APRIL. 1925 25 CENTS

Wireless Age

The Radio Magazine

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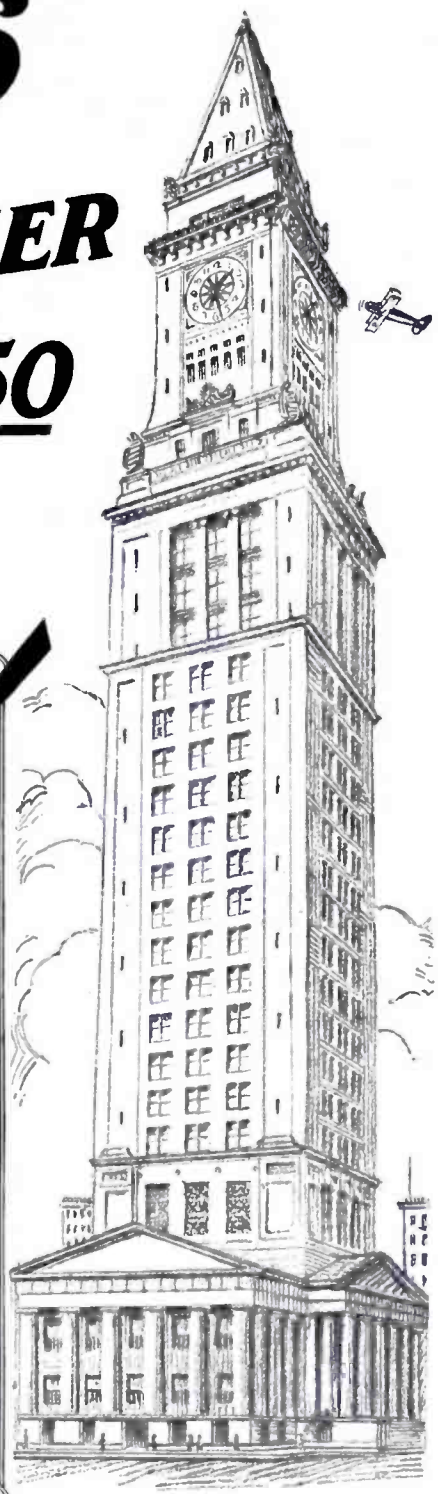

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Worlds Greatest Loud Speaker Value

Wireless Age

The Radio Magazine

Vol. XII No. 7

April 1925—Contents

Your Authors

ANN LORD, (Chicago Broadcasts) is a newspaper, editorial and magazine writer whose articles have appeared throughout the country. She was educated at the University of Chicago, and now resides in Chicago. Since she has definitely launched into magazine work during the last fifteen years we have seen many good short stories from her pen. The present article covers the Chicago broadcast stations quite thoroughly and is presented in a style so that you feel that you have actually been present to experience what Ann Lord writes about. Wireless Age readers will undoubtedly desire to read some of her future articles.

OTTO WILSON (The First Radio Inauguration) is a new author to Wireless Age readers. He is a feature writer and Washington correspondent for newspapers and several magazines. His work also includes research in compiling statistical reports which form the basis of feature articles that are of particular value in spreading information on business and industrial matters.

R. E. BOGARDUS (Super-DX Hi-F. Receiver) started in radio when it was "wireless." His first product was a spark coil set made to "work" a friend in the next block, in the days of E. I. Co., Duck and Bunnell. As commercial radio operator he went through four interesting experiences consisting of two collisions and a fire at sea, and a trip ashore which included the ship. The Captain and "Spark's" couldn't quite agree about the SOS on one of these occasions. Mr. Bogardus is now Instructor in the Radio Institute of America where he experiments extensively in short wave reception, and as a result the present article. He also operates WQAO, the Calvary Baptist Church Broadcast Station, and in spare moments writes technical articles. He eats and sleeps occasionally.

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"Quality Goods for Quality Readers"

Editorial Chat

IN BYGONE days by coach or buck-board hauled by untamed mustang through the wild woodlands of the Alleghanies; by barge across the inland waters, or by brigantine o'er the sea to southern ports and then relayed by pirogue and raft up the Mississippi Valley; westward bound by Prairie Schooner or the fast moving Stage Coach, the news of the inauguration of our early Presidents came to us. Since that day marvels have been many, but none greater than the marvel of President Coolidge's Inauguration. Before those on the outskirts of the audience at Capitol Hill heard the spoken word, millions scattered to the farthest reaches of our fair land, by means of radio, had heard each pronouncement in the recent inaugural ceremonies.

The story of the "First Radio Inauguration" is presented to our readers this month so that you may know in every detail the extent of this marvelous project.

International Language Problem

A study of the efforts and activities made by mankind to establish a common tongue is of vital interest to the present generation, especially those who have to do with radio. Now, more than ever before is there a pressing need, not alone in Continental Europe but throughout the world, for a common language. "Ail" in this issue is full of information on the subject presented by Dr. Talmey, who is eminently qualified to speak.

Technical

WIRELESS AGE this month is rich in technical material—you'll agree to that statement after reading "Super-DX Hi-F. Receiver," "Horns," "Direct Coupled Regenerative R. F. Receiver," "Experiments with 3-Circuit Tuners," "Straight Line Condensers," "How Radio Is Serving Henry Ford" and the story of "Oliver Heaviside."

General

To acquaint you with the worth-while present day happenings in radio WIRELESS AGE comes to you this month with such stories as "Radio in Europe," "Chicago Broadcasts," "Charting the Ice Fields," "Artists Out of the West," "Where the Great White Way Begins,"and "World Wide News."

A fiction story by William West Winter will give you a laugh, and so will Ed Randall in his "Broadcast Impressions," and our Cross Word Contest with winners for February, solution for March, and a new one to be solved, will be to your liking—perhaps you'll think so well of this issue you'll enjoy showing it to your friends.

—THE EDITOR.

Yes, You Can Log, *Sometimes*

An expert, with a sharp eye, a strong light, and a perfectly steady hand may be able to tune to even a half a degree of accuracy, using ordinary dials.

But that's far too coarse!

Any modern, sharp-tuning set should be tuned to at least an eighth of a degree of accuracy. Yes! Tuned and logged!

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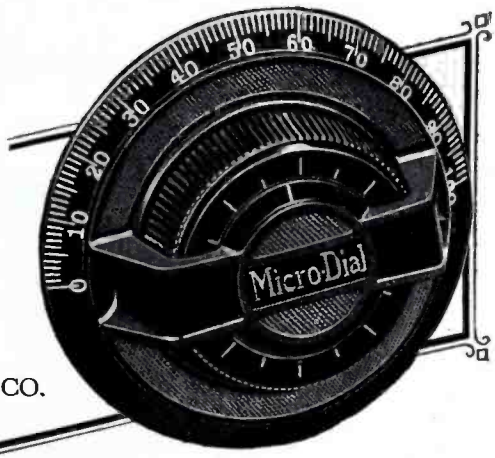

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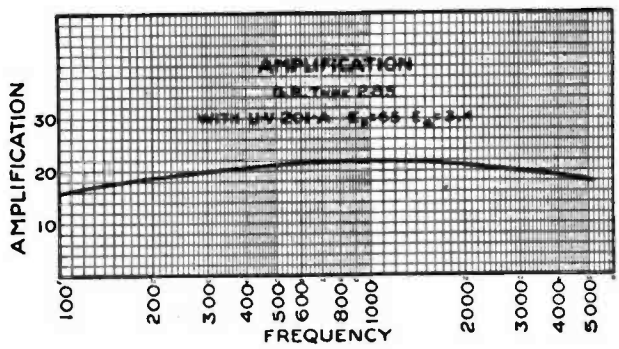

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Higher Amplification over the Entire Audio Range

THE marked superiority of the Type 285 Transformer is evident by its high and uniform amplification over the entire audio range. High amplification is attained by a turns ratio of 6:1. Ordinarily such high a ratio would lower the primary impedance and distort the lower notes, while the higher notes would be muffled or lost entirely by the effect of distributed capacity.

To offset these tendencies the core of the Type 285 Transformer is made of specially selected steel of high permeability, and the turns of the primary and secondary coils are increased to give a higher impedance and turns ratio. Consequently both ends of the curve are sustained, so that greater volume with better tone quality is the result.

More Natural Reproduction of Speech and Music

TONES of high and low pitch, whether instrumental or vocal, in combination or individually, are reproduced with a clarity that pleases the most critical radio listener.

So great is the amplification produced by the Type 285 Transformer that one stage using a Type 285 gives a volume that is approximately equivalent to that produced by two stages using any average transformers. Seldom is more than one Type 285 necessary to produce good loud-speaker volume with a quality of tone never before realized in radio reception.

If you want the best there is in transformer design, the General Radio Type 285 should be your choice.

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GENERAL RADIO Co

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"Quality Goods for Quality Readers"

VOLUME 12

Wireless Age
The Radio Magazine

NUMBER 7

Third International Ilo Congress at Cassell, Germany in 1923

AIL

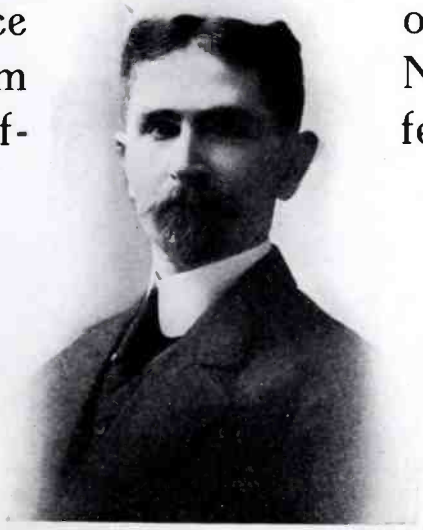
By Dr. Max Talmey

Philologist and Doctor of Medicine and Ophthalmology

The Auxiliary International Language problem as related to radio—Theory and Practice How Volapük, Idiom and Ilo have affected the problem Historical review—of various systems—Neutral, Esperanto

THE American radio enthusiast is delighted when he can "get" a station of a remote country. But of what use is it to listen to a speech sent out by radio from Stockholm if the listener does not understand Swedish? All he hears is a confused mass of unintelligible sounds. For radio to make itself understood at the same time in all receiving stations that its power can reach, one language understood in all of them at once, without any intermediary, is an undeniable requisite.

Radio will never attain the highest degree of usefulness in international intercourse as long as all nations have not agreed to adopt one and the same medium of intercommunication by speech. It is also a foregone conclusion that they will never concur in selecting as this medium, one of the living languages, for thereby one nation would gain immense advantages over all the others, especially in commerce. The Auxiliary International Language (AIL) must be strictly neutral, favoring no nation. Moreover, a living language is much too difficult to acquire, and utmost facility is an indispensable requirement of the Auxiliary International Language. Perfect neutrality would be obtained through the use of one of the dead languages, but these, too, are excluded because of the great difficulty to learn them and because of their inadaptability to modern conditions. The only alternative left therefore is a constructed language, to be adopted officially by all nations.



Dr. Max Talmey, author of "Logical Shape of the Auxiliary International Language" and of many other works on the problem of the AIL

A short historical review of the attempts to create a constructed language will give the reader a better insight into the Auxiliary International Language problem. Their history dates back 300 years, and during that time about 250 projects have been offered as solutions of the problem. They reveal a gradual evolution from crude impractical devices in the beginning to more or less perfect systems in the last 50 years. Dr. L. Couturat, the foremost authority on the problem (Histoire de la Langue Universelle), divides all these projects very appropriately into three classes: First, systems which disregard the natural languages completely and use only arbitrary elements, i.e., words and affixes; second, systems consisting both of natural and arbitrary elements; third, systems taking almost all their elements from the natural languages.

Dr. Ignatz Hermann (sitting) of Graz, Austria, and Dr. Sten Liliedahl of Stockholm, Sweden, pioneers of Ilo, members of the Akademio

From the beginning of that period to our time the question of a constructed language in general, and those projects offered as solutions in particular, have occupied more or less the minds of some of the greatest thinkers and scholars, such as Francis Bacon, Descartes, Leibnitz, Voltaire, Alexander V. Humboldt, Jacob V. Grimm, Victor Hugo, H. Schuchardt, Max Müller, Wilhelm Ostwald, Otto Jespersen, etc.

No project of the first one of the above mentioned three classes has attained any practical success. The first system to be put to extensive use and to gain wide publicity was Volapük, published in 1880 by the German priest Schleyer. It spread rapidly in all civilized countries and was extensively used in writing and speaking. Numerous books and magazines were printed in it, and at several large congresses it was spoken exclusively. The number of those practicing Volapük was estimated in 1889 at one million. Its decline began in the same year, however, the cause being intrinsic linguistic defects which became apparent through actual use. In 1893 the Vol.-Academy gave up Schleyer's system and devised an entirely different one, called Idiom Neutral. Although the latter was free from the shortcomings of its predecessor, it had no practical success. Volapük has the inestimable merit of having furnished for the first time the experimental proof, on a large scale, that a constructed language for writing and speaking is possible.

Dr. L. B. Woodcock of Scranton, Pa. He is one of the best connoisseurs of improved Ilo which he approves unqualifiedly, putting it into practice in correspondence with his Ilo friends

This proof was brought forth for the second time by Esperanto which was published in 1887 by the Polish physician Dr. L. L. Zamenhof. Its progress was very slow until 1896. In that year Marquis L. de Beaufront began to take interest in it and through his efforts its spread in France and then in many other countries. The number of practical Esperantists was estimated in 1903 at 50,000 in all countries, and it increased greatly in the following three or four years. In the United States Zamenhof's project was almost unknown until 1905. At that time the writer became acquainted with it and after long search he succeeded in finding in New York City half a dozen people who knew something about it. With their help he founded the New York Esperanto Society. Soon afterwards he published the first complete English text book of Esperanto and was elected as a member of the International Linguistic Committee for Esperanto (Lingva Komitato). All this was prominently reported in daily papers and magazines and soon other Esperanto clubs were formed in several large cities of the United States.

Practical use revealed substantial defects in Esperanto as had happened in

the use of Volapük, and able students, including Dr. Zamenhof, became convinced of the necessity of radical changes in the system. These changes however, could not be carried out owing to the resistance of certain interests in control of the propaganda for Esperanto. The consequence was that the best connoisseurs of the system, and a great many others, gave it up and adopted the language of the "International Delegation for the Adoption of an AIL." The New York Esperanto Society was one of the first clubs to adopt that language in 1908 and to change its name to the New York Ilo Society.

Every one of the projects considered until now, Idiom Neutral excepted, was the creation of one author who, as a rule, was not even a competent philologist. Zamenhof, for instance, was a young college student in his teens when he constructed his system. The "Language of the Delegation" (LD), however, was created by a body of scientists of international reputation. A Committee of the Delegation composed of eminent linguists and other scholars convened in October, 1907, and examined a great many systems as to their fitness for the role of the AIL. All of them were found inadequate. Included among them were Neutral, Esperanto, and a project, very similar to the latter, presented for examination by an author under the psuedonym Ido. It became known later that this author was Marquis de Beaufront. The Committee decided to recommend the construction of a new language on the basis of Esperanto and the project of Ido. This Committee instituted a Permanent Commission for that purpose, and adjourned after having held eighteen sittings. The Commission soon afterwards tried to bring about an understanding with the Esperanto leaders, but had no success. Thereupon it went its own way, elaborated a new language in conformity with the recommendations of the Committee, and published an official grammar and dictionaries in the spring of 1908. It is entirely erroneous to call this new language reformed Esperanto. The decision of the Committee had received a wording favorable to Zamenhof's project merely to conciliate the great number of those putting implicit confidence in Esperanto. The new language might be called more justly reformed Neutral, as admitted expressly by Dr. Couturat, the leading spirit of the Commission, in the statement which he attributes to Prof. Jespersen (Progr. V, p. 460): "One has already done too great a favor to Esperanto by taking it—rather than Neutral—as the basis of the new language which can also be called reformed Neutral."

Dr. Louis Couturat, French mathematician and philosopher, foremost authority on the Auxiliary International Language Problem

The new langauge was at first called Ilo. This was a reasonable, nonvisionary, impartial name, signifying merely International Language. But about two years later, in 1909, the Union formed for purposes of propaganda adopted de Beaufront's pseudonym Ido as the name of the language. Recently however, the writer has revived the original name Ilo which is now growing more and more in favor, especially in this country.

When criticism began to pour in upon Esperanto its influential leaders tried to obviate it by the dogma of inviolability: "Esperanto is inviolable, not subject to criticism, change, or reform; it is the living language of a living people—*"vivanta lingvo de vivanta popolo."* Here every argument had to stop, for a living language must, indeed, not be touched. Owing to this preposterous dogma Esperanto deteriorated through its intrinsic faults to the extent of being beyond correction. Here is not the place to expose those defects. The writer has done this in other works.

Entirely different was the policy of the Commission for Ilo. It founded an official organ, Progreso, and an Academy, and invited criticism from all sides to be published in that magazine or presented to the Academy. In this way Ilo has been brought to a high

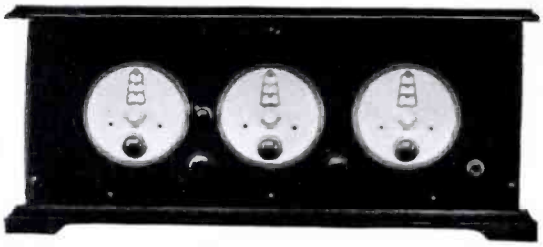
(*Turn to page* 32)

Charter members of the first Auxiliary International Language club in the United States. Reading from left to right the members are, in the upper row: J. Stedman, Stephen W. Travis, Charles S. Classen, Joseph Kubik; in the lower row: Alexander Duff, Dr. Max Talmey, C. P. Somerby. The club was founded early in 1906 as the New York Esperanto Society and its first president was Dr. Talmey. In 1908 the society gave up Esperanto and changed its name to the New York Ilo Society

Super-DX Hi-F. Receiver

By R. E. Bogardus and R. A. Bradley

Each meter of wave length is separated 10 degrees on the dials with a range of 40 to 500 meters!



2BW works British, Hungarian, French, Danish, Cuban, Italian stations and the Rice Expedition in the Amazon, South America, using this set for reception

I HAVE found, during many years of wireless reception, that invariably, when a weak signal was being read there always came a splash of static or some other signal that always just made enough interference to kill the one signal desired. That usually caused a slight disturbance in my manner and usually the first person that spoke to me afterward wondered what had happened to cause such an outburst of disagreeableness. Well, who wouldn't when we turn out the lights and hold our breath in order to copy those elusive signals. Even the scratch of a pencil made trouble at times. Is it not, therefore, natural to look around for some method of boosting those weak signals efficiently? We looked and looked—worked and worked, but somehow we always just missed it or were just beaten to it. We were still without that simplicity that is so necessary in telegraph work, especially on waves used by the amateur over the enormous space of a couple of hundred miles.

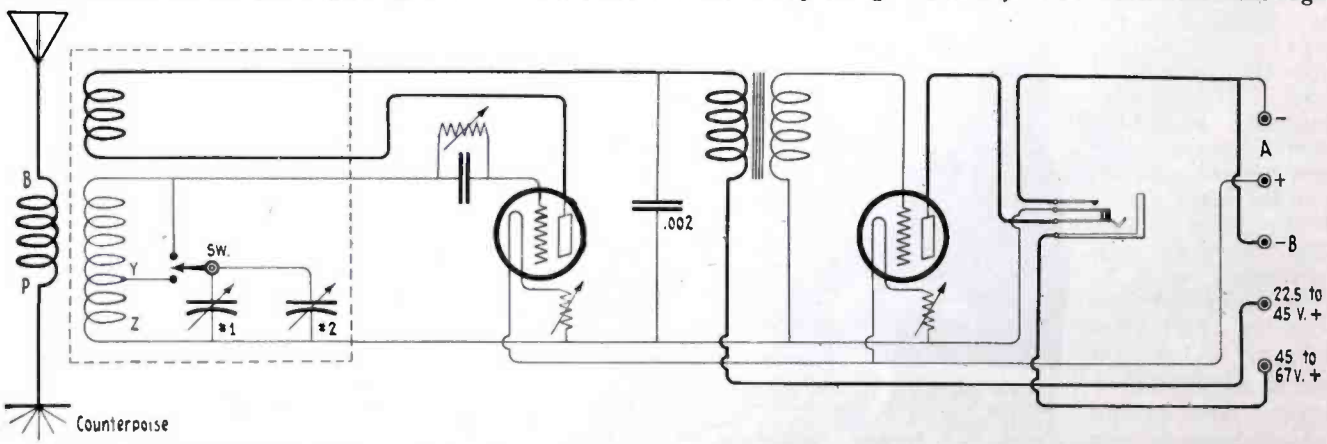
Then broadcasting came along with the result that better apparatus has been produced, most of which efficiently does what is requested of it, but still there remains the code work which apparently insists on being very weak. So—with the broadcast field well taken up by high powered sets it became too crowded and down the wavelength scale came the lower powered sets. On these lower wave lengths our sets just would not efficiently tune in the signals and remain stable. We hunted for better condensers and finally got them—then coils and got them also—but as much as we improved, just so much more, and many more weak signals we heard. We looked and worked, but it was elusive. It had been a subject of long experimentation and, frankly, not one of great success. In fact, the efficiency of a genuinely good broadcast tuner of today leaves little to be desired—at least on waves above 300 meters—but below this point so much was to be desired that I have been spending many, many nights chasing the solution to its den, where capture was possible and eventually accomplished through a hint on an entirely different condition, though the idea needed developments. The idea came from a noted New York amateur, who does not wish his name published, and by the natural sequence of orderly experimentation the results described in this article came into being.

LIST OF MATERIALS

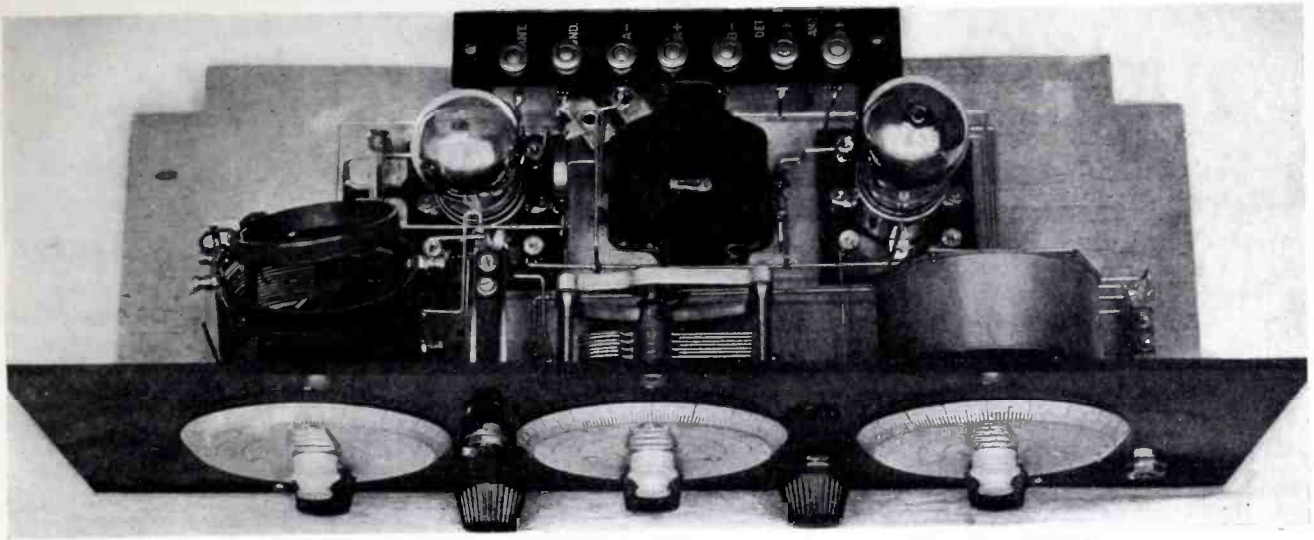
One 7" x 18" x 3/16" Radion Panel.
One Standard Bremer-Tully Tuner.
One .000125 mfd. Bremer-Tully Condenser Low Loss.
One .0005 mfd. Bradleydenser.
Two Howard Sockets.
Two Bradleystats.
One Bradleyleak and grid condenser.
One Carter switch Single Pole Double Throw.
One Pacent Filament Control Jack.
Three Ultravernier Dials.
One Hilco Precision By-pass condenser.
Seven Biding posts, etc.
One Cabinet.

Due to the many and varied conditions existing in the receivers of my readers, I believed it will be best to simply describe as far as possible, my own final work and leave the application of it to the individual. The improved circuit demonstrates the extreme need of increased initial grid voltage on the average detector tube and as finally worked out the circuit proves more efficient the lower the wave length operated upon.

First, I will consider the very short wave band—that of 40-43 meters, as yet hardly noticed except for small bits of scattered use. Then we will cover the medium and extremely popular band of 75-85.6 meters as well as that interesting lower band used by broadcasters. Some very fine programs are relayed on this band without public knowledge because the average receiver will not go below the 300-meter point efficiently. Last but not least the slight



The peculiar way in which the tuning condensers are connected across sections of the secondary coil is the distinctive feature in the circuit diagram



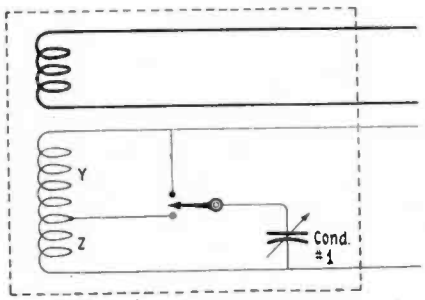
Relationship between instruments is clearly shown. No need for a panel layout with such an illustration

change for the regular broadcasting band will be investigated for those who wish to slip below 300 meters.

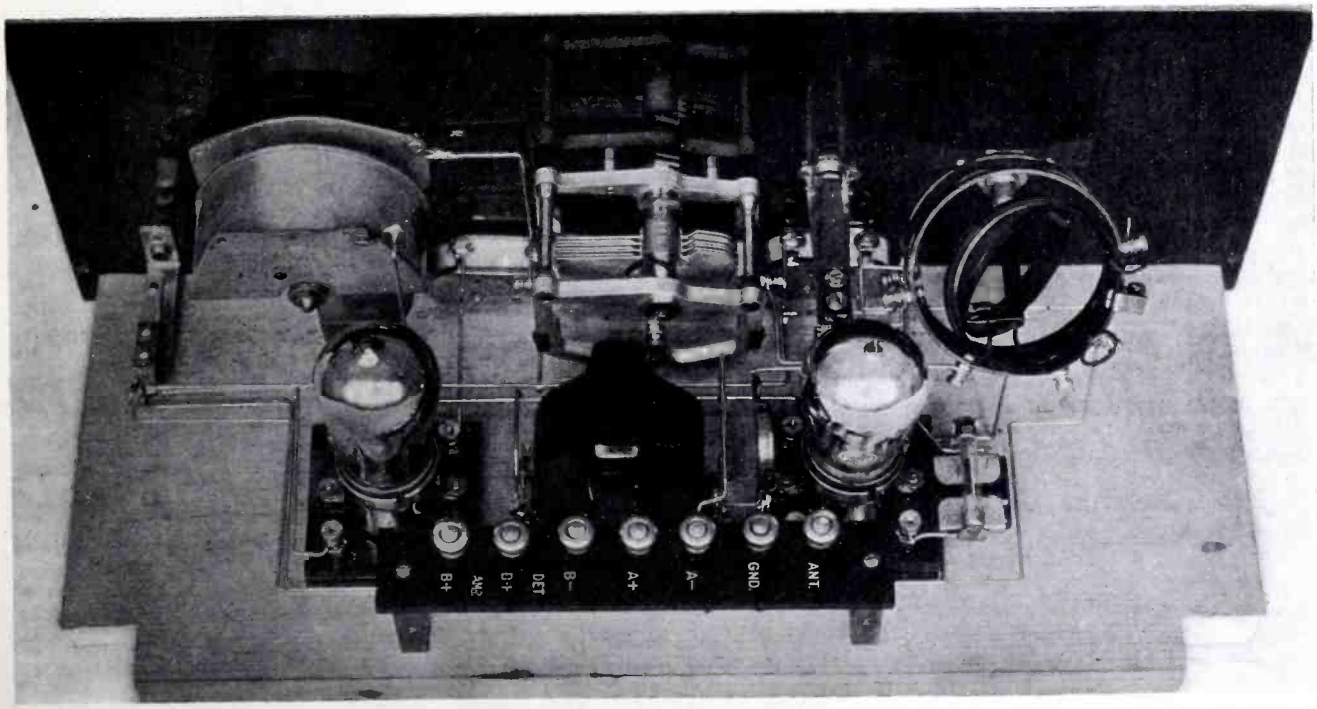
For the very short band, 40-43 meters, figure 1 gives the complete circuit. One step of amplification is shown, but for loud speaker operation an additional step may be added. There is no need of showing that because it is only a repetition of the first step, and all of you have built two-step amplifiers before. The tuner is the main thing in this article.

Figure 1 shows, within the dotted enclosure the main—and the important section. We used a standard Bremer-Tully Short Wave Tuner, normally 50-150 meter range—using a .0005 mfd. condenser with vernier. The standard connection gave the range of approximately 55 to about 280 meters, due to the wiring in the set, the larger condenser and the mutual tuning of the primary circuit. Using ground instead of counterpoise, the lower bands, 40-43 and 75-85 meters were covered by rewinding the secondary with 8 turns of No. 18 double cotton covered wire, which occupied the entire space on the coupler form, being spaced approximately one-eighth inch apart. Now TAP in the center, or the fourth turn (see diagram figure 2). "Y" has four turns and "Z" has four turns. Using the .0005 mfd. condenser, the tuning is now spread over the entire center section of the condenser scale, allowing many degrees per meter, and also—which is equally as important—it is possible to tune on both sides of this range. American amateurs have a 40-43 and 75-85 band, and our foreign friends have waves on both sides of ours, therefore we will not confine our range to our own waves. Note the

(*Turn to page* 51)



This is the way the secondary inductance is tapped



The whole works of this new receiver. Short leads, efficient apparatus and forethought in design and assembly are partly responsible for the records made

Loud-Speaker Horns

Acoustical characteristics of various types described

By Dr. J. P. Minton

WE have now completed our discussion on the loud speaker units, including the vibrating diaphragm. There are a great many factors which tend to limit faithful reproduction of radio broadcast music and speech. As has been pointed out in our discussion of the units of various types and designs, faithfulness of reproduction is considerably affected by the unit itself. The various factors which enter the problem were discussed but briefly. The magnets, the construction of the pole pieces, the air gap separating the pole pieces from the diaphragm, the coils surrounding the pole pieces, the material and rigidity of the unit case, the diaphragm, its diameter, its thickness, the particular material of which it is made, etc., are all problems which enter when we undertake improvement in loud speaker design from the viewpoint of the unit. These problems must be faced and studied, for improvement is intimately tied up with their practical solution.

Various sizes and designs of the conical type of horn experimented with

It must be perfectly clear, therefore, even to the layman and to the purchasing public that highly trained engineers with unusual experimental and theoretical ability must be employed to advance the art of radio reception. There are many, many manufacturers of radio sets, but precious few of them are contributing anything, whatever, to this advancement. They do not possess the trained engineers and scientists, and they do not have the visionary outlook into the future of radio development. These scattered groups of highly trained engineers working under the general direction of far seeing executives are working out the future of radio.

Recently an editor of a radio magazine stated that there were two words in radio which had been greatly overworked. One of these was 'distortion.' As a scientist, perhaps, I am entitled to speak with some authority, at least, on this question. There are only two outstanding questions about radio. First, where is it leading us to, with its associated problems? Second, how can it be improved? That is: "What is the future of radio?" and "How good can it be made?" are our problems. The latter deals largely with distortion in one way or another. The subject of distortion, therefore, will continue for some time to occupy the thoughts of engineers and to force itself upon the "rebellious" editors.

We want to leave, now, the subject of loud speaker units and go over to study together the other part of the loud speaker, namely, the horn. Let us put this question to ourselves, "could the horn be merely a straight pipe attached to the unit?" If we guess yes, then how shall it be designed? If we guess no, then, why not? To answer our question intelligently, we must find out something about the acoustical characteristics of straight pipes.

Since practically everybody, I presume, knows what the pipe organ is and have seen the numerous pipes of the various sizes of which it is constructed, our task is greatly simplified. The long pipes give the low, deep notes, the intermediate pipes give the higher notes and the short pipes give high pitch, flute and piccolo notes. An organ note is not a pure tone, but is a note rich in harmonics, particularly, the low notes. The high notes coming from the short pipes are relatively simple and possess few harmonics or overtones.

When an organ pipe is blown the note is a perfectly definite one. This is due to the fact that the pipe is an acoustical resonator, so to speak, and emphasizes or accentuates the sound in certain frequency regions. This phenomenon is illustrated in figure 1. Suppose, in this example, the pipe is 5 feet long and is a "closed" pipe; that is, it is closed at one end and the other is left open for the outflow of sound. The fundamental frequency of the lowest tone given off by the pipe has a wave length equal to four times the length of a pipe, provided it is closed at one end and opened at the other. (If both ends are open, then twice the length of the pipe gives the wave length of the lowest or fundamental tone). Consequently, the wave length of the lowest tone is 4x5=20 feet. The speed (1,100 feet per second) of sound in air divided by the wave length gives the frequency. Hence, the frequency of this lowest tone is 55 cycles.

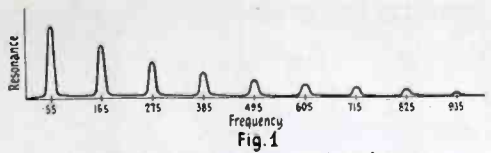


Fig. 1

Series of tones accentuated by stopped pipe 5 feet long.

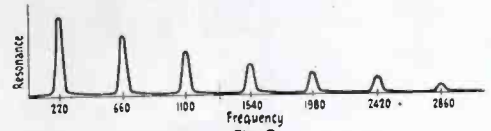


Fig. 2

Series of tones accentuated by stopped pipe 1 foot long.

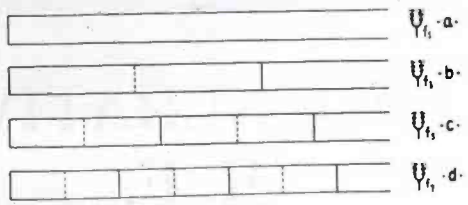


Fig. 3

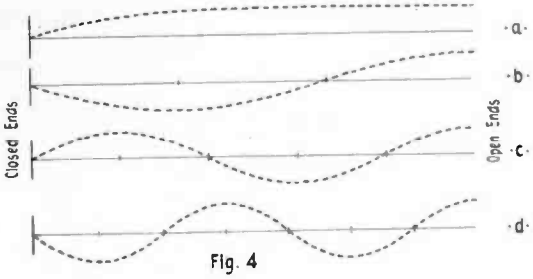
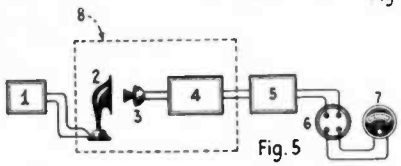


Fig. 4



1 - Vacuum tube oscillator
2 - Loud speaker
3 - Condenser transmitter.
4 - Three stage resistance coupled amplifier.
5 - Two stage resistance coupled amplifier.
6 - Thermo couple to convert AC to DC
7 - Galvanometer to measure AC output current.
8 - Sound proof booth to inclose 2, 3, and 4.

Fig. 5

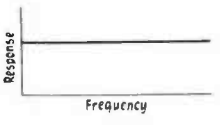


Fig. 6

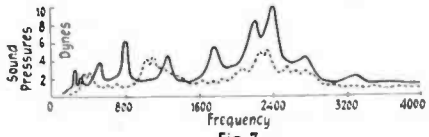


Fig. 7

Operating characteristics of certain pipes

The harmonics are determined by multiplying 55 times 3, 5, 7, 9, 11, etc. That is, there are no even harmonics, the absence of which determine the peculiar or characteristic quality of stopped pipes. Consequently, such a pipe will accentuate all tones in the region of 55, 165, 275, 385, 495, 605, etc., cycles. See figure 1.

If the pipe were a foot long, then the fundamental and overtones are 220, 660, 1100, 1540, 1980, etc., cycles. This state of affairs is illustrated in figure 2. A comparison of these two figures will show at once several important and fundamental points. In order to see the application of these curves to the design of loud speaker horns and to use them to assist in the selection of a desirable loud speaker, it will be necessary to discuss the various points of interest. Such information as we give in connection with pipes is old, of course, and has been known for many, many centuries. Even 175 years ago all the theory of pipes was worked out mathematically by Bernoulli and others of that period.

The two curves for straight pipes show a number of characteristics which may be stated and compared thusly:

1. There are a number of "peaks" or resonant frequencies, as they are called.

2. The peaks are very "sharp" according to the adopted nomenclature.

3. The peaks get smaller and smaller in height as their frequency increases.

4. The sound coming out from the pipes is very strong, or loud, at those frequencies corresponding to the peaks, and weak at all the frequencies between the peaks. That is, the height of the curve at any frequency is proportional to the intensity of the sound at that frequency and we label, therefore, the ordinates (vertical distances) "response."

