

Radio Digest

EVERY WEEK **Illustrated** TEN CENTS

REG. U. S. PAT. OFF.

Vol. IV

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CHICAGO, ILL., SATURDAY, FEBRUARY 17, 1923

No. 6

BILL FACES YEAR DELAY

PERIL GROWS AS SENATORS FAIL TO ACT

Monopoly Efforts Rapped
Representative Jones of Texas Claims Three Firms Are "in Cahoots"

BULLETIN

By L. M. Lamm

WASHINGTON.—The White Radio Bill is still resting on the desk of the president of the Senate. It has not yet been referred to any committee owing to the illness of Senator Kellogg of Minnesota, who is to engineer the bill in the upper house. There is some feeling as to what committee it shall be referred, and, according to the last minute reports, opposition to the bill is developing in the Senate and it is possible that it

DR. DE FOREST GIVES YALE RADIO LIBRARY

NEW HAVEN, CONN.—A fund for the purchase of a library devoted to the science of Radio has been established at Yale University by Dr. Lee De Forrest, who is a Yale graduate. Dr. De Forrest has also established a fund for a course of 30 lectures by Radio experts for the benefit of advanced students and members of the engineering staff.

will not pass the upper house at the present session of Congress. This, if true, will delay the passage of the much-needed legislation for practically one year.

WASHINGTON.—As announced in last week's issue of Radio Digest, the White

Yank Accent Gets Britishers' Nanny

Otherwise, England Reports, Transoceanic Communication was "Bully"

NEW YORK.—During the test recently when heads of the American Telephone and Telegraph company succeeded in talking by Radio direct to a group of prominent persons at New Southgate, England, reports from the old country were that the reception was clear and of good volume. From a mechanical point of view, everything was "bully."

There was, however, one objection. The British audience, which, by the way, included Guglielmo Marconi, grew tired of hearing the "American accent." They



Four splendid artists heard recently on the Class B wave of WCAE, Kaufmann and Baer, Pittsburgh. All are from Keith's Vaudeville. Left to right: Ruth Watson, soprano; Alice and Hazel Furness, sopranos; Irene Geirs-Dorf, of the Geirs-Dorf 10-piece jazz band

Radio control bill has been passed by the House of Representatives and the bill is now in the Senate.

There was considerable discussion on the floor of the House during the debate on the bill, with Representative Jones of Texas the principal opponent to the passage of the bill. As a matter of fact the talk on the floor showed that the Congressmen as a body know very little about Radio.

Jones Anti-Trust Amendment

Jones of Texas offered an amendment to the bill, which was rejected by the House "directing" the Secretary of Commerce not to allow licenses to monopolies instead of "authorizing" the Secretary not to. (Continued on page 2)

prayed that an Englishman be put on the phone, if at all possible.

One whose qualifications included a Park Lane way of saying things, could have commanded a fortune from the American magnates. But there was no such linguist immediately available.

Naval Radio Station Demolished

ANCHORAGE, ALASKA.—The S. S. Starr reported here by Radio recently that wind has demolished the naval Radio station on St. Paul Island in the Bering Sea.

Tulane University, Station WAAC, is now broadcasting the U. S. Department of Commerce reports at 7:05 P. M. Central time on Fridays.

Los Angeles Stockyards Plant Begins Service

LOS ANGELES, CALIF.—With the advance of 1923 another Radio broadcasting station was completed and made ready to present its message to the world. The new plant will be known to listeners as KPCL, otherwise, the new Los Angeles Union Stockyards. The station is expected to be a wonder for distance as the masts of the new station are 150 feet high, while the antenna is unobstructed from the four points of the compass.

The Stockyards station will transmit market quotations and crop reports from the government on 485 meters wave length.

STAR'S SONGS BRING BROADWAY TO FANS

NEWARK, N. J.—A program of recitations was given by Florence Flinn from Station WOR here Monday, January 29. The broadcasts comprised "That Old Sweetheart of Mine" and several other popular pieces. Miss Flinn has played in many Broadway productions, such as "Partners Again," "The Exciters," "Daddy Dimples" and is now in the "Masked Woman" at the Eltinge Theatre.

BILL FACES DELAY

(Continued from page 1)

In urging the adoption of his amendment along these lines Mr. Jones said:

"The only place in this bill where any effort is made to curb the tendency to monopoly in this business is in this immediate paragraph, and in this paragraph the Secretary of Commerce is not directed to refuse or revoke a license when he finds companies are trying to monopolize, but he is simply authorized to do so. It seems to me that if the Secretary of Commerce finds that, in his judgment, a company is trying to secure a monopoly in this business he should be directed to say that they proceed no further. And this is not a mere idle chance that there may be a monopoly.

Cites Case of Attempted Monopoly

"It is readily recognized that there is a grave danger of monopoly in the business, and my information is that the American Telegraph & Telephone Company, the Western Electric Company, the Westinghouse Electric and Manufacturing Company, and the Radio Corporation of America, are today endeavoring to get a monopoly in this business.

"The Western Electric Company monopolizes all broadcasting telephone apparatus that are recognized by the telephone company. In other words, it manufactures the apparatus that is used in the broadcasting stations in that connection.

"The American Telegraph & Telephone Company owns 100 per cent stock in the Western Electric Company. These big four companies have gone into a combination by means of which they seem to have divided the business up. The Western Electric Company is to manufacture all broadcasting apparatus that is used in connection with telephone transmission. The other companies agree not to manufacture that.

Companies "All in Cahoots"

"The Radio Corporation sells receiving sets, but they have agreed to sell only receiving sets that are manufactured by the Westinghouse Electric Company and by the General Electric Company, so they are all in cahoots. Only a short time ago the American Telegraph & Telephone Company owned a million dollars' worth of stock in the Radio Corporation, and so much public pressure was brought to bear on them they transferred their stock, but retained a contract of such a nature that it enabled them to bar the Radio Corporation from entering the field of commercial communication within the United States. **Curbing Monopoly Most Important Thing**

"The most important thing in connection with the proposed legislation is to try to curb monopoly in this business. We have considerable regulatory powers under the present law if they are used, but there is a grave danger of a monopoly. It is mentioned that the American Telegraph & Telephone Company refused to furnish its wires and service for the purpose of broadcasting an entertainment from the Century Theater in New York, which has been giving Radio concerts. There was talk about it all over the country, but they did not purchase the apparatus from these big four, and the American Telegraph & Telephone Company said:

"We will not let you transmit your entertainment over our wires." That is the situation with which we are confronted today, and with that situation prevailing does not this House think when the Secretary of Commerce, in view of the immense powers granted under this bill, finds that the companies are undertaking to monopolize the situation he should be directed to refuse or revoke a license."

Accept Second Amendment by Jones

Jones offered another amendment to the bill which was adopted and which reads as follows:

"Or whenever the Secretary of Commerce shall find that in his judgment any person or corporation is monopolizing or seeking to monopolize Radio communication directly or indirectly through the control of the manufacture or sale of Radio apparatus or by other means."

Jones also offered another amendment, which was rejected when the bill finally passed whereby an appeal could be taken in court from the action of the Secretary of Commerce in refusing or revoking a license.

A number of other amendments were also offered to the bill while it was under discussion. None, however, was adopted as the bill passed the House. As the bill finally passed it was substantially the same as reported out by the Merchant Marine and Fisheries Committee.

Up-to-Date Lightship to Carry Radio Fog Signal

NEW BEDFORD, MASS.—A new and up-to-date lightship is almost ready for Nantucket Shoals, and is now being completed at Bath, Me. It will present, among many other new features in lightships, a Radio fog signal, electric signal lights and an oscillator in place of the submarine bell. The services of a Radio operator will be enlisted. Radio communication equipment will be installed. This is the most important lightship station in the world, and there have been many requests that it be equipped with a Radio fog signal. The new ship will be on her station within a few months.

\$100 FLEWELLING PRIZE CONTEST RULES

1. Contest is open to all Radiophans, whether or not they are subscribers to Radio Digest, Illustrated. The contest is open now and will close February 24 at midnight. Awards will be announced in the March 17 issue of this publication.
2. The object is to locate and award prizes on a competitive basis for the best Flewelling circuit receiving set entered.
3. Prizes are: First, \$40.00; Second, \$25.00; Third, \$10.00; Fourth to Eighth (five prizes) inclusive, \$5.00 each.
4. In event of a tie, equal prizes will be awarded each tying contestant.
5. Judges will be the Technical Staff of Radio Digest.
6. To enter the contest send working drawings and diagrams together with an article of from 1,500 to 2,500 words in length describing the making and operation of an actual Flewelling circuit receiving set. The article should tell: (a) how to make the set, (b) how to operate it, (c) helpful suggestions for getting maximum results, (d) actual airline broadcasting station receiving range using only one tube, first employing only an indoor aerial but no ground, second, using a ground but no aerial, and third, if available, using only a loop aerial. Other combinations and notations on the antenna system used will be considered in the award of prizes.
7. In sending material for consideration in the contest, exclusive publication rights are automatically given to Radio Digest, Illustrated. All articles published, but not awarded prizes, will be paid for at regular space rates. Unused manuscripts will be returned to contestants on request.
8. In deciding the winners of the contest the judges reserve the right to call for any set entered to be sent in for examination and test. Tubes, A and B batteries and phones will not be required in sets sent in for testing.
9. Manuscripts will be judged from the standpoints of neatness, clarity of expression, completeness, and actual tried success of the set described.
10. Originality in the use of various parts of apparatus other than shown by Radio Digest in the Flewelling circuit heretofore, is encouraged and even recommended. See Rule 6, however, for method to be used in determining the range.

New England Fans Discuss Silent Period Proposal

BOSTON, MASS.—Considerable discussion is going on in amateur circles over the proposition of a silent period for amateurs, during which the many thousands of other Radiophans, who merely have receiving sets and wish only to listen to broadcasts, may have a chance for a clear ether without so much interference by signals they do not understand.

Radio Inspector C. C. Kolster recom-

mends the hours between eight and eleven in the evening, for the New England district. This will give experimenters and amateur "sparks" two hours after supper in which to experiment without waiting until the late hours of the night.

By making the silent period extend to eleven o'clock, the inspector thinks this will give Radio receivers a chance to hear the broadcasts from the West and South, whose best programs come in at this time after the nearer eastern stations have stopped.

CONTENTS

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"All the Live News of Radio".....	1 to 6
Second Flewelling Prize Contest Rules.....	2
Receiving Records Contest.....	4
WMAQ Fights "Faddists" in Air.....	5
Book Reviews.....	6
Radiophonists' Mart, Descriptions of New Apparatus on the Market.....	7
Radiophone Broadcasting Stations, Part I, Station Schedules and Instructions for Use of Directory.....	8
Editorials; Condensed by Dielectric; Indi-Gest, Humor Column.....	10
A-B-C Lessons for Radio Beginners, Chapter VII—The Crystal Detector, by Arthur G. Mohaupt.....	11
Cartridge Fuses Make Inductances; Five Other Kinks.....	12
Reinartz Panel Set Designed for Compactness, Part II—Arrangement of Apparatus and Wiring, by H. J. Marx.....	13
The "How" of the Simplified Super Circuit, Part III—A Discussion of the Variable Leaks, by E. T. Flewelling.....	14
Questions and Answers.....	15
Radio Illustrated, a Page of Pictures.....	16

Looking Ahead

The Flewelling Contest Papers are pouring in. Many unique Super sets have been constructed it seems. The contest closes February 24, so watch for the publication of the series of winners.

Part III of the Reinartz Panel Set Series, by H. J. Marx, next week, will describe the cabinet dimensions and battery connections. See Part II on page 13, this week.

E. T. Flewelling in His Exclusive Digest Series, will tell more about the Flewelling Super in his fourth article, to appear next week. Turn to page 14, this issue, and read what he says about the "fivver" set.

A-B-C Lessons for Radio Beginners, Chapter Eight, will be devoted to instructions for the making of an efficient crystal detector set. Nearly every Radiophan starts with a crystal set, so tell your beginner friends to read Mr. Mohaupt's article in the February 24 issue.

Pictures from Prominent Plants will be featured on pages one and five of next issue. Order it from your newsstand dealer or subscribe today.

Part II of the Radiophonists Telephone Book will be given on page eight of the February 24 issue. You can't get along without it, can you?

Newsstands Don't Always Have One Left

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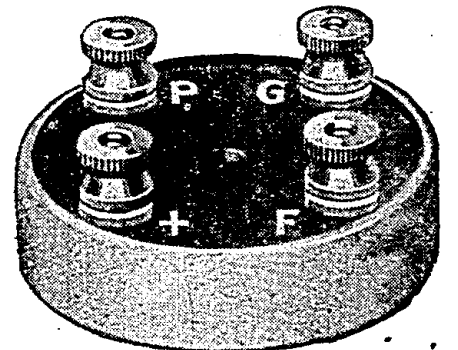
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Please find enclosed check M. O. for Five Dollars (Six, Foreign) for One Year's Subscription to Radio Digest, Illustrated.

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(Patent Pending)

Radio Frequency Transformers \$2

No radio set is complete without radio frequency amplification, and radio frequency amplification isn't perfect without Schindler's new improved transformers. Schindler's Transformers insure the highest type of amplification. They insure clearness, eliminate noise and static disturbance and bring the distant stations within your reach. Signals heretofore too weak for detection on outdoor antenna are made audible on small indoor loop aerials wherever Schindler's Transformers are applied. Price \$2. Order direct if your dealer can't supply you.



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(Patent Pending)

Schindler's "Build-Up" Mica Condensers insure high efficiency and full capacity. The "Build-Up" feature enables the operator to increase to any capacity up to .005 simply by adding extra plates of Mica and Copper Foil. 35c for capacity .0005. 75c for .006 for Flewelling circuit. An envelope containing 20 Mica and 20 Copper Plates, 25c. Order direct if your dealer hasn't Schindler's in stock.

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TESTS SHOW NEW USE OF AIR WAVES

RADIO VERSATILITY SEEN IN 'CARRIER' TRYOUT

Seek to Control Remote Apparatus After Successful Transmission of Voice Over Wires

PITTSBURGH, PA.—Before representatives of all the larger light and power companies of the United States, a new use of Radio was demonstrated recently, that of carrying on voice conversations by means of Radio waves over high tension power lines without the use of switches and just as is done in the ordinary wire telephone connection. It was also demonstrated that the system could be used for remote control of all manner of apparatus. The test was carried out between experimental stations located in the Colfax and Brunots Island power stations of the Duquesne Light company, points located about 30 miles apart, by engineers of the Westinghouse company and the Duquesne power company.

Effort to Control Switches at Distance
For a long period of time the engineers have been working on a method of carrier current control for use in central power stations and electric railways, or other points using high tension electrical lines. The idea behind the whole scheme is to superimpose Radio waves on the power lines and thus make use of Radio transmitting and receiving for both voice communication and control of remote switches.

Preliminary research work on ordinary transmission lines and feeder-line circuits had indicated that the use of wired Radio communication was simple and effective on such lines. But when trying out the Duquesne lines it was found that the system was so complicated and extensive that many additional problems had to be solved before carrier current despatching could be done successfully.

The demonstration test held January 11 was entirely successful and proved conclusively that this method interlacing the telephone with the power lines would soon be a feature in the plants of more progressive companies.

Saves One Line; Cuts High Tension Hum
It was demonstrated in a small room of the power plant in Colfax that the carrier current system of telephony allowing communication over high tension lines, besides saving an additional right of way, does away with the great noises and high induced voltages which operators so much dread in talking along lines that parallel high tension systems.

The new system was demonstrated over a 66,000 volt line and is unique in that the system was duplex and operated as does the ordinary telephone.

When the telephone receiver is unhooked, the transmitting station automatically starts up, allowing talk in both directions without any switching. This feature is entirely new in Radio as all other transmitting and receiving must be done by switching back and forth, because a station transmitting will not receive messages. The transmitting apparatus must first be switched off and the receiving circuit switched in. However, all this is done away with in the new system.

Selectively Picks Number Called

The calling or ringing of numbers is selective and operated by special selector keys which cause the bell to ring only at the station desired. This eliminates the distracting code ringing and allows station operators to keep their minds on their work.

The improved system has been carefully worked out by C. A. Boddie, Radio engineer of the Westinghouse company, and the technical and economic features are now being analyzed by Mr. Boddie, assisted by M. W. Cooke, of the Duquesne Light Company.

Plans to link New York City, Buenos Aires, Paris, London and Berlin with new super-power international Radiotelegraph stations are developing.

COB-WEBS IN MOVIES AIRPHONE ENTERTAINS

LONDON, O.—The moving picture machine in the schools at Cable, north of here, is covered with cob-webs and the former patrons are enjoying the Radio outfit recently installed at the school. For some time the picture shows have been losing money, it is stated, and the Radio outfit is expected to make up the deficit in short order.

MONTH'S EXPORTS TO CANADA HOLD LEAD

WASHINGTON.—Exports of Radio apparatus for November show that 159,950 pounds of Radio apparatus, valued at \$223,180, were exported in that month. The largest quantity from the monetary standpoint went to Quebec and Ontario with 23,214 pounds, valued at \$39,834, with Mexico, Argentine and Cuba following, in the order named.

PWX LINKS MOTHER TO DAUGHTER



Miss Harriet Williams in Havana, Cuba, wanted her mother in Toledo to hear some of her favorite old tunes. So she broadcast "Mother Machree," "April Morn" and other pieces from Station PWX in Havana, and her mother, using a neighbor's phones, heard them quite as plainly as if her daughter were singing and playing her violin right at home. Incidentally, Miss Wilson's voice carried 3,500 miles and was heard in Alaska—believed to be the record broadcast of a woman's voice

Adds Night Course in Radio

LITTLE ROCK, ARK.—Interest in Radio here has become so intense that the Little Rock High school has added

a course in Radio for amateurs at its night school. The class is the first of the kind organized in the state. It opened January 26. The class is in charge of C. N. Clayton.

GIRL'S VOICE HEARD 3,500 MILES AWAY

ALASKAN HEARS SINGER AT PWX, HAVANA

Performer's Mother, in Toledo, Listens to Favorite Songs Sung by Daughter Far Away

By F. N. Hollingsworth

HAVANA, CUBA.—What is believed to be the world's record for broadcasting a woman's voice was established recently by Station PWX of the Cuban Telephone Company here, associated with the International Telephone & Telegraph Corporation of New York. A letter was received at Havana from Robert E. Coughlin, of Douglas, Alaska, 3,500 miles airline from Havana, reporting that on the night of January 6 his wife plainly heard "Mother Machree" being broadcast from Station PWX. The singer was Miss Harriet Williams, a member of the staff of the American consul general in Havana. Miss Williams is a coloratura soprano, as well as a talented violinist.

Hoped Mother in Toledo Might Hear

She was formerly associate editor of a Mexican magazine in New York city. On the night in question, after a violin selection, she sang "Mother Machree" in the hope that her mother, who lives in Toledo, Ohio, might hear. Then she broadcast a few words by expressing the hope that her mother might be successful in hearing her. Since then hundreds of letters have been received from sympathetic fans wishing to know whether Mrs. Williams had picked up PWX. One fan grew so sympathetic that he wrote offering marriage.

Mother Falls First, Succeeds Later

Unfortunately, Mrs. Williams was one of the few who did not hear the program, for the day before the concert the man who owned the tree to which the antenna was attached cut it down.

On January 20, Miss Williams called her mother by long distance telephone and asked her to be listening for the concert that night, when she sang again. A neighbor of the mother, William Steinaker, has a receiving station with which he has been able to enjoy the programs from the powerful Cuban broadcasting station on numerous occasions. Knowing the anxiety of Mrs. Williams to hear her daughter, Mr. Steinaker invited her to his home, and to the delight of everyone was successful in receiving the Havana program clearly.

Sings Mother's Favorites

Miss Williams sang Batten's "April Morn" because she knew it was one of her mother's favorites. Then she played Wieniawski's "Obertass Mazurka" and Handel's "Largo" on her violin.

Station PWX has a 500-watt transmitter, sending regularly on 400 meters, and the International Telephone & Telegraph Company has an exact duplicate of this station at San Juan, Porto Rico, known as WKAQ, which sends on 360 meters.

Radio Set to Reward Crippled Boy's Deed

Lad Gave Half His Money So Another Could "Listen"

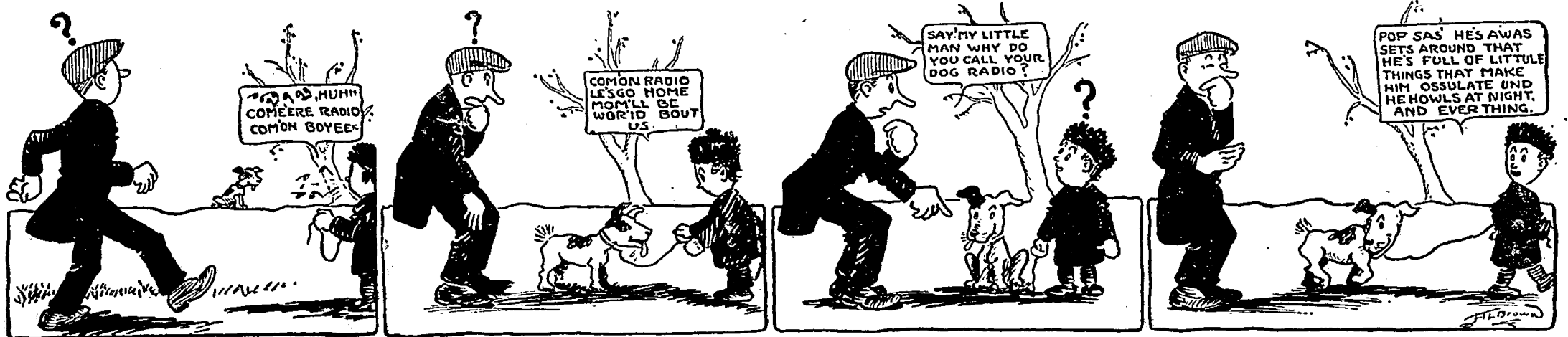
BOSTON, MASS.—The crippled boy who listened in at the Tremont Temple revival services of Rev. Dr. J. C. Masee and was so impressed with the music and preaching that he gave up one of his two precious dollars to help some other crippled boy have a turn at listening in, is going to have a Radio receiving set of his own. A number of Dr. Masee's loyal friends will provide the set, and when it is to be installed Dr. Masee will call upon the boy personally. Enough money has been contributed direct to Dr. Masee for this special purpose to insure that the boy will receive the set, one of the best.

