

Radio Digest

EVERY WEEK

Illustrated

TEN CENTS

REG. U. S. PAT. OFF.

Vol. V

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SATURDAY, MAY 12, 1923

No. 5

RADIO LINKS U. S. FLYERS

CLASS "A" LICENSES GRANTED 16 PLANTS

EACH GETS WAVE EXCLUSIVE IN OWN STATE

Wild Animal Circus, Daily Paper, Three Colleges, National Guard Unit, One Church, in List

WASHINGTON.—Sixteen Class A stations, the first of the newly classified broadcasters, have been licensed by the Department of Commerce. Although several of the licenses are for the same wave length, it will be noted that these are all in different districts and states, so separated as to avoid any marked interference.

Of the sixteen new plants, Louisiana received three, Kansas, Nebraska, Missouri, Oklahoma and Texas each received two, and Illinois, Pennsylvania and Indiana got one apiece.

Represented among the new broadcasters are a daily paper, a church, three universities, a wild animal circus, a national

(Continued on page 2)

The lower left photograph shows Miss Bernice Kazouoff, concert pianist and music instructor. She was one of the feature performers to be heard on a recent program broadcast from the studio of Station WEA, New York. One critic said, "Miss Kazouoff reminds one of the bouyant Percy Grainger and his individuality of interpretation." The young lady smiling so prettily in the center is none other than Miss Bonnie Barnhardt, "The Bedtime Story Girl" and assistant program director of the Atlanta Journal's Station WSB. In the right circle is Miss Cecil Arden, mezzo soprano of the Metropolitan Grand Opera Company, who sang to the listeners of WDAF a short while ago



'GREAT BOON' SAYS MAJOR GEN. PATRICK

Use Directional Waves

Chief of Air Fighting Forces Writes of Aid Airphones Give Pilots

By Major General M. Patrick, Chief of U. S. Air Service

Of all the discoveries and scientific developments of the past few years, none have been more interesting, nor rapidly exploited than aviation and Radio, two agencies which are destined to play a vital



WGI BANS "TRUST" SONG COMPOSITIONS

Independent Publishers Say Broadcast Is of Decided Benefit to Themselves

MEDFORD HILLSIDE, MASS.—The American Society of Composers, Authors and Publishers, controlling by copyright, the compositions of certain song writers and musical composers and also the publication of these compositions by certain publishing houses, has advised that it will not permit the broadcasting of its copyrighted music without payment of a fee for a license to do so. Station WGI, joining with 34 other stations, will not broadcast any composition covered by copyright belonging to the Society named.

KSD TO BROADCAST TEN WEEKS OPERA

Fans Will Hear St. Louis Municipal Opera Thursdays and Sundays

ST. LOUIS, MO.—Ten weeks of light opera, extending through the entire season of the St. Louis Municipal Opera Company will be broadcast this summer by Station KSD, the St. Louis Post-Dispatch. The broadcasting will be on Monday and Friday night of each week, weather permitting. In case of rain the postponed broadcasting will be on Thursday or Sunday night. Each opera will be sent out complete. The season will open May 28 with Victor Herbert's "Naughty Marietta".

part in both the future military and economic life of America, and which are mutually dependent one upon the other. (Continued on page 5)

WESTWARD HO—WITH AIRPHONE APPARATUS

PHILADELPHIA, PA.—Two Radio experimenters, Frederick Gannebauer, Bywood, Pa., and Howard Berliner, 2133 Spring Garden street, Philadelphia, have started in an automobile equipped with Radio with which they expect to conduct elaborate researches in various parts of the country to determine factors affecting Radio transmission. The young men have Los Angeles as their destination.

HAVE COURTS RIGHT TO REGULATE AIR?

WILLIAMS-BERGMAN CASE TO DECIDE ISSUE

Youthful "Sparks" Sued by Banker Radiophan for Alleged "Gumming Up of Atmosphere"

By E. E. Pearson

BLOOMINGTON, ILL.—Have the courts jurisdiction over the air? Can legal mandate control the boundless ether which extends from planet to planet and which has puzzled the scientists since the times of Aristotle? Will an injunction extend through the empyrean? These and other problems may be solved when the case is called in a few days in the Livingston county circuit court, the first injunction suit ever instituted to restrain a broadcaster by Radio.

The lawyers for the defense and prosecution have been busy preparing for the hearing, set for the April term of court. The eyes of the Radio world will be centered upon this unique issue. Men of national prominence from many sections of the country will assemble, including Herbert C. Hoover, secretary of commerce; Mitchell Lewis, machine gun manufacturer of New York; Hiram P. Maxim, president of the American Radio Relay League; K. B. Warner, secretary of the league, and other notables.

Banker vs. Youthful Sparks

When Cutter in his "Song of the Lightning" wrote, "Away, away, through the sightless air, stretch forth your iron thread," he had little idea to what marvels the study of electricity would lead. Yet his words were strangely prophetic when he predicted: "The journey ye make in a hundred years, I'll clear at a single bound."

Principals in this initial case, involving the right to use the air, are Edward McWilliams, president of the State Bank of Dwight, and W. Wylie Bergman, a youth of 18. McWilliams applied for and was granted a temporary injunction which restrained Bergman, an amateur Radio operator of the same city, from operating his broadcasting station, because it interfered with the receiving of Radio messages in the McWilliams mansion.

Tucked in one corner of the living room of the Bergman cottage is the Radio apparatus which has created such a turmoil. The little cubby hole that houses his instruments is packed and jammed with coils, gaps and other Radio apparatus. On the walls are tacked messages received at various times. He proudly exhibits his commission as chief of the northern Illinois district. High in the air, a distance of 150 feet, are his lofty aeriels. Day and night they receive and send the messages from and to other amateur stations from one end of the country to the other.

WORLD WAR VETERANS GIVE ETHER PROGRAM

Picked Men of 300 Broadcast from Station WNAC

BOSTON, MASS.—A special musical program by world war veterans who are students at the Boston Conservatory of Music and other musical schools and colleges throughout New England was broadcast from WNAC (Shepard Stores) station on April 10th. These veterans were selected from some 300 disabled men, veterans of the war in France, studying various branches of music for concert, orchestra or band work, under the supervision of the U. S. Veterans' Bureau, and the program was remarkable, both for its variety and high quality.

LICENSE NEW PLANTS

(Continued from page 1)

guard unit, a Radio Club and three electrical and Radio concerns.

The sixteen new stations and the wave lengths which they will use are:

KFGM, Abilene Daily Reporter, Abilene, Tex., 233 meters; KFHF, Central Christian Church, Shreveport, La., 266 meters; KFGP, Cheney Radio Co., Cheney, Kans., 229 meters; KFHI, Chas. V. Dixon, Wichita, Kans., 224 meters; KFGV, Heidebreder Radio Supply Co., Utica, Nebr., 224 meters; KFGC, Louisiana State Univ., Baton Rouge, La., 254 meters; KFFX, The McGraw Co., Omaha, Nebr., 278 meters; KFGJ, Mo. National Guard, 138th Infantry, St. Louis, Mo., 266 meters; KFHC, Univ. of Okla., Norman, Okla., 254 meters; KFHD, Utz Electric Co., St. Joseph, Mo., 226 meters; KFFZ, Al. G. Barnes Amusement Co., Dallas, Tex., 226 meters; KFGD, Chickasha Radio & Elec. Co., Chickasha, Okla., 248 meters; WABA, Lake Forest College, Lake Forest, Ill., 266 meters; WABB, Dr. J. B. Lawrence, Harrisburg, Pa., 266 meters; KFFY, Pincus & Murphy, Inc., Alexandria, La., 275 meters; WRAF, Radio Club Inc., Laporte, Ind., 224 meters.

A young lady of Mobile, Ala., took an examination for a first-class amateur license and passed with 91 per cent.

AN EVENING AT HOME WITH THE LISTENER IN (SEE NOTE BELOW FOR INSTRUCTIONS)

Station and City	Met.	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
CFCB, Toronto, Ont.	400	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	6:45-7:45
CFCN, Calgary, Alta.	440			11:30-12:30			11:30-12:30	
CKAC, Montreal, Que.	430		6:00-10:30		6:00-10:30		6:00-10:30	3:00-5:00
KDKA, E. Pittsburgh, Pa.	360	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	5:00-9:00	1:45-3:45
KFAF, Denver, Colo.	360	9:00-10:00	9:00-10:00				9:00-10:00	
KFDB, San Francisco, Calif.	400	10:00-12:00		10:00-12:00		10:00-12:00		9:00-9:30
KFI, Los Angeles, Calif.	400	7:00-1:00	7:00-1:00	7:00-1:00	7:00-1:00	7:00-1:00	7:00-1:00	10:00-1:00
KGW, Portland, Ore.	400	10:00-2:00		10:00-11:00		9:00-2:00		9:00-10:00
KHJ, Los Angeles, Calif.	400	8:45-11:30	8:45-11:30	8:45-11:30	8:45-11:30	8:45-11:30	8:45-11:30	12:00-1:00
KPO, San Francisco, Calif.	400		10:00-12:00		10:00-12:00		10:00-12:00	
KSD, St. Louis, Mo.	400	8:00-12:30	8:00-10:00	8:00-10:00		8:00-11:30	8:00-10:00	
KYW, Chicago, Ill.	427	8:00-9:30	8:00-9:30	8:00-9:30	8:00-9:30	11:30-1:00	8:00-9:30	7:00-8:00
NAA, Radio, Va.	710	5:45-7:30	6:05-7:20	6:25-8:40	6:45-7:40	7:00-8:40		
PWX, Havana, Cuba.	400			8:00-10:30			8:00-10:30	
WBAP, Fort Worth, Texas.	400	7:15-10:30	7:15-10:30	7:15-10:30	7:15-10:30	7:15-10:30	7:15-10:30	6:30-6:45
WBZ, Springfield, Mass.	422	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	6:30-8:00	7:00-8:00
WCK, Detroit, Mich.	400	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00		4:00-5:00
WDAF, Kansas City, Mo.	400	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	6:00-1:00	11:45-1:00
WDAJ, College Park, Ga.	360	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30	7:30-11:30
WDAF, Chicago, Ill.	360		10:00-2:00		10:00-2:00		10:00-2:00	9:00-12:00
WEAF, New York, N. Y.	400	6:30-9:00	6:30-7:00	6:30-9:00	6:30-9:00	6:30-7:00	6:30-9:00	
WFAA, Dallas, Tex.	400	8:30-9:30	8:30-12:00	8:30-9:30	8:30-9:30	8:30-12:00	8:30-12:00	9:30-10:30
WFI, Philadelphia, Pa.	400	5:30-6:00	5:30-6:00	7:00-9:30	5:30-6:00	7:30-9:30	8:00-11:00	
WGL, Medford, Mass.	360		7:30-9:00	5:45-7:30	8:30-10:00	8:30-10:00	7:30-9:00	8:30-10:00
WGM, Atlanta, Ga.	400	9:30-10:30	9:30-10:30	9:30-10:30	9:30-10:30	9:30-10:30	9:30-10:30	7:30-8:00
WGR, Buffalo, N. Y.	400	7:00-9:00		7:00-9:00		7:00-9:00		
WGY, Schenectady, N. Y.	370	6:45-9:00	6:45-9:00		6:45-9:00	6:45-11:00		6:30-7:30
WHA, Madison, Wis.	400	7:00-9:00	7:00-8:00	7:00-8:00	7:00-9:00	7:00-8:00	7:00-8:00	
WHAS, Louisville, Ky.	360		7:30-9:00	7:30-9:00	7:30-9:00	7:30-9:00		
WHAZ, Troy, N. Y.	400	7:15-8:30						
WHB, Kansas City, Mo.	400		8:00-10:00		8:00-10:00			8:00-10:00
WHK, Cleveland, O.	360	5:00-5:30	5:00-5:30	7:00-8:45	5:00-5:30	5:00-5:30	5:00-5:30	7:00-8:45
WIP, Philadelphia, Pa.	400	6:00-6:30	6:00-11:00	6:00-6:30	6:00-6:30	6:00-8:55	9:10-11:00	
WJAX, Cleveland, O.	360		6:00-7:30		7:15-9:30			
WJZ, Newark, N. J.	360	7:30-9:30	6:00-9:30	8:00-9:30	7:30-9:30	7:30-9:30	7:30-10:00	7:30-9:00
WKAQ, San Juan, P. R.	360				7:30-9:30		7:30-9:30	
WLAG, Minneapolis, Minn.	400	10:10-11:30	6:00-7:30	6:00-7:30	9:15-10:30	6:00-7:30	8:30-10:30	
WLW, Cincinnati, O.	360	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00			
WMAQ, Chicago, Ill.	400		7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	7:00-10:00	
WMC, Memphis, Tenn.	400	8:00-9:30	8:00-9:30		8:00-9:30	8:00-9:30	8:00-9:30	
WOAI, San Antonio, Texas.	400		9:30-10:30		7:30-9:30	7:00-8:30	9:30-10:30	7:00-9:00
WOC, Davenport, Ia.	400	7:00-8:30		10:00-11:00	7:00-8:30	7:00-8:30		
WOO, Philadelphia, Pa.	400	6:50-11:00		6:50-9:10				
WOR, Newark, N. J.	400	5:15-6:30	7:00-10:00	5:15-6:30	5:15-6:30	7:00-10:00	5:15-6:30	7:30-9:00
WSB, Atlanta, Ga.	400	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	10:45-12:00	
WSY, Birmingham, Ala.	360	8:00-8:45		8:00-8:45		8:00-8:45		7:30-8:30
WWJ, Detroit, Mich.	400		6:00-9:00	6:00-9:00	6:00-9:00	6:00-9:00		6:30-7:30

(Instructions for Use.—All the hours above are given in Central Standard Time. If your city uses Eastern Time, add one hour to each of the periods stated; if your city uses Mountain Time, subtract one hour; if your city uses Pacific time, subtract two hours. If in addition your city is using Daylight Saving time, add one hour to this result.)

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Looking Ahead

Now It's Spring—Moving and House Cleaning Are Over—and the weather is so nice that it would be a fine time to get up on the roof and repair or rebuild that antenna for the coming summer months. And in accordance with this suggestion, Thomas W. Benson, in his beginners' series next issue, will devote Chapter III to "Pointers About Aerials and Grounds." Let's fix up the storm-beaten old copper wires for many merry moments during the cool of the summer evenings.

Mr. Benson's Loud Speaker Construction Article, by the way, stirred up so much interest and brought his so many letters that he has promised to furnish soon an article for the Digest which will be a consensus of the data and information requested by the zealous homemade loud speaker constructors.

Flewelling Next Issue will tell Radiophans more about the making at home of a first-class one condenser flivver super. He's really anxious to help the many misguided Flewellingphans who can't get theirs to work properly, so read his detailed series now appearing in the Digest.

May 15 Is the Date for Many Wave Length Changes—That's why you should have the Digest's weekly three-part Broadcasting Station Directory (Page 8) to help you with the latest information on station wave lengths, schedules, calls, owners, time bands, etc. "An Evening at Home with the Listener In" is a feature that helps, too. Next issue this will contain a complete revision of wave length data.

H. J. Marx and His Reflex De Luxe, will be with us again May 19. He will tell you how the wiring should be done. He also promises—not next issue but soon—some honest-to-goodness data on the Hazeltine Neutrodyne receiving circuits. And another article he is planning is one which will tell how to build loading coils for Reinartz receivers, so that their wave length range will be increased.

Newsstands Don't Always Have One Left

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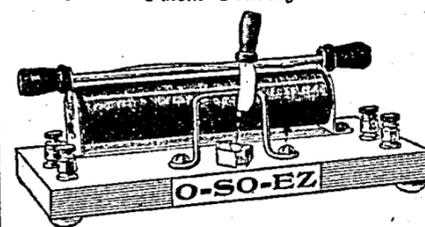
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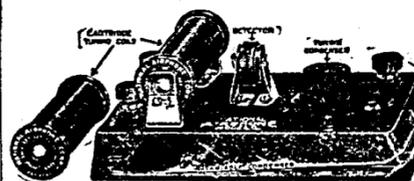


Actual Size

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NEW CODE SYSTEM DEvised BY SQUIER

SPEEDS UP TRANSMISSION NEARLY THREE TIMES

First Presentation of New Alphabet Given Before National Academy of Science

By Carl H. Butman

WASHINGTON.—A new telegraph alphabet for use in Radio, telegraph and cable in all languages has just been given to the world by Maj. Gen. George O. Squier, Chief Signal Officer of the Army and one of America's most prolific electrical communication inventors. With his new code system a speed 2.65 times the present transmitting rate can be achieved, and it is easier to tune to.

The first presentation of this new universal code was made recently by the General in a speech before the National Academy of Sciences in Washington. It now appears that the code used for almost 80 years will be superseded throughout the world, with a gain of over 150% in speed.

Variations to Perfect New Code

Briefly, General Squier proposes to vary the amplification or intensity of each half cycle of alternating current to send a dot, space or dash, each of which requires the same time of transmission. The signals are distinguished in receiving by the three different amplitudes, one each for the dot, dash and space. Six permutations are possible with the three intensities; one arrangement being to represent the dot with a certain intensity, the dash with a larger one and the space with a smaller amplification. The method tried successfully by General Squier in the Signal Corps laboratories was with the dash the largest, the dot intermediate and the space the smallest. Other methods will be tried, however, and a better arrangement may be found.

The system has been studied by Radio experts of the Army and Navy, who, it is reported, find no bugs in it; on the contrary, they see added efficiency, and decreased interference. It is the plan of the inventor to submit the system to the next International Technical Conference on Telegraphy with a suggestion for unification of all codes, Radio, wires and cable, using the same system of modulation for the signals.

Has Many Advantages Over Morse

The present telegraph alphabet was invented by Professor Morse in 1844, before the telephone, alternating arc or Radio transmission, and yet, with advances in nearly every other phase of communication, we have continued to use the same alphabet, which, it was pointed out by General Squier, does not fit. It was for this reason that General Squier "re-designed" the 80-year old alphabet for 1923 use. In the old alphabet the dots, dashes and spaces required different time for transmission, whereas the new plan provides for sending each in the same space of time. In his system in alternating current, no consecutive signals are of the same sign, but different amplitudes. In Morse such letters as S and H, required three or four signals of the same sign and were not as legible as the signs for the letters A and N, where no two signs were alike, they being composed of dots and dashes. The several letters of the old alphabet did not have the same legibility and the whole alphabet was slowed down by the "slow" letters to their speed. This defect has cost the world hundreds of thousands of dollars in transmitting costs, it is estimated.

Result of Eight Years' Work

General Squier's alphabet is the result of nearly eight years of research and experimentation, begun in 1915 in connection with devising a new cable alphabet. Its present application today to all three kinds of code work will make it no longer necessary to learn three code systems.

CFCN CONDUCTS DAY-TIME RECEIVING TEST

CALGARY, ALTA.—Tests for the information of the Canadian government are at the present time being conducted by CFCN, The W. W. Grant Radio, Ltd., broadcasting station at Calgary, under special instructions from Ottawa. CFCN is carrying out special daylight transmission tests in order to ascertain how broadcasts are received in the daytime in the provinces of Alberta, Manitoba, Saskatchewan and British Columbia.

BAN STOCK TIPS AND FIRM ADVERTISEMENT

NEW YORK.—Use of the Radio to broadcast market information or forecasts of business by its members is prohibited by the terms of a resolution adopted this week by the governing committee of the New York stock exchange. The resolution prohibits also broadcasting by Radio of any matter intended to advertise firms of members or to stimulate interest in particular securities on the stock market.

CFCN USES DIRECT WIRE FROM PLAZA

REMOTE CONTROL PROVES TO BE SUCCESSFUL

Broadcast of Imperial Orchestra, Mile and Half Away, Brings Many Congratulatory Wires

By Jeffrey J. Dingman

CALGARY, ALTA.—Remote control and a telephone cable line one mile and a half in length is now being used by CFCN, The W. W. Grant Radio, Ltd., at Calgary, to broadcast music from a downtown dance orchestra. This is the first time this device has been used in Radiophone broadcasting in Canada.

The first test was staged on the night of Saturday, April 14, from 10:30 o'clock to 11:30 o'clock, Mountain Standard Time, the regular broadcast hours for CFCN.

It proved entirely successful and hundreds of telegrams and letters were received, complimenting both Mr. Grant and the splendid orchestra.

Music Magnified 90 Times

Station CFCN, situated on Crescent Heights, one of Calgary's outlying districts which is on a considerably higher level than the city proper, was connected with the Imperial Orchestra at the Plaza Cabaret, in the business section of the city. A pair of cables was used, and they had a capacity and resistance equivalent to an ordinary open air telephone line thirty miles in length, in point of difficulties which it was found necessary to overcome. Music and speech was magnified ninety times regular strength by use of a special voice frequency amplifier designed by W. W. Grant, who also designed and manufactured the special pick-up equipment which was installed at the Plaza.

Plaza Dancers Pleased

The crowd of dancers and pleasure seekers who crowded the floor of the Plaza were immensely pleased by the novelty. However, surprised as they were when they entered the cabaret to find a Radiophone broadcaster installed, they were more surprised later when they learned that all sounds in the room could be heard all over the country. Clapping, applause, calls for encores, laughter and light talk, all could be distinctly heard by the multitudinous invisible audience, as was testified by telegrams received.

Both local and out-of-town Radiophans who listened in told CFCN that the orchestra reproduction was the best they had ever heard. This innovation, following close on many features recently staged by CFCN, has created considerable talk in local Radio circles.

Fans Wire Appreciation

Here are a few of the hundreds of telegrams which started pouring in one hour after the broadcast had ceased:

- "Concert coming in fine many thanks." Noel Kerr, Wenatchee, Wash.
- "Congratulations successful transmission tonight enjoying numbers broadcast." J. C. Ruff, Wallula, Wash.
- "Initial program remote control being received here perfectly a fine orchestra congratulations please acknowledge by Radio tonight." Frank A. Moore, Walla Walla, Wash.
- "Your concert coming in fine good stuff." A. J. Peters and W. J. Easson, Victoria, B. C.
- "Tests tonight coming in wonderfully loud and clear." A. F. Dickenson, Wenatchee, Wash.
- "Concert coming in splendidly." Vernal Salthers, Helena, Mont.

Similar programs from the Plaza's Imperial Orchestra have been arranged for in the near future, Mr. Grant has announced.

Almhouse to Have Set

BIRMINGHAM, ALA.—Radio may be a luxury enjoyed chiefly by the well-to-do but inmates of the Calhoun county almhouse, near Jacksonville, Ala., are going to hear concerts just like anybody else. The set was installed at the expense of the keeper, W. H. Nunnally.

SCREEN STAR HEARS OPERA



Above is Florence Vidor, star of the screen, listening in to a concert by the Chicago Opera Company, the music being radiated through the Cuban Telephone Company's Station PWX. Like many of the movie folks, Florence and her husband, King Vidor, the noted director, are ardent Radiophans © Photonevus

Fire Chief Broadcasts After Putting Out Blaze

Chief Goetz Tells WOAI Listeners About Spontaneous Combustion

SAN ANTONIO, TEX.—A touch of realism, not appreciated by Radiophans, was given to the address recently over Station WOAI, by Fire Chief A. J. Goetz of the San Antonio Fire Department, when Chief Goetz broadcast the fifth of a series of short talks on fire prevention.

