APRIL, 1924 25 CENTS

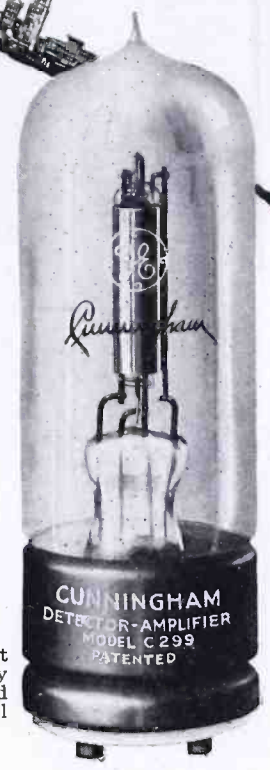
RADIO

(Reg. U. S. Pat. Off.)

"HIS FORMER PLAYMATE"

C-12—Similar to C-11 with standard base
$5.00

C-11—1.1 Volt .25 amp. Dry Battery Det. and Amp. Special Base
$5.00



C-299—3 Volts, 06 amp. Dry Battery Det. and Amp.
$5.00

C-300—6 Volts Gas Content Detector
$5.00

The complete line of Cunningham RADIO TUBES

FOR EVERY TYPE OF RECEIVING SET

WHATEVER type of receiving set or circuit you are using—one or more of these five Cunningham receiving tubes will be ideal for obtaining maximum distance reception with perfect reproduction of both voice and music.

Three of the five tubes are designed to use dry batteries for filament lighting. C-299, the latest development in Radio Tubes, is compact in design and highly efficient in operation as a radio frequency amplifier, a detector and as an audio-frequency amplifier. When used for the latter purpose, the output of two stages is sufficient for the operation of a small loud speaker.

The most remarkable feature of this tube is the new patented filament used which draws only .06 amperes at 3 volts.

C-11 is a dry battery tube with a special base for use in sets having special sockets. It is a good detector and audio-frequency amplifier. The filament is lighted from a single dry battery and draws .25 amperes.

C-12 is identical to C-11 in operating characteristics, but is mounted on a standard base to permit the use of a dry battery tube in sets equipped with standard sockets without the aid of special adaptors.

Whenever storage battery supply is available for filament lighting, the C-300 will be the best tube to use as a detector because it is the most sensitive for the reception of distant and weak signals.

Under the same condition, C-301A will be the best tube for amplification at either radio or audio frequency, because it gives greater gain per stage than any other tube on the amateur market. The new patented filament used, similar to that in C-299 draws only .25 amperes at 6 volts, reducing the necessity of frequent storage battery charging.

Patent Notices Cunningham tubes are covered by patents dated 2-18-08 and others issued and pending. Licensed for amateur, experimental and entertainment use in radio communication. Any other use will be an infringement.

C-301A—6 Volts ¼ amp. Amplifier
$5.00

The care and operation of each model of Receiving Tube is fully explained in our new 40-page "Radio Tube Data Book." Copies may be obtained by sending ten cents to our San Francisco office.

E. J. Cunningham Inc.

Home Office: **182 Second St.**
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154 West Lake Street
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30 Church Street
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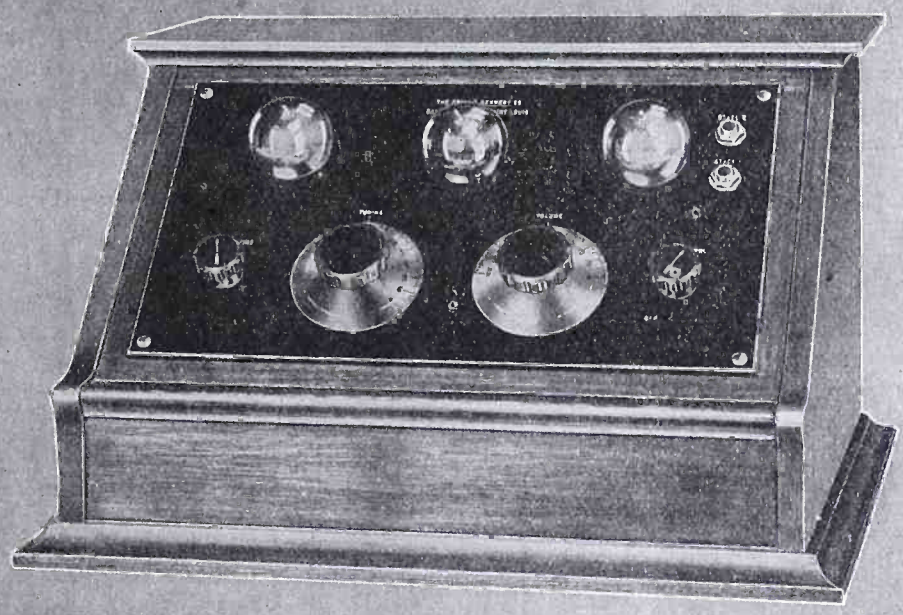
The Royalty K *of Radio*



KENNEDY MODEL V

Like the Artist Standing Before You

So pure, sweet and life-like is the tone of the new Kennedy Radio Receiver, Model V, that it really makes you feel the artist's presence—standing at your fireside—performing for you, in your own home!

And, with this new Kennedy, it is astonishingly simple to bring to your own living room the best broadcast entertainment in the country. You, your wife, mother, son or daughter—anyone—can operate Model V with an ease that brings its own form of fascinating pleasure. Only one dial is used to "tune in" a station—a slight regulation of a second dial controls the volume so you can bring in music or voice soft or pronounced as you wish.

Best of all, when once you have determined the dial setting for any station, that station (if it is broadcasting) will "come in" at its own dial setting—any night, anywhere, regardless of the kind of antenna used.

Think of the possibilities here! Many Kennedy owners make up their own station record—showing the dial setting for each station. How wonderfully simple—merely select the station you wish to hear and set the tuning dial to the number of that station.

Another feature about this new Kennedy is one that your neighbors will appreciate. It does not radiate to any appreciable extent—it does not throw out whining, whistling noises that interfere with listeners living near you.

When you buy your Kennedy Model V, you will add an attractive piece of furniture to your home. The mahogany cabinet is hand-rubbed to a beautiful finish. The polished black Formica panel, in contrast with the mahogany cabinet, creates a pleasing effect. There is no confusing mass of wires dangling from the cabinet and all batteries are completely enclosed.

Model V is really the receiver for you! It is a permanent investment that will bring you years of pleasure. It is sold, completely equipped with all dry battery tubes, dry batteries and Kennedy 3000-ohm phones with plug, for only $125.00 ($127.50 west of Rockies). Other models range from $285.00 to $825.00 (slightly higher west of Rockies) completely equipped, including built-in loud speaker.

$125
fully equipped
($127.50 west of Rockies)

Try this new Model V in your own home—your dealer will gladly arrange this for you. If you cannot locate him, write us direct for fully-illustrated literature covering this and other popular Kennedy models.

All Kennedy Radio Receivers are regenerative.
Licensed under Armstrong U. S. Patent No. 1,113,149.

THE COLIN B. KENNEDY COMPANY
SAINT LOUIS

KENNEDY

The Royalty K *of Radio*

Tell them that you saw it in RADIO

RADIO

Established 1917 as Pacific Radio News

Volume VI *for April, 1924* *Number 4*

CONTENTS for APRIL, 1924

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Forecast of Contributions for May Issue

Prof. C. M. Jansky of the University of Minnesota will start an authoritative series of articles which will give the non-technical man an idea of what is going on in the various radio circuits in which he is interested. He first takes up an elementary discussion of electric current, charge, pressure, resistance, inductance and capacity. As Prof. Jansky is a member of the Washington Radio Conference and a well known authority on radio, his articles should be of great interest and value.

Paul Oard presents a number of radio construction pointers, including complete directions for the construction and finish of a radio cabinet.

Samuel C. Miller has an unusually clear understanding of circuit requirements for maximum amplification. These he explains in the course of an article on matching impedances.

D. B. McGown details the construction and uses of various types of telephone receivers.

Keith La Bar gives directions for making a receiving set that will readily utilize any one of a half dozen circuits at will.

Charles F. Filstead completes his series of three articles on "A Reflex Receiver for Beginners" with a description of the single-tube reflex unit.

L. R. Felder has an excellent article on the theory of the neutrodyne. With a better understanding of its principles there is less difficulty in assembling this popular circuit.

Geo. C. Jones has a suggestive article on efficient radio-frequency amplification.

A. L. Munzig writes helpfully regarding the construction of a receiver using tuned radio-frequency with neutralized capacity coupling.

F. W. Morse, Jr., tells how to make a remarkably simple and effective set capable of performing nearly all of the functions to which a vacuum tube may be applied.

The fiction feature will be "McGuffy's Flying Antenna," by Paul Oard. Those who read about his experiences with an arc transmitter will know how good this story is.

MAGNAVOX

THE name Magnavox on a Radio Reproducer stands not only for the most careful workmanship and highest quality of material—it signifies also a fundamental *operating principle* utterly distinct from that of ordinary "loud speakers."

The exclusive use of this (electro-dynamic) principle by Magnavox has resulted in the production of a true Radio Reproducer accepted as the standard by which all other instruments are judged.

The base of the new model Magnavox Reproducer R3, showing *electrical modulator* —the significance of which is explained below.

Important features now offered in Magnavox Radio—the Reproducer Supreme

THE Magnavox electro-dynamic principle obviates the need of any mechanical adjustment (sometimes called a "modulator") to regulate the air-gap or change the position of moving parts. This famous principle of operation permits the use of an *electrical modulator* now a feature of R3 and R2 Reproducers.

This modulator, as the name implies, directly affects the character of the electrical circuit which creates the sound, controlling the sensitivity of the instrument and also its volume of reproduction,

Moreover, this *electrical modulator* produces a great saving of current (already reduced in the new R3 and R2 to a maximum of .6 ampere) for, by its action, the current value can be reduced to a minimum of .1 ampere.

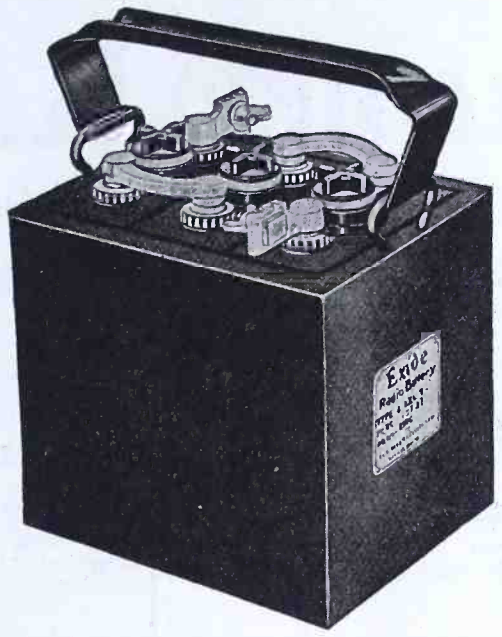
The new Magnavox electro-dynamic Radio Reproducers R3 and R2, in fact, are equipped with the first *true* sound modulating device ever designed. See them at your dealers and write us for catalog of Magnavox Reproducers, $35 to $50; Power Amplifiers, $27.50 to $75; Combination Sets, $59 to $85.

THE MAGNAVOX COMPANY, Oakland, California

New York Office: 370 Seventh Avenue

Perkins Electric Limited, Toronto, Montreal, Winnipeg, *Canadian Distributors*

4R



"A" Battery for six-volt tubes

When is a battery *cheap*?

A BATTERY that allows your soloist to be accompanied by a noise like a thunder storm is never a cheap battery; because it's certain that you will be dissatisfied and soon supplant it with a good battery.

Obviously, a battery that does not last long is not a cheap battery.

The battery that is really cheap is the one that gives perfect service and gives it a long time; one that does not have to be recharged too frequently —a silent, long-lasting battery, steady and dependable.

Because they give such good service and such long service, you will find Exide Radio Batteries cheap in the true sense of the word. They may cost you more than some to start with, but long life and freedom from repairs make the last cost low. And the added enjoyment you get from your set, through clarity and lack of needless bother, will be priceless.

In replacing a worn-out battery or when buying a new set, be good to yourself and get an Exide.

Complete line of Exides for Radio

There is a complete line of Exide Radio Batteries —batteries that give uniform filament current over a long period of discharge.

Apart from the 12-cell "B" battery there are three "A" batteries for whatever type tube you use. The Exide for 6-volt tubes gives full-powered, ungrudging service. It has extra-heavy plates and requires only occasional recharging. It comes in four sizes—of 25, 50, 100, and 150 ampere hours capacity.

The Exides for low-voltage tubes are midgets in size but giants in power. The 2-volt battery weighs only five pounds, has a single cell, and will heat the filament of WD-11 or other quarter-ampere tube for approximately 96 hours. The 4-volt "A" battery has 2 cells and will light the filament of UV-199 tube for 200 hours.

The dominant battery

On sea and on land the Exide plays an important role in the industrial life of the nation. In marine radio, Exide Batteries provide an indispensable store of emergency current. A majority of all government and commercial radio plants are equipped with Exides.

Exide Radio Batteries are sold by Radio Dealers and Exide Service Stations everywhere.

Ask your dealer for booklets describing in detail the complete line of Exide Radio Batteries. Or write direct to us.

Exide
RADIO BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

In Canada, Exide Batteries of Canada, Limited, 133-157 Dufferin Street, Toronto

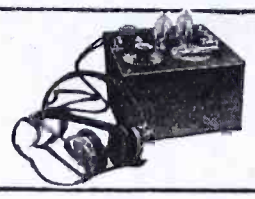
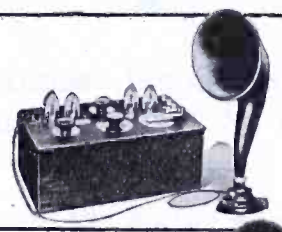
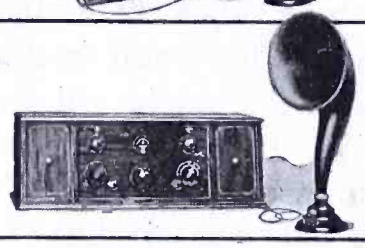
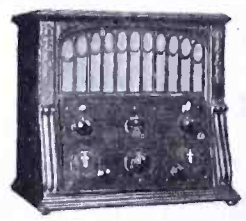
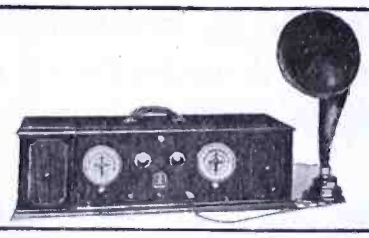
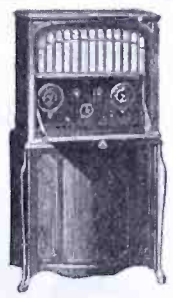
Tell them that you saw it in RADIO

Here—*the new* Radiolas!

New Triumphs of Radio Invention— New Performance Records

"There's a **Radiola** *for every purse"*

$35 to $425

	† Model	Price	Approximate Range	Type of Antenna	Degree of Selectivity
	**Radiola III** With two WD-11 Radiotrons* and head telephones.	$35	Up to 1500 miles with headphones. Local stations on Loudspeaker.	Outdoor or indoor antenna.	Improved selectivity. Minimum radiation.
	**Radiola Balanced Amplifier** To be used with Radiola III. With two WD-11 Radiotrons.*	$30	Gives Loudspeaker operation with Radiola III up to 1500 miles under favorable conditions.	Outdoor or indoor antenna.	
	**Radiola III-A** with four WD-11 Radiotrons,* head telephones and Radiola Loudspeaker.	$100	Loudspeaker operation up to 1500 miles under favorable conditions.	Outdoor or indoor antenna.	Improved selectivity. Minimum radiation.
	Same without Loudspeaker.	$65			
	**Radiola Regenoflex** with four WD-11 Radiotrons,* and Radiola Loudspeaker.	$206	Loudspeaker operation up to 2000 miles under favorable conditions.	Outdoor or indoor antenna.	Extraordinary selectivity. Non-radiating.
	Same without Radiotrons or Loudspeaker.	$150			
	**Radiola X** with four WD-11 Radiotrons.* Loudspeaker built-in.	$245	Loudspeaker operation up to 2000 miles under favorable conditions.	Outdoor or indoor antenna.	Extraordinary selectivity. Non-radiating.
	**Radiola Super-Heterodyne** with six UV-199 Radiotrons* and Radiola Loudspeaker.	$286	Loudspeaker operation up to 2000 miles with internal loop. With external loop up to 3000 miles under favorable conditions.	No antenna. (Concealed small loop built into set.)	Super-selectivity. Non-radiating.
	Same without Radiotrons or Loudspeaker.	$220			
	**Radiola Super-VIII** with six UV-199 Radiotrons.* Loudspeaker built-in.	$425	Loudspeaker operation up to 3000 miles under favorable conditions.	No antenna. (Concealed large loop built into set.)	Super-selectivity. Non-radiating.

† *All Radiolas sold without batteries.* * *Only dry batteries used.*

Send this coupon for an illustrated booklet that tells the story completely, with detailed description of every set.

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Dept. 54 [Address office nearest you]
Please send me your new free Radio Booklet.

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Sales Offices: 233 Broadway, New York
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Radiola

REG. U.S. PAT OFF

April 1924

RADIO

Established 1917

Trademark Registered U. S. Patent Office

Volume 6
No. 4

Radiotorial Comment

CONSIDERABLE opposition has already been aroused against the proposal of the Interdepartmental Advisory Committee at Washington that amateur or commercial licenses no longer be required from radio operators. This proposal would not abolish the station licenses but would do away with the operators' licenses. The idea is, in effect, to transfer the responsibility of proper operation from the government radio supervisors to the station owners, whether commercial, ship or amateur.

The purpose is evidently to relieve the overworked radio inspectors of much detail. It is believed by the proponents that commercial, ship or amateur organizations can do the necessary policing and exercise the needed control just as is done by the Signal Corps and the Navy, whose operators are not required to pass the examinations of the Department of Commerce. As a parallel case of private rather than public regulation is cited the locomotive engineer who is not required to have an operating license but whose employment is dependent upon his skill and experience.

The weak point in this comparison is that the Army and Navy authorities exercise a discipline over their operators which is impossible in civil life and that the railroads, under governmental regulation, are vitally interested in the competency of their locomotive engineers.

The opponents of the proposal explain that it will conflict with the international radio telegraph agreement that all ship operators must hold a certificate issued by the government to which the ship is subject. Without a licensed operator an American ship could not clear from a foreign port. Furthermore, the examination which must be passed before the license will be granted is a guarantee of competency. There is already a tendency on the part of some steamship companies to employ incompetent operators who are willing to accept wages below the standard scale. They are deterred from doing so only by the present laws and regulations. To let down the bars would endanger passengers and cargoes. The loss of a single ship because of the lack of proper communication would involve a greater financial loss than the cost of conducting examinations for many years.

In addition to this form of ship safety insurance there is also the matter of insurance against amateur interference, the worst of which comes from the operator who is not sufficiently skilled in code transmission nor sufficiently versed in the radio regulations to secure a license. A licensed amateur knows that he will lose his certificate if he breaks the law. He takes a pride in his license and what it stands for.

But if there were no such check on transmission chaos would result. No amateur radio club could cope with thousands of boys with spark coil sets. Broadcast reception would result. No amateur radio club could cope with dollars in receiving sets would be nullified.

In view of these facts and inasmuch as there has been no serious objection to the present system, there seems to be no reason for making a change excepting that of economy—which seems ill-advised at a time when more rather than less regulation is necessary.

WHO should be favored, the local or the long-distance listener? By local listener is meant the person who enjoys the concerts of a station say one hundred miles or less away. He may have a crystal or one-tube set with phones or may have sufficient audio-frequency amplification to operate a loud speaker. The long-distance, or DX, listener has a more sensitive and frequently less selective receiver and gets the greatest thrill from hearing a station one thousand miles or more away.

The one granting the favor is the local broadcaster. While his station is operating it is impossible for the average DX hound to get what he is after. The question then resolves itself to one of silent nights and silent periods. Should all the stations in a given locality shut down at the same time so as to facilitate long-distance work?

The answer is not unanimous either negatively or affirmatively. One Pacific Coast station recently stopped broadcasting between 7:30 and 8:00 P.M., after a short trial, because of many requests received from those who are able to get some of the Eastern stations during this period. As summer comes on and the daylight hours are lengthened, DX reception at this hour will become rarer.

Without doubt, the great, and usually silent, majority are those who are dependent upon the local stations for their entertainment. With those stations off the air, their sets are silent. So if the question is put to a vote, the "noes" will have it.

Furthermore, the local broadcasting is the best for a steady diet. While stunt reception, like auto speeding, gives a thrill, the greatest service that a broadcaster can give is to his local audience. Distance may lend enchantment but nearness is more practical.

RADIO has become synonymous with broadcasting in the public mind. All of the tremendous service of radio in the Army and Navy, on ship and on land, by commercial and amateur operators is frequently forgotten when radio is mentioned. Radio as a utility has been subordinated to radio as an amusement. It is like the pleasure car as compared with the auto truck.

Consequently it is of interest and value to read elsewhere in these columns what the Navy is doing with radio, to read how one corporation gives almost a complete world-wide service of radio communication, and what is being accomplished in the way of amateur transmission. While we enjoy the broadcasting let us remember that radio's greatest service to humanity is as a means of universal communication, going frequently where wires can't go and doing what wire communication can't do.

Radio Compass Station at Cape Elizabeth, Me.

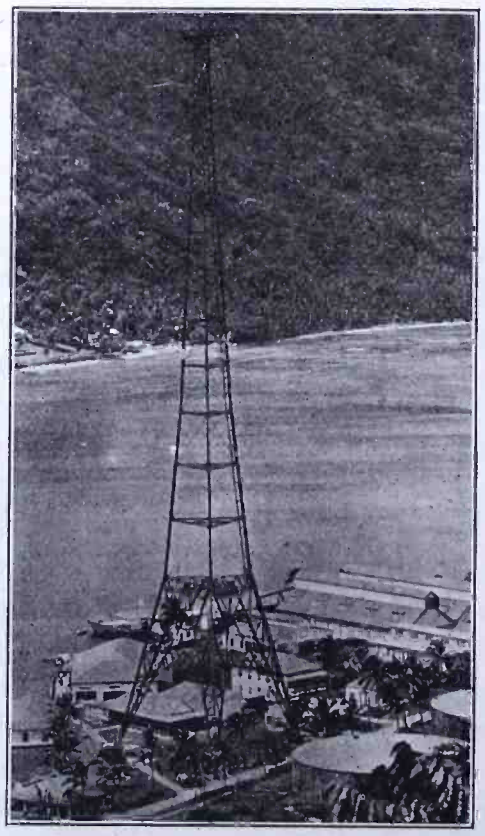
The Radio Network of the Navy

By S. R. Winters

This article succinctly states what is involved in the U. S. Navy's twenty-five million-dollar investment in radio equipment. It graphically presents the extent of the Naval communication service and tells what is being accomplished in its use.

THE Naval Communication Service, operating under the Chief of Naval Operations of the United States Navy Department, is world-wide. So comprehensive is this system that, with the exception of a neck of territory in the eastern Mediterranean and Asia Minor, high-powered radio-telegraph stations radiate electric energy directly to every part of the globe. Even the Near East, indirectly, is included in the communication net of Uncle Sam, since vessels operating in the Mediterranean waters are enabled to receive radio messages from Washington by the interlocking of European wireless stations with land lines and cables.

The Naval Communication Service was established as a means of furnishing swift intelligence between the United States Navy Department, the fleets, and the outlying possessions of America. It is a system of defense and as such, of course, serves its greatest mission in time of war. In time of peace, however, the duties imposed upon this communication system are both continuous and variable in nature. The traffic in messages between the Navy Department and the fleets of ships is a task of no mean magnitude. Assistance is to be rendered mariners, which aid takes the form of time signals, weather reports, storm warnings, hydrographic reports, and the transmission of distress signals. Commercial communication systems — telegraph, cable, and radio—may suffer a temporary impairment or disruption of service. In such exigencies, the Naval Communication Service is in a position to handle the commercial traffic until the business interests involved have made necessary repairs. Then, too, not the least of the peace-time functions of this world-wide intelligence service is the fostering of friendly and sympathetic relations with other nations. This objective is served by placing the communication system at the disposal of the press and commercial interests the world over at nominal charges.



Radio Tower at Tutuila, Samoa

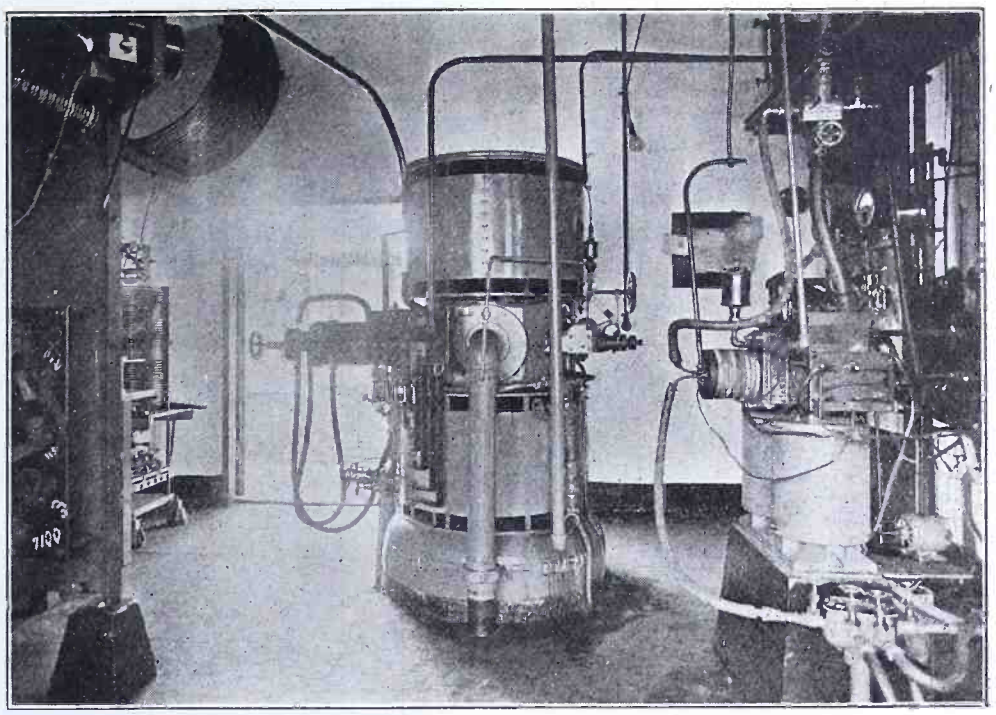
Clearly, a communication service of such wide ramifications involves a considerable financial investment and pretentious physical equipment. Thus, when we are told that the United States Government has an investment of $25,000,000 in this enterprise, it occasions little surprise. This figure represents ownership by the Navy Department in approximately 40 high-power radio stations, capable of transmitting messages over distances ranging from 800 to 6,000 miles, and possession of 95 radio stations of intermediate power, with a transmitting range up to 800 miles. There are 46 radio-compass stations established and operative along the shores of the Pacific and Atlantic Oceans as aids to navigation. The physical equipment thus outlined, coupled with the radio installations on ships and aircraft, represent an investment of $25,000,000.

The Naval Communication Service bridges the Pacific Ocean at several points with radio-telegraph circuits, the giant of which is the one extending from San Francisco to the Philippine Islands. The volume of traffic thus routed and the distance over which it is effectively conveyed subscribe to the significance of the term "long-distance radio communication". One-third of the traffic spans the Pacific Ocean and the other two-thirds are relayed at Honolulu or Guam, or both. There is a half-hourly schedule between San Francisco and Honolulu, so that this service is practically continuous. Commercial traffic is not ac-

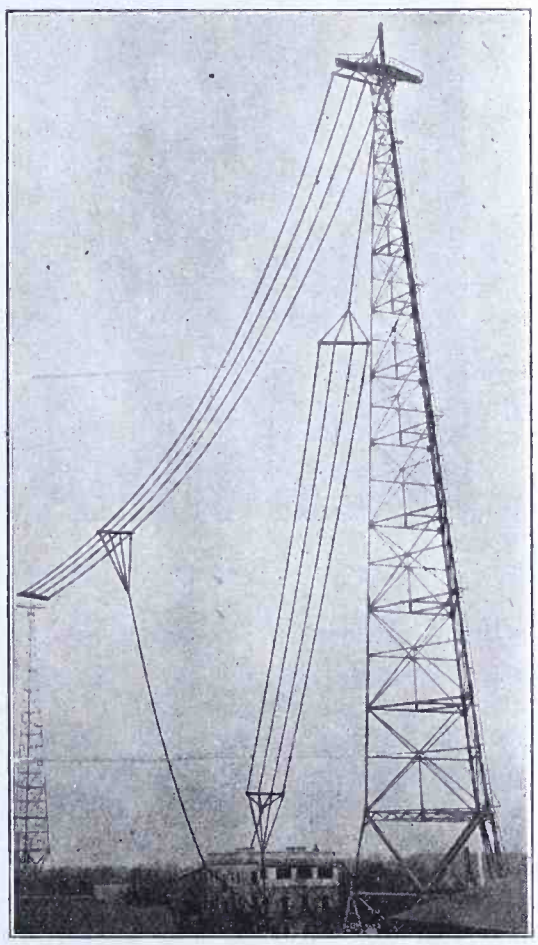
cepted at San Francisco for Honolulu, although it can be and is taken to points beyond Honolulu. Press matter is transmitted between San Francisco and Honolulu. Across the Pacific Ocean, the Navy Department maintains powerful radio-telegraph stations at Honolulu, Guam and Cavite, and reaching to the southward is the wireless station at Tutuila in the Samoan Islands. From Guam to Japan messages are sent by means of cable, although it is within the power of the latter country to establish radio communication with Guam.