Australia has two Radio broadcasting stations, each giving a regular program once a week.

THE ANTENNA BROTHERS

Spir L. and Lew P.

All the Symptoms



STANDARDIZE RADIO TEACHING IN ARMY

BIG PART IN TRAINING OF OFFICERS

Board Lays Down Definite Program; 1,309 Hours of Study for Signal Men

By Carl H. Butman

WASHINGTON.—Radio has a very important part in the education of army officers in communication, instruction in which important subject has recently been standardized.

A definite program of instruction in radio, as part of the schooling of all signal corps officers and other officers assigned for training from the regular army, national guard, reserve corps and civilian military training camps, has been laid down by a board of army officers.

The board, headed by Col. H. B. Fiske, and including Major S. M. Walmsley, signal corps, recently filed its report on army service schools including the signal school at Camp Vail, N. J. Three communication courses are prescribed; the company officers' course, an advanced tactical and administrative course, and an advanced technical course, all of which include the subjects of radio and "wired-wireless."

Extent of Courses

The course for company officers includes approximately 1,309 hours of study for signal officers and 1,285 hours for officers of other arms. Courses extend over a period of nine months, commencing in September. Radio telegraphy and telephony covers a period of 180 hours and includes theoretical and practical instruction in fundamental electrical principles, spark sets, thermionic vacuum tubes, continuous wave sets, antenna systems, wave meters and other auxiliary apparatus, with special attention to army radio sets.

Tactical radio procedure is studied during 20 hours. This includes the principles governing the organization and operation of tactical radio nets for all arms, and the procedure essential to successful net operation. Other subjects pursued by the student officers includes codes and ciphers, combat orders, electricity and magnetism, wire communication, code practice, message centers, etc.

Advanced Studies Given

Advanced studies in radio are prescribed in the tactical and administrative course for signal officers assigned to units larger than divisions. This is also a nine months' course and covers study and instruction periods totaling 1,235 hours. The subject requiring the greatest time is the development of signal equipment which covers 300 hours. Radio systems of divisions and larger units requires 150 hours, and includes instruction on the tactical uses of the various radio sets furnished to Army combat units, the organization of such sets into nets and their operation. Instruction in the preparation of orders to signal officers of divisions, corps and armies such as the allotment of wave lengths, call letters, and special sets is also given. Fifty hours is designated for the study of codes and ciphers, their design and solution.

Some broadcasting stations have adopted a novel scheme for letting listeners in know that they are still tuned in during the brief intervals of silence between numbers on the programs. As soon as a number is concluded a metronome, a small ticking instrument used by pupils of music, is set in motion until the next announcement is made.

RECEIVING RECORDS? SEND 'EM IN—

By the Contest Editor

WELL, here we are again with a supplement to the list of 262 records published last week. Seems as though no DX records are unbeatable.

In last issue, we—the contest editor—said that we would be glad to receive complete descriptions of sets used by the holders of records of 2,300 miles and over. Then we can tell other fans the tricks used to make real records. Have you had a record of that class published? Send in the facts about your set if you can qualify.

After the list of records follows the rules of the contests. Every week more new DX listeners are fighting to see their names in print. Here are the latest record holders:

Station—Miles Away—Who Heard It

- CFCN—2000, C. M. Bussey, Hudson, N. Y.
- CHCQ—2100, G. F. Alken, Providence, R. I.
- CJCG—1425, G. E. Wharton, Houston, Tex.
- KDZA—2025, Breisch Motor Co., Ringtown, Pa.
- KFAB—2325, Breisch Motor Co., Ringtown, Pa.
- KFAE—1650, G. E. Wharton, Houston, Tex.
- KFBJ—1775, Richard Reeder, Alliance, O.
- KFC—1875, G. E. Wharton, Houston, Tex.
- KFCB—1425, O. P. Klein, Leduc, Alta., Can.
- KFCX—1075, G. E. Wharton, Houston, Tex.
- KMG—1050, C. C. Sawyer, Liberal, Kans.
- KPO—2550, C. M. Bussey, Hudson, N. Y.
- KXD—2075, Richard Reeder, Alliance, O.
- KYT—2325, Breisch Motor Co., Ringtown, Pa.
- KZY—1150, D. D. Coutts, Madison, S. D.
- NAA—1075, C. M. Bennett, Aurora, S. D.
- WBAB—1425, G. E. Wharton, Houston, Tex.
- WBAJ—1075, G. E. Wharton, Houston, Tex.
- WBAX—1350, G. E. Wharton, Houston, Tex.
- WBT—1250, W. C. Wolverton, M.D., Linton, N. D.
- WBT—1725, W. F. Macleod, Prince Albert, Sask., Can.
- WCAF—2125, Perkins Benneyan, Fresno, Calif.
- WCAQ—1025, W. F. Macleod, Pr. Albert, Sask., Can.
- WCAQ—1025, G. E. Wharton, Houston, Tex.
- WCK—1225, W. F. Macleod, Prince Albert, Sask., Can.
- WDAL—2450, J. Beckman, Seattle, Wash.
- WDAS—1250, C. M. Bennett, Aurora, S. D.
- WDAY—1200, G. E. Wharton, Houston, Tex.
- WDT—1400, G. E. Wharton, Houston, Tex.
- WEAT—1300, Richard Slegel, Lawrence, Mass.
- WFAC—1200, G. E. Wharton, Houston, Tex.
- WFAF—1425, G. E. Wharton, Houston, Tex.
- WGAP—1700, W. F. Macleod, Pr. Albert, Sask., Can.
- WGAP—1050, D. D. Coutts, Madison, S. D.
- WHAM—1125, W. C. Wolverton, M.D., Linton, N. D.
- WHAS—1700, O. P. Klein, Leduc, Alta., Can.
- WIK—1150, G. E. Wharton, Houston, Tex.
- WIP—1150, D. D. Coutts, Madison, S. D.
- WJAS—1900, Louis Raymond, Pullman, Wash.
- WKAF—1500, C. M. Bennett, Aurora, S. D.
- WLAW—1450, C. C. Sawyer, Liberal, Kans.
- WMAK—1175, Wm. J. Wolverton, Linton, N. D.
- WMAK—1300, Mascn Bradley, Pavilion, N. Y.
- WMAQ—1150, W. F. Macleod, Pr. Albert, Sask., Can.
- WNAC—1600, G. E. Wharton, Houston, Tex.

department of this publication, using a Geo. F. Cram Co. standard Radio map of the United States. Owing to much variance in maps, the distances are only given to the nearest 25 miles and are claimed accurate only within 50 miles.

5. There are no prizes awarded. The only compensation record holders receive is the distinction of recognition through the columns of RADIO DIGEST.

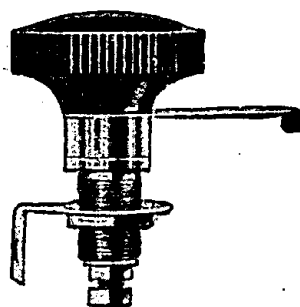
Radio broadcasting, it is believed, will make for better speech. Listening regularly to correct English will ultimately have its effect and broadcasters of spoken material to be efficient must of necessity use good English.

Lockport to Be Heard Far

LOCKPORT, N. Y.—The Norton Laboratory of this city has installed a new transmitter with the intention of broadcasting messages as far as the Pacific coast.

KING QUALITY

ALL THE NAME IMPLIES



King Quality Switch Levers

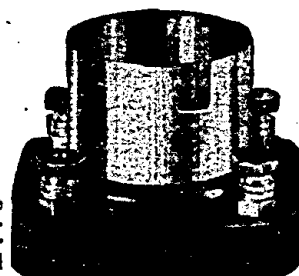
With perfect mechanical and electrical features. Mirror finish Bakelite knob with polished knurl that glows like a diamond. 3 sizes: 1 in., 1 1/4 in., 1 1/2 in.

Write today for bulletins containing complete lists of parts, prices, etc.

IMPROVE your set in appearance and service. King Quality parts are the Best money can buy; cost no more than inferior made products. We use genuine Bakelite exclusively.

PRICES:
1" and 1 1/4"
Radius: 55c
1 1/2" 60c each

King Quality Vacuum Tube Socket



Base of genuine moulded Bakelite with mirror finish; tube and terminal binding posts of brass, nickel plated and highly polished. Black or mahogany finished Bakelite Base.

PRICES:
Black or Mahogany Bakelite \$1.00

Radio Apparatus Division
KING SEWING MACHINE COMPANY, Buffalo, N. Y.

REINARTZ

ALL PARTS NECESSARY
DEALERS: WRITE FOR DISCOUNTS

HUDSON-ROSS
123 W. Madison St. Chicago

"ALL-AMERICAN" Amplifying Transformers

Two years of successful use all over the world guarantees permanent satisfaction. Radio and Audio Frequency.

Send for Circulars

Rauland Manufacturing Company
35 South Dearborn Street Chicago

Wessco

W. E. SUPPLY AND SERVICE CORPORATION
18 MURRAY STREET, New York

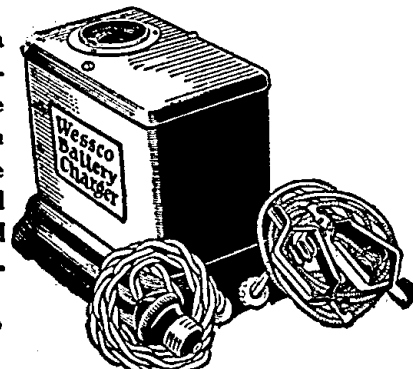
2 Blocks South of Chambers, between Broadway and Church St.

OUR PRICES SPEAK LOUDER THAN WORDS

FREE FREE FREE
WITH EVERY \$10.00 AND OVER PURCHASE A \$1.50 22 1/2-VOLT VARIABLE B BATTERY

Mail orders must include postage. TERMS:—Money Orders with Orders—checks not accepted. All Merchandise offered is Standard, Guaranteed, and is of perfect workmanship.
\$20.00 WESSCO BATTERY CHARGER DE LUXE

Equipped with a doubly durable vibrator which can be removed in less than a minute without the use of tools. Special rubber treads and various other im-



provements. Adapted for the recharging of radio A and B batteries and automobile storage batteries at the special introductory price of \$12.95

- SOCKETS:**
\$1.00 Genuine Bakelite Socket.....\$ 0.45
- DIALS:**
\$1.00 Genuine Bakelite Dials—3-in. 45c;
4-in.55
- VARIOCOUPERS:**
\$7.00 Guaranteed Genuine Bakelite Pioneer Variocoupler, silk wound..... 4.75
\$4.25 Variocoupler, guaranteed high quality..... 2.25
\$8.00 Moulded Variocoupler, highest quality..... 4.50
\$5.00 Shamrock Variocoupler..... 2.50
- TRANSFORMERS:**
\$5.00 Acme Transformer..... 3.40
\$3.00 Radio Frequency Transformers..... 1.65
\$6.50 Wessco Audio Transformers, highest quality guaranteed..... 3.25
Thornderson Transformer..... 2.50
\$3.00 Radio Frequency Transformer..... 1.50
- VARIOMETERS:**
\$6.50 Pioneer Variometer, genuine Bakelite, silk wound..... 4.50
\$6.00 Wessco Variometer, highest quality guaranteed..... 3.25
\$4.50 Variometer, guaranteed high quality..... 2.40
\$6.50 Moulded Variometer, highest quality..... 3.50
- BATTERIES:**
\$ 6.75 Westinghouse Storage B Battery..... 4.75
\$24.00 A Battery, 100 Amp., 6 V..... 16.75
\$19.00 A Battery, 80 Amp., 6 V..... 14.45
\$14.50 A Battery, 60 Amp., 6 V..... 8.75
\$3.00 Battery, 2 1/2 V. Variable, highest quality guaranteed. Large size..... 1.45
\$1.75 B Battery, 2 1/2 V. Variable, highest quality guaranteed. Small size..... .75
\$7.00 Westinghouse Storage B Battery..... 5.50
\$1.00 W. D. II A Battery..... .55
- CONDENSERS:**
\$5.00 23-pl. Variable Condenser..... 1.65
\$5.50 43-pl. Variable Condenser..... 1.95
3-plate Vernier Variable Condenser..... .70
50c Mica Condensers..... .15
Thornderson Grid Condenser..... .15
Bronze Bus Bar, tinned, ft..... .02
100 ft. solid Copper Antenna Wire..... 1.40
- MAGNAVOX—NEW TYPE, NEW CONSTRUCTION, NEW FINISH—ON SALE.**
\$10.00 Guaranteed highest quality Wessco Phones. Superior to any phone on the market at the price. Introductory price..... \$4.95

- PANELS:**
Guaranteed Genuine Bakelite Panels—7x10, \$1.25; 7x16, \$1.85; 9x10, \$1.60; 5x5, 47c; 5x9, 95c; 6x12, \$1.25; 7x12, \$1.50; 7x9, \$1.15; 12x14, \$3; 7x24.....\$ 3.00
Spaghetti, per length..... .07 1/2
Special Electric Soldering Iron, two heat..... 4.95
20c Bezel..... .15
- PHONES:**
\$5.00 Murdoch Phones..... 3.55
\$1.00 Freshman Variable Grid Leak..... .75
- WIRE:**
100 ft. coil No. 14, 7-strand pure copper Aerial Wire..... .50
Magnet Wire 20 per cent. off list.
- RHEOSTATS:**
\$1.00 Rheostat..... .32
Johns-Manville Bk. Com. Tubes, 3-in..... .25
- DETECTORS:**
\$.75 Crystal Detector..... .35
\$.40 K. D. Crystal Detector..... .16
\$1.50 Multi Jack..... 1.15
\$1.50 Twin Adapter..... .75
\$1.25 Universal Plug..... .75
- BATTERY CHARGERS:**
\$18.00 Westinghouse Battery Chargers..... 14.40
\$19.50 Westinghouse Battery Chargers for A & B Batteries..... 15.60
70c Open Circuit Jack..... .25
95c Double Circuit..... .30
75c Battery Hydrometer..... .35
- KNIFE SWITCHES:**
Knife Switch S. P. S. T..... .14
Knife Switch S. P. D. T..... .22
Knife Switch D. P. D. T..... .35
Wooden Horn..... 5.50
Contact Points..... .06
\$5.00 Standard Metal Horn..... 4.50
\$7.50 Standard Metal Horn..... 7.00
\$22.00 Pathe. Large Speaker..... 15.00



"HE WHO lightly promises is sure to keep but little faith."
—Said Lao Tzu.

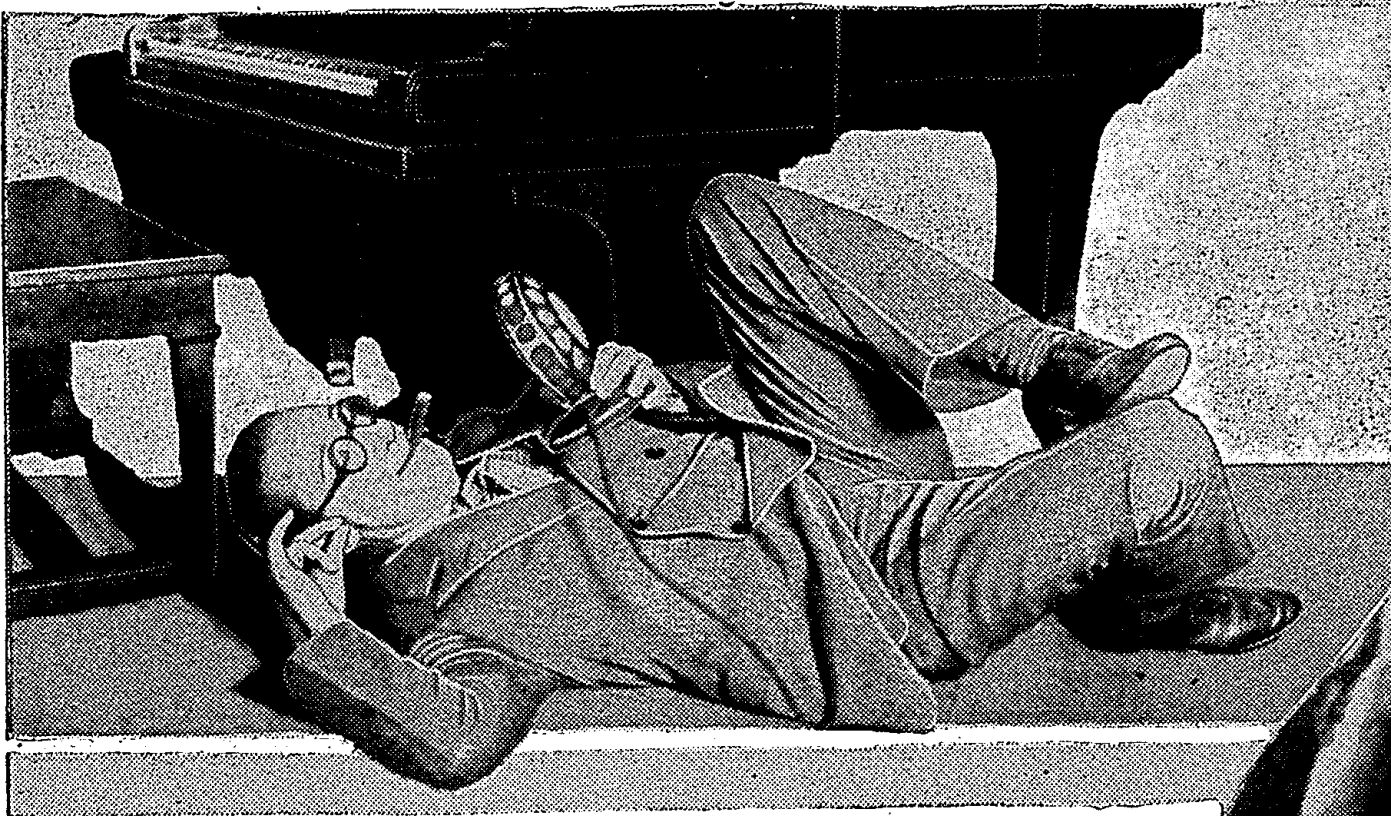
Beware of unproven statements—get results with a Grebe Receiver.

A. H. GREBE & CO., Inc.
RICHMOND HILL, N. Y.

Western Branch
451 East 3rd St., Los Angeles, Cal.

Doctor Mhu.

WMAQ FIGHTS "FADDISTS" IN AIR



A few peeps into the WMAQ studio on the opening night would have shown Ed Wynn, "The Perfect Fool," and Olga Menn, brilliant Chicago clubwoman and soprano of note. Ed persisted in his clownish actions as he lay on the floor, as pictured above, and officially opened the now famous station at 7 P. M., Central time, October 2, 1922

Chicago Newspaper-Store Station Operated for Service, Advertising

"Best None too Good for Fans" Is Principle Upon Which Daily News-Fair Store Programs Are Planned—Managers Aim to Keep Radio from Being "Plaything"

By Vera Brady Shipman

"This is Station WMAQ, the Chicago Daily News broadcasting service, on top of the Fair Store."

Within that announcement lies the advertising secret of a great newspaper and a large department store. For WMAQ is a joint ownership organization, the Fair paying the equipment and operation expenses, while the News controls the broadcasting program service completely.

Why does a newspaper operate a broadcasting service? The answer is this, according to Walter Strong, business manager of the Chicago Daily News:

"The first function of a newspaper is service to its readers. The newspaper should take up a new departure as evidence of its faith in progress. Radio came as a novelty. It has grown into a genuine factor, past the stage of a craze. It is an institution in the home and abroad. What better service can a newspaper afford than that of stimulating both the home and occupational progress of the reading public?"

Best None Too Good for Fans

The Chicago Daily News, appreciating the growing enthusiasm for Radio, began broadcasting programs of merit. The best would be none too good for the News Radiophans.

When Mr. Strong opened the Radio department he took William S. Hedges from the traction news division and placed him in charge of a questions and answers column. This rapidly grew into a regular daily newspaper feature with special Saturday supplement.

The first programs broadcast under the News auspices were sent out from KYW April 25, 1922. The News ran a half-hour program each evening along with others. Miss Judith Waller was placed as the head of the Radio program service. Miss Waller is primarily an educator and her aim has been from the first to elevate the standard of broadcasted programs.

To Keep Radio from Being Plaything

"Now, we could let the fad go on being a fad," said Miss Waller, "and only hear the inferior programs, by amateurs, the jazz bands, the cheap ballads put out by third-rate music publishers, if we preferred to do so; and doubtless that is what thousands of people have already done, Radio being put away as a plaything—laid one side with the closed player piano and phonograph.

"Those of us who know what the possibilities of Radio really are do not want it ever to become a plaything. We want to keep it as an educational opportunity, a means of giving the people higher and better things. We want to reach the people in communities cut off from the big cities with all their advantages.

Helps Small Community Home

"Think, for instance, what it might mean to the home in a small community where the professional artist never goes to actually hear Galli-Curci sing or Fritz Kreisler play or Prof. Forest Ray Moulton give a lecture on astronomy or to hear the

leaders on any subject discuss the big questions they are so vitally interested in. Isn't it a bit more personal than hearing Galli-Curci or Kreisler on a record or reading a lecture or speech in the newspaper or magazine?"

"If Radio can bring all these things into the home isn't it likely that the tendency will be a returning to the old home circle and won't it bring an interest to the farm that will, in a way, offset the longing for the 'big city'?"

Staff of Musicians

Miss Waller's assistants are musicians, Miss Elizabeth Burton, assistant director of program service, is organist of the First Methodist church. Donald Weller, operator, Robert Whitney, announcer, are musicians, as are the various assistants.

On October 2, 1922, at 9:15 P. M., Station WMAQ was opened on the Fair Store. A gala night program was given by Daddi, formerly of the Chicago Opera company, Miss Olga Menn, soprano, a Chicago society leader, Wally Heymar, violinist, and Alma Birmingham, accompanist.

The first person to speak over WMAQ was Ed Wynn, whose antics in "The Perfect Fool" were elaborated in his dedicating remarks at the 7 P. M. program that evening when the air was officially intruded upon.

Like Entering Music Conservatory

A visit to Station WMAQ is like entering a music conservatory. Taking the photo gallery elevator in the Fair Store to the eleventh floor, and walking to the front of the building facing above State street, you enter a reception room having chairs for waiting. Then on into the studio, wholly sound-proof, artistically furnished in brown tones, easy chairs and davenport here and there, a large fern, soft brown draperies, a Mason and Hamlin grand piano.

