at $10 a share, "as a speculation," by a New York Curb Market house. The offering is of 250,000 shares of common, no par value. The total common is 1,000,000 shares, of which 50,000 are treasury stock and 950,000 outstanding.

The De Forest Radio Co. interests formed the new corporation, purchasing all the capital stock of Jenkins Laboratories, Inc. C. Francis Jenkins, inventor, is vice president of the Jenkins Television Corporation. The manufacture of a home television receiver is contemplated.

Waves Exert Pressure

When a wave in any medium falls on a surface it causes a pressure. Thus sound waves falling on a wall try to push the wall over. Light waves do the same thing. And since radio waves are simply long light waves the radio wave from a station exerts a pressure on all buildings in its way. This assumes that the wall stops the wave, or part of it.

Radio University

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

When writing for information give your Radio University subscription number.

WHAT IS MEANT by wobbulation in a radio transmitter and what effect does it have on the receivers tuned to the wobbulating station?

(2)—Is there any connection between wobbulation and modulation?

(3)—What is the cause of wobbulation?

(4)—Does a piezo controlled transmitter wobbulate?

WILLIAM H. JACK,
Marion, Indiana

(1)—"Wobbulation" is a term applied to the variations in the carrier frequency of a station when caused by the process of modulation. It makes the station broad when tuned in.

(2)—Yes, the modulation causes the "wobbulation" when the transmitting circuit is improperly adjusted.

(3)—It is caused by changes in the internal resistance of the oscillating tube. The frequency of an oscillator depends on the ratio of the resistance in the tuned circuit to the internal plate resistance.

(4)—The piezo crystal holds the frequency constant and hence prevents "wobbulation." So does a master oscillator, provided that the intensity of the oscillation is kept constant.

* * *

WHAT IS the basic principle of operation of a condenser loudspeaker?

(2)—Please outline some of the essential features of construction and operation.

(3)—Is a condenser speaker as efficient as a magnetic or dynamic speaker?

JOHN WINTON,
Baton Rouge, La.

(1)—The condenser speaker is based on the fact that two electrically charged conductors repel each other when they are charged with the same kind of electricity, and attract when they are charged oppositely. For example, if a battery of high voltage is connected between them the plates are attracted.

(2)—A practical condenser speaker consists of two plates placed close together. One is rigid to resist motion and it is perforated to allow air to get through. The other plate is thin and light and free to move and is the diaphragm.

(3)—A condenser speaker can be made as sensitive as a magnetic or dynamic speaker by making the steady voltage between the plates high. The force of attraction between the plates is proportional to the square of the polarizing voltage. If a signal voltage is superimposed on the steady voltage, the differential force, that is the output, is proportional to the signal voltage and to the polarizing voltage. Thus doubling the polarizing voltage doubles the sensitivity. From 300 to 600 volts should be used as polarizing voltage.

* * *

I HAVE BUILT the Economy Three and it in fine tone, volume and sensitivity. I live within three blocks of a high power station, which I cannit tune out. Can you suggest a way of tuning it out when I want distant stations?

(2) Will it be of any help to shorten the antenna?

ARMAND ROMAINE,
Newark, N. J.

(1) The simplest way to reduce the interference from the local station is to put a wave trap in the antenna circuit. You can either buy the trap ready made or you can make it yourself. Forty-three turns of wire on a three in form shunted with a .0005 mfd. condenser makes a good trap. Put five to 10 turns around the coil and connect in the antenna circuit away from the set.

(2) It will help the selectivity some but it will reduce volume. You might try an indoor antenna which you can do without a great deal of trouble. Just string a wire as high and as long as you can without doubling the wire back.

* * *

IS IT A FACT that a radio set can be used for detecting the presence underground of mineral deposits, such as oil, coal, iron and copper? If so, what kind of set is required?

(2) Please publish a detailed description of the method used, including circuits, or if that is not possible please tell me where I can find information on the subject.

FRED W. SCOTT,
Sacramento, Calif.

(1)—It is a fact that radio waves are being used for the purpose. Many special radio sets are required, one of which is a transmitter.

(2) We cannot publish a complete account of the method, at this time at least, but you will find a thorough discussion of the subject in the October, 1928 Proceedings of the Institute of Radio Engineers. You can also get more information on the subject by writing the U. S. Bureau of Mines, Washington, D. C.

* * *

I HAVE BUILT a Universal receiver which is entirely satisfactory except that the tickler is subject to hand capacity. Can this be remedied?

(2) Will shielding help?

WILLIAM MORRISON,
Cleveland, Ohio.

(1) Yes, by mounting the tickler condenser away from the panel and coupling it to the control knob by means of a bakelite rod.

(2) Shielding helps. Put the shield between the hand and the coils and condensers in the set.

* * *

I WISH to electrify my Economy 3. Can I use raw AC on the filaments of the screen grid tube and the high mu detector?

(2)—If, not, what is the best method of electrifying?

(3)—Is it necessary to have a high resistance voltmeter for alternating voltages, or will one of 100 ohms per volt do?

E. BRUCE McLEOD,
New York, N. Y.

(1)—Not without a great deal of hum.

(2)—Use a trickle charger having a rate of about .75 ampere and filter the output with a pair of electrolytic condensers and a heavy duty choke.

(3)—For ordinary measurements it is not necessary to use a high resistance meter, that is, to measure the line voltage and the voltages of the low voltage secondaries.

* * *

I HAVE a dynamic speaker, AC model, with built-in rectifier. When I put the speaker on my receiver the volume is very low and the music and voice sound frazzled. I do not get that fine volume and tone that were present when the same dynamic was demonstrated elsewhere. What can be the cause?

ACTON BIERCE,
Seattle, Wash.

You must connect the plugged cord to the AC line, to supply the rectifier with current, so that this will be delivered in its DC form to the field coil or pot magnet of the dynamic. When you do that you will get the same kind of reception you heard in the demonstration. The fact that the speaker works at all, when the AC line is disconnected, as it is in your case, is due to stray magnetism in the field coil. This is never enough to give anything like decent results, so make your proper connection at once. If the AC cord has a pendant switch, you should press this switch "on" to get juice from the line.

* * *

IS IT necessary to use a round field structure in a dynamic speaker or can a square structure be used?

(2)—What is the best number of turns for the voice coil?

KURT ZWECK,
St. Louis, Mo.

(1)—A round structure is not necessary. A square structure is employed in a speaker that comes in kit form.

(2)—Any number of turns from one up may be used. There is no best number.

Literature Wanted

THE names and addresses of readers of RADIO WORLD who desire literature on parts and sets from radio manufacturers, jobbers, dealers and mail order houses are published in RADIO WORLD on request of the reader. The bank at right may be used, or a post card or letter will do instead.

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

I desire to receive radio literature.

Name .....

Address .....

City or town .....

State .....

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F. J. Lewis, 852 Berry St., Toledo, Ohio.
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Joe Freedman, 224 Broadway, Long Branch, N. J.
Martin W. Lundgren, 1859 East 69th St., Los Angeles, Calif.
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Thomas Harten, 46-25 189th St., Flushing, L. I.
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Robert, Fair, 707 North Gillette, Tulsa, Okla.
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Albert Mannion, 204 W. 17th St., New York, N. Y.
Robert G. Murray, 137 Wrentham St., Dorchester, Mass.
Walter Shogren, 1260 Edgerton St., St. Paul, Minn.
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Condenser Speaker Task

High Conductivity and Guard Against Plate-Touching Are Needed

By Rodman Ferris

THE condenser loudspeaker consists simply of two large metal surfaces placed very close together and insulated from each other. That is, they form an air condenser of parallel plates. One of these plates is the stator and the other the armature.