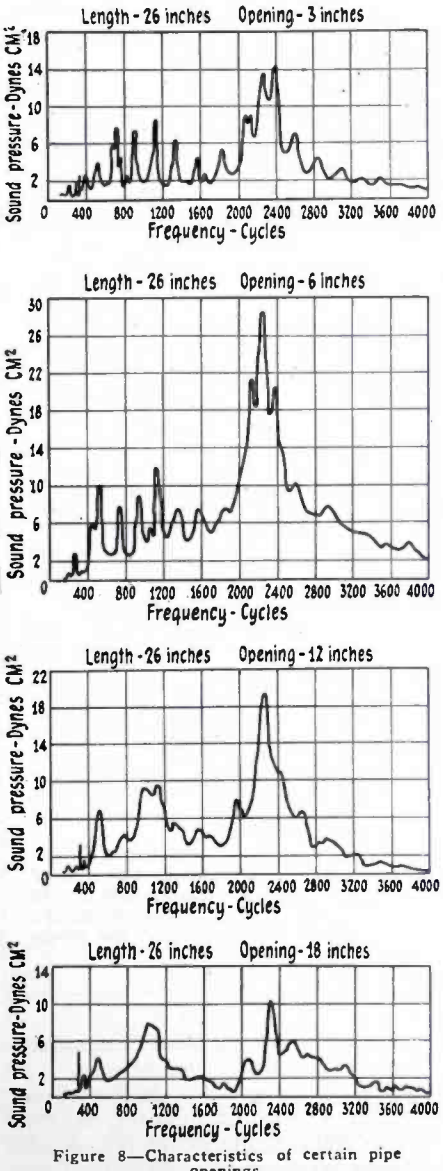


Figure 8—Characteristics of certain pipe openings

While we are on this subject, let us inquire to what extent the pipe (cylindrical resonator) assists or strengthens the sound of the fork. Suppose, for example, I have the following six tuning forks: d sharp (154 complete vibrations per second, called d.v.), c^1 (256 d.v.), g^1 (384 d.v.), a^1 (435 d.v.), c^2 (512 d.v.), g^2 (768 d.v.) and c^3 (1024 d.v.). We shall assume we can just hear each of these forks at a distance of one foot. That is, we shall strike them just hard enough to be heard one foot. We now strike the forks with the same intensity of blow while they are held in front of their respective cylindrical resonators. Instead of hearing them at one foot, we shall be able to hear them at much greater distances, because as indicated by figures 1 and 2, the response is much greater—we are at the top of the first peaks, so to speak. The following table indicates how far we can now hear the various forks.

d sharp	will	be	just	audible	at	100	feet
c^1	"	"	"	"	"	"	90	"
g^1	"	"	"	"	"	"	38	"
a^1	"	"	"	"	"	"	35	"
c^2	"	"	"	"	"	"	29	"
g^2	"	"	"	"	"	"	4	"
c^3	"	"	"	"	"	"	2½	"

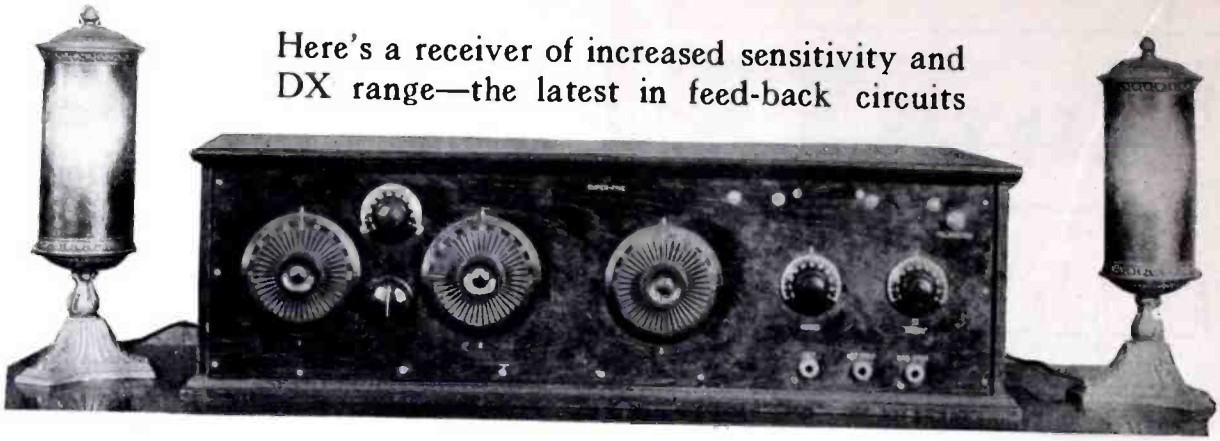
These figures show the tremendous importance and help of resonance in strengthening the sound. It is of very great benefit in loud speakers and it is made use of all the time in both the units and the horns, as well as in hornless loud speakers.

5. The peaks are regularly spaced in frequency.

Speaking from a comparative viewpoint between the long and the short

(*Turn to page 62*)

Here's a receiver of increased sensitivity and DX range—the latest in feed-back circuits



Direct-Coupled REGENERATIVE R. F. RECEIVER

By K. M. MacIlvain

THE feed-back circuit effected in the plate circuit of the first radio-frequency amplifier tube in this receiver is certainly a great asset to it. It increases the sensitivity of the receiver immensely and greatly increases the DX range of the set. By using this feed-back at this point in the circuit you will find that you will be able to bring in distant stations that you could never hear with the same circuit without the feed-back. The point of course in using this feed-back circuit is to orient the rotor of the feed-back coupler to such a point that you obtain maximum regeneration without producing an unstable condition. Thus you are able, at all times, to work your receiver at the optimum point of efficiency.

The wiring diagram of the circuit is shown in figure 1. The antenna is directly coupled to the first radio-frequency amplifier tube. The antenna lead-in is connected to one end of the rotor of a loose-coupler and this coupler must be pretty "loose." If it is of the type where there is very close coupling between the stator and the rotor windings it will not function as well as would be desired and might tend to make the circuit unstable. From the other end of the rotor winding a connection is made to one side of an 11-plate (.00025 mfd.) variable condenser, Ca. The other side of this variable condenser is connected to the grid side of the antenna tuning coil. The low side of the antenna tuning inductance is connected to the ground lead. This latter coil is shunted by a 17-plate, (.00037 mfd.) variable tuning condenser, the stator plates being connected to the grid of the first radio-frequency amplifier tube and the rotor plates being connected to the movable contact terminal of a 200-ohm potentiometer, the latter being shunted across the "A" battery leads.

MR. MAC ILVAIN SAYS—

THIS article deals with a receiver that, I believe, will be even more popular with the radio fans than the "D"-Coil Receiver which I covered quite thoroughly in WIRELESS AGE during the past year.

Up to the present I have never seen a circuit of the type described, and after giving it a trial and obtaining the proper constants, I must say that I was most agreeably impressed with its operation.

Although receiving circuits employing two stages of direct-coupled radio-frequency amplification, I will be very much surprised if I don't receive numerous letters from various parts of the country from radio enthusiasts and engineers who have tried this very circuit and have used exactly the same constants.

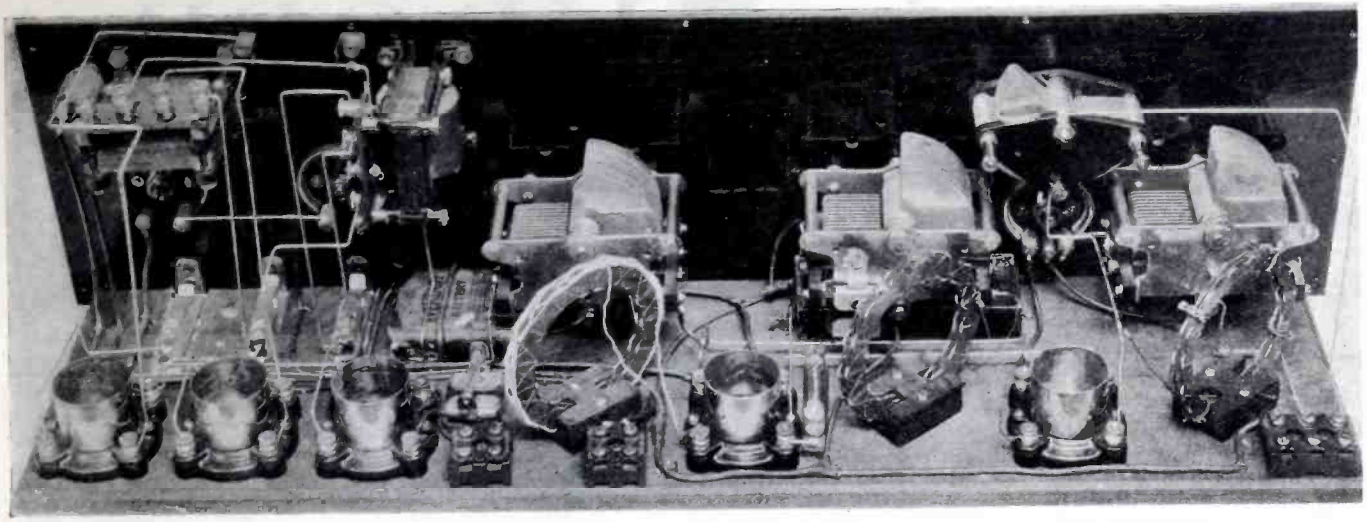
It might be interesting to note that such a case did occur with the "D"-Coil Receiver. Figure 8 coils or "D"-Coils had been used in commercial radio telegraph circuits for years and had been designed by one of the largest of the electrical manufacturing concerns. The only thing that I did was to apply these prosaic coils to a modern broadcast receiving circuit.

Adhering to the principle of letting the radio fans in on a good circuit, I am submitting this article for publication in a radio magazine which I believe will reach the greatest number.

The plate of the first tube is connected to one side of the stator winding of the loose-coupler. The other end of this stator winding is connected to the tap near the low end of the second radio-frequency tuning inductance. (The construction of these coils will be discussed later.) The low side of this second radio-frequency tuning inductance or direct-coupled transformer is connected to the positive 90-volt "B" battery terminal.

The secondary winding of the second transformer is shunted by a 17-plate, (.00037 mfd.) variable condenser which is used to tune this stage. The stator plates of this condenser are connected to the grid of the second radio-frequency amplifier tube, but they cannot be connected directly to the grid. The reason for this is, that, since we are using a direct coupled radio-frequency transformer to couple the plate circuit of the first radio-frequency amplifier tube to the input circuit of the second, we have "B" battery potential on the secondary winding as well as on the primary winding, since there is a metallic connection between the two.

The primary winding is that portion of the coil (gf) between the points (p) and (f) whereas the secondary embraces the entire winding between (g) and (f). To contrast this condition with the usual radio-frequency transformer it might be well to note that in the latter case the primary and secondary windings are separate and



Rear view of the direct-coupled regenerative r.f. receiver—note the mounting and position of the specially designed r.f. coils

are insulated from each other. Therefore any plate potential on the primary coil does not impress a corresponding potential on the secondary coil.

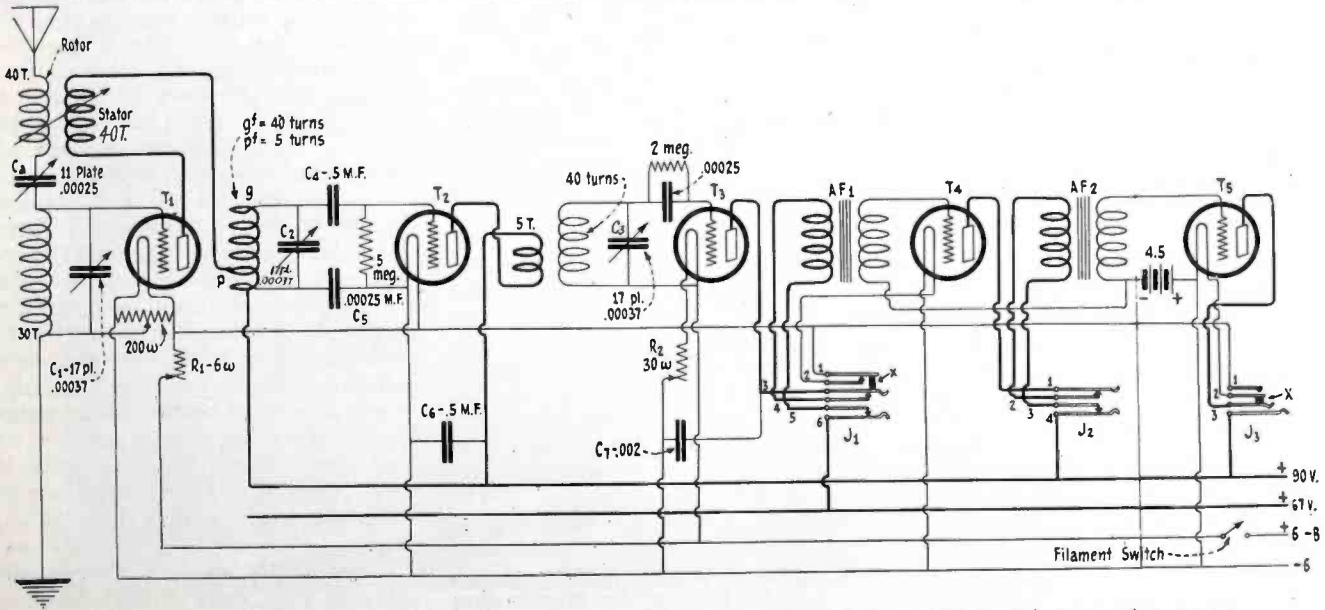
In the case of this receiver, however, the plate potential is on the secondary of the transformer as well as on the primary and therefore, if we connected the high side of the secondary winding directly to the grid of the succeeding tube we would impress a direct current potential of 90 volts on the grid of that tube and this would certainly not tend to lengthen the life of the tube in question. Therefore, a .5 mfd. fixed condenser is connected in series with the lead from the stator plates of the second tuning condenser (C_2) to the grid of the second radio-frequency amplifier tube, (T_2). This condenser has a capacity of high enough value to offer a very low resistance to the flow of radio-frequency currents and at the same time blocks off the plate potential which has been impressed upon the transformer winding from getting through to the grid of (T_2).

The rotor plates of the second tuning condenser (C_2), cannot be connected directly to the negative filament terminal as it would put "B" battery voltage on the filaments of all tubes and their length of life under these conditions would be far below normal. The .00025 mfd. condenser (C_5) is used to block the D.C. from the filament in this instance.

The 5-megohm resistance between the grid and negative filament terminals of the second radio-frequency amplifier tube (T_2) is an essential feature. The circuit may function without it and still again it may not. If the tube sockets used in the construction of the receiver are of the best material, the set most likely would refuse to function due to the high degree of grid insulation and subsequent lack of opportunity for accumulated electrons to leak off. You see, a great many of the electrons passing from the filament to the plate, within the tube, are intercepted by the grid and they will charge up on the plate of the condenser (C_4) that is connected to the grid unless there is a leakage path for them to flow through. If the grid insulation is very good, they will accumulate to such an extent that the grid of (T_2) will go far enough negative to cause the current in the plate circuit to become zero. To use the ordinary expression, the tube blocks.

With the grid of (T_2) held negative by the charge of electrons on C_4, electrons will cease to flow from the filament to the plate of the tube and no more electrons will accumulate on the grid. Then, after a short space of time, the charge accumulated on the condenser C_4 will leak off—since, no matter how good the insulation, there

(*Turn to page* 26)



Circuit diagram of the direct-coupled r.f. regenerative receiver—all the values are given so that you can use it in constructing your set

Radio in EUROPE

By Anne C. Granbeck

What is going on in Italy, Czechoslovakia, Spain, Belgium, Norway, Sweden, Hungary, etc.

WE IN America, who regard our country as almost the birthplace of modern broadcasting, might very well give attention to not only the present situation in the South of Europe, but also to the arresting fact that 32 years ago Budapest had a broadcasting service supplying 7000 subscribers with a daily program which was, for all the world, like a 1925 broadcasting schedule. Dr. Karl d'Ester, professor of journalism at Munich, recently called attention to this fact, now almost forgotten.

Theodor Puskas, a Hungarian engineer, originated the idea and worked it up most successfully. He had in use 600 miles of wire providing direct service, independent of the ordinary telephone service; and over these wires went all the standard broadcasting which we know today, from bedtime story to stock exchange and weather reports! The subscription price was 10 hellers per day (about 2 cents), exclusive of the cost of installation. Of course, headphones alone were possible then; but on the other hand, there was none of the difficulties of tuning in or charging batteries, etc. The thing was purely telephonic, of course.

While it lasted it was greatly relished by the entertainment-loving Hungarians. The broadcasting organization, at its height, had 180 employees, including singers, newspaper men, orators, etc., but probably because the engineer was no business man, or because the thing was quite too successful, Puskas went bankrupt. Nobody had the temerity to follow him and the whole idea sank out of sight. Puskas even sold time for advertising purposes, a la the modern broadcasting stations. Reprinted herewith is a typical broadcasting program enjoyed by the subscribers in Budapest in the year 1893.

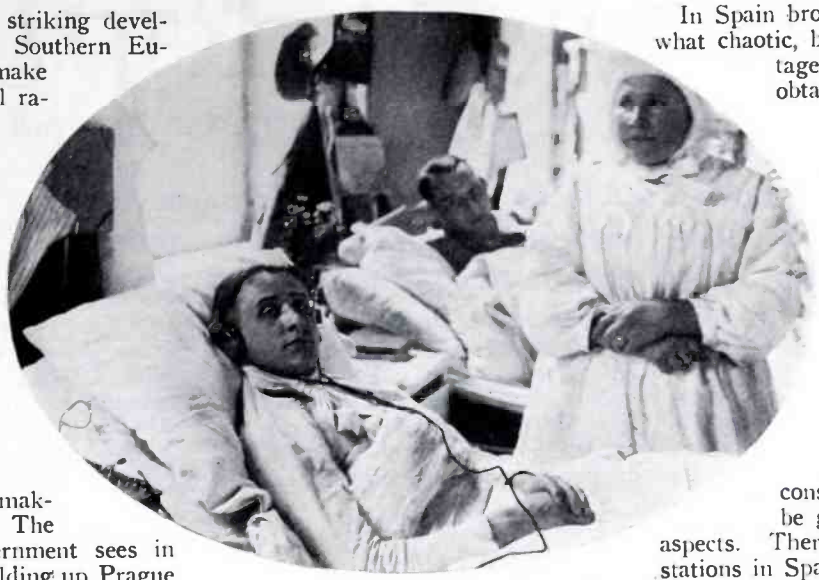
I speak of this as an introduction to the consideration of Southern European radio broadcasting conditions, in order that we may not think too meanly of a part of Europe which is far less up to date in radio than any other at the present time.

Members of a well known Italian Club listening to a presentation of "Tosca" which was broadcast from Covent Garden, London, England

IN SPITE of the fact that Marconi is an Italian, and that, therefore, the Italians might well be at the forefront of radio, Italy has not progressed very far. The Government of Italy has agreed to grant a broadcasting concession to the company called the Unione Radiofonica Italiana, in which the British Broadcasting Company of England is financially interested. The broadcaster is to receive two-thirds of the money collected by the Italian owners of receiving sets, plus an annual fee from the licensees for broadcasting service. Revenue is also to be obtained from the broadcasting of advertising matter, but this is to be shared equally between the Government and the broadcasting company. A Marconi Q type broadcasting transmitter has now been installed in Rome and it is hoped that Radio will now be broadcast generally. Certainly there is sound reason to hope for this in view of the intense love of music by Italians and of entertainment in general. The Government's arrangement with the British Broadcasting Company includes a condition that within a certain period broadcasting stations are also to be installed at Milan and Naples. There are at the present time only three stations in Italy, two of which are in Rome, and only one of which has even a call number. One of these operates on 3,200-meter wave length (ICD). Another one operated by Ing. Ranieri operates on 350 to 450 meters. There is another station at Centocello operating on 2,900 meters. The new arrangements in Italy are already stirring up popular interest and much, no doubt, will be heard from this when it begins really to function. In Italy, as well as in other Mediterranean countries, every town of any size has its local opera company and the public is very fond of it. When operatic music from the great centers like Milan, Naples and Rome is put on the air, it is certain that music in Europe will enjoy an even more distinct advance.

PERHAPS the most striking development in radio in Southern Europe is the plans to make Prague a great musical radio center and place on the air the National Opera of Czechoslovakia, one of the most famous in all Europe. This nation is a central nation of Europe, and its attitude as a young and vigorous state is excellent evidence of the new international statesmanship which thoroughly appreciates the strategic value of radio in the making of good will. The Czechoslovakian Government sees in radio the means of building up Prague as one of the leading musical and cultural centers of the world, while at the same time serving its own interest very strikingly, and helping to build up its already strong national spirit. The Government has already planned to erect stations for operation on a rental basis by a broadcasting company.

Czechoslovakia, it is not always appreciated, stands very high in music. Recently the broadcasting of Czechoslovakian music from WGY at Schenectady received much applause and it was widely noted that this country had a nationalistic style of composition and rendition little known in the United States. The famous Bohemian Octet under the direction of Rudolph Piscocek was heard for the first time in this country not so many months ago.



Invalided soldiers in foreign lands are also furnished radio entertainment though not as efficiently as in our own country.

THIS projected plan for the broadcasting of national opera at Prague—which will be listened to by radio fans all over Europe—is a most significant indication of the way Europe is shaping up gradually in regard to radio. It will in the not too distant future be an accomplished fact that the best musical genius of five or six leading European nations will be available to all European listeners in; and more than one harrassed European statesman pins some hope to radio as a growing means of lessening the sharp antagonisms of Europe.

In Spain broadcasting is still somewhat chaotic, but there is this advantage, it is open to anyone to obtain a license from the Government to run a broadcasting station for a certain period. A company representing Spanish interests is being formed to draw a real broadcasting plan, and this it is expected will shortly be ratified by the Spanish Government. Broadcasting of advertising is permitted by law in Spain and it is expected that considerable attention will be given to the commercial aspects. There are, at present, four stations in Spain, two in Madrid, one in Barcelona and one at Cartegena. There is another to be installed soon at San Sebastian.

IN BELGIUM plans are also under way for a broadcasting station on a commercial basis operated by a private company. The Army and Aviation Forces operate broadcasting stations at present.

In Denmark broadcasting is by no means new, as there have been many amateurs broadcasting in the early days. Very poor results, due to inadequate equipment and unsatisfactory programs, were obtained and conditions there indicate comparatively little present hope of change.

Hungary—in spite of the fact that

(*Turn to page 26*)

Germany's "Charlie Chaplin," does his little bit on one of the Berlin streets, aided by a portable radio set, which is strapped to his back

Experiments with the 3-CIRCUIT TUNER

By H. C. Silbersdorff

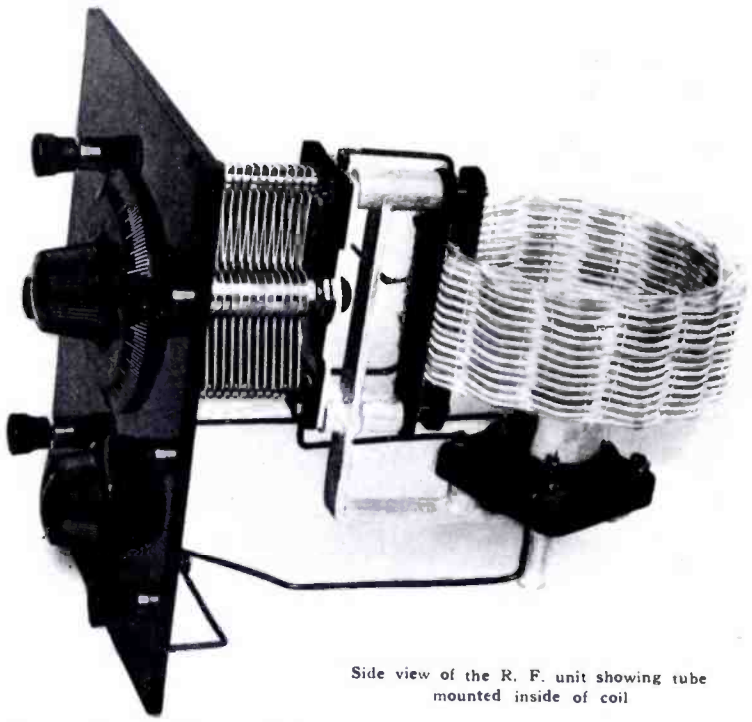
Various methods of adding radio frequency amplification—Tuned secondary without primary—The use of spider web coils in place of variocouplers

WHEN the newcomer in radio gets to the point where he is thoroughly interested in radio, he is often fascinated by the possibilities of experimentation which it offers. The big change in volume or clearness of a signal which is brought by making a small change here or adding a leak there, interests him. He tries this, and tries that and before he is aware of the fact, he is what is known as an experimenter.

It is not long before he decides he wants to build a set himself. This set must of course bring in local stations louder, and distant stations stronger than can be possibly done by his friend; or a neighbor's set. After trying to pick out and decide upon a particular circuit from the array of "Supers," "Dynes" and "Flexes" he is confronted with the problem of buying a quantity of expensive material and tracing out and worrying through a complicated wiring diagram, and at the same time he has no assurance that it will work when he has it finished.

He has heard and read much about the standard three-circuit regenerative receiver; he has yet to hear a knock against it and decides that undoubtedly this is the circuit he should build. Many successful receivers depend upon some form of regeneration to get volume and distance. It is easy to see that a circuit that provides for sure regeneration under all conditions, and for good control by the operator will fulfill the universal demand.

It is not the purpose of this article to go into details on the construction of this popular circuit. It has already been published many, many times in this and other radio magazines. Instead we are going to point out and describe a few experiments which, while old to a few, are new to many, especially the B.C.L.'s.



Side view of the R. F. unit showing tube mounted inside of coil

First of all let us assume that you have already constructed one of the above receivers. If you did the job the way it should be done you will have a set using low loss material throughout and that is the best that money can buy.

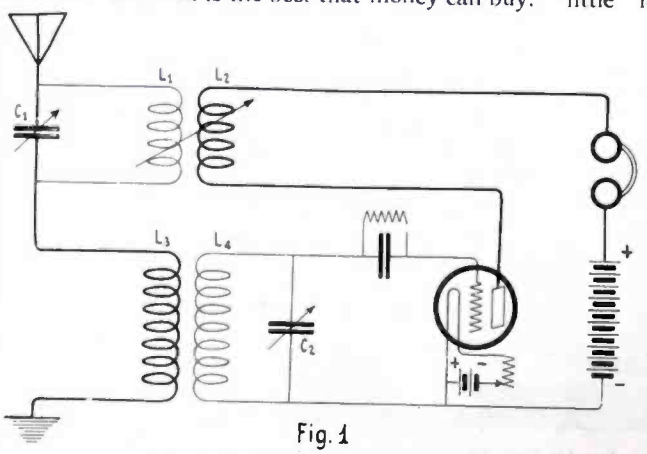


Fig. 1

The circuit designed for added selectivity

The primary might be of tuned or untuned type. If of the latter it is necessary to have it so arranged that a variable coupling can be had between the primary and secondary windings. The secondary inductance should be of the air core or staggered winding, using a fairly heavy wire, say No. 14 B. & S. gauge.

Great pains must be taken to choose a good make of low loss condenser for the tuning of this circuit, as the tuned circuit offers great possibilities for losses and every precaution must be taken to conserve every bit of energy which is transferred to it. Need I repeat that which already has been said many times before: make all leads as short and as direct as possible, taking care not to have grid and plate leads run parallel?

We have the above set; for the most part we are satisfied with it. It is comparatively easy to tune one local station out from another. When the locals are off we get our share of distance, but there are certain times when we wished the set were just a little more selective so as to be able to tune in that distant station away from that other semi-distant station which is working on nearly the same wave length.

It is a common trouble with all radio sets, anything we can do to make them just a little more selective increases our chances of getting better distance just that much more.

Figure 1 shows a circuit which seems to do the trick and gives an added degree of selectivity with one added control — an added control means little to the man who is after DX. The condenser

which has a capacity of 250 micro-microfarads is connected between the antenna and the primary winding. Around this we have shunted 15 turns of wire shown as L1; this is coupled to the feedback coil shown as L2. These two coils are mounted up in the form of a regulation variocoupler; in fact, an old one will answer the purpose very nicely if it is rewound, coil L1 being wound on the outside of stator tubing and L2 or tickler can be the rotor, without changes.

Continuing with the open circuit we have a ten-turn winding which is then connected to the ground. This coil can be wound on the same piece of tubing as is L4 and should have its windings run in the same direction, but spaced about one-half inch away from it for coupling. This tube should have a diameter of 3½ to 4 inches and about 5 inches long. There are 45 turns in L4 which is shunted by the 500-micro-microfarad condenser.

An improvement over this method of construction, which will give slightly better controls over the circuit, but which will require still another adjustment, is to arrange the coils L3 and 4 so that their inductive relation to each other may be varied. This will help materially in getting the circuit to oscillate, especially in cases where reception is being carried on the same wave length or near the same wave length as that of the natural period of the antenna. There are many low loss tuners on the market, the great majority of which employ a fixed coupling between the primary and the secondary, with the result that when they are operated, difficulty is had in getting selectivity, which comes naturally when the circuit is brought near the oscillating point on the lower wave lengths. If it were only possible to increase this coupling the trouble would be eliminated. This, of course, is aside from the fact that it is always an advantage to use a condenser whose plates are so arranged as to give greater separation between stations operating on the lower wave lengths.

Condenser C1 and Coil L1 makes a very sensitive wave trap the adjustment of which makes possible the receiving of distant stations through local broadcasting.

Ideal operation in a regenerative receiver is only obtained when the circuit goes into easy oscillation. That is to say a sound similar to that of rushing wind will be heard as we near the critical point. If a dull thud is heard, which is so common in improperly designed sets, it is next to an impossibility to get up close to the oscillation point, which is so necessary if distant reception is to be had. The most common cause of this trouble is the use of a tickler coil having too much inductance. It has been found that 14 turns of No. 20 DCC wire wound on a 2¾ inch tube makes an ideal tickler coil and one which works beautifully on the broadcasting wave lengths. Another common cause is the use of a high plate voltage on the detector plate. It is only on rare occasions that one comes across a tube requiring a plate voltage higher than 22½ volts. In general 16 to 20 is just right, assuming, of course, that your batteries are delivering full voltage.

The addition of radio frequency amplification is usually not recommended to users of regenerative receivers, inasmuch as the detector tube in such a circuit is passing on a certain amount of radio frequency energy and is liable to make the set difficult to operate and control.

There are a number of ways in which this can be accomplished, some of which bear out the above statement; others which add but little if anything to the distance getting possibilities of the set. It has been my good fortune to try out a number of these schemes and I have come to the conclusion that one or two of the methods will prove to be quite an advantage to any such set incorporating three circuits in giving three very desirable features: first, greater sensitiveness, increased range; second, greater selectivity, more freedom from local interference; and third, better quality in signals, as the tendency to work the set to the last notch, causing distortion, is reduced.

The first scheme is shown in figure 2. This can be built into a separate cabinet and connected to your present set using the same A and B batteries, by means of binding posts.

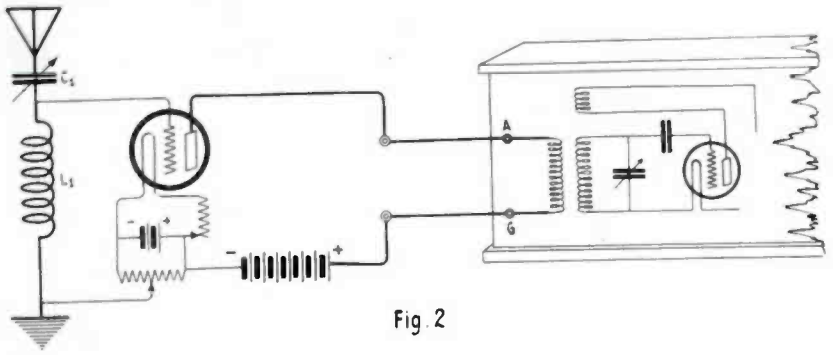


Fig. 2

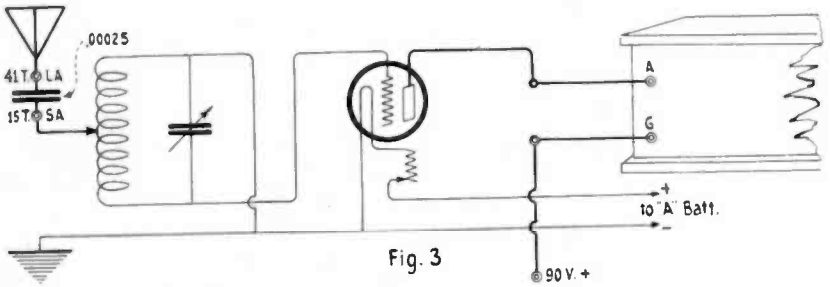


Fig. 3

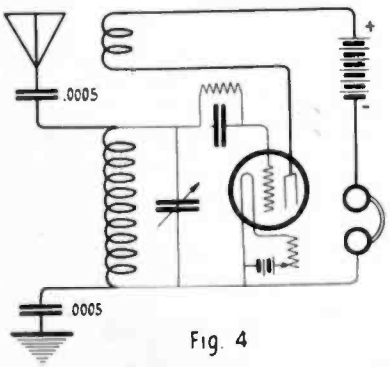


Fig. 4

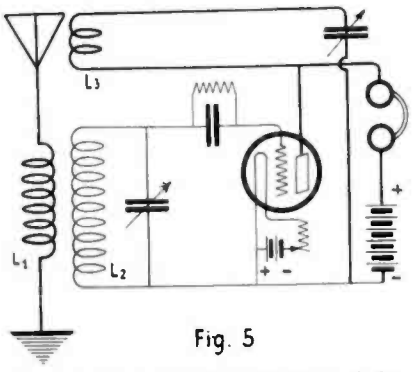


Fig. 5

Various combinations of R. F. added to the 3-circuit tuner and modifications of the tuner itself

The antenna condenser has a capacity of 1000 micro-microfarads and is connected between the antenna and the antenna inductance, which can be wound on a three-inch bakelite or hard rubber tube. It has sixty turns of No. 22 D.C.C. wire, the lower end of which is connected to the ground, and the center post of the 300-ohm potentiometer, the outside terminals of which are connected directly across the A battery. The grid of this tube must be

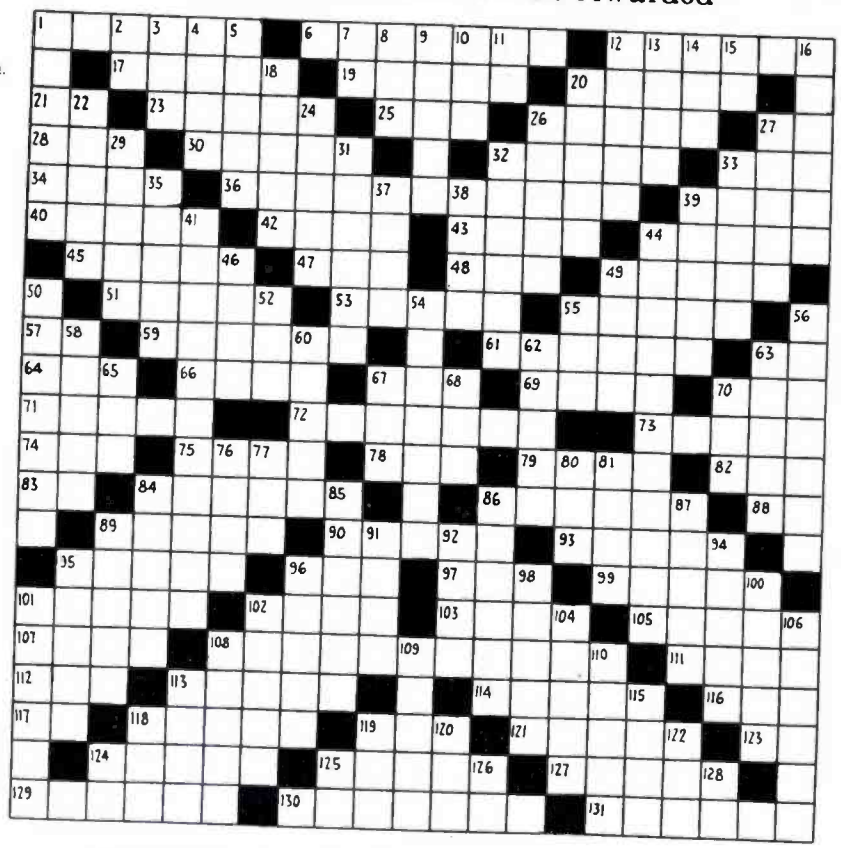
(*Turn to page 70*)

Cross Word Contest

One Hundred Prizes To Be Awarded

HORIZONTAL

1—Meal; victuals.
6—Electrical measuring instrument.
12—Electric current.
17—Having two feet.
19—After.
20—Linear measure (Plur.)
21—Field Service.
23—Subject of discourse.
25—Definite article.
26—Freed from moisture.
27—Province of Canada (Abbr.)
28—Da Da Da; Da; Da Dit Dit
30—Separates by violence.
32—Rises.
33—Coarse cloth.
34—Covering or shelter.
36—A natural force.
39—Duration.
40—Under age.
42—A timber.
43—Completed.
44—Enticed.
45—Marine growth.
47—Meaning three.
48—On storage batteries.
49—Pierced or penetrated.
51—Of greatest interest today.
53—Small live coal.
55—Can be heard.
57—Da Da Da; Dit.
59—Surrenders.
61—Chides sharply.
63—Form of address.
64—Vessel.
66—One time.
67—What battery acid did to carpet.
69—What the Dalton machine does.
70—Period of time.
71—Sharp-pointed instrument.
72—What ruins your condenser plates.
73—Old horses—Old-time huts—used in slot machines—cross word experts—also attached to ends of phone cords.
74—Portion.
75—Last in order.
78—Nevertheless; still.
79—Center of an electromagnet.
82—Tool for boring.
83—Dit; Dit Da Dit.
84—Large manufacturing centre in Japan.
86—Menace.
88—Central America.
89—Swift.
90—One to whom money is paid.
93—Seized.
95—Strips of wood.
96—Commit an error.
97—Da Dit Da Dit; Da Dit; Dit Da Dit.
99—Conductor of electricity.
101—Garments worn by Romans.
102—Pace of a horse.
103—To hold or catch.
105—Non-conductor of electricity.
107—Member of the world's first family.
108—Coil for changing electric pressure.
111—Exchange.
112—Guided.
113—A game.
114—Swiftness.
116—Jurisprudence.
117—Telegraph signal reporting trains.
118—Separate.
119—Small venomous snake.
121—Killed with a weapon.
123—Civil Engineer.
124—Grassy surface of land.
125—Drowse; slumber.
127—What we do with money.
129—Inspiring awe.
130—Foreboding.
131—Aft parts of vessels.