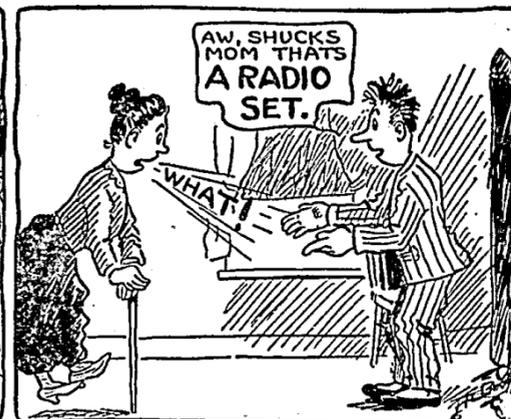
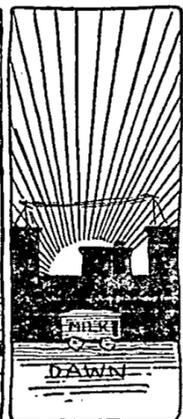
Appearing in his "fire-fighting togs," Chief Goetz stepped from his red racing automobile, used in answering all alarms, into the broadcasting studio, and took his place before the microphone. The chief had just returned from directing the work of the city's fire fighters as they battled the blaze and the elements in conquering a stubborn blaze at a warehouse.

The topic of the address was timely. Chief Goetz took as his subject "Spontaneous Combustion," and the fire from which he had just returned is thought to have been caused by spontaneous combustion in the warehouse filled with hay and grain.

THE ANTENNA BROTHERS

Spir L. and Lew P.

Try This on Your Cane



NEW YORK TO HAVE DUAL STATION SOON

MAY 15TH DATE SET FOR OPENING OF WJY-WJZ

Aeolian Hall Plant of R. C. A. to Give Double Program on 405 and 455 Meters

NEW YORK.—Broadcast Central, the new station of the Radio Corporation of America which has been the subject of considerable speculation among Radio listeners who have heard the station testing, will be opened May 15 at Aeolian Hall with call 2XR.

Located in the heart of the city's musical and theatrical district, where entertainment of the highest order is ever available, this station will offer the American public most elaborate programs with a very high degree of faithfulness in reproduction. The wires, high on Aeolian Hall, which tower 400 feet above the Fifth avenue and 42nd street, provide two distinct antennae. The new super-station will transmit two broadcast programs simultaneously, on different wave lengths.

WJY and WJZ New Calls
The closing of Station WJZ at Newark, N. J., now operated jointly by the R. C. A. and the Westinghouse Company, will coincide with the opening of Broadcast Central. The well-known call WJZ will be retained for transmission from the Aeolian Hall station on 455 meters, while the call WJY will be used for the other wave length of 405 meters, both of which have recently been allocated to the new station.

The new station is fitted with a double antenna and two independent transmitters which will permit a dual program to be broadcast. One program can be a classical or serious entertainment; the other, popular airs, dance music and lectures.

Divide Radiophans into Two Classes
A thorough analysis has been made of the types of programs best suited to the requirements of the public and this study has revealed the fact that generally, the Radio public may be divided into two classes, those who prefer classical or similar entertainment and those desiring dance music and popular airs.

Not only will transmission be carried on from the two studios which are a part of the station, but the main recital hall of Aeolian Hall has been connected to a switchboard in the station, thus providing another source of the finest music obtainable.

RECEIVING RECORDS? SEND 'EM IN—

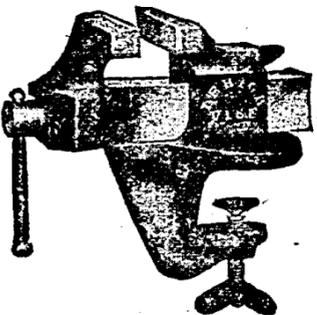
By the Contest Editor

WHAT do you think of these DX records? None of them under 1,200 miles! If you are able to pick up stations at distances approximating these, you can be sure you have a worthwhile set. H. S. Olding, of New Glasgow, N. S., is back again this week with five new records to his credit. The longest record this week, however, is sent in by M. H. Hall, of Boston, Mass., who listens in regularly to Hawaii. Watch for the contest rules next week.

Below are the record holders for this week:

- Station Heard—Miles Away—Who Heard**
CJCN—1000, Nestor Barrett, Republic, Wash.
KDPT—2600, R. G. Williams, Springfield, Mass.
KZDK—2050, C. E. Carber, Pittsburgh, Pa.
KMI—1550, H. E. Clark, Monmouth, Ill.
KQI—1650, H. E. Clark, Monmouth, Ill.
KTV—1600, H. E. Clark, Monmouth, Ill.
KYQ—5100, M. H. Hall, Boston, Mass.
WBAU—1200, H. S. Olding, New Glasgow, N. S.
WCAZ—1450, H. S. Olding, New Glasgow, N. S.
WDAX—1500, H. S. Olding, New Glasgow, N. S.
WFAA—2000, H. S. Olding, New Glasgow, N. S.
WMAV—1500, H. S. Olding, New Glasgow, N. S.

RADIO VISE



No. 1008

\$2.00

Weight 4 Lbs.

2 in. Jaw

The Handiest Tool for Building Your Own Set From Your Dealer or Send \$2.00

\$2.00 (\$2.25 west of Mississippi) and We Will Send One Postpaid

*Bonney Forge & Tool Works
Gilgiman & Meadow Sts.
Allentown, Pa.*

Dietzen SUPER-FONES



TYPE G
3000 Ohms
\$3.95
Postpaid

\$7.50 List Price—Highest quality instrument using best grade of materials. Made to bring in long distance. Can be used as a loud speaker unit. Dietzen fones receive clear, loud signals.

FREE A. B. C. of RADIO—a 62-page book written in clear, simple English, by a nationally known Radio expert. Explains the underlying principles of wireless telephony, with diagrams, drawings and glossary. A. B. C. of Radio FREE.

Send check or money order for \$3.95 TODAY for this wonderful Dietzen super-fono. Satisfaction guaranteed or money refunded.

Standard parts only in original packing. Sold on a "money-back" basis.

- DURATEK Permanent Crystal Detector.....\$ 2.00
- W.D.-11 Adapter65
- 2-inch Bakelite Dials..... .25
- 3-inch Bakelite Dials..... .35
- \$1.00 Bakelite Socket50
- 5.00 W. D. 12 Audio Frequency transformer..... 3.75
- 3.00 Owl Radio Frequency transformer..... 1.50
- 5.50 Coto Coil Radio Frequency transformer..... 3.45
- 3.00 Sleeper Radio Frequency transformer..... 1.95
- 5.00 Acme Audio and Radio transformer..... 3.45
- 8.00 Dayton Variometer..... 5.45
- 8.00 Dayton Variable Coupler..... 5.45
- 5.50 Marlock variable condenser, 23-plate..... 2.95
- 6.50 Murlock variable condenser, 43-plate..... 3.25
- 132.00 Radiola R. C. set..... 79.50
- 5.00 Multi-Radiosco..... 1.50
- Little Gem set..... 6.50
- 50.00 Turney single tube set..... 18.50

Money Order or Personal Check Accepted

Modell's
ESTABLISHED 1897

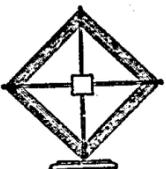
RADIO STORES
Dept. F. 11, 191 Fulton St., N.Y.C.

R. H. G. Mathews Speaks on So Called "Standard" Parts

COLUMBUS, OHIO.—"Don't buy any 'standard' Radio parts on the market, unless you know something about them," was the message of R. H. G. Mathews, central division manager of the American Radio Relay League and representative of the Chicago Radio Laboratory, in an address delivered at the Second Annual Amateur Radio Convention held in Columbus recently.

Explaining in detail tests made of "standard" Radio equipment, he asserted much of the higher priced receiving equipment, while of excellent mechanical construction, is very low in electrical efficiency. This condition is the result of many electrical manufacturers entering the Radio field without first obtaining a thorough knowledge of underlying fundamentals, and not in any intent to defraud, Mathews indicated.

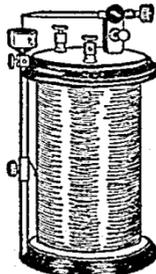
Ritter Loop Aerial \$1



A knock-down aerial. All parts perfect and made to fit properly. Results guaranteed. Can be assembled in 10 minutes. Loop aerials of this kind never sold for less than \$5. We manufacture and sell right from our factory.

Ritter Grand \$2.50

Crystal Set



The best set for beginners or others desiring a real good set for little money. Tunes up to 600 meters; can receive up to 50 miles radius under normal conditions. Has received 100% ratings from technical depts. of many publications. Call and see the crystal set and loop aerial working. Mail orders filled.

RITTER RADIO CORP.

230 Canal Street
New York City

DEALERS WRITE FOR DETAILS

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ALL PARTS NECESSARY DEALERS: ATTRACTIVE DISCOUNTS

HUDSON-ROSS
123 W. Madison St. Chicago

Good Bye Aerials!

So Long Static



(Pat. Pending)

Replaces aerials, loops, electric light plugs, etc. Eliminates lightning dangers. Reduces STATIC interference and distortion. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

Postpaid, Anywhere, for \$5.00

Satisfaction Guaranteed, or Money Refunded.

Short Cut Radio Corp.

243 West 54th St. New York
"Dept. R. D."

Makes Your Set Portable.
Size only 6 3/4 by 2 3/4.

Dealers write for our proposition

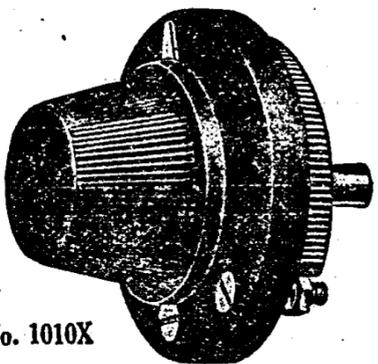
GREWOL—

Use the Grewol enclosed Crystal Detector for the Reflex Circuit. Dust-proof and fixed.

WERNES & PATCH

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AEROVOX



No. 1010X

30 Ohm Rheostat

Excellent results assured with use on New Type tubes.

UV199A UV201A

Using small filament current

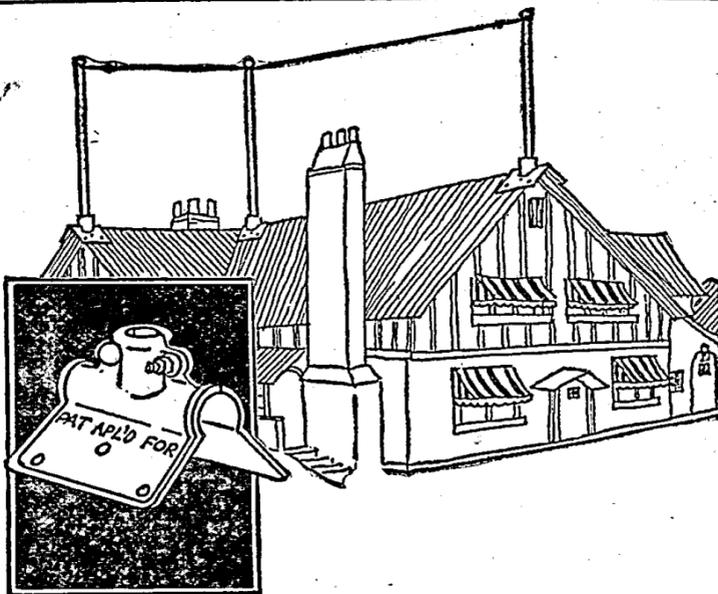
6 ohm\$0.75
20 ohm 1.00
30 ohm 1.10

At your dealers. Otherwise sent postpaid on receipt of purchase price

Write for catalog illustrating and describing our entire line of quality apparatus.

Territory Open for Jobbers

AEROVOX WIRELESS CORP.
228 W. 17th ST. NEW YORK



THE BULL DOG MAST SEAT

Fills a Long Felt Want

If you are detracting from the appearance of your home by using an unsightly mast (a 2x4 or crooked pole), install in its place the only Aerial Mast Seat on the market today. A solid and substantial base for your Mast, eliminating sagging and swaying, affording permanency and security. Greater range and more satisfactory results from your receiving set.

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STRONGLY CONSTRUCTED
QUICKLY AND EASILY INSTALLED
GRIPS YOUR MAST LIKE A VICE

Adjustable to any pitch of roof, either peaked or metal ridge roll type.

Seat for 1 inch Mast.....\$2.00 each
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If your dealer cannot supply you, clip coupon and mail with your remittance to

MAST SEAT MANUFACTURING CO.

119-D 5th Street S. E., MINNEAPOLIS, MINNESOTA

Jobbers and Distributors Write for Discount

MAST SEAT MFG. COMPANY, 119 Fifth St. S. E., Minneapolis, Minnesota RD-5-12-23

Gentlemen: Enclosed is \$..... Send me Mast Seats to cover remittance.

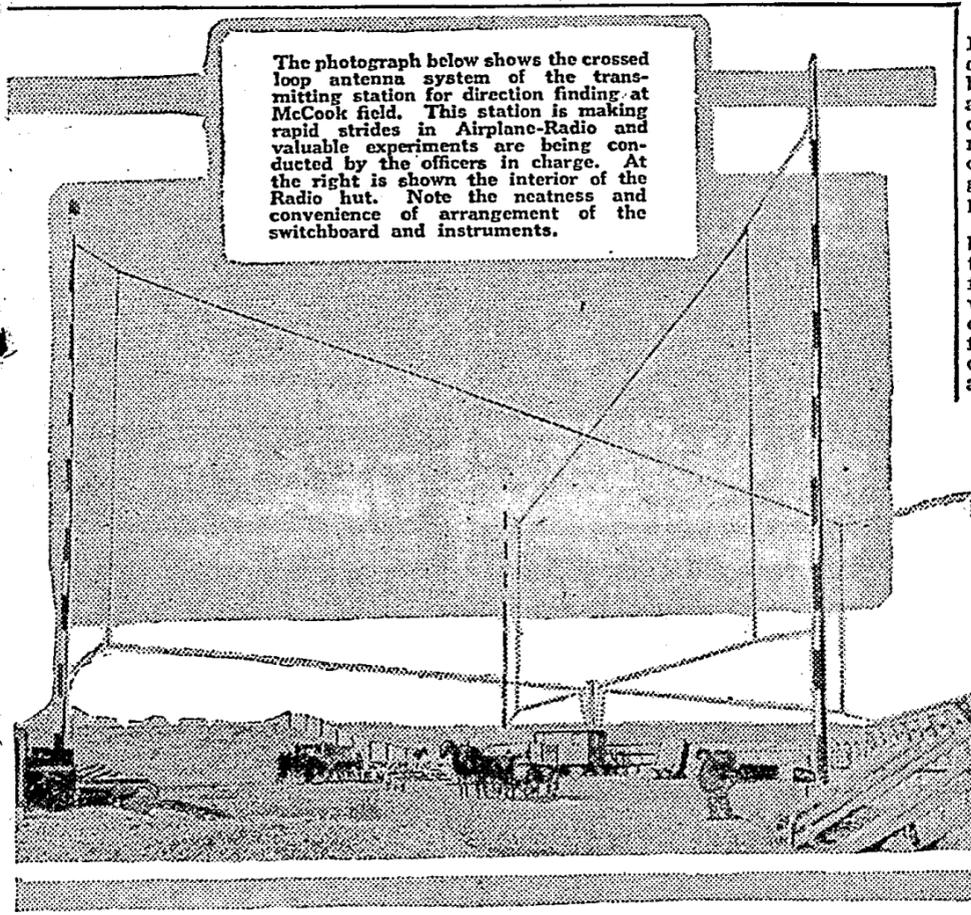
Name.....

Address.....

City.....

Check, Money Order or Bank Draft

RADIO LINKS U. S. AIR SERVICE



The photograph below shows the crossed loop antenna system of the transmitting station for direction finding at McCook field. This station is making rapid strides in Airplane-Radio and valuable experiments are being conducted by the officers in charge. At the right is shown the interior of the Radio hut. Note the neatness and convenience of arrangement of the switchboard and instruments.

(Continued from page 5)

It is obvious that Radio furnishes the only successful means of communication between the ground and airplanes in flight and by the same token, as aviation develops, both as a military arm and as a commercial agency for transportation, intercommunication between airplanes and ground will become one of the most important functions of Radio.

The value of Radio communication has been to aircraft in the past and its potential value in the future is realized but by few people. In all aviation activities in war and most of the flying in peace, aircraft have some definite mission to perform with reference to certain individuals or organizations on the ground. In war, all airplanes are equipped with Radio ap-

paratus, either telegraph or telephone, for intercommunication with the ground and other planes in the air. In peace time military and in commercial flying, Radio performs two functions: one, in intercommunication between plane and ground, and the other in intercommunication between ground stations and control points. Organized schedules for flying cross-country are still in the first phases of their infancy, yet in the short length of time that has elapsed since the signing of the armistice, much progress has been made. The establishment and operation of an aerial mail route by the Post Office Department from New York to San Francisco, and the success that has been attained in its operation, is well known. In this operation, Radio stations have been established at all landing fields and control stops and are used in the despatch of planes flying along the route, and in the dissemination of meteorological data on conditions along the route.

communication between planes in the air and ground and planes, but utilizing Radio frequency impulses it is being made use of in problems of aerial navigation, and already direction finding apparatus for aircraft has passed its first stages of development.

Pilots to Get Direction

The directional properties for both transmission and reception of coils and loops is well known and it is apparent that any direction finding system will be based on a proper utilization of these properties. In their application, two possible systems can be used. One is directional transmission on the ground and non-directional reception by means of a trailing wire antenna in the air, and the second is by means of non-directional transmis-

ETHER STATIONS TO USE NO PAY SONGS

BROADCASTERS UNITE IN NATIONAL ASSOCIATION

Hold Meeting at Chicago—Composer's Society Gets Little Satisfaction—May 14 Next Meeting

CHICAGO.—At the recent meeting held at the Drake Hotel, in which twenty of the larger broadcasting stations were represented, a national organization was formulated to be known as the National Association of Broadcasters. The aims and purposes of this organization are: To encourage and aid the development of musical and literary genius, to support every movement to advance the art of Radio broadcasting and to encourage the enactment of laws and legislation designed to meet this purpose, and to protect its members from unjust and unfair demands by anyone.

In order to put the newly formed organization on a firm footing a subscription of over ten thousand dollars was raised at one meeting. This amount is a nest egg toward a fund that is expected to reach the fifty thousand mark. All members have been called on to underwrite their stations with the amount considered to be the just share of preliminary expenses of organizing the Association, and starting the service of issuing music and song compositions to the members free of charge. It is also proposed by the broadcasters to establish dues on a sliding scale.

To Have Censorship Board

It is the plan of this association to establish a board of censorship in New York to which all musical compositions to be broadcast will be submitted. If the compositions pass this board, they will in turn be given to the individual stations to be put on the programs for the benefit of their listeners. In this manner it is anticipated to keep the standard of such numbers high and offer each member the service of unrestricted numbers free from an excessive tax or license.

Another development that is looked to by the association is the question of paid talent. At the present it has been a rarity to have paid performers on any broadcast program, but if any time in the future the tables should turn the members intend to be organized so as to meet reasonable claims.

Publishers Do Not Fare Well

Representatives of the American Society of Authors, Composers and Music Publishers met with small success when they appeared before the meeting to re-state their demands of royalties on copyrighted compositions. These men were allowed to present their case and then were dismissed with the statement they "were not needed further." At this time the meeting went into closed session at which only direct representatives from broadcasting stations were admitted.

At this session resolutions were passed as follows:

"The members of the association are determined to arrange the operation of their broadcasting so that the officers of a corporation, perhaps located many miles distant from their station, may rest easily in the knowledge that no music will or could be broadcast from their station which could involve them in any legal controversy.

Problem of Self Support

"The members believe that the one unsolvable problem confronting broadcasters has been the question of making broadcasting financially self-supporting. No plan has heretofore been developed which seemed feasible. The committee having charge of this phase of the Association's activities, believes and hereby goes on record as believing that this Association possesses within itself the power to collect very substantial sums of money, which sums should ultimately equal or at least nearly equal the cost of major broadcasting. Make no mistake about what here is being said. Put in other words, the committee believes that a membership in this Association will eventually be a great financial asset."

It was also developed that the American Society of Authors, Composers and Music Publishers controlled a comparatively small amount of the music published in America. The Producing Managers Association has already taken the stand that the society cannot control the songs of their productions and any license they would issue could not carry with it the right to broadcast the songs incorporated in their shows. This serves to cut down the entire list of compositions controlled by the society to about thirty per cent of the total. Of this balance, it was stated, the ones sung in the Broadway productions would be considered far superior, so the remaining few more popular songs are very small in number.

Does Broadcast Popularize Songs?

The question of popularizing the song was raised and met with the statement concerning a certain song that has been discarded from public sales for the past six months. This song was recently used by two powerful stations on several nights and the following week the investigated sales reached forty-five hundred copies. This was after the song had been long considered dead.

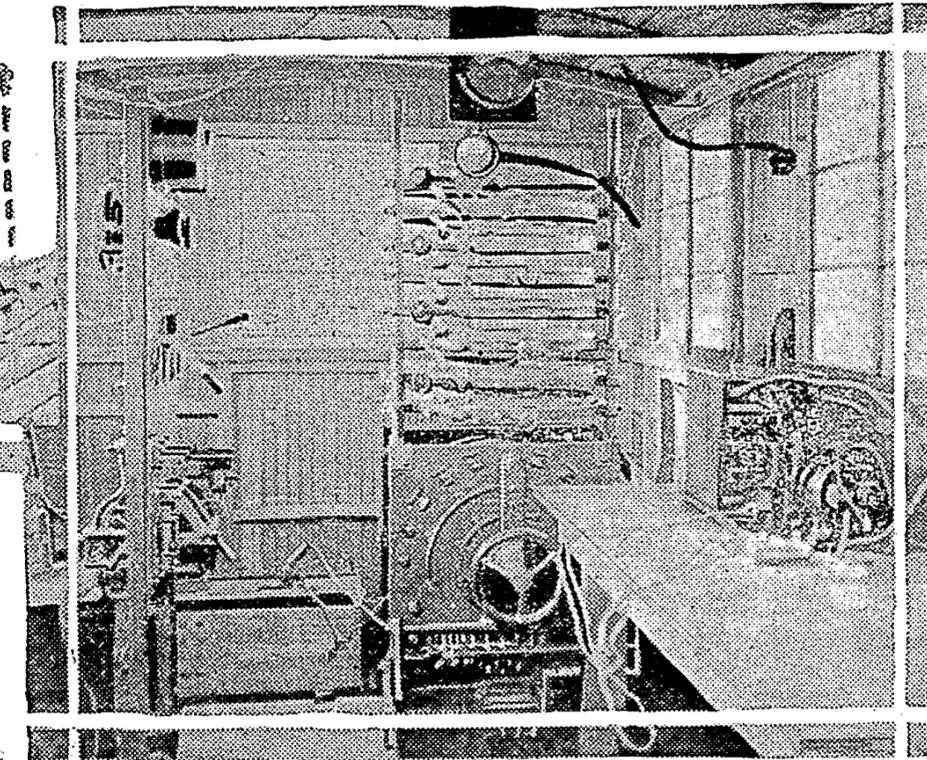
In an interview concerning the recent meeting one prominent broadcaster said:

"We have been told by the representatives of the American Society of Composers, Authors and Publishers that if we wish to test the legality of their claims they will be pleased to accommodate us."