Aside from a single cable maintained by the Postal Telegraph Cable Company, radio is the only quick and dependable means of communication between San Francisco and the Near East. The cable is a connecting link between San Francisco and Shanghai by way of Honolulu, Guam and Manila. At Guam there is a connection with Tokyo, through a cable maintained by Japan. From Manila, there is a connection to Hongkong, through a cable operated by Great Britain. The cable operated by the Postal Company from San Francisco to the Near East is of a limited capacity and not infrequently is disrupted from service for months, such impairment being due to coral formation between Guam and Manila. This untoward condition at the bottom of the Pacific Ocean, coupled with the enlarged facilities offered by radio-telegraph stations, tend to offset any contemplated plans of laying another cable.

There are seven important naval radio-telegraph stations operative along the coast of the Atlantic Ocean, namely, Bar Harbor, Sayville, Annapolis, Arlington, Cayey, Guantanamo and Panama. The one located at Bar Harbor is predominantly a receiving station, being largely devoted to the reception of wireless signals from Europe, from the fleet in the West Indies, and from the Pacific. The powerful radio-telegraph station at Annapolis occupies a corresponding position as a transmitting station, sending messages to Europe and



100 Kw. and 12 Kw. Arc Converters at Heuia, Oahu, T. H.



Radio Towers and Antenna at Philadelphia Navy Yard

Remote Control Receiving Station at Norfolk, Va.

to points along the coast of the Pacific Ocean. The wireless station at Sayville, Long Island, occupies a ranking position to the one at Annapolis as a transmitting station, being engaged in communicating with the fleet and as a standby for NSS, the station at Annapolis. These two high-powered transmitting stations are remote-controlled, their operation being negotiated by operators on the second floor of the Navy Department Building in Washington.

The world-wide communication system of the United States Navy Department was seen in action about a year ago when twelve destroyers were authorized to proceed from Hampton Roads, Virginia, to Constantinople, Turkey, for extending succor to refugees in the Near East. Radio-telegraph communication was established between headquarters in Washington, D. C., and the vessels in the Mediterranean Sea in this wise: By remote-control, NSS, at Annapolis, Maryland, sent a message by radio to a powerful wireless station in Paris, France, and by leased land line to Coblenz, Germany. Thence, the communication went to Vienna and from this point by radio to an American vessel in the Mediterranean, relayed by radio to Constantinople, where the Navy Department has a radio-telegraph receiving station and also a radio-equipped ship. The answer to any message would be routed in a like manner, except that the communication at Constantinople originated on the naval radio-equipped vessel and was received at Bar Harbor, Maine, and sent by conventional Morse telegraph to Washington. The feat of an operator on a radio-equipped vessel at Constantinople copying messages direct from Annapolis, Maryland, has been accomplished, but atmospheric disturbances in summer would doubtless interrupt such a long-distance service.

The principal radio-telegraph stations, operated by the Naval Communication Service in Alaska include those at Sitka, Ketchikan, Seward, Kodiak, Cordova,

Dutch Harbor and St. Paul. The frequent disruption of the cable to Alaska lends additional importance to the radio facilities for transmitting commercial traffic for the northwest. The radio-telegraph station at Cavite is in communication with French Indo-China and the Dutch East Indies, and the United States observes commercial traffic agreements with the respective administrations. Northward from Cavite are the radio-telegraph circuits to Peking and Shanghai. The ownership of the Vladivostok wireless station has been reconveyed to Russia. Eastbound trans-Pacific traffic is sent direct from Cavite to San Francisco. The use of the two radio circuits to China is restricted to government traffic according to a resolution adopted by the Washington Limitation of Armament Conference. This limitation denies to China the privilege of the reception of press by radio from the United States.

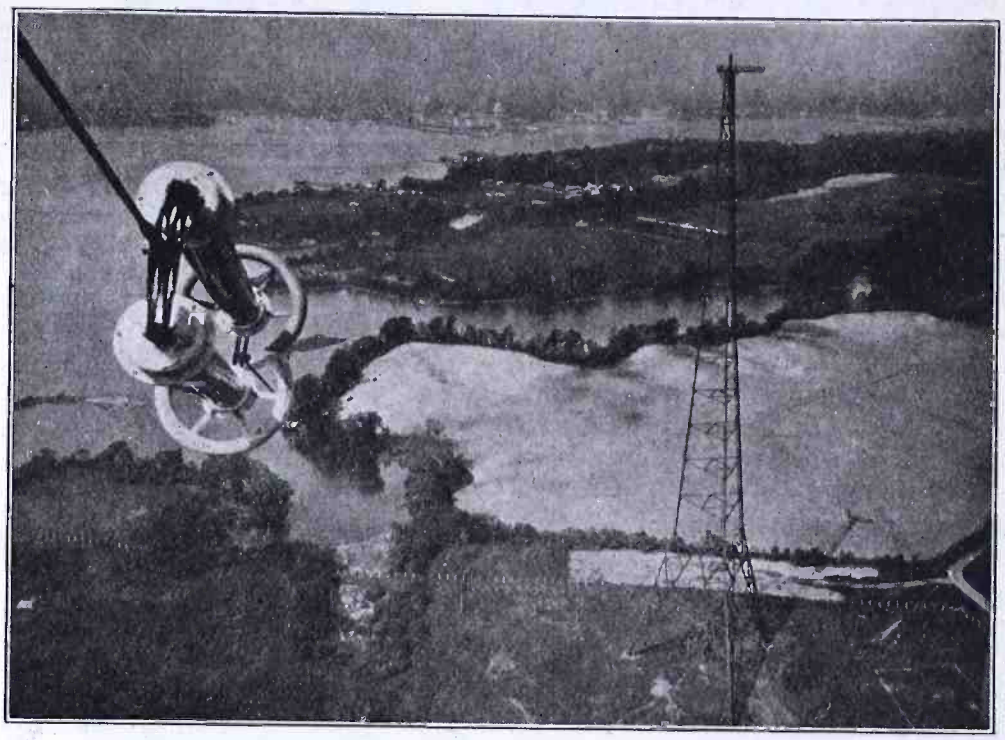
Radio compass stations, numbering 46, are established at intervals along the 44,000 miles of coast of the Pacific and Atlantic Oceans, and on the Great Lakes. These aids to navigation are valued at three quarters of a million dollars. During 1923, a total of 57,836 vessels were supplied with 120,523 bearings. These figures represent an increase of 29 per cent over those for the preceding year. During the last year six radio-compass stations (Cape Hinchenbrook, Alaska; Cattle Point, Washington; New Dungeness, Washington; Point Hueneme, California; Smith Island Washington; and Soapstone Point, Alaska,) gave only limited service during foggy weather, due to lack of personnel. Five radio-compass stations (Bird Island, California; Empire, Oregon; Key West, Florida; Lakehurst, New Jersey; and Point Loma, California) were put out of commission on account of lack of operating personnel. New radio-compass stations at St. Paul, Alaska, and Tybee Island, Georgia, are partially completed. A new station at South Pass, Louisiana, was commissioned and the station at Chatham, Massachusetts, was abandoned. Arrangements have been made for establishing low-frequency compass receivers on the Atlantic and Pacific Coasts, three each, and in the Hawaiian Islands.

The magnitude of the traffic handled by the Naval Communication Service is suggested by a capitulation of the number of words transmitted in one month: For the Navy Department, 704,804 words, and for other Government departments, 237,831 words. This represents a total of 942,000 words, or nearly one million, handled during a period of thirty days. In the course of three months of 1923, the traffic amounted to 4,500,000 words, of which 3,000,000 words were sent in the administration of business for the Navy Department. The Department of Agriculture, strange to say, sent nearly half a million words in three months; while the State and War Departments transmitted relatively large numbers of messages by radio. Based on commercial rates, the naval radio net handles annually approximately $4,000,000 of communication business for the Navy Department and other Government bureaus.

Other than this international system of radio communication, there are 68 wireless stations on our own shores, operated by the Navy Department, which are open to commercial traffic. Commercial companies may suffer from a congestion of business, a condition that may be relieved by utilizing the Naval Communication Service as an emergency agent. Primarily, however, these great stations that fringe our 44,000 miles of coast line are for the purpose of exchanging intelligence with seagoing vessels—the 400 floating radio stations, if you please. Commercial enterprises utilizing the facilities of these 68 naval coastal radio stations pay the customary rates demanded for such services. During the course of a single calendar year, the Naval Communication Service handled 5,359,317 words of commercial traffic, which yielded a revenue of $666,362.44.

Time signals broadcast from thirteen naval radio-telegraph stations, the dissemination of distress signals as a means of maritime security, the dispatching of weather forecasts, and the furnishing of bearings to mariners from a chain of radio compass stations, are among the other diverse activities which subscribe to the fitness of the title, "The Naval Communication Service". The time signals from the Naval Observatory are thus instantaneously blanketed over the globe and Father Time is guided accordingly. For a period of three minutes out of each fifteen all naval radio stations listen attentively for distress signals, and, upon receiving SOS calls, the Coast Guard of the United States Treasury Department is instantly apprised of the information about the vessel in trouble. The latter bureau is the life-and-property-saving agency of Uncle Sam. The Naval Communication Service disseminates the forecasts of the Weather Bureau from the Great Lakes at least five times daily. These warnings, according to one estimate, have resulted in a saving of $150,000 to this region during 1923. Moreover, the sources of the Weather Bureau of the United States Department of Agriculture for collecting meteorological data have been enlarged, through the Naval Communication Service, so as to include information from the Philippine Islands, Guam and the Hawaiian Islands; the Dutch West Indies; north and central Europe; and, more recently, from the north polar regions.

The United States Navy Department did not build any new radio stations during this last year, nor are the erection of any such structures contemplated for 1924. However, Rear-Admiral H. J. Ziegemeier is prophetic of an expansion of this world-wide intelligence system when he indulges in the following comment: "The history of the United States for years to come will probably be in the Pacific and that area must be thoroughly covered so that the nations bordering on that ocean may be in constant touch with each other, progressing side by side in commerce, art and science."



Triatic Insulator on No. 1 Tower at Annapolis

The "Flivver" Super-Heterodyne

By E. M. Sargent

This article describes a super-heterodyne receiver which has been so simplified as to bring it financially within the reach of practically every experimenter—hence the name. It has been found that a great deal of the expensive apparatus commonly used in super-heterodyne receivers can be done away with and replaced by other parts which will work equally well, if not better.

AN efficient radio-frequency amplifier for short-wave reception is something which engineers have been trying to perfect for the last fifteen years. Radio-frequency amplification can greatly increase the usefulness of any receiving set. It has not been in wider use because of the many difficulties in the way of getting even fair results with it. The trend of radio research and development is now in this direction and it is freely predicted that the next year will see many improvements in both the receiving range and the quality of reproduction of receiving sets.

One difficulty encountered with the ordinary radio-frequency amplifier is that it can only be efficient on the wavelength for which it is designed. If a change in wavelength is desired, this usually necessitates at least one extra control for every added stage of amplification. The efficiency of the present-day vacuum tubes as amplifiers at the extremely high frequencies which correspond to short wavelengths is very low. On wavelengths below 400 meters the vacuum tube efficiency is so low that frequently three stages are needed to be as efficient as a single stage of audio frequency. This is entirely due to the way the vacuum tube is designed. The capacity between the grid, filament and plate and in the base of the tube is so large that the high frequency currents are almost short-circuited.

The neutrodyne has done away with one of these difficulties. It is so constructed that all of the dials, except one, can be set for given wavelengths. This makes it as simple to adjust as a two-control set.

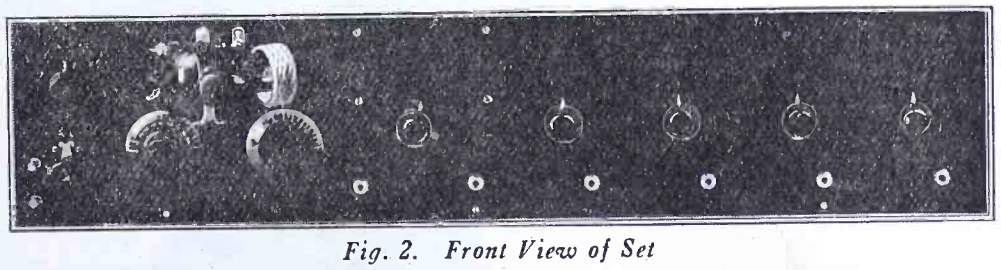


Fig. 2. Front View of Set

The super-heterodyne works on an entirely different principle from any other type of radio-frequency amplifier. It employs an external oscillator to set up a frequency differing from the frequency of the incoming signal. These two frequencies are run through the same circuit and their combination forms a third frequency which is equal to the arithmetical difference between the two original ones. This third frequency is the one that is amplified. Obviously the oscillator frequency can be varied to compensate for changes in the incoming frequency and the third frequency, or difference between the two, can therefore be kept the same regardless of the wavelength which is being received. The radio-frequency amplifier can be constructed for the wavelength corresponding to the third frequency and can be made as efficient as possible on this one wavelength.

Unlike other radio-frequency amplifiers the super-heterodyne is actually a "two-control" set regardless of the number of stages of amplification. It is suited equally well to antenna or loop reception. The amplification takes place on a long wavelength, hence the tube efficiency is high, and the efficiency per stage is much higher than any other type of radio-frequency amplifier. As the wavelength to be amplified is fixed, all coils can be designed for maximum efficiency on this wave.

There are many things to be considered in choosing the frequency for which the amplifier is to be built. If a wavelength above 2000 meters is selected, the coils are likely to pick up and amplify signals from the high-powered trans-oceanic arc stations. These will interfere with the reception of music unless the set is very well shielded. If too short a wave is selected the tube efficiency will be low. As the frequency to be amplified is obtained as the difference between the incoming frequency and that of the oscillator, it is plain that there will be two settings of the oscillator dial at which this frequency will be generated—one setting where the oscillator has a higher wavelength than the incoming signal and the other where it has a lower wavelength. If the amplified wavelength is too low, these two settings of the oscillator dial will be far apart and interference in receiving stations of widely different wavelengths may result. 1750 meters has been found to be a wavelength clear of interference and works very well for the set described in this article.

The antenna is tuned by means of a 43-plate series condenser and a honey-

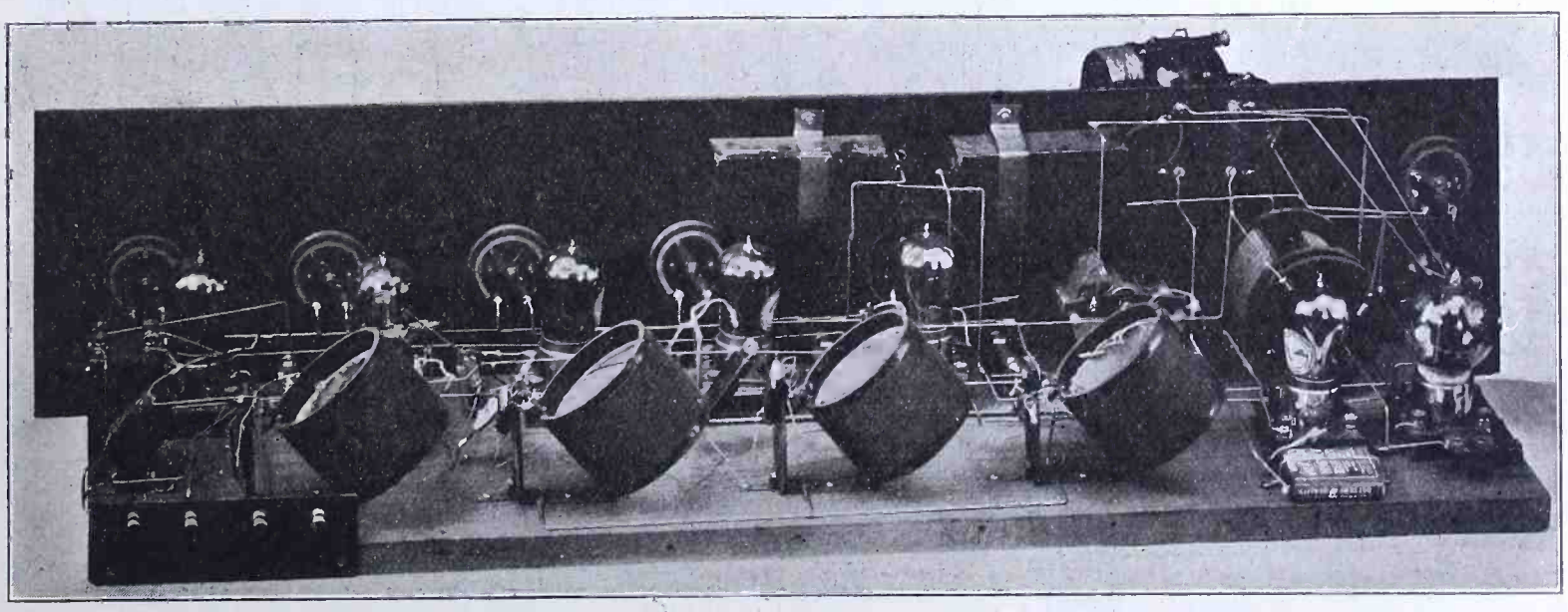


Fig. 3. Rear View of Set

comb coil. The size of the honeycomb will depend upon the wavelength which is being received and on the size of the antenna. Usually a 50 or 75-turn coil will be best.

The oscillator consists of a Kilbourne & Clark midget variometer which is tuned by a 43-plate vernier condenser. It is absolutely essential that the condenser have tight bearings and be pigtailed. The variometer is mounted on a Remler No. 40 coil plug by the construction shown in Fig. 1. The connections are also shown in this diagram. The variometer should be split; that is, the stator and rotor windings should be connected right through and the stator disconnected from the rotor. The stator and rotor are then joined by connection Y of Fig. 1. Three leads go from the variometer to the set, two being connected through the coil plug and the third to a binding post mounted on the front of the panel. The way in which the variometer is mounted enables the coupling to be changed between it and the antenna coil.

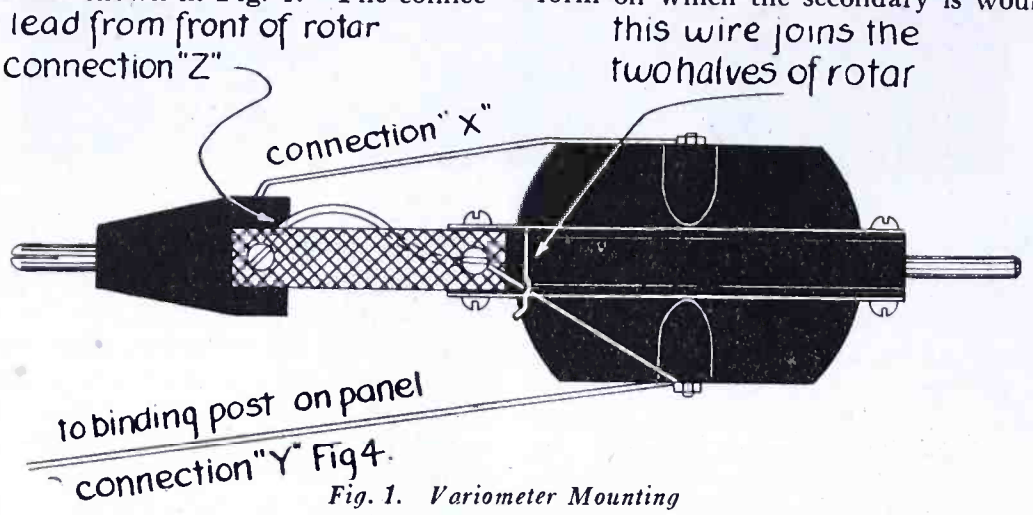


Fig. 1. Variometer Mounting

The amplifier coils or amplifying transformers are similar in appearance to neutrodyne coils, are set at an angle of 45 degrees with the baseboard and should be spaced about 8 inches between centers. The primaries consist of 50 turns of No. 36 D.S.C. wire wound on 3-in. cardboard tubing. A bakelite tube having an inside diameter of 3 in. and an outside diameter of 3¼ in. is the form on which the secondary is wound. This fits closely over the primary. If the primary is slightly too big to fit inside the bakelite tube, slot the bakelite tube lengthwise with a saw and spring it around the primary. The secondary consists of 250 turns of No. 36 D.S.C. wire. Both primary and secondary are 2½ in. in length.

Figs. 2 and 3 show the best arrangement for the apparatus. The controls shown in Fig. 2 reading from left to right are oscillator rheostat, antenna or loop switch, oscillator condenser, antenna condenser, potentiometer, first detector rheostat, radio-frequency amplifier rheostat, second detector rheostat and audio-frequency amplifier rheostat. When the set is used with an antenna and ground, the two-point switch should be thrown to "A". When it is used with a loop, throw the switch to "L" and connect the loop across the antenna and ground binding posts.

The sockets should be turned so that the filament terminals are nearest the panel and the grid and plate terminals toward the back of the set. Make all connections as short as possible. A single closed circuit jack should be included in the plate circuit of every tube except the oscillator. This has been found to be very handy when first testing out the set. Use No. 14 tinned wire for making all connections, preferably the round wire. The oscillator, the first detector and all of the amplifiers should be UV-201A or C-301A. The second detector should be a C-300. It is a good plan to use two stages of audio-frequency, although one stage is plenty to operate a loud speaker on stations within 1000 miles.

It is a good plan to operate the set on an antenna rather than a loop until the operator has become thoroughly accustomed to tuning it. It tunes differently from any other type of receiving set. The adjustment of the oscillator is extremely sharp—even half a turn of the vernier plate will bring in a station on a loud speaker and then tune that same station completely out. The wavelength is controlled by this condenser. The antenna condenser merely increases or decreases the intensity of the signal and is not very critical. The coupling between the variometer and the honeycomb coil should not be changed when tuning in a station. This coupling is rather close and once the best setting is found it can be left in that position. None of the rheostats are critical except the one con-

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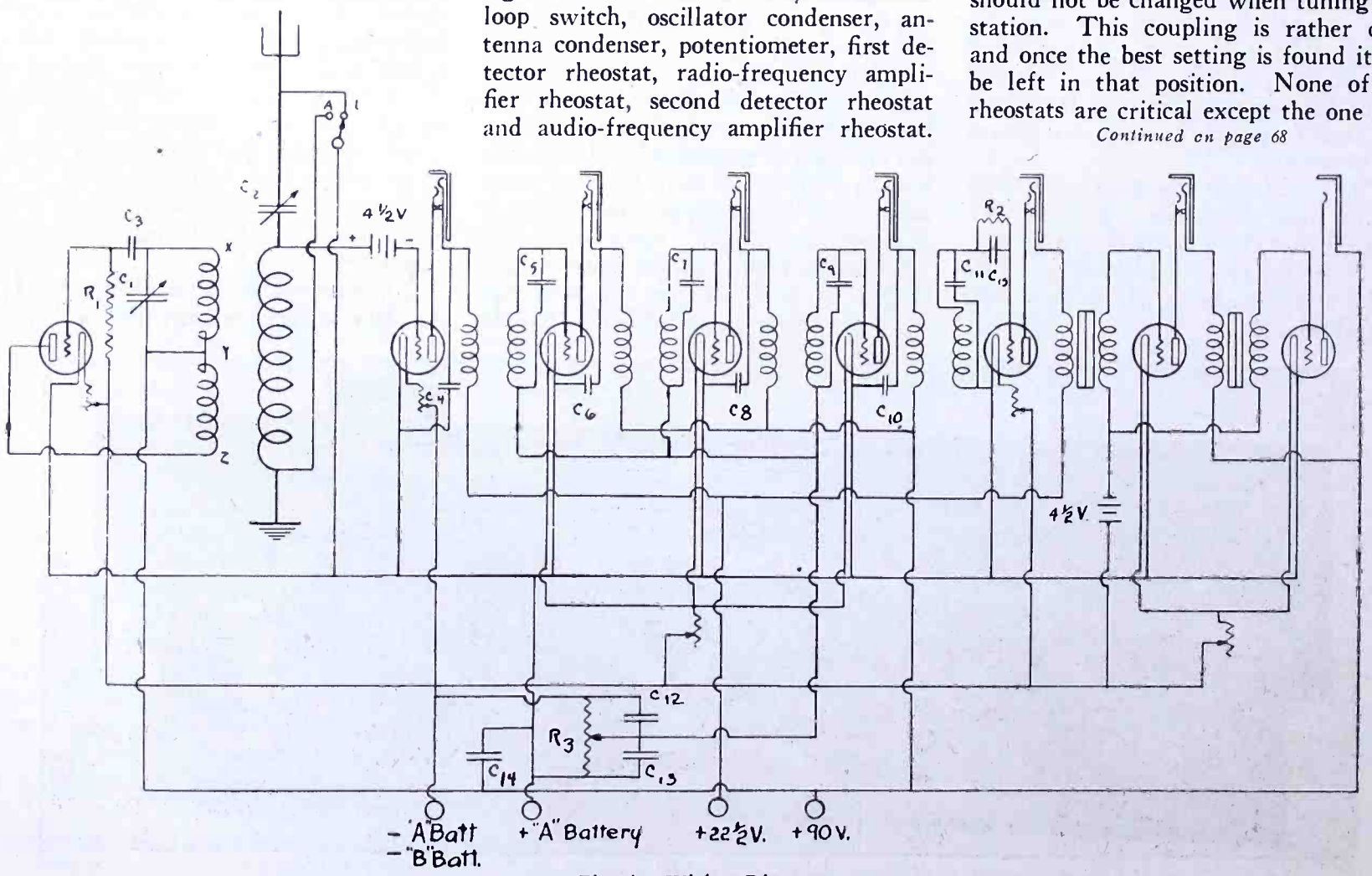


Fig. 4. Wiring Diagram

Double Rectification with Two-Crystal Receiver

By Jacque Avon

This suggestion, while not new, may be of interest and help to many experimenters. It offers an opportunity for interesting research.

ALTHOUGH much research work has been done on vacuum tubes during the past ten years, the humble little crystal still remains as the standard of pure reproduction. Aside from being inexpensive, this is the only attribute that the crystal can really boast of. What a fortune there would be for the man who could make a crystal as sensitive as a vacuum tube!

The writer has recently experimented with a method of double rectification which he believes worthy of the attention of any fan who still clings to this particular method of reception. Before revealing the constructional details it might be well to comment briefly upon the theory underlying its operation. Such procedure will allow the reader to do a little experimenting of his own.

Since the human ear is insensible to frequencies having an oscillatory rate of over twenty thousand a second and since telephone receivers cannot respond to currents having too high a frequency (due to the inertia of the diaphragm) it is necessary to bring the radio-frequency currents in the circuit down to an audible point. The crystal performs this function and a glimpse at Fig. 1 will

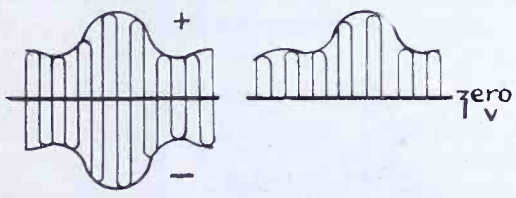


Fig. 1. Result of Rectification.

show how this is done. The resistance of the crystal varies according to the direction of the current passing through it; in one direction it offers little resistance and in the opposite direction it is so high that but little of the current passes and only half of the impulses are allowed to get through the crystal. Now what becomes of the other half? They are probably dissipated largely as heat. It is unnecessary to say that this is a very wasteful process of detection since only one-half of the current is utilized and, of course, the crystal is only one-half as efficient as it should be if both halves of the cycle could be used to energize the phones.

