VOLUME 1 NUMBER 10

PACIFIC RADIO NEWS

MAY, 1920 FIFTEEN CENTS

IN THIS ISSUE:

First and Only Pacific Coast Publication Devoted to Radio Communication

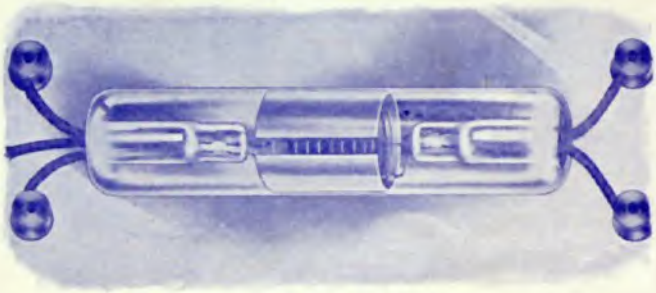
Licensed by DeForest

AUDIOTRON

The Original Tubular Vacuum Amplifier

The AudioTron Vacuum Tube is now manufactured and sold as a genuine audion licensed under DeForest Patents Nos. 841387 and 879532 to be used only for amplification in radio communication and only for experimental and amateur purposes and only in audio frequency circuits.

The AudioTron has a double filament of special thorium tungsten and the operating life is over 2000 hours. No special socket is required. The electrical and mechanical dimensions result in a heavy plate current and corresponding signal strength. Plate voltage under 40. Our guarantee insures Satisfaction.



PRICE $6.00 EACH

If your local dealer cannot supply you we will ship postpaid when cash accompanies order.

The AudioTron Exclusive Guaranty: Each and every AudioTron is guaranteed to arrive in good condition and to prove fully satisfactory. Replacement of unsatisfactory tubes will be made free of charge.

AUDIOTRON AUDIO-FREQUENCY TRANSFORMER.....$7.00

Laminated closed core, two coil type.

DEALERS:—Write for our attractive trade Proposition

AUDIOTRON SALES CO.

Lick Bldg. San Francisco, Calif.

Pacific Radio News

50 MAIN ST., SAN FRANCISCO

Vol. I MAY, 1920 No. 10

PAUL R. FENNER, Editor H. W. DICKOW, Advertising Manager

Entered as second class matter January 22, 1920, at the Post Office at San Francisco, Cal., under the Act of March 3, 1879.

PACIFIC RADIO NEWS is published monthly. Subscription rate is $1.50 per year in the U. S. and possessions; $2.00 in Canada and foreign countries. Single copies, 15 cents. For sale at news stands.

Address all communications to PACIFIC RADIO NEWS, 50 Main St., San Francisco, Cal. Contributions should be marked for the attention of the editor.
Forms close on the tenth of the month preceding date of magazine.

Radio Reflections

By S. Seleri

"Wireless is a kid's game" is a remark we often hear. It must be admitted that it is well-stocked with young men. Go into the offices of any of the commercial radio companies about 10:00 a. m. and you will find much to support this statement. As a rough guess I would say that about 75 per cent of the men in the business are below the age of 23. Fully 50 per cent seem to be under 21. When you see a fellow from 25 to 30 years old in the business you feel that he's out of place, or that there's something wrong with him. I am only 26, yet I feel like an old greybeard when I report at the office. You will not find so many youngsters in the foreign radio companies, for, in the first place, radio in Europe is looked upon as an important thing—not as a field for young tourists. An operator on a foreign ship is given a high rating—usually a parallel one to the purser and doctor. He heads his own table in the saloon and is allowed the freedom of the ship. The captain and other officers treat him as a man in a responsible position. Such names as "Sparks," "Wireless," etc., are taboo with him. He takes his work in a serious way—in a manner that befits its importance. When he comes in contact with passengers he knows how to conduct himself.

Over here we find things different. In the first place, wireless has always been such a poor game in its financial returns that men above 21 with any ambition in them wouldn't think of going into it; hence the large number of youngsters. It has largely been the practice in this country for a fellow to stick to the work until he reaches 21 or 22; then he goes to more fertile pastures. On account of the large number of kids in the field a lot of kindergarten treatment has been injected into the profession. Men of 24 and 25 do not like to come in from a long trip and be met with the cold greeting that they should have reported an hour earlier, 11 o'clock being too late for a ship that docked

at 9:30! Neither do they like to get ordered about like grammar-school boys when they're aboard ship. Some time ago I was on a passenger ship and was told that I was to eat in the quartermasters' mess, the other operator having made a fool of himself. Naturally I did not go out on that ship more than one trip. The captain asked me to stay, seeing that I was an old-timer, but I told him that I had been out of knee-length trousers for some time; I advised him to apply to the nearest kindergarten.

Not so long ago I was on a passenger ship that had the reputation of being the best job afloat—that treatment and everything about it was A-1. I left it to go with a captain with whom I had been shipmates when he was a second officer and the junior I had with me (a good man) went on a cargo ship. We were relieved by a senior operator 17 years old and a junior operator 15 years of age! Their knowledge, both in the radio and wordly respect, amounted to about nil; naturally they left the job in a bad way for the operators that relieved them. But I do not run down the youthful radio operator—I've met some that were O. K.—I merely wish to reveal the game as it is in the American merchant marine. I would suggest that if the young fellows stay in the work that every one of them join the United Telegraphers' Association and learn something about the responsibilities that go with a ship position, particularly the way to conduct themselves. There is some talk of a law being passed that will prevent minors from getting commercial radio licenses, so it behooves every youngster to snap out of it and conduct himself in the right manner. Radio is too important to be made a kindergarten of.

It may be interesting to the new men in the business to know that when radio was first installed on United States ships the treatment was fine. The jobs were spoiled by a lot of goofs. No doubt the U. R. T. A. will see that every operator gets put back to the old status; already their agreement with the steamship owners requires that their members must be given the same status as other ship officers of the licensed class. That was a fine stroke of work—next to the pay increase itself. And I sincerely hope that the association will fire every man out of its organization who does not conduct himself right. In this way the order will come in for much praise from the ship owners and the better class of operators; it will appeal to the public and will soon put American wireless to the plane that it should have reached long ago. Before long I look to see a condition where being dismissed from the association will mean that another job is impossible, because if you aren't a "United" man the other men aboard ship will not sail with you. Henceforth it will pay to keep in "good standing."

A little while ago I said that you don't find many men of ambition above 21 dabbling in the commercial radio game. I must qualify that in some respects. When I made that statement I had in mind the conditions that prevailed before the coming of the U. R. T. A.—that is to say, the increase in pay—and I was also thinking of a number of other things. Now, eight or ten years ago a man of my age had quite a good reason for entering wireless — it seemed to have a great future. At that time stations were springing up all over the country and equipments were being installed on ships every

(Continued on page 375)

Radio News In Brief

Radio Phone Carried on Person

W. W. Macfarlane of Philadelphia has invented a new radio telephone which can easily be carried and is perfectly portable. He was able to demonstrate that he could talk from his automobile to his home while riding through the streets of the city he lives in. It is claimed that the apparatus can be made for $20.

Fog No More Hindrance to Ships Entering Golden Gate With Radio

Ships may now enter the Golden Gate into San Francisco Bay in the densest fog with the aid of four radio compass stations. At any time the exact position of the ship may be determined. The bar and rocky bottom of the Golden Gate has no further terrors for the sea captain entering the port of San Francisco.

Radio Toll Per Word Reduced to Orient

Messages destined for Japan from the Pacific Coast are now subject to a reduced rate; namely, seventy-two cents a word. This announcement was made by the Radio Corporation of America. A 400-K.W. Alexanderson alternator is to be installed in Japan by the Radio Corporation for transpacific traffic.

