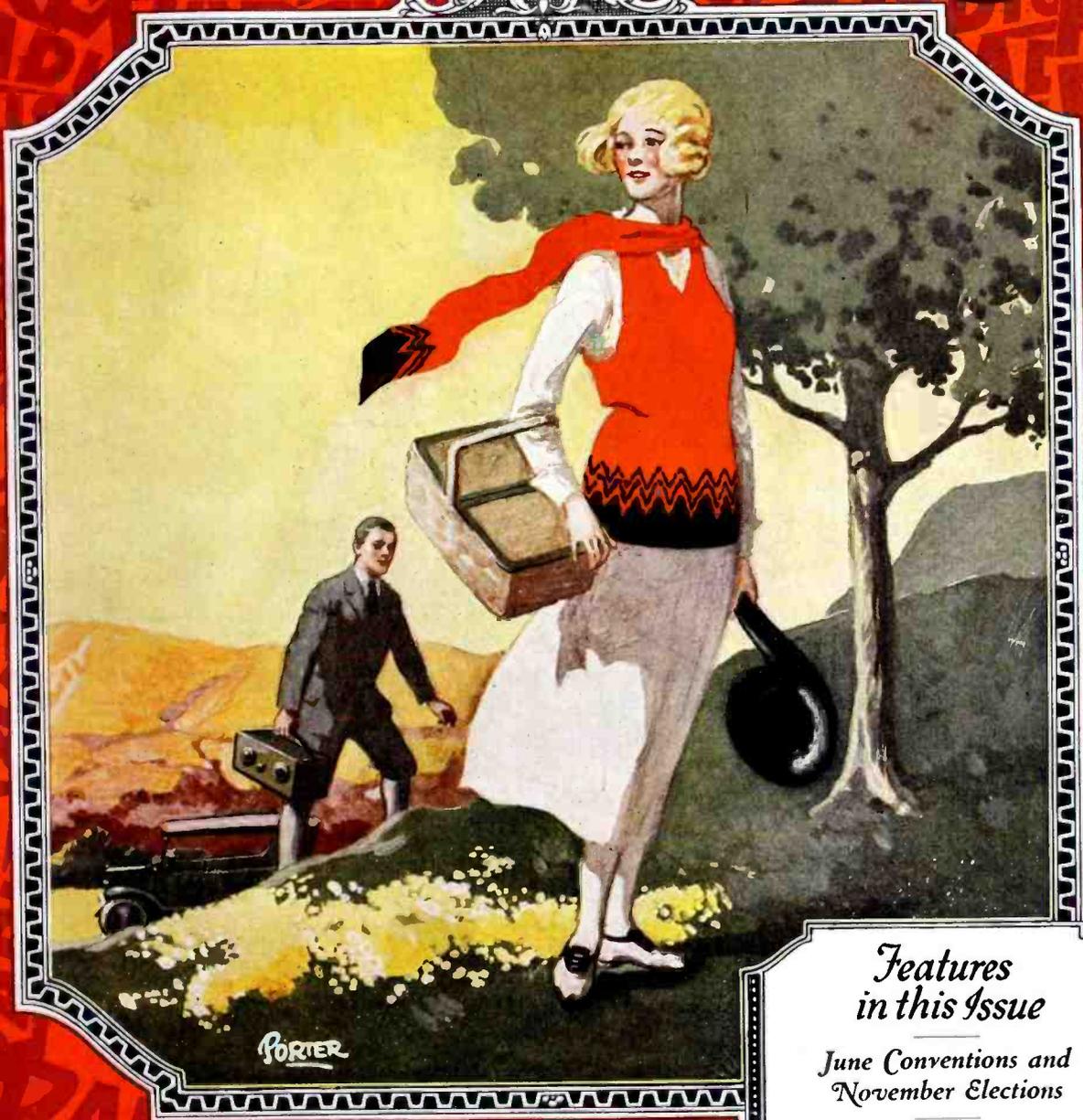


AUGUST 1924

25 CENTS

The Wireless Age

The Radio Magazine



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June Conventions and
November Elections

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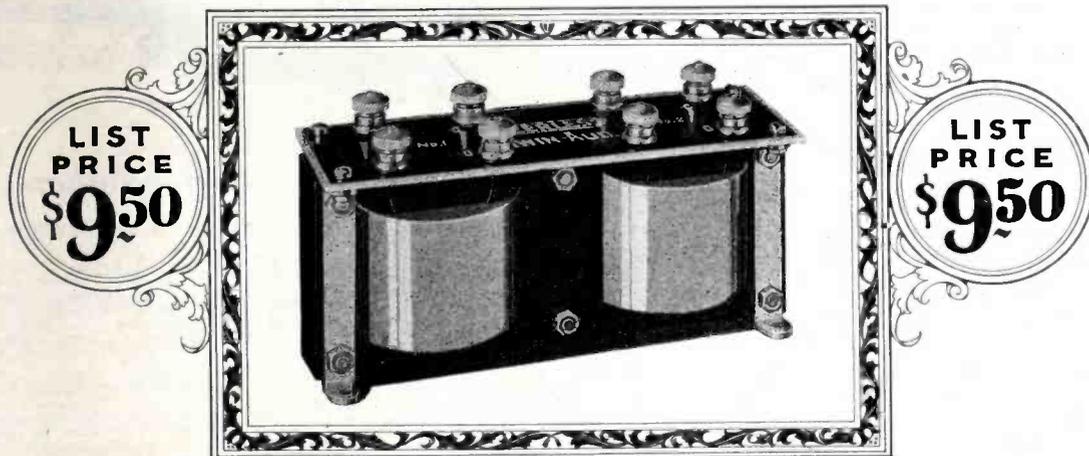
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Vol. XI

No 11.

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Your Authors

REV. HERBERT F. FULTON (To Those Who Attend Church) was born in West Springfield, Mass., January 19, 1889. Following his public school education, he attended Lowell Business Institute and Worcester Business Institute. Later he studied for the ministry at Boston University. Since then he has held pastorates at Oxford, Leicester, Upton, and Hampden. Rev. Fulton is special correspondent for *The Springfield Union*, and has written articles on rural life for *The Union*. At Boston University he specialized in "Rural Sociology and Psychology."

MR. STUART HYDE HAWKINS (Moose and Music in Maine) graduated from high school, then enlisted for the war. During his service he was chosen for the U. S. Naval Academy at Annapolis where he studied for three and a half years. The close of the war somewhat changed his outlook on life. It was his natural desire to write, and since the war released him from military obligations, he gave up the sword for a pen and served his apprenticeship on various New England newspapers. Later he studied art in New York. Accepting the publicity position at Broadcast Central (WJZ) he rapidly gained recognition. Mr. Hawkins has since contributed many articles and stories to well known publications.

MR. MAURICE BUCHBINDER (Wavemeter Calibration) is a graduate of the College of the City of New York. He studied radio under Dr. A. N. Goldsmith. From 1917 to 1920 he was in the Navy Department, Philadelphia, supervising destroyer radio installations. He was Maintenance Engineer for the International Radio Telegraph Company from 1920 to 1921. Since then he has been engaged at Columbia University with activities including dentistry as well as radio.

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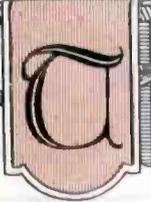
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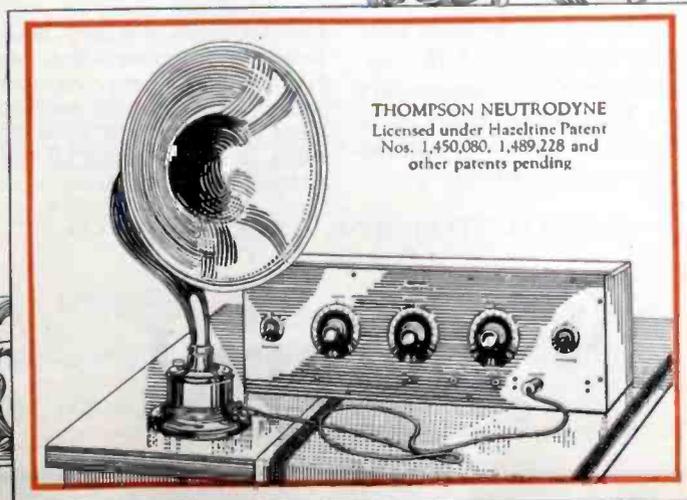
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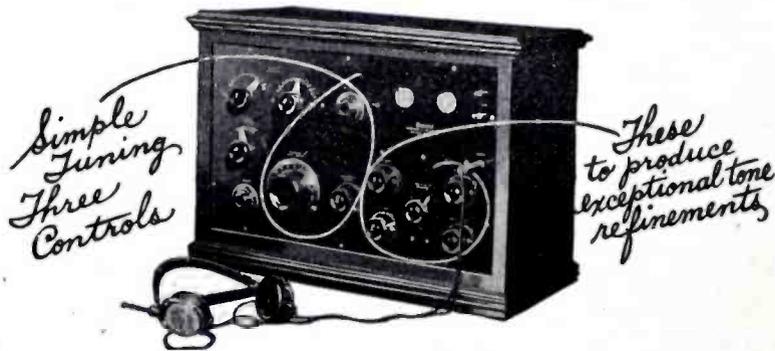
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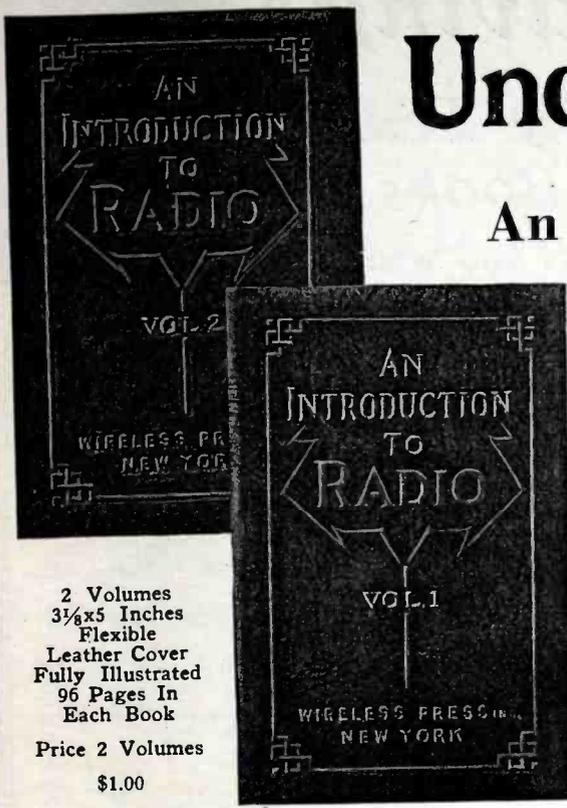
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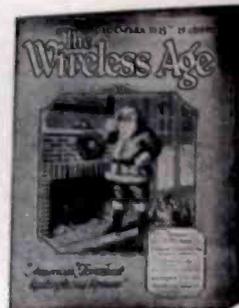
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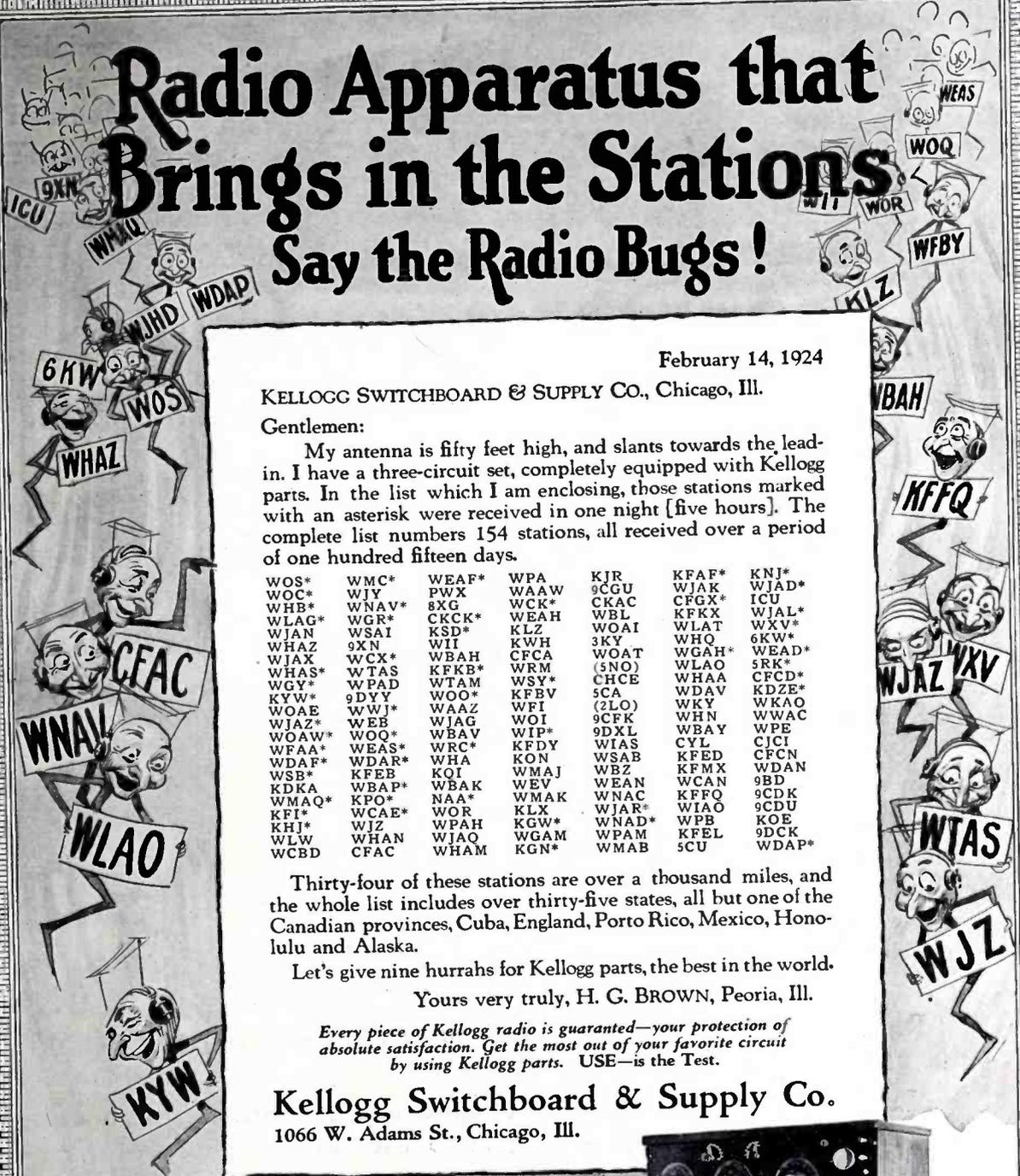
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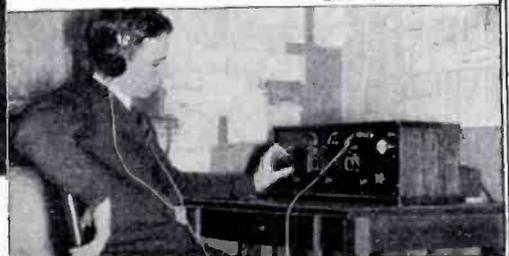
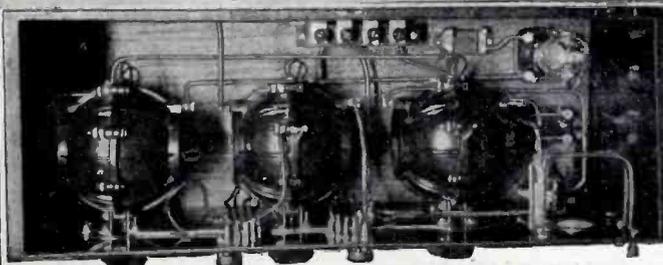
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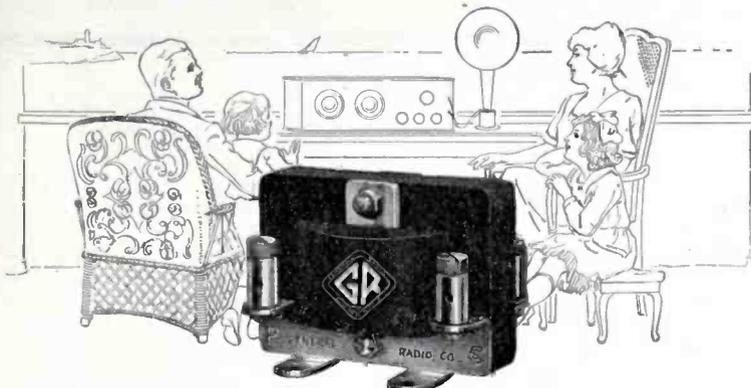
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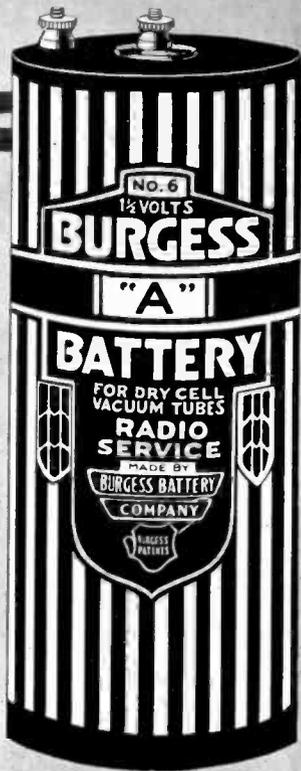
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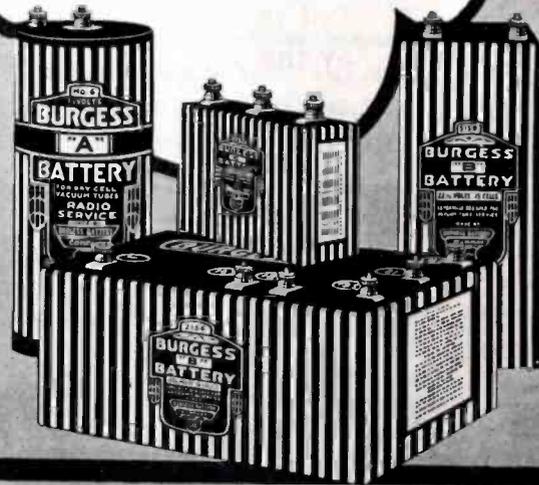
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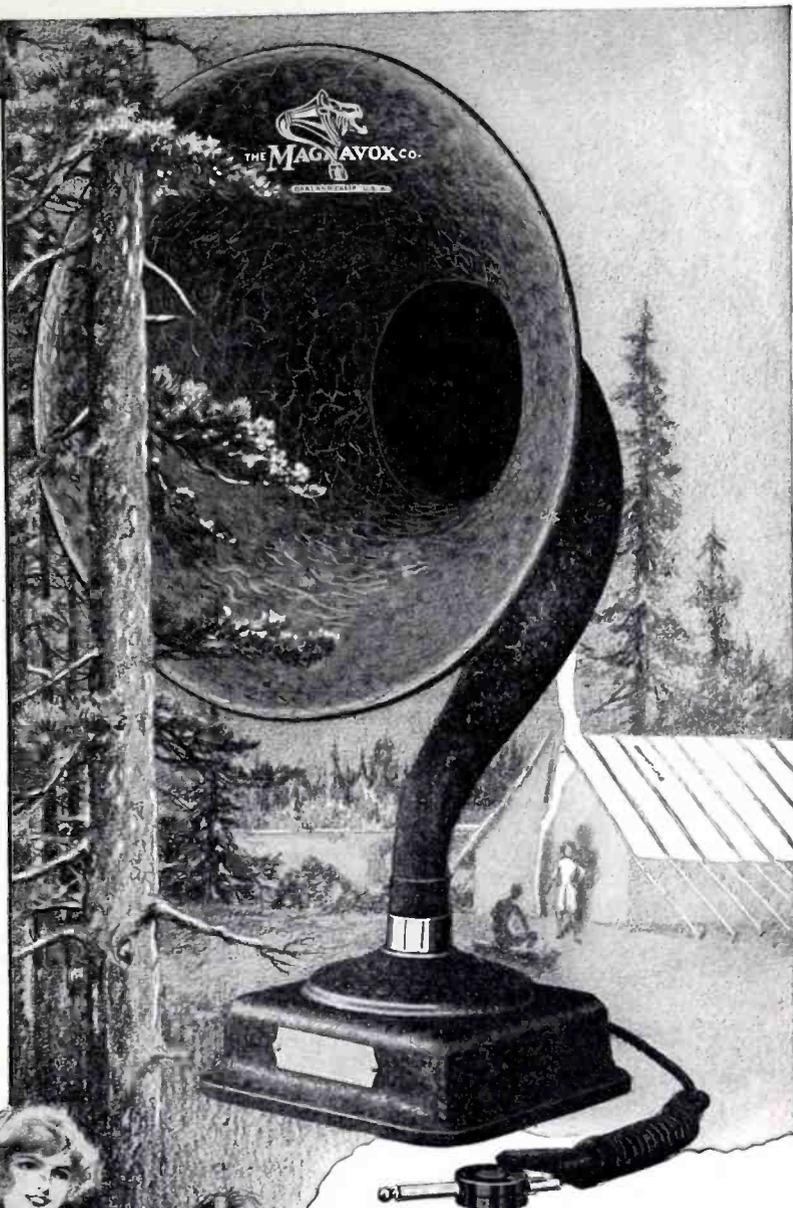
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Editorial Chat

THIS number of THE WIRELESS AGE has a cover of unique character. Radio is the one subject we have presented to you for twelve years—presented to you in all its ramifications. THE WIRELESS AGE has been THE Radio Magazine that has kept pace with the gigantic strides made in this new art.

Radio for the man, woman, child. Radio in social, civil, and private life. Radio as a force in the development of happiness and peace amongst all peoples—these are the things you may read about—in this—THE Radio Magazine.

In this issue you will find a bit of satire on page 17. That page has been dedicated to the important current issue of the month. We present there an editorial viewpoint that would ordinarily cause the slight elevation of ethically trained eyebrows should it appear as serious editorial opinion.

Those June Conventions

Then there is the article bearing on a subject of vital moment. The broadcast June conventions directly affects our politic body. And because the reaction comes at a time when our credulity is sought in matters of campaign propaganda this subject stands out as one of feature character. Likewise, education will command first place in our September issue. Education by radio.

Dr. Alexanderson

The story of a great personality, which requires, in the telling, a review of paramount radio development, measures up to a real standard. Read the story of Alexanderson and then judge for yourself how you may satisfy your natural desire to know more of those men who stand pre-eminent in the world of science. Dr. Michael I. Pupin, as a great educational figure, and a foremost leader in radio research and engineering, will be presented in our September issue. Many other personalities known to layman and engineer alike will appear in future issues of this magazine. Intimate contact with these brilliant minds reveals, so that we may comprehend, radio in many of its technical phases. There is no mystery, either within or beyond your grasp, in the field of radio. We need only follow the personal story of these human individuals who have blazed the trail along the frontier of early pioneer development and we will be enlightened.

A Mother Who Wanted a Career

Turning over the pages of the present issue you will find another story of a real personality. A woman this time. A mother who wanted a home career. As one of us she knows how to reach the rest of us. Her problems, a drama in domestic life, have been our problems. She has solved them as we can—and, as across the breakfast table, she tells us how. Next month she has something to say about education—the education of children—by radio.

You will find, too, a digest of outstanding broadcast events. Each month the really worth while programs are subjected to a critical examination. Correlated, we may grasp a picture of the whole, and come to know what the underlying principles are, and their subsequent value to us.

World Radio News

Radio news from all over the world is assorted, condensed and finally offered in these pages as the abstract of world wide activities.

Of technical material you will find only the best. Our objective is basic, and the presentation authoritative.

Of greater general interest will be our radio fiction. Beginning with the September number, a radio story packed full of action, flavored with romance and adventure and written by one of our leading authors, will be presented to you as the fulfillment of a very real demand.

Fiction—interviews with artists—opinions of national figures—all will be yours for the reading.

THE WIRELESS AGE as THE Radio Magazine, has a tradition to maintain. True, a tradition dating back to the comparatively recent 1911. But one that nevertheless acquired a background of experience long before the impetus of the radio industry could upset the equilibrium of our policy. The fever-heat of latter-day progress has not injured this tradition.

The present radio era, as fast as it unfolds itself, will be recorded for your benefit within these pages. Enjoy this issue of your magazine. Look forward to succeeding numbers with an open mind.

—THE EDITORS.

In This Space— Next Month—

Will be announced an improved product,
Which surpasses, in quality, any other
Similar product, at anywhere near our price.



UNITED RADIO CORPORATION
Newark, New Jersey



"THE AIR
IS FULL OF THINGS
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Eveready "B" Battery No. 772 for detector and amplifier. Connections at 22 1/2 and 45 volts, Three Fahnestock Clips. Approximate over-all dimensions, 8 3/4 in. x 3 3/4 in. x 7 3/4 in.

Eveready 6-volt Storage "A" Battery



No. 767 "B" Battery, 45 volts Variable taps Fahnestock Clips

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Sustained power!

WHERE table or cabinet space is limited, use this new vertical 45-volt Eveready "B" Battery No. 772. It has the same long life, the same steady high power as the horizontal Eveready 45-volt "B" Battery, but because it stands upright it takes less than half the table space.

Tables and most battery cabinets have more headroom than floor space. This battery is built in recognition of that fact. It fits the Radiola Super-Heterodyne cabinet perfectly.

Many multi-tube receiving sets use a "hard" detector tube which does not require fine adjustment of "B" voltage, so the new Eveready Vertical 45-volt "B" has but three plainly marked terminals, negative, plus 22 1/2 and plus 45 volts.

Standing upright to save space, made of large, powerful cells to last longer, here is the battery you've been looking for.

Manufactured and guaranteed by
NATIONAL CARBON COMPANY, Inc., New York—San Francisco
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If you have any battery problem, write G. C. Furness, Manager, Radio Division, National Carbon Co., Inc., 198 Orton Street, Long Island City, N. Y.

EVEREADY Radio Batteries - they last longer

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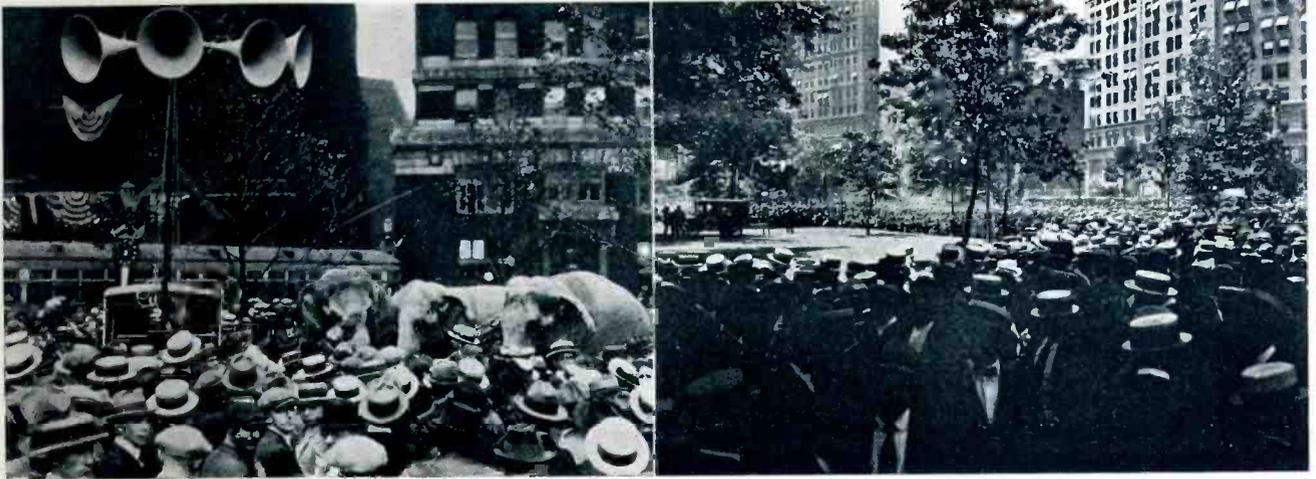


No. 771 Eveready "C" Battery, Clarifies tone and prolongs "B" Battery life

No. 764 The Space Saver Vertical 22 1/2 volt "B" Battery



No. 7111 Eveready Radio "A" Dry Cell Specially manufactured for use with dry cell tubes



Crowds in Cleveland (left) and New York (right) listening in on the Republican and Democratic Conventions broadcast by Western Electric Address System

The Dark Horse on Radio Pike

SHADOWY streamers flitted across the face of the moon, twisted, thinned, then with a swirling backlash utterly engulfed the last vestige of pale light. A black void, still ominous, settled over the stables at the Steepledown Race Course.

Three figures crept into the stall of Black Star, hands groping through the darkness, an occasional whisper stabbing the night like a sudden breeze that has awakened the slumbering voices of a Jack pine. A horse jerked at his halter and snorted.

Black Star, aroused, plunged into the corner of his stall, and stood there quivering. A hand touched his flank. He lunged again. A startled voice cried out, "Quick! Lead him over here! The 'dark' horse is ready to stampede!"

Heavy odds had been placed on Black Star the day before. His showing was bad at the try-out. In the stealth of the night a "dark" horse had been substituted for Black Star. And the dark horse won—won on heavy odds. No one knew of the hoax, other than the culprits. So the dark horse was cheered, and the wagers paid.

And that—we are told—is the origin of the dark horse expression used in politics to-day.

A stately figure stands on the party platform. His hair is streaked with iron-gray. The stern, upright principles of American democracy seem to radiate from the core of his dominant personality. The magnetism of his voice grips the audience and holds it in a high-strung passion of expectancy.

He steps forward, thrusts his clenched fist heavenward, and with a ringing voice denounces the un-American practices harbored in political machines. His audience is held spellbound, breathless. He points to the planks in his party platform, and with genuine emotion, indicates the high principles of self-government contained in each one.

A pause. He leans forward, slightly stooping. His audience responds, and leans forward in anticipation. With a mighty leap into the air he turns a complete back-flop over and beyond the principal of high-principled planks in his party platform. And there he remains.

Those of us who were listening in missed the sylph-like pantomime of this silvery-tongued orator. He was sufficiently athletic to impress all those who beheld, but the logic of his conduct was dissipated in the ether, long before it reached our radio. His presentation of facts was not clear. It was only the presentation of facts that we could assimilate, and failing this, we would only conclude that another "steam-roller" had been launched, and was truly christened in the good old-fashioned way.

With the advent of politics in radio, we are to become familiar with the individual statesman of our country. We will hear the oratorical fire-works of the professional politician, and come to know the depth of his sincerity. We shall hear, for ourselves, the message from an obscure, but conscientious leader of a political body, and judge with impunity the merits of his plea.

This we shall do by radio.

It is difficult to stampede the radio public with a dark horse and then crush the opposition with a steam-roller. Those of us who have listened in, care nothing for the filibustering mechanics of a political meeting, but greet them in the spirit of Blake:

"Mock on, mock on, 'tis all in vain;
You blow the sand against the wind,
And the wind blows it back again."



J. N. Darling's idea of a dark horse stampede—N. Y. Herald Tribune

How Broadcasting June November

Republicanism and Democracy—The Third Conventions—Changing Campaign Tactics the Sidewalks From Wall Street— Than Political Meetings—Looking

As Viewed by

The Republican Party represents rule by an intelligent few. The Democratic Party represents rule by the mass. But theory and practice are still subject to conflicting facts.

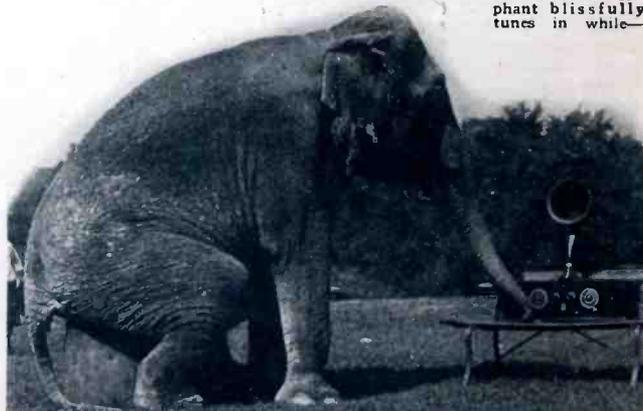
Owen D. Young of the General Electric Company makes this very pertinent observation:

"The wide-spread public interest evidenced in the broadcast conventions, indicates that a clear presentation of facts, only, will be countenanced by those who listen in to political speeches. The old method of meaningless oratorical demonstrations, delivered from a platform, will not be of any consequence to a radio audience. This fact will undoubtedly improve the statesmanlike delivery of political speeches to the American people."

AS we become familiar with any one subject, our individual viewpoints change in accordance with our ability to absorb the real, and our competency to cast out the ambiguous. The progressive ratio of opinion influenced may be measured either by our own adroitness in seeking information of reliable character, or by the vehicles of publicity commonly known to influence public opinion. In either case our source of information will have a direct bearing on our final conclusions. Radio is a direct source of information. Broadcasting the June conventions may then be readily accepted as an authoritative source of information bearing on the mechanics of the conventions and the subsequent principles of the political campaigns now in progress. He who has listened in may vote with impunity this coming November.

Just what effect radio has had on the third party policies is yet to be ascertained. The Republican Convention in Cleveland was a brief affair, hardly admitting the comprehensive attendance of the radio audience. The Democratic Convention at New York, in direct contrast, stood in the

The G. O. P. elephant blissfully tunes in while—



Calvin Coolidge and Charles G. Dawes, Republican candidates for President and Vice President

BROADCASTING the June conventions has accomplished a two-fold purpose. First, it has thrust upon us the mechanics of nominating our executive heads. This is knowledge gained that we have found the more valuable because it has come direct. Secondly, we have acquired a working basis for determining how we shall vote at the November elections. And this is important because knowledge gained is opinion influenced.

Our knowledge was gained direct. Our opinion was influenced direct. This by radio. At the November elections, those of us who have listened in will probably surprise the rest of us. And this because of radio.

REPUBLICANISM is that form of government known as non-monarchical. The Latin Republics scattered about the world are practicable examples. Democracy is that form of government in which the people rule themselves. England is a practicable example of that.

The United States has a combination, or confusion, or what you like, of the two. Republicanism and Democracy.

In theory, Republican rule is governmental administration by executives who direct the affairs of state independently of the will of the people. These gentlemen are elected by public poll, and then entrusted with the affairs of government according to the dictates of conscience, experience, and necessity. Actually, the will of the people is held and exercised by the people, through the instrument of recurrent voting. This obviates true Republican rule.

And in theory, Democratic rule is governmental administration by executives who direct the affairs of state only as they have been so directed by those who have elected them. These gentlemen are elected by public poll, and then entrusted with the affairs of government according to the voice of the people. Actually, the will of the people can only be complied with after the echo of public voice has been lost in the clamor of a new demand. This obviates true Democratic rule.

Conventions Affects the Elections

Party Question—Highlights of the June by Radio—Reaction of the Press—Down Broadcast Reception More Exacting Forward to the November Elections

William A. Hurd

glaring limelight for too long a period to escape the searching inquiry of those who listened in.

Senator Borah, in one of his speeches, said:

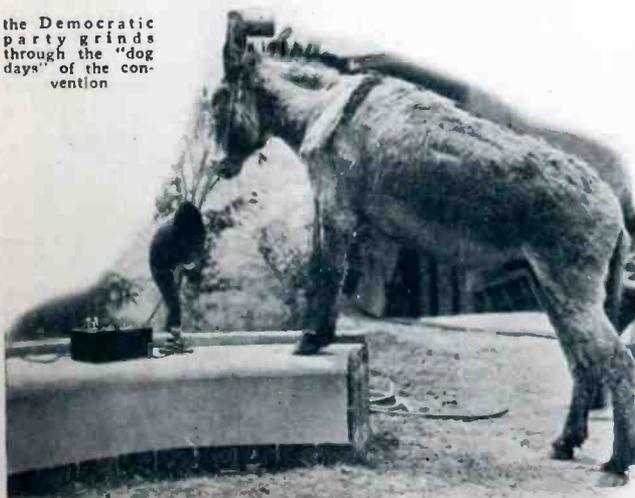
"It is one of the advantages of party government that one political party vigilantly watches and criticizes the other. I hope that will always be so. The conditions would soon be intolerable in this country if it were not so. The danger arises not out of criticism and exposure, but out of a tacit truce between the great parties that they will not criticize or expose the evil practices."

Senator Robert M. La Follette, it is to be hoped, will profit by the lesson beyond price that radio taught us in the June conventions. Broadcasting politics has served to educate us. And we are prepared to tune in for a liberal education from the third party.

THE Republican Convention in Cleveland was broadcast by sixteen stations located at points as far east as Boston and as far west as Kansas City, Missouri. Graham McNamee was the official announcer. His voice was carried below the convention hall to the control apparatus and there distributed over land wires to the stations situated at strategic points for the complete dissemination of all the convention proceedings. KDKA of course, relayed the entire convention to KFKX at Hastings, Nebraska, affording a greater range throughout the west coast states.

One of the most exciting periods of the Republican Convention in Cleveland was during the speech of John Adams Cooper, a delegate from Wisconsin, who offered a minority report to substitute for the majority report of the Resolutions Committee. The radical changes in the platform which he proposed aroused considerable interest

the Democratic party grinds through the "dog days" of the convention



John W. Davis and Charles W. Bryan, Democratic candidates for President and Vice President

on the part of the delegates. After speaking for five or ten minutes, the radio audience heard a great many hisses and boos and shouts which seemed to be in derision of the speaker. But the delegates though unsympathetic, were quite anxious to hear Mr. Cooper who offered the first real thrill of the convention. The hissing was directed at the Sergeant-at-Arms who was stepping forward to the end of the platform as if to lead the speaker away because the time allotted to him had expired. But the Sergeant-at-Arms was actually trying to push Mr. Cooper a little nearer the microphone so that the radio audience could have the full benefit of the political drama he was enacting.

General Dawes and his family listened in on the convention proceedings at a friend's home in Marietta, Ohio. Wholly unprepared for what was to come, the little gathering sat around chatting and speculating on the turn of events. Suddenly, the party was thrilled with the announcement that General Dawes had been nominated for the Vice-Presidency. Crowding around the loud speaker they heard in detail the particulars of the dramatic episode unfolded, and heard before the announcer's voice reached the delegates in the convention hall.

Eric H. Palmer, writing for the *New York World*, expressed his delight with the broadcasting of the convention. His enthusiasm reflects the real spirit of radio fans all over the country. He reported in part:

"Friends were listening in with me on the radio to the Republican National Convention in Cleveland.

"They admittedly were thrilled by the oratory, music, and the just plain noise that issued from the loud speaker. They said they had no difficulty in fancying themselves viewing the proceedings from vantage points right in the auditorium, instead of reclining at ease in a quiet room 600 miles away.

"Surely it makes our hearts beat faster to contemplate the candidates for President and Vice-President listening in, many hundreds of miles away, as their names are being cheered by delegates and spectators.



The opening session of the Republican Convention at Cleveland, Ohio. Microphones stood in front of the speakers and loud speakers hung over the platform projected the voice evenly over the hall

"To Calvin Coolidge have come two most dramatic episodes: first, to be sworn in as President of the United States by his father, in the little farm house in Vermont where he was born, and second, to sit in Washington to hear the eloquent words and the applause that marked his nomination as the choice of the Cleveland Convention. And General Dawes, out in Marietta, Ohio, listening in on a friend's receiver, heard the balloting that again called him into the public service, so that he knew long before the swift telegram, that he had been drafted to run with Coolidge.

"Radio annihilates distance, eliminates the time factor and provides us with the sense of being there when things happen. It gives us a greater zest for reading the papers the next day to get the stories of what has happened behind the scenes and to ascertain the way happenings to which we have listened have been described by journalistic word-painters.

"Thus radio and the press work hand in hand, not rivals, but adjuncts to each other—in the public interest."

THE Democratic Convention at New York was probably more exciting, and came to the attention of more people, through sheer length. Microphones placed on the dais in front of the speakers carried the voice to twenty stations located throughout the country.

The American Telephone and Telegraph Company, and the Radio Corporation of America were foremost in broadcasting the convention proceedings. Boston, New York, Washington, Schenectady, Buffalo, Providence, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Atlanta, Worcester, Kansas City and Hastings, Nebraska, were all represented. In some of those cities, several stations divided the honors. Graham McNamee was the announcer for the telephone company, and J. Andrew White announced for the Radio Corporation of America. Both announcers were stationed in glass booths, sound proof, but advantageous for close observation of the speakers and the delegates.

Microphones, distributed throughout the audience, could be cut in for the cheering and pandemonium that reigned when some critical move on the part of the delegates set the house off in wild demonstrations. Frequently the announcers had to break in with a brief description of the excitement and its cause. They kept in close contact with the control apparatus operators located below the hall by a system of buzzers and telephone connections. The per-

sonnel employed to broadcast the convention had to stay at their posts, in some instances, for twelve and thirteen hours.

This writer had occasion to sit through weary hours of balloting, the monotony being broken by nothing more exciting than a sojourn to one of the "hot dog" stands, and so it is with heart-wrung sympathy that an expression of deep understanding and gratitude is hereby extended to the broadcast personnel.

Soon after the convention opened, John Brown's ghost stalked about the Garden, recalled to sordid affairs of earthly origin at the mere mention of Wilsonian principles. The tumultuous clamor of leather-lunged convention fans rose in great waves of intonation that swept across the hall and broke in a mingled roar of stamping and shouting, and whistling and singing. The hilarious abandonment of a mob gone mad was truly infectious. Some one started a parade. Under the flag-draped roof of the Garden, five thousand people milled in the sweltering heat of a packed hall. As a single voice, the yell rose from fifteen thousand raw-hide throats: "Hail! Hail! The gang's all here!" The convention racket reverberated long after the commotion had subsided.

Other demonstrations marked the proceedings from day to day. The states up, standards in parade, the march going around the hall, and the audience on chairs and tables was a less frequent occurrence as the convention straggled out to repeated balloting. Forty ballots—forty odd—fifty—fifty odd—and so on seemingly for an interminable duration. An unexpected break in the unit rule of some state would bring a crash of applause, flags and handkerchiefs waving wildly by way of emphasis. But the proceedings proceeded, and with the sagacity of Poe's "Raven," we were prompted to quoth: "Evermore!"

Or was it, "Nevermore?"

MR. H. P. DAVIS, Vice-President of the Westinghouse Electric and Manufacturing Company, has been actively engaged in the development of radio dating back to the early pioneer days of KDKA. His contribution to this article is a dedication to the basic principles of American politics broadcast—mind you—broadcast to the American people. Here it is:

"From the reaction of the public to the broadcasting of the two greatest political demonstrations in the world, the Republican and Democratic Conventions, it must be ap-

parent to the leaders that political campaigns of the future must be conducted along different lines from those which were successful in the past.

"For the first time in history, the voting public heard every detail of the proceedings of the political conventions. It heard the wild, tumultuous shouting, the noises of the parades of the cheering delegates, the demonstrations that accompanied the nominating, and finally the enthusiastic scenes that accompanied the voting. The music of the bands and the singing of the artists also played a part in making these political conventions the greatest radio demonstration, or for that matter, the biggest thing in history that was ever brought to the ears of the public.

"The noisy demonstrations, the school-boy enthusiasm of the delegates, the three-ring circus aspect of the entire affair was lost upon the radio audience because it could not see the action. Such appeals to the emotions cannot be made by radio and there is no such thing as working up 'mob effects' on the radio listener seated in his own home. Therefore, the political managers, always eager to follow the lead of the public, will probably conduct their future campaigns along somewhat different lines.

"Candidates and campaign managers will come before the microphone and in carefully-worded, well-chosen addresses will state their positions on the various issues of the day. Music there may be with such political campaigns but the day of the stump speech, with the dramatic gesturing of the speaker and his frenzied words, the equally tempestuous parades of his cohorts; this whole appeal to the emotions is passing with the growing use of the radio telephone to broadcast over the entire United States. Radio will play a large part in the election of candidates of the future and because the voting public, at least the greater percentage of them, will actually hear their candidates, it is believed that the voters will grow more and more particular in making their choice.

"Broadcasting the proceedings of the conventions will undoubtedly, this year, bring more people to the polls than have ever before voted. The reason for this is because more people than ever before are taking an interest in the Presidential race since they have heard some of the convention proceedings by radio and have naturally made up their minds, one way or another, regarding the placing of their vote."

Mr. Davis also points out that since KDKA and KFKX have broadened out to international scope, the broadcast proceedings of the conventions were received in Argentina, South America.

Are we proud of our political conventions? Will we be equally proud of our political leaders during the present campaign? The world now listens in.

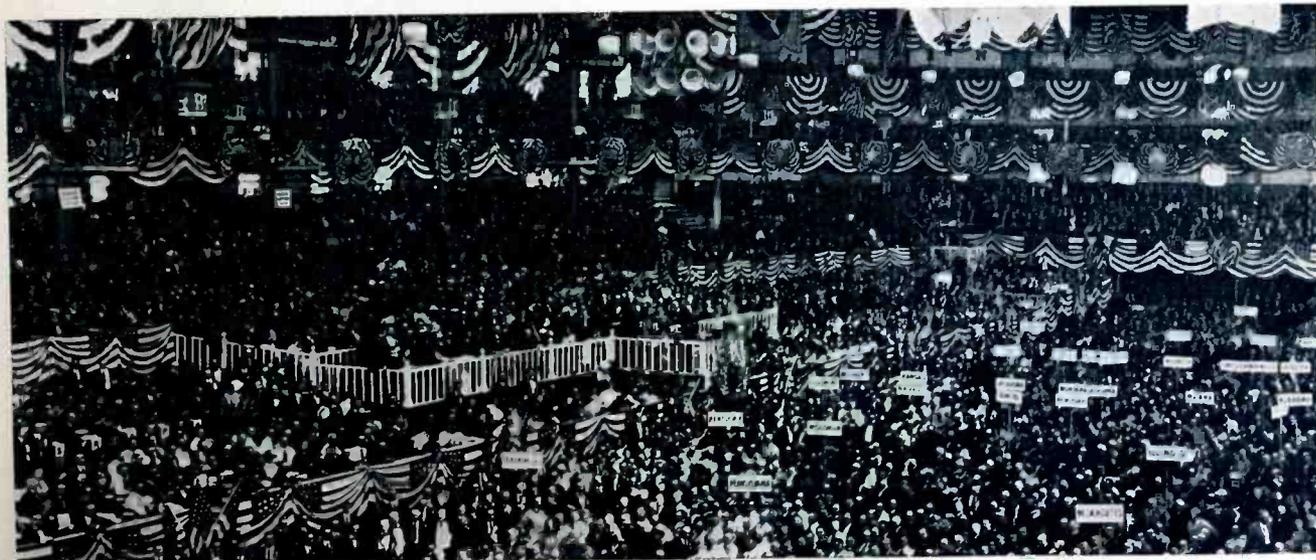
"Leaders in future political conventions," Mr. Davis believes, "will keep the fact in mind that their demonstrations are being heard not only in the United States, but also across its border and that the Canadians, the Mexicans and the Central and South Americans are also listening in to us choosing our presidential candidates. Perhaps with this in view there will also be other changes in political conventions in the future which will make their proceedings more in keeping with the dignity of the position the United States holds among the world's nations."

NEWSPAPERS were quick to realize the value of radio in reporting the proceedings of the convention. Every newspaper was represented at the conventions. Several foreign newspaper correspondents in reporting the Democratic Convention listened in on a Radiola Super-Heterodyne placed in a room at the Waldorf Astoria in New York. Other journalists and feature writers for American papers likewise engaged a room in the hotel and listened in on a Super-Heterodyne, exploiting to advantage their semi-privacy.

Removed from the heat of the riotous conventions, city editors of newspapers in Western and Mid-western towns copied the proceedings accurately, count by count. Corrections were had even before the reporters seated below the speaker could record them.

The significance is worthy of some reflection. Most city editors have resented the space devoted to radio sections and supplements. They have made the altogether pertinent observation that radio news belongs in the news columns. Radio features, technical articles, and broadcast stories absorb valuable news space. They really belong, it would seem, in magazines. There is certainly no doubt that a daily is purchased for news and a periodical is sought for stories and articles wholly devoted to subjects of deliberate treatment. And so it is that city editors turn to radio for news with the weight of editorial forethought.

Mr. Ford, city editor of the *N. Y. Evening Telegram and Mail*, transferred his Super-Heterodyne from his home to the office, and listened in on the convention proceedings for long hours, unwilling to relinquish his post lest some development escape his personal attention. This, in itself, was notable because Mr. Ford had originally been reluctant to employ any such device for news.



The Democratic Convention at Madison Square Garden, New York. Microphones were placed on a dais in front of the speakers. Loud speakers overhead projected their voices over the massive auditorium.

Another striking example of radio news reception was manifested by the *Brooklyn Times'* office. The following is an extract from an editorial in that paper:

"Seated with a set of ear pieces around his head, John A. Heffernan, Associate Editor of the *Brooklyn Times*, pounded the typewriter in perfect rhythm with the air waves that flowed into his ears through the *Times'* office radio.

"It was a remarkable feat, made possible by the combination of the latest achievement of science and a journalistic master hand. As a result, the story reads as vividly as an expert radio announcer's report plus the inimitable charm of the written word. It will stand unique in the chronicles of 'covering' conventions, and has the additional value of being safe from frequent imitation—because there are very few men even among the best in American journalism who possess the joint abilities of speed, fluent language, quick wit and a mind so receptive that an impression it has once received immediately reflects itself in a polished sentence."

This editorial expresses the exact attitude of many other newspapers scattered throughout the United States and in some foreign countries. As a matter of fact, the reaction of the press was too broad in scope, and includes too many dailies, for record in this article.

IMMEDIATELY after the Civil War, the majority of this country were middle class. Industrial wage earners were little known and capitalists were hardly of consequence. Each man had his little shop in the back yard and was comparatively independent. Colt discovered that he could pay men higher wages to work in his plant than those men could earn for themselves. And likewise, others with a new mechanical device had a market that made possible good pay to those who would become factory workers.

Today, the middle class—those who have an income they have not, themselves, earned—is a passing phase of America's economic and social structure. Workers—those who earn wages—are the great majority. Capitalists—those who control industries—although still a minority, are nevertheless a power. It is to these gentle-



Senator Robert M. La Follette has decided a Third Party is needed

men that we turn for guidance. They are successful, and consequently must know the way.

We must pause, however, to reflect that these same gentlemen are equipped to follow a course that might be extremely difficult for us. Observation is good. Imitation is bad.

A stroll through the financial houses of Wall Street will reveal the fact that radio has been used for listening in on the conventions and is being used to receive the campaign news. The reason is simple enough. The big men of this country want to know what is going on in the political camps so that they will know what to do with their votes next November. They heard the conventions broadcast. They separated the ambiguous from the real. They now listen in to check on the results of their observations. It is important to them, and it is equally important to us.

Receivers were installed in Wall Street. Mr. Noyes, President of the Associated Press, had one aboard his yacht. Ex-Governor Glynn of New York, confined in the hospital, listened in on a radio. One was installed in the Children's Court of New York. Another was operated in the Beth Abraham Home for Incurables. James J. Davis, Secretary of Labor, had one in full operation. Others were installed for Judge Gary, John Hays Hammond, Jr., Otto Kahn, Major General O'Ryan, Ex-Governor Henry Steward of Virginia, Dr. Dellinger of the Bureau of Standards, Police Commissioner Enright of New York, and a host of other prominent individuals.

A Radiola Super-Heterodyne was installed in the White House. These sets, requiring no aerial, ground, or other bothersome connections, have found a welcome in homes and offices that heretofore have not been graced with radio. The result has been an unprecedented radio attendance at our National Conventions.