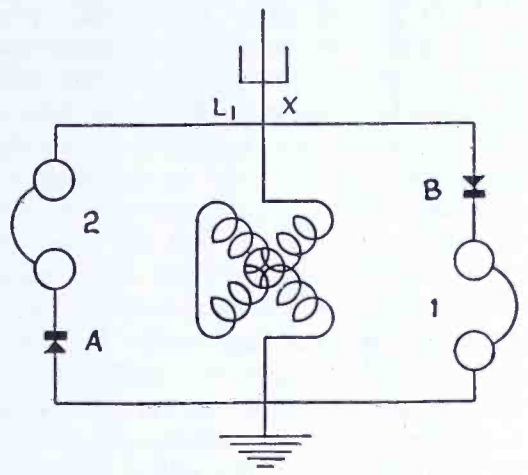


Fig. 2. Double Rectification with Two Phones.

The outfit illustrated in Fig. 2 is able to use both halves of the cycle but in a rather inefficient manner since it is necessary to employ two sets of 'phones. The writer draws attention to this type of equipment merely for the sake of those who are using two 'phones with a crystal set of the ordinary type. The use of more than one pair of 'phones in this way always robs an already inefficient device of what little efficiency it may have. More than one 'phone cuts the signal strength down to a low degree.

of phones is connected in series with the crystal as is general practice.

With an arrangement of this kind, it is necessary that each crystal be of equal sensitiveness. A good way to pick the crystals to be used is to try them in a single circuit receiver. If they match

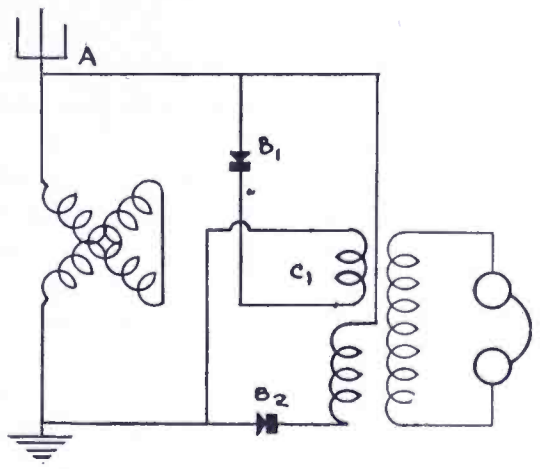
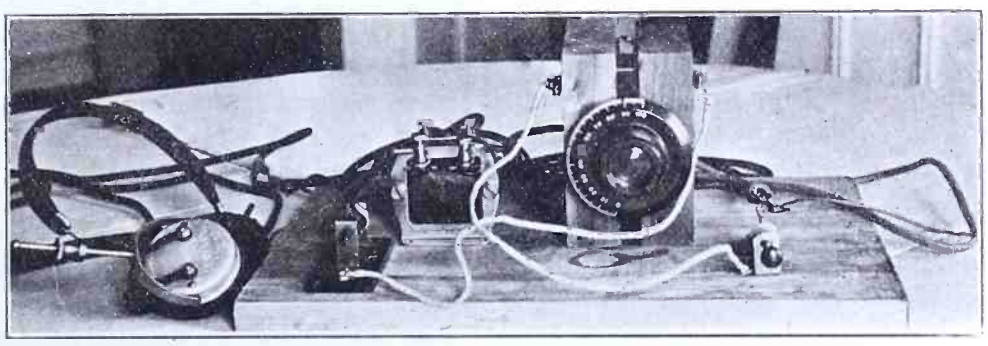


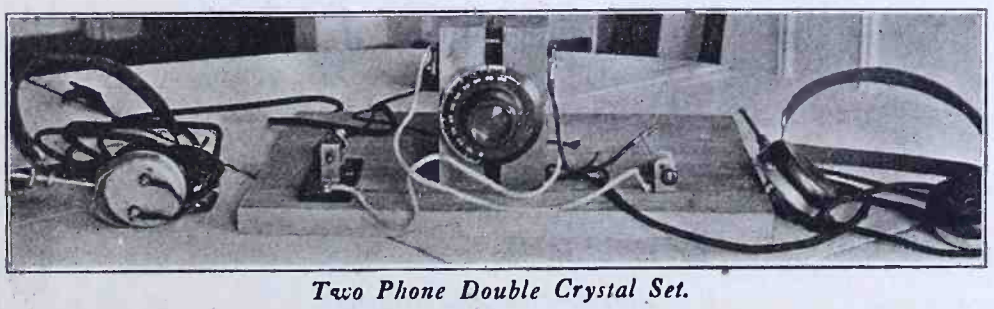
Fig. 3. Double Rectification with One Phone.

fairly well as far as the ear can detect, they will be suitable for use. If one crystal is more sensitive than the other, it is evident that one will "rob" the other and the signals will suffer in the one circuit.



Single Phone Double Crystal Set.

With the set shown, more than one pair of 'phones may be used and the signal strength, providing the simple directions given are closely followed, will be just as great as that in a set with a single pair of receivers. The reader will note that two crystals are used. He will also note that two independent circuits are used and that the crystals occupy different places in the circuits. However, only one tuning device in the form of a variometer, or an ordinary tuning coil for that matter, is necessary. Each pair



Two Phone Double Crystal Set.

Examination of the diagram will allow the reader to understand the reason for placing the crystals where they are in the circuits. It will be seen that they are reversed. On the one side, the catwhisker is connected directly to the aerial and tuning inductance while on the opposite side it is connected to the ground and tuning inductance. A positive voltage applied at the point *X* will be able to pass through the crystal *B* because its path is from catwhisker to crystal. Such an impulse will, therefore, operate the telephone receivers 1. During such an impulse (positive) practically no current would flow through crystal *A* since its direction would be from crystal to catwhisker. Every positive impulse will be heard at maximum strength in 'phones *1* while it will not be heard at all in 'phones *2*.

Now let's see what happens when a negative impulse reaches the opposite cir-

cuit. Here an altogether different process takes place. This is allowed to pass and the resulting current passes through the telephone receivers. In the one case a positive voltage exists at point L_1 while in the second case a negative voltage exists at point L_2. Thus two people can listen-in with the assurance that the signal strength will be exactly the same in each headset providing the crystals have been adjusted to a point of maximum sensitivity. Otherwise very poor results will be obtained.

The reader will naturally put the question: "Why is it not possible to produce a circuit with two crystals that will feed their output into one pair of receivers thereby doubling the signal strength?" This is possible and with a little care any crystal enthusiast can assemble an outfit of this nature. However, it is to be understood that such an outfit will not be one trifle more sensitive than a single crystal outfit. The effect is to merely increase volume; the range of the thing will be that of the range of a single crystal outfit. Nor should the builder expect to have a signal strength comparable to a vacuum tube outfit.

The materials needed for this experiment are: a good variometer, an ordinary audio-frequency transformer, a pair of sensitive telephone receivers and two crystals of equal sensitiveness.

In preparation for the experiment, it will first be necessary to take a tap off the primary winding of the transformer as near the middle of the winding as possible. The variometer is the only tuning instrument used and consequently it is connected directly in series with the aerial and ground. The cup side of each crystal is connected directly to the end of one of the primary coils while the other ends of the windings are connected to the catwhiskers. The telephones are connected directly to the output or secondary windings of the transformer.

The two transformer windings are connected in such a way as to cause the effects of the reversed currents to be added together instead of being neutralized as was the case with the other type of two-crystal receiver. When the current from point *A* passes through crystal *B*, none of this current can pass through the other circuit because of the high resistance of the crystal B_2. By the same token, current finding its way from the lower end of the variometer will be almost entirely shut off by the crystal in the other circuit. The rectified current components will therefore induce their combined effects into the secondary winding of the transformer and the signal strength should be about double that made possible by an ordinary crystal outfit.

A Burglar-proof Counterpoise

By Alexander Maxwell
9BRE-6CKG

WHAT is more exasperating than to get up early some cold, crisp morning with the intent of working some dx, and upon leaning on the key discovering that the tube flares up bright and the TC stays at zero? Generally the next half hour or so is spent in searching the set to find the cause of the trouble, and then at last the idea of inspecting the aerial arises. And upon going out it is discovered that the counterpoise had been cut down by some neighbor who sought this underhanded means to even up scores for a real or most likely imaginary cause. Generally the ham swears by the seven gods and the wouff-hong that he will have vengeance, but unless he is a disciple of Sherlock Holmes he stands a good chance of having to take his feelings out on the zinc rectifier. Many a time a prominent ham is off the air suddenly and when asked the cause he replies that his counterpoise was ruthlessly murdered by the old skunk next door, and he hasn't the cash on hand to create a new one.

As I happen to live in the city myself and there are three BCL's in the same building I have had good chance to observe the attitude of the one new in the game for one who is higher up. And my learning such cost me three counterpoises, two aerials, a mast, twenty-five feet of BX used as leads to the remote control spark set, one Benwood gap disc, and three lead-in bushings where someone smashed them with a hammer. The total amounts to the price of a quarter kw. tube, and I am none the better off, except in the experience gained, and the increasing love for my neighbors.

The reason I rave so is that I am not the only one who is so inconvenienced. There are several more in town in the same boat, and many in other towns.

Two years ago I spent my spring vacation working in a well known burglar alarm factory, and the last time I went out and found my counterpoise lying in the front yard, cut into three-foot lengths and the insulators smashed on the sidewalk I decided to do something to catch the sneak. I recalled a device in general use in places that wanted a burglar alarm system and couldn't afford an expensive installation. It was simply a hair trigger, double acting, like a cootie key, a black thread stretched across the door and a weight to balance it on the other side. Anyone bumping against the string would set off the alarm on one contact, and cutting the string set it off on the other. Very simple and very efficient.

So with this idea in mind I built a device on the same lines only on a grander scale, and hooked it up. I used the counterpoise as the string and a window weight as the counterbalance. It was rather hard to get a weight that would exactly balance, but after trying several I got one that came near to the correct weight. I aided this by winding an element from the rectifier around it. This exactly equalled the weights. The trigger arm was a strip of copper bus-bar a foot long and a sixteenth inch thick.

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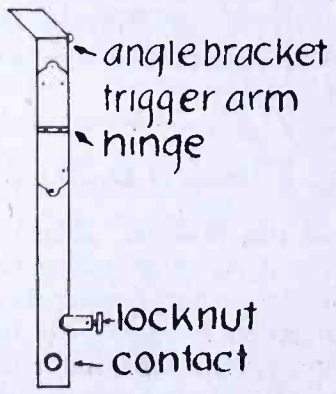
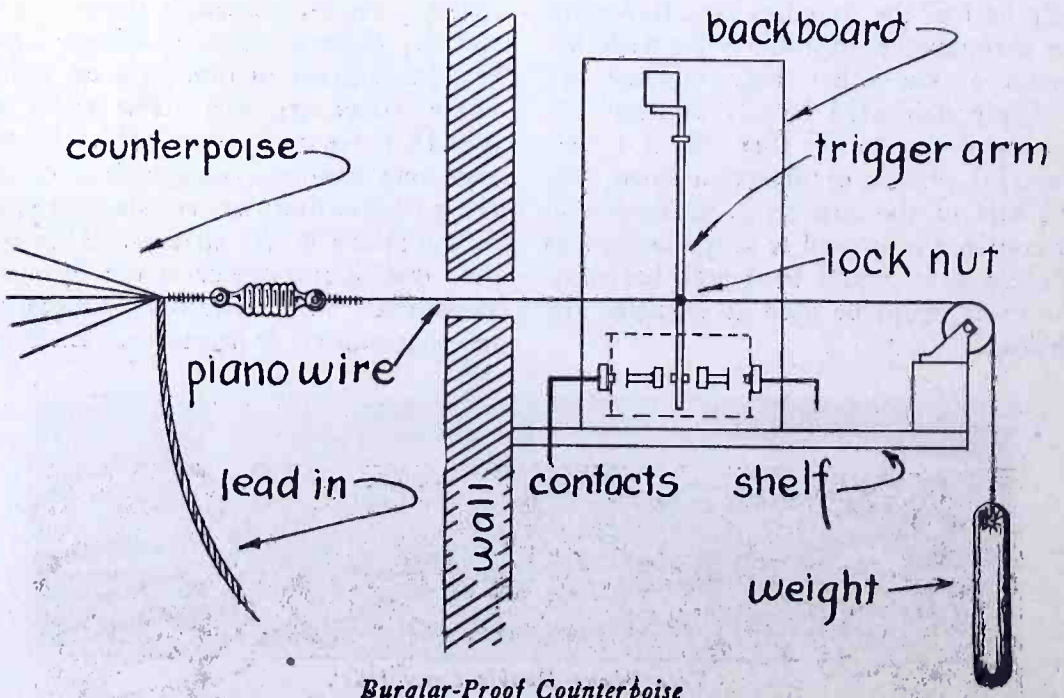




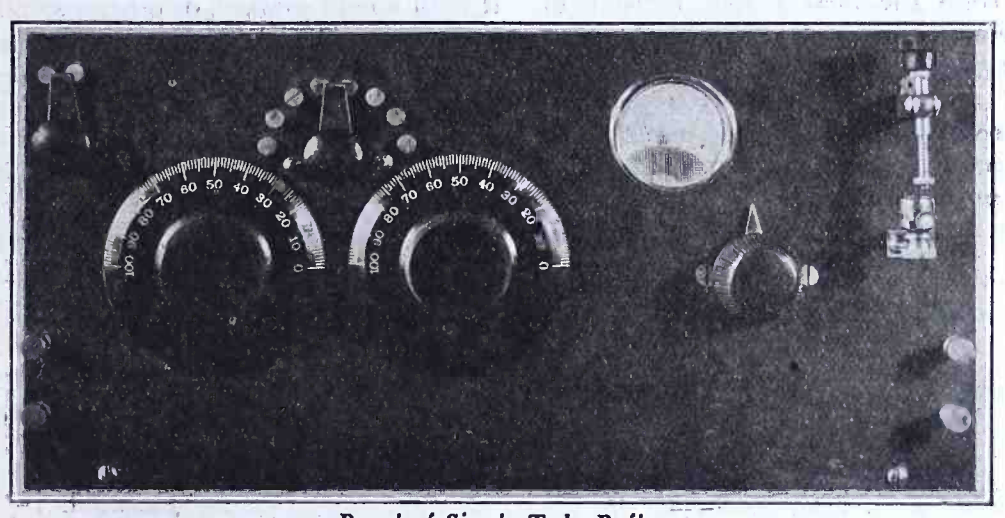
Burglar-Proof Counterpoise

A Single Tube Reflex Receiver

By Paul Oard

The outstanding advantage of this circuit is its economy in first and operating cost. With but one tube it gives excellent results with either an outside aerial or inside loop.

IN presenting this article it is not proposed to make extravagant claims that will be questioned upon actual test, but rather to aid in the construction of an instrument embodying the single-tube reflex circuit. Like every other circuit, it has its disadvantages as well as its excellent points, and it would be farfetched to claim that this circuit represents the ultimate development in receiving circuits, although it is undoubtedly a step forward in simplification of apparatus.



Panel of Single-Tube Reflex

In the reflex circuit amplification is taken care of by one tube, which functions both as an audio-frequency and a radio-frequency amplifier. Detection is accomplished by the crystal detector. The incoming signal is amplified many fold before it reaches the crystal detector, to then be re-amplified after it has been rectified by the crystal.

Tests show that this circuit in local broadcast reception is the equal of a non-regenerative three tube circuit and on outside stations at any distance, ofttimes much its superior, unless the outside station be of sufficient power to break across the "threshold" value of the detector, in order that the amplifiers may have something to work on. In comparison with a standard single circuit regenerative receiver, it compares favorably with the single stage of amplification on both local and outside stations in both volume and selectivity. It is not the equal of such a regenerative receiver with two stages of amplification. Neither is it the equal of a circuit using two stages of radio-frequency and detector, in distance work, although in closeup station reception, it would register greater audibility. Thus the claims made for the single tube reflex are to a great extent of a relative nature, and many factors must enter into consideration of such claims. The reflex does not distort signals when operating properly, but there is the rub. If the crystal detector is jarred out of adjustment, a howl will result that will outdo any three-stage regenerative at its worst, at certain tuning adjustments.

It may seem that the writer has set out to disprove an instrument which he proposes for building, but this is not the case. The foregoing is an effort to prevent the constructor from expecting too much for his money, and inasmuch as radio is now beyond the "stampede" stage, the writer feels entirely in order in this procedure.

The single tube reflex receiver offers the constructor a first-class instrument at a light cost of material and labor. It does not re-radiate badly, even when spilling over and howling when thrown out of adjustment. It is a whizz of an instrument in operating on local broadcasting stations, giving volume enough to be heard over a good-sized residence when an electro-dynamic type of loudspeaker is used. The receiver described here brings in stations varying in distance from 350 to 1000 miles on the same loudspeaker with sufficient volume to be heard in an average size room. It tunes quite sharp, has no troublesome capacity effects, and is easy to manipulate. The first cost is almost the last, a single tube only being required. Dry cells furnish the current for filament lighting if the tube is a dry cell type, and in any event upkeep cost is negligible.

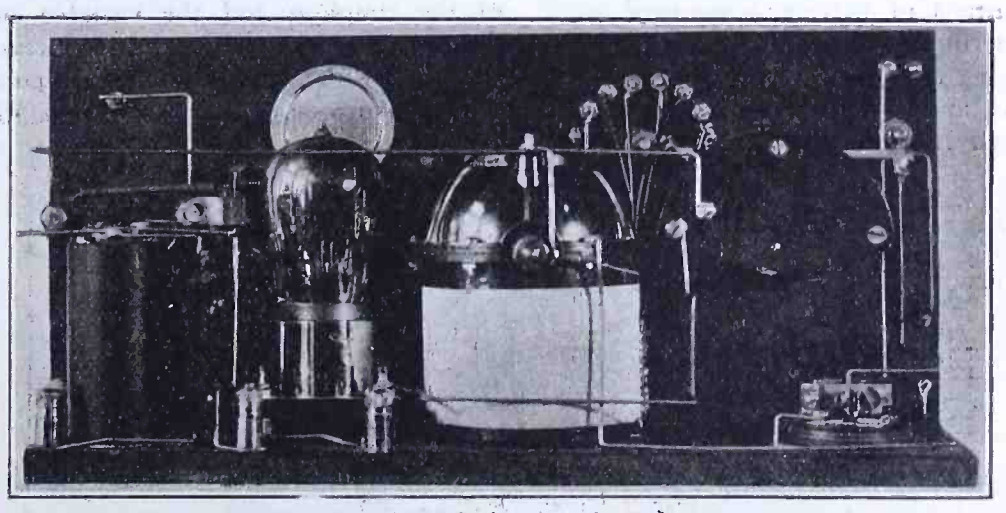
The materials required to construct the single tube reflex receiver herein described are listed as follows:

- 1 Main Panel, Bakelite, 6½x13x⅛.
- 1 Baseboard, Wood, 4x12½x½.
- 8 Binding Posts.
- 8 Switch Points
- 2 Switch Stops.
- 2 Dials, 3-in.
- 2 Switch Knobs and blades.
- 1 Lamp Bezel.
- 1 Crystal Detector, ball and socket type.
- 1 6 or 30 ohm rheostat.
- 3 oval head woodscrews, 1-in.
- 1 Vario Coupler, "Midget" type.
- 1 23 plate Condenser.
- 1 Radio-Frequency Transformer
- 1 Audio-Frequency Transformer.
- 1 Socket.
- 1 High Tone Buzzer.
- 1 .001 Fixed Condenser.
- 1 .002 Fixed Condenser.

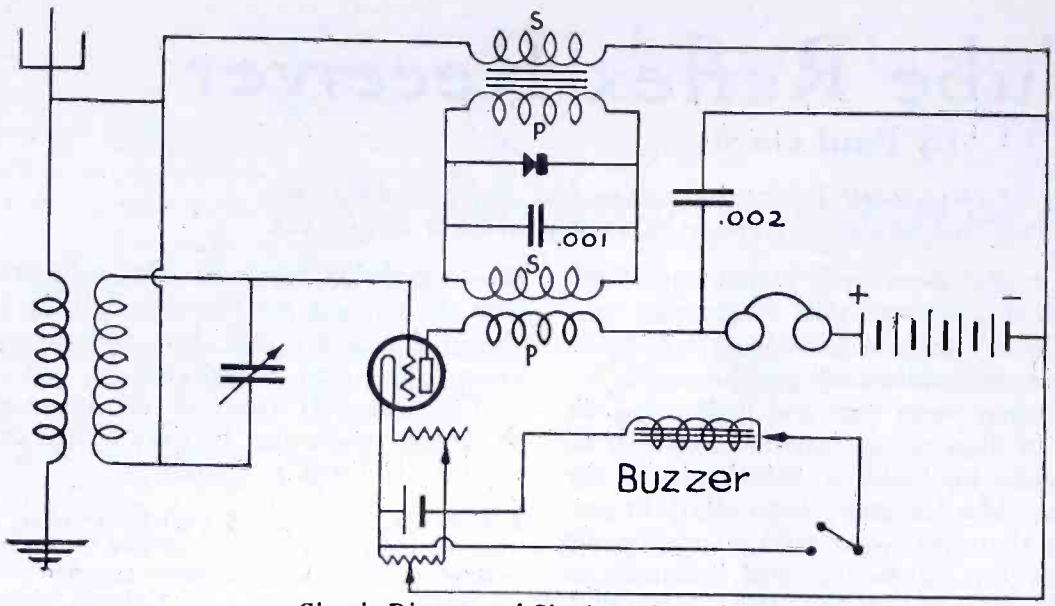
In picking a radio-frequency transformer, the open-circuit secondary type should be avoided. If in doubt as to whether the transformer is of this type, test with headphones and battery—if no "click" is heard, it is of the open-circuit type, and should not be used. The instrument shown here employed an Erla reflex transformer, which is satisfactory.

The use of a buzzer is a reversion to the "buzzer tester" used for locating a sensitive spot on the crystal in crystal sets, and, while it is not absolutely necessary that it be used, it is an especial help to the novice. A dead crystal renders the reflex circuit inoperative, having the same effect as shorting out the detector stand entirely. In two and three-tube reflex receivers, the buzzer test is of little use, for the crystal will "take hold" at once, even when not very sensitive, but in the single tube reflex circuit, the buzzer is a decided help.

In selecting a mineral for the detector, galena, in spite of the fact that it is a light contact crystal, is excellent. Silicon and pyrites are likewise good.



Rear View of Single-Tube Reflex



Circuit Diagram of Single-Tube Reflex

The one disadvantage to galena is that it requires a very light contact, and if the tuning and filament controls do not run smoothly and evenly, jarring of the main panel in making adjustments will introduce undesirable noises. Fixed contact detectors are not to be recommended unless they can be first tested in comparison with variable contact types. Regardless of the mineral, the constructor should endeavor to get only tested crystals, although the cost may be higher.

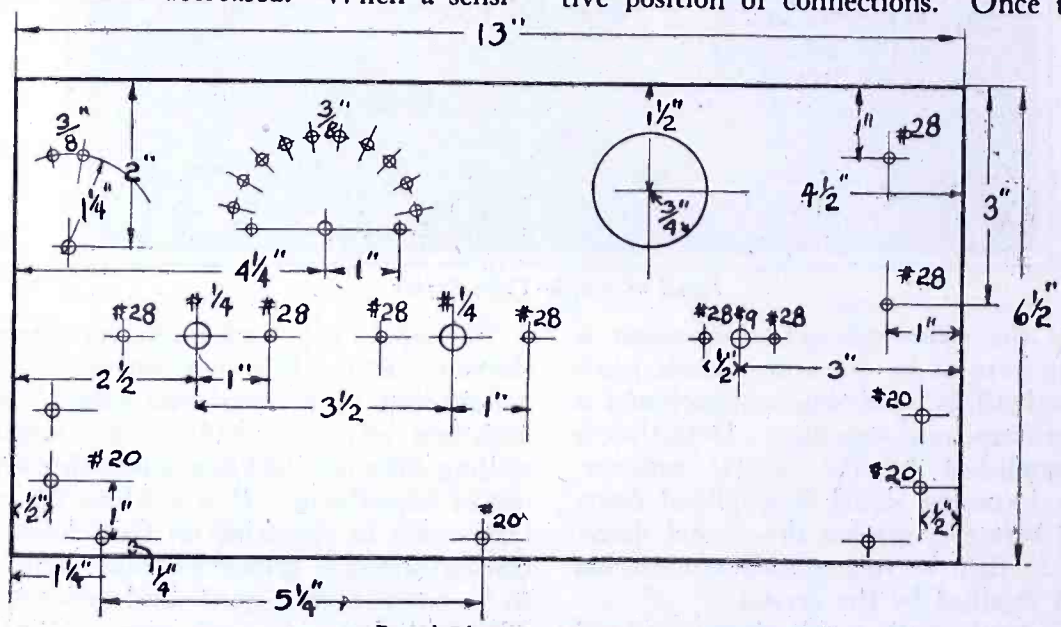
If one intends to use dry battery tubes the lamp bezel in the panel may be eliminated, inasmuch as it is difficult to tell by the glow whether the tube is burning or not, on account of the oxides with which the glass is coated, the receivers being the best index in this case.

It is good practice, though optional, to use bus bar wiring in connections. In the construction of this instrument, it was not found necessary to shield it, there being practically no capacity effect.

Once the instrument is wired, all connections should be traced out carefully and verified. The instrument should first be placed in operation on the conventional outside antenna, rather than attempting to operate it on the indoor or loop type, also, first operation should preferably be at a time when a nearby broadcasting station is on the air. Although the single tube reflex is an easy circuit to manipulate, proficiency in its use is gained only through some experience, and nearby stations offer the best means of getting acquainted with the instrument.

After connecting up to antenna, ground and batteries, the catwhisker is removed from the crystal. The switch is then thrown to start the buzzer. The note from the buzzer will register in the receivers loudly, in spite of the crystal being out of adjustment. The detector is then adjusted. If a sensitive spot is struck on the crystal, the note in the receivers will be increased. If a dead or inoperative spot is struck, the note will be decreased. When a sensitive spot is struck, switch off the buzzer. Next, varying both the coupling and the variable condenser, manipulate both until the familiar "boiling" note, similar to that of regenerative sets, is heard. The instrument is now in resonance on a given wavelength, and at its most sensitive point for such wave. Manipulation of the coupling and the variable condenser, together with the inductance switch, will afford a number of points of resonance at different wavelengths. Radio-frequency circuits in general are in resonance when this boiling point is reached, and an index to the operator's skill is shown by the rapidity with which he can change wave adjustments, and still hold the circuit in resonance.

On certain adjustments it will be found possible to tune in a broadcasting station by its carrier wave, when the crystal is not in adjustment, though speech will be distorted until the crystal is properly set. This method is hard on the ears, however, as at varying adjustments the set will go into violent oscillation until the contact on the crystal is restored. This is one of the major causes of distortion and squeal in the reflex circuit. Another cause will be found in operating the tube at either too low or too high temperature. It is best in first trying out the set to operate it with a loud speaker, or otherwise place the receivers rather lightly on the ears. Howling may of course be induced by leads of various units of the instrument being wrongly placed. If howling seems to be extreme, some of the trouble may be remedied by changing the relative position of connections. Once the circuit is in resonance there is no distortion of incoming signals.

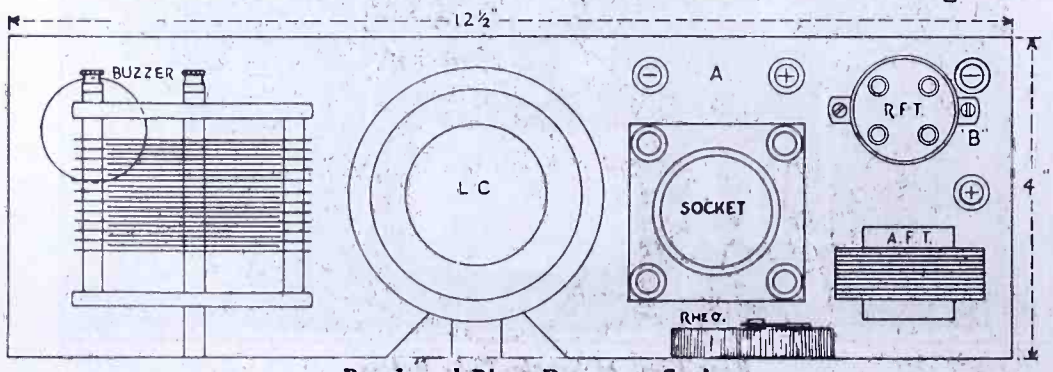


Panel Plan, Drawn to Scale

The single tube reflex operates with practically the same volume on outside antenna, with local broadcasting stations as does its larger brother, the three-tube reflex, but this comparison does not hold in working distant stations.

