

RADIO AGE

The Magazine of the Hour

Price
25 cents

NOVEMBER, 1923

IN THIS NUMBER

How to Make the Super-Heterodyne Set

By Frank D. Pearne
With Diagrams and Photographs

The Erla and Another Simple Tube Set

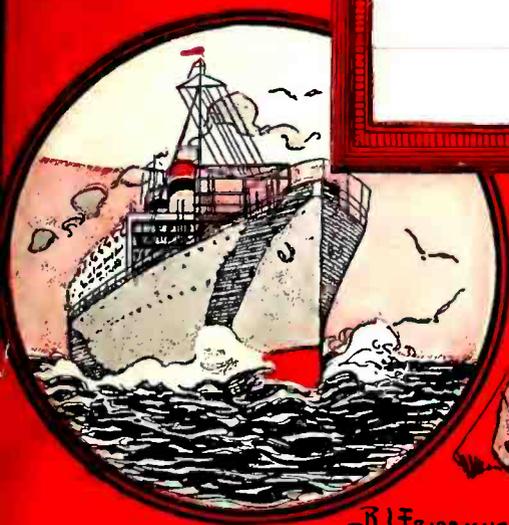
How to Learn the Code

(First Article)

What the Broadcasters Are Doing

Complete Corrected List of Broadcasting Stations

More Good Circuits



-R.L. Fawcett

LET OUR HOOK-UPS BE YOUR GUIDE

Your Radio Problems Solved for 30 Cents in Stamps

IF YOU are constructing a receiving set, a battery charger, a loading coil, a condenser, or a transformer and you need help in the way of clear diagrams and full detailed descriptions of that very thing you may have it by return mail.

We have laid aside a limited number of back numbers of Radio Age for you. Below we are listing the hook-ups and circuit diagrams to be found in these magazines. Select the ones you want, enclose 30 cents in stamps for each one desired.

We advise immediate attention to this as the stock of back numbers is diminishing rapidly.

May, 1922

- How to make a simple Crystal Set for \$6.

June, 1922

- How to make a Receiving Transformer.
- Aerials under ground and under water.
- Electric light wires as auxiliary to radio.

July, 1922

- How radio sends photograph across Atlantic.
- Application of Vacuum Tube to radio.
- Marconi's radio searchlight.

September, 1922

- Bank uses radio to serve public.
- How to construct the Reinartz Receiver.
- Federal Act regulating radio.

October, 1922

- How to make a Tube Unit for \$23 to \$37.
- How to make an Audio Frequency Amplifying Transformer.
- Radio Frequency explained.

November, 1922

- Photo-electric Detector Tubes.
- Design of a portable short-wave radio wavemeter.
- Explanation of Radio Frequency Amplification.

December, 1922

- Home-made battery charger for \$3.00.
- Principles of radio receiving equipment.

January, 1923

- How to make a sharp-tuning Crystal Detector.
- Fixed condensers in home-made receiving sets.
- Description of loading coil for simple sets.

March, 1923

- Layout and drilling for Reinartz Tuner, with amplification.
- How to make the Crystal Set do long distance work.
- Wired wireless.
- How to make an Audio Frequency amplifier.
- Symbols used in radio diagrams.

April, 1923

- The Kopprasch circuit.
- How to make a one-tube loop aerial set.
- A two-circuit Crystal Set.

May, 1923

- How to make the Erla single-tube reflex receiver.
- How to make a portable Reinartz set for summer use.
- New wave lengths.

June, 1923

- How to build the new Kaufman receiver.
- What about your antenna?
- Use of Rubber for radio parts.

July, 1923

- The Grimes inverse duplex system.
- How to read and follow symbols.
- Proper antenna for tuning.

August, 1923

- Construction of the Cockaday four-circuit tuner.
- An efficient two-stage amplifier.
- A simple buzzer transmitting set.

September, 1923

- How to load your set to receive new wave lengths.
- Simple Radio Frequency Receiver.
- Radio with the MacMillan expedition.

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RADIO AGE

The Magazine of the Hour

(Established March, 1922)

Volume 2

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Number 10

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What's Yours?

WE HAVE a friend who lives in the Copley-Plaza Hotel in Boston. He told us recently that he had installed a super-heterodyne receiver in his apartment in the hotel and that he was getting astonishing results. He said that in spite of the fact that there was a broadcasting station in the hotel, he was able to tune it out and get the Zenith-Edgewater Beach, WJAZ, the Westinghouse KYW and other Chicago stations. And he got them loud and clear on the loud speaker. He succeeded in bringing in Los Angeles with the earphones.

"Tell your readers about the super-heterodyne," he advised.

So in this issue we have presented a rather elaborately illustrated feature on the set with ten tubes. It looks like a complicated, difficult circuit to manage but we believe the average fan will not find it so. Except for additional tubes it is not particularly more expensive to make than other sets.

We feel sure no better diagrams and photographs of the super-heterodyne have been published and we are eager to learn from readers what success they have with it. Mr. Pearne put his great ability into this article with so much enthusiasm that we feel sure there will be calls for extra copies of this issue from all over the country.

It was also brought to our attention during the last month that many receiving set owners, who are nettled at the occasional interjection of code signals into their programs of music or other entertainment, might learn the code and thus extend greatly the fun of listening in.

We are presenting in this number the first of two articles on how to learn the code. Once learned it will enable you to read private, press and government messages flitting through the night.

Who has an idea for the December number? We are adding more pages from time to time. We want to fill all of the new space with what YOU want.

One more matter. The broadcasting list changes so rapidly that it is difficult to make it perfect, even with our special Washington service. If you see errors in the list you will confer a great favor by pointing them out. For each such correction we will forward a copy of the next issue free, or, if the correction comes from a subscriber, we will add one month to his subscription period, free.

—The Editor.

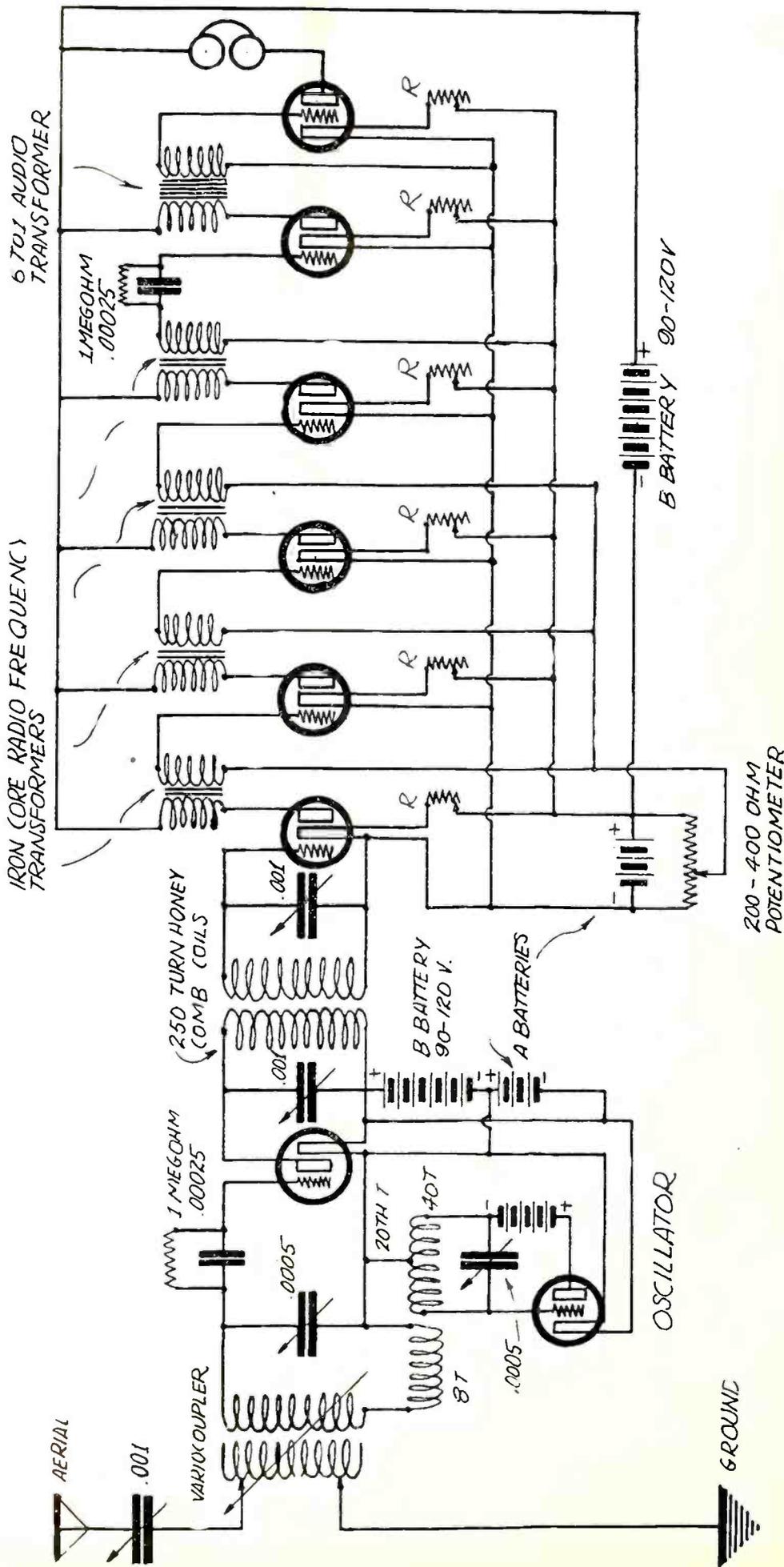


Figure 1.—Circuit diagram of the Super-Heterodyne receiver. The accompanying article by Mr. Pearne shows how this circuit is extended to a ten-tube receiver. This outfit is regarded as the most sensitive, most selective and the longest distance-maker. It is not as complicated nor as expensive as might appear at first glance.

RADIO AGE

"The Magazine of the Hour"

M. B. SMITH
PUBLISHER

PUBLISHED MONTHLY

FREDERICK SMITH
EDITOR

The Super-Heterodyne Receiver

By FRANK D. PEARNE

THE radio enthusiast of today is more interested in long distance reception than in receiving local broadcast stations. Regardless of the fact that a wonderful program may be going on at some local station, the fan gets a greater thrill out of hearing a poorly rendered musical selection from some station, a thousand miles away, and the popular idea at present is to get distance, no matter how good the local programs may be.

The most sensitive receiver known and one which will reach out farther than any other is the super-heterodyne, but because of the great number of tubes employed

ful as to whether or not such a receiver is much more expensive than some of the others which can not compare with it.

Its Advantages.

Before describing the construction of the super-heterodyne, an explanation of some of the principal advantages gained over other circuits will be given. Every radio fan knows the advantage of radio frequency amplification when properly applied, but unfortunately many have tried to use it, with little or no success while on the other hand there are many who have had wonderful results with it.

In the first place every radio frequency transformer has a natural or fundamental wave length of its own and when used at this particular wave length, the efficiency of the transfer of energy from one coil to another is very high, but when waves of other frequencies are impressed upon it, the efficiency drops off rapidly, as the frequency varies farther from the natural wave length of the transformer.

Of course, there are several ways of changing this natural wave length, such as connecting a variable condenser across the terminals etc., but even then the highest efficiency is only obtained when the frequency of the incoming wave is equal to the natural frequency of the transformer. Unfortunately broadcast waves vary considerably in their wave lengths, and one station might be brought in good and strong while another of a different frequency would not come in so well.

Now by the heterodyne method, which will be explained later, the frequency of the incoming wave can be changed at will, which makes it possible to send any ordinary wave, no matter what its original length may be, through the radio frequency

transformers at their highest efficiency. In other words, the waves of different lengths are all brought down to one common frequency, which is the natural frequency of the transformer. Thus all wave lengths are amplified at maximum efficiency, and without the use of any adjusting controls in the radio frequency amplifying circuit. The frequency change is accomplished without any appreciable distortion, which one might expect and all the characteristics of the original signal are preserved.

Operation.

The operation of the heterodyne is based upon the inter-action of two alternating currents of different frequencies. For example, if an oscillating current of 60,000 cycles per second is coming in on the aerial circuit and another oscillating current of 59,000 cycles per second is super-imposed on this circuit, a "beat frequency" is produced, which is equal to the difference of the two which in this case would be 1,000 cycles per second. The oscillating current which is superimposed upon the incoming current is produced by an oscillator placed inside of the receiver, which by means of a vari-

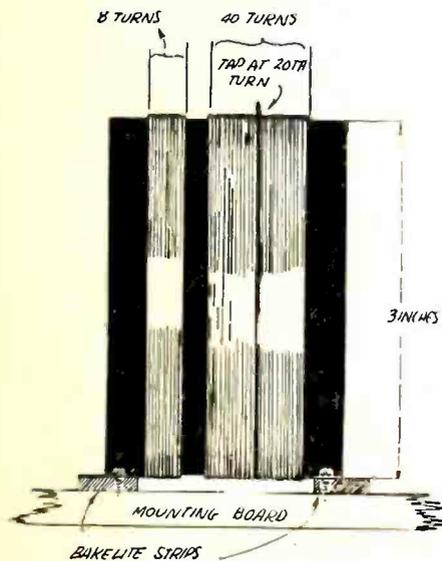


Figure 2.—Oscillator Coils.

in this circuit and the other apparatus used in conjunction with them, most amateurs balk at the expense entailed in making such a set. There are some, however, who consider the expense of a good outfit as a secondary matter and want the best, no matter what the cost may be, and after all, it is doubt-

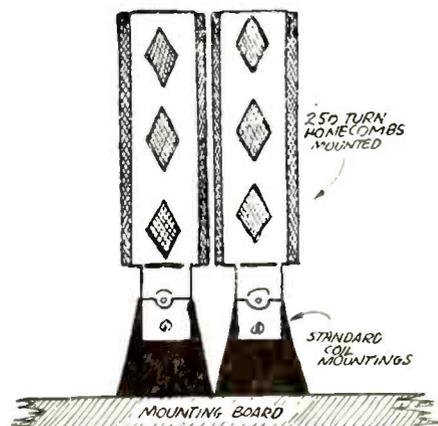


Figure 3.—Transfer Coils.

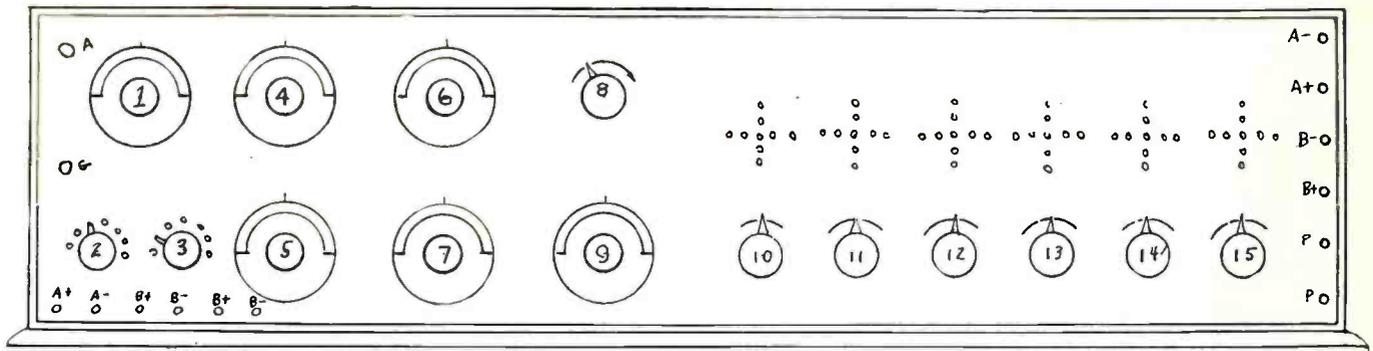


Figure 4.—Front Panel View of the Heterodyne Receiver.

able condenser may be made to oscillate at whatever frequency is desired, to produce a beat oscillation of the proper frequency to suit the radio frequency amplification component of the set.

It will be noticed that the circuit shown in Figure 1 contains two detectors and in order that the reader will not become confused, it must be stated that the first one acts merely as a frequency transformer, as its circuit contains an inductance and capacity which is tuned to the beat oscillations. This tends to suppress the high frequency leaving only the beat frequency, which is still too high to be heard in the phones, but is the correct fre-

The primary inductance in Figure 1 is shown as a variocoupler. This is to be used, when it is desired to use an outside aerial, but in case a loop is preferred, the coupler is not used and the loop is inserted in place of the secondary of the coupler shown in the drawing.

The oscillator, shown in Figure 2, is made on a bakelite tube three inches in diameter. One coil of No. 20 D. C. C. wire having forty turns is wound on this and a tap is brought out at the 20th turn. At a distance of about two inches from the coil, wind another one having eight turns. This distance is required to prevent the induced current in the eight turns becoming

makes, but should not have a ratio of more than 6 to 1, for the first step as shown. If a second stage of audio is added, the second transformer should have a lower ratio. 3 and $\frac{1}{2}$, or 4 to 1 will do very nicely.

The potentiometer, shown in Figure 1, is used to get the proper biasing current on the grids of the radio frequency amplifying tubes. The variable condensers shunted across the terminals of the honeycomb coils should have 43 plates, giving a capacity of .001 M. F. The variable condenser used in the oscillator circuit and that which is connected across the terminals of the rotor of the coupler and the 8-turn

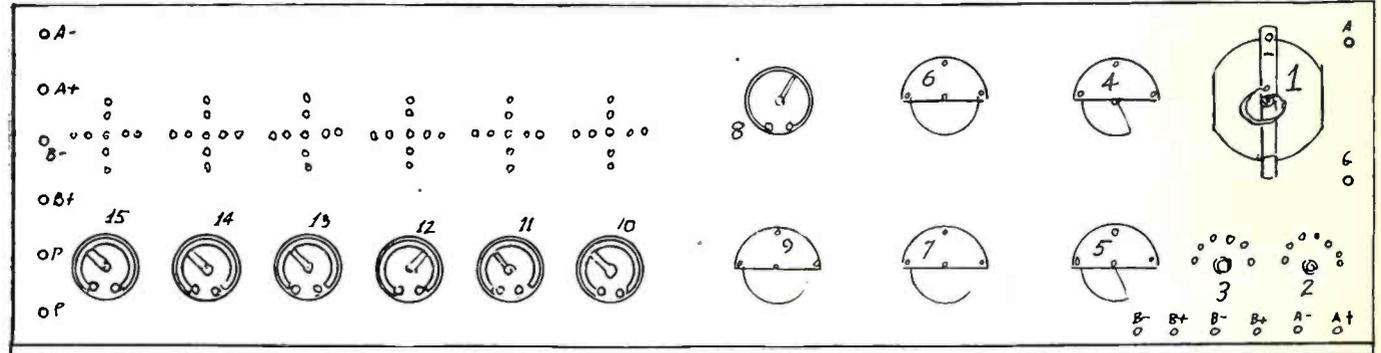


Figure 5.—Back Panel View of the Heterodyne Receiver.

quency to be passed on to the radio frequency amplifiers and from there to the second detector, where it is brought down to audio frequency and passed on through the audio frequency amplifiers.

Number of Tubes.

These sets usually contain ten tubes, one of which is used as an oscillator, two as detectors, five as radio frequency amplifiers and two as audio frequency amplifiers. In the set shown in Figure 1, only four are used as radio frequency amplifiers and one as an audio frequency amplifier. The balance of the tubes are used as mentioned before. If one desires to make the ten tube set, it is only necessary to insert another step of radio frequency, which will be connected like those shown, and another step of audio frequency.

too strong for the current in the aerial circuit, which would overpower the incoming wave if it were too close.

The energy of the "beat frequency" is transferred from the plate circuit of the first detector tube, to the radio frequency amplifiers, by two honey-comb coils of 250 turns each. These are shown in Figure 3. Because the oscillator may be so adjusted that a beat frequency of any number of cycles may be produced, the selection of the proper radio frequency transformers, as regards to wave length, becomes a very simple matter, but it has been found best to use those of a type having iron cores and wound for a wave length of 5,000 meters.

The audio frequency transformers may be of any of the standard

coil of the oscillator should have 23 plates with a capacity of .0005 M. F. Three separate sets of "B" batteries should be used in this set to avoid any leakage from one part of the circuit to another.

Panel Arrangement.