Rather than wage an expensive court battle our station has decided to refrain from broadcasting any of the selections the copyright of which is controlled by the society. Through the newly formed association we will be able to obtain selections that are the equal of any the society may control and will broadcast them instead."

To Vote on Officers

The Association of Broadcasters has called their next meeting for May 14, 1923 to be held at the Drake Hotel, Chicago. At this meeting the officers who were placed in nomination will be acted upon. The officers appointed at the recent meeting, whose names will be placed before the assembly for vote, are:



paratus, either telegraph or telephone, for intercommunication with the ground and other planes in the air. In peace time military and in commercial flying, Radio performs two functions: one, in intercommunication between plane and ground, and the other in intercommunication between ground stations and control points. Organized schedules for flying cross-country are still in the first phases of their infancy, yet in the short length of time that has elapsed since the signing of the armistice, much progress has been made. The establishment and operation of an aerial mail route by the Post Office Department from New York to San Francisco, and the success that has been attained in its operation, is well known. In this operation, Radio stations have been established at all landing fields and control stops and are used in the despatch of planes flying along the route, and in the dissemination of meteorological data on conditions along the route.

Army Has "Model Airway"

In addition to this route the Army now has in operation and has had for several months a so-called "Model Airway" along which planes fly on definite schedules. This airway extends north from Washington to Mitchel Field, Long Island; south to Langley Field, Virginia, and west through Cumberland, Maryland; Moundsville, West Virginia; Dayton, Ohio, to Detroit and Chanute Field at Rantoul, Illinois. Airplanes are sent out from all of these stations at regular intervals, and one or more planes are flying along each leg of the airway each day. The intercommunication between ground and planes at this time is limited, but intercommunication between landing fields and control stations along the route is completely established and planes are despatched and meteorological data sent out from these stations by means of Radio with a promptness and regularity such as is found in a well organized railroad system.

Certain of the planes are now equipped with Radio apparatus for intercommunication with ground stations and it is planned in the near future to so equip all planes.

The ultimate value that Radio can render aviation is tremendously great. Not only will it serve its purpose in inter-

communication with the ground and other planes in the air. In peace time military and in commercial flying, Radio performs two functions: one, in intercommunication between plane and ground, and the other in intercommunication between ground stations and control points. Organized schedules for flying cross-country are still in the first phases of their infancy, yet in the short length of time that has elapsed since the signing of the armistice, much progress has been made. The establishment and operation of an aerial mail route by the Post Office Department from New York to San Francisco, and the success that has been attained in its operation, is well known. In this operation, Radio stations have been established at all landing fields and control stops and are used in the despatch of planes flying along the route, and in the dissemination of meteorological data on conditions along the route.

direction from an antenna on the ground and directional reception by means of coils on the planes. Both of these systems are based on the same principle, wherein pilots will receive the impulses in the air and determine their location or their direction of flight therefrom. For example, in non-directional transmission, a system of beacons at principal cities throughout the country can be established which will send out signals with their own peculiar tone qualities and wave lengths. These signals are received by either stationary or movable loops on the airplanes and, by means of maximum and minimum points, the direction from which they are transmitted can be established. Having received signals from two or more stations, the airplane then determines its own location by plotting their directions. This system can be made general and can be utilized by a number of airplanes in flight. It requires the presence of personnel in the plane other than the pilot however, and for military purposes is limited in its application. In the system of directional transmission two loops are erected at an angle to each other varying from 90 to 180 degrees and are used as the transmitting antenna for the ground station.

Throw Over Switches Used

Mechanical throw-over switches are provided at the station which permit the transmission from first one loop and then the other. Loop antennae transmit most effectively in the direction of their own plane and least efficiently in a direction perpendicular to their plane. Consequently, in a system of alternate transmission from two loops the line which bisects the angle between them is the line upon which the intensity of signal sent from both planes is equal. In the employment of this system the bisecting line is pointed in the direction of the proposed flight and the plane flies along this line, endeavoring always to keep itself in such a position that this equal signal intensity is maintained. With the knowledge that this condition will obtain if he flies accurately, when one or the other of the signals becomes appreciably stronger than the other, the pilot knows that he has deviated from his line of flight and makes such corrections as will bring him back thereon. This system works equally well in flying either away from or toward the transmitter and furnishes a desirable means of direction finding for planes flying along a definite route.

Another system, and one which is used by commercial planes flying across the English channel between England and France, is one in which by means of directional reception on the ground at a number of stations, of signals sent from a plane in flight, the position of the plane is determined and its location furnished it by Radio telegraph.

The Week's Advance Broadcast Programs

Tuesday, May 8

CFCA (Eastern, 400), 8:00-9:00 P. M., Concert. Selection from "Tumblo Inn," Star Orchestra; "Roses," Arthur Davies, tenor; "Pizzicato Polka," Suite, "From the South," Star Orchestra; "The Swan," H. Saunders, cellist; "Until," Arthur Davies; "In Winter," My Orchestra; "The Evening Star," H. Saunders; "My Dreams," Arthur Davies; "Doves," Orchestra.

KHJ (Pacific, 400), 12:30-1:15 P. M., Concert; 6:45-7:30 P. M., Children's Hour, Concert and bedtime story by "Uncle John"; 8:00-10:00 P. M., Concert, Alpha Epsilon Chapter of Phi Mu Alpha, musical fraternity.

KSD (Central, 400), 7:00 P. M., Children's program, Thelma Roller, reader; Edward Melsenback, violinist; Fanny Kusselman, soprano; Lorraine Thessler, pianist; Harriet Thesen, reader; Milton Adler, pianist; Calvin M. Woodward, Manual Training School Orchestra; Musical program, 8:00 P. M., Olga Buermann, Swiss Alpine singer; Martin Klefer, zither; Fred Klefer, violin; Address, "Turkey and the Turks," Lt. J. I. Conolly.

KYW (Central, Daylight Saving, 447), 8:00-8:58 P. M., Musical program, Birdie Gordon, soprano, Sallie Horkes, accompanist; Arthur W. Blake, tenor, Martha Huber, accompanist; Henry Walter Graham, humorist.

WBAP (Central, 400), 7:15-8:00 P. M., Concert, Rex Maupin's Original Texas Hotel Orchestra; 9:30-10:30 P. M., concert, Harmony Club of Fort Worth, Tex.

WFAP (Central, Daylight Saving, 390), 10:00 P. M., Musical program, String Quartet, courtesy of Louis Brosseau; Mrs. Jane M. Spear, pianist; Clarence A. Pierce, baritone; Jack Chapman's Orchestra.

WDAR (Eastern, 400), 12:02-1:00 P. M., Organ recital, Stanley Theatre; Arcadia Cafe Concert Orchestra; 3:00-3:30 P. M., Song recital and short talks; 4:15-4:45 P. M., Betsy Logan on "Affairs of the Heart"; Musical program; 5:45-6:00 P. M., Dream Daddy with little tots; 7:30-7:50 P. M., Dream Daddy with boys and girls.

WFAA (Central, 400), 12:30-1:00 P. M., Address, DeWitt McMurray, editor of The Semi-Weekly Farm News; 8:30-9:30 P. M., Readings, Mrs. J. Y. Fincher and pupils; 11:00-12:00 P. M., Musical program, under auspices of W. A. Green Company.

WFI (Eastern, 400), 1:15-2:00 P. M., Concert, Meyer Davis Bellevue-Stratford Orchestra; 3:30-4:15 P. M., Musical recital; 6:30-7:00 P. M., Children's Own Half Hour.

WGL (Eastern, 360), 3:00 P. M., Amrad Women's Club; 8:00 P. M., "Twilight Tales," Uncle David; 6:15 P. M., "Iron Trade Review," 8:30 P. M., Musical program.

WGR (Eastern, Daylight Saving, 360), 2:00 P. M., Music; 4:00 P. M., Ampico recital.

WGY (Eastern, 380), 7:35 P. M., Address, "Marking Mountain Trails," Arthur H. Hopkins, New York State Conservation Commission; 7:45 P. M., Musical program, "Psyche," American Trio; "Old Time Frain," Edward A. Rice, violinist; "Boloro," American Trio; "The Swan," Ernest Burleigh, cellist; Address, "Union College Days of John Howard Payne," Dr. Charles Alexander Richmond; "Home, Sweet Home," Union College Glee Club; Address, "John Howard Payne and Home, Sweet Home," Willis T. Hanson, Jr.; "Rigoletto," WGY Instrumental Quartet; "Spanish Dance," Earl Rice, pianist; "A Little Bit of Harmony," Glee Club; "Canto Amoroso," Edward A. Rice and Leo Kliven, violinist and violist; "March," Quartet.

WHAS (Central, 360), 4:00-5:00 P. M., Organ recital, H. C. Conrad, organist at Alamo Theater; Musical program, Margaret Monroe, pianist; Ruby Freeman, soprano; Ruth Sharp, accompanist; "Just Among Home Folks," Courier-Journal; 7:30-9:00 P. M., Concert, Reta Trio; Reading, "An Interesting Historical Episode."

WIP (Eastern, 400), 2:00-3:00 P. M., Musical program; 6:00-6:30 P. M., Dinner dance program; 7:00-7:30 P. M., Uncle Wip's Bedtime Stories; 7:30 P. M., Recital; 10:10 P. M., 1:00 A. M., Dance music, Charlie Kerr's Orchestra in L'Aiglon Cafe.

WJAX (Eastern, 360), 7:30 P. M., Concert, Cleveland News Orchestra.

WLW (Eastern, 360), 10:00 P. M., Musical program, Stiles Male Chorus, First Baptist Church, Middletown, Ohio, R. E. Morrison, director, Mrs. R. E. Morrison, pianist; "Over the Hill at Break of Day," Male Chorus; "The Fisherman," R. E. Morrison, tenor; Leonard Boyd, baritone; "Praise Ye the Father," "The Son of God Goes Forth to War," "There, Little Girl, Don't Cry," "The Boys of the Old Brigade," Male Quartet; "De Connal Moon," Chorus; "On the Road to Mandalay," Mr. Morrison; "Carry Me Back to Old Virginia," Double Quartet; Piano solo, Mrs. Morrison; "Tell Me, Little Maiden," Chorus; Violin solo, George Cope; Negro Spiritual, Chorus; "On the Sea," "Pale in the Amber West," Quartet; "When Shall We Meet Again," Mr. Boyd and Chorus; Tenor solo, Wells Sharlie; "Stars and Stripes Forever," Chorus.

WMAQ (Central, Daylight Saving, 400), 4:35 P. M., Program arranged by Bush Conservatory of Music; 7:00 P. M., Instrumental selections, Chicago Civic String Quartet; Readings, Edmund Vance Cooke; Talk, under auspices of Nat'l Farm & Garden Ass'n; 9:15 P. M., Musical program, Mrs. Elizabeth Jenks, soprano; Sylvia Marburger, pianist.

WMC (Central, 400), 8:00 P. M., Musical program, arranged by Mrs. Neil Murphy; 11:00 P. M., Midnight Fric.

WOC (Central, 400), 3:30 P. M., Educational talk, A. G. Hinrichs; 5:45 P. M., Children.

WOO (Eastern, 400), 11:00 A. M., Organ recital, Mary E. Vogt, organist; 4:45-5:00 P. M., Organ recital and trumpets.

WWJ (Eastern, 400), 8:30 P. M., The Town Crier; Concert, The News Orchestra; Mrs. Fred Kopp, mezzo-soprano; Dean McComb, tenor; Doris McIntyre, pianist.

HERE is the fifth appearance of this new service for Digest Readers. There are only fifty eligible stations for the listening, but already twenty-two of these will be found in the "Advance Programs." Only features are listed below. Such parts of station programs as are regular week in and week out, are, as they have been from the start, found in the Digest Radiophone Station Directory. Much other data on the stations for which advance programs are given, will be found there.

Mannio Roth; "Tarengli," Star Orchestra; "Yesterday and Today," Norma Hermiston; Selection from "Katinka," Orchestra; "From the Land of the Sky-Blue Waters," Harry Adaskin, violinist; "The Star," Norma Hermiston; "Song of India," Orchestra.

KHJ (Pacific, 400), 12:30-1:15 P. M., Program by Boyle Heights Junior High School; 6:45-7:30 P. M., Concert and bedtime story by "Uncle John"; 8:00-10:00 P. M., Program by Chamber of Commerce of Overland Park.

KYW (Central, Daylight Saving, 447), 8:00-8:58 P. M., Musical program, Elyn Swanson, Euclid, contralto, Davis Jackson, Holsberg, accompanist; Frank D. Grief, tenor, Martha Grief, accompanist; Wilfred C. Marceau, reader.

WBAP (Central, 400), 7:15-8:00 P. M., Concert, Denton Epworth League; 9:30-10:30 P. M., Concert, Fort Worth High School Orchestra.

WDAR (Eastern, 400), 12:02-1:00 P. M., Organ recital, Stanley Theatre, Arcadia Cafe Concert Orchestra; 3:00-3:30 P. M., Tenor and piano solos; 4:15-4:45 P. M., Short talks and song recital; 5:45-6:00 P. M., Dream Daddy with little tots; 7:30-7:50 P. M., Dream Daddy with boys and girls.

WFAA (Central, 400), 12:30-1:00 P. M., Address, "The Republic of Texas," Judge Eugene B. Mose.

WFI (Eastern, 400), 1:15-2:00 P. M., Dinner Music, Meyer Davis Bellevue-Stratford Concert Orchestra; 3:30-4:15 P. M., Recital; 6:30-7:00 P. M., Surprise feature for children, and short story; 7:30 P. M., Boy Scout Radio Corp., 8:00-8:55 P. M., Musical concert and address; 10:30-12:00 P. M., Dance music, Meyer Davis Bellevue-Stratford Dance Orchestra.

WGL (Eastern, 360), 6:45 P. M., Program, "Camp Fire Girls," Eunice L. Randall; Concert, Amrad Banjo-Mandolla Club; Health talk, Henry Copley Greene of American Red Cross; Talk on Farm, Garden and Lawn, by Breck's; Amrad Banjo-Mandolla Club.

WGR (Eastern, Daylight Saving, 360), 3:00 P. M., Music; 4:00 P. M., Ampico recital; 8:00 P. M., Dance program, Ludolf Finkel Orchestra; Talk, "Give Your Car a Home," E. B. Thompson.

WHAS (Central, 360), 4:00-5:00 P. M., Organ recital, H. C. Conrad, organist; Concert, Mary Anderson Theater Orchestra; 7:30-9:00 P. M., Concert, under auspices of Alice Monroe, soprano, Jeffersonville, Ind.; Reading, "An Interesting Historical Episode."

WHK (Eastern, 360), 8:00 P. M., Concert, WIHK Orchestra.

WIP (Eastern, 400), 2:00-3:00 P. M., Short talks and musical program; 6:00-6:30 P. M., Dinner dance music; 7:00-7:30 P. M., Uncle Wip's bedtime stories.

WLW (Eastern, 360), 8:00 P. M., Concert, Syrian Temple Shrine Band, Noble Henry Fillmore, conductor, Noble Frank Simon, cornet soloist; "Noble Men," "Morning, Noon and Night," Band; "Willow Echoes," Noble Frank Simon; "Ballet Egyptienne," "The Man Among Men," "Dusty Trombone," "The Only Tune the Band Could Play Was Old Lang Syne," Band; Vocal selections by Syrian entertainers, Nobles Eddie Ball, Howard Halford and Billie Waterworth; "Hoy NOX to Play the Clarinet," Noble Jake Behrer; "A Bit of Everything," Noble Clarence Betzner; "Goodbye," Band.

WMAQ (Central, Daylight Saving, 400), 4:35 P. M., Program arranged by Cosmopolitan School of Music and Dramatic Art; 7:00 P. M., Stories, Georgeo Faulkner; 9:15 P. M., Musical program, Burdette Cleveland, pianist; Allene Webster, soprano.

WOC (Central, 400), 3:30 P. M., Educational talk, D. K. Kirk; 6:30 P. M., Bandman's visit; 7:00 P. M., Pipe organ recital, Edwin Swindell, organist, assisted by Mrs. O. D. Doran, soprano, Jessie Howell, reader; 10:00 P. M., Musical program, Second Congregational Church Choir, Moline, Ill.

WOO (Eastern, 400), 11:00 A. M., Organ recital, Mary E. Vogt, organist; 4:45-5:00 P. M., Organ recital and trumpets.

WWJ (Eastern, 400), 8:30 P. M., The Town Crier; Concert, The News Orchestra; Emma O. Hupe, soprano; Mrs. William Hester, contralto.

Musical program, Florence Drow, contralto; Luella Magill, soprano; Bertha Tapper, accompanist; Mrs. Dorothy Fischer, soprano; Philip Weintraub, violinist; Bertha Taub, accompanist; Jack Chapman's Orchestra.

WDAR (Eastern, 400), 12:02-1:00 P. M., Organ recital, Stanley Theatre, Arcadia Cafe Concert Orchestra; 3:00-3:30 P. M., musical program; 4:15-4:45 P. M., Betsy Logan on "Affairs of the Heart"; Musical program; 5:45-6:00 P. M., Dream Daddy with little tots; 7:30-7:40 P. M., Dream Daddy with boys and girls; 10:30 P. M., 1:00 A. M., Dance music, Arcadia Cafe Dance Orchestra, songs by Nettie Conrad, Harry Glyn and Thomas W. Huston.

WFAA (Central, 400), 12:30-1:00 P. M., Musical talent from the Melba Theatre; 8:30-9:30 P. M., Musical program, Walter J. Fried, violinist, Viola Beck van Katwijk, pianist; 11:00-12:00 P. M., Program under auspices of Bush & Gerts Piano Co.

WFI (Eastern, 400), 1:15-2:00 P. M., Dinner Dance Music; Meyer Davis Bellevue-Stratford Concert Orchestra; 3:30-4:00 P. M., Song recital; 6:30-7:00 P. M., Children's Own Half Hour with Cousin Sue.

WGL (Eastern, 360), 5:00 P. M., "Twilight Tales," Uncle David; 6:15 P. M., "General Conditions in the Shoe and Leather Industry," New England Shoe and Leather Ass'n; 9:30 P. M., Musical program.

WGR (Eastern, Daylight Saving, 360), 2:00 P. M., Music; 3:00 P. M., Music; 4:00 P. M., Ampico recital.

WGY (Eastern, 380), 7:45 P. M., Musical program furnished by Watervliet, N. Y., Chamber of Commerce, "Chansonette," Barclay Jermain Club Orchestra; "Dawn," "Spring Singing," Mr. Gabrielle Grober, soprano; "Nocturne in E Flat Major," "Valse Arabesque," Mary Danaher, pianist; "Cam Ye by Athol," "MacGregor's Gathering," Joseph A. Calhoun, tenor; Address, "The U. S. Army Gun Plant," Col. W. I. Westervelt, U. S. Army, Commandant, Watervliet Arsenal; "Viennese Popular Songs," "Souvenir of Wieniawski," Elva Vincent, violinist; "Nola," James A. Ball, pianist; "The Bridge," Mrs. Winslow, Masonic Quartet; "Traumerl Romanza," "My Heart at Thy Sweet Voice," Robert Hayden, cornetist; "Erin's Flag," Thomas H. Fischer, reader; "Tally

(Continued on page 9)

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Thursday, May 10

CFCA (Eastern, 400), 8:00-9:00 P. M., Concert. Selection from "The Firefly," Star Orchestra; "Salut D'Amour," Harry Adaskin, violinist; "Scenes Poetiques," Orchestra; "I Know a Lovely Garden," Thelma Bateman, soprano; "Serenade Espagnole," Orchestra; "O Trio Ma Vera," Thelma Bateman, violin solo, Harry Adaskin; Waltzes from "Flora Bella," Orchestra; "Spring," Thelma Bateman; Soldiers' Chorus from "Faust," Orchestra; 10:00-11:00 P. M., Dance program, Star Orchestra.

KHJ (Pacific, 400), 12:30-1:15 P. M., Concert; 6:45-7:30 P. M., Children's Hour, Concert and bedtime story by "Uncle John"; 8:00-10:00 P. M., Concert, Santa Monica Municipal Band.

KYW (Central, Daylight Saving, 447), 8:00-8:58 P. M., Musical program, Lyon & Healy Concert & Artist Department; 9:25 P. M., "Twenty Minutes of Good Reading," Rev. C. J. Peralta, S. J. Head of Dept. of English, Loyola University.

WBAP (Central, 400), 7:15-8:00 P. M., Concert, Choral Club of Stephenville, Tex.; 9:30-10:30 P. M., Concert, under direction of Will Foster, organist of the First Methodist Church.

WDAP (Central, Daylight Saving, 390), 10:00 P. M.,





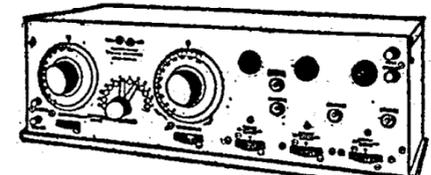
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Western Branch—451 East 3rd St., Los Angeles, Cal.

Wednesday, May 9

CFCA (Eastern, 400), 8:00-9:00 P. M., Concert, "Ballet Egyptian," Star Orchestra; "Sui Ci Dio," from "La Gioconda," Norma Hermiston, soprano; Violin solo.

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15.00—Western Electric Phones	9.25
6.00—Frost Phones (2000 ohm)	3.95
6.00—Frost Phones (3000 ohm)	4.45
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WIRE DIRECTED AIR WAVES MAKE GOOD

TESTS MADE ON PACIFIC COAST BETWEEN CITIES

500-Watt Transmitters Work over Power Lines for 200 Miles—Use High Waves

SAN FRANCISCO.—The "directed Radio system of dispatching," a new method of broadcasting, has recently been put into operation near this city by engineers of the Pacific Gas and Electric Company.

Messages were successfully transmitted a distance of 200 miles, between the Vaca Dixon substation, near Vacaville, Calif., and the Pitt river power house. Specially constructed 500-watt transmitters and standard receivers were used.

In explaining the experiments, Roy Wilkins, Radio engineer, stated that the electromagnetic waves were transmitted to the high voltage power lines at the point of sending and picked off at the receiving end.

High Wave Lengths Used

These waves followed the course of the steel tower lines in a straight line due north 120 miles from Vaca-Dixon to Cottonwood, then on a right angle turn going 80 miles into the Pitt region. Mr. Wilkins said tests were made using wave lengths of from 10,300 to 23,000 meters. Under this system of directed Radio, the energy or sound wave is not broadcast, but travels in the vicinity of the high power transmission lines and will not interfere with other sending or receiving stations.

The system will be used for transmitting messages between power houses in the mountains and large centers of distribution. This system will be especially valuable in maintaining a continuity of service during heavy storms when telephone lines and other systems of communication are unavailable.