Marconi Takes Cruise In Mediterranean

Signor Marconi is now engaged in making tests in directional receiving. He is making an extended cruise in the Mediterranean Sea with apparatus capable of transmitting and receiving three thousand miles.

San Francisco Engineers Invent New Transmitter

Two San Francisco engineers—Peter Jensen and Edwin Pridham—have invented a new telephone transmitter that transmits speech without any interference of stray sounds and other noises. As a test, telephone communication was carried on inside of a boiler on which a pneumatic hammer was pounding, and nothing was heard at the other end of the line except the desired speech. A series of holes drilled in the diaphragm is said to be the secret of the invention.

Y. M. C. A. Installs Radio and Forms Club

The Santa Barbara Y. M. C. A. has installed radio equipment capable of receiving stations as far away as Nauen, Germany, and Constantinople. A club has been formed and radio is diligently studied with the aid of practical work.

Seattle Enjoying Its Prime in Radio Amateur Activities

Never before in the history of Seattle has radio been of such universal interest as now. Amateurs are actually intercommunicating with Los Angeles, Cal., stations. The radio inspector of Seattle claims that the enthusiasm has burst its bounds, as many violations of the radio laws are being noticed.

San Diego Amateurs Organize Club Under the Naval Plan

Under the leadership of Milton S. Jackson (6JI) San Diego county amateurs have organized to form an association under the plans outlined by the Navy Department, Twelfth District. Recently the Twelfth District communication superintendent sent circulars to all amateur operators advising that considerable cooperation was to be given by the naval stations to amateurs.

Radio News In Brief--Continued

National Radio Company to Manufacture Radio Phones

The National Radio Company, which has for years been experimenting and perfecting a system of long distance radio telephony, is now going into the manufacturing field. A $50,000 factory will be erected in San Francisco and, it is said, will be completed within four months. The arc system of modulated oscillator is used in the National system and telephone conversations have been carried on up to seven hundred miles successfully.

Lieutenant Arrives in San Francisco on French Radio Mission

Lieutenant Guierre of the French Navy arrived in San Francisco recently on his tour of the world to determine possibilities of the French Government establishing radio stations throughout the world so that French warships will always be in communication with Paris.

New Naval Station to Be Erected at Tongue Point

A new naval radio station is soon to be installed at the proposed naval base, Tongue Point, Columbia River, Oregon. The details have not been announced yet. Radio service at the mouth of the Columbia River has been very poor in the past and it is hoped the installation of the new station will relieve conditions.

Radio Phone Tests Soon to Take Place

All commercial and amateur radio operators west of the Rockies will be listening-in to hear the radio telephone located in the Fairmont Hotel in San Francisco this month. Tests are to be made with Vancouver, British Columbia. This phone test will be made by the National Radio Company. A Canadian company has been formed to operate the national patents in Canada.

ERRATA IN CALL LIST

6BH—K. V. Dilts, 760 East California St., PASADENA (not Los Angeles), Cal.

6CM—D. M. Campbell, Highland Ave., NORTH GLENDALE (not Los Angeles), Cal.

6CX—G. A. Hatherell, 833 Idlewild St., INGLEWOOD (not Los Angeles), Cal.

6DQ—C. E. Ponnay, 6516 (not 651) Denver Ave., Los Angeles, Cal.

6FD—Hallie Midkiff, Minnesota and Ada, GLENDORA (not Glendale), Cal.

6FE—William Briggs, Box 24, Anderson, Shasta Co., Cal. (not Gas Point).

6FX—G. V. Tudhope, 4187 Manila Ave., OAKLAND (not Los Angeles), Cal.

6LW—N. Sunseri, 1260 East Colorado St., PASADENA (not Los Angeles), Cal.

6JS (not 6NW)—H. S. McCauley, Guerneville, Cal.

COMPACT 15,000-METER TUNER

The Halcun Radio Company has brought out a new compact 15,000-meter regenerative set complete with tuner, variable, "B" battery, bulb, etc., measuring only 13"x10"x6". This set was particularly developed for commercial use and for amateurs who desire a long wave compact cabinet receiver selling under $100. The set is on display at the new Halcun quarters, where interested parties are welcome to listen in any time.

The Standard Navy 2-K. W. Set

One of the finest developments of radio during the war was the standard navy 2-K.W. set. As an all-around set it stands head and shoulders above every other transmitter now in the field. The outstanding features of the equipment are the control panel, wave-changing switch, Lowenstein quenched gap and Dubilier condensers.

The control panel also carries the battery-charging apparatus, which permits the batteries to be charged at either a low or high rate. By means of the meter switches one can determine in an instant the voltage of each storage battery bank. The ammeter switch enables one to get a current reading on either bank or on both when the batteries are being used to operate the main set. The meter switches are so arranged that it is possible to measure the voltage or amperage of either the D. C. or A. C. circuits. The following meters are installed on the board: D. C. voltmeter, D. C. ammeter, A. C. voltmeter, A. C. ammeter, kilowatt indicator, frequency indicator and an ampere-hour meter. Several spare switches and connections are available for emergency lights. These lights are connected to the batteries when the ship's generator fails. Circuit breakers and an automatic motor starter are, of course, also included on the board.

The wave changer enables the operator to use 300, 600 or 952 meters. All that is necessary is to throw the switch to the wave that he wants to use—no other adjustments are necessary. It is stated that 800 meters will soon become the official wave for working with radio compass stations, and that wavelength will also be included on the wave changer.

Undoubtedly the Lowenstein sectional quencher used with this set is the best quenched gap now in use. This gap keeps cool, causes a greater radiation, is easily repaired when a gasket burns out and is capable of being varied in capacity. In the old type of quencher when a washer blew out it was necessary to take the whole gap apart to repair it. In the case of the Lowenstein gap all that it is necessary to do is to remove the defective unit and the quencher is ready for use again; the burnt-out section can be repaired without taking the whole quencher apart.

The Dubilier condenser is as much of an improvement over other types of condensers as the Lowenstein quencher is over other spark gaps. It excels all other forms of condensers by far. Its efficiency under heavy load and its ability to withstand the load without heating is remarkable.

The motor-generator used in connection with the standard navy 2-K.W. set is also worthy of mention. The absence of brushes on the A.C. side is a feature. While the machines are rated at 2-K.W., most of them can develop 2½ or 3-K.W. The machines have shown their worth under heavy traffic and during overload periods.

The navy inspectors say that most of these sets are good for a radiation of 20 amps. On the average set, an aerial current reading of 24 amperes can be obtained.

GREAT JAMMING ON THE ATLANTIC

By W. Reless

Since the signing of the armistice there has been the greatest jam in the air that radio has ever seen. Seemingly impatient and infuriated at its long silence as a result of the war, wireless came back with a vengeance so heavy in its effects that decent, reliable work on the Atlantic ever since has been almost impossible. All over the north Atlantic the brass-pounders are at it night and day.

The kind of work that is going on now is enough to move a pre-war operator to tears or the squirrel house. Every day one hears the parvenues in the game telling their history on 600 meters, wanting to know what ship is passing them, requesting NAA's press and weather, making "CQ" continually, etc. It's maddening. Seemingly the new men in the business can't keep out of the air—they must send or die!

For the love of Mike, fellows, cut out all that unnecessary sending on 600 meters. Every day operators are getting criticised by their skippers because they can't handle their business right, whereas the blame should fall on the men who create the unnecessary interference.

Close-up work should be done on short waves. If you must converse do it on 300 or 450. All sending of press and requests for it should also be carried out on these waves.

STANDARD UNIFORM FOR SHIP OPERATORS

A matter that has always given ship operators great concern is that every time they go from one steamship line to another they must wear the uniform prescribed by that line. In these costly times this is a matter that should be righted. The United Radio Telegraphers would do well to adopt a standard uniform—i. e, a uniform that is to be worn throughout the American merchant marine, irrespective of line.