The stator plate must be thick and rigid so that it cannot move when an electrical force is impressed between the two plates. The other plate, the armature, must be extremely light and flexible so that it can move toward and away from the stator as the force between the plates varies.

The insulation between the plate must be high enough to withstand the high steady polarlizing voltage which is appled, plus the peak voltage of the signal which is superposed on the steady voltage. For the sake of safety the insulation should be tested on a voltage at least twice as high as the steady polarizing voltage.

Spacing Should Be Small

Since the sensitivity of the speaker is greater the closer the two plates are together, it is important to make the distance as small as practicable.

But the maximum peak voltage that may exist between the plates determines how close the plates may be put. Air under ordinary atmospheric pressure can withstand a voltage about 30,000 volts per inch. That would mean that if the polarizing voltage is 3,000 volts the plates could not be closer than .1 inch at any point when no signal is impressed. If a considerable signal voltage is superposed on the polarizing voltage, the two plates will be attracted closer together. Hence there will very likely be a break-down.

Preventing Break-Down

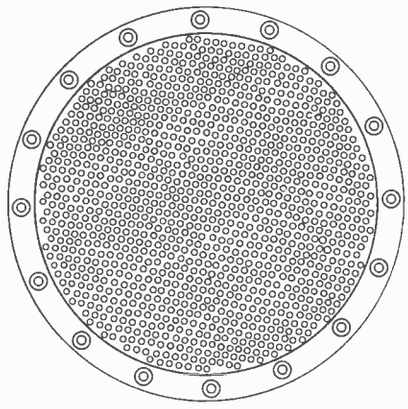
Suppose the distance is kept at .1 inch and the polarizing voltage is reduced to 1,500 volts. Then a considerable signal voltage can be impressed on the steady voltage before a break-down will occur, provided that the added attraction between the plates does not reduce the distance between the plates considerably. For any given distance between the plates the polarizing voltage, as well as the superposed signal, should be adjusted so that no break-down will occur.

If the frequency of the impressed signal voltage should happen to coincide with one of the natural frequencies of the moving plate, the swing of that plate may be accentuated so that a break-down might occur even if there is ample safety for all other frequencies. The resonance frequency for which there is greatest danger is the fundamental, at which the moving plate vibrates as a whole with the greatest amplitude at the center.

A great increase of the swing at any resonant frequency is prevented by damping of the armature. This damping is composed of both the useful load and other resistance. The useful load resistance is due to radiation of energy in the form of sound. This depends largely on the size of the vibrating diaphragm and on the effectiveness of the baffle, or on the length and shape of the horn that may be placed in front of the armature.

Aiding Radiation

If the two plates of the condenser were solid, and if they were separated by a solid ring, the air between the plates would be trapped. This would introduce excessive



THE STATOR PLATE OF THE CONDENSER SPEAKER SHOULD BE PERFORATED, TO LET THE AIR THROUGH.

damping, which would not contribute to sound radiation. For the reason the stator plate is perforated by a large number of holes, as illustrated. These holes will reduce the damping and also the pull between plates, so that the number and size of the holes must be adjusted to effect the best compromise between the damping and the sensitivity.

Current Flows

The armature plate must be light so that it will not resonate with any low frequency. It must also be stretched fairly taut. One suitable material is aluminum foil. But the moving plate need not be all metal. It might be a thin sheet of paper or cloth with a metal covering. Methods are available for spraying such materials with metal. Of course, the metal layer must be thick enough to prevent any considerable resistance to electric current.

Although the condenser is "static" in a sense, it requires current, for it requires current to charge any condenser. The condenser speaker is partly charged and discharged for every cycle of the signal voltage. If no current flowed into and out of the condenser, no sound could be radiated, for no electric power would be delivered to the speaker. Of course, for any given power the current is relatively small, since the voltage is high.

Clamping Holes

The large circles in the peripheral ring are holes for clamping the two plates together. The bolts through these holes must be provided with insulating bushings so as to prevent electrical contact between the plates.

Socket Antenna Plugs Finally Become Popular

More socket antenna plugs are being sold today than ever before, states Charles Golenpaul, sales manager of Clarostat Mfg. Co.

"Although this device was introduced to the radio public several years ago, it did not prove popular for a long while," according to Mr. Golenpaul. "There were many reasons for its cold reception.

"In the first place, broadcast signals were not as generally powerful as they are today.

"Secondly, our receiving sets several years ago depended mainly on regeneration for their sensitivity, with the result that they were operated on the verge of oscillation most of the time. Consequently, the slightest surge on the electric line served to unbalance the radio set and throw it into oscillation.

"Thirdly, the socket antenna plugs first introduced were not provided with the high-grade blocking or coupling condensers now available in our present socket antenna plugs."

Short Waves Retain Same Old Wanderlust

WGY'S short wave stations W2XAF and W2XAD are heard regularly in the Belgian Congo, South Africa, and frequently with "marvelous" clearness and strength. J. R. Nowell, a General Electric erecting engineer working at the plant of the Union Miniere du Haut Katanga, Likasi, Panda, in the Belgian Congo, reports that local men heard the last game of the World Series, Labor Day speeches and other feature broadcasts. They also get Holland and have heard a Melbourne, Australia, station.

Short wave conversations between W2XAF, WGY'S short wave station, and 2ME of Sydney, Australia, were heard in Essex, England, according to Charles H. Adler, living at 11 Alboin Road, Westcliff on Sea. He reported signals of amazing strength, whereas as a rule daylight in England weakens the signal of W2XAF. The sun was shining brightly at the time, he reports., The conversations were conducted at 6:30 a. m. Eastern Standard time. The time in Sydney was in the evening of the same day and it was about 11:30 a. m. in Westcliff on Sea.

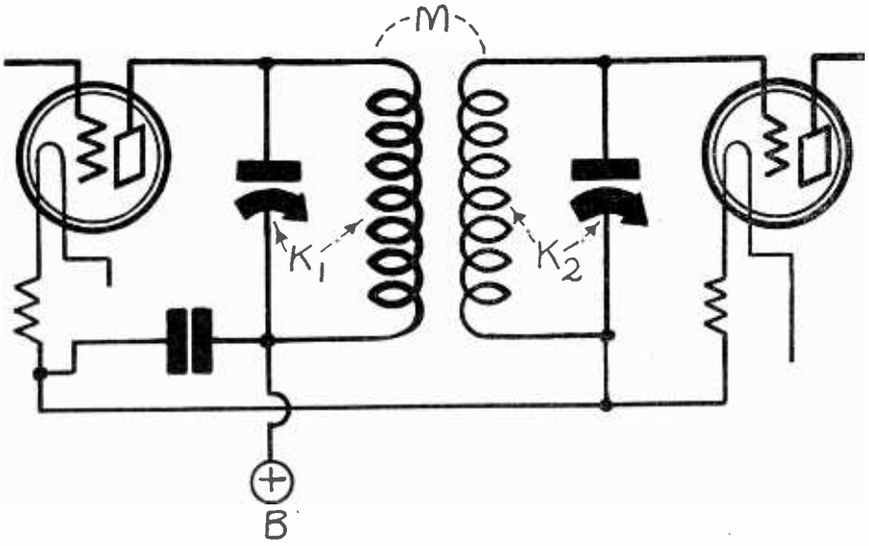
There are over 200 short wave receiving sets in the English colony in Georgetown, Demerara, British Guiana, according to F. Amachy, director of Booker Bros. McConnell & Co., Ltd. and the set owners depend upon the short wave stations of WGY and KDKA for their radio information and entertainment. The received signal is clear, distinct and of splendid volume, according to Mr. Amachy.