Opera Singers, Celebrities, Visit WMAQ

When the opera is in season, opera singers have broadcast. A visit to Chicago of a celebrity is apt to include a short talk over Station WMAQ. The National Federation of Women's Clubs with Mrs. Mary Oberndorfer as chairman of music, has instituted a series of lectures, recitals and pamphlets called "Hearing America First." And Mrs. Oberndorfer broadcasts a lecture recital weekly from WMAQ on this subject. The children's hour is adequately represented by Georgene Faulkner, the original Story Lady, whose Monday evening stories to children are anticipated by all youthful fans. College lectures, conservatory recitals, Babson financial reports, are sandwiched in between classical and semi-popular musical programs.

Cough Cures Pour in from Everywhere

From the fans who listen in, WMAQ receives an average of more than 250 letters a day. They are from everywhere, asking everything. The farthest distance is 4500 miles, from an U. S. cruiser in the South Seas near Australia. As I watched Miss Waller open the third mail

Four New Transformers Ready for Anacostia

Station Near Washington Will Be One of America's Strongest

FORT WAYNE, IND.—Transformers of the latest design have just been completed at the local works of the General Electric company for the government Radio station, NOF, at Anacostia, D. C., near Washington. These transformers, when installed, will make the station one of the most powerful in America.

Designs for the large transformers were made by engineers of the local works.

of the morning, a letter from an Iowa fan was followed by a query for a hook-up from downstate Illinois, and a garage owner from Indiana told of his pals listening in with him. In response to a midnight test when the operator inadvertently coughed into the microphone and said he wished he knew a cough cure, at least fifty suggestions for positive cures came in the mail the next day. A child writes in cramped style a request for Miss Faulkner to tell the story of Chicken Little. An isolated woodsman from the north country told of "WMAQ coming in fine" on a crystal detector.

Fair Store Tells Why It Broadcasts

And why does a great store like the Fair give space and financial equipment for a broadcasting station such as this?

E. J. Lehmann, Jr., president of the Fair Store and son of E. J. Lehmann, founder of the corporation, answers:

"The business value of Radio is one of those unseen forces which can never be counted. In dollars and cents, the returns are not evident. But in good will, advertising value and general publicity it brings in its own good returns. Hearing the station 'On the Fair Store' and hearing the name broadcast many times daily, cannot but be a strong advertising force and when the government so regulates its stations that they may be used as definite advertising medium, then the returns will show financial value, for the man who listens in to a program is willing to listen in to a talk on good merchandise, where and how to get it."

Siffer Lemoine, Radio Engineer of the Royal Swedish Telegraph Board, is in the United States studying the American Radio systems and to confer with government Radio officials.

8 BROADCASTERS LIMIT IN ENGLAND

Transmission Under New Plan Begins; Only Two Stations in Operation

LONDON, ENGLAND.—Broadcasting has finally begun in this country under the carefully devised plan which took practically a year to formulate and which was designed to eliminate as far as possible all of the difficulties which have been experienced in the United States, while retaining all of the advantages. In general the plan limits the number of broadcasting stations for the British Isles to eight in number, but so far only two are actually in daily operation, one in this city and the other in Manchester. A third is being erected in Cardiff, Wales.

It is believed that by limiting the number of active stations to eight the entire country will be adequately covered and unnecessary interference between two or more stations operating at the same time eliminated.

The first station to be put into operation was 2LO, which is installed in Marconi House, on the Strand, in the heart of this city. An experimental station had previously been in existence and the change to a permanent station was an easy matter. The latter has a power output of one and a half kilowatts, or approximately three times that of the average Class B station in the United States.

Since it went into operation 2LO has been heard over the entire country and easily reproduced on a loud speaker by a receiving set in the Shetland Islands, off the north coast of Scotland. There is no doubt that it will be heard over the eastern section of the continent of Europe, and under extremely favorable conditions may be heard on the eastern coast of America with super-sensitive receiving sets.

Hiker to Coast Talks to Family from Station WDAF

KANSAS CITY, MO.—Leo Riley, Columbus, Ohio, youth who recently started on a trip to San Diego, Calif., stopped off one night this week at the Kansas City Star's broadcasting studio and joined the Night Hawks of Station WDAF. While at the station he was permitted to send greetings by Radio to his family listening in in Columbus, all the members of which heard him.

REVAMP CHAMBER TO AID 'AIR EVILS'

LINK BIG INTERESTS AND PUBLIC IN SWEEP

National Radio Body Seeks to Improve Broadcasts and Cut Interference

(Special to RADIO DIGEST)

NEW YORK.—Sweeping reorganization of the National Radio Chamber of Commerce, linking up, as active workers in a nationwide plan to wipe out the evils of broadcasting and to solve other Radio problems, every major interest of the Radio industry and the public, is announced by President William H. Davis following a meeting of the Board of Governors at the Chamber's headquarters, 165 Broadway.

The Board of Governors adopted a new constitution providing for the admission to membership, either directly or through regional chambers of commerce, of individuals, including the audience or the listeners in, manufacturers, jobbers, dealers, broadcasters, amateurs, the press, and organizations and institutions interested in Radio, comprising educational, scientific, religious, civic, political and other bodies.

To Better Broadcasting

"Interference and the broadcasting of the trivial and valueless has injured the business and unless remedied may ruin it," declared a report of a special committee appointed to conduct a survey of the Radio situation and to recommend changes in the organic structure of the chamber, whose membership at the outset consisted of manufacturers.

The committee was composed of Henry T. Hunt, general counsel of the chamber and late member of the railroad labor board; George Lewis, secretary of the chamber; and Ralph C. Watrous, former lieutenant-governor of Rhode Island. Support and improvement of broadcasting in cooperation with the United States government and other agencies was said to be a main object of the chamber.

"The main factors in the situation," continued the report, "are: The Government of the United States is interested in Radio from the standpoint of national defense and public welfare. Furthermore, Radio is a public utility of interstate commerce.

White Bill Does Not Improve Quality

"Congress has before it the White Bill, which gives the Secretary of Commerce power to make regulations controlling broadcasting. This bill may be enacted into law within six months. When the Secretary shall have placed proper regulations in effect, interference will doubtless be reduced. However, neither the bill nor the regulations contemplated provide any support for broadcasting or any measures to improve its quality.

"The broadcasting class comprises manufacturing companies broadcasting to support and extend their sales of apparatus, department stores broadcasting for advertisement, newspapers broadcasting for advertising and news purposes, schools, colleges and universities broadcasting for educational purposes, churches cooperating with broadcasting stations, individuals broadcasting for their own amusement, and the broadcasting activities of the American Telephone and Telegraph Company carried on primarily as research and in preparation for whatever the future may develop.

"There are at present ineffective organizations of broadcasters, ostensibly national in scope but not including the

Book Reviews

The Radio Amateur's Handbook. By A. Frederick Collins. A new revised edition of this book is just out. It is complete, authentic and informative work on Radio. Fully illustrated. Price, \$1.50.

Vacuum Tube Receivers. By O. F. Heslar. A book that tells how to make a simple set. How to make a cabinet. It includes a 27 by 36-inch layout blue print. Price, 75 cents.

The Armstrong Super-Regenerative Circuit. By George J. Eltz, Jr., E. E. This is a De Luxe edition of this famous circuit. Profusely illustrated and fully explained. Fifty-two pages. Price, \$1.00.

Letters of a Radio Engineer to His Son. By John Mills. A series of interesting letters written to a boy. Each letter is full and complete and the most advanced student can skip over some of the letters and get just the information he desires. Price, \$2.00.

How to Retail Radio. A new book telling of tested plans and methods and policies for the dealer in Radio. Financing, location, store equipment and arrangement. Price, \$2.00.

Radio First Aid. Illustrated with working drawings and complete data as to the necessary equipment and cost of constructing from the simplest to the most modern Radio outfits at home. Price, \$1.

Radio Experimenters' Hand Book. By M. B. Sleeper. This book will help in the selection and the construction of simple apparatus for transmission and reception

principal broadcasters, as, for example, the Radio Broadcasting Society of America, which includes some thirteen or more small broadcasters. In this field some sort of cooperation is compulsory in the nature of things. Further cooperation has been brought about by the Department of Commerce."

Under the new constitution, both the membership and the aims of the chamber, now organized to function as a central force in Radio control and regulation, are much broadened.

Elements of Radio Telephony. By Wil-



KELLOGG RADIO FOR BETTER RESULTS

KELLOGG SWITCHBOARD & SUPPLY COMPANY
Chicago

liam C. Ballard, Jr., M. E. A reliable, authoritative discussion, in simple form, of the essential principles of Radio telephony and their application. The use of mathematics has been almost entirely avoided. Price, \$1.50.

Home Radio—How to Make It. By A. Hyatt Verrill. This book is particularly adapted for the amateur who desires to know how to make Radiophones. Twelve full page illustrations and diagrams. Price, 75c.

Radio for the Amateur. By A. H. Packer and R. R. Haugh. The underlying principles of Radio thoroughly explained in simple language and understandable illustrations. This book will teach you how to construct and operate a receiving set successfully. Price, \$1.50.

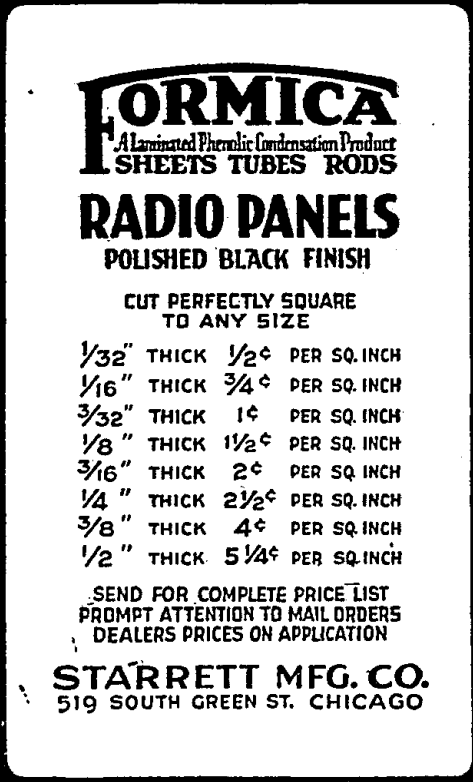
Radio Communication. By John Mills. The fundamental principles and methods upon which recent developments are based are emphasized. The vacuum tube is treated in a simple, fundamental and up-to-date manner. Present methods and tendencies of the art are explained in a chapter which is non-mathematical. Price, \$2.00.

The A B C of Vacuum Tubes. By E. H. Lewis. This is a book for beginners who

have no knowledge of either Radio or electricity and sets forth the elementary principles of theory and operation of the vacuum tube. No attempt has been made in this book to describe all the possible circuit arrangements, but those shown may serve as suggestions to experimenters who desire to evolve their own circuits. Price, \$1.00.

The book department of the Radio Digest is prepared to send you any of the books on Radio published, whether listed in our Book Review or not. Let us know what book you want, send us your check and we will see that the book is mailed to you. Postage stamps in payments for books not accepted. Send money order or check. Radio Book Department, Radio Digest Illustrated, 123 W. Madison St., Chicago, Ill.

The rapid development of Radio is proving of assistance to scientists in other fields. A German inventor, Heinrich Scheiferstein, through a study of the manner in which the oscillating currents in Radio transmit energy to each other, has developed by the use of an oscillating motor what he claims to be a noiseless timepiece.



FORMICA
A Laminated Phenolic Condensation Product
SHEETS TUBES RODS

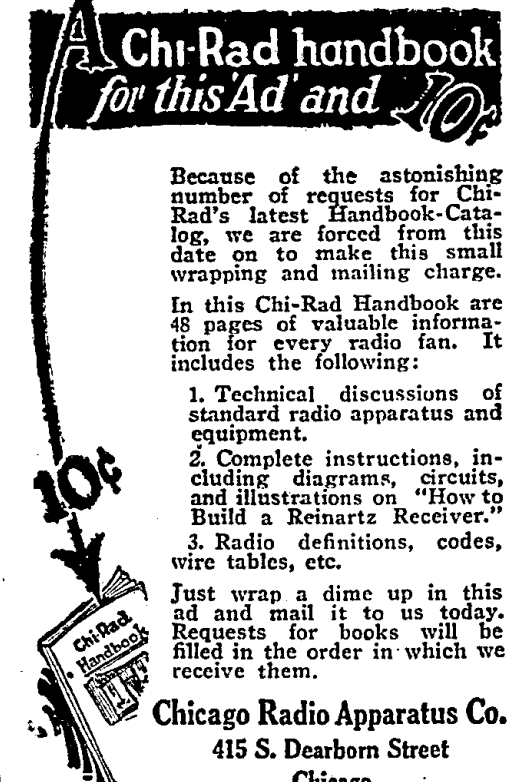
RADIO PANELS
POLISHED BLACK FINISH

CUT PERFECTLY SQUARE TO ANY SIZE

1/32" THICK	1/2¢ PER SQ. INCH
1/16" THICK	3/4¢ PER SQ. INCH
3/32" THICK	1¢ PER SQ. INCH
1/8" THICK	1 1/2¢ PER SQ. INCH
3/16" THICK	2¢ PER SQ. INCH
1/4" THICK	2 1/2¢ PER SQ. INCH
3/8" THICK	4¢ PER SQ. INCH
1/2" THICK	5 1/4¢ PER SQ. INCH

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PROMPT ATTENTION TO MAIL ORDERS
DEALERS PRICES ON APPLICATION

STARRETT MFG. CO.
519 SOUTH GREEN ST. CHICAGO



Chi-Rad handbook
for this Ad and 10¢

Because of the astonishing number of requests for Chi-Rad's latest Handbook-Catalog, we are forced from this date on to make this small wrapping and mailing charge.

In this Chi-Rad Handbook are 48 pages of valuable information for every radio fan. It includes the following:

1. Technical discussions of standard radio apparatus and equipment.
2. Complete instructions, including diagrams, circuits, and illustrations on "How to Build a Reinartz Receiver."
3. Radio definitions, codes, wire tables, etc.

Just wrap a dime up in this ad and mail it to us today. Requests for books will be filled in the order in which we receive them.

Chicago Radio Apparatus Co.
415 S. Dearborn Street
Chicago

WILLARD
WILLARD RADIO COMPANY
DEPT. R. D., 291 BROADWAY, NEW YORK CITY

Prices Right Goods Genuine Delivery Prompt

REINARTZ CIRCUIT
EVERY PART COMPLETE

1 Reinartz wound coil, 1 coil base, 1 tube socket, 1 Vernier rheostat, 1 23-plate .005 MFD variable condenser, 1 13-plate .0025 MFD variable condenser, 3 inductance switches, 25 switch points and nuts, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, 25 feet bus bar wire, 1 high-grade Radion panel and diagram \$10.00 and complete instructions.....

FLEWELLING CIRCUIT
EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial \$11.00 and diagram and complete instructions.....

3 Plate Variable Condenser; value, \$1.75; special at.....	\$1.05
13 Plate Variable Condenser; value, \$2.50; special at.....	1.20
23 Plate Variable Condenser; value, \$3.50; special at.....	1.35
43 Plate Variable Condenser; value, \$4.50; special at.....	1.65
13 Plate VERNIER Condenser; value, \$5.50; special at.....	3.75
23 Plate VERNIER Condenser; value, \$6.00; special at.....	4.00
43 Plate VERNIER Condenser; value, \$6.50; special at.....	4.25

V. T. SOCKETS—Nicked brass sleeve, composition base; value, \$1.00; special at.....	\$0.50
Ball Bearing inductance switch; value 75c; special at.....	.30

BEST QUALITY JACKS, Single circuit; value, 65c; special at.....	.30
Double circuit; value, 90c; special at.....	.45

VARIOCOUPLER—Celeron condensite and Litz Wire wound secondary; value, \$4.50; special.....	3.25
--	------

THREE INCH DIALS—Unbreakable—heat resisting composition—high finish; special.....	.30
TWO INCH DIALS—Same design—for rheostats and potentiometer; special.....	.25

EXTRA SPECIAL—Telephone Headsets; \$8.00 list; reduced to.....	3.50
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RAYMOND VERNIER RHEOSTATS—Value, \$1.50; special.....	.95
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ALUMINUM LOUD SPEAKING HORN—Nickel plated—highly polished; \$8.00 list.....	3.75
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Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID. Send check or money order.

Thousands of Satisfied Boosters Attest to the Superiority of the Genuine and Guaranteed

"All Wave" Coupler

TRADE MARK

Wave Length—150 to 3,000 Meters

Why Be Confined
To listening in on nearby stations, when the "All Wave" coupler in your set will enable you to receive broadcast reception from stations thousands of miles distant?

Be Prepared
To receive on the higher wave lengths that have been and will be allotted to broadcasting stations because of their ever increasing number.



THE "ALL WAVE" COUPLER COMBINES

SIMPLICITY OF EFFICIENCY

Price \$9.00

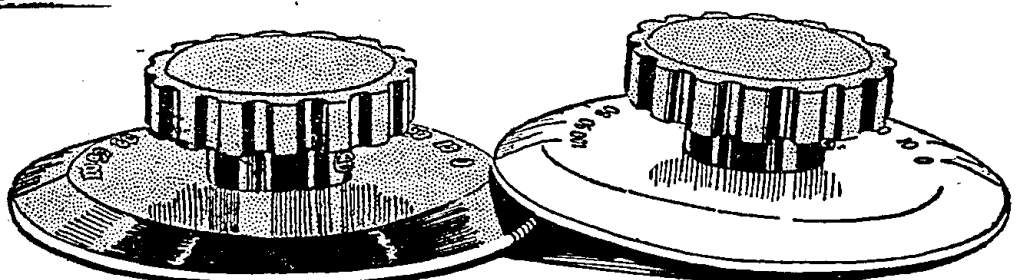
ASSEMBLY AND OF RESULT

Inasmuch as all variometers, variocouplers and loading coils are eliminated. Six efficient hook-ups sent upon receipt of ten cents in stamps to cover cost of mailing.

CAPITOL PHONOLIER CORPORATION
Dept. "R. D." 58 Lafayette Street, New York City

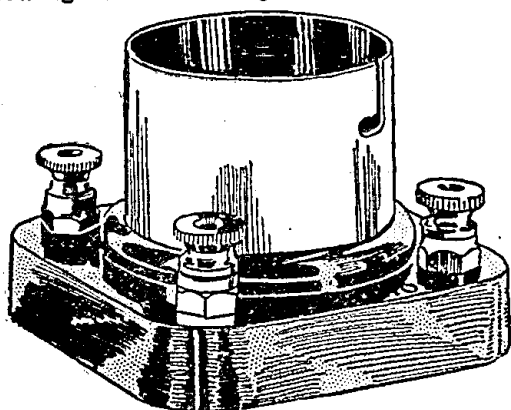
The Radiophonist's Mart

Moulded Knobs with Celluloid Disks



THE two dials shown in the illustration present no new features except simplicity and neatness of appearance. The dial plate is a pressed celluloid disc about 1/8 inch thick. The one is white finish with black graduations and numerals, while the other is black with white markings. The knobs on both are of polished black moulded bakelite. A brass bushing holds the plate and knob together, and also carries the set screw. The dials run true and show no warping tendency. They are placed on the market by the Radio Apparatus Division of the King Sewing Machine company, Buffalo, N. Y.

AN UNUSUAL socket in the sense that it combines substantial construction with extreme neatness of appearance and design, is shown in the illustration. It is manufactured by the Radio Apparatus Division of the King Sewing Machine company, Buffalo, N. Y.



Nickel Plated Socket on Bakelite Base

The base is made of moulded bakelite in polished mahogany or black finish. The metal tube of the socket is made of brass with a polished nickel plate finish. The binding posts, likewise nickel plated and polished, hold the spring prongs in position and are equipped with thumb

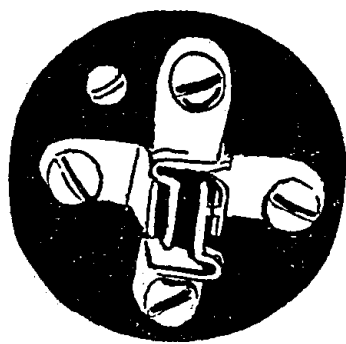
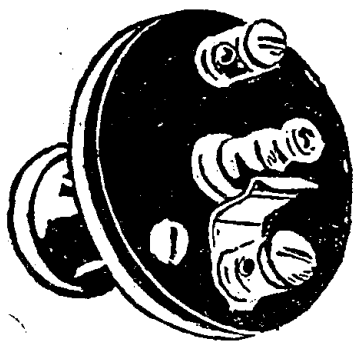
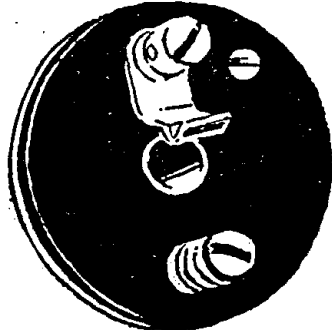
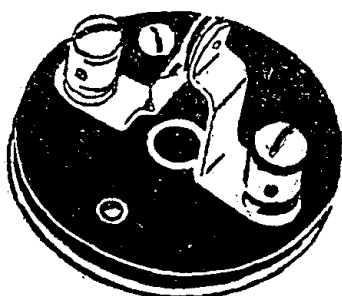
caps. The base has four holes for fastening down the socket to any base. The prongs at the base are set in sufficiently far that no metal parts touch the mounting board outside of the screws holding it down.

Localities Affect Transmission

The range of transmitting and receiving Radio messages depends upon the nature of the territory lying between the transmitting and receiving stations, the greatest range for a given power being obtained over water. Any metal, particularly iron or steel, lying between the stations will cause loss of signal strength. Such metal may either be in the form of artificial structure, such as building framework or tin roofs, or may be in the form of ore deposits. Some regions of the country are noted for their poor location for Radio reception. In many places it is possible to receive effectively from all directions but one, and it is usually found that in this direction a metallic structure or metal deposit is responsible for the lack of reception.

A fully charged storage battery gasses freely when it is time to remove it from the charging circuit and the specific gravity as indicated by a hydrometer reading will also stop rising.

Small Jacks Used for Switches



THERE is no doubt that the skill required in soldering has deterred many a Radiophonist from using jacks on his set. It is no easy job for the new beginner in Radio, unacquainted with soldering, to connect his leads properly to the jack terminals without splashing the solder all over, making a poor electrical contact or short circuiting adjacent terminals. For this reason jacks have been omitted and binding posts substituted in spite of the awkwardness in changing from phones to loud speaker or from one stage of amplification to another.