Figure 4 shows the layout of the panel and the cabinet on the outside. No. 1 is the dial for the variocoupler; No. 4 is the aerial condenser. No. 6 is the oscillator condenser and No. 8 is the potentiometer. The other three condensers, 5, 7, and 9 are mounted below these, and the two switches controlling the taps on the primary of the coupler, are mounted directly below the coupler; 10, 11, 12, 13, 14 and 15, are the controlling knobs of the different rheostats of the five amplifying tubes and the second de-

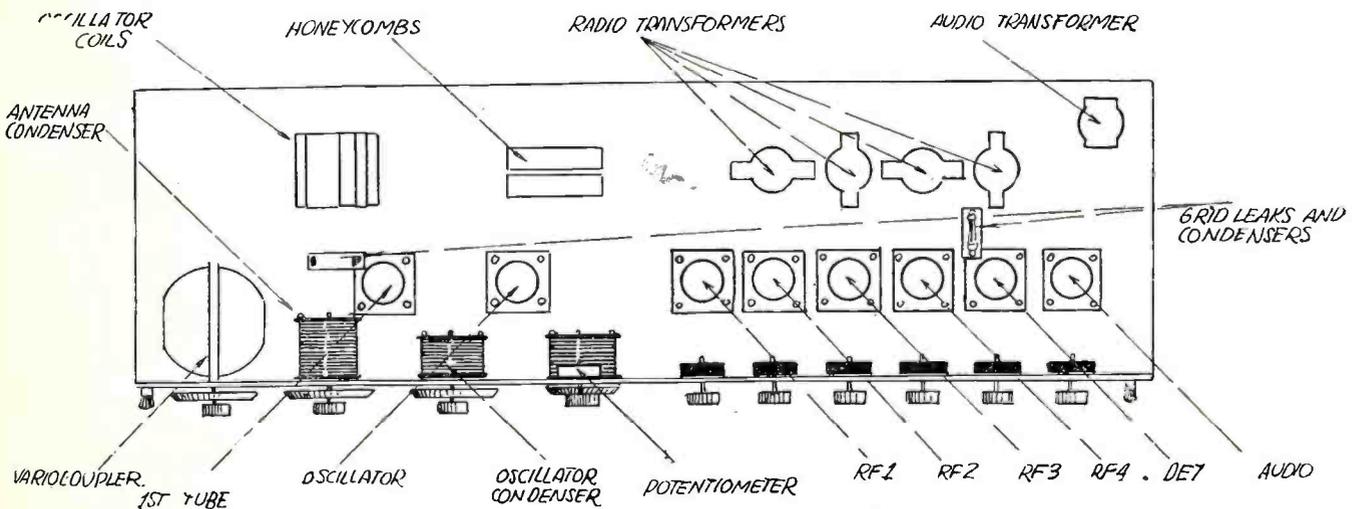


Figure 6.—Top View of the Super-Heterodyne Receiver.



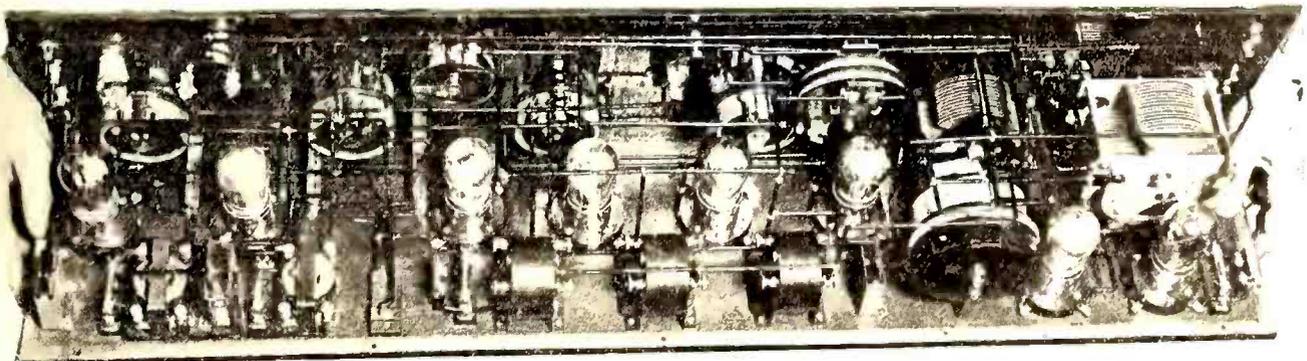
rector. Above these rheostat knobs are the holes drilled in the panel for the observation of the tubes. The position of the different binding posts also is shown. Figure 5 shows the back view of the panel, while Figure 6 is a top view which shows the method of placing and mounting the different parts on the

base board. The tuning of this set is not nearly so complicated as one would think and, in fact, if a loop aerial is used there will be only two controls after the radio frequency component of the circuit is adjusted. These controls will be the condenser across the loop and the oscillator condenser.

W. K. Koellner and his super-heterodyne set, which uses only two major controls. The photograph shows

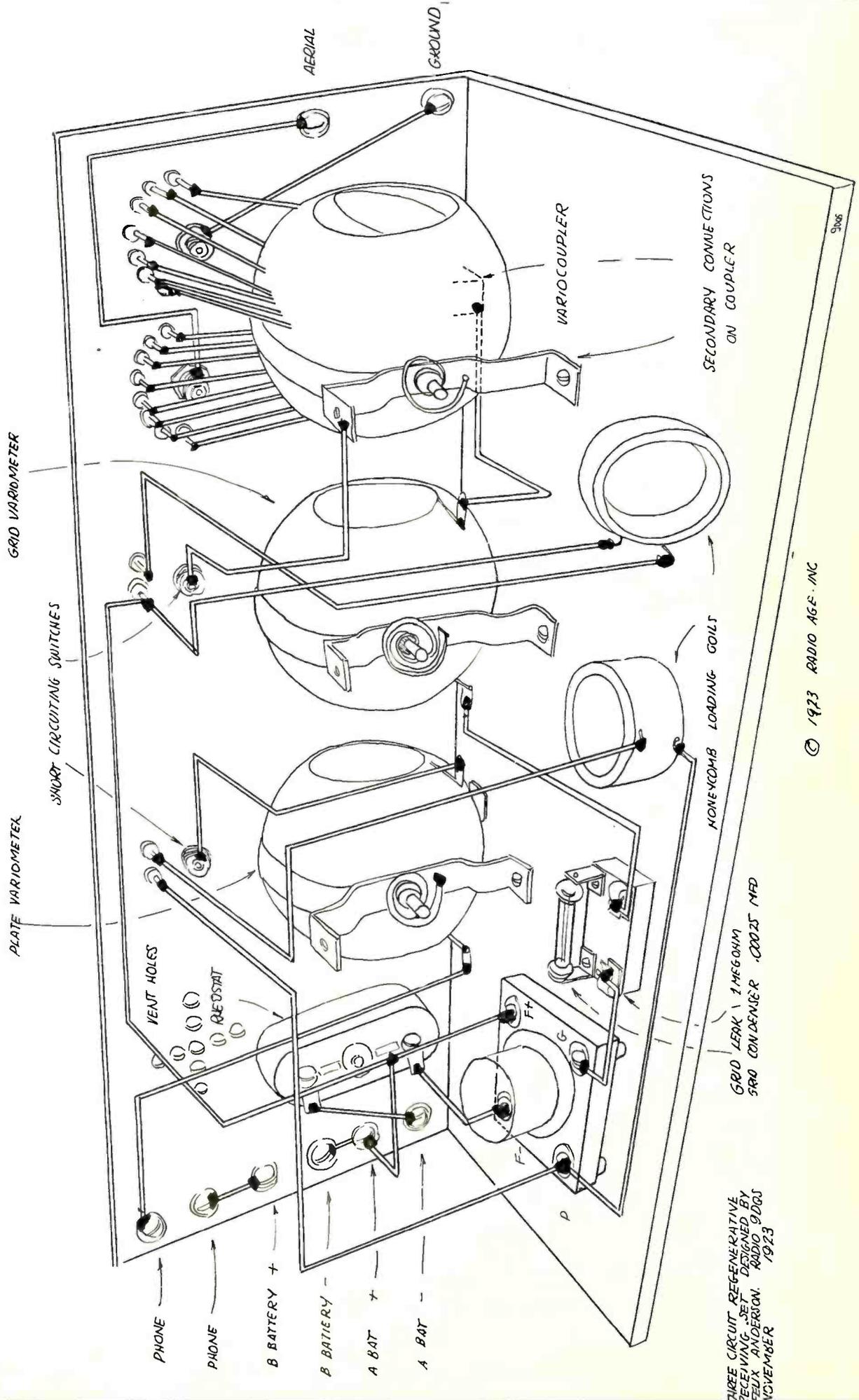
the neat panel arrangement. This is an extremely sensitive receiver.

(Kadel & Herbert, Foto.)



Interior of a well-built super-heterodyne receiver. This set requires only two major controls. Note neat arrangement of parts. Two of the tubes are detectors,

one an oscillator, three for radio frequency and two for audio frequency. Exterior of set is shown in the other photograph on this page.



THREE CIRCUIT REGENERATIVE RECEIVING SET DESIGNED BY FELIX ANDERSON. RADIO 9000 NOVEMBER 1923

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Construction of the Three-Circuit Tuner

By FELIX ANDERSON

WE HAVE had so many requests for information on the construction and operation of the three-circuit tuner that we are presenting herewith detailed information concerning this much talked of and efficient receiver. The three-circuit tuner sometimes called the Armstrong Circuit and also dubbed the two variometer-variocoupler circuit is an old standby which has been used for many years in amateur circles.

The reason for its great popularity is that minute changes of wave length and tuning can be effected, and for this reason it has proved a popular receiver with broadcast listeners who reside in large cities where interference from many high power broadcasting stations is always an important factor. That the set is an efficient one is demonstrated by the fact that it is the most generally used receiver among the amateurs interested in relaying code messages.

The construction of a set of this type is fortunately not difficult, and not overly expensive. The only disadvantage which seems to exist is that the set tunes so very closely that when it is placed in the hands of someone who does not appreciate the merits of a receiver which tunes as closely as this one it is classed as too difficult of operation.

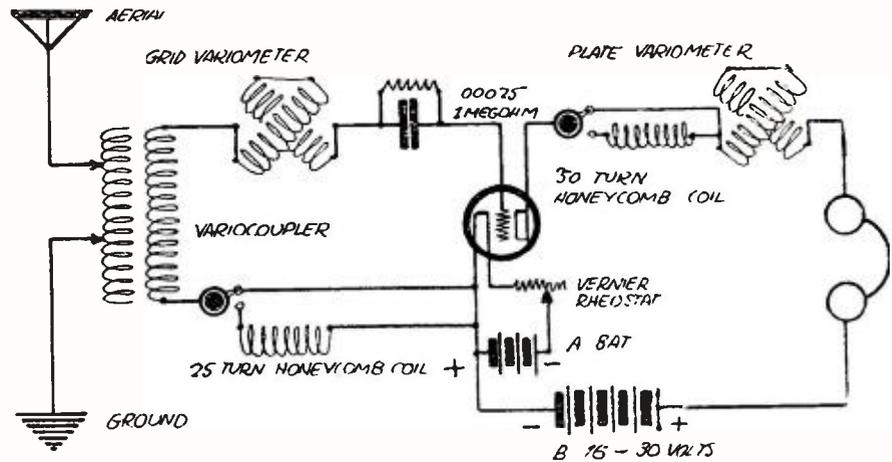
Speaking from personal experience with this circuit the writer wishes to say that he prefers it to almost any type of receiver having two or three stages of radio frequency amplification. Signals have been heard by the writer using a set similar to the one illustrated in the drawing on opposite page, from stations over three thousand miles away.

On silent nights in Chicago under favorable conditions the set brings in from twelve to fifteen stations of from five hundred to two thousand miles away, and while it is not a regular occurrence station KHJ at Los Angeles has been heard several times.

The parts required to make up a set of this type are all standard and can be purchased at your local radio store. You will need: One variocoupler; two variometers; one twenty-five turn honeycomb coil unmounted; one thirty-five turn honeycomb coil unmounted; one rheostat; four switch levers; two dozen switch points; eight binding posts; one .00025 grid condenser; one grid-leak; one megohm; one tube socket; one WD12 tube; one 22 1-2 volt B battery; one 7x15 panel; connecting wire, A battery, cabinet, phones, and antenna system and ground.

Construction

Drill holes for the various instruments, mounting them as shown in Figure 1. Space the variometers and coupler as far apart as symmetry will permit. This is done to reduce or eliminate any inductive effects which might exist between the



coupler or variometers. Placing them too close together will result in howling and "mushy groans" and will cut down on the efficiency of the set.

In order to be able to tune in stations using the new wavelengths the honeycomb coils are placed in the plate and secondary circuits. The short-circuiting switches, as shown in Figures 1 and 2, cut out the loading coils when the lower waves are desired.

The isometric sketch shows variometers of the basket ball type, but any variometer of good sturdy construction can be used.

Any type of tube may be used with this circuit with equally good results.

This set works best on broadcast listening when an aerial not over one hundred feet is used. The tuning of the set is very fine and much patience and perseverance are needed before good results can be obtained; however, after the knack has once been acquired the matter of tuning is exceedingly simple. Local stations may be tuned out at will if an antenna of not over forty feet in length is used.

The three circuit set is the real set for the BCL who wants a receiver that will really tune.

Will Japan Yield?

Many radio experts feel that the terrible disaster and the severing of communication wire out of Japan will aid materially in establishing better radio service between Nippon and the world. The policy of the Japanese government has been to control radio, although American commercial companies have been endeavoring to provide better stations and transmission for some time. It is now hoped that the radio corporation will be given an opportunity to establish high-powered stations in Japan in connection with the cooperation it has already given the government toward

better radio communication at less than the cable rates.

Millionaire Amateur

South Dartmouth, Mass.—After spending nearly a million dollars to build a magnificent mansion on the ancestral lands of the "Pilgrim Fathers," Colonel Edward H. R. Green, the wealthy son of Hetty Green, looked around for new worlds to conquer and hit upon radio, not as a mere pastime, but an absorbing study. An aerial 100 feet high stands out against the skyline and neighbors for miles around listen nightly to his station, "The Voice from 'Way Down East."

This is one of a series of hobbies which began for the Colonel as a boy when he started a chicken farm in Texas and ran the whole gamut from mules to fishing and politics to baseball. He introduced the first automobile and the first airplane in that state and topped off his career there when he purchased the world's largest private yacht.

Few of his friends realize, however, that Colonel Green was interested in radio before he came to Massachusetts. He was an amateur in Texas, when radio was young, and began his experiments about the time that he became a member of the American Radio Relay League. He has since maintained active concern in the welfare of amateur radio.

His other hobbies, including a houseboat, a Texas railroad and a stamp collection, are now held secondary to radio and he spends a great deal of his time riding around his beautiful estate, dotted with artificial lakes, in his electric auto, equipped with wireless.

The broadcast station, planned by Colonel Green, aided by several leading engineers of the country, is a well-furnished home itself, with a reception room. His programs are of the best, since they are sent from New York by wire, and as the evening breeze blows in from the shore, hundreds listen to what they call the colonel's "jazz fog."

How to Detect a Bootleg Tube

THE WIDE use of the UV-199 has led to numerous attempts on the part of unscrupulous manufacturers to counterfeit this tube. In external appearance some of the imitations bear such a close resemblance to the genuine tube that it is very difficult to detect the difference. Even the carton markings, the instruction sheets, and the trademarks etched on the tube itself have been copied very closely.

However, in spite of the resemblance in appearance, the electrical characteristics of the counterfeit tubes are very different from those of the genuine UV-199. So far, none of the manufacturers of the illegal tube has been able to duplicate the sixty milliamper filament of the UV-199 and most of the counterfeits require as much as one fourth of an ampere. Since the voltage of this filament can easily be made 3.0 volts, or less, the user of such a tube is often misled by the apparently satisfactory operation when the tube is first lighted, but he soon finds that his dry battery is quickly exhausted and often the tube itself fails in a few hours.

Of course, the easiest way of determining the current required by the filament is to use a milliammeter and voltmeter, but since such instruments are not in common use among radio experimenters another simple method described below may be used which gives a rough approximation of the filament current.

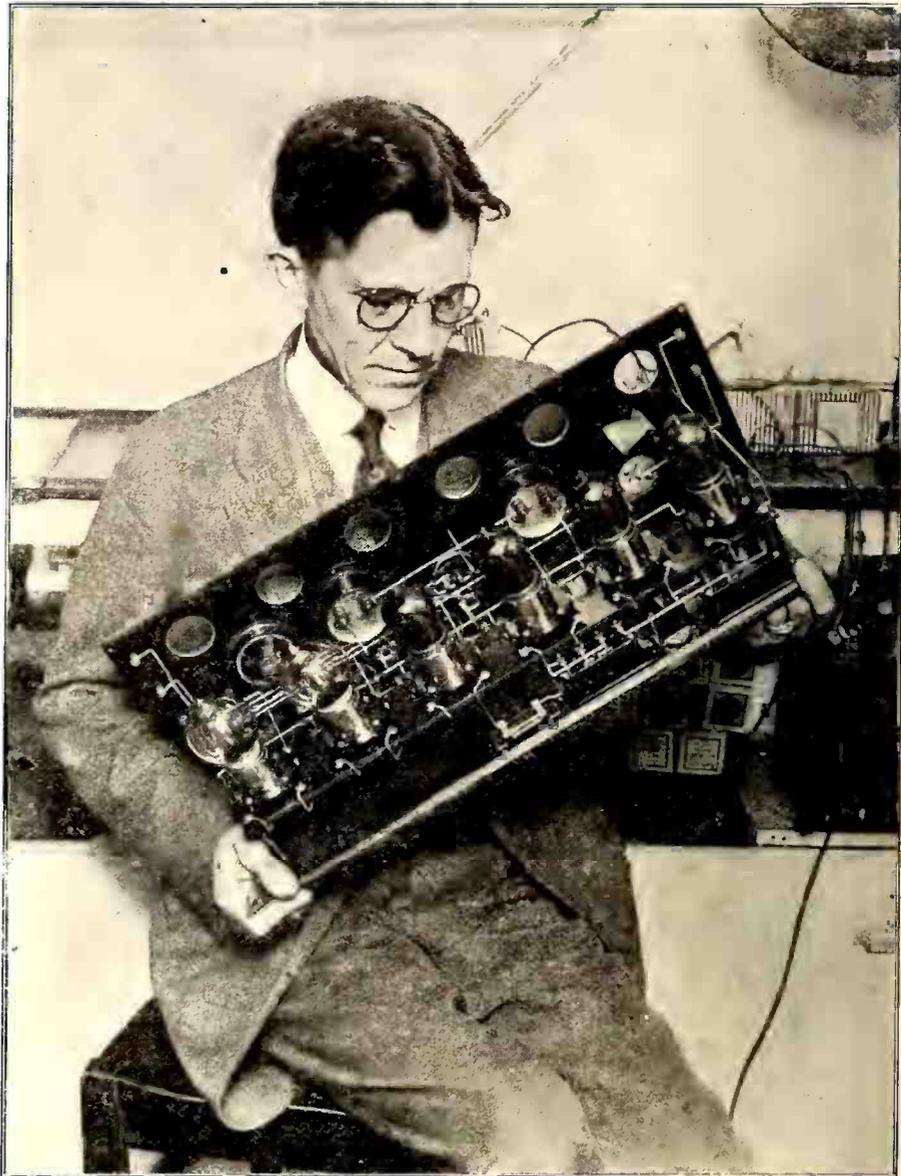
Connect three new six inch dry cells in series with the tube to be tested and an ordinary fifty-watt, 110-120 volt Mazda vacuum lamp. Figure 1 shows the proper connections. If the filament of the tube being tested does not take more than sixty milliamperes, it will light up almost to normal temperature. But, if the tube is not a genuine UV-199 and the filament requires appreciably more than sixty milliamperes, the resistance of the Mazda lamp will rise due to the higher current flowing through it, and the voltage on the tube will be so low that its filament will not light. In making the test, be sure that the tube is left in the socket for about thirty seconds to allow the Mazda lamp filament to heat up to constant temperature.

When the proper electrical instruments are available, an even better test is to use a voltmeter and milliammeter connected exactly, as shown in Figure 2.

At three volts the current through the filament of a genuine UV-199 Radiotron lies between fifty-five and sixty-five milliamperes.

For this test high quality instruments must be used, otherwise this test is worthless.

A voltmeter having a full scale reading of five is recommended. For the milliammeter use an instrument having a full scale reading somewhere between 100 and 250 milliamperes.



(Kadel & Herbert, Foto.)

M. W. Obermiller's receiver picks up distant stations with a loop aerial. It utilizes two stages of audio frequency and three of radio frequency, with but one control. The tonal quality achieved with this set is exceptionally good.

Steals \$1,500 Station

Rolla, Mo.—Radio thieves are active here.

The disappearance from this town of the entire apparatus at the amateur station, operated by S. P. Stocking of 610 State Street, and licensed by the government under the call 9AZH, has resulted in a statewide search by local police authorities, while circulars describing the equipment in detail have been sent all over the country.