FAN WORKS COPP SET SANS AID OF PHONES

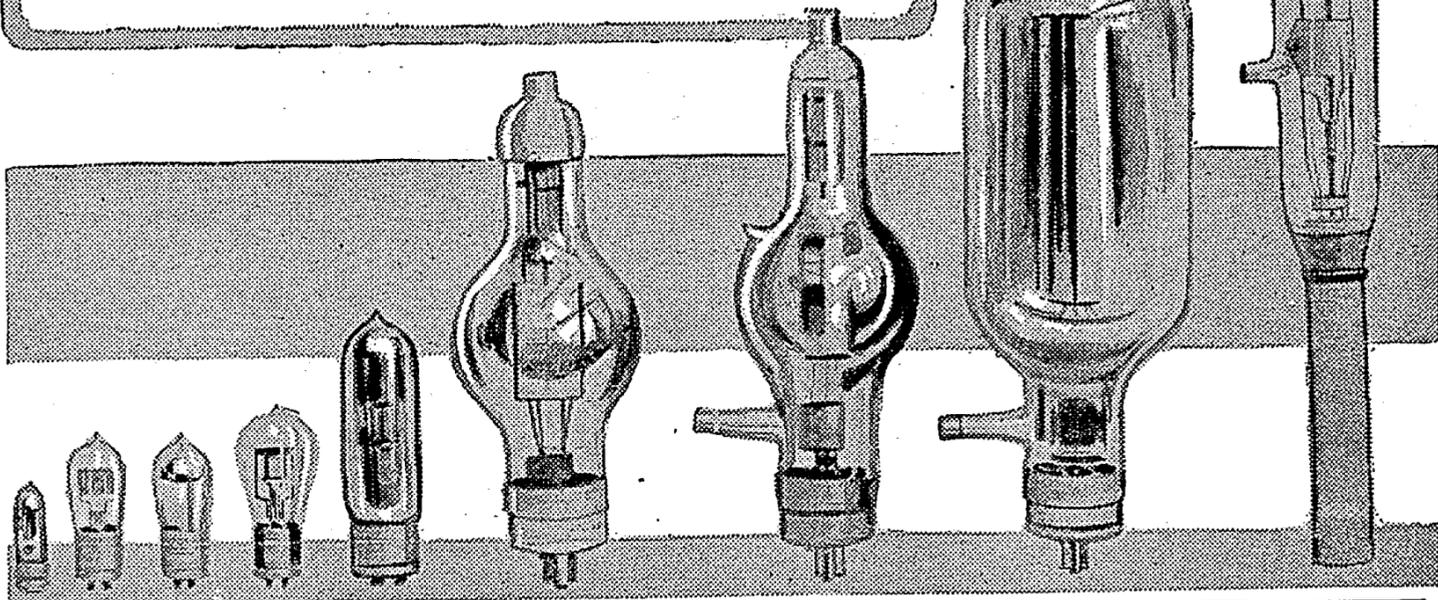
"Loud Speaking Transformers with Five-Foot Cord"—Next!

CLEVELAND, O.—Why worry about a little thing like telephone receivers? Just listen to J. T. Curtis, 7221 Dellenbaugh avenue. "Just recently, after using my Copp set, detector and two stages of amplification, I removed the phones, put them away, and detached the batteries without turning down the rheostats. I had been listening in on most all of the United States.

"The next evening I hooked on the batteries preparatory to the nightly seance but did not hook on the phones. I stepped out of the room for a moment and when I returned I was surprised to hear music.

PA AND MA RADIOTRON AND A GROWING FAMILY

From the smallest to the largest Radio vacuum tube on the market. Left to right are: UV-199, UV-200, UV-201-A, UV-202 (5 watt), UV-203 (50 watt), UV-204 (250 watt), UV-206 (1 kilowatt), UV-208 (5 kilowatt) and UV-207 (20 kilowatt). An idea of size may be gained from the fact that the UV-204 or 250-watt tube, which is in the center of the picture, is 14 1/4 inches in height. Photo by General Electric Co.



I found that it was coming from the set, but couldn't tell from just what part. When I turned off the amplifier rheostats the music ceased, so I think that in some way the music came from one of the transformers. Sounds fishy, doesn't it? But it sure is true."

From the foregoing we may expect to see advertisements reading like this: "Loud speaking transformers complete with headband and five foot cord."

Mathematical Broadcast First Given by Station WOR

NEWARK, N. J.—During the next few weeks Radio Station WOR will conduct an educational experiment very possibly the first of its kind.

This station has secured the services of Mr. William W. Strader to give several talks under the general topic of "Some Tools of Algebra." Mr. Strader is a teacher of mathematics of considerable experience, not only in the school room, but also as a lecturer before classes held in industrial plants. These talks will be from fifteen to twenty minutes long. They will no doubt interest many groups of listeners-in.

A lightning arrester is not needed with an indoor aerial.



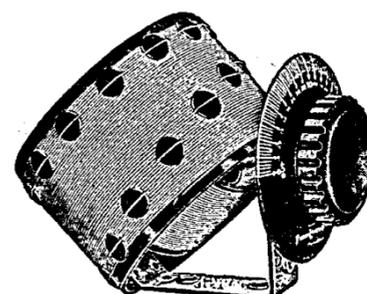
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INSTRUCTIONS FOR ASSEMBLY

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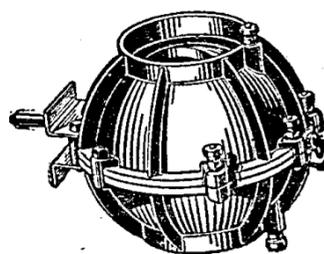
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Two terminals are provided for the rotor and three of the stator, permitting the variometer to be used in all known variometer circuits.

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Used and endorsed by all leading Radio Engineers of the country.

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All Capacities, 25 Cents

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Radiophone Broadcasting Stations

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AQG, Canton, O. 425 only. 500 ml. Hdqtrs. 135th Field Artillery O. N. G. Wed, Fri, music. Sun, church services. Eastern.

ASB, San Antonio, Tex. 200 ml. U. S. Army, Ft. Sam Houston. Mon, Thurs, irregular.

AV7, St. Paul, Minn. 400 only. 500 ml. 6th Inf. Minn. Nat'l Guard, St. Paul Armory. Daily ex Sun, 2-3:30 pm, music, announcements. Tues, 8:30-10 pm, Thurs, 8:30-9:15 pm. Central.

BE1, Tacoma, Wash. 400 only. 100 ml. Camp Lewis, U. S. Army, Third Signal Co. Daily ex Sat, Sun, 6-7 pm, music, announcements, lectures. Pacific.

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

CFCA, Toronto, Ont., Can. 400 only. 500 ml. Toronto Star. Daily ex Sun, 12 m, weather; 2:30-3:30 pm, news, music; 5:30-6, news; 8-9, concert. Sun, 5:45-7:20, 7:45-8:45 pm, concert. Eastern.

CFBC, Vancouver, B. C., Can. 440 only. 1,500 ml. Vancouver Daily Province. Daily, 8:30-9:30 pm, reports, news, music. Pacific.

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

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

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

CFCK, Edmonton, Alta., Can. 410 only. Radio Supply Co. Daily ex Sun, 8-8:30 pm, Music. Sun, 8:30-4:30 pm. Concert. Mountain.

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

CFXG, London, Ont., Can. The London Advertiser.

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

CFYQ, Toronto, Ont., Can. The Bell Telephone Co. Licensed only.

CFYG, Vancouver, B. C., Can. Victor Wentworth Oidium.

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

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

CHCB, Toronto, Can. Marconi Co. No regular program.

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

CHCG, London, Ont., Can. London Radio Shoppe.

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

CHVC, Toronto, Canada. Metropolitan Motors Co. Licensed only.

CHYQ, Montreal, Que., Can. Northern Elec. Co.

CHXC, Ottawa, Ont., Can. 450 only. 50 ml. J. R. Booth, Jr. Mon, Wed, 8:30-11 pm, music, entertainment. Eastern.

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

CJCA, Edmonton, Alta., Can. 450 only. 1,000 ml. 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. Mountain.

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

CJCD, Toronto, Canada. 410 only. 200 ml. T. Eaton Co. No regular program.

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

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

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

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

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

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

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

CJNG, Winnipeg, Man., Can. 400 only. 1,000 ml. 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. Licensed only.

CKAC, Montreal, Que., Can. 430 only. 1,000 ml. La Presse. Daily ex Sun, 2 pm, weather; 4:30-4:35, reports; 4:15-5:15, 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.

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

CKCE, Toronto, Ont., Can. Ind. Telephone Co.

CKCF, Regina, Sask., Can. 420 only. 1,500 ml. 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.

CKCH, St. John, N. B., Can. 400 only. 75 ml. Jones Elec. Radio Co., Ltd. Daily 4-5 pm, concert, reports. Eastern.

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

CKKQ, Toronto, Ont., Can. Radio Equipment & Supply Co. Ltd. Licensed only.

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

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

CKY, Winnipeg, Man., Can. 450 only. 500 ml. Manitoba Tel. Co. Daily ex Sun, 12:30-1:30 pm, news, music; 1:45-2:00 pm, markets. Tues, Thurs, Fri, 8:30-10 pm, concert. Sun, 9-9:45 pm, concert. Central.

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

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

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

DN4, Denver, Colo. 340 only. 200 ml. Colorado National Guard. Daily ex Sun, 8:15 pm, weather, news, concert. Thurs, 8:15-9:30 pm, special concert, speech. Mountain.

KDKA, E. Pittsburgh, Pa. 2,000 ml. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 10-10:15 am, 12:30-1 pm, music; 6-9:55 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 ml. Leo J. Meyberg Co. Daily, 1-2 pm, 8:30-9, 4:30-5:30, 7-7:15, music, reports, concert. Pacific.

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

KDPM, Cleveland, O. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 7-7:30 pm, news, weather, concert, lecture. Tues, Sat, 8-10 pm. Pacific.

KDYL, Salt Lake City, Utah. 485 also. 1,800 ml. Salt Lake Telegraph. Daily ex Sun, 7-8 pm, news, music, entertainment. Mountain.

KDY, San Diego, Calif. Sarcy Theater.

KDYQ, Portland, Ore. 25 ml. Oregon Institute of Technology. Tues, 9-10 pm, educational lectures. Pacific.

KDYS, Great Falls, Mont. 485 also. 1,000 ml. Great Falls Tribune. Mon, Wed, Sat, 8-10 pm, concert. Sun, 4 pm, church services. Mountain.

KDYW, Phoenix, Ariz. 100 ml. Smith Hughes & Co. Daily ex Sat, 7-7:30 pm. Mountain.

KDYX, Honolulu, T. H. Hawaii. 500 ml. Honolulu Star-Bulletin Co., Ltd. Daily ex Sun, 12:15-1:15

pm, reports; 6:30-7:30 pm, entertainment, music, talks. Sun, 11 am-12:15 pm, church services. 120th Meridian.

KDZA, Tucson, Ariz. Arizona Daily Star.

KDZB, Bakersfield, Calif. 500 ml. Frank Siefert. Daily ex Sun, 8-9 pm, reports, music. Sun, sacred program, irregular. Pacific.

KDZE, Seattle, Wash. 500 ml. 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.

KDZJ, Wenatchee, Wash. 700 ml. 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 ml. Nevada Machine & Elec. Co. (Nevada State Journal). Wed, Fri, 7-8 pm. Pacific.

KDZQ, Denver, Colo. Pyle & Nichols.

KDZR, Bellingham, Wash. 200 ml. The Bellingham Pub. Co. Mon, Wed, Fri, 7-8:30 pm, music, news, reports; 7:30-7:45, code practice. Tues, Sat, Sun, 7-8 pm. Pacific.

KDZT, Seattle, Wash. Seattle Radio Assn.

KDZZ, Everett, Wash. 50 ml. Kinney Bros. & Sepell. Daily ex Sun, 2:30-3:30 pm, 4:30-5:30, 8:15-9:15. Pacific.

KFAA, Phoenix, Ariz. 200 ml. McArthur Brothers. Daily ex Sun, 7:30-8:30 pm, news, weather, stock reports. Mountain.

KFAE, Pullman, Wash. 1,500 ml. State College of Washington. Mon, Wed, Fri, 7:30-9 pm, lectures, music, readings. Pacific.

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

KFAL, Boulder, Colo. 800 ml. Univ. of Colo. No definite schedule. Univ. activities. Mountain.

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

KFAP, Butte, Mont. Standard Pub. Co.

KFAT, San Jose, Calif. City of San Jose.

KFAR, Hollywood, Calif. Studio Lighting Service Co.

KFAT, Eugene, Ore. 100 ml. 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 ml. Boise H. S. Daily ex Sun, 3-3:30 pm, markets, news; 8:30 pm, weather. Tues, Fri, 8-9 pm, concert. Thurs, 7:30-8:15 pm, music. Mountain.

KFCY, Le Mars, Ia. 300 ml. Western Union College. Fri, 8-9 pm, music, educational. Central.

KFCZ, Omaha, Neb. Omaha Central H. S.

KFDA, Baker, Ore. 25 ml. 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 ml. Mercantile Trust Co. 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. Pacific.

KFDC, Spokane, Wash. 25 ml. E. B. Craney. Mon, Wed, Fri, Sat, 7:30-9 pm. Wed, Sat, 3-3:30 pm. Pacific.

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

KFDF, Casper, Wyo. 485 also. 600 ml. Wyoming Radio Corp. Daily ex Sun, 12:30 pm, weather, stocks. Wed, Fri, 8-9 pm, music. Sun, 8-9 pm, sacred music; 11-11:30, music. Mountain.

KFDH, Tucson, Ariz. 200 ml. Univ. of Ariz. Tues, Thurs, 7:30-8:30 pm, music, lecture, reports. Mountain.

KFDJ, Corvallis, Ore. Oregon Agri. College.

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

KFDP, Bozeman, Mont. H. Everett Cutting.

KFDS, Des Moines, Iowa. 300 ml. Hawkeye Radio & Supply Co. Daily ex Sun, 3 pm, reports, music. Mon, 9 pm, music. Thurs, 9:30 pm, music, entertainment. Central.

KFDR, York, Neb. Bullock's.

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

KFDU, Lincoln, Neb. Neb. Radio Elec. Co.

KFDV, Fayetteville, Ark. Gilbrech & Stinson.

KFDX, Shreveport, La. First Baptist Church.

KFDY, Brookings, S. D. S. D. State College of Agri. & Mech. Arts.

KFEB, Minneapolis, Minn. Harry O. Iverson.

KFEE, Taft, Calif. 200 ml. City of Taft. Mon, Wed, Fri, 6:15-7 pm, music, news. Pacific.

KFEC, Portland, Ore. 25 ml. Meter & Frank Co. Inc. Daily ex Sun, 12 m, reports; 4-5 pm, music; 6:30 pm, reports. Thurs, 9-10 pm, concert. Sat, 11 am-12 m, children's hour. Pacific.

KFEI, Tacoma, Wash. Guy Gresson.

KFEF, Denver, Colo. Radio Equipment Co.

KFEQ, Oak Neb. J. L. Scroggin.

KFER, Fort Dodge, Ia. Auto Electric Service Co.

KFEV, Douglas, Wyo. 485 also. 250 ml. Felix Thompson Radio Elec. Shop. Weather reports and special warnings. Mountain.

KFEY, Kellogg, Ida. Bunker Hill & Sullivan Mining & Const. Co.

KFEZ, St. Louis, Mo. American Society of Mech. Engrs.

weather; 3:30-4 pm, woman's program; 7:30, weather. Mon, Wed, Fri, 8-9 pm, concert. Mon, Fri, 11-12 pm, Hoot Owls. Fri, 7-7:30 pm, lecture. Sun, 7-8 pm, concert. Pacific.

KBY, Lacey, Wash. 250 ml. St. Martins College. Tues, Fri, Sun, 8:30-9:30 pm, news, concert, bedtime story. Pacific.

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

KBJ, Seattle, Wash. Louis Wasmer.

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

KBJ, Stockton, Calif. 100 ml. Gould, The Lig. Man. Daily ex Sun, 5-6 pm, concert. Mon, Wed, 9-10 pm, concert. Sun, 10-11 am, church services. Pacific.

KBR, Seattle, Wash. 1,500 ml. Northwest Radio Service Co. Daily ex Sun, 5:30-6:15 pm, reports. Mon, 7:30-8:30 pm, music. Tues, Fri, Sat, 8:30-9:30 pm, concerts, lecture, bedtime stories. Thurs, 9-10:30 pm. Pacific.

KBS, Los Angeles, Calif. 100 ml. 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 ml. 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. 1,500 ml. Warner Bros. Radio Supply Co. Daily, 11:30-1 pm. Fri, 8-9 pm, Sun, 12-1 pm. Pacific.

KLK, Oakland, Calif. 500 ml. Oakland Tribune. Daily ex Sun, 3:30-4:30 pm, 7-7:30, news, entertainment. Tues, 8-9 pm. Fri, 9-10 pm. Sun, 10-11 am, church services. Pacific.

KLZ, Denver, Colo. 200 ml. Reynolds Radio Co. Daily ex Sun, 7:30-8 pm, news, markets, bedtime story. Thurs, 8-9 pm, concert. Sun, 8:30-10:30 pm, concert. Mountain.

KMJ, Fresno, Calif. 300 ml. San Joaquin Lt. & Pr. Corp. Tues, Fri, 8-9 pm, music. Sun, 5-6 pm, music. Pacific.

KMO, Tacoma, Wash. 200 ml. Tacoma Times. (Lore Electric Co.) Daily ex Sun, 6-7, 9:15-10, concert, news, lecture. Pacific.

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

KNJ, Roswell, New Mex. Temporarily discontinued.

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

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

KNV, Los Angeles, Calif. Radio Supply Co.

KNX, Los Angeles, Calif. Elec. Lighting & Supply Co.

KOB, State College, N. M. 485 also. 500 ml. 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.

KOP, Detroit, Mich. 1,500 ml. 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 ml. Halo Bros., Inc. Tues, Thurs, Sat, 8-10 pm, concert, lectures. Sat, 3-4:30 pm. Sun, 11-12:30 pm, church services. Pacific.

KQI, Berkeley, Calif. Univ. of Calif.

KQP, Hood River, Ore. Apple City Radio Club.

KQV, Pittsburgh, Pa. 300 ml. Doubleday-Hill Elec. Co. Daily ex Sun, 12-12:30 pm; 4:30-5, music. Mon, Wed, Fri, 10-10:55 pm, concert. Fri, 4:30-5:15 pm, children's program. Eastern.

KQW, San Diego, Calif. 345 and 485 only. 500 ml. Chas. D. Herold. Daily ex Sun, 1-1:30 pm. Wed, 8-9 pm, concert. Pacific.

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

KRE, Berkeley, Calif. 600 ml. Maxwell Elec. Co. Mon, 8-10 pm. Wed, 9-10 pm, concert. Pacific.

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

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

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

KTW, Seattle, Wash. 500 ml. 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 ml. San Francisco Examiner. Daily ex Sun, 9-10 am, concert, chat to housewives; 11-12, reports; 2:30-3:30 pm, lecture, news; 5:15-6:45 pm, concert; 9 am, 12 m, 6:45 pm, weather reports. Wed, 3:30 pm, health bulletins. Sun, 9-10 am, 2-4 pm, 5-6, concert, news. Pacific.

KUS, Los Angeles, Calif. 300 ml. City Dye Works & Laundry Co. Daily ex Sun, 7-7:30 am, setting up exercises; 12-12:30 pm, concert, time. Mon, Thurs, Fri, 2-2:30 pm, lectures. Tues, Fri, 4-4:30 pm, code practice. Wed, Fri, 6-6:45 pm, concert. Pacific.

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

KWG, Stockton, Cal. 1,500 ml. 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.

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

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

KYI, Bakersfield, Calif. Bakersfield Californian.

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

KW, Chicago, Ill. 400 and 485 only. 2,000 ml. Westinghouse Elec. & Mfg. Co. Daily ex Sun, 9:30 am, 10-10:30, 11, markets; 11:05, weather; 11:50, news; 1:15, table talk; 12, 12:30, 1, 2:20, 2:45, 2:30, markets; 3, 3:30, 4, news; 4:15, markets; 4:30, 5, news; 6:30, markets; 6:50, bedtime story; 8, concert, 9, special. Sun, 11 am, 3:30 pm, 7, church services. Central, Daylight Saving.

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

KZM, Salt Lake City, Utah. 485 also. 1,000 ml. Deseret News. Daily ex Sun, 8-9:30 pm, music, news, bedtime stories etc. Mountain.

KZV, Wenatchee, Wash. 485 also. 200 ml. Wenatchee Battery & Motor Co. Daily ex Sun, 3:30-4:15 pm, weather. Mon, Wed, Fri, 1st to 15th each month, 8:45-9:30 pm; 15th to last each month, 8-8:45 pm, weather. Sun, 1st to 15th each month, 7:30-9 pm; 15th to last each month, 11 am-12:30 pm, church services. Eastern.

NAA, Dallas, Va. 710 only. 2,000 ml. U. S. Navy Dept. Daily ex Sun, 9:45-10:40 am, 12:25-12:40 pm, 1:45-2:20, markets, weather; 2:45-3, (Tues. only) Dept. Interior; 3:25-4:40, 5:05-5:20, markets, weather; 10:05-10:20, weather. Mon, 6:45-8:20 pm, Dept. programs. Tues, 7:05-8:20 pm, Dept. programs. Wed, 7:25-7:40 pm, Dept. programs; 8:05-9:40, Marine Band. Thurs, 6:45-8:40 pm, Dept. programs. Fri, 8:05-8:40 pm, band concert. Eastern.

QA, Ottawa, Ont., Can. Dept. of Marine & Fisheries.

PWX, Havana, Cuba. 400 only. 1,500 ml. International Tel. & Telg. Corp. Wed, Sat, 9-11:30 pm, music. Eastern.

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

WAAB, New Orleans, La. Valdemar Jensen.

WAAC, New Orleans, La. Tulane Univ.

WAAD, Cincinnati, O. 200 ml. Ohio Mechanics Inst. No regular schedule. Central.

WAAF, Chicago, Ill. 485 also. 300 ml. Chicago Daily Drivers Journal. Daily ex Sat and Sun, 8:40 am, 10:30, 10:45, 12:30 pm, 12:45, 3, 4:30, live stock and weather reports. Sat, same ex no program at 3 and 4:30 pm. Central.

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

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

KFAW, Santa Ana, Calif. 485 also. 100 ml. Radio Den. Daily ex Sun, 4-4:30 pm, news, reports, music. Mon, Thurs, 6:30-7:30 pm, concert. Pacific.

KFAV, Medford, Ore. 485 also. 500 ml. Virgin Radio Service. Mon, Fri, 9-10 pm. Special programs other days. Pacific.

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

KFBB, Havre, Mont. 485 also. 150 ml. F. A. Buttry Co. Daily ex Sun, 12:30 pm, agriograms, weather, news. Tues, Fri, 8-9:30 pm, music. Mountain.