The apparatus shown in the illustration is a new form of jack construction manufactured by the Radio Improvement company, New York, N. Y.

These jacks have miniature binding posts for all terminal connections. In addition, they do not project more than 1 1/8" from the back of the panel, thus cutting down the depth necessary for clearance in the usual form of jacks. As

observed from the front of the panel when mounted there is no difference in appearance from the usual type of jack. The construction is compact and substantial and is mounted in the same manner as the old type.

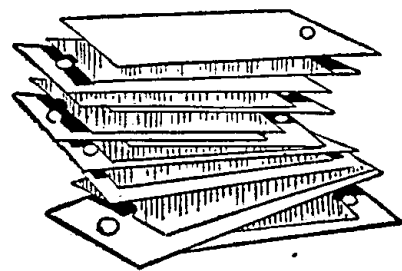
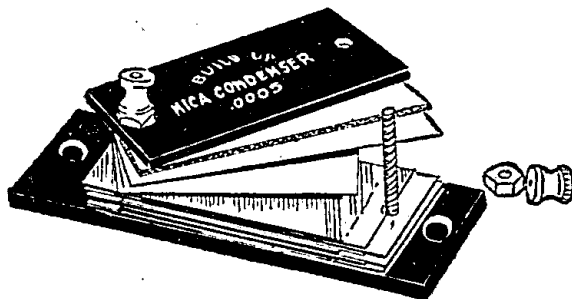
TWO SUPERSENSITIVE CIRCUITS (Both Copyrighted)

My Highly Improved Reinartz brings in all important stations on both coasts and Mexican border, loud, clear and without distortion. We dance to music from Atlanta received on one loud Baldwin unit. Build one of these wonderful sets from my blueprints and specifications, price 50c, or with a perfect and complete double wound sidewind coil, \$3.00 by mail. No other windings used. Photo of my set on a glass panel with every order.

My W. D. II Circuit is especially designed for use with the "Piccolo" tube and brings out the full value of that little tube as no other circuit can. Stations 1000 miles away come in clearly on one tube. This set is small, complete, portable. For the man who wishes the highest efficiency this is the set to build. Price of blueprint and specifications \$1.00, or with complete and perfect windings \$5.00. Photo of set with every order.

Either set is cheap and easy to build, easy to operate. Everything clearly shown. Please don't send stamps. S. A. Twitchell, 1925 Western Ave., Minneapolis, Minn.

Condensers Made of Mica and Copper



RADIO receiving sets using crystal or vacuum tube detectors require condensers in the circuits to insure the best reception from distant stations. The condenser must be of high efficiency and permanent capacity or undesirable noises will be produced in the set. Condensers using mica as the dielectric and copper foil as the conducting plates are more efficient because mica has the lowest leakage and hysteresis losses, and copper foil is the lowest resistance material for the plates. In addition to higher efficiency, mica condensers have a higher breakdown voltage.

The build-up mica condenser shown in the illustration has the mica dielectric and copper foil conducting plates held in intimate contact between the formica insulating pressure plate on top and the base below.

A rubber gasket (with fiber sheet between the rubber and copper plate) insures an equal distribution of the pressure over the entire surface of the plates. This is very important because regenerative vacuum tube sets are very sensitive to small changes in the capacity of any of the condensers in the circuit. In fact, much of the howling and squealing of receiving sets is directly traceable to faulty grid condenser construction. With the entire condenser under pressure the plates have no opportunity to vibrate and cause changes in capacity.

Condensers of many capacities are required in the various circuits now in general use and this form of condenser fills a definite need at a reasonable price for a condenser that may be easily increased or decreased in capacity.

Each mica plate with the alternate copper foil plates connected to the binding screws has a capacity of approximately .0002 mfd. By adding more plates of mica and copper foil the condenser may be built up to a capacity of .005 mfd. Intermediate values of capacity may be had by adjusting the tension of the nuts on the pressure plate. A slight decrease in the pressure reduces the capacity and an increase in pressure gives a greater capacity.

A grid leak unit consisting of a grid leak resistance deposited on a fiber plate may be placed on the top of the pile of

copper and mica plates, with the resistance side down, so as to make contact with copper plates near the screws. A mica plate is placed immediately under the grid leak unit so that the copper foil makes contact only at the ends.

The condenser parts are supplied in an envelope which contains 20 mica plates, and 20 copper foil plates, sufficient to build up a condenser to a capacity of .005 mfd. The condenser is manufactured by Charles Schindler, of Toledo, Ohio.

During a Caesarean operation recently performed in a hospital in Minneapolis, Minn., surgeons entertained the patient with a Radio set after applying a local anesthesia. The patient's mind was soothed and distracted from the operation by music from a specially arranged band concert.

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- \$16.50 "Homelarger" Deluxe..... 13.95
- \$5.50 180 Variocoupler on Bakelite silk wound wire..... 2.45
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- \$6.00 Genuine "Tuska" molded variometer with dial..... 2.95
- Ammeter for Testing "B" Batteries..... .49
- Hydrometers for Testing Storage Batteries... .39
- \$2.50 Phonograph Attachment..... 1.15
- \$2.50 Socostats..... 1.25
- \$5.00 43-Plate Condenser..... 1.95
- \$4.00 23-Plate Condenser..... 1.55
- Framingham Rheostats..... .45
- 2-inch Bakelite Dials..... .25
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- 4-inch Electric Dials..... .75
- W. D. 12 Transformer for W. D. II Tube..... 4.95
- \$1.00 Freshman Variable Grid Leak and Condenser Combined..... .69
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- Genuine "All-Wave" Coupler..... 7.90
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- Bus Bar Wire, Per Foot..... .02
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Radiophone Broadcasting Stations

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AG1, Presidio of San Francisco, Calif. 50 mi. Signal Corps, U. S. A. Sun, Thurs, 8-9 pm, instruction, music. Pacific.

AQ6, Canton, O. 425 only. 500 mi. Hdqtrs. 135th Field Artillery, U. S. Army, Wed, Fri, music. Sun, church services. Eastern.

AS6, San Antonio, Tex. 200 mi. U. S. Army, Ft. Sam Houston. Mon, Thurs, irregular.

AV7, St. Paul, Minn. Signal Corps, U. S. A.

BE1, Tacoma, Wash. 400 only. 100 mi. Camp Lewis, U. S. Army, Third Signal Co. Daily ex Sat, Sun, 9-10 pm, music, announcements, lectures. Pacific.

CFAC, Calgary, Alta., Can. 430 only. 1,000 mi. Western Radio Co., Ltd. Daily ex Sun, 12:30-1 pm, 3-4. Daily, 7:45-8:45 pm. Mountain.

CFCA, Toronto, Ont., Can. 400 only. 500 mi. Toronto Star. Daily ex Sun, 12 m, weather; 2:30-3:30 pm, news, music; 5:30-6, news; 8-9, concert. Sun, 8:45-9:45 pm, concert. Eastern.

CFCB, Vancouver, B. C., Can. 440 only. 1,500 mi. Van Couver Daily Province. Daily, 8:30-9:30 pm, reports, news, music. Pacific.

CFCE, Halifax, N. S., Can. 440 only. 150 mi. Marconi Co. Mon, Wed, Sun night, music, entertainment.

CFCF, Montreal, P. Q., Can. 440 only. 1,000 mi. Marconi Co. Daily ex Sun, 1-1:30 pm. Mon, Wed, Fri, 7:30-9 pm. Eastern.

CFCH, Iroquois Falls, Ont., Can. 400 only. 200 mi. Abitibi Power & Paper Co., Ltd. Daily, 8 pm, weather and stock reports. Experimental station. Eastern.

CFCN, Calgary, Alta., Can. 275, 440 only. 1,500 mi. W. W. Grant Radio Ltd. Wed, Sat, 10:30-11:30 pm, dance music. Wed, Sat, Sun, after 11:30 pm using test call 9AC. Mountain.

CFCX, London, Ont., Can. The London Advertiser.

CFYC, Fort Frances, Ont., Can. International Radio Develop. Co.

CFYD, Toronto, Ont., Can. The Bell Telephone Co.

CFYV, Vancouver, B. C., Can. Victor Wentworth Odium.

CHBC, Calgary, Alta., Can. 410 only. 1,000 mi. W. W. Grant Radio Ltd. (Morning Albertan.) Daily ex Sat, 8:45-9:45 pm, news, stock quotations, music. Mountain.

CHCA, Vancouver, B. C., Can. Radio Corp. of Vancouver. Ltd.

CHCB, Toronto, Can. Marconi Co.

CHCF, Winnipeg, Man., Can. Radio Corp. of Winnipeg, Ltd.

CHCG, Calgary, Alta., Can. 400 only. 150 mi. Western Radio Co., Ltd. Daily ex Sun, 3:30-4:30 pm. Daily, 7:45-8:45 pm. Mountain.

CHCS, London, Ont., Can. London Radio Shoppe.

CHCX, Montreal, Que., Can. B. L. Silver.

CHVC, Toronto, Canada. 410 only. 200 mi. Metropolitan Motors Co. Daily ex Sat and Sun, 5-5:30 pm, news, concert. Eastern.

CHVQ, Ottawa, Ont., Can. 450 only. 50 mi. J. R. Booth, Jr. Mon, Wed, 8-10 pm, music, entertainment. Eastern.

CJBC, Montreal, Que., Can. 420 only. 75 mi. Dupuis-Freres. Wed, Fri, 9-10 pm, music. Eastern.

CJCA, Edmonton, Alta., Can. 450 only. 1,000 mi. Edmonton Journal, Ltd. Daily ex Sun, 12:30 pm, weather, markets, 7:30-8 pm, Children's half hour, 8:30-9:30 pm, concert, reports. Pacific.

CJCB, Nelson, B. C., Can. 400 only. 100 mi. James Gordon Bennett. Daily, 8-9 pm, music, news, reports. Pacific.

CJCD, Toronto, Canada. 410 only. 200 mi. T. Eaton Co. Daily ex Sat and Sun, 4-4:30 pm, concert. Sat 12-12:30 pm, concert. Eastern.

CJCE, Vancouver, B. C., Can. 420 only. 150 mi. Vancouver Sun. Daily ex Sun, 8-10, music, news. Pacific.

CJCF, Kitchener, Ont., Can. 420 only. 50 mi. The News Record, Ltd. Thurs, 9-11 pm. Eastern.

CJGG, Winnipeg, Man., Can. 410 only. 1,000 mi. Manitoba Free Press. Daily ex Sun, 10-10:30 am, news; 12-1 pm, reports. Mon, Thurs, 8-10 pm, concert. Tues, 7-8 pm, music. Fri, 5:30-6:45 pm, music. Every other Thurs commencing Feb. 15, 11 pm-1:30 am, dance music. Alternate Sun, 8 pm. Central.

CJGH, Toronto, Ont., Can. United Farmers of Ontario.

CJCI, St. John, N. B., Can. 400 only. 75 mi. McLean, Holt & Co., Ltd. Daily, 8-9 pm, music, news, weather. Eastern.

CJCN, Toronto, Ont., Can. Simons, Agnew & Co.

CJCS, Halifax, N. S., Can. Eastern Telephone & Telegraph Co.

CJCY, Calgary, Alta., Can. Edmund Taylor.

CJGQ, London, Ont., Can. 430 only. 800 mi. London Free Press. Daily ex Sun, 12:30-1:30 pm, news, weather. Daily ex Tues, 7:45 pm, music. Tues, 7:30-8:30 pm, special program. Eastern.

CJNC, Winnipeg, Man., Can. 400 only. 1,000 mi. Tribune Newspaper Co. Daily ex Sun, 1-2 pm, Tues, 8-10 pm, Thurs, 7-8 pm. Fri, 8-10 pm. Alternate Sun, 8:30-10 pm. Central.

CJSC, Toronto, Ont., Can. Evening Telegram.

CKAC, Montreal, Que., Can. 430 only. 1,000 mi. La Presse. Daily ex Sun, 1:30 pm, weather; 1:35-2:30, concert; 4:30-4:45, reports; 5:30-6, dance music. Tues, Thurs, Sat, 7-7:30 pm, bedtime stories; 7:30-8:30, concert; 8:30-9:30, music; 10:30-11:30, dance music. Sun, 4-4:45 pm, 5-6, music. Eastern.

CKGB, Winnipeg, Man., Can. T. Eaton Co., Ltd.

CKGE, Toronto, Ont., Can. Can. Int. Telephone Co.

CKKC, Regina, Sask., Can. 420 only. 1,500 mi. Leader Pub. Co. Daily ex Sun, 10-10:30 am, news, music; 1:15-2 pm, reports, music. Mon, Wed, Fri, Sat, 7:30-8:15, music. Tues, 7:30-9, concert. Sun, 9 pm, sacred concert. Mountain.

CKOR, St. John, N. B., Can. 400 only. 75 mi. Jones Elec. Radio Co., Ltd. Daily 4-5 pm, concert, reports. Atlantic.

CKCZ, Toronto, Ont., Can. Westinghouse Co., Ltd.

CKKC, Toronto, Ont., Can. Radio Equipment & Supply Co., Ltd.

CKOC, Hamilton, Ont., Can. 410 only. 100 mi. Wertworth Radio Supply Co., Ltd. Mon, Wed, Fri, 8:30-9:30 pm, concert. Sun, church services. Eastern.

CKQC, London, Ont., Can. 410 only. 50 mi. Radio Supply Co. Mon, Wed, Fri, 7:30-8:30 pm, music, entertainment. Eastern.

CKZC, Winnipeg, Man., Can. Salton Radio Eng. Co.

DD5, Denver, Colo. 412 only. 1,500 mi. Fitzsimmons Gen. Hospital. Mon, Wed, Fri, 8-9 pm, music. Mountain.

DM4, San Antonio, Tex. 1,500 mi. U. S. Army, Kelly Field. No regular schedule.

DM7, San Antonio, Tex. 200 mi. U. S. Army, Brooks Field. No regular schedule.

DN4, Denver, Colo. 340 only. 200 mi. Colorado National Guard. Daily ex Sun, 8:15 pm, special concert, speech. Mountain.

KDZB, Bakersfield, Calif. 100 mi. Frank Siefert. Daily ex Sun, 7:30-8:15 pm, reports, music. Sun, sacred program. Irregular. Pacific.

KDKA, E. Pittsburgh, Pa. 2,000 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, music; 3, sports; 7-9:55 pm, news, features, markets, concert; 9:55-10, time. Sun, 10:45 am, church service; 2:45 pm, Bible story; 3 pm, concert; 4:45 vesper service. Eastern.

KDN, San Francisco, Calif. 485, 510 also. 500 mi. Leo J. Meyberg Co. Daily, 1-2 pm, 8:30-9, 4:30-5:30, 7:45, music, reports, concert. Pacific.

KDOW, New York, N. Y. S.S. America. Home port is New York.

KDPM, Cleveland, O. Westinghouse Elec. & Mfg. Co. KDPT, San Diego, Calif. 500 mi. Southern Elec. Co. Daily ex Sun, 7-7:30 pm, news, weather, concerts, lecture. Tues, Sat, 8-10 pm. Pacific.

KDVL, Salt Lake City, Utah. 485 also. 1,800 mi. Salt Lake Telegram. Daily ex Sun, 7-8 pm, news, music, entertainment. Mountain.

KDVM, San Diego, Calif. Savoy Theater.

KDVO, Portland, Ore. Oregon Inst. of Technology.

KDVS, Great Falls, Mont. 485 also. 1,000 mi. Great Falls Tribune. Daily 12 m weather, time. Mon,

Wed, Sat, 8-10 pm, concert. Sun, 4 pm, church services. Mountain.

KDYV, Salt Lake City, Utah. Cope & Cornwell Co. KDYX, Phoenix, Ariz. 100 mi. Smith Hughes & Co. Daily ex Sat, 7-7:30 pm. Mountain.

KDYX, Honolulu, T. H., Hawaii. 500 mi. Honolulu Star-Bulletin Co., Ltd. Daily ex Sun, 12:15-1:15 pm, reports; 6:30-7:30 pm, entertainment, music, talks. Tues, Fri, 3:45-4:30 pm. Sun, 11 am-12:15 pm, 5-6, Church services. 12:00 Meridian.

KDZA, Tucson, Ariz. Arizona Daily Star.

KDZB, Bakersfield, Calif. Frank E. Siefert.

KDZE, Seattle, Wash. 500 mi. The Rhodes Co. Daily ex Sun, 10:30-11 am, 3:30-4:30 pm, news, music. Mon, Fri, 7-8 pm, concert. Wed, 8-9 pm, concert. Pacific.

KDZF, Los Angeles, Calif. Automobile Club of Southern California.

KDZG, San Francisco, Calif. Cyrus Pierce & Co.

KDZH, Fresno, Calif. 485 also. 50 mi. The Herald-Bufford Co. Daily ex Sun, 8:15 am, 4-5 pm, news, reports. Daily ex Tues, Fri, 8-9 pm, reports, music. Tues, Fri, 6:30-7:30 pm. Sun, 8-9 am, church service. Pacific.

KDZI, Wenatchee, Wash. 700 mi. Elec. Supply Co. Daily ex Sun, 4:30-5:30 pm, music. Mon, Wed, Fri, 8-9 pm, music. Sun, 11 am-12:30 pm, church services. Pacific.

KDZK, Reno, Nev. 50 mi. Nevada Mch. & Elec. Co. (Nevada State Journal.) Daily ex Sun, 4-4:30 pm, news. Wed, 6:30-7:30 pm, music. Fri, 8-9 pm, special. Pacific.

KDZL, Ogden, Utah. Rocky Mountain Radio Corp.

KDZM, Centralia, Wash. 50 mi. Hollingworth Hdwe. & Radio Supply Store. Daily ex Sat & Sun, 8-9 pm, music. Pacific.

KDZO, Denver, Colo. 500 mi. Wm. D. Pyle. Daily ex Sun, 6:45-7:15 pm, news, 9-10 pm, concert. Mountain.

KDZR, Bellingham, Wash. 200 mi. The Bellingham Pub. Co. Daily ex Sun, Thurs, 7-8 pm, 8:30-9, music, news, reports. Tues, Wed, Fri, Sat, 7:30-7:45 pm, code practice. Sun, 7-8 pm, music. Pacific.

KDZT, Seattle, Wash. Seattle Radio Assn.

KDZZ, Everett, Wash. 50 mi. Kinney Bros. & Sep-

KFCO, Salem, Ore. 100 mi. F. S. Barton, Tues, Wed, Fri, 7-8 pm. Pacific.

KFCF, Walla Walla, Wash. Frank A. Moore.

KFCG, Billings, Mont. 500 mi. Electric Service Station. Inc. Tues, Thurs, Sat, 7:30-9 pm, music. Mountain.

KFCJ, Colorado Springs, Colo. Colorado Springs Radio Co.

KFCL, Los Angeles, Calif. Los Angeles Union Stock Yards.

KFCM, Richmond, Calif. 500 mi. Richmond Radio Shop. Mon, 8-9 pm, music. Sun, 1-2 pm, music. Pacific.

KFCP, Ogden, Utah. Ralph W. Flygare.

KFCQ, Casper, Wyo. Motor Service Stn.

KFCV, Houston, Tex. Fred Mahaffey, Jr.

KFDA, Baker, Ore. 25 mi. Adler's Music Store. Daily ex Sun, 5-6 pm, 7-8, music. Sun, 6-8 pm. Pacific.

KFDB, San Francisco, Calif. 400, 485 only. 1,500 mi. Daily ex Sun, 10-11 am, weather, markets; 11-11:30, news, quotations; 2-3 pm, lectures, concerts. Mon, Wed, Fri, 8-10 pm, concert. Sun, 7-7:30 pm, children's stories.

KFDC, Spokane, Wash. 25 mi. E. B. Craney. Mon, Wed, Fri, 8-9 pm. Sat, 8-10 pm. Sun, 4-5 pm, Irregular. Pacific.

KFDE, Boise, Idaho. St. Michael's Cathedral. Sun, 11:15-12:30 pm, 8-9:15 church services. Mountain.

KFDF, Casper, Wyo. Wyo. Radio Corp.

KFDH, Tucson, Ariz. Univ. of Ariz.

KFDJ, Corvallis, Ore. Oregon Agri. College.

KFDL, Denver, Colo. Knight-Campbell Music Co.

KFDS, San Francisco, Calif. John D. McKee.

KFEB, Taft, Calif. City of Taft.

KFEC, Portland, Ore. 25 mi. Meier & Frank Co. Inc. Daily ex Sun, 12 m, reports; 4-5 pm, music; 6-8 pm, children's hour. Pacific.

KFED, Polytechnic, Mont. 100 mi. Billings Polytechnic Institute. Mon, 8-9 pm, lectures. Mountain.

KFEJ, Tacoma, Wash. Guy Gresson.

KFEK, Denver, Colo. Radio Equipment Co.

KFFA, San Diego, Calif. 200 mi. Dr. R. O. Shelton. Daily, 6-7 pm, entertainment. Pacific.

7:30-8:15 pm, Fri, 8:15-9 pm, and Sun, 3-4 pm, concert. Pacific.

KLZ, Denver, Colo. 200 mi. Reynolds Radio Co. Daily ex Sun, 7:30 pm, news, markets, bedtime story, concert. Thurs, 8-9 pm, concert. Sun, 8-9 pm, church services. Mountain.

KML, Fresno, Calif. 200 mi. San Joaquin Lt. & Pr. Corp. Tues, Fri, 8-9 pm, music. Sun, 5-6 pm, music. Pacific.

KMO, Tacoma, Wash. 200 mi. Tacoma Times. (Love Electric Co.) Daily ex Sun, 11-1 pm, 6-7, 9:15-10, concert, news, lecture. Pacific.

KNI, Eureka, Calif. T. W. Smith.

KNJ, Roswell, New Mex. 485 also. 750 mi. Roswell Public Service Co. Daily, 8 pm, news, reports, concerts. Mountain.

KNN, Los Angeles, Calif. 100 mi. Bullock's. Temporarily discontinued.

KNT, Aberdeen, Wash. 600 mi. Grays Harbor Radio Co. Daily ex Sun, 2-3 pm, 5-6, 7-8, news, concert. Pacific.

KNV, Los Angeles, Calif. Radio Supply Co.

KOB, State College, N. M. 485 also. 500 mi. N. M. Agri. & Mech. Arts. Daily 11:55-12 m, 9:55-10 pm, time, reports. Mon, Wed, Fri, 7:30-8:30 pm, concert. Mountain.