On the streets of New York, evidence of a remarkable interest in the conventions met the casual wayfarer at every turn. The police department attributed the unusual traffic drop to radio. Eight theaters closed during the Democratic Convention and blandly asserted that radio was responsible. A severe falling off of freight traffic on

(Turn to page 57)



Rain did not dampen the ardor of fans who listened in on the conventions. The Western Electric Public Address System drew large crowds at all times

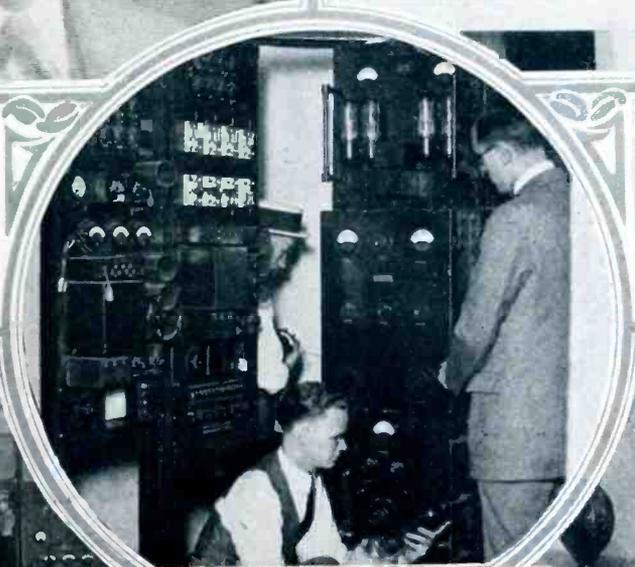
Broadcasting the Conventions



Graham McNamee, official announcer for the American Telephone and Telegraph Company at the Republican and Democratic Conventions. This photo, was transmitted by wire



J. Andrew White, official announcer for the Radio Corporation of America at the Democratic Convention in Madison Square Garden, New York. He is well known for broadcasting sports



Radio engineers installing amplifying and input apparatus in Madison Square Garden for the convention



The broadcast station at the Republican Convention. The proceedings were transmitted by direct wires to stations WGY, WGR, KDKA, KSD, WDAF, WJZ, WRC, WJAX, WTAM, WLW, WCAP, WGN, WLS, WMAQ, WNAC, and WEA. This range included Hastings, Neb., west, Boston, east, and St. Louis and Washington, south



One of the input installations at the Democratic Convention. Proceedings were transmitted by direct wires to stations WJZ, WEA, WGR, WCAP, WRC, WNAC, WTAT, WJAR, KDKA, WTAM, WJAX, WLW, WGN, WLS, WMAQ, KSD, WDAF, WDBH, WSB, WBZ and WGY. This includes Atlanta, Ga., south, Boston, east, and KFKX (relayed), west

Broadcast Artists You Have Heard



Ralph Mayhew, "Bubble Book Stories," the bedtime story teller who tells 'em from station WJZ.



The input equipment for the Vincent Lopez Orchestra which can be seen over the operator's shoulder. This novel photo shows the "business end" of your dance music

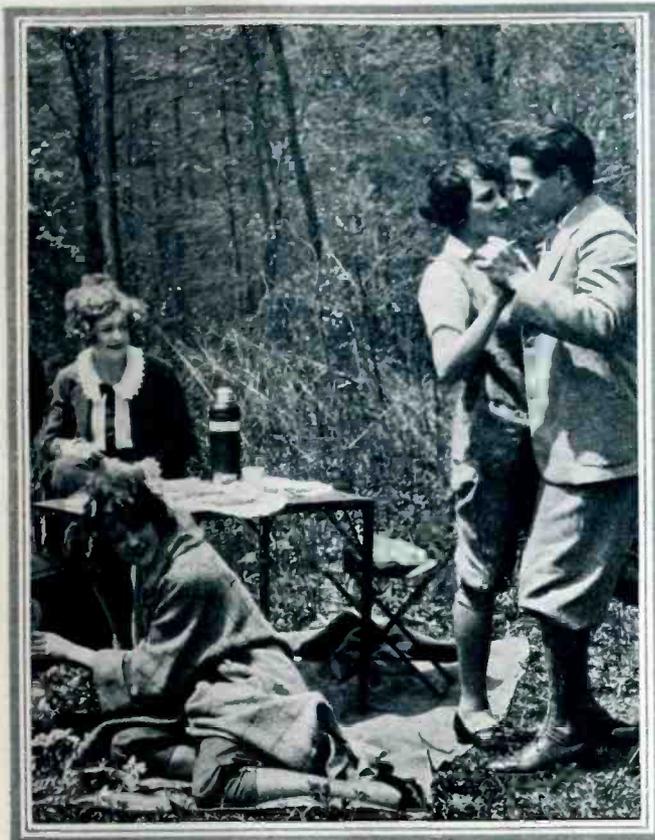


Mrs. Harold McCormick, nee Ganna Walska, lyric soprano. Photo made on the occasion of Mme. Walska singing from station WJZ at the Waldorf Astoria. Her radio reception surpassed all expectations



Frederick William Wile, WRC's political observer who broadcasts his reviews, "The Political Situation in Washington Tonight." Mr. Wile is one of our foremost political writers and correspondents

Enjoy Summer Radio



A radio on a summer's day picnic adds to the things we like best. The dancing may not be what it could be, but the real fun is there just the same

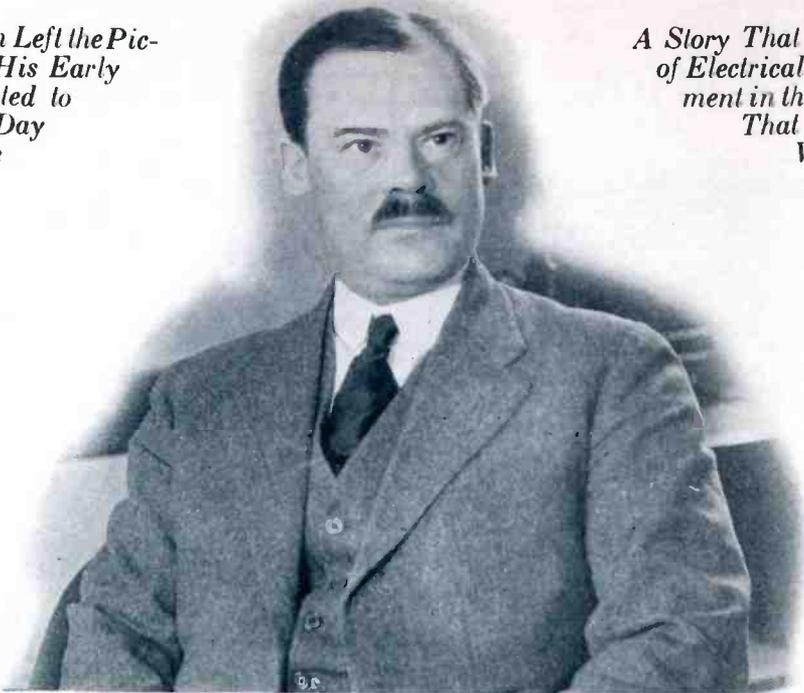


Not a mermaid—merely a mere maid listening in. A portable set on the beach is a welcome pas-time between dips



In the last month of summer, two winsome maids have carried their radio to the edge of a woodland lake, there to enjoy the rapture of nature in its virgin glory with the best of music and culture brought to them in the peace and rest of the open air. The reflected trees of the distant shore enhance the cool, translucent memories of a lake in the wild

E.F.W. Alexanderson Left the Picturesque Regions of His Early Boyhood and Migrated to America Where His Day Dreams Would Come True



A Story That Demands a Review of Electrical and Radio Development in the Telling—a Review That Could Not Be Told Without the Story of This Personality

A Radio System Built Of Air-Castle Dreams

A PICTURESQUE river, winding through a fertile and historic plain of Sweden past Tingshög hill where the ancient pagan kings led the people to worship, flows into the university city of Upsala, dividing the new from the old. Ascending the hills on the west shore, the old town leads up to the fine French-Gothic cathedral that dates back to 1260.

Among the university buildings in the vicinity of the cathedral are the ancient Gustavianum, built in the reign of Gustavus Adolphus, the Carolina Rediviva, and the handsome new Renaissance structure completed in the early eighties. Nestling in the heart of this charm, redolent with the memories of antiquity, the botanical garden offers a haven of peace for the students who stroll down the walks seeking, perhaps, a refuge from the perplexities of youth.

Professor A. M. Alexanderson, standing at a window of the university library, watched the students as they hurried away in the various directions to which their several interests led them, and he reflected, as he idly studied their mischievous demeanors, that his young son would

By Harvey Clawson

some day don the student cap which designates the wearers' class year, and consequent social status. Long after the last care-free voice had resounded over the garden, and the echoes of irresponsible youth were lost in the shadows of a Mediaeval glory, Professor Alexanderson stood at the window and pondered on the future of his boy, and he wondered as he stood there absorbed, what the future held forth. A faint smile crept over his face as he thought of the many fathers who had meditated at length over the same problem only to find in the end that an individuality is apt to be too intangible for arbitrary standards; always beyond the grasp of well-meaning intentions.

"This boy of mine," the professor reflected, "shall have the opportunities—all of them—that education will afford." He turned to depart, satisfied that for the present, at least, his procedure was obvious.

That night, as he lay thinking of the day's problems, an impish thought stole into his mind. He knew the dangers of over-education. "What," he asked himself, pointedly, "would

happen to my well arranged schedule if the boy lacked the practical turn of mind so essential to the useful application of acquired knowledge?" Whatever the answer, it was lost in sleep.

* * *

E. F. W. Alexanderson, the professor's son, graduated from the High School of Lund of 1896. The next year, in the shadow of the old Romanesque Cathedral, the younger Alexanderson studied at the University of Lund. With an early life steeped in the historic atmosphere of the ancient and picturesque regions of old Sweden, he entered the Royal Institute of Technology at Stockholm, eager for the learning that lay beyond the threshold of his boyhood world.

A post-graduate course at the Koenigliche Technische Hochschule in Berlin, and contact with cosmopolitan Europe, merely served to accentuate his curiosity. His was an open mind, ever receptive to greater knowledge, stimulated by a restless spirit that recognized no bounds. What he had learned seemed to be of small consequence, devoid of any immediate value. His mind soared into the realm of day-dreams and air-castles. The substance of his visions always seemed just be-

yond the grasp of intrigued fancy. He must seek for greater opportunities. He must go where advancement was not stifled by the inhibitions of precedent. It was then that he turned to America. * * *

E. F. W. Alexanderson migrated to the United States. That was in 1901. He entered the services of the C. & O. Electric Company as an electrical draftsman. One year later, he joined the staff of the General Electric Company at Schenectady where his extraordinary ability and inventive genius were soon recognized. His day dreams and fancies were caught and poured into the mould of practicable mechanics. Theories were cast into facts. His promotion to the position of consulting engineer was inevitable.

Today, Alexanderson stands at the pinnacle of success as the Chief Consulting Engineer of the Radio Corporation of America.

Mr. Alexanderson has been awarded a Medal of Honor by the Institute of Radio Engineers, in recognition of his contributions to the science of radio communication. Nevertheless, he is one of the most modest of men. It is only with great difficulty that he can be induced to take a prominent part on any official occasion.

Indifference toward his acquired knowledge is characteristic of him. His restless spirit still drives him on to solve the seemingly impossible.

While engaged in solving the problems encountered in the application of electrical power to the railways and industries, it occurred to him that the general principles adopted in power engineering might in many cases be applied to radio telegraphy. It was about this time that the need of a powerful high frequency dynamo for long distance wireless telegraph communication became apparent. For a long time radio engineers had recog-

nized the inefficiencies and limitations of the so-called "spark" and "arc" systems of generating high frequency currents, yet none of them were prepared to undertake the design of an alternator which would produce these currents directly. The problem in this case was the production of generators giving frequencies up to 100,000 cycles per second instead of the old requirements of the low-frequency dynamo used in ordinary power work, giving 60 cycles of current per second. This was a stupendous problem, and it was deemed wholly beyond the range of possibility.

Mr. Alexanderson pulled off his coat, rolled up his sleeves, and set to work with a smile of confidence. In the space of several months he had designed a practicable 100,000-cycle alternator giving an output of 2 kilowatts. His smile broadened to a grin.

"The radio engineer," Mr. Alexanderson said, "is, more than any other, compelled to work with conditions which are not within his control, and only partially understood. The law of probability and averages must therefore figure largely in his calculations."

It is notable, however, that he does not allow the law of probability and averages to enter into his results.

This first alternator, designed by Mr. Alexanderson, ran at a speed of 20,000 revolutions per minute, yet through the extraordinary care taken in its construction it functioned uninterruptedly. The output could be fed directly to the antenna system for the generation of the electromagnetic or ether waves of radio telegraphy.

The need of a more powerful high frequency dynamo was soon evident. Alexanderson and his assistants then undertook the development of a 50-kilowatt, 50,000-cycle alternator which proved successful at the New Brunswick high power station of the Radio

Corporation of America. But a still more powerful generator was needed for continuous trans-oceanic wireless communication under all conditions.

Mr. Alexanderson then accomplished his crowning achievement. He developed an alternator of 200 kilowatts, 27,000 cycles. Two of these gigantic machines were installed at the Radio Corporation of America's trans-oceanic station at New Brunswick, New Jersey. * * *

This high power radio station, the Alexanderson type, contains three important developments:

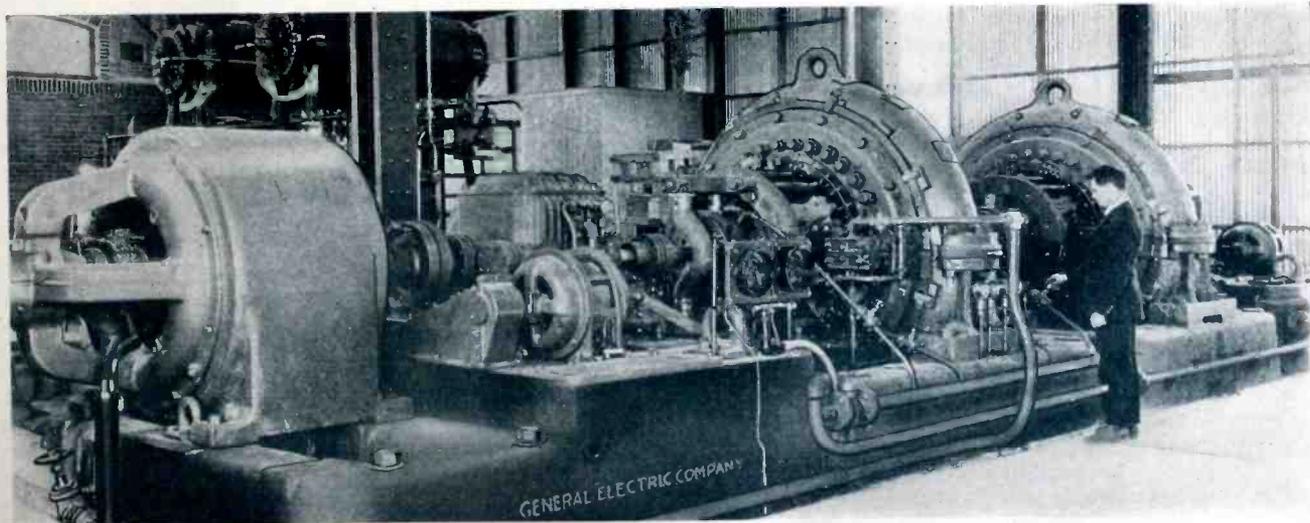
1. An alternator which generates currents directly at the frequencies which are required for radio circuits with which it is associated.

2. A magnetic amplifier which provides a non-arcing control of the alternator output for radio telegraphy, and is equally applicable to radio telephony.

3. A multiple tuned antenna which has markedly reduced the wasteful resistance of the flat-top antenna, and has therefore increased the transmitter over-all efficiency many fold.

These developments have been accomplished by Mr. Alexanderson, and perhaps can only be appreciated by those who are familiar with the problems of radio telegraphy.

The Alexanderson alternator is an inductor type of generator with a solid steel rotor having several hundred slots milled radially on each side of the rim. The slots are filled in with non-magnetic material, with the object of reducing wind friction to a minimum. The fillers are brazed into the disc in order that they may withstand the centrifugal strain of rotation. The rotor is designed for maximum mechanical



The Alexanderson alternator which generates currents at the frequencies that are required for radio circuits

strength by providing it with a thin rim and a much thicker hub. With this construction the strain on the material due to centrifugal force is the same from the shaft to the outer rim.

In regard to some of the electrical features of the alternator it will be noted that the armature and field coils are stationary, the requisite flux variations for the generation of radio frequency currents being obtained from the slots cut in the rotor. The rotor disc revolves between the two faces of the field yokes. The direct current supplied to the field coils produces a magnetic field flux which passes between the field yoke faces and through the rotor.

A solution of the problem of speed

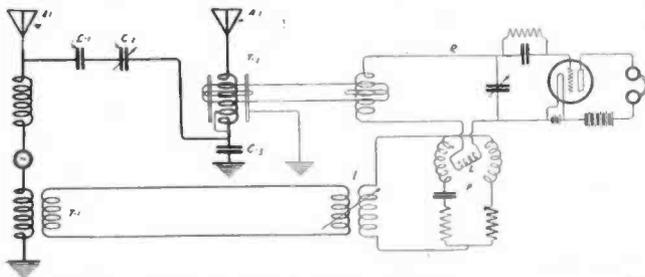
The multiple tuned antenna has, instead of the single ground wire usually employed, a number of ground leads which are brought down from the flat top at equally spaced intervals, and connected to earth through appropriate tuning coils.

The earth-wire system at the New Brunswick station is a combination of a buried metallic and a capacitive ground. Sixteen parallel copper conductors are laid underneath the antenna and buried one foot in the ground. They extend the entire length of the antenna and are spaced between towers. A network of wires and zinc plates are also buried in the ground around the station. At each of the five tuning points outside the station, con-

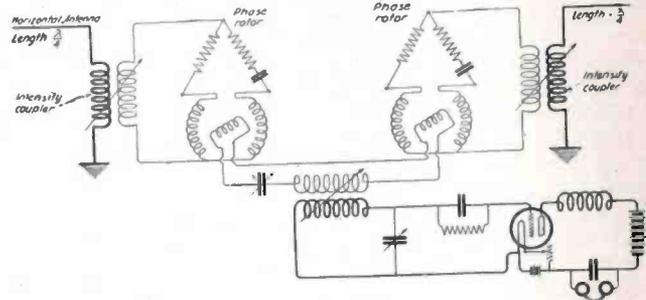
sending key is open, the amplifier short-circuits the alternator and detunes the antenna system, thereby reducing the antenna current to a negligible figure. When it is closed, the output of the alternator is fed to the antenna system.

A standard tower for high-power stations is used. This is of the self-supporting type erected on a suitable concrete base. The antenna wires are suspended from the steel cross arm at the top. This method of antenna suspension lends itself admirably to the long narrow antenna which has been found most suitable for the Alexanderson System. * * *

In explaining all this, Mr. Alexanderson injects a touch of the ro-



Fundamental circuit of the "Bridge Receiver"



The "Barrage Receiver" with phase rotators for eliminating interference

regulation with A. C. motor drive was found by Mr. Alexanderson in the use of a resonance circuit, which is tuned to a frequency slightly above the frequency to be maintained at the alternator. This circuit is supplied with current from one of the armature coils on the alternator. The current in this circuit increases with alternator speed, and, through the agency of a rectifier, a D. C. component operates on a voltage regulator connected in the circuit of the dynamo which supplies the saturation current for a set of variable impedances in the two phases of the motor supply circuit. The function of the regulator is to prevent, within established limits, either an increase or decrease of alternator speed.

The multiple tuned antenna used here may be said to establish a radical departure from the types of antennas formerly used for high-power radio transmission. The immediate object of the multiple antenna is to reduce the wasteful resistance of the long, low, flat-top aerials formerly used and to permit the length of such aerials to be increased indefinitely for the use of greater powers. The radiation qualities of the flat-top are not impaired by multiple tuning, as a series of tests have shown that with an equal number of amperes in either type, the same signal audibility is obtained at a receiving station, but there is an enormous saving of power in the case of the multiple antenna.

nection is made from the antenna flat top to the sixteen underground wires.

A still better distribution of the earth currents at New Brunswick was obtained by using a capacitive ground commonly known as a counterpoise, which is erected underneath the antenna and a few feet above the earth.

Telegraphic control of the large antenna currents involved in high-power radio transmitters has ever presented a difficult problem. Particularly has this been true when signaling at high speeds. Rapid signaling obviously requires some device that will not cause destructive arcs and will provide the desired modulation of antenna power without taking upon itself the burden of carrying the full power of the system, during the intervals between signaling.

The magnetic amplifier is a device which meets these exacting requirements, for it provides a non-arcing control with a minimum current in the key circuit, and it takes within itself only a small proportion of the total alternator output.

The magnetic amplifier in general may be described as a variable impedance which is connected in shunt with the external circuit of the radio frequency alternator. Its function is to reduce the voltage of the alternator and to detune the antenna system when the sending key proper is open, and to perform the opposite functions when it is closed. Thus when the

mantic. "It is the aim of the radio engineer," he says, "to charter the sea of the ether, to weather its storms and to provide a continuous service of communication day and night."

And he continues: "The transoceanic radio station is a power station. Its input is kilowatts and its output is words. The problem of radio engineering is to establish the relation between kilowatts input and words output. This relation between kilowatts and words is a chain comprising four separate subjects which are being studied by specialists in those subjects. They are:

- "1. Relation between kilowatts consumed and wave energy radiated.
- "2. Relation between wave energy at the transmitting station and wave energy at the receiving station.
- "3. Relation between wave energy at the receiving station and the speed at which words can be received.
- "4. Influence of atmospheric disturbances.

"The first subject deals with the radio power station and the antenna. The Radio Central antenna at Rocky Point, L. I. is designed from the ground up. It has six ground connections distributed over a distance of one mile and 150 miles of wire buried in the ground. Through these devices the ground resistance has been reduced to 1/10 ohm. The best types of antenna previously used have ground resistances of about 2 ohms. The

losses in the ground have thus been reduced at the rate of 20 to 1.

"The second subject is wave propagation. We have now a great deal of practical data which can be summed up in the rule that the most economical wave length for communication over a certain distance is about one five-hundredth of the distance.

"The third subject deals with the design of the receiving station. It has been found that the speed in words per minute at which it is possible to receive telegraphic code is directly proportional to the amplitude of the wave. A signal field strength of 50 microvolts per meter corresponds under average conditions to a speed of 50 words per minute.

"The fourth subject deals with the atmospheric disturbances. Our modern receiving system eliminates about 9/10 of the disturbances, but the residual which is not eliminated determines the speed of reception by the law of inverse proportionality.

"For elimination of disturbances we use a new type of antenna about ten miles long. It is a simple telegraph wire mounted on ordinary poles. It is not tuned for any particular frequency, and waves at all lengths travel along the wire with the velocity of light. The ether wave thus starts a wave on one end of the wire, and this wave travels along the wire while the original ether wave follows beside it in space, constantly adding energy to the wave on the wire, just as the wind starts a ripple at one shore of a lake and rolls it up to a large wave as it travels along. Thus the wave intensity in the wire grows and becomes a maximum at the far end of the wire. Fortunately on the Atlantic coast, most of the disturbances come from the West, whereas the signals come from the East. The wave antenna thus

separates the signal from the disturbance so that the signal appears at the east end of the wire and the disturbance at the west end. The energy of the disturbance is destroyed by absorption in a resistance at the west end of the wire, whereas a practically pure signal can be collected at the east end.

"With the data that is thus available the planning of a new radio system is no longer a matter of guesswork. Before designing our South American system, we sent an expedition of engineers to chart the atmospheric disturbances. Their findings led to a modification of the original plan because it was discovered that at the location first selected, the principal disturbance came from the same direction as the signal, and therefore could not be eliminated. From the data now available it is possible to calculate the number of words that can be received during each month in the year, although the stations have not yet been built."

Building the radio telegraph station at Warsaw, Poland, was a gigantic engineering project. Of course, the Alexanderson system was installed. Mr. Alexanderson was a leading figure in the furtherance and final realization of this station which is now in daily communication with the Radio Corporation of America, Broad Street Office, operating both ways at a speed of 80 words per minute.

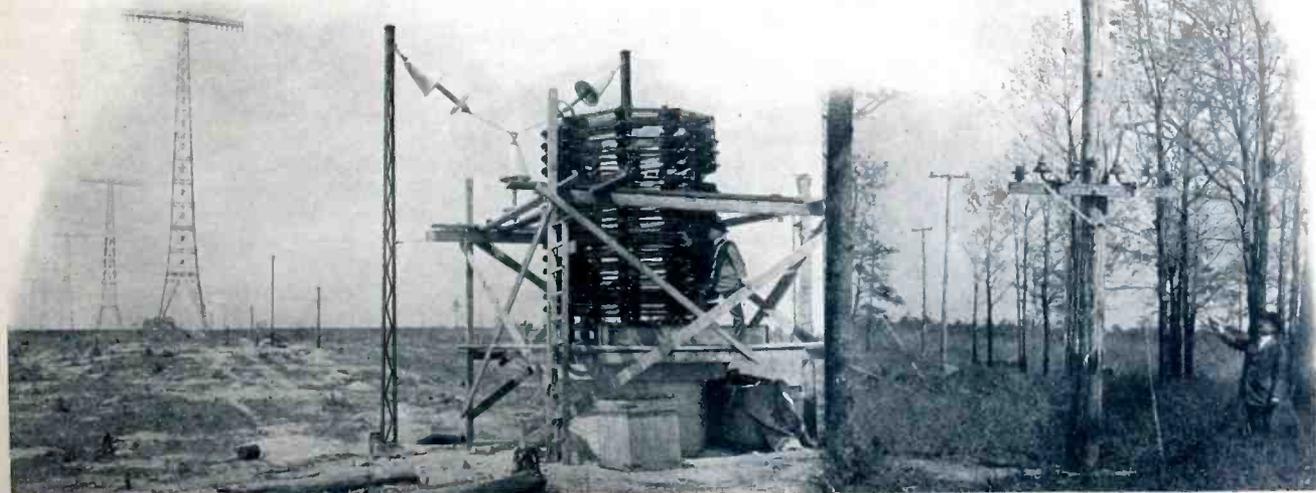
It was early in 1919 that the then newly constituted Polish Government realized that direct communication with the world, and especially with the United States, was essential. Surrounded as she was by nations whose hostility was either open or hardly concealed, she knew that reliance could not be placed upon the existing wire methods of communication, which entailed the use of the facilities of

other nations. Radio was the one most flexible, efficient and certain solution, and the determination to erect a radio station of high power was taken early in the history of the new nation. However, due to the necessity for placing finances in order, and investigating the offers of the various radio constructors, it was not until August 4, 1921, that the Polish Government signed the contract for the station it so eagerly desired. By this contract the Radio Corporation of America agreed with Poland to construct for it an international high power radio station of the most modern type, at an approximate cost of \$2,000,000, and to have it working in 1923. The promise was kept, and the actual operation of the plant has gone forward with the ultimate success.

The station in Poland is equipped with a broadcast receiver that has been fitted with loading coils so that it is capable of tuning to the long wave lengths of the Radio Central transmitter, and messages for Poland are sent direct on a regular schedule.

The Poland station is interesting in a number of ways, besides its general resemblance to the famous Radio Central at Rocky Point, Long Island. Probably the most striking feature of the installation is the power plant, in which some unusually difficult engineering problems had to be solved.

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The multiple tuned antenna system which has markedly increased the overall efficiency of transmitting stations

The Beverage receiving antenna at the Radio Corporation of America receiving station at Riverhead



Senators Howell Broadcasting the

Ralph B. Howell

U. S. Senator from Nebraska

Introduced a Resolution in the Senate to Broadcast Its Proceedings

tor who was not hearing clearly could turn on his receiving apparatus, and turn it off when he chose. In this way every word spoken which should be heard would be heard and of course be broadcasted.

My idea was to use the existing Army and Navy Stations. Immediately upon the announcement of my

resolution the Radio Corporation of America volunteered to undertake this broadcasting. The Senate has adopted the resolution. The War and Navy departments are now looking into the matter as set forth in the resolution.

The Congressional Record has a very limited circulation. Those few people who receive it do not read it to any extent. Its appearance is, as literature, uninviting. Consequently very little of the proceedings of Congress reach the people in their original form.

I believe that many meritorious measures would be acted upon and other proposals, which do not deserve approval, or consideration, would not be passed if the people knew the exact time at which they were being considered that these measures were up. Broadcasting of the Senate's proceedings would bring the people into closer touch with what their representatives are doing and would thus stimulate interest in the issues before the country. The galleries of the Senate would be extended to the borders of the country. Many people do not read much, but these same folks are interested in radio and would listen in.

Undoubtedly much of the irrelevant and extraneous talk and debate would be escaped if my plan were put into effect. Some Senators may be apprehensive that "talking to the country" would preclude the transaction of any business in the Senate, if the proceedings were broadcast. But I am not

one sharing this fear. The reaction from constituents resulting from the waste of time by unnecessary debate would more than offset the desire to make speeches for political effect. I am inclined to think that the length of speeches and the quality of debate would be respectively shortened and improved.

There would also be a tendency to be present on the part of Senators during the time the Senate is in session. Calls for a quorum would lessen in number. Senators would want to let their constituents know that they are following closely what is going on in the Senate.

The advertising value of broadcasting the proceedings would be great to the individual Senators and to the parties. Some one has expressed a fear that party organizations would exercise rather strict control over the time, with the result that only the best speakers would get much opportunity to set forth their views on the subjects under consideration. There is no such danger. Party discipline is not what it was in the period following the Civil War. No great issues now separate the two major parties. Members of Congress speak and vote with very free minds. I believe every member would be able to say what he wanted to say. This apprehension is not to be seriously entertained.

The procedure and manner of doing things here is a mystery to most of our citizens. The reason is that they do not have facilities to get the information they need to understand how we do things in Congress. When one can put on a head-piece or turn on a loud speaker and hear what is going on in Washington, so far as Congress is concerned, he would in a short time understand just why it takes so long to do things sometimes.

Personal touch is a very moving influence in human affairs. Reading about what happened in Congress is not nearly so stimulating as hearing it as it is being done. The reaction from Congressional action would be many

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and Dial on Senate Proceedings

Nathaniel B. Dial

U. S. Senator from South Carolina

Contends That It Is Not
Practicable Nor Desirable

THE Secretaries of War and Navy, by a resolution of the Senate recently adopted, have been requested to form a board of radio experts from their branches of the federal government to investigate the possibility and practicability of equipping the Senate chamber, without defacing it, so that the proceedings could be broadcast. The use of the existing plants and facilities of the War and the Navy Departments is contemplated in the resolution for this broadcasting. The inquiry is to cover also the cost of procuring and installing the necessary equipments, and a report is to be made by the heads of the two departments to the Senate.

Senator Howell, of Nebraska, is the author of this proposal. His resolution includes the consideration also of the matter of so equipping the Senate chamber so that every word spoken in debate, in whatever tone of voice, could be heard easily in any part of the chamber. There is often sufficient noise and confusion, under strained circumstances, to warrant the inquiry as to whether this disadvantage cannot be obviated. I believe something along this line is possible of accomplishment.

I am rather convinced that broadcasting of the proceedings of the Senate is not practicable. The conditions under which speaking is done in the Senate chamber are not comparable to the conditions in a broadcasting station, or to an occasion such as when the President makes a set speech. Any Senator is subjected in the course of a speech or a debate to many unlooked for interruptions. No one can anticipate just when the speaker is about to be asked a question. Debate is so fast and so attentively followed when an interesting and important matter is under consideration that perhaps three or four Senators are addressing the presiding officer at the same instant in an endeavor to get recognition in order to ask the speaker a question.

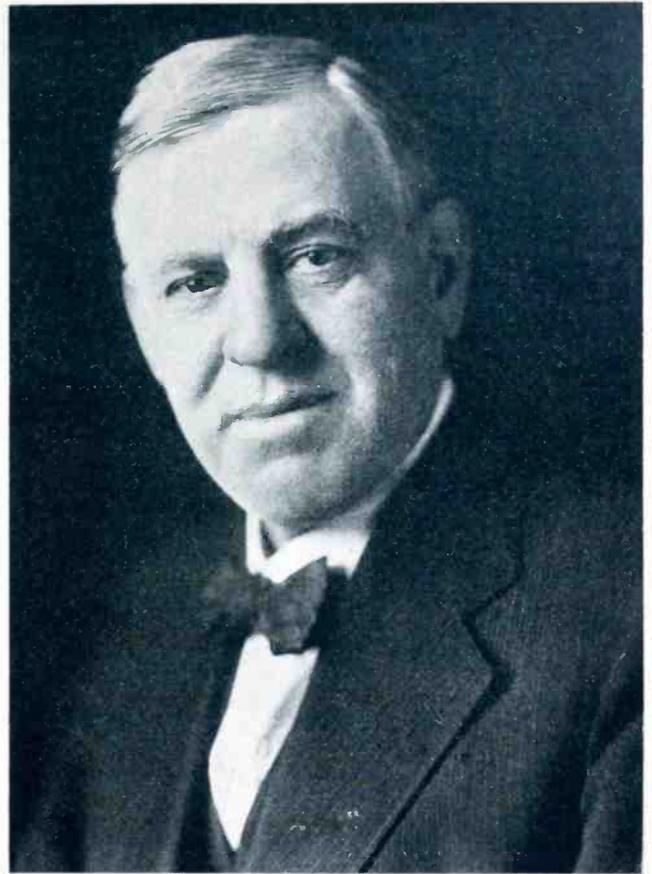
Granting that some sort of a system could be worked out so that each Senator's desk would be equipped with an arrangement, which could be controlled

at a central point, in order that only the Senator actually addressing the chair would have his voice received and broadcast, the operator of this intricate mechanism would have to be inhumanly active and alert to be able even approximately to follow the proceedings. It would, it seems to me, be beyond human ability and dexterity.

So much for the practicability of the project. The experts are the only persons who can tell us whether it can or can not be done. Science can do wonders. It likely will at some time be able to perfect even such an arrangement.

As to the merits of the proposal, I am quite satisfied in my own mind. I believe broadcasting of the proceedings of the Senate would be a bad thing for the country.

Congress would be slow to adjourn. The political possibilities would be enormous. We have too much talking in Congress now. The eyes of the country are ever on Washington, on the Federal Government, especially on the Congress, waiting and hoping, and in many cases, alas, expecting, that something will be done legislatively that will cure this or that public ill. Most of these things cannot be effected by simply passing a law or two. They require the working out of natural laws and economic processes. The basis of our liberties rests on the government, and the interest therein, of our states and small communities. Our people can accomplish much if they will demand that more be done near where they reside, and less at Washington. Not that there is anything which those who do not favor this new proposal would conceal from the public mind. The people are entitled to know all about what goes on in Washington.



But we do not want to fix their attention on one agency of the government for the best part of the waking half of the twenty-four hours.

What with the news bureaus, news agencies, news service, special correspondents, and the *Congressional Record* itself, there is surely no dearth of sources to which a curious individual can repair for his information. These various news gathering businesses, each operating independently, covering the same field, are in a very intensely competitive occupation. Each one of them cannot afford to miss anything important. Every worth while fact is related to the public, almost as soon as it happens. The people get this news from several sources, and from each source in a slightly different manner, with the result that all the angles are simultaneously presented to the public's attention for its consideration. The suppression of any news or facts which belong inherently to our people is impossible, much less the passing over of anything done in the legislative bodies, because all the latter are necessarily reported in the *Congressional Record*.

The dignity of the Senate as a body would be sure to deteriorate if the suggestion to broadcast its proceedings in full were adopted. A mighty political

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Municipal Station WNYC



Operator at receiving equipment at WNYC. This is primarily for listening in on possible SOS calls



Antenna system in course of completion for WNYC's new broadcast station. This aerial is of the cage type believed to be best suited at this point. Note skyscrapers in background



P. H. Geer at work on the one kilowatt transmitting equipment of WNYC. Many novel features will be broadcast from this new station, one of the most up-to-date of its kind in the country. All broadcasting will be done from the Municipal Building at New York City



Anton Grainer installing the speech amplifiers which step-up the voice vibrations caught by the microphone in WNYC's studio. New York City plans to compete with the best broadcast stations in the country, offering a highly diversified program

To Those Who Attend Church

Radio Church Services Have, From the Very First, Made a Broad Appeal

UNDoubtedly one of the permanent functions of radio broadcasting has become clearly defined when church services are considered. From the first days of this new medium of communication people listened in quite generally to religious services. It is now an established institution.

By means of radio the voices of the clergymen of Schenectady, previously limited to the churches in which they spoke, are now carried great distances. Every Sunday the services of a Schenectady church are attended by two congregations, one visible to the pastor, the other invisible but hardly less appreciative.

For months WGY, co-operating with the Schenectady Ministerial Association, has been putting religious services on the air. Because of the power of the station, the excellence of its modulation and its exceptionally favorable location for distance transmission, the messages of the Schenectady clergy have been carried thousands of miles reaching, especially, thinly populated sections in northern New York, New Hampshire, Vermont and eastern Canada. Each preacher has become known internationally, and his flock has increased many times.

Days after a radio service the clergymen of the church receives letters of appreciation from his listeners. The letters come from invalids, the aged, from the lame and blind and from institutional patients. A great many letters are received from people living in isolated communities where no church services are conducted. Woodsmen,

By Rev. H. E. Fulton



Rev. H. F. Fulton, Pastor of the Community Church

farmers, forest rangers, keepers of light ships on the coast and fishermen shut in by ice on islands off the Canadian coast have acknowledged reception of Schenectady services.

Frequently the letters contain sums of money, the senders feeling that by contributing to the collection they are more completely participating in the

The entire morning services at St. Thomas' Church, one of the oldest and best-known churches in Manhattan, is broadcast by station WJZ by means of the permanent microphone installation which has now been in use for over a year and which enables the radio congregation to hear the sermon, the choir numbers, and the hymns by the congregation in the church in practically perfect form. Tiny microphones installed in various parts of the church are switched in and out by the operator as the service changes from pulpit to congregation and from congregation to choir.—H. F. Fulton.

Invalids and Shut-ins as Well as the Isolated Now Attend Services

service. Some of the churches have set aside the "radio" collections as a mission fund. Each of the Schenectady ministers has broadcast so often that the listeners feel an intimate personal relationship and the letters breathe warmth and friendliness. Not infrequently the writer extends an invitation for a visit, for a fishing or a hunting trip.

Recently Dr. Philip Frick, pastor of the First Methodist Church, received a letter from a Vermont resident who asked the clergyman's assistance in locating a sister he hadn't seen for twenty years. The correspondent had a vague notion that his sister lived in or near Schenectady. Dr. Frick started an investigation with the result that sister and brother were reunited.

Rev. H. F. Fulton, pastor of the Community Church, at Hampden, Mass., relates the experience of his congregation after attending a radio church service. He says:

An innovation was introduced recently in The Community Church, located at Hampden, Mass., when on a Sunday morning, a radio receiving set was used in connection with the service. On account of my absence while attending a church conference in Lynn, Mass., a service was broadcast from the South Congregational Church, in Springfield, Mass., through station WBZ. The local congregation followed the service throughout, taking their customary seats during the playing of the organ prelude and bowing reverently when Rev. James Gordon Gülkey, of the South Congregational

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Grandfather and grandmother Keating listening in during Sunday morning church services



Rev. Lyman R. Hartley of the Port George Presbyterian Church, New York, installs radio sets to relieve sick members of his church



MRS. FREDERICK was at one time consulting Household Editor for the "Ladies' Home Journal," a contributor to "Farm and Home," a contributor to "Modern Priscilla," and is at present Household Editor for "Designer." Her activities in extending the benefits of home life by radio has attracted widespread interest throughout the country. This is a story of a mother who wanted just one career—the career of family and home and radio. Observing the illustration to the left Mrs. Fredericks can say like Cornelia: "These are my jewels," as well as a career.

How I Made a Career Out of Home and Radio

By Mrs. Christine Frederick

Founder of the Applecroft Home Experiment Station at Greenlawn, Long Island, author of "Household Engineering," "The New Housekeeping," and other works to do with scientific home management.

WITH two babies and a home to look after, and a feeling that my college education was going to waste in home drudgery, I was not in a contented state of mind ten years ago. (How familiar this will sound to hundreds of women!)

Then one day my husband and I went to hear Harrington Emerson, the scientific management expert. The tale of how factory work was being revolutionized by modern science fascinated me. Mr. Emerson explained the twelve principles of efficiency upon which all this was based. My college training arose from its slumbers—I got an idea! Why not apply to household work the principles of scientific management? Was not the home the greatest factory in the nation—and the one most behind the times? Were not women everywhere ground down by housework done in the same way, almost as a century before?

My husband and I studied the subject intensively; we laid out a series of scientific experiments; we applied the principles of routed, planned work, of proper equipment at the right levels,

etc. It was positively thrilling to see that the principles when applied did yield results, did cut down the housewife's footsteps, did reduce the time necessary to do the work, did eliminate false motions and duplicated effort. You should have seen our house during those experimental periods—kitchen torn apart to raise sinks to the no-stoop level; stoves re-arranged so that the "preparing process" of cooking moved in consecutive line from ice box to dining room door; and the "cleansing process" in a similar line from table, to sink, to drain board to shelves. Stop watches to time motions, pedometers to count the number of steps taken—it was an eye-opening work, in the revelation it gave of the reason why "women's work is never done."

I prepared a series of articles for a great woman's magazine, and they stirred the country. They were printed in book form ("The New Housekeeping," Doubleday, Page & Co.) and I was called upon to lecture before women's clubs and scientific societies all over the country. My book was

translated into Scandinavian, German and French. I opened up the Applecroft Home Experiment Station at Greenlawn, Long Island, our summer home, to continue the work, and issued bulletins, and continued my career as a writer for women's magazines and newspapers from the modern housewife's point of view. Previous to that very little but the old, out-of-date material for women had been provided.

I got thousands of letters from women, some of them tearful with the dreariness of household drudgery and pathetic in their eagerness to take a new view and apply new methods to housework. I was hailed almost as a prophetess and a deliverer, a founder of a new practical religion for women. You see, I preached the adoption in the home of the scientific idea with which men have done so much, while women have lingered in an archaic period.

I spent four years preparing a new and complete book—and added two babies to my family during the interval—which would give women a complete text book of the new methods. It is called "Household Engineering";

and is now used as a text book in many schools. Harrington Emerson and Frank B. Gilbreth, both famous engineers, were good enough to write introductions to these books.

I began to be called upon to write articles, prepare booklets and make new experiments and invent new household devices and helps. I was soon in a perfect whirl of work, and needless to say, I was happier the busier I got! But what has from the very start astounded me is that I have not done anything which any other intelligent woman could not have done. I merely stopped despising housework and studied it coldly and scientifically. I merely began to make a career of which most women regard as drudgery. I merely picked up the reins which most women wish desperately to throw down.

Never have I been more sure than now that the solving of the great problem of home-making and housework is a job which women must tackle and solve, and out of which careers are carved. I have the hardest time in the world trying to find an intelligent, trained house-manager for my own home, at very good pay. Think of it! The profession which belongs by tradition and by necessity to most women, and there are almost none available! We are coming rapidly—due to a decreased number of servants—to the point when women must do more of their own housework, but with the best available apparatus; and also we are arriving at a time when we must have professional house-managers available like trained nurses, for women who work in business or professions.

Almost as soon as radio came, I realized what a particularly great factor it was to be in woman's life, because isolation has been woman's greatest bug-bear. Two or three years ago,

when radio was an infant, I began making experiments. I have one of the earliest sets made for house use. I tried it in all conceivable home ways—as something to keep the sick-room cheerful; as an attraction to keep children at home nights; as an educative force and as plain home entertainment.

I believed in radio for women so much that I began to broadcast material to women; giving in a cheerful, womanly way the timely information women need for the household. Other broadcasting stations began to read my

Mrs. Christine Frederick has been actively engaged in organizing a radio cooking class. This class listens in on KYW, Chicago, while Mrs. Anna J. Peterson, director, broadcasts the lessons in culinary skill. Under the auspices of the Home Service Department of The Peoples Gas, Light & Coke Co., Mrs. Peterson covers every subject of general interest in cooking in a series of twelve lessons. To those who register for this course and send in written reports on at least nine lessons, radio certificates are issued. It is a course well worth the while of every woman who has a radio available. Write to KYW for particulars. The next radio cooking class will commence in October.

talks to listeners—even though I was personally absent.

Then I was asked by the editor of a famous women's magazine—"Good Housekeeping"—to assert my leadership as a spokesman for American women by writing an article which would tell what kind of material women would like to have broadcast to the home. I prepared a suggested list of things women want. Here it is:

1—Physical Education

- a. Daily "setting up" exercises.
- b. "First Aid" instruction.
- c. Health talks.
- d. Beauty hints.

2—Junior Features

- a. Little "Children's Hour."
- b. Woodcraft and animal stories.
- c. Adventure and history tales.
- d. Activities of Boy Scouts and Campfire Girls.

3—Household Interest

- a. Housekeeping and cooking.
- b. Market reports.
- c. Care and hygiene of children.
- d. Home decoration and furnishing.

4—Cultural Topics

- a. Correct English.
- b. Musical programs.
- c. Drama and book reviews.
- d. Fashion and dress discussions.

5—Social Interests

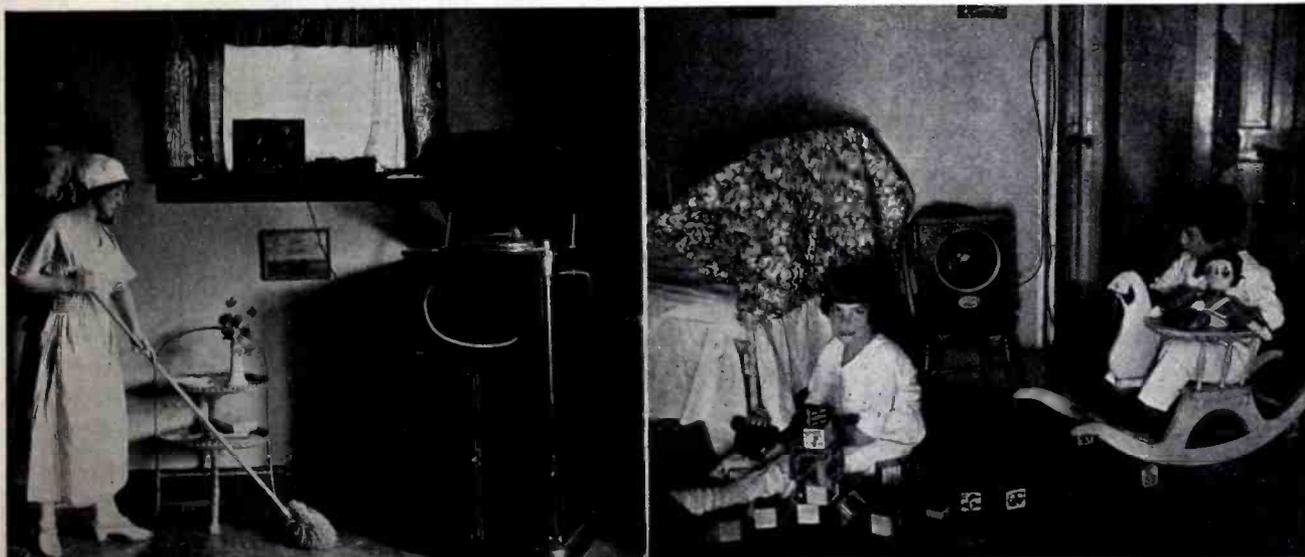
- a. Current events.
- b. Public affairs and politics.
- c. News of sports.
- d. Worship services.
- e. Home finance and thrift.
- f. Club and organization activities.

Many of these recommendations were immediately adopted by various broadcasting stations.

Perhaps the most decidedly advanced and effective use of radio for the benefit of the home was brought about when the Peoples Gas Company in Chicago sent for me to stimulate more interest in home cooking among Chicago women, who were contracting the cafeteria habit.

I organized a cooking school, now attended by over 10,000 women per week; and even designed special automobile trucks on which are mounted complete kitchens, and from which lec-

(Turn to page 90)



Illustrating Mrs. Frederick's application of the proper use of radio in the home while at work as well as play



The Conclusion of Our Adventures With Radio in the Canadian Wilderness

By Sinclair Arthur

SO many of my friends have protested against the unprecedented manner in which I left Dr. Hobart and myself in the wilds of Canada, that I feel there is no alternative for me other than a complete account of our sojourn back to civilization. I use the word "sojourn" advisedly. Our trip, from the time we left the Indian camp at the head of Pike Lake, degenerated to an expedition no less thrilling than a familiar visit to haunts commonly frequented by us.

In June, I described the vacation Dr. Hobart and I had planned. From Chicoutimi we traveled across Clear Lake, down the White Water and then stopped to visit the Indian family at Pike Lake. Our Indian guide, Joe, acting as interpreter, explained the marvels of our radio set to the uninitiated savages of his remote lineage. That celebration in the amphitheater that lay below the interlocking branches of the trees, with a venison feast before us, and the tribal dances displayed for our benefit, was an episode that Doc and I will remember to the end of our days. It is an experience worth the trip to the exclusion of all else.

Incidentally, that little party in the heart of a wild dominion was probably responsible for the change that came over us during our trip back to civilization. The nearest I can come to an analysis—in any degree accurate

—is the bland assertion that we acquired, that night, a feeling, or sense of familiarity with all things to do with a wilderness as vast and as untamed as we found in Canada. The idea is absurd—I acknowledge it—but there is no other way of accounting for our sudden feeling of kinship with this wild domain.

When we parted with the Indian family, we did so with a feeling that closely resembled occasions in which life-long friends have bid us adieu, preparatory to an indefinite separation.

Our other guide, the French-Canadian, Jacques, promised us what would amount to a glimpse of Paradise. And we were richly rewarded. Across Pike Lake, on a distant shore, a great area of land had been swept by a forest fire, leaving the ground clear for the tender vegetation that is not able to struggle through existence under the thick branches of giant trees. A riot of bright colored flowers covered the hillside in a variegated assortment of in-

conceivably brilliant shades. On the clear, translucent surface of the lake around us, the delicate tints of the evening's sunset streaked the myriad ripples with ever-changing combinations of crimson and blue. A faint odor of pine and spruce drifted across the water. The even cadence of the paddles lulled our keener perceptions, and called to mind the many stories of fairyland romance and adventure, learned in the days of early boyhood. The setting was perfect for a radio concert.

In spite of the fact that this radio of ours was a burden on the portages, the guides had become enthusiastic over its presence on this trip. In fact, Jacques annoyed me at times with his insistent demand for more music. During the summer months, the days in Labrador are long, darkness approaching seldom before 10:30 P. M. The long evenings were therefore the more enjoyable because of our radio.

Camp had been pitched on the shore early enough to have a long rest before the next morning's portage. Everyone, including the Doc and myself, worked terribly hard on the portages, often carrying more than we could support, and stand upright under the load. The full evening's program had been received from CKAC. The broadcasting of Ilo, the new international language, particularly engaged our



"We found an isolated farm hewn out of the great forest"

interest as a subject worth while.

After we had turned in for the night, Dr. Hobart and I lay for awhile musing over the strange sensation of feeling so much at home in our wild surroundings, and yet, always with the recurrent knowledge that we were several thousand miles away from our real habitation.

WE WERE suddenly awakened. Something was wrong—I knew it—but I couldn't grasp the full import of the situation. A voice pierced the utter blackness. It was the Doc. I jumped to my feet, fully awake. The raging elements had torn our tent loose from its mooring. Rain swept through our belongings—pelted our faces with needle-like intensity—whipped through the tree branches above with a swishing roar, heightened by the drone of the wind. Rain poured down our necks, soaked through our clothing, and washed about our feet in small torrents.