VERTICAL

1—Improve; better.
2—Lead (Latin abbr.)
3—Small inland island.
4—Blemish; mark.
5—Indian wigwam.
7—Milliliter.
8—Entangle or interweave.
9—Dielectric medium.
10—Short piece of connective pipe.
11—Suffix.
12—Place where milk is kept.
13—Freezes.
14—Primary color.
15—Plural suffix.
16—Examined, such as radiotrons.
18—What you turn to tune (Plur.)
20—Talk idly.
23—A disciple of the Greek philosopher Zeno.
24—What baby did before walking.
26—Performing.
27—Designated.
29—A giver.
31—Frightens.
32—Searches thoroughly.
33—Wearied; exhausted.
35—Plunder or ravage.
37—Neat; compact.
38—Averse to labor.
39—Moves as on a pivot.
41—X-ray photographs.
44—Sound producer.
46—Legal claim.
49—Brave.
50—A connector.
52—Da Da Da; Dit Da Dit Dit; Da Dit Da Dit.
54—Generates electricity.
55—Turf.
56—Radio detector.
58—An irregularity.
60—Blame clamorously.
62—Lay hold of suddenly.
63—Sorcery; enchantment.
65—Refusal; denial.
67—Indefinite number.
68—Take food.
70—Invest with knighthood.
76—Influence or power which protects.
77—Army Ordnance DePartment.
80—Order of Rail Road Telegraphers.
81—Paper measure.
84—Pertaining to birth.
85—Ladies kitchen apparel.
86—Singers.
87—Heads (French).
89—Ravaged.
91—Branches of learning.
92—Repetition of sound.
94—Pertaining to the nose.
95—Round or projecting parts.
96—Obliterate; expunge.
98—Boisterous play.
100—A shrub.
101—Claws.
102—General tendency.
104—Back bones of vessels.
106—Upright pillar in staircase (Plur.)
108—The bane of the rose.
109—Electric safety devices.
110—Gathers in.
113—Bivalve mollusk.
115—Regulated food.
118—Reverential fear.
119—Beverage.
120—A leguminous plant.
122—Point on the compass.
124—Dit Dit Dit; Dit Da Dit Dit.
125—Senior.
126—General Public (International Call Book designation.)
128—Doctor.

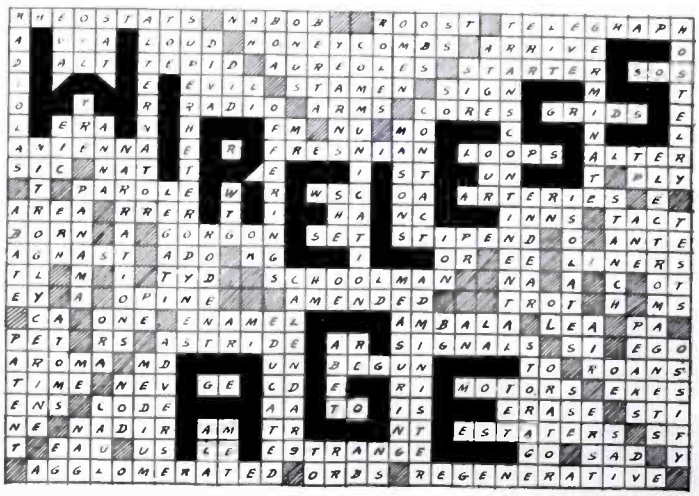
GET ACROSS

Composed by Helen F. Dittus

PRIZE CONDITIONS: Yearly subscriptions to WIRELESS AGE, The Radio Magazine, will be awarded to 100 correct solvers of the "Get Across" crossword puzzle who send in the best sentences composed of words found in this puzzle. The editors of the WIRELESS AGE will select the winning letters on the basis of legibility, style and composition. Closing date April 15. Winners will be announced in the June issue. The solution will appear in May WIRELESS AGE. Address "Get Across," WIRELESS AGE, 326 Broadway, New York City.

Solution to March Puzzle

(Winners will be announced in May WIRELESS AGE)



February WINNERS

Mrs. C. A. Mathiasen
Onawa, Iowa

Miss Mary Nielan
Pittsburgh, Pa.

Evelyn T. Simpson
New York City

Miss Irene Noey
Saginaw, Mich.

Alexander, E. Lewis, Rochester, N. Y.
Brancroft, D. A., Minneapolis, Minn.
Barbour, E. F., Pleasantville, N. J.
Bassett, Frank A., Detroit, Mich.
Beans, Clyde M., Cleveland, Ohio.
Bergen, John V. N., Port Jefferson, N. Y.
Bert, Lewis, Rockaway, Ore.
Boyd, Carl R., Ashley, Pa.
Brackley, Eugene, Stoneham, Mass.
Brandner, George, Ionia, Mich.
Breymann, John B., Jr., Toledo, Ohio
Brown, Paul V., Barnesville, Ohio
Burnham, Harry C., Edgewood, R. I.
Buttermore, C. L., Cleveland, Ohio
Campbell, Frank S., Richmond, Ind.
Capeling, L., Chatham, Ontario, Can.
Church, G. L., Joseph, Ore.
Cole, Arthur L., Detroit, Mich.
Conley, C. H., Clarksburg, W. Va.
Cross, Blakely E., Gloversville, N. Y.
Dana, P. A., New York City.
Darbyshire, James E., Point Edward, Ont., Can.
Dedrick and Marty, Brodhead, Wis.
Douglas, C., Jacksonville, Fla.
Dusek, William, New York City
Elliott, B. D., Tacoma, Wash.
Etchetts, Harold T., Hawthorne, N. J.
Farrer, C. W., Bridgeport, Conn.
Fogelsonger, Harold, Buffalo, N. Y.
Foster, Lee, Springfield, Ill.
Gager, E. B., Jr., Derby, Conn.
George, Kermit, Quakertown, Pa.
Goodwin, Roger L., Melrose, Mass.
Green, Fred and Tom, Joseph. Ore.
Greenleaf, A. R., Wakefield, Mass.
Harger, Oscar G., Weehawken, N. J.
Haseltine, George C., Fort Stockton, Tex.
Hendrickson, Charles, Minneapolis, Minn.
Hendrickson, Prof. E., Decorah, Iowa.
Henrickson, H. B., Washington, D. C.
Hilsenbeck, J. B., Jenkins, Ky.
Holcombe, E. S., Harmon-on-Hudson, N. Y.
Hopkins, A. L., Indianapolis, Ind.
Howard, Edward L., New York City.
Howe, Victor, Chicago, Ill.
Hulet, J. S., Holbrook, Ariz.
Jessel, Arthur F., Wauwatosa, Wis.
Jewell, J. D., Sandy Lake, Pa.
Johnson, J. H., Seattle, Wash.
Jones, W. T., Salt Lake City, Utah
Kellam, Fred, Indianapolis, Ind.
Kelly, J. V., Baltimore, Md.
Keyes, A. L., Milford, N. H.
Kipp, Aaron, Jr., Ellsworth, Kan.
Klipstein, G. P., East Orange, N. J.
Kloster, Theodore M., Brooklyn, N. Y.
Kreidel, George A., Yonkers, N. Y.
Kull, C. B., Mattoon, Ill.
Lee, Clarence, Brooklyn, N. Y.
Lorenz, Miss Margaret, Milwaukee, Wis.
Louderback, E. F., Puyallup, Wash.
Marceau, R., Detroit, Mich.
McCreary, Raymond, Beloit, Wis.
Mears, G. E., Detroit, Mich.
Moore, Kermit, Los Angeles, Cal.
Morey, Earl L., Bridgeport, Conn.
Neilssen, Steffen F., Brooklyn, N. Y.
Noey, Miss Irene, Saginaw, Mich.
O'Keefe, John J., Baltimore, Md.
Osborn, George, Unionville, Conn.
Pinkind, Thomas C., Galena, Md.
Planquette, Milton G., Brooklyn, N. Y.
Pray, Alfred R., Cleveland, Ohio
Rankin, H. W., Washington, N. C.
Raum, Charles L., Anacostia, D. C.
Rich, Ralph B., Chicopee Falls, Mass.
Riley, J. Richard, Oneonta, N. Y.
Ruhlman, R. L., Youngstown, Ohio
Ruoff, B. H., Irvine, Ky.
Schick, W. F., Kutztown, Pa.
Schlobohm, Otto A., Washington, D. C.
Schwerin, Benjamin, New York City
Servais, Mrs. Francis W., Falls Creek, Pa.
Shoop, Leon F., Ashley Falls, Mass.
Simpson, Evelyn T., New York City
Smith, Miss Jessie, Crete, Neb.
Smith, John W., New Britain, Conn.
Smith, Persey B., Richmond, Ind.
Snapp, R. J., Jr., Elkton, Va.
Straffon, E. E., Port Huron, Mich.
Tapparo, John A., New York City
Touroff, N., Marysvale, Utah
Tregenza, James H., Wharton, N. J.
Truscott, R. H., Pompton Lakes, N. J.
Vantran, Leo G., DeLancey, N. Y.
Viall, V. E., U.S.S. Denver, Balboa, C. Z.
Watts, Boyd, Detroit, Mich.
Welch, George A., Lyons, N. Y.
Welker, C. G., Milwaukee, Wis.
White, J. H., Dover, Del.
Wrightson, Mrs. George R., Baltimore, Md.

Mrs. Lena D. Neece
Colorado Springs, Colo.

Miss Jessie Smith
Crete, Nebr.

Miss Olga E. Enwistle
Wollaston, Mass.

Mrs. F. W. Servais
Falls Creek, Pa.

JUST BY WAY OF COMMENT

MUCH has been written about the fascination attached to the solving of cross word puzzles, and to the solvers this is the only interesting feature in a contest such as ours. The interest in examining and checking the replies coming—as they do—from every state in the Union, foreign possessions and other countries is a pleasure only afforded the editors.

Many of the answers to our February puzzle were very neatly filled in with ink by college professors and students; some were typewritten by stenographers: others were poorly pencilled—almost illegible solutions of the none-too-careful people—while quite a number were attractive drawings made by those with time and patience who took a personal pride in their work.

A more interesting feature, though, was the occasional letter accompanying the solution. Some of these letters were highly pleasing and contained subtle praise while others offered excuses for not being able to fill in a certain word.

Among the most neatly copied of the solutions received were those from: L. D. Lapp, Toronto, Ont.; I. F. Baker, Orange, N. J.; H. W. Hudelson, Vandalia, Mo.; J. E. Porter, Washington, D. C.; Marian C. Brown, Meriden, Conn.; and Ralph Hendrickson, Danville, Ind. We are sorry they are not among the winners.

A surprising number of ladies sent in solutions—many of them correct. In addition to the winners creditable answers also came from: Olga Entwistle, Wallston, Mass.; Mrs. H. F. Butler, Wiscasset, Me.; Mrs. R. Gephart, Edinburg, Ind.; Mrs. Margaret French, Wesleyville, Pa.; Miss Marcia G. Tibbits, Boston, Mass. and Miss Martha Thomas, Lyndonville, N. Y.

A. P. Heflin, Saginaw, Mich., sent in an excellent solution but just missed by one word. Others who made an almost perfect score were: Charles P. Cooper, San Francisco, Cal.; Frank H. Blood, Schenectady, N. Y.; A. P. Zeh, Beacon, N. Y.; P. A. Bartmess, Shreveport, La.; E. P. Tabbott, Fort Bayard, N. M.; William J. Newlin, Amherst, Mass., and Thomas F. Wright, East Orange, N. J.

In all, our February contest "went over big." From present indications the March edition is going to follow suit and we are looking for a big return on the present puzzle—the easiest thus far.

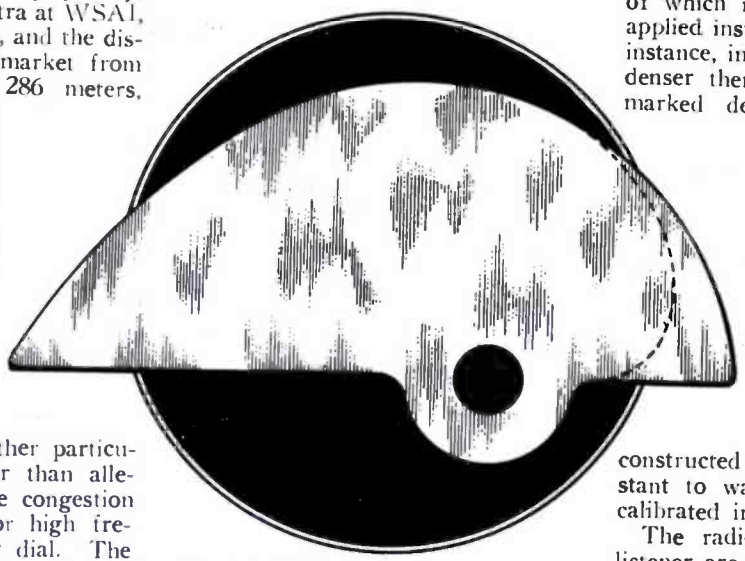
Straight Line Condensers

How to design a condenser that will separate uniformly the signals of all broadcasting stations and all radio frequencies

By S. R. Winters

THE inability of condensers and other tuning devices in present-day radio-receiving equipment to separate conveniently the signals transmitted on low wave lengths—of the order of 230 to 325 meters—is a common observation. For instance, you have very little separation on the dial between the "jazzy" music played by, say the Toadstool Orchestra at WSAI, Cincinnati, on 309 meters, and the discussion of the livestock market from WAAF, Chicago, on 286 meters, whereas two stations that many meters apart on the upper part of the dial would have a wide separation.

The Third National Radio Conference, in allocating additional wave bands for broadcasting purposes, included wave lengths as low as 200 meters for this popular service. This provision, as desirable as it is in other particulars, contributes to rather than alleviates the problem of the congestion at the low wave length or high frequency end of the tuning dial. The broadcasting stations are all separated 10 kilocycles apart in frequency, but the receiving sets we use have not been so designed as to give all stations equal advantage of this separation. With present equipment there remains this inherent difficulty in the reception of programs from broadcast stations operating on low wave lengths or high frequencies, namely, the crowding together of such stations in a small part of the lower end of the tuning dial. This obstacle is unfortunately peculiar to high frequencies with the use of present designs of radio receiving equipment, and should be eliminated. Therefore, Dr. J. H. Dellinger, Chief of the Radio Laboratory of the Bureau of Standards, has attacked the problem at its source. Like his many other contributions to this science, notable among these being his books, "Radio Instruments and Measurements," and "The Principles Underlying Radio Communication," he has analyzed this problem in the light of a fundamental proposition. In November, 1923, he worked out a special design of condenser which overcomes this difficulty, that is, a condenser that is capable of making uniform separations of all frequencies. Applications of the idea have been in progress since that time. This writer is indebted to Doctor Dellinger for the formulas and conclusions set forth in this article on how to make a wavemeter, condenser, or other device for the uniform spacing of frequencies and broadcasting stations all over the whole dial in the reception of radio signals.



Correct design of a straight line wave condenser plate

As is generally known, the dials on wavemeters, receiving sets, and other radio apparatus bear numbers which have little significance or value to the DX fan in logging distant broadcasting stations. There is now a tendency to design radio instruments with each dial graduated directly in kilocycles or meters—one the unit of frequency and the other the unit of wave length. The manufacture of dials bearing the designations of kilocycles is preferable to the present indirect way of denoting the wave lengths in meters since the stations are separated a uniform number of kilocycles apart, but a varying and meaningless number of meters. The kilocycle scale for dials, as well as the uniform separation of the frequency, is particularly feasible according to the formulas worked out by the Chief of the Radio Laboratory of the Bureau of Standards.

Fundamentally, every wavemeter, radio receiving unit, or transmitter contains a main tuning circuit, this being made up of inductance or capacity, one of which is variable or, in terms of applied instruments, is rotatable. For instance, in the case of a variable condenser there is a dial on which are marked degrees or other arbitrary numbers. Doctor Dellinger, for the sake of illustration, takes the example of the wavemeter in which the capacity is the variable element. However, the underlying principle of this instrument is equally applicable to variable inductances and to radio receiving and transmitting units which are so constructed as to be sufficiently constant to warrant the use of a scale calibrated in terms of frequencies.

The radio amateur and broadcast listener are familiar with the common form of the semi-circular movable plates which constitute the condenser on his receiving set. Generally speaking, the capacity of this tuning instrument is nearly proportional to the change of setting of the movable plates. In the new type of tuning instrument, however, it is necessary that the frequency of resonance, and not the capacity, be proportional to the change of setting. The frequency f of resonance in an electric circuit consisting of capacity C and inductance L in series is

$$f = \frac{159.2}{\sqrt{C.\ L.}}$$

Where f is expressed in kilocycles, C is in microfarads, and L is in microhenries. Considering apparatus in which the capacity is variable and the inductance is constant, the following equation is expressive:

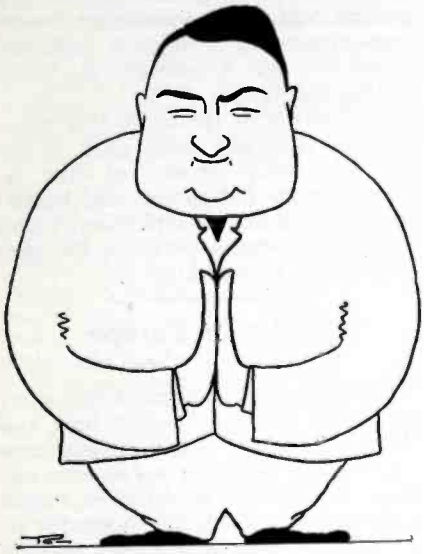
$$f\,L = \frac{1}{\sqrt{C}}$$

$$C\,L = \frac{1}{\sqrt{f^2}}$$

(*Turn to page 65*)

Broadcast Impressions

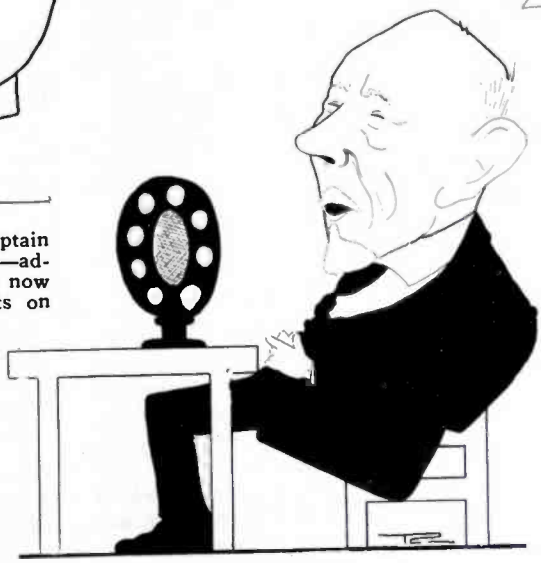
By Ed Randall



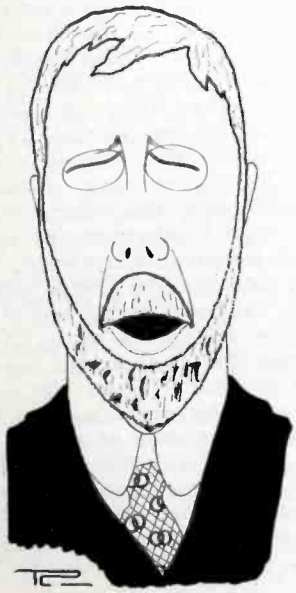
At WHN Big Bill Edwards—captain of Princéton football team, 1900—admonishes all youth to get in trim now for next season; also gives hints on reducing

(Below) Dan Beard, who illustrated "A Connecticut Yankee in King Arthur's Court," by Mark Twain, talks frequently from WEAF on the joys of outdoor camp life for boys

Alfred W. McCann, the Food Expert, broadcasting from WJY, says that the boarding-house prune joke is low and vulgar, for the mission of the stewed prune to the human system is noble and lofty



(Below) Augustus Thomas, the playwright, began work on the St. Louis Republican as staff artist in 1888. At that time all newspaper art work had to be cut by hand directly on the printing stone. He broadcast recently from WJZ on the theatre, and stated that it was impossible to appoint any one person to decide the propriety of plays



Arthur Twining Hadley, former president of Yale, at a National Republican discussion broadcast by WJY, said 100 passengers on a car at 10 cents each yields as much to the railroad as 10 passengers at a dollar each. The difference being that more people ride

Ruth von Phul, cross-word puzzle expert, defines WOR as a department store in three letters vertical, and then laughs at you horizontally

Direct-Coupled Regenerative R. F. Receiver

(*Continued from page* 17)

is bound to be a certain degree of leakage, in actual practice. With the grid potential back to normal, plate current will flow again and the receiving circuit will function for an instant, until the condenser C_4 becomes charged to a great enough degree to block the tube again and the same cycle of events will again take place. Now, it might be possible that the insulation of the grid and its associated leads will be low enough to allow the electrons to leak off as fast as they accumulate and in this case the circuit will function without any interruption due to this blocking effect just cited.

If you use efficient apparatus you will find it necessary to connect a resistance between the grid and filament terminals of this tube to supply a leakage path for the electrons which accumulate on the grid. For efficiency's sake this resistance should have a value of the order of the input impedance of the tube used; otherwise, if it is much lower, it will shunt some of the radio-frequency energy around the tube with subsequent decrease in output volume of the receiver. By practical application and bearing in mind the value of the input impedance of the tube in question, I found that 5 megohms was a good value for this resistance.

The plate of this second radio-frequency amplifier tube is connected to the positive "B" battery terminal through the primary winding of the third radio-frequency transformer which is of the inductively coupled type. It is well to note here that the plate is connected to the end of the primary winding which is farthest away from the end of the secondary that is connected to the grid of the detector tube. This maintains minimum capacity coupling between the plate of (T_2) and the grid of (T_3) which of course is desirable. The secondary of this third radio-frequency transformer is tuned with a 17-plate, (.00037 mfd.) variable condenser. The stator plates of this condenser are connected to the grid of the detector tube through the standard 2-megohm grid leak and .00025 mfd. grid condenser. The grid return (rotor plates of the tuning condenser) is connected to the positive filament terminal.

It is important to note at this time that all the amplifier tubes have their negative filament terminals connected directly to the negative filament supply lead. The positive filament supply has the 6-ohm rheostat (R_1) in series with it. This rheostat is used to control the filament temperature of all the amplifier tubes. The positive terminal of the detector tube is connected directly to the positive filament lead whereas the negative terminal of this tube is connected to the negative filament lead through a 30-ohm rheostat. The filament switch is in the positive filament lead.

A .002 mfd. radio-frequency by-pass condenser is connected from the plate terminal of the detector tube to the negative filament terminal, thus by-passing any radio-frequency energy in the plate circuit of the detector tube around the primary winding of the first audio-frequency transformer and the plate battery.

The question probably arises in your mind at this point as to the reason for the value of the capacity of C_7 being so much smaller than C_6. You probably reason to yourself that inasmuch as they are both radio-frequency by-pass condensers they ought to be of the same value in circuits which are functioning on the same input signal.

The value of the capacity of a radio-frequency by-pass condenser is a function of the frequency which it is desired to by-pass. The longer the wavelength—or the lower the frequency—you wish to by-pass the larger the value of the by-pass condenser required.

To operate the set, after it has been connected up properly, close the filament switch. The first four tubes will light, if the phones or loud speaker are not plugged in any jack. Now, if you plug the phones in the first jack, J_1, the fourth tube will go out and only the first three tubes will be lit which is all that is needed when you are listening in on the detector.

The circuit tunes in a similar manner to the ordinary five tube radio-frequency receiver which has two steps of tuned radio-frequency amplification. The dials on the condensers C_1, C_2 and C_3 will all be set at approximately the same position for a given station. The exception being that the condenser Ca effects the setting of C_1. Ca can be set at such a point that C_1 will have the same setting as the other two tuning condensers. If Ca should then be set at such a position that its effective capacity was increased, it would be necessary to lower the capacity of C_1 by moving the dial towards the minimum setting. When you have a station tuned in you will find that there will be an optimum setting on the condensers Ca and C_1 where the signals will have the greatest volume.

The 200-ohm potentiometer is used to maintain stability. You might not find this unit necessary at all under some conditions and then again you might find it a very important factor in the stability of your receiver. For instance, I installed a set in my home, in an apartment on the upper west side of New York City. The set was extremely stable and I never had to use the potentiometer, but kept the contact always on the negative side. Some time later I took it up to Chestwood which is a few miles out of the city and installed it in the home of a friend. Due to the change in antenna and ground constants I found that the potentiometer was a mighty important factor and was a necessity for maintaining stability.

The details of the method of winding the particular coils used in the radio-frequency circuits of this receiver are the only points that haven't been covered in this article and I plan to take this up in detail in the next issue of WIRELESS AGE.

Radio in Europe

(*Continued from page* 19)

it has had a taste of broadcasting many years ago—has given very little real concern to radio. An occasional program is put forth by a 250-watt station. However, a 2½-kilowatt station is being made ready for operation by the Post Office Department, and in view of the Hungarian spirit of gayety and music, there will, no doubt, be as rapid an economic development as conditions there will permit.

In the Baltic states, there is no broadcasting at all at present, but there are steps being taken in Esthonia and Latavia for radio, which will at least begin the radio era there.

AS FOR Switzerland, there is no organized broadcasting service, but a 500-watt Western Electric outfit will be installed shortly at Zurich and still another at Basle. There are air and army stations at Lausanne and Geneva.

As for Holland, there are additional broadcasting stations operated by electrical firms and other commercial institutions, but there are no organized broadcasting programs. However, the Hague Peace Conference was broadcast last winter at Gravenhage, with striking success. The Dutch Government has indicated its readiness to give concessions for two or three stations for regular transmission, but interests wishing to enter Holland for broadcasting purposes are concerned only with the establishment of a single station at present, with the result that a stalemate is encountered which may or may not last for some time. The Dutch Government wishes to insure that more than one station will be erected.

IN SWEDEN and Norway conditions are a little better. The Swedish Government proposes to own, operate and maintain the broadcasting stations, and will rent out such stations at standard prices including maintenance and upkeep. A broadcasting company is

(*Turn to page* 61)

Afloat and Ashore with the Operator

By W. S. Fitzpatrick

I'LL BET you don't know Lee Manley! As an answer I visualize thousands of radio professionals, and fans as well, rising up to take the bet, but right here I'll say that I pride myself on a rather keen sense of observation and, with a realization that I have followed Mr. Manley's activities—including the out-of-the-ordinary accomplishments—and his most remarkable rise during the past dozen years, I still stand pat.

His friends and admirers are of goodly number, but who among them really know him? True, they know his characteristic traits—always the gentleman, polite, jolly, real sense of humor, as square as any who traveled and as fair as a man or friend could be. Still he is deep, brainy, thoroughly original and a real organizer of big business.

I recall my first meeting with him. I was an inspector for the Marconi company and was on my way down West street, New York, when I noticed a tall youth with one of the then new large tuners posed on his shoulder. Recognizing the instrument as company's property I stopped and asked him where he was going.

Although his load was a weighty one, the day was hot and the hour was well close to his regular quitting time, he looked at me with his frank boyish expression, which to this day has never left him, and replied very courteously to my questions. I directed him to the ship he was looking for and passed on with a satisfaction that I had performed a service for the young fellow as well as my employers.

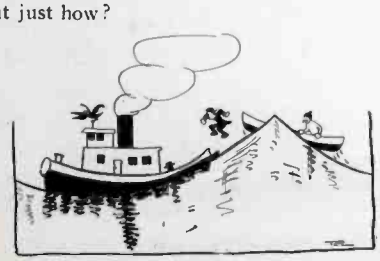
It is natural to suppose that such a trivial incident would immediately pass out of mind. But not so in this case; there was a most favorable impression formed that even the intervening years have failed to erase.

HOW vastly different was this first meeting compared with the one of yesterday afternoon! I was in the company of the editor of WIRELESS AGE when Mr. Manley's appearance brought to the editor a sudden inspiration.

Here was a man whose accomplishments in radio measured up with ninety per cent of those whose names appear in public print, but his modest disposition has warded off deserving publicity. The editor wanted him as the subject for an article! Would he oblige by giving some of his history? Not necessary; there was one who knew him and was well informed about him—referring to the present writer.

"Manley, there are a few who really know you," commented an observing member of the Radio Corporation of America.

This remark made me think. Mr. Manley is somewhat different from the average man, but just how?



Lee L. Manley
National Director of Sales Service Division, Radio Corporation of America

Is it because he controls hundreds of men under his direction with admirable efficiency, still is a loyal friend—or say, pal—to each one of them? Or, is it because he can judge character, and even ability, while passing jokes—in contrast to the stern self-styled character reading business man? Perhaps it is because he might impress you as being a care-free, fun-loving, over-grown boy while you are in his presence and you suddenly realize that he is a man with great responsibilities, one who is always planning, forever observing and one who has attained remarkable success.

During the time he was superintendent of the Maintenance, Repair and Inspection division of the Radio Corporation it was a common sight to see Mr. Manley in the repair shop at a workman's bench, a drill press or stamping machine well into the night turning out a rush job or perfecting some appliance his inventive genius had suggested. He prides himself on his mechanical ability and it is well known that many of the improvements on marine radio equipment were designed and executed by him.

Today he is the managing head of the national service division of the R. C. A. and from his offices in the Woolworth Building, New York, directs the various branches throughout the country.

Mr. Manley organized this division, which has grown to huge proportions and has become known—very favorably—to owners of sets and radio dealers even in remote country communities.

To appreciate Mr. Manley's organization with its various devices, systems and methods a visit to one of the service stations is necessary.

I CANNOT refrain from mentioning that Mr. Manley was once a radio operator and that he had a thrilling experience. This was on a lifeboat designed along new lines which the inventor claimed would prevent it from capsizing.

To prove the boat's seaworthiness a trip across the Atlantic was planned. Here was shown Manley's grit, although with all his willingness he never made the voyage—nor did the boat.

During the tests all went well until the boat got out in the open sea. On each successive trip Manley's attacks of *mal de mer* would grow worse until on one occasion in desperation he leaped to the tug, assisting in the tests, and right then and there finished his career as a sea-going radio operator.

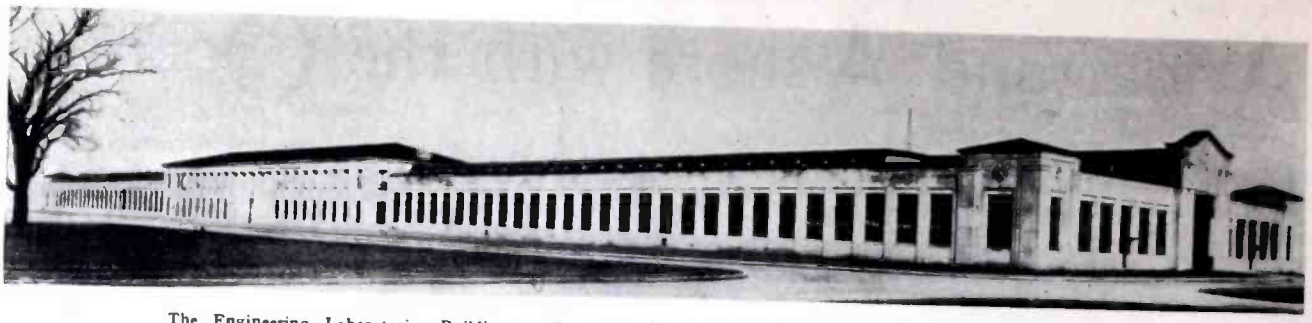
Following this he was assigned to the high power station at New Brunswick, from where he was transferred to the big transmitting radio plant at Honolulu, of which he was eventually made acting chief engineer. Later he became chief engineer of the New Brunswick station.

The first branch office of a radio company to be located at Philadelphia was opened by Mr. Manley, who was made district manager. This was at the height of the boom in ship building, for which that section was noted.

He also won distinction while at Philadelphia through his cooperation with naval and government authorities, who frequently consulted him and obtained much aid.

Following Mr. Manley's transfer to New York his successive promotions were rapid—and may they so continue, for here is one real thorough radio man.

Now, do you "know" Mr. Lee L. Manley?



The Engineering Laboratories Building at Dearborn, Mich., with the towners of WAV in the background

How Radio is Serving Henry Ford

This vast industrial project keeps functioning smoothly through the use of radio

By Howard S. Pyle

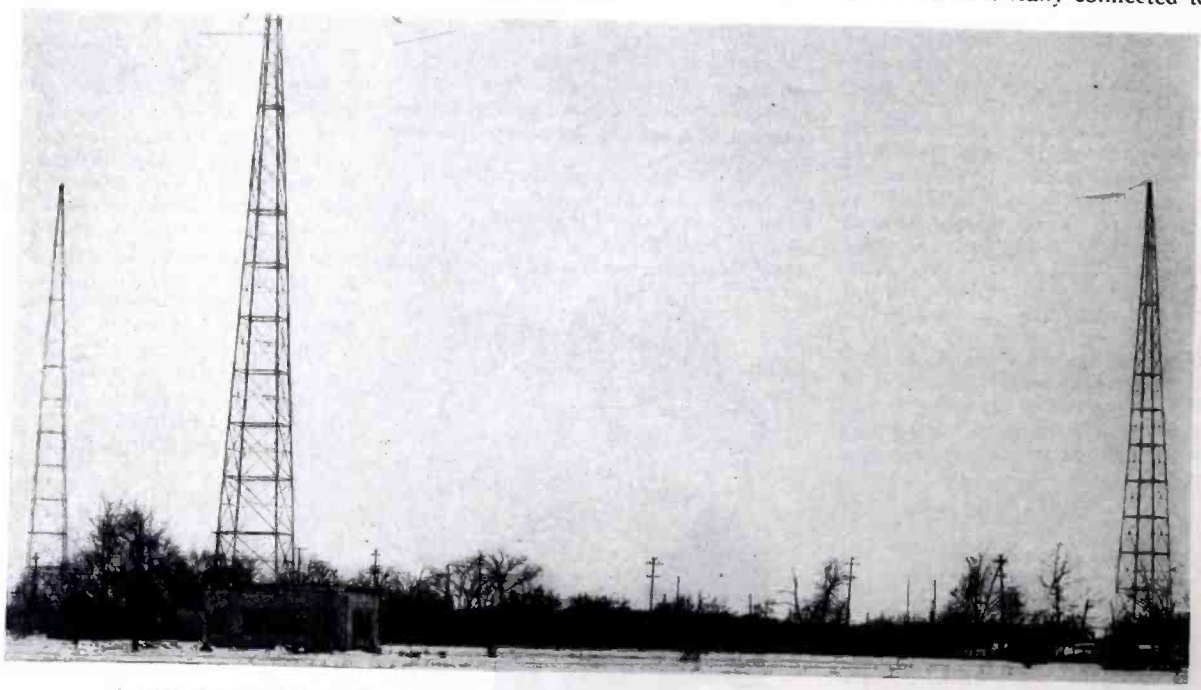
JUST ten miles west of Detroit a wide paved boulevard curves smoothly toward the main street of Dearborn, Michigan, and unfolds to our eye the white length and stately front of the new Ford Engineering Laboratory. Here center the personal interests of Henry Ford, his experimental research work, and the offices of the *Dearborn Independent*, Mr. Ford's weekly magazine. The building bears upon its columned facade the names of the great scientists of the past and present and a carved tablet with one of Mr. Ford's characteristic sayings about the "Three Principal Arts" — Agriculture, Transportation and Manufacture.

Nearby is a gleaming little triangular lake, from each of the three corners of which, rises to a height of one hundred sixty-five feet, the steel towners of WAV, the central station of an intricate communication network that has become an invaluable part of the communication facilities of the Ford Motor Company.

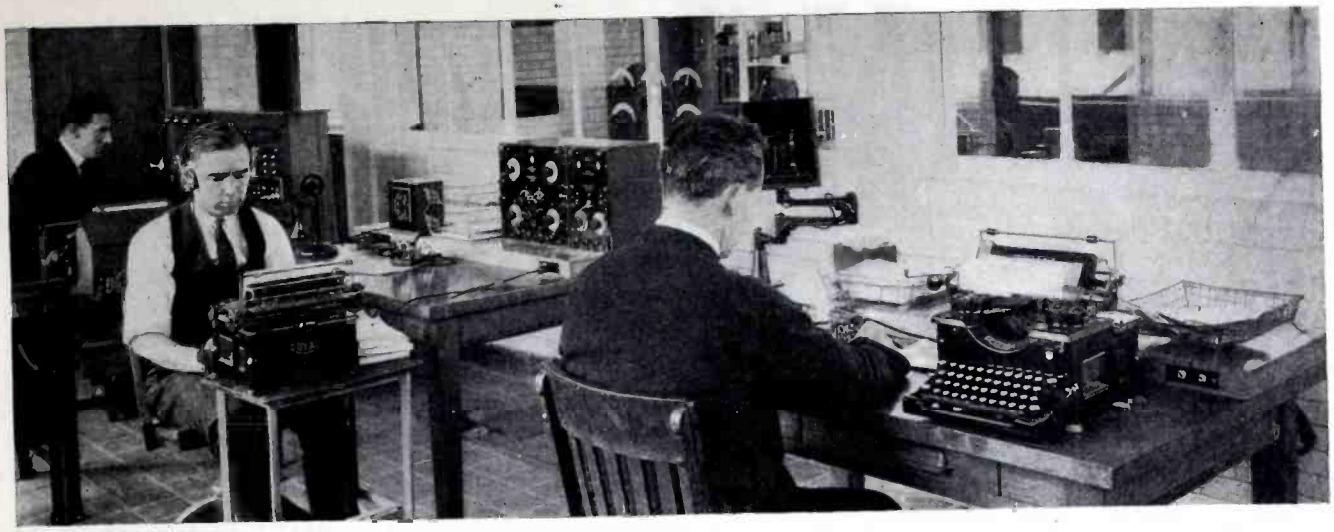
A courteous guide conducted us past an attractive little white cottage which is the dining club of the executives, down a broad walk to a solid square building of cut stone, nestling at the base of one of the huge towers. Cordially received here by the official in charge, we are taken on a systematic tour of the station.

To the average broadcast listener, much of the interior of WAV would be but a revelation in immaculate machinery, but to the enthusiastic amateur, the commercial operator or the engineer, this remarkable station presents a most interesting picture.