KOG, Los Angeles, Calif. 300 mi. Western Radio Elec. Co. Daily ex Sun, Wed, 5-5:30 pm, code, news. Mon, Fri, 7:40-8:20 pm, music. Wed, 4:30-5 pm, code, 8:20-9 pm, music. Pacific.

KON, San Diego, Calif. 200 mi. Holzwarner Inc. Daily ex Sun, 4-5 pm and 8:15-9, concert, news. Sun, 10-11 am, 4-5 pm and 8:15-9, church service. Pacific.

KOP, Detroit, Mich. 1,500 mi. Detroit Police Dept. Daily ex Sun, 1 pm, 6:30, reports, police information, emergency. Eastern.

KPO, San Francisco, Calif. 300, 400 and 600 only. 1,500 mi. Hale Bros., Inc. Daily ex Sun, 11-12 m, 3:30-4:30 pm, concert. Wed, 7:30-8:15 pm, concert. Sun, 11-12:15 pm, church service. Pacific.

KRI, Berkeley, Calif. Univ. of Calif.

KRL, Hood River, Ore. 350 only. 50 mi. Hood River News. Daily ex Sat, Sun, 7 pm, news. Tues, Fri, 8:30-9:30 pm, Sun, 9-10 pm, entertainment. Pacific.

KQV, Pittsburgh, Pa. 300 mi. Doubleday-Hill Elec. Co. Daily ex Sun, 12-12:30 pm, 2:30-3, music, lectures. Mon, Wed, Fri, 10-11 pm, music, entertainment. Eastern.

KQW, San Jose, Calif. 345 and 485 only. 500 mi. Chas. D. Herrold. Daily ex Sun, 1-1:30 pm. Wed, 8:15-9 pm, concert. Pacific.

KQY, Portland, Ore. 200 mi. Stubbs Elec. Co. Wed, Thurs, Fri, 6-7 pm. Mon, Tues, Sat, 9-10 pm. Pacific.

KRE, Berkeley, Calif. 200 mi. Maxwell Elec. Co. Wed, 9-10 pm. Sun, 5:30-7:30 pm, concert. Pacific.

KSD, St. Louis, Mo. 400 and 485 only. 1,500 mi. St. Louis Post Dispatch. Daily ex Sun, 9:40 am, 10:40, 11:40, 12:40 pm, 1:40, 2:40, 4, 8, Thurs and Sun, silent nights. Mon, Thurs, 11:30 pm, concert. Central.

KSL, San Francisco, Calif. 50 mi. The Emporium. Temporarily discontinued.

KSS, Long Beach, Calif. Prest & Dean Radio Co. No regular schedule.

KTW, Seattle, Wash. 500 mi. First Presbyterian Church. Sun, 11-12:30 pm, 3-4:30, 7-9:30, church service. Pacific.

KUO, San Francisco, Calif. 485, 525 also. 1,500 mi. San Fran. Examiner. Daily ex Sun, 9-10 am, concert, chat to housewives; 11-12, reports; 3-3:30 pm, lecture, news; 5:30-6:45 pm, concert; 9 am, 12 m, 6:45 pm, weather report. Wed, 3:30 pm, health bulletin. Sun, 9-10 am, concert; 5-6 pm, concert, news. Pacific.

KUS, Los Angeles, Calif. City Dye Works & Laundry Co.

KUY, El Monte, Calif. 500 mi. Coast Radio Co. Wed, 4-4:30 pm. Sat, 3-4 pm. Pacific.

KWG, Stockton, Cal. 1,500 mi. Portable Wireless Telephone Co. Daily ex Sun, 4-5 pm, news, concert, markets. Tues and Fri, 8-9 pm, concert. Sun, 2-3 pm, concert. Pacific.

KWH, Los Angeles, Calif. 485 also. 250 mi. Examiner. Daily ex Sun, 1:30-1:40 pm, 5:30-6, 6-6:15, 8:20-9, reports, entertainment. Sun, 8:30-9 pm, church service. Pacific.

KXD, Modesto, Calif. 100 mi. Modesto Herald Pub. Co. Daily ex Sun, Mon, 6:30-7 pm. Mon, 7-9 pm. Sun 1-2 pm. Pacific.

KXS, Los Angeles, Calif. Braun Corp.

KYI, Bakersfield, Calif. Bakersfield Californian.

KYQ, Honolulu, Hawaii. Electric Shop. No definite schedule.

KYW, Chicago, Ill. 400 and 485 only. 2,000 mi. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:25 am, 10, 1:20 pm, 2:15, 2:30, markets; 3 (3:30 ex Mon, Wed, Fri), 4, 4:15, 4:30, 5, news, sports (6:30 Mon only, news, reports, sports), 6:50, bedtime stories; 8-9, music; 9, news, sports; 9:05, special. Sun, 11 am, 3:30 pm, 7, church services. Central.

KZM, Oakland, Calif. 200 mi. Western Radio Institute (Hotel Oakland). Daily ex Sun, 6:45-7 pm, news. Pacific.

KZN, Salt Lake City, Utah. 485 also. 1,000 mi. Deseret News. Daily ex Sun, 3-4 pm, reports, music, 8-9:30 pm, music, news, bedtime stories etc. Mountain.

KZV, Wenatchee, Wash. Wenatchee Battery & Motor Co.

NAA, Arlington, W. Va. 710 only. 2,000 mi. Official government broadcasting station. U. S. Navy Dept. Mon, Tues, Thurs, 7:15-7:30 pm, lecture. Mon, Thurs, 6:45-7 pm, lecture. Tues, Thurs, 7:45-8 pm, health lecture. Wed, Fri, 8:30-9:45 pm, band concert. Eastern.

PWX, Havana, Cuba. Cuban Telephone Co.

WAI, Dayton, O. McCook Field U. S. Army.

WAB, New Orleans, La. Valdemar Jensen.

WAAC, New Orleans, La. Tulane Univ.

WAAD, Cincinnati, O. 200 mi. Ohio Mechanics Inst. Fri, 2:30-4:30 pm, and Sat, 8:15-10:15 pm, Cincinnati Symph. Orchestra concert. Central.

WAAP, Chicago, Ill. 485 only. 300 mi. Chicago Daily Probers Journal. Daily ex Sat and Sun, 8:30 am, 10:30, 10:45, 12:45 pm, 3, 4:30, live stock and weather reports. Central.

WAAH, St. Paul, Minn. 500 mi. Commonwealth Elec. Co. Tues, 8:30-10 pm, entertainment. Sun, 10:30 am, 3:30 pm, church service. Central.

WAAJ, Boston, Mass. 50 mi. Eastern Radio Inst. Mon, Wed, Fri, 9-10 pm, Tues, 10-11 pm, Thurs, 8:30-9:30 pm, Sat, 7-8 pm, music. Eastern.

WAAK, Milwaukee, Wis. 300 mi. Gimbel Bros. Daily ex Sun, 10 am, 11:10, 12:10 pm, 1:25, 3. Daily ex Wed and Sat, 7:15, 7:30 pm. Central.

WAAM, Newark, N. J. 300 mi. I. R. Nelson Co. Daily ex Sun, 11-11:55 am, 3-4 pm, music. Wed, 7:30-8 pm, code instruction; 8-9, special program. Eastern.

WAAN, Columbia, Mo. Univ. of Mo.

WAAP, Wichita, Kan. 485 also. 500 mi. United Electric Co. Daily ex Sun, 12-12:30 pm, educational program; 10:30 pm, weather. Tues, Fri, 8 pm, entertainment. Central.

WAAQ, Greenwich, Conn. 600 mi. New England Motor Sales Co. Daily ex Sun, 9:30 am-5:30 pm, every half hr. Eastern.

WAAS, Decatur, Ga. Georgia Radio Co.

WAAT, Jersey City, N. J. 70 mi. Jersey Review. Wed, 7-8 pm, concert, lecture. Sun, 7-8, church service, concert. Eastern.

WAAW, Omaha, Neb. 485 also. 500 Omaha Grain Exchange. Daily ex Sun, 9:45, 10:45, 11:45, 12:45, 1:20, 8 pm, market reports. 8:15-9 pm, music. Central.

WAAZ, Crafton, Pa. Radio Service Corp.

WAAZ, Youngstown, O. 500 mi. Yahrling-Rayner Music Co. Tues, Thurs, Sat, 8-9 pm, music, reports. Eastern.

WAAZ, Emporia, Kans. 250 mi. Hollister-Miller Motor Co. Tues, Thurs, 7-8 pm, entertainment. Temporary schedule. Central.

(NOTE—The second part of the station schedule list will appear next week.)

Continued—

THE BROADCASTING station directory is the most complete and authentic list of Radiophone plants. Letters are being sent various stations every day for information. No other paper or source provides the data given here. The idea is original and a service which RADIO DIGEST has maintained from the start. Every public service broadcasting station is to be found now, not only in the location index, but in the schedule list. The latter, however is divided, one third appearing this week, the second third to appear next week, and the last part, together with the state, city, station index, to appear the week following.

The station schedules, given here, are listed alphabetically by call letters. Following the call is given the city and state, the wave length (PROVIDING a wave length other than 360 meters is used), the miles range of the station, the owner of the station; the schedule of operating hours, and the kind of time used.

The state, city and call list appears with the last third of the station schedules and is merely an index. One wishing to find the calls of the stations in his vicinity, will find this index useful. Three successive issues of RADIO DIGEST will give one the most complete and accurate list of broadcasting stations obtainable.

pell. Daily ex Sun, 2:30-3:30 pm, 4:30-5:30, 8:15-9:15. Pacific.

KFAD, Phoenix, Ariz. 100 mi. McArthur Brothers. Daily ex Sun, 7:30-8:30 pm, news, weather, stock, reports. Mountain.

KFAE, Pullman, Wash. 200 mi. State College of Wash. Program irregular.

KFAF, Denver, Colo. 3,750 mi. Western Radio Corp. Daily ex Thurs and Sun, 8-9 pm, music, reports, news. Mountain.

KFAJ, Boulder, Colo. 800 mi. Univ. of Colo. No definite schedule. Univ. activities. Mountain.

KFAM, Moscow, Ida. 200 mi. The Electric Shop. Tues, Thurs, Sat, 7:30-8:30 pm, music, reports. Sun, church services.

KFAP, Butte, Mont. Standard Pub. Co.

KFAR, San Jose, Calif. City of San Jose.

KFAS, Hollywood, Calif. Studio Lighting Service Co.

KFAS, Reno, Nev. 300 mi. Reno Motor Supply Co. Mon, Tues, Thurs, 8-9 pm, music. Pacific.

KFAT, Eugene, Ore. 100 mi. Pac. Radio Co. Mon, Wed, Sat, 8-9 pm, lectures, music. Sun, 8:30-9:15 church service. Pacific.

KFAU, Boise, Ida. 485 also. 200 mi. Boise H. S. Daily ex Sun, 9:30-10 am, 3-3:20 pm, market, news, 8:30 pm, weather. Mon, Wed, Fri, 8:30-9 pm, concert. Mountain.

KFAV, Venice, Calif. 340 only. 50 mi. Abbot-Kinney Co. Mon, Tues, Wed, Fri, 8:30-9:30 pm, music. Pacific.

KFAW, Santa Ana, Calif. 485 also. 100 mi. Radio Den. Daily ex Sun, 4-4:30 pm, news, reports, music. Mon, Thurs, 8-9 pm, concert. Pacific.

KFAY, Medford, Ore. 485 also. 500 mi. Virgin Radio Service. Mon, Wed, 9-9:30 pm. Wed, 9-10:30 pm. Special programs other days. Pacific.

KFAZ, Redding, Calif. 200 mi. C. H. T. Weatherill. Daily ex Sun, 9-9:15 pm, reports, news. Pacific.

KFBB, Harre, Mont. 485 also. 150 mi. F. A. Buttery Co. Daily ex Sun, 9:30 am, agriograms, weather. Tues, Fri, 8-9:30 pm, music. Mountain.

KFBC, San Diego, Calif. 500 mi. W. K. Azbill. Thurs, Sun, 8-9 pm, Bible lesson, sermon. Pacific.

KFBD, Hanford, Calif. 485 also. 200 mi. Clarence V. Welch. Mon, Wed, 8-9 pm, 7:30-8:30, news, music, agriograms. Tues, Thurs, Sat, 6-7 pm, music. Fri, 8-9 pm, 9-10, news, music. Sun, 7-8 pm, church services. Pacific.

KFBE, San Luis Obispo, Calif. 50 mi. R. H. Horn. Mon, Wed, Fri, 4-5 pm. Wed, Fri, 7-7:30 pm. Pacific.

KFBG, Tacoma, Wash. First Presbyterian Church.

KFBH, Marshfield, Ore. Thomas Musical Co.

KFBJ, Boise, Ida. 70 mi. Jenkins Furn. Co. (Owyhee Hotel.) Daily, 8-9 pm. Mountain.

KFBK, Sacramento, Calif. 485 also. 300 mi. Kimball-Uspon Co. Daily ex Sun, 3-4 pm, 6-6:30, concert, news. Sun, 8-9 pm, church service. Pacific.

KFBL, Everett, Wash. Leco Bros.

KFBS, Trinidad, Colo. Chronicle News & Gas & Elec. Supply Co.

KFBU, Laramie, Wyo. Bishop N. S. Thomas.

KFBV, Colorado Springs, Colo. Clarence O. Ford.

KFCB, Phoenix, Ariz. 500 mi. Nielsen Radio Supply Co. Mon, Wed, Fri, 8-9 pm, music. Tues, 8-10, sports. Mountain.

KFCO, Wallace, Ida. 380 only. 100 mi. Auto Supply Co. Tues, Thurs, Sat, Sun, 7:30-8:30 pm. Sat, Sun, 9:30-10:30 pm, music. Pacific.

KFFE, Pendleton, Ore. 100 mi. Eastern Oregon Radio Co. Daily, 7:30-8 pm, music. Pacific.

KFGG, Pueblo, Colo. Lowenthal Bros.

KFGH, Astoria, Ore. Astoria Budget.

KFGI, Stanford Univ., Calif. 500 mi. 300 and 410 also. Leland Stanford Junior University. No regular schedule.

KFHJ, Santa Barbara, Calif. Fallon Company.

KFKI, Los Angeles, Calif. 400 only. 1,500 mi. Earl C. Anthony, Inc. Daily ex Sun, 1-1:30 pm, 5-6 pm, 7-7:30 pm, 8-11 pm. Tues, Fri, 1:30-2:30 pm. Sun, 10:30-11:30 am, 4-5 pm, 8-10. Pacific.

KFV, Yakima, Wash. 250 mi. Foster-Bradbury Radio Store. Daily ex Sun, 3-4 pm. Mon, Fri, 8-9 pm. Pacific.

KFZ, Spokane, Wash. 300 mi. Doerr-Mitchell Elec. Co. Tues, Wed, Fri, 7-8:30 pm, music. Sat, 7-8 pm. Pacific.

KGB, Tacoma, Wash. 200 mi. Tacoma Daily Ledger-William A. Mullins Elec. Co. Daily ex Sun, 7-9 pm. Sun, 5-7:30 pm. Entertainment, lectures, news, weather, tides, police reports. Pacific.

KGG, Portland, Ore. 500 mi. Hallock & Watson Radio Service. Daily ex Sun, 5-6 pm, music, entertainment. 7:30-8 pm, reports. Sat, 8-9 pm, answers to radio questions. Sun, Wed, 9-10 pm, music. Pacific.

KGN, Portland, Ore. 100 mi. Northwestern Radio Mfg. Co. Irregular schedule.

KGO, Altadena, Calif. 350 only. 300 mi. Altadena Radio Lab. Sat, 8-9:30 pm, concert. Pacific.

KGU, Honolulu, Hawaii. 485 also. 150 mi. The Honolulu Advertiser. Daily, 7:30-9 pm. Tues, Thurs, Sat, special program. 150th meridian. (Three hours later than Pacific.)

KGW, Portland, Ore. 400 and 485 only. 1,500 mi. The Features Oregonian Pub. Co. Daily, 3:30-4 pm, news, features. Mon, Wed, Fri, 8-9 pm, concerts. Sun, 7-8 pm, concert. Pacific.

KGY, Lacey, Wash. 250 mi. St. Martin's College. Tues, Fri, Sun, 8:30-9:30 pm, news, concert, bedtime story. Pacific.

KHD, Colorado Springs, Colo. 485 also. 50 mi. Daily ex Sun, 8:15 am, weather. Mon, Wed, Fri, 7-7:30 pm, music, lectures. Mountain.

KHJ, Los Angeles, Calif. 400 and 485 only. 2,000 mi. Los Angeles Times. Daily ex Sun, 12:30-1:15 pm, 6:45-7:30, 8-9:30. Sun, 10-11 am. Pacific.

KHQ, Seattle, Wash. Louis Wasmer.

KII, Sunnyvale, Calif. 500 mi. Radio Shop. Tues, 8:15-9 pm. Fri, 7:30-8:15 pm. Pacific.

KIJ, Stockton, Calif. 100 mi. C. O. Gould. Daily ex Sun, 5-6 pm, concert. Mon, Wed, 9-10 pm, concert. Sun, 10-11 am. Pacific.

KJR, Seattle, Wash. 200 mi. Northwest Radio Service Co. Daily ex Sun, 8-9 pm, miscellaneous. Pacific.

KJS, Los Angeles, Calif. 100 mi. Bible Inst. of Los Angeles. Tues, 7-7:30 pm, Thurs, 8-9, sacred music, lectures, etc. Sun, 11:30-12:30, 6-6:45 pm, 8-9, church services. Pacific.

KLB, Pasadena, Cal. 300 mi. J. J. Dunn Co. Mon and Fri, 7:30-8:15 pm, concert. Sun, 3-4 pm and 8-9, concert. Pacific.

KLN, Del Monte, Calif. Monterey Elec. Shop. Daily, 12-1 pm, weather, markets, news; 7-8 pm, concert. Pacific.

KLS, San Francisco, Calif. 300 mi. Warner Bros. Radio Supply Co. Daily, 11:30-1 pm. Fri, 8-9 pm, Sun, 12-1 pm. Pacific.

KLX, Oakland, Calif. 500 mi. Oakland Tribune. Daily ex Sun, 7:15-7:30 pm, news, entertainment. Tues,

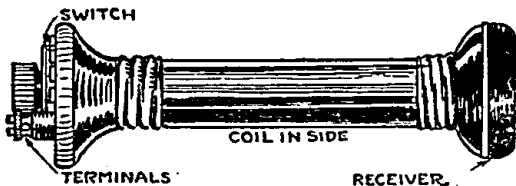
Old Flashlight Case Makes Receiving Set

The illustrations show a very unique Radio receiving set. The receiver and phone units are all enclosed in one case, making a very small and compact set. It consists of an old flashlight case with the flared part of another case, a piece



of one-inch radiator hose on which is wound a tapped inductance, a crystal detector, a three-inch dial with knob cut off in order to mount the rotary switch and switch points, and two binding posts for the ground and aerial connections.

Eleven switch points are mounted on the dial and taps are taken off on the first ten turns of wire on the inductance coil and also one tap is taken off on the fortieth and one on the fiftieth turn. The



rotary switch has two arms, one arm is set on the fiftieth turn and the other arm rotates over single taps until the station comes in the clearest.—Mrs. H. Mayer, San Antonio, Tex.

Because of the loneliness of lighthouse keepers, who are isolated for weeks, even months, Radiophone receivers are being installed aboard lightships at sea and in lighthouses around New York.



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Because of the extensive demand for a battery case that will insure home radio users against acid leakage we have designed our special Solid Rubber Battery Case. It is absolutely indestructible and acid proof.

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T. B. Grove, 718 East Park Av., Fairmont, W. Va., writes: "Battery arrived in excellent condition and to say that I am pleased is putting it very mildly. Your promptness in shipping was appreciated and will do all that I can to advertise your product in this vicinity. Again thanking you."

Frank C. Wozniak, Rt. 4, Box 101, Michigan City, Ind., says: "I am more than thankful to you for the kind and prompt shipment of the Batteries. They are just what I wanted."

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No other manufacturer offers such a high quality radio battery in a solid rubber case at such a low price. Save 50% on your next battery and get better and longer service. Buy a World Radio Battery. Write today—at once.

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6 Volt. 100 Amp., \$16.00

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Complete Parts for Reinartz Circuit

Includes 1 7x18 Formica Panel, 1 Bakelite Socket, 1 Howard Vernier Rheostat, 23 Plate Condenser, 11 Plate Condenser, 3 Switch Levers, 2 Dozen Switch Points, 1 Reinartz Wound Coil, 1 Variable Grid Leak, 8 Binding Posts, 25 Feet Tinned Wire, 1 Base for Coil, 1 Mounting Base Board, and 1 Diagram to Construct This Set. Complete. **\$11.45**

COMPLETE KNOCKDOWN RECEIVING SET

This includes 2 Variometers, 1 Coupler, 3 Dials, 1 Rheostat, 1 Cunningham Detector Tube, 1 Bakelite Socket, 1 Mahogany Cabinet, 7x18 Formica Panel, 6 Binding Posts, 1 Switch Lever, 12 Switch Points, 2 Stops and 1 Diagram to construct this set. Set is capable of receiving 1,000 miles if installed with outdoor aerial. **\$17.95**

VARIABLE CONDENSERS

\$4.30 Value, 43 PLATE, now \$1.75 \$3.10 Value, 5 PLATE, now \$1.25
\$3.70 Value, 23 PLATE, now \$1.45 \$2.70 Value, 3 PLATE, now \$1.15
\$3.30 Value, 11 PLATE, now \$1.35

U.S.A. SIGNAL CORPS Aviation Type 194-W WESTERN ELECTRIC PHONES, \$7.95

Each Phone Cap is covered with large soft rubber ear cushions, and an aviation leather helmet goes with each set! These are the only phones to pass the Government specifications for sensitiveness and loudness, the requirements called for in aircraft reception.