In the event that an inductive hum is picked up in the receivers, this may be eliminated ofttimes by disconnecting the lead that connects the antenna to the bottom of the secondary coil of the coupler. A loss of volume may be experienced, and tuning will be altered, but induction is removed. Ofttimes, throwing the house switch to the light mains will remedy the trouble also, the house wiring often being a contributing factor to induction hum.

In the event that it is desired to use an inside antenna, this may be a single wire from 50 to 75 feet in length, placed where convenient in the room.



Baseboard Plan, Drawn to Scale

A Real Short Wave Receiver

By John F. Rider

The increasing use of the lower wavelengths makes a short wave receiver desirable. After a brief discussion of the requirements to be met, the author describes the construction of a specially designed three-circuit receiver of the grid and plate variometer type without variable condensers.

THE subject of receivers is always an item of prime importance. The radiophone fan desires a receiver that operates with maximum efficiency on the broadcast wavelengths, and the amateur desires a receiver that operates with maximum efficiency on the amateur wavelengths. Both are gradually attaining their objectives, for the designers of receiving apparata have realized the fact that a receiver, in order to operate at the peak of efficiency on a specified wavelength band, must be designed solely for that band.

The subject of this article is a short wave receiver, i.e. a real he-man short wave receiver, that really operates on the short waves, one that has been tried and tested and found not wanting. Many receivers have been assembled and duly called "short wave" receivers, but very few have stood the acid test as such, for there is always a tendency to add just a few more turns, or a small condenser or two, so that the broadcasting wavelengths may also be covered with the same apparatus. These small additions have been the direct cause for the lack of real honest-to-goodness short wave receivers, for, as one man cannot do the work of two, one receiver cannot efficiently cover all the wavelengths.

Short wave reception and transmission offers an entirely different field than that of the high wavelengths. The frequencies encountered are many times greater, and this in itself is an obstacle, that will have to be conquered before perfect short wave reception and transmission will be possible, i.e. the effects of the high frequency will have to be overcome, for it has been conclusively proven that the electrical losses in the apparatus increase as the applied frequency is increased. Therefore, it is possible to add properly designed loading coils (distributed capacity of the coils being negligible in comparison to the variable capacity used in the receiver, and with minimum resistance), to a receiver in order to increase its wavelength range, and still retain a fair degree of efficiency. However, when we desire to decrease the wavelength range of a receiver, the situation is different. We cannot merely reduce the inductance or the capacity, for, as the wavelength range is decreased, the frequency band is increased, and with the increase in frequency we also obtain an increase in electrical losses; hence the apparatus to be used for short wave work must be so designed as to keep the losses at the minimum. Also, the distributed capacity factor is of importance, for in short wave work the inductance values are small, and all distributed capacity values must be kept to a minimum; capacity to inductance ratios are also of importance, as are many other things. Hence it is apparent that a "short wave" receiver must be designed for short, waves, if it is to be used for that purpose.

Let us now see what are some of the requirements of a "short wave" receiver.

1. It should operate on short waves, 80 to 220 meters.

2. It must oscillate throughout the entire range, and the magnitude of oscillations must always be controllable.

3. It must be selective. This feature is essential with minimum amount of controls, and minimum loss in signal strength.

4. The wavelength variations on the control dials must be greater than that obtainable at present in the average receiver. This point deserves consideration, for, although wonderful receiving records have been thus far created, they will be broken by new ones, when increased variations are obtained.

5. The tuning controls should be minimum.

6. The cost of construction should not be too great.

The above covers practically all the major points of a receiver, irrespective of the circuit used, and now this item requires some discussion. The writer has experimented with single, double and triple-circuit receivers, and most of their variations, and, weighing their advantages and disadvantages for short wave work, finally decided upon the three-circuit receiver, of the grid and plate variometer type. This circuit proved most selective, although the single-circuit allowed slightly greater signal strength, but the latter re-radiated more than the former. The condenser tuned secondary type was satisfactory, but did not give sufficient signal strength to compete with the grid and plate variometer type, hence this circuit is used in this article.

The schematic diagram is given in Fig. 1. Variable condensers have been entirely eliminated, for they are the greatest sources of trouble in short wave work, as the majority on the market are of poor design. The dielectric losses are great, and the minimum capacity is too large for work of this character. Further, the variable condenser was found to be unnecessary in the primary circuit, and the variable inductance was decided upon.

The following is the list of material required to construct the receiver:

1 .0001 mfd. fixed condenser.
1 .0002 mfd. fixed condenser.
1 single blade switch
1 double blade switch.
8 binding posts.
4 switch stops.
20 switch points.
2 large wood frame variometers.
2 lengths of 3½ in. outside diameter cardboard tubing, one piece ¾-in. long and the other 2-in. long.
1 grid condenser and grid leak.
1 rheostat (ohmage dependent upon the type of tube to be used).
1 VT socket.
1 baseboard 3½ in. x 5in. for socket.
3 ft. No. 16 dcc wire.
¼ lb. No. 20 dcc wire.
Necessary connecting wires, tube, batteries, aerial ground, etc.

It is apparent from Fig. 1 that fixed condensers are used in the primary cir-

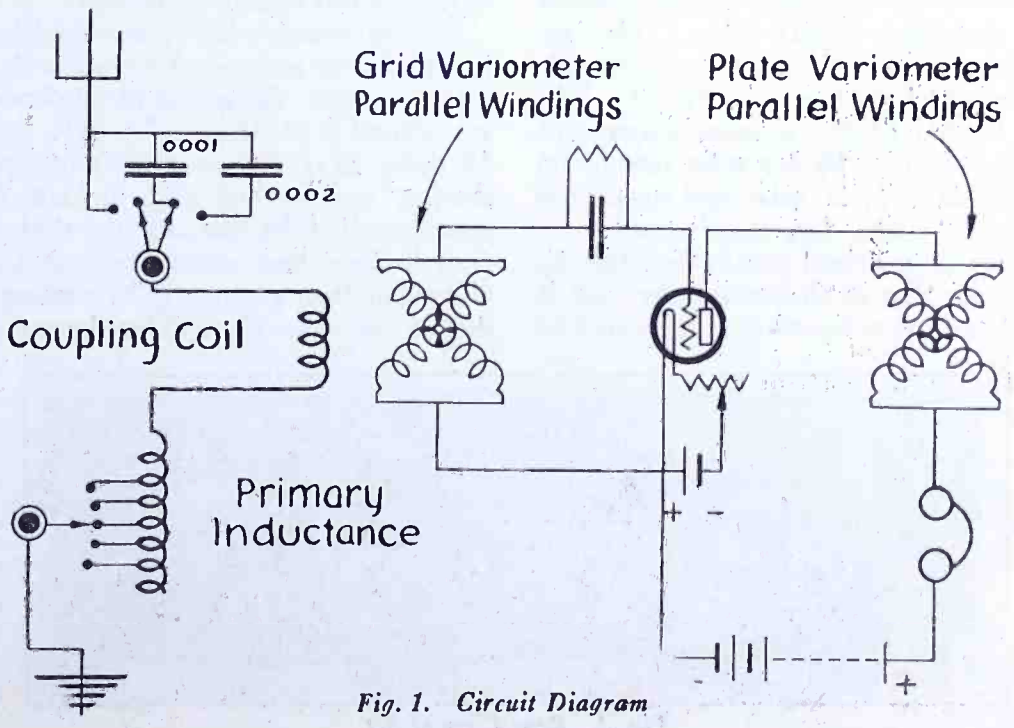


Fig. 1. Circuit Diagram

cuit. These are included in order to adapt the circuit to various aerials. In calculating these capacities, a theoretical aerial of .00025 mfd. was used, but the primary circuit will function efficiently on practically all amateur and broadcast aerials (experiments were conducted on all aerials up to .0005 mfd.), but it must be remembered that this set is to work on short waves; therefore it is best if a small aerial of about .0001 to .00025 mfd. is used. However, as aerials of this capacity are seldom found, the two small fixed condensers have been incorporated in the primary circuit. They are of .0001 and .0002 mfd. each. They are so wired as to allow the use of the aerial alone, the .0001 mfd. in series with the aerial, or the two condensers placed in shunt with each other, and then in series with the aerial. When the condenser of the lesser value is in series, the resultant capacity of the antenna circuit is .00007 mfd., and when the two are in shunt, and then in series, the resultant capacity is .000135 mfd.

The writer has disregarded the distributed capacity of the theoretical antenna, for the inductance value of the primary coil is practically at all times greater than that of the aerial. In addition it will vary with different aerials, and cannot really be taken into consideration. With the total antenna capacity of .00007 mfd. the primary circuit was resonant to waves between 95 to 175 meters, and with the .000135 mfd. capacity, to waves between 130 to 250. (The writer's antenna was slightly below .00025 mfd. and the resultant capacity when the .0001 mfd. condenser was used was less than .00007 mfd., and the receiver tuned from 70 to 155 meters, and from 110 to 220 meters.)

As can be readily seen from Fig. 1, no variocoupler is used, the primary being directly coupled to the grid variometer. Also that the primary circuit consists of two separate inductances, both wound in the same direction, and placed at right angles to each other. The layout of the apparatus on the reverse side of the panel is shown in Fig. 2. The first section of the primary consists of 3 turns of No. 16 dcc wire wound on the 3½ in. x ¾ in. tube, and constitutes the primary-secondary coupling medium. The winding should run in the same direction as that of the variometer, and is attached to that instrument by means of

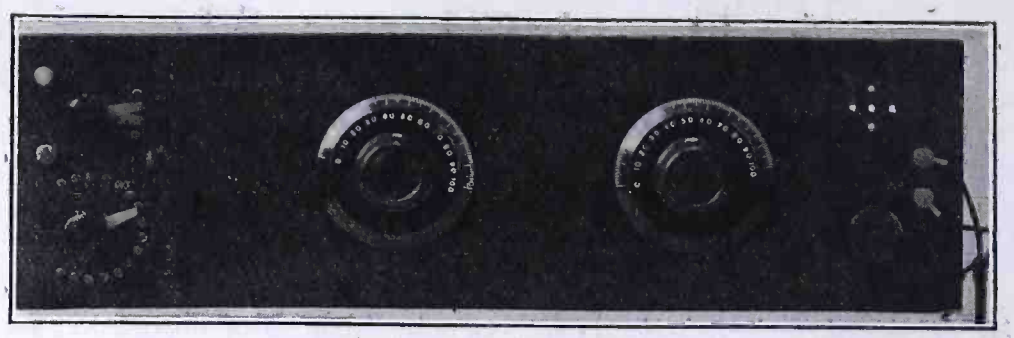


Fig. 3. Front View of Panel

two brass angle pieces. Its location is shown in both Figs. 2 and 2a. The

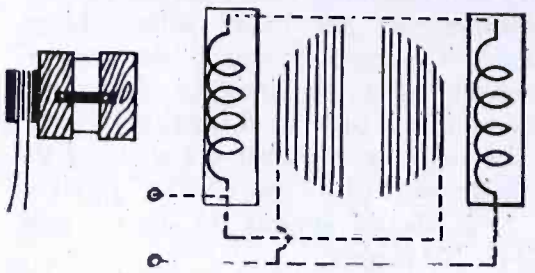


Fig. 2a *Fig. 2b*

second section of the primary inductances is wound on the 3½ in. x 2 in. tube, with the No. 20 dcc wire. The number of turns are 36 in all and are tapped as follows: 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 28th, 30th, 32nd, 34th and 36th. Exercise care when winding these coils to see that the turns are tight. Do not use any binder.

The grid and plate circuits are next. One more glance at Fig. 1 will show that the grid variometer acts as both tuning and coupling element; also that the connections into the circuit are made in the standard way, except that the variometer windings are connected in parallel rather than in series. This method of connection decreases the total mutual inductance of the variometer, and reduces its so-called wavelength range, in addition to which it allows a much greater variation in wavelength for a certain degree of revolution. These facts are also applicable to the plate variometer, as the windings of that instrument are also placed in parallel.

The variometers are of the old school, i.e. the frame is made of wood, as is the rotor, and most important of all the coils are wound with large wire, No. 16 or 18 dcc. Bear this in mind when purchasing variometers, and do not buy these small baby-like affairs, that are frail looking and wound with No. 28 wire, and then given a thick coating of shellac or varnish. The large size moulded variometers that have lately made their appearance upon the market are satisfactory, but the price is much higher than of the wooden form, so the selection of either is left to the bankroll of the purchaser. The actual change in windings from series to parallel does not entail any difficulties, and the method of procedure is as follows: The standard variometer as used today consists of two windings, the stator and the rotor being connected in series, with the free end of the stator constituting one terminal of the variometer, and the free end of the rotor the other. Shortcircuit these two terminals, and use this end as one terminal of the new parallel winding variometer. Take off the other connection at the point where the stator is connected to the rotor. (Do not break the connecting lead; use it merely as the other terminal of the variometer.) This is illustrated in Fig. 2B. The dotted lines show the connections that have to be made in order to change the windings of the variometer from series to parallel.

The rear and front views of the panel are shown in Figs. 2 and 3. The primary inductance should be placed as close to the inductance switch as possible. The two variometers should be separated about 5 in., and must be shielded against "body capacity" effects. The shields should be constructed of substantial material in order that a solid ground connection to them can be made. This precaution is absolutely necessary, as the tuning is very sharp, and body capacity would affect it to a very great degree. Unless properly shielded a weak signal may be heard when tuning, but it will entirely disappear when the hand is removed from the dial. The detector tube socket is mounted on the baseboard, as are the *A* and *B* battery binding posts, and the grid condenser and leak are attached directly to the grid terminal of the socket. The baseboard is attached to the panel by means of three heavy brass angle pieces, and its location is shown in Fig. 2. Looking over Fig. 3, we have the aerial and ground binding posts on the left end of the panel, then the aerial condenser switch, beneath which is the inductance switch. To the right of these switches is the grid variometer, the plate variometer, the detector rheostat, and the output binding posts respectively.

The wiring is an important item, and

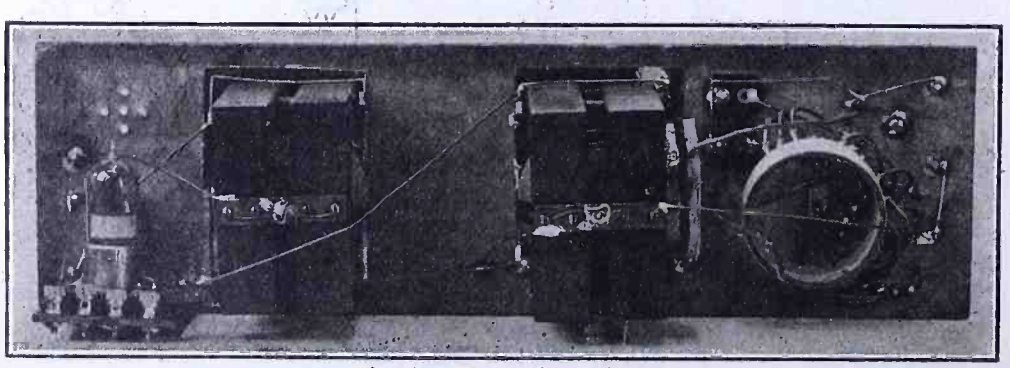


Fig. 2. Rear View of Set

Continued on page 72

The Enchanted Jackass

By Earle Ennis

This story is a weird conceit continuing the radio adventures of a couple of cow-punchers. Yet, with all its fantasy, it is true to type, exceedingly funny and not wholly impossible.

THE thing starts from Jimson tryin' to tell me there aint no use teachin' a Mex jackass nothing about radio.

"They is born plumb dumb," he says, "an' the longer they lives the dumber they gets. Give 'em time," he says, "an' they'll get into Congress!"

"Dumb is as dumb does," I comes back. "An' anyway you got to admit they've got elegant ears for long distance. I'll bet they could hear Tapioca, Japan just by sittin' on a hill," I says.

Jimson gives me a sad look full of asofetida.

"Them ears was give to jacks by Mother Nature," he opines, "so's folks could tell 'em from human bein's. They aint for radio else you'd find a General Electric stamp on 'em," he says. "An' take a tip from me and don't try to make no Doc de Forest out of a Mex burro. It aint fair to the burro."

But I has my own ijeas and I percolates same, the whiles I rolls a cigarette.

"The way I figgers jackass ears," I says, "they is considerable like this here superior Hetty-dine. Use what yuh got and see what happens," I says.

Jimson rolls over and busts a centipede which is gettin' all set nice and purty on his neck.

"Supposin' yuh had some such Marconi mule as you mentions," he asks. "What was yuh aimin' to do with same's ears?"

"Well," I replies, "it aint so much the ears I was thinkin' of. It was the entire jackass, as it were. In fact," I says, "to be frank and dishonest, I was aimin' to sell same to the rebel army for kale of the rellum."

We was lyin' under a mesquite in front of a shack on the Mex border, about three miles from same, at the time, so's to be handy for gun runnin' and other illegal acts which we was doin' with all comers at cut rates. Jimson gives me a sandy expression, and then rises and shakes me by the hand some fluent.

"Bud," he says, with great feelin', "I done you wrong. I sure did. Yuh aint near as stupid as yuh looks. Me—I aint seen nothin' in a jackass that wasn't ornery. An' as for a radio jackass—I has my doubts. I've heard some broadcast and I aint gone a heap crazy over it. If it's that yuh's figgerin' on yuh needn't count me in."

"Lissen," says I, "yuh aint never heard a jackass spout music and grand opera, an' weather reports and such," I says casual like. "This here is a high grade ijea. The jackass I'm thinkin' of is a super-jack," I says, "an' bank wound. An' he aint no infringement on Armstrong neither," I says.

Jimson looks kinda startled.

"Bud," he promulgates, "if that there is a inverse-duplex jackass with a vernier disposition—that's different. I'm aimin' to lissen."

Seein' I got Jimson goin' strong, I lowers my voice, the which is always safe on the border, and speaks from the heart out. When I finishes, Jimson throws his arms around me.

"Bud," he says, "Napoleon couldn't have done no worse." The which I considers plumb modest under the circumstances.

"We got to go to Paso for the stuff," I says.

Jimson gets up and dusts off a horned toad that's hangin' to his ankle.

"There 's no time like the past," says he. "Let's get goin'."

Which we does. We climbs into our little Jessie-junk and moseys over to the capital of Texas like we was all legitimate as to intent. Comes the next day, we is back at the shack again with a load of boxes. Some pronto from the border we picks up with a grimy lookin' bozo herdin' some woollies in a coulee.

"Stamos dumbbell!" salutes Jimson, friendly like. "Sabe usted El General Mendoza?"

The bimbo looks kinda scared but finally admits he has heard of the gent.

Continued on page 52

SOLDERING

By D. B. McGOWN

SOLDERING is that process whereby two or more pieces of metal are fastened together by fusing a softer metal of lower melting point onto the junctions of the two pieces. In distinction, when metals are welded together they are heated at their points of contact to such a temperature that they become plastic, and at the point of junction become actually one and the same piece of metal.

Soldering is divided into two classes: "soft soldering," where the solder is always an alloy of lead and tin, usually in the proportions of "half and half," and "hard soldering," or brazing, where silver, composition brass, and several other hard alloys are used as solders. We are chiefly concerned in radio work with soft soldering, and all operations hereafter described will be considered as only belonging to the soft soldering class, except where specified.

The soldering processes may be applied successfully to practically all of the more common metals, which are found in radio apparatus. Aluminum cannot be soldered by any soft soldering process, but several specially prepared patented solders are now available.

Soldering consists of heating the object or objects to be soldered to such a temperature that the lead-tin alloy will melt, and adhere to the metallic surfaces, which is usually called "tinning." The two surfaces are then held in contact with each other, heated again to the solder's melting point, and more solder added to fill up the interstices in the joint, and to make it solid. Usually this whole process takes place at the same time.

In preparing a surface for soldering, it is essential that it be clean. This can best be accomplished by scraping, polishing, or rubbing the surface until it shows "bright" all over. An old dull knife makes a good scraper. For small work a piece of sandpaper or emery-cloth can be used with good success to clean the surface. Objects that have been freshly machined and which are free from grease can usually be soldered without further cleaning.

No matter how bright the surface may appear, there is usually a thin invisible coating of oxide which prevents the solder from adhering to the surface. Consequently it is necessary to use some substance called a "flux" that will dissolve the oxide. Metals of the copper group can be soldered with resin, sal-ammoniac, zinc chloride, or hydrochloric acid. This includes all metals usually used in radio work, such as copper, brass, german-silver, bronze, and the like. Tin-plate, which is sheet-iron covered with a thin coating of tin, can best be soldered with resin, only. Metals of the iron group are quite difficult to solder, and can only be soldered with a flux of hydrochloric acid, which again is the only flux that will work properly on zinc or galvanized iron.

In heating the work, and applying the solder, two general methods can be used. The more common is to scrape the work, apply the flux and then heat the joint by applying a hot soldering copper (commonly called an "iron") the end of which is well tinned, to the joint. The joint heats, due to contact with the heated tool, and finally the solder runs off from the soldering copper and onto the joint, and the soldering iron is then removed, and the work allowed to cool. A second method is to heat the work directly with a flame, such as from a gasoline or alcohol torch, and to apply the solder whilst the work is hot. The former is the more common method, although the latter has many uses, and often is the easiest way.

The soldering iron may be heated over a gas flame or in the flame of a gasoline torch. A clean, soot-free flame should be used, or the iron will get black and dirty. The modern soldering irons are electrically heated by a jacket of resistance wire, which keeps them up to a proper working temperature at all times. This system is probably the simplest and most convenient, but, of course, has the disadvantage of requiring a source of current, which sometimes limits the iron's portability.

The point of the soldering iron must be tinned, and kept well tinned when in use. To tin an iron, the point should be carefully filed to the shape desired, while cold, using a rather coarse file. The iron should then be heated well above the melting point of solder, and the various sides of the iron's point again filed, until bright, using an old file, and immediately after filing some resin should be applied directly to the heated point, and, before it has burnt off, some solder melted on. This should, of course, be repeated for all the sides of the point, until the whole is well tinned. Another method is to cut a hole in a block of sal-ammoniac, drop a few drops of solder into this, and, with the iron well heated, rub the iron's point into the solder and sal-ammoniac. This method avoids some tedious scraping, but is not always as good.

Various patented and specially prepared fluxes are used for soldering, usually known as "paste" or "soldering compounds." These substances do not differ chemically from any of the basic fluxes described. Most soldering pastes are made of powdered resin and zinc chloride, thoroughly mixed and worked into a pasty form by the addition of petroleum grease, similar to vaseline. Sometimes a small amount of free acid is added to enable the paste to work on galvanized iron. Such substances are more convenient, but their action is exactly as described previously.

Sometimes specially-prepared s o l d e r is used, where the solder is either in the form of a tube, the interior being filled with resin or acid, and called respectively "resin cored" and "acid cored," or else finely powdered solder is mixed with flux, and applied directly to the work. Resin cored solder is the best of these, as the acid cored will corrode, and injure the work, after the job is done, and the powdered solder is only an excuse, at best.

"Sweating" is a soldering process whereby the whole of the work is heated and the solder allowed to flow through the entire joint. This is especially useful when soldering screws onto rods, handles onto utensils, etc.

"Super-Autodyne" Reception

By P. J. Townsend

The suggestions given here offer an excellent opportunity for the experimenter. The results obtained can be duplicated if the same care is used as was evidently employed by the author.

TO utilize an electron tube for the Autodyne method of reception it must function both as an oscillator and as a rectifier. There are numerous circuits that give these results with a degree of amplification which varies with the circuit. The circuits described in this article not only oscillate and rectify but give an enormous amount of amplification with a minimum of distortion and have been found to be sufficiently superior to other circuits to have been justly dubbed the "Super-Autodyne."

It is the aim of every radio fan to produce at small cost an efficient set with as few controls as possible. With this in mind I tried out numerous circuits to see what could be done using only one inductance and one variable condenser for the tuning elements. Circuit 1 was the ultimate outcome of

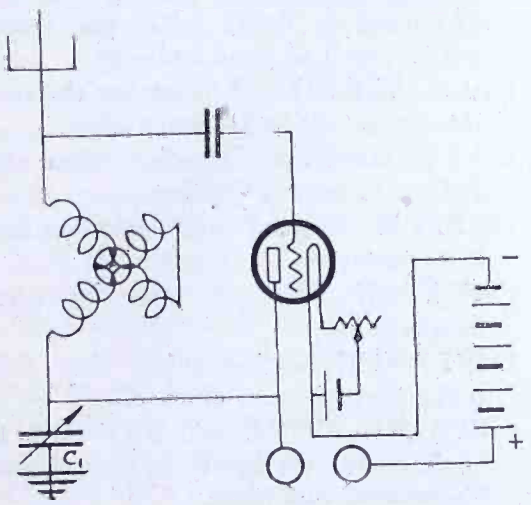


Fig. 1. Circuit for Soft Tube

these experiments and was used with great success on broadcast reception with soft detector tubes. Later experiments revealed the fact that it was possible to get very good results with hard tubes by shunting the grid and plate with a variable resistance, thereby inducing a small electron flow from filament to grid, as shown in Fig. 2.

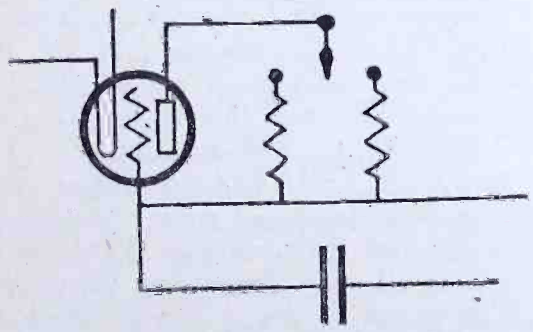


Fig. 2. Modification for Hard Tube

It was found that the bulb would not oscillate if the inductance was reduced below a certain value, regardless of capacity. This prevented the use of the split variometer for further reduction of the inductance for the amateur wavelengths, as the minimum that could be used was about equivalent to the zero position of the regular variometer. The only recourse then lay in the reduction of capacities, this is accomplished in Fig. 3. Likewise the tube would not oscillate if the capacity of the antenna was very great.

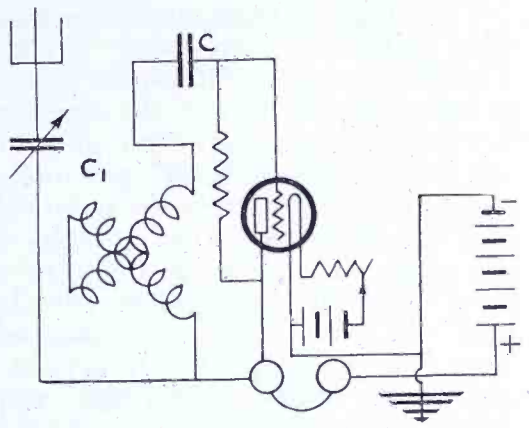


Fig. 3. Circuit for Amateur Wavelengths

The circuit in Fig. 1 may be used with either an inside or an outside antenna. If any trouble is experienced in making it oscillate cut down the capacity of your antenna and make sure that the lead-in wire is as far away as possible from anything that might induce capacity to ground. A one wire antenna from 80 to 100 ft. long works very well.

A special inductance was developed for use with these circuits. Its construction is a little beyond the scope of the average amateur but a standard variometer of good quality will suffice. In this case the circuit in Fig. 4 will

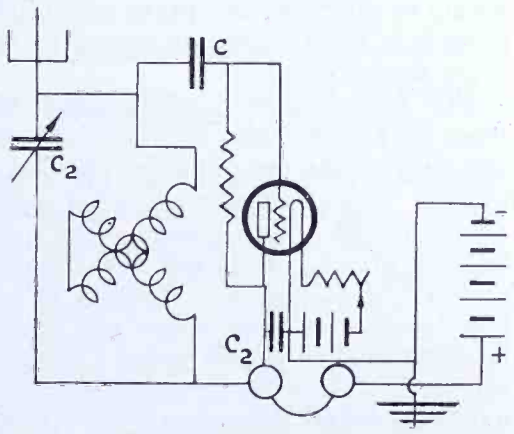


Fig. 4. Circuit with Fixed Plate Filament Condenser

probably not be needed but it may be of interest to those who like to experiment. The parts are the same as for the others with the addition of the fixed condenser *C*2. The capacity of this condenser depends on the antenna, etc., so its value is best determined by experiment. A variable condenser may be used in its place if so desired, otherwise its construction is as follows:

Cut two strips of copper ½" wide—one 1¼" long and one 2" long. Fold the 2" piece at its center and solder a lead wire to the back of the fold—also solder a lead wire to the extreme end of the 1¼" piece. Cut two strips of mica ¾" wide and 1⅛" long—push these in between the two leaves of the 2" piece of copper and push the 1¼" piece of copper in between the mica, with the lead end out. Be careful not to push it in far enough to short the condenser at the fold of the outside piece. Use copper (or brass) that is heavy enough to make a good clamp when the 2" piece is folded over, this will hold the condenser firmly together and make adjustment more certain.