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

KFBD, Hanford, Calif. 485 also. 200 ml. Clarence V. Welch. Mon, Wed, 3-4 pm, 7:30-8:30, news, music, agriograms. Tues, Thurs, Sat, 6-7 pm, music. Fri, 3-4 pm, 9-10, news, music. Sun, 7-8 pm, church services. Pacific.

KFBE, San Luis Obispo, Calif. 50 ml. 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 ml. Jenkins Furn. Co. (Owyhee Hotel). Daily, 8-9 pm. Mountain.

KFBK, Sacramento, Calif. 485 also. 300 ml. Kimball-Union Co. Daily ex Sun, 3-4 pm, 6-6:45, concert, news, codes. Sun, 10-11 am, church service; 8-9 pm, concert. Pacific.

KFBL, Everett, Wash. Leese Bros.

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

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

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

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

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

KFCG, Billings, Mont. 500 ml. Electric Service Station, Inc. Wed, Fri, Sun, 7:30-9 pm, music. Mountain.

KFCI, Colorado Springs, Colo. Colorado Springs Radio Co.

KFCL, Los Angeles, Calif. 485 only. 1,500 ml. Los Angeles Union Stock Yards. Daily ex Sun, 10-10:30 am, 12-12:30 pm, 4-4:30, 8-8:20, live stock reports. Pacific.

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

KFCP, Ogden, Utah. Ralph W. Fygaro.

KFCQ, Casper, Wyo. Motor Service Stn.

KFCV, Houston, Tex. 300 and 600 also. 300 ml. Fred Mahaffey, Jr. Daily ex Sun, Mon, 7:30-8 pm, markets, entertainment. Sun, 2-3 pm, church services. Central.

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

KFFE, Pendleton, Ore. 100 ml. Eastern Ore. Radio Co. Daily ex Sun, 8:30-9:30 pm, music. Pacific.

KFFO, Hillsboro, Ore. Dr. E. H. Smith.

KFFP, Moberly, Mo. First Baptist Church.

KFFQ, Colorado Springs, Colo. 250 ml. The Mark-sherell Motor Co. Daily, 8:15 am, weather; 4-5 pm, concert. Mon, Wed, Fri, 8-9:30 pm, special program. Mountain.

KFFR, Sparks, Nev. Jim Kirk.

KFFV, Lamoni, Ia. Graceland College.

KFFY, Alexandria, La. 275 only. Pincus & Murphy, Inc.

KFFZ, Dallas, Tex. 226 only. Al. G. Barnes Amusement Co.

KFGB, Cheboko, Colo. Lowenthal Bros.

KFGD, Chickasha, Okla. 248 only. Chickasha Radio & Elec. Co.

KFGF, Mt. Vernon, Wash. 50 ml. Buchanan, Stevens & Co. Daily ex Sun, 4:50-5:30 pm. Mon, Wed, Fri, 7-9 pm, music. Tues, Thurs, Sat, 7-8 pm, music. Sun, 2-3 pm. Pacific.

KFGI, Arlington, Ore. Arlington Garage.

KFGH, Gunnison, Colo. Colorado State Normal School.

KFGJ, Hood River, Ore. P. L. Boardwell.

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

KFGH, Neah Bay, Wash. Ambrose A. McCue.

KFGI, Santa Barbara, Calif. Fallon Company.

KFHR, Seattle, Wash. Star Elec. & Radio Co.

KFI, Los Angeles, Calif. 400 only. 2,000 ml. Earl C. Anthony, Inc. Daily ex Sun, 1-1:30 pm, 4-5 pm, 7-7:30 pm, 8-11 pm. Sun, 10:30-11:30 am, 4-5 pm, 8-11. Pacific.

KFJ, Portland, Ore. Benson Tech. Student Body.

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

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

KGB, Tacoma, Wash. 200 ml. Tacoma Daily Ledger-William A. Mullins Elec. Co. Daily ex Sun, 7-9 pm. Sun, 5-7:30 pm, entertainment. Pacific.

KGG, Portland, Ore. 500 ml. 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 ml. Northwestern Radio Mfg. Co. Irregular schedule.

KGO, Altadena, Calif. 350 only. 300 ml. Altadena Radio Lab. No regular schedule.

KGU, Honolulu, Hawaii. 485 also. 150 ml. 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 also. 1,500 ml. Oregonian Pub. Co. Daily ex Sun, 11:30 am,

ADVANCE PROGRAMS

(Continued from page 6)

Ho, "Wondering," John Fogarty, baritone; "Bally Ho," Frank L. Jurek, Thomas S. Morris; "Caprice," "The Top," Geraldine Castilian Dance, Lucia P. Walker, pianist; "A Son of the Desert Am I," Daniel A. Gilmore, baritone; "School for Scandal," "Comprenez-vous," Mary Rose Rogers, reader; "Wid de Moon, Moon, Moon," "I Have a Dream," Helen Ford, contralto; "Pastorale," "Gavotte," Ernest A. Moncey, pianist; "Our America," Orchestra.

Friday, May 11

CFCG (Eastern, 400), 8:00-9:00 P. M., Concert, Selection from "The Merry Widow," Star Orchestra; "Dante Boy," Agnes Adie, soprano; "Valse Bluetto," Orchestra; "O Dry Those Tears," W. Woods, cornetist; "Skaters Waltz," Orchestra; "Sing Me Love's Lullaby," Agnes Adie; "For You Alone," W. Woods; "Same Old, Dear Old Place," Agnes Adie; Serenade, "Through Battle to Victory," Orchestra.

Saturday, May 12

CFCG (Eastern, 400), 8:00-9:00 P. M., Concert; Selection from "Floradora," Star Orchestra; Bass solo, W. R. Curry; "Dream of Summer," Clarence Causton, violinist; "Ja Zarino," Star Orchestra; "The Two Grandsons," Grace La. Nocco, contralto; "The Blue Dube Waltz," Orchestra; "Minuet in G," Clarence Causton; Bass solo, W. R. Curry; "Ave Maria," Clarence Causton; "Selection of English Airs," Orchestra.

KHJ (Pacific, 400), 12:30-1:15 P. M., Program by Lincoln High School Girls' Glee Club; 6:45-7:30 P. M., Children's Hour, Concert and bedtime story by "Uncle John"; 8:00-10:00 P. M., Concert, Donald Campbell's Orchestra.

Sunday, May 13

WBAP (Central, 400), 11:00-12:15 P. M., Church services, First Methodist Church, Rev. J. W. Bergin, pastor; Will Foster, organist.

Monday, May 14

WBAP (Central, 400), 7:15-8:00 P. M., Concert, L. I. Withers, Miss Duncan, and others; 9:30-10:30 P. M., Concert, Saxophone Sextette, Ballinger, Tex.

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H. M. Morris, 417 Western Mutual Life Building, Los Angeles
Telephone 12011

58
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Vol. V Chicago, Saturday, May 12, 1923 No. 5

Public Health Service Aids Seamen

Wide Range of Ailments Prescribed Via the Air
ONLY a year ago the U. S. Public Health Service announced that it had completed arrangements to expand the medical aid service to American seamen by prescribing by Radio for any sailor who might be taken ill at sea and to make application for aid.

The range of diseases and mishaps for which aid has been evoked during the first year has been amazing. The list includes many of the common ailments. Many of the diagnoses were made on board ship because sailors are resourceful in meeting emergencies.

When the patient grows better and the captain's apprehension is relieved the case usually drops from observation. Weeks afterwards, perhaps, the interested hospital receives direct information as to what occurred later. All in all Radio has been pushing ahead in lines little known to those who just listen in for entertainment.

High School Instruction by Air

Possibilities Suggested as a Result of Experiment
WHAT are the possibilities of the Radio in school teaching? Is it going to be feasible to select the best teachers and have them broadcast their instruction throughout the city and country? We have correspondent courses of all kinds and as impersonal as they are, since they lack contact with the instructor, they are very successful and are being extended. A Radio course now comes within the realm of a possibility.

No doubt high school examinations will be the first thing to be broadcast. It will give thousands of students the benefit of a single lecture. Just picture the superintendent of the future sitting at his office desk listening in upon the recitations or tests.

Recently as an experiment a test was made in a high school where the instructor broadcast his lesson from a broadcasting station to the class room. The officials at the Board of Education were listening in all the time. The experiment was a success.

Standardization Needed

Efficiency and Appearance Should be Considered
THE time has arrived to take stock again and to ascertain what standards are good, what standards are unsatisfactory, and what additional ones will be required to bring Radio up to date. Where potent reasons stand in the way of standardization it is well to consider the desirability of making such concessions on the part of the patent owners as may be necessary to the mutual advantage of the public, the manufacturer, and the military.

It is not necessary that the various manufacturers approve a standard in efficiency and appearance of equipment, or improvements to aid in salesmanship, but it is highly desirable that standardization be required as regards interchangeability of accessories and moving parts to a certain degree, and above all that a standard of quality be adopted so that the service will not be a laughing stock to the detriment of the trade and the interest of the nation.

Summer Reception

Slight Changes Are Needed for Summer Outfits
ALL that is said about static does not dampen the ardor for the out-of-door enthusiast who has become a Radiophan during the past winter. Indications of an active summer with the ether waves are quite evident. Information gleaned from last summer's operation of sets then available has been used to devise outfits that are far ahead of the 1922 model in scope and efficiency.

There will be a greater number of portable sets with super-regenerative characteristics. In this class fall the Armstrong and the Flewelling. These sets are compact, they admit of a certain amount of rough handling, and they do receive if properly assembled and tuned up. Furthermore, they operate on a small collapsible loop with or without ground or with neither antenna or ground. Such sets are ideal for the hobo vacationer.

Another change will be noted in the sets arranged for the permanent camp. While multi-stage amplifiers will magnify the music to an amount loud enough for dancing it is probable that these camp sets will be equipped with more phones and fewer loud speakers. Audio frequency amplifies the stray sounds more than the desired sounds, hence for pure tones the set using phones and less amplification will be preferred.

RADIO INDI-GEST

LEM STEBBINS SWOONS AS HE TUNES IN RADIOKNUT'S EPISTLE BULLETIN

As this issue goes to press Mr. Stebbins has just regained consciousness and has been heard to murmur, "I'll bet he was kiddin'."

By Pisces Parvum

Squedunk, Minn.—Lem Stebbins, inventor, agriculturist, postmaster and local constable, is now confined at the local Quick Service (Veterinary) Hospital suffering from a severe attack of brain fever complicated with static.

Mr. Stebbins was found on the steps of the post office last Monday morning when Judge Tibbitts called for his mail. A letter, was found clasped in his right hand and it was necessary to amputate three fingers to remove it. This letter which is believed to be the cause of the entire trouble was as follows:

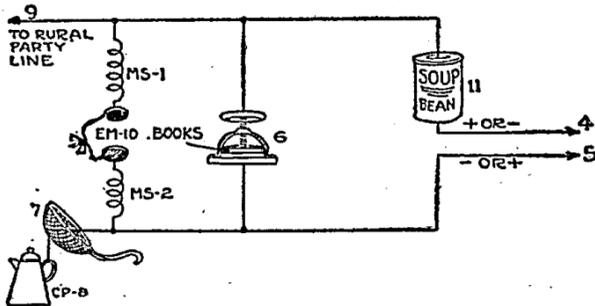
CENTRAL HOSPITAL FOR
HARMLESS INSANE
Sophopolis, Ind., 456, Padded Lane.

Mr. Stebbins:

It is with great pleasure that I take this method of letting you know that I am a thorough convert to the use of your hook-up. I rigged it up last night in my quarters and had hardly had it in operation for over five minutes until I got supper, in addition I got several other things which space and modesty forbids me to mention.

Yours radiofrantically,
Sliphen Burst.

The Stebbins' Sooper Degenerative



Key to Parts and Connections

MS-1, Marcelled coil; MS-2, Waterwave coil; 3, Nothing; 4 and 5, Connections to 110 or 1 1/2 volt D. C. generator that has A. C. output; 6, Letter-press type condenser; 7, Strainer to keep out static and coffee; 8, Coffee pot for grounds; 9, Connection to rural party line; 10, Pair of D. C. C. ear muffs; 11, Campbell or Van Camp Sooper Detector.

(Due to Lem Stebbins' touch of static we have to disappoint you by only running the drawing of his circuit.—Indt.)

QUESTIONS AND ANSWERS

Dear Indigest: I am still in the crystal set category but anxious to learn, and seeing the letter from Alagonquin Tonsils III, in No. 3 Vol. 5, am deeply interested. Will you please advise if it is necessary to use a gas pipe antenna in order to receive the illegitimate from the American Rum Running League? Also, where should I attach a fauset in the thing? Would it be O. K. to shunt a spigot across the phones, or does this go in the ground pipe? —Malt St., St. Louis.

A—We are at present experimenting but have not tuned in a thing. We don't think they are broadcasting but have heard rumor they intend to observe dry night Mondays. As to hook-up would suggest a bung starter (can be obtained from any local antique store) in place of the tickler coil.

Dear Indigest:—I would like to ask one question of your Q. & A. department. I have made a crystal set of the resistance tuned type also adding the Flewelling principle but I can not get my crystal to oscillate in the proper manner. Could you tell me my trouble. Yours truly, —Radio Bunk.

A.—We recommend you try the Stebbins Sooper Degenerative. Shake well before using.

Hen, You Move Us to Tears

Sir: This is to compliment you on your most excellent column, and your removal of the rest of the paper one column to the right of you. In the words of Henry Ford, "Sic Semper Tyrannus, Nox Vomica, Acetanilide, FOB Detroit." Were it possible for you to put aside your humble modesty for one moment and publish my effusion, I would be exuberantly flattered by having my contribution accepted for the first time out of forty-two attempts. —Henry the Ninth.

We Threw Ours Away the Night of Pagliacci

Dear Sir—Hurrah, Hurrah! They've gone an' did it themselves. We thot for a long time we would have to do it. Then we decided we would attempt pacific persuasion to tell them to do it. Finally we decided we would have to throw our set away 'cause they wouldn't do it, and now—THEY'VE DID IT! Hurrah! What's that? You don't know? The Am. Sy. of So-Called Authors, etc., have took jazz off the air. Wheeee! —Operry Orville.

Al's Versatile—He Can Draw 'Em Any Old Way

Dear Indigest: In Al Brown's cartoon, page 10, May 5, I see the bird has on a black vest in the first picture. In the third picture it is striped and in the last it is GRAY. Canyu beat it? —Voice of the West.

ALL PARTS COMPLETE FOR THE "SOOPER CIRCUIT"

Invented by Lem Stebbins

One Campbell Sooper detect., 1 letter press (U. S. Type), 1 pr. Ear Muffs, 1 Coffee Pot (inc. extra grounds), 1 w. w. coil, 1 marcelled coil, 1 strainer (large or small), 10 ft. pink ribbon for connecting circuit, and IN-DIGEST book on hook up. All \$19.99

CYCLONE LOUD SPEAKER CORP.

(Of America)

11111 1st St., Benzine, Mont. (Postage Pd. West of Pacific)

A Few New Sweet Tunes for His Ears



Condensed

By DIELECTRIC

If the broadcasters adhere to the new schedule provided to eliminate much of the interference that has almost ruined Radio entertaining we should be able to pick and choose from among the many stations sending out varied programs. The results of the recent conference bid fair to boost broadcasting to a new high level and to encourage those hesitant ones to invest in a receiving set. DX fans will benefit greatly by the new ruling.

The popular movie star "Dug" Fairbanks gave permission to Station KPO in San Francisco to broadcast a complete "Robin Hood" program. "Dug" owns the rights to this play and evidently was unafraid of reducing the gate receipts by so doing. WJZ has on several occasions been used to broadcast acts of plays direct from the theaters and so far as I am able to learn the attendance at these houses was subsequently as large, if not larger, than before listeners in were invited.

We called attention to the use of Radio in detecting latent power of hearing in those supposedly mutes, and now your attention is called to the remarkable results obtained by Dr. Winslow, a New York specialist, who is accomplishing great things with the aid of Radio in restoring hearing to the partially deaf. He hopes to be able to put aside his surgical instruments and effect cures with Radio alone. More and more is the practical phase of this science emphasized.

The experiment made from station WGR in Buffalo, N. Y., whereby an airplane was directed by broadcast instructions points to a new field for using receiving sets. It proves the practical asset Radiophony may be to those engaged in flying either for pleasure or profit. Upon reaching rather high altitudes the reception was poor, but this feature is being investigated by Radio experts. Advice may be given as to location, landing conditions, etc., which would be quite a help.

We in this country have been enjoying our Radio concerts while speeding along in railway trains and the novelty of the thing has worn off to some extent. In Canada, however, the first such experience was had quite recently when the Winnipeg-Vancouver train reported hearing concerts from several States of the Union besides Canadian stations. The Canadian Pacific railway company has the honor of first successfully receiving broadcasting on board its express train.

Radio has been made a part of hospital equipment in several instances. One of the latest to be recorded is that at the Fordham Hospital in New York City. A man was brought there for an operation which permitted of administering a local anaesthetic. While the four surgeons were engrossed in their work, the patient was noticeably enjoying some jokes that came through the headset provided for his amusement. Both the operation and the Radio reception were entirely successful.

It is evident that the proposal to install receiving sets in hospitals for the entertainment of the patients, and in quarters occupied by ex-service men, is receiving increased attention. The men who fought in the World War and are now in the Boise Barracks are enjoying the use of a five hundred dollar set presented to them by the War Mothers of Idaho. Better follow suit, if you have not already done so. You will be more than repaid by the genuine appreciation shown by these men.

Another huge transmitting plant is in course of construction near Miami, Fla., which it is estimated will be the second largest in the United States. It is being built by the Tropical Radio Telegraph Company for the purpose of handling South American, Central American and West Indian business at a cost of about two hundred thousand dollars. Not so long ago there were sceptics who scoffed at the idea of Radio being used extensively for commercial purposes. How about this?

First Steps for Beginners in Radio

Chapter II—Radio Waves and Their Propagation.

By Thomas W. Benson, A. M. I. R. E.

THE USUAL practise of using waves on the surface of water as an analogy in describing the action of Radio waves has nothing to recommend it but its simplicity. As a matter of fact it may lead to erroneous belief for several reasons. Radio waves travel through the mass of ether, if we may call it a mass, and not on the surface as the water analogy would indicate.

Substance in Which Radio Waves Travel

In order that the Radio waves may travel we must assume that a certain medium exists in which they may move. Since they travel freely through all known matter that is not a conductor in the usual sense of the word and pass through a vacuum where physical matter is absent we must then assume the existence of some subtle substance permeating all matter and extending to the uttermost end of space. This substance we term ether and its existence is generally accepted by science and used to explain many and varied phenomena in the fields of light and electricity.

Ether possesses great elasticity, has no

BEGINNERS will find the accompanying series by Mr. Benson very helpful in learning the rudiments of the popular science of Radiophony. The first chapter of his series appeared in the May 5 issue. The articles yet to appear are:

- Chapter III—Pointers about Aerials and Grounds.
- Chapter IV—About Condensers and Inductances.
- Chapter V—Tuners and How to Tune Your Set.
- Chapter VI—About Crystal Detectors.
- Chapter VII—Tube Detector Theory and Operation.
- Chapter VIII—The Regenerative Detector.
- Chapter IX—Radio Frequency Amplification.
- Chapter X—Audio Frequency Amplification.
- Chapter XI—How Super Regeneration is Accomplished.
- Chapter XII—Reflex Circuit Operation.
- Chapter XIII—About Headsets and Loud Speakers.
- Chapter XIV—Batteries Used in Radiophony.

constantly widening circle. It should be remembered that it is only the change in the lines of force that creates the wave. The waves increase in height as they

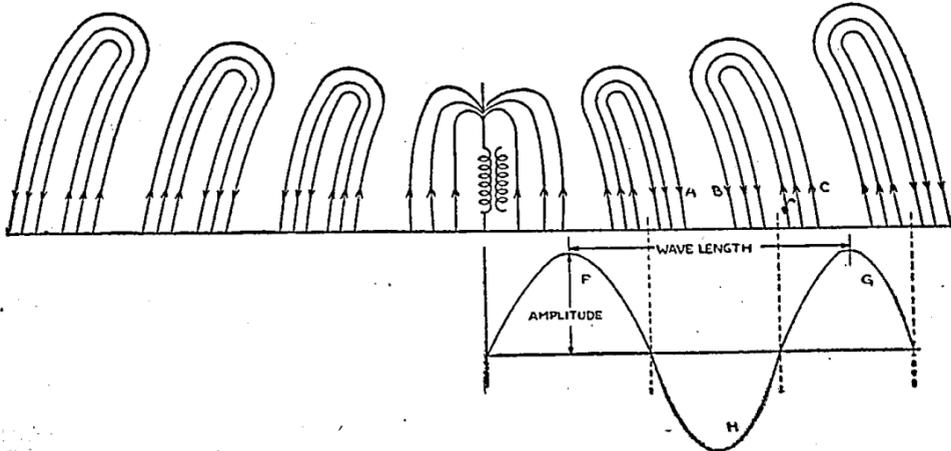


Figure 3—How the waves are snapped off from the transmitting aerial

inertia and exists in and around all matter. This is the medium through which the electromagnetic and electrostatic waves known as Radio waves travel.

When the ether is put under electrical stress at any point and the stress released a wave motion is created in the ether that travels in all directions in an expanding circle. This action takes place in the manner shown in Figure 3.

Waves Thrown Out From Aerial

Consider the aerial as shown, coupled inductively to a primary circuit excited

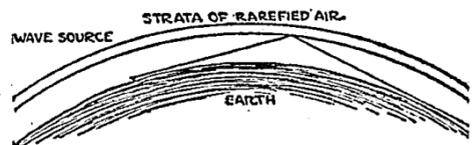


Figure 4—The waves are reflected by upper conducting strata of atmosphere

with a high frequency current. The aerial is then charged alternately positively and negatively. At the instant the aerial is charged positive the condition shown in the illustration exists. There is an electrostatic field extending from the elevated wires to the ground. When the polarity changes the ends of the lines of force run down the aerial and a wave is snapped off that travels in all directions away from the aerial in a

travel, following the surface of the earth.

These waves travel at the speed of light, that is 185,000 miles per second and result in the ether in all directions, being put under electrical stress in a vertical direction at equal distances. This may be clearer by observing the arrows marked on the waves. At A the stress is down, at B up, C down and so on. We can represent this stress by a curve as shown below where F and G may represent positive halves and H negative halves of the waves. When undamped waves are emitted the intensity of the electrical strain in each succeeding waves is the same, hence the amplitude is constant.

The Wave Length

The wave length of the wave is that distance between points where the strain is in the same direction. The wave length is then equal to the distance between humps in the wave as shown.

Bearing this in mind it is evident that the closer the waves are the shorter the wave length. Since the speed of the wave is constant they follow each other closer as the frequency of the exciting current increases. This should clearly demonstrate the relation between frequency and wave length. For instance, where a station is transmitting on a 400 meter wave length, and knowing that the waves travel with the speed of light being 300,000,000 meters per second, we can readily realize at the end of one second the first wave would have traveled that distance and the waves between would be spaced 400 meters apart. Since one wave is emitted per cycle the frequency of the exciting circuit is equal to the total distance 300,000,000 meters divided by 400 meters or 750,000 cycles per second. Conversely, the wave length can be determined by dividing the frequency in cycles per second into the distance traveled by a wave in one second.