COMPLETE PARTS FOR FLEWELLING CIRCUIT

Includes 6x14 Formica Panel, 23 Plate Condenser, 3 Micon .006 Condensers, 1 Freshman Variable Grid Leak, 1 Remler Leak, 2 Coil Mount, 2 Honeycomb Coils, 2 Coil Plugs, 1 Socket, 1 Howard Vernier Rheostat, 8 Binding Posts and 1 Diagram to Wire and Construct This Set. Complete. **\$12.45**

MAGNAVOX, LOUD SPEAKER, Type R3 \$34.95

VARIOMETERS, Genuine Mahogany, \$5 Value, Now \$1.95

VARIOCOUPERS, \$4.50 Value, Now \$1.75

HONEYCOMB COILS

1,500 Turns \$1.50	750 Turns \$1.00	75 Turns 40c
1,250 Turns 1.50	250 Turns 75c	50 Turns 40c
1,000 Turns 1.25	150 Turns 60c	35 and 25 Turns 40c
100 Turns 50c		

\$8.50 Guaranteed 3,000 Ohm HEAD PHONES \$3.65

RHEOSTATS 45c

SPONGE RUBBER EAR CAPS, Pair 50c

DIALS, 2, 3 and 3 1/2 inch 25c

Thordarson Amplifying TRANSFORMERS, \$4.50 Value, Now . . . \$2.95

GREWOL DETECTORS \$1.65

Signal Corps Super Sensitive Microphone Transmitters \$2.45

Solid Copper Aerial Wire, 100 ft. 35c	Lightning Arresters 95c	Phone Caps, for mostly all phones 25c	Lightning Switches \$2.65
Spaghetti Tubing, yard 10c	2-Slide Tuning Coils, at \$1.95	Signal Corps Hot Wire Ammeters, at \$5.45	Hydrometers, now at 45c
Cord Tip Plugs 60c	3-Coil Honeycomb Mountings, with Knobs \$4.20	Anti-Capacity Switches \$1.50	Freshman Variable Grid Leaks 95c

FORMICA PANEL, 1/8" thick, Black or Brown, Square Inch 1 1/2c

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58

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Legislation for Us All

Amendment to Bill Is Worthy of Notice

JUST recently the White bill passed the House almost unanimously. It now goes to the Senate. We have Representative Jones of Texas to thank for his amendment. This clause strikes a blow to the interests which have been so active in trying to close in on patents for the purpose of controlling the entire Radio trade and the ether. The amendment empowers the Secretary of Commerce to revoke the license of any firm or corporation attempting to monopolize broadcasting or the manufacture of apparatus.

The Senate will next take up the bill and present indications are that there will be little opposition to it as it now stands. Senator Kellogg will have charge of the bill in this division of the legislature. This bill with its amendment will greatly aid amateurs and the one who wants entertainment.

Response from Listeners

Public Wants Learned by Letter or Telegraph

THE improved quality of the concerts sent out from broadcasting stations is one of the reasons why broadcasting is holding its own. Before this day of filling the air with entertainment, the few owners of receiving sets were more interested in the why and how of the set instead of entertainment. The Radio audience has now grown to such an extent that the largest portion of those who listen in are doing so only for the entertainment, not for the technical side of the operation.

Ready-made sets which any one can operate have come on the market; the amateur who sets up his own set, once he has found his pet layout, gives himself little further trouble about its technical arrangement. Both he and the ready-made set operator are content to use their outfits as they are and concentrate on what they can get. For them the Radio receiving set has become less a piece of apparatus to be tinkered with in making constant experimental changes and adjustments.

One of the difficulties always has been that the person listening in was not in responsive touch with the broadcasting station. The broadcasting stations, on the other hand, faced a corresponding predicament. There was no spontaneous reaction from their audience. They tried to meet this situation by suggesting to their hearers that they let them know by postcard or letter.

It is not known who started it, but some ingenious person found the remedy for this one defect which stood in the way of complete action and reaction between audience and broadcasting station, and once it had found it, it proved extremely simple. He turned to his telephone, called a telegraph station and sent a telegram to the broadcasting station. Within a few minutes the broadcasting station had received the telegram and in turn was reading it out to the listeners. Here was a live contact with the audience and the station.

Picking Up the Carrier Wave

Re-Transmission a New Way to Relay Sound Waves

SOME amateurs have had recent successes in borrowing the carrier wave from a nearby broadcasting station for their own purposes. A crystal set owner received a concert at an exceptionally long distance just because his aerial paralleled one that had power transmission on it. A tube set will receive louder when a nearby transmission dynamo is running and not broadcasting. Does this tend to lend power to the incoming waves?

Various broadcasting stations are trying out this same method or something along about the same lines in relaying messages from a distant city to another. A Canadian station has used their instrument for re-transmission of concerts broadcast from New York. The waves are picked up by a powerful sensitive receiver and highly amplified. The output of the receiver is then fed into the broadcasting equipment and the very entertainment sent out from New York or Chicago can be enjoyed by others in distant sections of the country through their own broadcasting station who own simple sets.

Condensed

By DIELECTRIC

It is doubtful if most of us realize to what extent the Radio compass has been successful in averting disaster at sea. In severe storms near the coast vessels have been swept clear out of their course and driven dangerously near to shoals, and when the ship's captain has regained control of the movement of his ship, he has not known his exact location. By means of the Radio compass full information may readily be had and the proper course to steer is carried to him immediately upon receipt of his inquiry. During the course of six hours, eighty vessels were advised of their true location while approaching New York Harbor (I believe my figures are correct), some of which were then heading for shallow water. Just how many catastrophes have been averted solely through the efficacy of the Radio compass it is impossible to state, but the invention of such a scheme is of tremendous value to shipping.

Acoustics is a subject that has occupied the attention of experts, presenting them with a formidable problem. It is still a matter for exhaustive study and, as concerns Radio audiences, a very vital one. There are many features of broadcasting relating to the transmission of operas and concerts which need correction. These in large part are acoustical imperfections. As inspiring and generally enjoyable as are the concerts being broadcast, it remains for a later day to devise the means whereby the various choirs in an orchestra may be heard in their true value. I have no doubt that we listeners-in will find future concert halls to be designed with particular attention to what may be called Radio acoustics. There is no intention on my part to criticize without qualification the efforts of those broadcasting stations which are doing so much to spread a knowledge of classical music. They deserve the utmost praise and loyal support of all true lovers of music. No single feature of Radio is perfect. However, no effort is being spared to accomplish that end.

On New Year's eve the listening public were provided an opportunity of hearing the chimes in Old Trinity, New York city, and to many who were far distant from that city the melodies from these historic bells were heard for the first time. The famed carillon of Malines Cathedral in Belgium are now heard by Radiophans in that country, since the installation of a transmitting set in the belfry. What would it mean to us if we might tune in to some powerful station in the city of Philadelphia broadcasting the sound of our Liberty Bell from Independence Hall? It could be made to carry all over this land and even to Europe. No oratorical attempt could equal in effect the hearing of this historic bell on the fourth day of July, 1923!

The two hundred and-seventeenth anniversary of the birth of Benjamin Franklin was celebrated in Boston, New York and Philadelphia. Radio made possible a far larger audience at the ceremonies than could have been the case otherwise. It is not the season of the year when standing in a public square is entirely enjoyable, as was required of those attending the exercises in New York. Nor is it always convenient to travel from place to place to attend several interesting meetings. With a Radio receiving set one could hear the speeches in the warmth of his home and be altogether comfortable. It would have been impossible for most of us to gain access to the ballroom of the Bellevue Stratford Hotel in Philadelphia, yet thousands probably heard the entertainment given for the benefit of the members of the Poor Richard Club assembled there. This broadcasting from notable assemblages is one of the treats in store for the owner of a receiving set. I heard most that transpired at the inaugurations of three Governors—and was present at none of them. To hear the announcements at the Capitol of one state one minute and from another state the next is covering ground pretty fast.

Augustus Thomas expressed some skepticism as to being heard by folks in Oregon and Washington while he was speaking from station WOR in Newark, N. J. He didn't do as Mayor Rolph of San Francisco is reported to have done, invite all those listening in to wire him collect if they were able to hear his voice. If he had, the bill for telegrams would have shattered his disbelief in national broadcasting.

Before the fervor of this "high brow" reflection fades out, I want to recall to your attention what is being done in some of the colleges and universities along the line of broadcasting lectures by college professors. When this thing gets to going as I expect to see it by another year, then thousands of young men and women will find a counterpart to correspondence courses in the subjects selected for broadcasting from these higher schools of learning. The University of Washington has fallen into step with the times in broadcasting classroom lectures on history. Dr. Elliott, president of Purdue University, was one of the first to lecture in this fashion. There doesn't seem to be any sleeping sickness among the officials of Station WSB, for Atlanta, Georgia, is the home of the "School of the Air" from which prominent educators will speak on a variety of subjects appearing in the usual college curriculum each evening for a fifteen minute period. Station WHN will broadcast from its studio on Long Island what will amount to a university extension course. The University of Pennsylvania adds a course, "Principles underlying Radio communication," to be known as "Physics 5." Thus do they come in stronger and—Dielectric fades out.

What Ex-Governor Cox' Paper Thinks of It



COURTESY DAYTON (OHIO) DAILY NEWS

RADIO INDI-GEST

(This column is open to all aspiring Radioknits who tender suitable contributions. Try to "make" the column if you can. All unsuitable manuscripts are turned over to the Office Squirrel who does not guarantee their return or anything else for that matter.—Indi.)

Pancakes for Indi-Gest

An unusually attractive hook-up for morning reception consists of honeycomb coils tuned in with pancake inductances. The combination is regenerative to a degree. Aunt Jemima please note.

My Dear, Try to Shut Us Out

A California paper refers to Radio concerts that are "open to the public." We'll tell the world! There are more knot holes in a Radio broadcast than in a sand lot ball park fence.

All Broadcasting—No Attempts at Receiving

"Pa, what does broadcasting mean?" asked Clarence.
"Telling a secret to a woman, son," replied Pa.
—CINCINNATI ENQUIRER.

The Radio Fanatic Husband

He is a traveling salesman,
Home from Saturday 'til Sunday night.
"Now hurry with the dinner, dear,
I must set the Radio just right."
And from seven until twelve, P. M.
He never leaves his chair,
And then sits in till two, A. M.
Just to see what's there.



In the morning I will find upon
The stand, a nice long list,
Of all the far off stations that my
Husband couldn't miss.
And as the next day's Sunday,
He will sleep till one, P. M.,
And then he's up and doing the
Same thing over again.

MRS. PAUL W. SHUE.

Call in Abe to Split the Rails

Some Congressmen seem to think that Radio can be laid out like pastures or grazing lands, with neat wire fences which would keep the broadcasts and messages within the confines of a State. Two of them actually believe that State rights are involved in the bill before the House, and want local Radio control left with the State governments.

Jazzing Up the Ether

Despite the general use of Radio and the millions of fans informed as to the reception of broadcasts, some remain ignorant of its possibilities. The other day in the National Press Club, one member suggested that the set be "speeded up," saying the music coming in was "too slow."

A. B. C. Lessons for Radio Beginners

Chapter VII—The Crystal Detector

By Arthur G. Mohaupt

THE detector forms that part of a receiving station which renders the incoming oscillations, after they have been passed through the telephone receivers, capable of affecting the human ear.

In the previous chapters we learned that all Radio transmission is effected by means of electromagnetic waves which travel through space at very high frequencies and with a velocity of 300,000,000 meters per second. For example, a broadcasting station operating at a wave length of 400 meters, sends out 750,000 waves per second. These waves, on being intercepted by a receiving antenna, induce in it electrical oscillations of the

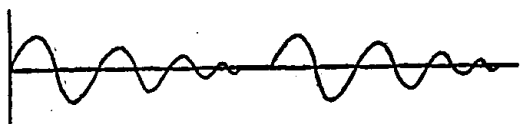


Figure 27

same nature and frequency. But these oscillations are all at a Radio frequency and far too rapid to be capable of affecting the human ear. It therefore becomes necessary to provide some means or device for reducing these high frequencies to an audio (audible) frequency, so that the human ear can recognize them and interpret their meaning. This is the part that is played by the detector in conjunction with the telephone receivers.

Damped and Undamped (C. W.) Waves

In an earlier chapter we were told that the high frequency electrical oscillations needed for Radio transmission are generated by means of special types of circuits having some form of inductance coil connected in series with a condenser. Two types of waves or oscillations are employed in Radio communication, one being known as damped wave transmission and the other as undamped wave (C. W.) transmission. These two types of waves differ both in their general form and their mode of propagation.

Damped waves, such as are generated by a spark transmitting station, consist of a series or train of waves each one of which is of less intensity than the preceding one. Such a train of waves is illustrated in Figure 27. The number of these wave trains that are radiated from the antenna per second, depends upon the spark frequency of the station. It is common practice to use a spark frequency of 1,000 discharges per second, and hence 1,000 trains of damped waves would be radiated from the antenna per second.

In damped wave Radio communication there are thus two frequencies to be considered; first the individual waves which occur at a Radio frequency, and second the trains of waves which occur at an audio frequency. The Radio frequency of the individual waves depends upon the amount of inductance and capacity in the transmitting circuit, while the audio frequency of the wave trains depends upon the spark frequency.

In undamped or C. W. transmission, all of the waves are of the same intensity,



Figure 28

and the antenna is charged with a continuous stream of uniform electrical oscillations. In the case of a Radio-telephone, these uniform or C. W. waves are modulated, or modulated as we say, into groups according to the nature of the voice or music that is being sent out. Here again we have two frequencies to consider, namely, the Radio frequency of the individual waves, and the audio frequencies of the groups into which the waves are modulated or modulated by the sounds that enter the transmitter. The individual waves that are modulated according to the nature of the transmitted sounds are known as the carrier waves.

The detector, therefore, operates upon the audio frequency groups or wave trains, and moulds them so that when they are sent through the telephone receivers they produce audible sounds corresponding in every respect to those that entered the transmitter originally.

The Crystal Detector

The detector, it is evident from the preceding paragraphs, forms the most important part or unit of the receiving station, for upon its proper functioning depends the quality of the sounds that are received. Numerous types of detectors have been devised and tried out since the Radio art first came into existence, but of all of these only two have survived and are now in common use. These two are the crystal detector and the vacuum tube detector. Each of these has its own field of application in that it best fulfills certain requirements.

The crystal detector is low in cost and easy to manipulate, but possesses the disadvantages that it requires delicate ad-

justments. The quality of the tones received, however, is very good.

The vacuum tube detector, on the other hand, is quite expensive not only in first cost but also in upkeep, for it requires the services of several batteries to supply electrical energy to the various circuits. The tube detector, however, is somewhat more positive in action and lends itself somewhat more readily to careful adjustments and amplification, in case it is desired to strengthen the received signals.

Various mineral crystals have been tried out, but today the one most commonly used is the galena (lead sulphide) crystal. The carborundum crystal is also used to some extent, especially in sets that are used for field service and are subject to rough usage.

The action of a crystal detector is based upon a peculiar property of certain crystals due to which they will permit an electric current to pass much more readily in one direction than in the opposite direction. The crystal thus acts as a rectifier, that is, it is capable of converting an alternating current into a unidirectional pulsating current. The term unidirectional means flowing in only one direction. The crystal is thus often said to rectify the incoming electrical oscillations.

Sensitive Spots on a Crystal

A mineral crystal does not have this rectifying ability distributed over its entire surface, but there are certain regions or spots that are more sensitive than others. These places at which the rectifying qualities are most pronounced are called the sensitive spots of the crystal. The crystal will thus operate more efficiently at these sensitive spots than at the other places on the surface.

In order that they can be conveniently handled, crystals to be used as detectors in Radio receiving sets are generally supported or mounted in a metal cup, as is illustrated in Figure 28. The crystal is held in place by means of three set screws passing through the walls of the cup, or



Figure 29

else is held secure with a few drops of low melting solder. A crystal must never be subjected to high temperatures, for these cause it to crack or scale off, and also greatly cut down the sensitiveness.

The metal supporting cup forms one of the electrical contacts to the crystal, while the other connection is made by means of a finely pointed piece of spring brass or copper wire. This fine point, sometimes called the cat whisker, is fastened to a movable arm so that it can be moved around over the surface of the crystal when it is desired to locate the sensitive spots. The point should rest upon the crystal firmly, but not with excess pressure.

A convenient form of crystal detector now available on the market has the crystal securely fastened to a neat support, and also has the contact point permanently fixed and set at a sensitive spot on the surface of the crystal. The crystal with its contact point is covered with a glass cover, while the rear is provided with two contact screws for connecting the detector into the circuit. The entire detector is thus very neat in appearance and very suitable for mounting on a panel. The permanent setting of the contact point also eliminates the task of locating the sensitive spot every time the detector is to be used.

How a Crystal Detects

We were just told that a crystal detector operates upon or moulds the audio frequency groups, so that when they are passed through a pair of telephone receivers they will produce sounds similar to those that initially entered the transmitting station. This operation is brought about in the following manner:

When a train of damped waves, such

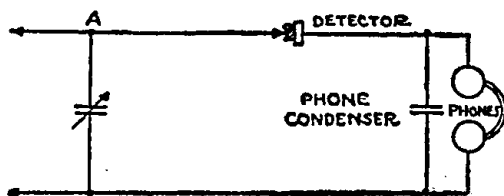


Figure 30

as are illustrated in Figure 27, are intercepted by the antenna of a receiving station, an alternating potential of the same nature is impressed across the terminals of the crystal. In the illustration the loops above the horizontal reference line represent the induced current pulsations in one direction, while the loops below the line represent the current pulsations in the opposite direction.

The crystal, however, permits current

to flow through it in only one direction, and hence only one-half of the current pulsations can get through while the other half cannot pass. The resulting current pulsations after they have been subject to this rectifying action by the crystal, appear as illustrated in Figure 29. Only one-half of each current wave was able to pass and hence the loops on one side of the horizontal line have been wiped out while the other half remains. The current flowing in the circuit beyond the crystal is thus a unidirectional pulsating current. These individual current pulsations still occur at a Radio frequency, but the groups of pulsations come in at an audio frequency. The Radio frequency oscillations are not capable of producing audible sounds, but the audio frequency groups can be caused to produce audible

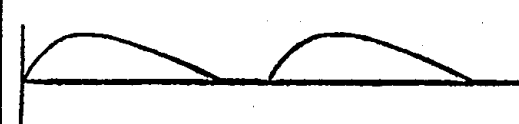


Figure 31

sounds by means of a pair of telephone receivers shunted by a small fixed condenser. The term shunted means connected in parallel or by-passed. The phone receivers are thus by-passed by the fixed condenser, as is illustrated in Figure 30.

The Action of the Phone Condenser

The current flowing in the detector and phone circuit shown in Figure 30 is a pulsating direct current we just found out. But a direct current cannot flow through a condenser, for the insulating dielectric forms a gap in the circuit. The result is that as these Radio frequency current pulsations flow through the circuit, they accumulate on the plates of the condenser and cause it to become charged. But this building up of a charge lasts only as long as one wave train continues, and furthermore, the charge at once tends to leak off through the telephone receivers. This discharge current in flowing through the receivers, how-

ever, has all the individual current pulsations ironed out, with the result that it forms a smooth current wave, one for each wave train. It forms a so-called envelope of the wave trains, as is illustrated in Figure 31.

As each of these discharge current waves flow through the telephone receivers, they attract the diaphragm. But since they occur at an audio frequency (corresponding to the frequency of the wave trains), they affect the receivers so that a sound is produced. And since these discharge current waves form an exact envelope of the individual current pulsations, the sounds produced by them will be in every respect identical with those that originally entered the transmitting station.

Operation of the Telephone Receivers

The telephone receivers, we all know, serve the purpose of converting the electric current pulsations into corresponding sounds, so that the electric oscillations received by the antenna can be rendered intelligible to our physical senses. The general principles of construction of the telephone receivers used for Radio work are the same as those used on our

(Continued on page 12)



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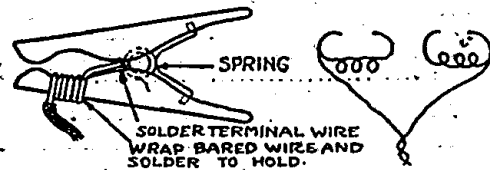
THERE are many little kinks worked out at home that would aid your fellow Radio worker if he only knew about them. There are new hook-ups, new ways of making parts and various unique ways of operating sets that are discovered every day. Radio Digest is very much interested in securing such material. Send them in with full details, including stamped envelope so rejected copy may be returned. The work must be entirely original, not copied.

RADIO KINKS DEPARTMENT,
Radio Digest Illustrated,
123 West Madison St., Chicago, Ill.

with any handy cotton covered or enameled wire; soldering one end of the wire to one end of the fuse and the other end of the wire to the other end. Bank the windings for best results. For a socket for these fuses use erector angles or regular fuse blocks. Wind these coils to suit the wave length desired.—Ben Bartzoff, Buffalo, N. Y.

Clip for Battery Connections

An ordinary wooden clothespin can be made into a good battery clip. A little wire twisted about one jaw and connect-



tions made to it from the lead, completes the clip. The clip can be attached and detached quickly and it keeps the terminals scraped clean.—G. A. Bessette, Valley Field, Canada.

A. B. C. LESSONS

(Continued from page 11)

ordinary wire telephones; but since the currents used in Radio practice are so very small, compared to those used in wire telephone communication, the Radio phone receivers must be made much more sensitive so that they will respond readily to the faint currents flowing through them.

The receivers commonly used for Radio work are of the watch case type and consist of a hard rubber shell or case in which is mounted a small electromagnet. The electromagnet is of the horse-shoe form, and has its two poles close together near the center of the receiver. The core is made of hard steel, and hence there is a slight but constant magnetic pull on the soft iron diaphragm which is adjusted so that it does not quite touch the poles. The electromagnet is wound with a large number of turns of fine wire, the ends of the windings being brought out to a pair of terminal screws by means of which the receiver is connected into the circuit.