After this condenser is hooked into the circuit it may be varied by sliding the center plate out until the proper adjustment has been found that will allow the set to oscillate over the widest range of the variometer and variable condenser. If in adjusting it is found that the capacity of the condenser is too small pull it apart, split the mica, and try again. After the adjustment has once been found it need not be bothered again. If the antenna is properly designed the condenser *C*1 may be eliminated and the variable condenser used to advantage in place of *C*2, as shown in Fig. 5.

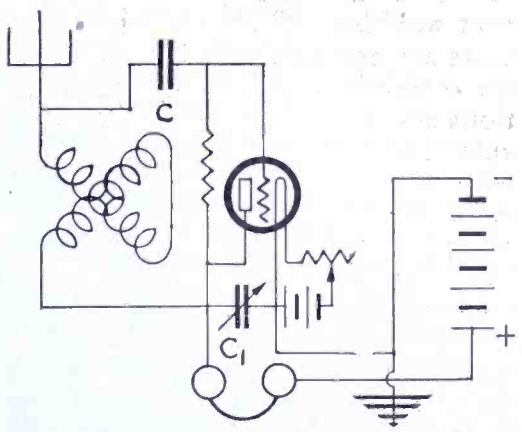


Fig. 5. Circuit with Variable Plate-Filament Condenser

The circuit in Fig. 4 was used with a diamond-shaped antenna in a small room. The diamond, consisting of about 28 ft. of wire, was hung by its corners from the center of the picture molding of each wall. The lead wire was about 7 ft. long and was fastened to one corner of the diamond, dropping straight down to the set. The steam radiator was used as a ground.

With this antenna broadcasting stations up to 1000 miles were picked up nightly using the head-phones, although, the room was in the heart of the business district of San Francisco and was partly shielded with grounded

sheetmetal. A loudspeaker was used for reception of local broadcasting.

Fig. 1 worked equally well, if not better, but Fig. 4 was used because it covered a wider wave range. Fig. 3 gave fair results on this inside antenna for 200 meter work, but Fig. 1 was excellent. A small condenser, such as the one described for *C*2 of Fig. 4 and adjusted in the same manner, inserted in the antenna lead permitted of tuning well below 200 meters. The same condenser may be employed for increasing the wave range by connecting it to antenna and ground.

The following is a list of the parts required:

C —Grid condenser, .00025 mfd., not critical.
*C*1—23 plate variable condenser, with vernier.
*C*2—As described in text.

1 Variometer.
2 Dials.
2 Remler grid-leaks.
1 Switch-lever and knob
2 Switch-contacts.
2 Switch-stops.
1 Socket.
1 Rheostat.
1 Headset.
1 Loudspeaker. (Optional).
1 Electron tube.

1—*A* Battery—depending on the tube used.
1—*B* Battery—90 to 120 volts for *A* tubes, 60 to 90 volts for others.
Binding-posts, etc.

Do not expect to get good results from poorly constructed apparatus. Likewise, do not think that because an article is high in price it is beyond reproach.

Use a grid condenser with mica dielectric. In selecting a variable condenser and variometer make sure that their bearings are free from play—you cannot do fine tuning with apparatus that wobbles. Sliding or friction contacts are not to be condemned if they are correctly made but pig-tail connections are to be preferred. Select a variable condenser with composition heads with metal bushings for bearings—metal heads are to be avoided.

Fig. 2 shows two resistance units connected to the grid with a switch between the remaining terminals and the plate. (Keep these leads as short as possible.) This is to eliminate the necessity of destroying the "Super" adjustment in order to do long distance work or vice versa. Grid-leaks are of too high a resistance for this work. The Remler leaks are recommended because the desired resistance may be obtained by the addition of a few pencil marks. Before using these leaks make sure that there is plenty of lead under the heads of the screws—if not put it on with a hard pencil.

It is advisable to assemble the parts on the table and give the circuits a trial before attempting to mount them on a panel for a cabinet. In both cases keep the leads as short as possible. Keep the plate wires away from the *B* and *A* battery leads—make the *A* and *B* battery leads as short as possible and keep both batteries well insulated from possible grounds. If you have a concrete floor put the batteries on a box or shelf if you do not want them on the table. Keep the antenna and grid leads as far away as possible from all other wires but do not lengthen them in an attempt to do this.

Audio frequency amplification may be added to these circuits in the usual manner but be sure and keep the amplifiers away from the tuning elements and do not crowd the bulbs, particularly the A type. Better results may be had with some transformers if a radio frequency choke is put into the plate circuit of the detector.

The tuning of these circuits is somewhat different from other circuits. Therefore, success will require a little patience on the part of the operator. Set the condenser between 0 and 10°, the variometer about 90°, put one or two pencil marks across the resistance unit and with from 20 to 30 volts on the plate, depending on the type of tube, turn up the filament rheostat until the circuit starts to oscillate. Turn the variometer slowly toward 0 and notice when oscillations stop. Adjust the resistance by erasing or adding more lead until the circuit oscillates at the lowest value of inductance, which should be about 15°.

Tune in some weak signal and keep adding capacity and subtracting inductance until you have the breaking point of the oscillations and the signal at the same place. Do this several times, adjusting *B* battery, filament rheostat and resistance unit until maximum signal strength is obtained. If you have the resistance about right—the capacity and inductance of such ratio that the bulb is about to stop oscillating—then backing off on the filament rheostat oscillations should stop gently instead of with a bang. If the bulb wants to squeal at this point add a little more lead to the resistance or add a few volts to the plate.

For the "Super" adjustment put from 60 to 120 volts on the plate, depending on the type of tube (see list of parts). Switch over to the other resistance unit and with a hard pencil rub on lots of lead, boosting the rheostat and retune as you do. As soon as you have reached a point where the signals become weaker gently erase a little of the lead. When the proper adjustment has been found there should be enough volume to work a loudspeaker at least thirty miles from a 500-watt broadcasting station.

If you have followed all the instructions in the text above and you still are unable to get the results as stated the fault is most likely in the antenna. This is the case if Fig. 1 fails to oscillate on 200 meters.

Last fall the circuit in Fig. 1, with two stages of a. f. amplification, brought in broadcast music on a loudspeaker from stations all over the United States, using a soft tube for a detector. This fall experiments have been confined to the hard tubes without a. f. amplification and very good results have been had as to east coast reception.

UP-TO-DATE RADIO DICTIONARY

Properly Bridged and Quenched

By L. H. LA MONTAGNE

"A" BATTERY—The part of a radio set that takes your money and makes light of it.

AERIAL—That which is used to catch messages; and our chins when cutting across lots late at night.

AMATEUR—One far advanced with the disease "radiomaniatis". Sometimes called interference and other pet names.

ARC—A method of transmission invented by Noah.

"B" BATTERY—That which supplies the necessary high-voltage kick to a radio set.

BROADCASTING—The gentle art of saying or doing what you want, out of reach of your audience.

CAGE AERIAL—A place for the parrot, hams, and other vegetables.

CAT-WHISKER—Another slam on Felix. Compare Cat-gut.

COPPER—A good conductor, but collects no fares.

CRYSTAL SET—A piece of glass in platinum.

DISTANCE — Something that will make prevaricators of us all.

GROUND WIRE—A wire used to anchor one's set firmly to terra firma. Compare ground hog.

GRID LEAK—The common cause for sloppy reception and appearance of some radio sets.

JACK—That substance used to buy and run a radio set.

LOUD SPEAKER — Any apparatus that speaks out loudly. Also loud squawker. Commonly referred to as an abomination by the neighbors.

MUSIC—That which is supposed to emanate from a broadcasting station.

PEOPLE—The abomination of the harassed radio dealer, and which often makes him wish that he had been on the ark . . . . with an augur.

RADIOMANIATIS—A disease fatal to pocketbook and time. Symptoms: The first indications are the desire to visit all radio stores and ask endless questions. Also a strong desire to gather up all homeless wire, insulators, etc., accompanied by a wish to put them into a "set". In the advanced stage, the victim is usually sleepy, and tired. Has a confirmed desire to talk nothing else but radio.

A Study of the Frequency Trap

By Jerome Snyder

Notwithstanding the large number of articles on wave traps already published in these columns, public interest in the subject justifies another. This is a "reason why" as well as a construction article offering wide latitude for experimenting.

THE problem which necessitates the use of a trap is this: A receiving antenna and receiving set together constitute a tuned circuit which has a resonance curve as shown in Fig. 1, when

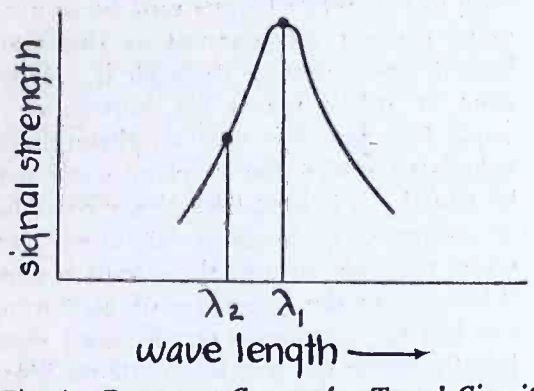


Fig. 1. Resonance Curve of a Tuned Circuit

tuned to the wave length λ. The signal response at its tuned wave length is a maximum, but it also receives an appreciable signal at other wave lengths. Thus at the wave length λ_2 its signal response may be 1/3 that of the maximum. The wave length λ_2 may be that of another broadcasting station. As a result considerable interference will be experienced. The object to be accomplished, therefore, is to insert in the system somewhere a device which will prevent, somehow, the interfering signal from reaching the receiver and thus actuating the detector.

This may be accomplished in a number of ways. One way is to oppose a very high impedance to this interfering signal, thus limiting its interference intensity to the point where it is negligible. This is equivalent to rejecting the interfering signal, hence the circuit is called a rejector circuit. Another way is to utilize a circuit which by-passes the interfering signal to earth, thus rendering the interfering signal harmless. A third way is to extract the energy from the interfering signal and absorb it in a side circuit generally called an acceptor. All these methods give rise to essentially different types of wave traps, all of which, however, accomplish the same purpose more or less efficiently.

In order to really understand the wave trap the following should be borne in mind. The wave trap is essentially a tuned circuit, and a tuned circuit is a filter. The amateur is familiar with the idea of a tuned circuit which has a very low impedance at the wave length to which it is tuned, and a higher resistance to all other wave lengths. If a circuit could be tuned sharply enough it would have a very low resistance to its tuned wave length, and extremely high resistance to all other wave lengths, hence it would receive only those signals coming in on its tuned wave. In other words it filters out all signals which do not come in on its tuned wavelength. A filter may be based on an opposite characteristic, namely it may be made so that it has an extremely high resistance to one particular wave length, hence it does not let this signal through.

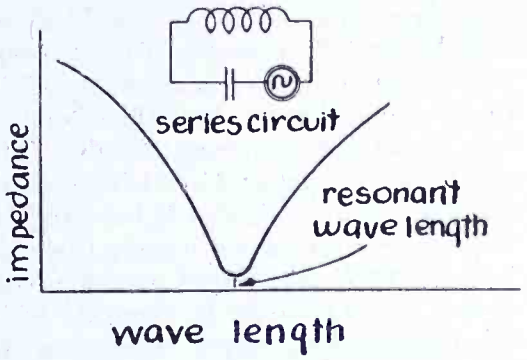


Fig. 2. Variation of Impedance with Wavelength in a Series Circuit

These ideas are illustrated by the graphs of these two circuits, shown in Figs. 2 and 3. Fig. 2 shows the impedance of its circuit at various wave lengths, and it is seen that it is very low at the tuned wave length, but so high at others that no signal on other waves can come in. On the other hand Fig. 3

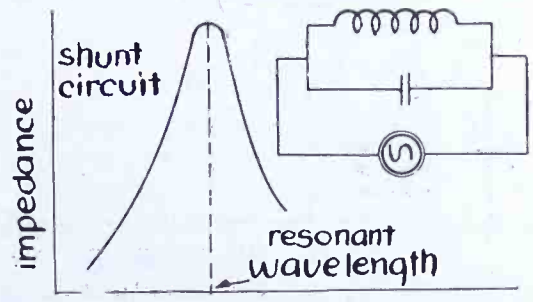


Fig. 3. Variation of Impedance with Wavelengths in a Shunt Circuit.

shows that the impedance of its circuit at the tuned wave length is so great that it does not let signals on this wave length through at all. Fig. 3 will therefore be recognized as the rejector circuit. With this in mind we can consider the various types of wave traps, how they function, and their practical design and construction.

Fig. 4 shows a simple tuned circuit parallel connected to the receiver. This tuned circuit is tuned to the incoming interfering wave, and has an impedance characteristic such as shown in Fig. 3, namely its impedance at the tuned wave length is a minimum. Since the receiver is tuned to a different wave length its impedance is greater to the interfering signal. As a result the interfering signal is largely shunted or by-passed to earth

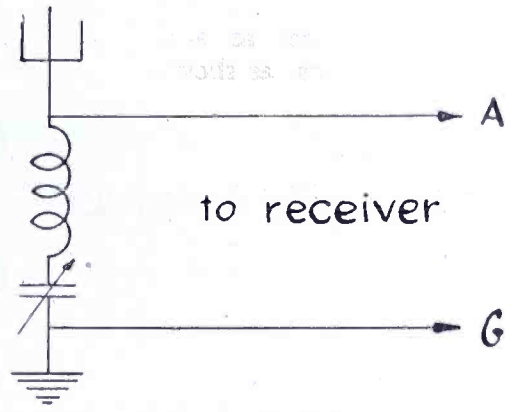


Fig. 4. Series Resonant Wave Trap

by the series tuned trap circuit. In building such a series resonant trap circuit usual receiving circuits constants had best be used, namely a variable condenser having a maximum capacity of about 0.0007 microfarads, and a 35-turn honeycomb coil, or its equivalent if the coil is built by the operator, namely about 35 turns on a 3-in. form.

This circuit for trapping the interfering signal is seen to be essentially a by-passing circuit. It therefore suggests two simpler possibilities. The first is the use of a simple by-passing condenser across the receiver as shown in Fig. 5. This

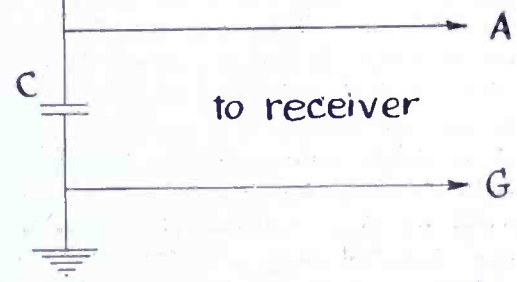


Fig. 5. By-passing Shunt Condenser as Trap.

condenser alone has very low reactance to all radio frequency currents hence it tends to by-pass them to earth. However, the receiver which is tuned to the desired signal has a much lower impedance at this wave length, hence it receives the desired signal rather than the by-passing condenser. However, the interfering signal which is different in wave length is offered a greater impedance by the tuned receiver than the by-passing condenser offers, hence it is largely shunted to earth and so causes no interference. The value of this condenser for ordinary broadcasting should be between 0.00025 microfarads and 0.001 microfarads, and the best value may be found by trial, using a variable 0.001 condenser. Of course some of the incoming desired signal will be shunted to earth, and hence it will be found that as the shunting condenser is increased the signal

intensity decreases somewhat. However the interference is considerably reduced by this expedient and the loss in intensity is well worth while.

The second expedient is the use of a few turns of wire in place of the condenser as a shunt across the receiver posts, as shown in Fig. 6. The writer

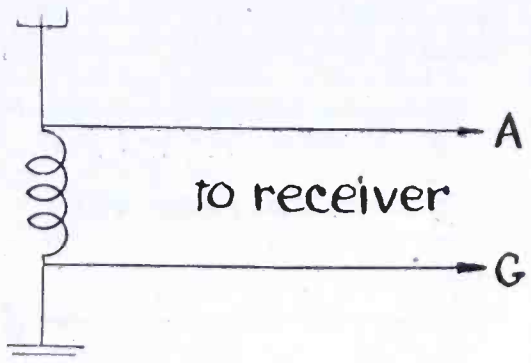


Fig. 6. By-passing Shunt Inductance as Trap.

has found a very suitable value to be about 10 turns of No. 20 single cotton covered wire on a 3-in. form. This scheme gives really excellent results. It seems to operate on essentially the same principle, namely the difference in impedance which it offers to the two incoming signals. It offers a greater reactance to the desired signal than the tuned receiver, hence the desired signal to which the receiver is tuned flows by preference through the circuit of least resistance, namely the receiver. On the other hand it offers less impedance to the interfering signal than the receiver which is not tuned to it. Hence the interfering signal flows through the shunting coil to ground and so clears the interference. Like the condenser, it causes some diminution in the intensity of the incoming signal, but the reduction of the interference warrants this. Both these simple expedients for interference reduction have the great virtue of practically no cost, extreme simplicity, and they function quite well.

The next type of filter to be considered is the absorbing circuit shown in Fig. 7. Here we have a tuned circuit

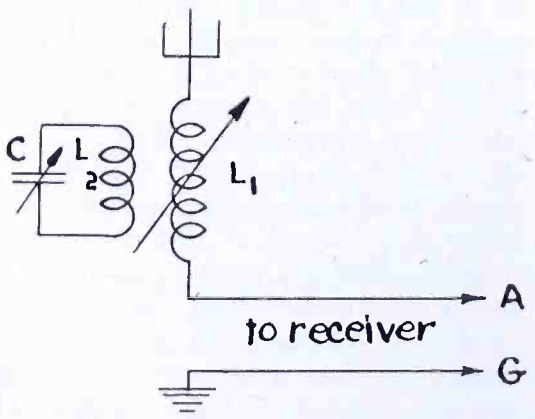


Fig. 7. Absorbing Circuit Trap.

coupled to the antenna by a few turns of a coil connected in series with the antenna. The tuned circuit is called the absorbing circuit. It is tuned to the interfering wave. Any energy due to the interfering wave flowing in the antenna is immediately extracted by the absorbing circuit tuned to it, and a large current flows in it. However, no current due to the interfering signal flows in the antenna itself, hence interference from this wave is entirely eliminated. The reaction of the absorbing circuit on the antenna is such that by its inductive relation to the antenna it introduces a counter electromotive force opposing that due to the interfering signal, hence no current due to the interfering signal flows in the antenna. Actual measurements were made, and by careful tuning of the absorbing circuit the current due to interference can be reduced to zero. For best results coil L_1, which is connected directly in the antenna, should have as few turns as possible. However it is possible to use too few turns, thus spoiling results. This coil should therefore be tapped at every turn, or every two turns, using a total of about 10 turns wound directly over the secondary coil L_2 of the absorbing circuit. The coil L_2 and condenser C, which constitute the absorbing circuit, should have regular receiving circuit values, namely C should be a 0.0007 microfarad variable condenser, and L_2 should be about 35 turns wound on a 3-in. form. Tuning of the absorbing circuit is done with the condenser until the interfering signal is eliminated, at the same time adjusting coil L_1 until best filtering action is obtained. This circuit is perhaps one of the most effective circuits for trapping undesired signals.

A simple modification of this trap is secured in the manner shown in Fig. 8,

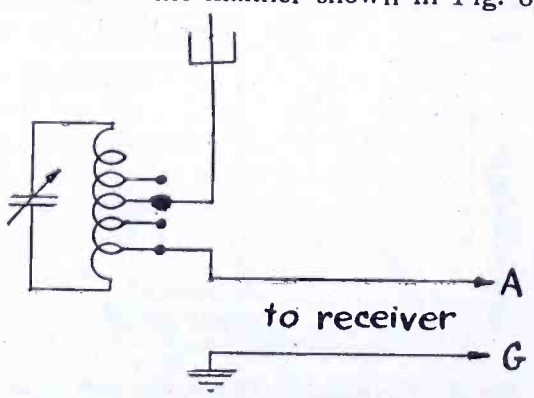


Fig. 8. Modified Absorbing Circuit Trap.

where only one coil is necessary. The single coil is wound with the regular 35 turns on a 3-in. form, but the end ten turns are tapped at every turn, or every two turns, which latter may be simpler and quite as effective. The connections are made as in the figure, coupling being conductive instead of inductive. This behaves identically like the circuit of Fig. 7, and is perhaps simpler in construction.

Finally there remains the rejector trap circuit shown in Fig. 9. This is a so-called parallel resonant circuit, and has impedance characteristics entirely different from the usual series circuit. Fig. 3 shows these characteristics, and it is seen that at wave lengths to which the circuit is tuned it has very great impedance. Hence if such a circuit is placed in series with a receiver as in Fig. 9 and tuned to

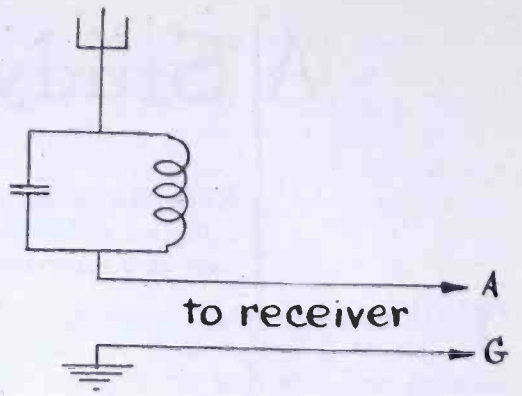


Fig. 9. Parallel Rejector Trap.

the interfering wave length, its impedance at this wave length will be so great as to prevent any current at this wave length from flowing through it. However at other waves its impedance is much less, hence it will let through the signals to which the receiver itself may be tuned. Theoretically this circuit has an infinite impedance at its tuned wave when the resistance of the circuit is zero. The greater the resistance of the circuit the less its impedance at its tuned wave length, hence the less favorable its filtering action will be. It is therefore evident that the best design is that which will give it a minimum resistance. For this reason best results will be secured with a large condenser and small inductance, since then the resistance due to the coil will be considerably reduced. Ten or 15 turns of wire with the corresponding capacity which would be about 0.004 micofarads is quite suitable, but if less turns with larger capacity can be used it would be better still.

Of course with all these trap circuits only one interfering station may be eliminated at one time, since the circuit can be tuned to only one wave. However two or three of these traps may be connected in series, each of them being tuned to an interfering station, thus eliminating as many stations as there are traps. Necessity for this does not often arise, fortunately. In such cases the simple expedient of shunting antenna and ground posts by either a by-passing condenser or inductance as explained above is the simpler expedient which will give satisfactory results.

In building all of the above the constructor must remember one important detail. No matter what the type of trap circuit, a trap is more efficient the less the resistance of its circuit. In the series resonant type of circuit it increases sharpness of tuning. In the parallel resonant circuit or rejector it increases the impedance to the interfering signal. Hence care should be taken that only the best type of low loss condenser is used, having only the best of insulating material on it. Air condensers are best, but where fixed large condensers are used, as in the case of the parallel rejector circuit mica condensers only should be used. Coils should be wound on forms of proved insulating material like hard rubber, contacts should be secure positive and soldered wherever feasible.

A Reflex Receiver for Beginners

PART II

By Charles F. Filstead, 6CU

This is an unusually simple and complete description of the construction of a one-stage audio-frequency amplifier unit. While primarily intended for use with the crystal detector unit described in March RADIO it may be used with almost any detector circuit.

IN this installment, we will take up the construction of a simple, one-stage, audio-frequency amplifier that is designed to operate in conjunction with the crystal receiving set described in March RADIO. This amplifier will work equally well with any other type of receiver. It is necessary merely to connect the binding posts marked *A* and *A* in Fig. 1 to the binding posts on the other receiving set where the receivers usually attach. The receivers are plugged into the amplifier by means of the plug and jacks, as will be explained later, and the batteries are connected to the binding posts at the back of the base. If the amplifier is properly constructed it will more than double the strength of the received signals.

The following is a list of the parts necessary to build the amplifier:

⅛-in. bakelite panel, 6x9.
⅛-in. bakelite terminal panel, 1x7.
½-in. hardwood sub-base, 6x7.
1 bezel.
2 double-circuit jacks.
1 receiver plug.
1 audio-frequency amplifying transformer.
1 thirty-ohm filament rheostat.
1 vacuum tube socket.
1 three-inch dial for rheostat (same make as used on the crystal set).
13 binding posts.

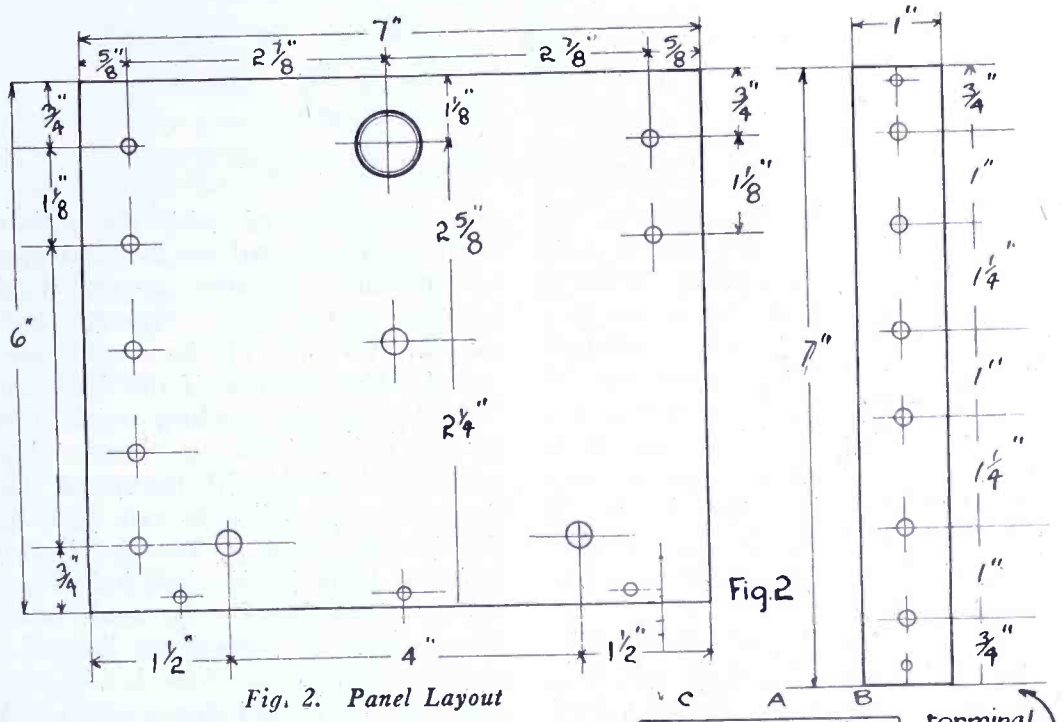


Fig. 2. Panel Layout

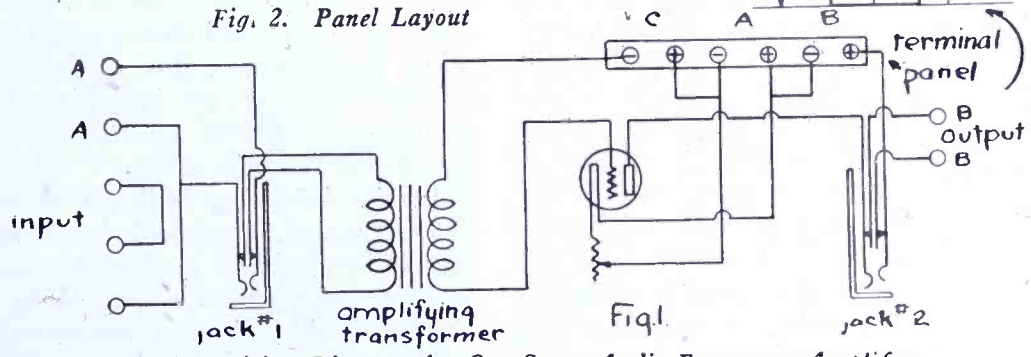


Fig. 1. Wiring Diagram for One-Stage Audio-Frequency Amplifier

The panel is laid out and drilled as shown in Fig. 2. Some of the dimensions will have to be changed, as the sizes of different makes of parts vary considerably. The sub-base is fastened to the panel by three ½-in. wood screws, put through holes in the bottom of the panel, and it forms a mounting for the tube socket and transformer. The tube socket is mounted on the sub-base directly behind the rheostat so that it is in line with the bezel in the panel. The transformer is fastened beside the socket. The six binding posts for the *A*, *B*, and *C* battery leads are mounted on the 1 by 7 in. terminal panel, as shown in Fig. 2, and the whole assemblage fastened on the back of the sub-base. It is raised ½ in. off the sub-base by a small block of wood under each end, and fastened by two 1 in. wood screws.