In this connection we think it would be a good idea to do away with the words "Wireless Operator," "Radio Operator," etc., on the cap. Some well-chosen emblem would, in our opinion, look much better. The French radio officers use an insignia consisting of a gold anchor in a field of sparks, which has a fine appearance.

COMMERCIAL OPERATORS INTERFERE WITH PRESS NEWS

The report comes from the San Francisco radio inspector's office that commercial operators have been interfering with press news sent from the navy stations along the coast. Press news is of great importance to various transpacific liners, and operators working their transmitters except for distress signals, while press news is being sent are liable to a revocation of their licenses.

SAN FRANCISCO RADIO CLUB ELECTS NEW OFFICERS

At the last regular monthly business meeting of the San Francisco Radio Club, Inc., the following members were elected to office for the coming twelve months:

H. W. Dickow, President.
R. Lyon, Vice-President.
W. Henry, Secretary.
R. Hamilton, Treasurer.
H. Holliway, Chief Operator.
I. H. Baum, Sergeant-at-Arms.

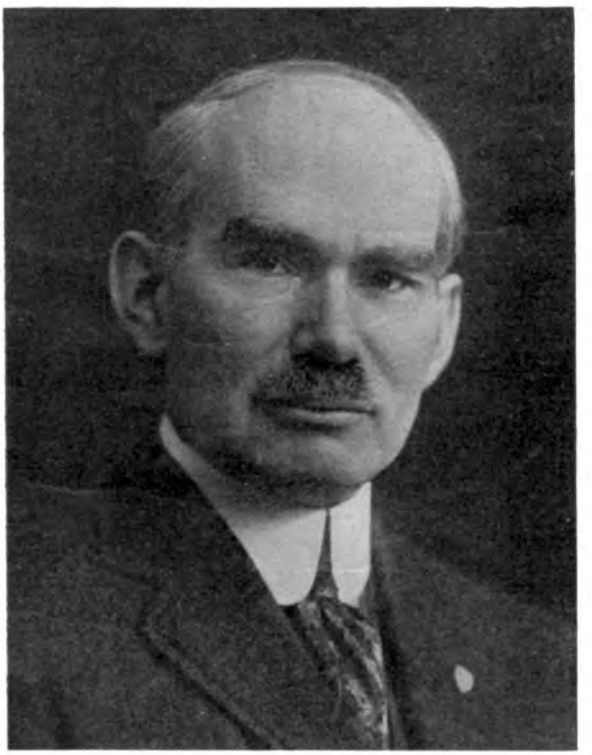
Installation of the newly-elected officers took place on April 12th.

Buzzer classes have been inaugurated and every member of the club will be given a buzzer test in order to be classified for a course of instruction that will enable the members to obtain commercial licenses. All local radio amateurs are cordially invited to attend a meeting of the club. Meetings are held weekly at 355 Presidio avenue.

New De Forest Company to Manufacture Radio Telephones In San Francisco

The Pacific Coast is welcoming the latest venture of Dr. Lee De Forest—the establishment of a fully equipped radio telephone factory at 451 Third street, San Francisco, Cal. Dr. De Forest has been wise to select the Pacific Coast for his field of operations, for this is the country of long distances and a ready market will be found for the product of the new company.

Lee De Forest, Incorporated—for that is the name of the new firm—will manufacture radio telephones exclusively, and a full stock of the Eastern De Forest Radio Telephone and Telegraph Company's apparatus will be carried to supply Pacific Coast dealers.



Dr. Lee DeForest

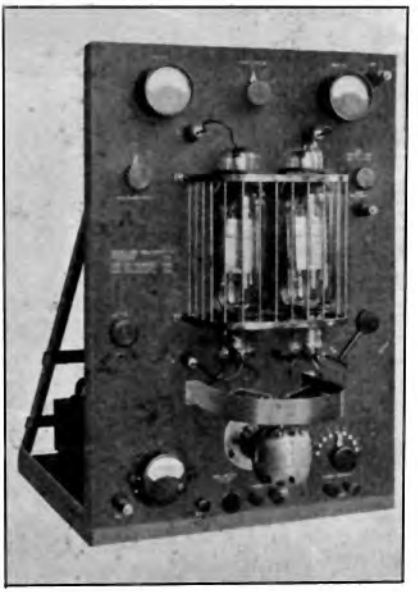
The factory will include a modern vacuum bulb plant for the manufacture of oscillion bulbs. These bulbs

1 K.W. Tube Compared to Ordinary Desk Telephone

are well known to radio men as generators of oscillating currents. Several types of bulbs will be handled by the new corporation from the small VT type requiring an input of only 12 watts to the large power tubes able to handle full one kilowatt. The accompanying illustration shows the one-kilowatt tube placed alongside of an ordinary desk telephone.

Lee De Forest, Incorporated, are to manufacture four sizes of the radio telephone transmitters. The smallest will be the one-quarter kilowatt size, which will transmit radio telephone messages seventy-five miles with the average size antenna. This distance is, of course, only average, since the quarter-kilowatt transmitter has actually been used over much greater distances with perfect results. The next size transmitter is of one-half kilowatt capacity; the third, one kilowatt capacity, and the next, a two kilowatt transmitter. The two kilowatt transmitter is capable of transmitting from 150 to 450 miles, depending on the height of the an-

(Continued on page 371)



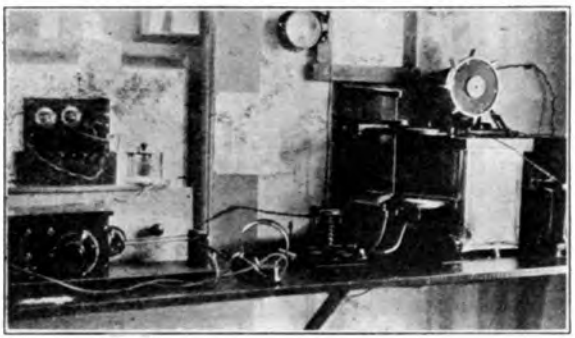
1 K.W. Transmitter

Radio Telephone Receiver

An Amateur Radio Relay Station

By Rupert E. Kempf

Station 7CC has worked 9JE, 6ZA 6EA, 6BF 6BR, 6EJ 6AT, 6AE and others



Note the wide coupling. 7CC radiates 8.4 amperes

It is the aim of almost every wide-awake amateur to have a sending set capable of transmitting at least five hundred miles consistently. The conclusions drawn in this article are the result of careful experimentation at Station 7CC, owned and operated by Mr. Jack Woodworth and the author.

In sets having high tension transformers of 20,000 volts or higher, the greatest factor to contend with is the insulation. In the author's case a 20,000-volt Thordarson was used. By referring to the photo of the station, it is seen that the sending set is compact. Such compactness necessitates much care in wiring. Good insulation in one place and indifferent insulation at another does not lead to success. The entire sending set MUST be well insulated throughout. The lead-in in particular must be kept away from all trees and roofs, for these absorb a large amount of radiated energy. It was found best to bring the lead-in into the operating room through a plate glass.

The home-made glass plate condenser is far better when oil-immersed. The particular one that is used at 7CC consists of thirty glass plates one-quarter inch thick coated on both sides with tinfoil six by eight inches. The resulting capacity is approximately .009 mfds. This is about the maximum capacity that can be used in amateur work.

Of very great importance is the rotary gap. Different types, speeds and metals were used in experimentation. Low tones, though undoubtedly giving the loudest signals at the receiving end, involve high voltage difficulties. The condenser builds up excessive potential, causing an undue leading of the spark. Kick-backs and condenser breakdowns are also the results of using low-tone gaps. High-toned stations are much easier to read, but one rarely ever hears a high-toned station very loud. This concerns only those sets using rotary gaps. Listen in to the amateurs any night and these stations come in louder as the rotary gap slows down.