The outer door opens directly into the operating room with its modern selective receiving apparatus for the radio circuits, and its direct land wire to the main manufacturing plant at River Rouge. The printer-telegraph system in use between the Rouge plant and the station enables the Dearborn operator to transcribe the radio signals directly on a typewriter keyboard, which is electrically connected to auto-



Antenna system and station WAV at Dearborn, Mich. This is the central station of the Ford communication net



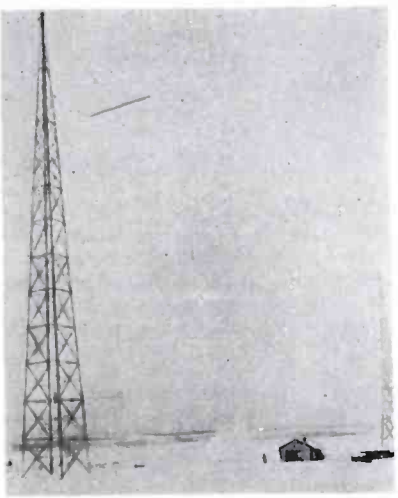
Operating room of WAV

matically transmit the signals by land line to the Rouge plant, thus eliminating the relay time necessary were the more conventional key and sounder used for retransmission.

Directly behind the operating tables a partition of glass and glazed tile separates the operators from the transmitting equipment, and yet keeps the entire transmitter room in plain view of the operator. Thus he can observe the various meter readings as well as the physical functioning of the instruments under his control.

The duplicate transmitters are of the continuous wave type, employing vacuum tubes as oscillation generators, each transmitter delivering one thousand watts of energy to the antenna, and were designed and constructed entirely in the Ford shops.

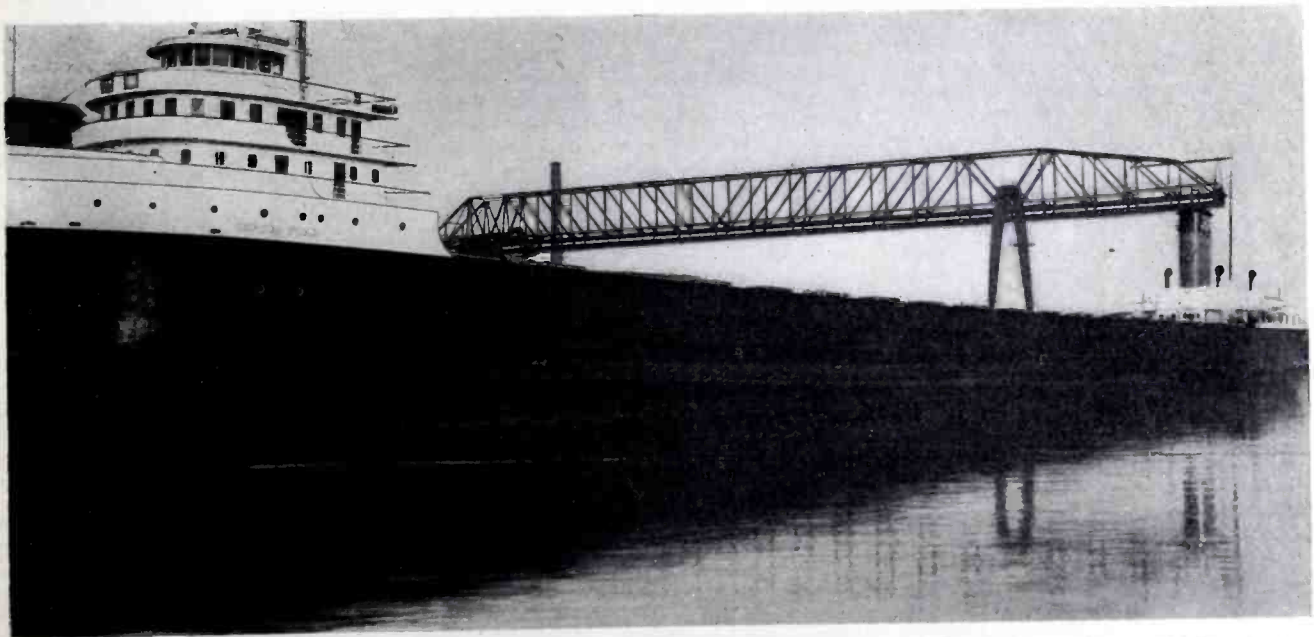
The plate supply current is ordinarily obtained from the two hundred thirty volt alternating current supply of the plant power house, suitably transformed and rectified. The resulting continuous wave note is very pure and pleasing to read. Motor generator equipment for emergency plate potential supply is also provided and the machines installed in the Transmitter room. The current is fed to the antenna through a system of heavy copper piping and massive lightning switches mounted on the ceiling of the transmitter room. Similarly are the counterpoise and ground feeders handled.



The antenna system of Station WCT, L'Anse, Mich., located on the shores of Lake Superior

Experimental work is being conducted on the antenna system in various combinations of ground and counterpoise. For ordinary communication purposes, two five-wire antennae are swung between two of the four-hundred-fifty foot spans between tow-

(*Turn to page* 67)



The motorship Benson Ford, one of the five vessels equipped with the standard 1 K. W. vacuum tube C. W., I. C. W. and telephone transmitters of the Radio Corporation of America

WORLD WIDE NEWS

By C. S. Anderson

Managing Editor of Wireless Age

Land's End Radio Station, just completed at Rockaway Point, N. Y. to aid the U. S. Coast Guard in their work

Indian Wireless—"Wireless World" Changes Hands—WJZ Re-Broadcast from London—International Radio Conference—Brazil's Super-Station—Vienna Concert House Programs

Indian Wireless

(*By* WIRELESS AGE *Special Correspondent*)

IN a recent interview Commander R. L. Nicholson, D.S.O., the Director of Wireless of the Indian Posts and Telegraphs Department, expressed hopes of a cheap and direct news service from the Dominions of Canada, New Zealand, Australia and South Africa with India. So far as the development of wireless for inland telegraphic purposes was concerned the Government of India are now examining the possibility of using radio as an adjunct to land lines, whenever fresh telegraph facilities seem to be called for. The 25 K. W. Stations at Madras and Rangoon are carrying a reasonable proportion of the telegraph traffic between India and Burma using the Baudot system for the purpose. No great necessity is likely to arise in the immediate future for installing radio for further inland communications in India. The erection of a large beam station has been left to private enterprise and a company has been formed in Bombay with the object of obtaining the right to erect a powerful transmission and receiving station capable of communicating with other parts of the world. The company may probably include two or more beam stations when the occasion arises. If the scheme for an airship communication with India materializes, the Government would erect a wireless station, possibly at Bombay, so as to enable the airships to keep in touch with India as soon as they leave Egypt.

Regarding interior communications on the beam system, the British General Post Office has undertaken to erect under contract with Marconi the necessary reciprocating station in the United Kingdom as each Dominion installed one. The requirements of the Government of India as regards the Indian Imperial Station were that the system should be capable of duplex communication simultaneously and be able to transmit a hundred words a minute for twenty hours a day at a charge not exceeding three-fourths of the prevailing cable rate. The beam system, though unfortunately impracticable during many hours of sunlight, has the advantage of sending messages to a great distance with a small amount of energy and cost. As showing the economy in energy, 25 kilowatts which were necessary for radiating a long non-directional wave from Madras to Rangoon, would be sufficient to transmit a short wavelength used with the beam system from the United Kingdom to India. The beam cost about one-eighth of the ordinary long wave non-directional station for the same range. The fact that a short wavelength was destroyed by dim light was compensated for by the very much more rapid transmission that was possible when the beam station could be worked and it was practicable to send messages on the beam system at the rate of 300 to 400 words a minute. Hence by a suitable allotment of types of traffic, the beam system could efficiently supplement the cable. Practically all deferred messages and a great deal of press traffic as well as the increasing popular daily letter telegram, could thus be transmitted at considerably cheaper rates than those at present extant with the cable. The news messages could probably be transmitted at a quarter of their present rate and it will be possible in the near future for newspapers in India to receive an adequate daily summary of news from all the Dominions, instead of having to rely on the London clearing house for cable messages. The big newspapers of India would then be in as advantageous a position as their London contemporaries for getting the news of the world.

Lastly, as regards the future of broadcasting in India, Commander Nicholson thought that it might have a considerable vogue in the big centers of population and among planters and others in outlying districts, but there are some difficulties to contend with in India, not the least being a serious scarcity of first class entertainment talent. According to him more might be done by newspapers and agencies to broadcast news than is the case in the United Kingdom, which would be to the advantage of the press and would probably be more effective in inducing people to read papers than say, the average poster.

"Wireless World" Changes Hands

THIS year *The Wireless World*, of the blue and green cover, that was familiar to those veteran radio-fans of ten years ago, and more, will pass away; and a new "Wireless World" will rise in its place, England's oldest radio journal, which has been published until now by the Wireless Press, has been taken over by Messrs. Iliffe et Sons; and at the same time, it is announced that the magazine will be entirely modernized in shape and outward appearance, its scope will be widened, and contents enlarged; but at the same time it proposes to retain the character which has built it a place in the wireless world, since the infancy of radio.

WJZ Re-Broadcast From London

THE Radio Corporation of America recently successfully re-broadcast a program of dance music sent out by Station 2LO, London, from the Savoy Hotel. Enthusiastic listeners-in declared the result was as clear as programs ordinarily received from Pittsburgh.

The hookup for this demonstration—said to be the first of its kind ever accomplished—consisted of a wire communication from 2LO to 5XX at Chelmsford, England, where the entertainment was put on the air at 1,600 meters and 20,000 watts. The station at Belfast picked the music from the ether and re-broadcast it on 120-meter wavelength

to the experimental station of the Radio Corporation in Van Cortlandt Park, whence a land wire brought it to WJZ for its final retailing to the radio public of America.

It was estimated one-fiftieth of a second elapsed between the striking of a note in the Savoy Hotel and its sounding in the ultimate earphone on this side of the Atlantic.

International Radio Conference

OVER fifty nations, all interested in radio communication have received from the State Department of the United States an invitation to attend the International Radio Conference which is to be held in Washington, D. C., next September.

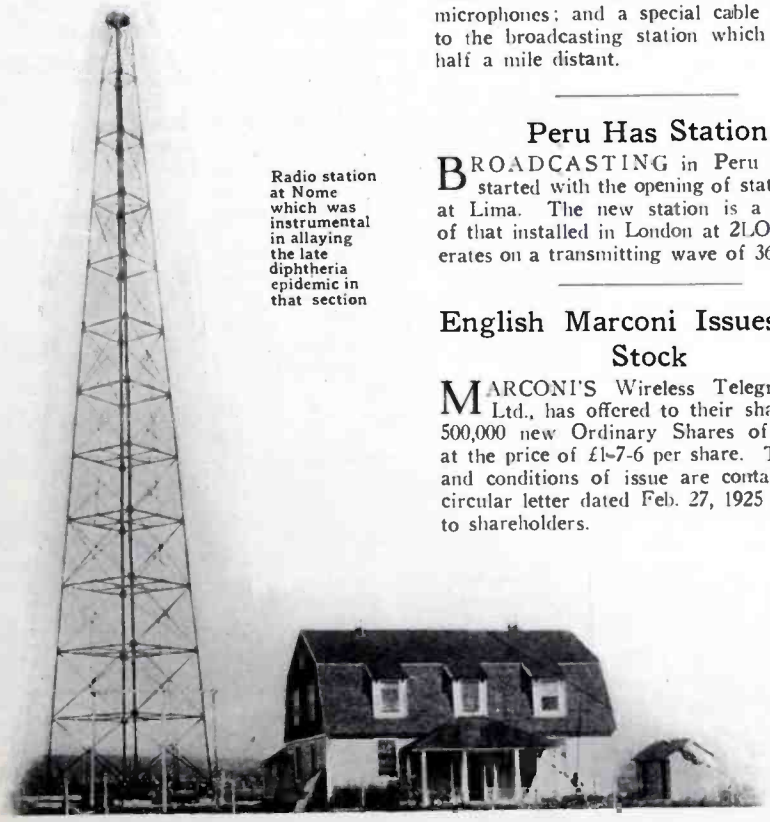
Many important new laws and regulations are sure to emanate from this Conference, which will take in broadcasting, short and long waves, power for transmitters, amateur communication, and other points that have developed since 1912 with the onward progress of radio communication.

Brazil's Super-Station

EVERY leading radio nation in the world will have a part in the construction of the radio station which will soon be erected in Brazil, not far from Rio de Janeiro.

That is, the station will be put up in collaboration by an Internationale of Associated Companies. The towers will be erected by Telefunken, the aerial by the Radio Corporation of America, the transmitting apparatus will be furnished by the British Marconi Company, and the generators by the French Compagnie Générale de Téléphonie sans Fil.

The new station will be built on much the same type as the French super-power station at Ste-Assise.



Radio station at Nome which was instrumental in allaying the late diphtheria epidemic in that section

PWX provides Sunday concerts for workers and children in Cuban sugar fields

Vienna Concert House Programs

IN RESPONSE to the demand of the hundred thousand and more owners of receiving sets in Vienna for better radio programs, the broadcasting company has completed arrangements for the transmission of the musical programs of the famous Vienna Concert House.

The stage of the hall has been surrounded with the latest and most sensitive types of microphones; and a special cable will lead to the broadcasting station which is about half a mile distant.

Peru Has Station

BROADCASTING in Peru has been started with the opening of station OAB at Lima. The new station is a duplicate of that installed in London at 2LO, and operates on a transmitting wave of 360 meters.

English Marconi Issues New Stock

MARCONI'S Wireless Telegraph Co., Ltd., has offered to their shareholders 500,000 new Ordinary Shares of £1 each at the price of £1-7-6 per share. The terms and conditions of issue are contained in a circular letter dated Feb. 27, 1925 addressed to shareholders.

Wire-Link Radio Broadcast System

COMPLETION of a direct-wire link between station WBZ, Springfield, Massachusetts, and the studios of the twin-station WJZ and WJY, New York City, is announced by the Radio Corporation of America. WBZ will hereafter participate in the simultaneous broadcasting of feature events with one or more of the four stations already linked together by the twin-stations.

WGY, Schenectady, and WRC, Washington, have both been connected to WJZ and WJY for several months. With the New York studios as the heart of the system, special programs of the WGY studio have been relayed to WJZ, WJY, and WRC, and special programs in Washington have been relayed to WJZ, WJY, and WRC. The system has been used most often, however, in relaying New York programs to the Washington and Schenectady stations.

The addition of WBZ to the chain will enable that station to broadcast programs originating in New York, Washington, or Schenectady, and will also enable either or all of the four stations to transmit programs originating in either Springfield or Boston. Thus each of the five stations has a "remote-control studio" in five different cities. The WJZ-WJY-WGY-WRC-WBZ system now covers the entire eastern half of the United States with easy "local reception."

Aerodrome Wireless

WIRELESS communication is an important factor in the organization of the airways and it is being increasingly used in the air services which are being developed all over the continent of Europe. In connection with the programme of development in Roumania, the Roumanian War Ministry has ordered two aerodrome wireless stations and twelve complete aircraft sets from Marconi Wireless Telegraph Co., Ltd.

Ail

(*Continued from page 11*)

degree of perfection and its vocabulary greatly enlarged through strictly scientific work lasting seven years and carried on by competent scholars aided and advised by many serious students of the Auxiliary International Language problem. In 1914 a period of stability of ten years was decreed during which no further changes were to be made and not even to be discussed in the official organ, and soon afterwards enlarged dictionaries were published in French and German. Very recently also enlarged dictionaries in English have appeared.

Ilo can, and should be further improved by removing all objectionable traces of its faulty bases, Esperanto and the project of Ido. No interruption should take place in this work of perfecting the language more and more. The writer has never approved of the long period of stability. *Errors to which a large number of people have become accustomed can never be eradicated,* as proved by the example of Volapük and Esperanto. In the preface to a new text book of Ilo the writer has this to say about the improvements yet to be made and about the harm produced by a long period of stability: "It is almost inevitable that certain features which cannot bear logical analysis may find entrance into a complicated structure requiring architects of all nationalities. This could come about, for instance, by a few architects of one nationality gaining undue preponderance over all the others, with the consequent inculcation of national peculiarities in the international language. Such errors, whatever their nature or cause, must be promptly set aside as soon as recognized. They invite criticism, and thus bring on dangers that cannot be evaded on the plea of a dogma of inviolability—*dogmato di netusheblezo,*—or of a period of stability—*periodo di stabilezo*—both of which amount to the same thing.

"An unduly long period of stability is prejudicial to Ilo also for another reason. It stops progress, and this involves retrogression, degeneration of previous achievements. Indeed the character of Ilo, which had been steadily improving up to 1914, began to show signs of degeneration a few years later; and it cannot be denied that this was largely due to the ill-advised institution, in that year, of a long period of stability.

"The writer has always been in favor of immediately eliminating from the language whatever can be proved to be logically untenable (Raporto XIII, etc.) and of carrying on without interruption the work of perfecting the language to the highest degree possible. In various publications * he has called attention to some necessary or useful improvements; has pointed out established usages, some officially sanctioned, others non-official, that are incompatible with sound reasoning, and has proposed adequate modifications of those imperfections. The most able students of Ilo have approved his views and proposals. He feels, therefore, justified in offering to all those interested in the Auxiliary International Language problem a short grammar of Ilo which teaches the language completely and in the sense outlined."

For the reassurance of those students of Ilo who may fear that further improvements may compel them to learn the language anew, it can be stated that the shape of Ilo is already finally established (see "Logical Shape of the AIL" and "Problem of the AIL") and that the improvements yet needed will not change that shape to any appreciable degree.

Ilo has already been put to extensive practical use in four international congresses, and in numerous publications, books and regularly appearing periodicals. Everywhere it has proved to be an efficient language, far superior to all previous systems, and to fulfill better than any of them the foremost requirement of the Auxiliary International Language—namely ease of acquisition. Seventy-five per cent. of its vocabulary is known to English speaking people and the whole elementary grammar is practically contained in this one short rule: The main parts of speech are recognizable at a glance through characteristic endings. These are as follows: Every word of two or more syllables ending in *o* is a noun in the singular; in *i* a plural; in *a* an adjective; in *e* an adverb; and in *ar, as, is, os, ez* a verb respectively in the infinitive, present, past, future, and imperative. The pronunciation of the vowels is the continental one, *a, e, i, o, u*—sounded like in palm, pet, pink, porch, pull. The consonant *c* is pronounced like *ts* in wits. This is all the grammar needed for translating into English quite complicated Ilo sentences. A few are cited here for illustration, and the English translation is given under the Ilo text and in the same order of the words so that a dictionary is not needed.

Bela blumi floras en la gardeno, ed
Beautiful flowers bloom in the garden and

alta arbori, kun grina folii en la somero,
high trees, with green leaves in the summer,

donas ombro a la domo e plezuro a
give shade to the house and pleasure to

pueri ed adulti. Elektrala ondi propa-
children and adults. Electric waves propa-

gas la sono kun la rapidezo di la lumo.
gate the sound with the rapidity of the light.

La soldati kombatis brave e defetis la
The soldiers fought bravely and defeated the

enemiki komplete. La marveloza de-
enemies completely. The marvelous de-

velopo di redio en la lasta dek yari
velopment of radio in the last ten years

rendas posibla rediefar longa diskursi
renders possible to broadcast long speeches

fro Amerika ad Europa. Per redio ed
from America to Europe. Through radio and

Ilo la homi povas parolar kun, e kom-
Ilo the people can speak with and under-

prenar, altra homi, qui habitas en dis-
stand other people who live in dis-

tanta landi e havas diferanta matrala
tant lands and have a different maternal (mother)

linguo.
tongue.

The preceding illustrations are sufficient to show that Ilo can be learned in a few lessons to the extent of being able to understand any given Ilo text. Radio amateurs will therefore not have to lose much time in acquiring a knowledge of the Auxiliary International Language they are so much in need of for communicating with others of a different mother tongue. In a subsequent article we shall give further illustrations of Ilo.

Finally a little poem is presented to show that Ilo is also well adapted for poetry. The original is Goethe's "Wanderer's Nachtlied," a gem of lyric poetry. Dr. Ignatz Hermann of Graz, Austria,* translated it into Ilo, and there is a version of it in English by Longfellow. A comparison of all the three shows that, in faithfully imitating both the form and spirit of Goethe's wonderful lyric, Dr. Hermann's Ilo translation is not excelled by the version of the great American poet.

Wanderer's Nachtlied
By Goethe

Ueber allen Gipfeln
Ist Ruh;
In allen Wipfeln
Spürest du
Kaum einen Hauch;
Die Vogelein schweigen im Walde.
Warte nur, balde
Ruhest du auch.

Nok-to-kansono di migrero By Dr. Hermann	**Wanderer's Night Song** By Longfellow
Super omna kolini	Over all the hill-tops
Es quietezo;	Is quiet now;
Super omna somiti	On all the tree-tops
Tu sentas apene	Hearest thou
Subtila sufleto.	Hardly a breath;
L'uceli silencas en la foresto,	The birds are asleep in the trees.
Vartez nur, balde	Wait, soon like these
Repozos tu anke.	Thou, too, shalt rest.

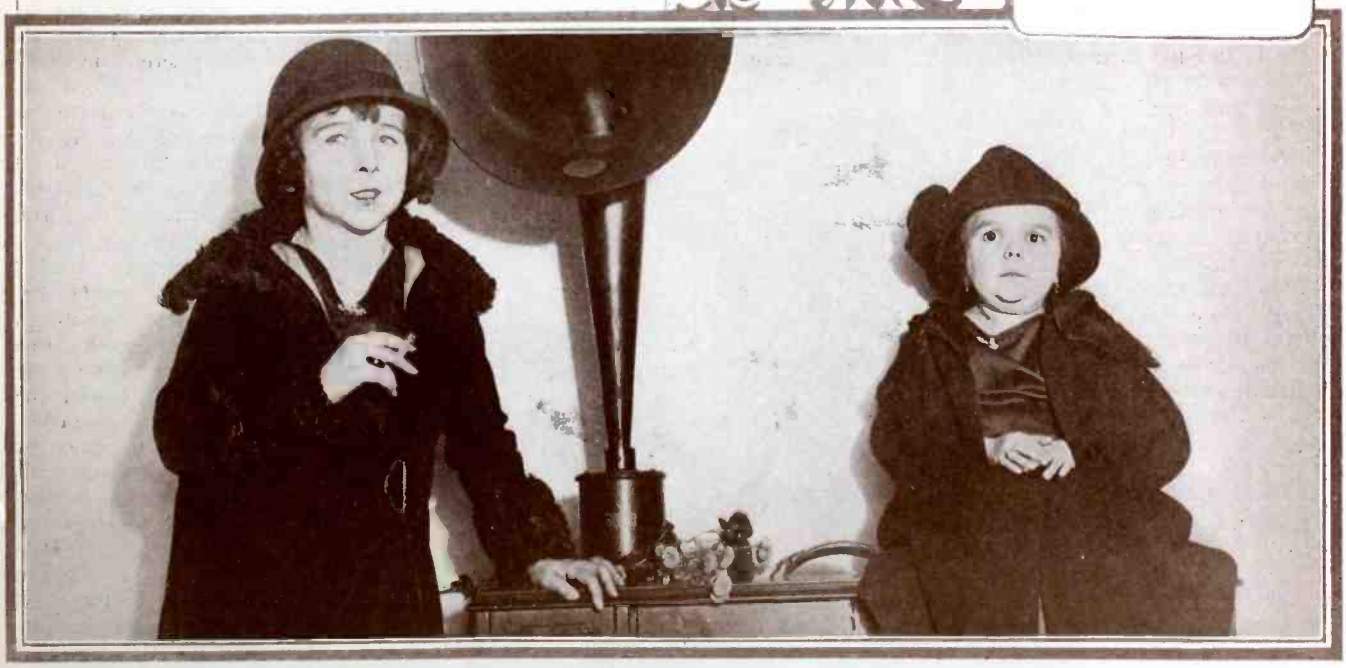
* Exhaustive Text Book of the LD; Lektolibro di Ilo; Raporti; Filologiala Temi.

* Dr. Hermann (died in July, 1923) was one of the most revered members of the Akademio and a pioneer of the International Language idea and of Ilo which he handled masterfully in prose, and in an unequaled manner in poetry. He was one of the circle of "most able Ilists" whose unstinted approval and commendation have encouraged the writer to brave the *"periodo di stabilezo."* Another one is Dr. L. W. Woodcock of Scranton, Pa., who has given the writer some valuable suggestions for the improvement of Ilo.

Entertainment *for* Entertainers

Hope Hampton, movie star, indulges her radio fancy with a miniature crystal receiver and seems to enjoy it

Pauline Chambers, noted dancer, studies the terpsichorean art on the California beaches to the accompaniment of broadcast music



Two of the famous Singer Midgets troupe, Anna Negder (left), and Victoria Negder, sisters, listening-in. They are radio enthusiasts and a Radiola is part of their luggage on all tours

Taking the oath of office—note the six microphones in the foreground

The First Radio Inauguration

President Coolidge's inauguration becomes historic

Millions listen to the ceremonies for first time

By Otto Wilson

"DO YOU, Calvin Coolidge, solemnly swear that you will faithfully execute the office of President of the United States, and that you will, to the best of your ability, preserve, protect, and defend the Constitution of the United States, so help you God?"

With these words, delivered in a strong vigorous voice, Chief Justice Taft instituted on March 4 last the first radio inauguration in the history of the country. President Coolidge's response, "I do," was spoken in so low a voice as to be scarcely audible. But a moment later his clear tones rang out in the opening phrases of his address, so firm and resonant that all of his millions of listeners might hear, without strain, each deliberate syllable.

From a radio point of view the occasion was indeed historic. No one can dream what a tremendous part radio is to play in the nation's future life. But for hundreds of years the elected executive of the American people, beyond doubt, will speak his first message as President directly into the listening ears of a radio audience comprising a large proportion of the nation he is to lead. Centuries hence historians will hark back to the inauguration of 1925 as the first in a long series of such events to be broadcast to almost every country who cares to hear it.

Before another President takes the oath of office, the people he is to serve may be able to count on seeing as well as hearing the ceremonies, so swiftly does invention move in these wonder-working days. Could they have tuned in visually as well as audibly on last March 4 they would have witnessed a spectacle more impressive in its setting than any other, perhaps, which this country has to show. For a background there was the broad and stately Capitol, with its magnificent dome dominating the whole scene and communicating to it, somehow, a protecting sense of serenity and stability. Great flags hung between the portico columns and fluttered from a dozen staffs. Large green laurel wreaths helped to vary the color scheme, while just below the President's station the official arms of the United States showed up light yellow against the white background of the stand. Extending a hundred feet out into the broad plaza a low platform held thousands of favored guests, with a special section reserved for the President's friends from Massachusetts, and in all directions beyond them stretched the vast crowds of tens of thousands of Washington citizens and visitors gathered together from every part of the country.

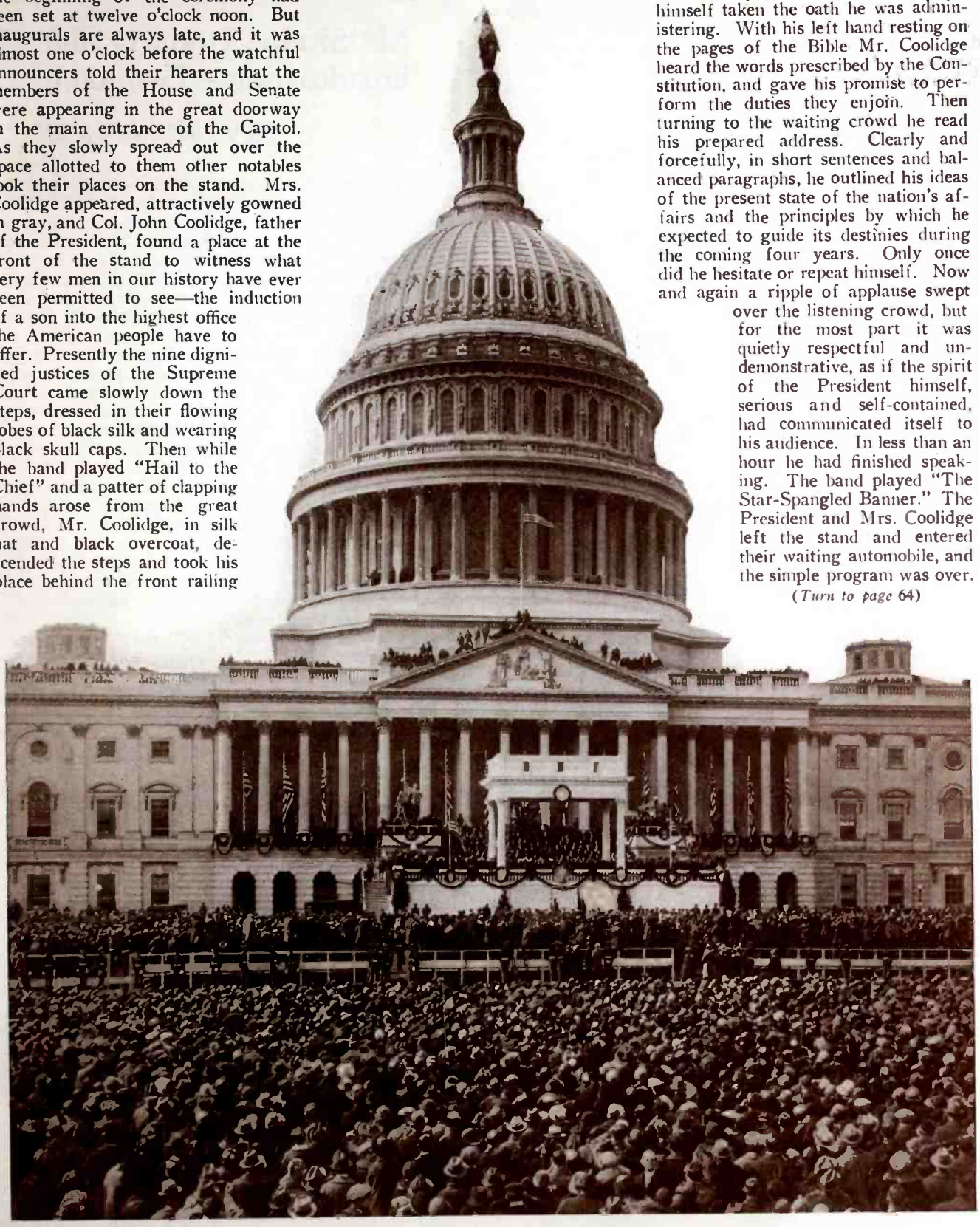
The President and the First Lady in the Land in the Inaugural parade

"Coolidge luck," which threatens to become proverbial in American history, this time took a meteorological turn, and the throng was quite comfortable in weather coolly pleasant — almost a miracle for inauguration day in Washington. While Frederick William Wile, head of the inaugural press committee held the crowd at the Capitol with an interesting talk, the two radio announcers Graham McNamee for

the Bell system and Norman Brokenshire for the Radio Corporation of America, painted colorful pictures of the scene for their audiences of scattered millions. The time set for the beginning of the ceremony had been set at twelve o'clock noon. But inaugurals are always late, and it was almost one o'clock before the watchful announcers told their hearers that the members of the House and Senate were appearing in the great doorway in the main entrance of the Capitol. As they slowly spread out over the space allotted to them other notables took their places on the stand. Mrs. Coolidge appeared, attractively gowned in gray, and Col. John Coolidge, father of the President, found a place at the front of the stand to witness what very few men in our history have ever been permitted to see—the induction of a son into the highest office the American people have to offer. Presently the nine dignified justices of the Supreme Court came slowly down the steps, dressed in their flowing robes of black silk and wearing black skull caps. Then while the band played "Hail to the Chief" and a patter of clapping hands arose from the great crowd, Mr. Coolidge, in silk hat and black overcoat, descended the steps and took his place behind the front railing of the attractive stand erected for the occasion.

As simple and severely plain as the New England life from which he sprung was the ceremony of his inauguration. With upraised right hands the Chief Justice and the President faced each other, while an attendant held an open Bible between them. Never before had a President been sworn in by a Chief Justice who had himself taken the oath he was administering. With his left hand resting on the pages of the Bible Mr. Coolidge heard the words prescribed by the Constitution, and gave his promise to perform the duties they enjoin. Then turning to the waiting crowd he read his prepared address. Clearly and forcefully, in short sentences and balanced paragraphs, he outlined his ideas of the present state of the nation's affairs and the principles by which he expected to guide its destinies during the coming four years. Only once did he hesitate or repeat himself. Now and again a ripple of applause swept over the listening crowd, but for the most part it was quietly respectful and undemonstrative, as if the spirit of the President himself, serious and self-contained, had communicated itself to his audience. In less than an hour he had finished speaking. The band played "The Star-Spangled Banner." The President and Mrs. Coolidge left the stand and entered their waiting automobile, and the simple program was over.

(*Turn to page* 64)



Part of the immense crowd in front of the Capitol during the inauguration—the unseen audience was estimated at 20,000,000

THREE

Mr. Shawn Moriarty and broadcasting—Two loud-

By William

MR. SHAWN MORIARTY and Mr. Claus Baumwetter lived side by side in brand new houses separated by a scraggly hedge and the width of a driveway running back to Mr. Moriarty's sheet tin garage. Mr. Moriarty was a Cement Block contractor in a small way and Mr. Baumwetter, during his hours of toil, presided over a delicatessen. Chance and a persuasive realtor with a new and shiny development on his hands and a disposition to dispose of hastily built six-room-and-tile-bath houses for seven hundred and fifty dollars down and the rest like rent, had made them next door neighbors in the suburb of Shady Villas. The two houses were very much alike except for a slight difference in the roof lines, though one had been sold to Mr. Moriarty as a "Donegal Cottage" while the other had gone to Mr. Baumwetter as a "Dutch Colonial." Having a good deal of buying inertia to overcome, the agents in charge of the sale had fortified themselves shrewdly with inducements to be dwelt on as "talking points," chief of which was an already installed and complete radio set in each house.

"Der laws should chall every ret headed Mick vat butts der air into mit shrieks and yowls und monkey shines! Py Golly!"

REVERE F. WISTEHOFF

Mr. Moriarty came home one evening with the knowledge of a day well spent in industry and profit and with a luxurious anticipation of a warm and restful fireside—if the chimney did not smoke—and some blissful hours of music from the air. Mr. Baumwetter, on the same evening, came home in much the same state of mind. Both ate with heartiness, discarding coat and shoes for shirt sleeves and carpet slippers, and after appetites had been stilled for the time being, each sat him down to manipulate the magic dials, Mr. Moriarty seeking the distraction of listening to Callahan and O'Shea in a selection of Ballads of the Ould Sod, while Mr. Baumwetter tried to tune in on the Hofbrau Haus Band Concert. Neither was especially expert and the inwards of the sets were profound mysteries to them, made more so by the exceedingly sketchy and more or less extemporaneous directions, which had been furnished them by the sellers of the property.

Mr. Moriarty grunted and fumbled gingerly with his dials, referring every now and then to a slip of paper on which he had laboriously figured out the procedure. The result was distressing. The yawning horn that stared him in the face emitted a series of raucous and dreadful yowls and screams.

"Phwat the divil," said Mr. Moriarty, heatedly, "has coom over th' dom' thing? 'Tis loike the wailin' of O'Mara's pet Banshee on the night of th' Big Wind."

MRS. EILEEN MORIARTY was a high school graduate and a woman of intellect. Having a radio set she had set out to inform herself concerning it, using as a medium her favorite radio magazine. Wherefore she was primed with technicalities and much confusion of mind.

"'Tis what they call 'interference' I have no doubt," she informed Mr. Moriarity. "Some wan o' the neighbors is mussing the air all up on you. I don't know how 'tis done, but it is as the paper says."

Mr. Moriarty tried again, perspiration be-dewing his ample face. The result was even more of a torture.

"Bedad!" said he with profound rage, "'tis thot domned Dootchman over the d-r-rive! Ye can tell be the squeal of it thot there is pig's feet and sauerkrout in the hor-rn. And me set

CHEERS!

Mr. Claus Baumwetter, speakers that worked

West Winter

the night to listen to Callahan singin' 'Swate Molly O'Dea' loike the thrush thot he is. The Divil fly away wid the Dootch, say I, frum the Kaiser down to Baumwetter and beyant! I will go and put the fear o' St. Kevin in the heart of him!"

And heedless of Eileen's feeble protests, he rose in all his wrath and stalked out of doors into the moonlight, muttering furiously to himself:

"Interference, is it! Is the loikes of thot kraut tub to spill pickled delicatessen be the quart into ivery r-radio horn on th' block? Be th' Bull of Ballyvaghan, I'll give him somethin' to howl for!"

AT ALMOST the same instant Mr. Baumwetter, in an equal state of anger, emerged from his front door and strode across the meagre patch of sand that would some day be lawn, toward the domicile of Moriarity. They met at the party line of the two estates, halting with the two-foot high hedge between them. Their fists came up together and were shaken under opposing noses.

"Bedad and be domned to ye!" said Mr. Moriarty, violently, calling upon a hazy knowledge of technicalities, "ye hov got a hook-up made out of a frankfurter and ye've wound the tail of it into the very—oh—coopler so thot the howlin' is disturbin' the peace of thousands. If ye do not uncoople thot Dashhoond cirkut ye hov there, I'll be doin' it for ye wid an axe, ye murderin' Dootch sleep killer!"

Mr. Baumwetter replied with equal fervor.

"Irish bummer vat you vass!" said he, shrilly. "*Du lieber strausse!* Der laws shoult chail effery ret headet Mick vat butts der air into mit shrieks und yowls und monkey shines! Py Golly! I bet you dot you are full off dot Irish bootleg stuff so dot you t'ink you are cranking der fliffer mit der radio. Sooch a massacre! *Himmel Gott!*"

"Shut up, ye Dootch thief o' the world. 'Tis ye're Auntie Nye thot is afther wakin' the Siven Slapers o' Kilmain! Bedad, 'tis nawthin' but barbed wire and every prong of it has been puttin' torture to me this half hour past!"