"Are you there?" Doc yelled.

Above the roar of a nature gone mad, the guides' voices pierced the night: "Stay where you are! You move—you get loss!" In a moment, Jacques was at my side rolling our supplies and equipment into a blanket. He explained later that he had done that merely to keep them from being blown away or misplaced in the confusion. At the time, I thought he was trying to keep them dry. Such an attempt, obviously, would have been preposterous.

Jacques clutched my sleeve. "Pardon, M'siere," he said, "we mus' put the tents together, yes?"

I opened my mouth to reply. Water immediately ran in, causing a spluttering of words. "Yes! anything!" I gurgled.

Doc heard it and laughed—or rather, I should say, started to laugh. It ended in another splutter that pleased me immensely. He should have had more decency than he displayed under such trying circumstances.

Jacques and Joe finally succeeded in getting the two tents together in the general form of a wigwam, with an opening at the top. A blazing fire was started in the center and we all gathered around, our clothes hanging on improvised racks to dry. With the increasing warmth of the fire, some cheerfulness returned. Enough clothing was at last dried to wrap about

our persons. Strange, that a small thing like garb should be responsible for the return of confidence and the regaining of a vast amount of our lost dignity.

Doc wanted to try the radio, and since nothing would satisfy him until he had been convinced of the futility of the idea, the receiver was retrieved from the pile of equipment and set up for the experiment.

Joe, the Indian, wanted to know what Doc was doing. "DX hunting," I explained. Joe's eyebrows lifted slightly. I explained further that DX hunting was a mild form of the old, royal game of hunting the whiffle-poof in the jungles of America, but Joe's eyebrows remained up, and so I decided to leave them there.

When Dr. Hobart found that the ra-

take the chance with his one shot. He killed the two partridges, but, as he put it, he had to jerk the gun over quick in order to hit both birds.

After three more days of wandering, he found a small lake full of geese. He slipped into the water, and swimming around among them, tied their feet to his belt with a line that he happened to have in his pocket. His greediness, however, resulted in tying himself to too many of the fowl. Alarmed, they rose into the air carrying him with them. And, he concluded, in order to get back to earth he had to pull the geese, one by one, down to him and kill them. In that way the few remaining birds were weighted down to such an extent that they were forced to land gradually, which they did without injuring him in the least. And, needless to say, he had enough food to get him back to the nearest trading post.

OUR little party, none the worse for the storm, reached the low, rolling tundra land of northern Labrador. Rank vegetation and dense swarms of gnats and black flies tormented us nearly to the point of distraction. We were certainly glad to turn around for the trip back to the forest-land. Even our radio refused to work efficiently so far north, although I'll admit that our distraught temperament might have been the real trouble. The tundra of northern Labrador is so vast, and so difficult to navigate, no one has yet been able

to make the trip across them.

On our way back we found an isolated farm, hewn out of the great forest. Just why anyone should wish to live in such a place the year round was beyond our powers of imagination. The farmer, a rather unfriendly individual, did consent, after some bargaining, to haul our canoe and equipment to Roberval where we could get a train back to Chicoutimi.

This farmer, whose name I have forgotten, irrevocably rejected every attempt made by Dr. Hobart and myself to demonstrate the joy and value of radio. We wondered afterward why either of us should be concerned about this backward individual, and finally arrived at the conclusion that sympathy alone was responsible for our Good Samaritan inclinations.

In Roberval, the people gathered
(Turn to page 86)



"On a distant shore a great area of land had been swept by a forest fire"

dio could not pick up anything at that hour of the night, we all settled back, lit our pipes and began to tell stories.

Jacques had the best story of the lot. Although he told it as an actual experience of his, I am passing it on at its face value.

It seems that he lost his canoe a thousand miles from the nearest town. To walk that distance in the Canadian wilderness is a dangerous undertaking. But with the fortitude (of one telling a story), he set out on his long journey back. In a couple of days he became very hungry, and since he only had one shell left in his gun, he had to wait for a good chance to get plenty of game with the one shot. He saw two partridges, one sitting on a low branch near the tree, and the other perched some distance to the right on a higher branch, Jacques said that he had grown so hungry, he decided to

The World of Sound

Second Instalment of a series of articles on

SOUND in its relation to RADIO

By John P. Minton, B.S., Ph.D.

Consulting Engineer, Technical and Test Department,
Radio Corporation of America, Fellow, Institute of
Radio Engineers and American Physical Society.

THE radio broadcasting stations take the sound in the air, change it over into electric currents of audio frequencies and transmit or radiate them into the surrounding space or ether on the high frequency carrier wave. At the radio receiver the detector tube separates out the currents of audio frequencies from the high frequency carrier wave and then feeds them through an amplifier to the loud speaker or head phones where they are changed back to sound. Much has been said for the radio, but relatively little has been told about the sounds themselves which we desire to transmit and receive. It seems appropriate then to consider the question of "what is sound" and to describe, in a way understandable by all, some of the common things we experience in the "World of Sound."

In the world of sound three elements are essential; material objects, the air and the ear. Around us are objects of every description. A moving railroad train, subway and elevated trains, moving automobiles, moving people, the running animals, the flying birds, the grasshoppers, the crickets, the "galloping fish," the charging wild beast, the moving boats, the moving branches and leaves of the trees, etc. I could go on, naming hundreds of objects about us. Those I have named move of their own accord or can be made to move by external means. In

moving they produce little quivers, so to speak. These little quivers are often far too small to observe with the eye, in which case other means must be provided in order to detect the motions.

We live in a vast ocean of air and all these objects are immersed in it, so to speak. When these tiny motions occur a corresponding motion in the adjacent air takes place. The motion of the adjacent air is communicated to all the surrounding air and it thus runs in all directions through all the surrounding space, spreading out, weakening as it gets farther away until finally it dies.

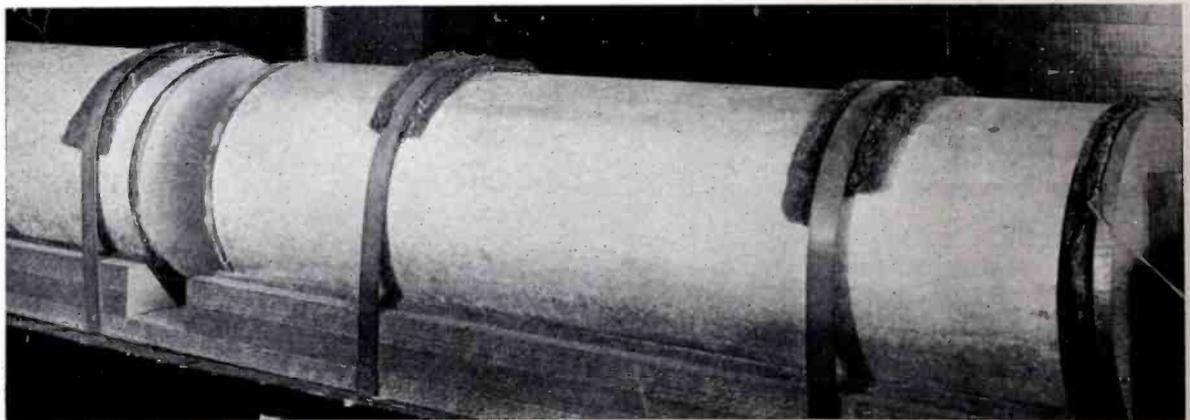
It is of the greatest significance to us that the air can carry ever so many quivering motions at once, each motion being independent of the others. We are all familiar with this. The sounds of voices, the music of instruments, the noises from passing street traffic, the rustling of leaves, the singing of birds, come to us all together. We need only concentrate our attention on any one of various groups of sounds associated with any particular object to readily comprehend the presence and significance of each of the various groups.

Besides the movements or quivers of objects and the air, there is another important object, the ear, which performs its function so marvelously in the world of sound.

It is not surprising that we human

beings as well as practically all animals have been endowed by nature with organs suited especially to detect and observe these quivers and vibrations in the air. In the first article of this group we described how the ear responds to these aerial vibrations. In this respect the ear is unlike the eye. The phenomena of light are of the universe, but our experiences with sound are those of the earth itself, and so we speak, with perfect correctness, of the World of Sound. If the whole of free space were filled with air or other gases, I wonder what awe and fears we would experience by the myriads of new sounds which would come to us from distant quivering planets, suns, stars, etc. Perhaps we should be satisfied with our own world of sound!

To each of us these aerial quivers which travel throughout the air are of great importance. Through long experience we can easily detect and correctly interpret practically all of them. Let some new and unfamiliar sound come to our ears. How quickly our full attention is focused to interpret it. Does it signify danger—alarm us? For the moment it is of supreme importance to us. It may be the whistling of a bullet through the air, the boom of cannons, volcanic eruption, an earthquake, a falling building, a collision of automobiles, the stealthy step of a wild cat, the cautious step of a burglar. We know them all and per-



The laboratory apparatus used to determine the sound transmission characteristic of various materials—note the slot at left where the material is inserted and then clamped tightly in place

haps, have learned to interpret them because of their significance to us. They are also so different. Indeed, the ear is more wonderful than we give it credit for! It can detect the difference between the voices of men and women, it can distinguish one voice from another. It knows the different inflections of the voice and it can detect instantly and interpret correctly even the spirit that lies behind the spoken word or the cry of the babe! It is everything, almost, to us to be able to converse with our friends and associates, and thus set in motion very special kinds of aerial quivers or vibrations. The world of music also gives great joy and pleasure to many and in this realm, too, special kinds of quivers are produced. Both of the special kinds of vibrations will be treated in a forthcoming article on "Speech and Music in the World of Sound." For the present, let us become more familiar with the nature of sound.

We have seen that the air adjacent to a vibrating object vibrates with it and that these vibrations of the air are propagated throughout the region. In other words, air conducts the sound vibrations, so to speak. We have all watched the water waves traveling along the surface of the water. This constitutes a wave motion passing through water. Sound is a similar wave motion passing through the at-

mosphere or air. This can be easily demonstrated. In figure 1 is sketched a glass vessel which can be exhausted of the air within it by pumping out the air. An electric bell is suspended within the vessel and is connected to a battery outside the vessel.

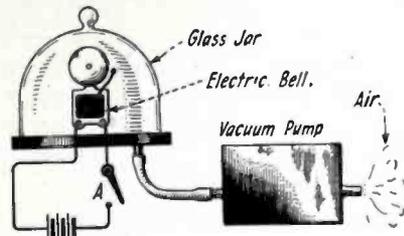


Figure 1—Apparatus used to demonstrate the characteristics of sound

If the electric circuit is completed at A, so that the current operates the bell, we hear it quite easily. We now slowly exhaust the vessel and we observe that the sound from the bell grows weaker. When the exhaustion

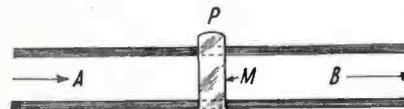


Figure 2—Determining sound transmission through various materials

of air has reached a high degree the sound disappears entirely. This shows that the presence of the air is necessary in order for the sound to be propagated

away from a vibrating object. The eye can observe the vibrations of the clapper throughout the whole process which shows that air itself is not needed for light propagation.

This experiment shows that sound will not pass through a vacuum and for this reason no sounds from objects external to our earth can come to us. Air then is the conducting medium for sound waves just as free space or ether is the conducting medium for radio waves and light. This experiment also shows that glass—and other solid objects—not only conduct sounds well, but conduct them without change so that we are able to identify them after they have passed through. When the bell is operating the air is caused to vibrate. These vibrations of the air molecules cause a corresponding vibration of the wall of the vessel by the air molecules beating back and forth against the glass. The glass in turn causes the outside air molecules to vibrate and these motions run throughout all space, a small portion of them acting upon the drum membrane of the ear as described in our previous article.

Sound will also travel through water and other liquids in exactly the same way that it travels through all solids and all gases. During the war great use was made of the passage of sound waves through water in detecting the



Dr. Minton conducting tests with loud speakers in sound proof booth



Exterior view of the portable sound proof booth built especially for acoustic experiments

presence of and finding the location of submarines and other boats. All material objects then are conductors of sound. Some are better conductors than others, just as some materials are better conductors of electricity than others. For example, let sound be passing down an iron tube or pipe, as illustrated in figure 2. At a convenient place, P, the pipe is cut in two and various materials are inserted at the joint as shown by M. Let the sound pass from the section A, through M to the section B. If M is air, the sound in A is practically equal to that in B. For all other materials the sound in B is less than that in A. In figure 3 is shown a group of curves which illustrate how the sound is transmitted through a group of various materials, including ordinary wool felt, soft rubber and lead. The wool felt and rubber were 1/16-inch thick while the lead was 5/1000-inch thick. The curves show the percentage of the sound in A which passes into B through various numbers of layers of the three materials. The curves show clearly that for equal thicknesses the lead transmits by far the least, the soft rubber next and felt the most of these three substances.

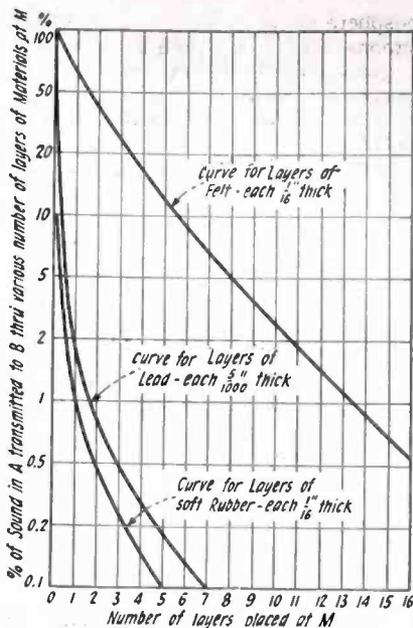


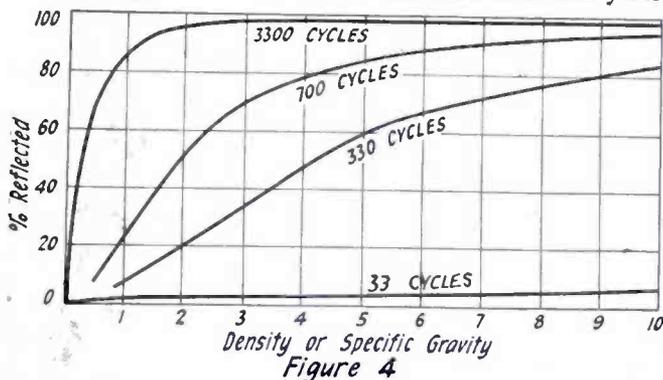
Figure 3—Graphs showing the sound transmission characteristic of various materials

materials, but high pitch sounds cannot do so. Then figure 5 shows that the material must have thickness in order to reflect sound no matter how dense or heavy the material may be.

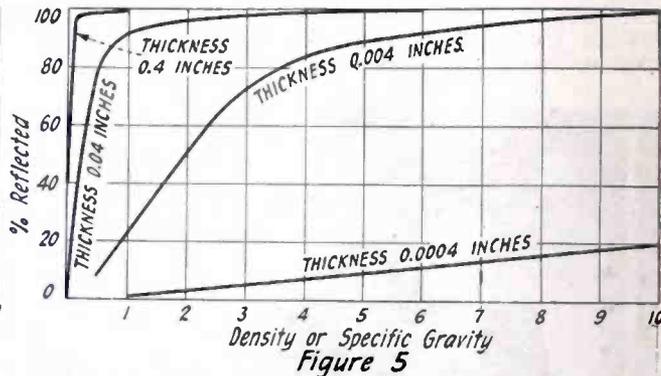
sound. For this reason they are used as absorbers of sound and are made use of in broadcasting studios, auditoriums and theaters.

These three phenomena, namely transmission, absorption and reflection of sound play an important rôle in radio. Suppose, for example, it is desired to broadcast the performance of a symphony orchestra. The music is a complex mixture of sounds from all the different instruments, some low pitch ones, some high pitch ones, some intermediate pitch ones and some a mixture of all pitches from the very lowest to the highest. The lowest pitch sounds tend to pass out through the walls of the hall. That is, there is, in a way, no such a thing as a hall for low pitch sounds. The higher pitch sounds are reflected practically 100 per cent. from the walls and windows. Of these the very highest pitch ones are quickly absorbed by the draperies, rugs, cushions and clothing, while the lower pitch of the reflected sound is not so much absorbed. The result is a peculiar combination or balancing of the instruments of the orchestra, with a preponderance of intermediate frequencies which quickly build up in the hall what is known as reverberation and resonance effects. When therefore

What happens to the sound that



Graphic curves of the characteristics of various materials in sound transmission



does not pass through the material M? Some is absorbed in the material itself and the remainder is reflected from M back into the A section of the tube itself. The heavy or dense materials, like lead are good reflectors of sound, but the light ones, like felt are poor reflectors. We are all familiar with reflection of sound from buildings, from mountain sides, from interior walls of large rooms, etc. The curves in figure 4, show the percentage reflection of sound from materials. The light materials having a density less than one are poor reflectors, but the heavy ones are better reflectors. These curves also show how the high pitch sounds are easily reflected, but the low pitch ones are very difficult to reflect, even from the most dense materials such as copper, iron, etc. That is, low pitch sounds pass right through such

Again, the less dense materials, such as felt, cotton, soft wood, sawdust, sponge rubber, rugs, etc., absorb much

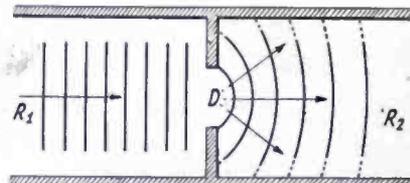


Figure 6—Long sound waves pass through the door D and spread out to fill up all of the room R₂

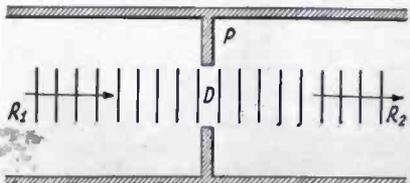


Figure 7—Short sound waves pass through the door D and do not spread out to fill up all the room R₂

we broadcast music from halls and auditoriums, this peculiar reverberation effect is readily observable. In studios this effect can be reduced by proper acoustic treatment of the walls, floors and ceiling to a point where it is not noticeable.

These three phenomena also enter in radio for the home. Here again, however, this effect can be controlled and reduced to a negligible point by proper selection of the furnishings of a room. However, if one desires to have the loud speaker in a room apart from the room in which he is located, difficulty of another nature is encountered in addition to these three. In this case the sound will usually have to pass around corners, through halls, perhaps from one floor to another, etc. If sound were a flood of water, it would be possible to get it to fill up every nook and

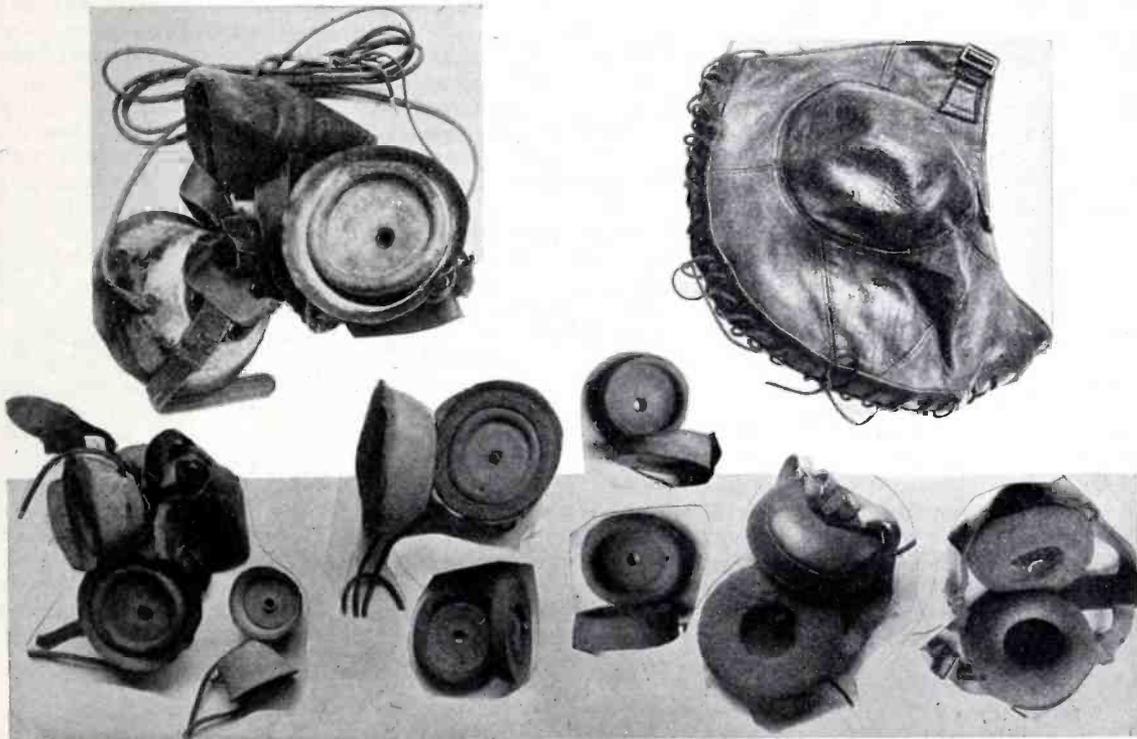
crevice with sound. The low pitch sounds do act like this, but the high pitch sounds do not. These are more like the water flowing from the end of a hose and go only where we direct it, so to speak, and cannot pass around corners and fill up the space beyond. In other words the high pitch sounds act somewhat like light in this respect.

These phenomena of diffraction of sound waves are represented by the figures 6 and 7. The door, D, connects the radio room R₁ to the listening room R₂. In the case of the very low pitch sound waves, they are long compared with the dimensions of the door and so spread out to fill up the whole of the second room as shown in figure 6. In the case of the high pitch sound waves, they are small compared with the dimensions of the door and so pass

sounds will pass from one room to another without much absorption, but the higher pitch ones will be greatly absorbed in their passage along halls from one room to another. Distortion, then, takes place in the original sounds and the effect is not altogether pleasing.

The discussion given above shows how sound energy is propagated and, furthermore, like electric energy along wires or through space as in radio waves, it encounters certain resisting forces which decrease the amount of sound energy that would be transmitted if these forces were absent. All of us are familiar with resistance of the wires, the inductance of the coils and the capacity of the condensers used in radio receiving sets. The acoustical analogies to resistance, inductance and

fact that the coil of wire, L, has a certain electric resistance. That is, we cannot divest the wire of its natural electric resistance. Similarly, we cannot divest the neck, n, of its acoustical resistance. The air molecules move back and forth along and in contact with the internal walls of the neck and we all know that rubbing two bodies together requires a certain force on our part and also requires an expenditure of energy as is evident by the heat produced at the rubbing surfaces. This is the corresponding case in electric resistance and is also of the same nature in acoustics. In the electric analogy the resistance is decreased if we increase the cross sectional area of the wire. The same sort of thing holds in the acoustical case—the acoustic resistance, which causes absorption of



Aviator's helmets with their shielded and sound-proof phone receivers made of material determined by the charts in figures 3, 4 and 5

through it without spreading out as shown in figure 7. Consequently if a person is directly in front of the door, he will receive better results than if he stood around the corner as at P. We are all familiar with this effect of diffraction in the case of water waves and many of us are acquainted with it in the case of radio reception. The same phenomenon is observed when large objects are placed in front of a loud speaker or are between the listener and loud speaker. This is why, of course, it is much easier to understand a loud speaker when we are directly in front of it than when we are located in another room.

In addition to diffraction effects as mentioned above, the low frequency

capacity may be illustrated in the following diagrams. In figure A a vessel



is represented by v with a neck, n, of small internal diameter, leading from the chamber v to the external air, a. The corresponding electrical analogy is represented in figure B where the capacity, c, corresponds to the air chamber v and the inductance L corresponds to the narrow neck or opening, n. Changes in the magnitude of L correspond to similar changes in n. The same holds true for corresponding changes in the magnitude of C and V.

Now we are all familiar with the

acoustic energy, is decreased if the internal bore of the neck is increased. We can also decrease the acoustic resistance of the neck by having its walls perfectly smooth molecularly speaking. This effect of smooth walls however, is of importance only when the bore is small. In ordinary work, like speaking tubes, loud speakers and horns, the effect is of negligible importance.

This analogy is worth carrying further. We also desire to transmit the maximum amount of energy—be it electric, acoustic or mechanical, in order to work at the highest efficiency. In the mechanical case suppose we desire to transmit coal from a Pennsylvania mine to a New York City apart-

(Turn to page 88)

EAST MEETS WEST IN

In Outstanding



Walter Wilson, as "Uncle Bob," broadcasts bedtime stories from KYW

WILLIAM JENNINGS BRYAN has been a romantic figure in American politics. When occasion demands he can still hold the nation in the grip of his oratorical genius. It is significant that Mr. Bryan should come forward with the assertion that radio has been the greatest invention since the advent of movable type. In the May issue of *THE WIRELESS AGE*, Mr. Bryan advanced the claim that radio will materially help bring about world peace. Further, he stated that from small candidates up to the presidential nominees each can address the nation the day before election, concentrating their arguments upon the contested issues and answering any misrepresentations that may have been made.

The abuse of so tremendous an influence, he continued, would be so harmful, that the government, acting for all the people, may be relied upon to insure fairness in the use of broadcasting.

Senator Royal S. Copeland had more to say in these pages in the July number. We all know the extent to which radio has been used by President Coolidge in his addresses to Congress. The use of broadcasting during the Republican and Democratic Conventions is now common knowledge. It is, there-

EXIT FIREWORKS ORATORY,
HIGH LIGHTS OF THE THEATER,
THE ROYAL GAME OF CHESS

fore, the employment of that instrument of publicity in the coming election campaigns that most concerns us now.

One notable result is the lesson learned by politicians during the conventions in New York and Cleveland. The old method of oratory, with fist-shaking and hair-tossing, was found to be of small value to B. C. Ls., in some cases, thousands of miles distant. Before the fall campaign opens, some of these gentlemen will probably engage private tutelage with teachers of public speaking.

Dr. Delbert Lean, professor of public speaking at Wooster College, predicts that the radio will do much to improve the literary quality of political speeches. Most of the old-time speakers depend much on their physical appearance, their bodily movements, gesticulations and facial contortions to stir their audience. Any important point was driven home with a resounding bang of the fist on a convenient table. A whole plank in the platform of the opposing party could be dismissed with a snap of the fingers. A shrug of the shoulders was sufficient to make a pigmy of an erstwhile gigantic opponent. Pantomime took the place of logic, and clear English was not necessary if the speaker was sufficiently

athletic to dazzle his audiences.

But with the radio these tricks are as useless as an icebox on a Polar expedition. The swaying of the listeners' emotions is secondary to clear presentation of facts. Only the master of English, who depends solely on the power of his words and his ability to use them, will be able to convince.

Will Rogers, in an off moment when he wasn't occupied with coiling his lariat, voiced the opinion that the convention in Cleveland was the first vice-presidential convention ever held in that city. Such remarks have caused the turning of the tide in many important issues of state. Humor livens any serious project. And it should be so. But a happy limit automatically becomes effective in broadcasting. That vehicle of information is too far-reaching for one speech, one catch-phrase, or a single political stratagem to carry undue weight. A first class broadcast station will not allow one party broadcast privileges without an equal advantage open to the other political body. Propaganda is barred; debate is encouraged. Political machines cannot reach broadcast stations, nor control their policies, as they often do other fields of public opinion, primarily because broadcast stations operate without direct return, and will continue to operate without profit in the future. And then, as Mr. Bryan points out, the abuse of such a tremendous influence would be so harmful, that the



The St. Louis Symphony Orchestra broadcast under the

THE GREAT MID-WEST

Broadcast Events

government, acting for all the people, would take active, and probably stringent, measures to insure fairness in the use of broadcasting.

That, alone, is well worth remembering. This presidential campaign will be a broadcast campaign. Tune in on it. As never before, you may rely upon active, individual participation in American politics now that you have radio at your disposal.

Washington led the "straw-foot" brigade in the cause of democratic franchise. Lincoln took drastic steps toward cementing a government run for the people, of the people and by the people. Radio has come to us as an agent of the politic body of America. It is for those of us who will use it.

LENOX ROBINSON'S "Crabbed Youth and Age," second prize-winning one-act play of the Little Theater Tournament, was presented in full, from the studio of station WJZ. The Garden Players of Forest Hills, an organization of non-professional players, has presented some seventy-five productions, both long and short, in the last nine years. Many of their productions have been given out of doors, using the naturally picturesque background of their beautiful gardens. The cast includes seven.

Of the professional plays broadcast by WJZ, "Sitting Pretty" at the Fulton Theater, and "Plain Jane" at the New Manhattan, were big hits.

Queenie Smith as an orphan in "Sitting Pretty," injected spice and mirth

NEW LANGUAGES AND OLD THE MODERN TROUBADOUR OMNI-ORAL PRODUCTIONS

into the broadcast performance. Next best was Frank McIntyre, the comedian. Although Eleanor Griffith, as Queenie Smith's sister, had a rather attractive, winsome manner when viewed from the theater seats, much of her real personality was lost over the radio. The garden party ball, which comprised most of the second act, could not be broadcast effectively since too much time elapsed between spoken lines and the following musical numbers. But for the benefit of those who listened in on "Sitting Pretty," it may be said that nothing was lost through hearing only the first of the two acts. The second act is good only if it is seen. The first act, however, happened to be sufficient unto itself for broadcast purposes.

"Plain Jane" was worth while broadcasting. It is more worth while seeing. Although musical numbers were especially lively and tuneful, and the comedy of the best, the bright scenery and costumes, and the unusually pretty feminine members of the cast, could not be radioed. Described? Yes—but what of it? A broadcast announcer could not do "Plain Jane" full justice. The prize fight in the second act was described, blow by blow, by J. Andrew White, the pioneer "fight" announcer. Incidentally, the "blows" were altogether realistic.



Val McLaughlin, the kiddies "Sandman" broadcasting from WOC

MANY LEGENDS about the origin of chess have been handed down through the ages from dim antiquity. One account runs that an army, long besieged, was in grave danger of broken morale. To prevent the threatening dissension in the ranks, the king had designed a game in which the element of luck would not be a factor. He reasoned that such a game would engage the interest of his men, so arousing mental activity, that each would forget his individual grievances, and thereby regain the confidence that is essential to any project in which a great many have come together for a single purpose. The human weakness for "taking a chance" was soon responsible for the introduction of the practice of casting dice in order to determine which player would make the first move. But chess has come down to us as a product of evolutionary development, always retaining the one great principle—a game well adapted to stimulating thought.

Incidentally, it is significant that the legendary king wishes to stimulate thought at a time when his men, besieged and oppressed, were on the point of revolution. A combination of two thought producers—broadcasting and chess—has been successfully tried and proved popular.

Devotees of the ancient and royal game of chess have used many and



direction of Rudolph Ganz has received enthusiastic response



Upper: R. H. McNee showing his pet Bobcat how to broadcast through station KHJ

Lower: Arthur Murray and Hope Hampton broadcasting dancing lessons from WOR

Both rather typical of East and West



varied ways of playing the game. Great matches have been held by mail, telegraph, cable and telephone.

And now, two of the best chess teams in this country have played their intercollegiate match in the most novel way yet devised—by radio.

Station WIP, Philadelphia, broadcast for the team of the University of Pennsylvania, Station KDKA, Pittsburgh, broadcast for the University of Pittsburgh team.

Both teams had powerful radio receivers installed, the one in Philadelphia tuned to KDKA, and the one in Pittsburgh tuned to WIP. Moves were announced over the air.

Radio-chess enthusiasts were able to watch the progress of this great match as easy as if they were at the game. By placing a chess board next to their receivers, and moving the men as indicated by the radio announcements, they could at all times see just how the game was progressing and who stood the best chance to win.

WENDELL HALL reached Davenport on his tour of eastern and mid-western broadcasting stations as an Eveready entertainer. In his very first appearance at Station WOC, he gained favor with the station's radio audience by ringing the changes of the community's slogan.

"Station WOC," Hall microphoned, "Where the West Begins and Where the Tall Corn Grows," adding, with his famous chuckle, "Sixty Gallons to the Acre."

Iowans liked it and liked Hall. Somebody offered to present him with 1,000 photographs of himself to be

offered to his radio correspondents. WOC's management chipped in by standing back of additional requests over 1,000 if the demand were heavier; and the Eveready Battery Organization, under whose direction Hall was making the tour, also agreed to underwrite whatever additional demand might come in.

When he appeared the next evening at WOC, the offer was broadcast.

Hall was scheduled to sing at WWJ, Detroit, the next week; and the week following that, at WSAI and WBAV in Ohio and so on for another month.

He could not wait on at Davenport to receive the mail resulting from his offer. Much as he wanted to, he could not arrange to have it forwarded to him for his personal attention while en route.

It poured in. WOC officials were nonplused. One thousand letters arrived. Then the second thousand. The third! The fourth! Five thousand! And more!

Hall's stay at WOC was one stop on a tour that included twenty-two broadcasting stations. He is the first radio artist to go on an air-circuit. His inimitable crooning of songs to the accompaniment of his ukulele had established him firmly with radio audiences, especially that of KYW, for more than a year before his tour.

In the twelfth and thirteenth centuries, troubadours toured continental Europe, carrying tales of distant towns, disseminating culture, and generally affording welcome entertainment. This originated in Provence, France. From that origin grew many of the social advantages that practically rescued the world from a return to the Dark Ages. The troubadours were an important contribution to the Renaissance Period. Today, we have Chautauqua and vaudeville circuits. Broadcasting, at first, seemed to threaten the existence of those institutions. But such air-circuit tours as that of Wendell Hall's may be another tremendous step forward in the equitable distribution of knowledge that naturally arises from traveling dispensers of that which lies over the horizon and is not to be had except through one who has been there and has seen.

A marked tendency toward local broadcast reception has for long been evident. Local programs, for the most part, can be enjoyed with greater comfort and less effort than DX hunting. It remains for modern troubadours to add the romantic touch to our home broadcast programs. There is much that we can learn from these lyric poets. If they do little more than incite interest, they have accomplished a great deal. We cease to learn at such time that our interest lags.

LANGUAGE is the dress of thought. Ilo is a universal language well adapted to broadcasting. Especially, since broadcast stations have turned to international program development.

The Canadian newspaper, *La Presse*, realizing the importance of an international language, recently gave a course in Ilo which they may now supplement through their powerful broadcast station, CKAC.

Ilo is the result of the collective labor of the world's best philologists and is not a one-man product. Employing the characters of the international alphabet (Anglo-Latin) ONLY, Ilo can be printed, typewritten or telegraphed throughout the civilized world, without alterations or modifications.

Ilo offends no national prejudice, its roots being essentially international: 80 per cent. now known by English, French, Italians, Spaniards, 65 per cent. by Germans, 52 per cent. by Russians, etc. The educated Latinist is not favored at the expense of the general public.

The list of Ilo words is a long one. Thousands of publications in all parts of the world have carried Ilo items. Radio broadcasting stations have spontaneously known the benefits of Ilo to humanity—thus helping to solve, in a practical way, the problem of linguistic intercommunication.

The older international language is Esperanto, and is claimed, by many of its advocates, to be the better for auxiliary international communication. In fact, there is much to be said in favor of both.

Esperantists of France had a thrill recently when they heard brother Esperantists talking from station WIP in Philadelphia. It was announced, prior to the Esperanto broadcast, which was clearly heard in France, that European stations would listen in. The experiment was a success. Esperantists, both in American and Europe, hailed this broadcast of their international language, as one of the biggest steps ever made for the advancement of Esperanto.

Which of the two languages shall be the ultimate preference is hard to determine at this early stage of their development. It is, however, safe to predict that broadcasting will be the necessary stimulus for the eventual adoption of some language, and understood, by all civilized peoples.

STATION WJY presented a new and heretofore untried form of broadcast entertainment, which included our evening performances. For the lack of a better term, they were styled "Omni-Oral Productions." Each performance was of two hours' duration, the invisible curtain rising at 8:30 o'clock on the evening of each performance.

The basic principle of the "Omni-Oral Productions" was to give a radio performance which was a unified whole, in which each act, although complete in itself, was an integral and coherent part of the entire performance. While the "Omni-Oral Production" was primarily designed to please the listener who tunes to WJY at 8:30 and remains so tuned until the conclusion of the program at 10:30, each act was in itself as fully attractive and entertaining as any features of similar nature on present-day programs.

Each performance was opened with an instrumental overture, allowing the invisible audience a "tuning-period" of five minutes. Next came a prologue, appropriate to the general nature of the evening's production and explaining the locale of the acts which were to follow. Then came the various episodes which comprised the evening's performance, each of from fifteen-minute to a half-hour duration, each one varying from its predecessor in type, but dove-tailing in atmosphere and color with all the others. To the announcer was assigned the responsibility of creating the mental-picture scenery which would aid the listener in "attending" the new type performance.

THE WIRELESS AGE has proposed

something of this nature, editorially. An evening's entertainment constructed with a degree of continuity throughout the program should merit hearty response from listeners in. Such programs would of necessity be prepared with greater care and a deal more thought exercised in making up the schedules.

"A Night with the Conquistadores" opened with a five-minute overture, followed by a brief prologue explaining the nature and locale of the production. A twenty-minute episode of brilliant Spanish and Argentine dance-music, played by one of the leading Spanish orchestras of New York, comprised the next act. Following that, Miss Mildred Delma, the gifted Spanish singer, sang several Spanish Folk Songs, and Vincent De Sola rendered the most famous "Compositions of Spain."

Episode III introduced "A Sunday in Caracas," a fascinating reminiscence by Mr. E. E. Plummer, of the customs and manners of that country. In Episode IV the Piedmont Trio, one of the outstanding instrumental organizations in the country, presented a program of Latin American dances. In Episode V a noteworthy group of artists, including Madame Glukerja Campanieskaja, known throughout Europe as "Russia's Greatest Carmen," Eumenio Blanco, celebrated tenor; Francesca Catalina, nationally famous Spanish soprano, and Paul Morenzo, one of the foremost singers of today, presented "Bits of Carmen."

The second of the "Omni-Oral Productions," "A Night Out of the Past," was opened with a prologue. At 8:40 the invisible curtain rose on Episode I, "The Songs You Know." The celebrated Royal Trio was heard in Episode II, singing "Songs of the '60's." Max Kalfus, eminent tenor who has received unusually large response from the radio listeners after his previous concerts from WJY, presented "Songs of the '90's," and George Laval Chesterton, journalist author, traveler, spun some of his fascinating

Queenie Smith as the orphan in "Sitting Pretty" broadcast through WJZ



reminiscences in Episode IV. The Temple Quartet, one of the leading male organizations of its type in the East, sang the "Songs of 1900" as the final episode.

"Sport," the third of the "Omni-Oral Productions" presented to the invisible audience by station WJY, commenced with a lively jazz overture. Following the prologue, the Hennessey Orchestra presented a twenty-minute episode of dance music and xylophone solos. The "Dixie Stars," otherwise known as Bernard and Robinson, gave a genuine rollicking "Sing-Song," followed by Episode III—"Three Miles Up" as told by Andrea Peyree, famous French aviatrix and holder of the World's Altitude Record for Women. Upon returning to terra firma, Koty and Abram, one of the most popular teams on radio, sang popular songs and ballads, and in Episode V, Major J. Andrew White re-lived the most famous radio battles he had witnessed. Episode VII consisted of a one-hour dance program.

The last of the "Omni-Oral Productions," "A Night at the Opera," was arranged with episodes and musical numbers selected from operas known best to all.

—W. A. H.



RADIO NEWS FROM ALL OVER THE WORLD

Owen D. Young, Mediator on German Reparations

PREMIER MacDonald and Premier Herriot have come to a complete accord on the knotty reparations problem such as England and France have not known in five years.

The two Premiers have put their signatures to a combined program.

Mr. MacDonald yielded to the French demand not to disturb the Reparations Commission's powers, but both Premiers agreed it proper to invite an American to sit with the Commission to decide whether Germany shall have failed to meet payments according to the experts' plan. In other words, they compromised by turning over the power to decide the most delicate question to an American.

The agent for reparations, called the "King of the World" by the experts who drew the plan, will, if the London conference accepts the British and French plan, be in reality the most powerful and most responsible individual in the world.

The man they have in mind, if he will accept, is Owen D. Young, Chairman of the Board of the Radio Corporation of America, and one of the American experts who framed the much discussed Dawes plan.

Mr. Young is now in London. He is likely to prove the mediator to put the plan into action, and may some day have it in his power to say whether Germany has failed in her payments willfully.

Seek News from MacMillan

WILLIAM CHOAT, Toronto radio amateur and radio operator for the Canadian Government steamer *Arctic*, which left Quebec, July 1 on her annual trip to Baffin Bay, may be the first amateur operator to relay back

to Canada and the United States the complete details of the winter experiences and homecoming arrangements of Capt. Donald B. MacMillan, Arctic explorer.

The departure of the *Arctic*, under the Northwest Territories Branch of the Canadian Department of the Interior, comes at a time when the arrival of daylight in the Far North is beginning to shut off the radio contact between MacMillan and radio amateurs



President Coolidge's father, John Coolidge, listening to the broadcast conventions

in Canada and the United States.

The radio messages that have come from Donald Mix, the explorer's radio operator, last fall and winter, have become gradually less frequent as darkness began to leave the polar regions. Of late there have been only a few weak messages that have sufficed to show the *Bowdoin's* crew have come through without hardship. The last one told of the explorer's plan to start for home soon.

Predicts Era of International Broadcasting

"WITHIN the next twelve months the farmer in Kansas or Missouri, as well as the city dweller may participate in a demonstration of broadcasting and hear radio programs

from Paris, London, South America, and possibly from other parts of the world, as a result of plans of superpower development now contemplated by the great electrical interests of this country," according to David Sarnoff, Vice-President and General Manager of the Radio Corporation of America, in a recent address at the annual convention of the Associated Manufacturers of Electrical Supplies.

"International broadcasting which will link up the furthestmost corners of the earth is closer at hand than the public imagines," Mr. Sarnoff said.

"The two outstanding developments in broadcast transmission during recent months," he continued,

"have been first, the increased power of sending stations under the system of superpower, and second, the advent of rebroadcasting, or the method of linking a number of broadcasting stations so that a program may be passed on instantaneously from station to station.

"We have thus far been thinking in terms of national broadcasting," Mr. Sarnoff continued.

"It is a fact, however, that developments now in progress will project the human voice, and programs of music and information across the oceans. I see international broadcasting in the offing. I may say that in the next twelve months or so we will witness a demonstration of it. When the farmer in Missouri or Kansas can actually tune in and listen to voices in London, Paris or Vienna, in South America or the Orient and vice versa, then you will have introduced a new element into the situation which will immeasurably multiply the present benefits and opportunities of radio. To me the real thrill lies in the great humanitarian aspects of radio and its significance not only as a national, but an international factor."

Palestine Turns to Radio

EVEN the Holy Land has succumbed to the radio, "getting distance" now being one of the popular amusements of Palestine, according to a report received by the Palestine Foundation Fund from Jerusalem. The installation of radio apparatus in Palestine was given official sanction by a government ordinance issued on June 3, the ordinance permitting all inhabitants owning their homes to install either receiving or broadcasting instruments.

The demand for radio sets has increased greatly since the issuance of the government order, according to the report. Radio programs are all given in Hebrew, for the ancient language of the Bible has once more become the everyday language of Palestine, as a result of Jewish efforts to rebuild the Jewish homeland. The Jerusalem Opera Company, whose repertory includes most of the well known Italian, French and German operas, all given in Hebrew, furnishes some of the most popular radio program numbers.

The British government is planning to install a powerful broadcasting and receiving station on the Mount of Olives, where Government House, the home of the British High Commissioner, Sir Herbert Samuel, is situated, to keep the Home Office in close touch with Palestine. The Zionist Executive also plans installing a station to reach the headquarters of the World Zionist Organization in London.

North Pole Expedition Radio Equipped

BRITISH wireless fans are much interested in the expedition of the Oxford University men to the North Pole. Their boat, the *Polar Bear*, is the first British craft to set out for the point furthest north equipped with a wireless set.



Hon. Claro H. Recta, minority leader of the Philippine House of Representatives, attended the Democratic Convention and found time to listen-in between sessions

The men on the exploration are delighted with the new arrangement. Already they are counting on listening in to their favorite singers though far from home, and hope to hear the sounds of Piccadilly and Leicester Square even in the land of snow and ice.

Not only the *Polar Bear*, but every sledging party will be equipped with its own hand-driven transmitting apparatus, so that contact between them and their base ship may be maintained.

This year the *Arctic* carries a short wave I. C. W. outfit, which will enable its operator to transmit on the amateur wave lengths between 100 and 150 meters. This equipment is in addition to her two regular sets, consisting of a standard 600 meter 2 kw. spark transmitter, and a continuous wave transmitter working on a 2,100 meter wave length.

The call which has been assigned to the *Arctic* is VDM, while that of MacMillan's ship is WNP. Special

permission has been granted for all Canadian licensed amateur stations to use the wave length of 120 meters during specified hours, although transmission on this wave will not be permitted for any other communication.

In order that amateurs will know when to be at their stations for communication with the expedition a definite schedule has been arranged during which Mr. Choat will listen for signals. He will stand watch on the short wave length daily, except Wednesdays and Saturdays, from 11 P. M. to midnight, eastern standard time. Saturday, however, the hours will be extended from 11 P. M. to 3 A. M.

Radio Concession in Paraguay Sought

APPPLICATION has been made to the Paraguayan Chamber of Deputies by Messrs. Eduardo Rojas & Compania of Asuncion for a concession giving this company exclusive rights to sell radio telephone equipment in Paraguay for five years. It is said, that Mr. Rojas has already obtained the necessary equipment for broadcasting and will place it in operation within six months if the concession should be granted. He contemplates using American material.

Broadcasting in South Africa

ALTHOUGH not actually granted, the Government has definitely promised a broadcasting license to the Associated Scientific and Technical Societies, Johannesburg, for a broadcasting station to be installed in that city.

It is announced that the new station will be installed on the top of the Stuttaford Building, with a broadcasting studio located on the third floor in the same premises. The wave length



Police vans equipped with receiving apparatus helped the regulation of crowds at Epsom Downs on Derby Day—Orders were transmitted from a captive balloon above the field



(Left) Honorio Pueyrredon, Ambassador from Argentina and (Right) Dr. L. S. Rowe, Director General of the Pan American Union, addressing the invisible audience

will be between 350 and 450 meters. A 500-watt transmitting set will be used.

The Associated Societies' license gives them an area for the collection of fees from listeners extending 100 miles in all directions from Johannesburg and it is expected that the station will be supported by the fees paid in by persons owning receiving sets.

Benjamin G. Lamme Dies

BENJAMIN G. LAMME, Chief Engineer of the Westinghouse Electric and Manufacturing Company, known as one of the "wizard trio" of American inventors, the others being Edison and the late Dr. Steinmetz, died recently in Pittsburgh, Pa., after a lingering illness. He was sixty and had been with the Westinghouse Company since 1889.

More than 150 inventions stand in his name in the Patent Office. He devised the "umbrella" generators that first harnessed the power of Niagara Falls. The high tension system of power transmission, the perfection of the alternating current system, the synchronous converter, railway electrification (applied for the first time successfully by him to the New Haven Railroad), the single-phase alternating current, the high voltage railway system and the single-reduction gear street car motor are among his notable productions.

Thomas A. Edison, Guy E. Tripp, Chairman of the Westinghouse Board, and David Sarnoff, Vice President of the Radio Corporation of America, joined in tribute to Mr. Lamme.

WNYC—526 Meters—Opened
NEW YORK CITY received its share of the air for the first time on July 9, when WNYC, municipal broadcasting station, successfully went

into operation. The Police Department Band and Mayor Hylan took turns in the studios on the twenty-fifth floor of the Municipal Building while more than 400 on the roof and thousands in homes listened in.

Mayor Hylan, in a short speech, declared that listeners, by means of the new station, would learn all about New York City if they tuned up to 526 meters, and promised that the new instruments would aid the Police and Fire Departments and do a great many things no station has done before. He added:

"Municipal information, formerly available only after perusal of reports, is now to be brought into one's home in an interesting, delightful and attractive form. Facts, civic, social, commercial and industrial, will be marshaled and presented by those with their subjects well in hand. Talks on timely topics will also be broadcasted. Programs sufficiently diversified to meet all tastes with musical concerts, both vocal and instrumental, featured at all times, should make 'tuning-in' on the Municipal Radio pleasant as well as profitable.

"Through the employment of this modern and very effective means of transmitting information an aroused public interest in the municipal government may logically be expected to ensue upon a broader understanding, a clearer knowledge and a deeper appreciation of its functioning. And it follows, as night the day, that the more enlightened the citizenship the better it becomes."

Foreign Notes

BELGIUM is now approaching the dilemma which must be faced sooner or later by the amateurs of every country that develops an interest in radio. She is in the throes of deciding whether receiving sets shall or shall not be heavily taxed. The legislators have advanced numerous tax plans, any one of which would wipe radio out of the country. But the Radio Club de Bruxelles (The Brussels Radio Club) has raised the battle standard. This Club proposes not only to prevent the proposed new taxes but to abolish the old ones as well.

THE principal station of the Kingdom of the Serbs, Croats and Slovenes has just been inaugurated at Rakovitsa, near Belgrade, the first message sent being an official salutation to the French Minister of Posts in Paris.

ANOTHER conference has been held at Lausanne, Switzerland, and may have as far reaching effects for the future as did the famous political conference held in that city. The re-

cent assembly was one of the national pastors, who have taken up the organization of religious worship by radio. An agreement having been reached between them and the radio people, religious services are now to be broadcast regularly every Sunday evening at 8 o'clock. To avoid schisms and quarrels, the services will be largely evangelical.

PRACTICALLY all the royal visitors to France make it a point to visit the station of Ste. Assise. Prince Taffari, absolute ruler of Abyssinia, made a special trip to this great radio center. From there he thanked all of France for her hospitality to him and his suite while he was in Paris.

HOLLAND, which up to now has been principally famous for her production of bulbs—both tulip and radio—is going to have her first exposition of radio early in September.

AN interesting commentary upon the speech of the King of England, recently broadcast from Wembley, is that a large percentage of the letters received from hearers have been from women. Many have commented upon the splendid modulation of the sympathetic quality of His Majesty's voice. another phase of radio to restore the "personal touch."

International Radio Week

INTERNATIONAL Radio Week will be held November 23rd to 30th, inclusive, according to announcement of the National Radio Trade Association who conducted this event last year and who are making plans



Professor M. I. Pupin receiving I. R. E. medal for his research work in radio—Major Armstrong and Prof. J. H. Morecroft, president of the institute took part in the ceremonies

for an even greater international exposition of radio progress this season.

In addition to the activities in the United States among broadcasters and the radio trade in general, Great Brit-

ain, France, Australia, Canada and Cuba will join in the celebration.

In England the various trade associations already organized will have complete charge of the English part of the celebration, while in the other countries special committees appointed by the trade bodies in the radio field will handle the details to make all the special programs dovetail into one another so as to insure the success of this world wide movement.

From London to South America

TESTS made by Senatore Marconi from Poldhu to Buenos Aires in the Argentine Republic have been eminently successful. The first message transmitted was from Señor Le Breton, Minister of Agriculture of the Argentine Republic, who was in London, to General Justo, Minister of War, Buenos Aires. The message was in Spanish of which the following is a translation:

Marconi, who combines great power of realization with his Latin genius, favors us by selecting Buenos Aires for his first experiment of absolutely direct communication. I avail myself of his generous offer to tender a most cordial salutation to the steadfast defenders of our national flag.