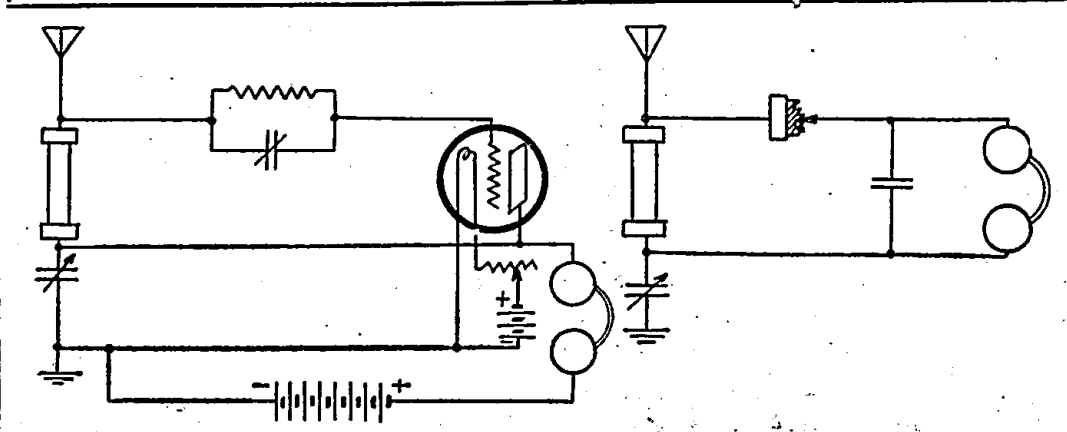
As the electric current pulsations of the detector circuit flow through the windings of the electromagnet they alternately strengthen and weaken it, and thus cause variations in the magnetic pull on the diaphragm. The diaphragm is thus caused to vibrate in exact unison with the electric current pulsations, the result being that sounds are produced which are identical with those which were initially sent into the transmitting station. An important point to remember is that it is not the sound waves that travel through the air and are then heard in the telephone receivers; but the sound waves at the transmitting station cause high frequency currents to be generated and sent out broadcast. At the receiving station these electrical waves are again converted into sound waves. There are thus two transformations of energy taking place.

Rating Telephone Receivers

Telephone receivers as used for Radio service are generally connected in pairs, forming a headset. They are usually rated according to their resistance, as 2000 ohm or 3200 ohm sets. The higher the resistance the greater number of turns are used in winding the magnet, and a greater number of turns makes the receivers more sensitive.

But it will not do to compare the receivers made by two different manufacturers solely on their resistance as a basis, for one make of receiver may have

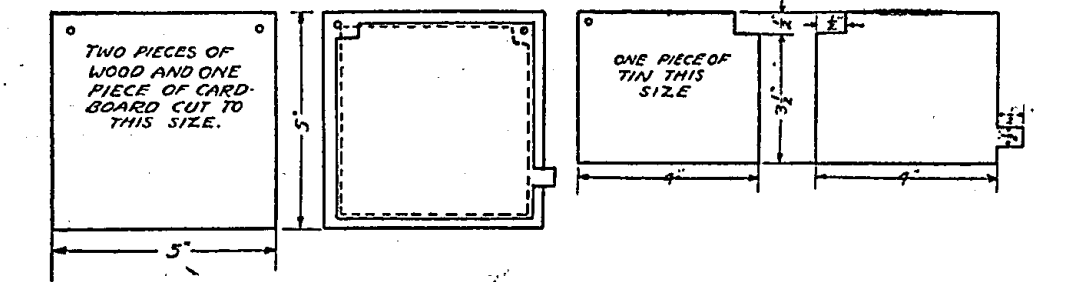
NEW COIL SHOWN IN TWO CIRCUITS



Homemade Variable Condenser

The type of variable condenser shown in the illustration can be made easily and used temporarily until one can be purchased. Cut two pieces of tin 4 inches square. On one leave a small tab 1/2 inch

Put the piece of cardboard over the tin, the bolts passing through the holes provided for them. Lay the other plate on this, allowing the other bolt to pass through the hole in the tin. Lay the other board on in the same manner as the first and turn the top of the binding posts



square. On one leave a small tab 1/2 inch variation. Bore a hole for the binding post in the corner and on the same edge opposite. On the other plate drill a hole in the corner for the post.

The corner adjoining the hole and directly above the tab cut a 1/2-inch square out, as shown. Cut two pieces of cigar box wood 5 inches square, also cut a piece of cardboard to go between the plates to the same size. Bore holes in adjoining corners of all three for binding posts.

One of the boards is placed on the table after the bolts for the binding posts are run through the holes provided for them. Place a piece of tin over it, putting the bolts through the hole in the tin and allowing the notch fit around the other post.

down fairly tight. Variation is accomplished by pulling the out or pushing it in the wooden frame.—Keron C. Morrill, Farmer City, Ill.

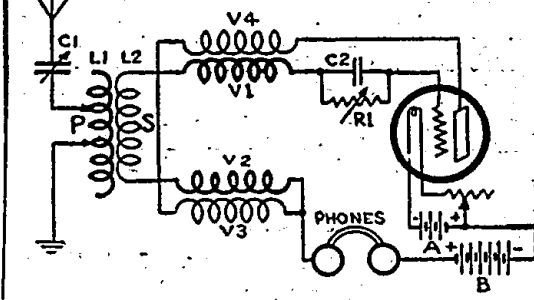
Filling Chips in Panels

Sawing and drilling panels sometimes result in chipping on the best side. If this chipping cannot be avoided either of the following mixtures may be used to fill the chipped part, after which they may be colored to match the panel with ink. Dissolve celluloid in banana oil and ether. This gives a good mixture. Dissolve as much celluloid as possible in some high grade concentrated acetic acid.—Glen E. Gaugin, Escanaba, Mich.

Long Distance Circuit with Double Feed Back

The set shown in the illustration may be of interest to many readers who would like to receive from long distance, broadcasting stations without using many tubes and transformers. I can tune out all local interference and tune in distant stations loud enough to be heard several feet from the phones on only one tube. The most distant station I have heard with this hook-up was Denver Station, KFAF, which came in very clear.

This is a double feed back circuit and is



- A—Storage battery (6 volts)
- B—"B" battery (22 1/2 volts)
- C1—Variable condenser (.0025 M. F.)
- C2—Fixed Condenser (.0005 M. F.)
- L1—Stator of variocoupler
- L2—Rotor of variocoupler
- V1—Stator of variometer
- V2—Stator of variometer
- V3—Rotor of variometer
- V4—Rotor of variometer
- R1—Variable grid leak

very sensitive. Oscillations in the plate circuit cannot blur out music as the phones are not in line with the main oscillations.

The amplification of this circuit is enormous. To obtain this double feed back the use of the two variometers is required, the rotors of both being separated and connected as shown in the illustration. The rotors are in the plate circuit and the stators in the antenna or secondary circuit.—Alton Theodore, Charleston, S. C.

Amplifier Tubes

Changing the vacuum tubes in an amplifier around often gives good combinations which improve the results materially. The tube of the first step can be changed with that of the second and the second with the third. The best combination will be found by experiment.

One long wire will give better results than several short ones for your aerial.

a higher resistance, on account of finer wire being used, than another, and yet it will not be as sensitive as the second. Hence, the statement that a 3000 ohm set is more sensitive than a 2000 ohm set does not mean anything, unless both sets are of the same make and are wound with the same kind of wire.

Operation of the Entire Receiving Station

We will now review briefly the complete operation of a crystal detector Radio receiving station, and in this manner sum up the contents of the last four chapters. A Radio receiving station consists essentially of four parts, each of which performs its own individual operations. In the first place, there must be some form of antenna to intercept the electromagnetic waves as they pass through space. Electrical oscillations of the same nature and frequency as were originally sent out from the transmitting station are induced in the receiving antenna. In order that the antenna will respond most readily to these induced oscillations, the receiving station must next contain some form of tuning device by means of which the wave length of the receiving station is adjusted or tuned to that of the incoming waves. For this purpose devices such as tuning coils, loose couplers, variocouplers, or variometers can be used.

The third essential part of the receiving station is the detector which accepts the groups of Radio frequency oscillations and rectifies them into unidirectional pulsations. These direct current pulsations then strike the condenser shunted across the telephone receivers. Here a charge accumulates, which finally leaks through the telephone receivers. These discharge pulsations thus occur at an audio frequency and form a so-called envelope curve of the respective groups of Radio frequency oscillations. As they flow through the telephone receivers, they cause variations in the strength of the electromagnets, and in this manner set the diaphragm into vibration. Audible sounds are thus produced which in every respect resemble those which originally entered the receiving station.

Although the entire processes as just explained seem perfectly simple and natural, we must not forget that they represent the results of many years of study and effort carried on by some of the keenest scientists and investigators of the entire world. Little do many of us appreciate or realize the large amount of time and labor that was spent in solving many a little process which now appears

of almost minor importance.

Chapter Eight

Having now completed our study of the principles of operation of a Radio receiving station, we are ready to put our knowledge into practical use by constructing a crystal detector set and then observing its operation in accordance with the instructions just given. Accordingly, Chapter Eight will be devoted to the details of construction of an efficient crystal detector receiving set. The chapter will thus comprise a practical conclusion to the work taken up this far.

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Reinartz Panel Set Designed for Compactness

Part II—Arrangement of Apparatus and Wiring

By H. J. Marx

IN THE first section of this series, the layout of the panel was given, along with an illustration of the front view of the panel, when assembled. The rear view of the panel, showing the apparatus, is given on this page. In addition the hook-up diagram is given for convenience in following through the connections. The list of parts required will enable the fan to purchase the proper apparatus and thus avoid the possibility of omitting some of the essentials.

There is a decided tendency on the part of the fans to make slight alterations in not only the parts required but also in the hook-up. Under such circumstances the performance of the set is affected, occasionally for the better, but more often for the worse. Then a letter follows requesting information covering the reasons for the inefficiency of the set. It is suggested that the directions be followed carefully and the set tested. Then if alterations are contemplated, they can be tried out and results compared with the operation of the original set.

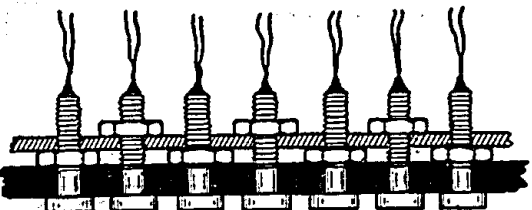
Use of Sliding Baseboard

A few comments on the list of parts required are essential. After the panel has been drilled, it is fastened to the baseboard by means of three flathead wood screws through the three countersunk holes drilled in the base of the panel. The tube socket and the spider web coil are mounted on this baseboard.

In purchasing binding posts, the type with a fair sized hole through the screw on which the cap is threaded, will be found most convenient.

Novel Contact Point Mounting

The 1/4-inch spacing between contact point holes may be found rather small, but was necessary for compactness. In order to avoid having the brass nuts touching and thus shorting the windings, a rather novel procedure was followed. A piece of panel stock or fiber 1/8 inch thick, two inches wide and four inches long was clamped to the back of the panel, covering the location of the contact point holes. When these holes were drilled in the panel, this strip was drilled at the same time so that the panel and strip exactly coincided in the location of the holes. Three arcs were then drawn at 1/2 inch radius, using as centers the location of the holes for the three lever switches. This space was then cut out for clearance of the lever switch mounting on the back of the panel. The contact points were then inserted in the holes of the panel and every alternate point fastened with a nut. The

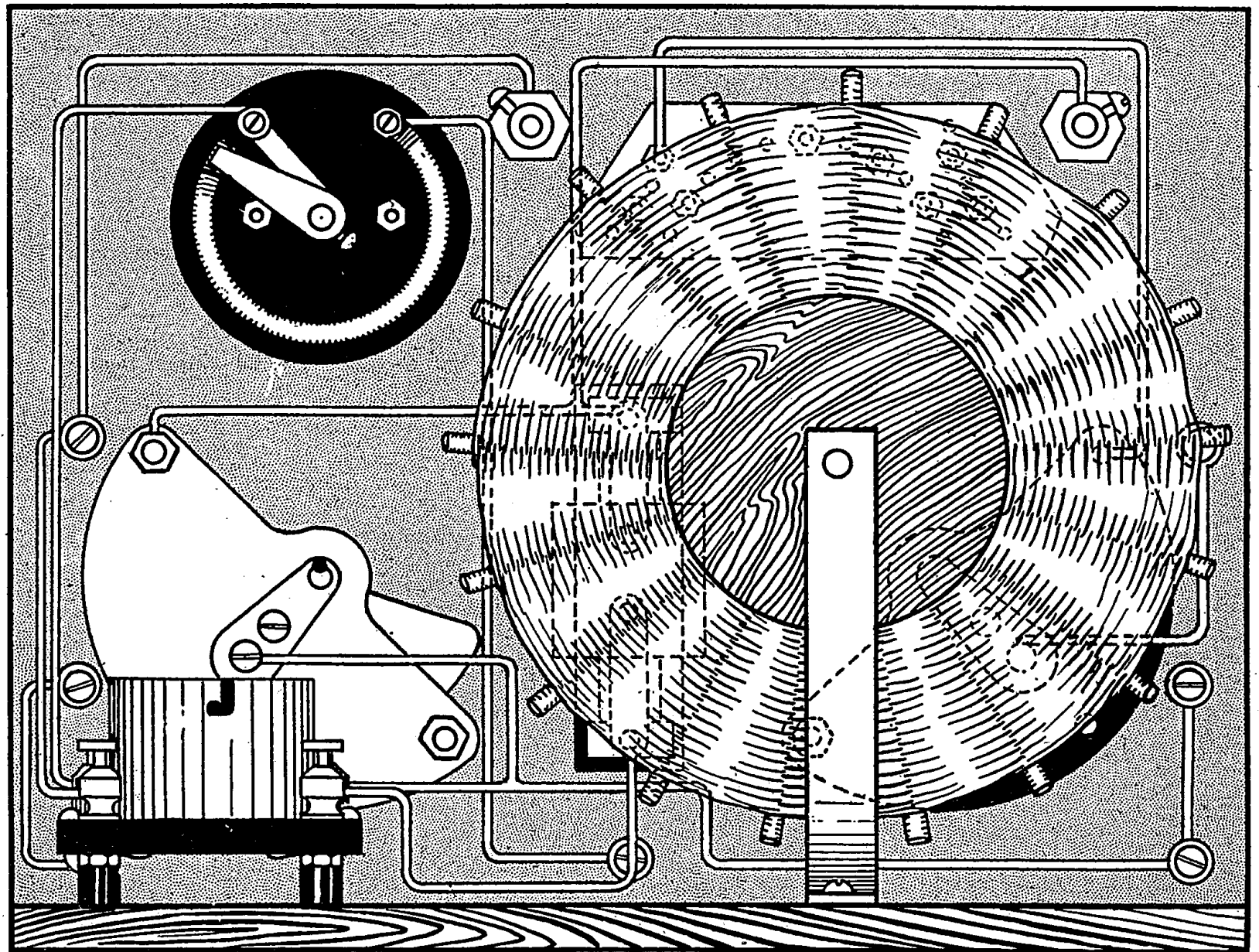


strip was then laid over this, with all the contact points passing through its holes. The nuts were then screwed down on the remaining points. This is shown in the illustration. In this way a very compact mounting was made possible, without the possibility of the nuts touching one another. Instead of fastening the leads under the nuts, however, they are tip-soldered to the contact studs as shown.

Parts Required

The tube socket should be of the base mounting type. A combination socket rheostat, a few of which are on the market, can be used if desired, but this will necessitate the tube projecting through a hole in the top of the cabinet.

There is a slight advantage in using a vernier rheostat, but it is not absolutely essential. The variable grid leak will be found of considerable advantage, since in this circuit each change of tube requires a readjustment in order to get the efficient reception for which this circuit is noted. A .00025 mfd. fixed grid condenser



is used in conjunction with the variable leak.

The variable condenser (.0005 mfd.) used in the grid coil circuit should be of the vernier type for the purpose of more accurate control of the tuning of the secondary circuit. The plate circuit condenser (.00025 mfd.) is variable but need not have the vernier control, as the 180 degrees of variation for so small a capacity is more than sufficient for accurate control. Naturally the vernier control here is not objectionable if used, but will cost more originally.

The spider web coil can be wound by the amateur following the instructions given in the November 25 issue of Radio Digest, or many will find it much simpler to use one of the spider web coils made especially for the Reinartz circuit, a number of which will be found on the market.

In the manufactured coils, the number of taps on the windings may not agree with those accounted for in the diagram, but the number of contact points can be altered to suit the coil, or some of the contacts can be kept open, just using those that are required.

Wiring the Set

It is impossible to state just how much wire will be required for connections as it will vary considerably. The square bus bar type of tinned copper wire will make a neat job but requires considerable painstaking care in assembly, using right angle bends and straight line runs. Attention should be paid to avoid running the grid leads parallel to some of the other circuit leads or the inductive effective will cause inefficiency and noisy reception.

Spaghetti can be used to insulate the leads, if the round tinned wire is used. The heavier gauge of wire is recommended

for more substantial workmanship. Care should be taken to secure well soldered joints throughout.

Arrangement of Apparatus

As shown in the rear view, the tube socket should be mounted on the base in line with the rheostat. It is advisable then to make all other connections before mounting and connecting the spider web coil. The position of the coil should not be left out of consideration. In order to avoid interference of the other wiring with that of the coil the position of the latter was designed as shown. After all the connections have been made the coil is mounted vertically with the taps facing the panel. These can then be wired to the contact points with short, straight wires carefully soldered. Naturally these should not touch each other.

Watch the leads so that proper clearance is allowed for the rotation of the condenser plates so as to avoid trying to bend the leads out of the way afterward.

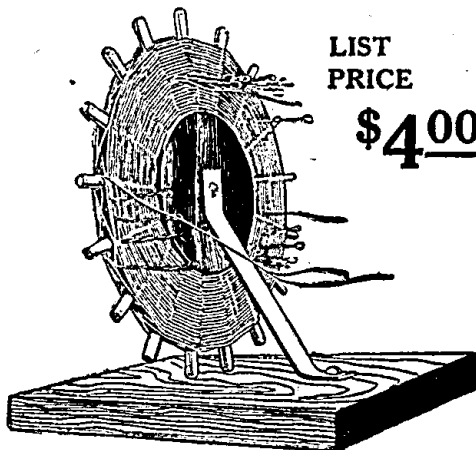
The front view illustration of the Reinartz Panel (shown last week) had the binding posts incorrectly marked. The one on the left should be A—; the one in the center, A+B—. This correction is made to correspond with the hook-up diagram and back of panel shown on this page.

The cabinet dimensions, battery connec-

tions, etc., will be taken up in the next article.

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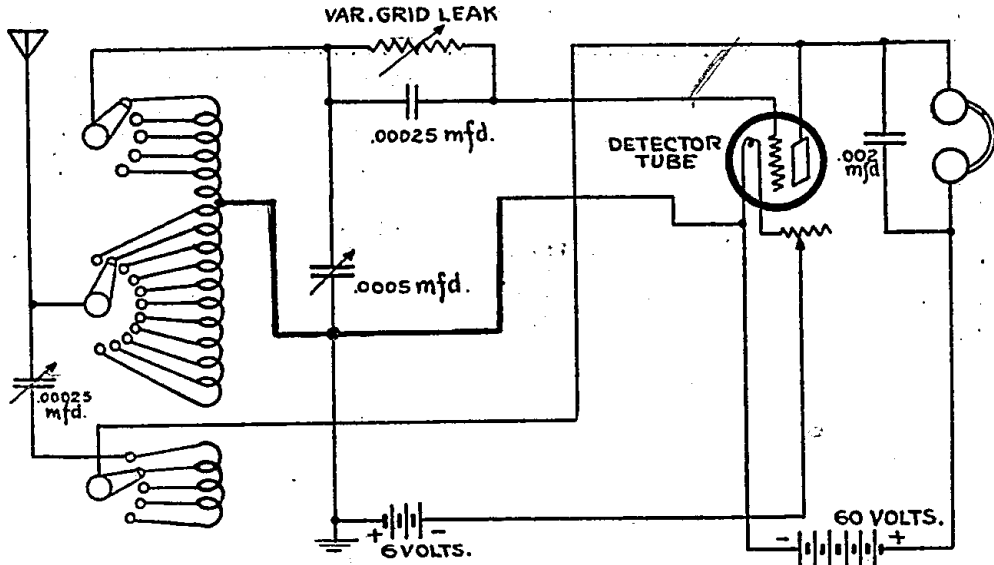
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The "How" of the Simplified Super Circuit

Part III—A Discussion of the Variable Leaks

By E. T. Flewelling

THE greatest amount of trouble encountered by the fans who are working with the Flewelling Super seems to center about the two grid leaks R1 and R2 (see diagram given last week), and it will doubtless be worth while to take up a little space to consider the nature of the difficulty.

In the average Radio circuit the grid leak is really not very critical in its value. Because of this it has been found satisfactory to use, as a rule, the step-by-step type of leak in which the value is changed as the arm or switch lever moves over the numerous points of contact.

Flewelling Super Needs Special Leak

While such a leak may be very suitable for use in ordinary Radio circuits, its use in the Flewelling Super circuit will simply mean failure to secure maximum results. This is due to the fact that the correct value desired will usually be found to be somewhere in between two contacts. The circuit might operate but the operation can not be compared with the results to be secured with a leak that was capable of exact and close adjustment.

The Flewelling Super is dependent upon its action to a very marked degree upon obtaining the exact value of the leak resistances. For this reason the leaks should receive extra attention and care. An adjustable leak which can be set at any value up to 5 megohms without the radical jumps encountered in using the step by step type, should be used. Care should be taken that the two leaks are adjusted in co-ordination—that is, that they are both set to the point that gives maximum returns.

Homemade Leaks

The use of a pencil mark between condenser terminals will enable one with a little patience to secure any desired leak resistance value. This is accomplished by rubbing off or adding to the marking. Either a soft lead pencil or India ink may be used, but it is well to note that both materials are subject to change in value as the humidity of the atmosphere changes.

This type of leak will give very good results if, after it is set properly, it is clamped under a strip of rubber or glass for protection from atmospheric changes. If India ink is used (and this is recommended), the leak should be made up and then set aside for a day or so, in order that it may become thoroughly dry. Otherwise its resistance will keep changing until it dries.

Fan Will Find Critical Point on Leak

After the set is operating satisfactorily the amateur will find a point in the leak adjustment, if all other factors are right, where the received signal is tremendously amplified. When a Radiophan in Boston, Chicago or Denver, using the Super on a loop or the ground alone, brings in Atlanta, Ga., he may be reasonably sure that his set is working.

Where Credit Is Due for DX Work

Right here is a good place to refer to a question that has arisen repeatedly, both in connection with the Super and with other Radio sets, particularly the crystal type. We are reminded that much long distance reception is accomplished through the kindly offices of a nearby regenerative receiver that is re-radiating back to our set. It is to be

regretted that this idea has gained such belief in the minds of people. Such an action is an impossibility.

The long distance work sometimes done by a receiver of unknown sensitivity, for instance, a homemade set, is very often credited to "reradiation", when as a matter of fact the receiver is standing squarely on its own feet. Let it be said here that no Radiophan ever heard a concert through the generosity of a re-radiating receiver.

He has heard noise and distorted unrecognizable sounds, yes, but never any such things as music. A nearby regenerative receiver will rob the Radiophan of a certain amount of energy and may reradiate some, but it will not be a pleasant type of "music." This statement will, I hope, cheer up a lot of amateurs. They need have no fear of giving their Super or other set all of the credit that it deserves for long distance.