It follows that we must have a happy medium of the two types. The one in my mind that serves the best is one giving about a 240-cycle note. The one used at 7CC is composed of a nine-inch disc with eight electrodes and is run at a speed of 1800 R. P. M. The 240-cycle note was gained by using four stationary electrodes. The method used may be seen by looking at the picture of the gap. The stationary electrodes are

(Continued on page 380)

A True Undamped Wave Receptor

The accompanying photograveure illustrates the compactness of this receptor, the size of the cabinet being 12 inches by 9 inches by 6½ inches. This instrument receives undamped wave signals only. No loose couplers, vario-meters, loading coils, etc., are used in this cabinet.

The inductance coils are placed edgewise to each other, the "cloverleaf" way, as a true undamped wave receptor requires only a remarkably small coupling inductance, but considerable self-inductance. These inductances are adjustable to the finest degree by the use of a magnetic field control attached to one of the two closed circuit coils. This control consists of a metallic ring of variable circumference or surface and controls the electro-magnetic field of the undamped tuner.

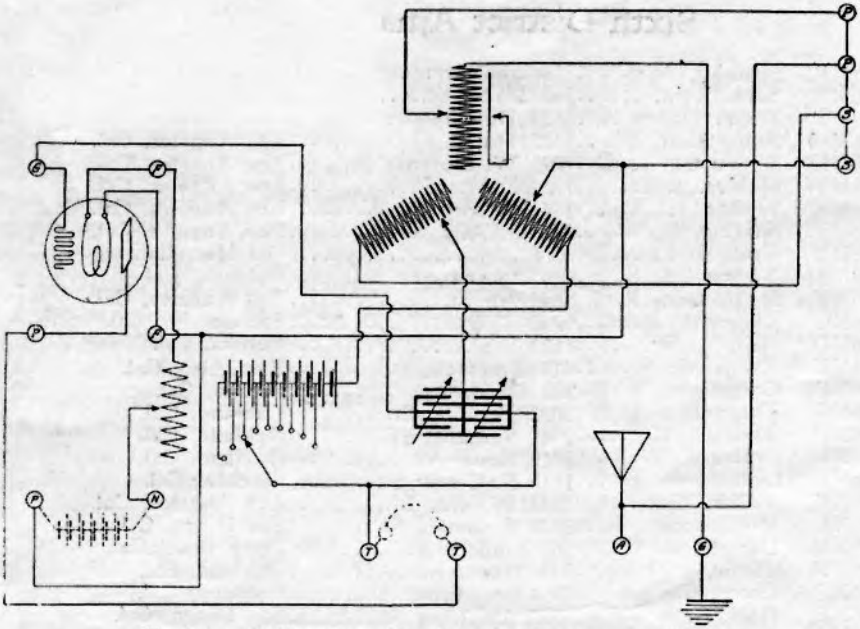
This control or variable short circuiting device, simple as it may seem, is one of the most important improvements in undamped wave reception, as it enables the operator to tune out interference by signals of almost the same wave length as the one he desires to read. All three coils are physically or metallically inter-connected.

It may be well to state that this receptor has absolutely nothing in common with the ordinary type in general use, which consists of primary, secondary and so-called tickler circuits. These tickler circuits are not required in this receptor, as it is an instantaneous and permanent oscillator. It can be depended upon to bring in every signal emitted by any undamped transmitter clearly and distinctly, including transatlantic signals of any wave length now in use. Damped wave interference is impossible. Static and other noises are fully eliminated.

The condenser is of the variable duplex type, preferably of a ferrous metal.

It is the opinion of the inventor that it will be impossible to build an undamped wave receptor that will receive damped wave signals as well as one of the standard damped receptors, since they function on two distinctive principles.

It is usual to tune in arc signals on the common damped wave receptor by simply adding large enough inductances and by changing one of the tuner leads in the plate and phone circuit, causing an oscillating circuit of a freakish and unreliable nature. Such an arrangement permits both damped and undamped signals to come in together with strong electrostatic interferences, especially during the summer months, rendering the reception of clear and dis-



Hookup of Disc Core Receiver for Undamped Waves

tinct signals a difficult task.

The diagram shows the method of connections. This receiver is the invention of Mr. Ernest C. Mignon, 69 Hillside Place, Newark, N. J., and he will be glad to furnish inquirers with further data by private communication.

RADIO FOR PROPAGANDA PURPOSES

Radio was made great use of during the war for spreading propaganda. Probably the largest users of radio for this purpose were the Germans. The giant station at Nauen, the signals of which can be heard in any part of the world, was busy night and day sending out material prepared by the Teutonic propaganda experts. It is easy to prevent propaganda from going the mail, cable and wire routes, but it is impossible to prevent its transmission via radio. When Europe was first plunged into war the only way that the Germans could get news to neutral countries was by radio telegraph.

Now that the war is over the Bolsheviki are transmitting much propaganda through the air. The big station at Moscow loads the ether with Soviet propaganda daily. The Bolsheviki utilize the station at St. Petersburg for this purpose also. Both the damped and undamped systems are used.

After the armistice was signed the Germans sent out carefully prepared press bulletins, thinking that they would be published in the Allied papers and have an influence in softening the sentiments of the Entente statesmen and thus make them more considerative and lenient towards the Central Powers.

(Continued on page 376)

Sixth District Amateur Stations

6MR	Schmidt, Wm.	51st and Vermont Sts.	Los Angeles, Cal.
6MS	Sant, Robt.	746 Maine St.	Long Beach, Cal.
6MT	Hoyn, Harry	6122 De Longpre St.	Los Angeles, Cal.
6MU	Roberts, H. W.	5327 Monte Vista St.	Los Angeles, Cal.
6MV	Thompson A. K.	1025 W. Florence St.	Los Angeles, Cal.
6MW	McKee, J. L.	123 N. Alta St.	Los Angeles, Cal.
6MX	Freitas, E. A.	554 W. 45th St.	Los Angeles, Cal.
6MY	Soaring, Harold	300 N. Alta St.	Los Angeles, Cal.
6MZ	Gray, J. F.		Del Mar, Cal.
6NA	Nielsen, A. S.	849 Athens St.	Oakland, Cal.
6NB	McHolland, R. I.	3545 7th St.	Los Angeles, Cal.
6NC	Thomson, Ralph	1730 T St.	Sacramento, Cal.
6ND	Hill, A. W.	1121 B St.	Eureka, Cal.
6NE	Evans, G. W.	414 Emerson St.	Palo Alto, Cal.
6NF	Cornelison, R. E.	827 O St.	Fresno, Cal.
6NG	Thornalley, R. W.	3027 E. 16th St.	Oakland, Cal.
6NH	Thomas, R.	2949 Summitt St.	Oakland, Cal.
6NI	Brainard, Wallace.	5719 Keith Av.	Oakland, Cal.
6NJ	Griffith, R. E.	1015 N. Center St.	Stockton,Cal.
6NK	Heller, Bertram	1133 W. 41st Pl.	Los Angeles, Cal.
6NL	Middlebrook, R. P.	2744 Columbia St.	San Diego, Cal.
6NM	Daniels, E. H.	266 Lindero Av.	Long Beach,Cal.
6NN	Clazie, F. J.	947 71st Av.	Oakland, Cal.
6NO	Cross, Charles	5504 Broadway	Oakland, Cal.
6NP	Hart, G. L.	3785 Albatross St.	San Diego, Cal.
6NQ	Nelson, H. S.	22 Kensington Apts.	Salt Lake City, Utah.
6NR	LeConte, L. Jr.	2501 Piedmont Av.	Berkeley, Cal.
6NS	Somers, M. G.	1828 W. 41st Pl.	Los Angeles, Cal.
6NT	Frederickson, C. J.	Front and Montezuma Sts.	Rio Vista, Cal.
6NU	Kosier, H. W.	312 Orange Av.	Monrovia, Cal.
6NV	Van Woods, P. O.	Fort Winfield Scott	San Francisco, Cal.
6NW	Ousterhoudt, E.	8011 Crockett St.	Los Angeles, Cal.
6NX	Quement, Frank	51 Pleasant St.	San Jose, Cal.
6NY	Bickel, John E.	745 N. Pickering St.	Whittier, Cal.
6NZ	Capwell, C., Monte Cresta Av. & Kelton Ct.		Oakland, Cal.
6OA	Bernett, L. P.	428 B St.	Hayward, Cal.
6OB	Briare, W. W.	150 Golden Gate Av.	San Francisco, Cal.
6OC	Van Gorder, L.	3149 22nd St.	San Francisco, Cal.
6OD	Gardner, D.	515 El Centro St.	So. Pasadena, Cal.
6OE	Johnson, S. F.	2940 Maiden Lane	Altadena, Cal.
6OF	Martin, J. A.	6002 Linwood St.	San Diego, Cal.
6OG	Young, A. L.	1431 11th St.	Douglas, Ariz.
6OH	Mannon, J. B.	404 Dora St.	Ukiah, Cal.
6OI	Doan, La Chance.	1148 9th St.	Douglas, Ariz.
6OJ	Bullen, C. C.	918 5th St.	National City, Cal.
6OK	Schaur, R. H.	1009 E. Haley St.	Santa Barbara, Cal.
6OL	White, R. M.	717 E. Windsor Rd.	Glendale, Cal.
6OM	Hutchins, Geo.	403 N. Benton Way	Los Angeles, Cal.
6ON	Thompson, H. E.	3104 Grove St.	Oakland, Cal.
6OO	Mackin, G. R.	88 Peralta Av.	San Francisco, Cal.
6OP	Cal. Inst of Technology		Pasadena, Cal.
6OQ	Payer, E.	904 Irving St.	San Francisco, Cal.
6OR	Hill, J. C.	743 Mildreda St.	Fresno, Cal.
6OS			
6OT	Berry, F.	359 E. 13th South St.	SaltLake City, Utah.
6OU	Babcock, J. W.	2227 Piedmont Av.	Berkeley, Cal.
6OV	Brozel, E. H.	1355 Union St.	San Diego, Cal.
6OW	McCormick, C. K.	39 Cliff St.	Santa Cruz, Cal.
6OX	Rominger, G. E.	241 S. Orange St.	Glendale, Cal.
6OY	Doerr, Stanley	137 S. Cedar St.	Glendale, Cal.