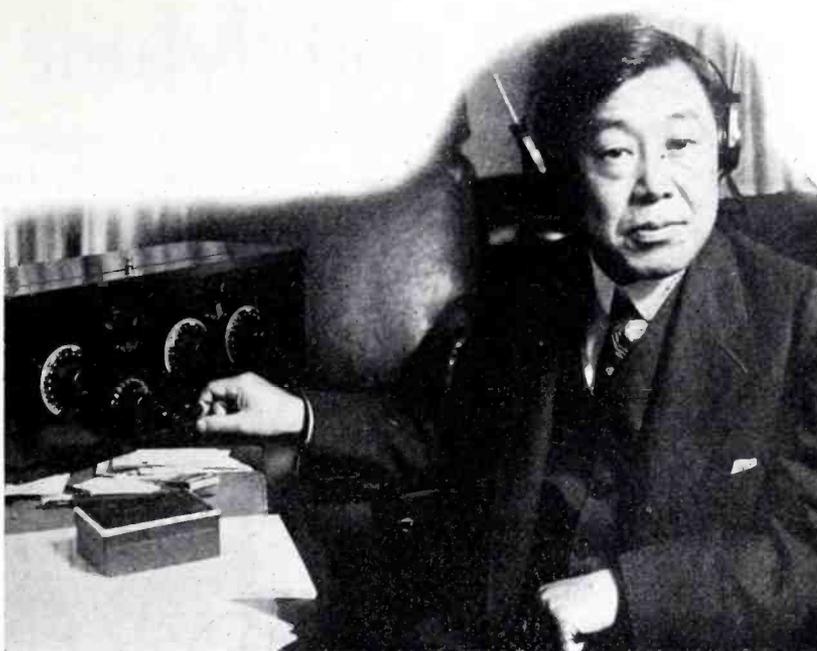
This is the first message which has been transmitted to the Argentine by the Beam system and according to telegraphic advice just received by Senatore Marconi the message was received practically instantaneously in Buenos Aires upon a single transmission.

There is now every reason to expect that there will soon be provided a direct telegraph service from London to the South American Republics insuring the delivery of messages within a few minutes of their transmission and at substantially reduced tariffs.

Radio World's Fair

THE First Radio World's Fair to be held in Madison Square Garden and the 69th Regiment Armory, New York City, September 22nd to 28th, is attracting the radio geniuses of the world and scores of them are preparing to introduce their latest inventions at the coming exposition.

Managers U. J. Herrmann and James F. Kerr have been compelled to enlarge the "New Inventions Section" to a size which will allow the exhibition of one hundred devices. Among the noteworthy American discoveries to be shown will be at least three different instruments designed for the purpose of radiocasting photographs in motion. Europe will also be well represented in this department.



Masanao Hanihara, Japanese Ambassador listens in on the political conventions

Several Continental inventors will display new inventions of a most unusual character. Half a dozen recognized wireless engineers are now busily engaged trying to perfect systems for radioing pictures.

Sixty nationally known manufacturers of the United States will have de luxe exhibits at the Fair and England, France, Belgium, Italy, Switzerland and Austria will have proper representation in the "Foreign Section." Exhibition booths of elaborate construction will fill both big buildings.

A number of the leading radio trade organizations are planning to hold their 1924 conventions in New York during the Fair and arrangements are now being made to conduct their business meetings in the lecture halls and demonstration auditoriums of the Armory and Garden between the hours of 9:00 and 12:00 o'clock every morning.

Fully a thousand jobbers and dealers, native and foreign, will attend the big show and two hours per day will be set aside for the exclusive transaction of business between these wholesale buyers and the exhibitors.

The International Amateur Builders' Contest is assuming such proportions that the show management expects this feature to fill the entire basement of Madison Square Garden. Blanks for this competition are being distributed by radio dealers here and abroad and entries are already coming in from all parts of the world. Twenty-five prizes will be awarded in this contest and entry blanks with full particulars will be supplied to all who write direct to General Manager James F. Kerr, Hotel Prince George, New York City.

Gun Range-Finders in Philippines Use Radio

RADIO spotting from army airplanes aided in the annual coast artillery practice at Fort Mills in the Philippines, the average error of the deviation from the target being only twelve yards at a range of 11,000 yards. So successful was the radio spotting that both artillery and aviation officers plan close co-operation in these annual practices.

The 2d Air Squadron stationed at Kindley Field in the Philippines, acquitted itself with honors in relaying data, and reporting the fall of the shells of coastal rifles from the air.

During the entire practice which occupied over two weeks, not a single radio failure was reported.

Trans-Atlantic Phone Tests

THE 200-kilowatt transmitting apparatus by which the British government hopes to inaugurate wireless telephony conversations with America will be installed about the end of August at the Rugby station. It is hoped to begin the experiments during the following month.

Speaking in the House of Commons, Postmaster General Hartshorn stated that experiments were in progress to test the possibility of establishing commercial telephone wireless between England and the United States. "Spasmodic communication," said Mr. Hartshorn, "has been achieved over extremely long distances, but the aim of the experiments which are now being conducted is to devise a system which will give a reliable and continuous service."

Moose and Music in Maine

A story with a background of reality written by one who has spent many summers in the Maine woods

Story and Illustrations by Stuart Hyde Hawkins

SILENCE pure as mountain water and heavy as winter blankets: silence so absolute that its very emptiness weighed down upon one like a heavy burden; silence so vast, so unbreakable, that one's reason swayed and tottered under the strain, urged by the realization of helplessness and impotence.

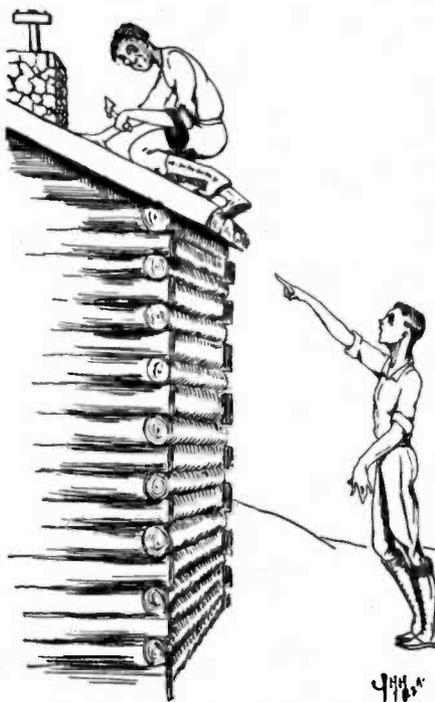
I took off the head-phones and tossed them dejectedly upon the smirking radio set before me. Totum pushed my pipe across the table-top and smiled sympathetically. Good old Totum! He had never seen a receiving set before, and never heard this one utter even a squawk, but he had accepted its added weight at the portages without a murmur because I wished it, and now he smiled cheerily because he knew I was discouraged. And I, who had created delightful dream-pictures of his amaze and wonder when I should first tune in a concert, could, in spite of my utmost efforts, conjure nothing but silence from the "greatest DX receiver ever built."

To be sure, the location was a hitherto untried one—a tiny camp, unoccupied for eleven and a half months of the year, on the shore of an absurdly small, but wondrously beautiful lake-without-a-name in the deepest backwoods of northern Maine, but the set should at least have howled with glee as I tickled it, I was sure. I had bought it from an amateur friend a week ago in Portland, where I had joined the old Penobscot Indian who now smiled across the table. Totum, whose real name is a paragraph long and signifies He-who-stares-at-death-and-laughs, had become my summer mentor in the intervals between mowing the lawn and chopping wood at our Casco Bay summer cottage, and had become Totum upon our first meeting. I was aged four when he appeared just after I had been shown my first Indian Totem-Pole. That was some nineteen years ago, and in the interim Totum had initiated me into the mysteries of woodlore and woodfolk on every possible opportunity during the summer months; and we were now on the fifth day of an indefinitely long moose-hunt.

So far the moose had proved effectively shy; at least, we had seen none, and I was beginning to feel that Totum regarded the radio as an ill-omen and a Jonah—provided that civilized Indians

adopt the Jonah superstition along with Christianity—while the long evenings which I had planned to enliven with Broadway jazz remained dreamily quiet, broken only by my disgusted epithets.

The failure of the radio was the only fly in the ointment of content, however, and even that could not mar the perfection of the trip. To him who has never experienced it there is an unguessed joy in store in the sheer pleas-



"Totum erected the aerial according to my directions given from the ground"

ure of being alive which the Indian Summer days in the virgin forests of Maine can bring. Cool but not cold, with no taint of civilization's ruthlessness, the days fly by in laughing haste, carrying with them regret, not that nothing tangible has been accomplished, but that they do not allow longer time in which to do nothing so well. Naturally we should have liked exceedingly to have seen a moose. The primary object in our coming was to give me a head for the Massachusetts mantel-piece, but we were content to bide our time and let the moose come when they would.

Dismissing the radio from my mind as the pipe commenced to draw well,

I slouched down with my feet toward the rough stone chimney-place and demanded that Totum explain the absence of moose.

"Moose here O. K.," came in slow, careful syllables from behind the cloud of blue tobacco smoke on the other side of the table. "Moose don't like new thingabob, mebbe."

It was what I had feared; his righteous indignation at the twenty apparently useless pounds had at last overcome his politeness, and from experience I knew that nothing would alter his dislike for the silent box.

"Perhaps you're right, I hadn't thought of that," I conciliated. "What do you think of going across the ridge tomorrow and down by Lake Big-Trout—a name of our own adoption, by the way? Maybe if we get away from the box we'll find the moose."

"Uh-huh. Better turn in now, then," was the extent of his enthusiasm.

At what seemed like midnight, but proved to be only a half-hour before dawn, Totum shook me awake and pointed to the already-boiling coffee-pot. In about three minutes—the toilet of a hunter is delightfully simple and quick—I was ready to eat, and as we closed the cabin door behind us the sun was just coming up over Mount Skil-ee-och-nar-ee, which is a poor attempt to render in English the guttural flow of syllables with which Totum designated the pine-covered slope across the Lake-without-a-name. Fifteen minutes' paddling—it was cold on the water and we stroked with a zest—brought us to the other end of the lake, where we beached the canoe and struck off towards the pass over the tiny divide.

Totum never spoke when he was hiking, so my thoughts were my own for the better part of four hours. After the first quarter-mile my interest in the landscape waned, and my boots followed subconsciously in the prints of Totum's knee-moccasins. Walking, particularly strenuous walking, is most conducive to mental activity, I believe—certainly I have always found it so—and my thoughts leaped from subject to subject at random, until they suddenly lighted upon the silent receiving set. In every detail I traced the hook-up, assuring myself that I had done everything which I could or should have; nothing was wrong with the set itself—repeated and thorough investi-

gation had satisfied me on that point. And of a sudden a light burst upon my troubled intellect. Totum had erected the aerial according to my directions given from the ground—and I had gone inside to rescue the potatoes for supper as he was making the final connections. He had appeared in the doorway while I was still at the stove, and had grunted a favorable reply to my inquiry as to whether the task was done. In the evenings which followed I had torn down and rebuilt the set with no thought as to the antenna; and now I was convinced that in the connections on the roof lay the secret of the silence.

Just at that point in my mental peregrinations I heard a grunt of satisfaction ahead, and even as I raised my eyes from the trail I stepped through a fringe of scrub-bush and found myself upon the infinitesimal beach of Lake Big-Trout. Without a word Totum leaned both our guns against a tree and pulled out the home-made pemmican which Totum and Totum alone can make palatable. We munched the bread and meat in complacent silence, while I tried desperately to find a suitable phrasing for the expression of my doubts as to Totum's technical ability. By the time we had finished I had decided not to tread upon the tender toes of his sensitivity, but to wait and investigate for myself upon our return.

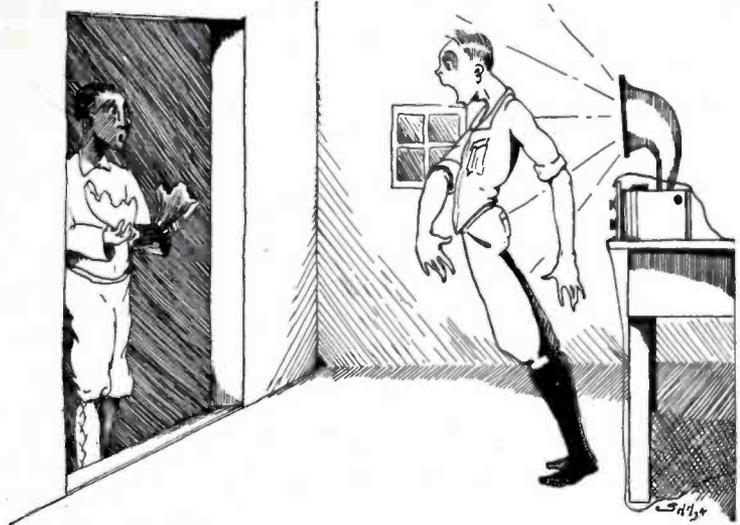
The afternoon was devoted to exploration—that heart-breaking routine which is known to every hunter of wild game—and it was not until well-nigh sunset that Totum found moose-signs. We had reached the far-side of the lake, and found a treeless peninsula jutting out from the shore-line for some five hundred yards. Unmistakably the peninsula was being used as a drinking-place by moose—not one moose, but at least three of them; and without a word Totum led the way to a hiding-place in the undergrowth at the southern base of the peninsula and left me lying there with my gun. For an eternity, of perhaps ten minutes' duration, after the stealthy crackling of his moccasined feet had ceased, absolute silence covered the entire lake. His Majesty the Sun, having seen that all was as well as could reasonably be expected of a world inhabited by men, retired rapidly behind the pines to the west, and the lake became imbued with that desolate beauty which dusk in the Maine woods brings. Suddenly an eerie wail, half animal, half human, totally unnerving, shattered the stillness. For a moment my body was a mass of goose-flesh, and I perspired in quaking silence. Then I realized that it was only Totum, calling through his birch-bark moose-horn in an attempt to draw the real moose to the scene. I heard the sound often before—I

have heard it many times since—but invariably its weird uncanniness sends an involuntary chill through my whole being.

For perhaps a half-hour the call continued. "Totum must be blue in the face from blowing," I thought. Grayness had almost given place to blackness, the sky overhead was a candelabrum of myriad crystals, when my hair rose on end with a vengeance. An ungainly mountain, with a pine-tree

tum had evidently decided to trail him, at least he answered no hail of mine during the next half-hour. And as it was cold and raw on the lake-side, and as my self-esteem was at its lowest ebb, I started for the camp.

That hike was without doubt the meanest one I have even taken! What made me keep on for over five hours through practically pitch-dark woods I do not know to this day. When I finally leaned wearily against the door-



"Totum stood in the doorway staring pop-eyed over a rather small spread of moose-antlers"

across its crest, stood not two hundred feet away, stamping an impatient pile-driver (one of four) and shaking the branches of its crown nervously. Nobody had ever told me that a moose was large enough to fill a city block! This creature filled the landscape! My gun felt like a feeble pea-shooter as I subconsciously brought it to my shoulder. And then and there I experienced my first real case of "buck fever." Try as I could—although to my startled vision the moose was larger than the entire Appalachian Range—I could not steady my trembling body sufficiently to aim at the vital hinter-shoulder which Totum had so diligently described to me during the past week.

For at least a century I waved the muzzle in small circles, until in desperation I pulled the trigger. To myself I have never been able to state incontrovertibly that my eyes were open when I fired; and when I did see clearly through the haze of smoke the peninsula was empty.

Reviling myself for a weakling and a coward, I strode to where the apparition had been standing and called for Totum. From far away, rapidly going farther, a heavy crackling was audible, proof positive that the moose was unharmed. "But at least he's as scared now as I was then," gave some meager satisfaction to my spirits. To-

jamb of the cabin the moon, rejected mistress of the sun, was gliding down towards the hills in hopeless pursuit of her errant lover. And staring me insolently in the face was the "Silent Six," that paragon among paragons of radio sets! In a sudden burst of resentment—"Couldn't I do anything right on this trip?"—I grabbed the pliers and flashlight and clambered onto the roof.

There beside the chimney lay two bright ends of wire, waiting and longing for someone to unite them!

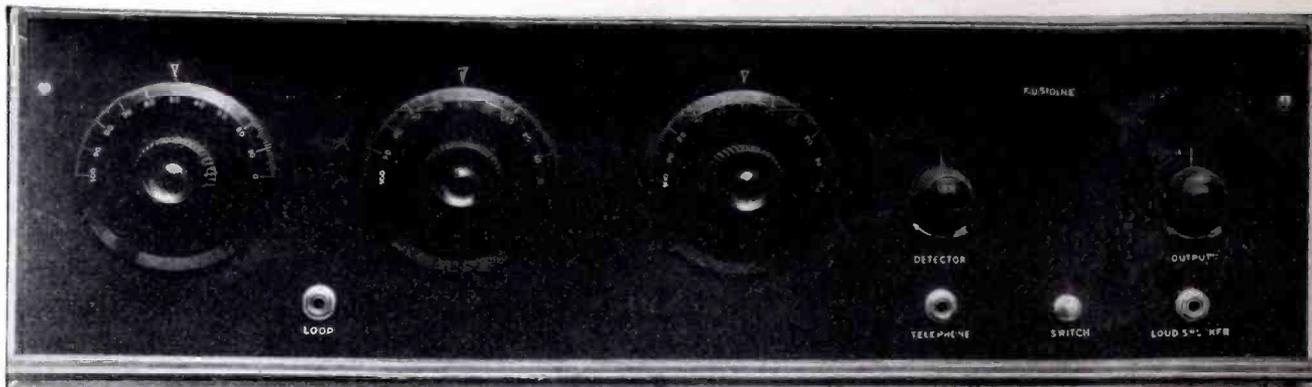
That done, and done vindictively well, I slid down and threw myself full-dressed upon the bunk.

* * *

I awakened to find it dark, and knew that I had slept through twelve precious hours. Totum was not in the cabin, but his gun, from its accustomed place in the rack, told me that he was within call. As I opened my mouth to shout, the receiving-set caught my eye again, and with that hopeless hope which has suffered repeated defeat I rolled out of bed and crossed to the table.

I figured the time at between seven and ten—I was too sleepy to look at my wrist-watch, and besides I knew it had run down—and was sure that the air was full of radio waves if only

(Turn to page 86)



Front panel view of the five-tube Fusidine

The 5-Tube Fusidine

A Receiver That Is Clear in Tone—Easily Tuned—Selective—Not Difficult to Construct—Brings in the DX on Speaker Through Local Stations

By A. H. Cubberly

THE set to be described in this article will more than please you with its performance provided you follow the instructions carefully. The author believes this to be the best five-tube set—considered from all angles—that may be made from five tubes without reflexing. It has all of the advantages of selectivity, volume and distance reception and yet it is not critical either in its operation or in its construction.

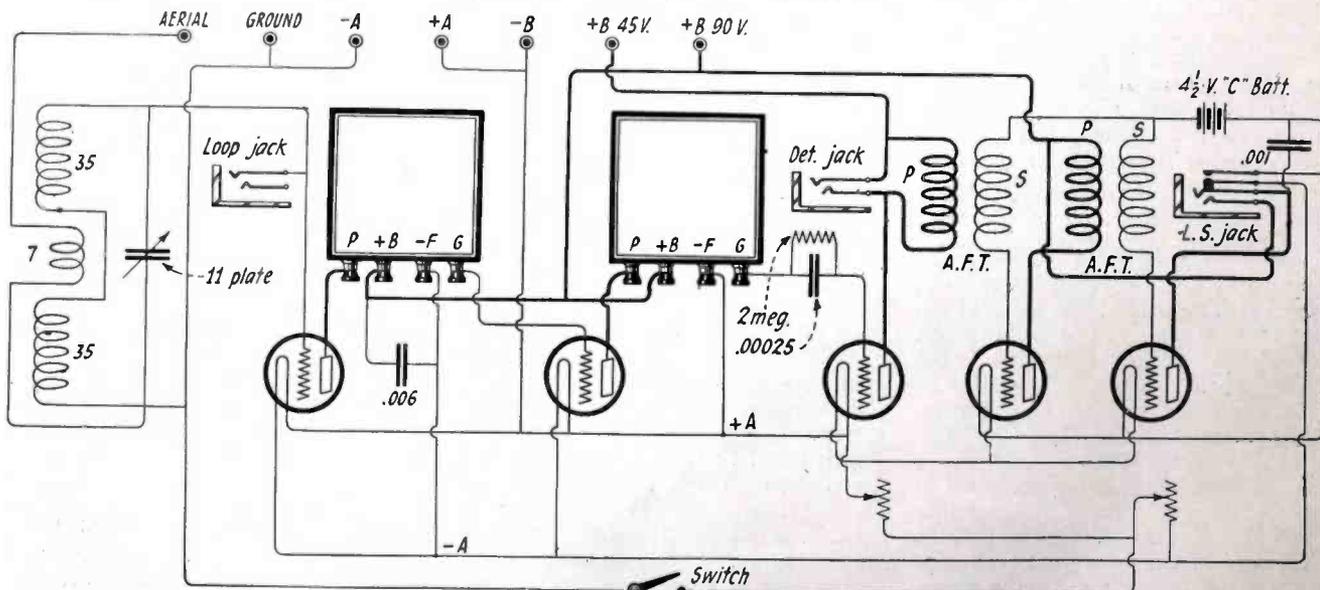
The distance it will receive under favorable conditions seems to be limited only by the amount of interference of local stations, single circuit nuisances, or static and the strength of the sending station. An idea of its selectivity may be had when you con-

- Advantages of The Fusidine.**
1. **Quality.** Reception is clear and perfect reproduction of the broadcasting.
 2. **Control.** All stations once tuned in may be logged and easily tuned in again at the same dial settings.
 3. **Distance.** Brings in distance stations on the Loudspeaker.
 4. **Operation.** Tuning is sharp, but not critical. Operation of filament rheostat is not critical. Set will not interfere with your neighbor.
 5. **Assembly.** There is nothing at all critical about the construction except to follow the wiring diagram exactly.
 6. **Cost.** Is extremely low when quality of reception and actual value of completed set is considered. Appearance of the set will add to the attractiveness of any home.

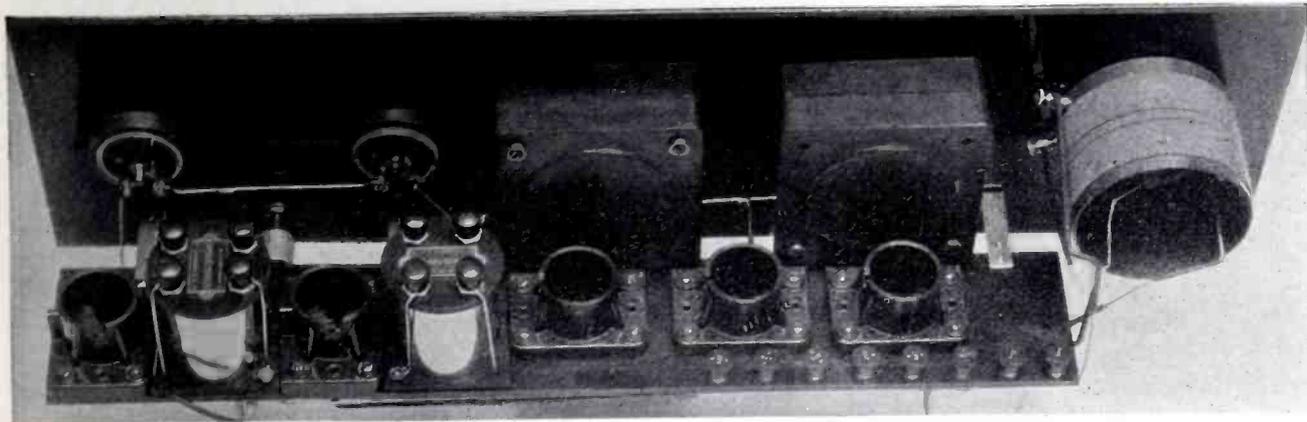
sider that with the set operating in the office of THE WIRELESS AGE and with the powerful WEAF station broadcasting from across the street, we were able to tune out WEAF completely and bring in WHN on the loud speaker. Also, in Newark, N. J., we were able to get both WDAP, Chicago, and WSAI, Cincinnati, while WHN, New York, and WOR, Newark, N. J., were broadcasting. All came out full and clear from a Music Master loud speaker. On an exceptionally good night KHJ, Los Angeles, was heard at about 2 A. M. on the loud speaker.

Neither potentiometer or neutrons are used or required as the set operates perfectly without them.

While distance reception comes in



Circuit diagram of the five-tube Fusidine receiver using Phusiformers in the radio frequency amplifying circuit



Top view of the assembled set showing the tube sockets, a. f. transformers, Phusiformers, tuning coil, etc.

better with long outside aerial and a good ground, local stations may be heard plainly on the loud speaker using only a loop or using an aerial without ground.

An open circuit jack is used on the detector, thus making it possible to listen on the head phones without interfering with the loud speaker. This may be desirable sometimes, as for instance, if the set is located in a store or hall where the loud speaker may be a distance from the set. It is then possible for the operator of the set to listen in while tuning the stations or at the same time the loud speaker is operating. Also it may sometimes be desirable to run wires from the detector plug to head phones at a sick bed in another part of the house from that in which the loud speaker is located.

A filament control jack is used on the amplifier tubes so they will not burn when the plug from the loud speaker is removed.

The following points should be noted about the use of the loop. An open circuit jack is used to plug in the loop. You will see that a connection is made from only one side of this jack to the set when the loop is plugged in. This is done to impress all of the energy from the loop to the grid connection of the first tube. Experiment may prove that both sides of the loop should be connected to the set, but if so, both sides of the loop should be connected to one side of the jack. This may be easily done by connecting the

two ends of the loop to the two sides of the plug and then bridging the plug posts with a short piece of wire, connecting them together. The aerial and ground should be disconnected from the set if there is static or other interference when using the loop.

In assembling the set, all parts and jacks, except the two phusiformers,

necessary on the three large tuning dials.

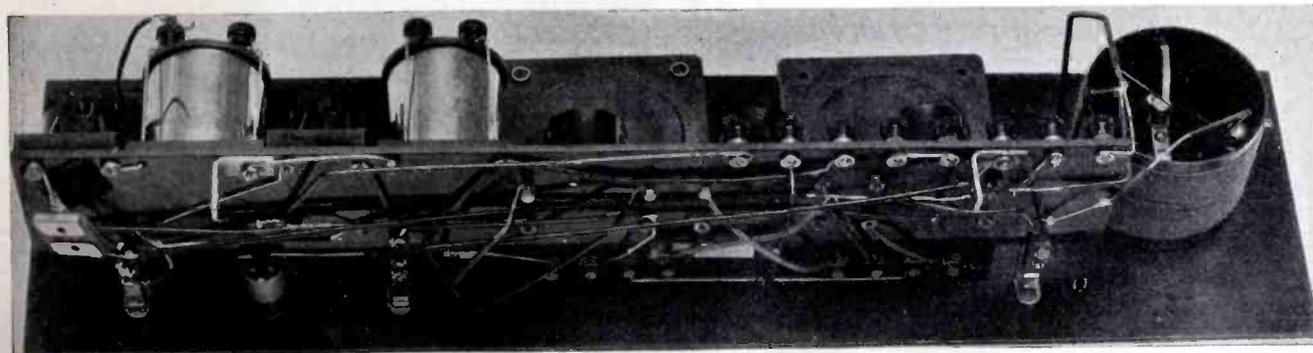
The construction of the special tuner is as follows: Wind 35 turns of wire onto a 3½-inch bakelite tube, then skip enough space to allow 7 more turns with a space of one-eighth inch on each side; then wind 35 more turns in the same direction and connect in the center with two wire ends which may be passed through two small holes drilled in the bakelite tube. These ends may then be fastened together and soldered on the inside of the bakelite tube, thus making 70 turns in the same direction which is the secondary of the special tuner. Then wind 7 turns in the space in the center, in the same direction which forms the primary of the tuner. Any silk or cotton-covered wire from size No. 20 to No. 26 will do for this tuner. The two outer ends of the primary and the secondary windings may be fastened to binding posts which may be mounted along the ends of the bakelite tube.

The wiring of the set can all be put out of sight under the sub-panel, making a very neat appearance when anyone looks inside of the cabinet. This is easily accomplished by removing the screws from each socket and replacing with longer ones which must be turned down instead of up. The sockets are then mounted on the sub-panel and the wiring is connected from the under side with the nuts that were taken from the sockets originally. The jacks

(Turn to page 59)

- MATERIALS REQUIRED**
- One 7" x 26" x 3/16" Mahagonite panel (Radion).
 - One 3½" x 21" Black sub-panel (Radion).
 - One 7" x 26" Mahogany finish cabinet.
 - One open circuit jack for detector (Federal).
 - One closed circuit jack for loop (Federal).
 - One filament control jack for Amplifier (Federal).
 - One special tuning unit (see details for making).
 - One 11-plate variable tuning condenser (Pacent).
 - One bakelite tube 3½" dia. x 3½" long.
 - One power 6-ohm rheostat (Tillman).
 - One 30-ohm rheostat for detector (Tillman).
 - Two Phusiformers (Pathé Red Style or Cosmopolitan).
 - Two audio transformers, 4½ to 1 ratio (Superior Products Co.).
 - Five special bakelite sockets (D. W. May & Co., Newark, N. J.).
 - One filament control switch (D. W. May & Co., Newark, N. J.).
 - Three 4-inch Mahagonite dials (Radion).
 - Two 2-inch dials or knobs for rheostats (Radion Mahagonite).
 - Seven marked binding posts, Aer. Gnd. — A. + A. — B. — B. — B. (Eby).
 - Three lengths bus wire.
 - Three lengths high quality varnished spaghetli. (Alpha "Special").
 - One .006 fixed mfd. condenser (Essex of Newark, N. J.).
 - One .00025 fixed condenser and variable grid leak (Chas. Freshman).
 - One .001 fixed mfd. condenser (Chas. Freshman).
 - One set radio panel marking letters (Quik-Engravo).
 - Twenty round head brass bolts 6/32 x 1¼" for sockets.
 - Twenty small style hexagon nuts for 6/32 bolts.
 - Six round head brass bolts 6/32 x 1½" for jacks.
 - Two oval head nickel plated brass screws for mounting panel into cabinet, size about ¾" x No. 6.

two rheostats and the special tuner and 11-plate condenser should be mounted on the subpanel. The other parts may be assembled on the main panel. The 11-plate condenser for the special tuner may be mounted inside of the special tuner which is wound on a 3½-inch bakelite tube. Verniers are not at all



Rear view showing parts mounted on sub-panel and the wiring underneath

What's in a Name?

introducing
our new name

The Radio Magazine

How do you like it? Here's your
opportunity to tell us and perhaps
win a \$10.00 gold piece :: ::

\$20.⁰⁰ in gold For Best Letters

\$10.00 in gold for the best letter, not to exceed 200 words, on why you think our new name "THE RADIO MAGAZINE" is a good one for your favorite radio magazine, or—



\$10.00 in gold for the best letter, not to exceed 200 words, on why you think we should retain our present name "Wireless Age"



Choose either side. Contest open to all of our readers. Prize winners will be announced in our November issue. The contest ends September 30. Address all letters "Title Contest," Wireless Age, 326 Broadway, New York City.

AFLOAT AND ASHORE WITH THE OPERATOR



DICK JOHNSTONE, popular West Coast radio man and boss of the RCA operators out of the port of San Francisco, attributes his start in the game to the big San Francisco earthquake and fire of April 18, 1906.

While going through the ruins he found some material with which he built his first aerial. Then with a detector consisting of two pieces of carbon with a sewing needle across their tops, a dry battery and a single telephone receiver of 75 ohms, he spent many an hour through the nights waiting for signals from the few ships and station in operation at that time.

His success encouraged him to improve the equipment as well as his ability to read the code and two years later, in 1908, he heard the Russian Hill station calling Honolulu, then acknowledge receipt of the first message to pass by radio between the Hawaiian Islands and the continent. This incident of the first establishment of radio communication between the Islands and the mainland is a historic one in radio. Mr. Arthur A. Isbell was at the Honolulu end while Mr. L. A. Malarin was at the California station.

Not long after this Johnstone, through added improvements to his station which included a galena detector, was able to pick up Honolulu. He also installed a coil transmitter with which he worked with other amateurs up to a hundred miles away.

He overheard a ship sending a distress call and perhaps it was this that started it, but anyhow, he decided he was going to be a sea-going operator. In the summer of 1912 he obtained a "Certificate of Skill in Radio Communication," which the government issued to all operators during the year previous to starting the regular licenses, and was assigned to the old Pacific Mail liner *Acapulco* as only operator—there were no two-operator ships those days—in charge of a 240-cycle Marconi set, a Fleming valve detector and a ten-inch spark coil.

Mr. Johnstone's first trip was a hard one. Shortly after leaving the Golden Gate for Panama the oil condensers blew out and if it were not for the spark coil he would have been entirely out of business. After several days of real work he had the main set again in operation, but in the meantime suffered the torture of hearing the San Francisco station calling him at a distance of 1500 miles while he

By *W. S. Fitzpatrick*

was unable to answer. With the Fleming valves on this trip he copied signals up to 2200 miles.

During the three years that followed Mr. Johnstone was operator on several Pacific coast vessels and made twenty-two round trips to Honolulu on the flag-ship *Wilhelmina* of the Matson



Richard Johnstone, chief operator of the Radio Corporation of America's marine department at San Francisco

fleet. On all these trips galena was used as a detector and not once did he or his partner, Edward F. Smith, fail to communicate with San Francisco or Honolulu direct, or through relay in the static season.

At this time Mr. Johnstone's ambition turned toward the famous KPH coast station as San Francisco. To accomplish this end he spent much of his time while in port at the station stand-

ing relief watches, and in addition mastered the Morse code which was required.

In 1915 he received an appointment to the KPH station which he held for five years, two and a half years of which were under naval control. In April, 1917, he enlisted in the navy with the others of the station's staff and from then until January, 1920, he was on the circuit, either marine or high power, covering Hawaiian and Oriental traffic.

On February 1, 1920, following his release from the navy, he was appointed storekeeper and in January of the following year was promoted to his present position, that of chief operator of the Radio Corporation of America, marine department, at San Francisco.

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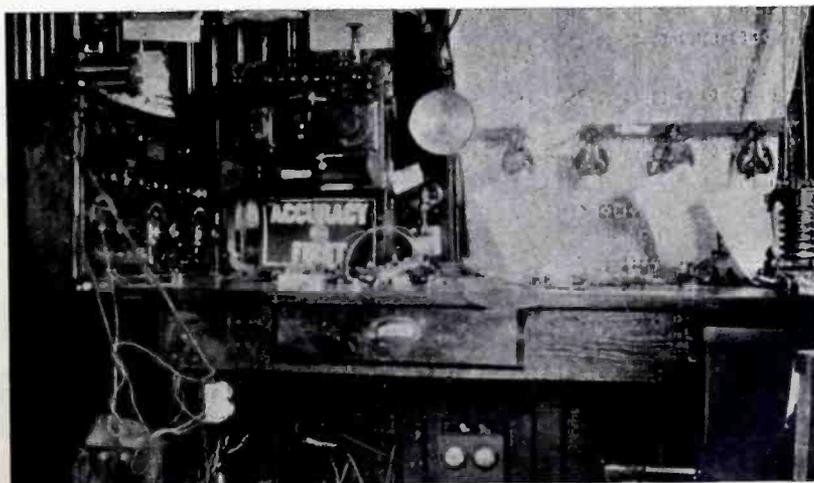
ONE of the interesting reminiscences of Mr. Johnstone is that of listening to his first radio concert back in 1909, when a young man by the name of McCarthy had a wireless phone transmitter on Hayes Street, San Francisco, from which he broadcast songs and music of Columbia records for the entertainment of amateurs. A few years later and long before the present day broadcasting there was a station on the roof of the Fairmont Hotel which transmitted phonograph music to the delight and entertainment of ship and coast station operators as well as amateurs.

* * *

HERE is an interesting letter that came during the month:

"775 Buena Vista Ave.,
Alameda, Calif.

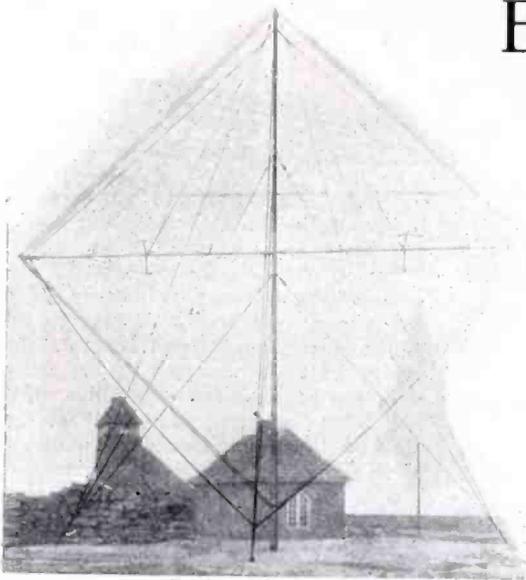
(Turn to page 92)



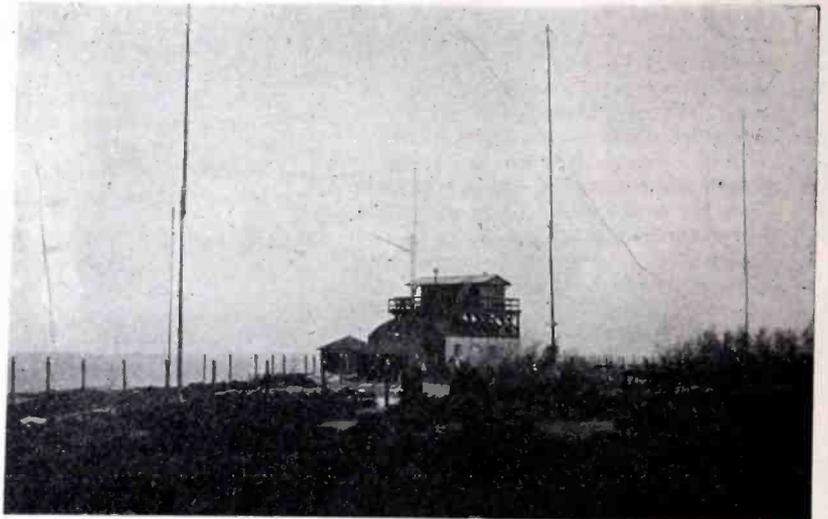
KPH station at Daly City, Calif., as it was in 1914 to 1916 when Mr. Johnstone was operator there

European Over Sea Duplex Radio Telephony

By Dr. Albert Neuburger
Berlin Correspondent for The Wireless Age



Receiving station Rønne



One of the first European duplex radio telephone stations

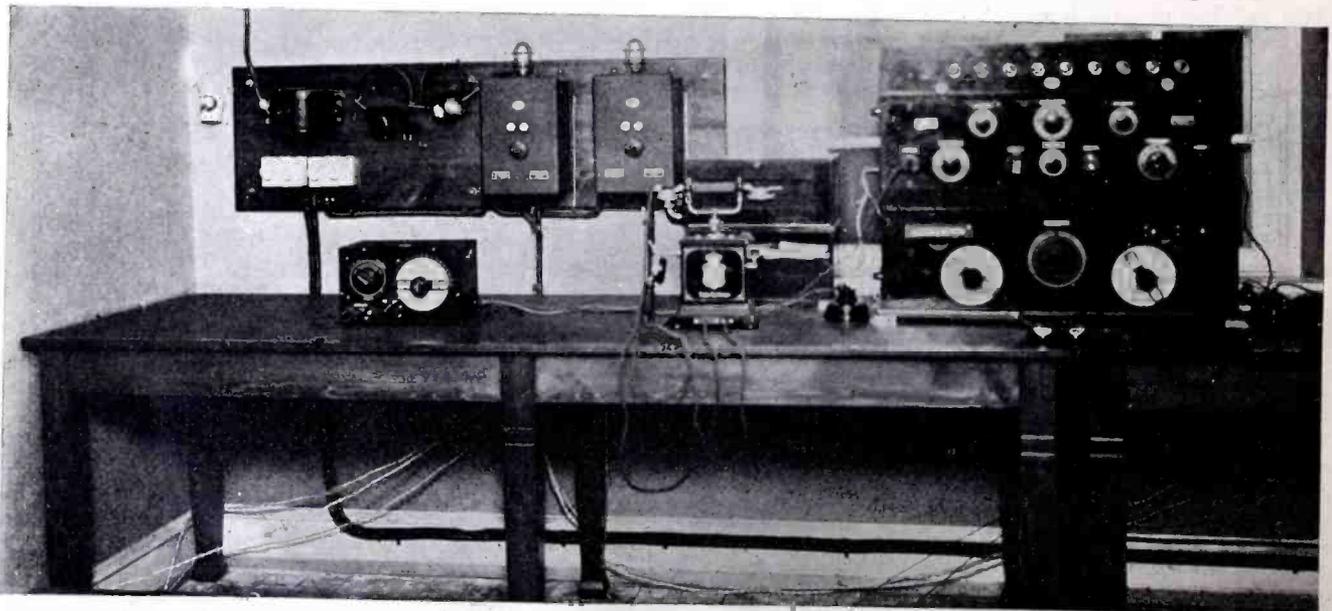
THE first radio duplex-line for service between Copenhagen and the isle of Bornholm is now in operation. It serves not only for the connection of that city with the inhabitants of the isle, but also makes it possible for anybody in Denmark to speak with each subscriber on the isle of Bornholm, which is situated in the Baltic and belongs to Denmark. No changes were necessary on the ordinary land line telephone apparatus to connect it in with the radio circuit and the subscribers who speak from Copenhagen to the isle do not realize that they are connected by radio. Only the clearness of the voice, which is better than it has been, marks the improvement that has been accomplished through the use of radio.

When a telephone connection is desired the subscriber in Copenhagen

calls in the usual manner for his central-office and gives the operator the telephone number desired. The central-office makes the connection in a few seconds so that conversation may proceed.

The difficulties to overcome in the installation of this system were of different kinds. How to conduct the weak microphone-currents through the telephone network of wires so that it would actuate the radio transmitting apparatus efficiently was one of these problems. On the other hand, the feeble impulses in the receiver must be magnified so that they may be con-

ducted over the land line to the central-office and to the subscriber with sufficient intensity and clearness to be readily heard. This problem was solved by using modern amplifiers and adapting them to this special use. The problem of establishing practical duplex-telephony without mutual disturbance required careful planning. The subscriber using the common land line apparatus is not able to switch from transmitting to receiving on the radio circuit. This difficulty was overcome by devising an automatic distributor which is constructed on the principles of the Wheatstone's bridge.

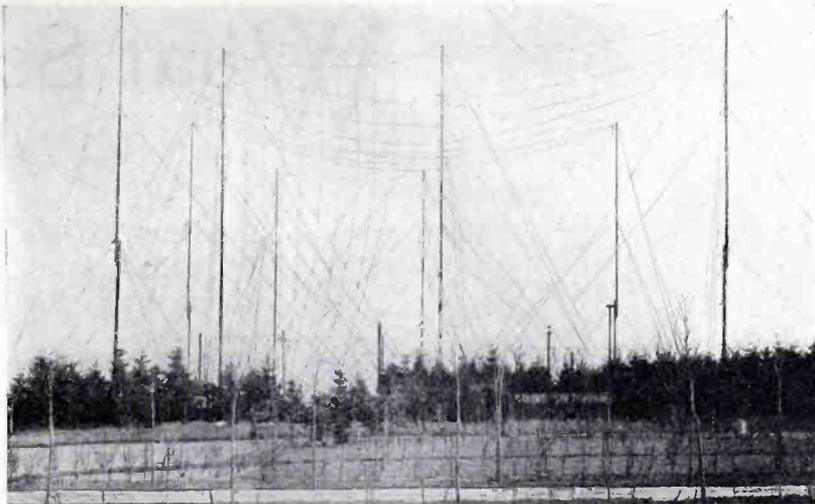


Interior of the receiving station of Rønne on the Isle of Bornholm

For the Copenhagen-Bornholm circuit the radio transmitter is located at Lingby near Copenhagen. This station works with a Lorenz-Poulsen transmitter. The receiving installation is situated on the isle of Amager in the southwest of Copenhagen. For receiving there is erected a frame aerial which is installed on a 25-meter mast. With this mast there are connected two horizontal tubes, extending out from its both sides which help to bear the antenna. At the receiving station is installed the distributor mentioned above.

The transmitting station of Bornholm is at Hameren in the northern part of the island, while the receiver stands near the port of Rønne at the west coast of the island. The transmitting station at Hameren works with an energy of 0.8 kilowatts in the antenna, also using a Lorenz-Poulsen transmitter.

This new duplex radio telephone works for the present only between Copenhagen and Bornholm, a distance of 150 kilometers. In the near future, however, it will probably be used also for other purposes and perhaps there will be a service between Copenhagen and Berlin, for at the trials made before opening the Copenhagen-Bornholm line tests were successfully made



Radio station at Lingby near Copenhagen

with two-way conversation between Berlin and Copenhagen, a distance of 350 kilometers. It was the first time that the telephone systems of two great cities were connected by radio. Before opening this important radio-telephone circuit between Berlin and Copenhagen international treaties between Germany and Denmark must be signed and therefore it will still be some time before this circuit is opened for public use. During the tests the American

steamer *United States* was also successfully communicated with. The captain of the ship spoke from a distance of more than 500 kilometers out on the Atlantic westward from the coast of Norway with a subscriber in Copenhagen. This indicates that the transmitting and receiving stations of the new duplex radio line are capable of being used for other services in addition to the service between Copenhagen and Bornholm.

June Conventions and November Elections

(Continued from page 22)

the Hudson River called for an investigation which disclosed the startling fact that boatmen, dock hands and longshoremen had deserted their posts to listen in at the various radio stores ranging from Battery Park to 14th Street.

Most of the radio stores had power speakers and the doings in the convention hall could be heard above the roar of passing elevated trains and vehicular traffic.

On the sidewalks of Chicago and the byways of New Orleans, in the Commons of Boston and at the markets of San Francisco, banker and baker and candlestick maker listened to the June conventions. Each interpreted the proceedings according to his ability. Across the land we shall go to the polls and cast our votes, each according to his weal.

THE majority of women speakers at stations WHN and WOR, during the Democratic Convention, were delegates. Women are new in politics. They have not acceded to the oratorical fireworks method of delivery. Consequently, they broadcast well, and shall command a hearing.

Some of the speakers were Mrs. George Bass of Chicago, Mrs. Emily Newell Blair of Joplin, Mo., Mrs. Charles Williams of Washington, Mrs. Solon Jacobs of Birmingham, Mrs. Gertrude M. Pottangall of Augusta, Mrs. Berton McMillan of Tennessee, and Mrs. James W. Gerard of New York. They are a credit to this nation.

Cool Cal Coolidge sounds well over the radio. Cool Cal delivers a cool, dispassionate speech that sounds equally well over the radio. His success has been attributed to radio. Those who should be able to judge, point

out that he has reached millions merely because he talks deliberately, concisely, and is understood by those who listen in.

The cool, confident voice of a woman coming to us by radio is a revelation.

General James G. Harbord of the Radio Corporation of America, has a common sense message for those who want to know how broadcasting the June conventions affects the November elections:

"Broadcasting will give the people cleaner politics and more effective self-expression. Within a month those who have listened in to the great nominating conventions have divided orators into two classes—the old fashioned ranter, the man with the semaphore gestures, the tremulo in his voice, depending on emotional and hypnotic effect, seeing only an audience of a few paltry thousands; and the keen, clear-voiced, self-contained, logical speaker, delivering a message for thinkers listening in by the millions, and not to be moved by the devices of the old style stump speaker. In political matters more than in any other form of human endeavor, archaic methods still prevail. In getting out the vote, either for a cause that is right or a cause that is wrong, office holders with pecuniary interest in the result are still a major influence. Pulling the doorbell, pleading with lethargic voters to go to the polls and do their duty, is hard work.

"Over the broad highways of the ether will come, in the campaign that is now upon us, the human contact between statesmen and people, that will supplant professional politics and mechanical effort at the front door of the voter, with truth and conviction within the home."



What Selectivity Accomplishes

Another article of utmost importance to radio fans who wish to operate their sets for maximum efficiency

By Dr. Alfred N. Goldsmith, B.S., Ph.D., Fellow, I.R.E.

Director of Research, Radio Corporation of America



The second harmonic super designed for selectivity on broadcast wavelengths

ON a winter's night, there may be passing through the air, waiting to be trapped by a suitable receiver, literally hundreds of radio messages from broadcasting stations, trans-oceanic stations, and marine stations. It is clear that some powerful scientific agency is required to pick out any desired one of these messages sharp and clear, and free from interference from the rest of the myriad of hurrying signals which accompany it. Every broadcast listener knows the practical side of the solution, namely the process of "tuning" his receiver to the desired signal to the more or less complete exclusion of all the other signals.

Every signal has its own wave frequency (expressed in kilocycles) or wave length (in meters). Consider a 750-kilocycle (or 400-meter) signal. In part "A" of the drawing accompanying this article, the tuning dial of the receiver is shown set to this frequency, and the strength of the signal is then "very loud," and is indicated by the height of the dashed-line curve drawn above the scale on the dial. If, however, the incoming signal were of the same power, but of a frequency of 730 kc. (kilocycles), its loudness in the telephones would be less, as shown at the point marked "loud" on the dashed-line curve. If the signal frequency were 700 kc., it would become "readable" only, and if the signal frequency were 670 kc., it would be practically "inaudible." Such a receiver as this would therefore discriminate completely between equal signals, one of which was on 750 kc. (400 meters)

and the other on 670 kc. (448 meters). A good crystal receiver will have about this selectivity or power of selection between signals of different frequencies, but the radio engineer would regard this as poor selectivity for any vacuum tube set. Sets employing radiotrons should give much greater selectivity than this. To take an extreme instance of excellent selectivity, the effects shown in the lower portion "B" of the first drawing should be studied. It will be seen that while the signal is very "loud" at 750 kc., remains at practically the same loudness to 755 kc., and then drops very rapidly, becoming "inaudible" at 756 kc.

The type of receiver shown at "A" in the drawing will therefore respond to signals falling within a band of frequencies about 160 kc. wide and has very little selectivity. It will not cut out local interference to any great extent, and its user will have to be content with listening to the strongest of his local stations. The type of receiver shown at "B," however, will respond only to signals within a narrow band of frequency, about 10 kilocycles wide. It has extremely good selectivity. In fact, it is not feasible to improve its selectivity at all without destroying the quality of the music received from an ordinary broadcasting station. Theory and experiment agree in showing that a band of 10 kc. width is required for good musical reproduction, and any receiver that receives a band of less than this width is entirely too selective and will destroy the quality of the concerts received. It was for this reason that the Department of Commerce, acting on the recommendations of the Second National Radio Conference, assigned frequencies to

broadcasting stations 10 kilocycles apart so that they could be entirely distinguished from each other by a receiver having the greatest usable selectivity and so that they, in turn would not interfere with each other by producing audible whistling or "beat" notes when they were transmitting.

The following tables give in a general way the degrees of selectivity, or power of distinguishing between signals of equal strength at different frequencies, and the usefulness of each class of selectivity:

Receiver tuned to 750 kilocycles (400 meters).

1. Equal signals become inaudible 80 kc. off tune—that is, at 670 kc. or 448 meters. This is poor selectivity, and will barely enable the listener to distinguish between local stations.
2. Equal signals become inaudible 30 kc. off tune—that is, at 720 kc. or 460 meters. This is good selectivity, and will in general enable distinguishing between local signals and some distant signals.
3. Equal signal becomes inaudible 10 kc. off tune—that is, at 740 kc. or 405 meters. This is very good selectivity, and will meet most requirements of reasonable interference-prevention.
4. Equal signals becomes inaudible 5 kc. off tune—that is, at 745 kc. or 403 meters. This is excellent selectivity, and will meet all possible requirements. It is, in fact, the very limit of selectivity which can be employed with ordinary broadcasting transmission without injuring the quality of music. Greater selectivity than this, therefore, is unusable and undesirable.