Magnetic Field of the Wave

In addition to the electrostatic strain or rather because of it there is a magnetic field in each wave parallel to the surface

of the earth. This magnetic field is equal to and identical with the electrostatic field and one cannot be emitted without the other.

As the waves travel over the surface of the earth there are several conditions acting to hinder and others to assist in their propagation. The ideal medium for their transference would be a perfect insulator for there would then be no absorption. However, they must pass through the air, and as this substance is not always a perfect insulator, due to the presence of moisture and dust which act to absorb some of the energy and dissipate it in heat, it weakens the wave. On the other hand the propagation is assisted by having a good conductor as a guide, which is naturally the earth.

Where the conductivity of the earth

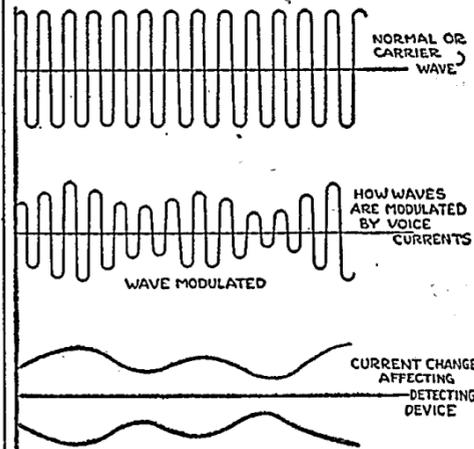


Figure 5—Current changes affecting the detecting Device

is low the waves are also hindered and energy absorbed in overcoming this resistance. This accounts for the fact that the range of a given set is much greater over water than land. Furthermore the upper strata of the atmosphere are much rarified and hence more conducting than the denser air near the earth's surface.

(Continued on page 16)

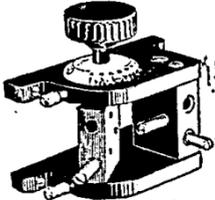
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By placing this Resistance Unit in the Rheostat circuit, regular 6 ohm Rheostats will properly operate the new No. 201-A and No. 199 Tubes.

Each Code No. 15-A, 15 ohm, for No. 201-A Tube...50c
Code No. 25-A, 25 ohm, for No. 199 Tube...50c
Write for bulletins on this and other Carter products
CARTER RADIO COMPANY
209 South State Street, Chicago

ADJUSTABLE COIL MOUNTINGS FOR FLEWELLING CIRCUIT

Triple Coil Mounting.....\$5.00 List
Double Coil Mountings..... 3.50 List



A patented feature locks the coil in place and prevents the coil from being thrown out of adjustment once station is tuned in.

Licensed under U. S. De Forest Pat. 1365170
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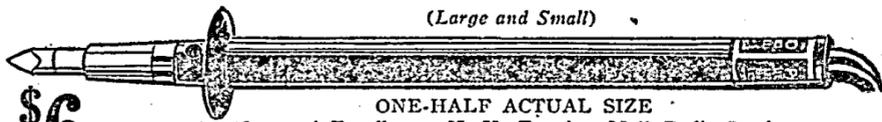
Hear Atlanta On Crystal

We receive programs from Atlanta, Minneapolis, Davenport, Fort Worth, Dallas, Kansas City, St. Louis, Denver on Crystal without batteries. Usual crystal set requires only easy, inexpensive changes. Send stamp for further information or \$1 for copyright drawings and instructions. Everything clearly explained. Satisfaction GUARANTEED.
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THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current
(Large and Small)



\$6 ONE-HALF ACTUAL SIZE
Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute
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POST ELECTRIC COMPANY (Dept. 509), 30 E. 42nd St., New York

Both the manufacturers' and amateurs' problems on all fine work are readily solved by the instrument constructed for this particular purpose.



"SENIOR" SET

For Distance—For Clearness—For Getting What You Want When You Want It

The MICHIGAN "SENIOR" Regenerative Receiver with Michigan Split Hair Vernier Dial Control is the ONE BEST SET



"JUNIOR" SET

Licensed under Armstrong's U. S. Pat. 1,113,149 and pending Letters Pat. 807,388, representing the highest development of Regeneration, the soul of radio.

Send for Circular describing Michigan "Senior" and "Junior" Receivers and Michigan Radio Accessories.

Factory Branch: 9 South Clinton Street, Chicago, Illinois
H. O. Rugh, Radio Engineer, in charge

MICHIGAN RADIO CORPORATION
GRAND RAPIDS, MICHIGAN

Single Circuit Receiver Easily Tuned

Local Broadcasters Cut Out by Simple Receiver

Most Radio men regard the single circuit receiver as being very inefficient. I have given both the single and the three-circuit hook-up to men who were building

WORKSHOP KINKS? EARN A DOLLAR—

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
123 West Madison St., Chicago, Ill.

their first tube set, and found that the single circuit was best for the beginner, because of the ease in tuning. The signal strength of a single circuit set is greater than a three-circuit set.

Now then we will come to the part that gives us the trouble. After the Radio-phan has the single circuit set in operation for some time he finds that he is bothered with local interference, or in other words when a local broadcasting station is going he cannot hear the distant stations.

The usual way to direct him is to buy two variometers and change his set to a three-circuit tuner. This circuit is more or less complicated to operate and does not give the same results at first that the single circuit set did, and our friend thinks he has been fooled.

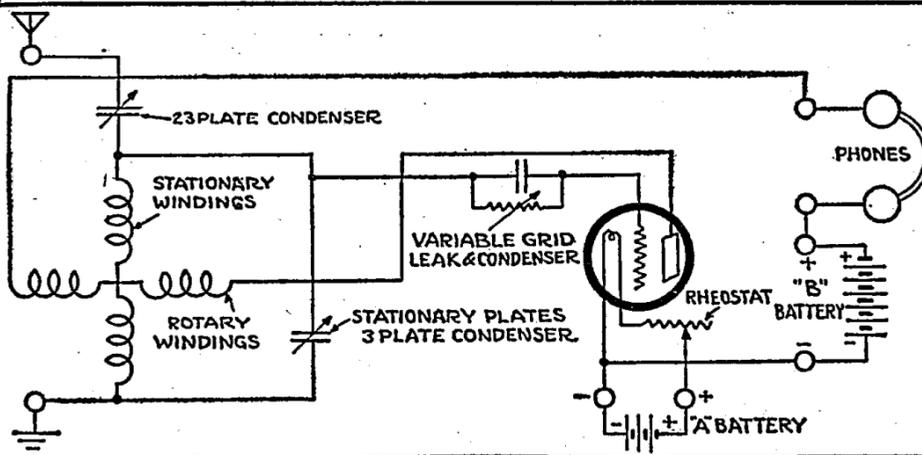
I have had this very thing put up to me ever since broadcasting began and I have found a solution to this problem. With the parts as given in the material list a single circuit set can be built that will be found very selective.

- MATERIAL LIST**
- 1 Moulded variometer
 - 1 23-Plate vernier condenser
 - 1 3-Plate variable condenser
 - 1 Rheostat
 - 1 Tube socket
 - 1 Variable grid condenser
 - 8 Binding posts
 - 1 6x12x $\frac{1}{2}$ Inch formica panel

By referring to the hook-up you will note that the variometer has been disconnected so that the stator windings can be used independent of the rotary windings. The stationary winding forms the main inductance and the rotary winding forms the tickler or feed-back inductance.

The ordinary single circuit hook-up is used except that the 3-plate condenser is connected across the main inductance. The aerial binding post should be connected to the stationary plates of the variable condenser to reduce the capacity effect. If this is done and the variometer is a good moulded one it will not be necessary to shield the panel.

SPLIT VARIOMETER IN CIRCUIT



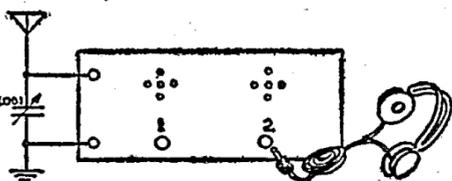
Another important item is the variable grid leak. Be sure and use a good one.

In operating this set tune in some distant station and adjust the B battery and the grid leak until the best results are obtained. After this is done it is only necessary to tune the variable condensers and the variometer, and the grid leak will not need adjustment in tuning, if the music you are listening to does not sound just right tune in another station and see if they are not better, sometimes the trouble is in the broadcasting station and you will only get your set out of adjustment by trying to clear them up.

If these directions are followed out carefully you will find this a wonderful set, so be sure and read the article carefully before building the set.—John H. Boos, Jr., St. Louis, Mo.

Simple Long Wave Set

In the illustration is shown how to make connections in an aerial system for receiving long wave signals.



With this hook-up I can plainly hear NSS. The diagram is self-explanatory.—Fritz Franke, Chicago, Ill.

The Idle Battery

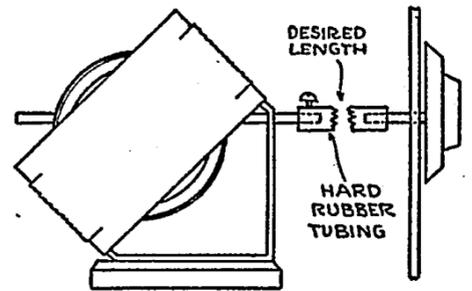
Storage batteries which are to stand idle for a month or two should be fully charged before being put away. If the battery is permitted to stand for any length of time in a discharged condition, the plates will become white, an indication that sulphate is forming, which is very harmful to the cells.

PHANTOM-CIRCUIT

Build Your Own. This marvel of mystery, using no loop, no aerial and no ground, brings in music instead of interference. We have heard stations 950 miles distant on one tube. By using WD-11 tube set can be entirely self contained. Very easy to build from our instructions, use your own spare parts, nothing complicated like radio frequency or super regenerative. Only one tuning control. Complete instructions, with hook-up and photo of circuit mailed to you for 60 cents. Stamps accepted. VESCO RADIO SHOP, Box D-704, Vacaville, Calif.

Rubber Tube in Shaft Shields Variometer

In your March 31st issue under the Question and Answer department you informed Number (2150) HCH, Charleston, W. Va., that there was no practical means of reducing body capacity except by shielding the panel of the receiving set. The accompanying sketch shows the methods employed to eliminate body capacity. The condenser and coupler are set back



from the panel and the shafts are made short with a piece of hard rubber tubing connecting them.—Judson C. Sullivan, Akron, Ohio.

WD 11 Hook-Up positively free of body capacity

also giving selectivity, sensitivity and record distance, postpaid for 25 cents, or complete set of parts for \$13.50.

C. W. KAUTZ

Box No. 362 Lancaster, Pa.

Care of Storage Battery

The following pointers will be helpful in keeping your A battery in proper condition: Do not allow the battery to become completely discharged. Always maintain the level of the electrolyte (acid and water) above the tops of the plates, usually $\frac{1}{4}$ inch. Keep the battery well charged at all times, as it is difficult to revive a dead battery which has been standing idle for a long time.

Do not allow the electrolyte to bubble over on to the tops of the cells. If this happens, reduce the charging rate. Keep the top clean to avoid leakage loss.

Determine the gravity range of your particular battery and keep it within proper limits by frequent tests with a hydrometer.

Spirola BETTER LOUD SPEAKERS \$3.85

TRUE CABINET TYPE, like the finest modern phonographs, with all their beauty and perfect tone. Makes your two-step set a real ENTERTAINER for family and friends. SPIROLA DUPLEX uses any headset. SPIROLA SIMPLEX uses Baldwin or other unit. Either type, black with nicked fittings, \$3.85; mahogany finish with bronzed throat, \$4.85.

At dealers or postpaid (C. O. D. if preferred). Absolutely guaranteed. L. H. DONNELL MFG. COMPANY, Dent, D. Box 70, ANN ARBOR, MICH.

WILLARD

WILLARD RADIO COMPANY
Dept. R. D., 291 Broadway,
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"The Best for Less"

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 .0005 MFD. variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade panel ALREADY DRILLED AS PER DIAGRAM, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit **\$11.00**

Two-Stage Radio Frequency Amplifier—Parts complete in every detail for this Circuit—\$11.00.

CONDENSERS	
3 Plate Variable; value, \$1.75.....	\$1.05
13 Plate Variable; value, \$2.50.....	1.20
23 Plate Variable; value, \$3.50.....	1.35
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Honeycomb Coils, 50 turns mounted, \$0.95
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Double Coil Mountings..... 2.45
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VARIOCOUPLER—Celeron Condensite and Litz Wire Wound Secondary; Value \$4.50. Special \$2.95

AUDIO FREQUENCY TRANSFORMER—Designed for use with W. D. 11 Tubes, list, \$4.50; price \$2.75

BALL BEARING INDUCTANCE SWITCH—value 75c. special.....\$0.30

V. T. SOCKETS—Nickel, brass sleeve, composition base value, \$1.00; special at... .50

EXTRA SPECIAL—Telephone 3000 Ohms Headsets; \$9.00 value; reduced to.....\$3.50

ALUMINUM LOUD SPEAKING HORN—Nickel plated, highly polished; \$8.00 list.....\$3.75

A BEAUTIFUL "SALRITE" PENCIL FREE

With every order of \$12.50 or more. Made of beautiful Mahogany Rubber, about five inches long. Equipped with vest pocket clip, 10 extra leads and eraser. Will write like a charm and last a lifetime. Only a limited supply available—so rush your order now.

BEST QUALITY JACKS, Single Circuit; value, 65c; special at.....	.30
Double Circuit; value, 90c; special at.....	.45
MULTIPLE POINT INDUCTANCE SWITCH with Knob and Dial (15 switch points)....	1.75
LIGHTNING ARRESTERS approved by underwriters.....	\$0.90
THREE-INCH DIALS—Unbreakable—heat resisting composition—high finish; special.....	\$0.30
TWO-INCH DIALS—Same design—for rheostats and potentiometer; special at.....	\$0.25
FILAMENT RHEOSTAT—Condensite base; value, \$1.10; special at.....	.70
FILAMENT RHEOSTAT with 2 1/2" dial; value, \$1.50; special at.....	.85
TELEPHONE PLUGS.....	.60
FRESHMAN VARIABLE RESISTANCE LEAK and MICON CONDENSER Combined	.75

REINARTZ CIRCUIT EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD. variable condenser, 1-13-plate .00025 MFD. variable condenser, 3 inductance switches, 16 switch points and nuts, 4 switch stops and nuts, 8 binding posts, 2 3" dials, 1 variable grid leak, 1 .002 MFD. phone condenser, 23 feet bus bar wire, 1 high-grade panel ALREADY DRILLED AS PER DIAGRAM and complete instructions..... **\$10.00**

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R.F. Added to Flewelling Receiver

Two Steps Gives Better Control Over Flivver

Two stages of Radio frequency added to the Flewelling circuit adds greatly to the reception. The accompanying diagram shows the connections. I am using a 23-plate variable condenser in the antenna circuit. The coil has fifty turns of No. 20 double cotton covered wire, tapped at every fifth turn. The potentiometers are 200 ohms each.

Radio frequency is better than audio frequency because it is not so noisy. It gives better control on the Flewelling set. I found that the filament is very critical. I am using 201A tubes, but find that 201, or even WD-11 works about the same. I am only using 201A for battery economy sake.

I would like to try this on two stages of audio frequency, but I am not sure my phones will stand the high signals. I have tried it with one stage of audio frequency and all the phones will do is to rattle.

I found that using the Radio frequency that I can tune in waves that could be just heard on the Flewelling set. I believe that by using this combination and two stages of audio frequency and having a set of phones that will stand the high strain it would be superior to any set or hook-up that has ever been made.—Joe Stickler, Mt. Carmel, Ill.

Laying Out the Set

First decide definitely what kind of set is to be built. Purchase the best quality of apparatus, having the electrical characteristics that the particular set requires. Take special care to select parts of good mechanical construction as well.

Lay the instruments on the table, trying different arrangements of the parts until an arrangement is found with symmetrical appearance, and with as short wires to the tuning, grid and plate circuits as can be secured.

When the proper layout is found, a scale laid alongside of the parts will give an approximate idea of the size panel it will be necessary to buy. Try to arrange the parts to fit a standard size panel, which may be purchased at almost any Radio store.

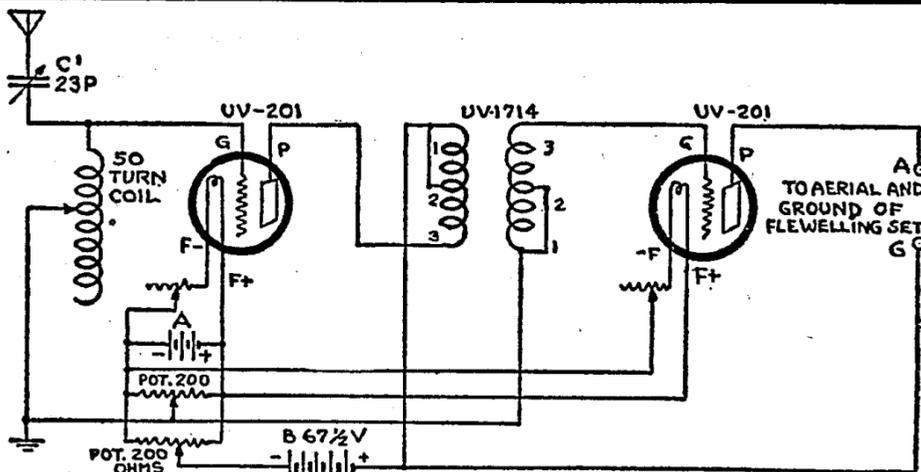
Particular care should be taken in the wiring of the set to keep grid and plate wires separate and away from the filament wires. This will reduce the liability of squealing and broad tuning to a minimum.

The filament circuit may be of almost any length, provided the wires that carry the current are large enough to prevent an excessive drop in voltage. Number 14, or the square bus wire sold for wiring sets, is very good for this purpose.

The output circuit of a two-stage amplifier should never be brought near to the grid circuit of the detector tube, as howling almost inevitably results. More cases of howling amplifiers can be traced to improper placing of the wires than to any other one cause.

In wiring a set don't try to do too many things at once. Start at the input end and work across to the output end. When connecting a set with vacuum tubes, connect

HOOK-UP FOR TWO R. F. STAGE



the filament wires to the sockets and rheostats first, and then follow from input to output circuits.

A grounded copper sheet on the back of the panel where the condenser or variometer is mounted is of considerable value both as a shield against the effects of the operator's hands when tuning, and as a convenient place to solder such wires as need to be grounded. Especial care should be taken to cut out around all screw and shaft holes, or any other places where the metal parts of condensers or other instruments may touch the shield.

Inside Antennae

Remarks about excellent quality of indoor aerials with crystal sets are as frequent as comments upon their efficiency. This difference is, of course, due to the conditions under which the aerials were operated. As a rule, indoor aerials are unsuccessful on the first floor of a building or where surrounding high structures may intercept the waves before they strike the antenna. In suburban locations or in elevated sections of the city considerably better results may be obtained.

Length of Aerial

When the aerial is too long (over 150 feet), wave lengths may be reduced to a better value by putting in a variable condenser in series. For the aerial that is too short (under 75 feet), it is advised to put in either a variable condenser across the antenna inductance, or a loading inductance in series with the antenna to boost the wave length to a higher value.

Door bell wiring often furnishes an excellent antenna for a crystal set, although where a bell-ringing transformer is used the results are not so good. Both terminals of the bell should be tested to obtain the best side of the line.

Voltage of Storage Batteries

Storage batteries, immediately after being charged, have a slightly higher voltage than that which they are rated. Care should be observed in using vacuum tubes when batteries are in this condition. It is best to allow the battery to stand for a time after being charged.

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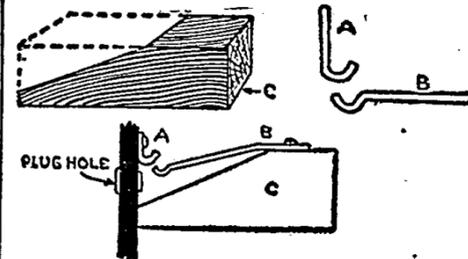
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Open Circuit Jack Made From Wood and Copper

I find that a very good open circuit jack can be made as follows: A block of wood 3/4 inch square and 3 3/4 inches long is cut as shown at C. Procure two small pieces of copper and cut one of them 1/4 by 3/4 inch and the other 3/8 by 1 inch. Bend the first piece as shown at A and the second one as at B. A hole large enough to allow the plug to pass through it is bored in the panel exactly in front of the place where the block of wood is to be nailed.

The strip of copper A is screwed against the panel above the hole so that when the



plug is pushed in it will make a good contact. The strip B is also screwed in place on the block so that the tip of the plug is connected to it. The block is now fastened in place and the jack is completed.—Jesse T. Bonney, Franklin, Va.

Over 3,500 patents relative to Radio have been granted in the United States.

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What Now of the Hazeltine Neutrodyne Circuit?

Latest Addition to Hook-Up Family Presents Possibilities

By H. J. Marx

THE latest development in Radio is the popular craze for new circuits. The rank amateur plays with his apparatus, hooks it up in a slightly different way, hears a station and promptly advertizes that he is the inventor of a new circuit. The Radio publications, hard pressed by a clamoring rank of fans for new stuff, promptly fall and announce that they are going to feature another new wonder circuit.

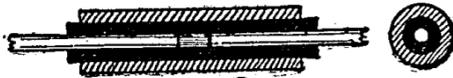
The question of the practicability of these new circuits can only be decided through an actual set-up of the apparatus and a test of operation. Considering the number of these new wonder circuits, the reader can readily conceive the fact that it is not an inexpensive proposition. In doing this, though, the real worth of the circuit is soon disclosed. The simplicity

unit, should be kept as low as possible. Because of this, the peculiar method of winding honeycomb coils was developed and in like manner lattice and spider web coils were placed on the market. This same condition holds true of transformers and even in vacuum tubes, between the three elements because of the dielectric value of the vacuum in the bulb. Even the wiring of the set creates capacity reactions if closely spaced. The actual microfarad value of this capacity effect may be small, but its ultimate effect on the operative efficiency of a receiving circuit is very important.

Professor Hazeltine discovered a method of fighting fire with fire—namely, of applying an external capacity to the circuit from tube to tube which offsets or neutralizes the internal capacity of the coupling.

available, it is a simple matter, but rare is the amateur that can boast of all this.

The method used in manufacturing the Neutrodyne condensers is illustrated in the small insert. There is a small composition tubing of good dielectric value into which there is inserted copper wire at each end—the thickness will be about No. 8 gauge. Over the tube is slipped a



copper sleeve. There is then a condenser capacity between the tube and the wire at each end, but since the wires are not touching or connected, the whole is equivalent to two condensers in series. By pushing the wires in or pulling them further out, a very minute control of a low capacity value is obtained. After the proper value has been reached the wires are held in position and the hole unit sealed. In other words, a permanent variable is not necessary.

A Neutrodyne Hook-up

In the hook-up is given a circuit in which the neutrodyne system has been incorporated. The two condensers marked C-1 are the neutrodynes, the adjustment of which will be detailed later. The circuit consists of two stages of Radio frequency amplification, tube detector and two stages of audio frequency amplification, one of which is reflexed to the first Radio frequency tube. The second stage of audio uses a separate tube, making four tubes in all.