In two successive visits, probably planned by the same conspirators, every piece of this privately owned set, from a pair of lightweight phones to a 100-watt transmitter, valued in all at nearly \$1,500, has vanished into the night. Stocking is a member of the American Radio Relay League and has asked fellow amateurs to aid him in recovering any

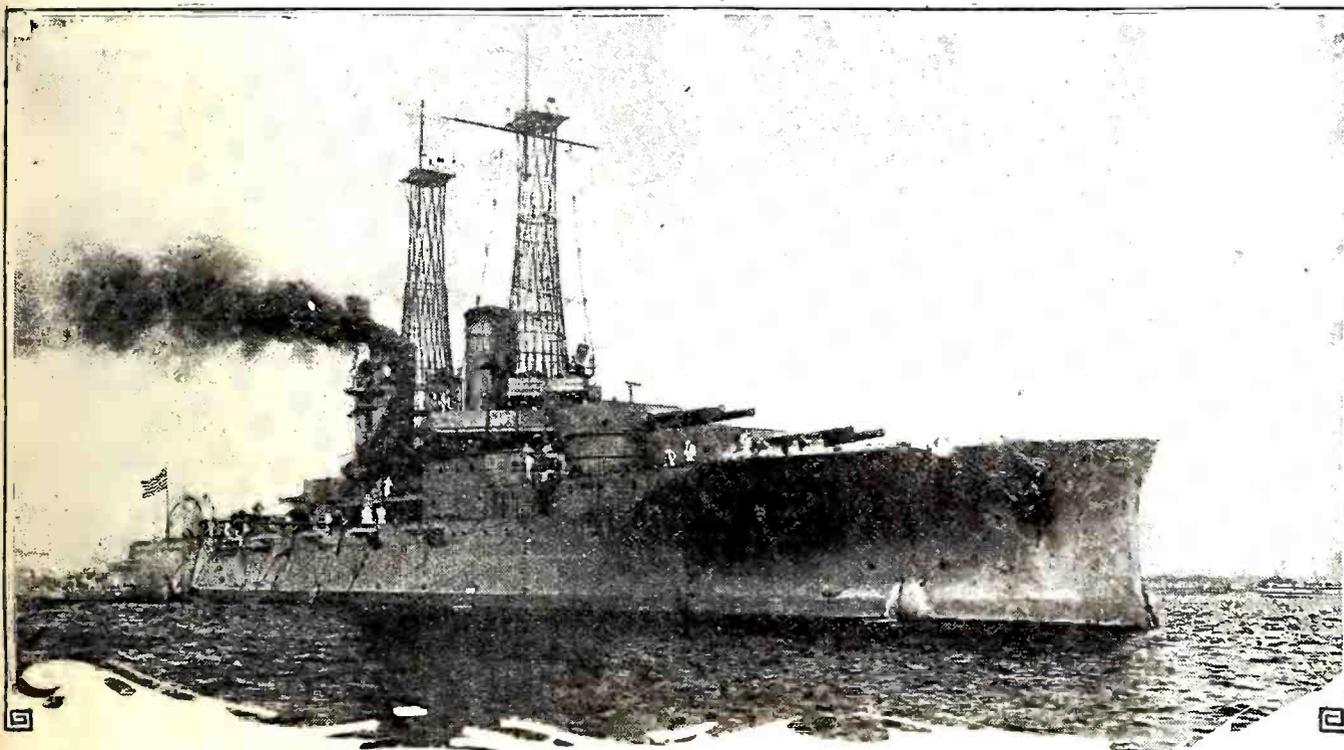
part of the missing radio station.

Evidently the time has now come, Mr. Stocking believes, when a radio station is as difficult a thing to keep as an automobile and the thief, who has been bitten by the radio bug, is equally annoying as the joyrider who picks up a stray car and abandons it on a deserted country road. The difference is that the radio thief carries his work further, believing that "findings is keepings."

The new owner of station 9AZH may already be on the air, but if the truth be known, his presence is not welcome.

Of course 9AZH's parts may be scattered far and wide, dribbled away among secondhand dealers at half the value, but the assumption is that the thief or thieves knew the game and set a much higher price upon the set, which is that of "ownership."

Radio Will Guide \$7,246,687 Ship to Destruction



WASHINGTON, D. C.—The next radio-controlled ship of the Navy will be the old battleship, "North Dakota," authorized in 1907 and commissioned in 1910, but designated to be scrapped by the Arms Conference. A lack of available funds for the radio-control equipment will prevent the execution this year of the navy's plan to carry out extensive gun-fire and aerial bombardment with this ex-first-line ship as moving target. She will be de-commissioned and much of her armament and equipment salvaged in anticipation of equipping her with radio control apparatus next year. In the meantime, she will be kept in good condition at her present berth at the Norfolk navy yard.

"How can the navy afford to sink a vessel whose hull, armor and machinery alone cost \$7,246,687, and whose radio equipment will cost \$100,000 more, at least?" some critics will ask. In the first place, she is useless as a fighting craft, but the answer lies in the results

of the aerial bombing and the gun-fire experiments with the old "Iowa," now at rest in Panama Bay.

She was the navy's first radio-controlled target ship, and the only full-sized ocean-going craft ever operated by radio without men aboard. From her, naval radio engineers learned how to control a vessel from a distance; the aviators learned how to bomb moving targets, while the range-finders and gunners experienced for the first time long range and even indirect fire at a real battleship while under way. Designers and ordnance experts also gathered valuable data.

Improvement in all lines of the service was noted; hence a second ship is to be radio equipped, when sufficient funds are appropriated. She must be sunk or disposed of eventually, but with special shells and bombs, it is planned to keep her afloat as long as possible when the final maneuvers start.

The "North Dakota" will have radio control equipment similar to that on the

old "Iowa," sunk last winter. The equipment will enable her to proceed at a higher rate of speed, approximating fifteen knots, it is understood. Radio control will provide for increasing her speed to maximum from a low initial speed and stopping her. The speed cannot be varied, but she can be maneuvered right and left by her radio rudder control from her operating ship several miles away.

The new radio equipment will cost \$100,000, it is estimated, although no definite figures have as yet been prepared. The total cost of partly scrapping, that is removing guns, etc., will also cost another \$100,000, but this amount would be entailed through the armament agreement.

Captain Chauncey Shackford is chairman of a special naval board, appointed by Secretary Denby, to prepare plans for the conversion of this vessel into a radio controlled target ship and outline a program of tests.



Talking to MacMillan

(Special to Radio Age)

Prince Rupert, B. C., Oct. 15.—Hawaii has established radio contact with the North Pole; the Arctic seas, swept by icebergs, and the sunny shores of the tropical Pacific islands have met through the ether, according to messages received here from the exploration party in charge of Captain Donald B. MacMillan, by Jack Barnsley, operator of a local amateur station and member of the American Radio Relay League.

Safe in winter quarters at Refuge Harbor, about ten miles north of Etah, Greenland, Donald H. Mix, radio operator for WNP, Wireless North Pole, has sent a number of personal messages from the Bowdoin's crew to relatives at home advising the safety of all hands.

For several nights in succession the North Pole has come in at the local station clear and strong and finally, when atmospheric conditions were unusually favorable, a five hundred word press message giving full details of exploration progress.

Although he has himself been bound in the silence of the North, unable to push

down in Hawaii, which is the extreme opposite in temperature, have been heard at the Pole, according to Mix, who sent a radiogram to the operator of that station, through Barnsley, that his transmitter was heard plainly while in communication with amateur radio station 6ARB.

With all the power available through his two fifty-watt tubes and sticking by his set until early morning, Barnsley has been forwarding nightly messages to and from the Arctic schooner, several of which, destined to various points of the United States, have been delivered already via the American Radio Relay League system.

Mr. Barnsley has been advised through the A. R. R. L. Headquarters at Hartford, Conn., that he is the winner of the Zenith receiver and amplifier, offered by the Chicago Radio Laboratory to the first amateur to receive a press message from Wireless North Pole.

Broadcasting in Sweden

"Svenska Rundradioaktiebolaget" is the name of a new firm in Sweden for broadcasting. The organizers of the company are Elektriska Aktiebolaget, A. E. G., Allmänna Telefonaktiebolaget, L. M. Ericsson and others. The minimum capital of the company has been fixed at 100,000 kroners and the maximum at 300,000 kroners. The company has applied to the government for a concession to transmit information by radio.

Appointed Chairman

E. B. Mallory, manager of the Radio Sales Department of the Westinghouse Electric and Manufacturing Company, who is located in New York City, has accepted the invitation to be chairman of the Radio Communication Committee of the American Marine Congress, which will be held in New York City, November 5 to 10, inclusive. The congress will be held in connection with the American Marine Exposition.

Mr. Mallory is now chairman of the radio section of the Associated Manufacturers of Electrical Apparatus.

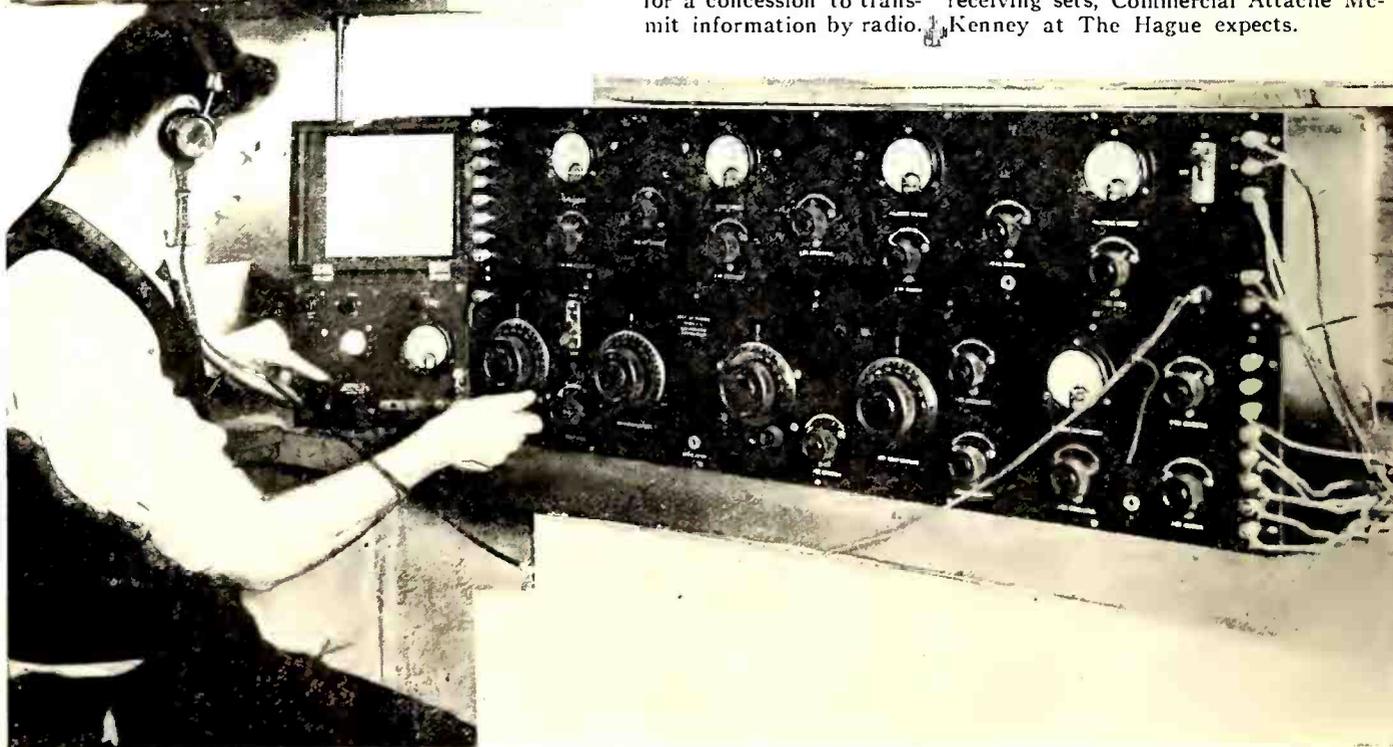
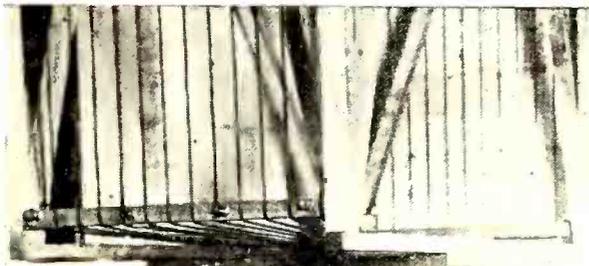


Duty Reduced

The import duty on apparatus for wireless telegraphs imported into British India has been reduced to not more than two and one-half per cent ad valorem. The former rates of import duty on telegraph instruments and apparatus and parts thereof were fifteen per cent ad valorem except if imported by, or under the orders of, a railway company, when they were subject to a duty of ten per cent ad valorem.

Dutch Need Sets

An urgent call for radio receiving apparatus from The Netherlands is expected as soon as radio broadcasting starts. Dutch manufacturers are able to supply vacuum tubes, having made them for local and export use for some time, but there will be a shortage of receiving sets, Commercial Attache McKenney at The Hague expects.



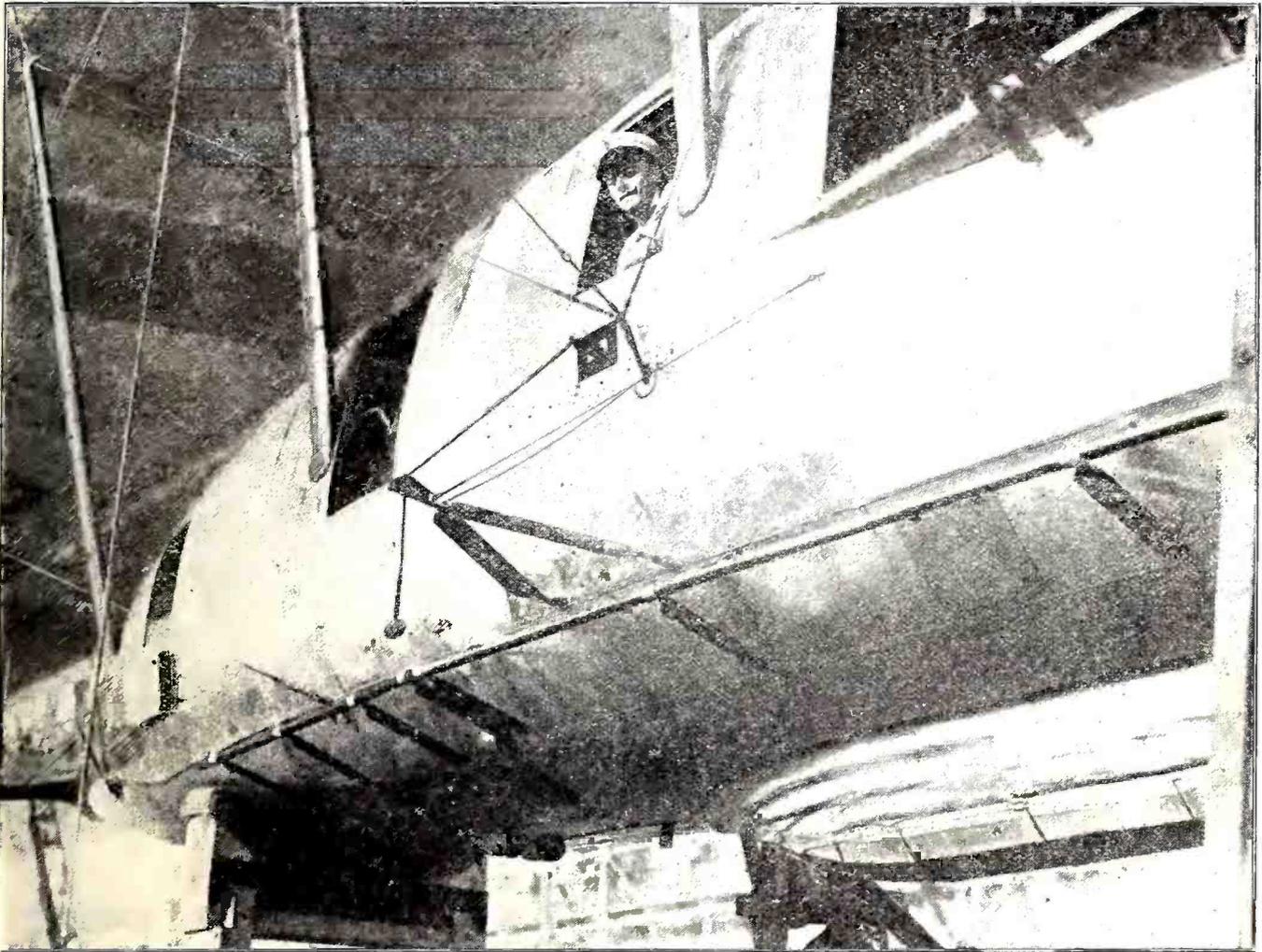
signals from his powerful transmitter past the radio absorbing curtain of the aurora, Mix has successfully heard amateur stations in all of the nine United States districts.

The signals of amateur station, 6CFU,

Claude Golden, builder of this fourteen-tube super-heterodyne receiver, suspects it is the most sensitive radio receiver in existence. It picks up Pacific Coast and European signals. It uses a specially constructed loop aerial, a portion of which may be seen at the upper left of the picture. Photograph gives good idea of arrangement of controls and adjustments. For selectivity the super-heterodyne has never been equalled.

(Kadl & Herbert. Foto.)

KWY Broadcasts Route of Airship



The East and Middle West recently were thrilled by a glimpse of the giant U. S. navy dirigible airship, ZR-1, which sailed from Lakehurst, N. J., to St. Louis and thence to Chicago and return to Lakehurst, in two days. In the gondola of the great craft, shown in the above photograph, was installed a radio outfit with which communication was maintained with head-

quarters on the Jersey coast. Note the lead-in insulator and the V-shaped frame that supports the antenna. The antenna consists of a hundred feet or more of wire, which is pulled down by a weight and dangles like a pendulum. Man looking from window (or is it a porthole?) is John T. Robertson, radio operator in charge.

WHEN the giant navy dirigible, ZR-1, nosed her way out of a bank of clouds within sight of her home hangar at Lakehurst, N. J., on the morning of October 3, she had completed a record trip to St. Louis and return, consuming forty-seven hours and forty-nine minutes. The ship covered approximately 2,200 miles during forty-six hours actually in the air.

As great an achievement as this trip proved in many respects, among the most remarkable features in connection with it was the radio—this in itself was noteworthy. Radio practically replaced wireless which heretofore was the only means by which airships could keep in touch with terra firma.

When the flight started from Lakehurst, N. J., station KDKA of the Westinghouse Electric & Manufacturing Company, located at East Pittsburgh, kept in touch with its progress. Arrangements had been made with correspond-

ents in the different cities over which the dirigible passed to report by radio its movements. After the ZR-1 left St. Louis, Westinghouse Station KYW, at Chicago, followed its movements and gave a report over radio from its station every fifteen minutes.

Radio fans were advised approximately about the time when it would pass in their vicinity and were asked to keep in touch with KYW and let the announcer know as soon as they sighted the dirigible. This request was met with numerous phone calls and telegrams from many points along its route enabling thousands to keep in touch with its movements so that they could watch its flight.

Army Station

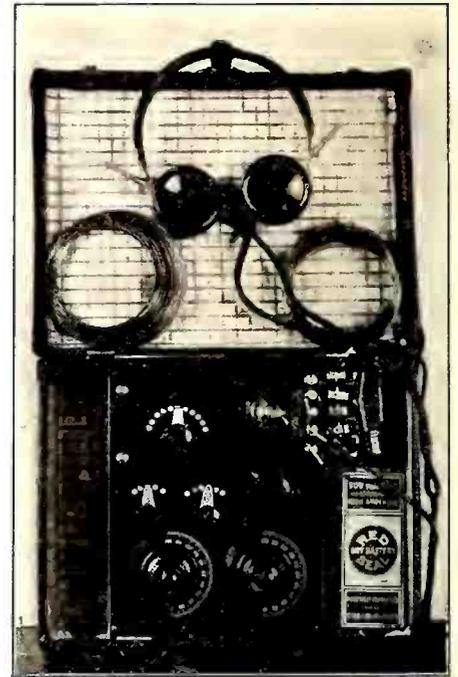
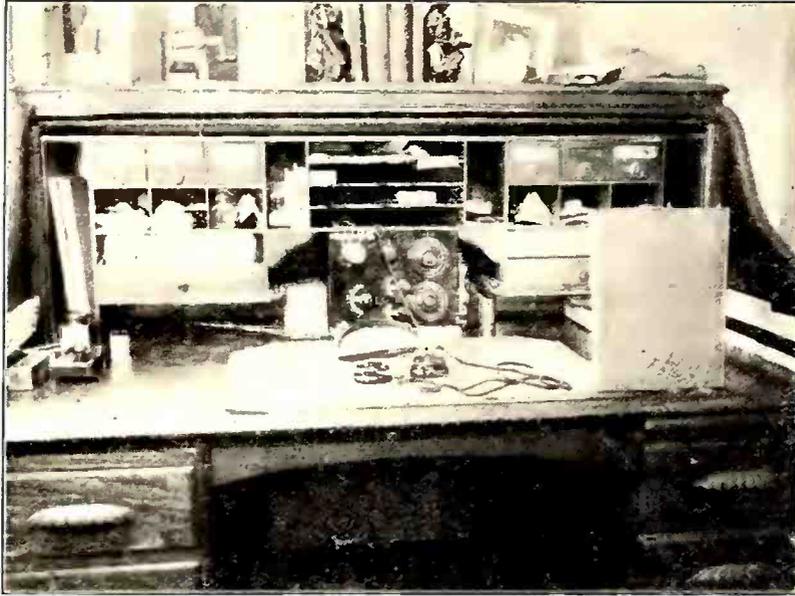
The first of November witnessed the inauguration of the big new Army Signal Corps, radio station at Fort Douglas,

near Salt Lake City, Utah. This is the largest radio telegraph station of the army; it has but one tube but that is a water-cooled ten kilowatt tube. The General Electric Company built this equipment.