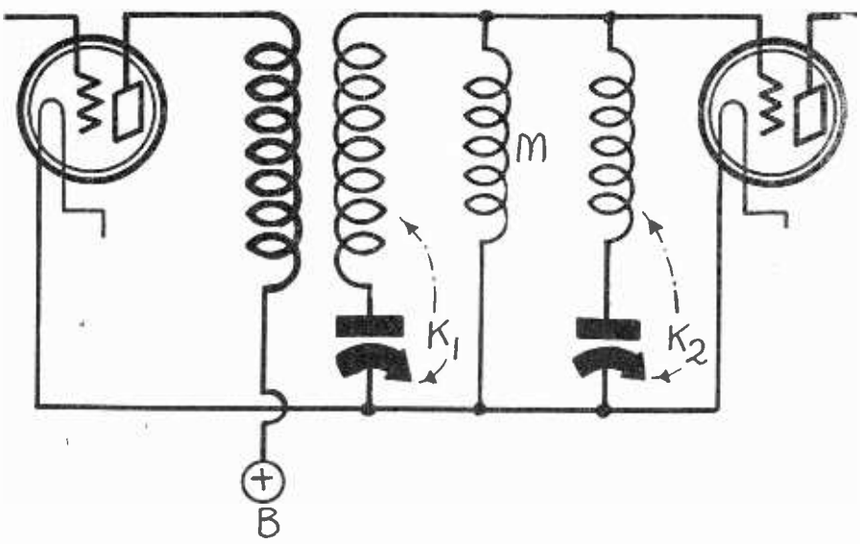
WGY'S regular night broadcast program (379.5 meters) is also sent on short waves as follows: by W2XAF, on 31.4 Peters, Monday, Tuesday, Thursday and Saturday, and by W2XAD on 21.96 meters, Monday Wednesday, Friday and Sunday.

The Use and Virtue

By J. E.

Technical





FIGS. 1 AND 2.

A BAND PASS FILTER, CONSISTING OF TWO EQUAL TUNED CIRCUITS, COUPLED BY MUTUAL INDUCTANCE. (FIG. 1, TOP)

A BAND PASS FILTER, CONSISTING OF TWO EQUAL TUNED CIRCUITS, COUPLED BY A COMMON REACTANCE. (FIG. 2, LOWER)

WHEN ordinary tuned circuits are used in a receiver it is difficult to obtain selectivity and quality at the same time. That fact has been known as long as tuning, but it was not recognized as an evil until broadcasting began. Nothwithstanding the known facts, receivers have been brought out which were claimed to be "as sharp as a razor and absolutely free from distortion."

In any receiver employing ordinary tuned circuits the choice must be between selectivity and quality, or a compromise effected. If conditions require a very high order of selectivity, the quality must assume secondary importance. If quality is the prime requisite, selectivity must be mediocre.

Since DX requires high selectivity for the uninterfered reception of one station, the recipient must be satisfied with the full low and medium notes in the signal, without getting so much of the higher notes.

If the signal received is to contain all the notes in proper proportion, the receiver cannot be extra-selective and the recipient must be content with a little interference from other stations. If the desired station is at a considerable distance its signals will probably be less intense than the signals from a closer station to which the circuit is not tuned.

Band Pass Filters

That is the condition when ordinary tuned circuits are used in the receiver. But there are means available whereby the receiver may be made highly selective without at the same time impairing the quality.

There are various band pass filters which have the characteristic of accepting signals lying within a certain band with very little attenuation and at the same time rejecting those lying outside that band.

These filters do not cut off the higher audio frequencies in the signal and hence they do not impair the quality. But these circuits cannot be called "ordinary," for there are only a few receivers in which they have been incorporated.

Band pass filters are especially applicable to the intermediate amplifier of a Super-Heterodyne because they can be adjusted once for best response and left alone. They are also suitable for broadcast waves, but introduce a little complication in the tuning mechanism. Some excellent broadcast receivers incorporate band pass filters successfully, and undoubtedly there will be many more in the near future, as there is an intense interest in the subject at this time.

Pass Band Determination

A simple band pass filter consists of two tuned circuits coupled together, both tuned to the same frequency. The reception characteristic in the pass band region depends on the degree of coupling between the two tuned circuits. Generally, the characteristic will contain two peaks with a depression between them. The closer the coupling between the two circuits, the farther apart will be the peaks and the deeper the depression Be-

WNYC IS LOSER ON TIME PLEA

Washington.

The application of WNYC, operated by the City of New York as a municipal station, for full time on the 570 kilocycle channel, was denied by the Federal Radio Commission. The station shares time with WMCA transmitter, Hoboken, N. J., which station also has pending an application for seven-eighths time on this channel, and later will be given a hearing.

The Commission also denied the applications of WKBO, at Jersey City, N. J., operated by the Camith Corporation, for full time and an increase in power, and Edwood W. Lippencott, Long Beach, Calif., for a construction permit. They Jersey City station requested full time on 1,370 kilocycles, with a power assignment of from 500 to 5,000 watts. It now shares time on the 1,450-kilocycle channel with three other stations, with 250 watts power.

WNYC contended at its hearing before the Commission that, under the allocation, it is not afforded sufficient time to broadcast necessary features in the interest of the people of New York. The mayor of New York City, J. J. Walker, made the application for full time on behalf of the station.

Mayor Walker said at New York City Hall: "I think it is so important to the city that, if possible, and if necessary, we will carry the matter into the courts."

# of Band Pass Filters

Anderson

Editor

low the lower peak and above the higher the transmission will fall rapidly so that at frequencies a few percent above or below the peaks there will be practically no reception.

The method of coupling the two tuned circuits is not of much importance. The coupling might be by mutual inductance as in any ordinary transformer. This is shown in Fig. 1. K1 and K2 are the two tuned circuits and M is the mutual inductance between the two tuned coils. The characteristic is shown in Fig. 3B. It has two peaks at frequencies F1 and F2 and a depression at Fo.

Another method of coupling is shown in Fig. 2, K1 and K2 constituting the two tuned circuits and the inductance coil M the coupling means. The transmission characteristic of this circuit is also B in Fig. 3. In Fig. 2, the inductance M could be replaced with a condenser of rather large value without changing the circuit in any essential respect.

Variation of Coupling

In Fig. 1 the coupling is reduced by reducing M by any of the well known means, that is, by placing the coils farther apart or by turning them so that they are more nearly perpendicular. The coupling is increased by placing them close together and parallel.

In Fig. 2 the coupling between the two circuits is reduced by reducing the inductance of the coil M. The coupling is increased by increasing the inductance of this coil. If M in Fig. 2 is replaced by a condenser, the coupling is reduced by making the condenser larger, and conversely, it is increased by making the condenser smaller.