Condensers C-2 should have a capacity of .001 to .002 mfd. Condensers C-3 are variable, with a capacity of .0005 mfd. One rheostat is used for the two Radio frequency tubes, one for the detector and one for the separate audio frequency tube. Depending on the type of tubes used, the plate voltage may require changing.

Adjusting the Neutralizing Capacity

The set is completely set up and tuned in for reception. In adjusting the first

neutralizing condenser the wire to the filament terminal of the socket of the second tube is disconnected. This shuts out the filament current of that tube without removing it from the socket. There will still be sufficient capacity coupling to pass signals through and reception will be heard in the receivers. The first condenser is then adjusted until this reception in the receivers is completely shut off. In this way the capacity coupling has been completely neutralized. The filament wire is connected and the same way is followed for the second condenser and the third tube. After the adjustments are completed these condensers are sealed and should not be further adjusted. But any alteration in the coupling apparatus nullifies the action of the neutralizing condensers. The internal capacity of vacuum tubes of the same type does not vary to any great extent and does not necessarily require new adjustment of the neutrodyne when a tube is changed. A change in the type of tube will, however.

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Green silk on Bakelite Tubes with diagram, \$5.65. REINARTZ ULTRA CIR. SET PARTS, \$29.90 Ultra Reinartz Tuner Unit & Diag., \$5.95, wound to the specifications of March 24 Radio Digest. Ruby Mica-Copper-Bakelite mounted Condensers N. P. binding posts, .00015, 50c; .0015, 60c; .0025, 70c. Reinartz coil Doub. green silk-Bakelite Spider, \$1.65; Reinartz plate circuit chokes (triple adjustable), \$1.70. Complete set Reinartz tuner and detector parts, \$10.95. Tuner, Det. and 2 Stage, \$18.90. Two stage outfit, \$8.95.

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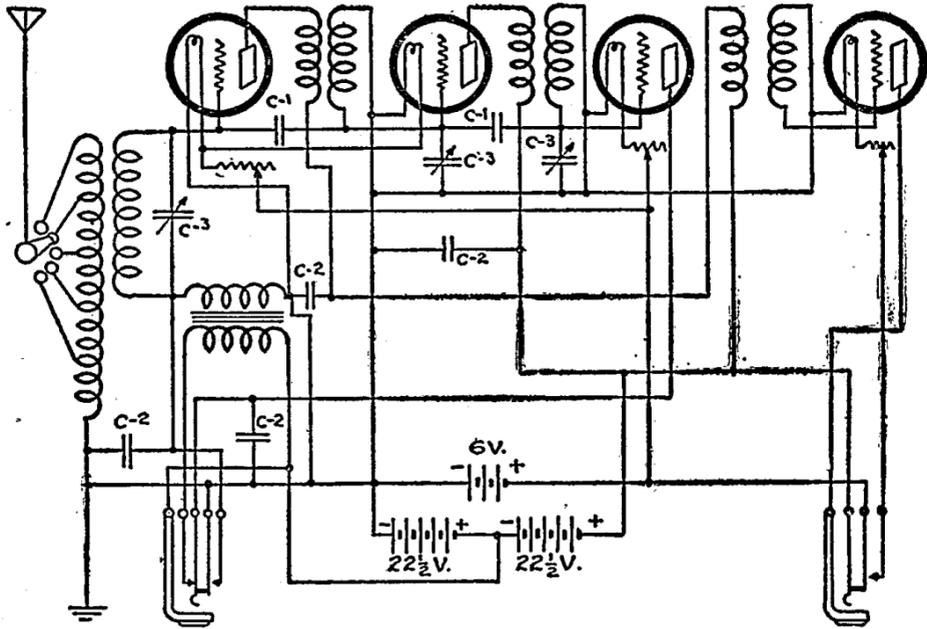
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or difficulty of the hook-up becomes apparent.

There are many circuits that are unusually good and efficient, but perhaps are much too complicated for the average fan to construct; then, too, they are difficult to operate. Sometimes the difficulty may not necessarily be one of construction but rather a question of theoretical balance of the circuits. This last factor is one that the greatest percentage of fans will find it extremely difficult to overcome.

One of the new circuits that is effected by this last factor is the Hazeltine Neutrodyne. The word "circuits" is used but actually it is a misnomer. The Hazeltine Neutrodyne is not a circuit but rather a method of overcoming, through neutralization, the various capacities in the coupling from tube to tube of any multi-tube receiving set.

Theory of Neutralization

Every amateur knows that the internal capacity, due to the condenser action between turns in the windings of any tuning

The values of these neutralizing capacities are so small that they are expressed in units of micro-microfarads. And one million micro-microfarads make one microfarad. Expressed in microfarads the value of the neutralizing capacity runs from .000001 to .00001 microfarad.

It is in this respect that the writer feels that the application of this principle to the average receiving set is a little beyond the ability of the average Radio fan.

The best method of obtaining such low capacity values is by connecting two or more very small condensers in series, then the capacity value of the series becomes—

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}} \text{ (depending on the number in series)}$$

Because of the low value necessary the adjustment becomes exceptionally difficult unless the proper equipment, methods and facilities are available. As a manufacturing proposition, with testing equipment

How to Make a Flewelling Receiver

COMPLETE Blue Prints
for the construction of a Flewelling Receiving Unit and two step amplifier.

Instructions for Assembly
Description of apparatus and accessories and details of tuning.

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RADION PANELS, Stock Sizes, 3/16 in thickness.					
Size—	Black	Mahogany	Size—	Black	Mahogany
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6x10 1/2	1.15	1.40	7x24	3.00	3.70
6x14	1.50	1.85	7x48	6.00	7.40
6x21	2.25	2.75	9x14	2.25	2.75
7x 9	1.15	1.40	10x12	2.15	2.60
7x10	1.25	1.55	12x14	2.85	3.45
7x12	1.50	1.85	12x21	4.25	5.20
7x14	1.75	2.20	14x18	4.25	5.20
7x18	2.25	2.75	20x24	8.50	10.35

Your dealer can usually supply any of the above sizes from stock. If you cannot get it send us your order with the price (give the dealers' name), and we will ship promptly.

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How to Make One Condenser Flivver Super Set

Part II—Construction of Variocoupler

By E. T. Flewelling

IN OUR last article we began a description of how to build the new one condenser Flewelling super set, and started the details of the tuning inductance and tickler coil. Before going on with the constructional details I believe that it would be a very good idea to show some of the advantages that might be expected from the construction of this receiver.

Securing the Best Reception

We are going to describe how to secure the most from the set, and because of the construction we will find ourselves in possession of really two sets instead of one and can then take our choice of the one that we like best, or of the one that best suits our local conditions. Really, what we will describe will be this—a single circuit straight regenerative receiver and the Flewelling super receiver, and we will be able to change from one to the other as we wish, simply by moving one switch, and possibly a slight adjustment of the grid leak.

Such a receiver is wonderfully adapted to local conditions of any kind and will enable one to receive broadcasting of some kind, no matter where one may be located, whether in the woods, an apartment, or an automobile, and too, the builder may be confident of securing very much greater volume than is obtained with a one-tube set, reports of loud speaker operation on local stations are very common.

To builders of this set, the writer promises that he will use every possible effort to describe it, that the most may be obtained from it and it may not be amiss to say here that he uses such a set himself in preference to any other, and that aside from any personal feeling in the matter.

Panel Mounted Apparatus

In this series we are going to use panel mounted apparatus with coils, etc., in the rear, so that if it is desired the completed set may be put into a suitable cabinet. A great many persons do not

The tuning inductance described in our last article, if wound on the 4-inch tubing that was specified, would have a wave

Perhaps the easiest way to take off the tap is to wind to the point where a tap is desired, clean off the insulation at this

when the strip is bent back to go under the bared section again. This gives a tight winding throughout and leaves the bare sections free from the rest of the winding so that we may solder our taps to them without interfering with the rest of the coil. The completed coil would look like the sketch, Figure 1.

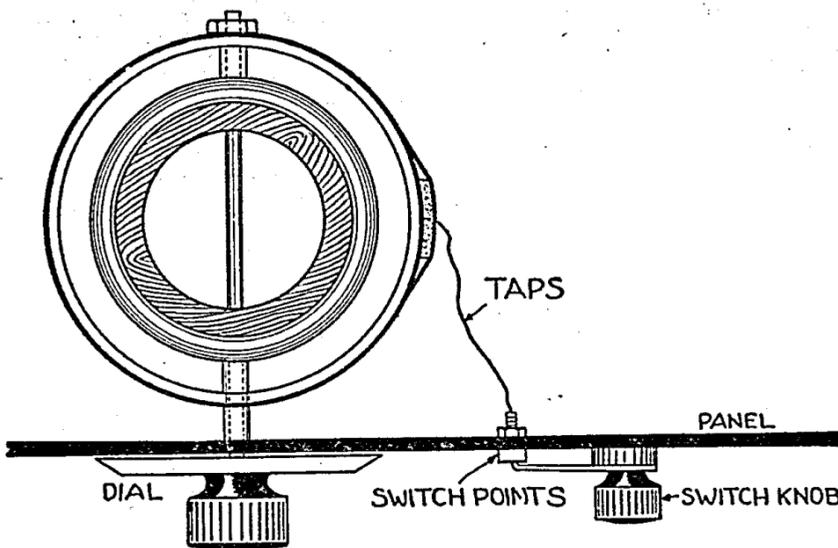


Figure 2

length range of about 300 to 600 meters on the average antenna.

Last week some of the broadcasting stations were re-assigned wave lengths that went as low as 225 meters and in order to reach this point it will be best if taps are taken off of the coil at the 30 and 40 turn points. That will give us the following for the completed coil: 130 turns of No. 22 or No. 24 double-covered wire wound on a cardboard or bakelite tube 4 inches in diameter, with taps taken off at the following points: 30, 40, 50, 75, 100, 115, 130 turns, or a total of 7 taps.

As stated before, no attempt should be

point for 1/2-inch, then lay under the bared section a piece of cardboard one inch by 6 inches long. Continue around the tube until the cardboard strip is met again, bend the strip back out of the way and continue winding until the next tap,

Winding the Rotor

Suitable holes must be drilled into the tube for the mounting of the tickler ball and this detail will be left to the builder of the set. The holes may either be drilled through the sides of the tube or, you can if you wish, mount the ball and its shaft at the end of the tube—it is simply a matter of preference.

The ball should be large enough that it will fit the tube fairly snug and yet not interfere with it. One hundred to 125 turns of wire on the rotor ball will be

(Continued on page 18)

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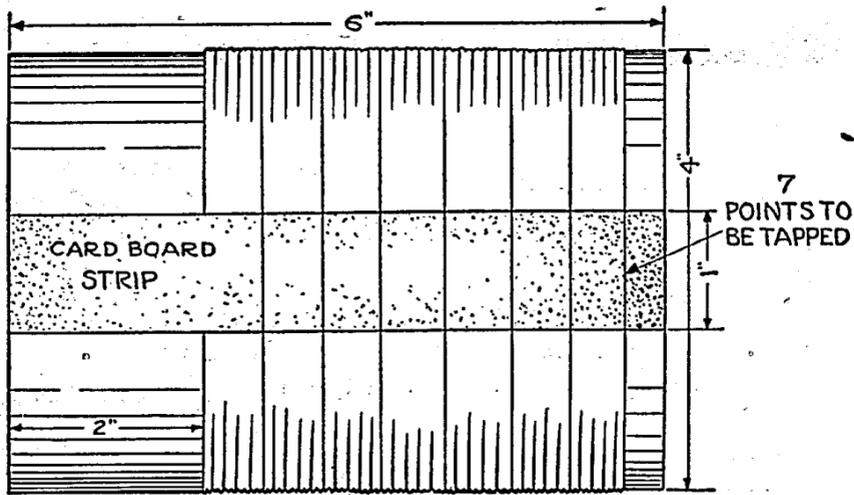


Figure 1

like outside mounted coils and for this reason we began our description of the set by describing how one might build his own self-contained tuning inductance and tickler coil for mounting in the rear of the panel.

This inductance is of the tapped type so that one may choose the required number of turns and therefore differs from the honeycomb coils that were called for in previous articles. Honeycomb coils are very suitable for the circuit, but because of the difficulty of mounting them on the rear of the panel and because of so many who wish to build their own coil and set together with the difficulty that some have in choosing the right size coil to match up with the antenna used, we will use the good old reliable tapped inductance for this particular set.

made to bring out taps from separate turns. A typographical error gave the tap as 85 turns when it should have been 75 turns, which is the preferable point.

Winding on the Coil

The winding may be put on the tube without leaving any opening for the tickler shaft as sufficiently close coupling will be obtained by mounting the tickler ball at one end of the tube, as will be shown.

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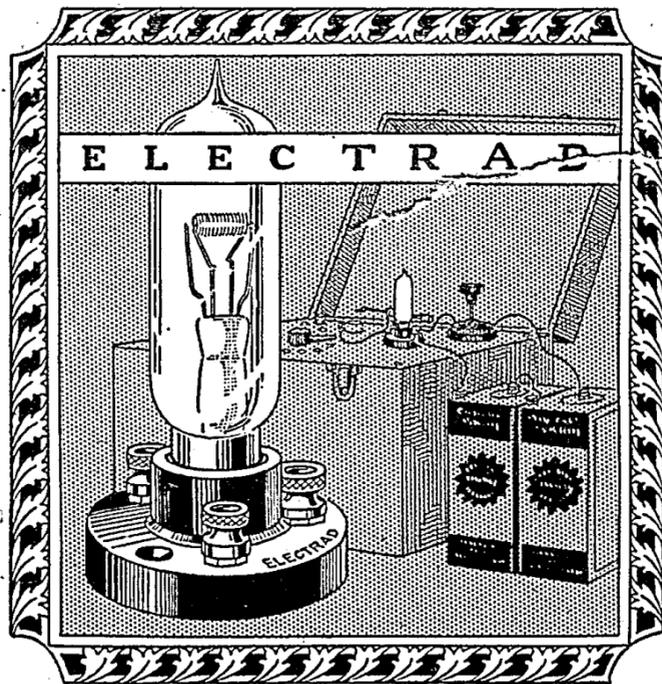
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FIRST STEPS IN RADIO

(Continued from page 11)

At night this strata of rarified air is presumably rather clearly defined and acts as a reflector to reflect the waves back to earth as shown in Figure 4. This accounts for the greater night range of Radio sets. When the sun is shining the upper layers of the atmosphere are ionized or electrified and thus made partially conducting, but since this area of conducting medium is not as clearly defined as at night more or less absorption takes place.

Local Condition Affects Reception

The above are natural conditions existing about the earth, but we have in addition local conditions that affect the reception of Radio waves. As a rule the waves follow rather closely the surface of the earth, but when mountains are reached part of their energy is absorbed resulting in the valley beyond being in a sort of wave shadow that weakens the received signals materially.

In a similar manner large conducting structures such as the metal framework of a building serve to cast shadows, figuratively speaking, that often makes reception difficult if not impossible from certain directions. The waves have no difficulty in passing through masses of matter provided they are good insulators, but when conducting masses are encountered a short circuiting effect takes place that absorbs the energy. The effect of this is to cut a sort of gap in the wave front, but the rest of the wave travels on and closes up the gap again but the total energy in the wave is reduced.

In using a loop aerial the presence of conducting masses in the neighborhood causes distortion of the wave's front and thus gives erroneous directional effects when the loop is used as a compass.

Aerial at Receiving Station

So much for the emission and propagation of the waves. Let us consider how they affect the aerial at the receiving station. In a generator we have a fixed magnetic field through which wires on the armature are rapidly moved, resulting in a current being generated in them. A similar phenomena takes place at a receiving station for Radio waves with the exception that we have a stationary conductor, the aerial, across which the Radio waves with their magnetic field sweep, thus generating a current. At the same time the electrostatic component of the wave induces a current in the aerial to assist that induced by the magnetic field. Since the electrostatic stress reverses in direction with each wave with the magnetic field being likewise reversed, an alternating current is induced in the receiving aerial.

By properly tuning the receiving aerial so that its period of oscillation is the same as the transmitting aerial each succeeding wave will add to the energy in the circuit with an increase of current value to act on the detecting device used. The two aerials are said to be then in resonance and maximum signal strength results.

Waves Modulated

We have considered a simple wave without modulation for the sake of clearness but it is necessary that the waves be modulated or changed in order to transmit signals or speech. In Continuous Wave Telegraphy this is done by simply starting and stopping the waves to form the telegraph code or to throw the transmitting aerial in and out of resonance with the receiver. The frequency of the waves at short wave lengths is too great to be audible, so it is necessary to produce beats in the receiver circuits that they may be audible but this will be covered later on.

In Radio telephony the problem is more difficult. Upon the plain wave emitted at Radio frequency is impressed the audio wave or the variations of the currents from a microphone. The voice wave modulates or clips off the tops of the emitted waves as shown in the illustration, Figure 5. Here we see the voice wave forms a sort of envelope for the waves of higher frequency. However, we cannot hear the individual carrier waves because of their high frequency, but we can detect variations in the amplitude of the waves, which takes place at audible frequencies. In this manner the sound waves affecting the microphone in the transmitting station are carried by the Radio waves and impressed upon the receiving aerial to produce intelligible speech.

(TO BE CONTINUED)

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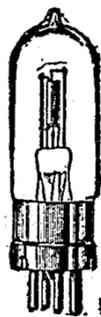
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For Silent Operation

Shield the back of the panel with a thin sheet of metal, solder all connections tightly, make sure that the switch points and arms are not loose, use spaghetti with wires coming from the tops of the vario-

coupler and insert a variable grid leak in the circuit. By this method it is often possible to get rid of most of the unpleasant noises.

Connecting Batteries

When connecting batteries to other Radio units, trouble may be avoided by connecting the wires to the battery last, and then just touch the last wire before making permanent connection. There is always a possibility of having wrong connections.

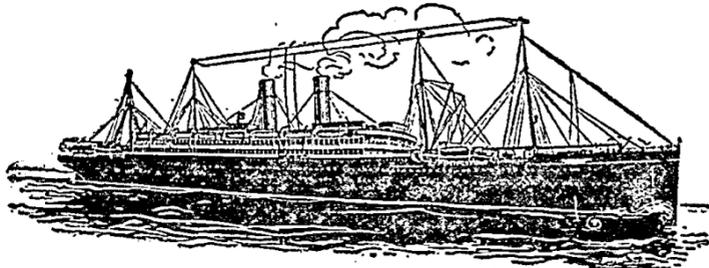
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Making a Three Tube Reflex De Luxe Receiver

Part II—Sub-Panel Layout

By H. J. Marx

NOT only the present but also the prospective popularity of reflex circuits is indicated by the considerable amount of interest that is being shown by Radiophans in the different types of these circuits. Many are the questions that are asked relative to the efficiency of operation and results that can be anticipated. Details are being requested of the many variations that are possible.

Two Classes of Circuits

For review, there are two classes of reflex circuits, one of which covers that form of circuit where each stage of audio frequency is reflexed through the tubes in the same order as the Radio frequency, called the straight reflex, and the other where the audio frequency passes through the tubes in reverse order of the Radio frequency stages, known as the inverse reflex.

A further sub-division can be made on the basis of the types of intertube coupling, such as transformer, resistance, tuned impedance, etc. Of these the transformer coupling has received the most attention. Other types of coupling show promising indications but have not been fully developed for maximum results. One fan asks for an analysis of the Neutrodyne Reflex—this is not a special form of reflex, but rather an application of a method of neutralizing intertube coupling capacity effects. As this will be taken up in an article on the subject no details will be given at this time.

Efficiency of the Reflex

A typical question asked, is "What can one expect from an average working reflex?" Unfortunately a satisfactory an-

swers which always furnish a fine variety of howls and squeals. Who then can figure what can be expected?

What May be Expected in Reflex Circuits

The writer, however, has developed an efficiency percentage of what may be expected in reflex circuits compared to the corresponding stages in a straight circuit:

One tube set—Radio frequency, 75 per cent; audio frequency, 75 per cent.

Two tube set—straight reflex—Radio frequency, 70 per cent; audio frequency, 65 per cent. Inverse reflex—Radio fre-

quency, 75 per cent; audio frequency, 75 per cent. The use of a crystal detector may decrease the volume that may be expected from the detector stage, provided a tube

were used, but it makes up for it in the simplicity of operation and clearness of the reception. The crystal volume then may be considered as 80 per cent of that of the tube. Applying these rules to the Reflex De Luxe the relative efficiency should be that of a good five tube set. Theoretically this hook-up is equivalent to two stages of Radio frequency, detector and three of audio frequency—the summation of the efficiency values gives a relative value of 80 per cent on the whole or equivalent to about five tubes. This has been substantiated by the results obtained with this set. Naturally the various factors affecting the efficiency of all circuits may alter these values considerably.