After the apparatus has all been mounted on the panel and sub-base, it should be wired up with bus-bar wire according to the diagram given in Fig. 1. All leads should be kept as short and direct as possible. A thin metal or leather washer should be put on the rheostat shaft under the dial to keep the dial from rubbing on the panel. The builder can use his own judgment in building the cabinet, for so many articles have appeared on that subject that no dimensions will be given.

A word about the type of vacuum tube to use should not come amiss here. If the builder has a six volt storage battery, he can use either a C-301A or a UV-201A tube, which take ¼ ampere. Without a doubt they give much better signals than other types of tubes. For operation on dry cells, a UV-199 or a C-299 should be used. They take 1/16 ampere. Running two hours a night, three dry cells should last about four months on two 199 or 299 tubes. These three dry cells are the *A* battery, and they should be connected in series and to the *A* battery terminals on the amplifier. The *B* battery should have a voltage of from 45 to 90 volts; up to a certain point the more voltage it has the louder the signals. The *B* battery should be connected to the *B* battery terminals of the amplifier, taking care that the polarity is connected as shown in the diagram.

To improve the quality of the music and to cut down the excessive consumption of plate current at the higher voltages (90 volts, or above), a *C* battery should be used, ordinary flashlight batteries sufficing. The voltage to be used in the *C* battery circuit varies with the *B* battery voltage. If a 45 volt *B* battery is used, a 1½ volt dry cell will be just right for the grid bias, or *C* battery. If 90 volts is used on the plate, the *C* battery should be 4½ volt flashlight battery, or three dry cells. The polarity of the *C* battery must be connected as shown. If a *C* battery is not desired, it can be left out, and the two *C* battery binding posts shorted by a wire. A 199 or 299 tube does not fit a standard socket, so an adapter must be purchased if one of them is used.

Fig. 3 shows how the amplifier is connected to the crystal set. To make the set look neater, metal straps should be used in place of wires to connect the panels together. The cord from the head phones is attached to the plug, and plugged into either of the two jacks. The left-hand jack connects in the crystal set alone, while the right-hand jack connects in both the crystal set and the amplifier. When the plug is in

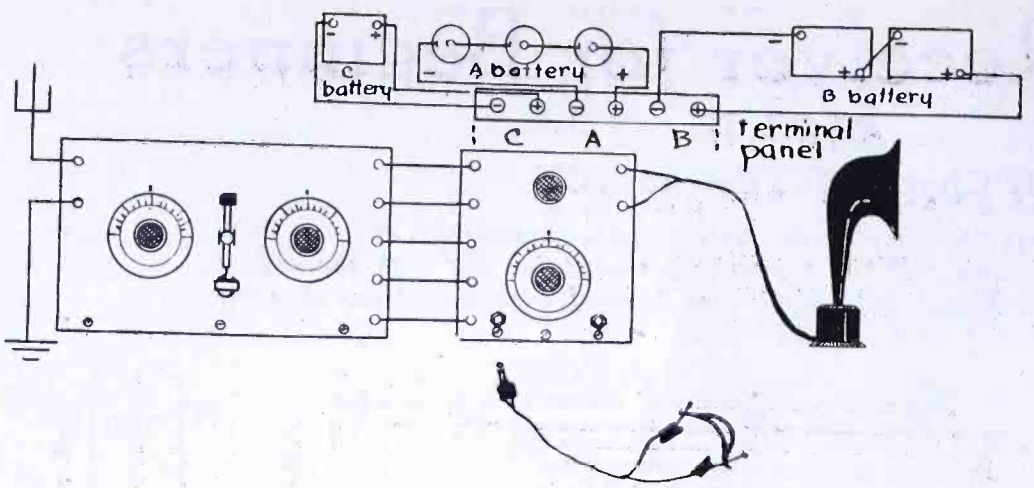


Fig. 3. Connection of Amplifier to Crystal Set

the left-hand jack the filament of the tube should be turned off, as it is not being used. The polarity of the *B* battery must be connected as shown, but the *A* battery leads should be reversed while the set is running. One way of connection will be found better than the other. If a loud speaker is desired, it can be connected to the two binding posts on the right of the amplifier, marked *B* and *B* in Fig. 1. When the loud speaker is used, the receiver plug must be pulled out of the jack.

In the next installment we will take up the construction of a single-tube unit which, when connected to the crystal set already described, will form a single-tube reflex receiver. It might be explained here that a single-tube reflex using a crystal detector is equivalent to a three-tube receiving set. The amplifier described in this installment can be used in conjunction with the other two instruments, making the equivalent of a four-tube set, with but two tubes actually used.

A HANDY DRILL LIST FOR MACHINE SCREW TAPS

By CHARLES F. FILSTEAD, 6CU

AN amateur to be worthy of the name must be a good mechanic. To build a set properly he must have a good working knowledge of taps, dies, and drills, for the biggest part of the actual construction of a set is the drilling and tapping of the panel. A good job of tapping, or threading a hole cannot be done by guesswork; if the tap is too small for the hole the threads will not be cut deep enough, and if the tap is too large it will be likely to break off if forced, and there is always the danger of breaking the panel. I am giving here a list of the drills to use for the different size taps used in machine work. In my own work, I have found this list so indispensable that I would be lost without it. It is surprising how easily and rapidly a panel can be tapped with its aid.

This tap list will also be found useful in determining the size of an unknown machine screw. To do this, the machine screw is compared with the different drills in the set until one is found that is of the same diameter as the outside diameter of the screw. By referring to the list, the size of the screw can be found. For instance, if the drill was a No. 28, then the machine screw would be a No. 6. If the experimenter has a complete drill set with the metal frame that holds the drills, he can easily find the size of a screw by inserting it in the different holes in the drill holder until one is found that fits the screw snugly. The number of threads per inch of the machine screw can then be found by means of a standard thread-gauge. Another, but slower method of finding the number of threads per inch is to try the screw in the different dies in the set until one is found which it fits.

In the following drill list there are three columns, numbered 1, 2, and 3. In the first column is given the size of the tap or machine screw. The first number in this column is the size of the machine screw, and the second number is the number of threads per inch of the screw. Column 2 gives the size of the drill to be used for drilling a clearing hole for the screw, i.e.: a hole that fits the outside diameter of the screw; and column 3 gives the size of the drill to be used for tapping the hole.

Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Col. 3
2-48	44	50	8-24	19	31
2-56	44	49	8-30	19	31
2-64	44	48	8-32	19	30
3-40	39	49	9-24	16	30
3-48	39	47	9-28	16	28
3-56	39	45	9-30	16	28
			9-32	16	26
4-32	33	46			
4-36	33	44	10-24	11	26
4-40	33	43	10-30	11	24
			10-32	11	24
5-30	1/8	43			
5-32	1/8	42	11-24	6	21
5-36	1/8	41	11-28	6	20
5-40	1/8	38	11-30	6	19
6-30	28	38	12-20	7/32	24
6-32	28	37	12-22	7/32	20
6-36	28	36	12-24	7/32	19
6-40	28	35	12-28	7/32	18
7-28	24	34	13-20	15/64	17
7-30	24	33	13-22	15/64	17
7-32	24	32	13-24	15/64	15

Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Col. 3
14-20	1/4	15	19-16	5/16	1
14-22	1/4	11	19-18	5/16	B
14-24	1/4	10	19-20	5/16	C
15-18	F	12	20-16	P	C
15-20	F	10	20-18	P	E
15-22	F	8	20-20	P	F
15-24	F	7	22-16	S	H
			22-18	S	J
16-16	I	12			
16-18	I	8	24-14	3/8	L
16-20	I	7	24-16	3/8	M
			24-18	3/8	N
17-16	L	8	26-14	13/32	O
17-18	L	4	26-16	13/32	P
17-20	L	3			
			28-14	7/16	R
			28-16	7/16	S
18-16	19/64	2			
18-18	19/64	2	30-14	29/64	U
18-20	19/64	1	30-16	29/64	V

THOSE OLD OPERATORS

By H. BUNCH

LAST NIGHT.
* * *
I WENT ashore.
* * *
TO SEE some friends.
* * *
AND THEY had.
* * *
A RADIO Set.
* * *
THAT WAS on the blink.
* * *
SO I fixed it.
* * *
SO WE could hear.
* * *
THE FINE concerts.
* * *
AND A man speaking.
* * *
ABOUT THE War.
* * *
BUT AFTER a time.
* * *
SOME SHIPS.
* * *
STARTED BUTTING in.
* * *
AND SOMETIMES spoiled.
* * *
THE FINE concert.
* * *
AND THE people.
* * *
RAVED.
* * *
AND PULLED their hair.
* * *
AND SAID.
* * *
THE OPERATOR.
* * *
OUGHT TO be.
* * *
KILLED.
* * *
AND I felt sorry.
* * *
FOR THE poor.
* * *
OLD OPERATOR.
* * *
WHO WAS doing.
* * *
HIS DUTY and.
* * *
EARNING HIS living.
* * *
SO I said.
* * *
TO MY friends.
* * *
MAYBE THIS.
* * *
SAME OLD operator.
* * *
WAS SENDING a.
* * *
MESSAGE.
* * *
THAT MEANT so much.
* * *
TO THE lives of men.
* * *
UPON THE sea.
* * *
THEN THEY stopped.
* * *
RAVING.
* * *
AND PULLING their hair.
* * *
AND SAID.
* * *
THEY WERE sorry.
* * *
AND I thanked them all.
* * *
BECAUSE I am one.
* * *
OF THOSE same.
* * *
OLD OPERATORS.
* * *
THAT GO to sea.
* * *
AND SOMETIMES.
* * *
BUTTS IN.
* * *
ON B.C.L's.
* * *
BUT NOT on.
* * *
PURPOSE.
* * *
I THANK you.
* * *

Ocean Falls, B. C.

The Super-Regenerative Circuit

By L. R. Felder

This is a simple explanation of the means whereby super-regeneration is accomplished in a vacuum tube circuit. It deals only with the theory of the subject. This, the second in a series of articles on the five big circuits, will be followed by an article on the theory of the neutrodyne.

THE super-regenerative circuit is the logical conclusion of the reasoning which explains the action of the simple regenerative receiver. In order to appreciate how it follows directly on the heels of the principles of regeneration let us recapitulate briefly the outstanding features of regeneration as explained in the first article of this series. Regeneration is possible only with detectors which are able to amplify at the same time. Some of the amplified signal in the output circuit of the detector is then coupled back into the input of the detector. This feed-back energy is in phase with the incoming signal, therefore they add up, thus increasing the intensity of the received signal. It was then shown how this resultant increase in signal intensity could be viewed from two angles: 1. As regeneration increased the feed-back voltage increased, hence the current in the input circuit increased. 2. As regeneration increased the resistance of the input circuit decreased, hence there was an increase in the signal current.

For a sound understanding of super-regeneration the latter point of view is fundamental. Regeneration, then, involves a decrease in the resistance of the input circuit associated with the vacuum tube detector. Thus as the tickler is coupled more and more tightly to the input circuit the resistance of the input circuit decreases more and more, thus the signal current continually rises, and the well-known regenerative amplification increases. If the regenerative coupling is made so close as to reduce the effective resistance to a fraction of an ohm very great signal amplifications will be secured, since less opposition is offered to the flow of current. If it is thus possible to reduce the effective resistance to such low values why can not the resistance be reduced to zero, in which case the amplification obtained would be enormous?

Such a procedure actually does happen. When the tickler coupling is made very tight the feed-back voltage induced in the input circuit is sufficient to completely neutralize the resistance of the input circuit, i.e. the effective resistance of the input circuit is decreased to zero. There is now no resistance to impede the flow of current. When this state of affairs occurs, however, the entire circuit associated with the vacuum tube begins to oscillate on its own initiative. These self oscillations interfere with the signal currents, distort the signal and destroy the signal amplification.

These actions are familiar to users of regenerative receivers, even if they do not thoroughly understand them. Broadcast listeners know that when they tune their receivers to a station and have very little tickler coupling the received signals are undistorted. As the regeneration is increased the signals become louder and louder, for the effect of this increased regeneration is to decrease the circuit resistance. However, if they increase regeneration beyond a certain point the signal suddenly becomes distorted and mushy and very much weaker. At this critical coupling the regeneration was so great that the circuit resistance was completely annulled and reduced to zero. At this point the circuit breaks into self-oscillations which destroy the regenerative amplification and produce distortion.

It is thus seen that although regeneration produces marked amplifications there is a definite limitation to the amplification thus produced. Regeneration decreases the circuit resistance, and so long as the circuit is at some small positive resistance above zero regenerative amplification is secured. But when regeneration is so great that it reduces the effective circuit resistance to zero no amplification is secured because of the generation of oscillations.

Simple regeneration, then, is limited in its amplifying possibilities by the rise of self-oscillations. It will be apparent that if it were possible to continue the regeneration beyond the point where the resistance of the circuit were zero and to carry it in the region where the resistance of the circuit were below zero or negative, the amplifying properties of regeneration would be infinitely increased, *if self-oscillations could be prevented.* For if the circuits can be prevented from oscillating the process of building up amplification by increasing regeneration can take place without limit. The prevention of these self-oscillations is what is actually accomplished by Armstrong's super-regenerative circuit.

From the above it will be realized that if the input circuit of the tube has a positive resistance the tube will be stable and no oscillations result. It is only when the input circuit resistance goes to zero and below that it becomes unstable and breaks into oscillations. This idea is well known among the amateur fraternity. When an amplifier or receiver is so unstable that it tends to howl, a resistance inserted in the grid circuit immediately stabilizes the circuit and kills any tendency to oscillate. However, if the regenerative receiver is kept at a positive resistance all the time, the amplification due to regeneration will be limited. Armstrong, however, discovered that it was necessary to give the circuit a positive resistance only a small part of the time, in order to kill the tendency to oscillate.

The reason for this phenomenon is as follows: When the circuit associated with the regenerative receiver has zero or negative resistance due to very tight tickler coupling, it will oscillate. However, it takes a certain definite time for the circuit to break into oscillation. If, therefore, the circuit is regenerating to the limit its resistance will be zero or negative for a short period of time before it breaks into self-oscillations. During this period the enormous amplification of the circuit will be available. If at the instant it is ready to break into oscillations the circuit is momentarily given a positive resistance the self-oscillations will be nipped in the bud, and the high amplification secured will not be destroyed. The circuit is given a positive resistance for only an instant, as this is sufficient to avoid self-oscillations, and then is again thrown back into its highly regenerative stage where its resistance is zero or negative, and amplification is very high. This is the principle of super-regenerative action: Namely, regeneration is increased to the point where the tube normally oscillates, and the circuit has a negative resistance, but oscillations are avoided by giving the circuit a positive resistance at intervals. By thus preventing oscillations the high amplification due to the excessive regeneration is maintained.

There are two principal methods for securing super-regenerative action: (1) the plate, (2) the grid method. In both methods a separate oscillator is employed to reduce regenerative action in order to avoid oscillations.

To understand the plate method consider Fig. 1, which has two separate circuits, circuit I being a simple regenerative circuit, while circuit II is an oscillator circuit. The plate circuit of the oscillator tube is connected directly to the plate of the regenerating tube through a choke coil *L*. Suppose now that the oscillator tube is disconnected from the receiving regenerator tube and that the circuit is in a highly regenerating state, but is not yet oscillating. The amplification due to this high re-

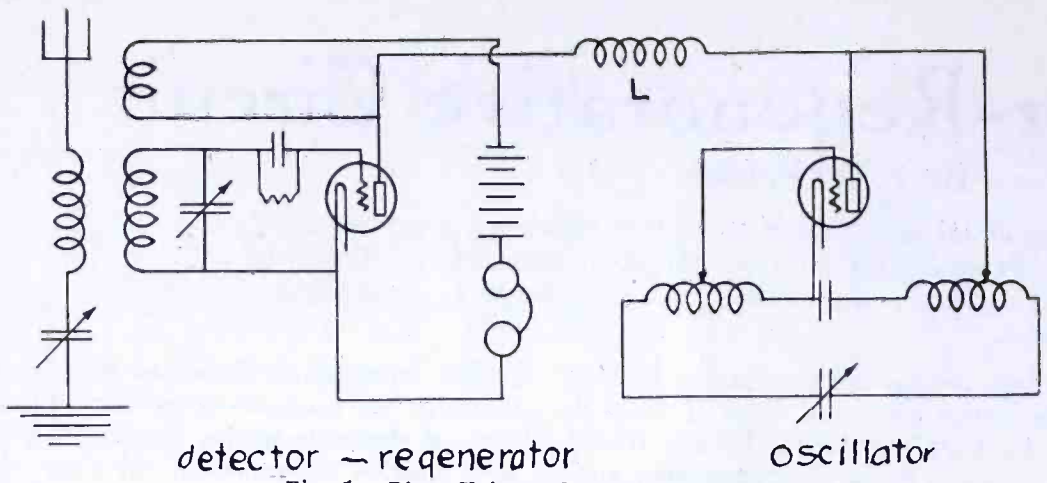


Fig. 1. Plate Voltage Super-Regeneration

generative action is very great. If now the plate potential is increased the amplification and regeneration will be still further increased. However, due to the excessive regeneration, the tube will begin to oscillate after a short period. Suppose that at the instant it is ready to break into oscillations the plate potential is decreased. This decreases the amount of regeneration and amplification, and hence stabilizes the circuit again. This cycle of events is then repeated over and over, thus preserving the large amplifications secured by super-regenerating.

Now obviously the variation in plate voltage must be made periodically, and the decrease in plate voltage must take place at the instant when the regenerating receiver tube is ready to break into oscillations. The best way to secure a periodic plate voltage variation is to superimpose on the plate of the regenerating tube another voltage which varies periodically. This is accomplished by the oscillator circuit of Fig. 1. The oscillating voltages developed by the oscillator tube are applied to the plate of the regenerating tube through the inductance *L*. During the positive half of the alternating voltage cycle the plate voltage on the regenerator is increased and increased regeneration and amplification result. During the negative part of the cycle the voltage on the regenerator plate is decreased, regeneration is likewise decreased and any tendency on the part of the regenerator to oscillate is at once avoided. In order for this last action to occur the negative voltage impulses must be timed so that they are applied to the plate just when the regenerator tube is ready to break out into oscillations. This timing is easily taken care of by varying the frequency of the oscillations, until maximum amplification is secured without howling of the regenerator receiving tube.

The same equipment is necessary for the grid method, only instead of superimposing the A. C. oscillating voltage on the plate of the regenerating detector tube it is superimposed on the grid of the detector tube. Let us suppose again that the feedback coupling of the regenerator is very tight. The amplification secured will be very great if the detector does not start to oscillate. In order to prevent the circuit from oscillating use is made of the fact that if the losses in a grid circuit of a tube are increased the tendency to oscillate is decreased. If a positive potential is applied to the grid of a tube grid current flows and the grid losses increase. This is equivalent to increasing the effective resistance of the grid circuit, and hence to neutralizing the effect of high regeneration, thus avoiding the tendency to oscillate. If this positive potential is applied periodically at the instant when the detector regenerator is ready to trigger off into oscillations, oscillation of the detector tube will be prevented and thus the high amplification due to super-regeneration will not be sacrificed. This periodic positive potential is obtained from the oscillator tube as shown in Figure 2. When the negative half cycle of the oscillating voltage is applied to the grid of the detector regenerator the tube is still in its highly regenerative state. The frequency of the oscillator should be adjusted so that at the instant the detector-regenerator tube is ready to break into oscillations the positive half of the voltage wave from the oscillator is applied to the grid of the detector. This increases the losses in the grid circuit, since the grid draws current at positive potentials, and thus prevents the tube from oscillating and dropping the amplification.

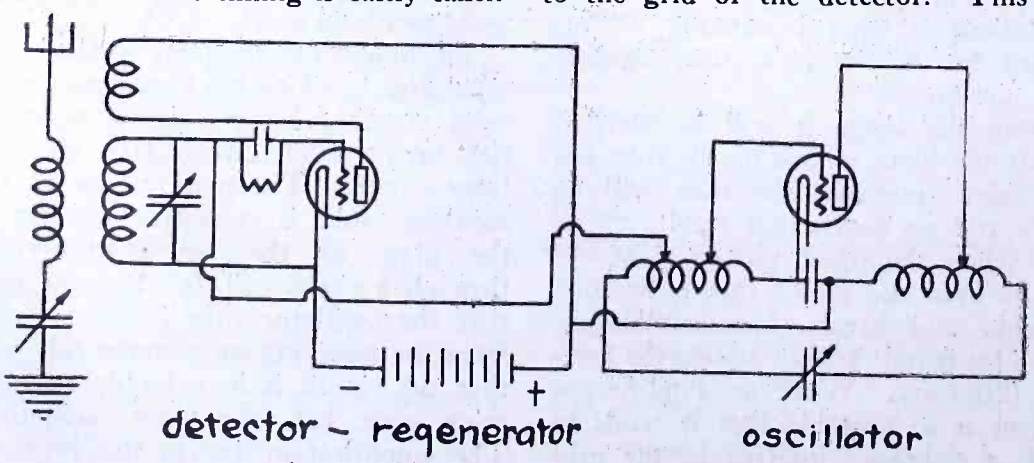


Fig. 2. Grid Voltage Super-Regeneration

Super-regeneration is thus seen to be a means for increasing regeneration beyond the usual howling point and still preventing it from howling, in this way utilizing the enormous amplifications obtained from the increased regeneration. This type of receiver is not yet as common as the simple regenerative receiver. But in the early stages of radio neither was the simple regenerative receiver common until the circuits were reduced to simple forms. The same development and simplification will probably take place with the super-regenerative receiver until it has been made simple enough for commercial purposes. This receiver circuit, like its forerunner the simple regenerative receiver, is the invention of Edwin H. Armstrong and constitutes one of the very few real contributions to radio reception.

WHAT YOU SHOULD KNOW ABOUT STORAGE BATTERIES

By EDWARD T. JONES, I.R.E.

ONE of the simplest, yet most misunderstood pieces of radio apparatus, is the storage battery, especially as regards the reason for charging and how the battery charges and discharges. A fully charged storage battery turned over to you by the dealer should be cared for as carefully as a vacuum tube. Just because it looks like a box of unbreakable "junk" is no reason why you should abuse it and then afterwards demand a new battery for the one you aided on its way to the scrap heap.

When a battery is fully charged *all of the acid* (which was added to the pure distilled water when the electrolyte was put in the battery) has been removed from the plates and is again ready to attack them. Diluted sulphuric acid is used as the fluid or electrolyte. Pure sulphuric acid has a specific gravity of 1.842. This high density acid would prove injurious to the plates of the battery and it would last but a short time. The acid is therefore mixed with chemically pure water until its density, or specific gravity, is brought to 1.250 or whatever the manufacturers' rating is. This being the specific gravity of your battery electrolyte it is an easy matter to test with a hydrometer to ascertain the condition of the battery—that is, how much of the acid is in the plates and how much is left in the electrolyte. A battery should always be charged to the point where the hydrometer reads maximum specific gravity marked by the manufacturer. Any acid left in the plates tends to set up a whitish scale on the plates. This is a disease known as "sulphating."

Continued on page 76

Radio Construction Pointers

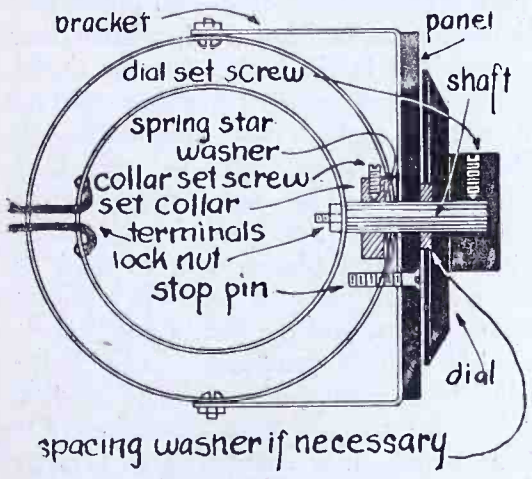
By Paul Oard

Here are a number of practical ideas for the home builder of radio sets. Several of them can easily be applied to existing sets. All of them require only the simplest tools.

A "Floating" Rotor

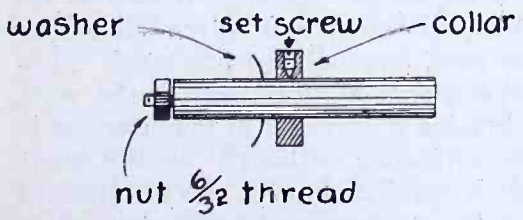
RADIO constructors, in making up variocouplers or variometers, ofttimes experience difficulty in so mounting the rotor as to insure smooth operation and an absence of wobbling when the dial is rotated. This is largely due to not getting both front and back bearings in the stator coil, through which the rotor shaft passes, so aligned that the shaft runs true.

The "floating" rotor takes care of this matter in an efficient way. It will be noted that the rotor is held in position



A Floating Rotor

by the dial. With this arrangement there is only one bearing, and in place of the usual friction contact for the two ends of the rotor winding, flexible leads are brought out through the rear, in the place where ordinarily the rear bearing shaft would be, eliminating noises due to poor contact. The set collar is provided with a set screw of sufficient length to act also as a stop, the stop pin being so mounted so that the two will strike on a revolution of the dial. Leads will thus be prevented from twisting and breaking.

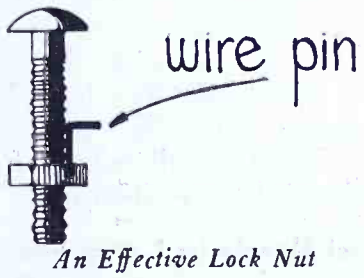


The thickness of the star washer will determine the pressure at which the dial should be set to insure proper operation. Most dials are provided with a slight projection to insure clearing the surface of the panel. If this projection is absent, a thin washer may be inserted between the dial and the panel to afford this clearance. With a tiny bit of vaseline or a drop of oil on the bearing surface, the dial may be set tightly, and will still revolve with a smoothness of operation that will be gratifying, and with complete lack of wobbling.

As described, the rotor and its bearing are supported by the panel itself, and thus have no connection with the stator coil. It is thus possible to use tubing of less mechanical strength than would otherwise be required. Cardboard, properly treated with shellac to prevent moisture absorption, is satisfactory for this purpose.

Lock Nuts That Stay Locked

THERE are two common methods of fastening hexagon nuts. One is to use a small lock washer, the other to screw on an extra nut against the first one. The nut may also be soldered to its shaft, though this is not to be recommended where it may be desirable to remove the nut later.



An Effective Lock Nut

Another satisfactory method is to drill a hole between the nut and the shaft, and force a short length of wire into it, bending over and cutting. The nut will not move as long as this is in place, and should it be desired to remove the nut, the wire may be pulled out with pliers, and the nut will then unscrew. A sharp pointed center punch should be used to center the drill.

Shock Proof Socket Assemblies

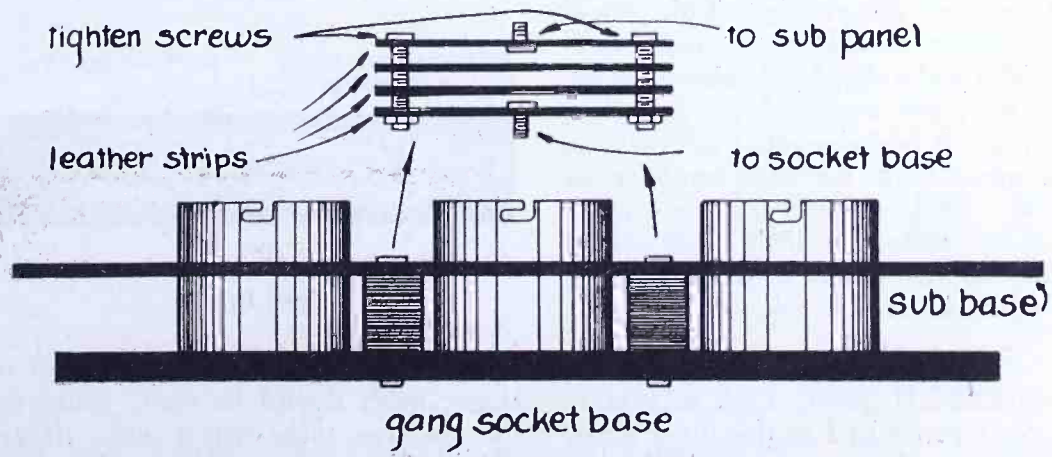
THE newer types of vacuum tubes generally require some form of socket mounting that will serve to deaden vibration, which, if not prevented, results in disagreeable ringing sounds, particularly in multi-stage amplification. A common method of offsetting vibration is to mount the assembly on rubber sponges, but there are instances where some other method is to be preferred, particularly in that type of set where the sockets are mounted beneath a sub-base which is attached to the main panel, and which supports the assembly.