As was stated, if the coupling between the two circuits in either type of filter is increased the two peaks move farther apart and the depression deepens. There exists one coupling, called the critical coupling, at which the depression disappears and the two peaks merge into one. As the coupling is reduced below the critical value, the single peak sharpens. Curve C shows the shape of the curve when the two peaks have merged. Curve A shows the shape of the characteristic when the coupling is excessive. The two peaks are far apart and the depression is very deep.

Effect of Resistance

If the resistance in the two tuned circuits is high, the two peaks will be low and broad, and the depression for any given coupling will be shallow. If the resistance is low the peaks will be high and sharp and the depression for any coupling will be deep. The sides of the curve above the high peak and below the low peak will be very steep. This is a desirable characteristic, for the object of the band pass filter is to have sharp cut-offs and a level response between the peaks.

Now it is possible to select the coupling between the two tuned circuits so that the two peaks fall at any desired frequencies. For example, they may be made to fall on two frequencies which are 5,000 cycles below and above the carrier frequency, or the frequency to which the receiver is adjusted. When the locations of the peaks have been determined, the depth of the depression can be varied to any desired value by adjusting the desistances in the two circuits.

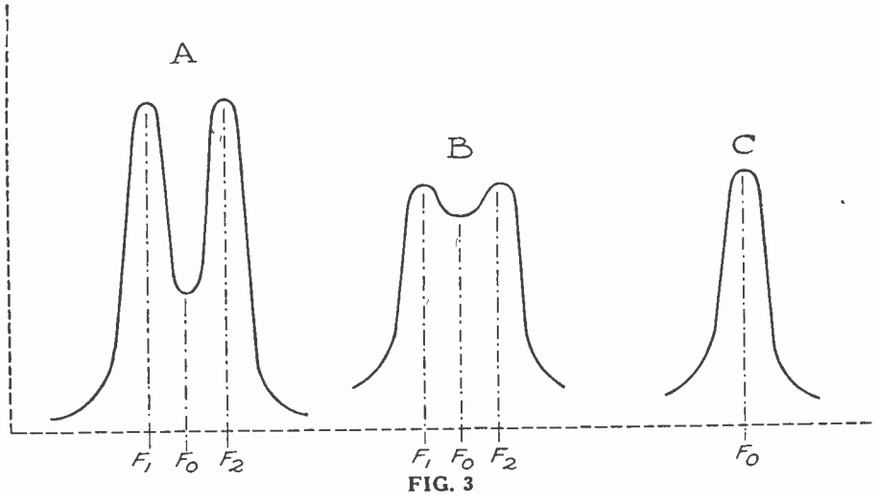


FIG. 3

CHARACTERISTIC OF BAND PASS FILTERS LIKE THOSE SHOWN IN FIGS. 1 AND 2. "A" SHOWS THE CASE WHEN THE TUNED CIRCUITS ARE COUPLED TOO CLOSELY, "B" THE CASE WHEN THEY ARE MODERATELY CLOSELY COUPLED AND "C" THE CASE WHEN THE COUPLING IS CRITICAL

If this procedure does not result in sharp enough cut-offs another identical filter can be added. This should be placed between two other tubes.

Equalizing Reception

When there is a considerable depression between the two peaks the low frequencies will come out less strongly than the high up to the peaks. Both the high frequency and the low frequency peaks contribute to intensify the higher audio frequencies. For example, if the peaks are placed 5,000 cycles below and above the carrier frequency, the 5,000 cycle audio frequency in the signal will be intensified. This is just the reverse of the effect of tuning in ordinary circuits. This reversal might be utilized in equalizing transmission which is down at 5,000 cycles and above.

An application of this method of equalizing is to the Super-Heterodyne. If image interference in such a circuit is to be reduced effectively it must be done by tuning sharply in the high frequency level. But this cuts off the upper side frequencies and accentuates the low. The characteristic will be like C in Fig. 3.

The filter in the intermediate level then can be made so that the transmission is like that in A Fig. 3, putting the peaks at 5,000 cycles away from the intermediate frequency. The intermediate frequency filter then would not only increase the selectivity but it would restore the quality impaired by the high frequency tuner. And the sharp tuning on the high frequency level would cut out effectively the carrier which gives rise to image interference.

It would not be difficult to design the tuned circuit in the high frequency level and the filter in the intermediate level so that the overall effect in the 10,000 band is equal for all frequencies in that band. The result would be a Super-Heterodyne which does not squeal, which is selective and which does not cut sidebands.

Voltage Governs Tone of Televised Image

We are concerned with "tone" in the television image just as we are concerned with tone in broadcast reception, according to Stephen H. Anderson of the Clarostat engineering staff.

"It is generally the practice to connect the television kinolamp or neon tube directly to the amplifier output," states Mr. Anderson, "without provision for precise voltage regulation. Consequently, a fixed tone is obtained in the image, with either too much contrast between lights and shadows, or too little contrast. In the case of the silhouette figures broadcast by the Jenkins Laboratories of Washington and received in many parts of the country sharp contrast—practically black and white—is most desirable.

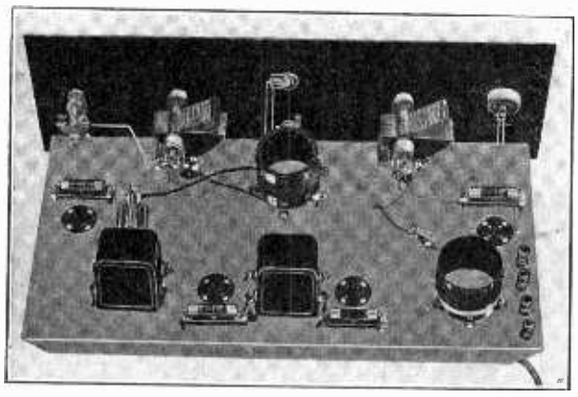
"In the case of half-tone figures broadcast by others, a delicate tone is required, with just the proper contrast between lights and shadows to give us satisfactory definition.

"In television reception, precise resistance in the kino-lamp circuit amounts to about the same thing as the focusing arrangement on the usual camera. Without precise adjustment, we cannot obtain sharp pictures.

"Therefore, it is necessary to insert a suitable variable resistor, such as the standard clarostat, in the kino-lamp circuit, so that the applied voltage may be delicately adjusted until the desired contrast is obtained. The current may be adjusted so that on strong negative impulses the light goes out, while with positive impulses the glow intensifies. At this adjustment of current, the tone and contrast are most distinct and realistic for the television signals that are usually received."

Build the New

SCREEN GRID UNIVERSAL!



Unusual Results on Four Tubes!

HOW much can one achieve on only four tubes? The new Screen Grid Universal is the answer. It meets all the requirements of the wavelength reallocation, brings in distant stations distinctly, affords exceptional tone, and is easy to build. You'll be surprised at the results. Your friends, too, will admire your receiver. You can sit them down in your parlor and give them loudspeaker reception of distant stations they never heard of—100-watt stations, too!

The screen grid tube is used as a radio frequency amplifier in a new and most efficient manner. Correct circuit design and co-ordinated parts make this circuit outstanding. Build it now!

Very Selective, Yet Lots of Volume!

Two dials tune in the entire wavelength band, using either .0005 mfd. or .00035 mfd. tuning condensers. The circuit affords all the selectivity you need, separates stations excellently and without "background reception," and despite this fine selectivity, affords more than enough volume, so that you must tone it down with the volume control, even on far-distant stations!