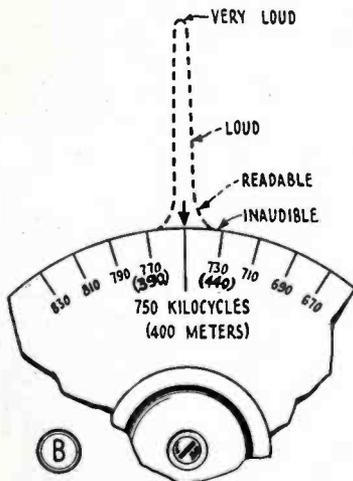
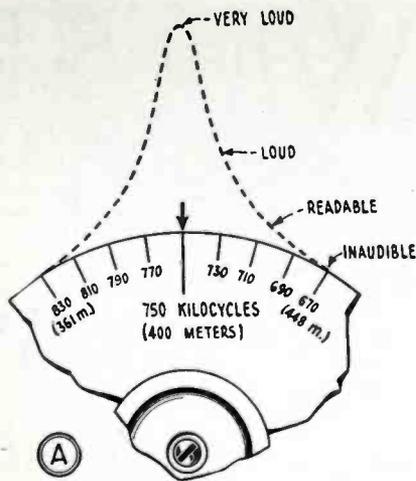
As a general rule it may be said that a good crystal receiver of the single circuit type will have selectivity in Class 1 of the above table; a non-regenerative receiver will fall between Classes 2 and 3 and generally nearer Class 2; a properly used regenerative receiver will be in Class 3; and the obtaining of a Class 4 receiver requires special design and construction. The accompanying photograph shows some of these receivers.

The selectivity which can be obtained from a receiver depends not only on its design, but also on the correctness of its use. Even the best receiver carelessly used will not yield all the desired results. For this reason, a series of suggestions are given below for getting the greatest selectivity from various types of receivers and thus avoiding interference as far as possible:

In using a non-regenerative receiver of the two-circuit type, reduce the value of the coupling between the antenna circuit and the secondary circuit as far as permissible for the desired signal strength. The tuning of the antenna and secondary circuits should then be sharp.

In using a single-circuit regenerative receiver, do not use an antenna any larger than is required to give a loud signal on the most powerful local station when the tickler has been brought up to the point where further increase begins to spoil the quality of the music.

If difficulty with howling or covering the wave length range is experienced under the condition mentioned in suggestion above, place a condenser



Tuning effects of poor and excellent selectivity

across the ground and antenna binding posts of the receiver—the value of this condenser being about five ten-thousandths (0.0005) of a microfarad.

In using two-circuit regenerative receivers, keep the coupling from antenna to secondary circuits as loose as will give the desired signal with tickler adjustment well up toward the point where further increase begins to disturb the quality of the music. If necessary reduce antenna dimensions as well and add a condenser to the set as mentioned previously.

Be satisfied with signals of reasonable loudness.

The selectivity of any type of set being necessarily limited, it is necessary to be content with nearby station concerts if one is located very close to such stations. Distant station reception, if absolutely required, must then wait for the later evening hours.

Ever so often, the broadcast listener will be told of some receiver that picked up a very distant station loudly through powerful local stations on nearby frequencies or wave lengths and without interference. If he cannot duplicate these results, it is no positive reason for discouragement because transmission conditions vary so much from night to night that any general conclusion is meaningless. Distant stations are sometimes amazingly strong and easily received. It is not meant that receivers of high selectivity will not accomplish wonders compared to those having poor selectivity. What is meant is that "one swallow does not make a summer," and that single records prove very little.

The 5-Tube Fusidine

(Continued from page 53)

must also have the bolts replaced with longer ones so they may be mounted on the sub-panel without disturbing the insulation. The jacks are placed upside down and the sub-panel is bolted between the bases of the jacks and the insulating pieces. The shape of the jack springs may have to be changed slightly, using a plug to test them with to be sure that the jack still operates correctly after it has been mounted. As a precaution against blowing out a tube, you are advised to connect the set completely and attach the A battery and try out a tube in each socket before connecting the B battery. A plug must be inserted in the loud speaker socket before the amplifier tubes will light. A wet storage A battery and 201A Radiotrons are recommended throughout.

When the set is completed, the op-

eration is very simple. Be sure the A and B batteries are connected as shown; also the aerial and ground. Insert the phone plug into the loud speaker jack. Turn on the detector and amplifier rheostats until all tubes light, but not strong enough to cause hissing in the phones. Turn the first large dial to any position, say about 30; then rotate both of the other large tuning dials from about 25 to 35 simultaneously. If a station is heard, re-tune each of the dials for greater clearness and place the phone plug into the detector tube jack and insert the loud speaker plug into the amplifier jack. If no station is heard try changing the first dial up or down about two points and with it in the new position, rotate both of the other two dials about 5 points above or below the number on the first dial. If no station is heard

after trial on all of the different points it may indicate that the dials have been incorrectly set on the shafts. These three large dials must be set so they will have the 100 reading opposite the upper mark when the condensers are coupled at maximum capacity or when the rotary condenser plates are fully inside and between the fixed plates.

A peculiar thing about this set is that no sound is heard until you get a station and therefore it is hard to get stations the first time. Especially is this true if you have been using a set that tunes in stations on the "whistle." However, after you have succeeded in picking up a station you should log it as it will always come in on the same dial settings just like the combination on a safe. And what is more, you will not annoy your neighbor while you are operating the receiver.

IN SUMMER TIME

on ships at sea, on ranch and on farm and in many occupations the Weather Man is indispensable around the whole year; but in summer time and vacation time all of us—however sheltered our winter existence may be—wander from day to day, "What will be the weather?" If we are planning a boating trip it is necessary to get a weather forecast; if a picnic is planned, or an outing of any sort, we must regard the probable weather. A sudden unforeseen change of weather will ruin our day's sport or a week's vacation. Now, whether we get our weather advice through the daily paper or more directly from our radio receiver—which in many remote vacation spots is the only way—we are bound to be interested in Uncle Sam's use of radio and radio broadcasting to increase the service of his Weather Bureau.



Tempering the Weather

150 Broadcast Stations Enable the Weather Bureau to Serve All Parts of the Country and Vessels at Sea in Its Work

By S. R. Winters

A POET living in the sixteenth century wrote, "God tempers the wind to the shorn lamb." Herdsmen on the ranches in Wyoming, in the twentieth century, are safeguarding their shorn flocks of sheep and their offspring from freezing rains by virtue of weather forecasts dispersed by radio. The shearing of sheep and the arrival of new-born lambs are practically simultaneous occurrences and a wintry rain is disastrous to both unless shelter is given during unfavorable weather conditions. Warnings of precipitation by radio afford opportunity for the bringing of the flocks from the open range to the corrals, thus lessening the mortality rate of wool- and mutton-producing animals.

A farmer in Wisconsin upon receiving, by radio telephone, forecast of a cold wave of some duration, communicated with his neighbors and secured their co-operation to the end of scraping and patching the community highway. The road was cut up and in a deplorable state, a condition that would have endured throughout the winter months had the cold wave settled upon it. However, the weather warning by radio telephony enabled the farmers to scrape the bumpy highway and roll a new road-bed in the nick of time. The cold wave, true to the forecast, arrived and the road with its fresh surface froze over. In a measure, it was a boulevard throughout the winter months.

A highway engineer at Carrolton, Illinois, is building a concrete bridge in sections upon the strength of daily weather forecasts received by radio at the local bank, duplicate copies of the bulletins being regularly supplied this bridge builder. A warning of rain may

necessitate the employment of an extra force in order to hurry to completion a section of the bridge. He is thus enabled to safeguard his concrete

building activities against freezing conditions.

A fisherman, off the New Jersey coast, casts his nets and seines for the finny tribe in obedience to the storm warnings issued by radio. He writes, "I am interested in the weather prevailing and predicted on the fishing grounds from South Jersey as far north as New England." For a reason not altogether dissimilar, farmers in the vicinity of Peekskill, New York, realize the opportune time for harvesting of hay, lest rainfall spoil the newly cured grass. Likewise, producers of cranberries in the vicinity of Chatsworth, New Jersey, learn of the visitations of Jack Frost by radio. These frost warnings likely insured an adequate supply of cranberry sauce for your Thanksgiving and Christmas turkey.

These testimonials suggest the diversity of interests

served in the broadcasting of weather forecasts, warnings, and like information by radio. The frequency of the appearance of the words "weather forecast" or "weather report" in the daily broadcasting programs exceeds that of any other service. Moreover, the Weather Bureau of the United States Department of Agriculture is the only agency, government or otherwise, that has enlisted so many broadcasting stations in disseminating its programs—112 radio-telephone and 25 radio-telegraph stations co-operating.

"Fair and warmer; gentle winds," as commonplace as this phrase and its variations may seem, is of universal appeal. The universal language centers about the weather conditions. The Wyoming ranchman who tends his flock of sheep with the changeable weather conditions constantly in mind



Professor Charles F. Marvin, Chief of the Weather Bureau, United States Department of Agriculture

RADIO AND THE WEATHER BUREAU

Radiophone communication has established an epoch in the public usefulness of the Weather Bureau. Great things were done in the disseminating of its forecasts and warnings by means of the telegraph, telephone and cable systems of communication, newspapers and the mails. However, a large part of the public, especially in the rural districts, could not be reached by such agencies, and vessels could not be supplied with vital information after they left port. Radio overcame these difficulties and has become an indispensable factor in the work of the Weather Bureau. Advises and warnings of the Weather Bureau are now systematically broadcast from 150 stations which gives service instantly to homes in all parts of the nation and to vessels at sea.

Charles F. Marvin,
Chief, U. S. Weather Bureau.

and the street-car conductor who exchanges greetings in terms of "cold weather" and "a fine day" are both concerned in forecasts, whether the interest is based on useful application or idle curiosity. Hence, it is safe to assume that music, speech or what not, when dispensed by radio, does not challenge as widespread interest as the condition of the weather on the morrow. The composite interest in weather reports is reflected by the results of a recent survey in which it is computed that 265,000 persons in the United States directly receive forecasts by use of radio. This estimate does not take into account the practice of the operators of radio outfits who distribute the information thus received to their neighbors.

"In my opinion radio offers greater potentialities for the advancement of meteorological science than any other development within the past 20 years," are the words of E. B. Calvert, meteorologist of the Forecast Division of the Weather Bureau, United States Department of Agriculture, in appraising this medium of intelligence for both collecting observations and in the dispersing of forecasts. That radio will be employed eventually as a vehicle of studying weather conditions in remote areas, not now invaded by the cable and telegraph, is implied in the following words of Mr. Calvert which he gave to me in the course of an interview:

"We must secure data as to conditions that are occurring in the inaccessible regions of the north and study them in relation to weather sequences. We know much of the laws in relation to storms and anti-cyclones; about where they form, and the effect of the rotation of the earth on their motions. We know that conditions in one region have a bearing on the weather in another; that a storm over one country today will move to another tomorrow, the next day, or perhaps a number of days later. We feel certain that conditions in and about the polar regions have a decided bearing on conditions of the inhabited regions to the southward.

"The crying need of meteorology is for more information from those places; more reports to form as complete charts for the northern hemisphere as may be possible. It is not to be supposed that telegraph, telephone, or cable lines will ever be advanced into the frozen regions of the north, but it is well within reason and expectation that scientists equipped with radio apparatus will penetrate into these regions, suffer hardships for the sake of science and send daily reports which will mean so much to meteorology and the progress of the world."

The use of radio telegraphy in the collection of observations pertaining to



Happy the farmer who has a radio set. So the weather man can tell him whether rain or sun or snow will come

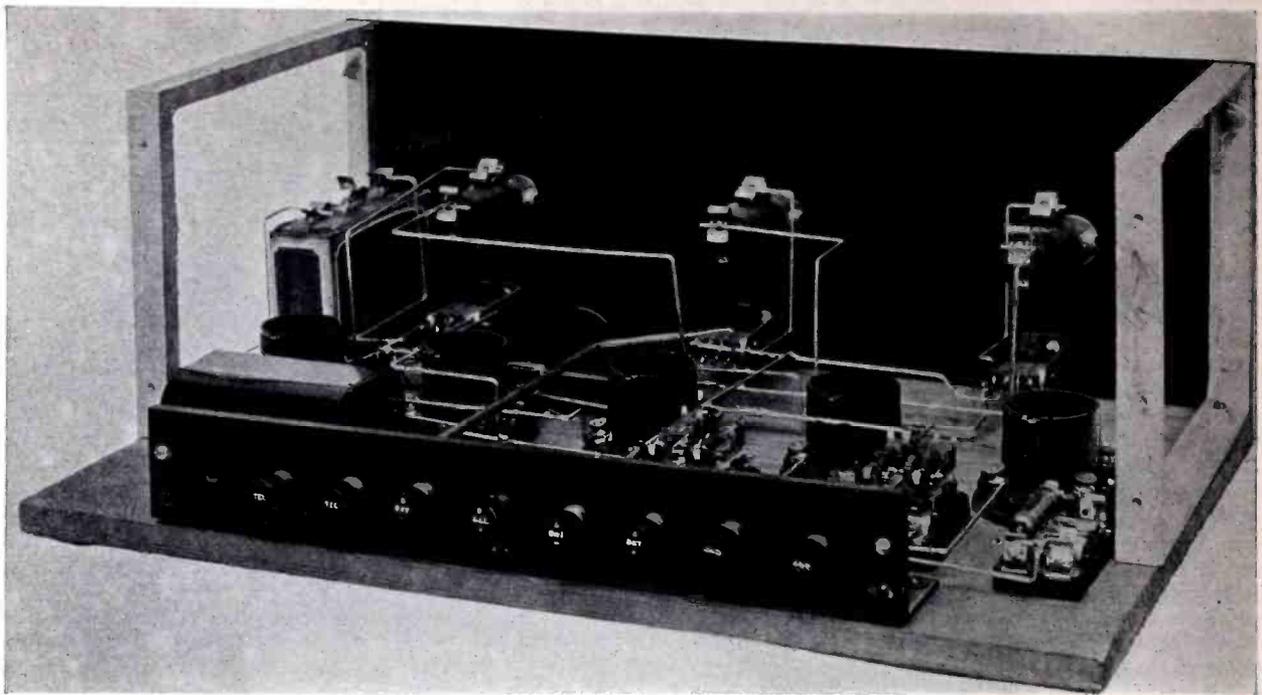
the weather in areas not penetrated by land-line communication systems is problematical, of course. The application of radio telegraphy in assembling and reporting atmospheric conditions over expanses of water is, however, a reality—in fact, a daily occurrence. Reports from vessels plying the "seven seas" are received with almost the facility and dispatch that observations are made and exchanged by the land-observing stations of the Weather Bureau. Ships equipped with radio apparatus have been enlisted to take and forward two observations daily to the district forecast centers located at Washington and San Francisco. A nominal sum is paid for each observation. However, such substantial corporations as the Texas Company, the Standard Oil Company, and the Texas Oil and Refining Company, in recognition of the value of these storm warnings, make observations and forward them free of cost to the Weather Bureau, except for the radio and land-line tolls.

The extent of the use of radio telegraphy as a weather observer is suggested by the records that 298 individual ships made approximately 10,000 observations during twelve months. This service includes reports of storms and hurricanes over water areas, their intensity, direction of movement and rate of progress. These warnings after being charted are distributed for the benefit of the ships of all nations. Masters of all vessels operated by the Shipping Board are required to take and transmit daily observations, without cost to the Weather Bureau. In a notable recent instance of the alertness of seafaring vessels in reporting the existence of a hurricane, a warning was issued by the Weather Bureau

of a hurricane located south of Nassau and Cuba and during the four-day period of the movements of this storm within a certain area 114 observations were made by masters of ships. The meteorologist in charge of the Forecast Division of the Weather Bureau received a letter from a shipmaster indicating that he picked up, by radio, the first warning issued and was thus enabled to chart his course away from the area in which the hurricane was spending its fury.

However indispensable radio telegraphy may be in reporting observations of atmospheric conditions over vast expanses of water, it is not contemplated that this medium of communication will ever displace the Morse telegraph system as a means of collecting weather observations on land. In fact, the 240 observing stations in the United States and Canada are tied into one vast telegraph system, as it were. There are 23 telegraph circuits averaging about 750 miles in length, the longest being 1340 miles and the shortest 231 miles. One of these telegraphic circuits extends from Washington to St. Louis, tying in eleven stations, including Chicago, St. Louis, Springfield, Indianapolis, Terre Haute, Evansville, Cincinnati, Dayton, Columbus, Pittsburgh and Washington. At 8 o'clock each morning the Washington observation is transmitted over this telegraphic circuit and every operator on this telegraph line copies the message. This procedure is duplicated on all of the communication systems until the 240 reports from as many observing stations are distributed throughout the country by 9 o'clock or a few minutes earlier in the morning. Thus this system of collecting obser-

(Turn to page 75)



Rear view showing position of parts and the wiring

The SUPER-TONE AMPLIFIER

An amplifier that faithfully reproduces the exact tone quality of incoming signals

By Robert Alan

HAVE you ever wished to throw efficiency and economy to the four winds and forget all the careful habits which you have formed in your experience as a radio experimenter? Most of us have. Have you ever tired of the everlasting substitution of a makeshift appliance for the genuine article in the construction of a radio receiver? If you have, you will appreciate our emotions when we completed the Super-Tone Amplifier.

We have had one ideal. An amplifier that would faithfully reproduce the exact tone quality of incoming signals. This Super-Tone Amplifier is the realization of our ideal.

The ordinary audio-frequency amplifier, using the present-day closed core transformer, can amplify only a limited band of frequencies. This frequency band often fails to amplify the high and low notes on the musical scale. The inherent losses in windings and laminations of the iron core has so far made impossible the perfect audio frequency transformer which rectifies one-half of the alternating current sine. Consequently, these audio frequency transformers were not used in this amplifier, and for the same reason we chose the resistance-coupled, or rather, the capacity-coupled amplifier which makes use of the voltage drop across the resistance inserted in the plate circuit. A resistance-coupled

amplifier when properly constructed, amplifies all frequencies perfectly. Therefore, when one is connected to the detector tube we will not miss the notes of a bass horn nor the warbles of a coloratura soprano. This is because the voltage drop across the resistance inserted in the plate circuit through which the plate current flows actuates the grid of the following tube.

The amplification of a resistance-coupled amplifier at so-called audio frequencies, is slightly greater than the amplification of each amplifier tube. Many people are under the impression that in a transformer-coupled amplifier the transformer does all the work and the tube acts only as a coupling. In a properly designed amplifier the tube should do most of the work and the transformer do the coupling. In the case of the resistance-coupled amplifier the coupling is merely a condenser and the tube does practically all the work. For this reason tubes used in a resistance-coupled amplifier should have the same characteristics and be matched. It would likewise be well to have some method of accurately regulating the filament current. This was accomplished with Fil-Ko-Stats in the Super-Tone Amplifier.

Most audio frequency amplifiers have a tendency to amplify tube noises and atmospheric disturbances. The transformer amplifier amplifies to the

greatest extent the frequencies of these disturbances. Although more volume is obtained by placing the resistance-coupled amplifier after the push-pull amplifier, by placing these two separate kinds of amplification in the reverse order, stray noises are less apt to enter the final stage of amplification. Consequently, static is not amplified as it is an ordinary transformer coupled amplifier. Although the Super-Tone Amplifier is not a static eliminator, it is certainly a static "diminisher."

CONSTRUCTION DETAILS OF THE SUPER-TONE AMPLIFIER

As the majority of the instruments employed in this amplifier are mounted on the baseboard, it is advisable to put all these instruments in place before any work is done on the panel. Five and three-quarter inches from the front of the baseboard draw a line parallel to the front and back of it. This will be the center line for your sockets. The first socket is centered two inches from the left. This is the detector socket. Five and one-half inches from the left fasten the second socket and in the middle of the baseboard mount the third socket. Then using these same measurements locate the fourth and fifth tube sockets. Be sure in mounting the sockets that the two filament posts of each socket are fastened toward the front of the panel so that the filament

leads will all run between the sockets and the panel. This is necessary because of the connections to be made with the automatic filament lighting jacks. Between the detector tube and first amplifier tube socket and as close as convenient mount the first resisto-coupler and between the first amplifying tube and the second, mount the second resisto-coupler. The grid condenser and grid-leak of the detector tube are mounted directly back of the grid binding posts on the detector socket, so that the grid lead is as short as possible. In the set made up in our laboratory, this lead was not over one-half inch long. The push-pull amplifying transformers are rather large and it is necessary to mount them in the position shown in the photograph in order to have room for them at all. The binding posts, looking at them from the rear, are marked B+ amplifier, 150 volts, B+ amplifier, 90 volts, B+ detector, 45 volts, A+ B- A- C+, plate, tickler, filament and grid. This makes nine binding posts. The Eby posts are admirably suited for use in this amplifier because of the excellence of their make-up and because they have engraved on their tops exactly what each stands for. Start with the grid and plate lead of each socket and make your connections to the binding posts and to the instruments. Leave the filament connections to the last. Next drill the holes for the Quinby frames which are fastened to each edge

of the panel. Then drill the holes for the three Fil-Ko-Stats and three Patent jacks. Draw your center line down the length of the panel three and one-half inches from either edge. The first Fil-Ko-Stat is mounted three and one-half inches from the extreme left end of the panel and the second Fil-Ko-Stat is mounted three and one-half inches from the right end. The middle one, of course, is mounted in the center of the panel. Holes for the three jacks are drilled directly below the Fil-Ko-Stats and one and one-half inches up from the base of the panel.

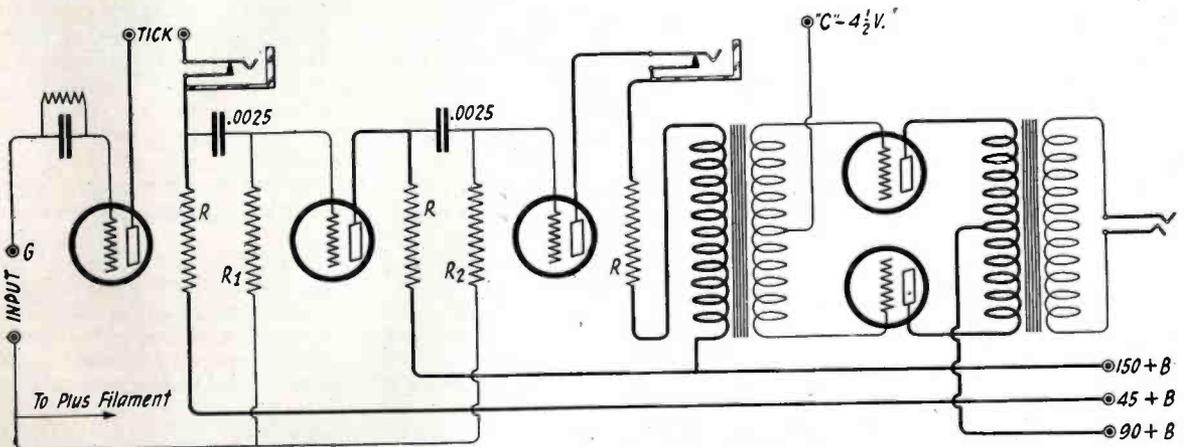
Now go over the diagram of the filament connections and study them thoroughly before you attempt to hook them up. With a red pencil go over the diagram as each connection is made so that you are automatically checked up if you omit anything. The filament connections on this amplifier are the most complicated of any that you are liable to run across in constructing a modern receiving set. The filament return lead from the tuner is connected to the positive side of the filament. The return lead from the "C" battery in the push-pull stage is connected to the negative side of the filament. The return lead from the resistance-coupled amplifier is connected to the positive side of the "A" battery.

Now connect up your detector jack. Place the tube in the socket and apply six volts to the "A" battery binding post. Turn up the Fil-Ko-Stat, place

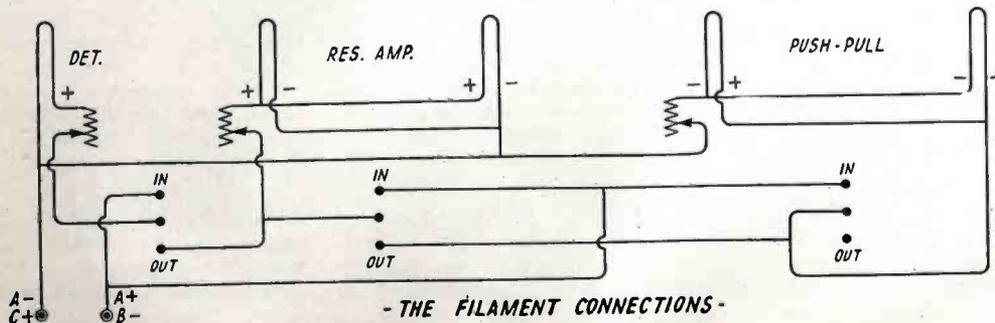
the phone plug in the detector jack. Now when the plug is inserted in the jack, the detector tube should light up. When it is removed it should break the filament circuit and the tubes should go out. Now complete the filament connections for the resistance-coupled stage and connect up the second jack. Now check up on your movements so far and place the plug in the detector jack. The detector should now light up as before and upon removing the plug it should go out and should have no effect on the next two tubes. Now plug in on the second jack. This should light the first three tubes and upon the removal of the plug they should go out. Next connect up the push-pull stage. When the plug is put in the third jack all tubes should light up and when it is removed all tubes should go out. This method of procedure will check up on any discrepancies in your wiring. Be sure not to make a mistake in placing the resistance and grid leaks. The resisto-coupler posts are marked.

OPERATION OF THE AMPLIFIER

The only operating details which are necessary to mention are the matching of the tubes in the push-pull stage and the resistance coupled stage. Pairs of tubes which work well together should be placed in the same kind of amplification. After the filaments are lighted, a careful regulation of the filament rheostat will greatly enhance the clarity of reproduction.

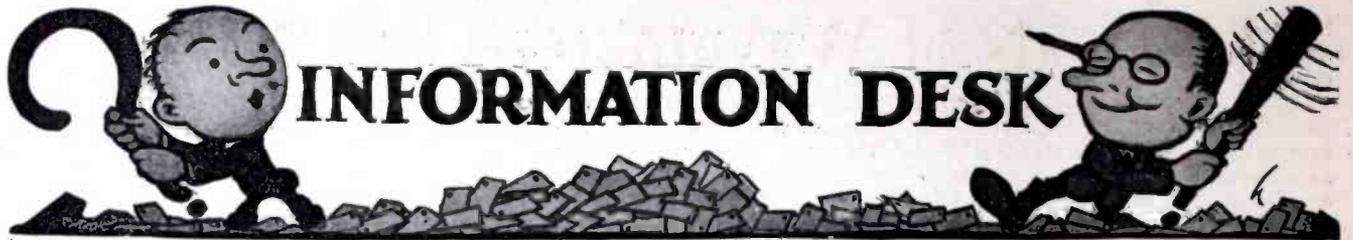


THE GRID AND PLATE CONNECTIONS -



THE FILAMENT CONNECTIONS -

Circuit diagram of the super-tone amplifier



CONDUCTED BY R. A. BRADLEY

Due to the great volume of correspondence which this department entails, we are forced to remind our readers on the following points. Be sure to inclose a self-addressed stamped envelope with your questions. Make your questions clear and concise. If you wish information on your set, please inclose a rough sketch of hook-up if possible. Do not ask us to tell you how far your set will receive or how far any set should receive. It is impossible to answer this question as there are too many things which enter into distance reception and too many variable elements to make a qualified statement. Please do not ask us to make comparisons between different makes of apparatus or sets. We printed in the Information Desk for May what we termed an ideal letter. If you wish immediate response to your inquiries, follow the general outline of this letter.

Using the Information Desk

SOME of the letters which we receive in our every day mail show a decided lack of thought on the part of some of our readers. We are sure it is this rather than ignorance because of the absurdity of some of the questions. A short time ago we received a letter in which the writer asked several questions concerning a receiver described in the pages of THE WIRELESS AGE. Among other things he asked us to compare this set with a standard manufactured product, mentioning the name of the manufacturer. Don't you see in what position this places us? We cannot make statements concerning a particular type of manufactured receiver, nor can we uncompromisingly praise a special receiver. This same writer went on to ask what ratio of transformers he should use in constructing this receiver. In this particular receiver there was specified a list of materials used in the construction of the set. We even went so far as to mention the manufacturer which in this case was the Acme Apparatus Co. These people make excellent transformers of one ratio. If the writer had taken the trouble to look up this list of materials it would have been apparent to him that the Acme people make but one ratio of transformer, which they find suitable for all purposes. In most construction articles when special transformer ratios were used it was specified in the list of materials.

Then there is that ever present letter from some of our readers who ask if a certain receiver can be used with UV-199's or WD-12's and so forth. We encourage our readers to read the slip which is enclosed with each genuine Radio Corporation of America or Cunningham tube and to read it carefully. This advises in each case exactly what that tube is best suited for. Every tube on the market that is of standard make, can be used as a detector tube. Of these the best detectors are the UV-200 and C-300. These tubes are especially designed for detecting purposes. They will not serve satisfactorily as an audio-frequency amplifier nor a radio-frequency amplifier. Its sole function is to detect and it does that very well. All the other tubes are more or less "hard tubes," and act best as amplifiers. For a radio-frequency amplifier you should use the UV-199 or UV-201A. For an audio-frequency amplifier the UV-199, WD-11 and WD-12 and UV-201A are all suitable. The WD-11's and WD-12's were not designed for radio-frequency amplification and

therefore cannot be expected to do this well.

Then there is the writer who asks if one set will give more volume than another. With the exception of the superheterodyne and the ultradyne, the volume is directly dependent upon the distance of the station from your receiver and the amount of audio-frequency amplification used. If one receiver has a detector and two steps of audio-frequency amplification and another receiver has two steps of radio, detector and two of audio and in each case the same "B" battery and the same tubes are employed and the receiver is located at the same spot, the results if both are properly designed will be practically the same. In other words the amount of pep obtained depends almost entirely upon the audio-frequency amplifica-

push-pull stage greatly enhances its value in regard to volume and clarity.

Mr. P. S. Young writes that he has constructed the one-tube reflex described in the May issue of THE WIRELESS AGE and states that he cannot get any station except KDKA, and that not very loud. He advises that he cannot get a squeal except when the variable condenser is turned too high.

Mr. Young's trouble probably lies in the crystal detector which he employs. If the crystal detector does not make good contact or is out of adjustment, the results will be similar to those he has obtained. The fact that he gets anything at all does not indicate that the crystal is rectifying. The radio frequency tube when reflexed will act some-

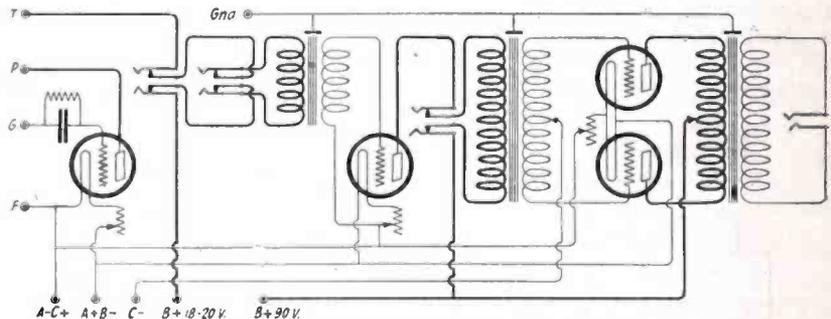


Figure 1—Circuit diagram of a. f. and push-pull amplifier

tion and not upon the detector nor what comes before the detector.

Mr. Harry W. Schaller of Oak Park, Ill. asks, Will you please show in your columns a hook-up for an audio-frequency amplifier using one stage of straight transformer coupled and one stage of push-pull amplification including in the diagram the detector tube and a jack connection for an external detector? I have two sets, one with the detector included and one without and I would like to use this amplifier with either.

The diagram you desire is shown in figure 1. The second jack from the left is the external detector jack. By plugging the output of a detector tube into this jack the two stages of audio may be used and by connecting the four output posts of a tuner to the four input posts the whole amplifier and the detector may be used. This sort of an amplifier is a very handy thing to have as it permits the use of either of two sets with the addition of one extra detector tube. And of course the fact that the second stage is a

what as a rectifier. Mr. Young, we recommend that you get a better crystal detector, preferably an adjustable one.

Mr. Jerome A. McCreary of Westfield, Pa. writes, "Will you please explain to me the action of the plate variometer in producing regeneration in the ordinary regenerative receiver?"

In the tickler coil circuit regeneration is produced by inductive coupling between the grid and plate circuits. This is accomplished by placing the plate inductance in inductive relation to all or part of the grid circuit. The signal voltage after it reaches the plate circuit is fed back by induction to the grid circuit and this feedback is controlled by variable coupling between the grid and plate coils. This action is readily understood. In the two-variometer-vario-coupler receiver the action is somewhat different. The feedback here takes place through the condenser formed by the plate and grid of the detector tube which for a UV-200 is something

(Turn to page 78)

Methods of Wavemeter Calibration

Standard Calibrated Meters, "Click" Method, Harmonics and Standard Wave Lengths Used to Construct Calibrating Curves

By Maurice Buchbinder

A WAVE-METER is, as the name indicates, a device for measuring the wavelength of a circuit. Essentially it consists of a coil, or series of coils, and a variable or adjustable condenser. The coils and condenser must be well built mechanically, electrically efficient, and permanent in physical constants, in order that a calibration once performed should be relatively lasting. Besides these essentials the wavemeter may have either a driving device for generating radio oscillations—such as a buzzer—or a detecting device for detecting oscillations in another circuit—such as a crystal and headphones. In either case the particular attached device must be present in the circuit when the wavemeter is originally

so as to diminish the capacity effect, which, negligible at high wavelengths, is quite large at the lower wavelengths and capacities. If both external attachments are present in the wavemeter a calibration is made in each condition—that of receiving and of transmitting by buzzer.

There are several methods available for calibrating a wavemeter. All methods but two require the use of another accurately calibrated standard meter. It is however possible to use known wavelengths as a standard, instead of a wavemeter. It is the purpose of this article to describe in detail each of these methods.

STANDARD CALIBRATED METER

The simplest possible method is il-

of the coils and in that way the whole wavemeter range is covered. After having gone through a calibration of this kind we can reverse the process, that is, receive with the standard wavemeter and listen with the meter being calibrated. Thereby two sets of calibration curves are drawn up for wavemeter B, for use as a receiver and a driver respectively—a smooth curve being drawn for each coil for a condenser range of 0 to 180 degrees.

CLICK METHOD OF CALIBRATION

The above method, as already mentioned, is the simplest, but it is not the most accurate. The most accurate method for calibrating wavemeters, because it permits the sharpest tuning, is that which may be called the "click"

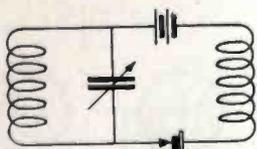


FIGURE 1

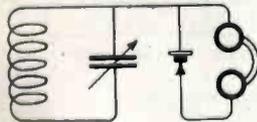


FIGURE 2

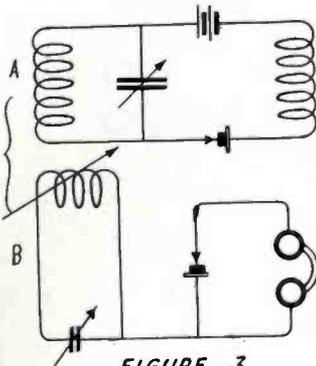


FIGURE 3

Various circuits for wavemeter calibration

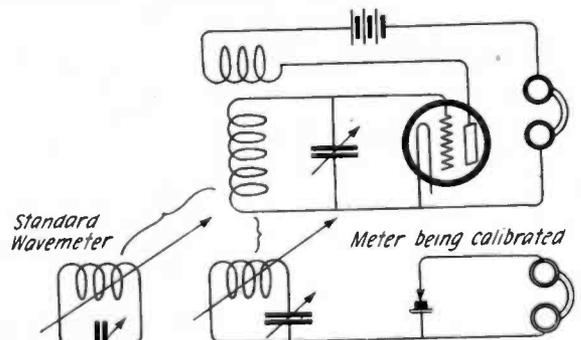


FIGURE 4

calibrated else its addition or subtraction will affect the wavelength through its intrinsic capacity.

The best wavemeters used for standards in radio laboratories have no extraneous parts. They are merely coils shunted by fixed condensers, and a switching device for selecting the particular capacity desired and thereby changing the wavelength. Fixed condensers are preferable to the usual variable condensers because the latter are mechanically more delicate and liable to change of form.

For ordinary practical usage, however, our wavemeter will present a number of coils, a variable condenser, and either a buzzer or crystal-headset combination or both. The buzzer would be employed in a circuit such as is shown in figure 1; the crystal-headset in a circuit such as is shown in figure 2. It should be noted that the latter are not connected in the usual way across the variable condenser, but are unilaterally attached. This is done

illustrated by means of the diagram in figure 3. A represents the standard meter whose calibration curve is known for use as a driver or source of radio signal. B represents the meter which is to be calibrated, connected for use as a receiver by the unilateral method of connection. In the process of calibration we set meter A at the lowest wavelength, and, using the smallest coil of meter B, tune in the signal coming from meter A by varying the condenser of the unknown wavemeter B. At a certain point the buzz emitted by A will be heard. The location of this point can be sharpened by loosening up our coupling between A-B. Then we know of course, that at this point, whatever the condenser reading of meter B may be, the circuit wavelength is that given by the standard A. We then go on, increasing the wavelength by gradual steps and in about ten readings cover the entire range of wavemeter B for its smallest coil. The same is done for each one

method. In this procedure use is made of an auxiliary oscillating tube circuit capable of being adjusted through a wide range of wavelengths. It is based upon the following phenomenon of oscillating circuits: If a circuit be made to oscillate and another circuit be magnetically coupled to it, then when the second circuit is tuned just to the wavelength of oscillations, these oscillations will suddenly disappear—and the disappearance will be manifested by a click in the listening ear-phones due to a change in plate currents. Furthermore, if the coupling between the two circuits be made very loose, then the sharpness of this disappearance will become quite remarkable, the movement of a fraction of a degree of condenser being sufficient of this principle is quite simple. We must have an auxiliary oscillating tube circuit, a standard wavemeter, and the unknown meter which is being calibrated. The standard wavemeter is coupled to the source and adjusted

until the click is heard, the wavelength of the source having meanwhile been kept constant. Coupling is opened up until the reading is as sharp as we desire it. The standard is now removed and the unknown substituted, the process of determining a "click" point being repeated by varying the condenser of the unknown wavemeter. Then we are safe in saying that the wavelength of the standard and the unknown were exactly equal at the time of the click, and the wavelength of the meter being calibrated is thereby determined for one setting. We then go on to vary the frequency of the source and pass through the range through which it is desired to perform the calibration. Data are thereby given for drawing up calibration curves exactly as with the first method. The question arises in one's mind, does not the mere coupling of another circuit to the source, affect its wavelength

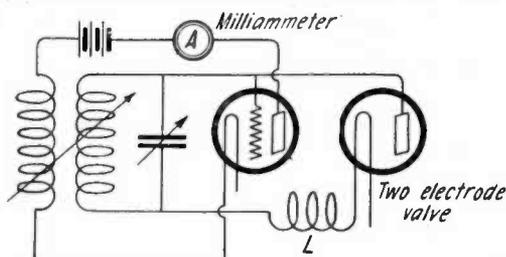


FIGURE 5

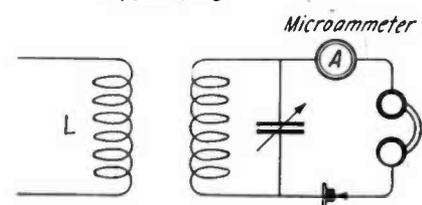


FIGURE 6

and thereby lessen the accuracy? But a little thought shows that the method is not dependent upon any constancy of wavelength—although by use of very loose coupling this is practically attained—but on a direct comparison of known with unknown; *i. e.*, any changes will hold for both known and unknown and cancel one another. Figure 4 reveals the method graphically. The unknown meter may be calibrated in a condition of no external attachments, with a driver, or with a headset-crystal combination. A separate group of curves will result in each case.

HARMONIC METHOD OF CALIBRATION

The method of calibration next to be described can be used by an experimenter without a standard wavemeter at his disposal. It is therefore a particularly valuable and, as it happens, a most accurate procedure. It is not well known that any C. W. oscillating

circuit does not vibrate at merely one frequency, but it consists of a fundamental frequency and several harmonics, the number depending upon vacuum tube characteristics and so on. Thus a vacuum tube working at 1000 meters also gives off energy at 500, 333½, 250, 200, etc., meters, namely, the first, second, third and fourth harmonics respectively. These harmonics are comparatively minute in intensity, but by suitable methods they are easily made manifest. Theoretically, harmonics in a vacuum tube circuit occur only in case of distortion. The maximum distortion would occur if we entirely suppressed one-half of the oscillation, that is to say, if we rectified the oscillation. It has been shown by mathematicians that a rectified oscillation is exceedingly rich in harmonics. Hence, practically, if we desire to intensify harmonics in an oscillation for a certain purpose, we

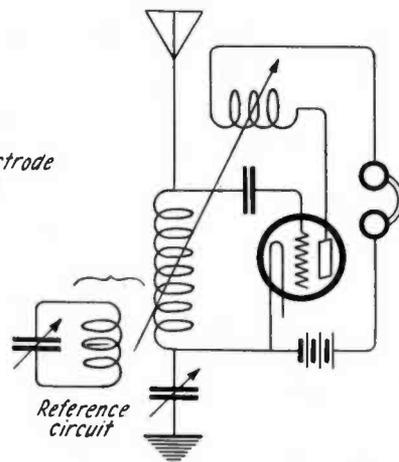


FIGURE 7

Method of calibrating various vacuum tube circuits

should endeavor to entirely rectify the oscillation. A circuit which is exceedingly rich in these harmonics will be found in figure 5. It consists of a standard oscillating power circuit. Shunting the condenser of this circuit we find a two-electrode tube in series with an inductance L. The two-electrode tube—which may be an ordinary vacuum tube with the plate and grid joined as one electrode, and the hot filament as another—rectifies the current as it passes through the inductance coil L. In L therefore will be found a circuit very rich in harmonics. The vacuum tube used for oscillations should be a power tube such as the U V-202 and a high plate potential (200-300V) should be employed so as to insure a large amount of available energy. We now have ready, by means of this circuit, a source of oscillating current rich in higher frequencies. It is possible to detect them down to the seventh and eighth har-

monic. The detection is quite simple. All that is necessary is a receiving circuit containing a microammeter in the detector circuit, as illustrated by figure 6. If instead of a direct source of plate potential for the oscillator we should use alternating current, then it would not be necessary to use a microammeter, but the A.C. hum could be heard directly in the earphones.

We now proceed with our method of calibration. Suppose we set the oscillator so the fundamental oscillation is a known wavelength. Then the harmonics also are known because they are exact halves, thirds, quarters, etc., of the fundamental for the first, second, third, etc., harmonics respectively. To illustrate, if the fundamental be 16900—that of the big naval station at Annapolis—then the first harmonic is 8450, the second is 5633, the third is 4225, the fourth is 3380. In the absence of a standard wave-

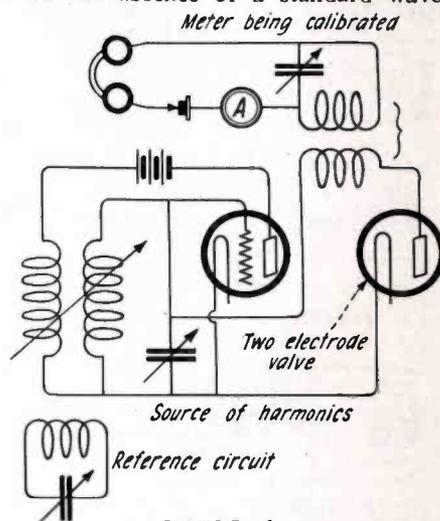
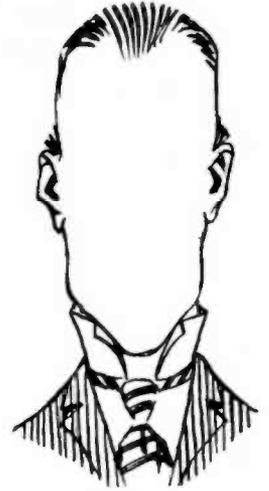
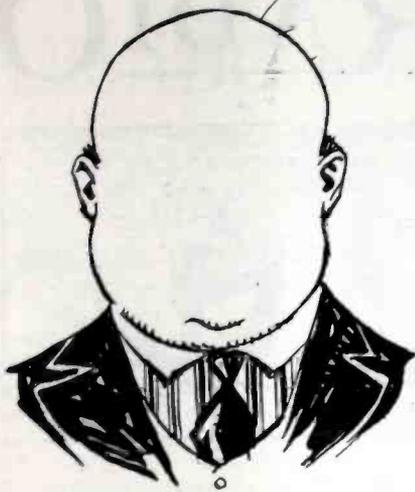


FIGURE 8

meter we should, of course, be just as much at a loss to establish our fundamental as we should be in trying to calibrate according to the methods previously outlined. There is a way, however, whereby we can fix a reference circuit accurately at certain high wavelengths, namely, the wavelengths of the high power stations of which Annapolis is an example. The fixing of the reference circuit is done by means of the click method. We listen in for Annapolis using a single circuit oscillating tube receiver (figure 7). Then we tune until the whistle is just reduced to zero frequency: *i. e.*, until as we change the condenser either way, we get the familiar swish of a heterodyne due to a rise in beat frequency. This is the so-called zero heterodyne. With the receiver fixed at this point we couple to it our reference circuit and vary the latter until a click is heard, as before, making our

(Turn to page 75)



Put Your Photo in One of These Frames And Win a Prize in the Subscription Contest

IN the June issue of *THE WIRELESS AGE* I told about the struggle I have had as a youngster in securing an adequate radio set. As very little was then known about radio, and few dealers even had so much as a glimmering of what it was all about, I had to get my information from library books and carry newspapers in order to purchase the necessary parts.

My first set was a disappointment. It was a good set, but I had worked so hard to get it the result seemed to fall much below my anticipation. I wanted more parts. I wanted a better radio station.

After my set had been completed, and used for some time, my ambition turned to vacuum tube detectors and still better parts. In those days, the old William B. Duck catalogue was my favorite book. I got real joy out of every improvement made.

Once I had conquered the difficulties, I resolved that some day I would make it easy for other young chaps to get the parts with which to build a set. That unquenchable, and very real, desire has stayed with me to this day. My interest has always been centered in boys. In fact, my own boyhood days were a curious admixture of unending troubles. If I wasn't doing a Marathon down the hall with an irate school teacher after me, I was usually misjudging my schoolmates and starting something I could not finish. Often enough I was the despair of my patient parents.

Happily, though, I am now able to realize

my ambition—I have the authority and the resources to place within the reach of every live youngster the parts for a radio set, or a complete set ready for operation.

Just write a letter to the Boys' Editor. Tell me whether you want a complete set; parts to go with a set you now have; or

**First Prize—Paragon RB 2
\$135.00 Receiver.**

**Second Prize—Thompson Mag-
naphone \$35.00 Loud Speaker.**

**Third Prize—N&K Imported
\$8.50 Headset.**

The contest closes September 15th. All subscriptions for the contest must be in this office not later than that date.

The rules of the contest will be found on this page.

In the event of ties, each tying contestant will be awarded a prize identical in character with that tied for.

This contest is open to all who wish to earn their own radio sets.

just what you do want. I will see that you get it.

I have 35,000 names of people who have bought radio sets. Each one of the 35,000 will like to know more about *THE WIRELESS AGE*. Some of those people, in fact, have been taking the magazine, but forgot to renew their subscriptions. Those 35,000 people live in every part of the country. Some of them live in your own town or city.

When I have received your letter telling me what you want in radio, I will write to you and tell you how many subscriptions you must get in order to earn what you

want. Even ONE subscription will get you a radio part.

I will teach you how to sell subscriptions. That is important. I will then give you a calling list, supply you with samples and send you out as a full-fledged salesman. You must be a good salesman, and well trained, before we can put the magazine in your hands as a responsible staff-representative in your district.

When I know that you have the right stuff in you, I will give you the appointment for your section and then establish a credit account in your name. You can draw cash from that account or get what you want in radio parts at wholesale prices.

This is not a temporary affair. The job is open to you as long as you feel that I am giving you the proper attention and a good clean-cut proposition.

A surprising development in the widespread response to this offer has forced me to extend the scope of my plans. Some of the old-timers, the successful subscription salesmen, have written to me. Most of them have been selling subscriptions for other national magazines, but have been attracted by this new schedule. The old-timers are experienced and it is exceedingly gratifying to know that they are more satisfied with my plan than any other they had yet had. But to those, and the many other grown-up "boys," who wish to join the ranks, I must definitely state that this schedule will not

(Turn to page 92)



LAUGHS in RADIO

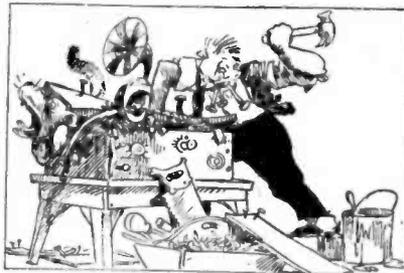
S'MATTER POP?—A HASH MAKER DESIGNED IT



—N. Y. Sun

*Why shanctoday
General store
New York
I am gude for hunter man wot
come at dis place las-der ille for
hunting deer deer hunter man bring
it with him machins for hear you
spik from far place a lissin wit
him Sunday nite also Tuesday nite
to hear song bout my ole modder
date long Stam I dont see my modder
an i ting date dame fring song
also a heer oder song i dont no
de name Tuesday nite storie for
de small boy and girl bout make
de star shine for dem if dey is god
boy and girl hunter man loff lake
hell an tole me as you how we
make some moon shine
to heer you spik jus de same lak
you at me place i ting you has
good machine i lissin more
nex wick
Thank you and much abbl
John Cornell
John P.O. Delta Canada*

THE ONLY WAY WE CAN REPAY THEM



Some-time we is out got to make a home gown out of our own



And in case in all our radio friend friends who have helped us while away so many evenings

—N. Y. Tribune

osophers have remarked—is that. It would be, in our opinion, a real test, if Professor Ensign had cashed a money order at a post office with radio identification.

"The Liar"

A fool there was and he spent his dough
(Even as you and I).
For one of these new fangled radio
That was built for a hundred miles or so
But the fool thought he ought to get Tokio
(Even as you and I).

Oh the money it cost
And the sleep he lost
And the wonderful lies he planned
To tell to the fellows who hadn't got wise
And unless they're bugs they'll never get
wise
And never will understand.

So the fool stayed up all night and tried
(Even as you and I).
To get the stations away outside
His natural zone just to swell his pride
When he said he got them we knew he lied
(Even as you and I).

Oh the stations he got
And the ones he sought
Are always one and the same
To the radio bug who has learned how to lie
And we all know how easy one lies
If he's in the radio game.

—S. W. LEAVER.