In the method here illustrated, ½-in. leather belt-lacing is used. A three gang assembly is shown, but one, two or four socket assemblies may also be mounted, by placing the suspensions at the end of socket base. From three to six pieces of the lacing are used, according to the distance that it is desired to suspend the socket base from the sub-panel. When the tightening screws are turned down, the ends of the suspensions are drawn together, causing the suspension to bulge out in the center, tapering to the ends. Flat headed screws 6/32 or 8/32 thread, with thin nuts for the tightening screws, should be used. The leather lacing may be drilled with ordinary machine drills, or the holes may be cut with a punch or a knife.

This method of mounting the sockets makes for a fairly rigid mounting, yet absorbs vibration effectively. A number of variations in the mounting are possible. If no subpanel is used, the suspensions may be placed beneath the base of the socket assembly, instead of above, and fastened to the baseboard, instead of the subpanel. Likewise, if no sub-base is used, and it is desired to suspend the assembly, brackets may be fastened to the main panel, and the assembly suspended from these.

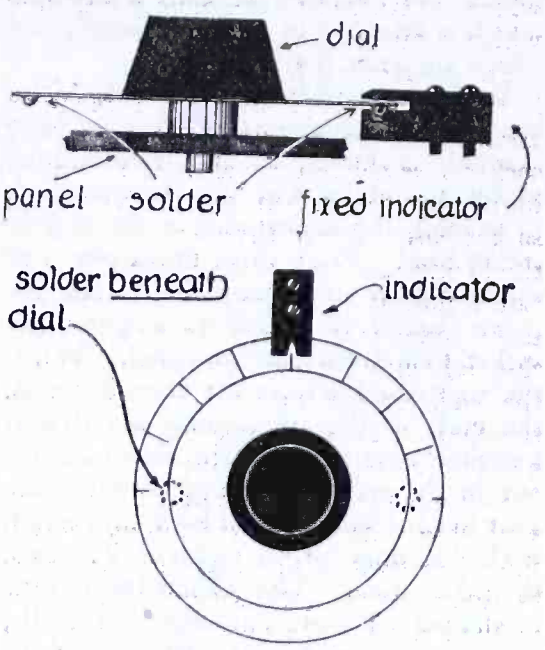
A Dial Stop For Flat Metal Dials

OFTTIMES a means of stopping rotation of the flat metal dials on the half or full turn is desired, especially where there is no means provided behind the panel for checking the dial. The method here described serves this purpose, as well as providing an indicator for the dial figures. Most flat metal dials are provided with a collar that raises them from ¼ to ½ in. above the



Shock Proof Socket Assembly

panel face. An indicator is made of ¼-in. sheet bakelite, the slot, which may be sawed with two hacksaw blades fastened together, being placed so that the rim of the dial moves through without scraping. The under side of the dial is scraped very clean, and a drop of solder placed at the point where it is desired that the dial stop. One drop is placed, if a full turn is desired, two if a half turn is wanted.



Stop for Metal Dial

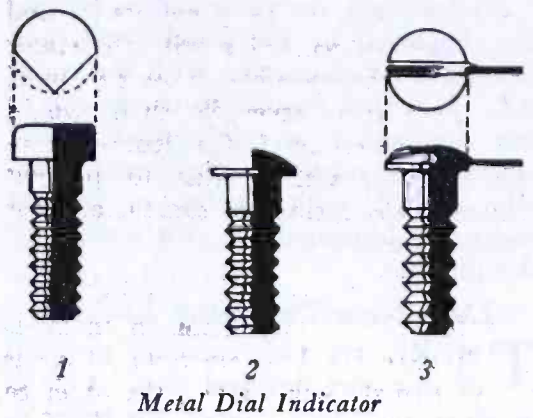
Many of the metal dials are finished in a brush silver effect that will not stand a great amount of heat without tarnishing, therefore if such a dial is to be used, employ a quick grabbing soldering flux and a good hot iron.

If the solder is to be applied uniformly at one spot on each of a number of dials, a disc of sheet aluminum should be cut to the diameter of the dial. Drill a hole, with say a 8/32 drill, through this disc at a spot corresponding with that where it is wished to secure the solder. Place this disc over the under side of the dial, apply flux through the hole, and put a drop of solder through it. The solder will not stick to the aluminum, but will adhere to the dial, which generally is of brass. Thus a uniform job may be done on all dials.

If it is desired that the dial move with some resistance, the indicator should be cut so that the under surface of the dial will rub against it. This will also serve to true up a metal dial that does not run evenly. This proves of use where an inductance rotor, moving stiffly, and a variable condenser, moving easily, are mounted on the same panel, and it is desired that the dials on each move with the same amount of tension. Sould the dial make a grating sound in rotation, a little thick oil or vaseline applied to the under side of the dial will take care of this.

Dial Indicators of Metal

A SWITCH point, filed so that it corresponds to *1* of this illustration, makes an excellent pointer or indicating point for a dial. In *2* is shown an 8/32 round head machine screw, the head of which is filed so that but one-half remains. The slot already cut in the head becomes a part of this indicator. In *3* is shown the machine screw "as is," but with a short length of wire soldered neatly into the slot, forming an indicating point.



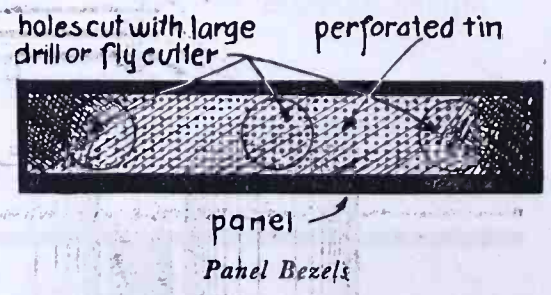
Metal Dial Indicator

If nickel plated parts are used, the filed parts should either be re-nickeled, or red or black enamel may be used to cover the brass surfaces where the nickel plate has been removed. A pleasing color contrast is thus formed. The indicator is mounted as close to the dial as possible, so that the point, the slot, or the wire, as the case may be, allows a mark against the dial graduations. These indicators are all suitable for the familiar beveled composition dial.

Panel Bezels or Lamp Ports

AS many holes as there are vacuum tubes in your receiver are bored in the panel at the desired location, using either a large machine drill, or the fly cutter described in a recent issue of RADIO.

Most well stocked plumbing shops carry metal sheet known as "perforated tin," which is thin sheet iron, stamped with perforations of varying size ranging from around 100 to the square inch to around a dozen or so. If the holes cut in the panel are in line with each other and not too far apart, a strip of the sheet is cut so that it will cover them all, otherwise squares of the metal are cut for each hole. The metal may be fastened to the panel by means of small machine screws, or by the use of good thick shellac as an adhesive.



Panel Bezels

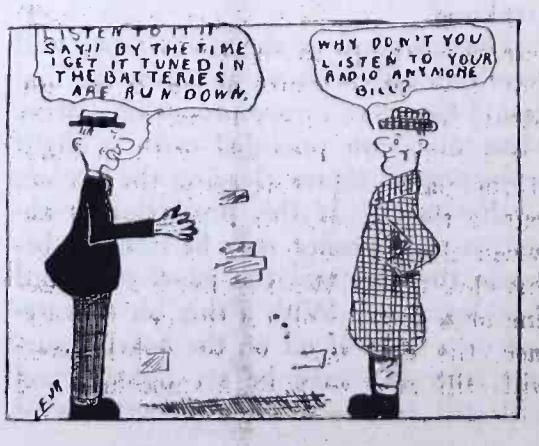
For the new silvered tubes, metal of larger mesh should be used, while for the old type tubes which when lit are quite brilliant, the smaller mesh is best. As this screen is already heavily tinned, it needs no further treatment as to finish, but if desired, it may be coated with black, or plated in any one of a number of finishes. If the holes are beveled from the front of the panel, a first class job results.

If this metal screen is not obtainable, ordinary screen, preferably of copper, or a very fine mesh screen that is used to filter gasoline, and which may be obtained at most hardware stores, may be used instead. The later is generally tinned, so that no treatment is necessary.

Shielding the Panel

MANY receivers require shielding the panel to eliminate capacity effect. The constructor who can cut a sheet of copper or brass so that it makes a presentable job is rare, particularly when there are a number of switch points and binding posts on the panel, which must be provided for in laying out the shield. Using the perforated tin above referred to, one can make a most presentable job. Due to the holes, it trims well with ordinary tin snips, and using a good, sharp cold chisel, or even a wood chisel, with the metal placed over a block of soft wood, all cut outs for switch points, binding posts, and the like, a good workmanlike job is produced. The holes, being in straight rows, make it needless to lay out the job with a square. On many panels, it is possible to so arrange the shield that it will act as a screen for the lamp bazels already referred to. The contrast against bakelite is very pleasing.

Hard soldering, or brazing, is generally similar to soft soldering, except that it is always done with a torch, and never with an iron. Borax is usually used as a flux, and a special compound of brass, called "spelter," is used as the solder, although soft silver alloys are also used, especially on fine work. The preparation and cleanliness of the work in brazing is every bit as important as in soft soldering, although usually more skill is required in such work. Brazing is a far stronger and more satisfactory method of joining metal than soft soldering, but it has only a limited field of application, due to the high temperatures used.



Miles of Standard Cable

In the absence of any standard of audibility, telephone engineers, and more recently radio engineers, have adopted an expression "miles of standard cable" as a measure of amplification. As this expression is meaningless to the average amateur and is seldom explained in popular books and articles, it is of interest and value to reprint the explanation given in the new "Radio Tube Data Book" published by E. T. Cunningham, Inc. The curves given for the C-299 and C-301A tubes are equally applicable to the corresponding UV tubes.

ONE of the most important uses of the vacuum tube is to amplify or increase the intensity of electric currents. Tubes of certain design are specially adapted to this purpose. These tubes are called "amplifier tubes." The single word "amplifier" generally refers to the combination of an amplifier tube and the necessary associated circuits to produce amplification.

Such an amplifier is most readily understood if considered as a telephone repeater, that is, a device capable of receiving telephone currents and giving out other telephone currents of the same wave form but of greater magnitude. The increased energy in the output circuit is supplied by the plate or *B* battery. In this manner the voice or music currents are amplified or built up without distortion. Electric currents at both voice frequency and radio-frequency are often amplified as many as ten or twelve times between the microfone in the studio and the sound reproducing device of the receiving set.

Since amplification plays such an important part in both radio transmission and reception it is obviously necessary that there be some convenient unit for measuring the amount of amplification between the input and output of an amplifier.

For many years prior to the advent of the vacuum tube, transmission losses in telephone lines were measured in terms of the mile of standard No. 19 gauge cable at a frequency of 796 cycles. When the vacuum tube came into use as a telephone repeater this same unit was adopted as the standard for measuring repeater or amplifier gains.

If a circuit is said to have an amplification of 25 miles, it means that it would take 25 miles of standard No. 19 gauge telephone cable to reduce the signal to its original value.

In an amplifier circuit the terms "power amplification," "current amplification" and "voltage amplification" are also used. These terms express the ratio of power, current or voltage delivered from the amplifier to the power, current or voltage received by the amplifier.

The gain in miles always depends directly on the power amplification, a given ratio between input power to the amplifier and output power from the amplifier always corresponding to the same number of "miles gain."

In a well-designed amplifier circuit both the current and the voltage amplification ratio will be equal to the square root of the power amplification ratio. Under these conditions it is most convenient to think of the gain in miles as depending on the current ratio. This makes it possible to get a fairly accurate comparison between gain in miles and the increase in audibility or sound intensity, since within certain limits, depending on the mechanical construction of the sound-reproducing device, sound intensity is directly proportional to current.

The table given below shows current or audibility ratios and power ratios for gains between 1 and 30 miles of standard cable.

The gain in miles obtained in any circuit is within certain limits proportional to a number of factors. One of these is the potential applied to the plate of the tube. The curves in Fig. 1 show the gain in miles, with C299 tubes, obtained at plate potentials between 15 and 85 volts, at two fixed values of grid potential. These curves are a good illustration of the importance of using a negative grid potential in the amplifier circuit. The curve for zero grid potential shows that with a plate potential of 40 volts the gain is 20 miles. With a negative grid potential of 1½ volts and the same plate potential the gain is 26 miles. Referring to the table, it will be seen that a 20-mile gain represents a current ratio of 8.83, and that a gain of 26 miles

Miles of Standard Cable	Current Ratio or Audibility	Power Ratio	Miles of Standard Cable	Current Ratio or Audibility	Power Ratio
1	1.11	1.24	16	5.71	32.7
2	1.24	1.54	17	6.38	40.7
3	1.38	1.92	18	7.11	50.6
4	1.54	2.39	19	7.92	62.8
5	1.72	2.97	20	8.83	78.3
6	1.92	3.70	21	9.84	97.4
7	2.14	4.60	22	11.0	121.1
8	2.39	5.72	23	12.25	150.7
9	2.66	7.12	24	13.65	187.1
10	2.97	8.85	25	15.2	233.4
11	3.31	11.02	26	17.0	289.8
12	3.70	13.7	27	18.9	359.8
13	4.12	17.0	28	21.1	447.8
14	4.49	21.1	29	23.5	559.2
15	5.12	26.37	30	26.3	693.5

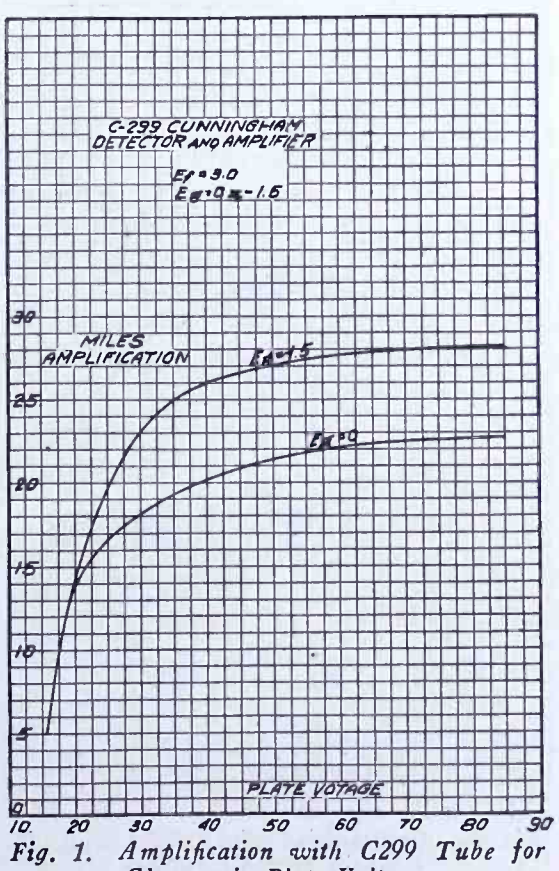


Fig. 1. Amplification with C299 Tube for Changes in Plate Voltages

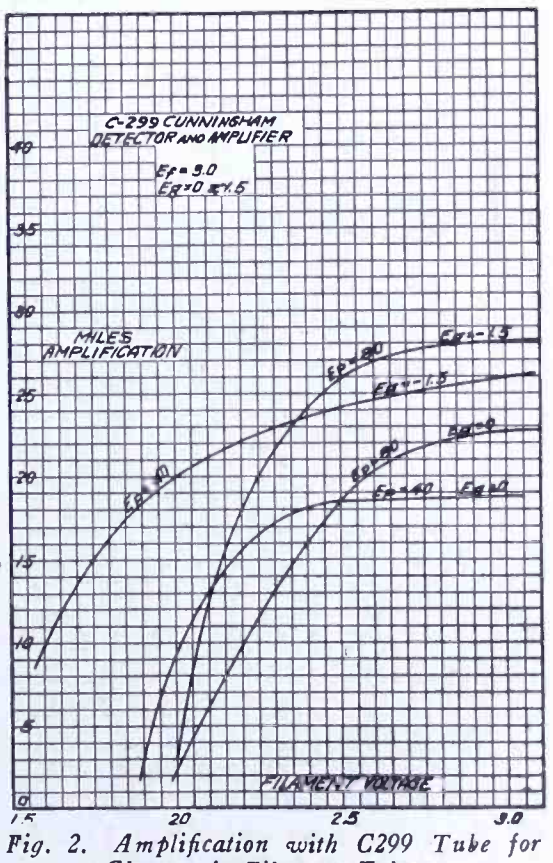


Fig. 2. Amplification with C299 Tube for Changes in Filament Voltage

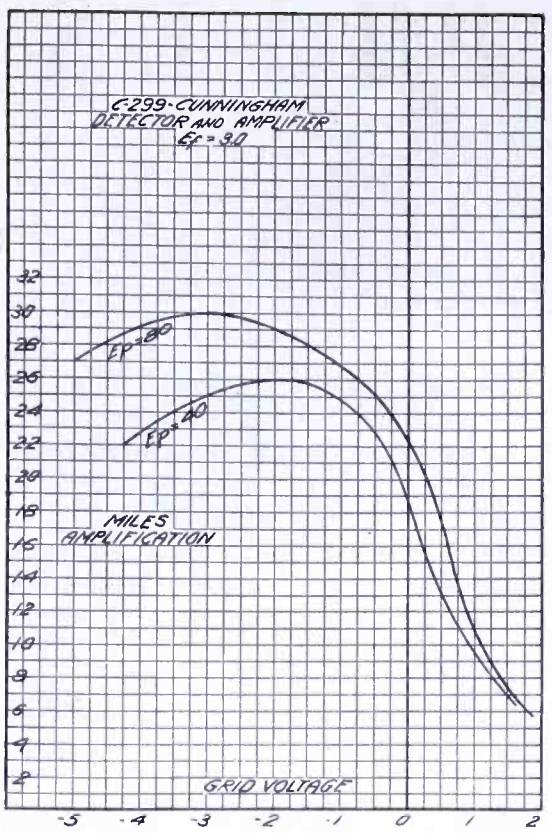


Fig. 3. Amplification with C299 Tubes for Changes in Grid Voltage

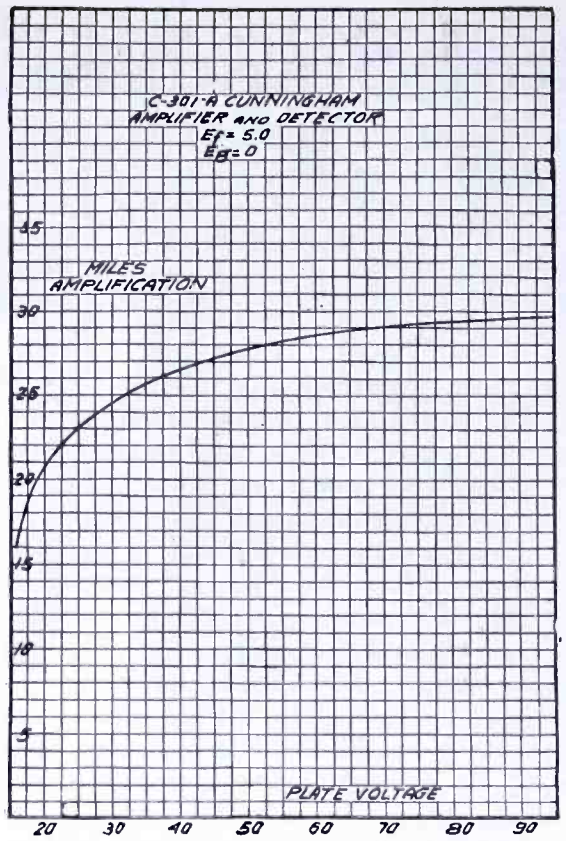


Fig. 4. Amplification with C301A Tube for Changes in Plate Voltage

represents a ratio of 17. Thus under the conditions stated the use of a negative grid potential of 1½ volts almost exactly doubles current ratio or audibility.

Another controlling factor of the gain in miles is the filament voltage. The curves in Fig. 2 show the gain in miles obtained with C299 tubes for filament voltages between 1½ and 3 volts. Two values of plate potential are used, 40 and 80 volts. For each of these potentials two curves are shown, one with the grid potential at zero, and the other with a grid potential of 1.5 volts. Note that greater gain is obtained with 40 volts on the plate and a negative grid potential of 1.5 volts, than when using 80 volts on the plate with zero grid potential.

The curves in Fig. 3 again illustrate the necessity of using a negative grid potential in an amplifier circuit in order to obtain the maximum gain. They also show that the amount of grid potential necessary is proportional to the plate potential used. When using 80 volts on the plate, and zero grid potential, the gain is approximately 23 miles. When using a negative grid potential of 3 volts, the gain is approximately 30 miles. Referring to the table, it will be seen that 23 miles gain represents a current ratio of 12.25, and that a 30-mile gain represents a current ratio of 26.3. This means that the use of the negative grid potential a little more than doubles the audibility.

The curve in Fig. 4 shows how the variation in plate voltage affects the amplification of a C301A tube.

Fig. 5 shows the miles amplification obtained with filament voltages varying between 2½ and 5 volts, at two fixed values of plate potentials. These curves again illustrate the value of using a high plate voltage in an amplifier circuit in order to obtain the highest possible audibility. Note that the maximum gain shown here with a plate potential of 40 volts is 26½ miles, while the maximum gain with a plate potential of 100 volts is 30 miles. Referring to the table, it will be seen that these two values of gain expressed in miles amplification represent current ratios of approximately 18 and 26.3 respectively. This means that the use of the higher plate potential will give an increased audibility of over 45%.

The curves in Fig. 6 illustrate the gain obtained in miles amplification at two fixed values of plate voltage with a grid potential varying between negative 5 and positive 2 volts. These curves are both illustrative of the necessity of using a negative grid potential in an amplifier circuit. For instance, if the rheostat is placed in the positive filament lead and the grid return from the secondary of the amplifying transformer is made between this rheostat and the battery, the grid will have a positive potential in the neighborhood of 1 or 2 volts. Note the greatly increased gain under such conditions and always be sure that your *A* battery leads are not reversed.

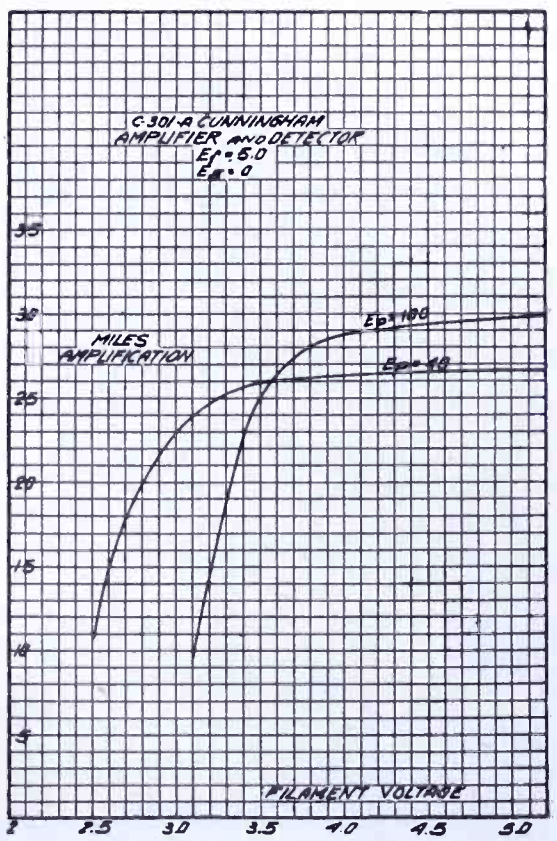


Fig. 5. Amplification with C301A Tube for Changes in Filament Voltage

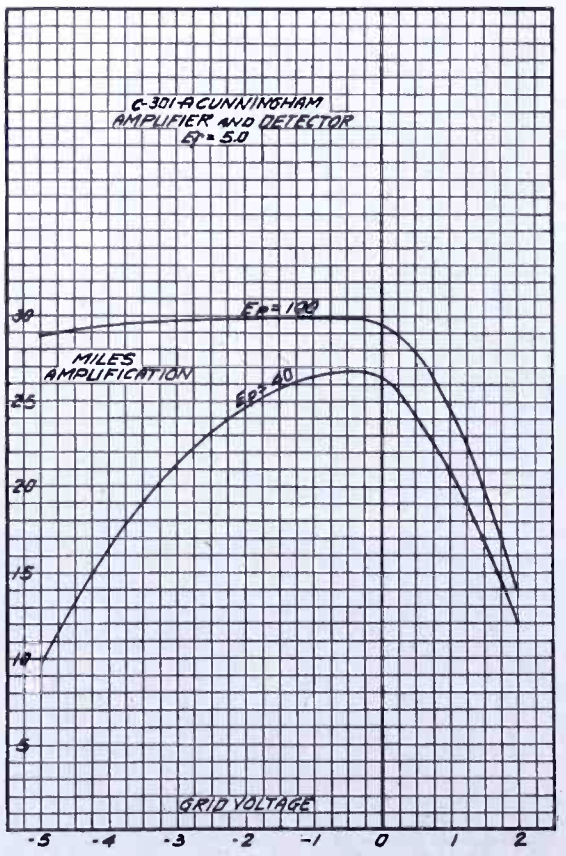


Fig. 6. Amplification with C301A Tube for Changes in Grid Voltage

OFFICIAL REGISTRATION

By DR. A. E. BANKS, 6XN

"IN the good old days," is a phrase used by the amateur radio fraternity indicating two distinct conditions in the art of radio. One class of amateur refers to the period before the law was in effect which required licensing of transmitters and adherence to spark wavelengths; in other words to the free for all period when one's bank account was the sole limit to the power used or the wavelength employed. The other group of amateurs refer to the "good old days" as those prior to the broadcast era. Things have changed so remarkably in amateur radio since the advent of radio broadcast that many of us have not had time to readjust ourselves and there still remains a hankering for the old times.

It is peculiar to know that whenever evolution has dictated changes in regard to radio privileges a great percentage of the amateur fraternity have been inclined to take exception to what they think is an innovation. Going back to the original condition of things in the

Continued on page 74

QUERIES & REPLIES ON C.W. PRACTICE

BY

Gerald M. Best

TECHNICAL ADVISOR

Questions submitted for answer in this department should be typewritten or in ink, written on one side of the paper. Al answers of general interest will be published. Readers are invited to use this service without charge, except that 25c per question should be forwarded when personal answer by mail is wanted.

How does the "Phantom Circuit" differ from an ordinary regenerative receiver with an antenna and ground?—J. Q. A., Greenville, Tex.

The Phantom circuit is simply a tuned plate regenerative receiver, and any ordinary tuned plate regenerative set will give as good results with a small antenna and a capacity to ground.

I have some core pieces 9 in. x 1⅜ in. Please furnish me with the data for making a 10-henry audio-frequency choke for use with two 50-watt tubes. What capacity condenser should be used with the choke to furnish a good filter for a synchronous rectifier?—A. H., Honolulu, T. H.

Cut the core pieces in half, and build up a square core 1½ inches high. On this core wind 4000 turns of No. 29 cotton covered wire. The choke should have an inductance value high enough for your purpose, but I cannot guarantee that it will be exactly 10 henrys, as the core material you have might be widely different in flux density from normal, and give greater or less inductance, as the case may be. Any capacity from 6 to 10 M. F. will be sufficient for good filtering action in a synchronous rectifier circuit.

Please show me how to add a stage of radio frequency amplification to my present detector and three-stage audio-frequency amplifier. Will the radio-frequency circuit re-radiate into the antenna? —W. H. J., Crockett, Calif.

The circuit shown in Fig. 1 is a revised circuit of your receiver, with one stage of radio frequency amplification added. It would be best for you to equip the last audio frequency stage to handle the power it would surely receive, so I have indicated a 25 henry choke in the plate circuit, with an audio frequency bypass through the 2 M. F. condenser. The last audio frequency tube should have 120 volts plate and 9 volts negative grid battery, the other two audio frequency tubes having 90 volts plate and 4½ volts negative on the grids. The circuit shows how to use the same 9 volt battery for all three tubes. It would be advisable to shunt the *B* battery with 2 M. F. condensers, as shown, in order to avoid the chance of coupling between stages, with resultant howling.

Kindly publish the circuit for the Type D Transinductor.—C. C., Iron River, Mich.

This circuit was published on Page 20, Fig. 4, February RADIO. Further information about the circuit may be obtained from Clinton H. Hulbert, Menominee, Mich.

Please publish a circuit for a simple spark transmitter, with a list of parts.—W. E. L., Clem, Ore.