Another similar station is being erected at Leavenworth, Kan., by the Western Electric Company, but this station will operate with two tubes and will have a telephone circuit as well as the radio telegraph. The radio circuit between these two stations, the Arlington, Va., station, and a landline from Leavenworth to San Francisco, will span the United States. Each of the two interior stations will be equipped with two steel 300-foot towers.

It is the plan of the army radio service not to use coastal stations, that part of the work being handled by the Naval Communication Service, and the army does not desire to interfere with ship to shore communication.

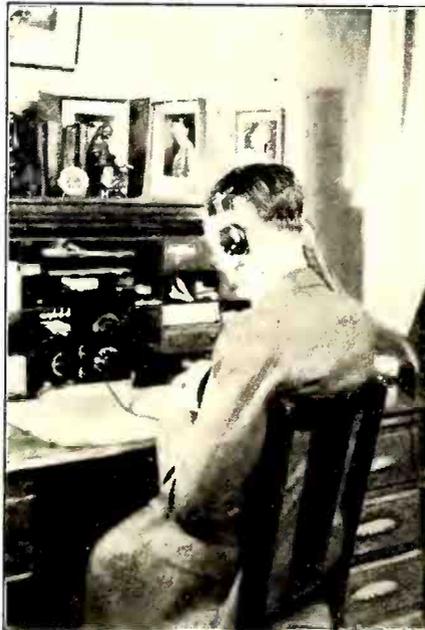
What Becomes of the Portable Reinartz in Winter?



Last May, RADIO AGE printed instructions relative to the construction of a vacation outfit, embodying the Reinartz circuit, and it gives us great pleasure to learn that the set has proven a worth while undertaking as far as its use during outings and vacations are concerned.

Joseph Budlong of 2406 Foster Avenue, Chicago, is the proud owner of one of these handy portable Reinartz receivers, and writes us that the set not only demonstrated its worth during his summer vacation, but also has made itself more valuable inasmuch as its compactness and small size enabled him to remodel it into a household radio set with a minimum amount of trouble.

He tells us that its size just suggested placing it into his desk in



"What Becomes of the Portable Reinartz Set in Winter?"

At top, left, the portable Reinartz set adjusted into a roll-top desk. At right, top, the set as it was used during the summer. Below, Mr. Budlong using his Summer set at his Winter headquarters.

Needs Radio Operators

Radio operators seeking employment will find excellent opportunities this fall for real radio work on board ships of the United States Shipping Board, which sail the seven seas and call at every port in the world.

The annual turnover of radio personnel is large, due to several causes, among them being the fact that many college men spend their summer vacations sailing the briny deep as marine radio operators, and then return to their studies at the end of the vacation season.

It is understood that approximately 100 first class radio operators can be placed on government vessels alone during the next few months.

On the first of last July, the government increased the pay of all its commercial operators approximately fifteen per cent. The monthly rates of pay now

in effect range from \$85 a month to \$125. A few positions pay a higher salary.

Radio operators aboard Shipping Board ships are classed as officers and, in addition to their regular monthly pay, receive free lodging, meals and such other accommodations as are accorded to ships' officers.

Applicants for berths as radio operators must hold commercial first class radio operators' licenses, which are issued by the Department of Commerce. Examinations for such licenses may be taken any time at the offices of the Department of Commerce's Radio Supervisors, located at the following places:

one of the compartments, and he found on trial that the idea worked admirably. The set was removed from the grip used to make it portable as shown in the accompanying photo, and was placed in one of the compartments of the desk. The batteries and all unsightly wires were brought into the set through the back of the desk, and only the controls, and phones are visible to the operator. When he intends to make another extended trip where radio would be entertaining, all that is necessary to do is to remove the set and batteries from the desk compartment and place it into the grip and whisk away.

To testify as to the efficiency of the set, he enclosed the following list of stations heard during his spare moments in September:

WGY, KDKA, WSAI, WLW, WDAF, WOS, WTAS, WCBF, KSD and all local stations.

Custom House, Boston, Mass.; Custom House, Baltimore; Custom House, New Orleans; L. C. Smith Building, Seattle, Wash.; Custom House, New York; Federal Building, Atlanta, Ga.; Custom House, San Francisco, Calif.; Federal Bldg., Detroit, Mich.; and Federal Building, Chicago, Ill.

Radio operators who desire employment on board Shipping Board vessels and holding required licenses should communicate with the radio companies which employ operators for the Board. These companies are: Radio Corporation of America, Ship Owners Radio Service, Inc., and Independent Wireless Telegraph Company, all of which have offices in large American ports.

What the Broadcasters are Doing

(News for this department is solicited from all stations.)

Willard Station

The most powerful radio broadcasting station in the world relying exclusively on storage battery power is WTAM, the large new broadcasting station of the Willard Storage Battery Company, of Cleveland. It is on a wave length of 390 meters.

WTAM has installed a 1,000 watt transmitter, making it one of a very few with such high wattage. WYG at Schenectady, heard all the way around the world, is transmitting with 1,000 watts.

The new station has been erected on a large lot adjoining the immense Willard plant. A substantial building to house the station provides separate rooms for the transmitting equipment, storage batteries, reception parlor and studio, with commodious dressing rooms for the artists who will entertain the invisible audiences.

The outstanding and unique feature of the Willard station is that it not only has 1,000 watts for transmitting but that storage batteries, which have for some time been recognized as the ideal source of power for clear and steady transmission, are being used exclusively. Huge racks of storage cells provide the 2,500 volts required by the 1,000 watt transmitter.

The station has been so planned and built that no moving machinery is in or near the station. Even the machinery for control of ventilation and heating is remotely situated from the building.

An unusual form of aerial is employed, specially designed to eliminate static interference. The antenna consists of twelve wires in a double cage of six wires each. This aerial has a span of 100 feet, with a weight of approximately 300 pounds. It is suspended at a height of about 138 feet between the two 140 foot towers. The giant towers are constructed of four inch angle iron to a height of 112 feet, the remaining distance being covered by thirty-eight foot masts of wood. Stranded steel guys, with numerous strain insulators, are set into concrete piers for back bracing, and the legs of the towers are deeply seated in more massive piers of concrete.

A counterpoise, sixty feet wide and 250 feet long, is supported by twelve inch I beams, twelve feet tall, immediately beneath the spread of the aerial. This counterpoise is composed of twelve 250 foot lengths of antenna wire spaced five feet apart.

Cleveland's best entertainers are already listed for this station. Programs are to be broadcast on Wednesday and Saturday evenings of each week, starting at 8:00 p. m., eastern standard time.

New Bible on Air

Station KYW, Westinghouse, Chicago, is broadcasting the popularized version of the New Testament, an American translation by Professor Edgar J. Goodspeed, of the University of Chicago. The reading is conducted from 6:30 to 6:35 o'clock each Sunday evening.

Arrangement for broadcasting this modern translation of the New Testament was made with Dr. Goodspeed and

the Chicago Evening Post, which controls the Chicago newspaper rights of the Goodspeed version.

The New Testament, an American translation, is a new translation of the New Testament in the language of today. It is a dignified, scholarly version that retains the vigor, ease and clarity of the original Greek—a reverent translation that removes the stumbling block of a vocabulary centuries old. It has been designed not only to tell Americans what the ancient writers say, but to make it easy and pleasurable for modern readers to turn to the greatest book in all literature.

Since Westinghouse station KYW has been in operation, which will be two years in November, the program managers have attempted to develop an extensive schedule of church services mainly for the benefit of those persons of the invisible audience who are shut-ins and otherwise incapable of attending the services at their neighboring churches.

This schedule is now complete with the station broadcasting two separate services each Sunday. The first of these is the program of the Central Church, which is broadcast from Orchestra Hall, Chicago, beginning at 11 o'clock in the morning.

Each Sunday night the services of



WOR, Newark, N. J., has been making a lot of friends. One of the reasons, in addition to the excellent station equipment, is the announcer, Joseph Barnett, whose portrait appears herewith, smiling into the microphone.

(Kadel & Herbert, Foto)

the Chicago Sunday Evening Club, which are held in the same place, are sent by way of the ether. This is accomplished by a special sealed telephone wire connecting the hall with the station. Now, in addition to these two features, the introduction of the reading of the New Testament will be welcomed by radio listeners who are devoted churchgoers.

Sunday Night Music

The WGY Symphony Orchestra, re-organized for the season of 1923-24, gave the first of a series of five weekly concerts to be broadcast by WGY, the General Electric Company radio station, Sunday afternoon, October 14. Leo Kliwen, director last season, will again direct the orchestra of twenty-five men. Guest directors will be invited to take charge during the series of concerts.

Arrangements have been made with the management of the State Theatre in Schenectady, N. Y., to have the concerts in the large auditorium of his theatre. Pick-up devices, or microphones, gather in the sound waves and the theatre is connected to the transmitting equipment of WGY by telephone lines. The listeners not only hear the music but also share in the applause which follows the numbers.

The concerts by the WGY Symphony Orchestra last spring proved very popular with the radio fans and the continuance of the work of this organization is prompted by the many requests which have been received for a first class Sunday musical program.

Mexican Band at WJAZ

The Zenith-Edgewater Beach Hotel broadcasting station, Chicago, on the evening of Sunday, September 30, gave to its listening audience throughout the United States a rare treat which was fully appreciated as is evidenced by the thousands of letters pouring in to the station. The Official Mexican police band of eighty-seven pieces, sent to this country by President Obregon, appeared in full uniform and rendered a concert of continuous playing, lasting over one and one-half hours. Many of this band stood during the entire time, and there was no intermission. When the director of the band was asked if they did not desire an intermission, his reply was, "Oh, an hour and a half of straight playing is nothing. In Mexico we often play steadily for three hours."

This band came to the United States on the heels of the recent recognition of Mexico as a friendly handclasp from President Obregon. To put it in the words of the Mexican Consul: "We can express our appreciation most appropriately through music." The Mexican Consul stated this was the first appearance of this band at any radio broadcasting station.

The band was organized twenty years ago by Velino M. Preza, who still is conductor and has seen it grow not only in the affections of the Mexican people,

Fooling the Cat

IT MAY be possible, soon, to turn over a few household tasks to radio broadcasting stations. For example, it is conceivable that the cat may be put out at night by an order delivered at a given hour by a radio broadcasting station.

WGY, the Schenectady station of the General Electric Company, recently broadcast a "Farmers' Program." The numerous numbers were introduced as part of a celebration of the fiftieth wedding anniversary of Josh Quinby and his wife, Samantha. The announcements were all informal and instead of signing off in the usual formal manner "Josh," after speeding the departing guests, called to the cat preparatory to locking the kitchen door and blowing out the lights. His call "kitty, kitty, kitty" was carried to a great many homes with the following result as related in two letters received by WGY:

"To convince you how perfectly we received your program," wrote Mollie Chesbrough, of Addison, N. Y., "I will tell you that our pet kitty was lying on the sofa asleep. When the bridegroom of fifty years ago was calling kitty to put her out, our kitty immediately got up to see who was calling him and for two or three minutes did not remove his gaze from the magnavox."

Charles J. Chase, who runs the general store at Sebec Station, Maine, writes: "Our cat heard you call and knew it was bedtime and hid away and did not want to be put out."

but in the esteem of foreigners, and especially of the highest musical critics.

In 1908, when President Diaz met Mr. Taft, then President, in conference on the Mexican border, this band furnished the musical setting, and President Taft personally expressed his appreciation and extended his felicitations to the conductor.

It is a symphony band, and every member is a Mexican and a musical expert. The requirements for admission are extremely rigid. The youngest member is twenty-two and the oldest sixty-five. There are no string instruments in the band other than two bass viols. There are twenty clarinets, ten cornets, six saxophones, etc., etc. An extremely difficult combination to put over the radio, and preparations were in progress five days to properly stage and reproduce this band from station WJAZ.

The name of this band is somewhat of a misnomer and would indicate a relation with the police force, but in reality all members are accomplished civilian musicians.

This mark of friendliness on the part of President Obregon in sending to the United States this wonderful band has cost the Mexican government approximately \$100,000.

On Sunday evening, directly in front of the band in the Marine dining room of

the Edgewater Beach Hotel, were seated as guests of the hotel at dinner the Mexican Consul in the seat of honor and the consuls representing the following countries: Great Britain, Argentine, Columbia, Cuba, Czecho Slovakia, Denmark, France, Germany, Japan, Netherlands, Spain, Sweden, Uruguay. The consuls' table was decorated with the flags of the various nations there represented.

New Denver Station

Denver, Colorado, has been selected as the site of a powerful radio broadcasting station by the General Electric Company, according to an announcement made recently by Martin P. Rice, director of broadcasting for that company. Work on the new station will be started as soon as the General Electric Company station at Oakland, California, is finished, probably in December.

Denver will have the third and last station in the General Electric program of broadcasting stations. The first, WGY, at Schenectady, has been in operation for the past eighteen months. Oakland, the second station, is the first to be housed in a structure erected exclusively for broadcasting equipment.

Both the Oakland and Denver stations will be modeled after WGY, so far as equipment is concerned. They will have the same power and sending radius as WGY which, under favorable atmospheric conditions, has been heard on a single transmission in every state in the union, in England, Hawaii and countries of South America.

McDonald Elected

The first annual convention of the National Association of Broadcasters was held in New York and on October 12 the following officers were elected:

President, Eugene F. McDonald, Jr., of the Zenith-Edgewater Beach station WJAZ, Chicago.

First vice president, Frank W. Elliott, WOC, Davenport, Iowa.

Second vice president, John Shepard III., WNAC, Boston.

Secretary, J. Elliott Jenkins, WDAP, Chicago.

Treasurer, Powel Crosley, Jr., WLW, Cincinnati.

The directors chosen were: Harold Power, WGI, Medford Hillside, Mass.; William S. Hedges, WMAQ, Chicago; Bowden Washington, WLAG, Minneapolis; Henry J. Rumsey, WDAP, Chicago; Leon Samuels, WJAR, Providence, R. I.; W. S. Harris, WLAG, Minneapolis; G. Brown Hill, KVQ, Pittsburgh, and Robert Shepard, WEAN, Providence, R. I.

562 Broadcasters

Sixteen broadcasters closed down their stations during September, while fifteen new ones opened. This shows a loss of one broadcaster for the month, leaving 562 stations on the air. These stood as follows on October 1: 260 Class A; forty-five Class B; 255 Class C and two Class D (development).

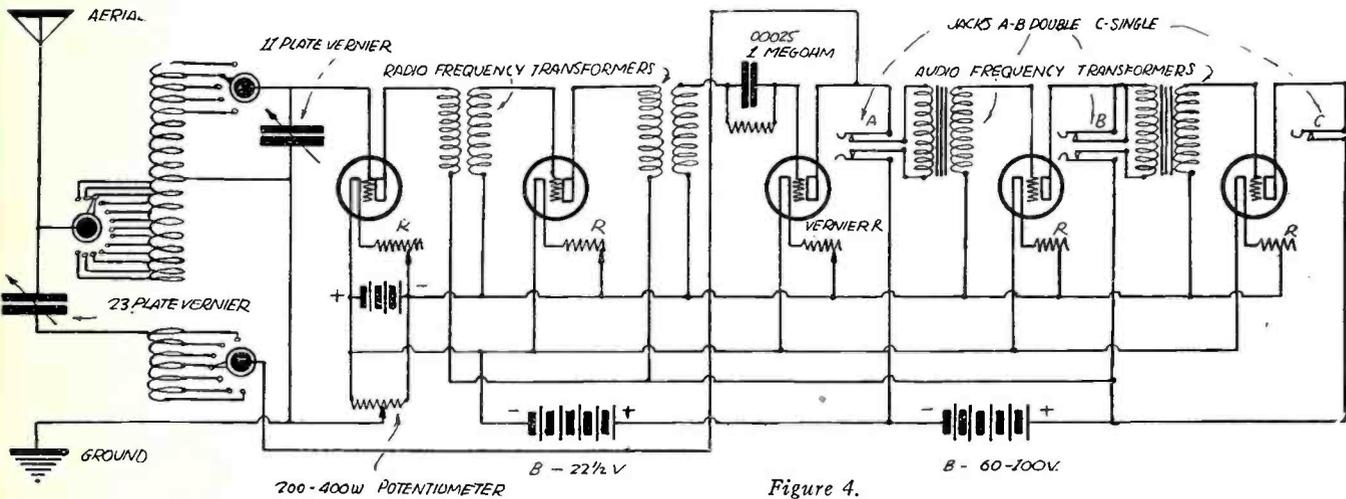


Figure 4.

the wave of KYW (536 meters) may be efficiently tuned in on an average antenna with the coils as described in the August issue.

L. W. O., Glenmora, La.

Question: As one of your subscribers, am coming to you for a little help on rewiring my set. It is a nonregenerative radio frequency receiver. I tore the blame thing down, and now can't get it back together again. I am sending a rough sketch the way the various parts are situated on panel and back, and would appreciate it greatly if you would draw in the proper way the wires should be attached. I left out the grid condenser or leak as I did not know where it went.

Answer: I am returning herewith your isometric sketch with the wires drawn in, and am printing in Figure 4, the correct electrical connections for the set you mention.

D. M. T., Boulder, Colo.

Question: In the August number of your magazine on page twenty-six, you have a diagram of a regenerative set, and I would like to have a diagram of the two stages of audio amplifications which can be used with this circuit.

Answer: The diagram you wish was printed in Figure 2 of the September Troubleshooter section.

J. S., Bronx, N. Y.

Question: I am a reader of RADIO AGE, and I notice that you print good diagrams. I wish you would print a diagram of a one tube set using spider web coils and condensers.

Answer: I am printing in Figure 1, a copy of the circuit you can use with the apparatus you mention. If operated intelligently it should give very good results.

J. B. S., Cicero, Ill.

Question: Am considering building a large set. Could you send me a circuit that would receive any station from coast to coast on loud speaker, that would tune out local stations and also that would eliminate static?

Answer: I am sorry to say that I

cannot give you a copy of a circuit that I could guarantee would do all those things, but I am sure you will find that the super heterodyne described in this issue will interest you when I tell you that a set of this type was used in the amateur transatlantic tests, and got results, and the navy and other government stations use it with great success. I heard of an amateur experimenter having picked up 2LO in London, England, from a point somewhere around New York, and I think that it speaks pretty well for the circuit. As far as the static is concerned I cannot do much for you, nor can anybody else.

L. F. M., Kansas City, Mo.

Question: I have constructed a Kaufmann circuit which does not give satisfactory results. I have followed instructions with the exception of a switch of eight taps on the ground side of the variocoupler. Connections are well soldered and tested many times but the volume is no greater than I get on a crystal set. I have received long distance but once which was Omaha two hundred miles distant, and which came in very faintly. I have placed the active twenty coil directly beneath the condensers and the position of the switch of same seems to make very little difference. I wound my own coils which may be the source of the trouble. I filled the rotor with 24 wire which took 140 turns and I have 70 turns on the primary tapped every 8 turns, with 8 individual turns. Should I add another tube? If so, please send me a diagram for connecting it. I am a great believer in the Kaufmann circuit, and think the fault is with me and not with the set. I am using WD 12 tubes, and have tried new batteries with the same results. When first constructed the set gave good results with the tube burning very dimly, but now it will not work unless it is burning very brightly. I hope you can locate my trouble from the poor description I can give you. I follow RADIO AGE each month for improvements and have tried a condenser in the antenna which does not increase the volume at all.

Answer: Your varicoupler secondary is too big, and if you will decrease the number of turns on the secondary of the variocoupler to about 70 turns, you will

find that your results will be much better. Inasmuch as you heard WOAW, which transmits on 527 meters, it leads us to believe that your set is tuning much too high. I also wish to suggest that the addition of another B battery so as to raise the plate voltage on the detector tube will probably make the set work better. You might make sure that you are using a condenser of .00005 mfd as designated, as this is a small but important feature in the set. The grid leak adjustment is also an important matter. I am sending you herewith a diagram showing how a stage of audio frequency amplification may be added.

S. S. Quincy, Ill.

Question: I would like to know if a plate variometer can be used in the Cockaday circuit as per the enclosed diagram with any additional increase in efficiency? Is it possible to make a variometer from a variocoupler by connecting the secondary and primary of the variocoupler in series?

Answer: The variometer stunt you suggest will not work very well, inasmuch as the set is already a tuned plate affair with the coil B. This makes the variometer unnecessary. The use of an audio transformer will require another tube, connected in the manner shown in the August issue. The variometer made out of a variocoupler as you suggest will not give results anywhere equal to those of a regular variometer, and I feel that you would profit in buying a regular variometer should you decide to make a circuit using one.

If your newsdealer has sold out his supply of Radio Age you are likely to miss just the hook-up that you have been looking for. To avoid any such chance fill out the coupon in this issue and send in your subscription. Then you will be safe. And don't forget that with each subscription at the special price of \$2.00 a year, or \$1.00 for six months, we send you free the popular Reinartz Radio booklet FREE. Address Radio Age, 500 N. Dearborn Street, Chicago, Ill.

Pick-Up Records by Our Readers

LAST summer we heard several pessimists make the remark that radio was dead—that it would not come back in the same manner as it did last year, and that its period of usefulness as an entertainment was past. They contended emphatically that the novelty of listening had worn off and that the general radio public was no longer interested.