"Liar vat you are!" retorted Mr. Baumwetter, furiously. "Not'ting you know aboudt it, Irish! Carrying der hodt is not der training fer a radio mechanic. Such an ignorance vat you haff!"

"But 'tis an educated fist I will be afther introducin' to ye," said Mr. Moriarty, as he made a vicious pass at Mr. Baumwetter. "Stoody thot, ye bum!" He landed heavily on Mr. Baumwetter's nose.

"Und interfere mit dot!" yelled Mr. Baumwetter, as he swung solidly upon Mr. Moriarty's ribs. In another instant they had locked affectionately together and were as one stepping back and forth over the hedge, which, feeble at best, was soon reduced to absolute desuetude. On the small veranda of each residence, their wives appeared, adding shrill protests to the noise of battle. Simultaneously each lady had a brilliant thought and fled indoors to the telephone, to ring frantically for the police. The result was additional and hopeless interference, this time on the telephone wire, as they were on the same party line. Another battle, verbal this time, quickly developed through and by the transmitters as each tried to get the ear of Central. As each was shouting "Police" at the top of her lungs, Central finally got excited herself and rang the required number so violently as to lead the chief of police to believe the bank was being robbed. He had his money in it. He rang a riot call and led all his reserves out to the police flivver.

In the meantime the main battle was a drawn affair. If Moriarity was fiery and active, Baumwetter was heavy and solid. Each was doing damage and each was receiving it. A number of neighbors erupted from other villas and encouraged them impartially, with such shrill vociferousness that officer No. 46, otherwise policeman Hans Jensen, was at last aroused from contemplation of the beauties of the night and bestirred himself to reach the scene of hostilities. He came ma-

"Ye hov got a hook-up made out of a frankfurter and ye've wound the tail of it into the very-oh-coopler so thot the howlin' is disturbin' the peace of thousands"

jestically, as was his wont, and his calm voice was pitched to still the storm of strife.

"AY tank I ask you bummers vat you mean!" he said sternly, laying ponderous hands on the battlers. They turned on him simultaneously and biffed him. He was a placid and mountainous Swede and efficient in his own way. He cuffed both heads together with impartial unconcern and, when the riot squad arrived in the flivver with the patrol wagon following hard in its wake, he strode forth dragging both forms and flung them into the latter.

"Ay tank it iss all raight, cap'n," he said to the anxious chief. "Yust a Mick and a Fritz haffing soom fun. Ay settle 'em!"

"Run 'em down to 'squire Fiebleman's court and haul 'em up!" barked the chief. "Which one of 'em started it?"

"Ay bain't sure," said Jensen. "Ay tank bot' iss on de hop!"

"Well, they'll do their future hoppin' in the hoosegow!" said the police chief, nettled at having misunderstood the importance of the affair. "Bring 'em along to the Bastille!"

With Jensen interposing his ample form between them, the two foes rode stationward and in due time were haled before a uniformed lieutenant who expressed curiosity concerning their antecedents and family histories. While he was taking the pedigrees, Justice of the Peace Fiebleman entered hurriedly and took his seat on the throne of justice. Hours meant little to the Justice as long as there was a prospect of a fee to be earned and this promised to net him a couple of fairly fat ones. He glared with judicial majesty at either culprit. They could not meet the frowning countenance of the Law and instead, bent lowering looks upon each other.

"I will hear and dispose of the case at once," said the 'squire, portentiously.

"Then ye will be afther hangin' this murderin' rascal without more ado, yere honor," said Mr. Moriarity, ingratiatingly, "for disturbin' the p'ace, assaultin' orderly citizens an' deefenin' ivery ear within miles wid the squawlin' of his r-radio. Sure, he is dangerous to be at lar-rge, he is so!"

"Py Golly, der truth it iss not in him, 'squire!" exclaimed Mr. Baumwetter, excitedly. "This bummer iss der cause vat makes itt all. For vy he slugs me in ter nose? Maybe he tells you iff you ask him!"

"Silence!" roared the Justice. "Officer, let us have the facts."

OFFICER JENSEN scratched his round poll. He was strictly impartial, there being no Swedes involved other than himself.

"Ay tank dey bot' raise Hall!" he suggested after due thought. "Dey faight yust der same ass cat und dog! Ay tank so!"

The Justice considered the case solemnly. He finally frowned upon both once more, so that they well might have quaked in their boots had they been observing.

"Under the Statute as made and provided," he said at last, impressively as though he wore the fatal Black Cap, "I have no alternative but to find you both guilty. Thirty dollars or thirty days! Pay the lieutenant at the desk as you go out."

"Pwhat!" yelled Mr. Moriarty. "Thir-rty scads fer thoompin' thot bla'guard whin I ought to git a medal fer the same? I'll niver pay ut!"

"Ough! Himmel und blisters!" echoed Mr. Baumwetter. "Thirty dollars fer an Irisher! Der iss no Joostice!"

"There's a Justice of the Peace though!" commented the austere 'squire. "Lock 'em up, lieutenant, and let 'em think it over!" He rose with dignity and went hence to sleep soundly in the consciousness of rectitude and duty well done. The lieutenant haled the protesting belligerents to the barred door opening upon the court from the local House of Incarceration. He considered the scene proudly. There was one large room in the jail, having a window opening on to the street in front. Half way to the rear it was divided by a steel barred partition containing two doors. At right angles to this another partition without doors, running back to the rear wall, formed two cells, in each of which, at the rear, was a barred window. There were two cots in each cell and on one of them in the cell to the right, lay a snoring and restful figure.

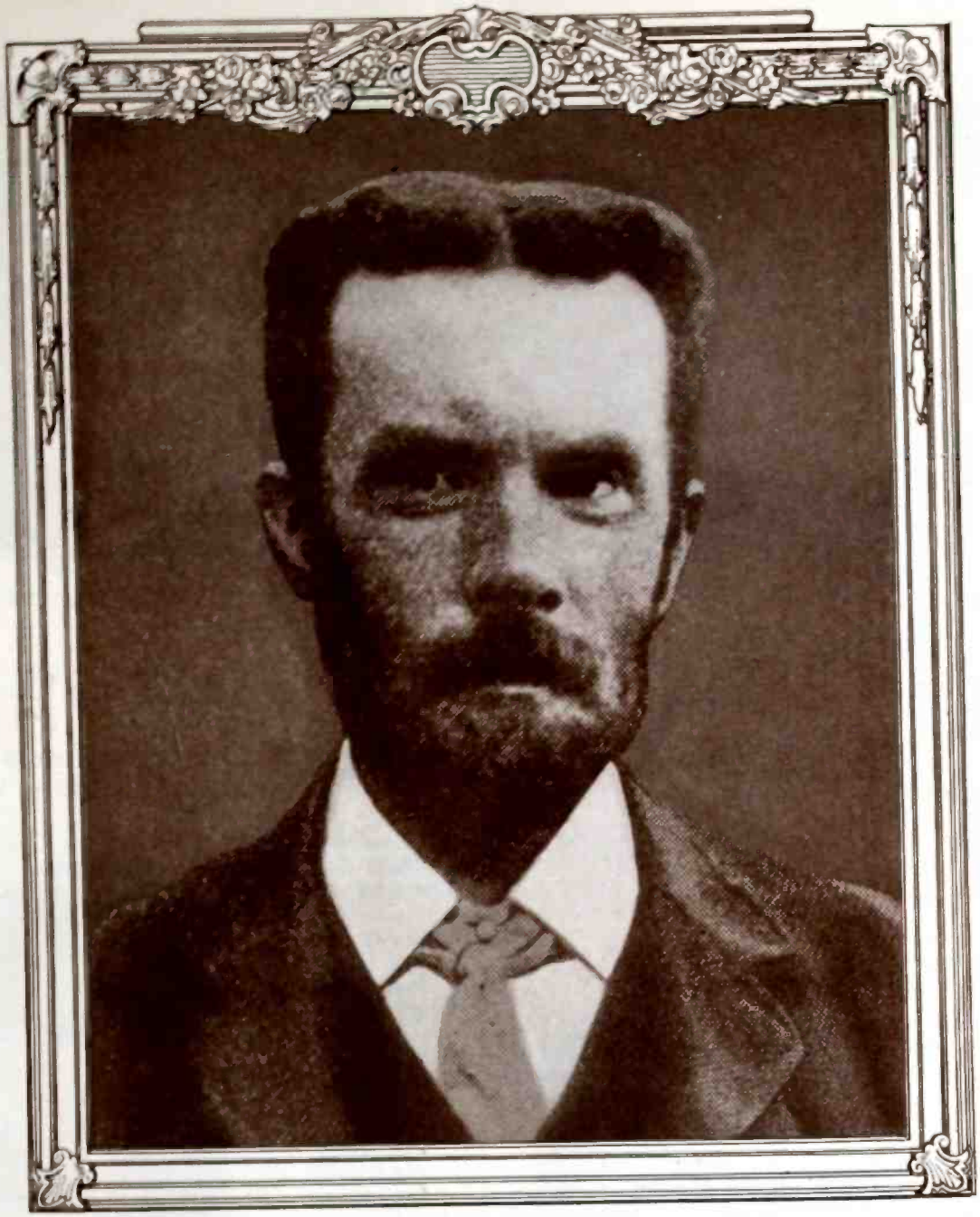
Mrs. Eileen Moriarty was a college graduate and a woman of intellect. Having a radio set, she had set out to inform herself concerning it, using as a medium her favorite radio magazine

"I will not put you in with the bum, there," said the lieutenant, benevolently, "seeing he probably needs some disinfecting before being fit to receive company. So the two of you together and if there is any more battling, I will come among you with two hands and a hard club to educate you into the 'Order of Civility.'"

With that he opened the left hand cell and thrust them in. They instinctively sidled away from each other and sat on their respective cots, eying the other with the ferocious and suspicious regard of a wild cat for a wolf. Their teeth gnashed but the lieutenant's warning was effective, especially as he himself sat down at a table in the room outside and hoisted his feet comfortably aloft.

A light burned in a dusty bulb over his head, throwing the place into shadow outside of a circle in the midst of which he lounged. Back against the walls on one side loomed the dim outline of a stack of files and on it was something that must eventually catch the eye of any newly fledged radio fan—or, for that matter, that of one fledged long enough to moult several times. Its outlines were dim and vague yet it appeared to be a fine and handsome set, one guaranteed to get DX on the Loud Speaker. As though in spite of themselves, the faces of the two prison-

(*Turn to page* 48)



OLIVER HEAVISIDE

His genius and his work

By Oscar C. Roos

Consulting and Research Engineer of F. A. D. Andrea

ON February 3, 1925, there passed away one of the most original and profound mathematical geniuses that the world has ever seen. A man whose vision and clear thinking has paved the way for a host of physicists who, today, are exploring the continually widening field of radio and wire telegraphy and telephony. His genius has been spent on the solution of the most difficult problems in the propagation of electric impulses; in the theory of radiation; and in the explanation of some of the least known properties of mathematical series which usually are ignored as soon as they are found to be divergent.

However much Oliver Heaviside has been appreciated by a few leaders such as Lord Kelvin, the famous FitzGerald, Dr. Searle, and a few others on the Continent, it is not generally known that the first physicist in America to

(*Turn to page* 71)

IT is indeed strange to note that Heaviside anticipated the modern use of Dust Core Transformers for high frequencies and to avoid distortion, years before several physicists and finally the Western Electric Co. produced transformers using such cores. Such cores were experimented with as early as 1906 in this country and the results bore out what Heaviside had predicted.

Harry Geise, the original "How Do You Do" man, assistant director at WQJ

Quin A. Ryan, chief announcer and "Uncle Walt" at Station WGN

Robert D. Boniel, director at Station WEBH

Chicago

Here are some of the entertainers from KYW, WLS, WQJ, WEBH, WGN and WTAS

A FEW days ago I came across a letter written by one of our earliest radio fans to Mary Garden, the famous soprano of the Chicago Grand Opera Company.

The author of this epistle is a shy, Frank Bacon-sort-of-man, who would not write a letter to anyone, unless it was of the utmost importance. Therefore, the letter to the grand opera star aroused my curiosity. I insisted as only a woman can, ".....and why the letter on file to Mary Garden"?

He looked at me in amazement for a moment then replied:

"We owe homage to Mary Garden. She ushered in the sniveling, little thing we first called radio. It came to Chicago as any new born thing; fearfully, expectantly, hopefully; yet at the time with but little promise, and now," proudly, "look at it!"

Ford Rush and Glenn Powell, "Lullaby Twins" who broadcast from WLS

Judith C. Waller, director at WMAQ

So that is what I am doing; looking at it, and listening in on my home-made set. It certainly has grown, that tiny unpromising thing called radio. It's about the biggest, lustiest, healthiest, happiest thing that ever grew from so small a beginning. Radio in its present stage furnishes a hint, upon which a Franklin might work with more certainty when he coaxed the lightning from the clouds.

This, according to the archives of Middlewest history, happened in the Auditorium, November 11, 1921. On that night a new dot appeared on the radio map, that dot represented Chicago. The broadcast was made from

Coon-Saunder's "Night Hawks" who broadcast from KYW

Broadcasts

By Ann Lord

the Westinghouse station KYW. Since then KYW has grown into one of the most powerful and select stations in the country. From a staff of three it has grown to a staff of over thirty—all experts in the radio world.

Walter C. Evans, the earliest member of this staff is still chief engineer, and Wilson J. Wetherbee remains director. KYW is on the air twenty-four hours a day, six days a week. It was the first to broadcast grand opera, football and college sports and to give an entire play from the theatre. It was also first to carry a newspaper connection, and it acted as train dispatcher during the heavy snows of 1923-24.

The present programs are usually classical in nature and represent the best talent of both this continent and Europe. The nightly entertainment given in the Balloon Room of the Congress Hotel is popular dance music played by Coon Saunder's Oriental Night Hawks. If their better programs are classical, certainly one may say that this part of the program is jazzy. Messages from the admirers of the Night Hawks have come from almost every corner of the globe. Listening in as I do each night, I get the impression that everybody with a set belongs to their insomnia club, and along with the others I find I am not always willing to stand by when they sign off.

VERY early in the history of radio, Middlewest newspapers sought through its use to enlarge their scope of public service. Among the first to establish a broadcasting station was WGN, the *Chicago Tribune*. This is presided over by Quinn A. Ryan; jolly, genial, and a whole show by himself. He is the original "Uncle Walt of Gasoline Alley." Since Marion Gertrude Haines established "Skeezix Hour" for that ever elusive bachelor baby, Uncle Walt has been with us. He's as much a fixture in Chicago as the Chicago river or the Wrigley Building. This station is operated from the Drake Hotel, and I always get a good program over my receiving set.

With a flip of the dials, I tune in on WMAQ's program. This is the only station in Chicago operated by a woman. She is Miss Judith C. Waller, *Chicago Daily News*, and official Radio Chairman of the General Federation of Women's Clubs.

The programs from this broadcasting station took on a home atmosphere from the start, and is built of features that fit the home. WMAQ is dubbed high-brow by many, but Miss Waller stays with her original idea, being convinced of the value and interest of educational features. Programs include three lectures a week, two from the

(*Turn to page* 54)

Forbes Fairbairn, manager, and Lee Sims, pianist, at WJAS

A Coast Guard vessel issuing radio warnings of a monster iceberg

CHARTING THE ICE-FIELDS

How life and property is protected in the North Atlantic by radio-equipped Coast Guard Cutters

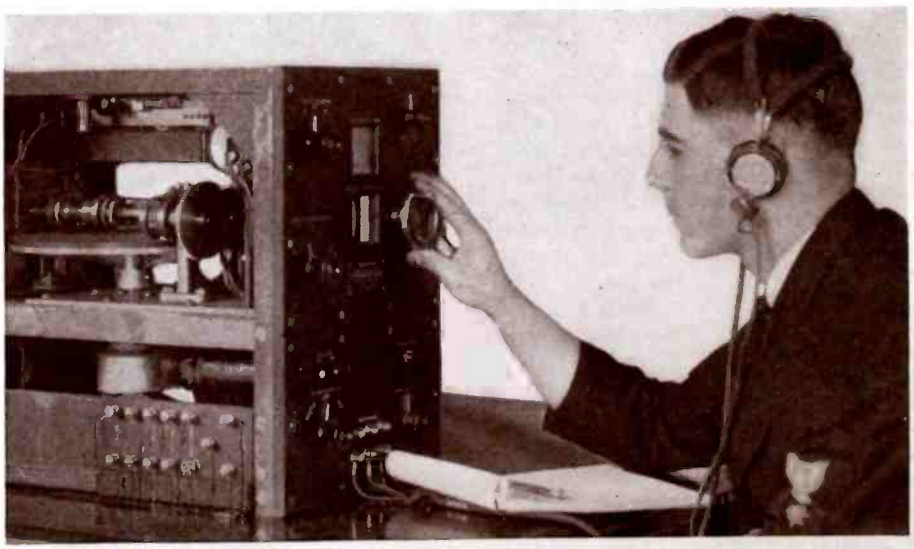
By S. R. Summers

THE captain of a steamship leaving Detroit, Michigan, with a cargo for European points may accept as commonplace the instructions charting his course up the St. Lawrence River. However, without an ice-patrol system in the vicinity of the Grand Banks, off Newfoundland, a floating mass of ice might cross the pathway of the vessel and the cargo fail of its destination.

Life and property would be in constant jeopardy from icebergs and field ice, but for the warnings issued frequently by radio-equipped patrols, assigned in a region where navagation is menaced. Therefore, the two cutters of the Coast Guard alternately on duty this winter, beginning about March 1, 1925, have been provided with modern radio-communication facilities for the daily issuance of warnings to trans-Atlantic shipping interests of the whereabouts of huge chunks of ice.

Both the *Modoc* and *Tampa*, ice patrol vessels, have been equipped with electron-tube transmitting equipment, displacing the arc transmitters in use during former years. This new equipment has a power rating of two kilowatts, and is capable of sending signals either by radio telegraphy or radio telephony. The transmitter makes use of seven electron tubes—two as power amplifiers, four as intermediate power amplifiers, and one as a master oscillator. The special attachment whereby the radio operator may shift from radio telegraphy to radio telephony employs six vacuum tubes—one as a speech amplifier and five as modulators.

A departure in the operation of this combination radio telegraph and telephone transmitter is the absence of the conventional means for changing from one frequency or wave length to another. Instead of a switch or other special selector, large variometers are used in changing from one frequency to another. The ice-patrol cutters have been assigned two bands of wave lengths—one from 600 to 960 meters, and the other from 1,600 to 2,800 meters. The change from one band to the other is accomplished by a switch, but variometers are employed in going from one wave length to another in either range of the two bands of frequencies. These variometers are each about one foot in diameter, and in comparison with the ordinary types of variometers used in radio-receiving sets it is like contrasting giants with dwarfs.



The sonic depth-finder installed aboard the "Tampa" to locate icebergs—it employs sound waves and radio waves in its operation

The transmitter proper is comprised of two panels, these being bolted together. The master oscillator variometers, band-change switch, plate and filament controls, and the vacuum-tube cradle, are included on one panel. The antenna variometer,

loading inductance coil, band-change switch key and over-load relays, and antenna inductance switch are contained on the other panel. Antenna and plate currents and plate and filament voltages are indicated by means of four meters mounted at the top of these subjoined panels. The electron tubes are visible from the front of the equipment, thus making them readily accessible in the event that replacements are necessary. There is a distinct modulating unit, adapted to mounting on a table, for use in radio telephone and tone telegraphy communication. This separate piece of apparatus consists of modulator and speech amplifying vacuum tubes, a tone alternator, reactors, condensers, etc.

The transmitter proper is capable under normal conditions of putting two kilowatts in the antenna. This power output, however, is subject to variations with respect to the method of signaling and the frequency at which it is functioning. For instance, in radio telephony or tone telegraphy, operating on a frequency band between 312 and 500 kilocycles, the obtainable antenna current will approximate 12 amperes. On the other hand, in signaling by means of continuous-wave telegraphy, at a frequency of 107 kilocycles, approximately 17 amperes of current will be supplied the antenna. And, if functioning at 187 kilocycles, the antenna current may approximate 22 amperes, when signaling by means of continuous-wave telegraphy.

The master oscillator-intermediate power amplifier and main power-amplifier circuits used in this transmitter, according to the General Electric Company, will insure a great constancy of frequency, as well as ease of adjustment. That is to say, the equipment may be held constantly at a desired wave length and yet the frequency may be readily varied to any wave length between the bands assigned. Controls are available for curtailing the power of the antenna to one-fourth of its normal value. The source of power supply for this radio transmitting outfit is direct current at 120 volts. A two-unit motor generator set supplies energy to the plate and filament elements of the transmitter. The fundamental wave length is 382 meters, but any frequency between 107 and 187 kilocycles and between 312 and 500 kilocycles may be obtained.

Preparing to use explosives to shatter an iceberg

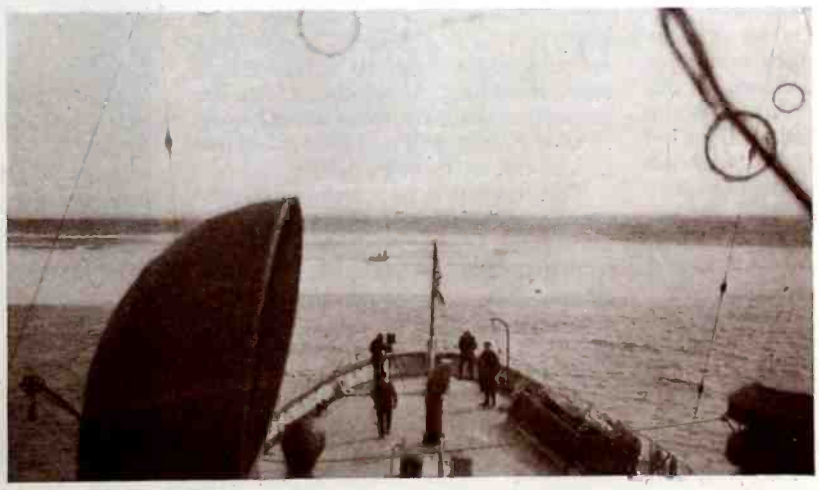
The Coast Guard, alert to its opportunities and with maximum service as its objective, has made certain improvements in the antenna system on the ice-patrol cutters. Heretofore, some difficulty has been experienced with leaky insulators on ship antennae; therefore, the Coast Guard is the first branch of the Government service to actually install "Pyrex," or glass insulators. Glass, of course, is impervious to unfavorable weather conditions, and, needless to say, does not absorb water. The manufacturer of the newly introduced glass insulators also claims that this type of insulating material has a low phase angle difference and does not change appreciably with various wave lengths. The glass insulators used on the *Modoc* and *Tampa* are 30 inches long and are capable of withstanding a strain of 4,500 pounds.

Formerly, the ice-patrol vessels were equipped with both arc and spark transmitters. The installation of modern transmitting equipment, using the latest type of electron tube, means that the arc transmitters will be discarded altogether. A spark transmitter, however, will be retained on board both the *Modoc* and *Tampa*, which will be pressed into service as needs may demand or in cases of emergency. Radio compasses and a sonic depth finder (on the *Tampa*) will also be installed on these ice-sleuthing cutters. The latter device, designed by the Bureau of Engineering of the United States Navy Department, is for the first time being used in an attempt to locate icebergs by the principle of sound. The sonic-depth finder uses a certain amount of radio apparatus in its functioning, but the principle of operation is to determine the depth of a body of water by measuring the time elapsing for echo of a sound to travel to the bottom and back to the surface of the ocean.

"The object of the patrol is to locate the icebergs and field ice nearest to the trans-Atlantic steamship lanes," states the Coast Guard, in explaining the purpose of this service in the interest of humanity and commerce. "It will be the duty of patrol vessels to determine the southerly, easterly, and westerly limits of the ice and to keep in touch with these fields as they move to the southward, in order that radio messages may be sent out daily, giving the whereabouts of the ice, particularly ice that may be in the immediate vicinity of the regular steamship lanes."

The greatest menace from ice formations is during March, April, May and June. The continuity of the ice-patrol is uninterrupted during this period of time, and for a longer duration, in the event that the danger to navigation is not removed naturally.

(*Turn to page* 60)



Ice-field off shore, Newfoundland—one of the ice-patrol vessels making observations

ARTISTS

Here are some headliners from

By Dr. R.

Tilda Rohr, KFSG soloist

UP IN the San Francisco Bay District of California, Etta Wilson Coleman has been engaged in many branches of theatre activity since her first appearance in a child part at the age of four. A little more than a year ago she presented her first radio play and, because of its immediate success, she now confines her activities almost entirely to radio.

A little over a year ago, Mrs. Coleman staged the old war time drama, "Shenandoah," with probably the largest cast that ever entered into a radio dramatic production. "Shenandoah" was presented from KLX, in Oakland, and now Mrs. Coleman is director of the KLX Players. They plan to present some of the plays from local theatres, but most of their activities will be confined to radio.

In these days of various debates of marriage versus a career it is interesting to know that Mrs. Coleman believes that women can have both and by systematic management have opportunity to develop latent talent. In a recent interview she said: "There is nothing like an outside interest to make a woman a more charming and agreeable companion to her children and in her home and there is no reason why women's talents should be allowed to stifle and die just because we have material cares every day."

Mrs. Coleman finds ample time to look after her dramatic interests and devote some attention also to her daughter and three sons. In the remaining leisure period she has a number of hobbies, including dancing and swimming, hiking and hunting.

So far she has not succumbed to the cross word puzzle. She does have another activity, however, that probably will prove my contention that Etta Wilson Coleman is one of the most versatile radio performers imaginable—she actually designs and makes her stage costumes and hats.

The KLX Players present two plays a month—generally on a Friday night at eight o'clock, Pacific time—one a drama and one a comedy. Between

Radio playwright is the title Etta Wilson Coleman has made for herself at KLX

times they fill in on programs in giving Irish comedy, Persian dramatic reading, Kipling programs, and the like.

DOWN in Los Angeles every Monday night from 10 to 11, Pacific time, the Hotel Alexandria Orchestra presents an hour of dance music played from the radio studio of *The Examiner* and broadcast through KFI.

This in itself is no startling news for there are more than a hundred radio orchestras in the Southwestern metropolis. But the fact that this orchestra has brought in more letters from people in the middle west and east than all the other orchestras from that studio put together is significant.

The answer is in the enthusiasm and vigor of the leader of the orchestra, Ray West. Young West conducted the concert orchestra for a period of two years in the Alexandria and then debarked with a new orchestra enroute for the South Sea Isles to play aboard ship.

A little more than a half year later he stepped off the boat in Los Angeles Harbor and found a representative of the hotel waiting with a contract to organize and direct a jazz orchestra to play every evening in the Franco-Italian dining room of this famous hostelry.

So Mr. West now leads the dance orchestra and presents the radio concerts each week. One of his first was dedicated to people in Tahiti who heard the orchestral music played in Los Angeles by practically the same organization which had entertained them the previous season in the South Sea.

Probably the most remarkable thing about this bit of radio narrative, however, is the fact that Ray West, still in his early twenties, finds time every weekday to motor out to the Southern Branch of the University of California and take a collegiate course from which he intends to graduate some of these days. He has composed two or three numbers and his most cherished desire is to compose a college song for his Alma Mater.

ONE of the most unusual requests ever sent through the air was broadcast not long ago from a Los Angeles station. A film director wanted fifty white geese for a release called,

Henry Morgan, basso-cantante, has enthused many KFQX audiences

OUT of the WEST

the West—Tune in on them

L. Power

"The Goose Woman," but apparently geese did not read advertising for no response was forthcoming from newspaper advertisements.

So he thought perhaps the geese might pick up their ears and listen in when they heard his frantic appeal by radio. It seems that there is a scarcity of white geese in the City of the Angels. There are gray geese and black geese, and brown geese and blue geese but no white ones could be found. That is—not until the radio appeal was made and the next day there was a long line of people with white geese under their arms waiting patiently outside the studio door in the hope that their pet goose might have a chance in the movies.

Another role radio is playing for filmland is that of casting characters for various roles. An early selection for a part in a large production was recently necessary and radio fans were asked to help in casting the role and hundreds of letters poured into the movie and the radio studio as a result.

KFQX, a 1,000 watt station in Seattle, has brought Henry Morgan, basso cantante, to the attention of radioland and now so tremendous is the enthusiasm of radio and music fans alike that Mr. Morgan is heard from this Pacific Northwest station nearly every week with a program of old time favorites and classic numbers.

Gregorio Artieda is the popular operatic vocalist of KLX

ONE of the most popular vocalists from Oakland's KLX is Gregorio Artieda who can be heard almost any time via the air for he generally sings two or three times a week.

Maestro Artieda is a Spaniard who was born in Palma on the island of Mayorca which was the birthplace of Father Junipero Serra, the founder of the Missions of California. For six years he sang soprano parts in the local churches until his voice changed and a year and a half later, he began the study of the violin and also voice training.

His voice changed to a tenor and, at 20, he sang his first grand opera, which was "Faust," in a cast which included his teacher in the role of "Mephistopheles," while Artieda took the role of "Faust."

The Spanish mainland, Portugal, Italy, France, Central and South American countries were visited in concert tours, which included three trips to the United States, before he finally made America his home.

In San Francisco he met Helen Swett, a graduate of Stanford, whom he married and they now live in Oakland where Mrs. Artieda is executive secretary of the Public Welfare League.

Ray West, leader of the Hotel Alexandria Orchestra, has received more letters than all others that broadcast from KFI

Bertha Lincoln Heustis, former president of the League of American Penwomen, appears monthly at KFI

Bits of Italian opera and snappy Spanish tunes, have made tremendous hits with listeners-in but Mr. Artieda's biggest successes via radio have been in "Faust," "Rigoletto," "Traviata," "Pagliacci," "Cavalleria Rusticana" and "Martha."

Although this musician often sings from KLX he appears in operatic roles only at intervals of a month. Plans for the spring include the presentation of operas by American composers alternating with the old favorites.

Closing an unusually interesting interview, Artieda said: "I advocate the passing of a law which shall require every opera company to present an opera by an American composer at least once a week."

"WHEN do we eat," was the frantic cry of the American army landing on foreign shores. "Where are the redskins and cowboys," shrilly chants the vast army of tourists and sight-seers invading Southern California constantly. The inferior novels and the cheaper class of movie films are still creating misconceptions of life in the Pacific Coast states.

Cowboys, redskins, Spanish peons, old-time prospectors—the bizarre and unusual—that's what the newcomer wants to see. The Los Angeles Branch of the League of American Penwomen is trying to spread abroad the real truth about California's life and affairs.

Mrs. Bertha Lincoln Heustis, wife of a famous physician, was at one time president of the national organization. Now she is head of the Los Angeles branch as well as radio chairman for the Western division. During an interesting lifetime she has had remark-

(*Turn to page* 59)

Left to right—Johnny Hines, A. E. Lee, Col. B. B. McAlpin, Holbrook Blinn, Irvin S. Cobb, J. Andrew White and Paul Dumont at the opening of WMCA

WHERE THE GREAT

The most recent addition to the New York stations

IF YOU wander down Broadway today between the brightly lighted shop-windows, and amidst the glare of the electric light signs, to 33rd Street and Broadway, you will find New York's latest contribution to the radio world. Here at the hub of the great shopping section, at the foot of that historic lane which is known as New York's Great White Way, stands the Hotel McAlpin, and if you look up above the heads of the throngs of people, above the glaring signs, above the sky-scrapers, you will find silhouetted against the stars, the antenna of WMCA.

Through this new station which entered upon its career with such a flourish, on the evening of Washington's birthday, the Hotel McAlpin plans to present you with all that is best in the stage world of today. As far as studio forces go, few of the smaller stations are better equipped, for the personnel has been chosen with an eye to the type of entertainment program in which WMCA will specialize. We have for instance, dapper little Paul Dumont, whose juvenile countenance insists on giving the lie to his reputed thirty-six years and grown-up children. Mr. Dumont, who will fill the position of assistant announcer and program arranger, is well-known to radio fans as his excellent baritone has been heard for some time through WJZ and WGBS. Although he mainly does concert songs and operatic arias, you may have preferred him in the "Harry Lauder" songs, which he handles with a vivacity inherited from some remote Scotch ancestor. He is also well-known in Jersey. Here he is a soloist in the Monclair Glee Club, and in Masonic circles, while in New York he is at present soloist at the Calvary Baptist Church.

The studio staff. Left to right—Ed. Squires, Paul Dumont, Ralph Powell and Marion Gilliam

In his early days when he lived in the region of the other side of Brooklyn Bridge, Dumont was known as the "wonderful boy basso of Brooklyn," for at the age of fifteen he had already developed a remarkable bass. This also gave rise to his cognomen of the "Little Man with the Big Voice."

The position of Announcer-in-Chief at WMAC is filled by

Ernie Golden at the piano, with his Hotel McAlpin orchestra

WHITE WAY BEGINS

By Golda M. Goldman

Eddie Squires, known as the "Globe-Trotting Announcer."

Squires and Dumont have already appeared on the air together as the "Radio Troubadours," a feature which they inaugurated a year ago at WJZ. Mr. Squires has earned his title because he has covered so much territory in his radio career. He will be remembered by radio fans from his connection with the famous Drake Hotel Station, in Chicago, later with the powerful WLAG at Minnesota, and most recently with that prince of stations in Pittsburgh, KDKA. One of Squires specialties is a "one man show" which is a burlesque on operatic singers, including soprano. In fact he has become known as the "Joe Cook of the radio," as he does as varied a stunt as Joe Cook does in the "Vanities." He has been in vaudeville and has appeared in company with Kenneth

(*Turn to page 76*)

The Florence Richardson Orchestra rendered some of the feature numbers at the opening of WMCA

Three Cheers!

(*Continued from page 38*)

ers turned in that direction and finally they rose and crept to the bars, to peer more closely at it.

"MISTER," said Mr. Baumwetter, placatingly and insinuatingly. "Iss dot a radio?"

"Yeah," said the lieutenant, casually. "That's just what it is. One of them sets with which the degenerate and soft headed females of the country is ruinin' the reformin' function of the prisons. The Society for the Softening of Hardened Criminals has gone and donated one of them things to every Hoosegow in the State. They cost most as much as the criminals steal in a year."

"Bedad!" said Mr. Moriarty, with awe, "She's wan darlin' set fr'm the looks of her!"

"Py Golly!" echoed Mr. Baumwetter, not to be outdone. "I pet you he iss a five tubber, aindt it?"

"Shut up, ye Dootch cheese!" snarled Mr. Moriarty. "Pwhat do yes mean mid thot 'he' stuff? Sure, a r-radio is always a she loike a ship. Go to school an' learn somethin'."

"Shut op py yourselluf!" said Mr. Baumwetter. "He iss a he, und efen a bapy knows so mooch. You Ignorance."

"Ah! Stop the bicker!" yawned the lieutenant, rising and sauntering to the set while the prisoners looked on eagerly. "Start something, will you' and the both of you dead wrong! This radio is an It and I can prove it."

"Iss dot so, mister!"

"Th' divil ye can!'

"Yes, it's so," retorted the lieutenant, who was by way of being a wit in his own estimation. "It ain't feminine or masculine because it's neuter. Get me? Neuter! See! It's a neuterdyne set, ain't it? Ha, ha!"

He was safe from them because the bars kept them at bay, so he lived on. And so satisfied with himself was he that he decided to give them a bit of a treat, which, also, might serve to awaken the sleeping vagrant in the other cell and still his snoring. So, in another moment he had tuned in on one of the big stations and the strains of the announcer's voice were filling the confines of the Place of Sighs. That voice came in clear and distinct, quite without the shrieks of lost souls and the howls of the damned ones that had created such havoc in the relations of the two neighbors. They shut their eyes behind their bars and listened with ecstacy. They caught only a final sentence of the announcer.

"——famous tenor of the Household Quartette will now render a series of patriotic songs for your entertainment. Station buzz-guss-fuzz, broadcasting songs by Mr. Steenroot of the Household Quartette. Kindly stand by."

THEY stood by, clinging to the bars and in a moment the famous tenor of the Household Quartette was filling the fetid atmosphere of the jail.

"Columbia, the Gem of the Ocean" he sang, and as his clear and vibrant tones came over the ether in the stirring air, the hearts of Mr. Moriarty and of Mr. Baumwetter swelled and grew warm within them. Hesitantly, they began to draw nearer to each other. At each bar of the music patriotism and a sense of mutual fellowship in the possession of a common allegiance pervaded them more and more. They began to hum the tune, even as the lieutenant started to beat time to it with swaying head and a prideful smile.

Without conscious thought, but following an uncontrollable urge, Mr. Moriarty and Mr. Baumwetter clasped hands and faced each other. A moment later the rolling bass of Baumwetter and the clarion baritone of Moriarty filled the jail to an extent which caused the bum in the next cell to roll upward and blink blearily at them.

"Ah, cheese! W'at t'ell!" he growled. "Can't ye let a stiff flop in peace?"

But Mr. Baumwetter only roared:

"Columy, der chem off der ochun!"

Mr. Moriarty echoed him:

"The proide ov th' brave an' th' free—"

Mr. Baumwetter:

"Der zhrine off eadge badriots devochun!
Der vorldt offers homitch to dee!"

And finally, in a grand and mixed crescendo of accents:

"Th' A-r-rmy und Nafy for iver!
Th-r-ree cheers mit der ret, whoite und blue!"

IT WAS a bit confusing, but the true fire was so unmistakable there, as the two erstwhile enemies stood, right hands clasped fraternally, left hands raised and resting on each the other's shoulder, faces turned to the skies beyond the jail roof, love of the adopted fatherland shining in each eye, that all animosity died in them. Mr. Moriarty erupted when the song died away.

"Bedad, Dootchy, ye are all r-right and as good a hoondred per center as any dom' kluxer or Knight of Coloombus!"

"Ya! Und der same to you, Irish!" Mr. Baumwetter came back. "Dot's a great gountry und a great song! I pet you I get me von off dose neutral sets right away iff it cost a hoontret dollar. Vot's der make, lieutenant?"

The lieutenant obligingly gave the information. Mr. Moriarty was aroused.