Stable Leaks Make Set Reliable

To return to the subject of the leaks again. A change in the value of the leaks (due to atmospheric or other changes) may very easily be sufficient to make the set stop operating. If the amateur neglects to protect the leaks from such changes it is very apt to fail him at a critical moment. This occurs often when he is showing his friends what his set can do. If this point is taken care of, the Flewelling Super will be found to be as stable as any other Radio set.

Tubes and Plate Voltages

It has been stated several times that the average best results have been obtained by using 100 volts on the plate of the tube. It might be well to point out that this is only true when 100 volts happens to be the best for the particular tube in use. This voltage may run from 16 to 200 or more volts and can only be determined correctly by trial, at the same time watching the two leaks.

One of the best tubes used by the writer is a WD-11 dry cell tube with 45 volts on the plate. Hard tubes are best but fair results have been obtained with soft ones. It should be noted that if a solid conductor were used across the leaks, the B battery would paralyze the tube and have other harmful effects. It is the combination of proper leak and B battery value that gives the desired results.

Once the leaks have been set a slight change in their value may be compensated for readily by adjusting the B battery voltage.

Making Super From Single Circuit Set

Another consideration of value in constructing a Super will be taken up here and will more or less explain why the various values are called for. If the amateur builds, say, a single-circuit regenerative receiver and is located near a broadcasting station, he is not liable to have much trouble in bringing in that station. He will, however, get no volume, nor be able to tune in the more distant stations until his set regenerates and oscillates properly in the broadcasting range.

In order that the uninitiated may become familiar with what a set is expected to do, it is suggested that the Super set be started as a single-circuit regenerative set, still using the same coils etc., as called for in the Super, but simply

leaving the bank of condensers out of the circuit for the time being.

After such a set is put together it is then connected to the aerial and ground as usual. The amateur may hear spark stations sending but no broadcaster. Yet he knows that he should hear one. This is a common experience and the amateur is apt to find when he reverses the connections to the tickler coil that he will hear the music.

Determining Oscillation

Now it will be necessary to see if the set will oscillate properly within its range. If the finger, perhaps moistened slightly, is placed on the grid binding post of the tube socket, and the tickler (L75) is set to more or less close coupling with the inductance (L50), the set can be said to be oscillating properly if upon touching the post one hears a "cluck" and another "cluck" when the finger is removed. The set will not give this result at any arbitrary setting, of course, but should do so in the vicinity that broadcasting is received. The oscillation will be found controllable by manipulation of the tickler coupling and the tuning condenser.

Non-oscillation is shown when upon touching the grid post, a single "click" is heard in the phones and no sound as the finger leaves the post.

Regeneration will be indicated (if the

set oscillates properly) by the increased volume of the income signal as the tickler is brought up to closer coupling with the inductance. When the maximum point is passed the tube goes into oscillation and the familiar howl starts. Such action of the set will show that at least most of it is correctly adjusted and it will then be easier to begin on the Super part.

Flewelling Has No Limit

It has always been, since the advent of the vacuum tube and regenerative circuits, the great desire of the Radio enthusiast to carry on the increase in volume, as he turns the tickler up, beyond the point of maximum without encountering the howl or "spill over." If the above plan is followed it will be very interesting to note how this can be done after the Super part is added. Theoretically there isn't much of a limit to how far regeneration may be carried or amplification obtained, although practically, of course, there is a limit.

However, it will be found far better to bury the howl in a little bank of condensers than in the headset, because when properly adjusted the Super does not "spill over" and consequently does not howl.

(To be continued next issue.)

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Questions and Answers

Stranded Antenna Wire

(1920) DJS, Blackfoot, Idaho
I am installing a receiving set, consisting of detector, one stage of tuned radio frequency amplification, and a two-step amplifier. This set is put out by the Crosley Mfg. Co. of Cincinnati.
What phones would you suggest? I want phones good enough that I will not become disgusted with them and throw them away, and get a better set.
What makes of tubes and "B" batteries would you suggest with this outfit? Is 16-strand braided antenna wire better than the plain? What do you think of the corrugated surface wire, put out by the Yardell Corp., Utica, N. Y.? They claim this wire has a collective surface of 10 points.

I noticed your article of "Antennae and Lead-ins" in the December 30th issue of Radio Digest and would like to say I had figured on putting in an aerial, like the one mentioned in your article.
It will be a single strand, 40 feet high, 75 feet long, N. W. by S. E., the other wire will be S. W. by N. E., same length and height. Three poles will be used. The center pole holding the end of both wires, insulated good. A lead-in from each wire, with a double switch, allowing me to use either aerial by simply throwing the switch inside the room.

My idea for this kind of an aerial is this: I have noticed on several of the sets in my town a certain broadcasting station will come in very clearly on an aerial facing a certain direction, while another fellow with aerial facing opposite direction will hardly be able to pick them up. What do you think of the idea? I do not understand a .001 mfd. condenser in series in use with an aerial. Would you please explain?

I do not know whether you charge 25 cents for answered questions, like some information bureaus, but will inclose it to be sure.

Will you please answer by personal letter?

Do you know of a good book for Radio receiving that is easy to understand and yet one that will go right down to the inside of a set and tell you what each part is, what it is for, and how it works?

I have been told that the direction your lead-in is taken off, the broadcasting stations in that direction will come in clearer than those facing the opposite end of aerial. Is this so? Would there be any advantage in having a lead-in from each end of aerial? Can "B" batteries be re-

charged? What do you think of the home-charger? What is meant by Potential and Potentialmeter?

A.—It is not our policy to recommend any particular make of apparatus. Secure phones of well advertised make and rugged construction of three thousand ohms. The same advice applying to all apparatus.

The sixteen strand braided antenna wire is highly desirable. The corrugated surface wire cited is also very good and effective. Your idea for construction of antenna is good. It is admitted that a more or less directional value exists from lead-in end. No special advantage in having lead-in from each end. A .001 variable condenser in the antenna circuit is for tuning.

Application to the Book Department of Radio Digest with specific designation of special phase of Radio information desired will lead you to securing an authorized work on the subject.

B batteries can be recharged when of the storage type.

The Homecharger is all right. Tube rectifiers are highly efficient.

Potential means possible voltage. A potentiometer is a meter for controlling amount of potential.

Radio Frequency and Regeneration

(1936) JGR, Los Angeles, Cal.

Being a constant reader of your valuable paper and seeing a hook-up of the Flewelling single tube super-regenerative set, I have decided on building a set accordingly. However, I see by the hook-up and picture of the circuit, that one step of audio frequency is used. I would much prefer using one-step Radio frequency if it can be accomplished. Radiophans here seem to think that Radio frequency cannot be used on a regenerative set successfully, but I note an article in your issue of December 30, page 11, Mr. Horle, of the Federal Telephone and Telegraph Company states that R. F. is much better than A. F., but he does not state whether or not R. F. can be used in a regenerative set with success. Will you please advise me as to whether or not it can be used, especially with the type transformer I have mentioned?

A.—Radio frequency amplification may be used with a regular regenerative circuit, but not with the Flewelling successfully.

Radio frequency amplification has its virtues and its limitations, and if not well understood in principle and use is apt to be difficult.

Reflex Circuit

(1946) ELH, Akron, Ohio

I would like to ask you a question or two concerning the reflex circuit. I have two Federal audio No. 226-W and two Acme A-2 Radio transformers. Can these be used in the reflex circuit?

Would a variocoupler with units and tens on 80 turns of No. 20 D. C. wire be all right?

I have built several sets and never had any trouble with them, but when I built the Reinartz hook-up that you published some time ago it would not work. I tried everything, even left it at the Radio store a couple of days, and they found everything just right, commending the workmanship, but could not find out why it failed to work. I removed the variable condensers and some of the wiring and it worked better.

Five different coils were tried out and there was no difference. I now have the Copp tuner and detector hooked up to the amplifiers and it works fine.

A.—All apparatus you mention for use in the reflex circuit is correct. The trouble you have with the Reinartz circuit seems to be with the coils. The common fault in construction of these coils is to have a short circuit in the two inside coils, even though special care may have been taken to prevent this trouble. Would advise re-wiring coil. The Reinartz gives exceptional results when perfected and is well worth the endeavor.

Day Reception

(1982) AJN, Walnut Ridge, Ark.

As a subscriber to the Radio Digest, I wish to ask you to tell me why I cannot get stations in the day time? At night we hear everything from California to Cuba and New York. I also hear the Drake

Hotel, but have never heard KYW, which we are very anxious to hear, especially the grand operas.

I have a Westinghouse R. C. set and loud speaker and should hear everything.

A.—The electromagnetic waves are set up near the earth's surface and are partly transmitted as guided wave trains along the earth's surface, modified by refractions and absorptions at its irregularities. In the daytime the upper conducting boundary will be less definitely marked than at night on account of partial ionization of the air by the sun's rays. Hence there will be less reflection of the wave known as space wave in the daytime, and consequently the guided wave will not be assisted materially by a reflected or refracted part of the space wave. At night, when the upper boundary is more sharply defined, there is more reflection of the space wave, which in general gives stronger signals at night.

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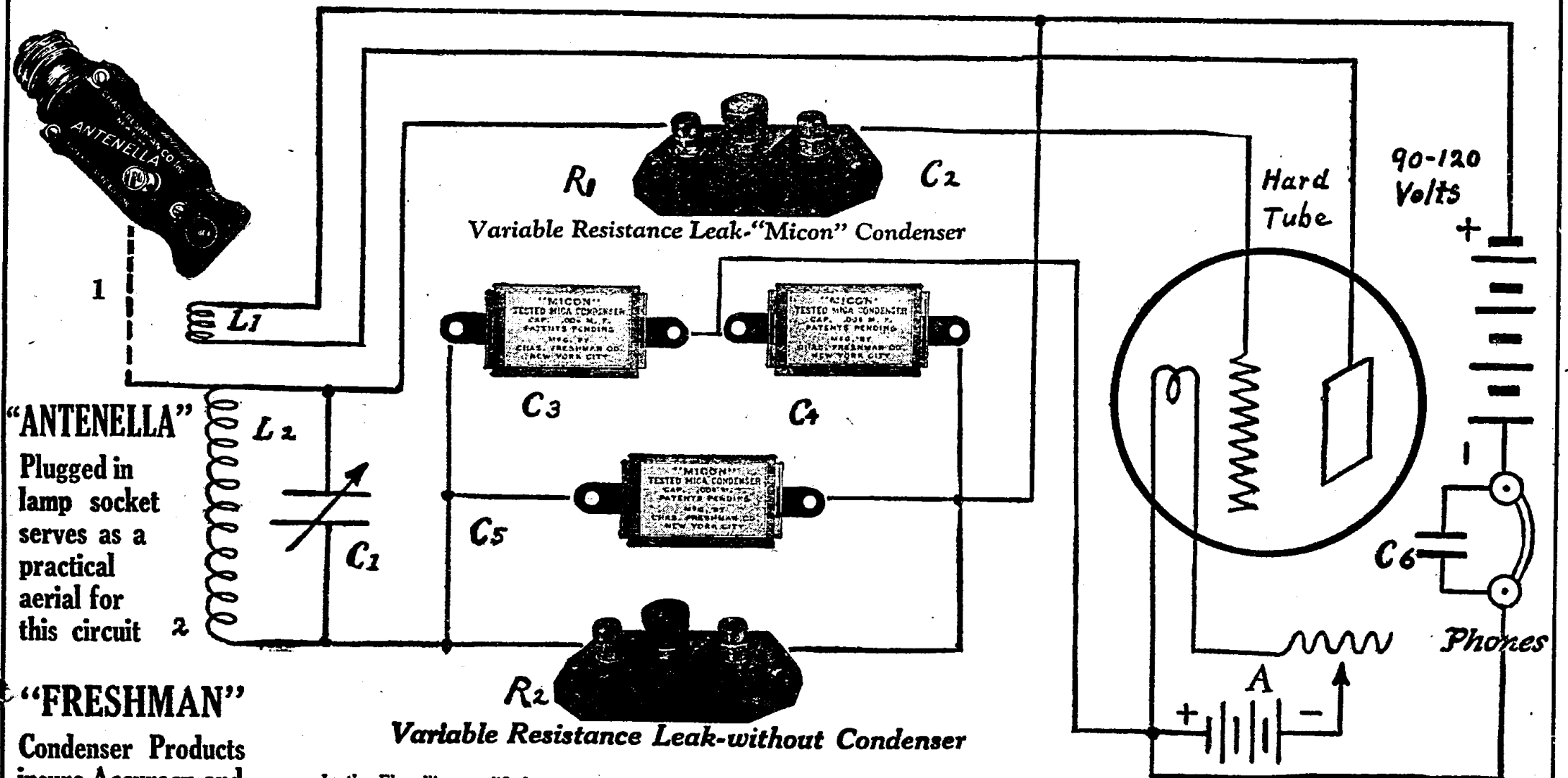
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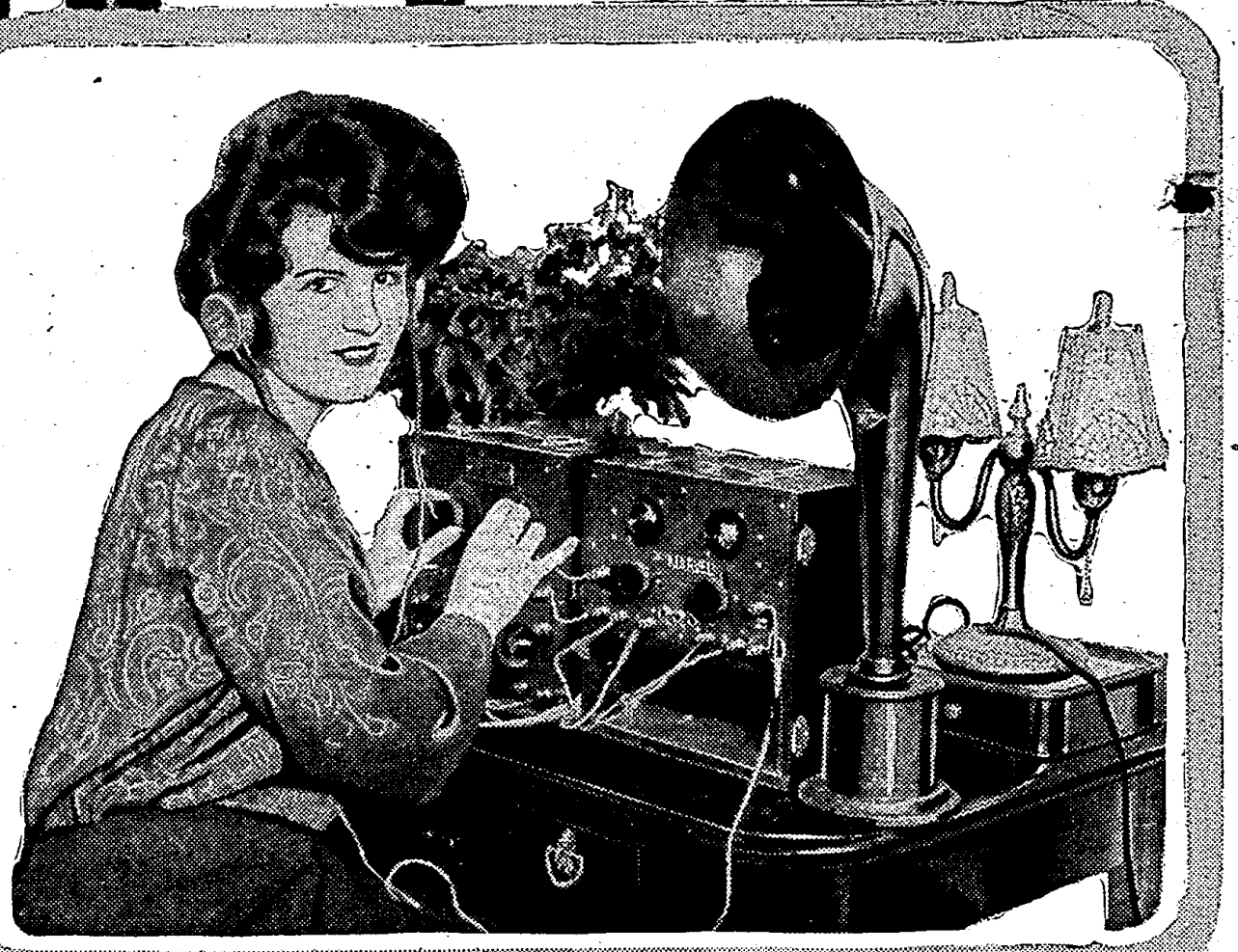
In the Flewelling modified super-regenerative circuit the following are the values of the constants: C₃, C₄ and C₆, approximately .006 mfd. MICON, not critical; R₁ and C₂—FRESHMAN COMBINATION VARIABLE RESISTANCE LEAK and MICON—.00025 mfd. Condenser, critical. R₂, FRESHMAN Variable Resistance Leak without condenser, very low. C₅ 'phone condenser, Micon .001 mfd. "B"-battery, 18 to 250 volts using UV-201 tube (110 volts found very good); L₂ is 50-turn coil or equivalent; L₁ is 75-turn coil or equivalent; C₁ is .0005 mfd. The two dotted leads, 1 and 2, are used in various ways. Using both ground and aerial, connect these to 1 and 2. Using either aerial or ground alone, or one side of Antennella or loop, connect to 1, leaving 2 free. Using both sides of loop or Antennella, connect to 1 and 2.

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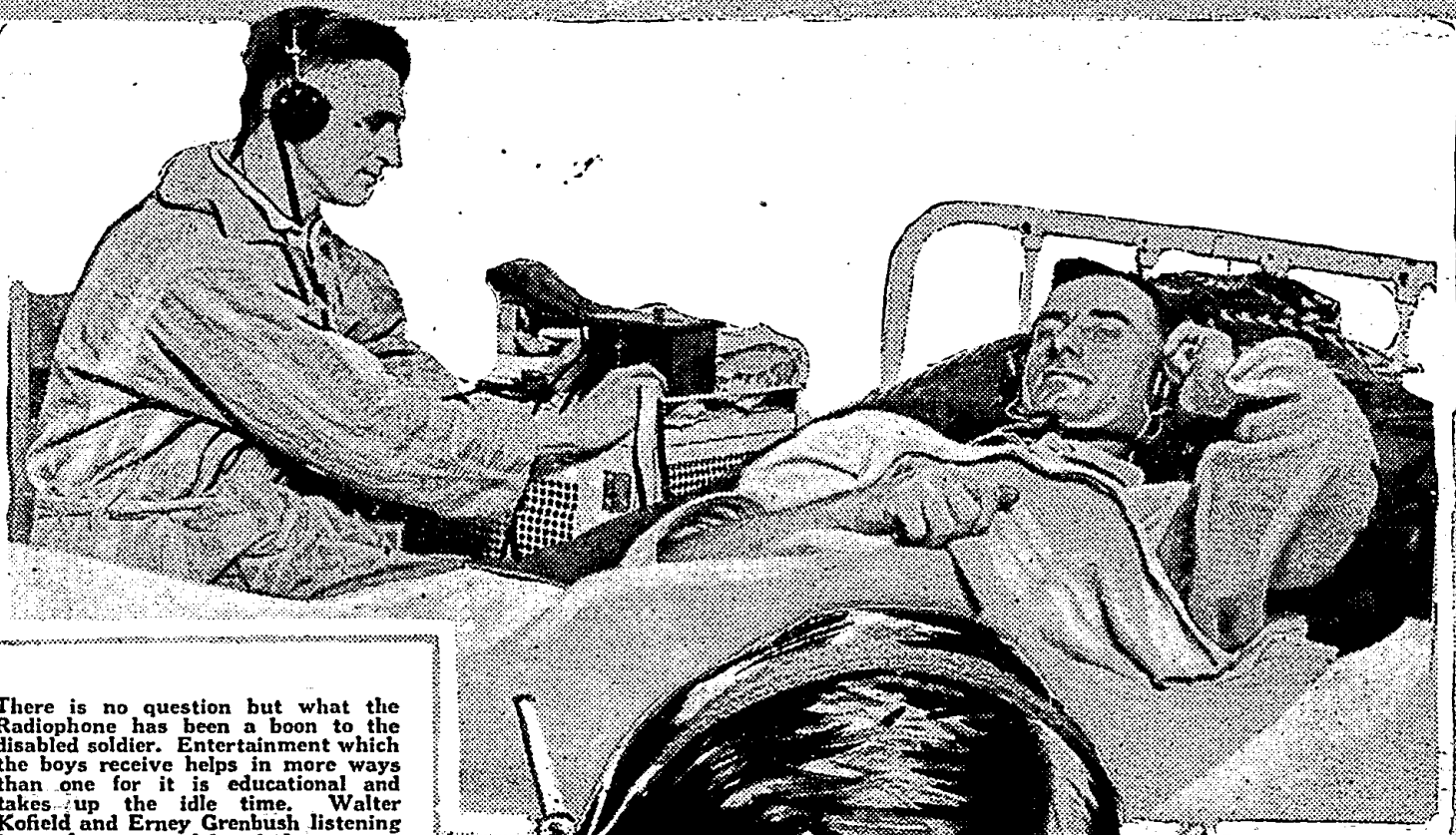
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Micon .006..... 1.00

Radio Illustrated



Miss Dorothy Knapp was selected as America's most beautiful girl at the present time, but she is not the only beauty shown in the picture, for there is the Radiophone, and you must admit, if you are a real fan, that it is some beauty, too, and must be a great entertainer for the distinguished party with the head phones © K. & H.

Recently there was filmed a play entitled "Via Radio" in which many scenes were prepared and many stage settings, one of which is shown in the picture. However, this picture is one which may be readily duplicated in the average American home. The father and son are much interested in what they are hearing over the Radiophone at home



There is no question but what the Radiophone has been a boon to the disabled soldier. Entertainment which the boys receive helps in more ways than one for it is educational and takes up the idle time. Walter Kofield and Erney Grenbush listening in at the veterans' hospital

© World Wide Pictures

Since the advent of the Radiophone many babies have been entertained by the music as well as the bedtime stories. Baby John Ferrec is a very young Radiophan, but nevertheless he is interested in what is coming through the headphones. It is just as interesting to the little folks as the older people for there is something mysterious about having a voice come out of the air or a box. Many times the mother is relieved of baby's care by the use of a simple receiving set

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