We wish that we could have taken some of those doubting Thomases and shown them the mass of inquiries asking for information on how a set could best be improved, and put into shape for winter months, and want to call the attention of those pessimists to the fact that the broadcasting stations are increasing their programs, and various other developments in radio responding to the demand caused by the overwhelming increase in public interest.

If you'll take a tip from us, we predict the greatest radio season ever staged, and we base our decision on letters similar to the ones we are printing herewith. Day by day, in every way, the conditions necessary for satisfactory radio reception are becoming more ideal, and if you haven't already put your set into the good receiving condition, by all means do so—you're missing out on something great.

THE EDITOR.

RADIO AGE,
Gentlemen:

I built a Cockaday receiver according to your article and diagrams in RADIO AGE of August.

With a U V 200 detector unit, I get Fort Worth, Atlanta, St. Louis, Kansas City, Schenectady, Troy, Buffalo, Detroit, and many others; even while local stations are broadcasting, I bring in WLW, Cincinnati.

Not alone is the Four-Circuit Tuner a super-selective receiver, bringing in loud and clear the weak long distance station over the strong local stations; it reaches out to infinite distance, bringing in clearly and perfectly audible that heretofore evasive and much desired long distance station, and without the mushy groans and body capacity accompanying distance tuning with other sets.

I find that the 17-plate condensers are absolutely necessary in the set, and are unquestionably more preferable than the 23-plate type, the latter being too critical. I would recommend that every fellow using this circuit install condensers of the vernier type, as closer tuning can much more easily be effected.

The Four-Circuit Tuner is a joy, and I hereby propose a vote of thanks to Lawrence Cockaday, and to those who have helped develop this superlative receiver.

Sincerely,

WARREN C. WOOTTEN.

4648 North Winchester Avenue, Chicago, Ill.

The above letter goes to show that even admitting that public interest in radio decreases during the summer months,

RADIO AGE does not slow up on printing the best stuff. It also demonstrates the necessity of your reading RADIO AGE regularly if you "want to keep up with the crowd." Thank you, Mr. Wootten, for the kind interest shown in the matter. When we find that our articles and information can make a fellow react sufficiently to take the time to write us a letter we know it must have hit the right spot.

RADIO AGE,
Gentlemen:

On Labor Day I constructed a Cockaday four-circuit tuner as shown in your August number and up to last night have caught the following stations: KSD—St. Louis, PWX—Havana, WDAF—Kansas City, WDAP—Chicago, WFAA—Dallas, WGM—Atlanta, WGR—Buffalo, WHAS—Louisville, WHB—Kansas City, WJAZ—Chicago, WLAG—Minneapolis, WLW—Cincinnati, WMC—Memphis, WOAW—Omaha, WOC—Davenport, WOS—Jefferson City, WSAI—Cincinnati, WSB—Atlanta, WSY—Birmingham, WNAV—Knoxville, WCBD—Zion, and WTAS of Elgin, Ill.

From the above list you will note that I have caught stations whose wave length range from 309 meters (Cincinnati) to 547 meters (St. Louis). All the above were caught with one stage of audio amplification, using WD 11 tube and only 22½ volts on the plate of the amplifier.

Last winter I built several Reinartz sets and have had very good success with them all but I believe that the four-circuit tuner is superior to any. WMC (Memphis) is a very strong station, located not over two miles from my home, but I can tune them out and when I say tune them out, I mean that I don't get even a slight whisper from them. Am going to add another stage of audio frequency to my set and expect to get some real pleasure out of it this winter.

The Cockaday circuit is extremely simple to make, and not very expensive, and it has a Reinartz circuit beat a hun-

dred ways for simplicity of operation.

Yours very truly,
FRANK A. FLECKENSTEIN.
Memphis, Tenn.

What do you say to that, you fellows with Reinartz sets? We know that the Reinartz is a mighty good circuit, and is hard to beat, but Mr. Fleckenstein backs up his contention with a pretty good list of stations heard. What about the Kopprasch, fellows? Can you beat this Cockaday record of hearing as many stations in the period of time Mr. Fleckenstein heard (from the third to the twelfth of September)? Let's have your lists.

By golly—here's a letter from George W. Jeffers, of Pennsgrove, New Jersey. He's the fellow who wrote us all about his experiences with the Kaufmann circuit. Wonder what he's got to say. We printed his letter in RADIO AGE, and he probably didn't like it.

RADIO AGE.

Dear Sirs:

I see by the last issue of the RADIO AGE that you did everything but print my picture in the Kaufmann matter. I don't remember, but I think I stated in my last bunch of chatter that you could certainly pick the good things. I have built to date according to your specifications and illustrations, the following sets for my own personal use, and think that you will probably be interested in knowing what I think of them.

The Reinartz is a world beater; the Cockaday four-circuit very good; the Kopprasch was playing with this outfit about thirty minutes the other night and it brought stations in so fast that I could not log them. I told you all about the Kaufmann some time ago. It surely is a fine circuit, and then the little Erla reflex. I had the night off last night and went "fishing" around with the set, and caught the following:

WJAR, WMAF, WBZ, WGY, WEA, F,
(Continued on page 38.)

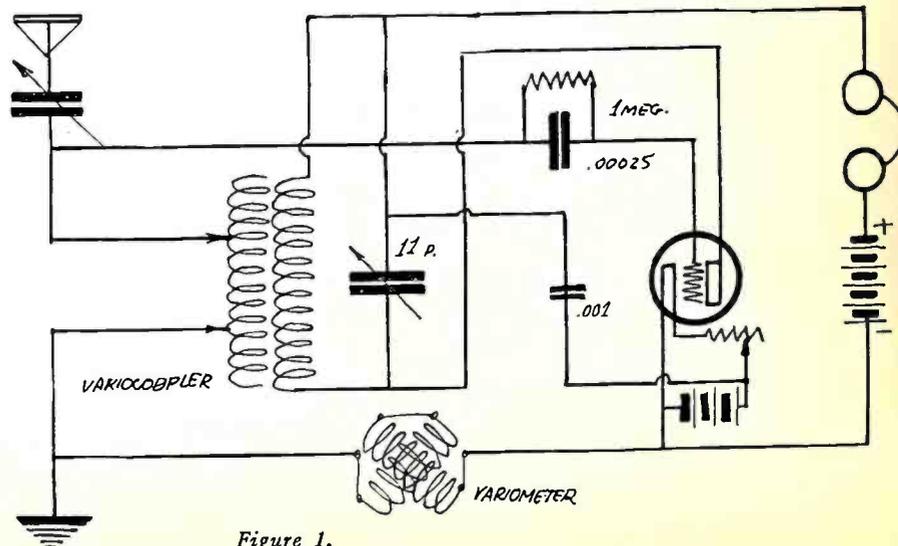


Figure 1.

Little Things That Help

Plate Battery Adjustment

THERE are times when tubes operate more efficiently on higher or lower plate voltages than specified, and often the matter of the addition of one or two volts is hard to accomplish when block B batteries are used.

A set may bring in the carrier wave of some long-distance station, but difficulty may be experienced in bringing the set up to the oscillating point without the tube "spilling" over, and starting to oscillate, distorting the signal, and often requiring tedious and painstaking tuning. The filament voltage may be decreased to a point where the set stops oscillating, and signal disappears with the click, and if the amount of resistance in the filament circuit is decreased the click is again heard, and the set begins to oscillate again without bringing in the voice or music.

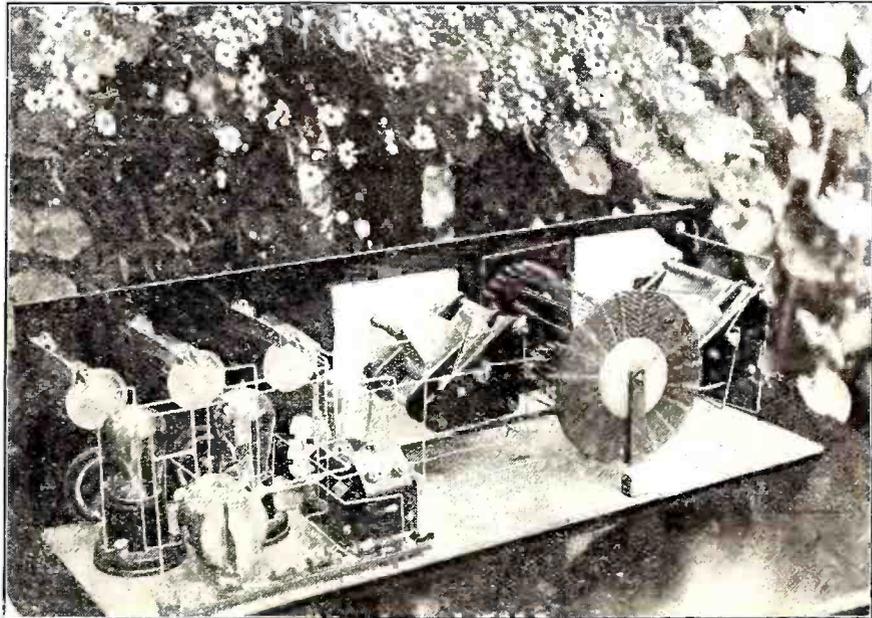
If this is experienced usually a decrease in plate battery will compensate for the difficulty, and the signal will usually come in strong and clear with a decrease of two to four volts in the plate circuit of the detector. However, it is sometimes the opposite, and the tube will not function efficiently with only 22½ volts, and requires an additional amount of plate voltage. If your tube is a hard one, and fails to oscillate, the best way to make it do so, is to procure another 22½ volt battery or about five flashlight cells, and add them in the manner shown in Figure 1. In this manner close adjustment of the plate voltage is effected, with the gain of proper efficiency from the tube.

Flewelling

Radio Age:

What has become of all the Flewelling enthusiasts? From local observation it seems that most of the fans are disgusted with the set. Until a few days ago I was among this class, but since I had the coils and a WD 11 tube and a 23-plate condenser lying around the house I made up my mind that I would give it another chance, so I went to a regular radio store and got three of the .006 condensers such as are mounted on the CRL grid leak and condenser and a ½ meg. grid leak, one of those capsular looking ones and a CRL condenser with the grid leak attached, and a new dry cell. Went home and hooked the set up in about two hours and was listening to Chicago stations at 9:30 p. m. and the following evening I heard the same Chicago stations, the Drake and the Edgewater as well as WOAW at Omaha.

The hook-up that I used may be the same as any other hook-up in circulation for this set, but it was one of the number of hook-ups given out by the Charles Freshman Company, and is just a circular, advertising the parts that they manufacture for the particular set.



How to Lay Out That Reinartz Panel

THE accompanying photograph is an ideal arrangement of apparatus for the Reinartz set, and we are printing the layout because it shows clearly the mounting, shielding and arrangement of parts used in the Reinartz. The set is the property of Fred C. Meynert, of 4914 Waveland Avenue, Chicago, Ill., who hears many long-distance stations.

All of the tuning controls are placed

at the left-hand side of the panel, and are shielded carefully with tin foil, fastened to the panel with shellac. Note especially how the transformers are placed at right angles to reduce inductive effects.

A Bradleystat is used in the first stage to facilitate close filament control on the detector. One of the novel features of the set is the placing of the binding posts on the back of the mounting board as shown.

Primary Condensers on AF Transformers

IN AN oscillating detector circuit the capacity of the telephone cords (which is of the order of 75 MMF.) is often sufficient to by-pass the radio frequency current around the high inductance of the phones, but when the primary of an amplifying transformer is substituted for the phones, it should be shunted with a condenser of a few hundred micromicrofarads or more.

Ultra Audion Coil

Further tests with the Ultra Audion circuit, described and illustrated in the October number of RADIO AGE, indicate that a spider web coil, with 75 turns, will produce better results than can be obtained from the honeycomb coil, as shown in the illustration last month.

Ratification has been made of the contract between the French Compagnie General de Telegraphie Sans Fil and the Russian Radio Electric Trust, according to cable advices from Trade Commissioner Butler, at Paris. The Agreement provides for the installation of wireless stations and manufacture of apparatus in Russia.

I have my set on the second floor and the lead-in wire is about fifty feet long and the ground wire is about the same length; my aerial is a four-wire flat top, fifty feet long. I have but one binding post on the set and that is where one would ordinarily connect the aerial, I have no binding post for a ground connection, and find that on local stations the tube is taxed to its fullest capacity by connecting both the aerial and ground to this one binding post, though excellent results are obtained with either aerial or ground singly or with a piece of wire, thrown on the floor about six or eight feet long. On long distance stations I find that the best results are obtained by using only the ground wire. I am using the WD 11 tube with a single dry cell and use only 16½ to 18½ volts of B battery on the distant stations, but the B battery voltage can be increased on the local stations.

I thought, perhaps, some of the fans would be interested to know that this circuit will really give wonderful results if high-class equipment is used and care is taken in wiring.

Yours very truly,
G. F. McCULLOUGH,

451 Fillmore Street, N. E., Minneapolis, Minn.

The Auditory Method of Learning the Radio Code

By FELIX ANDERSON

Technical Assistant, Radio Age and Kendall North, Radio 9BDL.

WE PRESENT herewith the means of getting the very most out of that receiver of yours. The authors explain in a series of two articles the fundamental steps in learning the radio code, how to avoid doing the wrong things, and outline a series of steps for the novice to follow in the process of learning to copy. The system described utilizes a procedure widely different from the customary memory or visual systems, inasmuch as it appeals to the faculties of hearing and the ability to write instead of seeing and saying it. You can acquire this fascinating branch of radio in a remarkably short time and considering the pleasure and benefits it affords, it is certainly worth while to know it.

Before we go any further let's get on a sound basis. Those who are interested exclusively in programs and entertainment over the radio, raise their hands. . . . Now those who raised their hands pass on to the next article, as these lessons will not interest them.

We assume that the fellows who didn't pass on to the next article are interested in experimenting and improving themselves and their sets to the *n*th degree, and are interested in getting as much as possible out of their efforts applied to radio. We don't want to waste your time so before we go any deeper into this matter we want to assume the correct attitude toward this new attempt, and we will tell you quite frankly that you won't realize much out of code and copying unless you apply some real honest-to-goodness interest at the start. After you have mastered the first obstacles you will find that it is only a matter of your spending the time to reap the benefits. You will find new phases of the game open to you, that you never dreamed you could command.

You'll have to admit that you are one of those fellows who listens to about one-half of a number of a program from some DX broadcast station, and after getting the call and putting it down with all the accompanying thrills, you start all over again and "fish" around for more distant stations, more calls, and look for greater and more thrills. The better the receiver works, the more programs you hear, and the shorter the program, the more stations you put down. Isn't that so? We've heard some fellows cuss and fume at some announcer and performer for not announcing oftener, and for not making their renditions shorter. Probably you are the very fellow we mean.

Summing it all up, your entire interest seems to be centered upon the call of the station, and not upon what the station is broadcasting.

You are just the fellow who ought to learn the code.

Sound Chart of Radio Code			
SOUND	LETTER	SOUND	LETTER
dit.....	E	di di DAH DAH DAH	2
di dit.....	I	di di DAH dit.....	F
di di dit.....	S	DAH di DAH.....	K
di di di dit.....	H	DAH di DAH dit.....	C
di di di di dit.....	5	DAH di DAH DAH.....	Y
DAH.....	T	DAH DAH di DAH.....	Q
DAH DAH.....	M	di DAH dit.....	R
DAH DAH DAH.....	O	di di di DAH.....	V
DAHAHAHAHAH.....	O (Zero*)	DAH di di DAH.....	X
di DAH.....	A	DAH DAH di dit.....	Z
di DAH DAH.....	W	di di di DAH DAH.....	3
di DAH DAH DAH.....	J	di di di DAH.....	4
di DAH DAH DAH DAH.....	1	DAH di di di dit.....	6
DAH dit.....	N	DAH DAH di di dit.....	7
DAH DAH (dit.....	G	DAH DAH DAH di dit.....	8
DAH DAH DAH DAH.....		DAH di di di DAH.....	BK
dit.....	9	di di DAH DAH di dit.....	? mark
di DAH DAH dit.....	P	DAH DAH di dit DAH.....	
di DAH di dit.....	L	DAH.....	! point**
DAH di dit.....	D	di dit di dit di dit.....	Period
DAH di di dit.....	B	DAH di DAH di DAH.....	Attention
di di DAH.....	U		

*Zero is sometimes sent as 5 DAHS.
**Also used as method of expressing laughter.

You probably don't think that listening to code signals can afford much pleasure and entertainment, but just for an experiment, let's sit down in front of that receiving set of yours, and tune it down to about 185 meters. You say surely—that's where you hear the code; it's about the most meaningless bedlam of dots and dashes you ever heard, and means about as much to you as a wooden leg to a marathon dancer. You never give the matter thought except when the code-senders interfere with your reception of BC signals. Single one of those fellows out, and let's copy him. You'll probably hear something like this:

2BGF 2BGF 2BGF de 7ZV 7ZV 7ZV
GE MSGS ER QSR? 2BGF de 7ZV k.

What does all this mean? Let's decode it into plain American language. That's station 7ZV, somewhere up in the western part of the state, talking to another amateur on the Atlantic seaboard. 7ZV is calling 2BGF, greeting him good evening, telling him that he has messages and wants to know if 2BGF won't relay them for him. The k on the end of the transmission is the invitation to send. In all probability you didn't think that you could hear so far with your receiver, and are astonished at hearing this distance, but when one considers that to a little over seven hundred broadcast stations transmitting over a wide range of waves, there are more than ten thousand active amateur stations being operated over a wave band of from 150 to 200 meters, the matter begins to seem plausible. Your chances for distance on code signals versus broadcast signals are about three times as great.

It is not necessary to restrict oneself to amateur code signals. The reader can load his set up to 600 meters or higher and receive ships, naval stations, foreign and domestic commercial stations as well as the high-powered long-wave government stations maintained all over the world. You can copy press and news dispatches France, South America and if your set is working well, even Dutch Java is possible. And there is also the much sought thrill of hearing the world-silencing cry, S O S, from some unfortunate ship.

After you have learned the code sufficiently well, you can apply for a license, and enter the transmitting game, with its manifold pleasures and its unlimited entertainment.

What we started out to tell you about was how to learn the code, and we regret to say that space does not allow us to tell you about the thrills and entertainment furnished by reception of code signals from ships, Polar expeditions, naval stations all over the world, hearing press reports, distress signals and amateur traffic and we feel sure that learning the code will hold as much for you as it did for us.

Getting back to the original theme, we want to tell you of the methods *not* to use in learning the code.

About the worst thing you can do is to take a code chart and sit down and tediously memorize it visually. The point is this. You don't sit down in front of a receiver with the head set on and see the signals—you hear them. When you hear them you don't say dot, dash, or equivalent—you write them down. If

(Continued on page 32.)

Schenectady Gives the English a "Kick"

TWENTY-ONE English radio fans have written WGY, the General Electric Company broadcasting station, announcing successful reception of the Schenectady station's program during the first week in September. WGY and other American stations have been heard frequently by the English fans but trans-Atlantic transmission is rather unusual at this period of the year.

Many of the writers compare WGY with the transmitting stations in England and on the continent and a majority of them refer to programs broadcast September 6 and 8. W. E. Philpott of Rye, Sussex, England, picked up WGY in the early morning of September 1. He writes: "I was rather 'bucked' up with the results. Congratulations on the fine modulation. You were quite equal to Birmingham and Manchester."

Henry Meyers, of Low Fell, Durham, England, heard WGY and writes: "For consistent strength and clarity the concert came through much better than I get the London transmission."

J. Rhodes writing from Leeds, Yorkshire, England, said WGY was as "clear as Manchester, forty miles away."

The report of H. L. Holt, of Manchester, England, is especially interesting inasmuch as he received WGY on an indoor aerial. He writes:

"The apparatus I was using consists of an indoor aerial across the kiddies' bedroom and the ordinary detector and

one stage of low frequency. The aerial is just a length of bell wire stretched backwards and forwards across the room in the form of a W and a V and then through the floor to the living room below the set. The tuner is just an ordinary single circuit regenerative one."

Reception on a loud speaker strong enough to wake a person sleeping upstairs with bedroom door shut, is report-

ed by T. Hall Felton of Grimsby, England. Mr. Felton was listening in with his father, Dr. E. H. Felton, who is vice-president of the Grimsby District Radio Society. He has a five valve (tube) experimental set. "On two high frequency valves," he writes, "you are as loud as the English stations on three valves. In operating the loud speaker five valves were used." Mr. Felton

the name of a hymn. In place of the name he wrote a portion of the melody in musical notation. This was recognized and it checked perfectly with the WGY station log.

It would appear from the letter of Gilbert Davis, of Magheramorne, via Belfast, Ireland, that American broadcasting stations threaten to cause violation of law in Ireland. Mr. Davis

writes: "I can get your music any evening but your speech only when X's are fairly quiet. Your transmission is far better than any in Paris or The Hague. Owing to my set having only three valves (one detector, one high frequency and one amplifier) most of my friends are very doubtful as to my getting you, and as 'curfew at 12' exists still over here and I cannot let my friends listen in for themselves."

In addition to the letters received from Great Britain, WGY received letters from E. M. Bacigalupi, of Hilliard, Washington, Chris Maginn, Jr., of Aberdeen, Wash., and Paul Bernier, of Shaunavon, Saskatchewan, mentioning reception of the program of Sept. 8.