"Divil a bit will ye best me, Baumwetter. 'Tis meself will hov wan o' thim with goold knobs stuck all over it, an' dom the expinse. And, liftinant?"

"What is it, Mike?"

"'Tis not me name but I'll be afther ignoring ye the while. Is th' foine Hizzhonor was soakin' us still shtandin'?"

"You still got your choice," said the lieutenant.

"Py Golly!" exclaimed Baumwetter, "Iss dot so? Und Frieda und your missus vill be vretting. I tell you vot, Moriarty! I ain't sooch a biker minself. I joost bay der vines und ve go home, no?"

"Divil a bit y'll pay the foines!" protested Mr. Moriarty. "Not whoile Shawn Moriarty has a r-roll in the jeans of him. 'Tis meself will pay thim."

ARGUMENT started to wax again and might have led to a destruction of the newly established *entente* had not the officer been tactful. He suggested a compromise by which each paid the other's fine and, having led them to the room where the Justice held Court, after giving them their release, he also gave them a wink. He had not forgotten they they had betrayed the possession of further funds.

"And now, since we are all friends once more and no hard feelings," he said in a whisper. "I have a couple bottles of genuine pre-war stuff which we took off a bootlegger who is personally known to me. It is costly stuff, but I like you both. For five dollars apiece I will risk my job and slip you each a pint of it."

In the glow of generosity they were tempted and fell. Besides, who, if not an officer of the Law, should have really fine, pre-war stuff! They offered, even, to treat him when he had supplied them, but he declined on the score of a sense of duty that was imperative and tyrannical. So they departed to the freedom of the night, arm in arm and bottle in hand—or on hip.

Fraternity impelled not too long waiting and the corks came out on the nearest dark corner. The liquor, if pre-war at all, must have been pre-war dynamite. It had a most alluring kick which made them blink. As they wandered homeward, stopping now and then for another libation, patriotism again awoke in them and with it the desire to chant to the night their sentiments. They rambled past the figure of Officer Jensen who was leaning against a light pole contemplating the stars. He brought his calm

(*Turn to page 51*)

Appliances and Devices

A Super Amplifier

ELECTRICALLY, the resistance coupled audio frequency amplifier more closely approaches amplifying perfection than any other means available. The Daven Radio Corporation, Newark, N. J., has recently put on the market a complete resistance coupled amplifier incorporating three stages of amplification. It is the most compact three stage amplifier on the market and greatly simplifies the adding of quality amplification to any receiving set. It may be used on base-board or back of panel of any

cabinet, or it may be simply placed upon the table without permanent fastening to other equipment. Binding posts are provided for the input, the output, and both battery connections. All plate resistors, grid leaks and fixed condensers are included, so that it is only necessary to make the connections with tuner and batteries. The volume delivered is about equal to the two step transformer coupled arrangement, but of course far superior to it in quality. All connections of the amplifier are invisible, being underneath the base; and therefore, all of the labor of assembly is eliminated. It is the aristocrat of amplifiers, de luxe in every sense of the word, and is designed for those who appreciate the very best.

A New Type of Coil

A RADICALLY new coil has been developed by the Radio Units Inc. known as the Andrews Paddle-Wheel Coil. It has an exceptionally high ratio of inductance to resistance which is the real test of a coil. In the Paddle-Wheel Coil a shorter length of wire is used for a given inductance which means a general reduction of resistance. The compact spiral winding makes possible the use of larger wire thus further lowering the resistance without increasing distributive capa-

city. The small amount of insulating material used and its placing, reduces absorption losses to a minimum. The wire is held in place by slots and each group of turns is space insulated from the others.

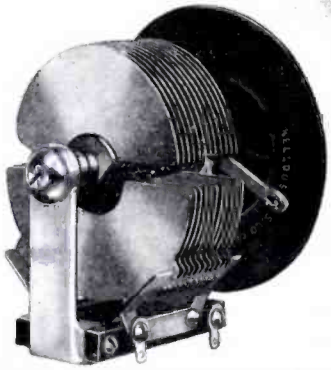
No dope of any kind is applied to the windings yet the coil will retain its form indefinitely. The coil is designed to be used in conjunction with a variable condenser of .00025 mfd. capacity. The Paddle-Wheel Coil can be used in any hook-up where a first class radio frequency transformer or inductance is required.

Kellogg Low Loss Condenser

THE Kellogg .0005 mfd., 23-plate condenser is built in an altogether novel manner. The stator plates are firmly held at the bottom by two small hard rubber strips in the center of a light, but strong U frame. This frame, of course, is entirely open at the top, the shaft of the rotor being fitted across the tops of the U. Reliable contact is assured in three separate plates and the tension held by a friction washer.

By loosening a couple of set screws the rotor shaft can be immediately removed from the frame when it is necessary for cleaning or other purposes without removing the condenser from the panel. It is but the work of a minute to replace this rotor shaft.

This Kellogg low-loss condenser can be mounted on the side of the U frame or at the bottom, and where it is desired to mount the radio frequency coil on the condenser frame, it can be attached in a minute's time.



In circuits using two or more of these condensers, the sub-base or sub-panel, which is usually mounted horizontally at right angles to the face panel by means of special brackets or attached with the aid of the jacks, can now be fastened rigidly in place without brackets or other extra metal by set screws in the bottom of the U frame of these condensers. This simplified mounting does away with extra parts and assures great rigidity of the base panel.

Mounting of stator plates and adjustment of rotor assures even spacing in this condenser. At minimum capacity, the plates are separated nearly one-quarter of an inch.

A Radio Receiver Lock

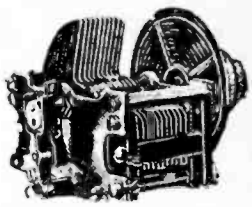
THE Cutler-Hammer Manufacturing Company of Milwaukee, Wisconsin has announced the "Radioloc," a locking switch, which makes it possible to lock the set "off" when you leave it, protecting batteries from being run down and tubes burnt out by children—or even grown-ups—who might accidentally or carelessly snap on the set, and forget it.

The switch, installed in the "A" battery circuit, also provides a convenient means of interrupting reception without loss of station—the set being "out" when the key is in the slot and always "off" when the key is removed. Broad contact surfaces assure high efficiency and freedom from noise.

The "Radioloc" is easily installed, requiring only one hole in the panel. The switch mechanism is direct and firm, insuring quiet operation.

A Precision Condenser

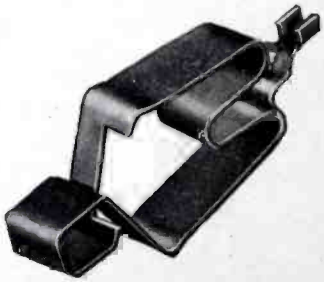
THIS new low-loss condenser is the result of years of manufacturing experience and has the unique and sound principles of construction, as may be found in the highest grade apparatus. It is manufactured by the United Scientific Lab. Inc.



Rigid frame construction without depending upon insulation as part thereof, thereby eliminating all possible chances of misalignment is one of the features of the new condenser. Straight line capacity is obtained by scientific construction of rotor and stator plates, which are made of a special grade of brass. Pigtail connection on rotor insures absolute electrical contact with rotor. Hard rubber dielectric outside of the electro-static field insures maximum efficiency and low losses.

The Sherman Battery Clip

THE Sherman Battery Clip is one piece made of a very fine grade of special spring steel coated with hot lead to withstand acid fumes. There are no places where frictional wear can remove the lead and permit corrosion, nor loose parts to permit the clip to come to pieces. The electrical current is carried through every part



of our clip with an even distribution, so there is no overheating from the current jumping through parts too small to accommodate it as in some other types. The construction is such that every particle of the entire clip lends itself to the work of gripping tenaciously, and the clip has not only a heavy spring tension but is resilient and flexible, which makes it cling under all circumstances and prevents its tipping over and becoming knocked off from an accidental blow as is the case with rigid clips.

Three Cheers!

(*Continued from page* 48)

and untroubled gaze down to them, in search of further breaches of the peace. But they were locked together and caroling:

"C'loombia, th' Jim uv th' ooshin;
Der bride off der brafe und der free—"

and, since the law had no rules against patriotic effusiveness, its conscientious Limb let them pass.

ON THE small porch of Mr. Baumwetter's residence, truce and amity also prevailed. For many hours of agony and fear the two brides had waited word from their husbands, shedding many tears in solitude until common grief drove them together.

It was at this moment that Mr. Baumwetter and Mr. Moriarty arrived, arms interlocked, hats on opposite sides of their respective heads.

"Vunce again, Py Chiminy!" shouted Mr. Baumwetter.

"Let 'er r-roll!" echoed Mr. Moriarty. And together:

"The Ar-rmy an' Nafy feriver!
Dree jeers mit der ret, vite und blue."

Alas! The ear of Mr. Moriarty, rendered sharp by the stuff, or by patriotism or something, caught, at last, a false note in the harmony.

"Bedad!" said he. "Be the Black Bull of Ballyvaghan, did I hear ye mockin' us Amurricans, ye Dootch bla'guard? Fwhat was thot ye said?"

Feebly, astonished, Mr. Baumwetter stammered:

"I say notting bot 'dree Jeers—'"

"Three *jeers*, ye thraitorous Heinie!" shrieked Mr. Moriarty, in frenzy. "I'll tache the loikes o' ye to insoolt th' flag—" And he aimed again for Mr. Baumwetter's nose.

"Oomp!" said Mr. Baumwetter. "Irisher bum! Take dot!" And he retaliated on Mr. Moriarty's jaw.

Mrs. Eileen Moriarty looked sternly at Mrs. Frieda Baumwetter. Mrs. Baumwetter looked as sternly at Mrs. Moriarty.

Together they descended the steps and marched into the fray even as the aroused Jensen came in sight, descending on them to keep the peace intact. Before he could arrive two firm and muscular thumbs, each backed by a sturdy forefinger, had closed on an ear of each belligerent. Simultaneously, two open hands smacked home on two other ears.

As Officer Jensen drew up on the torn and trampled scene of battle, on either hand he heard the slamming of doors. In the castles of Moriarty and of Baumwetter, silence prevailed as far as the outside world was concerned.

Officer Jensen meditatively cast an eye to the stars and strolled onward.

Super DX Hi-F. Receiver

(*Continued from page* 13)

placing of the wave changing switch. When using four turns of the coil the lower 15 or 20 degrees range is broadened out to cover a greater part of the scale. Throw the switch up to cover the entire coil and immediately we condense the scale reading, but materially enlarge the range of the tuner. With this connection in use the tuner will satisfactorily cover the middle band of 75-85 meters and well below the 40-43 meter band. In fact, it will tune to the natural period of the entire coil. This fundamental frequency is controlled by the minimum capacity of the condenser and its allied circuit, below which, the tuner will not function. This holds true, even if the tapped portion of the coil only, is being used. It will be well to note, that this fact governs the minimum tuning range of any circuit utilizing inductance and capacity. Lower tuning ranges may be had only by the use of lower values of inductance, while the upper range is largely controlled by the values of capacity used. The tickler of the Bremer-Tully Short Wave Tuner does not have to be changed, but a variable grid leak is absolutely necessary, and must be adjusted for each band; that is to say, the

tapped range will have one adjustment and the entire coil's range will have another. This, my friends, is the secret of the smoothness of reception. Should a fixed leak be placed in the set, howls and almost uncontrollable regeneration, with a very sharp oscillation point, will be your lot. This covers the fundamentals concerning this short wave section.

In the utilization of the 60-280-meter band we use the standard B-T Tuner, upon which is normally 17 turns, taking in this instance a tap at the seventh turn, which, on my tuner in conjunction with the mentioned condenser, covers a range of 60-106 meters. This places the tuning range of the 75-85-meter band to approximately the center of the tuning condenser scale, occupying 24 degrees with this 10-meter band, on a 100-degree scale. This gives plenty of room for the separation of signals on approximately the same wave length and also leaves plenty of tuning range on either side of this band. With the entire coil in the circuit we efficiently receive the Canadian amateurs who operate on a wave length of 125 meters, and can tune to include all the alloted waves of American Class A broadcasting stations. This automatically takes in the still popular amateur band of 150-200 meters, on a desirable section of the tuning scale.

As mentioned, the present day good broadcast tuners cover the upper band in a manner to satisfy the most exacting. The broadcast band on the B-T Tuner with a .0005 mfd. condenser covers the scale of 10 to 50 degrees on my tuner. I used this large condenser because I wished to go up above the normal range in order that commercial telegraph and marine stations could be copied. In fact, my tuner covers the various Naval and commercial C.W. and phone bands up to and including the Naval radio compass stations which operate on 800 meters. On the lower broadcast bands (222 to 278 meters) a tap, so that "Y" contains 20 turns and "Z" has the remainder or 40 turns, will enlarge the original 20 degrees to that of the entire scale. Again, let me say, a variable grid leak is an essential.

Let me give you an actual instance of the work accomplished by Dr. A. L. Walsh, Radio 2BW in Northern New Jersey. Up to the time I placed this method of tuning in his hands for actual communication tests he had heard just exactly one foreign amateur, except, of course, Canadian amateurs. After its adoption he has, in the late afternoon and early evening worked twelve British, two French, one Danish, one Italian, one Hungarian, one Cuban and innumerable Canadian stations, besides every American district, and has our well known Rice Expedition now in the Amazon, South America, in with loud speaker volume consistently. I have little time to listen in, but on my own set located in Brooklyn I have many times had every district within an hour. CB8 in Argentina is just as consistent as any local station.

You will note that when using the lower tapped section that no condenser is connected to the grid leak, therefore instead of losing signal strength through the losses, we simply have the reverse—a building up of wave trains, efficiently, due in part to the auto-transformer action of the apparently untuned section of the coil. This is, however, tuned by the mutual inductance and the resulting action is comparatively large.

An explanation and an additional refinement as noted in the present tuner which is shown in the diagram, is the use of a small capacity tuning condenser of .000125 mfd. capacity and the use of a loading condenser of .0005 mfd. The operator can reverse the procedure and use No. 2 condenser for tuning and use No. 1 condenser for the additional vernier. If both have the Ultravernier dials the set is in a condition for calibration when placed in the permanent receiving location. The counterpoise and ground connections should be adhered to.

Chicago Broadcasts

(*Continued from page* 41)

University of Chicago, and one a week from Northwestern University. Continuing this thought, Miss Waller has tied up with the Union League Club of Chicago for its Saturday forums; the Central Y. M. C. A. for its Friday forums, the Field Museum, Art Institute and Association of Commerce for other broadcasting features.

Harry Hansen, author of Midwest Portraits, and editor of the book page talks on his subjects, I always have the feeling of being the recipient of an intellectual feast when I can tune in on his reviews and talks.

The children are entertained by Mrs. Gene Davenport, the lullaby lady; Georgene Faulkner, the storyland lady; and by "Daddy" and Mrs. Frances M. Ford's Wide Awake club.

WQJ broadcasting from the Rainbow Gardens, is operated by Jerry Sullivan, the originator of engaging artists in the Middlewest for exclusive radio performances. The aim of this station is entertainment. There is a "Koffee Klotasche Klub" composed of hundreds of housewives living in Illinois and adjoining states who, through invitation come to Chicago as guests of WQJ once a month and see the radio program broadcast. The party consists of the first three hundred who apply for tickets, and each applicant awaits her turn to come in for the entertainment, and the quota is always taken.

WQJ is said to be the quietest station in Chicago. One never hears the drop of the proverbial pin, and when asked what they did with the rustle of skirts, one of the stars told me that it went out with the present styles and Rip Van Winkle. Jerry Sullivan turns the station over to Ralph Williams and his Hotsy Totsies from 1 till 2 o'clock each night. Hotsy Totsy Hour is conducted by Williams in his own inimitable way. He signs off by promising to meet his best friends "In My Dreams," his latest song hit.

Jerry Sullivan is proud of his assistant director the original "How-do-you-do" man, Harry Geise. The "How-do-you-do" song started modestly with four verses. When Mr. Geise sang it for me by request last night, it had grown to 7,600 verses and is still going strong. This song has served to unite persons lost from each other. One recent case was that of a brother and sister who through this song found each other over WQJ and were reunited after a separation of fifteen years.

WEBH is probably the most advanced station in Chicago. It is operated by Robert D. Boneil, Edgewater Beach Hotel. Mr. Boneil is about the only person between the elec-

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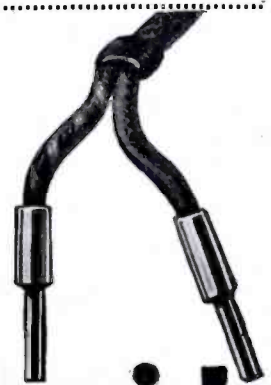

The Jewett Vemco Unit

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"Quality Goods for Quality Readers"

tric energy, in its raw state, and the finished product as it comes to you in your rocking chair. As a matter of fact, there are three others on the force but they are never seen nor heard, unless something goes wrong with the station. Never having had any trouble, the other three remain a myth.

Dean Remick has charge of the studio and he knows how to extract melody from a piano. Also he is adept in handling the studio performers. Now that the characters of WEBH are on the stage, let's listen in on "The Voice of the Great Lakes." The Oriole orchestra furnishes dance music from the Marine dining room. Extra numbers come from the Crystal studio. Everything is built around Mr. Boneil's glass cage. He sees everything and everybody, and he is seen by everybody as he works in his glass cage, but the walls are made double, so no sounds can penetrate or mar broadcasting.

WTAS is the only privately owned broadcasting station in Chicago. It came into existence out of the loneliness of a man's heart. That man was Charles E. Erbstein, lawyer and citizen of Chicago. During the absence of his wife and children one winter, Mr. Erbstein thought a radio set might be cheering. So pleased was he with receiving that he immediately decided to start his own broadcasting station. He is one of the first to operate a station by remote control. The studio is in Kimball Hall, Chicago, but is connected by Western Union wire to his country estate, Villa Olivia, 38 miles away.

Mr. Erbstein spent a year or two experimenting with programs, always letting the people decide what they like best. This has resulted in the present programs of entertainment only. Each Monday night WTAS broadcasts before an audience of 1,000 people. Negotiations are now being made to secure an auditorium with seating capacity for 3,000 people. At a recent program 5,000 applied for admission of which 4,000 were turned away.

Forbes Fairbairn is manager of the Chicago studios at Kimball Hall. They have the exclusive rights to their artists. This right includes Fred Hamm's orchestra which is considered one of the best in the Middlewest. Aiming, as they do for entertainment alone, it is always interesting to tune in on WTAS.

WLS Chicago, belongs to the farmer. It was built for one purpose —to give rural America a cross section of every line of thought in the nation. Edgar J. Bill, director, had worked out a series of unusual farm features, agricultural woof and warp, with the experience and cooperation of the dirt farmer. Six million farmers' wives

are going to school together over WLS. The long mellow note of the distant locomotive whistle does not sound so lonely, now we've got our receiving set. Let the echo of the whistle float across the valleys, down the corn rows whispering over the great waving bread fields to lose itself in the haze of hills.

WLS claims to give the most complete radio farm service in the world. Daily weather reports and special storm warnings are issued regularly. A summary of all farmers markets—live stock, grain, dairy, fruit and vegetables, hay and feed markets are read.

R. F. D. is the name of the national radio farm organization launched in Chicago over WLS. The name stands for "Radio Farmers' Democracy." This farm radio club meets in various communities at 8 o'clock each Tuesday night. Ten thousand members already bid fair to become a force in farm life of the Middlewest.

George Hay, announcer for WLS won the golden trophy by popular radio vote for being the best announcer in radiodom. It is valued at $5,000.

WLS was the first Middlewest station to broadcast moving pictures. This was done when Betty Bronson appeared in Chicago for the inaugural of Barrie's "Peter Pan," whose popularity has caused the feature to be continued.

Out of it grew the mythical Woodshed theatre which was built by Ford Rush and Glenn Rowell, the "Lullaby Boys." They recently announced to their radio audience that "reserved seats" on the air would require the remittance of two pins. The kind and size was not specified. As a result thousands of pins came by mail to WLS, Woodshed Theatre, Chicago—small pins, clothes pins, safety pins, pins of all sizes, kinds and descriptions. The biggest pin was made to order by members of the Kenosha Club. It is engraved in honor of Ford and Glenn and was presented to them by the Kenosha Club members of the Nash Motor Co. Up to date 5,000 pins have been received for the Woodshed theatre's mythical auditorium. The children produce plays in which they are called actots.

WBCN Chicago. came in with the new year. Robert Northup, director, keeps alive the community spirit among merchants, real estate and business men of the South Side. It is operated by the publishing firm of Foster and McDonnell.

WPAY Oak Park, a Chicago suburb, is another rather new broadcasting station with community interests. One hears announcements of church services, sermons, college and school news. New and then a sprinkling of good music causes one to applaud from the arm chair.

William Hale Thompson has announced that he is now establishing a broadcasting station in the Wrigley Tower, Wrigley Building. Another station is to be installed in the Palmer House, which will shortly open its new hotel structure.

"Despite radio, Chicago is becoming more literary?" is recorded in the annual report of the Librarian of the Chicago Public Library, Carl B. Roden. "In 1924 the city supplied 617,428 more books to 43,000 more citizens than in 1923 when radio was less popular."

The more I look at the results of radio, the better I like it.

Artists Out West

(*Continued from page* 45)

able success as a writer, vocalist and concert pianist—having made a number of country wide tours.

Instead of a sleeping, slumbering old Spanish town or a wide open prairie village, with cowboys whooping down the main street, radio fans are coming to realize that Los Angeles is a thriving metropolis.

Once a month KFI broadcasts these programs which include literary events and musical numbers and which introduce to the radio public well known musical and literary characters of the Southwest. The Writers Club Revue is an annual event and this year's music was composed by Jerome Gibler. "Blue Eyes," "Magical Carpet of Love," and "Pirates Song,"—some of his numbers —were sung on the Penwomen's program by Betty Blythe, beautiful screen actress, and Mrs. Gus Reed.

TILDA ROHR, contralto, has sung from four of the Los Angeles broadcast stations, but now she is heard every week from KFSG, the Angelus Temple, in solo work.

Not so many years ago Tilda Rohr was busily engaged in housework at the family home in Switzerland and often she took part in the song festivals so popular with the Swiss people. But no opportunity favored to appear professionally and the magic wand of America beckoned as it does to many.

She found inspiration, upon landing on the shores of the United States, in the fact that she could earn her own living as a language tutor and still continue her vocal lessons late afternoons and evenings and now, ten years later, all of her sacrifices are well repaid.

Tilda Rohr is truly grateful to America for the opportunity which it has given her and for the intelligent interest displayed by patrons of art and music. She shows this, I think, by singing from the various stations whether the programs are "paid" programs or not. Radio has helped her

entertain and cheer thousands and she is one of the radio musicians to whom money isn't everything.

A year ago March the final naturalization papers for Miss Rohr were signed and she gave a naturalization party through KHJ at which time she gave an all-American program of vocal numbers assisted by various artists. A truck load of mail greeted her on returning to the studio the following week for all of radioland was proud to join in sending greetings of congratulation to a plucky little Swiss girl who had come to America ten years before with nothing but the determination to succeed in the vast world of music.

Miss Rohr sings several times a week via radio which probably wouldn't be possible if it were not for the out-door life which she leads. The many out-of-door sports with which California abounds help keep the young lady in splendid condition and she lives in a snug little bungalow atop a high hill where sleeping porches and the sunshine of California bring health and happiness to many.

Charting the Ice-Fields

(*Continued from page 43*)

For instance, during the last observation season the first ice-patrol cutter left Boston on March 17. After fifteen days of vigilance, excluding the time consumed in going to and from Nova Scotia, the *Tampa* was relieved by the *Modoc*, the latter sleuthing for large chunks of ice for a like duration. These alternate fifteen-day courses continued during the ice-patrol season.

The patrol vessel broadcasts ice information three times daily on wave lengths of 600 and 621 meters. Each message is sent three times, with an interval of two minutes between each transmission. The hours of this daily radio communication are 6:00 A. M. and 6:00 P. M.

It is suggested by the Coast Guard that vessels on patrol should, when feasible, send all reports by the naval radio station at Bar Harbor, Maine, using 2,750 meters wave length. The radio station of the Radio Corporation of America at Chatham, Massachusetts, is used when the Bar Harbor station is inoperative. The information thus disseminated outlines all ice spotted, its position, and probable drifts of icebergs. Also the ice-patrol cutter defines the limit of the ice territory and determines the most southerly iceberg. The data furnished the Hydrographic Office in Washington are broadcast by radio telegraphy from naval radio stations located at Arlington, Virginia; Boston, Massachusetts; New York City; Norfolk, Virginia; and Charleston, South Carolina.

Radio in Europe

(*Continued from page 26*)

in process, representing the Swedish press and manufacturing interests. The broadcasting company will provide a studio and maintain broadcasting accommodations. The revenue will be derived in part from receiving licenses and other commercial sale of time. For two years Sweden has had broadcasting, and "Telegraph Administration" is the company behind a project which includes interlinking various cities by telephone, much as stations are linked up in the United States. A curious feature of the radio situation in Sweden is that possession of loud speakers are assessed a higher amount than receiving sets, being officially recorded as luxuries!

In Norway one of the first broadcasting stations on the Continent exists—a 500-watt Western Electric outfit in Christiana. Tests made show that this station is heard as far as France and Ireland, and Norway is making very fast progress in radio. Its methods are more comparable to the British plan than any other in Europe.

It is an odd commentary on the European radio situation that the installation of radio receiving sets is actually illegal throughout Continental Europe generally. The licensing system may be compared, somewhat invidiously, with prohibition conditions in some parts of America. The "prohibition" is being widely disregarded. Continental radio fans obtain material for sets, manufacture them and simply fail to take out a license. This situation may be annoying to the financially harassed Governments of Europe, who leave no stone unturned to work up new sources of revenue; but from the radio point of view, it is a distinctly hopeful sign. It indicates the great vitality and popularity of radio, and the need for taking it into consideration as a popular article.

When the legal situation is thoroughly cleared up and radio made into a reasonable and efficient system, there is no question but that Europeans will be as much interested in radio as anyone else on the globe—provided always, of course, the impecunious Europeans have money enough to purchase the "makings."

All European Governments have been extremely reluctant to set aside their jealous and iron-class restrictions on radio, which are wartime remnants and based on international suspicion, in the main; and the radio restrictions are further evidence of the political mare's nest into which Europe has permitted itself to get into. They must necessarily be clarified before the real European radio era can begin.

The first sign of change has been the realization of the decided value of

radio as an international means of communication and understanding. To European politicians of the old school, this spells, in blunt practical words, opportunity for publicity and propaganda for nationalistic purposes; and on this basis it is now receiving more than usual attention. Some countries have made large expenditures for such propaganda and publicity, and as they get further into the radio situation, it just naturally helps to iron out the kinks and loosen the tight places in the political situation as well.

Broadly speaking, the cultural and musical possibilities of really high-powered stations with adequate technical broadcasting equipment in the key places of European musical life, is bound to create an international radio era of first importance. Already it makes a live American fan's ears tingle with envy at the thought of what European radio fans will shortly be able to tune in on.

Perhaps when the short wave length development predicted has taken place, trans-Atlantic transmission will be so improved that at least those on the Atlantic seaboard in America will stand a good chance of hearing concerts from the Prague and other projected radio music centers. The real hope of this short wave length outlook lies in the technical fact that very special high-powered stations will not be needed. The ordinary ones will do. The use of the short wave length will make possible listening in by American radio fans to European stations in a degree scarcely dreamed of now. This is certainly an event to look forward to.

A TYPICAL PROGRAM FROM THE YEAR 1893 GIVEN IN BUDAPEST.

Nine A. M. Standard time signal, synopsis of day's program.
9:30 Vienna and foreign news, chief contents of newspapers of previous evening.
10:00 Budapest Exchange opening.
10:30 Chief contents Budapest morning newspapers.
11:00 General and economical news.
11:15 Local and sport news, theatrical criticisms.
11:30 Vienna Exchange opening.
11:45 Parliament sitting.
At noon there were time signals by which all subscribers might regulate their watches. Then the program went ahead:
12:30 Stock quotations.
1:00 News briefs.
2:00 Foreign telegrams.
2:30 Local news.
3:00 Exchange closing.
3:15 Weather, court news, theatrical, sport, style notes.
4:00 Foreign market prices.
4:30 Military music.
6:30 Miscellaneous news; opera.
10:00 Gypsy concert.

Loud Speaker Horns

(*Continued from page 15*)

pipes, we observe the following quite marked differences.

1. In the case of the long pipe the peaks are close together; they are 110 cycles apart. In the case of the short pipe the peaks are much further apart, being 440 cycles apart. Long pipes, then have peaks close together, short pipes have them far apart.

2. Long pipes have a low fundamental tone and all their overtones are scattered throughout the lower frequency band. Short pipes have a much higher fundamental tone and their overtones are scattered throughout a much greater frequency range.

3. The quality of the sound given off from the long pipe will be rich in low frequencies and will sound of a comparatively deep or low pitch. A sharp or high pitch quality note will be given off by the short pipe. A long pipe will be relatively deficient in high frequencies and a short one will be lacking in low frequencies.

The group of sketches shown in figure 3 will serve to illustrate why it is possible to obtain all the peaks or frequencies of maximum response from a pipe. There are four pipes, *a, b, c* and *d,* all the same length and closed at the left hand ends. The tuning forks are of the ordinary variety, but of pitches whose frequencies are in the ratio of 1, 3, 5 and 7. The pipes are all of a length equal to one-quarter the wavelength of the frequency of the fork *f*. Then while the fork *f*, vibrates from its mid-position, shown by the solid line, to its outermost position, shown by the dotted line, the pressure wave of the sound has had time to travel to the opposite end of the pipe. While the fork returns to its mid-position the pressure wave has been reflected from the closed end of the pipe and has returned to the open end. Upon reaching the open end a large part of the sound is again reflected back in the pipe and some of it goes off into the surrounding air. At the open end the air moves the fastest and the fork is also moving the fastest as it passes through its mid-position. That is, the air at the open end of the pipe, as the sound wave reaches this end, is moving in phase, so to speak, with the fork. Under these conditions the maximum amount of energy of the fork can be given to the air column. That this is so can be demonstrated easily. Without the presence of the pipe, the fork will vibrate perhaps for a minute, but with the pipe present, the fork will cease to vibrate perhaps, after ten seconds. The pipe causes the fork to lose energy very fast when the two are vibrating in phase, as we described it. If the pipe were a little longer or shorter, no effect would be observed by placing the fork near its open end. There is thus produced a great abundance of sound when the fork and pipe are in unison, so to speak. This is represented by the first peaks, in figures 1 and 2.

The dotted lines in the pipes *b, c* and *d* indicate where the air motion is a maximum and the solid line where it is a minimum. The former is called a loop while the latter is called a node. These cross lines indicate the nature and location of the motion in the pipes in order that reinforcement of the sound from the forks may occur.

These motions of the air in the pipes can also be represented as shown in figure 4. The a^1, b^1, c^1 and d^1 corresponding to *a, b, c* and *d* in figure 3.

Reflection of sound energy always occurs whenever the characteristics of the air column changes. At the closed end, the change from air to a solid end is quite abrupt and so all the sound is reflected. At the open end the change is from an air column, confined by the rigid walls of the pipe, to the unconfined outside air. Reflection, therefore, occurs at this end, too, and much of the sound is reflected back and forth within the pipe. However, the change at the open end to the outside air is less marked or abrupt than at the closed end. For this reason, not all the sound is reflected at the open end. For this reason some of it gets out into the surrounding air.

Reflection, therefore, back into the pipe at the closed end is responsible for the phenomenon of strong resonance and the building up of intense or loud tones.

This description of sound in pipes and its reinforcement by them will be sufficient to allow us to enter the field of the performance and purpose of the loud speaker horn. We shall begin this discussion with a description of how we make our measurements and tests, followed by giving some results.

The measuring system is shown, schematically, in figure 5. The vacuum tube oscillator gives or supplies alternating current at any audible frequency, say from 50 to 15,000 cycles, and at any desired intensity. This current from the oscillator enables us to supply current at the audible frequencies to the loud speaker, (2). The loud speaker gives off sound at any desired frequency and the condenser transmitter (3) responds to the variable sound pressure. The transmitter is of great uniformity both as regards time and frequency. That is, its response is practically constant at nearly the whole frequency range and does not change with time. It is calibrated, as we call it, to show the relation between the sound pressure acting on the diaphragm and the voltage generated in it by this pressure.

The purpose of the amplifiers, (4) and (5), is to enable us to measure very accurately the voltage generated by the condenser transmitter. This means that we have to first calibrate the amplifiers. This is done by removing the condenser transmitter and substituting for it a given, or definitely measured, voltage from the oscillator (1). By means of the thermo couple (6) and the galvanometer (7) we measure the current output into (6) at various frequencies with the known voltage applied to the first amplifier, (4). This second calibration enables us to know what voltage the condenser transmitter has generated. The first calibration, then, enables us to determine at once the sound pressure at the various frequencies. We plot these pressures at the various frequencies and we obtain a curve similar to those shown in figures 1 and 2.

Now, what kind of a curve do we want in order to obtain the best results? The answer to this question is what you are all waiting for, because the most desirable loud speaker will be the one which gives the best curve. The best or ideal curve is a straight line at all frequencies, as illustrated in figure 6. What does a curve for a loud speaker mean? It means simply, that the various sounds at the various frequencies will have a loudness proportional to the height of the curve. Hence, if a loud speaker gave a curve like those in figures 1 and 2, the sound would all be concentrated in a few frequency bands. The results would be exceedingly poor and radio reproduction would still be in the "Dark Ages." On the other hand, if the loud speaker gave a curve like that shown in figure 6, the results would be ideal and the loud speaker would be perfect, in that it will reproduce with equal efficiency all the sound-currents of the various frequencies given to it. That is, it will reproduce faithfully what is supplied to it. Reproduction of the original music and speech, would now require perfect broadcasting and receiving, of course.

We shall begin our study of the horn by giving some results which we have obtained for straight conical horns. The photograph of this group of horns with Dr. Wolff of the electro-acoustic division of the laboratory standing beside them will indicate to the reader the wide and inclusive range covered by our tests. We wanted the facts on them all so we would know what we could expect from conical horns. Here are the facts: they have been published in the "Proceedings of the Institute of Radio Engineers" in the August, 1924 issue. I shall review these facts here for the purpose of making those conclusions of general interest known to all of you.

Many people think that big horns should give intense sounds and small horns should give relatively weak sounds. Let me answer this question for all of you as far as straight conical horns are concerned. In figure 7 you will find the answer. The solid curve is for the small 1 foot horn with an opening of two inches at the large end, if it can be called "large."

The dotted curve is for the mammoth 6 foot horn with an opening of 3 feet at the large end. The small end of both horns is 5/8" in diameter. The dotted curve is lower than the solid one and the two curves show that the little 1 foot horn with a 2-inch opening is much superior at all frequencies (except in one small region around 1000 cycles) to the large six-foot horn. Incidentally, this is most frequently true in the human world as well as in the world of sound! Both horns were tested with the same unit.

In figure 8 are shown a group of four curves. These curves are for four conical horns, each about two feet long, but with the following openings at the large ends: 3, 6, 12 and 18 inches. The photograph shows this group of horns intermingled with other horns. These horns are about the average length of loud speaker horns and the curves showing the response at the various frequencies are typical for many loud speakers. Let us see then, what is the difference amongst them. We shall quote the author's original article:

"As we would expect, resonance is pronounced, the peaks are sharp, and the ratios of the maxima to minima are large for the horns with the 3 and 6 inch openings. The horn resonance is much less marked for the 12 inch opening and is practically absent for the 18 inch opening. The average sound output from the largest aperture horn of this length is about the same as that from the one having the smallest opening. The two intermediate horns give superior results, the larger of these two having less resonance and more uniform output than the smaller of the two."

"The peaks for this group of horns should be about 200 to 250 cycles apart. The fundamental for these two-foot horns should be in the region of 120 to 130 cycles. The curves show small peaks in this region. However, the diaphragm cannot vibrate vigorously at this low frequency and a small sound output must be the result. This is even true for the longer horns tested. The horn will be of little value for low frequencies, even if it is a long one, unless the receiver unit itself has at least a reasonable amount of vibrational energy at those frequencies. This shows the importance of having a low natural frequency unit to give low frequencies. On the other hand, the low frequency unit will not vibrate with much intensity at the high frequencies which would rather indicate the desirability of a high frequency unit."

This quotation indicates rather briefly what we look for in the study of these performance curves, so to speak, for loud speakers. They tell us a great deal and we could say right off hand, don't purchase a horn with a too small or too large an opening. The former will cause too sharp resonance peaks which means that most of the sound energy is reflected back and forth in the horn and never gets out into the room at all. The latter will have less reflection of sound from the opening, but not enough resonance to intensify the sound.

The First Radio Inauguration

(*Continued from page* 35)

But there had been one participant never before seen on an occasion of this kind. When Mr. Coolidge appeared on the stand and the immense throng of spectators focused their eyes and opera glasses upon him they saw in front of him an object which spoke mutely, but eloquently of the advance of American inventive genius in the four years since the last inaugural was held. Almost hiding the Presidential form was a black iron frame containing six little white disks. They were the metallic ears through which a fifth of the nation was to listen to its chief.

Four years before, when President Harding's address was amplified for the benefit of the crowd on the Capitol plaza, the microphones were hidden away under flowers and decorations. This year they stood out boldly, as if proudly conscious of the new role to which they had advanced in the national life. They were fixed to a metal standard which the telephone company had prepared for holding the President's manuscript, and from two of them wires led to the amplifying and broadcasting apparatus of the Radio Corporation of America. Two others were connected with similar equipment of the Bell system, from which a wire carried the message to the New York relaying station, and the remaining two served the public-address system for the benefit of the crowd in front.

As the inaugural speech proceeded, these finely sensitive little disks caught every accent, every slight inflection, and carried it to the ears and understanding of the whole United States. Both for himself and his vast audience it is highly fortunate that the voice of the first of all radio Presidents should have such excellent carrying qualities. Not only did President Coolidge's hearers all over the land follow the sense of his remarks, but from the tone of his voice, the emphasis he placed on this or that sentiment, the steady manner of his delivery, the deliberate and clear-cut enunciation, they obtained as well a knowledge of the inner quality of the man which they never could have received from printed words in newspapers. Only through the subtle tones and accents of the speaker's actual voice which the silvery little disks brought to them could they catch the fine shades of meaning which served to define him for them. When the short address was completed it is safe to say that the American people had a far more intimate sense of what manner of man this President of theirs was than they had ever before had of any President after his first inaugural address.