SUBSCRIPTION CONTEST

Well, men, here's the list of contestants to date of going to press and the number of subscriptions secured by each one:

Gilbert Earle, Berkeley, Cal..... 4
Asa S. Keller, Monroe, Wash..... 2
Martin L. Jones, New Orleans, La.... 1
J. V. Husen, San Francisco, Cal..... 1
Oliver Wright, Pasadena, Cal..... 2
Charles F. Filstead, Los Angeles, Cal. 1
Carl E. Roth, Napa, Cal..... 0
Herbert Vincent, Fresno, Cal..... 0
E. W. Leeper, Long Beach, Cal..... 1
Laurence J. Hall, San Francisco, Cal. 2
Earl H. Andreen, Superior, Wisc..... 0
Harold M. Huston, San Fernando, Cal. 0
James Walker, San Dimas, Cal..... 0
Omar Humphrey, Jr., Seattle, Wash... 0
J. Prendergast, San Francisco, Cal....10
T. K. Teeter, San Francisco, Cal..... 1
N. G. Hueter, San Francisco, Cal..... 0
E L. Chaix, San Francisco, Cal..... 1
Albert O'Neil, St. Paul, Minn..... 0
P. Byrne, San Francisco, Cal..... 1
Irving H. Baum, San Francisco,. Ca... 3
Kenneth Hupp, Berkeley, Cal..... 0
Clarence Harris, San Francisco, Cal... 0
L. Aufdenkamp, Laguna Beach, Cal... 1

You are pretty slow, men, or else you are hoarding your subscriptions to shoot in the last minute.

We've decided to give everybody a big chance to earn more of the fifty-cent coupons, so have extended the closing date till MIDNIGHT OF JUNE 1st, 1920. That gives you all one whole extra month in which to pile up a few more "subs" and increase the amount of coupons which will go out to you after June 1st. Now get busy in these last forty days and work hard. There are a tremendous amount of radio men all over the United States who are not subscribing now and who will subscribe when you give them a sample copy of "PACIFIC RADIO NEWS." Don't let a man go with just a promise; get his money and his name and address—he'll thank you for it later.

Here is a list of the most important firms manufacturing and handling radio apparatus. You can exchange your coupons for their radio apparatus:

Leo J. Meyberg Co.,
428 Market St., San Francisco, Cal.
C. Brandes, Inc.,
32 Union Square, New York City.
Colin B. Kennedy Co.,
140 Second St., San Francisco, Cal.
Remler Radio Mfg. Co.,
San Francisco, Cal.
Tresco,
Davenport, Iowa.
Audiotron Sales Co.,
Lick Bldg., San Francisco, Cal.
Halcun Radio Co.,
San Francisco, Cal.
Radio Apparatus Service,
Washington, D. C.
Parkin Mfg. Co.,
San Rafael, Cal.
Toledo Radio Specialties Co.,
P. O. Box 343, Central Sta., Toledo, O.
Radio Equipment Co.,
1525 N. Fawn St., Philadelphia, Pa.
Shotton Radio Mfg. Co.,
Scranton, Pa.
A. H. Grebe & Co,
10 Van Wyck Ave., Richmond Hill, N.Y.
Modern Radio Equipment Co.,
Elizabeth, N. J.
Wireless Specialty Apparatus Co.,
Boston, Mass.
The Acme Apparatus Co.,
27 Windsor St., Cambridge, Mass.
The Western Radio Elecertic Co.,
512 E. Ninth St., Los Angeles, Cal.
Teco Radio Co.,
Boston, Mass.
The Radio Shop,
San Jose, Cal.

6OZ	Garner, Glenn	2454 Washington St.	Ogden, Utah.
6PA	Dalziel, C. F.	12th and Chestnut Sts.	PasoRobles, Cal.
6PB	Fowler, L. B.	703 Olive Av.	Redlands, Cal.
6PC	Packard, L. W.	87 S. Chester Av.	Pasadena, Cal.
6PD	McArdle, J. J.	263 Day St.	San Francisco, Cal.
6PE	Mailander, H. C.	423 Westminster Av.	SaltLake City, Utah.
6PF	Maher, T.	426 29th St.	San Francisco, Cal.
6PG	Redmond, J.	340 40th St.	San Francisco, Cal.
6PH	McGuire, E. J.	1855 Church St.	San Francisco, Cal.

The Construction of Modern Radio Apparatus

By Wm. Williamson

It seems that the proverbial amateur radio man who "made every piece of apparatus in his set except the phones" is nearly extinct. Whether this is due to a prosperity wave, or merely downright laziness on the part of the radio amateur, is a question. But when one investigates and finds that there are so many different pieces of apparatus which are easily constructed in the workshop of the average radio experimenter, a new ambition is immediately aroused, especially when it is found that the cost drops to one-half the amount of the assembled apparatus.

The apparatus to be described in this and in the following installments of this series will start with a complete explanation of what is needed to suit the average amateur who wishes to get the greatest efficiency out of the particular piece of apparatus to be described, and then a complete description of how to actually construct the apparatus. All the apparatus to be described will, if the details as well as the general considerations are carefully followed, work better under the conditions encountered in the average amateur's station than most of the apparatus sold in the stores today, and the reasons for this increase of efficiency will be carefully shown in each case.