The screen grid RF tube is followed by two -01A tubes, while the output tube may be a —12A or —71A power tube, depending on whether you have 135 volts or 180 volts maximum at your disposal.

Screen grid coils especially designed for this receiver permit you to obtain any desired degree of selectivity, but always with a high level of reproduced sound. The primary of the interstage coupler is tuned, while the secondary doubles the voltage by step-up ratio.

The circuit is stable, easy to build, easy to tune. Build it from the official blueprint and the theoretical expression and constructional details in the December 1st, 8th and 15th issues. This blueprint was made directly from the laboratory model of this receiver as constructed by Herman Bernard, the designer. It is a remarkable blueprint, because the wiring that is done on top of the subpanel is shown just as you want it, in the actual manner of its appearance Also, the wiring underneath the subpanel is shown as it actually appears. Hence there are two separate, clear life-sized views on one sheet, not just one view, made to appear "transparent."

When you turn the subpanel upside down for underneath wiring you don't have to imagine the direction the leads take. Nothing is left to the imagination.

RADIO WORLD, 145 W. 45th St., New York City
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Enclosed please find $1.00 for which send me at once a blueprint of the 4-tube Screen Grid Universal Receiver, as designed by Herman Bernard.

45c extra for Dec. 1st, 8th, 15th issues of Radio World.

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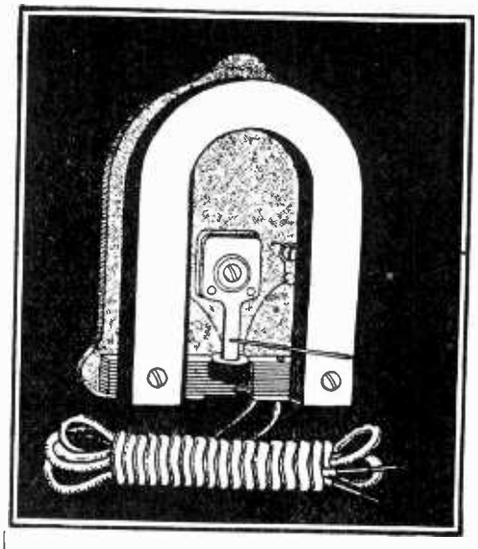

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Unit

With 5-foot cord, less bracket, apex, chuck and nut. Cat. PA. **$3.00**

New Moulded tri-foot bracket, fits Powertone, Polo, B.B.L., Brielle, Paratone and other units. Cat. BA.....65c

Apex, Thumbscrew and Chuck. Cat. AA.....10c

You Cannot Buy a Better Unit at Anywhere Near This Price!

The 1929 Model Powertone Unit, that drives any cone or similar type speaker, is an extremely sensitive and faithful reproducer. The magnet coil (the black ring under the pin in illustration) is wound to higher impedance than is ordinarily encountered. Volume is greater. The unit has an adjustable armature.

Both the tone and the appearance are brilliant! You may order a new model Powertone Unit with perfect safety. It's a pippin, say those who use it. If you don't agree with that, return the unit ten days after receipt and get your money back promptly. No questoins asked—but all questions gladly answered. Immediate shipment guaranteed.

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Complete Kit of Parts for the Four-Tube

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As Specified by Herman Bernard

What You Get L1, L2—One Screen Grid two-winding RF transformer, with center-tapped secondary; Model 5RF for .0005 mfd. L3, L4—One Screen Grid high impedance interstage coupler, with center-tapped primary; Model 5TP for .0005 mfd. C1—One .00025 mfd. Aerovox grid condenser, with clips. C2, C3—Two Hammarlund Midline .0005 mfd. tuning condensers. C4—One Hammarlund junior condenser; Cat. No. MCII (50 mmfd.). R1—One Lynch metallized grid leak, 2 meg. R2—One No. 622 Amperite, with mount. R3, R4, R5—Three No. 1A Amperites with three mounts. Rh—One 50-ohm rheostat. T1, T2—Two National new audio transformers. SW—One filament switch. PL—One pilot light bracket with lamp. Two dials with two dial pointers. Two knobs. Four binding posts (Ant., Gnd., Speaker plus, Speaker minus). One 10x20-inch aluminum self-bracketing subpanel, with sockets affixed, and including hardware and insulating washers. One 7x21-inch drilled Bakelite front panel. One nine-lead battery cable. One Peewee clip. **$35.00** NET

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One screen grid 422.....$3.50
Two 410A at $1.00 each..... 2.00
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Send $7.50 for set of four tubes for this receiver.
Specify whether power tube wanted is 412A or 471A

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Bakelite front panel alone, drilled....$2.35
Drilled aluminum subpanel alone, with self-bracketing feature, built-in sockets, extra washers and hardware 3.00
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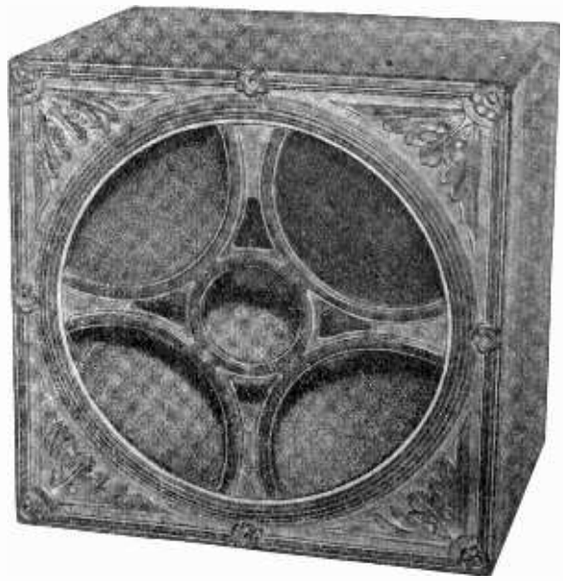
An Extraordinary Speaker

THE super-sensitive and acoustically faithful twin magnet POLO UNIT in a de luxe housing, with moulded metal front piece, makes a first-class table model speaker. It will stand the heaviest load — even two 250 tubes in push-pull without rattling—yet is so sensitive it will work well from *any* output tube, even a 201A!

Compact and handsome, this table model graces any living room or parlor, is inconspicuous to the eye but alluringly predominant to the ear.

The unit is mounted on a special bracket that makes it impossible for the unit to get out of adjustment. The table model, of the free-edge cone type, is furnished completely built-up, ready to play.



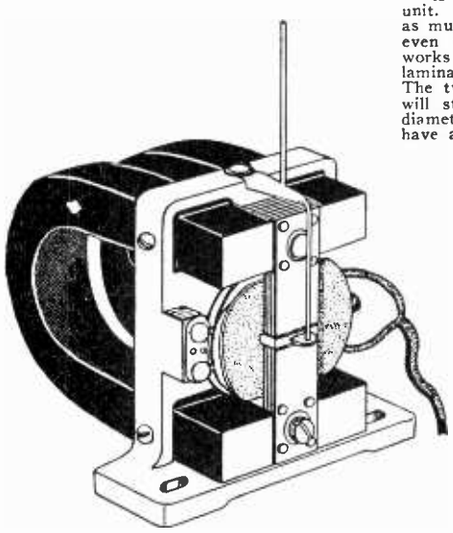
The Table Model Polo Speaker, an outstanding example of the magnetic type of speaker, is shown one-third actual size.

The grill or front piece is moulded, while the rest of the housing is wood. Both grill and housing are furnished in rich, conservative two-tone brown spray.