Drama at WGY

The WGY Players opened their second season (1923-1924) at the General Electric Company broadcasting studio, Schenectady, Thursday night, October 4. The play was "Three Live Ghosts." During the previous season, forty-three plays were presented. Plans for the new season include the acting of one play

weekly. As a result of the receipt of over 6,000 letters, over a four-day period, "The Sign of the Cross" will be repeated. Among the other productions planned will be a special adaptation of "County Fair," by Neill Burgess.

Several new features will figure in the 1923-1924 season. Plays selected from those written especially for radio as a

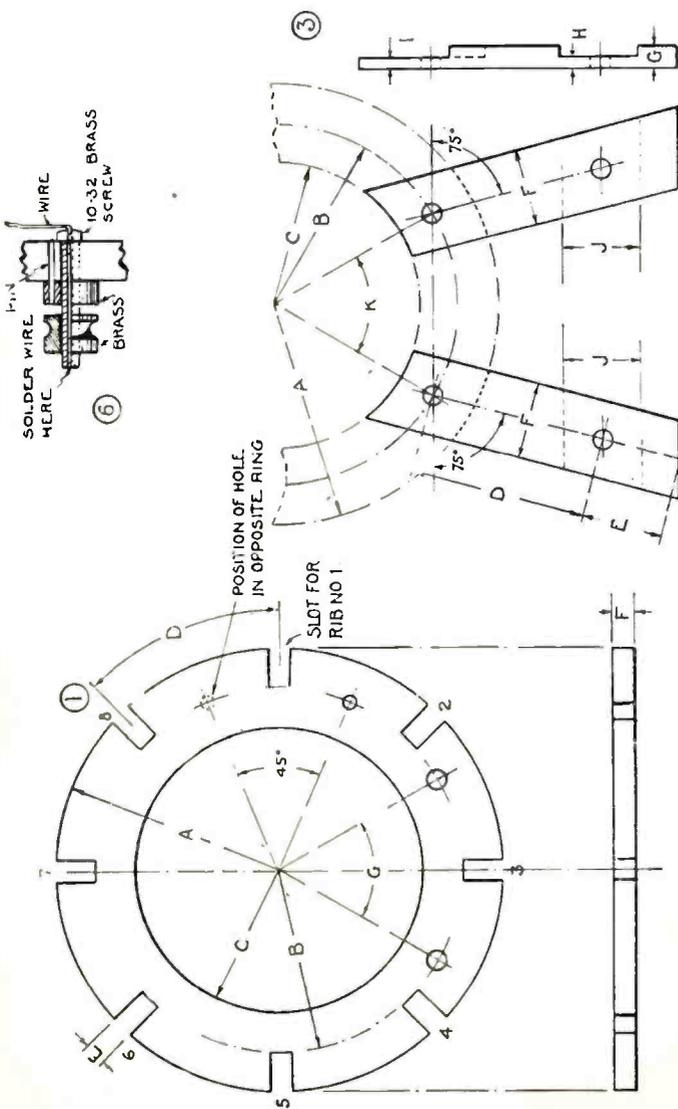
(Continued on page 38)



Dr. Charles P. Steinmetz, peer of electrical wizards, photographed for RADIO AGE at the LaSalle Street railroad station, Chicago, on October 11. The great engineer was on his way to Schenectady from the West, where he had been enjoying a rare vacation trip. He is chief engineer of the General Electric Company. Radio fans hold the little gentleman almost in reverence because of his vast knowledge of the mysteries of wireless.

picked up WGY on September 4, 6 and 8.

H. Constable, of London, heard speech and music on September 1. "At 5:23 a. m. I heard your station working and easily got your speech and music on a small loud speaker. I got you comfortably on one high frequency and one detector valve and with two note magnifiers worked the loud speaker." Mr. Constable sent in a log but failed to get



FRAMEWORK - INSULATING MATERIAL THROUGHOUT

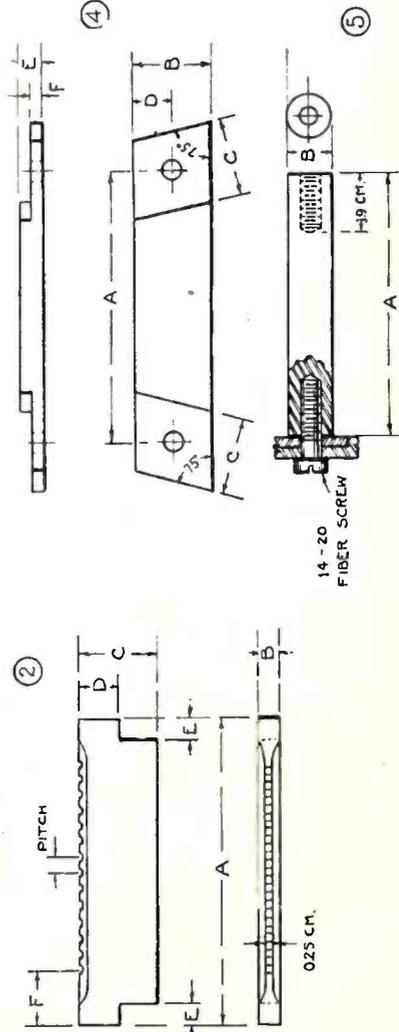


FIG. 2.- WORKING DIMENSIONS FOR PARTS OF INDUCTANCE COIL FRAMEWORKS.

FRAMEWORK FOR GROUP I

COIL NO.	PITCH	DIMENSIONS IN CENTIMETERS										
SYM.	NO.	A	B	C	D	E	F	G	H	I	J	K
1	2	6.24	5.12	4.01	4.5	0.64	0.95	5.9	5	5	5	5
2	2	8.71	0.94	2.22	1.11	0.95	1.95					
3	2	6.75	5.12	4.01	4.92	2.05	2.2	0.95	0.48	0.48	0.48	2.23
4	2	6.75	5.12	4.01	4.92	2.05	2.2	0.95	0.48	0.48	0.48	2.23
5	2	7.58	2.22	2.22	2.11	0.95	0.48					

FRAMEWORK FOR GROUP II

COIL NO.	PITCH	DIMENSIONS IN CENTIMETERS										
SYM.	NO.	A	B	C	D	E	F	G	H	I	J	K
1	2	6.32	7.05	5.78	4.5	0.64	0.95	6.15				
2	2	0.64	2.54	1.27	0.95	1.95						
3	2	8.32	7.05	5.78	5.72	2.29	2.54	0.95	0.48	0.48	0.48	2.55
4	2	8.32	7.05	5.78	5.72	2.29	2.54	0.95	0.48	0.48	0.48	2.55
5	2	10.19	2.54	2.54	1.27	0.95	0.48					

* GIVEN ABOVE

FRAMEWORK FOR GROUP III

COIL NO.	PITCH	DIMENSIONS IN CENTIMETERS										
SYM.	NO.	A	B	C	D	E	F	G	H	I	J	K
1	2	12.0	10.41	8.63	3.0	0.64	0.95	8.05				
2	2	0.64	3.18	1.59	0.95	1.95						
3	2	12.0	10.41	8.63	8.38	2.71	3.18	0.95	0.48	0.48	0.48	3.18
4	2	12.0	10.41	8.63	8.38	2.71	3.18	0.95	0.48	0.48	0.48	3.18
5	2	17.63	3.18	3.18	1.59	0.95	0.48					

* GIVEN ABOVE

FRAMEWORK FOR GROUP IV

COIL NO.	PITCH	DIMENSIONS IN CENTIMETERS										
SYM.	NO.	A	B	C	D	E	F	G	H	I	J	K
1	2	15.26	14.27	12.60	3.0	0.64	0.95	7.6				
2	2	0.64	3.18	1.59	0.95	1.95						
3	2	15.26	14.27	12.60	9.53	3.28	3.18	0.95	0.48	0.48	0.48	3.18
4	2	15.26	14.27	12.60	9.53	3.28	3.18	0.95	0.48	0.48	0.48	3.18
5	2	22.43	3.18	3.18	1.59	0.95	0.48					

* GIVEN ABOVE

FRAMEWORK FOR GROUP V

COIL NO.	PITCH	DIMENSIONS IN CENTIMETERS										
SYM.	NO.	A	B	C	D	E	F	G	H	I	J	K
1	2	20.24	18.33	16.43	2.2	0.64	0.95	7.6				
2	2	0.64	3.18	1.59	0.95	1.95						
3	2	20.24	18.33	16.43	11.94	3.96	3.61	0.95	0.48	0.48	0.48	3.62
4	2	20.24	18.33	16.43	11.94	3.96	3.61	0.95	0.48	0.48	0.48	3.62
5	2	28.0	3.61	3.61	1.91	0.95	0.48					

* GIVEN ABOVE

\$4,000,000 for Radio

Schenectady, N. Y.—Six radio transmitters, to be the most powerful on the American continent, operating from vacuum tubes and first to make use of the General Electric twenty-kilowatt radiotron, are being installed by the United Fruit company and the Tropical Radio Telegraph company at points in Central America and the United States for the purpose of completing the links of an adequate communication system between the Americas.

These transmitters will be located at: New Orleans, Miami, Puerto, Barrios, Guatemala, Tegucigalpa, Honduras, Managua, Nicaragua and Almirante, Panama.

The Tropical Radio company operates the stations at New Orleans, Miami, Tegucigalpa and Managua, while the stations at Puerto Barrios and Almirante are operated by the United Fruit company.

The first of these six sets ordered by the Radio corporation for the United Fruit company has just been completed at the Schenectady works of the General Electric company, and will be shipped within a few days to the Teg-

ucigalpa station. The other five are scheduled to be completed and shipped at the rate of one a month, and, as about two months will be required to install each set, it is expected all six will be in operation by the middle of next year.

The United Fruit company established the first radio stations in Central America and was the first to establish commercial radio communication between Central America and the United States. It was shortly after the international yacht races off Sandy Hook had been reported by radio that the first sending and receiving sets were purchased and installed at Port Limon, Costa Rica, and Bocas del Toro, Panama. This was in 1904 and service was inaugurated the following year.

The operation of these two stations convinced the directors of the United Fruit company that radio was practical and valuable in a business which handled such a highly perishable product as the banana. So the year following, or 1906, stations were opened at Bluefields and Rama, Nicaragua.

All these stations, because of the lack of land communications, handled in addition to the company's business a large share of the telegraph business of the general public between these places and the United States and Europe. Other stations have followed since then until now, with the six new tube transmitter stations, there will be a total of nineteen, comprising what is known as the United Fruit company's radio system.

No wonder General James G. Harbord was interested when he found a radio set at the New York show, which had been captured from the Germans at Chateau Thierry. The General was there in 1918 and it was the American outfit, part of which was under his command, that finally gained a victory over the Kaiser's picked forces. General Harbord is now president of the Radio Corporation of America.

(Kadel & Herbert, Foto)



The United Fruit company has spent more than \$3,000,000 in the development of its radio system and upon the completion of new stations under construction its investment in radio probably will exceed \$4,000,000.

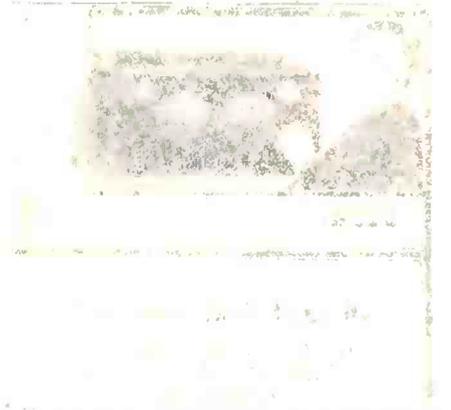
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If you have not bought your Rehnartz Book, fully illustrated with hook-ups and clear description of how to make this popular circuit, send \$2.00 in money order or currency and we will send you the booklet "Rehnartz Radio" and place you on the subscription list of Radio Age for one year. Address Radio Age, 500 N Dearborn Street, Chicago, Ill.

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Don't let Body Capacity interfere. Use our pane shielding which is applied to any set in five minutes without removing instruments. Price 35c. H. & M. Specialty Co., Box 66, Brighton, Mass.

If your newsdealer has sold out his supply of Radio Age you are likely to miss just the hook-up that you have been looking for. To avoid any such chance fill out the coupon in this issue and send in your subscription. Then you will be safe. And don't forget that with each subscription at the special price of \$2.00 a year, or \$1.00 for six months, we send you free the popular Rehnartz Radio booklet FREE. Address Radio Age, 500 N. Dearborn Street, Chicago, Ill.

Learning the Radio Code

(Continued from page 22.)

you visualize the code, it will only mean that you have wasted your time, and that you will have to start all over again. Don't do it! That's just about the way the average beginner gets started on code copying, and that probably accounts for some of the rotten copying (called "hogwash" by real amateurs) and it also will testify to some of the terrible sending and spacing (called "fist" and QSC by amateurs) one hears on the air sometimes.

We've seen several code system teaching charts ranging, some pretty high, some fair, and others absolutely worthless. Most of them appeal to the beginner's ability to remember a jumble of words, and as a rule with few exceptions end up in a jumble. The beginner tries to remember a whole lot of word combinations, and when it comes to copying, he finds it doesn't apply, and becoming

for if the letter C is sent poorly with improper accent, the receiver will hear n n, and if the sense of the copy he is making will not prompt him to change it, an error will result. The code is just full of these little possibilities for error, and it will be a wise move to get the accent of the individual dashes and dots fixed in mind so that trouble may be avoided later in copying.

The next step will be for you to get down to the actual business of training yourself to recognize these combinations of accented DAHS and less accented Dits as letters, and to train yourself to write the correct letter or number down when a certain sound or combination of sounds is heard.

Get a piece of paper and a pencil, sit down with the idea firmly set in mind that you are going to learn something if you never did before and with this chart do the following:

1. Run through the list of code sounds, paying no attention to what letters they are, at a moderate speed, to familiarize yourself at saying the sounds and the various combinations of sounds as they appear. Don't pay any attention to the letters—that will come later. Remember—ACCENT THE DAHS!

2. After you have satisfied yourself that you have the sounds and accents correct, take your pencil and say "dit," writing down the letter E on the paper, next di dit, writing I, di di dit, writing S and so on down the list. Don't say the letters corresponding to the sounds out loud—write them down, because that's what you are going to do when you hear them later. When you hear di di dit, you won't say S out loud—you'll write it down on a piece of paper.

3. Do the same way with the DAH, DAH DAH, DAH DAH DAH (TMO) group and right on down the chart until you have the combinations of sounds firmly fixed in mind. The chart is arranged in the grouping according to the similar sounds to facilitate the learning of the respective letters, and also to avoid the customary fault of learning the ABCDE end of the code very well and neglecting the XYZ and number end of the alphabet.

After you have made sure that you are familiar with each letter and number of the code alphabet as shown on the chart, spell out simple words such as radio, message, received, etc., in code form using the dah dit sounds. If you are at home or in private, you can spell them out softly to yourself, if not, you can spell it out mentally. You can think out the words in code any place, no matter where you are, but bear in mind that you must concentrate on what word you are sending to yourself, so that when the mind received a certain accent or sound it will automatically substitute (or rather register) the corresponding letter of the alphabet.

After you have become more familiar with the code you will find that this comes

without thinking—it becomes almost another sense, and you find you will find yourself associating different sounds you come in hearing range of, with code letters. It will probably arouse the humor of our readers when we say that the code has gotten so thoroughly into our systems that when walking along the street, we quite frequently find ourselves decoding mentally the various sounds as they issue from nearby automobile horns, inasmuch as they sound so much like code signals. But this is only an illustration to show how the reading and decoding of sounds becomes a part of your subconscious self, and the only way you can make it come to you without thinking, is to literally form a habit of thinking of the letters of the alphabet in the sense of sounds instead of a sort of mental vision of the letter when it is issued. You will be able to see this point more clearly as you proceed with the business of learning; as you keep on practicing, you will find that this understanding the code and recognizing the various letters state is creeping back into your head, and you begin to feel that they become part of you.

We might suggest that a good cure for insomnia is this business of learning the code. Try it some night when you can't go to sleep. Say different code letters, and different words in code, and see how quickly it takes your mind off worldly affairs, and makes a veritable machine out of you, busy at mentally registering and reflexing impulses of thought. Eventually, code will get you just as one of those songs you can't erase from your mind. The reader will probably recall that at some time there was some little ditty or tune that he couldn't get out of his head. The reason for it can be explained by the fact that it was sung mentally and out loud so often that before really realizing it, it is sung without any thought on the part of the singer. That's just about the way the code should affect you. You practice it until it comes without thinking. It becomes a part of your subconscious mind.

In concluding this installment, we want to impress upon our readers the necessity of learning every character shown on the chart—we have compiled it from actual experience in the code game, and know what you are expected to copy, and have not put any unnecessary letters or numbers or abbreviations on the chart, and we also wish to make clear the necessity of regular practice on this sound principle, if you wish to learn code. You have got to keep your mind constantly reminded at reasonable intervals of the the code letters and sounds, if you want to learn it within a reasonable length of time, and in closing we want to give you a few pointers on the best way to go about it:

1. Practice at least fifteen minutes a day or more *conscientiously* if you want to get results. The less time you spend on learning the code the longer it will take you to acquire speed.

and how they sound when heard over the air through the receivers.

About the easiest way to imitate a code letter is to resort to the old, baby saying of DAH. This sound will just about imitate the letter T in code as it is transmitted from a high power spark set, and represents the dash element in code letters. The only other and important sound heard over the air in code is the dot which can be very well represented by the sound DI, sounding the I short, as in "it." By sounding DI you have the equivalent sound transmitted for the letter E. This sound when combined with the sound DI thusly: DAH dit (the t is added for easier enunciation) gives the letter N in radio code. Reversed thusly: di DAH (accenting in both cases the DAH) will give the sound one hears when the letter A is transmitted.

The dashes being three times as long as the dots (the DAH sound representing the dashes) must necessarily be accented, and the di sound should be made as short as possible to preserve the correct accent of the code character, in order that it may be easily recognized. The necessity of getting the DAH sound accented is demonstrated in the case of the letters C and N. If the dashes (DAHS) are not accented properly when the letter C is transmitted, the combination N N will result, whereas if the dashes are given the proper time duration and accent, the letter C will be sent properly. This applies to both receiving and transmitting,

2. Go about it with the idea in mind that you are learning something that will be useful, and will give you pleasure later.

3. Don't forget to accent the DAHS.

Practice on what we've given you until the next issue of RADIO AGE, when we will tell you just how and the best way to go about beginning to copy the amateur and other code signals; what systems the radio operators use in calling and talking to each other, and some of the abbreviations used over the air in radio code. Don't try to copy the code coming through the air until we tell you how—radio operators talk in a language almost their own, and you won't get any sense out of it. Watch for our instructions next month on how to handle the key, when we will tell you how to send properly, so that the most experienced operator will tell you that your fist is not "rotten." If you're with us, you are going to learn the code.

(Note—Another interesting installment on how to copy code signals will be printed in the next issue of RADIO AGE. Don't miss it.—The Editor.)

Greatest Show

Manager James F. Kerr was one of the visitors in New York during the radio exposition at the Grand Central there and he made a study of exhibits and show methods that will assist in putting on the big radio show which is to be held in Chicago at the Coliseum, beginning November 20. It is predicted by those in touch with the arrangements for this exposition that it will be the greatest ever held west of New York and it is likely to draw even greater crowds than attended the eastern exhibition.

Already entered in the prize contests for the most novel and for the best built homemade receiving sets are crystal detectors that you can carry in your vest pocket or under your hat; sets that are made from a handful of bailing wire, a few hairpins and a couple of tin cans; super-heterodynes with their nine and eleven tubes and a radius that takes in Ireland and Yap, sets that you can put on the horn of a cow so bossy will be entertained while the handsome dairy maid extracts the lacteal fluid.

There will be small sets concealed in dolls and woolly bears so that when baby is put to bed with her pet toy in her arms she can be lulled to sleep by the bedtime stories, or by a lecture on how hydro-electric power, properly distributed, will be the salvation of the farmer.

In the contest for novel sets, which is confined to school pupils in Cook County, the entries are limited to crystal and one-tube sets. For the best homemade set anything goes, and this contest has already brought entries from as far east as New Jersey and as far west as California.

The amateur sets will not have any monopoly of the novelty features, as middle west manufacturers are rushing through designs and patents for improvements and for new apparatus

which will be exhibited for the first time at the Chicago show. Word from the New York show was that there was a dearth of new ideas there. That will not be the case here, it is declared.

Just one of the many big features of the manufacturers' exhibit section will be the new apparatus which is now being designed by E. T. Flewelling for the Buell Manufacturing Company of Chicago. H. H. Frost, who has taken the largest exhibition space in the show, will also have on exhibit for the first time some new ideas in radio.

Receiving Condensers

THE value of a good condenser in a receiving set is not always fully appreciated. The dielectric losses of a condenser are equivalent to adding a series resistance in the oscillating circuit. To add a series resistance in an oscillating circuit means loss of energy, with corresponding broadened tuning, and diminished signal strength. It is important that the losses in condensers be kept low.