Only a little short of a record for size was the audience which listened in on Mr. Coolidge's speech. Local officials in charge of the broadcasting estimate the number at 18,000,000 to 20,000,000—more than half the population of Italy or France and five times as many people as the whole United States contained when George Washington delivered the first inaugural address. Had the proceedings been held at night, in all likelihood the invisible audience would have comprised more people than had ever before heard at the same time the sound of one man's voice. As it was, the number of stations hooked up, twenty-five in all, fell slightly short of the number on one or two previous occasions when President Coolidge has spoken. But all his former radio addresses had been campaign speeches or talks on particular subjects made on special occasions. For the first time on March 4 he spoke as a President of the United States formally delivering an official message directly to his fellow countrymen.

In handling the broadcasting arrangements both the Radio Corporation of America and the Bell system had an important part. By a standing agreement these two companies, using the same wave length, have full possession of the air on alternate days in Washington, the one remaining silent while the other broadcasts. Wednesday, March 4, happened to fall on a day assigned to the Radio Corporation, and from its Washington station, WRC, the receiving sets of the capital and vicinity took in the inauguration program. This service was also extended to three other stations, WJZ in New York City, WGY, Schenectady, and WBZ, Springfield, Mass.

The American Telephone and Telegraph Co. carried the program by wire to its broadcasting station in New York, WEAF, and from there relayed it over long-distance telephone wires to all parts of the country. In the east

it reached the ears of the radio public through stations WEEI, Boston; WJAR, Providence; WTIC, Hartford; WOO, Philadelphia; WCAE, Pittsburgh; WGR, Buffalo; WCTS, Worcester, and WFBL, Syracuse. Middle West audiences received it through WEAR, Cleveland; WLW, Cincinnati; WWJ, Detroit; WMAQ, Chicago; WDAF, Kansas City; WHO, Des Moines; WCCO, Minneapolis-St. Paul, and KLZ, Denver. On the Pacific Coast, stations KFI, at Los Angeles, KPO at San Francisco, and KLX at Oakland, were connected up, while for the southern states WSB, at Atlanta, was the only station sending in a request for the service. To all these widely separated stations the transmission was faultless, and the multitudes of listeners-in could follow the proceedings almost as closely as the onlooker in Washington.

Four years ago the public-address system by which President Harding made himself heard to 50,000 or 60,000 people was hailed as "a telephone achievement ranking with the opening of the transcontinental line." Today, so quickly do we adapt ourselves, it seems odd that such an achievement should be thought remarkable. How will this present feat of addressing a mere 20,000,000 people at one time, look to us when next a President-elect holds up his hand to take the oath of office?

Straight Line Condensers

(*Continued from page 24*)

Suppose the capacity and inductance elements of a wavemeter have such values that at maximum capacity setting the resonance frequency is 100 kilocycles: This is the frequency for a condenser setting of 180 degrees. The frequency in kilocycles corresponding to the other settings is progressively greater as the capacity is diminished. With this new type of condenser it is necessary that there be some capacity in the circuit when the variable condenser is set on zero. A convenient value for this capacity is such that the frequency at minimum capacity setting of the variable is twice the frequency at maximum capacity setting.

The manufacturers designing this type of condenser need not necessarily graduate the instrument at every degree. Instead of this procedure, a graduation line could be drawn at 180 degrees but marked 100; one drawn at 90 degrees and marked 150, and one at 0 degrees marked 200. With suitable lines between the markings the graduations could be extended over the entire condenser dial. Then the dial would bear markings proportional to kilocycles or frequencies, instead of the meaningless figures on present dials.

Furthermore, the frequency spacing and the spacing of broadcast stations will be the same at the low end as at the high end of the dial. The scale can just as well be numbered from 0 to 100, with uniform spacing.

As already stated, the scale on a condenser of ordinary design is very open at the upper end or on long wave lengths and congested at the lower end or on high frequencies. This objection, however, is surmounted by the design built by the Radio Laboratory of the Bureau of Standards. First, it may be generally concluded that the shapes of the conventional plates of the various commercial designs of condensers determine the crowded condition or too liberal spacing of the various points along the scale of the dial. Therefore, in order to obtain a dial with a uniform spacing with respect to both low and high frequencies, it is necessary that either the moving or fixed plates of the condenser be so shaped that the angular setting is proportional to the reciprocal of the square root of the capacity. To accomplish this, the type of condenser designed by Doctor Dellinger and useful in wavemeters and other apparatus has movable plates according to this formula,

$$R = \frac{a}{\sqrt{(b-o)^{\frac{3}{2}}}}$$

Where a and b are constants, R is the radius of the plate at any point, o is the angular setting of the dial, in degrees or any other unit.

Then the formula is modified to allow for the hole cut in the fixed plates which makes for the clearance of the shaft, as follows:

$$R = \frac{a}{\sqrt{(b-o)^3 + V^2}}$$

Where "V" is radius of hole.

A straight line frequency variation requires that the capacity in the circuit be not reduced clear to zero—as the frequency would go to infinity—that is, there must be a fixed capacity in parallel with the variable element. The shape of the plate is different, depending on what minimum capacity is chosen. A convenient value for the minimum capacity in the circuit is one-quarter of the maximum, or one-third of the capacity of the variable condenser at maximum setting. The shape of the plates for such a combination is shown in illustration on page 24.

One of the advantages of the straight line condenser, according to Doctor Dellinger, is that a dial calibration requires very few observed points since a straight line can be drawn through a few points more readily than can a curve.

Experimental condensers of the type outlined in this article have been built by the Radio Laboratory of the Bureau of Standards and in practice measured up to theoretical predictions.

How Radio Is Serving Henry Ford

(*Continued from page 29*)

ers and are arranged for multiple tuning. Over a ton of copper wire, sunk in the lake which is straddled by the towers, provides an excellent ground connection.

The Dearborn station represents two years of constant experimentation, and development work is continually in progress to further improve the efficiency of communication. The present capacity of four hundred messages per eight-hour day is soon to be increased to two thousand by the installation of loop receiving equipment, which will permit of simultaneous duplex operation.

Aside from a small room wherein the necessary storage batteries are arranged, the balance of the building is given over to furnace and wash-rooms. Stepping into the outer air and glancing at the low, rolling country surrounding the station with the huge towers rising majestically above, we are at once struck by the wonderful location which together with the thoroughness and efficiency of the installation, doubtless explains the remarkable results which have made an enviable record for WAV.

While WAV is the hub about which the Ford Motor Company's radio communication system revolves, it is by no means the only station of interest in the intricate scheme. Some three hundred miles to the south in Springfield. Ohio, is located WNA, through which much of the railroad business of the Detroit, Toledo and Ironton Railroad passes to and from Dearborn. And still farther south—not far from the Kentucky border, in the quaint little town of Jackson, Ohio, station WJQ provides a communication outlet for the southern terminal of the D. T. & I.

The equipment at Springfield, while not so elaborate as that at Dearborn, comprises the same rugged and efficient vacuum tube transmitter and a medium wave vacuum tube receiver and amplifier of the conventional regenerative type. The antenna at WNA stretches from a short mast atop the freight office of the D. T. & I., which houses the station, to a steel tower a few hundred feet to the rear. Rectified alternating current serves here also as a source of plate potential with entirely satisfactory results. WNA communicates directly with Dearborn and Jackson and acts as a relay point for the latter station when necessary.

The installation at Jackson differs somewhat from the higher powered installations at Dearborn and Springfield and resembles more closely a well-kept amateur station. A one-hundred-watt vacuum tube transmitter located in the

ticket office of the D. T. & I. passenger depot at Jackson, feeds into a short antenna stretching across the tracks. As in the other Ford stations, rectified alternating current is the very satisfactory source of plate potential. The traffic at Jackson is not so heavy, but what the radio operator can easily handle other duties as assistant to the station agent and telegrapher, and such an arrangement is consequently in effect.

WJQ represents the tip of but one spoke in the communication wheel radiating from Dearborn. To the west but a few miles from WAV is the attractive little village of Northville, Michigan, where the Ford Company operates a small manufacturing plant. Instantaneous communication with the offices at Dearborn is provided through the medium of a small, low-powered transmitter, working with the mother-station on schedule time.

And far to the North—the longest and most difficult leg of the circuits—are the new stations at L'Anse and Iron Mountain, Michigan. Radio plays a more important part in these far northern mining activities of the titanic organization than at the more southerly points, for in the remote Michigan peninsula the mail service is sometimes slow at best and telegraphic communication not always dependable. Particularly is this true in the long winter seasons when snow and ice often play havoc with telephone and telegraphic communication. It is then that radio comes into its own.

The station equipment at Iron Mountain is housed in a small building constructed atop the water filtration plant and consists of the conventional five-hundred-watt vacuum tube transmitter with a rectifier supplying the plate current, the primary source of which is the two hundred twenty volts A. C. mains which supply current for other power purposes within the plant. The antenna at this station is of the T type and is supported by a steel mast on one end and a convenient water tank tower on the other.

The station at L'Anse is located on a high hill overlooking Lake Superior. The radio equipment here is substantially a duplicate of that at Dearborn, having the same 1,000-watt transmitter, rectifier, and two 165-foot antenna supporting towers. The primary power supply here is obtained from the power house at the company's manufacturing plant one-quarter mile away. The antenna is of the T type with suspended counterpoise and ground system. The building housing the apparatus is of attractive brick and stucco construction and is complete with toilet facilities, heating plant, etc.

The L'Anse station is the key point for the company's Northern system of radio communication and through it are

relayed messages to and from the company's vessels while in Northern Lake Superior to the mother-station at Dearborn.

This station also relays all messages passing between the Iron Mountain and Dearborn stations and besides there is a vast amount of local traffic passing between L'Anse and Iron Mountain at each of which points the company has manufacturing plants.

These two northern stations complete the net-work of land stations, but do not by any means represent the full extent of Mr. Ford's radio system. On the Great Lakes, two steamers, two huge motor-ships and a trim yacht carry the Ford flag to many important Lake ports. And not only to the cities of the great inland seas does the motor car manufacturer send his ships. But very recently the *S. S. Onondaga* arrived in South America with the first shipment of motor parts ever to go from Detroit to the southern continent directly. And the staunch *Oneida,* sister ship of the *Onondaga,* is sturdily pushing her way along the wave-tossed Atlantic seaboard on a regular schedule.

All five of the Ford vessels are equipped with the latest and most modern of apparatus. With the exception of Mr. Ford's own yacht, the *Sialia,* the ships are all equipped with the standard one-thousand-watt vacuum tube C. W., I. C. W. and telephone transmitters of the Radio Corporation of America marine type.

3-Circuit Tuners

(*Continued from page* 21)

connected to the side of the condenser which connects to the coil. The set will not function if connected to the far side. The customary method of having the stationary plates connected to the grid is important, the movable ones going to the antenna.

There is another and simpler method of connecting this added stage of R.F. which has the advantage of reducing the additional controls to but one. This is shown schematically in figure 3. A tap is taken off the fifteenth turn from the top of the coil for connection to the antenna, and its lower end connected to the grid of the tube. From the opposite end of the coil, connection is made to the negative filament which is also connected to the ground. The plate is again connected to the A post on the regenerative receiver with its ground post to the positive side of the R.F. plate potential. The same B battery can be used for the R.F. and the detector, tapped off at correct point. The positive A being already connected to the negative B in the set, we have no need to repeat this connection in the R.F. circuit. If the grid of the R.F. tube is connected to the stationary plates and the movable ones to the ground

troubles from hand capacity will be reduced to a minimum. A .00025 mfd. condenser is connected in the antenna lead each side of which is connected to a binding post. This will enable the maximum efficiency to be obtained with either a short or long antenna. The photograph will give an idea or two on how such a separate R.F. unit can be constructed.

The circuit shown in figure 4 will be welcomed by the great army of fans who like to experiment, but whose radio equipment is confined to a three-circuit tuner layout. The circuit shows a tuned secondary which is capacity coupled to the antenna and ground through two .0005 mfd. fixed condensers. The scheme applies a strong signal voltage directly upon the grid of the tube, giving greater volume to the signals in general.

I have in mind still one more circuit which will give interesting food for thought for the experimenter, and this is shown in figure 5.

Regeneration over the entire range of the receiver is controlled by a variable capacity and it is important that a well made instrument be used, as a short in this unit means a direct short on the B batteries, causing a possible burnout of the head phones.

Oliver Heaviside

(*Continued from page 39*)

fully utilize his methods in finding a short-cut to the most difficult problems in electric waves along wires, was John Stone Stone, one of the contestants with Michael Pupin and the Frenchmen Hutin and Leblanc, for the fundamental patents underlying the modern practice of carrier-wave telephony in the early 90's, and a radio leader in America.

Before going into the specific reasons for our admiration of Heaviside's work, it is well to try to understand his type of mind and its reaction in his relations to his colleagues in England. He really lived in great poverty for a number of years and was a thorough recluse, due originally to the fact that he aroused official opposition among inferior men by his matchless handling of the more difficult problems which were far over the heads of the leaders in the British Post Office. So great was the difference in the grasp of the subject on the part of his detractors and himself that no less an individual than William Preece, then head of the British Post Office, pronounced Heaviside's theories—since verified to the hilt—as nonsensical! Heaviside, who had developed an ironical and sometimes bitter humor through the studied silence of those who could not follow him, replied by sudden diversions in the midst of his more profound papers, to these gentlemen. Caustic and sly raillery at the super-rigorous school of

the mathematicians at Cambridge also often interrupts his most profound analyses.

He often delighted to write out the differential equation of a very difficult problem and then immediately give the answer, closing with the remark that "the proof of the pudding is in the eating thereof." Such omissions often required weeks of work by those who wished to understand his results, and as his collected papers only appeared in the London *Electrician*—which published three volumes of his "Electromagnetic Theory," contributed between 1891 and 1912, and his "Electrical Papers," published by Macmillan in 1892, and now worth $50 a volume—being out of print—he never felt that the general engineering public had been "sold" on his methods by these two organizations. There has, however, been recently issued by Ernest Benn, Ltd., a new three-volume edition of his "Electromagnetic Theory," and it is safe to say that within the last five years there are many physicists in this country who have been or are now using his mathematical methods. Aside from John Stone Stone, the pioneer in this field, there might be mentioned the names of Messrs. Fry and Carson of the Western Electric and A. T. & T. Companies, respectively, together with A. Press, and V. Bush, who have published papers based on Heaviside's methods.

It is extremely difficult to give a simple idea to the average radio fan of just what Heaviside did to prove himself to genius. If one says that he considered the equations of electromagnetic actions in a more complete way than Maxwell did, by making them "symmetrical," one has to explain that he invented what is known as "magnetic conduction," which would correspond to a condition in nature by which the mere presence of magnetic flux in a medium consumed energy, just as a passage of dielectric flux with its attendant current along a conductor consumes energy through the "electric resistance" of the wire. The solutions of the resulting equations were reduced to represent the facts of nature by simply placing this "magnetic conductance" equal to zero, in which case they assumed the conventional form first discovered by Maxwell. Heaviside, in other words, had such a profound knowledge of these equations that like Helmholtz he could afford to "play" with them and yet he had a steady grip on their real physical meaning; so profound indeed, that some of his results are not generally used in radio work even yet.

To illustrate this point, it may be interesting to think of the usual fundamental formula given by Neuman for getting the inductance of a wire by

considering that the elementary current filaments in it are all removed to infinity—torn apart as it were. This work is a measure of the inductance of the current in that length of wire. Heaviside considered the dielectric displacement current was due to the potential difference at the end of an elementary "unit" of current and called its effect "the inductance of the dielectric." This conception, when applied to the problem of finding the inductance per cm. of a simple vertical antenna with different current distributions on it was solved by the writer at the request of John Stone Stone in 1904 for "straight line" current distribution with very low frequency and for a transmitter vibrating at its fundamental. The results are not of great practical importance at this time, but are only mentioned to show that most of Heaviside's work was of an unusually practical nature. In fact he poked fun at mathematicians who in their efforts to be too rigorous lost sight of the physical nature of the problem under consideration, while wallowing in a slough of equations.

To come down to the most startling and dramatic event in Heaviside's life, we may take his first papers in the *Philosophical Magazine* which started in 1885. Heaviside pointed out how no less an authority than Sir William Thompson (afterwards Lord Kelvin) had failed to consider the true nature of electromagnetic propagation of signals in the cable. He showed how Lord Kelvin's theory was merely a theory of diffusion and not one of true propagation, because it neglected the self-inductance of the cable. A diffusion theory in such a case would be like engineering the receipt of signals by heat along a brass rod. At one end would be placed alternately a piece of ice and a candle and at the other end a thermo couple. If these alternations of temperature were spaced as "dots and dashes" we would have a rough analogy to the original action of the Trans-Atlantic cable. The only solution, to make such a cable practical, was that attempted by Lord Kelvin after a Mr. Whitehead had ruined the previous cable by shooting high tension sparks into it from an induction coil. Lord Kelvin shows that not the intensity of the electric charge, but the quantity of electricity which flowed determined success. In fact he stated that with a primary battery no bigger than a gun-cap he could send signals across the Atlantic cable!

Heaviside, on the other hand, showed how once self-inductance was taken into account and utilized—even to the extent of being actually introduced into a cable—a condition of true propagation of energy was achieved. The signals would go on of their own ac-

cord with definite velocities, according to the way in which they were impressed; i. e., whether there was a sharp impulse or whether they consisted of a sign wave or a combination of a few such waves they would show distortion. In other words, the shape of the signal was so altered that it "tailed out" and hence such a cable, or even a long telephone line, would be out of the question for telephony under usual conditions. Heaviside, however, proved that such a thing as a distortionless cable, or a circuit, was possible and was the first one to give the equation for achieving this result. He found that not only would self-inductance help the cable, but that by also introducing leakage at various points regularly spaced throughout the cable, there would result an improvement in the quality transmission. This was due to the fact that signals of all frequencies, into which the transmitted impulses could be analyzed, were propagated at the same speed.

In view of the fact that Heaviside utilized what are now known as Bessel's functions with matchless ease, while the ordinary radio engineer labors with "complex" algebra, it is worthwhile to point out that his so-called "Bessel cable" is very closely analogous to a simple vertical antenna whose capacity per unit length near the ground is much greater than it is at the upper end.

Such a cable shows a constant velocity of a signal at each part of it, but has reflection at every point. Again, if the product of the capacitance and inductance per unit length along a cable (or vertical antenna) differs from point to point, but having their ratio the same throughout, there will be no reflection within the cable, but a change of velocity at every point of disturbance along the cable. These interesting facts were brought out more than a generation ago by this genius.

Heaviside never mingled with his contemporaries and, like other great men who either through their own sensitiveness or love of solitude shunned the outside world, his work may yet be generally unappreciated for another generation. A similar case is that of the great electrical experimenter, Cavendish, who anticipated some of Faraday's results by 50 years, but whose inclination to secrecy prevented his recognition during his lifetime.

So arbitrary were some of Heaviside's early contemporaries in regard to their inability to perceive his conclusions that his own brother, A. W. Heaviside, attempted in vain to have these theories accepted in a paper on their practical applications before the Society of Telegraphic Engineers of England. Heaviside made this attitude of his colleagues the occasion for the

expression of amused contempt in many of his papers. However, it seemed to embitter him to such an extent that as soon as he began to be recognized, he fled to Devonshire and emerged no more to the day of his death. He never attended the meetings of any engineering or scientific societies, nor even came to hear the congratulations tendered him when he was given the highest honors within the power of European and American electrical professional men to bestow. In fact, Heaviside spurned the honor of being elected after much wrangling as an honorary member of the American Institute of Electrical Engineers. It took almost endless effort to make him consent.

The most unfortunate aspect of Heaviside's hermit life had its rise in the extraordinary increase of prices brought on by the War during his old age, which took place in his 75th year. He was delicate and sensitive, and he suffered not only inconvenience at first, but later—after the loss of his housekeeper who went insane and had to be put away—he lived on alone. He refused to accept financial aid or gifts beyond a pension of $800 a year which was practically forced on him by the government. He preferred to sink into neglect.

His work and genius has helped materially in erecting large industrial organizations controlling communication agencies, yet he receives just two lines in Great Britain's "Who's Who."

It is not out of place to call attention to the importance of Heaviside's use of divergent series in the solution of certain differential equations. He was already the greatest manipulator of Bessel's Functions of his generation. He blazed the way and deserves the credit. By justifying the use of a series whose sum first approaches but never quite reaches a definite value and then suddenly increases without limit, he succeeding in solving many equations. Such an expansion is called an asymptotical expansion and has been much used in recent years. It was quite a victory to take the despised divergent series and make it serve its turn in engineering.

The famous so-called Heaviside Layer in the upper atmosphere of ionized particles, giving rise to exceptional long distance transmission with short waves and to many freak transmissions with long waves and moderate power clear around the earth, is a conception due to Heaviside. This seems to be the only case in which his name has been generally securely connected to an enduring contribution to perpetuate his fame. This layer accounts for fading and for the curvature of electric waves as well as for other peculiarities of transmission.

Heaviside's most strikingly original work was perhaps his invention of the "operational solution" of the differential equations necessary to express the problem of suddenly applying a "unit voltage" or other disturbances to a cable. To do this he had to use an expression or "function" as it is called, whose value before a certain instant would be zero and whose value thereafter would always be unity. He not only solved this problem, but he devised a way by which the very symbols of operation could be treated like the ordinary algebraic quantities used in solving simple equations. When these equations have been reduced by simple laws, the engineer employing them has only to interpret them in order to get his results in a small fraction of the time which cumbersome and elaborate methods then in vogue would have required.

Oliver Heaviside was not without due gratitude and the finer feelings of that culture which should go with eminence in any walk of life; as his letter of profound gratitude and appreciation to John Stone Stone for first introducing and applying this "operational calculus" in America shows.

The great lesson of his life seems to be that after all, human beings are not merely symbols of action, but that in every intellectual relation, however remotely social it may be, it is best to cultivate the "human touch," since no man can go further in any endeavor than the co-operative spirit of his colleagues will permit him; otherwise, his work will be driven into secret places, and its influence will be attenuated until long past the psychological time for it to arrive to arouse world-wide enthusiasm. This is particularly true as a possibility for modern scientists with the advent of the very means which this neglected and morose genius passed on to us as the shadows were closing down on his labors.

Where the Great White Way Begins

(*Continued from page 47*)

Harlan, Lowell Sherman, etc. He is a graduate of Yale, and not only possesses a fine baritone voice, but is also a fine pianist and capable of playing all types of music.

The entire studio and operating staff will serve under the direction of Marion K. Gilliam, who has for ten years been Editor-in-Chief, in charge of the publications of the Rockefeller Foundation, and who has been more recently identified with the radio, as a program booker and studio manager. Mr. Gilliam a supervisor of program making, will see that an unusual menu is offered the radio fan. According to his plans WMCA will specialize in

(*Turn to page 78*)

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Where the Great White Way Begins

(*Continued from page 76*)

musical features offering some operatic stars and others under regular vaudeville contracts who will get permits from their managers to appear for him. Plans have already been made to broadcast at all of the Christian Science Churches of greater New York, and this will be a regular Sunday night feature.

A very charming little lady, Dorothy Higgins, will be studio accompanist. She is a twenty-year old pupil of Guy Maier, and is now with the Angela Diller School of New York, studying theory, while Bruce Simonds of the Yale School of Music is perfecting her technique. She has been heard from WEAF, WNAC, etc., and even during the practice period of WMCA gave pleasure.

As I said before the new station opened with a regular series of firecrackers on Washington's birthday night, and if the great variety of talent presented that evening is to be the criterion for future performances, you had better get your radio set for that station. A list of the people appearing reads like a publicity catalogue, and included all types of famous people. Of course, one of the principal features was Ernie Golden, and his Hotel McAlpin orchestra. Ernie has been the guiding spirit of the McAlpin grill since last June. He is an old Keith Vaudeville head-liner, and records for the Edison Company. His Hotel McAlpin orchestra, which will go on the air three times a week, consists of eleven pieces and plays arrangements which are Ernie's own work. He has organized twenty bands which are playing all over the country. He was musical director of the "Greenwich Village Follies" one year and played with William Rock, and Frances White, in vaudeville for two years.

Another head-liner of the evening was Florence Richardson and her girl band from Zit's Central Park Casino. This was Miss Richardson's radio debut, and I foretell that Central Park is going to become popular this season for something more than its benches.

Not the least unusual person on the studio staff, is Ralph C. Powell, Jr., the chief of the Engineering staff.

Other people who "did their stuff" on the program were: Irvin Cobb, Andy White, Graham McNamee, Nathan Glantz, Louis Brau, Rube Goldberg, Holbrook Blinn, Miss Olga Steck, Betty Rand—well they were on till about 2:00 in the morning, so I think I will surrender the job of trying to tell you all who were there and leave it to you to find out what they are doing now.

BROADCASTING STATION DIRECTORY

KDKA Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. 309
KDLR Radio Elec. Co. ..... Devils Lake, N. Dak. 231
KDPM Westinghouse Electric & Mfg. Co., Cleveland, O. 250
KDPT Southern Electrical Co. ..... San Diego, Cal. 245
KDYL Newhouse Hotel ..... Salt Lake City, Utah 250
KDYM Savoy Theatre ..... San Diego, Cal. 280
KDZB Frank E. Seifert ..... Bakersfield, Cal. 209
KDZE Rhodes Department Store ..... Seattle, Wash. 270
KEPT Cope & Johnson ..... Salt Lake City, Utah 268
KFAB Nebraska Buick Auto Co. ..... Lincoln, Nebr. 248
KFAD McArthur Bros. Mercantile Co.. Phoenix, Ariz. 272
KFAE State College of Washington .... Pullman, Wash. 330
KFAF Western Radio Corporation ..... Denver, Colo. 278
KFAJ University of Colorado ..... Boulder, Colo. 360
KFAN The Electric Shop ..... Moscow, Idaho 360
KFAU Independent School District of Boise City, Boise High School, Boise, Idaho 500
KFAW The Radio Den ..... Santa Ana, Cal. 280
KFCC First Congregational Church ..... Helena, Mont. 248
KFBB F. A. Buttrey & Co. ..... Havre, Mont. 360
KFBC W. K. Azbill ..... San Diego, Cal. 223
KFBG First Presbyterian Church ..... Tacoma, Wash. 360
KFBK Kimball-Upson Co. ..... Sacramento, Cal. 283
KFBL Leese Bros. ..... Everett, Wash. 224
KFBU The Cathedral ..... Laramie, Wyo. 270
KFCB Nielsen Radio Supply Co. ..... Phoenix, Ariz. 238
KFCF Frank A. Moore ..... Walla Walla, Wash. 256
KFCL Leslie E. Rice, Los Angeles Union Stock Yards, Los Angeles, Cal. 236
KFCP Ralph W. Flygare ..... Ogden, Utah 208
KFCY Western Union College ..... Le Mars, Iowa 252
KFCZ Omaha Central High School ..... Omaha, Neb. 258
KFDD St. Michael's Cathedral ..... Boise, Idaho 252
KFDH University of Arizona ..... Tucson, Ariz. 258
KFDJ Oregon Agricultural College ..... Corvallis, Ore. 360
KFDL Knight-Campbell Music Co. .... Denver, Colo. 226
KFDM Magnolia Petroleum Co. ..... Beaumont, Texas 306
KFDX First Baptist Church ..... Shreveport, La. 360
KFDY South Dakota State College .... Brookins, S. D. 360
KFDZ Harry O. Iverson ..... Minneapolis, Minn. 231
KFEC Meier & Frank Co. ..... Portland, Ore. 248
KFEL Winner Radio Corp. ..... Denver, Colo. 254
KFEQ Scroggin & Co. ..... Bank, Oak, Neb. 268
KFER Auto Electric Service Co. ..... Fort Dodge, Iowa 231
KFEX Augsburg Seminary ..... Minneapolis, Minn. 261
KFEY Bunker Hill & Sullivan Mining and Concentrating Co., Kellogg, Idaho 360
KFFB Jenkins Furniture Co. ..... Boise, Idaho 240
KFFE Eastern Oregon Radio Co. ..... Pendleton, Ore. 360
KFFP First Baptist Church ..... Moberly, Mo. 266
KFFR Nevada State Journal ..... Sparks, Nev. 226
KFFV Graceland College ..... Lamoni, Iowa 250
KFFY Louisiana College for Women .. Baton Rouge, La. 275
KFGC Louisiana State University .... Baton Rouge, La. 268
KFGD Oklahoma College for Women .. Chickasha, Okla. 252
KFGH Leland Stanford University, Stanford Univ., Cal. 270
KFGQ Crary Hardware Co. ..... Boone, Iowa 226
KFGX First Presbyterian Church ..... Orange, Texas 250
KFHA Western State College of Colorado, Gunnison, Colo. 252
KFHJ State Teachers College ..... Warrensburg, Mo. 234
KFHL Penn College ..... Oskaloosa, Iowa 240
KFHR Star Electric & Radio Co. ..... Seattle, Wash. 283
KFI Earle C. Anthony, Inc. ..... Los Angeles, Cal. 469
KFIF Benson Polytechnic Institute .... Portland, Ore. 248
KFIO North Central High School .... Spokane, Wash. 252
KFIQ First Methodist Church ..... Yakima, Wash. 242
KFIU Alaska Elec. Light & Power Co., Juneau, Alaska 226
KFIZ Daily Commonwealth and Oscar A. Huelsman, Fond du Lac, Wis. 273
KFJB Marshall Electric Co. ..... Marshalltown, Iowa 248
KFJF National Radio Mfg. Co. .. Oklahoma City, Okla. 261
KFJI Liberty Theatre ..... Astoria, Ore. 252
KFJM University of North Dakota, Grand Forks, N. D. 280
KFJR Ashley C. Dixon & Son ..... Stevensville, Mont. 258
KFJX Iowa State Teachers College .. Cedar Falls, Iowa 280
KFJY Tunwall Radio Co. ..... Fort Dodge, Iowa 246
KFJZ Texas National Guard, 112th Cavalry, Fort Worth, Texas 254
KFKA Colorado State Teachers College ... Greeley, Colo. 273
KFKB Brinkley-Jones Hospital Association, Milford, Kan. 286
KFKQ Conway Radio Laboratories ..... Conway, Ark. 250
KFKU University of Kansas ..... Lawrence, Kan. ...
KFKV F. F. Gray, 3200 Richardson St., Butte, Mont. 283
KFKX Westinghouse Electric & Mfg. Co., Hastings, Neb. 341
KFKZ Nassour Bros. Radio Co. . Colorado Springs, Colo. 234
KFLA Abner R. Willson, 1321 W. Blatinum St., Butte, Mont. 283
KFLB Signal Electric Mfg. Co. ..... Menominee, Mich. 248
KFLE National Educational Service ..... Denver, Colo. 268
KFLP Everette M. Foster, 1242 South Sixth St., Cedar Rapids, Iowa 256
KFLR University of New Mexico ... Albuquerque, N. M. 254
KFLU Rio Grande Radio Supply House, San Benito, Texas 236
KFLV Swedish Evangelical Mission Church, Rockford, Ill. 229
KFLX George R. Clough, 1214 40th St., Galveston, Tex. 240
KFLZ Atlantic Automobile Co. ..... Atlantic, Iowa 271
KFMB Christian Churches of Little Rock, Little Rock, Ark. 254
KFMQ University of Arkansas ..... Fayetteville, Ark. 248
KFMR Morningside College ..... Sioux City, Iowa 261
KFMT George W. Young, 2219 W. Bryant Ave., Minneapolis, Minn. 231
KFMW M. G. Sateren, 127 Blanche St., Hougton, Mich. 266
KFMX Carleton College ..... Northfield, Minn. 283
KFNF Henry Field Seed Co. ..... Shenandoah, Iowa 266
KFNG Wooten's Radio Shop ..... Coldwater, Miss. 254
KFNJ Central Mo. State Teachers College, Warrensburg, Mo. 234
KFNL Radio Broadcast Association .. Paso Robles, Cal. ...
KFNV L. A. Drake, 505 Third St. ... Santa Rosa, Cal. .. 228
KFNY Montana Phonograph Co. ..... Helena, Mont. 248
KFNZ Royal Radio Co. ..... Burlingame, Cal. 227
KFOA Rhodes Dept. Store ..... Seattle, Wash. 455
KFOC First Christian Church ..... Whittier, Cal. 230
KFOD The Radio Shop ..... Wallace, Idaho 224
KFOJ Moberly High School Radio Club .. Moberly, Mo. 246
KFOL Leslie M. Schafbuch, 502 W. Marion St., Marengo, Iowa 234
KFON Echophone Radio Shop ..... Long Beach, Cal. 230
KFOO Latter Day Saints University, Salt Lake City, Utah 242
KFOR David City Tire & Electric Co., David City, Neb. 226
KFOT College Hill Radio Club ..... Wichita, Kan. 231
KFOU Hommel Manufacturing Co. ..... Richmond, Cal. 254
KFOX Technical High School ..... Omaha, Neb. 248
KFOY Beacon Radio Service ..... St. Paul, Minn. 252
KFPG Garretson & Dennis ..... Los Angeles, Cal. 238
KFPH Howard C. Mallander, 992 Lake St., Salt Lake City, Utah 242
KFPL C. C. Baxter, 205 Grafton St. ..... Dublin, Tex. 242
KFPM New Furniture Co. ..... Greenville, Texas 242
KFPN Missouri National Guard, 70th Infantry Brigade, Jefferson City, Mo. 242
KFPR Los Angeles County Forestry Department, Los Angeles, Cal. 236
KFPV Heintz & Kohlmoos ..... San Francisco, Cal. 236
KFPW St. John's Church ..... Carterville, Mo. 268
KFPX First Presbyterian Church ..... Pine Bluff, Ark. 242
KFPY Symons Investment Co. ..... Spokane, Wash. 283
KFQA The Principia, 5539 Page Ave., St. Louis, Mo. 261
KFQB Searchlight Publishing Co., Fort Worth, Texas 254
KFQC Kidd Brothers Radio Shop ..... Taft, Cal. 232
KFQD Chovin Supply Co. ..... Anchorage, Alaska 280
KFQE Dickenson, Henry, Radio Laboratories, Colorado Springs, Colo. 224
KFQG Southern California Radio Association, Armory Exposition Park, Los Angeles, Cal. 228
KFQH Albert Sherman, Hillsbourgh Box 51, Burlingame, Cal. 220
KFQI Thomas H. Ince Corp. ..... Culver City, Cal. 234
KFQJ Harbour-Longmire Co. ..... Oklahoma City, Okla. 236
KFQK Democrat Leader ..... Fayette, Mo. 236
KFQL Oklahoma Free State Fair Association, Muskegee, Okla. 252
KFQM Texas Highway Bulletin ..... Austin, Texas 268
KFQN Third Baptist Church ..... Portland, Ore. 283
KFQR Walter L. Ellis, 625 East 6th St., Oklahoma City, Okla. 250
KFQT Texas National Guard, Thirty-sixth Signal Co., Denison, Texas 252
KFQU W. Riker ..... Holy City, Cal. 222
KFQV Omaha Grain Exchange ..... Omaha, Neb. 231
KFQW C. F. Knierim Photo. Radio & Electric Shop, North Bend, Wash. 248
KFQX Alfred M. Hubbard, 310 Green Bldg., Seattle, Wash. 233
KFQY Farmers State Bank ..... Belden, Neb. 273
KFQZ Taft Radio Co., 5653 De Longpre Ave., Hollywood, Cal. 239
KFRB Hall Brothers ..... Beeville, Texas 248
KFRC Radioart Studio ..... San Francisco, Cal. 270
KFRF W. R. Brown ..... Alexandria, La. 242
KFRH The Radio Shop ..... Grafton, N. D. 268
KFRJ Guy Simmons, Jr., 515 Clifton St., Conway, Ark. 250
KFRL Men's Club of First Presbyterian Church, Grand Forks, N. Dak. 240
KFRM Lieut. James P. Boland, U. S. A., Fort Sill, Okla. 263
KFRN M. Laurence Short ..... Hanford, Cal. 224
KFRO Curtis Printing Co., 1109 8th Ave., Fort Worth, Texas 246
KFRP Trinity Church ..... Redlands, Cal. 206
KFRQ Radio Market Service Co. ..... Portland, Ore. 213
KFRU Bristow, Oaklahoma (Etherical Studios) 394
KFRW United Churches of Olympia .... Olympia, Wash. 220
KFRX J. Gordon Klemguard ..... Pullman, Wash. ...
KFRY New Mexico College of Agriculture & Mechanic Arts, State College of N. M. 266
KFRZ The Electric Shop ..... Harrington, Neb. ...
KFSG Echo Park Evangelistic Association, Los Angeles, Cal. 277
KFSY Van Blaricom Co., 20 So. Main St., Helena, Mont. 261
KFUM W. D. Corley, 114 W. Del Norte St., Colorado Springs, Col. ...
KFUJ Hopper Plumbing & Heating Co., Breckenridge, Minn. 242
KFUL Thomas Goggen & Bros. ..... Galveston, Texas 258
KFUO Concordia Seminary ..... St. Louis, Mo. 549
KFUP Fitzsimmons General Hospital .... Denver, Colo. 234
KFUR Perry & Redfield ..... Ogden, Utah 223
KFUS L. L. Sherman & Church ..... Oakland, Cal. 234
KFUT University of Utah ..... Salt Lake City, Utah 260
KFUQ Julius Branton Sons ..... San Francisco, Cal. 236
KFUU Colburn Radio Laboratories .. San Leandro, Cal. 224
KFUV G. Pearson Ward ..... Springfield, Mo. 252
KFUY Irvine H. Bouchard ..... Butte, Mont. 254
KFUW Carl W. Lewis ..... Moberly, Mo. 233
KGB Tacoma Daily Ledger ..... Tacoma, Wash. 252
KGO General Electric Co. ..... Oakland, Cal. 312
KGU Marion Mulrony ..... Honolulu, Hawaii 360
KGW Portland Morning Oregonian ..... Portland, Ore. 492
KGY St. Martin's College ..... Lacey, Wash. 258
KHJ Times Mirror Co. ..... Los Angeles, Cal. 395
KHQ Louis Wasmer ..... Seattle, Wash. 360
KJR Northwest Radio Service ..... Seattle, Wash. 283
KJS Bible Institute of Los Angeles, Los Angeles, Cal. 252
KLDS Reorganized Church of Jesus Christ of Latter Days Saints 268
KJQ C. O. Gould ..... Stockton, Cal. 273
KLS Warner Bros. Radio Supplies Co., Oakland, Cal. 241
KLX Tribune Publishing Co. ..... Oakland, Cal. 509
KLZ Reynolds Radio Co. ..... Denver, Colo. 283
KMJ San Joaquin Lt. & Power Corp. ..... Fresno, Cal. 234
KMO Love Electric Co. ..... Tacoma, Wash. 360
KNT Walter Hemrich ..... Kukak Bay, Alaska 263
KNX "Hollywood" Los Angeles Evening Express 337
KOA Rocky Mts. Broadcasting Station, General Elec. Co., Denver, Colo. 323
KOB New Mexico College of Agriculture and Mechanic Arts, State College, N. M. 360
KOP Detroit Police Dept. ..... Detroit, Mich. 277
KPO Hale Bros. ..... San Francisco, Cal. 423
KPPC First Presbyterian Church ..... Pasadena, Cal. 228
KQV Doubleday Hill Electric Co. ..... Pittsburgh, Pa. 275
KQW Chas. D. Herrold, 407 First St., San Jose, Cal. 239
KRE Berkeley Daily Gazette ..... Berkeley, Cal. 258
KSAC Manhattan ..... Kans. 340
KSD Post Dispatch (Pulitzer Pub. Co.), St. Louis, Mo. 546
KTHS ..... Hot Springs, Ark. 374
KTW First Presbyterian Church ..... Seattle, Wash. 360
KUO Examiner Printing Co. ..... San Francisco, Cal. 245
KWG Portable Wireless Telephone Co., Stockton, Cal. 247
KWH Los Angeles Examiner ..... Los Angeles, Cal. 360
KYQ Electric Shop ..... Honolulu, Hawaii 270
KYW Westinghouse Elec. & Mfg. Co., Chicago, Ill. 536
KZM Preston D. Allen, 13th & Franklin Sts., Oakland, Cal. 241
KZKZ Electrical Supply Co, 109 Plaza Maraga, Manila, P. I. 270
KZRQ Far Eastern Radio Co., Manila Hotel, Manila, P. I. 222
WABO Hickson Electric Co. ..... Rochester, N. Y. 277
WBBM H. Leslie Atlas, 7421 Sheridan Road, Chicago, Ill. 226
WBES Bliss Elec. Co. ..... Takoma Park, Md. 222
WCAZ Carthage College ..... Carthage, Ill. 246
WCEE Charles E. Erbstein, R. F. D. 6, Box 75, (Near) Elgin, Ill. 275
WCM Texas Markets & Warehouse Department, Austin, Texas 268
WCTS C. T. Sherer Co. ..... Worcester, Mass. 268
WDBE Gilham Schoen Elec. Co., 22 Luckie St., Atlanta, Ga. 278
WEAR Goodrich Tire & Rubber Co., Cleveland, Ohio 389
WEAU Davidson Bros. Co. ..... Sioux City, Iowa 275
WFBD Gethsemane Baptist Church .. Philadelphia, Pa. 234
WFBJ St. John's University ..... Collegeville, Minn. 236
WGBB Harry H. Carmon ..... Freeport, N. Y. 244
WGBC First Baptist Church ..... Memphis, Tenn. 266
WGBG Breitenbach's Radio Shop ..... Thrifton, Va. 226
WGBH Fall River Herald Publishing Co., Fall River, Mass. 209
WGBM Theodore N. Saaty, 92 Dover St., Providence, R. I. 234
WGBN Hub Radio Shop, 728 First St., La Salle, Ill. 256
WGBO Dr. Roses Artan, 197 Ponce Leon Ave., San Juan, P. R. 275
WGBQ Stout Institute ..... Menomonie, Wis. 234
WGBT Furman University ..... Greenville, S. C. 236
WGST Georgia School of Technology ..... Atlanta, Ga. 270
WHBA Shaffer Music House ..... Oil City, Pa. 250
WHBB Hebal's Store ..... Stevens Point, Wis. 240
WHDI William Hood Dunwoody Ind. Ins., Minneapolis, Minn. 278
WIL Benson Radio Co. ..... St. Louis, Mo. 273
WJAZ Zenith Radio Corporation, 332 So. Michigan Ave., Chicago, Ill. 268
WKAQ Radio Corp. of Porto Rico .... San Juan, P. R. 340
WLIT Lit Brothers ..... Philadelphia, Pa. 394
WMCA McAlpin Hotel ..... New York City 428
WRAA Rice Institute ..... Houston, Texas 256
WRHF Washington Radio Hospital Fund, 525 11th St., Washington, D. C. 256
WSAG Gospel Tabernacle ..... St. Petersburgh, Fla. 266
WSAN Allentown Call Publishing Co. .. Allentown, Pa. 229
WSAX Chicago Radio Laboratory ..... Chicago, Ill. 268
WSRO Radio Co. (Harry W. Fahrlander), Hamilton, Ohio 252
WTAM Willard Storage Battery Co. .... Cleveland, Ohio 389
WAAB Valdemar Jensen, 137 S. St. Patrick St., New Orleans, La. 268
WAAC Tulane University ..... New Orleans, La. 360
WAAD Ohio Mechanics Institute ..... Cincinnati, Ohio 258
WAAF Chicago Daily Drover's Journal .. Chicago, Ill. 286
WAAM I. R. Nelson Co. ..... Newark, N. J. 263
WAAN University of Missouri ..... Columbia, Mo. 254
WAAW Omaha Grain Exchange ..... Omaha, Neb. 278
WABA Lake Forest University ..... Lake Forest, Ill. 227
WABB Harrisburg Sporting Goods Co., Harrisburg, Pa. 266
WABH Lake Shore Tire Co. ..... Sandusky, Ohio 244
WABI Bangor Railway & Electric Co., Bangor, Me. 240
WABL Connecticut Agricultural College, Storrs, Conn. 283
WABM F. E. Doherty Automotive & Radio Equipment Co. Saginaw, Mich. 206
WABN Ott Radio, Inc., 1627 State St., La Crosse, Wis. 244
WABQ Haverford College Radio Club .. Haverford, Pa. 261
WABR Scott High School ..... Toledo, Ohio 263
WABU Victor Talking Machine Co. ..... Camden, N. J. 226
WABW College of Wooster ..... Wooster, Ohio 207
WABX Henry B. Joy ..... Mount Clemens, Mich. 245
WABY John Magaldi, Jr., 815 Kimball St., Phila., Pa. 242
WABZ Coliseum Place Baptist Church, New Orleans, La. 263
WAHG A. H. Grebe Co. ..... Brooklyn, N. Y. 316
WAIT A. H. Waite Co., 32 Weir St. Taunton, Mass. 229
WBAA Purdue University ..... West Lafayette, Ind. 283
WBAN Wireless Phone Corporation ..... Paterson, N. J. 244
WBAO James Milliken University ..... Decatur, Ill. 275
WBAP Wortham-Carter Publishing Co. (Star-Telegram), Fort Worth, Texas 476
WBAV Erner & Hopkins Co. ..... Columbus, Ohio 294
WBAX John H. Stenger, Jr., 66 Gildersleeve St., Wilkesbarre, Pa. 256
WBBA Plymouth Congregational Church, Newark, Ohio 225
WBBD Barbey Battery Service ..... Reading, Pa. 234
WBBG Irving Vermilya ..... Mattapoisett, Mass. 248
WBBH J. Irving Bell, 1511 Gordon St., Port Huron, Mich. 205
WBBL Grace Covenant Church ..... Richmond, Va. 283
WBBP Petoskey High School ..... Petoskey, Mich. 214
WBBR Peoples Pulpit Association ..... Rossville, N. Y. 273
WBBS First Baptist Church ..... New Orleans, La. 252
WBBU Jenks Motor Sales Co. ..... Monmouth, Ill. 224
WBBV Johnstown Radio Co. ..... Johnstown, Pa. 248
WBBW Ruffner Junior High School ..... Norfolk, Va. 222
WBBY Washington Light Infantry, Charleston, S. C. 268
WBBZ Noble B. Watson, 233 Iowa St., Indianapolis, Ind. 227
WBCN Southtown Economist Station .... Chicago, Ill. 266
WBDC The Baxter Laundry Co., 747 Fountain St., N. E., Grand Rapids, Mich. 256
WBRE Baltimore Radio Exchange .... Wilkesbarre, Pa. 231
WBS D. W. May (Inc.) ..... Newark, N. J. 252
WBT Southern Radio Corp. ..... Charlotte, N. C. 360
WBZ Westinghouse Elec. & Mfg. Co., Springfield, Mass. 337
WCAO St. Lawrence University ..... Canton, N. Y. 263
WCAE Kaufman & Baer Co. ..... Pittsburgh, Pa. 462
WCAG Clyde R. Randall, 2813 Calhoun St., New Orleans, La. 268
WCAH Entrekin Electric Co. ..... Columbus, Ohio 265
WCAJ Nebraska Wesleyan University, University Place, Neb. 280
WCAL St. Olaf College ..... Northfield, Minn. 360
WCAO The Sanders and Stayman Co., Baltimore, Md. 275
WCAP Chesapeake & Potomac Telephone Co., Washington, D. C. 469
WCAR Southern Radio Corp. of Texas, San Antonio, Texas 263
WCAT South Dakota State School of Mines, Rapid City, S. D. 240
WCAU Durham & Co. ..... Philadelphia, Pa. 278
WCAV J. C Dice Electric Co. ..... Little Rock, Ark. 360
WCAX University of Vermont ..... Burlington, Vt. 360
WCAY Milwaukee Civic Broadcasting Station, Hotel Antlers, Milwaukee, Wis. 266