Table Model Polo Speaker, Cat. TMP, consisting of de luxe housing and moulded grill, with sprayed finish; mounted Polo Unit, with cone and special bracket; also 10-ft. cord All built-up, ready to play..... .....$13.50

[Note.—Those who possess a Polo Unit and desire the housing, special bracket and cone, may obtain these by ordering Cat HO at $5.00.]

THE Polo Unit, using two magnets, to double sensitivity, is regarded by many experts as the best magnetic unit. It weighs three full pounds—almost three times as much as an average unit—and will stand the strain of even two 250 tubes in push-pull without rattling. It works well out of any type tube. The pole pieces are laminated and the armature can't get out of adjustment The two magnet coils are housed in bakelite. This unit will stand 180 volts without filtering, due to the large diameter wire used on the special coils. All Polo Units have a bronze-green casing and black twin magnets.



Polo Unit, shown one-half actual size. Furnished complete with unit, apex, chuck, nut. 10-ft. cord, bracket and hardware. Cat. PU $10.00

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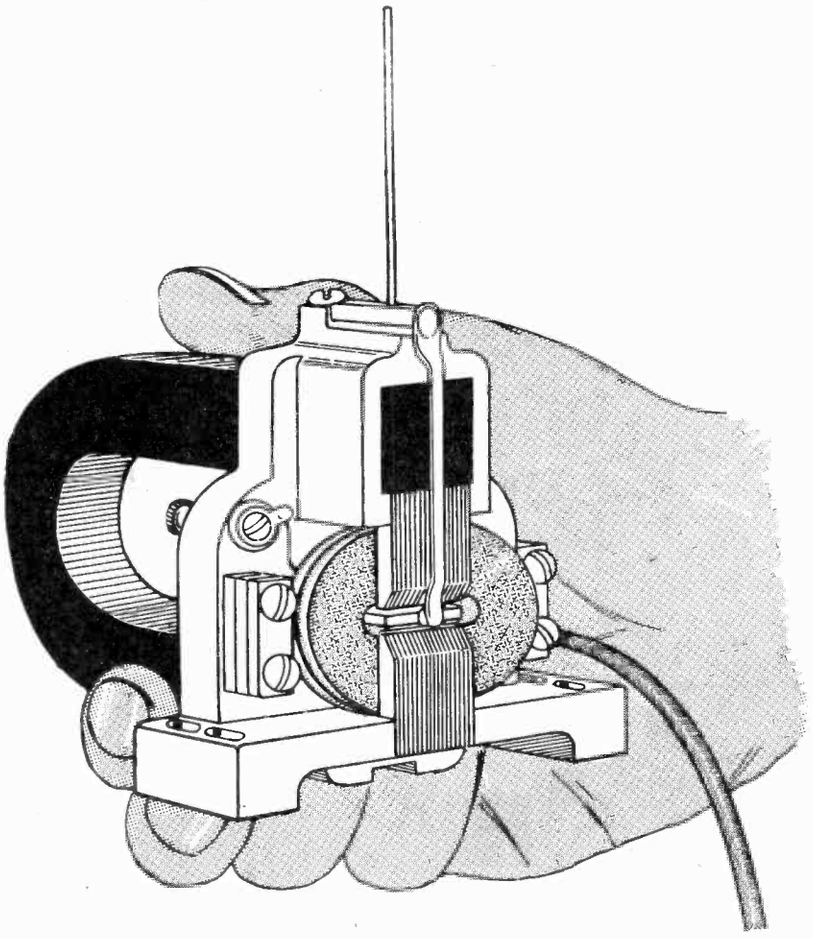
The fully corrected list of reallocations of stations effective Sunday, November 11th, appeared in RADIO WORLD dated November 3d. The call letters, frequency, owner and location are given by States. Fifteen cents a copy. Or send $1.00 for trial subscription of eight weeks, and this issue will be sent FREE.
Radio World, 145 W. 45th St., N. Y. C.

New HBH Unit

Sets World Standard!



Any degree of volume is kept well in hand by the new HBH loudspeaker unit, for cones, cloth diaphragm speakers, etc. The unit is shown full size.

TWO years' intensive investigation of the minute details of construction that lend superiority to a magnetic type Unit have resulted in the combination of all the known assets into the new HBH unit. The result is something so far superior to anything you have ever heard or dreamt of, that we sum it up in six words: The finest unit in the world. Get one *now*—try it for ten days—money right back if you're not overjoyed!

This unit has won the enthusiastic acclaim of leading acoustical experts. There are eleven secret reasons for its uncanny performance. And now these advantages are yours at last!

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☐ 65c extra for moulded mounting bracket.

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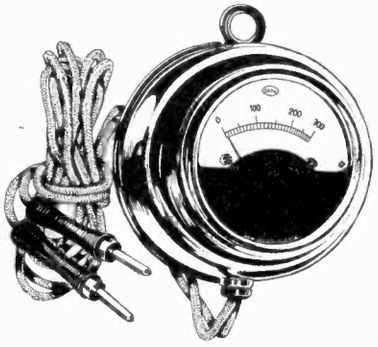
For Portable or Panel Use



High resistance 0-300 Voltmeter, accurate to 1%. Measures any DC voltage to 300, including B eliminators. Provided with 30" cord, with luxurious jack tips and hanger. Meter full nickel de luxe finish. No. 346F. **$4.50**

No. 347F, same as above, but 0-500 volts, $6.00

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(See No. 348 under "Pocket and Portable Voltmeters.")

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No. 316—For reading DC voltages, 0-16 volts, 1.00
No. 326—For reading DC voltages, 0-6 volts, 1.00
No. 337—For reading DC voltages, 0-50 volts, 1.00
No. 339—For reading DC voltages, 0-100 volts, 2.25
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No. 18—For testing amperage of dry cell A batteries and voltage of dry or storage A batteries, double reading, 0-8 volts, and 0-40 amperes DC.....$1.25
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No. 218—For preventing excess voltage on the filament and cathode of AC tubes, by compensating for excess line voltage.....$5.00

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No. 23—For showing when 6-volt A battery needs charging and when to stop charging; shows condition of battery at all times.....$1.00

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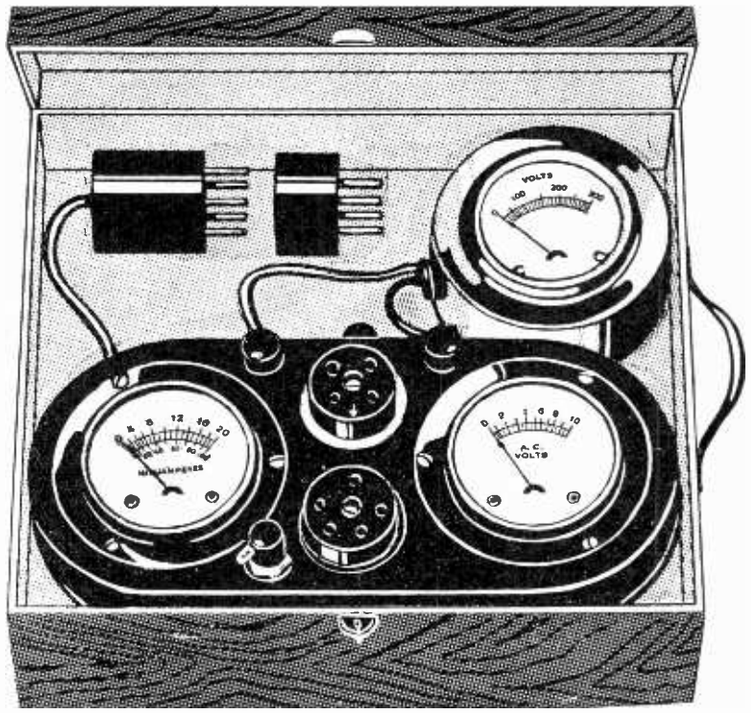
With Each Jiffy Tester Combination!