PROF. FOREST C. ENSIGN of the University of Iowa was able to cash a personal check in a strange bank in another city recently with the sound of his voice over the radio as his only identification. An officer of the bank recognized Professor Ensign's voice as one he had heard a short time

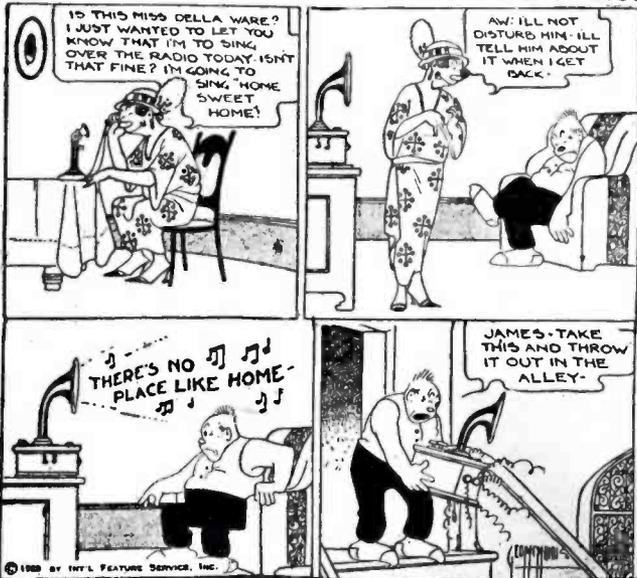
ago giving an address from the University of Iowa radio station WHAA. And that—as so many eminent phil-

BRINGING UP FATHER

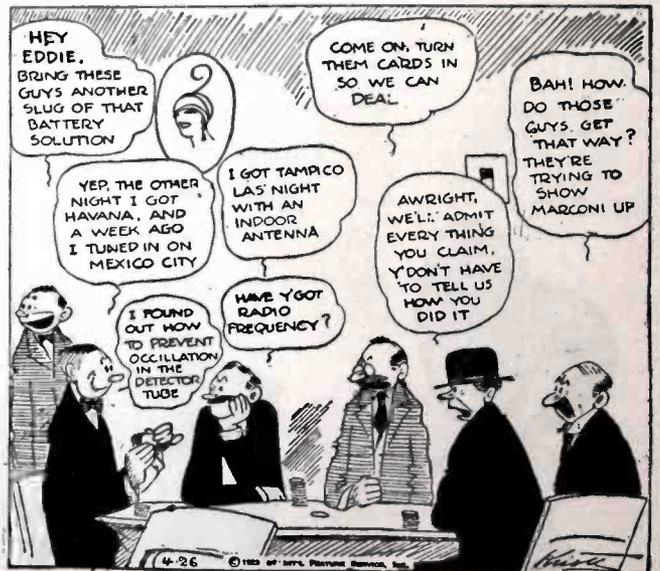
BY GEORGE McMANUS

EDDIE'S FRIENDS

BY JEAN KNOTT



—N. Y. American



—N. Y. Evening Journal

The ABC of Your "C," "B" and "A" Batteries

How to Recharge Your "A" and "B" Storage Batteries From a 32-Volt System and the Correct Method of Tapping "C" Batteries

ALL types of storage A and B batteries may be readily and successfully recharged from a 32-volt farm lighting system. The diagrams show how the Willard A and B radio batteries may be recharged by merely using the house lighting receptacles connecting with a cord and 32-volt lamp in series with the battery.

Select the socket which is most convenient for charging the battery. Screw in an attachment plug, being careful

not to touch the positive or negative terminals of the battery while the charging device is being operated to charge the plant battery. After obtaining the polarity make sure that the positive of the charging line is attached to the positive of the six-volt storage battery as indicated in figure 3.

A number of radio set owners today require the use of a C battery. Those who possess Willard storage B batteries need not purchase a separate cell or battery for this purpose.

Figure 1 is a diagram showing the

method of tapping "C" batteries from a "B" battery. On receiving sets which connect negative B to negative A it is not necessary to open tap connector A.

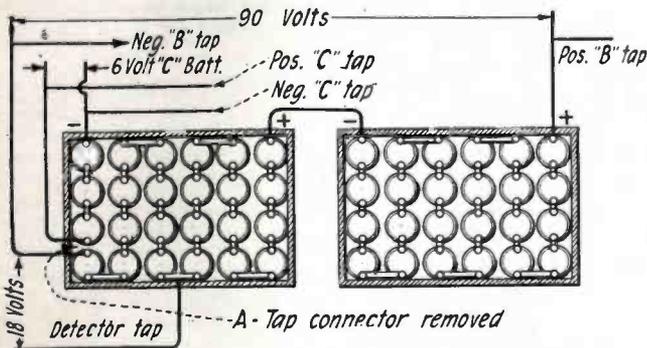


Figure 1

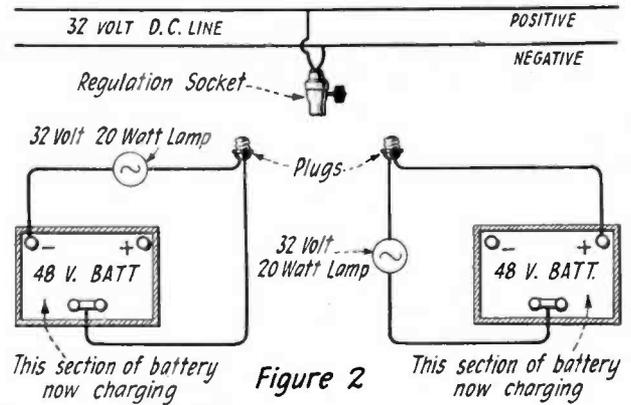


Figure 2

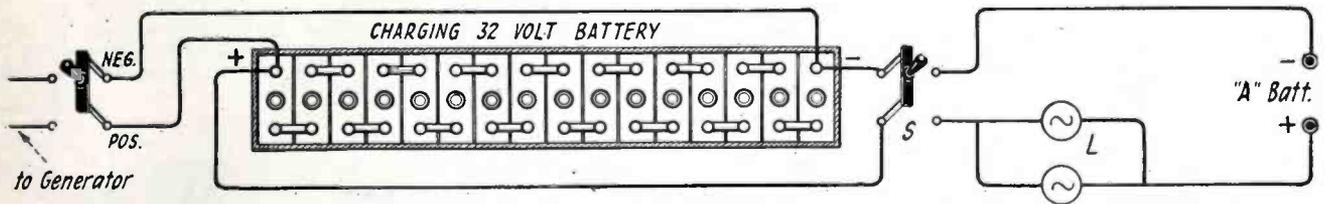


Figure 3

Figure 1—Diagram showing how "C" battery voltage is tapped from regular "B" battery. On receiving sets which connect negative B to negative A it is not necessary to open tap connector A.
 Figure 2—Charging 48-volt "B" battery from 32-volt D.C. supply
 Figure 3—Charging "A" battery from 32-volt system

that the two wires do not touch each other. Determine the polarity of the charging wires by placing the ends of the attachment leads in a glass of water. Bubbles will form around the negative wire. If both leads show bubbles, the negative lead will give off a far greater number. After determining which is the positive and which is the negative lead, put some kind of a distinguishing mark on the negative and always use this particular socket when charging.

To properly recharge the batteries the positive of the charging line must go to the positive of the battery. It is possible to recharge only 24 volts of B battery at one time. Therefore, we would recommend the buying of 24-

volt B batteries, by following the method in the diagram. Any multiple of this system may be used such as 48, 72, 96, and 120 volts.

A fully charged radio A or B battery will have a specific gravity reading of 1.275 to 1.300 and may be considered discharged when it has a specific gravity reading of 1.175. For best results the battery should be recharged when it has a reading of 1.200.

Owing to the very low charging current needed for a B battery the efficiency of a charging plant is not lowered to any great extent by charging it from the plant storage batteries, rather than from the generator. However, a high charging current is needed for an A battery and it should only be

charged while the generator is being operated to charge the plant battery.

manner in which negative B taps can be taken off the storage B battery and used for C battery purposes. The voltage for C batteries varies from two to six volts on the ordinary receiving set. If six volts are required, it is necessary to use three storage cells of the B battery, if four volts then two cells, two volts then one cell.

Figure 1 will answer the purpose for most cases. Note that the three end cells of the battery have been divided from the balance of the 24 cells. This hook-up gives an individual six-volt, four-volt or two-volt battery as a C battery. In rare cases it may be that more than six volts will be required for C battery. If, however, more than six (Turn to page 84)

RADIOVIEWING THE INDUSTRY

The Mart—a Dead Spot—the Southwest—Merchandising—Photography vs. Radio—Literature—the Black Suitcase—and Milwaukee's Radio Exposition

PERMANENT radio expositions in the country's market centers are mute evidence of the growth of radio. More important, these expositions, being of a permanent character, establish radio as an industry that has come to stay.

The Chicago Radio Mart, on Michigan Boulevard, has been opened as a centralized, open-all-the-year-'round exhibition for dealers and jobbers. This represents a worthy confidence in an industry comparatively new. It also indicates an earnest effort to catch-up and run abreast of radio's rapid progress.

* * *

IT has just been learned that DX reception has been logged from a number of distant stations by an antennaless receiving set operated on Montauk Point, L. I., until now believed by the government, many radio engineers and amateurs to have been a dead spot for other than nearby local stations. This performance resulted from a hasty experiment conducted under the supervision of Dr. Francis LeRoy Satterlee, of Flushing, L. I., inventor of the Satterlee Coils, and adds another to a growing list of achievements credited to the inventions of this well-known radio scientist.

At its eastern end, Long Island branches into two arms, and Montauk Point, whose lighthouse is first glimpsed by homecoming Americans, is located on the extreme narrow strip of land, between Block Island Sound and the Atlantic Ocean, as being quite dead for western sending stations. So far as known, previous scientific investiga-

tions for radio reception have been discouragingly futile, and it is generally reported that perhaps one of the most remarkable facts concerning the Montauk reception was that all stations were received with no antenna. The receiver itself, which is more commonly known as the Moon C-2-A, manufactured by the Moon Radio Corporation of Long Island City, N. Y., employed by Dr. Satterlee, was taken from factory stock. Dr. Satterlee's official log of the event has recorded the instrument as "Moon C-2-A, No. 1121, stock." Another unusual consideration is that all the stations logged were received with distinct audition over a non-power loud speaker.

* * *

THE Southwest Radio Exposition will be held in Dallas, Texas, November 14th to 22nd, inclusive, in the southwest's finest and largest palace, the Gardner Park Auditorium. This exposition will be under the auspices of the S. W. R. C.

Manufacturers and dealers from all over the country will be there with exhibits. Viewing the situation from the standpoint of local enthusiasm, this show will undoubtedly be a mile-stone in the enterprise of southwestern radio development.

Texas is a large state, geographically. Projects instigated there usually reflect the largeness of its wind-swept plains. Radio is a decided asset to those who live on ranches far removed from human contact of any sort, and Texas intends to make the most of radio.

* * *

ANOTHER instance of progressive merchandising employed in marketing radio products is the attractive display containers

in which the sockets, made by the Alden Manufacturing Company, are neatly arranged for the retail trade. Sound merchandising is a guarantee of dependability. The public, just now, is very much interested in that phase of radio.

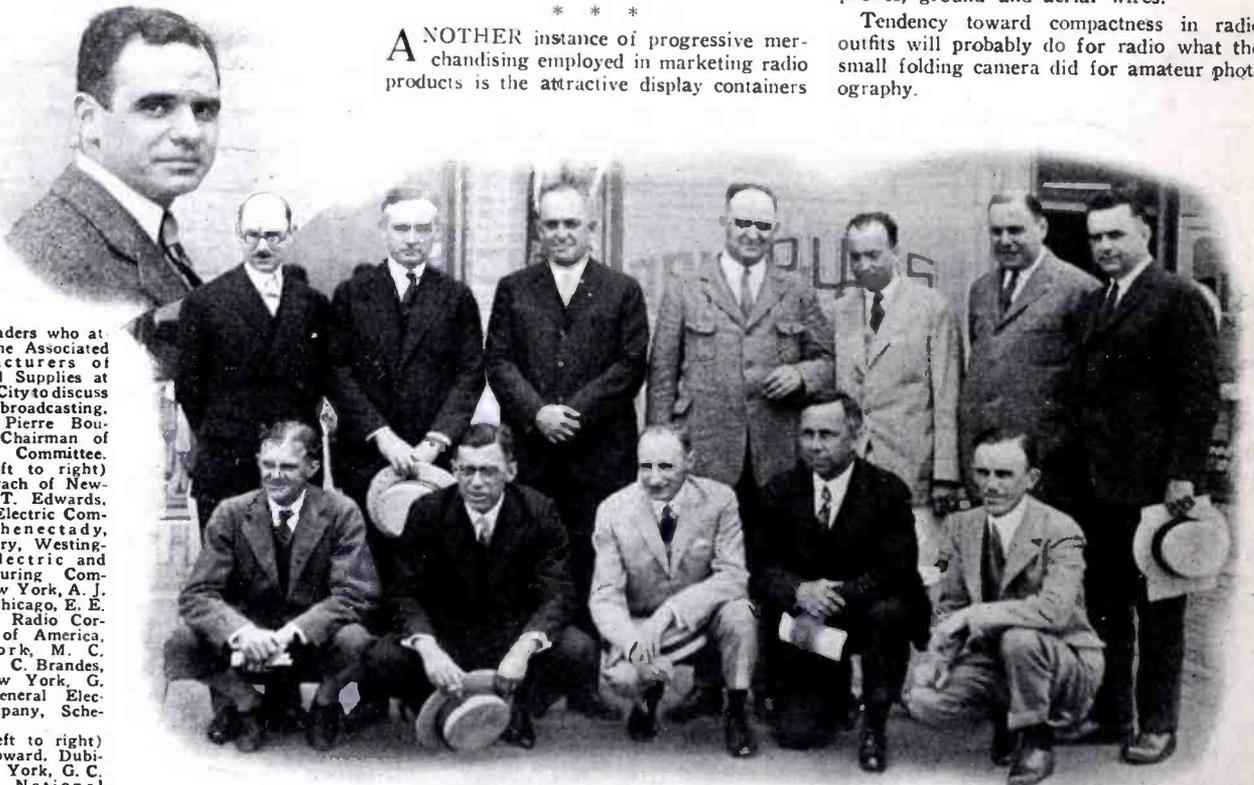
A new circuit booklet entitled, "What to Build" is printed by this concern, and packed with every Na-ald product. This booklet shows diagrams, and includes complete building information for several selected and tested circuits using from one to five tubes. Among these circuits are the Neurodyne, Reflex Superdyne, and a Two-Stage Amplifier. Other information of interest to the radio owner is contained in this booklet. It may be purchased direct by those who care to send for it.

* * *

CLARENCE E. OGDEN, Founder and President of the Automatic Electrical Devices Company, manufacturer of the Homcharger, has recently organized and incorporated under the Laws of Ohio, a new concern—The Kodol Manufacturing Company—for the manufacture of a portable radio set, of which he is the inventor.

This company's first offering to the trade will be a small, compact and really portable long distance radio set—The Kodol—the Camera of Radio. This set weighs less than five pounds complete with all accessories. Contained within a neat leather covered case is a standard UV-199 tube, "A" and "B" dry batteries, pair of standard head phones, ground and aerial wires.

Tendency toward compactness in radio outfits will probably do for radio what the small folding camera did for amateur photography.



Radio leaders who attended the Associated Manufacturers of Electrical Supplies at Atlantic City to discuss super broadcasting. Insert: Pierre Boucheron, Chairman of Publicity Committee. Rear (left to right) L. S. Brach of Newark, E. T. Edwards, General Electric Company, Schenectady, E. Mallory, Westinghouse Electric and Manufacturing Company, New York, A. J. Carter, Chicago, E. E. Bucher, Radio Corporation of America, New York, M. C. Rypinski, C. Brandes, Inc., New York, G. Stein, General Electric Company, Schenectady. Front (left to right) G. V. Howard, Dubilier, New York, G. C. Furness, National Carbon Company, New York, I. Adams, Radio Corporation of America, N. Y., G. K. Heyer, Western Electric Company, N. Y., R. H. Manson, Stromberg Carlson, Rochester.

LITERATURE invariably follows in the wake of any activity. Much of it is useless. That which actually contains information of value to those who are interested in the particular activity seldom realizes the proper distribution. Book reviews, in daily and periodical publications, serve that end in good measure, but only for literature of a non-publicity character.

Many radio manufacturers have printed booklets, designed, of course, to promote their individual interests, but commendable on the very good grounds of dispensing knowledge.

A striking example of this is to be found in booklets published, from time to time, by the Federal Telephone and Telegraph Company. Their latest achievement is offered in, "Who Will Be the Next President"?

* * *

THE DX Instrument Company have printed a small booklet, "Improved Radio Reception Through Scientific Tube Tuning," in which the vacuum tube has been comprehensively explained. The necessity of tuning the vacuum tube, perfect adjustment, the problem of the tube control, and just what happens in a tube, has all been dealt with in a manner worthy of the reputation enjoyed by text books.

"Amplification Without Distortion," is a fifth edition of that booklet, published by the Acme Apparatus Company. It contains 36 pages of information that every set owner would find of real value, exceptionally well illustrated, and surprisingly to the point. In general, it is a discussion on radio, with particular reference to the construction and operation of radio, audio and reflex amplifiers and sets. Space alone prohibits the review which this thorough-going booklet deserves. Incidentally, it will be well to ask for the supplementary pamphlets when writing for this booklet.

Lewis J. Selznick has entered the radio field with the same enterprise that has made for his remarkable success in moving pictures. He has issued a leaflet presenting "The Miraculous Voice From the Sky" in which he incorporates his new Portable Voceleste Receiver. The unsuspecting reader would anticipate another story of a "just released film." Mr. Selznick then followed with a clever booklet entitled, "Getting Results with the Voceleste" (Voice from the Sky). This is arranged in a clear, concise manner that makes it interesting reading whether one has a Voceleste or not.

* * *

THE Zenith Radio Corporation has a new six-tube portable set, including batteries and loud speaker, built into a small suitcase.

President McDonald of the Zenith Radio Corporation made a remarkable demonstration in Chicago. Carrying the set, he started from the twentieth floor of the McCormick Building, rode down the elevator, walked through the lobby, stepped into a taxi, and traveled around the city, a tenor singing apparently from the suitcase during his sojourn. This continued on his way into the Congress Hotel. Throughout the demonstration, crowds gathered, hardly believing their hearing. When Mr. McDonald repeated this experiment in New York, a near riot occurred.

The dramatic character of such episodes is a passing incident. Of far greater importance is the significance of such possibil-

ities. Compact, portable receivers will probably add tremendous impetus to the spreading of the gospel of radio.

* * *

THE first session of the "Distributors' Service Class" was held at 98 Worth Street in the Technical Class Room of the Radio Institute. Forty-one were present, representing a large number of RCA distributors in the Eastern District. The class was called to order and its object briefly explained. Mr. Chubb and Mr. Holmes, of the Westinghouse Electric and Manufacturing Company, were then introduced, their subject being Radiola III, Radiola III-A and Radiola Balanced Amplifier. After the talk all questions were answered and instruction was given on locating and remedying defects.

The next program was discussion on Radiola Regenoflex and Radiola X. Immediately following this, luncheon was served at the Pine Tree Restaurant; followed by inspection of the Harrison Lamp Works.

The following is a complete list of those attending the first session: Aeolian Company, J. A. Wotten, W. H. Converse, Jr., New York City; Beckley-Ralston Co., H. Marshall, Pittsburgh, Pa.; Charleston Elec. Sup. Co., E. H. Robertson, Jr., West Virginia; Doubleday-Hill Elec. Co., A. J. Zuzel, Washington, D. C.; Elliott-Lewis Elec. Co., G. E. Sammens, Philadelphia; F. D. Pitts Co., R. Lennihan, Boston, Mass.; F. H. Stewart Elec. Co., D. C. Cook, Philadelphia; H. C. Roberts Elec. Co., C. F. Phillips, Syracuse, N. Y.; Havens Elec. Co., Inc., S. J. Lane, Albany, N. Y.; Iron City Elec. Co., J. E. Tarter, E. J. Handlon, W. D. Lowery, Pittsburgh, Pa.; Landay Brothers, E. J. Clarke, New York City; Lewis Elec. Sup. Co., W. J. Downey, Boston, Mass.; Ludwig Hommel & Co., J. H. Hall, W. K. Thomas, Pittsburgh, Pa.; Manhattan Elec. Sup. Co., Inc., W. E. Moran, New York City; McCarthy Bros. & Ford, J. Eichman, Jr., Buffalo, N. Y.; Music Master Corp., J. H. Peth, Pittsburgh, Pa.; National Light & Elec. Co., J. S. Gelon, Newark, N. J.; National Elec. Sup. Co., W. J. Selt, E. L. Maschmeyer, Washington, D. C.; Penn Elec. Eng. Co., W. E. Acker, Scranton, Pa.; Pettingell-Andrews & Co., C. M. Bishop, Boston, Mass.; Pierce Elec. Co., J. A. Mook, Jr., Tampa, Fla.; Radio Dis. Co., A. Nelson, Newark, N. J.; Robertson Cataract Elec. Co., H. R. Lord, Buffalo, N. Y.; Robertson Cataract Elec. Co., C. N. Van Cleeef, Rochester, N. Y.; Southern Elec-



The R.C.A. Distributors' Service Class

tric Co., L. W. Passano, Baltimore, Md.; Superior Supply Co., E. K. Kitts, Bluefield, W. Va.; Stoehr & Fister, R. Besecker, Scranton, Pa.; Times Appliance Co., R. E. Cook, New York City; Tri-City Elec. Co., F. E. Leach, Newark, N. J.; Union Elec. Co., A. E. Baumbach, Pittsburgh, Pa.; Union Elec. Sup. Co., R. J. Liedel, Providence, R. I.; Wetmore Savage Co., H. Finn, Boston, Mass.; Woodhouse Elec. Co., J. F. Gulley, B. Goodman, Norfolk, Va.; Jos. M. Zamoiski Co., J. Holloway, Baltimore, Md.

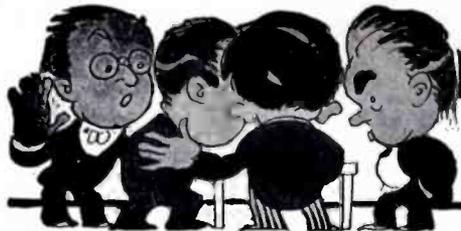
BELIEVING that the fall and winter seasons promise to show the greatest development in the popularity of radio in Milwaukee, nearly one hundred dealers have joined forces for a radio exposition. The co-operative demonstration will be held September 1 to 7 at one of the largest halls in the downtown section of Milwaukee. Each firm participating will have demonstration space in which to show their equipment. The show will be under the direction of the *Milwaukee Journal*.

Dealers in Milwaukee became interested in the radio possibilities of a united exposition after the *Milwaukee Journal* had completed a survey of the city showing that but one family out of every ten owned radio equipment.

The exposition will be held in the Arcadia Ballroom of the Hotel Antlers, in the heart of Milwaukee's downtown business and theater section. The program will include artists from the larger broadcasting stations who have been heard in Milwaukee in the last year. This includes the larger stations in Chicago, Elgin, Ill., Davenport, Ia., and others. Each night during the exposition a different set of entertainers will do actual broadcasting from the exposition auditorium. Arrangements have already been made for the appearance of these popular artists.

The demonstration will be held the week following the Wisconsin State Fair at Milwaukee. An attendance of more than 50,000 is predicted. One-third of the total spaces have already been allotted to Milwaukee dealers.

Local radio dealers have expressed the opinion that what radio business needs more than anything else is a chance to educate the public on radio development and that every effort made to bring the dealers and public nearer together merits their support.



NEW APPLIANCES AND DEVICES



Allen Soldering Paste



L. B. ALLEN CO., INC., manufacturers of soldering supplies, located at 4519-29 N. Lincoln St., Chicago, Ill., recently developed a new soldering paste known as the Allen Special Radio Soldering Paste. This paste is guaranteed by the manufacturers to be non-corrosive, fumeless and is approved by the National Board of Underwriters. It is a quick working flux designed to secure a clean soldered job. It is put up in a conveniently sized can and retails at a low price. In connection with this new soldering paste the company has published an interesting pamphlet "How and Why to Solder Radio Sets."

Kodel Portable Receiver



WITH reams being written every day and the radio magazines devoting some of their space to the portable radio receiver, the Kodol Manufacturing Company of Cincinnati, Ohio, deems the time propitious to announce the Kodol. This is a complete radio receiver packed in a camera case. Complete is really the word to use as space has been provided for "A" and "B" battery, vacuum tube and head phones, together with two collecting wires; and weighing as a whole only 4¾ pounds.

No aerial is necessary, and by attaching the ground to a water pipe or some other connection that will complete the circuit, the receiver is ready for use.

Sales to the vacationists are being pushed as the Kodol Company sees tremendous pos-

sibilities in this field: Long range, easy carriage and low price being the big factors in the appeal. This receiver has an appeal to all classes of vacationists as it is adaptable to various conditions and will meet with the most exacting requirements.

Prest-O-Lite Co. Broadcast Auto Race

MOST of the thirteen and one-half million automobile owners are interested in the International 500-Mile Race at Indianapolis, yet only about one hundred and fifty thousand of them get an opportunity to see this speed classic. But this year The Prest-O-Lite Co., Inc., of Indianapolis, whose enormous factory is directly across the road from the Speedway, broadcast the race through Chicago Tribune Station, WGN, and the speed fans got a realistic impression of the race on their radio.

A special wire was run from a sound-proof booth in front of the judges' stand at the Speedway direct to the broadcasting station at Chicago and over this wire one of the most absorbing pictures of a sporting event ever given went on the air.

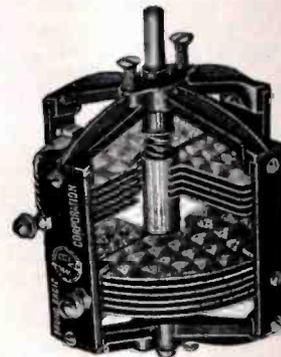
Special arrangements were made to cover every phase of the activity at the huge 2½ mile brick oval. Leading to the booth were telephone lines from important points at the track. For instance technical experts stationed at the pits furnished authoritative information on the pit stops of the cars. The reporting of the standing and the speeds of the cars alone presented a problem requiring quick, accurate co-operation as the race proved to be the fastest and most bitterly fought in the history of the classic with the lead frequently alternating.

From the standpoint of realism, the broadcasting has seldom been excelled. The roar of the motors, the cheering of the crowds, the tense instructions of the drivers as they stopped for supplies and hasty adjustments were so graphically transmitted from a special microphone in the Prest-O-Lite pit that listeners said, "Everything was there except the smell of burning rubber."

"Sen" Kaney, one of the best known of his craft, handled the announcing. Henry Ford supplied an unexpected feature of the day's activities by addressing the radio fans on the significance of the race in relation to the automobile industry. Mr. Ford, who himself was a builder and pilot of racing cars in the early days of his career was referee of the race.

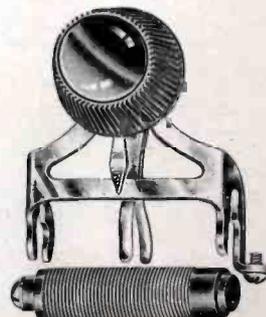
It is reported that the broadcasting aroused unusual interest. Hundreds of thousands of sets tuned in and in radio stores, garages and private homes great crowds followed the progress of the race on special charts which were distributed by The Prest-O-Lite Co. Thousands of telegrams, letters and applause cards were received thanking The Prest-O-Lite Co. and the Chicago Tribune for the wonderful program and congratulating them on their success.

The Multiple Tuning Bruno Condenser



THE Bruno Radio Corporation, 300 Water Street, N. Y. City, announce that they are now in production on a new low loss condenser. There are many features embodied in this precision instrument. Long brass bearings insure smooth turning and long life. The method of mounting this condenser is greatly simplified by the three-in-a-line arrangement for drilling. The 22-plate type Bruno Ultra-Vario Condenser as pictured here has two 11-plate blocks which are electrically insulated from each other. Consequently by parallel or series connections a user may obtain a 7, two 11's or a 22-plate condenser. This model has been so designed by Bruno engineers to be used to tune two stages of radio frequency with one dial. This feature alone should appeal to the amateur who wishes to simplify the number of tuning controls. The price is \$5.50 list.

Unity Cartridge Rheostat



THE Unity non-vernier rheostat, or cartridge rheostat, is designed for efficiency and economy, say the makers, the Unity Manufacturing Co., Chicago. A phosphor bronze fork type of contact is used. This insures minimum changes and smooth variations in resistance. The positive contact given by the fork type makes certain that no distortion or noise is caused by leaks in the amplification circuit, where non-vernier rheostats are used.

The rheostat is single hole mounting. Resistance cartridges suitable for each tube are sold separately, so that tubes may easily be changed in a set, and the proper resistance inserted, without removing the bracket from the panel, and at very small expense. Potentiometer Cartridges are also made which fit the same brackets.

Daven Resistance-Coupled Amplifier

THE Daven Radio Company have brought out the type 3-A Amplifier illustrated, and in their catalogue set forth its merits very enthusiastically.

It is claimed that this amplifier is worth while to the broadcast enthusiast because of the absence of distortion in receiving programs.

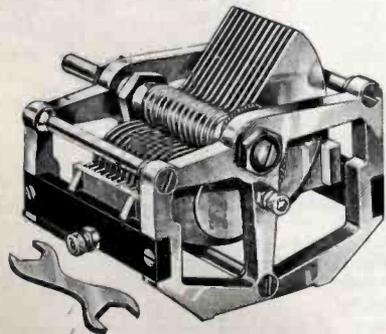


It is said that in addition to other features this amplifier consumes $\frac{1}{4}$ of the usual plate current and eliminates the necessity of using "C" batteries. Another advantage is that there are no delicate windings or wires to fuse under the strain of excessive loads. The ballast resistors eliminate the necessity of rheostats to maintain a proper filament current throughout the useful discharge of the "A" battery. The Amplifier is equipped with pilot lamps showing what tubes are in operation. The wiring system is so arranged that the plugging in of the receivers automatically cuts out the Loud Speaker attached to the binding posts.

Bremer-Tully Condenser

A NEW "laboratory type" variable condenser is among the latest products of the Bremer-Tully Mfg. Co.

This is of the "low-loss" "high-ratio" type. It is arranged for either panel or base-board mounting and both rotor and stator plates of aluminum are cast by a new and improved method. End plates are, also, of cast aluminum of unique design, which gives the product a very handsome appearance.



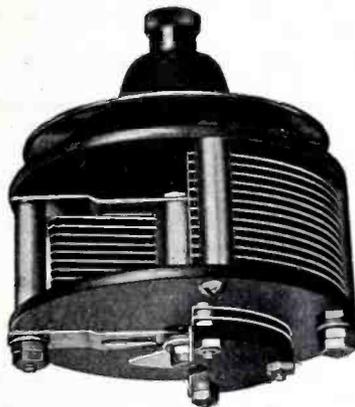
Long Wave Transformers



JEFFERSON ELECTRIC MFG. COMPANY'S Intermediate Frequency Transformers are especially designed for use as amplifiers in all circuits requiring this type transformer. In such circuits it is highly important that the transformers match and are in perfect balance. A slight deviation will usually render the set inoperative. Expert designing and workmanship have placed behind these transformers the reputation for uniformity of manufacture and performance which all Jefferson products enjoy. Their specially constructed, high grade laminated silicon steel cores assure great stability and power. This transformer covers a range of wave lengths from 5,000 to 25,000 meters.

Newest Type of Rathbun Condenser

THE newest member of the Rathbun family is a vernier combination type with main rotor shaft and vernier rotor shaft absolutely independent of each other; it is

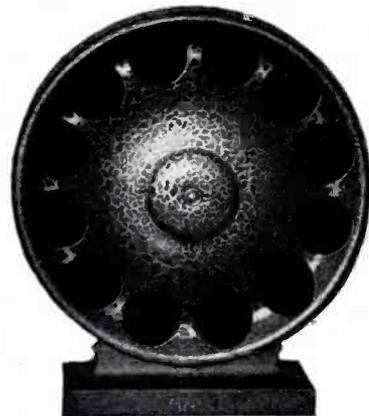


impossible for one to move the other under any condition of adjustment. The new condenser has a positive and independent contact for both vernier and main rotor; no current passes through bearings. These points and the fact that all metal parts are of brass, bronze and aluminum insure minimum resistance. High efficiency and low loss are secured through wide spacing of contacts from rotor and stator element and the use of the minimum amount (consistent with strength) of the best grade of bakelite obtainable as dielectric for end plates. A vernier capacity of .00002 mfd. affords a real vernier adjustment that makes tuning of the most critical circuit an easy matter.

N&K Imported Loudspeaker

THE N&K Imported Loudspeaker, Type W, has broken away from all tradition. It projects sound by reflection. In this process the sound is diffused so that it issues from the speaker in all directions, not merely in one direct line. It projects sound waves in their full roundness, giving forth a soft, mellow, musical tone.

It is different in shape. The N&K Imported Loudspeaker is not easily tipped over or knocked down. Circular in shape and mounted on a low flat base, it presents an agreeable appearance to the eye and harmonizes with the furnishings of even the finest home. It is economical of space. The pleasing black and gold stippled surface



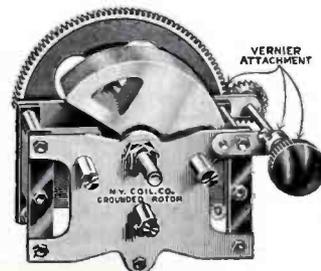
gives it an air of distinction also. The base, felt protected, does not scratch or mar polished surfaces.

Type W, N&K Loudspeaker is made of burtex, a scientific product providing the stiffness of wood or metal, but neither cellular nor crystalline in composition. It is more like a very thick, absolutely rigid fabric. This quality causes it to transmit only the actual vibrations of the broadcast waves.

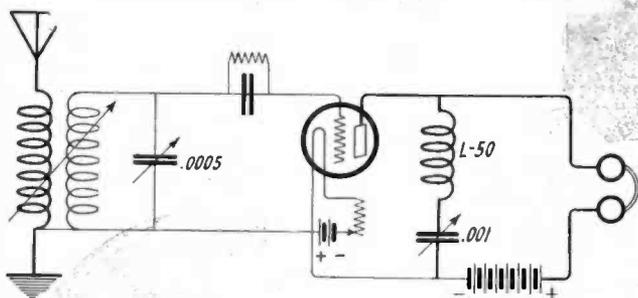
The unit used in the new Type W, N&K Loudspeaker embodies the same quality of tone as the N&K phone units, but is adapted to amplification purposes. It is especially designed for the reproduction of musical tone, bringing out the entire range of the human voice or musical instrument with extreme clearness, sharpness and naturalness.

New York Coil Condenser

A LOW loss grounded rotor variable condenser of novel design. Adjustable cone bearings support the revolving plates. Flexible pigtail connections prevent loose contacts. Hard rubber is used as the dielectric. A geared vernier may be added by attaching with screws.

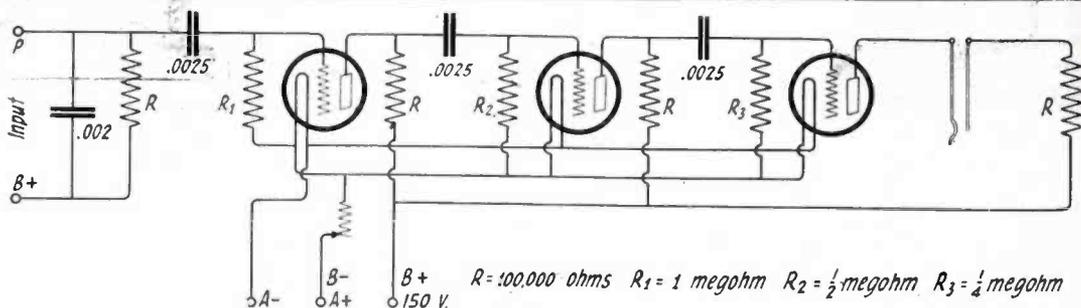


Selected Radio Hook-Ups for the Home-Builder



IN figure 1 we show a circuit which few of the present day constructors are familiar with. It is the, at one time, well-known "X" circuit designed by Roy Weagant for the reception of long wavelengths and employing large honeycomb coils. It takes very little twisting and turning of this diagram to show the old Reinartz circuit which suddenly came into such marked popularity at the advent of broadcasting. It is a very simple matter to convert the two honeycomb coils one tube super-regenerative into this

circuit. All that is needed to change is the addition of a 43-plate variable condenser and a 50-turn honeycomb coil inserted in the plate circuit as shown. If the circuit does not oscillate readily the coil L should be placed in inductive relation to the secondary coil. This primary-secondary coil can be either a variocoupler or two honeycomb coils. In connecting up the circuit be sure that the rotary plates of the variable condenser are connected to the filament side of the circuit. Any type of tube may be used and the "A" battery and rheostat should conform to the type of tube employed. Do not shunt the phones and "B" battery with a fixed .001 mfd. condenser as in ordinary circuits as this is the equivalent of placing this condenser between the grid and plate terminals of the tube. The path of the radio-frequency current should be from the plate of the tube through the coil L through the variable condenser to the grid circuit by way of the positive filament. In case the circuit does not oscillate insert in the plate circuit between the coil L and the phones a choke which may be a 200-turn honeycomb coil. This will prevent the radio-frequency currents from passing through the phones and high resistive "B" battery. It will be found that this circuit if constructed properly will give a very nice control of regeneration, being a very stable and sensitive receiver.



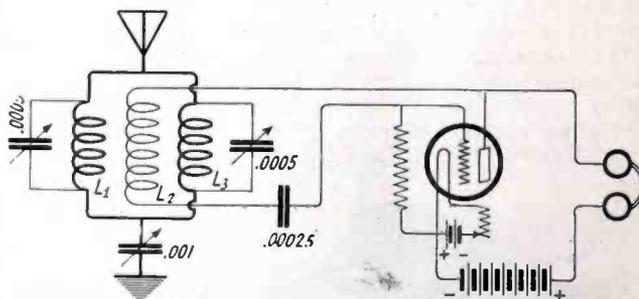
FOR those who desire quality rather than disagreeable volume coming forth from a loud speaker, the resistance coupled amplifier shown in the diagram in figure 2 comes the closest to approaching the ideal. Because of its characteristics it can be used as a radio-frequency amplifier, as an audio-frequency amplifier or as an intermediate frequency amplifier in connection with a heterodyne receiver. When used as an amplifier of radio frequencies it is not recommended for use on the 200- or 600-meter wave band, because

of other details which render its operation at these frequencies very poor. The construction of such an amplifier is very simple and has been made more so since the advent on the market of suitable mountings for the resistances and grid leaks and coupling condensers. For further information on these consult the "ads" in the last pages of this issue and the article on the super-tone amplifier. In figure 2 the value of "R" is 100,000 ohms. R-1 is one megohm, R-2 is one-half megohm, R-3 is one-quarter megohm.

FIGURE 3 represents a Colpitts oscillator used in a detector circuit with the addition of a wave trap and an oscillation trap. These latter two items also comprise the antenna tuning circuit. Coil L2 is a 50-turn honeycomb coil which comprises the grid plate circuit. As it stands now this represents an oscillating circuit.

It is a continuous generator of oscillations, the frequency of which is dependent upon coil L2 and the coupling between L1 or L3 and L2.

In order to control this oscillation and permit the right amount of regeneration the trap and tuning circuits L1 and L3 are shown. These are inductively coupled to the coil L2 and this coupling should be variable. Many of us will remember that this is quite the same as the four-circuit tuner except for the antenna coupling. The coil L3 acts as an absorber of oscillations and the condenser across this coil is employed to bring it into resonance with the coil L2. L1 serves as a wave trap and a tuning control for the antenna circuit together with a condenser shunted across it. A vernier rheostat control such as the Filkostat should be used in order to secure the best results. This circuit, like most honeycomb coil circuits, is rather difficult to tune at first and it will be necessary for the operator to acquire a little experience in this type of receiver in order to get the



knack of it. In connecting the variable condensers into the circuit, be sure that the rotary plates are hooked up to the ground and the stator plates to the aerial to avoid hand capacity effects in tuning. In case the circuit does not oscillate, insert in the plate circuit between the phones and the plate a radio-frequency choke. This can be made up by winding 250 turns of No. 28 D. S. C. wire on a two-inch tube in a helter-skelter fashion. Don't use regular nor banked nor any fancy winding.

To Those Who Attend Church

(Continued from page 33)

Church, offered his morning prayer. Through the courtesy of Dr. Gilkey, the usual church announcements were made over the radio and the offering was taken at the proper time by deacons of the church.

The full service, including hymns, announcements, choir singing and sermon came in with great clarity and the audience was unanimous in endorsing the whole arrangement.

The inspiration for the service came to the pastor one day as he was passing a Springfield music store where a radio receiving set with loop aerial was being exhibited. Entering the store he made arrangements for a preliminary "try-out" of the set at his church. A group of officials who heard the set on the night of the "try-out," were loud in their praise of its performance. In fact, so loudly did the concerts come in from Louisville, Ky., Washington, D. C., and Boston, Mass., that the operator was compelled to soften the tones to a large extent.

On the previous Sunday to the radio service taking place, the pastor made arrangements with the congregation to sing the Doxology at the close of the service and also instructed the deacons to greet the people as they left the auditorium. Previous arrangements were made with Dr. Gilkey to say a few words of greeting to the members of the church.

The introduction of a service of this type into a country church has opened up a great field of speculation. One writer claims that soon funerals, weddings and all church services as well as pastoral visitations will be conducted from a city church sending station by radio. Such a view, however, is not logical to any who understand modern country life where the social factor is to be considered. The country church is always in need of a personal leadership. However, what we do think will come will be the introduction of a radio sending apparatus into the average country parsonage which at stated times can be used by a busy pastor to keep in touch with his members and constituents living at a distance from the center. One thing is sure, that the latest improvements in the scientific world are quite readily introduced into a country church today.

Tempering the Weather

(Continued from page 61)

vations serves its purpose admirably and radio will hardly displace the Morse telegraph in this particular service.

A farmer quotes a weather report to the effect: "Farmers be merciful to live stock tonight, a cold wave is coming and the weather will be down

below zero before morning, with a piercing cold wind from the North." He obeyed the mandate of the Weather Man and his cattle were snugly enclosed under shelter. The name of this farmer will be legion if we are to accept the seasoned opinion of E. B. Calvert, meteorologist in charge of the Forecast Division of the Weather Bureau, when he told the writer:

"The Weather Bureau has taken advantage of the opportunity that radio telephony provides for reaching the farmers, and arrangements have been made for the establishment of broadcasting systems in all of the states. Government, commercial and private broadcasting stations are utilized. Forecasts and warnings are furnished to these stations and are broadcast on schedule hours two or three times daily.

Methods of Wavemeter Calibration

(Continued from page 66)

coupling a minimum. In this way we know that the reference circuit is tuned to the same wavelength as Annapolis, namely 16900 meters. Care should be taken to tune in the fundamental and not a harmonic of this station.

With a reference circuit adjusted to 16900 meters we go back to the source of harmonics and adjust the fundamental to 16900 meters using the reference circuit as wavemeter. Then the first harmonic is 8450, the second 5633, the third 4225, and the fourth 3380. Let it be assumed that our wavelength calibration is to cover a range of 3500 meters down to one hundred meters. The wavemeter being calibrated is adjusted to the fourth harmonic of the source of oscillations by coupling to it—namely to 3380 meters. We can then use this adjustment to set our oscillation source at 3380 meters. This fundamental will have a first harmonic of 1690, a second harmonic of 1126, a third of 845, a fourth of 674, a fifth of 563. The unknown wavemeter is tuned in successively to these harmonics. To get lower down on the curve of calibration we again change our fundamental setting by use of the just obtained calibration points, this time, to 1126. The first harmonic of this fundamental is 563, the second is 378, the third is 281, the fourth is 225, the fifth is 187. By an additional resetting we can reach as far down as desired. To fill in the gaps between calibration points we start another series with a first setting of the fundamental at 4225 instead of 3380. It is obvious that we can find as many points as necessary for a smooth continuous curve by choice of suitable reference wavelengths and harmonics. It is also evident that by merely listening in to one

wavelength, namely, 16900, of Annapolis, we can calibrate a wavemeter through any desired range with considerable accuracy. The whole procedure is shown in figure 8.

The method in the description of it seems complicated. But in reality it involves merely the use of some large coils, condensers, a microammeter, besides the more usual possessions of a radio experimenter. It has the advantage of requiring no standards and a use of the method will teach more about the properties of radio circuits than many pages of reading can tell.

STANDARD WAVELENGTHS USED FOR CALIBRATION

The next and final method of wavemeter calibration to be discussed, like the previous one, requires no standard meter. It is based on the fact that the Bureau of Standards station WWV, Washington, D. C., sends out periodically a series of standard wavelength signals by continuous wave, preceding the signal by an announcement of the wavelength. The power of the station is sufficient to make it audible anywhere east of the Mississippi. In brief, the method is this: The WWV signals are picked up by a unicircuit oscillating tube receiver. The C.W. is heterodyned and the receiver accurately adjusted to zero heterodyne at each one of the waves broadcast, in every case the condenser setting being noted. Then the wavemeter which is to be calibrated is coupled with the receiver and by the click method already described, at each of the settings of the receiver successively, the wavemeter is adjusted so as to just cut out the oscillations, using loose coupling. Then, as before, the wavemeter setting for each case equals the wavelength of the WWV signal. Thus data is furnished for drawing smooth calibration curves.

The transmissions on August 5 include the frequencies used by ship and point-to-point communication, those on September 5 ship communication, those on September 22 broadcasting.

All transmissions are by unmodulated continuous-wave telegraphy. A complete frequency transmission includes a "general call," a "standard frequency signal," and "announcements." The "general call" is given at the beginning of the eight-minute period and continues for about two minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letters WWV intervening. This signal continues for about four minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted, and contain a statement of the measured frequency.