Transformers

The first consideration with the construction of a transformer will be the reason for its necessity and what it is to be used for. Primarily, a transformer is a device used on alternating current which transforms or changes the voltage, either higher or lower, according to the requirements of the particular case. In radio work it is necessary to have a high voltage alternating current to charge the condensers, which, at the proper time, discharge across the spark gap and cause waves to be set up in the ether, provided the proper intermediate devices are used. A low voltage could, no doubt, be used and probably would be used if the current could be made to jump the air gap, but owing to the high resistance of the air, this cannot be accomplished.

A transformer consists of a coil of wire called the primary, usually wound on an iron core, and another coil of wire called the secondary. Current of the voltage available is supplied to the primary coil and the current given out by the secondary is, in radio work, of much higher voltage than that of the primary. The voltage given off by the secondary depends on two factors: First, the voltage of the current supplied to the primary, and, second, on the ratio of the number of turns in the secondary to the number in the primary. This can be best explained by a simple example. Suppose that we supply 100 volts to a primary of 200 turns. Now, if we have a hundred times as many turns in the secondary as we have in the primary, or 20,000 turns, we will get a voltage of a hundred times as great (neglecting the resistance of the secondary wire), or 10,000 volts, which is 100 times greater than the primary voltage.

The modern power transformer, such as is used on lighting circuits, is a very efficient device, oftening delivering 98 per cent of the power delivered to the primary at the secondary terminals. Another very pe-

culiar and interesting thing in connection with a power transformer is that it is self-controlling; that is, it draws from the supply line only that power which is taken from the secondary. For proper operation at highest efficiency the transformer secondary and the condenser circuit should be in resonance—i. e., the condenser should be of such a size that the condenser will absorb all of the current delivered at the terminals of the transformer secondary. A complete explanation of the theory involved in the above cases is beyond the scope of this paper, and readers are referred to any good book on alternating current theory if a mathematical proof of the above is desired.

If the transformer and condenser circuits are in resonance, as above stated, it will be found that if they are worked at exactly the resonant frequency that an enormous current will be drawn, this being especially noticeable in the modern 500-cycle quenched spark sets, and if worked at resonance the transformer will burn out in a short time, as can be readily seen, as the condenser is acting as a complete short circuit to the secondary, which in turn causes the primary to draw all the current possible from the line. Therefore, in quenched-spark sets especially, the transformer and condenser circuits are worked out of exact resonance, but as near to it as is possible without overloading the apparatus. In most cases they are worked at about 20 per cent below resonance; that is, on 500 cycles the true resonance point will be found at about 620 cycles (in Navy standard sets at about 580 cycles). They could be worked above the resonant point as well as below, but in this case serious damage might be done to the apparatus if the operator slowed down the motor generator set when signing off, as is sometimes done. On a 60-cycle transformer and condenser the above will be found to be as true as on 500 cycles, but the resonant points are not so critical. It will be assumed that all apparatus will be used on 60 cycles, which is the standard universal commercial frequency today, in the description of the apparatus in this series.

The 60-cycle transformers used in radio work are, or should be, all made so that they are self-controlling; that is, when connected to a 60-cycle supply line of proper voltage, with the proper resonant capacity across the secondary circuit, they will draw their rated load without the use of any controlling devices such as rheostats, reactance coils, or the like. Two general methods of construction allow this condition to be fulfilled—namely, the "open core" and the "magnetic leakage" closed core type. The open core transformer is constructed on the same lines as a large spark coil, without a vibrator, but is extremely inefficient and will not be considered further. In this series, the magnetic leakage type of transformer will be described. In this type the leakage is possible due to the peculiar shape of the core, the flux passing across the air gap between the coils in such a manner as to cause a great deal of leakage, with a consequent better result when used for radio work.

The first step in constructing a transformer is to build a core. This is made of a number of strips of sheet iron—or, better, silicon steel—about No. 28 gauge, cut to the proper size, varnished and assembled, after which the windings are slipped into place. The most convenient material to use for cores is sold at most sheet-metal shops as "stove-pipe iron" and will serve admirably for the purpose. Silicon steel, when obtainable, is to be

preferred, but it is very difficult to procure in small quantities. The builder is advised to have the sheet metal cut up into strips in the shop before it is bought, as it will save a great deal of tedious and unpleasant work, and it is besides almost impossible to cut the strips to an exact and equally accurate width by hand, while they will be of uniform size when machine cut. After cutting the strips should be given a coat of shellac or some insulating varnish of the baking variety. This is to insulate the strips from one another and prevent their heating due to eddy currents in the core.

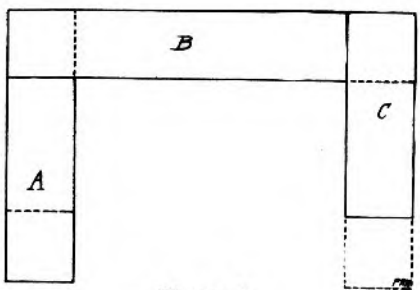
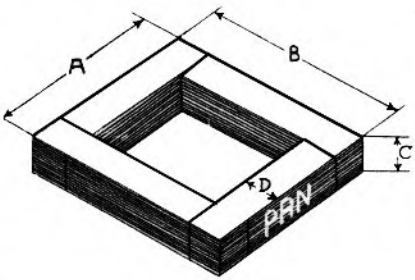


Figure 1.

The core is assembled by first taking one long strip, B, and two short ones, A and C, and laying them down as shown in Figure 1 on a flat board or table. Another short strip is laid down so that its end comes to the dotted line on strip A, when it will be found that it will cover a square of strip B; a second long strip will be found to come to the outside edge of strip C, covering the joint between B and C, and another short strip will extend out beyond C, as shown by the dotted lines. The strips are piled up in this manner until the proper height is reached, which should be equal to the width of the individual strips, this height, or thickness, of the core being, however, the same as the width of the strips when the core is clamped in



a vise in such a manner that all the strips are tightly compressed.

After the pile is completed, remove from the table and clamp the long side in a vise so that the two legs protrude. These two legs may then be taped with friction tape or varnished linen tape. Do not cover the ends of the legs with tape, as the remainder of the long strips of core iron are to be fitted into them after the winding is done. The long side of the core should also be tightly taped to hold the core together.

Below are given complete dimensions for the cores of ¼, ½ and 1-K.W. transformers. Refer to the drawing of the core for the proper widths and lengths:

	—Power—		
	¼ K.W.	½ K.W.	1 K.W.
B	7.25"	9.0 "	10.0"
A	5.5 "	6.5 "	7.0"
C	1.25"	1.75"	2.0"
D	1.25"	1.75"	2.0"
Size large strips	1.25" by 6.0 "	1.75" by 7.25"	2.0" by 8.0"
Size small strips	1.25" by 4.25"	1.75" by 4.75"	2.0" by 5.0"

All strips are to be cut from No. 28 (approximately) sheet iron or silicon steel. The weights of the various cores are about 12 pounds for the ¼ K.W., 20 pounds for the ½ K.W. and 25 pounds for the 1 K.W.

(To be continued.)

MISSES THE NEWS

A man interested in radio who is not a subscriber to PACIFIC RADIO NEWS misses a great deal.

(Continued from page 362)

tenna. All transmitters may be used either as telephones or for continuous wave telegraphy. When the latter is utilized the transmitting distances are trebled. An illustration of the one kilowatt transmitter is shown herewith.

Mr. R. M. Klein, the manager of the San Francisco plant, is starting an active campaign of education to introduce the De Forest radio telephone to the commercial field, where it is most needed. Uses for radio telephones will be found in communicating between locations where satisfactory line communication does not exist, according to Mr. Klein. Claims for the De Forest radio phones are very modest. This fact may be observed by a perusal of the new catalog soon to be off the press. It is felt that an under-estimation of the apparatus when described to the prospective owner of a radio phone will tend to satisfy him much more than the use of a great amount of extravagant claims, and after the installation is once in operation, the owner will find the descriptions in the catalog are made with great integrity.