This Meter Outfit Makes Thirteen Vital Tests in Only 4½ Minutes!

INSTRUCTION SHEET GIVES FULL DETAILS OF THESE THIRTEEN TESTS

The Jiffy Tester in its Case is a Testing Laboratory All by Itself. Leave the meters in the case. Simply lift out the plug, attaching the four-prong adapter, if testing a four-prong tube. Put plug in socket of receiver to be tested; put tube in Tester socket. The B voltmeter automatically connects to the proper points when its tipped leads are inserted in the two binding posts at rear.



This housed Jiffy Tester, with high resistance voltmeter for measuring B voltages, including those of eliminators, is a service kit of the highest value. The case is furnished in a de luxe finish, with handle. A patented snaplock makes it impossible for the lid to open accidentally. The Tester and high resistance meter fit so snugly in place that they will not jar in transportation. A 5-day money-back guaranty attaches to each sale.

Jiffy Tester Combination, shown one-third size, includes 0-10 voltmeter reading AC or DC (same meter reads both); 0-20, 0-100 milliammeter, with change-over switch; cord and plug with 4-prong adapter; 0-300 high resistance voltmeter. Price $13.50. Complete instruction booklet and de luxe carrying case FREE with each order.

Jiffy Tester a Scientific Trouble Shooter

Every service man, custom set builder, home experimenter, student or teacher needs one of these Jiffy Tester Combinations Amply accurate for this class of work. You will be well satisfied with assured 5% plus or minus accuracy. Jiffy Tube and Set Tester, consisting of 0-20, 0-100 combination milliammeter, 0-10 AC and DC voltmeter and 0-300 high resistance voltmeter. De luxe carrying case and instruction booklet FREE with each order. Jiffy Tester Combination A.

$13.50

The 0-300 high resistance voltmeter in "Jiffy Tester Combination A" is accurate to 5% plus or minus, so that at maximum reading it is not more than 15 volts off. Those desiring a more accurate 0-300 high resistance meter, never more than 3 volts off, at maximum reading, should order "Jiffy Tester Combination B," which has a 0-300 meter accurate to 1%, at a cost of $1 extra. Order "Jiffy Tester Combination B." De luxe carrying case and instruction booklet FREE.

$14.50

Here Are the Thirteen Vital Tests!

(1) to measure the filament voltage, up to 10 volts, of AC and DC tubes;

(2) to measure the plate current of any one tube, including any power tube, from less than 1 milliampere up to 100 milliamperes;

(3) to measure the total plate current of a receiver or amplifier, up to 100 milliamperes. (Hardly any set draws more);

(4) to measure the B voltage applied to the plate of tube; the voltage across B batteries or B eliminators, up to 300 volts;

(5) to determine the condition of a tube, by use of the grid bias switch;

(6) to measure any tube's electronic emission;

(7) to regulate AC line, with the aid of a power rheostat, using a 27 tube as guide;

(8) to test continuity of resistors, windings of chokes, transformers and circuits generally;

(9) to find shorts in bypass and other condensers, as well as in inductances, resistors and circuits generally;

(10) to read grid bias voltages, including those obtained through drops in resistors;

(11) to determine the presence of distortion and overloading;

(12) to test for correct bias;

(13) to determine starting and stopping of oscillation.

[*Note—Instruction booklet fully informs you how to make each and every one of these tests in a jiffy.*]

Note All That You Get!

For $13.50 you receive:
(1) One Two-in-One 0 to 10 voltmeter for AC and DC. Same meter reads both. Scale especially legible at 1½ to 7½ volts. This meter reads the AC and DC filament voltages.
(2) One DOUBLE reading DC milliammeter, 0 to 20 and 0 to 100 milliamperes, with changeover switch. This reads plate current, which is always DC in all sets.
(3) One 0-300 volts high resistance voltmeter, No. 346, with tipped 30" cord to measure B voltages.
(4) One 5-prong plug with 30" cord for AC detector tubes, etc., and one 4-prong adapter for other tubes.
(5) One grid switch to change bias.
(6) One 5-prong socket.
(7) One 4-prong socket.
(8) Two binding posts.
(9) One handsome moire metal case.
(10) One instruction sheet.
(11) One de luxe carrying case.

If 0-500 volt 5% accuracy high resistance meter is preferred to 0-300 volts, add $1.00, and order Combination C at $14.50.
If 0-500 volt 1% accuracy high resistance meter is preferred to 5% accuracy 0-500 voltmeter, add $2.00, and order Combination D at $15.50.
[*Note—A pair of adapters for UV199 tubes, Cat. No. 999, at $1.00 extra. These are not sold except with Jiffy Tester Combination.*]

GUARANTY RADIO GOODS CO.,
145 West 45th Street, New York City.
(Just East of Broadway.)

Please ship at once your Jiffy Tester Combination for which I will pay postman advertised prices, but no shipping charges. (Check off below.)

- ☐ One Jiffy Tester Combination A (0-10 v., 0-20, 0-100 m. a., 0-300 v., carrying case, instruction booklet FREE.....Price $13.50
- ☐ One Jiffy Tester Combination B (same as above, but with 0-300 voltmeter accurate to 1%). Price.....$14.50
- ☐ One Jiffy Tester Combination C (same as A, except 0-500 voltmeter replaces 0-300). Price.....$14.50
- ☐ One Jiffy Tester Combination D (same as C, except 0-500 voltmeter is accurate to 1%). Price.....$15.50
- ☐ Set of 199 adapters. Price..... $1.00

NAME.....

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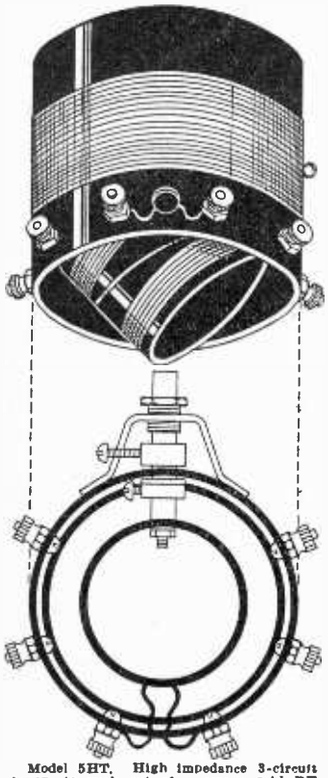
CITY..... STATE.....