In good condensers these losses are kept low by using only a high grade hard rubber for the solid dielectric. They are further diminished by using only a small quantity of this dielectric, and so placing it with respect to the electrostatic field that the dielectric hysteresis losses are kept at a minimum.

Don't buy a condenser that is constructed using a lot of insulation, and be careful to see that the insulation is not moulded mud.

If your newsdealer has sold out his supply of Radio Age you are likely to miss just the hook-up that you have been looking for. To avoid any such chance fill out the coupon in this issue and send in your subscription. Then you will be safe. And don't forget that with each subscription at the special price of \$2.00 a year, or \$1.00 for six months, we send you free the popular Reinartz Radio booklet FREE. Address Radio Age, 500 N. Dearborn Street, Chicago, Ill.

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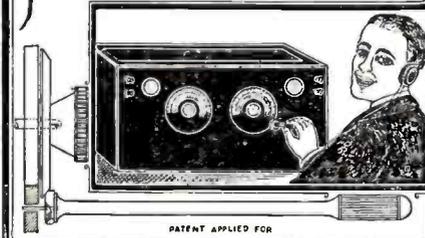
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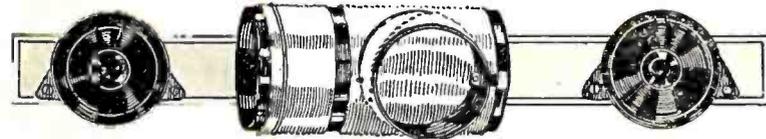
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The Erla Triplex Circuit

MANY of our readers have asked for a description of the new three-tube Erla Reflex circuit which seems to have created a great deal of interest among the fans lately, because of its ability to get the distant stations. The extreme sensitiveness of this set makes it possible to use an inside aerial, or a loop as desired, although much better reception may be obtained by using the former, which may consist of a single strand of wire stretched through the attic, or through several rooms. The principal advantage of the loop is its directional characteristics, which are not needed in the more sensitive reflex arrangement described.

It must be understood that the construction of this set cannot be carried on in a slipshod manner, but if the details given are carefully followed out to the letter, wonderful results may be expected. In this, as in other reflex circuits, the tubes do double duty, and the excellent results obtained are due to the fact that in doing double work, the three tubes will give the equivalent strength of six tubes used in the old way and this in connection with the crystal detector, should give range and selectivity which compares very well with a seven tube set.

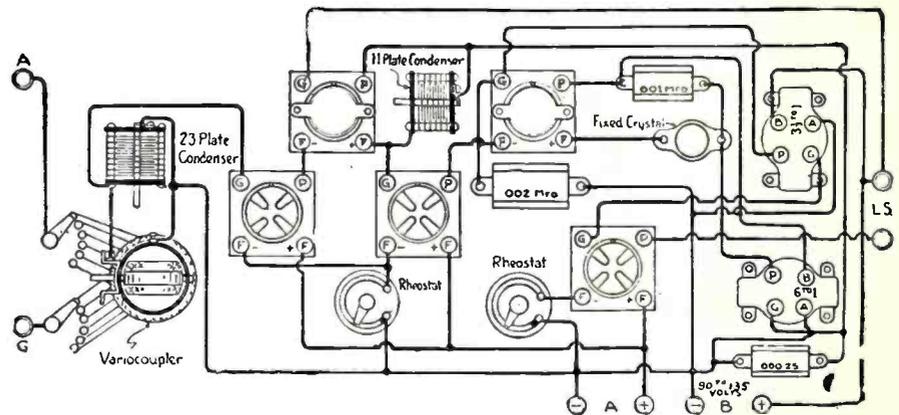
The Triplex circuit shown in the accompanying drawing can be easily traced from start to finish. The aerial is connected to one of the switch levers on the variocoupler, and the ground is connected to the other. The binding posts for the A and B batteries are plainly marked and are shown at the bottom of the drawing. The two posts on the extreme left are to be connected to the loud speaker. It will be noted that five sockets are shown, although only three tubes are used.

The extra sockets are used for mounting the radio frequency transformers, which are made for the purpose, but if other types are used, these extra sockets can be dispensed with, although for the best results, the reflexing transformers shown in the drawing, should be used.

The crystal used is of the fixed type and because of the greatly amplified current which passes through it, will be found to function very well and will never need adjusting. The audio frequency transformers should be of a type known to have the best of reflexing qualities. It must be stated here that all audio frequency transformers will not work in these sets and most of the trouble which one encounters in the construction of reflex sets, is due to this fact.

The values shown for the small fixed condensers must be carefully noted and any change in the capacity used at these different points in the circuit may mean failure. These values have been determined only by careful scientific experimenting and any substitution should be avoided.

The best tubes for this work are the C-301-A or the UV-201-A in the order named. C-299, or UV-199 may be used if desired, but the volume of the reproduction will be somewhat reduced.



Monitor Control

Washington, D. C.—The question of what monitor control is, seems to be worrying a number of radio fans, who try to keep abreast of the rapidly advancing art of radio communication.

Most of them know what remote control is, the expression itself practically indicating the method of operating a distant transmitter by land lines.

Monitor control is a similar method of receiving at a station removed from local electrical interference, and transmitting the signals by land lines to the central office. A radio engineer or expert radio-man stands watch in the distant receiving station and sees to it that the receiving sets are tuned in and functioning properly during the reception of a message.

The Navy monitor control system, now used at San Francisco, San Diego and at the Radio Central in Washington, is a refinement of duplex operation. Three units, instead of one are operated: the transmitting station, the monitor receiving station, and the control or central operating office. This system is employed in the interest of efficient administration, rapidity of service and elimination of errors due to land wire relays, all activities being controlled at administrative headquarters or central office. Headquarters are frequently located where there would be interference from electric power lines or unfavorable atmospheric conditions for radio reception.

To overcome these difficulties, a monitor collecting or receiving station is established at a place free from all electrical disturbance. Signals are there received on overhead antenna or loops, and are impinged through suitable coils, on land wire loops, called "tone channels" composed of two land wire circuits between the monitor and the administration station, where the signals are transferred through suitable coils to the operator's head phones. By this method, operators are relieved of all functions except operating.

A large number of messages for simultaneous transmission and reception, including duplexing, can be handled, at the same time from administration head-

quarters. At San Diego, the monitor station is located at Point Loma, eight miles from district headquarters. All incoming signals are monitored from Point Loma to headquarters. All outgoing signals are sent from headquarters, the operator at headquarters controlling the transmitting key at the high-power transmitting station at Chollas Heights, twelve miles from San Diego by land wire.

The monitor station is located on the roof of the Navy Department in Washington, as little electrical interference in that part of the city is found.

New Coils and Condensers

It may be of interest to our readers to know that the Radio Instruments Company, of Chicago, Ill., is the manufacturer of the Cockaday coils already wound and ready to set up, and is also the manufacturer of seventeen plate condensers, to be used in the four-circuit tuner. The coils are neatly wound, the bank wound in particular. The makers of these coils claim them to be of low distributed capacity, and of close tuning properties.

The condensers embody a new principle in the way of a vernier, inasmuch as they do not use a separate plate for this purpose. This feature is allowed for by a closely adjusted cam, giving variations, which the manufacturer claims is not possible with the usual type. The use of the cam in connection with a special well designed pigtail connection cuts the losses in the condensers down to a minimum.

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Broadcasting Brings New Musical Era

By L. H. Rosenberg

PLANS for both improving Radio Station WBZ and initiating new ideas for broadcasting made by the Westinghouse Electric Company at Springfield, Mass., will make the station distinctive in the field of broadcasting. The new arrangements include radical changes in the method of broadcasting musical recitals and the introduction of lectures that will make the station unique in broadcasting circles.

Springfield is one of the most prominent musical centers of New England and although it is not generally known outside of the community, the number of musically inclined persons is proportionately greater than any other center in the country with the exception of Boston. In the past, the musical programs have been very similar to other radio stations throughout the country. The artists and musicians in the city and vicinity gave varied programs of instrumental and vocal music which brought forth generous applause from the radio fans from near and far.

These musical programs were arranged with due regard to the artist's ability and the needs of the radio station. It was firmly believed that these programs were the proper thing for broadcasting and the many letters received proved this point. As station WBZ was one of the first broadcasting stations in the country—it began operations in September, 1921—it was only natural that some pioneering had to be done.

As time went on, it was observed that although the music was appreciated, something was lacking in the presentation to assure its complete success. It might be stated in passing that after the first novelty of radio wore off, there was a great demand for more popular music. The directors of the station were firm in their belief, however, that a great amount of popular music would not stand the test of time and therefore classical music was made to predominate the program under protest from some of the radio listeners.

This belief in better music was strengthened by the comments that began to come in and the policy of broadcasting only good music was strictly adhered to. In fact, it appeared as if the public had begun to appreciate music and as far as radio was concerned, the demand for popular music had greatly diminished.

It is this condition that now confronts the radio station, and judging from the fans, the present policy could be continued indefinitely. But WBZ thinks that the present methods in their entirety are not adequate to make for permanent broadcasting and it is thus looking into the future, as it were, to anticipate the public's desire.

The public, or that portion of them who before the advent of radio, never heard a classical concert and therefore did not appreciate good music, are now becoming more and more interested in music. Although they are not trained in the art,

they are beginning to appreciate music, and it is the natural feeling that they desire to know more about it.

For this reason, WBZ is planning to give music in such a manner that the public will come to know music. Courses in music, written so the lay public can understand them, will be given with illustrations of the music talked about. In other words, a study of music will be made by the public from both the viewpoint of the composer and the elements of the art with illustrative interpolations.

This will not be done in miscellaneous talks but will be given in a series of lectures that will give the interested radio fan a complete course in music. It is thought that this plan will add a new impetus to radio music by the radio fan and will do much to hold his interest in radio.

It has been the practice of radio stations in the past to allow magazines and other agencies to broadcast miscellaneous material which may or may not be of interest to the radio listener. Most of the material broadcasted was given by persons who had a selfish purpose in giving it. They either wished to advertise themselves or their business. The material that they broadcast was, therefore, more or less indirect advertising and the public was always aware of this fact. They said, however, that is, most of them, that as they were getting the material free of charge that "beggars cannot be choosers" and were satisfied with the broadcasts. The broadcasters have found it rather difficult to make a good selection of the material, and often incorrect statements would slip into these talks.

The speeches by prominent personages, however, always were well received, but the majority of stations were not able to obtain such persons every night in the week.

Therefore, they used material thrust upon them by people wishing to further their own interests often with sad consequence. The matter was inflicted upon the radio audience and many times brought an avalanche of protests. In this connection, however, there is invariably two sides to the story. Every time that some people complain about a broadcast, there are always other persons who praise it. This, it might be said, is one of the main troubles of the broadcasting director. There is always the pro and con to be considered on cases in dispute.

In view of the great number of miscellaneous addresses that are thrust upon the public, it is thought by WBZ that it might be a good idea to go to the other extreme and broadcast only a series of lectures. Heretofore, this policy has been restricted because of the unreliability of radio for distant purposes.

Radio, at this time, surely, should be advanced to such a state that difficulties of interference and nonreception within a reasonable distance from the station,

are not present. If these problems have not been solved to the highest degree, their solution will come more quickly if a definite interest to listen in on certain occasions is manifest.

In view of these conditions Station WBZ intends, for fall and winter broadcasts, to initiate continuous events. This will be done to motivate the program and assure the constant listening in of radio fans within constant hearing distance of the station.

Take, for instance, the course in "The Art of Writing Short Stories." This department will be conducted by Dr. J. Berg Esenwein, of the Home Correspondence School. Dr. Esenwein is well-known throughout the country for his courses in journalism and is considered one of the best authorities on the subject. For a number of years, he was editor of Lippincott's Magazine, which went out of existence shortly after he resigned the editorship. Dr. Esenwein has prepared a series of ten lectures on short story writing which will not be given merely as detached informational talks, but in such a manner that they will have the definite purpose of teaching the listeners interested in the subject. The course will be given at periodic intervals and at the end of the course, radio fans who would try their hand at writing will be invited to submit stories. The best stories that are written along the lines suggested by Dr. Esenwein will receive prizes.

It is thought that this course will maintain interest in the lectures, as there will be a definite goal at the end of the course.

In the same manner it is planned to give courses in economics, psychology, English, literature and many other subjects. Each course will have a definite object and the radio students will receive a reward in college credits or otherwise recompensed.

An arrangement has been made with the Northwestern University, a prominent evening school in New England, whereby these courses will be given by some of the foremost professors of this part of the country; also, arrangements are under way with Massachusetts State Extension Department for courses especially adapted to the interest of women and girls.

Although many of the plans are in the making, a complete system will soon be laid out to fit the needs of a New England broadcasting station to render the best possible service to the radio audience. WBZ is of the opinion that these efforts will bring renewed and continued interest in radio broadcasting. After a few years of experimental broadcasting to try to analyze the needs and desires of the radio fans, it is now time to put the stations of the country on a real utilitarian plan so that the greatest number of people may benefit from the great expenditure of time, money and energy that is being placed on broadcasting.

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Radio on the Rifle Range

By CARL H. BUTMAN

Washington, D. C.—Radio, or its half brother, wired-wireless, will be used very soon on big national rifle ranges between the firing lines and the target pits as a substitute for line telephone systems.

Results of recent Signal Corps tests during the National Rifle matches at Camp Perry, Ohio, have demonstrated that a wired-wireless system will cost only a third the money required to install and operate a regular telephone system. In addition, the new system would last several years longer than the present field telephone service, which usually requires replacement every three years.

On this range with 100 targets, 1,100 men fire in three hours' time, and about seventy-five men, one for each ten targets, were required by the Signal Corps to maintain telephonic communication between the firing points and the butts where the targets and the markers are located. The initial cost of the complicated equipment is approximately \$35,000 and the annual upkeep, including personnel, amounts to about \$11,000. Usually, the whole range from 200 to 1,000 yards, is being fired at the same time. The markers have to pull each target down, find the hit, if there is one, and mark it.

This is done by pasting a paper sticker over the bullet hole, hoisting the target and indicating with one of three large disk markers where and what the hit was. When the men fail to so mark a target, believed to have been hit, the range officer has to call up the proper pit on one of several phone lines and order the target re-examined and marked. It is easy to see that this entails considerable bell-ringing, answering and conversation over regulation phone circuits.

The new system planned and laid out by Captain H. W. Webber, of the Signal Corps, eliminates considerable time, work and complication. With a field radio transmitting set, five loud speaker receivers and a little wire, he conducted a most satisfactory test for the National Rifle Association and the army at Camp Perry during the last days of the recent matches.

When a target was not pulled down, he spoke into the transmitter on the firing-line, saying, for example, "Mark 21," or "Mark 67," which would be at least 200 feet from No. 21. All along the line of pits the five loud speakers announced his order, and No. 21 or No. 67 came down and was marked promptly. Those in the pits not concerned with the numbers called paid no attention.

The cost of a wired-wireless system to replace the almost worn out equipment at Camp Perry is placed at \$12,000, and the maintenance with about twenty-five men is estimated at about \$4,000, for the period of the national rifle matches. These figures, while estimates only, show an initial saving of \$23,000 in equipment and about \$7,000 for labor, not to men-

tion far longer life of the wired-wireless equipment and the ease of putting it up and taking it down in the severe winter months when the range is closed.

Pick-Ups of Hook-Ups

(Continued from page 20.)

KDKA, WIP, WOO, WFI, WJAR, WCAP, WSAI, 8XB, WDAP, WJAX, WJAZ, WSB, WLAG, KSD, WAAM, WFAA, WBAK.

I finished up about 3:20 a. m.! Pretty good catch, don't you think? Will try for a better list some time soon, and let you know about it.

Yours very truly,

GEORGE W. JEFFERS.

Open the window—we want to throw our chest out. Mr. Jeffers ought to get Mars when he tries out the super heterodyne circuit of this issue. The fact that all of the foregoing circuits were printed during the summer goes to show that the only way to get results is to "Let Our Hookups Be Your Guide."

Dr. R. L. Barnhardt, of 212½ West Main Street, Spartanburg, S. C., wants to pass on some first rate information concerning the Hopwood circuit to our readers:

RADIO AGE.

Gentlemen:

I am sure that BCL's who have been using the Hopwood circuit as described in the July RADIO AGE, page twenty, will be glad to know that they can improve their sets by making a few additions as shown by the enclosed drawing.

In making the changes, be sure to place the rotary plates of the 11-plate condenser to the lead going to the phones, and also to place the fixed condenser as shown.

Very truly yours,

DR. R. L. BARNHARDT.

(The suggested changes in the circuit, as made by Dr. Barnhardt, are shown in Figure 1. We would be glad to forward any letters telling of results obtained by these changes to the above contributor.)

This concludes the Pickups By Readers section for this issue. RADIO AGE would be glad to have lists of stations heard by our readers, and any other information which would prove interesting. Address communications to the RADIO AGE, Pickups by Readers Department, 532-500 North Dearborn Street, Chicago. This is the Pickups by Readers Department of RADIO AGE signing off, wishing you a happy Thanksgiving.

EEEEUURRK.*

(*Business of shutting off generator.)

Inductance Coil

(Continued from page 25.)

individual strand should be continuous throughout the entire length of the cable and each strand should be insulated from every other strand throughout the entire length. As to the size of the wire it would seem that, for mechanical reasons, the wire should not be much larger than No. 18 (B & S). This limitation permits of the use of high-frequency cable as large as forty-eight strands of No. 38 wire.

British Radio

Recent statements of the British Postmaster General indicate that a solution has been found to the problems connected with the establishment of the British Empire wireless chain, says Consul General Skinner, London, in a report to the Department of Commerce. Not all points connected with the issuance of wireless licenses have been disposed of, but there is every indication that the government has adopted a policy which will permit private radio companies to establish high-power stations both in the United Kingdom and in the colonies. At the same time the Post Office will proceed with its own plans for a highpower station at Rugby.

The private interests which have applied for licenses are the Marconi's Wireless Telegraph Company, Limited, and the Eastern Telegraph Company, the latter being the largest unit in the British cable system. The Marconi Company has contracted with the Union of South Africa and the Dominion of Canada for high power radio stations designed to communicate direct with England, and is associated with the Amalgamated Wireless which has a similar contract in Australia.

The Eastern Telegraph Company is the first cable concern of any size to take up radio transmission as an adjunct to its cable service.

The arrangement reached by the post office with the Marconi Company is believed to be unique in the history of telegraph operation. The telegraph services of the empire are to be conducted by the wireless pool, consisting at present of the Marconi Company and the post office, although it seems certain that the Eastern Telegraph Company will be taken in at a later date should its plans for stations in India and China meet with success. The wireless stations necessary for the proposed imperial service will be furnished in certain agreed proportions by the two parties to the contract, the company furnishing two stations in the first instance and the government one.

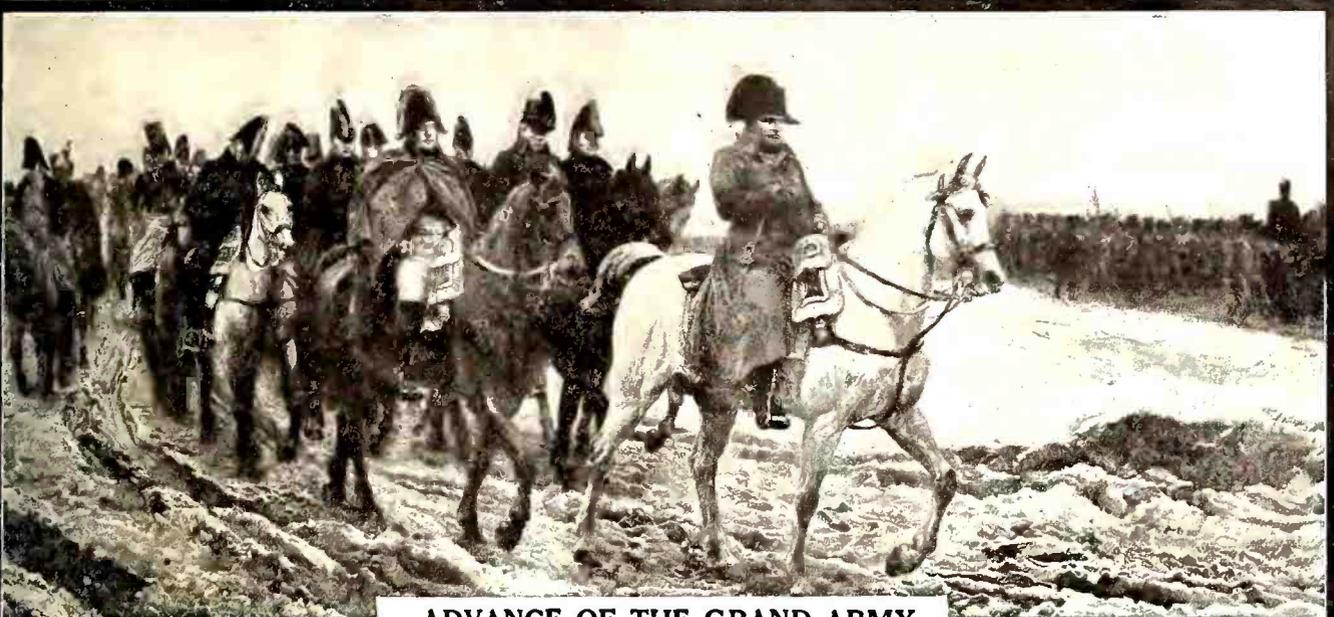
The position of the government in the communication field is greatly strengthened by the consummation of this agreement and it is probable that the approaching coordination of land telegraphs, international radio, and submarine cables will form a worldwide system of communications for the British Empire that will result in very effective government control of the whole field.