The new De Forest radio telephone apparatus will be constructed so that an expert radio engineer will not be required to operate it; in fact, the attention required after being once installed and adjusted is no more than that necessary for a typewriting machine or any similar mechanical office appliance.

AMBITION SHOWN

Several men showed their ambition in response to our notice that we paid for our material. They received a check for their trouble. Why don't you get busy too?

—PACIFIC RADIO NEWS.

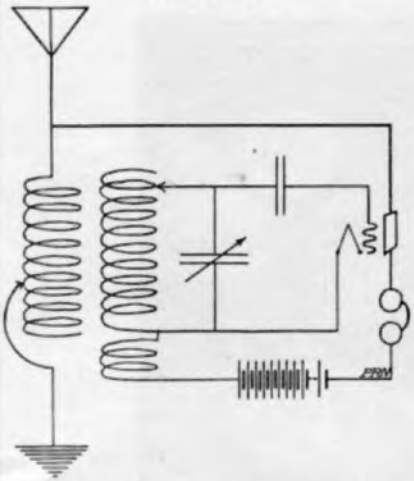
(Continued from page 356)

day. Everybody looked to see the game amount to something. It savored of many encouraging possibilities. The men who went into the work at that time have mighty good reasons for having done so. Since then many have gone into other lines, but a small number remain—whether through faith in the future of wireless or a lack of courage to tackle something else I cannot say. Anyway, they are still with us and they comprise some of the best men in the field today. When I think of the shameful treatment that many of these old-timers got from one of our biggest radio companies it makes my blood boil. Many of these veterans lost out when the navy took over the land stations; a number of them are rambling the seas again. Personally, I should like to see the shore stations go back to the commercial companies or be made civil service jobs so that old ship operators will have something to look forward to on shore. As things stand now, seagoing jobs are about the only ones that are worth while.

It is a shame that a solid radio organization like the U. R. T. A. of today did not spring into existence several years ago. Some of us who worked for nothing for about five years would have had better bank accounts than we now have. I believe that the majority of the men stuck to the game because of their interest in the work and the hope that the future might bring something of value. Of course, in a line of work like our's one is bound to find adventurers. The travel itch has always been a human trait. Radio has an alluring fascination about it that has a strong effect in making the old boys stick. Any number of the pre-war operators could

(Continued on page 375)

GOOD CONTINUOUS WAVE HOOKUP



It will be noticed that the only difference between this and a straight audion hookup is that a lead runs from the plate direct to the antennae binding post on the receiver. I find that this arrangement makes the bulb oscillate much more easily than where other circuits are used. It also possesses the additional advantage of requiring less current in the plate and filament circuits, thereby increasing the life of the tube. For the best results a tickler coil is necessary. The tuning will not be so sharp where this scheme is used, but the increase in the audibility of the signals will offset that.

While anchored off Norfolk, Va., in broad daylight the following stations were copied with this hookup: Stavanger (LCM), Nauen (POZ), Eifel Tower (FL), Nantes (UA), Rome, (IDO), San Diego (NPL), Pearl Harbor (NPM), and Balboa (NBA). All of these stations were easily audible and NPL's entire press broadcast was copied.

For getting on the waves of these stations—they're above 10,000 meters, honey-comb loading coils were used.

(Continued from page 372)

have secured licenses as deck or engineer officers if they had gone into that line of work; others could have qualified as pursers. Financially, they would have been much better off today had they taken up these last-named lines. I don't hesitate in saying that I think the radio operators in point of intelligence are as bright and, in some cases, more so than the officers of any other branch on shipboard. Right away I know some of you challenge that statement; you say to yourself, "If they're as bright as you say, why didn't they have brains enough to organize a union long ago?" You've got me there—I can't answer that. It makes it all the harder to understand when one thinks of the powerful organization that the firemen, oilers, sailors and waiters have had for a long time. As a radio man, when I ponder over this it makes me feel ashamed of myself. We lacked good backbones, I think—we were too meek and easy-going. If I remember right, some sort of a union was organized back in 1912 or 1913, but it could hardly have been called a union—not as I understand the word. The men struck after letting the company know about it several months in advance! The thing turned into a fizzle—a joke. But when the firemen struck they won! Such is the power of organization.

Mr. Gompers, head of the American Federation of Labor, has said that organization is the only hope of the worker. He could not have said a more powerful truth. Organization applies to many other things besides labor. Take an army, navy, railroad company, steamship company, or any kind of business—do you think they could succeed if they lacked good organization? I should say not. So we see that organization is a powerful factor. But

(Continued on page 376)

(Continued from page 375)

we must not only be cognizant of that fact—we must jump into it and become a substantial part of it. The most powerful marine organization in the world is the Marine Engineers Beneficial Association of America. So strong is it that all it needs to do is make a reasonable demand and it is complied with at once. Now that's the kind of an organization that the radio men want—one whose every reasonable demand must be met with and met with at once. In the past the wireless men have been very unreasonable—they've been so unreasonable that they let the radio companies pay them less than a dishwasher, besides being indifferent to outrageous treatment! Hereafter, fellows, be reasonable! If you insist upon becoming the meek sheep of old you'll get eaten up by the wolves, and take it from me, you'll not come in for much sympathy. A great journalist has said that repetition is the soul of journalism, so I shall repeat Mr. Gomper's mighty maxim: "Organization is the only hope of the worker."

(Continued from page 365)

It is to ge regretted that some of the German people did not install receiving apparatus and copy the news that the United States sent out. In this way the majority of Germans, who were kept in ignorance by the Kaiser's clever publicity men, could have learned the truth, all of which might have had a great bearing on shortening the war. As it was, it was their emerging from ignorance that caused the revolution and snapped the terrible militaristic ring with which the war lords surrounded the otherwise rational Germans. They learned the truth and the truth made them free.

(Continued from page 363)

made of brass, while the disc is cast aluminum. A gap speed of 3400 is more desirable, but where only an 1800 R. P. M. motor is available, the above scheme was found to work very well, though the quenching is not so good.

Probably the best oscillation transformer for amateur use is the pancake type. In tuning, a hot wire ammeter is necessary. If a hot-wire ammeter is not at hand, some idea of the radiation may be had by using a lamp in series with the antennae. If a decremeter is not to be had, the pancakes of the oscillation transformer should be separated about eight inches, and with about two turns in the closed circuit, the open circuit should be tuned to maximum radiation. AT STATION 7CC WE RADIATE 8.4 AMPERES INTO THE ANTENNA WITH EIGHT-INCH COUPLING.

By wise placing of the instruments, leads totaling less than 12 inches may be had in the closed circuit. Short leads are very necessary for high efficiency.

At 7CC No. 6 wire is used to connect the transmitting instruments, and one long dash of ten seconds heats the wire so that it is impossible to touch it. It is hoped that this emphasizes how important large surface leads and connectors are.

7CC is heard almost every night on the Pacific Coast and as far east as Illinois. The "proof of the pudding is in the eating." Readers can draw their own conclusions.

Heard at 6BS, San Francisco, for the month of February: 6AK, 6AY, 6BQ, 6CM, 6CS, 6CV, 6DH, 6DK, 6EA, 6EB, 6EF, 6EJ, 6EN, 6ER, 6FD, 6FE, 6FX, 6GR, 6GQ, 6JD, 6JM, 6ZA, 7CC, 7CH, 7CW, 7DK, 7GG, 7ZB,.