5-DAY MONEY-BACK GUARANTY

HOW TO USE SCREEN GRID COILS



Model 5HT. High impedance 3-circuit tuner, to work out of a screen grid RF tube. For .0005 mfd. $3.00
Model 3HT. Same as above, but for .00035 .....$3.25

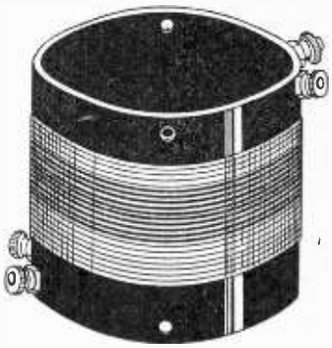
WHEN a screen grid tube is used as a radio frequency amplifier, the maximum gain, the best amplification, the most volume and the most DX are obtained by tuning the plate circuit. Then this enormous amplification is itself doubled by providing a secondary with twice as many turns as the primary has. The secondary is not tuned. The high impedance 3-circuit tuner at left (Model 5HT) is an example, as is the two-winding coil (Model 5TP) at lower left. The primary in these two instances is the outside winding and the tuning condenser goes across it. The secondary is wound on a separate form that is riveted inside the primary form. Preferably mount coils with binding posts at bottom for short leads. Then the connections for Models 5HT, 3HT, 5TP and 3TP are, from right to left as you look at the back of the coil: B+135, near front panel; plate of screen grid tube; two rotary leads (for tuner only); grid and (next to panel) grid return.

The antenna coil to use in screen grid circuits is 5A or 3A (upper right), because it is so designed as to equalize tuning. The low, almost zero, capacity between grid and filament of the tube is compensated by extra turns of wire, so that if the tube following the screen grid is of another type, for instance a regular detector, the elemental capacity difference is nullified. The antenna coupler has a continuous winding in shaded colors. The end with the larger number of distinctive turns goes to grid, the opposite end to ground. Either of the two remaining binding posts goes to antenna.

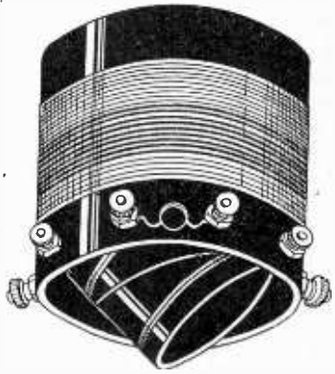
For single control screen grid sets the inductive trimmer type of antenna coupler (Model 5AS or 3AS, at right) should be used. The inductive trimmer coil for interstage coupling is Model 5TPS or 3TPS (not illustrated), but its connections are shown in the diagram at lower right. An inductive trimmer adds to or subtracts from the reactance, which is very important for resonance in single control sets. Trimming condensers only increase reactance, hence fail where decrease is needed.

Model 5TPS Interstage coupler to screen grid tubes, with inductive trimmer. For .0005 mfd. $2.25
Model 3TPS, same as above, except it is for .00035.....$2.50

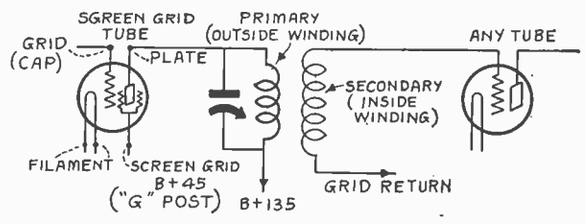
ALL ROTOR COILS HAVE SINGLE HOLE PANEL MOUNTING FIXTURE



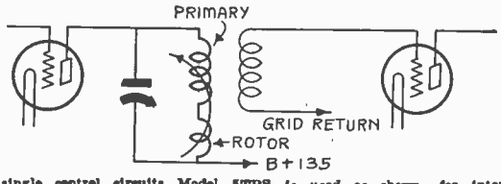
Model 5A. Conductively coupled antenna coil for input to screen grid radio frequency amplifier. For .0005 mfd condenser. Price $1.75
Model 3A. Same as above, but for .00035 .....$2.00



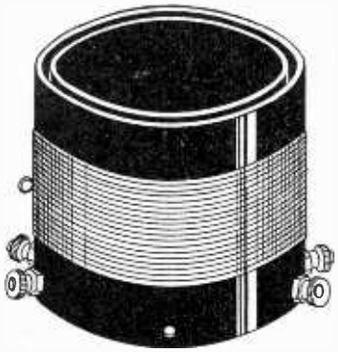
Model 5AS. Conductively coupled antenna coil for single tuning control screen grid sets. Rotor is an inductive trimmer. For .0005 mfd. $2.75
Model 3AS, same as above, but for .00035 ....$3.00



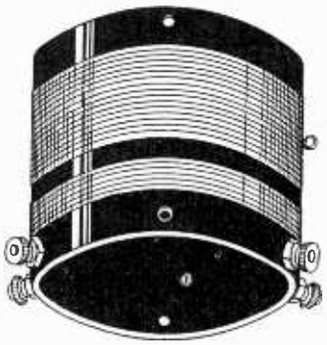
How tuned primary in plate circuit is wired for a screen grid tube. This illustrates the use of Model 5TP or 3TP, also Model 5HT and 3HT, except for the rotor coil connections.



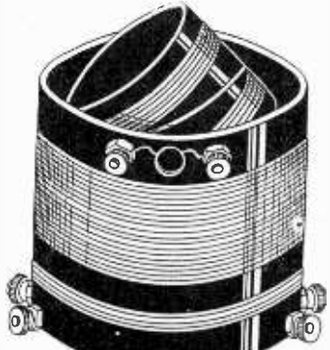
In single control circuits Model 5TPS is used as shown, for interstage coupling. The rotor is an inductive trimmer. The tube at left is a screen grid.



Model 5TP, the wiring of which is shown in the diagram directly above, is an interstage coupler for screen grid tubes. For .0005 mfd. $2.00
Model 3TP. Same as above, but for .00035 .....$2.25



Model R5, interstage coupler for replacing present coil in existing receiver when screen grid tube is substituted. For .0005 .....$1.50
Model R3. Same as above, but for .00035 .....$1.75



Model T5, standard 3-circuit tuner, not for screen grid tubes, but for all others. For .0005 .....$2.50
Model T3, same, but for .00035.$2.75

Coils for Other Than Screen Grid Tubes

When any tubes other than screen grid tubes are used as radio frequency amplifiers, standard coils are used, for instance Models T5 and T3, the three-circuit tuner shown above at right.

For the antenna coil in such a circuit use one with two separate windings, the familiar radio frequency transformer, with about 14 turns on the primary. This RF transformer is therefore used as antenna coil and as an interstage coil.

The resultant loose coupling of antenna reduces the capacity effect of the antenna and thus the standard TRF coils, with 201A, 112A, 226, 227, 199 or 240 tubes, providing the same RF tubes are used throughout, may be used in single control sets without trimming devices. This is true if the coils are absolutely matched, as Models RF5 and RF3 are.

The small winding (primary) is connected in the antenna-ground circuit, or, for interstage coupling, in the plate circuit. The large winding (secondary) is tuned and is put in the grid circuit.

Model RF5. Antenna coil or interstage coupler for any and all tubes, excepting only screen grid tubes. For .0005 .....$1.00
Model RF3, same as above, but for .00035 .....$1.25
Model T5, standard 3-circuit tuner for .0005 .....$2.25
Model T3, standard 3-circuit tuner for .00035 .....$2.50

USE THIS COUPON

Screen Grid Coil Co., 143 W. 45th St., N. Y. C. (Just East of Broadway)

(Specify Quantity in the Squares)

Please mail me at once your following coils, for which I will pay postman the advertised prices, plus a few cents extra for postage.

☐ Model..... ☐ Model..... ☐ Model..... ☐ Model..... ☐ Model.....

Name .....

Address .....

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

SEND NO MONEY!