"Schenectady Gives the English a Kick"

(Continued from page 23.)

result of the WGY \$500 prize contest will be put on, the winning play being featured. Many other especially prepared radio dramas will be produced, several of which will have their initial performance at WGY.

Edward H. Smith, director of the players, with the assistance of engineers, carpenters, etc., is planning and constructing new devices allowing the more vivid representation to the radio fan of new scenes and actions. One of these novelties will be a horse race.



ADVANCE OF THE GRAND ARMY

NAPOLEON'S name fills more pages in the world's solemn history than that of any other mortal. The advance of his Grand Army into Russia is the turning point of his career and marks the beginning of his downfall. During the World War mighty armies marched over the battlefields where Napoleon fought over a century ago. All the causes of this mighty struggle may be learned from the pages of history. The one complete, accurate, authoritative and reliable history, depicting the rise and fall of every empire, kingdom, principality and power, is the world-famed publication,

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Dr. John Clark Ridpath is universally recognized as America's greatest historian. Other men have written histories of one nation or period—Gibbon of Rome, Macaulay of England, Guizot of France; but it remained for Dr. Ridpath to write a history of the entire World from the earliest civilization down to the present day.

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We will name our special low price and easy terms of payment only in direct letters. A coupon for your convenience is printed on the lower corner of this advertisement. Tear off the coupon, write your name and address plainly and mail now before you forget it. We will mail you 46 free sample pages without any obligation on your part to buy. These will give you some idea of the splendid illustrations and the wonderfully beautiful style in which the work is written. We employ no agents, nor do we sell through bookstores, so there are no agents' commissions or book dealers' profits to pay. Our plan of sale enables us to ship direct from factory to customer and guarantee satisfaction.

Six Thousand Years of History

RIDPATH takes you back to the dawn of History, long before the Pyramids of Egypt were built; down through the romantic troubled times of Chaldea's grandeur and Assyria's magnificence; of Babylonia's wealth and luxury; of Greek and Roman splendor; of Mohammedan culture and refinement to the dawn of yesterday, including a full authentic account of the World War. He covers every race, every nation, every time, and holds you spellbound by his wonderful eloquence.

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RIDPATH is endorsed by Presidents of the United States, practically all university and college presidents, and by a quarter of a million Americans who own and love it. Don't you think it would be worth while to mail us the coupon and receive the 46 sample pages from the History? They are free.

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RIDPATH pictures the great historical events as though they were happening before your eyes; he carries you with him to see the battles of old; to meet kings and queens and warriors; to sit in the Roman Senate; to march against Saladin and his dark-skinned followers; to sail the southern seas with Drake; to circumnavigate the globe with Magellan. He combines absorbing interest with supreme reliability.



FREE COUPON
THE RIDPATH HISTORICAL SOCIETY
 Cincinnati, O.
 Please mail, without cost to me, sample pages of Ridpath's History of the World, containing photogravures of The Surrender at Sedan, Napoleon, and other great characters in history. Also write me full particulars of your special offer to Radio Age readers.

THE RIDPATH HISTORICAL SOCIETY
 CINCINNATI, O.

NAME

ADDRESS

RADIO AGE INSTITUTE

To insure 100% value to readers of advertisements, as well as 100% value to the advertisers themselves, radio equipment is now being tested and endorsed by the

RADIO AGE INSTITUTE
500 NORTH DEARBORN STREET
CHICAGO, ILLINOIS

No charge is made for testing and approval, and all merchandise will be returned as soon as possible, transportation expenses to be paid by the manufacturer. Lists of makers of approved radio goods will be published from time to time.

SERVICE DEPARTMENT FOR READERS

Please remember that Radio Age has one of the best radio instructors in the United States, who is ready to answer any technical question. This costs subscribers nothing.

RADIO SENSATION OF 1923

Erla Receivers out-distance all other sets with an almost unbelievable volume and a naturalness that cannot be distinguished from the source of reception.

This is the famous Erla Reflex Hook-up. Less than one year old—but has taken the entire nation by storm. Every listener-in raves about it and wants a set of his own immediately.

So easy to construct that anyone who can handle a screw driver can build the set complete in a surprisingly short time—about 1 1-2 hours. Everything is so simple and easy.

NO SOLDERING WHATEVER—ONLY A SCREW DRIVER NEEDED.

One tube hook-up makes set equal to any other two tube set ever invented. Erla two tube set equals four tubes of the best of other hook-ups.

Erla three tube hook-up has no equal up to seven tubes of other sets. This hook-up brings in the most distant stations with a volume equal to powerful local stations. In volume this hook-up equals that of any seven

tube set ever devised. And for naturalness of tone has no equal in any other set of any number of tubes. The results from the Erla 3 tube is naturalness itself and cannot be improved upon. Actual size working diagrams make every thing simple and easy.

Every piece of apparatus and every wire is pictured in it's exact place—every article needed is listed on the diagrams.

With such wonderful results to be obtained from an Erla hook-up at a very low cost you cannot afford to waste time and money building other sets that cannot possibly begin to equal Erla hook-up performance.

Diagrams sent same day your order is received. Send P. O. or Express Money Order or Bank draft or Bank Cashier's check. Do not send stamps or personal checks.

Erla Hook-up Diagram Prices

3 sheets for making	1 tube set	25c
3 sheets for making	2 tube set	35c
3 sheets for making	3 tube set	50c

FRANK D. PEARNE

Sole Distributer of Erla Diagrams for U.S. and Canada
829 Waveland Avenue, Chicago, Ill.

Mexican Show

Mexico has had its first radio show. It has been a most popular and successful show, which could out of sheer brilliancy and beauty compare with some of the best radio shows in the United States last winter.

The show was held in the "patio" of the School of Engineering in Mexico City. Booths were installed about the court, and in the center portion the "Casa del Radio"—the Home of Radio was built. Many firms, including the Siemens Company, Hubbard & Bournal, J. M. Velasco, R. L. Azcarraga, Beers Electric, and Westinghouse Electric, placed on exhibition in attractive booths some of the most modern radio broadcasting equipment available.

The exposition was officially opened by President Obregon, of Mexico, and was the occasion of extensive ceremonies and celebrations. Accompanying the president were members of the cabinet, prominent officials, and engineers, and M. Rolland, of the Radio League of Mexico.

During the show, which lasted ten days, there were many unusual features. Among these were brilliant balls, attended by representatives of the government, officials, and prominent society senoritas. A contest among amateurs for the best homemade radio set was staged, the prize going to two young boys of Mexico City. Daily broadcasts were sent from The Home of Radio, one of the most popular announcements being those which were sent out during the Firpo-Hibbard fight, which took place in "El Torso."

Finally, prizes were given to the various booths of the exhibitors, the first prize being awarded to the Westinghouse Electric Company. At the time of the distribution of the prizes, Mr. Rol-

land, an officer of the Radio League of Mexico, made a plea for the extension of radio activities in Mexico, and suggested that the Secretary of Commerce appoint a commission to study the situation from all angles. The broadcasting service in Mexico is entirely inadequate, the broadcasts picked up being mostly from stations in the United States.

Connections of Unmounted AF Transformers

IN ORDER to obtain the best results from an amplifying transformer, certain precautions should be observed. Since what is wanted is the production of the maximum potential, or rather the change of potential on the grid of the amplifying tube, it is best to connect the grid to the outside terminal of the secondary of the transformer. This is because the outer portion of the secondary has smaller capacity to ground than the inner portion, due to the proximity of the latter to the primary winding, which is connected to the filament and other low potential parts of the circuit. This capacity effect increases with frequency, and therefore reduces the intensity of high notes proportionately more than low ones, thus tending to cause distortion. Howling or oscillation at audio frequencies is caused by coupling (either electrostatic or magnetic) of the amplifier grid to some other part of the circuit, and is more troublesome with two or more stages of amplification than one. If the electrostatic and magnetic couplings are made to oppose each other the tendency to oscillate is minimized, and when a transformer is connected into a circuit it is worth while to reverse the leads to the primary to see which connection is better. In some

cases the oscillations are above audibility, but the strength of signals is reduced, nevertheless.—Bulletin 916, General Radio Company.

Radio in China

China will soon have five commercial radio stations and may develop broadcasting also, according to information received in Washington. Contracts have been signed for a high-power station, similar to the French Lafayette Station, to be built at Shanghai, and four others of lower power to be located at Peking, Harbin, Canton and Shanghai. They will be built by the Federal Telegraph Company. The last four will serve as feeders for the big Shanghai trans-Pacific station.

Four attempts to establish radio broadcasting in China have been made at Shanghai, and although one fifty-watt set is still in operation the right to continue is questioned by the Chinese Ministry of Communications, Trade Commissioner Smith advises the Department of Commerce.

The first effort to institute modern broadcasting was made by the Radio Corporation of China from a set on the roof of the Robert Dollar Building; but the scheme was shortlived. A little later the Electric Equipment Company installed a fifty-watt set on the top of its building on Nanking Road, ostensibly for experimenting and for demonstrating radio sets for its customers. This station is still operating. Broadcasting programs were next offered to the public by the Shanghai Evening News, and recently the Wing-On Co., Ltd., a large department store, installed a station.

Broadcasting development in China is said by the United States Commissioner to have been retarded by the fact that the importation of wireless apparatus was prohibited by the Chinese government in March, 1923. This embargo was based on an earlier mandate which stipulated that all telegraphs and telephones, whether wire or wireless, were electrical communications and as such should be operated solely by the government. An organization known as the Shanghai Amateur Radio Society has been active with propaganda for radio for the past few months but little success is reported.

Readings by Radio

Rev. Claude J. Pernin, S. J., has resumed his regular Thursday night "Twenty Minutes of Good Reading," from Westinghouse Station, KYW. This feature was discontinued for several weeks while Rev. Mr. Pernin was out of the city.

This feature consists of the dramatic interpretation of short stories, poems, passages from recent books and other literary selections.

Rev. Claude J. Pernin, S. J., is Professor of English literature of Loyola University, Chicago, and has conducted courses in English for this University for the past five years. He has given courses in the art of the short story, Shakespeare, Tennyson and Browning and the novel, as well as courses in public speaking.

Reinartz Book FREE

Reinartz Radio Book with Hook-ups—best book on best circuit—written and illustrated by Frank D. Pearne. If you want one free, fill out the coupon.

RADIO AGE,
500 North Dearborn St.,
CHICAGO.

Please send me FREE one of your Reinartz Radio Books and send me Radio Age for I want to take advantage of this Special Offer. I enclose

Name.....

City.....

Street and Number....

More Real Radio For Less Real Money

RADIO AGE increases its number of pages this month but instead of increasing its price it offers a *reduction* in its regular subscription rate.

More pages in Radio Age mean more of our excellent circuit diagrams, more of our timely instructions, clearly written by experts, on how to build sets and how to operate them.

More helpful hints to radio experimenters; more illustrated answers to questions; more published letters from readers who have discovered new kinks;

Despite all this we are making you *this special offer*: We will send you Radio Age for one year for \$2.00, or for six months for \$1.00 if order is accompanied by coupon.

Newsdealers may fail you. For 16 $\frac{2}{3}$ cents a month you can make sure of getting your magazine on the dot.

(This offer will be withdrawn on December 1, 1923.)

Month by month we are printing more and better radio information *and we print nothing else* but radio. If you have been reading Radio Age you know that we printed the best drawings and circuit diagrams of the Reinartz, Kaufman, Grimes, Erla and the Four-Circuit systems that have been published. We are going to keep up that sort of practical trail-blazing.

Each month we correct our complete list of United States and Canadian broadcasting stations. You will find such a list a pleasure when on fishing expeditions for the far stations.



THIS COUPON SAVES YOU MONEY

Radio Age, Inc.,
500 North Dearborn Street,
Chicago, Ill.

Please enter (renew or extend) my subscription to Radio Age for

One Year at \$2.00

Six Months at \$1.00

This gives me the bigger and better magazine at a reduction over the old rate and insures my getting the magazine promptly each month. I enclose \$2.00 (money order or currency by registered mail). If by check I add 5 cents for exchange.

(No additional cost to Canadian subscribers. Foreign \$1.25 for six months; \$2.50 for one year.)

Name.....

Address.....

Turning on Our Loud Speaker

IN HIS editorial of the October issue, the Editor might have told you more about what readers thought about RADIO AGE, and the matter printed in this magazine, when he turned on the loud speaker but space did not permit. He was able to broadcast only one specific expression of appreciation.

We want to (modestly) tell you a little more about what people write us, and what they think, while we have the loud speaker going.

We pick out the letter of Herbert E. Schlueter, of Canistota, South Dakota, as a typical boost given RADIO AGE by many readers, when he says:

"I have been a reader of the RADIO AGE for a long time, and I like it very much. I have built several sets according to instructions printed in RADIO AGE, and think they are fine business."

The letter of O. Keith Baldwin, of Bridgman, Michigan, is a type of many from readers who have found the value of this magazine, as a source of real, practical information concerning broadcast reception. He says:

"Enclosed you will find a check, for which please extend my subscription to the RADIO AGE for one year. I believe this speaks my regard for your wonderful little magazine better than any words I might say."

In our correspondence files we have letters from fans who have cultivated that "Let Our Hookups Be Your Guide" habit to a degree. Let the following letter explain:

RADIO AGE,
Gentlemen:

I failed to receive my copy of RADIO AGE for September. I had almost as soon miss my pay check as RADIO AGE, so please mail me a copy as soon as possible.

Very truly,

J. H. JONES.

Crestwood, Ky.

Advertisers, please notice. Here's a letter from a man who makes advertising his business, and who evidently knows the value of reader interest in a good radio publication:

RADIO AGE,
Gentlemen:

Thank you very much for the information you sent me the other day. I am going right ahead with the amplifier, and if it is any satisfaction to you to know it, will confine myself as far as possible to parts advertised in RADIO AGE.

My original hookup (Reinartz detector) was taken from your pages of the May issue, and it has worked very satisfactorily.

Thanking you again, I am,

Very truly yours,

R. W. CLASSEN.

Chicago, Ill.

One reader tells us that he bases his decision as follows:

"I have been buying your magazine at news stands in Moline, Rock Island and Davenport, and I think it is among the best, if not the very best magazine devoted to the radio experimenter that comes to my notice. Believe me when I say that I am judging pretty closely, because all magazines of any worth at all come under my scrutiny. They all come to my reading table, so you see I speak from experience, and to justify my contention, I am going to subscribe to RADIO AGE and make it come to me regularly."

Now that's a pretty nice compliment, and if weren't too busy making up a better book for you next month, we would probably turn a 75-turn handspring.

Harry E. Johnson, of 1111 East 62nd Street, Chicago, Ill., writes us:

"I have just become a member of your RADIO AGE family, being a disciple of your technical editor, Mr. Pearne, and I hope it will be the largest radio magazine in the game some day. I have followed Mr. Pearne's instructions, and find with joy that RADIO AGE is the only place I can get them regularly and with certainty."

Thanks, Mr. Johnson. We'll show that to Mr. Pearne. He has many fellows who have profited by following his teachings, and we know he feels great when he hears that they appreciate his information.

We are the recipients of many letters commenting on the method of presenting circuits and ideas, a good sample being the following extract taken from a letter from Martin A. Zeiger, of 45 West 18th Street, New York City:

"I read with great interest your article and drawings on the three-tube Grimes Inverse Duplex, which appeared in one of the recent issues of RADIO AGE, the article by Frank D. Pearne, and the clear drawings by Felix Anderson.

"May I compliment you on these isometric drawings, which are a great help to 'radio nuts' such as myself, as they eliminate any doubt as to panel layout, or connections."

When we exhibited the above letter to Mr. Anderson, our engineering draftsman, he got so worked up that he chewed the corner off his drawing board. HI! Leonard Madsen, of Sioux City, Ia., says:

"I have had a few of your magazines, and they are fine."

After Mr. Madsen has read about two more issues, he will get something like Mr. Jones, of Crestwood, Ky., and feel about as lost without RADIO AGE as a traffic cop who has just swallowed his whistle.

J. H. Hoffman, of Chicago, Ill., wrote us for information some time ago, got it free of charge because he was a subscriber, and then after he had worked out the information given him told us:

"I wish to thank you for the information on the Armstrong circuit which you so kindly sent me, and want to tell you that I am getting very good results; I had TWELVE outside stations the first night I tried the set!"

Before we turn off the loud speaker we want to tell you that all the above letters were unsolicited, and we print them to show our readers how this magazine is received. For the fellow who is not a reader of RADIO AGE, we print them to demonstrate the value of cultivating that "Let Our Hookups Be Your Guide" habit.

Mexican Station

A powerful radio broadcasting station has been inaugurated in the Mexican Federal Capital, Trade Commissioner McKenzie reports from Mexico City.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio Age published monthly at Mount Morris, Illinois, for October 1, 1923.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Frederick A. Smith, who, having been duly sworn according to law, deposes and says that he is the editor of the Radio Age and that the following is, to the best of his knowledge and belief a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher Radio Age, Inc., 500 N. Dearborn St., Chicago; Editor, Frederick A. Smith, 500 N. Dearborn St., Chicago; Managing Editor, Frederick A. Smith, 500 N. Dearborn St., Chicago. Business Manager, M. B. Smith, 500 N. Dearborn St., Chicago.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.) Radio Age, Inc., Frederick A. Smith, 500 N. Dearborn Street, Chicago, Ill.; John H. Lohbeck, St. Louis, Mo.; M. B. Smith, 500 North Dearborn Street, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only.)

FREDERICK A. SMITH,
(Signature of editor.)

Sworn to and subscribed before me this 8th day of October, 1923.

HARRIET DILLON
(My commission expires June 7, 1927.)

Reinartz Radio

How to make this distance wrecker.
How to amplify it.
How to make a Reinartz panel.

With Hook-ups

Written and Illustrated by
FRANK D. PEARNE

*Chief Instructor in electricity at Lane Technical High
School, Chicago, and famous writer on radio
construction and operation.*

Experts agree this Reinartz Hook-up
is best for average fan.

Hook-up for the Long Distance Crys-
tal Set—They are all trying it.

This book has helped thousands

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OR CURRENCY TO PUBLISHER*

—≡ Price 50 cents ≡—

This booklet free with each yearly or six months
subscription order. See coupon in this issue.

Why Donald B. MacMillan Chose the Zenith

The great hardship of the Arctic is not cold but solitude. MacMillan had seen men crazed by the terrible North Pole isolation.

Radio could break the awful spell of the ice-fields. But with the success of his expedition at stake, none but the most powerful long-distance set obtainable would answer. Captain MacMillan chose the

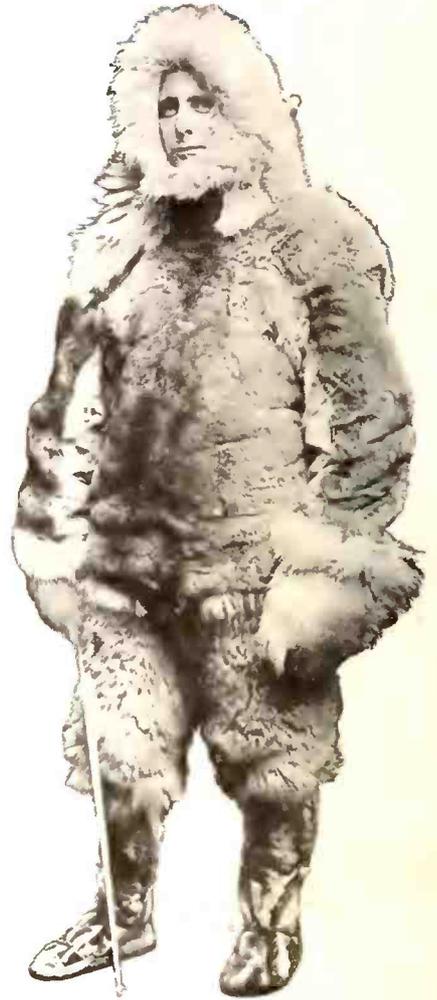


Results justify his choice.

Every week a message is being broadcasted from the Zenith Edgewater Beach Hotel Broadcasting Station, Chicago, to the men of the staunch ship Bowdoin, frozen into the ice 11 degrees from the Pole.

And by Zenith wireless, Captain MacMillan sends his messages back to civilization. He reports that he and his crew are listening not only to messages and music from Chicago but even from Havana, Cuba and from Honolulu!

Thus is new history being made; and the supremacy of the Zenith in the field of radio, which was established by the Berengaria test, is being made even more out-standing by these new adventures of the Zenith in the Frozen North.



Zenith Radio Corporation

332 South Michigan Avenue, Chicago, Illinois



Licensed Under Armstrong U. S. Patent No. 1113149.

ZENITH RADIO CORPORATION,
332 South Michigan Avenue,
Chicago, Illinois

Gentlemen:—Please send me illustrated literature on Zenith Radio.

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