TUBULAR
BULB
ADAPTER
$1.50

SOMETHING
NEW!
VARIABLE
GRID LEAKS

HIGH VOLTAGE STORAGE BATTERIES FOR RECEIVING OR RADIO PHONE USE
Send stamp for Circular

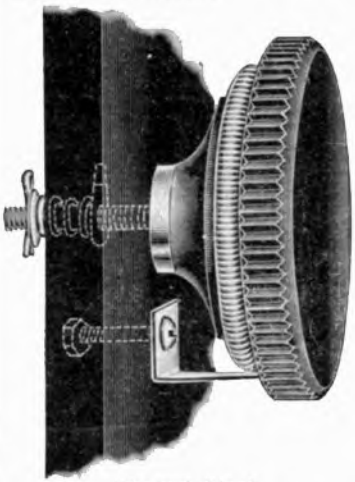
Sonoma Radio Laboratories
Box 297, Sonoma, Sonoma Co., Cal.

---

11 Plate Var. Condensers . $1.65
21 Plate Var. Condensers . 2.15
41 Plate Var. Condensers . 2.65
Formica 1/4, 2 1/2c square inch
Sizes up to 24 x 36
Formica 1/8, 1 1/2c square inch
Rheostats, $1.50

The General Appliance Co.
82 Marion Street
Seattle, Washington

Parkin Rheostat Now $1.00
WHY PAY MORE?
when this is the easist mounted, smoothest running, best rheostat on the market.



(Actual Size)

No. 35 Parkin Panel Type Rheostat (Pat. pending) has easily renewed resistance unit mounted on back of **moulded Bakelite Knob.** Shaft is moulded into knob, cannot come loose. "Off" position provided . 360 degree rotation insures fine adjustment.

Write for descriptive circular of audion panels, switches, binding posts, contacts, etc.
Dealers: Write for proposition

PARKIN MFG. CO.
San Rafael, Calif.

Save Your Money

THE RADIO APPARATUS
SERVICE
UNION SAVINGS BANK BLDG., WASHINGTON, D.C.
"A SUPPLY COMPANY FOR THE RADIO AMATEUR"

Our Price Lists Tell

MANUFACTURERS' REPRESENTATIVES
NEW ADDRESS 711 13th St., N. W. Washington, D. C.

Classified Advertisements

ADVERTISEMENTS IN THIS SECTION ARE THREE CENTS PER WORD NET. REMITTANCE, IN FORM OF CURRENCY, MONEY ORDER OR STAMPS, MUST ACCOMPANY ORDER.

WIRELESS AMATEURS. We are selling "Areogram" radio pads, one hundred sheets for twenty-five cents. Just the thing for keeping a record of messages received or sent out. Send your orders now. Only a limited supply. Agents wanted. Sample 3 cents. The Areo Press, 45 N. Division St., Buffalo, N. Y.

FOR THIRTY DAYS ONLY!!! Galena detector stand on bakelite base given free with every order for three pieces of galena. Send 75 cents for this bargain offer. RADIO SALES CO., 251 Duboce Ave., San Francisco, Cal.

SEND FOR MY LIST OF RECEIVING APPARATUS. I HAVE SEVERAL GOOD BARGAINS. ALL USED APPARATUS. WILL SELL AT REASONABLE PRICE. I. A. FOX, 1403 9th St., Oakland Cal.

WANTED—COPIES OF PACIFIC RADIO NEWS. We will pay 25 cents for copies of the January, 1920, and March, 1920, copies in good condition. PACIFIC RADIO PUB. CO., 50 Main St., San Francisco.

Instant Attention!

Every order received (unless for specially built apparatus) is positively shipped within 24 hours, and oftentimes less. There are no patience-taxing delays, when you deal with this concern—"IT'S ON THE JOB!"

Look Out!

For something brand new and unusually attractive:

Antennae Switches,
Oscillation Transformers,
Amplifying Transformers,
Bulb Adapters.

Extra Efficient Values

Reco Keys	$6.50
Reco Short-wave regenerative receiver	$35
54-Volt B Battery, guaranteed 6 months	$4
Detector and 2-step Amplifier (no bulbs)	$40
Audion Detector Cabinets, V T or Audiotron Mountings	$20

Send a stamp for our snappy monthly bulletins, with everything that's new while it is new.

THE RADIO ENGINEERING CO.
614 N. Calvert St., Baltimore, Md.

PACENT ELECTRIC COMPANY

INCORPORATED

150 Nassau St. New York

We are builders and specialists in electrical, radio and laboratory equipment suitable for amateur, experimental, research and communicating purposes and are therefore in a position to serve electrical jobbers, operators, amateurs and other interested persons to the best advantage.

You are invited to visit our show rooms which are always complete with the latest equipment; all designed by the best known engineers in the field and includes Genuine Dubilier Mica Condensers, Standard VT batteries, Grebe correctly designed receiving equipment, imported Seibt variable air condensers, Rawson ultra-sensitive instruments, vacuum tubes, standard radio laboratory apparatus, etc.

A. H. GREBE & CO.
DUBILIER CONDENSER CO.
RAWSON ELECTRICAL INSTRUMENT CO.
ELECTRICAL PRODUCTS MFG. Co.
RICHTER & BYRNE.
IMPORTED SEIBT CONDENSERS.
VACUUM TUBE APPARATUS.
AND OTHERS

PACENT ELECTRIC COMPANY, Inc.

Telephone Beekman 5810

150 Nassau Street New York

PRESENTING
TWO NEW
TYPES OF
VACUUM
TUBES
for
EXPERIMENTERS

The Moorhead
Electron Relay

The Moorhead VT
Amplifier-Oscillator

The Moorhead Perfect Vacuum Tube Combination

—the Moorhead Electron Relay and the Moorhead VT Amplifier-Oscillator; perfected to meet the increasing demand for tubes of superior efficiency, wherein all desirable features are combined without subordinating any desirable operating characteristics.

THE MOORHEAD ELECTRON RELAY $6

The Electron Relay is the original tubular vacuum valve, brought out by this company in 1915, and is unexcelled as a detector. The tube is of the so-called "soft" type requiring relatively low B battery potential. Both types of tubes are rugged in construction and unqualifiedly guaranteed.

THE MOORHEAD VT AMPLIFIER-OSCILLATOR $7

The VT Amplifier-Oscillator is the Navy SE 1444 "hard" tube, and is designed and manufactured expressly for amplification and oscillation purposes. A combination of two or more VT tubes as amplifiers with an Electron Relay as the initial detector or oscillator is the ideal receiving combination for long distance amateur or long wave reception.

Specify full names of tubes when ordering. Orders may be placed through a dealer or sent direct with check, draft, or money order.

Amateurs — Watch for our transmitting tube announcement.

Dealers — Write us now for prices and full particulars.

PACIFIC RADIO SUPPLIES CO., DISTRIBUTORS FOR

The Moorhead Laboratories, Inc.

638 Mission Street, San Francisco, Cal.

REFERENCE: ***The American National Bank, San Francisco, Calif.***

"R W 4" Size 12"x8"x6½"

Mignon "RW4"

Undamped Wave Receptors

NO Loose Couplers
Loading Coils
Variometers
Amplifiers

Strongest, Most Distinct Signals

IMPORTANT NOTICE

The Mignon System Apparatus, R W 1, R W 2, R W 3 and R B D 8 are no longer manufactured and are superceded by the improved R W 4, U W 1 and B D 1. These apparatus are manufactured exclusively by the MIGNON MFG. CORP., sole owners of the MIGNON SYSTEM PATENTS (see U. S. Letters Patent No. 1328672).

INFRINGERS will be PROSECUTED

Address all communications for Mignon Apparatus to

Mignon Manufacturing Corporation - Newark, N. J.

Damped and Undamped Wave Apparatus for all purposes

Endorsed by Radio Department of D. L. and W. R. R. Co.

Write for Literature

Mignon Mfg. Corporation

Dept. W NEWARK, NEW JERSEY

SUPERIOR MIGNON SYSTEM RADIO APPARATUS

Representative Canadian Radio Mfg. Co., Bienville, Que., Canada