BROADCASTING STATION DIRECTORY

The Most Authentic, Up-to-the-Minute List of Stations Broadcasting in the United States, Canada, England, France and Cuba

United States Stations

KDKA Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. 326
KDPM Westinghouse Elec. & Mfg. Co., Cleveland, O. 270
KDPT Southern Electric Co., San Diego, Calif. 244
KDYL Newhouse Hotel, Salt Lake City, Utah, 360
KDYM Savoy Theater, San Diego, Calif. 280
KDYQ Oregon Institute of Technology, Portland, Ore. 360
KDYX Star Bulletin, Honolulu, Hawaii 360
KDZB Frank E. Siefert, Bakersfield, Calif. 240
KDZE Rhodes Co., Seattle, Wash. 270
KDZI Electric Supply Co., Wenatchee, Wash. 360
KDZR Bellingham Publishing Co., Bellingham, Wash. 261
KFAD McArthur Bros. Mercantile Co., Phoenix, Ariz. 360
KFAE State College of Washington, Pullman, Wash. 330
KFAF Western Radio Corp., Denver, Colo. 360
KFAJ University of Colorado, Boulder, Colo. 360
KFAN The Electric Shop, Moscow, Idaho 360
KFAR Studio Lighting Service Co., Hollywood, Calif. 280
KFAU Boise High School, Boise, Idaho 270
KFAW The Radio Den, Santa Ana, Calif. 280
KFAY Virgin's Radio Service, Medford, Ore. 283
KFBB F. A. Buttery & Co., Harre, Mont. 360
KFBC W. K. Azbill, San Diego, Calif. 278
KFBE Reuben H. Horn, San Luis Obispo, Calif. 242
KFBG First Presbyterian Church, Tacoma, Wash. 360
KFBK Kimball-Upsen Co., Sacramento, Calif. 283
KFBL Leese Bros., Everett, Wash. 224
KFBS Trinidad Gas & Electric Supply Co. and the Chronicle News, Trinidad, Colo. 360
KFBV The Cathedral, Laramie, Wyo. 283
KFCB Nielsen Radio Supply Co., Phoenix, Ariz. 238
KFCF Frank A. Moore, Walla Walla, Wash. 360
KFCV Fred Mahaffey, Jr., Houston, Tex. 360
KFCY Western Union College, Le Mars, Iowa 252
KFCZ Omaha Central High School, Omaha, Nebr. 258
KFDA Adler's Music Store, Baker, Ore. 360
KFDP Ralph W. Flygare, Ogden, Utah 360
KFDD St. Michael's Cathedral, Boise, Idaho 252
KFDF University of Arizona, Tucson, Ariz. 268
KFDJ Oregon Agricultural College, Corvallis, Ore. 360
KFDO H. Everett Cutting, Bozeman, Mont. 248
KFDV Gilbrecht & Stinson, Fayetteville, Ark. 360
KFDX First Baptist Church, Shreveport, La. 360
KFDY South Dakota State College, Brookings, S. Dak. 360
KFDZ Harry Q. Iverson, Minneapolis, Minn. 231
KFEC Meier & Frank Co., Portland, Ore. 248
KFEL Winner Radio Corporation, Denver, Colo. 254
KFEF J. L. Serogin, Oak, Nebr. 360
KFER Auto Electric Service Co., Fort Dodge, Iowa 231
KFEV Felix Thompson Radio Shop, Casper, Wyo. 263
KFEK Augsburg Seminary, Minneapolis, Minn. 261
KFEY Bunker Hill & Sullivan Mining & Concentrating Co., Kelloug, Idaho 360
KFEZ Associated Engineering Societies of St. Louis, St. Louis, Mo. 248
KFFB Jenkins Furniture Co., Boise, Idaho 240
KFFE Eastern Oregon Radio Co., Pendleton, Ore. 360
KFFO E. H. Smith, Hillsboro, Ore. 229
KFFQ Markshertel Motor Co., Colorado Spgs. Colo. 286
KFFR Nevada State Journal, Sparks, Nev. 226
KFFV Grace Land College, Lamoni, Iowa 360
KFFX McGraw Co., Omaha, Nebr. 278
KFFY Pines & Murphy, Alexandria, La. 275
KFFZ Al. G. Barnes Amusement Co., Dallas, Tex. 226
KFGC Louisiana State University, Baton Rouge, La. 254
KFGD Chickasha Radio & Elec. Co., Chickasha, Okla. 248
KFGL Snell & Irby, Arlington, Ore. 234
KFGQ Cray Hardware Co., Boone, Iowa 226
KFGB Heildreder Radio Supply Co., Utica, Nebr. 224
KFGK First Presbyterian Church, Orange, Tex. 250
KFGZ Emmanuel Missionary Coll., Berrien Spgs., Mich. 266
KFHA Western State College of Colo., Gunnison, Colo. 252
KFHB Idaho Theater, Hood River, Ore. 280
KFHF Central Christian Church, Shreveport, La. 266
KFHH Ambrose A. McCue, Neah Bay, Wash. 261
KFHJ Fallon & Co., Santa Barbara, Calif. 360
KFHR Star Electric & Radio Co., Seattle, Wash. 283
KFHX Robert W. Nelson, Hutchinson, Kans. 229
KFI Earle C. Anthony (Inc.), Los Angeles, Calif. 469
KFID Ross Arbuckle's Garage, Iola, Kans. 246
KFIF Benson Polytechnic Institute, Portland, Ore. 360
KFIL Windisch Elec. Farm Equip. Co., Louisburg, Kans. 234

KFIO North Central High School, Spokane, Wash. 252
KFIQ Yakima Valley Radio Broadcasting Association, Yakima, Wash. 242
KFIU Alaska Elec. Light & Power Co., Juneau, Alaska 226
KFIX Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Mo. 240
KFIZ Daily Commonwealth and Oscar A. Huelman, Fond-du-Lac, Wis. 273
KFJB Marshall Electric Co., Marshalltown, Iowa 248
KFJC Seattle Post-Intelligencer, Seattle, Wash. 270
KFJF National Radio Mfg. Co., Oklahoma City, Okla. 252
KFJJ Liberty Theater, Astoria, Ore. 252
KFJK Delano Radio & Electric Co., Bristol, Okla. 233
KFJL Harsaac Manufacturing Co., Ottumwa, Iowa 242
KFJM University of North Dakota, Grand Forks, N. D. 280
KFJQ Electric Construction Co., Grand Forks, N. Dak. 280
KFJR Ashley C. Dixon & Son, Stevensville, Mont. 258
KFJV Thomas H. Warren, Dexter, Iowa 224
KFJX Iowa State Teachers College, Cedar Falls, Iowa 280
KFJY Tunvall Radio Co., Fort Dodge, Iowa 246
KFJZ Texas Nat'l Guard, 112 Cav., Fort Worth, Tex. 254
KFKA Colorado State Teachers' Coll., Greeley, Colo. 273
KFKB Brinkley-Jones Hospital Assn., Milford, Kans. 286
KFKC Conway Radio Laboratories, Conway, Ark. 250
KFKV F. E. Gray, Butte, Mont. 283
KFKX Westinghouse Elec. & Mfg. Co., Hastings, Nebr. 341
KFKZ Nassour Bros. Radio Co., Colorado Springs, Colo. 234
KFLA Abner R. Wilson, Butte, Mont. 283
KFLB Signal Electric Mfg. Co., Menominee, Mich. 248
KFLO Paul E. Greenlaw, Franklinton, La. 234
KFLE National Education Service, Denver, Colo. 268
KFLH Erikson Radio Co., Salt Lake City, Utah 261
KFLQ Bizzell Radio Shop, Little Rock, Ark. 261
KFLR University of New Mexico, Albuquerque, N. Mex. 254
KFLU Ito Grande Radio Supply House, San Benito, Tex. 236
KFLV A. T. Frykman, Rockford, Ill. 229
KFLW Missoula Electric Supply Co., Missoula, Mont. 234
KFLX George R. Clough, Galveston, Tex. 240
KFLY Fargo Radio Supply Co., Fargo, N. Dak. 231
KFLZ Atlantic Automobile Co., Atlantic, Iowa 273
KFMB Christian Churches of Little Rock, Little Rock, Ark. 254
KFMQ University of Arkansas, Fayetteville, Ark. 263
KFMR Morrisville College, St. Louis City, Iowa 261
KFMS Prelmuth Department Store, Duluth, Minn. 275
KFMT George W. Young, Minneapolis, Minn. 231
KFMU Stevens Bros., San Marcos, Tex. 240
KFMW M. G. Sater, Houghton, Mich. 266
KFMX Carleton College, Northfield, Minn. 283
KFMY Boy Scouts of America, Long Beach, Calif. 229
KFMZ Roswell Broadcasting Club, Roswell, N. Mex. 250
KFNC Alonzo Monk, Jr., Corsicana, Tex. 234
KFNF Henry Field Seed Co., Shenandoah, Iowa 266
KFNG Wooten's Radio Shop, Coldwater, Miss. 254
KFNH State Teachers College, Springfield, Mo. 236
KFNJ Warrenburg Electric Shop, Warrenburg, Mo. 234
KFNL Radio Broadcast Association, Paso Robles, Calif. 240
KFNV L. A. Drake, Santa Rosa, Calif. 234
KFNW Peabody Radio Service, Peabody, Kans. 240
KFNY Montana Phonograph Co., Helena, Mont. 261
KFNZ Royal Radio Co., Burlington, Calif. 231
KFDA Rhodes Co., Seattle, Wash. 455
KFOC First Christian Church, Whittier, Calif. 236
KFOD The Radio Shop, Wallace, Idaho 224
KFOF Rohrer Electric Co., Marshfield, Ore. 240
KFOH Radio Bungatow, Portland, Ore. 283
KFOJ Moberly High School Radio Club, Moberly, Mo. 246
KFOK Leslie M. Schafbuch, Marengo, Iowa 234
KFOP Echophone Radio Shop, Long Beach, Calif. 234
KFON Willson Construction Co., Dallas, Tex. 268
KFOT Edwin J. Brown, Seattle, Wash. 224
KFPB Cape & Johnson, Salt Lake City, Utah 268
KFQE Dickenson-Henry Radio Laboratories, Colorado Springs, Colo. 240
KFQF Donald A. Bout, Minneapolis, Minn. 278
KFSG Echo Park Evangelist Assn., Los Angeles, Calif. 278
KGB Tacoma Daily Ledger, Tacoma, Wash. 252
KGG Hallock Watson Radio Service, Portland, Ore. 360
KGN Northwestern Radio Mfg. Co., Portland, Ore. 360
KGD General Electric Co., Oakland, Calif. 312
KGU Marlon A. Mulrony, Honolulu, Hawaii 360
KGW Portland Morning Oregonian, Portland, Ore. 492
KGY St. Martins College, Lacey, Wash. 258
KHJ Times-Mirror Co., Los Angeles, Calif. 395

KHQ Louis Wasmer, Seattle, Wash. 360
KJQ C. O. Gould, Stockton, Calif. 273
KJR Northwest Radio Service Co., Seattle, Wash. 283
KJS Bible Inst. of Los Angeles, Los Angeles, Calif. 360
KLS Warner Bros. Radio Supplies Co., Oakland, Calif. 360
KLX Tribune Publishing Co., Oakland, Calif. 509
KLZ Reynolds Radio Co., Denver, Colo. 360
KMJ San Joaquin Light & Power Corp., Fresno, Cal. 248
KMD Love Electric Co., Tacoma, Wash. 360
KNT Walter Hemrich, Kukak Bay, Alaska 263
KNX Electric Lighting Supply Co., Los Angeles, Calif. 360
KOB New Mexico College of Agriculture & Mechanic Arts, State College, N. Mex. 360
KOP Detroit Police Department, Detroit, Mich. 286
KPO Hale Bros., San Francisco, Calif. 423
KQP Apple City Radio Club, Hood River, Ore. 360
KQV Doubleday-Hill Electric Co., Pittsburgh, Pa. 270
KQW Charles D. Herrold, San Jose, Calif. 360
KRE Berkeley Daily Gazette, Berkeley, Calif. 275
KSD Post-Dispatch, St. Louis, Mo. 546
KTW First Presbyterian Church, Seattle, Wash. 360
KUO Examiner Printing Co., San Francisco, Calif. 360
KUY Coast Radio Co., El Monte, Calif. 256
KWG Portable Wireless Telephone Co., Stockton, Calif. 360
KWH Los Angeles Examiner, Los Angeles, Calif. 360
KYQ The Electric Shop, Honolulu, Hawaii 270
KYW Westinghouse Electric & Mfg. Co., Chicago, Ill. 536
KZM Preston D. Allen, Oakland, Calif. 360
KZV Wenatchee Bat. & Motor Co., Wenatchee, Wash. 360
WAAB Valdemar Jensen, New Orleans, La. 268
WAAC Tulane University, New Orleans, La. 360
WAAD Ohio Mechanics Institute, Cincinnati, Ohio 360
WAAF Chicago Daily Drovers Journal, Chicago, Ill. 286
WAAM I. R. Nelson Co., Newark, N. J. 263
WAAN University of Missouri, Columbia, Mo. 254
WAAP Omaha Grain Exchange, Omaha, Nebr. 360
WABA Lake Forest College, Lake Forest, Ill. 266
WABB Harrisburg Sporting Goods Co., Harrisburg, Pa. 268
WABD Parker High School, Dayton, Ohio 263
WABE Y. M. C. A., Washington, D. C. 283
WABG Arnold Edwards Piano Co., Jacksonville, Fla. 275
WABH Lake Shore Tire Co., Sandusky, Ohio 240
WABI Bangor Railway & Electric Co., Bangor, Me. 240
WABL Connecticut Agricultural College, Storrs, Conn. 283
WABM F. A. Doherty Automotive & Radio Equipment Co., Saginaw, Mich. 254
WABN Ott Radio (Inc.), La Crosse, Wis. 244
WABO Lake Avenue Baptist Church, Rochester, N. Y. 283
WABP Robert F. Weing, Dover, Ohio 266
WABQ Haverford College Radio Club, Haverford, Pa. 261
WABR Scott High School, Toledo, Ohio 270
WABS Essex Mfg. Co., Newark, N. J. 244
WABT Holiday-Hall, Washington, Pa. 252
WABU Victor Talking Machine Co., Camden, N. J. 226
WABV John H. DeWitt, Nashville, Tenn. 263
WABW College of Wooster, Wooster, Ohio 234
WABX Henry B. Joy, Mount Clemens, Mich. 270
WABY John Maguid, Jr., Philadelphia, Pa. 242
WABZ Coliseum Place Baptist Church, New Orleans, La. 263
WBAH Purdue University, West Lafayette, Ind. 360
WBAI The Dayton Co., Minneapolis, Minn. 417
WBAJ Wireless Phone Corporation, Paterson, N. J. 244
WBAK James Millikin University, Decatur, Ill. 360
WBAP Wortham-Carter Pub. Co. (Star Telegram), Fort Worth, Tex. 426
WBAY Erner & Hopkins Co., Columbus, Ohio 390
WBAX John H. Stenser, Jr., Wilkes-Barre, Pa. 460
WBAY Western Electric Co., New York, N. Y. 392
WBBA Newark Radio Laboratories, Newark, Ohio 240
WBBD Barbek Battery Service, Reading, Pa. 234
WBBF Georgia School of Technology, Atlanta, Ga. 270
WBGG Irving Vernalia, Mattapoisett, Mass. 248
WBHH J. Irving Bell, Port Huron, Mich. 246
WBHL Neel Electric Co., West Palm Beach, Fla. 258
WBBL Grace Covenant Church, Richmond, Va. 283
WBMM Frank Atlas Produce Co., Lincoln, Ill. 226
WBNN A. B. Blake, Wilmington, N. C. 275
WBBO Michigan Limestone & Chem. Co., Rogers, Mich. 250
WBPP Petoskey High School, Petoskey, Mich. 246
WBQQ Frank Crook, Pawtucket, R. I. 252
WBRR Peoples Pulpit Association, Rossville, N. Y. 273
WBBS First Baptist Church, New Orleans, La. 250
WBBT Lloyd Bros., Philadelphia, Pa. 234
WBBU Jenks Motor Sales Co., Monmouth, Ill. 224

WBBV	Johnston Radio Co.	Johnston, Pa.	248
WBBW	Buffner Junior High School	Norfolk, Va.	222
WBBY	Washington Light Infantry	Charleston, S. C.	268
WBBZ	Noble S. Watson	Indianapolis, Ind.	227
WB	D. W. May (Inc.)	Newark, N. J.	360
WBZ	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337
WCAD	St. Lawrence University	Canton, N. Y.	280
WCAE	Kaufmann & Bauer Co.	Pittsburgh, Pa.	462
WCAF	Clyde B. Randall	New Orleans, La.	268
WCAH	Entokin Electric Co.	Columbus, Ohio	236
WCAJ	Nebraska Wesleyan University	Lincoln, Neb.	360
WCAK	Alfred P. Daniel	Houston, Tex.	263
WCAL	St. Olaf College	Northfield, Minn.	360
WCAM	William C. Chesapeake	Villanova, Pa.	360
WCAN	Sanders & Stayman Co.	Baltimore, Md.	360
WCAP	Chesapeake & Potomac Tel. Co.	Washington, D. C.	469
WCAR	Southern Radio Corp. of Texas	San Antonio, Tex.	360
WCAS	William Hood Dunwoody Industrial Institute	Minneapolis, Minn.	280
WCAT	South Dakota State School of Mines	Rapid City, S. Dak.	240
WCAU	Durham & Co.	Philadelphia, Pa.	286
WCAV	J. C. Dice Electric Co.	Lititz, Pa.	360
WCAX	University of Vermont	Burlington, Vt.	360
WCAY	Carthage College	Carthage, Ill.	246
WCBA	Charles W. Heimbach	Allentown, Pa.	280
WCBG	University of Michigan	Ann Arbor, Mich.	280
WCBH	Wibur G. Voliva	Zion, Ill.	345
WCBJ	Chicago Radio Co.	New Orleans, La.	268
WCBK	Howard S. Williams	Pasadena, Miss.	280
WCBM	University of Mississippi	Oxford, Miss.	242
WCBN	Charles Schwarz	Baltimore, Md.	360
WCBP	Radio Shop of Newark	Newark, N. J.	233
WCBZ	Coppettell Brothers' Music	Chicago Heights, Ill.	360
WCK	Stix-Baer & Fuller Dry Goods Co.	St. Louis, Mo.	360
WCM	University of Texas	Austin, Tex.	360
WCMX	Detroit Free Press	Detroit, Mich.	517
WCMA	Tampa Daily Times	Tampa, Fla.	360
WCMB	Kansas City Star	Kansas City, Mo.	411
WCMD	J. Laurance Martin	Amarillo, Tex.	263
WCME	Trinity Methodist Church (South)	El Paso, Tex.	268
WCMA	The Courant	Hartford, Conn.	268
WCMA	Automotive Electric Co.	Chicago, Ill.	360
WCMA	Drexel Hotel	Chicago, Ill.	360
WCMA	Lit Brothers	Philadelphia, Pa.	395
WCMA	Samuel A. Walte	Worcester, Mass.	360
WCMA	Shoum & Kilburn	New Bedford, Mass.	360
WCMA	Radio Equipment Corporation	Fargo, N. Dak.	244
WCMA	Kirk Johnson Co.	Chicago, Ill.	258
WCMA	Immanuel Lutheran Church of Valparaiso	Valparaiso, Ind.	234
WCMA	Superior State Normal School	Superior, Wis.	234
WCMA	Church of the Covenant	Washington, D. C.	234
WCMA	James D. Fallin	Tuscola, Ill.	278
WCMA	Frank D. Fallin	Elm, Mich.	230
WCMA	American Tel. & Tel. Co.	New York, N. Y.	492
WCMA	Wichita Board of Trade	Wichita, Kans.	280
WCMA	Cornell University	Ithaca, N. Y.	286
WCMA	University of South Dakota	Vermillion, S. Dak.	283
WCMA	Borough of North Plainfield	North Plainfield, N. J.	286
WCMA	Shepard Co.	Providence, R. I.	273
WCMA	Ohio State University	Columbus, Ohio	360
WCMA	Mobile Radio Co.	Mobile, Ala.	360
WCMA	Evening News Publishing Co.	Baltimore, Md.	261
WCMA	Dartmouth College	Stout Falls, N. H.	275
WCMA	Iris Theater	Houston, Tex.	360
WCMA	Benwood Co.	St. Louis, Mo.	273
WCMA	Edgewater Beach Hotel Co.	Chicago, Ill.	360
WCMA	Hurlburt-Still Electrical Co.	Houston, Tex.	360
WCMA	St. W. W.	St. W., Tex.	230
WCMA	Dallas News and Dallas Journal	Dallas, Tex.	476
WCMA	Carl F. Woese	Syracuse, N. Y.	234
WCMA	Times Publishing Co.	St. Cloud, Minn.	273
WCMA	H. C. Sprately Radio Co.	Poughkeepsie, N. Y.	360
WCMA	Electric Supply Co.	Port Arthur, Tex.	375
WCMA	Hi-Grade Wireless Instrument Co.	Asherville, N. C.	360
WCMA	Hutchinson Elec. Service Co.	Hutchinson, Minn.	360
WCMA	Missouri Wesleyan College	Cameron, Mo.	360
WCMA	New Columbus College	Stout Falls, N. H.	275
WCMA	University of Nebraska	Lincoln, Neb.	360
WCMA	Strawbridge & Clothier	Philadelphia, Pa.	395
WCMA	Lancaster Elec. Sup. & Const. Co.	Lancaster, Pa.	248
WCMA	Cecil E. Lloyd	Pensacola, Fla.	360
WCMA	Glenwood Radio Corporation	Shreveport, La.	252
WCMA	Ernst & Angert	Chicago, Ill.	361
WCMA	South Bend Tribune	South Bend, Ind.	360
WCMA	American Radio and Research Corporation	Medford Hillside, Mass.	360
WCMA	Thomas F. J. Howlett	Philadelphia, Pa.	360
WCMA	Chicago Radio Laboratory	Chicago, Ill.	448
WCMA	Federal Radio Institute	Chicago, Ill.	419
WCMA	Interstate Electric Co.	New Orleans, La.	242
WCMA	General Electric Co.	Schenectady, N. Y.	360
WCMA	University of Wisconsin	Madison, Wis.	360
WCMA	State University of Iowa	Iowa City, Iowa	484
WCMA	Clark W. Thompson	Galveston, Tex.	360
WCMA	Marquette University	Milwaukee, Wis.	280
WCMA	University of Cincinnati	Cincinnati, Ohio	222
WCMA	Hafer Supply Co.	Joplin, Mo.	283
WCMA	Roberts Hardware Co.	Clarkburg, W. Va.	283
WCMA	University of Rochester (Eastman School of Music)	Rochester, N. Y.	258
WCMA	Seaside House	Atlantic City, N. J.	231
WCMA	Courier-Journal and Louisville Times	Louisville, Ky.	400
WCMA	Wilmington Elec. Spec. Co.	Wilmington, Del.	360
WCMA	Hauselmae Polytech. Institute	Newark, N. J.	380
WCMA	Sweeney School Co.	Kansas City, Mo.	411
WCMA	Rudolph Co.	Cleveland, Ohio	283
WCMA	George Schubei	New York, N. Y.	360
WCMA	Jovlin Automobile Co.	Hockford, Ill.	252
WCMA	Galveston Tribune	Galveston, Tex.	360
WCMA	Howard R. Miller	Philadelphia, Pa.	254
WCMA	Gustav A. DeCortin	New Orleans, La.	234
WCMA	Heer Stores Co.	Springfield, Mo.	252
WCMA	Fox River Valley Radio Sup. Co.	Sheboygan, Wis.	224
WCMA	Journe-Stockman Co.	Omaha, Neb.	278
WCMA	University of Engineering of Milwaukee	Milwaukee, Wis.	246
WCMA	Chronicle Publishing Co.	Marion, Ind.	226
WCMA	Home Electric Co.	Burlington, Iowa	283
WCMA	McKeesport, Pa.	McKeesport, Pa.	234
WCMA	Continental Elec. Supply Co.	Washington, D. C.	360
WCMA	Gimbel Bros.	Philadelphia, Pa.	509
WCMA	Jackson's Radio Eng'g Laboratories	Vaco, Tex.	360
WCMA	Norfolk Dairy News	Norfolk, Neb.	283
WCMA	Clifford L. White	Greentown, Ind.	254
WCMA	D. M. M.	Peoria, Ill.	280
WCMA	Peoria Star	Peoria, Ill.	280
WCMA	Capper Publications	Topeka, Kans.	360
WCMA	The Outlet Co.	Providence, R. I.	360
WCMA	Pittsburgh Radio Supply House	Pittsburgh, Pa.	250

WIAT	Kelley-Vantrier Jewelry Co.	Marshall, Mo.	360
WIAX	Union Trust Co.	Cleveland, Ohio	390
WIAY	Denison University	Granville, Ohio	229
WJX	Deforest Radio Tel. & Tel. Co.	New York, N. Y.	360
WJY	Radio Corporation of America	New York, N. Y.	405
WJZ	Radio Corporation of America	New York, N. Y.	455
WKAA	H. F. F.	Cedar Rapids, Iowa	268
WKAD	Charles Looff (Ctescent Park)	E. Providence, R. I.	240
WKAF	W. S. Radio Supply Co.	Wichita Falls, Tex.	360
WKAN	United Battery Service Co.	Montgomery, Ala.	226
WKAP	Dutrie W. Flint	Cranston, R. I.	360
WKAQ	Radio Corporation of Porto Rico	San Juan, P. R.	360
WKAR	Michigan Agri. College	East Lansing, Mich.	280
WKAS	Laconia Radio Club	Laconia, N. H.	254
WKAY	WKY Radio Shop	Oklahoma, Okla.	360
WLAG	Cutting & Washington Radio Corporation	Minneapolis, Minn.	417
WLAH	Samuel Woodworth	Syracuse, N. Y.	234
WLAJ	Waco Electrical Supply Co.	Waco, Tex.	360
WLAK	Vermont Farm Machine Corp.	Bellevue Falls, Vt.	360
WLAL	Naylor Electrical Co.	Tulsa, Okla.	360
WLAF	W. J. Jordan	Louisville, Ky.	360
WLAW	Arthur Schilling	Kaibab, Ariz.	360
WLAV	Electric Shop	Pensacola, Fla.	254
WLAW	Police Dept. of City of N. Y.	New York, N. Y.	360
WLAX	Putnam Electric Co.	Greencastle, Ind.	231
WLBY	University of Minnesota	Minneapolis, Minn.	360
WLBL	Wisconsin Dept. of Markets	St. Paul, Wis.	360
WLW	Crosley Mfg. Co.	Cincinnati, Ohio	309
WMAA	Radio Supply Co.	Oklahoma, Okla.	360
WMAA	Clive B. Meredith	Cazenovia, N. Y.	261
WMAA	Round Hills Radio Corp.	Dartmouth, Mass.	360
WMAA	General Supply Co.	Lincoln, Neb.	254
WMAJ	Drovers Telegraph Co.	Lockport, N. Y.	273
WMAK	Norton Laboratories	Lockport, N. Y.	273
WMAA	Trenton Hardware Co.	Trenton, N. J.	256
WMAA	First Baptist Church	Columbus, Ohio	286
WMAA	Chicago Daily News	Chicago, Ill.	448
WMAA	Alabama Politechnic Institute	Aib., Ala.	250
WMAA	Kingshighway Presby. Church	St. Louis, Mo.	360
WMAA	Commercial Appeal	Memphis, Tenn.	500
WMAA	Doublay-Hill Electric Co.	Washington, D. C.	261
WMAA	St. Peter's Store	Boston, Mass.	278
WMAA	University of Oklahoma	Norman, Okla.	360
WMAA	R. J. Rockwell	Omaha, Neb.	360
WMAA	Syracuse Radio Telephone Co.	Syracuse, N. Y.	286
WMAA	Wittenberg College	Springfield, Ohio	275
WMAA	Charleston Radio Elec. Co.	Charleston, S. C.	360
WMAA	C. Rhodes	Butler, Mo.	231
WMAA	Texas Radio Corp. and Austin Steamship	Austin, Tex.	360
WMAA	Lenning Brothers Co.	Philadelphia, Pa.	360
WMAA	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	236
WMAA	Henry Kunzman	Box 167, Port Monroe, Va.	360
WMAA	Dakota Electric Institute	Yankton, S. Dak.	244
WMAA	Municipality of New York	NYC	528
WMAA	Shotton Radio Mfg. Co.	Albany, N. Y.	360
WMAA	Pase Organ Co. (H. P. Maus)	Lima, Ohio	266
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WMAA	Commercial College	Tyler, Tex.	360
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WMAA	Kalamazoo Radio Co.	Kalamazoo, Mich.	360
WMAA	Henry P. Lundskow	Kenosha, Wis.	229
WMAA	Boyd M. Hamp	Wilmington, Del.	360
WMAA	Pennsylvania Nat. Guard, 112th Inf.	erie, Pa.	242
WMAA	Boodmen of the World	Omaha, Neb.	526
WMAA	Frank J. Wolff	Trumbull, Conn.	240
WMAA	Palmer School of Chiropractic	Davenport, Iowa	484
WMAA	Iowa State College	Ames, Iowa	360
WMAA	Pine Bluff Co.	Pine Bluff, Ark.	360
WMAA	John Wamanaker	Philadelphia, Pa.	509
WMAA	Western Radio Co.	Kansas City, Mo.	360
WMAA	L. Bamberger & Co.	Newark, N. J.	405
WMAA	Missouri State Market'g Bu.	Jefferson City, Mo.	441
WMAA	Pennsylvania State College	State College, Pa.	283
WMAA	Donaldson Co.	Okmulgee, Okla.	338
WMAA	Electric Institute Corp.	New Haven, Conn.	266
WMAA	North Dakota Agricultural College	Grand Forks, N. Dak.	360
WMAA	Agricultural College	N. Dakota	360
WMAA	Avery & Loeb Electric Co.	Columbus, Ohio	286
WMAA	Auerbach & Guettel	Topeka, Kans.	360
WMAA	St. Patrick's Cathedral	El Paso, Tex.	360
WMAA	Concordia College	Moorehead, Minn.	360
WMAA	John R. Koeh	Charleston, W. Va.	273
WMAA	Horace A. Beale, Jr.	Parkesburg, Pa.	360
WMAA	E. B. Gish	Amarillo, Texas	234
WMAA	Morris Radio News Station	Springfield, Vt.	275
WMAA	Sandusky Radioist	Sandusky, Ohio	240
WMAA	Coles County Tele. & Telex. Co.	Mattoon, Ill.	258
WMAA	Electrical Equipment Co.	Miami, Fla.	283
WMAA	Seranton Times	Seranton, Pa.	280
WMAA	Calvary Baptist Church	New York, N. Y.	360
WMAA	W. Texas Radio Co. (Abilene Daily Reporter)	Abilene, Texas	360
WMAA	Prince-Walter Co.	Lowell, Mass.	266
WMAA	Catholic University	Washington, D. C.	236
WMAA	Radio Equipment Co.	Peoria, Ill.	360
WMAA	Calumet Rainbow Broadcasting Co.	Chicago, Ill.	360
WMAA	Rifle Institute	Corpus Christi, Texas	360
WMAA	The Radio Club	Laporte, Ind.	224
WMAA	Stanley N. Road	Providence, R. I.	231
WMAA	Northern States Power Co.	St. Croix Falls, Wis.	248
WMAA	Lombard College	Galesburg, Ill.	244
WMAA	Black Hawk Electrical Co.	Watertown, Mo.	236
WMAA	St. Louis Radio Service Co.	St. Louis, Mo.	360
WMAA	Antioch College	Yellow Springs, Ohio	242
WMAA	Avenue Radio Shop	Reading, Pa.	238
WMAA	Fleeson's Garage	Gloucester City, N. J.	268
WMAA	Radio Sales Corporation	Peoria, Ill.	229
WMAA	Radio Corporation of America	Washington, D. C.	405
WMAA	Doron Bros. Electrical Co.	Hamilton, Ohio	360
WMAA	Union College	Schenectady, N. Y.	360
WMAA	University of Illinois	Urbana, Ill.	360
WMAA	City of Dallas, Police and Fire Signal Dept.	Dallas, Tex.	360
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WMAA	Clemson Agricultural Col.	Clemson College, S. C.	360
WMAA	J. A. Foster Co.	Providence, R. I.	261
WMAA	Loren V. Davis and George Prestman, Sr.	St. Petersburg, Fla.	244
WMAA	United States Playing Card Co.	Cincinnati, O.	309
WMAA	Grove City College	Grove City, Pa.	360
WMAA	Johnston Radio Club	Allentown, Pa.	229
WMAA	Seventh Day Adventist Temple	N. Y. City	263
WMAA	Douglty & Welch Elec. Co.	Fall River, Mass.	254
WMAA	Donohoe-Ware Hardware Co.	Plainville, Conn.	360
WMAA	Port Chester Chamber of Commerce	Port Chester, N. Y.	263
WMAA	Chase Electric Shop	Port Chester, N. Y.	263
WMAA	Atlanta Journal	Pomero, Ohio	258
WMAA	J. & M. Electrical Co.	Utica, N. Y.	273
WMAA	Alabama Power Co.	Birmingham, Ala.	360
WMAA	Penn Traffic Co.	Johnstown, Pa.	275

WTF	Louis J. Gallo	New Orleans, La.	268
WTF	Kern Music Co.	Providence, R. I.	258
WTF	The Radio Shop	Portland, Me.	236
WTF	Toledo Radio & Electric Co.	Toledo, Ohio	252
WTF	Willard Storage Battery Co.	Cleveland, Ohio	390
WTF	Cambridge Radio & Electric Co.	Cambridge, Ill.	242
WTF	S. H. Van Gordon & Son	Ossau, Wis.	254
WTF	Reliance Electric Co.	Norfolk, Va.	280
WTF	Charles E. Erbstein	Elkin, Ill.	286
WTF	Edison Electric Illuminating Co.	Boston, Mass.	242
WTF	Ruegg Battery & Electric Co.	Tecumseh, Neb.	244
WTF	Agricultural and Mechanical College of Texas	College Station, Tex.	280
WTF	Williams Hardware Co.	Streator, Ill.	231
WTF	Oak Leaves Broadcasting Station	Oak Park, Ill.	283
WTF	Thomas J. McGuire	Lambertville, N. J.	283
WTF	Kansas State Agricultural College	Manhattan, Kans.	273
WTF	Hoenig, Swern & Co.	Trenton, N. J.	226
WTF	Sanger Bros.	Waco, Tex.	360
WTF	Wright & Wright (Inc.)	Philadelphia, Pa.	360
WTF	Lawrence J. Crowley	Joliet, Ill.	227
WTF	Galvin Radio Supply Co.	Camden, N. J.	236
WTF	Michigan College of Mines	Houghton, Mich.	244
WTF	Ford Motor Co.	Dearborn, Mich.	273
WTF	WW Detroit News	Detroit, Mich.	517
WTF	Loyola University	New Orleans, La.	280

Canadian Stations

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CJCD	T. Eaton Co. Ltd.	Toronto, Ont.	410
CJCF	Chas. Guy Hunter	London, Ont.	430
CJCF	The Hamilton Spectator	Hamilton, Ont.	410
CJCF	Northern Electric Co. Ltd.	Montreal, P. Q.	341
CJCF	Marconi W. T. Co. of Can. Ltd.	Montreal, P. Q.	440
CJCF	Dr. G. M. Gelder	Quebec, P. Q.	400
CJCF	Toronto Radio Research Society	Toronto, Ont.	350
CJCF	Canadian National Railways	Ottawa, Ont.	435
CJCF	J. L. Philippe Landry	Mont Joli, P. Q.	312
CJCF	E. B. Booth, Jr.	Ottawa, Ont.	435
CJCF	Western Canada Radio Supply	Victoria, B. C.	400
CJCF	Manitoba Telephone System	Winnipeg, Man.	450
CJCF	Vancouver Daily Province	Vancouver, B. C.	410
CJCF	Star Publishing & Printing Co.	Toronto, Ont.	400
CJCF	The Calgary Herald	Calgary, Alta.	430
CJCF	La Presse Publishing Co. Ltd.	Montreal, P. Q.	430
CJCF	Abitibi Power & Paper Co. Ltd.	Iroquois Falls, Ont.	400
CJCF	The News Record	Kitchener, Ont.	295
CJCF	London Free Press Printing Co. Ltd.	London, Ont.	450
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The Daven Radio Type 3-C Amplifier Kit

as illustrated, contains all the parts necessary to build a three stage resistance coupled amplifier. It is packed in a neat compartment box with full directions for assembly and operation with any detector and tuner.

Price Complete **\$13.50**

THE IDEAL BROADCAST AMPLIFIER

Only an amplifier that can reproduce a woman's voice with the sweetness and color of reality—the mellow richness of the contralto, the piercing beauty of the coloratura soprano—is worthy of being called "IDEAL." This is the acid test of amplifiers. Almost all amplifying systems fail before it, and only the resistance coupled amplifier passes the test consistently, economically and invariably.

The Daven Radio Resistance Coupled Amplifiers

bring forth a new quality and beauty from every receiver, the most lowly or the most pretentious—a purity of tone that rarely passes the first tube. To the laymen, the resistance coupled amplifier is a revelation, to the virtuoso it is the realization of that subtle perfection that he alone appreciates!

Read our booklet, "Resistors—Their Application to Radio Reception"
By Zeh Bouck. Price 15 cents.

DAVEN RADIO CORP.

Resistor Specialists

11 CAMPBELL STREET, NEWARK, N. J.

Information Desk

(Continued from page 64)

of the order of .00008 mfd. and for the 201A is .00010 mfd. The feedback is induced into the grid circuit by placing a variable inductance—which in this case is a variometer—in the plate circuit of the detector tube. The tickler coil circuit, however, is preferable to the variometer tuned, because the latter has too much effect on the wavelength and is not to be recommended.

Charles Yerrick of Fort Worth, Texas, wishes to know how to add two stages of tuned radio frequency to his present detector and amplifier unit.

The diagram for this is shown in figure 2. The transformers shown are exactly like the

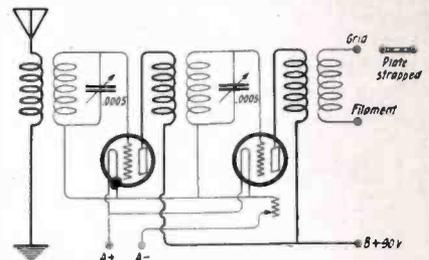


Figure 2—Tuned radio frequency circuit

astatic transformers shown in the D-coil Receiver in the June issue of THE WIRELESS AGE. The coils are wound on 3-inch tubing slotted at opposite sides of the diameter with a slot 1/2-inch wide and the primary wound with 12 turns of No. 20 D.C.C. or D.S.C. wire and the secondary wound with 60 turns of the same size wire. The windings are separated 3/8-inch. With this number of turns a .0005 mfd. variable condenser will tune to the entire broadcast wavelength band and the need for the .001 mfd. condensers will be obviated.

Mr. W. J. Udick of Pittsburgh, Pa., writes, "I have started to build the 'D' coil receiver described in the May issue of THE WIRELESS AGE, but find that you did not mention the ratio of the audio-frequency transformer. I would also like to know where the B minus is connected."

The ratio of the audio-frequency transformers can be anything from 5-to-1 to 10-to-1 in the first stage and preferably a 3 1/2-to-1 or 4-to-1 in the second stage. In Mr. McIlvain's set two Acme audio-frequency transformers were used each having a ratio of 3 1/2-to-1. The negative B should be connected to the positive of the A battery as in all amplifiers.

Reinartz 10-Meter Radio Transmitter

IN a short acceptance speech after receiving the Radio Cup, an annual award of the Executive Radio Council, Second District, given to the radio amateur whose experimental work during the year most befits him for the honor, John L. Reinartz, recognized radio engineer and amateur radio experimenter declared at a monster convention of radio amateurs from the Metropolitan area that he had turned over to the Navy Department his en-



Imported
LOUDSPEAKER
TYPE W

Watch for announcement in the September magazines. New in principle, new in shape, new in quality of reproduction, price \$27.50. Made by the makers of the famous N & K Head Set, Model D. 4000 ohms, price \$8.50.
T.H. GOLDSCHMIDT CORP.
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ZENITH Super-Portable
A six-tube radio set, completely self-contained. Does not need to be opened to operate. Write today for full particulars and name of nearest dealer.



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McCormick Building, Chicago

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tire developments on a radio transmitter functioning on 10 meters. He further declared that his system could be adapted to any amateur station operating today, within less than ten minutes. Previously, radio communication on 100 meters was considered epoch-marking. At this high frequency, special insulation is necessary, as bakelite bursts.

President W. J. Howell of the Executive Radio Council presented Reinartz with the cup before several hundred cheering amateurs gathered at the Convention Hall of Seaman's Church Institute, 25 South Street, Saturday, June 7th. Reinartz was selected for the award for his short-wave transmission and reception experiments. Preceding the award, Boyd Phelps, Wm. Diehl, J. Clark, P. Willis delivered technical papers.

Broadcasting Senate Proceedings

(Continued from page 30)

fold intensified. Senators and Representatives would hear oftener and more promptly from their electorate as a result of this innovation.

The great value, of course, of broadcasting the Senate's proceedings lies in the educational factor. We need more general and intensive public knowledge of what the great public questions are. Extend this proposal to the courts and legislatures of all the states. Let one's imagination add to that the probability of radio photography and radio vision, so that one might see, as well as hear what these agencies are doing, and even the most conservatively thinking person will see that a great improvement in our government and its workings is bound to take place.

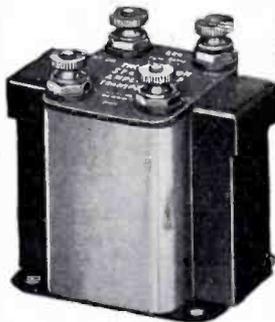
I believe that broadcasting of the proceedings of Congress is coming and that it will be very beneficial to the country."

Broadcasting Senate Proceedings

(Continued from page 31)

bureau would immediately develop. Parties and politics are essential if a country is to keep out the morass such as some unfortunate lands are now suffering in. But politics simply for its own sake has no justification and it should not be permitted to hamper business legislation. I am afraid that much of the time of the Senate would be wasted under any such arrangement in purely political activity.

The educational value of this proposal I think is not large. One has but to read the *Congressional Record* to



SUPER TRANSFORMER
(audio frequency)

The Mirror of the Broadcasting Studio

"Why, Charles, that musical reproduction is perfect. Can that be our old set? It looks the same but how different it sounds. We were never able to get such perfect music before. It seems as though the artists were right here in the room. What have you done?"

"Simplest thing in the world, Mary. The boys at the office have been talking Thordarson Amplifying Transformers so hard that I decided to install them in place of my old ones. I see now that it was a wise move."

* * *

The Super Transformer is indeed the mirror of the Broadcasting Studio. It was designed with one primal aim—perfect reproduction. It has the same function in a radio set that the reproducer has on your phonograph. Install a pair—it will take you but a few minutes—and you will marvel at the rich musical quality obtained.

Kennedy, Zenith, Radiodyne and many other leading set manufacturers use the Thordarson Super Transformer in their apparatus. That's irrefutable proof of Thordarson superiority.

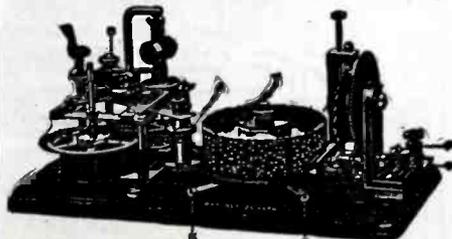
THORDARSON
ELECTRIC MFG. CO.

Huron and Kingsbury Streets

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Learn the Code at Home with the Omnigraph

"Just Listen—The Omnigraph will do the teaching"



THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Codes—right in your own home—quickly, easily and inexpensively. Connected with Buzzer, Buzzer and Phone or Sounder. It will send you unlimited messages, at any speed, from 5 to 50 words a minute. THE OMNIGRAPH is not an experiment. For more than 15 Years it has been sold all over the world with a money back guarantee. THE OMNIGRAPH is used by several Depts. of the U. S. Govt.—in fact, the Dept. of Commerce uses THE OMNIGRAPH to test all applicants applying for a Radio license. THE OMNIGRAPH has been successfully adopted by the leading Universities, Colleges and Radio Schools. Send for FREE Catalog describing three models. DO IT TODAY.

THE OMNIGRAPH MFG. CO.
16B Hudson St. New York City

If you own a Radio Phone set and don't know the Code—you are missing most of the fun

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A MAMMOTH SPECTACLE
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SEPT. 22 to 28 Monday to Sunday Night
INCLUSIVE
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New York City.

know that many, many pages must be plowed through in order to procure the coveted information sought for. Much of the labor of the Senate is merely routine, of no particular interest to most people. Yet it is business which must be consummated, and it would of course come over the radio. Sometimes the pace of the proceedings is extremely rapid, and in these cases, especially when, for example, bills on the unanimous consent calendar are being considered—to make the case emphatic, at night sessions—radio would be impossible even with the most perfect equipment, operators and atmospheric conditions. Why, the Senate passed, as I recall, ninety-four bills at one session!

Improvement in the knowledge of the public as to things political will come not only from the reading and hearing of the news of the day's proceedings. We need now in this country a return to the fundamentals of our Constitution. The study of the basis of the government takes much time and thought and contemplation; such a process and avocation is far removed in character from broadcasting the Senate's proceedings.

The House of Representatives could, of course, decide also to broadcast its proceedings. The Supreme Court might like the notion. Each state legislature would undoubtedly be interested. The advertising opportunities are so full of potentialities. One can easily see that there would be practically no end to the train of eventualities of the Senate's approval of this proposal.

Radio has accomplished wonders for mankind. Its possibilities, are, of course, still mostly in the future. We have hardly scratched the uppermost surface.

However, I can see no good results accruing from broadcasting the proceedings of the Senate, and I can see many disadvantages resulting from any such unlikely decision.

A Radio System Built of Air-Castle Dreams

(Continued from page 29)

There being no available source of suitable electric energy, a separate electrical generator plant had to be provided. This contains two engines, one a Diesel, and the other a steam turbine, each of 750 horsepower. The Alexanderson alternators are 200 kilowatts each.

* * *

Although Mr. Alexanderson has been associated with the great strides made in power transmission, his radio researches have by no means been con-

IMPORTANT ANNOUNCEMENT

Soon to Be Made

NATANN Battery Charger
THREE STYLES

Listing \$22⁰⁰, \$17⁵⁰, \$13⁵⁰

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EMPIRE
Oiled Tubing
Real Radio Sets of today—the kind that last long and work best—are insulated with genuine Empire Oiled Tubing.

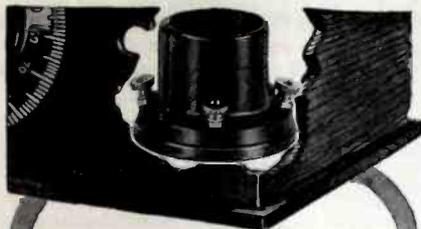
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Get Directly at Them

Are the contacts in the sockets of your radio set easily accessible for ordinary and necessary cleaning?

With Na-ald De Luxe Sockets in use you need neither sandpaper or an extra reach to keep contact strips and tube terminals bright and clean.

Just rotate the tube three or four times. Instantly the dual-wipe laminated contacts remove corrosion, making a bright perfect connection. This action is on the side of the tube terminals away from the soldered ends. "It's the contact that counts."

Make your Superheterodyne set free from socket trouble by using Na-ald De Luxe Sockets.

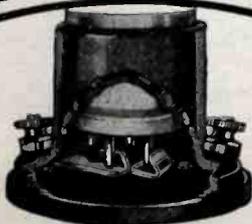
Sockets and panel mounts for all tubes. Prices 35c to 75c. Send for catalog.

ALDEN MANUFACTURING CO.
Dept. A SPRINGFIELD, MASS.



Keep
Contacts
Clean

NA-ALD



New! —A Calibrated Grid Leak!!

\$2.00



TERMINAL PORTS SPACED TO FIT THE STANDARD GRID CONDENSERS.

You set it for a specified resistance and adjust it for best results. You read the resistance in exact terms of the megohm through a peep-hole in the panel. (It's also equipped for table mounting.) Each FIL-KO-LEAK is individually hand-calibrated in the laboratory. Resistance element is constant and accurate, and is not affected by atmospheric conditions or wear. The FIL-KO-LEAK assures you smooth, gradual control of resistance. You will get both distant and local stations with greater clarity and volume than ever before, for when the negative bias on the grid of the detector tube is precisely right the tube neither "chokes" nor "spills over". The improvement will be most noticeable on the weakest stations.

Every FIL-KO-LEAK is guaranteed to be perfect electrically and mechanically, and to be accurately calibrated over the operating range for all tubes (1/2 to 5 megohms). This calibration is doubly checked before the instrument is shipped.

FIL-KO-LEAK

SCIENTIFICALLY CORRECT
VARIABLE GRID LEAK

—With the \$100 Guarantee

1.50



Bakelite Insulation Hermetically Sealed.

Solid Brass Mounting Bracket

Absolutely warranted to protect your set from lightning, with a guarantee to pay you \$100 or to repair your set, should it be damaged through faulty operation of the arrester.

The "umbrella" shield keeps dust, moisture, etc. from the insulation, preventing leakage losses from aerial to ground. This makes certain that all radio impulses reaching the antenna pass through your set, which assures maximum reception.

FIL-KO-ARRESTER

SCIENTIFICALLY CORRECT
RADIO LIGHTNING ARRESTER



—With Battery Switch Attached

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Supremacy proven by every test

The only compression type rheostat with a battery switch attachment. Combines the advantages of infinite control of filament current with the simplicity of an ordinary battery switch. And at no extra cost! If you want perfect control of any type tube in any hook-up—if you want freedom from tube noises—if you want DX stations you never heard before—maximum signal strength—longer tube and battery life—then you must use FIL-KO-STAT. Battery switch attaches to regular FIL-KO-STAT mounting screws. No extra holes to drill.

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SCIENTIFICALLY CORRECT
RADIO RHEOSTAT



—Simple Sturdy Sure

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Carries the usual FIL-KO-PARTS unconditional guarantee.

A single-hole mounting "A" Battery switch that's easy to attach.

Wiping contacts assure clean, positive connection when the switch is in the "On" position. When the switch is "Off", the contacts have a positive break and are separated by highest quality insulating material.

The end terminals of the switch can be used for solder connections, or connecting wires can be held in place by the screws provided for that purpose.

The nickel knob and the entire housing are insulated from the terminals, so that any wires accidentally coming in contact with any part of the switch outside of the terminals themselves can cause no damage.

FIL-KO-SWITCH

SCIENTIFICALLY CORRECT
"A" BATTERY SWITCH



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This trademark is on all genuine RADION Panels. Accept no substitutes. 21 Stock Sizes. At all dealers.

RADION

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Panels, Dials, Sockets, Knobs, Insulators
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GAROD

NEUTRODYNE*
TYPE \$135 without equipment
RAF

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Made by
THE GAROD CORP.
170 Pacific Street
NEWARK, N. J.

RADIO AMATEURS TALK 7,000 MILES FOR 2 HOURS

*Argentinian and New Zealander
Establish What Is Declared a
Record for Non-Professionals.*

BUENOS AIRES, May 24 (Associated Press).—Carlos Braggio of Bernal, near here, and Ivan O'Meara of Gisborne, New Zealand, radio amateurs with 7,000 miles of South American continent and Pacific Ocean between them, conversed for two hours by radio Thursday morning, establishing what is claimed to be a world's amateur radio record.

Braggio, who knows English, had spent most of the night unsuccessfully attempting to get some North American amateur to answer the signals of his station, CBZ8, when at 4 o'clock in the morning he was amazed to receive an answer from the other side of the globe—O'Meara's station, 2AC.

The amateurs opened a conversation which continued until 6 o'clock, when Braggio told O'Meara he had been up all night and wanted to go to bed. The New Zealander answered that he was sorry because it was only 9 o'clock in the evening at Station 2AC. Later on Thursday Braggio received a congratulatory cable from O'Meara, confirming the conversation.

In connection with the radio communication test inaugurated this week with the United States, Argentine amateurs are unable to understand why they are able to get signals from North American amateurs while the latter apparently are unable to get theirs, although some of the Argentine stations are more powerful than some of the American ones which have been heard.

It is believed that many of the powerful broadcasting stations operating in the United States nightly interfere with the Argentine waves. In the future Braggio will try sending on a 120 meter wave-length at 3 A. M., Eastern Standard Time.

Argentinian and Jerseyite Exchange Radio Greetings

Special to The New York Times.
HARTFORD, Conn., June 2.—Two-way radio communication by amateurs between North and South America was attained for the first time last week by Norman R. Welble of Collingwood, N. J., and Carlos Braggio of Bernal, suburb of Buenos Aires. The feat was checked and verified today by the American Radio Relay League of this city, which tonight announced that Welble and Braggio had a twenty-minute connection on short wave lengths just before daybreak last Friday.

Braggio heard the New Jersey amateur calling him, and at 4:15 A. M. sent the following: "GM greetings and congratulations QRZ QRK."

Welble immediately replied in Spanish, "Saludo, Amigo de America del sur QRK."

A letter dated May 21, received to day from E. J. Simmonds, an English amateur, stated he had heard the South American station transmitting.

Mr. Braggio Used

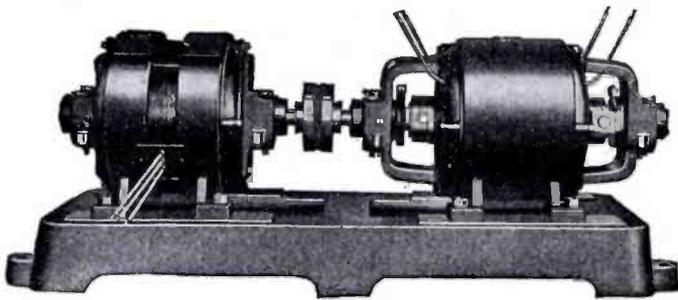
"ESCO"

Item 37—Double Commutator
1000 V. 600 W. for Plate
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He writes:

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fined to that branch of engineering. He has carried out extensive development and research work in connection with radio receiving apparatus.

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Further researches of vital importance were conducted by Mr. Alexanderson that led to the evolution of the duplex radio telephone system by which a subscriber to a land line telephone could establish connection with a radio telephone station and conduct a two-way conversation with the facility of an ordinary land-line circuit.

The two phases of this system of duplex radio telephony are classified by Mr. Alexanderson as the "bridge receiver" and the "barrage receiver."

The bridge receiver is a device which permits reception of signals at a given station while the transmitter at that station is in operation. This is accomplished by erecting a separate receiving and transmitting antenna, but placing them close enough together to gain the approximate effect of a Wheatstone bridge, the receiver and transmitter being so paired that a "balance" is obtained.

The barrage receiver is a combination of two aperiodic horizontal antennas. These have a unilateral directional characteristic. By the means of appropriate phase shifting devices, signals from any given direction can be balanced out while the desired signal is retained.

And so it is that many of us have come to know of rapid strides in the telegraphic and telephonic progress of radio, and have learned to use many of the service systems, of which many could be traced back to the tremendous activity of E. F. W. Alexanderson, and yet those are the ones of us who have failed to realize the romance of their origin, or the adventurous sojourns into the realm of science that lured this great personality to seek the unexplored and accomplish the impossible.

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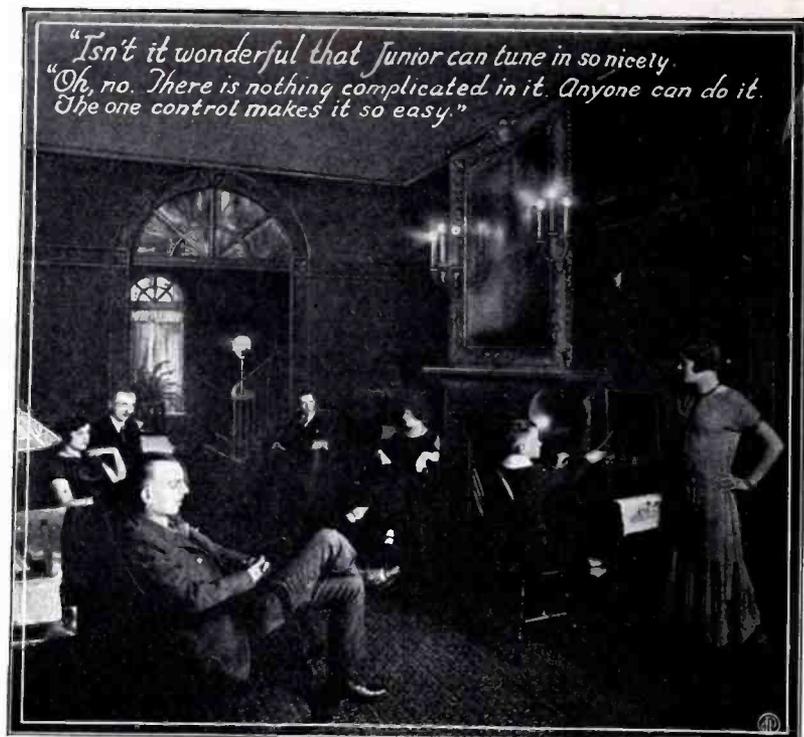
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Alexanderson's exploits, we stroll into the United States Patent Office and find more than 100 patents granted to him during the course of a few years. Along with this extensive program, we find that he has had time to present more than twenty scientific papers before the American engineering societies and through the technical press. And all of them bearing upon principles and practice in power engineering and radio telegraphy and telephony.

Then we drop in to visit Mr. Alexanderson. Busy? Of course! But we are cordially received, comfortably seated, and immediately put at our ease by this very human mortal. Lo! he is one of us. His interest centers on boats—big boats this time—but after all, what is the difference between boyhood, hand-whittled ships, and modern battle-cruisers? A small difference in our ages, perhaps.