The Sub-Panel

Since no baseboard was used, it was found necessary to assemble all apparatus on the main panel. This was finally accomplished by means of a sub-panel that was mounted on the ends of the variable condensers by means of brass angles

as shown in Figure 1. Four of these angles were used, two each on each condenser on the right and left side of the main panel. Depending on the condenser construction, this mounting method connects the brass angles in direct electrical circuit

(Continued on page 18)

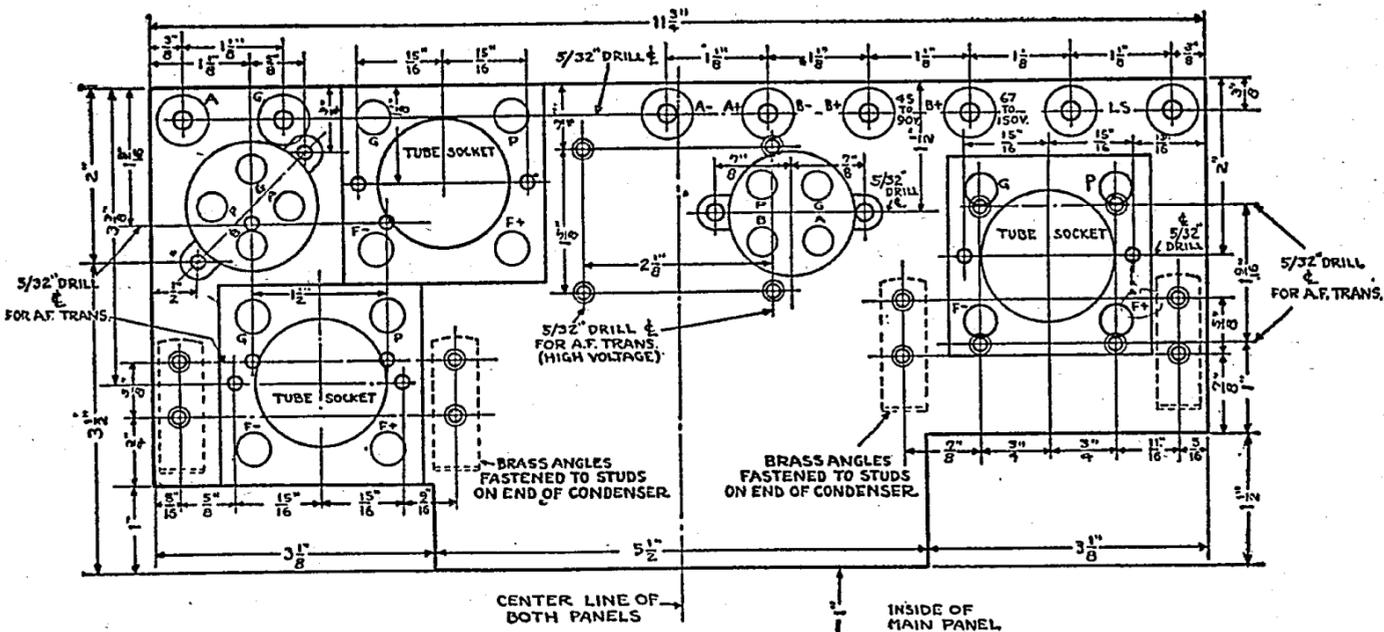


Figure 2

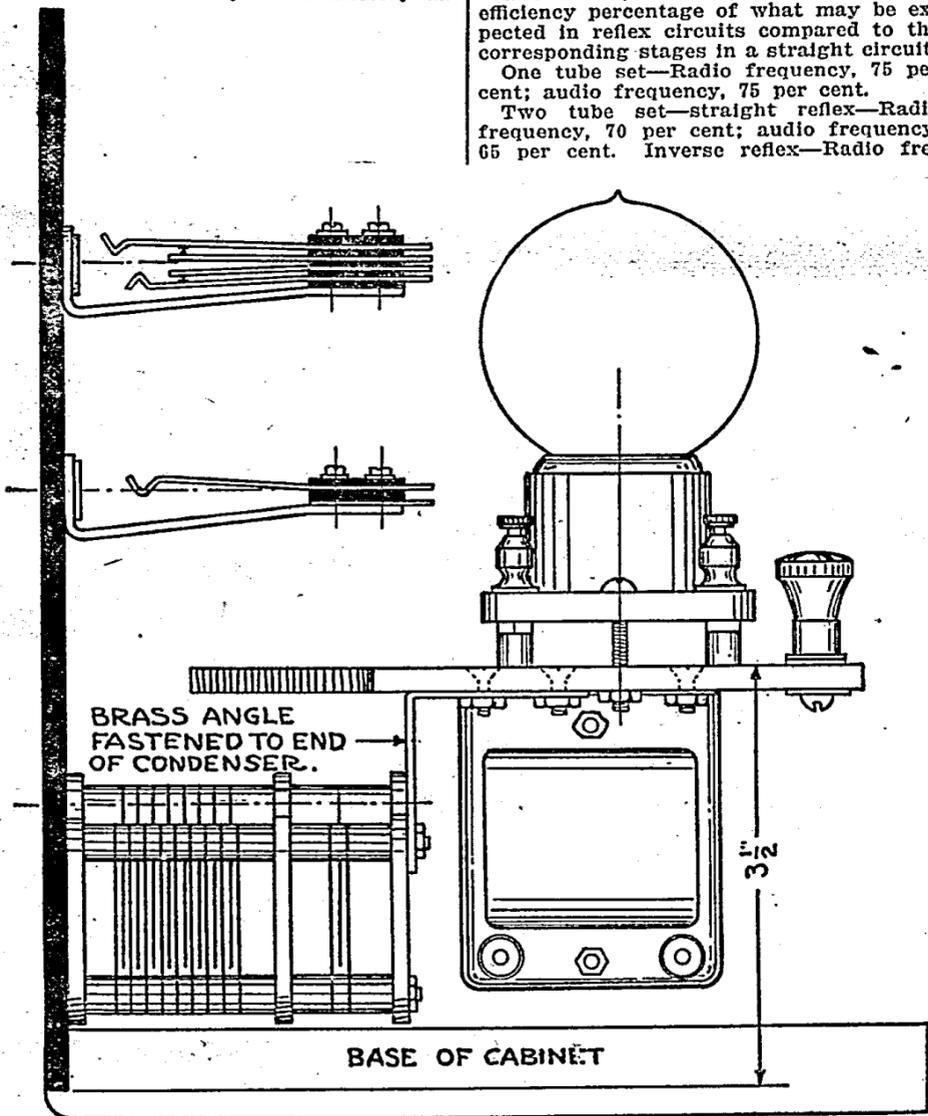


Figure 1

swer is very difficult, not because the operation of reflex circuits is unreliable, but on account of variations found in the efficiency of all apparatus used in Radio. For example, as has been stated before, the efficiency of a reflex circuit depends to a great degree on the vacuum tubes and how the coupling methods match up with the characteristics of the tubes. As an illustration, the impedance value of the average peanut tube is such that it will not operate satisfactorily with the average transformer. Therefore in a reflex circuit this handicap is increased because of the necessary relation of the two transformers to the tube. Then again, even a poor circuit will, in some places, give good results, while in other places, big cities for example, even the best of circuits will often refuse to do anything but the ordinary class of reception. One man may have a wonderfully efficient aerial while the other fellow with a similar set gets nothing on account of a poor antenna. Some fans have the knack of wiring a set up right without inductive reactions between

quency, 75 per cent; audio frequency, 75 per cent.

The use of a crystal detector may decrease the volume that may be expected from the detector stage, provided a tube

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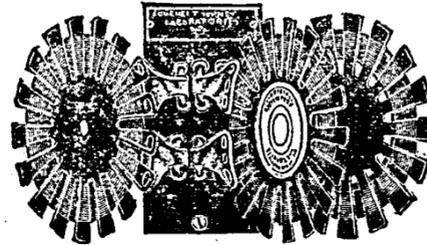
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THREE TUBE REFLEX

(Continued from page 17)

to the fixed plates of the variable condensers. For this reason care should be taken that neither the angles or the brass screws for mounting come in contact with any of the apparatus or wiring, this creating a short circuit. If the holes for the mounting screws are sufficiently countersunk in the sub-panel they will not come in contact with any of the apparatus mounted on the top of the panel.

Sub-Panel Layout

The layout of the sub-panel is shown in Figure 2. It will be noted that the two Radio frequency or reflex transformers are mounted on top with the three tube sockets and the binding posts. The three audio frequency transformers were suspended from the underside of the panel. The center transformer was found long enough to rest on the base of the cabinet when the panel was in place and thus acts as an additional support for the sub-panel.

All holes for mounting suspended apparatus were countersunk sufficiently so that the heads of the screws for mounting were at least 1/8-inch below the surface of the panel.

It might be well to suggest that a number of holes about 1/8-inch in diameter should be drilled in this sub-panel before any mounting is done. These are for passing through the leads for connections between the upper and lower instruments. It will probably be necessary to drill some after the apparatus is in place but some trouble will be saved.

In the next part of this series the details of wiring will be taken up.

(TO BE CONTINUED)

FLIVVER SUPER SET

(Continued from page 15)

found suitable and no absolute number is given because it is not critical and will vary with the ball used and the size of wire, and No. 28 or 30 wire will be found very good. Do not attempt to put as many turns of wire on the ball as you can because you will only defeat your purpose.

We have simply described the ordinary variocoupler with more than the usual number of turns on the rotor and so one can, if they desire, use a standard variocoupler and rewind the rotor ball to meet the requirements of this receiver, that is to the 100 to 125 turns. If more than this number of turns are used, one will encounter trouble when using the set as a straight regenerative set.

The shaft for the rotor should be in

such relation to the taps on the tube that when it is mounted on the panel the taps will be on the side of the tube and not on the back or front in relation to the panel. This point is shown in Figure 2. This results in increased efficiency of the set because of the short taps that it allows us to make.

Connections Should be Short

This point brings us to a very important thing to be considered when any kind of a Radio receiver is being built or designed. That is the very great importance of making all of the connections in the set as short as we possibly can. If we remember this point and do our best to carry it out in our set it will result in our having a receiver that not only looks good and works good, but one in which it is very easy to follow connections, and it will often be found that this last is no small consideration being of especial value in amplifier circuits.

In order that we may start to assemble this set we will take up in our next article the layout of the panel, and why; and I believe that the why of panel layouts will show several things of interest to some of us.

(TO BE CONTINUED)

Stops Singing Noise

If there is a continual singing noise when the amplifiers are used it is caused by the tubes or amplifying transformers being too close together. If available space is limited place the transformers at right angles. It is not advisable to use more than two stages of audio frequency amplification.

At least 50 per cent of the efficiency of a receiving set depends on the skill of the operator who is tuning it.

The Reader's View

Flewelling Set

Just finished a Flewelling set with no other information or directions than that published by your valuable paper and say boy! she sure puts the old crystal set in the shade on the north hill side.

Everything but the WD 11 tube is home-made, including variable Vernier condenser, honeycomb coils and B battery.

Halo Brothers, KPO, of San Francisco are now broadcasting and it sounds just like it was in the same room. Calgary, Alberta and Kansas City (Sweeney Auto School) and Ft. Worth come in like a house-afire and the Portland Oregonian Hoot Owls need a muffler to hold the volume down so that they can be heard. The

Los Angeles Examiner comes in splendid and occasionally Denver.

Am going to assemble the set on a panel and expect to get some real good results then.

There has been a good deal of criticism of the Flewelling in Spokane but that's the builders' fault, not Flewelling's.

Well, I must sign off but want to tell you want the Radio Digest is the best and most up-to-date literature on the art of Radio communication seen in these parts. Good luck to you. I'd sooner miss my meals than the Radio Digest.—Carl Raney, Spokane, Wash.

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Permit me to congratulate you on the innovation in this week's issue—"Advance Broadcast Programs"—that alone is worth more than your subscription price warrants and will be of inestimable benefit to all "phones."—F. W. Sykes, Chicago, Illinois.

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Questions and Answers

Bugbear of Body Capacity.

(2427) ARM, Chicago, Ill.
 Tell me how to get rid of body capacity in the Flewelling set. It is something awful. I have shielded the panel and grounded the shield and, while I get some relief, it is still bad.

While sitting at the instrument things go along well. If I get up on my feet the music is gone and it takes about one minute while standing before it comes in full tone again or if I split my head piece and give one of the phones to my wife I retaining the head piece, it deadens the sound the moment she handles it.

Why can't I get out-of-town signals? I can only use 21 to 45 volts on the plate, more than that seems to deaden the sound. I am using a peanut tube and I notice one newspaper says as a detector use only 20 and one or two amplifying stages use not more than 45 volts. Why? Will it kill the tube or shorten its life?

Can I use 20 volts on detector and 45 volts on a one or two step and will I get better results?

I cannot receive unless I use antenna. My antenna is 100 ft. two wires, 50 each, and about 50 ft. drop to second floor, or 150 ft. in all.

Please tell me about body capacity and voltage on plate using peanut tube. The newspaper says do not use in super circuit.

When it comes to going from KYW to WDAP or between any other local broadcasting outfit the Flivver can't be beat.

A.—Answering your inquiry with reference of Flewelling circuit will advise that the bugbear of body capacity effect which is so pronounced in this, as in all super-regenerative circuits, is engaging the attention of our experts towards a reduction if not a complete elimination. As soon as developments are perfected our readers will promptly be apprised of findings in the matter.

Excessive voltage will shorten the life of the tube of course, but in the case of a WD-11 tube that would mean about one hundred and fifty volts. You can with perfect assurance use sixty-five volts on the plate of a WD-11 tube.

You can use 20 volts on detector and 45 on a one or two step, as suggested, although we would advise high plate potential on all tubes in the Flewelling circuit. WD-11 tubes will function satisfactorily in a super-regenerative circuit.

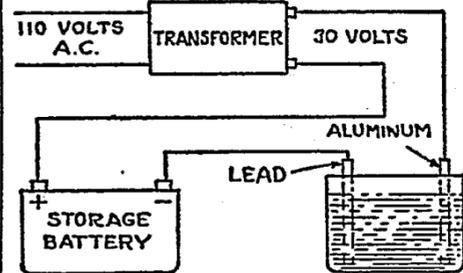
Your antenna construction of two 50-

The Radio Digest Q. & A. Department does not consider it ethical to divulge circuits of manufactured sets. We request that all such inquiries be mailed to the manufacturers.

foot wires does not constitute 100 feet. That must be accomplished in each wire, including lead-in. A single wire of that length is an ideal antenna construction, generally speaking.

Charging Batteries

(3636) DBS, Crawfordsville, Ind.
 Please tell me how to make a rectifier out of a pair of 1,000-ohm telephone ringers. I understand this can be done. If a transformer is used, please tell me what kind.



A.—Experience shows it impractical to make a rectifier from a 1,000-ohm telephone ringer. Theoretically it would work out by connecting the coils to the A. C. current and arranging contacts for the clapper to strike. In practice it will be found that the ringer will stick because the armature is too heavy to keep in step with the alternations of the A. C.

The majority of telephone ringers are tuned to work on about 40 cycles. Hence, 60-cycle current is a little too fast for them.

As a rule the electrolytic rectifier is more practical for home construction, and if not pushed too hard will prove very satisfactory.

A very good arrangement is shown in the accompanying illustration, using a transformer to step down the current to 30 volts. A simple rectifier cell can be made by placing an aluminum and a lead plate in a jar large enough to hold two quarts of water. The solution consists of four tablespoonfuls of baking soda and two tablespoonfuls of vinegar and sufficient water to nearly fill the jar. Connect the rectifier cell in series with the transformer secondary and the battery, the lead plate being connected to the negative lead of the battery. This rectifier will pass four or five amperes, depending on the size of the plates, and keep a battery well charged up. A transformer rated at from 100 to 150 watts should be employed.

Remagnetizing Phones

(2381) WG, Detroit, Mich.

I have a pair of phones of a good make but the magnets are getting very weak with resultant loss of audibility. Can you please tell me if I can remagnetize them myself and how?

A.—Answering your inquiry with reference to remagnetizing phones,—it is, in our opinion, doubtful if you could accomplish it practically. New magnets can

be secured from manufacturer at a reasonable cost and they may be substituted for the present ones. This would be much the better method.

Windmill Tower Aerial

(3446) JAK, Paxton, Ill.

Is it advisable to attach a 120-foot single wire aerial to the top of a 35-foot steel windmill tower? Wire would run north-east and southwest, the southwest end running to the house. If so, how far away should the aerial proper commence? Would placing a long style insulator in the wire running from the tower to the end of the aerial do any good? Is it necessary to have both ends of the aerial the same height from the ground?

A.—Answering your several inquiries, would advise as follows: Construction of aerial from steel tower, as suggested, is all right if wire is properly insulated from the tower. The aerial proper may begin at about three feet from the tower. An incline in aerial will be all right, however; the highest end should be furthest from receiving apparatus for best results. Any standard insulator will serve effectively.

Aerial Masts

(3477) CVH, Cedar Rapids, Ia.

Kindly give me a little information through your Questions and Answers column when convenient. I have two steel masts and eight guy wires on each. None of these are insulated. Should they be insulated?

A.—Answering your inquiry, we are advising that masts used in antenna construction are not necessarily insulated unless used for a transmitting circuit.

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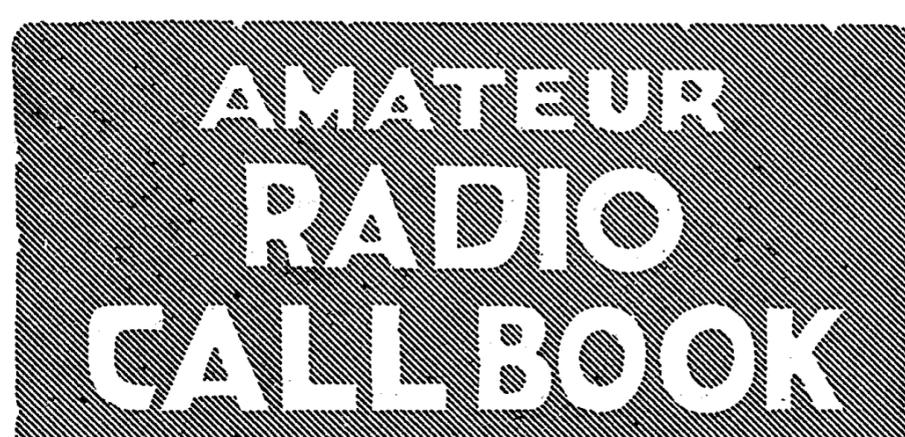
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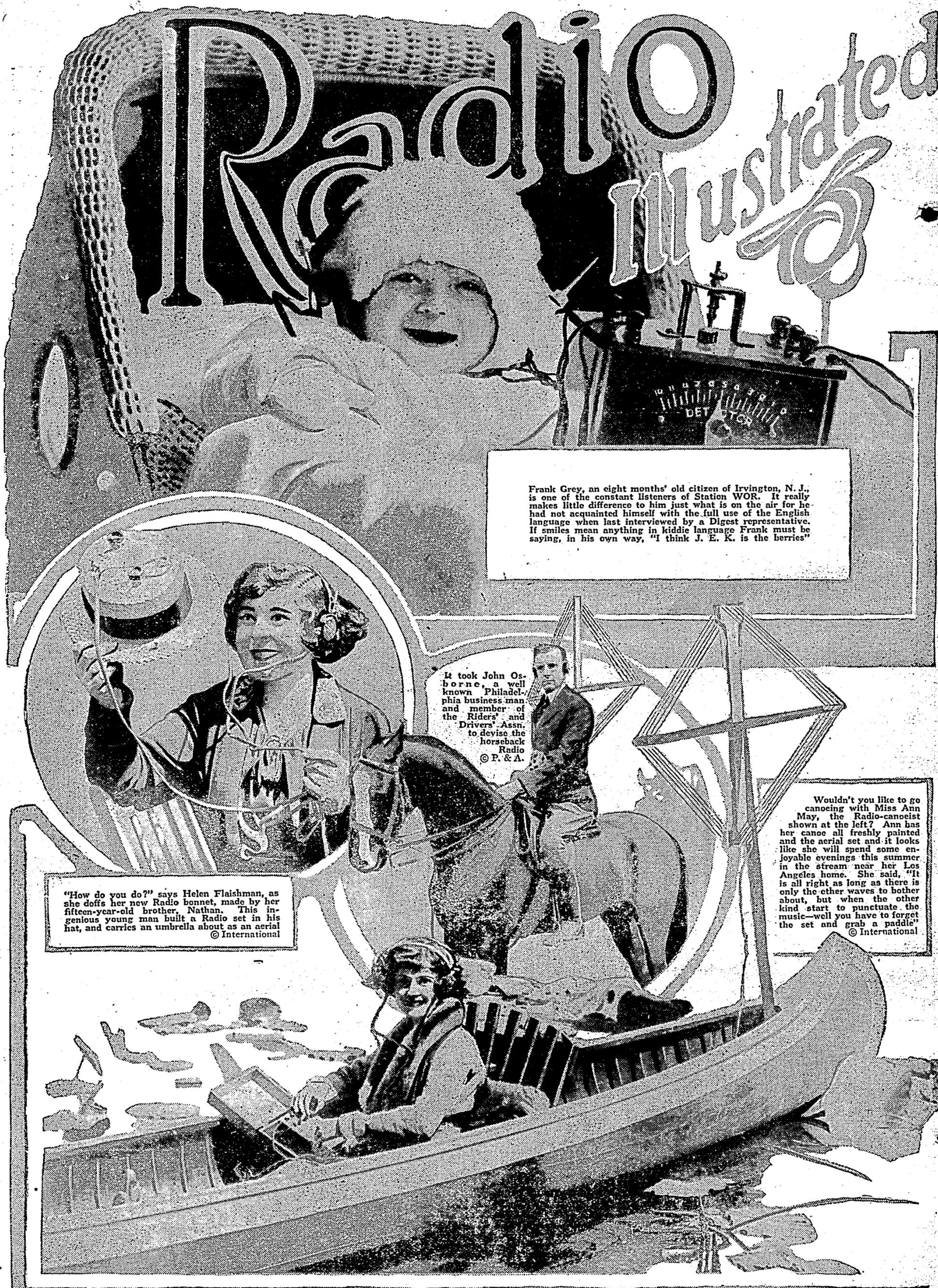
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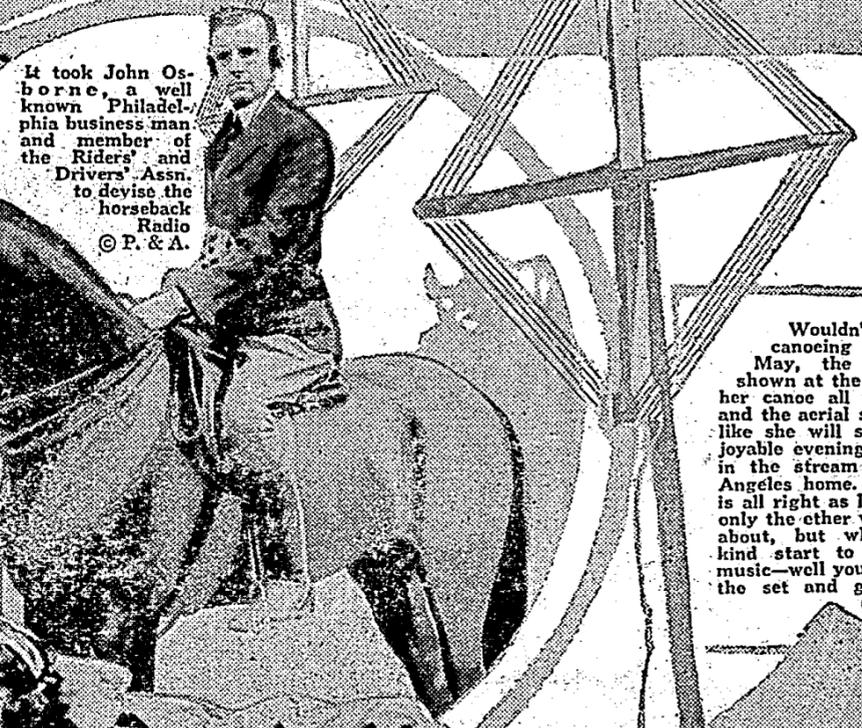
Radio Illustrated



Frank Grey, an eight months' old citizen of Irvington, N. J., is one of the constant listeners of Station WOR. It really makes little difference to him just what is on the air for he had not acquainted himself with the full use of the English language when last interviewed by a Digest representative. If smiles mean anything in kiddie language Frank must be saying, in his own way, "I think J. E. K. is the berries"



"How do you do?" says Helen Flaishman, as she doffs her new Radio bonnet, made by her fifteen-year-old brother, Nathan. This ingenious young man built a Radio set in his hat, and carries an umbrella about as an aerial
© International



It took John Osborne, a well known Philadelphia business man and member of the Riders' and Drivers' Assn. to devise the horseback Radio
© P. & A.

Wouldn't you like to go canoeing with Miss Ann May, the Radio-canoeist shown at the left? Ann has her canoe all freshly painted and the aerial set and it looks like she will spend some enjoyable evenings this summer in the stream near her Los Angeles home. She said, "It is all right as long as there is only the other waves to bother about, but when the other kind start to punctuate the music—we'll you have to forget the set and grab a paddle!"
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