WCBA	Charles W. Helmbach, 1015 Allen St., Allentown, Pa.	280
WCBC	University of Michigan.....Ann Arbor, Mich.	229
WCBD	Wilbur G. Voliva.....Zion, Ill.	356
WCBE	Uhalt Radio Co.....New Orleans, La.	263
WCBG	Howard S. Williams.....Pascagoula, Miss.	268
WCBH	University of Mississippi.....Oxford, Miss.	242
WCBI	Nicoll, Duncan & Rush.....Bemis, Tenn.	240
WCBJ	J. C. Mans.....Jennings, La.	244
WCBL	Northern Radio Mfg. Co.....Houlton, Me.	280
WCBM	Charles Schwarz, Charles and North Aves., Baltimore, Md.	229
WCBO	Radio Shop (Inc.).....Memphis, Tenn.	250
WCBQ	First Baptist Church.....Nashville, Tenn.	236
WCBR	Charles H. Messter.....Providence, R. I.	246
WCBT	Clark University.....Worcester, Mass.	238
WCBU	Arnold Wireless Supply Co.....Arnold, Pa.	220
WCBV	Tullahoma Radio Club.....Tullahoma, Tenn.	252
WCBW	George P. Rankin, Jr., and Maitland Solomon, Macon, Ga.	225
WCBY	Forks Electrical Shop.....Buck Hill Falls, Pa.	230
WCBZ	Coppotelli Brothers Music House, Chicago Heights, Ill.	248
WCCO	Washburn Crosby Co., 200 Chamber of Commerce, Minneapolis, Minn.	417
WCK	Stix Baer & Fuller Dry Goods Co., St. Louis, Mo.	360
WCX	The Detroit Free Press.....Detroit, Mich.	517
WDAE	Tampa Daily Times.....Tampa, Fla.	360
WDAF	Kansas City Star.....Kansas City, Mo.	411
WDAG	J. Laurence Martin.....Amarillo, Tex.	263
WDAH	Trinity Methodist Church (South), El Paso, Tex.	268
WDAS	Sam Waltz's Radio Shop.....Worcester, Mass.	360
WDAY	Radio Equipment Corp.....Fargo, N. D.	244
WDBC	Kirk Johnson & Co.....er, Pa.	250
WDBD	Herman E. Burns.....Martinsburg, W. Va.	251
WDBF	Robert G. Phillips.....Youngstown, Ohio	222
WDBI	Radio Specialty Co.....St. Petersburg, Fla.	246
WDBJ	Richardson-Wayland Electrical Co., Roanoke, Va.	229
WDBO	Rollins College.....Winter Park, Fla.	240
WDBP	Superior State Normal School.....Superior, Wis.	231
WDBQ	Morton Radio Supply Co.....Salem, N. J.	234
WDBR	Tremont Temple Baptist Church...Boston, Mass.	256
WDBS	S. M. K. Radio Corp.....Dayton, Ohio	275
WDBT	Taylor's Book Store.....Hattiesburg, Miss.	236
WDBV	Strand Theatre.....Fort Wayne, Ind.	258
WDBW	The Radio Den.....Columbia, Tenn.	268
WDBX	Otto Baur, 138 Dyckman St., N.w York, N. Y.	233
WDBY	North Shore Congregational Church, Chicago, Ill.	258
WDBZ	Boy Scouts of America, Ulster County Council, Kingston, N. Y.	233
WDM	The Church of the Covenant, Washington, D. C.	234
WDWF	Dutee Wilcox.....Flint Cranston, R. I.	500
WDZ	J. L. Bush.....Tuscola, Ill.	275
WEAA	Frank D. Fallain, Police Building, Flint, Mich.	234
WEAF	American Telephone & Telegraph Co., New York, N. Y.	492
WEAH	Wichita Board of Trade.....Wichita, Kan.	268
WEAI	Cornell University.....Ithaca, N. Y.	254
WEAJ	University of South Dakota...Vermillion, S. D.	278
WEAM	Borough of North Plainfield, North Plainfield, N. J.	261
WEAN	Shepard Co.....Providence, R. I.	273
WEAO	The Ohio State University.....Columbus, Ohio	360
WEAP	Mobile Radio Co.....Mobile, Ala.	360
WEAU	Davidson Bros. Company.....Sioux City, Iowa	275
WEAY	Iris Theatre.....Houston, Texas	330
WEBA	The Electric Shop.....Highland Park, N. J.	233
WEBC	Walter C. Bridges.....Superior, Wis.	242
WEBD	Electrical Equipment Service Co., Anderson, Ind.	246
WEBE	Roy W. Waller.....Cambridge, Ohio	234
WEBH	Edgewater Beach Hotel Co.....Chicago, Ill.	370
WEBJ	Third Ave. Ry. Co.....New York City	273
WEBK	Grand Rapids Radio Co...Grand Rapids, Mich.	242
WEBL	R. C. A. United States (portable)	226
WEBP	Spanish Fort Amusement Park, New Orleans, La.	280
WEBQ	Tate Radio Co.....Harrisburg, Ill.	226
WEBR	H. H. Howell.....Buffalo, N. Y.	244
WEBT	Dayton Cooperative Industrial High School, Dayton, Ohio	270
WEBW	Beloit College.....Beloit, Wis.	283
WEBX	Nashville, Tenn. R. R. No. 9, Franklin Pike, Johen E. Caln, Jr.	263
WEBY	Hobart Radio Co.....Rolindale, Mass.	226
WEBZ	Savannah Radio Corp.....Savannah, Ga.	234
WEEI	Edison Co.....Boston, Mass.	303
WEMC	Emmanuel Missionary College, Berrien Springs	235
WEW	St. Louis University.....St. Louis, Mo.	280
WFAA	The Dallas News, The Dallas Journal, Dallas, Texas	476
WFAM	Times Publishing Co.....St. Cloud, Minn.	273
WFAN	United Battery Service Co.....Montgomery, Ala.	226
WFAV	University of Nebraska.....Lincoln, Neb.	273
WFBB	Eureka College.....Eureka, Ill.	240
WFBC	First Baptist Church.....Knoxville, Tenn.	250
WFBE	John Van De Walle, P. O. Box 41, Seymour, Ind.	
WFBG	William F. Gable Co.....Altoona, Pa.	277
WFBH	Concourse Radio Corp.....N. Y. C.	273
WFBI	Calvin Radio Supply Co.....Camden, N. J.	236
WFBK	Dartmouth College.....Hanover, N. H.	256
WFBL	Onondaga Hotel.....Syracuse, N. Y.	252
WFBM	Merchants Heat & Light Co., 519 Guaranty Building, Indianapolis, Ind.	268
WFBN	Radio Sales & Service Co., 1 Broad St., Bridgewater, Mass.	226
WFBQ	Wynne Radio Co., 226 Fayetteville St., Raleigh, N. C.	252
WFBR	Fifth Infantry, Maryland N. G., Fifth Regiment Armory, Baltimore, Md.	254
WFBT	Gloucester County Civic League, Pitman, N. J.	231
WFBY	Signal Officer, Fifth Corp Area, Ft. Hayes, Columbus, Ohio	...
WFBZ	Knox College.....Galesburg, Ill.	...
WFI	Strawbridge & Clothier.....Philadelphia, Pa.	395
WGAL	Lancaster Elec. Supply & Const. Co., Lancaster, Pa.	248
WGAQ	Yource Hotel.....Shereveport, La.	252
WGAZ	The South Bend Tribune.....South Bend, Ind.	275
WGBA	Jones Elec. & Radio Mfg. Co., Baltimore, Md.	254
WGBF	Fiske Furniture Co., 307 Upper 5th St., Evansville, Ind.	217
WGBI	Frank S. Megarge.....Scranton, Pa.	240
WGBK	Lawrence Campbell.....Johnstown, Pa.	248
WGBS	Gimbel Brothers.....New York City	316
WGI	American Radio & Research Corp., Medford Hillside, Mass.	360
WGN	Drake Hotel.....Chicago, Ill.	370
WGR	Federal Telephone Mfg. Co.....Buffalo, N. Y.	319
WGY	General Electric Co.....Schenectady, N. Y.	380
WHA	University of Wisconsin.....Madison, Wis.	283
WHAD	Marquette University.....Milwaukee, Wis.	275
WHAG	University of Cincinnati.....Cincinnati, Ohio	232
WHAM	Eastman School of Music, Rochester, N. Y.	277
WHAR	Seaside Hotel.....Atlantic City, N. J.	275
WHAS	Courier Journal and Louisville Times, Louisville, Ky.	400
WHAV	Wilmington Electrical Specialty Co., Inc., Wilmington, Del.	360
WHAZ	Rensselaer Polytechnic Institute.....Troy, N. Y.	380
WHB	Sweeney School Co.....Kansas City, Mo.	411
WHK	Radiovox Co.....Cleveland, Ohio	283
WHN	George Schubel, Loew's State Theatre Bldg., New York City	360
WHO	Banker's Life Co.....Des Moines, Iowa	526
WIAD	Howard R. Miller, 6318 N. Park Ave., Philadelphia, Pa.	254
WIAK	Journal-Stockman Co.....Omaha, Neb.	278
WIAS	Home Electric Co.....Burlington, Iowa	283
WIK	K. & L. Electric Co.....McKeesport, Pa.	238
WIP	Gimbel Brothers.....Philadelphia, Pa.	509
WJAB	American Electric Co.....Lincoln, Neb.	229
WJAD	Jackson's Radio Engineering Laboratories, Waco, Texas	353
WJAG	The Norfolk Daily News.....Norfolk, Neb.	270
WJAK	Clifford L. White.....Greentown, Ind.	254
WJAM	D. M. Perham, 332 Third Ave., W. Cedar Rapids, Iowa	268
WJAN	Peoria Star.....Peoria, Ill.	273
WJAR	The Outlet Co.....Providence, R. I.	360
WJAS	Pittsburgh Radio Supply Co.....Pittsburgh, Pa.	275
WJD	Richard Howe.....Granville, Ohio	217
WJJD	Mocs Theart.....Mooseheart, Ill.	278
WJY	R. C. A.....New York City	405
WJZ	R. C. A.....New York City	455
WKAA	H. F. Paar, 1444 Second Ave. E., Cedar Rapids, Iowa	278
WKAD	Charles Looff (Crescent Park), East Providence, R. I.	240
WKAP	Dutee W. Flint.....Cranston, R. I.	360
WKAR	Michigan Agriculture College, East Lansing, Mich.	280
WKAV	Laconia Radio Club.....Laconia, N. H.	254
WKY	W. K. Y. Radio Shop...Oklahoma City, Okla.	360
WLAP	W. V. Jordan, 306 W. Breckenridge St., Louisville, Ky.	286
WLAX	Greencastle Community Broadcasting Station, Greencastle, Ind.	231
WLB	University of Minnesota at Minneapolis, Minn.	
WLBL	Wisconsin Department of Markets, Stephens Point, Wis.	278
WLS	Sears, Roebuck & Co.....Chicago, Ill.	345
WLW	Crosley Radio Corp.....Cincinnati, Ohio	423
WMAC	Clive B. Meredith.....Cazenovia, N. Y.	265
WMAF	Round Hills Radio Corp.....Dartmouth, Mass.	360
WMAH	General Supply Co.....Lincoln, Neb.	254
WMAK	Northern Laboratories.....Lockport, N. Y.	265
WMAN	Heskett Radio Station.....Columbus, Ohio	277
WMAQ	Chicago Daily News.....Chicago, Ill.	448
WMAY	Kingshighway Presbyterian Church, St. Louis, Mo.	280
WMAZ	Mercer University.....Macon, Ga.	261
WMBF	.....Miami Beach, Fla.	...
WMC	Commercial Appeal.....Memphis, Tenn.	500
WMH	Ainsworth-Gates Radio Co.....Cincinnati, Ohio	309
WMU	Doubleday-Hill Electric Co...Washington, D. C.	261
WNAC	Shepard Stores.....Boston, Mass.	278
WNAD	University of Oklahoma.....Norman, Okla.	254
WNAL	Omaha Central High School.....Omaha, Neb.	258
WNAP	Wittenberg College.....Springfield, Ohio	248
WNAR	First Christian Church.....Butler, Mo.	231
WNAT	Lemig Bros. Co.....Philadelphia, Pa.	250
WNAX	Dakota Radio Apparatus Co.....Yankton, S. D.	244
WNJ	Radio Shop of Newark.....Newark, N. J.	233
WNYC	City of New York.....New York, N. Y.	525
WOAC	Page Organ Co.....Lima, Ohio	261
WOAF	Tyler Commercial College.....Tyler, Texas	360
WOAI	Southern Equipment Co.....San Antonio, Texas	394
WOAN	Vaughn Conservatory of Music, Lawrenceburg, Tenn.	360
WOAV	2nd Battalion, 112th Inf., P. N. G., Erie, Pa.	215
WOAW	Woodmen of the World.....Omaha, Neb.	526
WOAX	Franklyn J. Wolff, 600 Ingham Ave., Trenton, N. J.	240
WOC	The Palmer School of Chiropractic, Davenport, Iowa	498
WOCL	Hotel Jamestown.....Jamestown, N. Y.	275
WOI	Iowa State College.....Ames, Iowa	360
WOO	John Wanamaker.....Philadelphia, Pa.	509
WOQ	Western Radio Co.....Kansas City, Mo.	360
WOR	L. Bamburger & Co.....Newark, N. J.	405
WORD	Peoples Pulpit Association.....Batavia, Ill.	278
WOS	Missouri State Marketing Bureau, Jefferson City, Mo.	441
WPAJ	Doolittle Radio Corp.....New Haven, Conn.	268
WPAK	North Dakota Agricultural College, Agricultural College, N. D.	275
WPAU	Concordia College.....Moorhead, Minn.	286
WPAZ	Dr. John R. Koch.....Charleston, W. Va.	267
WPG	Municipal Radio Station....Atlantic City, N. J.	296
WPSC	Penna State College.....State College, Pa.	291
WQAA	Horace A. Beale, Jr.....Parkersburg, Va.	360
WQAC	Gish Radio Service.....Amarillo, Texas	234
WQAE	Moore Radio News Station.....Springfield, Vt.	275
WQAM	Electrical Equipment Co.....Miami, Fla.	283
WQAN	Scranton Times.....Scranton, Pa.	250
WQAO	Calvary Baptist Church.....New York, N. Y.	360
WQAS	Prince-Walter Co.....Lowell, Mass.	252
WQJ	Calumet Rainbo Broadcasting Co..Chicago, Ill.	448
WRAF	The Radio Club.....Laporte, Ind.	224
WRAL	Northern States Power Co., St. Croix Falls, Wis.	248
WRAM	Lombard College.....Galesburg, Ill.	244
WRAN	Black Hawk Electrical Co.....Waterloo, Iowa	236
WRAO	St. Louis Radio Service Co.....St. Louis, Mo.	360
WRAV	Antioch College.....Yellow Springs, Ohio	263
WRAW	Avenue Radio Shop.....Reading, Pa.	238
WRAX	Flexons Garage.....Gloucester City, N. J.	268
WRBC	Immanuel Lutheran Church....Valparaiso, Ind.	278
WREO	Reo Motor Car Co.....Lansing, Mich.	288
WRC	Radio Corp. of America.....Washington, D. C.	469
WRK	Doron Bros. Elec. Co.....Hamilton, Ohio	270
WRL	Union College.....Schenectady, N. Y.	360
WRM	University of Illinois.....Urbana, Ill.	273
WRR	City of Dallas Police and Fire Signal Dept., Dallas, Texas	261
WRW	Tarrytown Radio Research Laboratory, Tarrytown, N. Y.	273
WSAB	South East Missouri State Teachers College, Cape Girardeau, Mo.	360
WSAC	Clemson Agricultural College, Clemson College, S. C.	360
WSAD	J. A. Foster Co.....Providence, R. I.	261
WSAI	United Playing Card Co.....Cincinnati, Ohio	326
WSAJ	Grove City College.....Grove City, Pa.	229
WSAP	Seventh Day Adventist Church, N. Y. C., N. Y.	263
WSAR	Doughty & Welch Elec. Co....Fall River, Mass.	254
WSAU	Camp Marienfeld.....Chesham, N. H.	229
WSAV	Clifford W. Vick Radio Construction Co., Houston, Texas	360
WSAZ	Chase Electric Shop.....Pomeroy, Ohio	244
WSB	Atlanta Journal.....Atlanta, Ga.	429
WSL	Hatfield Elec. Co.....Utica, N. Y.	242
WSOE	School of Engineering of Milwaukee, Milwaukee, Wis.	246
WSRF	Harden Sales and Service.....Broadland, Ill.	233
WSUI	State University of Iowa, Capitol and Washington Sts., Iowa City, Ia.	...
WSY	Alabama Power Co.....Birmingham, Ala.	360
WTAB	Fall River Daily Herald Pub. Co., Fall River, Mass.	266
WTAC	Penn. Traffic Co.....Johnstown, Pa.	209
WTAF	Louis J. Gallo, 2222 Lapeyrouse St., New Orleans, La.	268
WTAL	Toledo Radio & Elec. Co.....Toledo, Ohio	252
WTAP	Cambridge Radio & Elec. Co...Cambridge, Ill.	242
WTAQ	S. H. Van Gorden & Son.....Osseo, Wis.	254
WTAR	Reliance Elec. Co.....Norfolk, Va.	280
WTAS	Charles E. Erbstein, R. F. D. 6, Box 75, Elgin, Ill.	286
WTAT	Edison Electric Illuminating Co., Boston, Mass.	244
WTAU	Ruegg Battery and Electric Co., Tecumseh, Neb.	242
WTAW	Agricultural & Mechanical College, College Station, Texas	280
WTAX	Williams Hardware Co.....Streator, Ill.	231
WTAY	Oak Leaves Broadcasting Station, Oak Park, Ill.	250
WTAZ	Thomas J. McGuire.....Lambertville, N. J.	261
WTG	Kansas State Agricultural College, Manhattan, Kan.	273
WTIC	The Travelers Insurance Co....Hartford, Conn.	348
WWAD	Wright & Wright, Inc.....Philadelphia, Pa.	360
WWAE	Lawrence J. Crowley (Alamo Ball Room), Joliet, Ill.	242
WWAO	Michigan College of Mines.....Houghton, Mich.	244
WWI	Ford Motor Co.....Dearborn, Mich.	265
WWJ	Detroit News.....Detroit, Mich.	517
WWL	Loyola University.....New Orleans, La.	280

ALASKA

KFIU	Alaska Electric Light & Power Co.....Juneau	226
KFQD	Chovin Supply Co.....Anchorage	280
KNT	Walter Heinrich.....Kukak Bay	263

CANADA

CFAC	The Calgary Herald.....Calgary, Alta.	430
CFCA	Star Publishing & Printing Co., 18 King St. W., Toronto, Ont.	400
CFCF	Marconi Wireless Telegraph Co. of Canada, Ltd., Canada Cement Bldg., Phillips Square, Montreal, P. Q.	440
CFCH	Abitibi Power & Paper Co., Ltd., Iroquois Falls, Ont.	400
CFCK	Radio Supply Co., Ltd., 10229 101st St., Edmonton, Alta.	410
CFCL	Centennial Methodist Church, Victoria, B. C.	400
CFCN	W. W. Grant Radio, Ltd., 708 Crescent Rd. N.W., Calgary, Alta.	440
CFCQ	Radio Specialties, Ltd., 791 Dunsmuir Ave., Vancouver, B. C.	450
CFCR	Laurentide Air Service, Ltd., Nickle Range Hotel, Sudbury, Ont.	410
CFCT	The Victoria City Temple, 1110 Douglas St., Victoria, B. C.	410
CFCU	Jack V. Elliot, Ltd., 123 King St. W., Hamilton, Ont.	410
CFCW	London Radio Company.....London, Ont.	430
CFDC	Sparks Company, Wallace & Fitzwilliam Sts., Nanaimo, B. C.	430
CFHC	Henry Birks & Sons, Ltd., 708 Crescent Road N. W., Calgary, Alta.	440
CFKC	D. J. Fendell, Patricia Theatre Bldg., Thorold, Ont.	295
CFLC	Chas. Guy Hunter, 551 Adelaide St., London, Ont.	430
CFQC	The Electric Shop, Ltd., 144 Second Ave. N., Saskatoon, Sask.	400
CFRC	Queen's University (Dept. of Electrical Engineering), Fleming Hall, Queen's University, Kingston, Ont.	450
CFXC	Westminster Trust Co., Columbia & Begbie Sts., New Westminster, B. C.	440
CFYC	Victor Wentworth Odlum, Mercantile Bldg., 318 Homer St., Vancouver, B. C.	400
CHBC	The Albertan Publishing Co., Ltd., 708 Crescent Road N. W., Calgary, Alta.	410
CHCE	Western Canada Radio Supply, Ltd., 919 Fort St., Victoria, B. C.	400
CHCM	Riley & McCormick, Ltd., 708 Crescent Road N. W., Calgary, Alta.	440
CHCS	The Hamilton Spectator, Spectator Bldg., Hamilton, Ont.	410
JCHIC	Northern Elec. Co.....Toronto, Ont.	350
CHNC	Toronto Radio Research Society, 46 Lauder Ave., Toronto, Ont.	350
CHUC	International Bible Students Association, Cor. Main and 2nd Sts., Saskatoon, Sask.	400
CHXC	J. R. Booth, Jr., 28 Range Rd., Ottawa, Ont.	435
CHYC	Northern Electric Co., Ltd., 121 Shearer St., Montreal, P. Q.	341
CJBC	Jarris Street Baptist Church.....Toronto, Ont.	312
CJCA	The Edmonton Journal, Ltd., Journal Bldg., Edmonton, Alta.	450
CJCD	The T. Eaton Co., Ltd., Queen St. W., Toronto, Ont.	410
CJCE	Sprott Shaw Radio Co., Room 1604, Tower Bldg., Vancouver, B. C.	400
CJCF	The News Record, 39 South Cameron St., Kitchener, Ont.	295
CJCK	Radio Corporation of Calgary, Ltd., 223 Second Ave. N. E., Calgary, Alta.	316
CJCL	A. Contiore.....Montreal, P. Q.	270
CJCM	J. L. Philippe Laundry.....Mont Joli, P. Q.	312
CJCN	Simons, Agnew & Co.....Toronto, Ont.	410
CJGC	London Free Press Ptg. Co., 440 Richmond St., London, Ont.	430
CJSC	The Evening Telegram, 81 Bay St., Toronto, Ont.	430
CKAC	La Presse Publishing Co., Ltd., Cor. St. James St. & St. Lawrence Blvd., Montreal, P. Q.	430
CKCD	Vancouver Daily Province, 142 Hastings St. W., Vancouver, B. C.	410
CKCE	Canadian Independent Telephone Co., Ltd., Wallace Ave. & Ward St., Toronto, Ont.	450
CKCI	Le "Soleil," Limited, C. W. Lindsay Bldg., cor. St. John & St. Eustache Sts., Quebec, P. Q.	295
CKCK	Leader Publishing Co., Ltd.....Regina, Sask.	420
CKCO	Dr. G. M. Geldert, 282 Somerset St. W., Ottawa, Ont.	400
CKCX	P. Burns & Co., Ltd., 708 Crescent Rd. N. W., Calgary, Alta.	440
CKFC	First Congregational Church...Vancouver, B. C.	385
CKLC	Wilkinson Electric Co., Ltd..2119 Seventh Ave.	400
CKOC	Wentworth Radio Supply Co., Ltd., Hamilton, Ont.	410
CKY	Manitoba Telephone System, Sherbrooke St., Winnipeg, Man.	450
CNRC	Canadian Nat'l Railways.....Calgary, Alta.	440
CNRE	Canadian Nat'l Railways.....Edmonton, Alta.	450
CNRM	Canadian Nat'l Railways.....Montreal, P. Q.	341
CNRO	Canadian Nat'l Railways.....Ottawa, Ont.	435
CNRR	Canadian Nat'l Railways.....Regina, Sask.	420
CNRS	Canadian Nat'l Railways.....Saskatoon, Sask.	400
CNRT	Canadian Nat'l Railways.....Toronto, Ont.	400
CNRW	Canadian Nat'l Railways.....Winnipeg, Man.	450
CNRA	Canadian Nat'l Railways.....Moncton, N. B.	313

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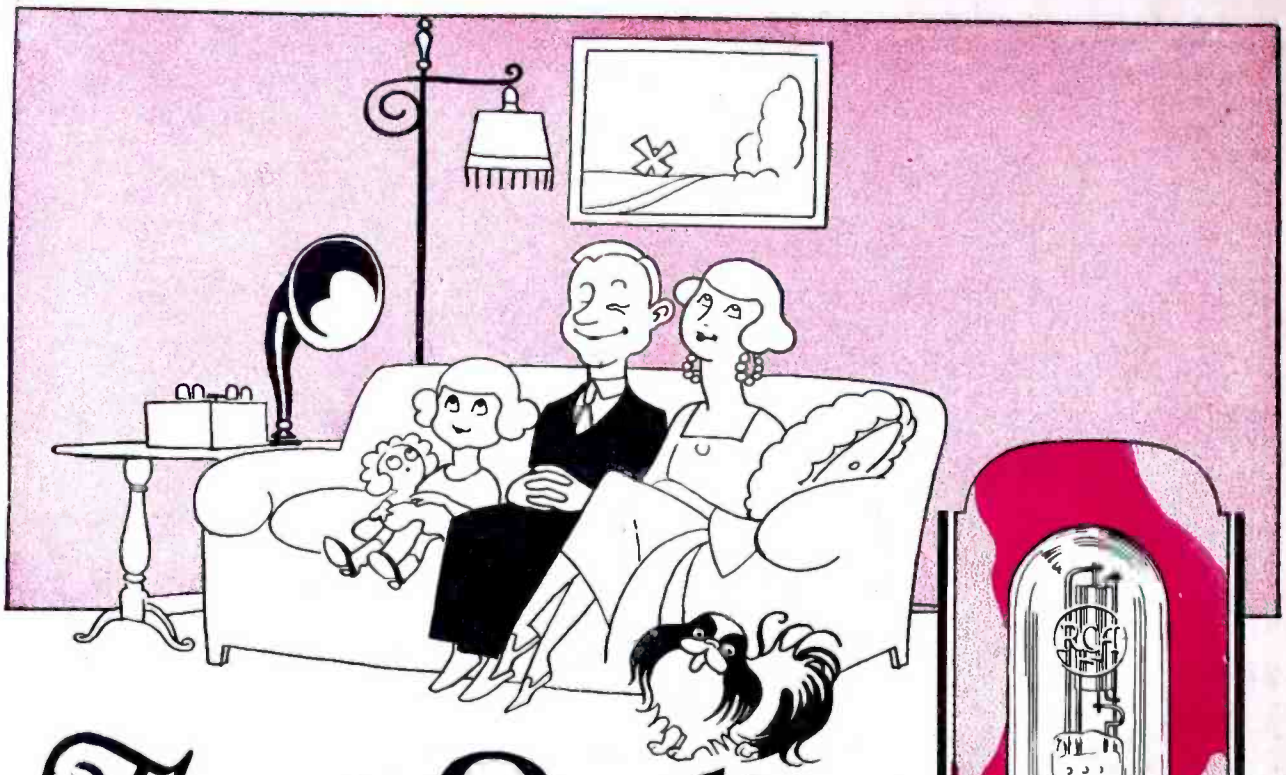

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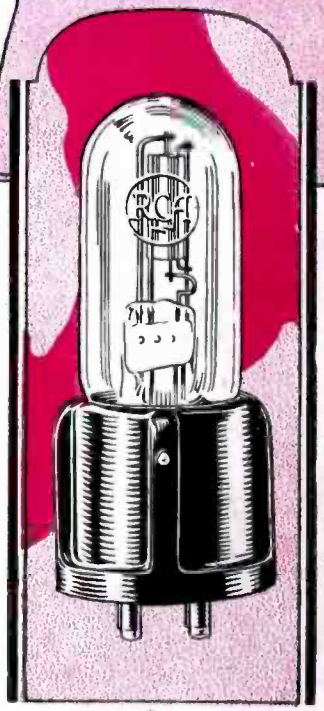

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