Mr. Alexanderson tells us about his experiments in electric motor propulsion of battleships in the U. S. Navy. The New Mexico and other battleships of that type are now electrically propelled by apparatus designed by him. His attention was also directed to electrical propulsion of freight and passenger ships with the result that a large Japanese transport and many other privately owned ships now receive their motive power electrically.

Here, indeed, is a man whose enterprise and versatility and remarkable achievements amount to a thorough review of electrical and radio development, but a review that is indelibly associated with the growth and development of a personality.

The ABC of Your "C," "B" and "A" Batteries

(Continued from page 69)

volts are required, the desired amount of voltage may be tapped off in accordance with figure 1 for C battery.

When the battery requires recharging, the C battery cells should be thrown in series and the entire battery recharged just the same as though it were a standard 48-volt B battery.

In figure 1 the alternative connection A shows the C battery as a part of the regular B battery and is recommended where a radio set is so wired that the negative A and negative B battery are connected together.

For proper operation as a C battery the negative B lead is extended to any number of cells which are to be used as a C battery. In this particular diagram, six volts or three cells are utilized. However, this hook-up should not be used where the negative B battery lead goes to the positive A.

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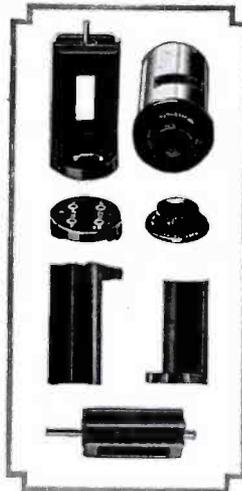
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Radio in the Canadian Wilderness

(Continued from page 37)

around us to stare at our radio and speculate about its performance, but none seemed the least disposed to do anything more about it. So the Doc and I let the matter rest there.

The town of Roberval is a small clearing in the heart of a vast forest. The people are mostly of French extraction and were not particularly cordial. They were probably a little shy in front of strangers. It is true that few people from the outside world, especially from the United States, ever visit this town. Like most of the French-Canadian villages, this one is dominated by a church at the head of the main street. The conspicuous absence of trees mark the fear of the forest, common to most French-Canadians. To stay in a lumber camp during the season is, to these people, a feat that proves beyond question, the full manhood of the one who can do it.

On the train back to Chicoutimi, we saw a few lumberjacks who were returning from camp. The wild, uncouth manner of those men unmistakably branded them with the supreme hardship of that existence. Few care to pursue the calling over one or two seasons at the most.

When Dr. Hobart and I finally arrived in Montreal, we agreed that a trip into the Canadian wilderness is really worth while. The more so, with radio. Our next trip there will include a better receiver. Probably, an RCA portable Super-Heterodyne.

Moose and Music in Maine

(Continued from page 51)

the set would capture some of them. I lit the tubes—all six of them—and turned the dials half-heartedly.

Without a word of warning the loud-speaker emitted a ribald squeal which suddenly merged into and disappeared from among the strains of a jazz song—the most wonderful sounds I have ever in all my life heard.

I stood inarticulate, my feelings were chaotic with mingled glee, amazement, shock and triumph. For a full minute I stood with open mouth, grasping the realization that what I heard was genuinely true. As suddenly at it had left me the power of speech returned, and as the yell finally passed my lips I turned to the door to see Totum staring pop-eyed over a rather small spread of moose-antlers.

I was the first to break the silence. "So you got one, did you?"

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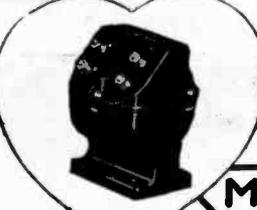


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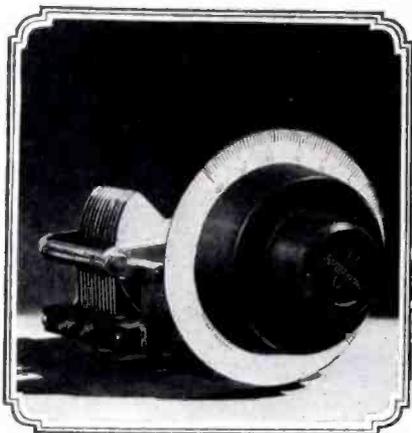
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See page 6.

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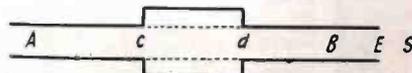
Sound

(Continued from page 41)

ment house. A tremendous amount of energy is wasted in our task of accomplishing this. The number of changes or handlings of the coal undergoes in being transported to the apartment house is alarmingly large and each handling necessitates a large expenditure of energy in order to change it from one state to another. Thus far all our effort is spent in attempting to reduce the energy expenditure or waste to a minimum. If, however, a way could be found so as to eliminate the many changes or handlings and one scheme of transportation used then much effort would be saved.

The same thing holds in electricity and also in sound. In the case of electricity the greatest care is used in telephone and radio transmission to avoid changes in the electrical characteristics of the apparatus from point to point. Wherever changes occur, a loss in energy by reflection is certain to occur. This is why your loud speakers and phones have a high resistance in order that such resistance may equal or "match" that of the plate circuit of the tubes. It is also the reason why a transformer in a radio set is made with a definite number of turns in the primary and secondary windings.

In the case of sound passing along a pipe or through space care must be used in order to secure the transmission of the maximum amount of sound energy. In the accompanying figure if sound is passing along a pipe in the direction of A to B, more sound energy will be transmitted in case the internal diameter of the pipe is unchanged, as shown by the dotted lines, than is trans-



mitted if the diameter is suddenly increased at *c* and again decreased at *d*. At both *c* and *d* sound energy is reflected back toward A and less is transmitted to B. Reflection of sound energy again occurs at the open end, E, of the pipe and still less energy gets out into the surrounding space S. In a later article when we take up loud speakers we shall see how important these effects are in securing efficient and satisfactory horns for loud speaker use.

There are numerous other phenomena which we might describe to show the nature of sound, but it seems wise to include these in the next and succeeding articles. The present article may be summarized briefly somewhat as follows: Around us are material objects of every description immersed in an ocean of air. These objects are caused to shake or vibrate and set the surrounding air in a corresponding

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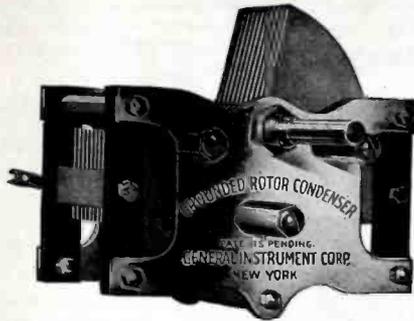
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Type AF-6 (Turn ratio 5), has long been acknowledged the Standard of Excellence for audio amplification.
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 Address..... City.....

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SUPER
HETERODYNE

A perfect combination of Balanced Tuned Radio Amplification and Intermediate Amplification in a Super-Heterodyne.

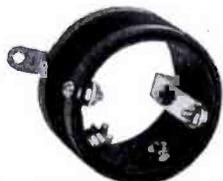


Illustration shows seven tube set. The Super-Unidyne may be built in five tube receiver for use with Western Electric Power Speaker, six or seven tubes with one or two stages audio, or eight tubes for one stage audio and two tube Push Pull Power Amplifier. Two stages Tuned Radio and one Stage Intermediate Radio used throughout.



Kit for building the Super-Unidyne Including all Special Coils, Set of Full Size Blue Prints, Instructions, etc. \$16.00
Full size blue prints only, set of two 21" x 48" 1.50

All standard parts from your dealer.



No. 35 Tuned R. F. Transformer, for all circuits.

Price \$2.50



Intermediate Transformer, made in 30-50-100 K. C., for all circuits.

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THE first set employing the Super-Unidyne principle was placed in the hands of the user one year ago and since that time over ONE HUNDRED sets, built for and by the individual and subjected to every conceivable test have gone into use.—Not One Set Has Ever Been Changed.

UNIRADIO Tuned R. F. Transformers (not mounted at an angle) and Calibrated Intermediate R. F. Transformers have made the SUPER-UNIDYNE possible. No new or untried features are employed, every principle has been used by Radio Engineers throughout the country. A simple combination, thoroughly explained and easily understood puts the SUPER-UNIDYNE ahead of every other set of any type.

UNIRADIO Kits will make any type Super Het better and cheaper. Every kit calibrated and tuned at highest point.

If your dealer does not carry UNIRADIO Parts we will supply you direct. Jobbers and Distributors will want our line. Write or wire for proposition.

UNIRADIO MANUFACTURING COMPANY

Makers of

High Grade Radio Apparatus

Sale Dept., Jos. Mack Bldg.

Detroit, Michigan



state of agitation or motion. This constitutes sound. The ear, is merely a detector of sound which exists whether the ear is located in the right position to hear it or not. The air carries all these quivers simultaneously and because of long experience and association and their importance to us, we can identify and correctly interpret all of them.

As to some of the characteristics of sound, it has been shown how the air, other gases, solids and liquids are all conductors of sound while a vacuum is not a conductor of sound. We have also described sound absorption, reflection, transmission, and diffraction and shown how they enter in determining the quality of broadcast performances and home reception of radio. We described in some detail the analogy between electrical and acoustical energy, its transmission, the similarity between the electrical inductance capacity and resistance and the corresponding acoustical quantities, and finally, we described similar precautions which were necessary to take in order to transmit the maximum amount of both electrical and acoustical energy.

How I Made a Career

(Continued from page 35)

turing and demonstration of cooking is done at street corners!

But the crowning achievement was a radio cooking school and "radio teas." Nobody seemed to grasp the idea when I first proposed it; but it is a wonderful, standard institution in Chicago now. Think of it, women graduate from this school and secure diplomas, without ever stepping outside of their homes! They hear the lectures by radio and are examined by mail. Can you appreciate what this means to the host of women who wouldn't have time or money to take a school course?

And the "radio teas"! They are a joy to uncounted thousands of women. They may have a baby on their lap, or a dirty apron on, and be too tired to get up out of a chair, but they can "come to the radio tea" nevertheless! They can feel themselves in a group, and hear what other women have to say, and learn something, even though they are "tied to their jobs," as so many, many women must be. It had never occurred to me, but such radio talks and "teas" are an especial boon to the ambitious foreign woman who speaks English poorly.

Farm women, likewise, find radio an especial boon. Distance in her case keeps her from frequent communion with other housewives; keeps her from attending cooking or other women-subject lecturers. I believe the radio means a new era for women, an era of benefits only begun.

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you will find the
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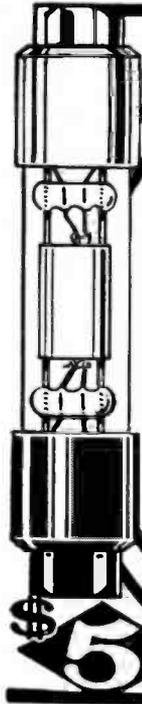
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London Hawaii -Porto Rico

A Canadian amateur (T. A. Crowe, Calgary), operating on three Myers Tubes, heard the concert broadcasted by 2 L.O., London, England, and picked up Hawaii and Porto Rico the same evening. (Calgary Herald, April 1st). Are you getting results like this? You can with

Myers Tubes Practically Unbreakable

They banish the noise that spoils reception and give wonderful volume and clarity to long-distance messages. Myers Tubes function perfectly as Detectors, Amplifiers and Oscillators. You can't break 'em unless you deliberately try. Two types: Dry Battery and Universal for storage batteries. (4 volts)

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Complete with clips ready to mount. No extra equipment required.

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Radio Vacuum Tubes
240 CRAIG STREET, W.
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PREMIER



Audio Frequency

\$3.50

TRANSFORMER

A Lap Ahead of the Field
About the size of an English Walnut. Saves space; light weight; mounts anywhere; unsurpassed in performance.
Ratios 1 to 3, 1 to 4, 1 to 5, \$3.50, 1 to 10, \$1.50. Ask your dealer. Send for Bulletin No. 92.

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14 A—RADIO BOOKLET

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JEWELL 14 A RADIO BOOKLET
ILLUSTRATING OUR COMPLETE
LINE OF RADIO INSTRUMENTS
WITH HOOK-UPS

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Write for a copy today

A new twenty-four page booklet will be sent, gratis, to those interested in building their own receiving sets.

A simplified method of construction is described. Illustrations and diagrams.

On Request

EISEMANN MAGNETO CORPORATION

WILLIAM N. SHAW, President

165 BROADWAY, NEW YORK

Prize Contest

(Continued from page 67)

favor them in the least.

Men who make their living by subscription selling have accepted my plan whole-heartedly, and have joined the staff on the basis outlined here.

One special feature deserves attention. To furnish an extra incentive, and to put a little sport into this plan, I have made a contest of the whole affair. This contest closes September 15th, and all who want to get in the running must do so at once. Later, I will arrange other contests, but this present one is the big event.

I am giving a Paragon RB2 \$135.00 Receiver for first prize. This prize goes to the one who sends in the most subscriptions by September 15th.

For second prize, I am giving a Thompson Magnaphone \$35.00 Loud Speaker to the one who sends in the next largest number of subscriptions by September 15th.

And the third prize is an N&K \$8.50 Headset for the one who sends in the third largest number of subscriptions by September 15th.

The prizes will be given in addition to what you receive for the subscriptions. If you win a prize, your subscriptions will bring you cash or radio parts just the same. You are paid for your time even though you don't win a prize!

Put your photo in one of the frames and send it in—we want to see what you look like! But act promptly. Do it at once!

Burt Evans

—Boys' Editor.

Afloat and Ashore with the Operators

(Continued from page 55)

"Dear Sir:—

"I wish to thank you for giving me a line on one of 'That Old Gang of Mine'! Have not been in touch with Frank Rosenquist since he was up in Maine during the war. Frank and I used to build tuning coils about three feet long out of wire from old buzzers. Ask him about them.

"Just as a suggestion, would it not be possible to extend the scope of your articles to take in some of the old timers who have left the game but who will never be forgotten? It would prove most interesting. I most certainly would like a line on old ops, for instance, 'Don' Pieri, Dick Cuthbert, 'Red' Sutherland and 'Dusty' Rhoades.

"I am at a loss to know just exactly how to reach Frank so would ask that you forward these lines to him. Would like to hear from him and if he or any of the other old timers get out this way, there most certainly will be a place for them to hang up their hats and room for their feet under the 'mahogany'.

"Thanking you, I am,

"R. J. DEAN,

"Ex-operator, SS. Montanan, Eocene, Prinz Jochim, Pennsylvanian, Texan, Mexican, Nebraska and naval radio station Pt. Arguello."



U. S. TOOL CONDENSERS
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Designed for most accurate capacity and guaranteed to give 100% satisfaction—the guarantee that is bringing U. S. Tool to the fore with careful set-builders.

Buy Condensers by Capacity—Not Plates
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End Plates of CELORON

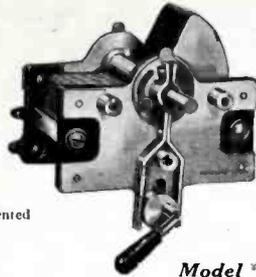
FOR Superheterodyne
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Condensers of recommended capacity for all known circuits are also carried in stock by leading radio retailers.

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Patented

Model "B"

HAMMARLUND
VERNIER VARIABLE
CONDENSER
Will Increase Your Range and Volume
ELIMINATES INTERFERENCE

- (1) Lowest losses (100 small to measure)
- (2) Micrometer Vernier
- (3) Soldered brass plates
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- (7) Takes any size dial

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RECEIVERS

THE ULTIMATE IN RADIO RECEPTION



A high resistance crystal is best for Reflex Sets. B-METAL resistance is very high. Your dealer will supply it.
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10th Floor
525 Woodward Ave., Detroit, Mich.

Small Ads of Big Interest

Space in this department costs only 65 cents a line
Minimum space 7 lines Payable in advance

MAKE \$100 WEEKLY in Spare Time. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays \$100 profit. No big investment, no canvassing. Sharpe of Colorado made \$955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your country is gone. **OZARKA, INC.**, 854 Washington Blvd., Chicago.

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FREE!

Radio "Applause Cards"

"— Station W-J-Z signing off. If you have enjoyed the artists' program, won't you write in and tell them?"

By all means! Quickly and easily with "Applause Cards". They're handsomely printed mailing cards. All ready for you to fill in with your comments, sign, and drop in the mail box. Keep a pack of them near your receiving set. You can use "Applause Cards" liberally because they are **FREE AT YOUR RADIO DEALER'S.**

("Applause Cards" were originated by this Company, makers of the popular Dictograph Loud Speaker and the Aristocrat Dictograph Headset. The only "Applause Cards" are Dictograph Copyrighted "Applause Cards".)

A big **FREE** package of them awaits you at your dealer's. Or, if he has not yet stocked, we will send you a large package of "Applause Cards" prepaid direct to you, providing you will furnish us with your dealer's name. Dept. F-8.

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FRESHMAN

Double Adjustable crystal Detector for panel or base use, complete **\$1.50**

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FREE! Write for building plans and hook-ups of Super-Heterodyne, Reflex, and other popular circuits. Ask for list L-113.

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Radio Condenser Products

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15

A number of MYBOYS

have found that they can own a **Real Loud Speaker Without Cost.** They are earning this Loud Speaker by giving me a few hours a week.

Here is **YOUR** chance to add a Loud Speaker to your set and let the whole family really enjoy listening in.

This **Perfectone**

LOUD SPEAKER will reproduce perfectly and with plenty of volume. In fact it is adjustable so the volume can be regulated to your requirements.

A \$15 Loud Speaker for only 12 subscriptions. You can earn this in part of your spare time. Besides—

Winning a Paragon \$135.00 Set. See Page 67 for Complete Information.

Burt Evans.

Mail This Coupon Today

THE WIRELESS AGE,
326 Bway., N. Y. C.

Dear Burt,

I want to earn the Perfectone.....
Please send me complete information.

I have not a radio set now.

Name

Address



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- 2 AIB Benton H. Marder, 614 Belvidere Ave., Plainfield, N. J.
- 2 AIT Richard Dupont, 445 Grand Ave., Astoria, N. Y.
- 2 CXT Radio Engineering Co., 55 Halsey St., Newark, N. J.
- 2 CPT Alfred Waring, 75 Higgin St., Forest Hills, N. Y.
- 2 AFD Theodore H. Adams, 486 7th St., Brooklyn, N. Y.
- 2 ADE Joseph P. Morrow, 849 5th Ave., Astoria, N. Y.
- 2 GM Worthington C. Lent, Central Park, Schenectady, N. Y.
- 2 GE David Bauman, 1729 Fulton Ave., New York, N. Y.
- 2 FX Harry Friedman, 1390 Clinton Ave., New York, N. Y.
- 2 EY Fred J. McKinney, 84 Ella St., Bloomfield, N. J.
- 2 CDE Joel E. Ennis, Jr., Campbell Ave., Castleton, N. Y.
- 2 FV Cecil J. Padon, 107 E. 35th St., New York, N. Y.
- 2 FV John M. Sheridan, 84 Amity St., Brooklyn, N. Y.
- 2 ER Charles W. Brown, Jr., 471 Tompkins Ave., Brooklyn, N. Y.
- 2 AIE Gerald Chassman, 606 E. 140th St., New York, N. Y.
- 2 AIC Roderick MacMillan, 42 Kennet Ave., South Ozone Park, N. Y.
- 2 AIA Leonard M. Horowitz, 37 W. 73d St., New York, N. Y.
- 2 EY Irving Korenman, 1465 60th St., Brooklyn, N. Y.
- 2 AHD Rudolph Zuhajsky, 811 E. 83rd St., New York, N. Y.
- 2 PE David Tallanoff, 1473 E. 14th St., Brooklyn, N. Y.
- 2 BQ Walter E. Lida, 2043 Benedict Ave., New York, N. Y.
- 2 CFX Robert T. Bradshaw, 402 Tremont Pl., Orange, N. J.
- 2 ALS Frank A. Gunther, 145 E. 92nd St., New York, N. Y.
- 2 JC Bloomfield Radio Club, 82 Broad St., Bloomfield, N. J.
- 2 WII Henry L. Bogardus, 253 Grove St., Montclair, N. J.

- 2 BQ Fred T. Haule, 633 E. 135th St., New York, N. Y.
- 2 BDV James F. Wood, 333 W. 14th St., New York, N. Y.
- 2 CPC Reuben Turetsky, 185 Anson C. N. Y. C.
- 2 CRT Dominic G. Bodkin, Jr., 897 Lafayette Ave., Brooklyn, N. Y.
- 2 CWD Paul Anaeker, 530 W. 178th St., New York, N. Y.
- 2 AFM Walter H. Grove, Jr., 104 Ocean Ave., Manassquan Beach, N. J.
- 2 FW Walter T. Mills, Jr., 199 DeKalb Ave., Brooklyn, N. Y.
- 2 AUB Louis Maiter, 400 DeKalb Ave., Brooklyn, N. Y.
- 2 ACE Charles D. Birret, 122 W. 91st St., New York, N. Y.
- 2 AFK Morris Kunitsky, 740 Trinity Ave., New York, N. Y.
- 2 AEX Moe Brimberg, 917 St. Marks Ave., Brooklyn, N. Y.

Eighth District

- 8 AAY Allison L. Mitehell, Boyd St., Mt. Jorett, Pa.
- 8 ACP Basil V. Hughes, Cambridge, Mich.
- 8 AJR Walter R. Kiefer, P. O. Box 10, Lattimer Mines, Pa.
- 8 AJV Wm. Jackson, 90 Burlington St., Detroit, Mich.
- 8 BEQ Connellsville Spark Club, Poplar Grove, Connellsville, Pa.
- 8 BIQ Gail Beelman, 1219 Dawson St., Toledo, Ohio
- 8 BRK Henry Ross, 1225 Chiefa Rd., Columbus, Ohio
- 8 BLX Kirke E. Davis, 194 Glendale Ave., Detroit, Mich.
- 8 BMA Paul E. Horton, 285 Elmwood Ave., Newark, Ohio
- 8 BMD Gordon Batkinson, 600 McGraw Ave., Detroit, Mich.
- 8 BMO Laurence W. Lloyd, 410 N. Mildred St., Charlestown, W. Va.
- 8 BMT Laurence J. Birkel, 564 Clifton St., Springfield, Ohio
- 8 BMU Charles Al. Brelsford, 1885 Grasmere St., E. Cleveland, Ohio
- 8 BNE Raymond D. Nichols, 83 So. Newberry Ave., Cuyahoga Falls, Ohio
- 8 BNI Kenneth E. Fields, 627 Broad St., Conneaut, Ohio
- 8 BNL Frederik Snider, 318 Jackson St., Jackson, Mich.
- 8 BO* J. W. Smith, 2316 Lawrence Ave., Toledo, Ohio
- 8 BOH Robt. Wm. Mallett, 216 Cooper St., Utica, N. Y.
- 8 BOO Howard George, 215 Pike St., Dunkirk, N. Y.
- 8 BOW Henry L. Carter, 477 N. Goodman St., Rochester, N. Y.
- 8 BOX R. C. Gilbert, 502 Garfield St., E. Rochester, N. Y.
- 8 BPB Harvey G. Noah, R. F. D. No. 1, Lodi, Ohio
- 8 BPF James R. Merritt, Spragueville, N. Y.
- 8 BPH John McClure, Stop 139—on Lake Shore Line, Wickliffe, Ohio
- 8 BPI Samuel C. Fusco, 104 Fulton St., Utica, N. Y.
- 8 BPM Wm. N. Terrell, 1100 Steuben St., Utica, N. Y.
- 8 BPW Ansonia High School, West Canal St., Ansonia, Ohio
- 8 BQN Stuart W. Farmer, 233 West Ferry St., Buffalo, N. Y.
- 8 BQR Donald R. Palmer, 35 14th St., Port Huron, Mich.
- 8 BQU Robt. H. McCauley, Orchard Park, Sewickley, Pa.
- 8 BQW Clark R. Kemp, 29 Reading Ave., Hillsdale, Mich.
- 8 BQY Byron Sankey Roudabush, 52 Front St., Minersville, Pa.
- 8 BRG Francis Blake, John and Hugins St., Clayton, N. Y.
- 8 BRT Fernwood Quirk, N. Main St., Coudersport, Pa.
- 8 BRV Charles G. Williamson, 128 N. 4th St., Newton, Mich.
- 8 BRX Edward Stanko, 235 Hudson St., Buffalo, N. Y.
- 8 BSP Woodruff G. Evans, 70 N. Madison St., Rome, N. Y.
- 8 BSS Aloysius I. Wolf, R. F. D. No. 1, La Rue, Ohio
- 8 BST Clyde M. Fuller, 4078 Tlireman Ave., Detroit, Mich.
- 8 BSY Earl W. Welmer, 42 Poplar St., Wheeling, West Va.
- 8 BTN Z. M. Poling, 818 Sheldon St., Scottsdale, Pa.
- 8 BTS Wm. T. Burlingame, 72 Tremaine St., Kenmore, N. Y.
- 8 BVB Edw. C. Brichts, 3393 Williams Ave., Detroit, Mich.
- 8 BVZ Arble L. Bailey, 347 So. Maple St., Akron, Ohio
- 8 BXQ Wm. Wlrawa, 4419 Gamma Ave., Cleveland, Ohio
- 8 BYT Howard L. Crumrine, 167 N. Lyman St., Wadsworth, Ohio
- 8 BZJ Herbert De Weese, 321 Stillwater Ave., Dayton, Ohio
- 8 BZK Paul Roth, 2540 Overlook Rd., Cleveland Heights, O.
- 8 CAG Henry Henriksen, 2892 E. 115th St., Cleveland, Ohio
- 8 CAN Edw. G. Lloyd, 26 Beverly Rd., Buffalo, N. Y.
- 8 CFX Walter A. Nelson, 818 Sheldon St., Grand Haven, Mich.
- 8 CIK Eugene C. Woodruff, 14-16 Maple St., Bay View, Mich.
- 8 CII Donald Heisner, 1305 14th St., Lorain, Ohio
- 8 CIR Harold Strobel, 1797 Holcomb St., Detroit, Mich.
- 8 CWO Everette Woodmansee, Route No. 4, Sabina, Ohio
- 8 CZS F. M. Louwarty, R. R. No. 1 Burk Ave., Kalamazoo, Mich.
- 8 CZU Chas. Beakert, 2705 Hastings St., Detroit, Mich.
- 8 DJL Paul Schneebelen, Jr., 558 East Broadway St., Toledo, Ohio
- 8 DMO C. Blauvelt, 522 Seventh St., Hamilton, Ohio
- 8 DNP E. A. Krall, 212 Hargrove Ave., Pittsburgh, Pa.
- 8 DPE Lee E. Spencer, 501 Canton St., Jeannette, Pa.
- 8 DQV Julius Constat Rosendahl, 610 Cedar St., Irwin, Pa.
- 8 DQW Glenn R. Rosenbauer, 606 Bay St., Rochester, N. Y.
- 8 DRC Geo. B. Sears, 186 Exeter St., Buffalo, N. Y.
- 8 DRD Harold F. Byrd, 1626 Lewis Dr., Lakewood, Ohio
- 8 DRE Theodore Suman, R. R. No. 13 Covington Pike, Dayton, Ohio
- 8 DRF Lewis H. Schmidt, 5158 Middlesex, Springfield, Mich.
- 8 DRG Charles W. Lewis, Jr., Walloon Lake, Mich.
- 8 DIH John J. Barney, 519 W. Market St., Mahoney City, Pa.
- 8 DRI Robt. Hale, 810 Beall St., Wooster, Ohio
- 8 DRJ Francis J. Cady, 14 1/2 McElwain St., Amsterdam, N. Y.
- 8 DRK Charles R. Thompson, 1522 Francis St., Port Huron, Mich.
- 8 DRI Alton E. Smith, 206 E. 12th St., Alliance, Ohio
- 8 DIM Francis V. Broady, 314 National N. W. Rapids, Mich.
- 8 DIRN Richard G. Irwin, 842 Parkway Blvd., Alliance, Ohio
- 8 DIRO Wm. A. Flansburg, 23 Railroad St., Adams, N. Y.
- 8 DRP Sid McCuskey, So. Main St., Hudson, Ohio
- 8 DRQ Roland A. Morgan, S. Maple Ave., LeRoy, N. Y.
- 8 DRR Loren Isaac Davidson, 338 West 11th St., West Va.
- 8 DIS Fred W. Diehl, South Water St., Kent, Ohio
- 8 DIET Louis Rouse, 1432 Freeman St., Cincinnati, Ohio
- 8 DIU I. M. Chambers, 2931 Jefferson Ave., Cincinnati, O.
- 8 DIW Reuben C. Wenter, 3309 Canton Ave., Detroit, Mich.
- 8 DRW C. A. Grissinger, 316 Welsh St., Wilmington, Pa.
- 8 DIX Leuls A. Cartwright, Jr., 502 Glenwood St., Youngstown, Ohio
- 8 DRY Richard P. Kennan, 614 Boyd St., Watertown, N. Y.
- 8 DIY Lawrence E. Ross, 103 Warren St., Glens Falls, N. Y.
- 8 DSA Howard R. Stacks, 2151 Fulton St., Cincinnati, Ohio
- 8 DSE G. Warnock McMillan, Dayton Ave., Xenia, Ohio
- 8 DSC Earl F. Downey, 614 State St., Charleston, West Va.

- 8 DSD Sam Laruth, 39 Granden Ave., Niles, Ohio
- 8 DSE Leonard Dombush, 805 Osborne St., Kalamazoo, Mich.
- 8 DSF Harold Pike, 2 R. F. D., Fairgrove, Mich.
- 8 DSG Harold See, Fairview Lake, Iaftan, Pa.
- 8 DSH P. O. Wertz, 1331 Oak St., Toledo, Ohio
- 8 DSI Bernard C. O'Brien, 442 Maplewood Ave., Rochester, N. Y.
- 8 DSJ Edward J. Galambos, 264 E. Blvd., Cleveland, Ohio
- 8 DSK Beta Sigma Rho Alpha Chapter, 201 Highland Ave., Ithaca, N. Y.
- 8 DSN Leonard C. Raimy, 20 Troy Pl., Buffalo, N. Y.
- 8 DSM Dean N. Wallace, 1523 Oneida St., Utica, N. Y.
- 8 DSNQ Cog City Radio Club, 303 Reynolds St., Charleston, West Va.
- 8 DSO Dr. C. Oliver Regener, 8 Tuxedo Ave., Hawthorne, N. J., Portable
- 8 DSP Jack Postwick, 3769 Hogarth St., Detroit, Mich.
- 8 DSQ Parker E. Wiggin, 714 Armorel Blvd., Wilkingsburg, Pa.
- 8 DSS Byron N. North, 626 Stewart Ave., Ithaca, N. Y.
- 8 DST Frank Mayhew, Jr., 121 (Portable), East Bloomfield N. Y.
- 8 DSU Ethelbert Seller, Box 626 (Portable), East Bloomfield N. Y.
- 8 DSV Anderson G. Wertz, 714 Homer St., Johnsown, Pa.
- 8 DSW Rowland F. Hudson, 2574 Chalmers St., Detroit, Mich.
- 8 DSX John K. Harper, 1240 Prospect Ave., Toledo, Ohio
- 8 DSY Robt. J. Hunter, 6 Costello Park, Rochester, N. Y.
- 8 DSZ Paul V. Zepher, P. O. Box 102, Lewisburg, Pa.
- 8 DTA Roy Jones, 9519 Preston Ave., Cleveland, Ohio
- 8 DTB J. Porter, 525 Isabella Rd., Connellsville, Pa.
- 8 DTC J. B. Dittoe, Main St., Shamone, Ohio
- 8 DTD I. Herbert Halligan, 2338 Luena Ave., Pittsburgh, Pa.
- 8 DTE R. G. Colvin, Owens West Va.
- 8 DTF Gilbert S. Weckizer (Portable) Penn Yann, N. Y.

SPECIAL AMATEUR

- 8 ZG Loren G. Windom, 1375 Franklin St., Columbus, Ohio
- 8 ZV Cecil Yates, R. D. No. 6, Wadnesburg, Pa.

CHANGES

- 8 AAN Elmer Brownell, 127 Gold St., Utica, N. Y.
- 8 AAU Otis J. Gravitt, R. F. D. No. 47 S. Main St., Greenville, Pa.
- 8 AAV Lester E. Clark, 40 Bentley Ave., Hubbard, Ohio
- 8 AAZ Vance L. Miller, 295 Charendon Ave., Canton, Ohio
- 8 ABA John M. Staule, 119 Quincey Ave., Mt. Oliver, Pittsburgh, Pa.
- 8 ABC Orson S. Finch, 8 Woodruff Ave., Binghamton, N. Y.
- 8 ACB Warren H. Cox, 902 Pierpont Ave., Cleveland, Ohio
- 8 ACX Wilkingsburg High School, 14589 Wallace Ave., Wilkingsburg, Pa.
- 8 ACZ G. M. Hoyt, R. F. D. No. 1, Perry, Ohio
- 8 AD Frank T. Lawler, 32 River Rd., Cheboygan, Mich.
- 8 ADE Gregory Armstrong, 1905 E. 90th St., Cleveland, Ohio
- 8 AEE Myrick F. Osborn, 316 So. Clinton St., Olean, N. Y.
- 8 AEX Wm. Robt. Bymes, 2895 Lee Rd., Cleveland, Ohio
- 8 AFL Alarvin G. Barrick, 2509 Ardlen, West Va.
- 8 AFT Heights Radio Club, 2500 Derbyshire St., Cleveland Heights, Ohio
- 8 AGB Gomer L. Davies, 730 Wyrning St., Seranton, Pa.
- 8 AGB Arthur Schaulder, 3483 W. 9th St., Detroit, Mich.
- 8 AGF M. Crosby Bartlett, 236 Burns Ave., Detroit, Mich.
- 8 AG Albert E. Hughes, 32 Vaughn Ave., Wheatland, Pa.
- 8 AGD Frederick C. Fay, 9 N. 4th St., Ilion, N. Y.
- 8 AGQ Wm. H. Keister, Oakmont High School, 5th and 14th Aves., Oakmont, Pa.
- 8 AHP Richard H. Kolks, 2373 Flora Ave., Cincinnati, Ohio
- 8 AHZ David Bear, Jr., 16 Forbes Terrace, Pittsburgh, Pa.
- 8 AII* C. Bosworth Johnson, 1526 Quarter St., Charleston, West Va.
- 8 AIV Elmer W. Wolf, 4394 Pearl St., Cleveland, Ohio
- 8 AIB Louis G. Ward, 519 No. Mantua St., Kent, Ohio
- 8 AIG Harold R. Susenmler, 529 Penna. Ave., Elmira, N. Y.
- 8 AII* Raynal W. Andrews, 978 Harvard Ave., Rochester, N. Y.
- 8 AII* Francis E. Coyne, 1852 E. 73rd St., Cleveland, Ohio
- 8 AK Robt. Hunt, 1610 Greenon Rd., Cambridge, Ohio
- 8 AKA Paul E. Rice, R. F. D. No. 3, Uhrichsville, Ohio
- 8 AKN Henry S. Hixby, 194 Jamestown St., Towanda, N. Y.
- 8 AL Wilson E. Weckel, 515 South Ave., N. W., Canton, O.
- 8 AMF* Harry E. Hewitt, 1033 Orange Ave., Youngstown, O.
- 8 AMR B. H. Hudoff, 49 Greenfield St., Buffalo, N. Y.
- 8 AMG Albert B. Fuller, 238 Goodman St., Rochester, N. Y.
- 8 AMU J. K. Sterrett, 1001 Walnut St., Erie, Pa.
- 8 AN Earl Niskanen, 12043 Cloverland Blvd., Detroit, Mich.
- 8 ANC Tom Melman, 1828 Ansel Rd., Cleveland, Ohio
- 8 AND* Frank D. Fallain, Police Bldg., Beach Sp. Flint, Mich.
- 8 ANB Edwin W. Tarbox, 536 Lima St., Findlay, Ohio
- 8 AOB Sherwood J. Beutler, 238 Loring Ave., Buffalo, N. Y.
- 8 AO* Robt. B. Tabbot, R. F. D. No. 4, Box 49, Island Ave., Toledo, Ohio
- 8 AOR James D. Bobb, 207 Allen Blvd., Kalamazoo, Mich.
- 8 AIP Stanley Rieaman, 1404 Mariss Ave., Cincinnati, Ohio
- 8 AIQ Archie W. Pauli, Jr., Hamilton Ave., Wheeling, W. Va.
- 8 AIO Olive B. Meredith, 129 Broadwing Ave., Cazenovia, N. Y.
- 8 ARB Richard S. Tener, 129 Broadwing Ave., Cazenovia, N. Y.
- 8 ARF Raymond F. Schilling, 227 Franklin St., Marietta, Ohio
- 8 ARL Theo. R. Carter, 1722 Whitney Ave., Niagara Falls, N. Y.
- 8 ARV Ross Moorhead, R. F. D. No. 69, Findlay, Ohio
- 8 ARW Joseph J. Elias, 103 Main St., W. Lansing, Mich.
- 8 AS Albert Pocheion, Jr., 533 Grand Blvd. E., Detroit, Mich.
- 8 ASE Samuel E. Pence, 12 Woodrest Terrace, Woodlawn, Wheeling, W. Va.
- 8 ASV Harold C. Kaufmann, 745 A St., Lorain, Ohio
- 8 ATT Geo. W. Sawyer, 356 Hazelwood St., Rochester, N. Y.
- 8 AUV John Raskaus, 1537 Broadway Ave., N. W., Rapids, Mich.
- 8 AVG Robt. C. Bohannan, 1816 Devon Rd., Columbus, O.
- 8 AVI Albion Z. Blair, 707 Walter St., Portsmouth, Ohio
- 8 AVW J. Donald Maus, 852 S. Clinton St., Defiance, Ohio
- 8 AVZ Maurice M. Collins, Fourth St., Lewiston, N. Y.
- 8 AWA Clinton A. Petry, 111 Hilltop Ave., McKinley, Dayton, Ohio
- 8 AVW* Thomas W. Bingham, 3313 Observatory Rd., Cincinnati, Ohio
- 8 AVX Victor D. Gettys, 130 N. Park St., Warren, Ohio
- 8 AXZ (Holding call)
- 8 AXI Robt. G. McHugh, 34 Taylor Ave., Binghamton, N. Y.
- 8 AXH Thos. Clark Galbreath, 311 East Main St., Endicott, N. Y.
- 8 AYY Joseph Heferle, 1515 Kelsey St., Toledo, Ohio
- 8 AYZ Edw. H. Tremains, 733 So. St., Findlay, Ohio

8 AYW Wm. B. Scott...733 Eastan Ave., Pittsburgh, Pa.
 8 AZH Levon R. McDonald, 240 So. Park St., Owosso, Mich.
 8 AZI (Not assigned)
 8 AZJ Ira J. Treest, 563 Buckingham St., Columbus, Ohio
 8 AZK Arthur C. Boardman, 123 Vermont St., Miami, N. Y.
 8 BAH Harry Tommonds, 1748 Wacker Ave., Lakewood, Ohio
 8 BAL Wm. K. Killensmith, 3317 Waltham Ave.,
 Dormont, Pa.
 8 BHC Edward C. Enderle, 272 So. 22nd St., Columbus, Ohio
 8 BBF (Called)
 8 BCC Hacedell
 8 BCN Ira D. Taber, 829 Genesee St., Utica, N. Y.
 8 BCN David Younger, 1922 Rosemont Rd.,
 East Cleveland, Ohio
 8 BCX* H. C. Urschel, 244 N. Enterprise St.,
 Bowling Green, Ohio
 8 BDG Frank R. Day, 102 Center Ave., Schuylkill Haven, Pa.
 8 BDQ Clarence B. Maultz, 742 Mentor Ave., Painesville, Pa.
 8 BEJ Ray M. White, North Clay St., Millersburg, Ohio
 8 BFP Not assigned
 8 BET Eugene E. Aiden, 9 1/2 W. Union St., Box 82,
 Athens, Ohio
 8 BEX Wm. A. Wright, 226 Cornell Ave., Dayton, Ohio
 8 BEY Howard R. Stevenson, 8341 Mack Ave., Detroit, Mich.
 8 BFD Amos C. Hosteler, 416 Waltham St.,
 Montefontaine, Ohio
 8 BFG Edward Roberts, 83 Genesee St., Skaneateles, N. Y.
 8 BFI Edward J. Richards, 25 Locust Ave.,
 Morgantown, West Va.
 8 BGA Wm. Siegman, 147 Farum Ave., Royal Oak, Mich.
 8 BQH Donald T. Pake, 1304 Granger Ave., Ann Arbor, Mich.
 8 BKH Geo. G. Braendle, 740 Bagley Ave.,
 East Grand Rapids, Mich.
 8 BHI Lynn Erratt, 325 N. Huron St., Cheboygan, Mich.
 8 BID Allan H. Smith, 351 W. Fayette Ave.,
 Syracuse, N. Y.
 8 BIS Alvin D. Barkeloe, 183 Henry St., DeWavere, Ohio
 8 BIT Howard G. Jamison, 147 Mayflower St.,
 Pittsburgh, Pa.
 8 BJM Brandt Enos, 404 Crest Ave., Charleroi, Pa.
 8 BJU Ralph P. Huddy, 109 Dorchester Ave.,
 Thos. W. Scott, 401 E. Cedar Ave.,
 Harold Knubbe, 2514 Chalmers Ave.,
 Wm. M. Butler, 1011 Race St.,
 McKenzie Cottrill, 120 LaGrange St.,
 BKJ Frank L. Kuttler, 321 Main St.,
 BKL Joseph J. Krompa, 2731 Newark St.,
 Raymond W. Sears, 2721 Beatty St.,
 BKO John C. Hopkins, 201 Wilson Ave.,
 BKR H. K. Kunkle, 326 Columbia St.,
 BKY Albert Silvers, 1323 Pittsburgh,
 John N. Greene, 25 Livingston St.,
 Geo. E. Munschauer, 27 Dodge St.,
 HLA H. A. F. Drdas, 1186 E. 71st St.,
 BLS Frederick F. Branch, 74 Front St.,
 BLV Ray E. Pattington, R. F. D. No. 2,
 Meade G. Pattington, R. F. D. No. 2,
 BMB Frank M. Sarver, 2842 Stanton Ave.,
 Fred F. Pacholke, 2 F. Wells Hill, E.
 Donald R. McCallister, 209 Hamilton,
 Kenneth B. McAlpine, 61 Parkwood Ave.,
 Kenmore, N. Y.
 8 BMQ Robt. B. Fairchild, Portville, N. Y.
 8 BMJ John S. Hunter, 807 Crawford St.,
 8 BMX Claude B. Davis, 13 N. Pine St.,
 8 BMZ Yates M. Hoag, 213 N. Cooper St.,
 8 BNA Albert P. Parker, 201 N. Main St.,
 8 BND Elvin R. Van Arsdale, 119 Giles St.,
 8 BNF Charles E. Maynard, 138 So. St.,
 8 BNO Thomas A. Hendricks, 2911 Somerset St.,
 Heights, Ohio
 8 BNQ Edward Dempsey, 211 W. First St.,
 8 BNR Alfred Tucker, 4732 Franklin Ave.,
 8 BNS Charles E. Sichel, 1540 Arch St.,
 8 BNU Henry Kuehlemeler, 1206 Fischer Ave.,
 8 BVF Clarence Vogel, 129 S. Van Lear St.,
 8 BNW John Hoop, 413 11th St.,
 8 BNK Ernest J. Schulz, 1311 Colburn St.,
 8 BOD Not assigned
 8 BOM Phillip Levison, 10022 Hampden Ave.,
 8 BOQ Geo. Paterhohn, 2128 W. 105th St.,
 8 BOU Henry L. Mueller, Box 305, Myomnd St.,
 Springdale, Pa.
 8 BP C. G. Gutman, 3584 E. 120th St.,
 Andrew Nosker, 1461 Western Ave.,
 8 BPE Paul Learn, 76 Slocum St.,
 8 BPV Wm. Roy McShaffrey, 23 Penn Ave.,
 8 BPY Charles M. Schindler, 623 Penn Ave.,
 8 BQD Milton Mackey, R. F. D. No. 2,
 8 BQE Daniel H. Ammon, 1609 Dickson Ave.,
 8 BRH R. G. Hills, 106 Morgan St.,
 8 BRC Harry S. Nichols, 421 Boston St.,
 8 BRH Wm. E. Nichols, 421 Boston St.,
 8 BRJ Herbert W. Haberl, 35 Haldane Ave.,
 8 BRQ Edw. Steiner, 8873 Buhl St.,
 8 BTK Edwin A. Link, Jr., 31 Belmont Ave.,
 Birmingham, N. Y.
 8 BU* F. B. Knutti, 669 Spruce St.,
 8 BUG John S. Scott, 1272 State St.,
 8 BUN Wallace M. Jennings, 41 Main St.,
 8 BUU Malcolm Brown, 567 Bird Ave.,
 8 BVF Geo. M. Clasper, 1200 N. Main St.,
 8 BVT Barnett H. Baskin, 1825 Brightwood Ave.,
 Battle Creek, Ohio
 8 BVU Lehr Hackenberger, 1104 N. Main St.,
 8 BWH Chas. A. Qulek, 316 Green St.,
 8 BWO Harry S. Curry, 330 13th St.,
 8 BWR I. Dale Ball, R. F. D. No. 4, Box 76,
 Battle Creek, Mich.
 8 BWV Petroleum Telephone Co., 1 Sycamore St.,
 8 BWY Elmer W. Reeve, 1529 Broadway St.,
 8 BXA Edwin Esslinger, 601 W. Madison St.,
 Ann Arbor, Mich.
 8 BXG Not assigned
 8 BXN Richard G. McClure, 413 Williams Ave.,
 8 BXP Donald A. Grant, 56 Barelay St.,
 8 BXT Leland F. Fuller, 83 W. Main St.,
 8 BYC Unassigned
 8 BYG Harold W. Waters, 208 State St.,
 8 BYJ Nevin L. Straub, 1045 Sunday St.,
 8 BYR Clare Wm. Davis, 618 W. Jefferson St.,
 Grand Ledge, Mich.
 8 CCJ R. T. Schlandecker, 450 W. 4th St.,
 8 CCS Carlton E. Bailey, 412 11th St.,
 8 CD Claire White, 115 Mechanic St.,
 8 CDC John T. Galey, 363 Third St.,
 8 CDE Paul F. McGinley, 413 E. 6th Ave.,
 8 CDK Henry Calderhead, 37 8th St.,
 8 CDN Rufus T. Washburn, Fourth St.,
 8 CDQ Frank L. Wagner, 38 N. Patriot St.,
 8 CDR Frederick Fichtel, 64 Anichinorlo St.,
 8 CEH Thomas Scau, 317 Third St.,
 8 CEO Arthur McAulay, 309 Third St.,

8 CIG J. S. & E. Perry, Locust Lodge & Laurel Bank Ave.,
 Deposit, N. Y.
 8 CIX Unassigned
 8 CKE D. L. Dean, R. F. D. No. 4, Birmingham, Mich.
 8 CKB W. Nelson, 818 Sheldon Ave., Grand Haven, Mich.
 8 CFC S. Fridrick, 421 Ohio St., Midland, Pa.
 8 CGF R. Bunke, 123 Walke St., East St. Johns, Mich.
 8 CHJ O. J. Pettit, Seminary St., Wilson, N. Y.
 8 CHN O. J. Benedict, 529 Axtell St., Kalamazoo, Mich.
 8 CHC G. E. Jones, 1144 Academy St., Scranton, Pa.
 8 CKN D. P. Greene, 204 Union St., Hamburg, N. Y.
 8 CL S. B. Sippel, 204 Union St., Hamburg, N. Y.
 8 CLJ A. C. Zurbuch, 179 E. Center St., Akron, Ohio
 8 CMA Unassigned
 8 COF E. W. Briarley, 1738 E. 90th St., Cleveland, Ohio
 8 CBD B. Larzch, 13 Eureka St., Pittsburgh, Pa.
 8 CSL Unassigned
 8 CSR C. J. Anderson, 422 3rd St., Marietta, Ohio
 8 CST Marion Law, 1421 Donald St., Kenmore, Ohio
 8 CAW Unassigned
 8 CSY Unassigned
 8 CNP W. P. Brater, 3833 Glenmore Ave., Cheviot, Ohio
 8 CNS L. J. Lese, E. Liberty, Ohio
 8 COP Unassigned
 8 CQC W. Whitmore, 47 Vick Park E., Rochester, N. Y.
 8 CQF J. F. Hurley, 514 Buckeye St., Hamilton, Ohio
 8 CWF K. W. Kelwin Kearney, 3760 W. Philadelphia St.,
 Detroit, Mich.
 8 CWF R. M. Moore, 525 W. Main St., Bellevue, Ohio
 8 CWO E. Woodhouse, 406 Alameda St., Sabina, Ohio
 8 CZU C. Belsky, 2705 Hastings St., Detroit, Mich.
 8 CZW W. Wilson, 335 Hoyt St., Buffalo, N. Y.
 8 DGL Holding this call
 8 DGT W. Russell, 11907 Thornwood Ave., Cleveland, Ohio
 8 DGZ Unassigned
 8 DHK John H. Hackenberg, 1321 Franklin Ave.,
 Columbus, Ohio
 8 DCR* Donald Starr, 119 Sycamore St., Steubenville, Ohio
 8 DHE Courtney H. Wenger, 822 Gilmore Ave., Canton, Ohio
 8 DHI Orson M. Buch, 728 7th St., Niagara Falls, N. Y.
 8 DHS Eugene G. Livingston, 423 Putnam St., Findlay, Ohio
 8 DIX Edward Perry, Locust Lodge Laurel Bank Ave.,
 Deposit, N. Y.
 8 DIV Lyle Dusenbury, 216 Liberty St., Pontiac, Mich.
 8 DIY* Lesie Leach, 406 Alameda St., Sabina, Ohio
 8 DJS Tremain M. Hughes, 542 Seneca St., Middletown, Ohio
 8 DMN D. Herschkowitz, 7834 Melrose Ave., Detroit, Mich.
 8 DMT Alfred H. Van Norden, 109 Hudson St.,
 South Glens Falls, N. Y.
 8 DSR Donald Starr, 1119 Sycamore St., Steubenville, Ohio

CHANGES

8 RL Birmingham High School, Birmingham, Mich.
 8 RLB Wm. B. Barnes, 3321 Blanchard St., Toledo, Ohio
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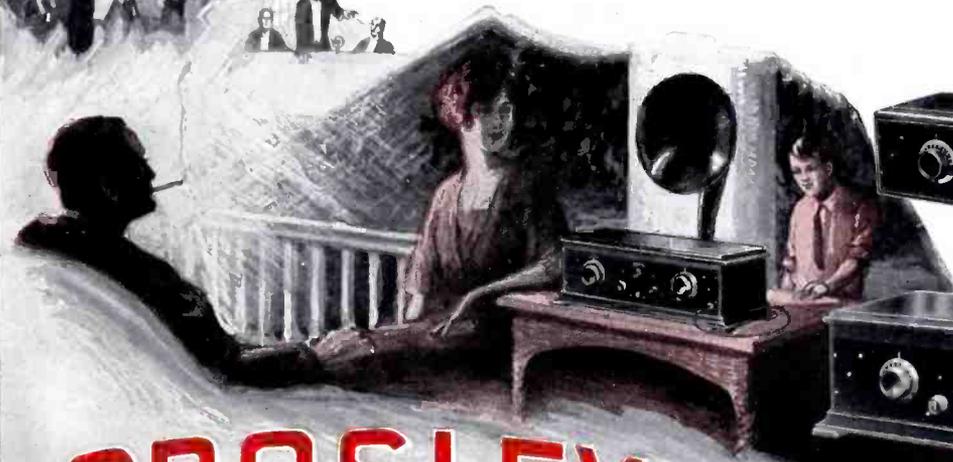
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