My advice about spark transmitters in general is to forget them. They are a back number, and are as out of place in radio of today as a horse and buggy is on the state highways. I will be glad to give you a simple vacuum tube transmitting circuit, the material for which will cost you less than a spark set, and will enable you to telegraph over much greater distances, but I must decline to publish spark circuits in a column devoted to continuous wave activities.

Please show me how to add one stage of radio-frequency amplification to my honeycomb coil set, indicating the necessary switches for cutting out the radio-frequency stage when it is not desired.—R. H. D., Seattle, Wash.

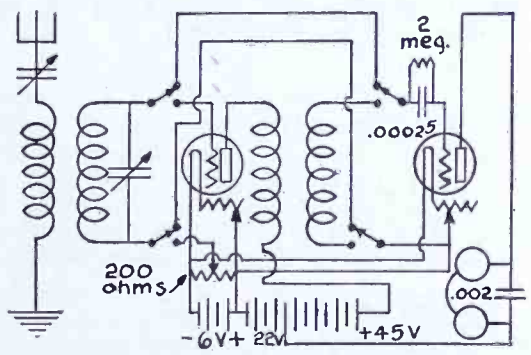


Fig. 2. One Stage R. F. Added to H. C. Set

The circuit is shown in Fig. 2. The switch for cutting out the radio frequency amplification may be a Federal anti-capacity key, which has sufficient contacts to take care of all the connections.

Please tell me how to get a shock from an Ives transformer.—G. S., Los Angeles, Calif.

Your question is rather shocking, to say the least. If you have an Ives Toy Transformer, which steps down to 6 volts, you will be unable to receive a shock from the secondary terminals. You will, of course, be able to feel the line voltage if you care to.

Please tell me how to make a transformer for operating a 2-ampere tungar bulb.—R. C. L., Berkeley, Calif.

Build up a core with a window 4 by 4 in., and a cross sectional area of 1½ x 2 in., of silicon steel. On this core wind two coils, one on each leg. The primary coil consists of 275 turns of No. 20 D. C. C. wire. The secondary coil is in two sections, one for the filament, and the other for furnishing the charging voltage. The filament secondary consists of 5 turns of No. 14 D. C. C. wire, and the charging secondary consists of 38 turns of No. 18 D. C. C. wire. Both secondary windings are in series.

Could you tell me what circuit is efficient on 100 meters?—M. R., Cole Camp, Mo.

It is very difficult to give you a good description of a first class very short wave receiver, without consuming a lot of space. Hence, I recommend that you obtain a copy of February *QST*, and refer to the article on Page 8, about Low Loss Tuners. For the

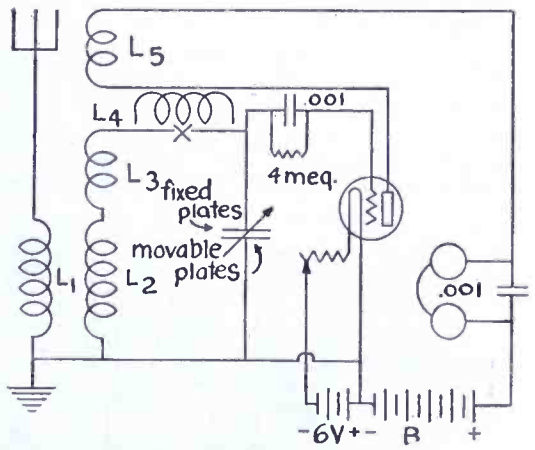


Fig. 3. 100-Meter Receiver

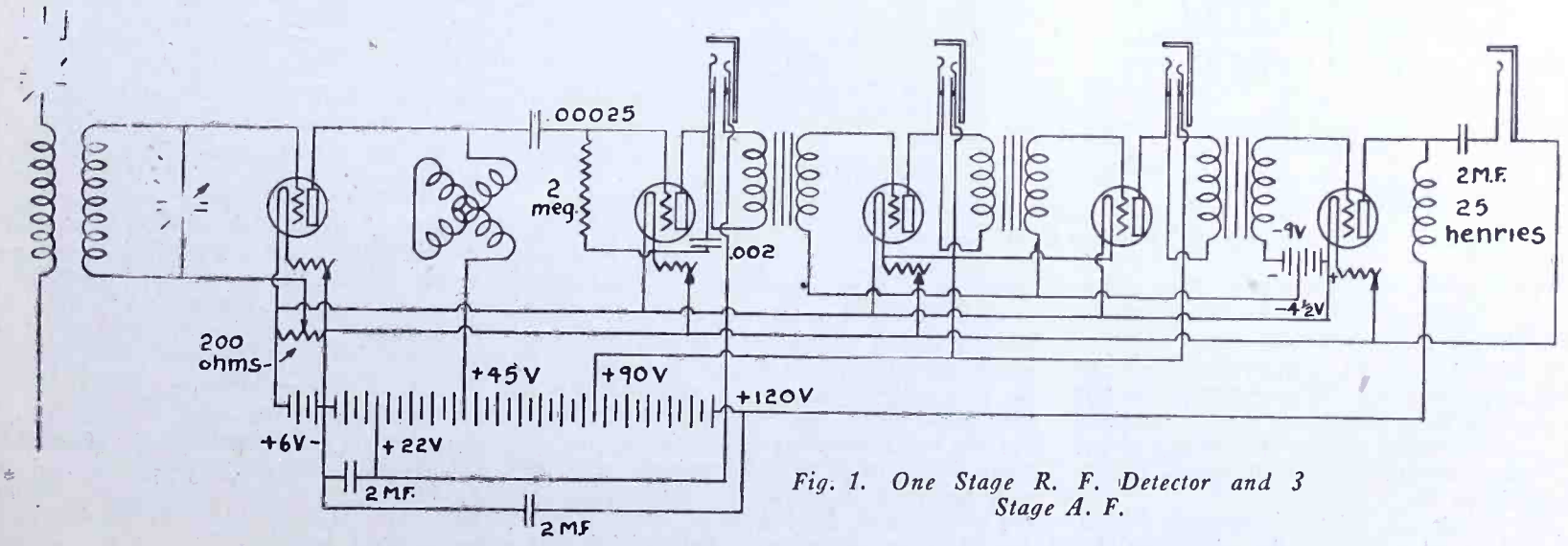


Fig. 1. One Stage R. F. Detector and 3 Stage A. F.

benefit of other readers, however, I am publishing the circuit diagram of the 100 meter set built by F. H. Schnell, which from all reports is performing wonders. The circuit diagram is shown in Fig. 3. L_1 consists of 5 turns, 2½" diameter, wound in basket fashion. L_2, which is the first section of the secondary, consists of 6 turns of No. 16 D. C. C. wire, basket wound, diameter 3¼". L_3 is the second section of the secondary, 12 turns wound the same as L_2. L_4 is the secondary loading coil, 30 turns, wound like L_2 and L_3. L_5, the tickler coil, 11 turns of No. 28 D. C. C. wire, 2½" diameter, arranged to be turned by a tickler shaft. Receivers for operation on wavelengths below 150 meters must be extremely free from body capacity effects, and have a maximum wavelength not above 250 meters. Hence, the receivers ordinarily used for broadcast reception, with a minimum wavelength around 175 meters, will not do for the shorter waves, and cannot be easily modified to operate as low as 100 meters.

I am bothered with a 60-cycle hum from a nearby high voltage line. Placing the antenna at right angles does no good. Is there any cure for the trouble?—C. P., Springfield, Ore.

If the noise continues after you have disconnected the antenna and ground, your trouble is probably from lack of shielding within the set. If you are very near a high voltage line, enough induction will be picked up by your vacuum tubes to cause a very objectionable noise, which may be eliminated by shielding the inside of your cabinet and the back of the panel with sheet brass, copper or tinplate. The shield should be grounded, and the negative end of your *B* battery should also be connected to ground. Should the noise cease when the antenna is disconnected, you are probably experiencing trouble from a leaky insulator in the power line, and a conference with the power company is usually the best remedy for this sort of interference. I know of no absolutely reliable method of eliminating the sort of power induction caused by leaky insulators continually flashing over, and transmitting high frequencies on a large number of wavelengths simultaneously.

Please publish a circuit for a 10-watt C. W. transmitter, using high voltage furnished by "S" tubes. I have a single coil inductance, and would like to use a loop of two turns of wire wound around the inductance for loop modulation with a microphone.—J. R. C., Wallowa, Ore.

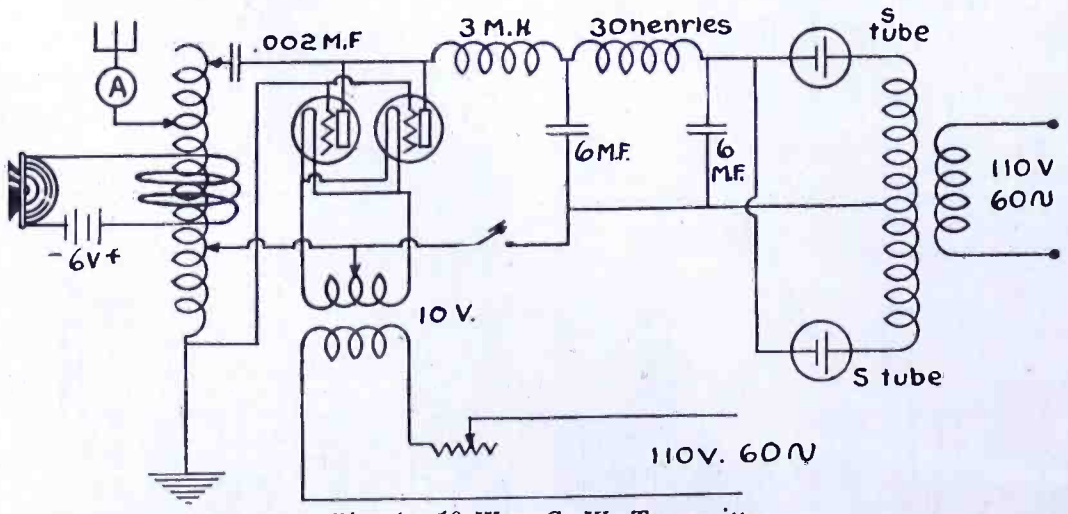


Fig. 4. 10-Watt C. W. Transmitter

The circuit is shown in Fig. 4. Loop modulation is not very satisfactory, but might be all right for short distances.

I would like to construct a simple radio-telegraph transmitter for use on 200 meters. Please publish a circuit diagram of such an outfit, giving the values of the different pieces of apparatus.—J. C. O., Bethlehem, Pa.

The circuit you wish is shown in Fig. 5. You will need a 5 watt tube with associated socket, a filament rheostat, air condensers capable of withstanding 500 volts, a variocoupler of the 180 degree type, a small toy transformer, and the necessary plate transformer. The filament rheostat is placed in the primary side of the filament transformer, which is the toy transformer mentioned above. Remove the stator winding of the coupler and replace it with 25 turns of No. 14 cotton covered wire. Unwind the rotor winding, and place thereon 25 turns of No. 18 cotton covered wire. The stator winding is then used as the antenna inductance and the rotor as the grid coil. Fixed condensers and a grid leak, as in indicated in the diagram, will also be required, and for best results in tuning, you should have a small hot wire or thermocouple ammeter, for indicating the antenna current. This transmitter will not be the most efficient one you could possibly build, but will not be a great expense to start with, and should be fairly easy of adjustment, besides emitting a sharper wave than the ordinary single coil outfits.

Please give data for making a plate transformer, of 500 watts capacity, with a 1500-volt secondary for the plates of the transmitting tubes, and 8 and 12-volt secondary for lighting the filaments. The core pieces I have on hand are 1⅜ in. wide.—A. S. C., Honolulu, T. H.

Cut the core pieces into lengths so that you can build up a core with a 4½ in. window, and 2 in. high. This will give you a cross section 1⅜ by 2 in. I presume your core pieces are of common soft iron; if they are of silicon steel the cross sectional area should be reduced by half to obtain the same number of lines of force. For the primary winding, 294 turns of No. 14 cotton covered wire should be wound on one leg of the core, and over it should be wound 32 turns of No. 12 cotton covered wire, with taps brought out at the following turns; 4.5, 16, 27.5. The 16th turn is the center tap, and to obtain 12 volts, use the entire winding. For 8 volts, use the 4.5 and 27.5 turns as end terminals, with the 16th turn still in use as the center tap. On the other leg of the core wind 4000 turns of No. 29 cotton covered wire, for the high voltage secondary. Great care must be observed in properly insulating the high voltage secondary from the core, by wrapping the core with empire cloth.

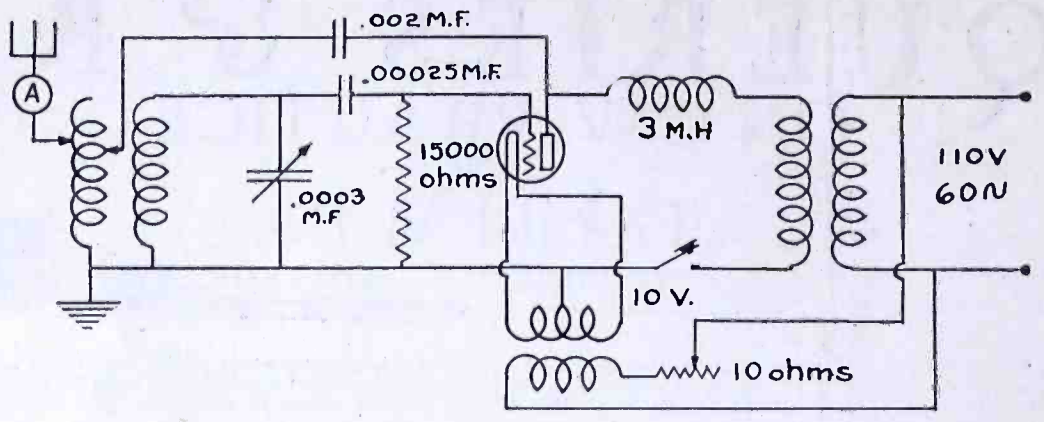


Fig. 5. One Tube Telegraph Transmitter

Please indicate how I can add a stage of radio-frequency amplification to my sodion detector tube outfit.—J. R. Y., Anaheim, Calif.

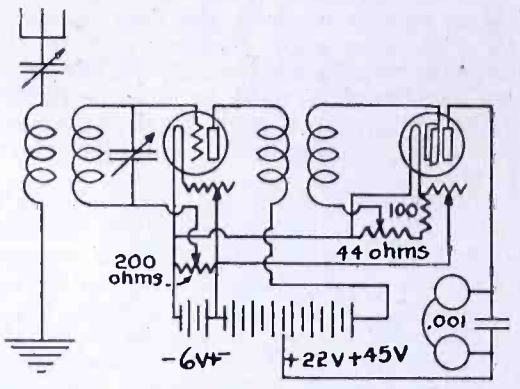


Fig. 6. One Stage R. F. with Sodion Detector

Such a circuit is shown in Fig. 6, an untuned radio frequency transformer being used between the two vacuum tubes.

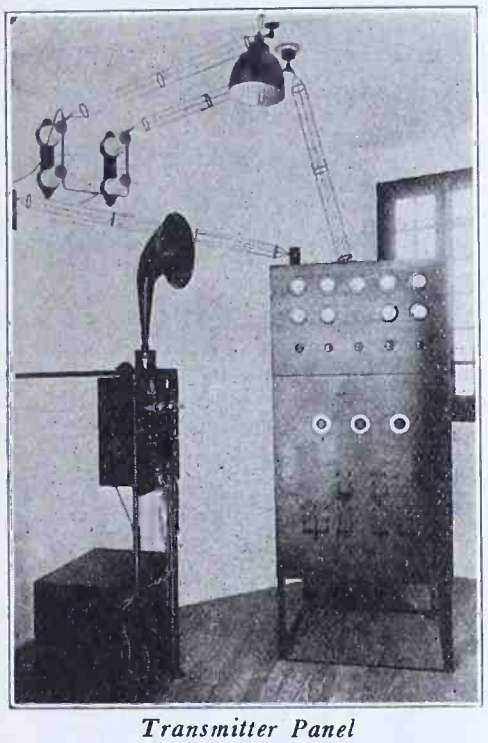
Please define the use of the term "second harmonic" in regard to super heterodyne receiving equipment.—R. C. H., Waldo, Ore.

Any vacuum tube oscillator will generate frequencies other than the particular frequency it is designed to give, these frequencies being multiples of the original frequency, called the fundamental. For example, if the oscillator were operating at 300,000 cycles, it would also generate frequencies of 600,000, 900,000, 1,200,000, etc., each higher harmonic, of course, being much lower in power than its predecessor. Thus, in a super-heterodyne circuit, it has been found practicable and desirable to reject the fundamental frequency, and use the second harmonic, which is twice the fundamental, so that a small variation in the fundamental will cause a big variation in the harmonic frequency. If the intermediate frequency amplifier of the super-heterodyne is tuned to 50,000 cycles, and the incoming frequency is 650,000 cycles, then the heterodyne oscillator is set at 300,000 cycles. The second harmonic will then be 600,000 cycles, and will produce a beat of 50,000 cycles with the incoming frequency, thereby operating the intermediate frequency amplifier at its point of greatest efficiency. This idea permits a greater frequency range of the receiving set with a given number of scale divisions on the air condensers, and produces greater apparent selectivity. Commercial types of receivers using the harmonic principle may differ somewhat from the above, but the theory is along parallel lines.

"How to Get the Most Out of Your *B* Battery" is a useful booklet from the National Carbon Company of New York and San Francisco. As a part of the many valuable hints there is a complete explanation of the use of the *C* battery.

A NEW MEXICAN STATION

During the past month a new station has been heard on the air from the City of Mexico. This is the joint property of "Cia. Parker, S. A." and the largest newspaper of Mexico, *El Excelsior*.



Transmitter Panel

The transmitting apparatus, microphone amplifier, speech amplifier, signaling system and all controls are housed in a specially constructed re-enforced concrete room. Joining this room is another of special construction of hollow concrete walls which have cotton padding in this hollow space, thus insulating every sound of the motor-generators. This second room contains two large motor-generator sets to supply necessary high voltage direct current, and an inductive frequency changer or rotary transformer, which is used to raise the local three phase fifty cycle current to three phase sixty-three cycles.

The studio and reception rooms for the artists are located on the ground floor of the building, some five hundred feet away from the transmitting apparatus. The entire installation is elaborate and nothing in the way of effort or expense has been sacrificed to make this station the best in Mexico.

The transmitter is arranged for use either as a ½ k. w. Hartley circuit or as a 1 k. w. master-oscillator system.

The antenna is T type and consists of two 30 in., six wire cages spaced 16 ft. apart with an 18 in. eight wire cage lead-in which drops straight through porcelain deck insulators to the transmitter. The antenna system is supported by two 75 ft. steel towers, the distance between towers being 200 ft. These towers rise from the roof of a four story building. A radial counterpoise is employed and consists of copper cables radiating from a center near the antenna lead-in. All parts of the antenna system are insulated with special porcelain insulators for a voltage of 75,000 volts.

View of Mexico City from Aerial Towers

U. S. CLASS B BROADCAST STATIONS

Arranged in Order of Wavelength Allocations

Wave-Length in Meters	Frequency in Kilocycles	Call Letters	OWNER AND LOCATION	Power in Watts
309	970	WLW	Crosley Mfg. Co., Cincinnati, Ohio	500
312	960	KGO	General Electric Co., Oakland, Calif	1000
319	940	WGR	Federal Tel. & Tel. Co., Buffalo, N. Y	750
326	920	KDKA	Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa	1000
330	910	KFAE	State College of Washington, Pullman, Wash	500
337	890	WBZ	Westinghouse Elec. & Mfg. Co., Springfield, Mass	1000
345	870	WCBD	W. G. Voliva, Zion, Ill	500
380	790	WGY	General Electric Co., Schenectady, N. Y	1000
...	...	WHAZ	Rensselaer Poly. Inst., Troy, N. Y	500
385	780	WOAI	Southern Equipment Co., San Antonio, Tex	500
390	770	WTAM	Willard Storage Battery Co., Cleveland, Ohio	1000
...	...	WJAX	Union Trust Co., Cleveland, Ohio	500
395	760	KHJ	Los Angeles Times, Los Angeles, Calif	500
...	...	WDAR	Lit Bros., Philadelphia, Pa	500
...	...	WFI	Strawbridge & Clothier, Philadelphia, Pa	500
400	750	WHAS	Courier-Journal, Louisville, Ky	500
405	740	WJY	Radio Corporation of America, New York City	500
...	...	WOR	L. Bamberger & Co., Newark, N. J	500
411	730	WDAF	Kansas City Star, Kansas City, Mo	500
...	...	WHB	Sweeny Auto School, Kansas City, Mo	500
416	720	WBAH	The Dayton Co., Minneapolis, Minn	500
...	...	WLAG	Cutting & Washington Radio Corp., Minneapolis, Minn.	500
423	710	KPO	Hale Bros., Inc., San Francisco, Calif	500
428	700	WSB	Atlanta Journal, Atlanta, Ga	500
441	680	WOS	Missouri State Marketing Bureau, Jefferson City, Mo	500
448	670	WMAQ	Chicago Daily News, Chicago, Ill	500
...	...	WJAZ	Edgewater Beach Hotel, Chicago, Ill	1000
455	660	KFOA	The Rhodes Co., Seattle, Wash	500
...	...	WJZ	Radio Corporation of America, New York City	500
461	650	WCAE	Kaufman & Baer Co., Pittsburg, Pa	500
469	640	KFI	Earl C. Anthony, Inc., Los Angeles, Calif	500
...	...	WCAP	Ches. & Pot. Tel. Co., Washington, D. C	500
...	...	WRC	Radio Corp. of America, Washington, D. C	500
476	630	WBAP	Star-Telegram, Fort Worth, Tex	750
...	...	WFAA	News-Journal, Dallas, Tex	500
484	620	WHAA	State University of Iowa, Iowa City, Iowa	500
...	...	WOC	Palmer School of Chiropractic, Davenport, Iowa	500
492	610	WEAF	American Tel. & Tel. Co., New York City	1000
...	...	KGY	Oregonian, Portland, Ore	500
...	...	WBAY	Western Elec. Co., New York City	500
500	600	WMC	Commercial Pub. Co., Memphis, Tenn	500
509	590	WIP	Gimbel Bros., Philadelphia, Pa	500
...	...	WOO	John Wanamaker, Philadelphia, Pa	500
...	...	KLX	Tribune Pub. Co., Oakland, Calif	500
517	580	WCX	Detroit Free Press, Detroit, Mich	500
...	...	WWJ	Evening News., Detroit, Mich	500
526	570	WOAW	Woodmen of the World, Omaha, Neb	500
536	560	KYW	Westinghouse Elec. & Mfg. Co., Chicago, Ill	1000

MELBOURNE BROADCAST HEARD IN HOBART

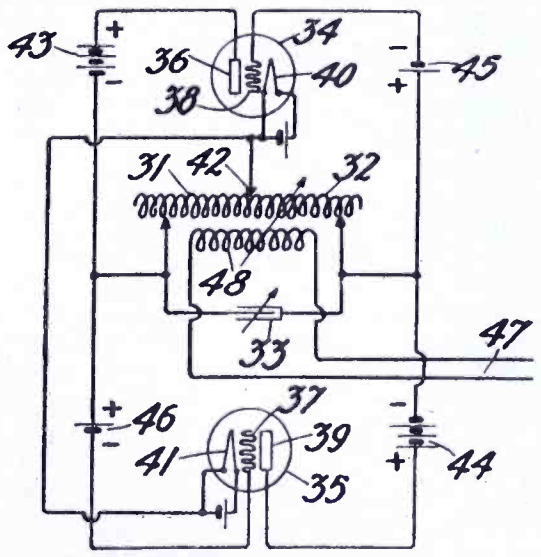
Successful broadcasting tests were made at Melbourne on January 25, 1924, by the Amalgamated Wireless, Ltd. A member of a local musical production sang a number of songs which were distinctly heard at King and Flinders Islands and even at Hobart, Tasmania. The power used for transmission was a quarter kilowatt. This service will consist of musical entertainments, vocal and instrumental concerts, weather reports and forecasts from the Meteorological Bureau, sporting results, and lectures and addresses by prominent speakers. It is said that a permanent station will soon be erected probably at Footscray, near Melbourne, with a wavelength of 1,720 meters, says Assistant Trade Commissioner Elmer G. Pauly, Melbourne, in a report to the Commerce Department.

DIGEST OF RECENT RADIO PATENTS

Prepared by White, Prost & Evans, patent attorneys, San Francisco, who have been particularly active in the radio field for many years, and from whom may be obtained further information regarding any of the patents listed below. These patents are selected especially with reference to their possible application and use by the radio amateur.

R. V. L. Hartley, Pat. No. 1,472,470; October 30, 1923. Method of and Means for Producing Alternating Currents.

This patent describes a few modifications of the Hartley oscillation circuit, the principal feature of which is electromagnetic coupling between the input and output circuits of a thermionic three-electrode tube. One modification shows two tubes *34, 35,* the space current sources *43* and *44* of which are arranged to be alternately active for alternate half-waves of the oscillations. In this way it is possible to secure distortionless, pure sine waves for all conditions of loading of the device.

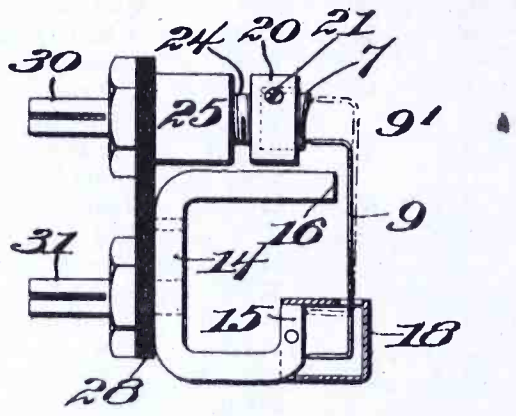


Modified Hartley Circuit

The oscillations are produced in a closed oscillatory circuit including coils *31* and *32,* electromagnetically coupled, and the adjustable condenser *33.* The work circuit *47* is variably coupled to the coils *31* and *32.* The input circuit of tube *34* includes coil *32;* the output circuit includes coil *31.* The reverse arrangement holds true for tube *35.* It is also to be noted that grid bias batteries *45, 46* are used, and this forms one of the features of the invention, being shown in an oscillatory tube circuit instead of in an amplifier circuit. Since the input and output circuits are coupled to exchange energy through coils *31, 32,* oscillations will be set up. If these oscillations at one point are such that the grid *38* is negative as regards cathode *40,* then grid *37* of the other tube is positive, and vice versa. This reverse arrangement is due to the association of coil *31* with the input circuit of tube *35* and with the output circuit of tube *34;* and the association of coil *32* with the output circuit of tube *35* and the input circuit of tube *34.* Due to this feature, batteries *43* and *44* are alternately active in producing positive surges of current, and as a result, a pure sine wave can be had for the oscillations.

E. F. Randall, Pat. No. 1,475,027; November 20, 1923. Detector for Wireless Signals.

The usual crystal detector requires a resiliently mounted exploring electrode to secure the necessary pressure between it and the crystal. Such an arrangement has been found to be unstable, since any slight jar can upset the adjustment. This invention aims to correct this situation by providing an electrode *9* which is urged by the force of permanent magnet *14* against the crystal *7.* In this way a constant pressure can be maintained. The member *9* has one or two legs contacting with one pole *15* of the magnet *14,* the other pole *16* being arranged to influence the electrode *9* near its contact point. The electrode *9* may be easily slid over the face of pole *15.* Electrical contact is established to electrode *9* through the post *31* and pole *15.*



Improved Crystal Detector

R. A. Heising, Pat. No. 1,465,357; August 21, 1923. Radiocommunication.

This patent describes a receiving system whereby frequencies differing by as little as 10,000 may be readily differentiated and caused to affect different telephones *29* and *30.* Thus suppose that two signals are simultaneously transmitted so as to affect the antenna *15*—one a modulated wave of 500,000 cycles, and the other, a modulated wave of 510,000 cycles. Under ordinary conditions these two signals would seriously interfere. To overcome this, it is proposed to use a local source *17* to affect the receiving antenna circuit, which source may be operating at say 450,000 cycles. The detector *18* has an output circuit including the two tuned circuits *23,* and *24*; and the current in this output and 510,000 cycle modulated waves, but also the difference frequencies of 50,000 cycles and 60,000 cycles. The circuits *23* and *24* may be tuned sharply to these frequencies and it is possible to select either or both of them by the aid of detectors *27, 28.* The modulations still persist in these two difference frequency currents, and accordingly they affect the phones *29* and *30.*

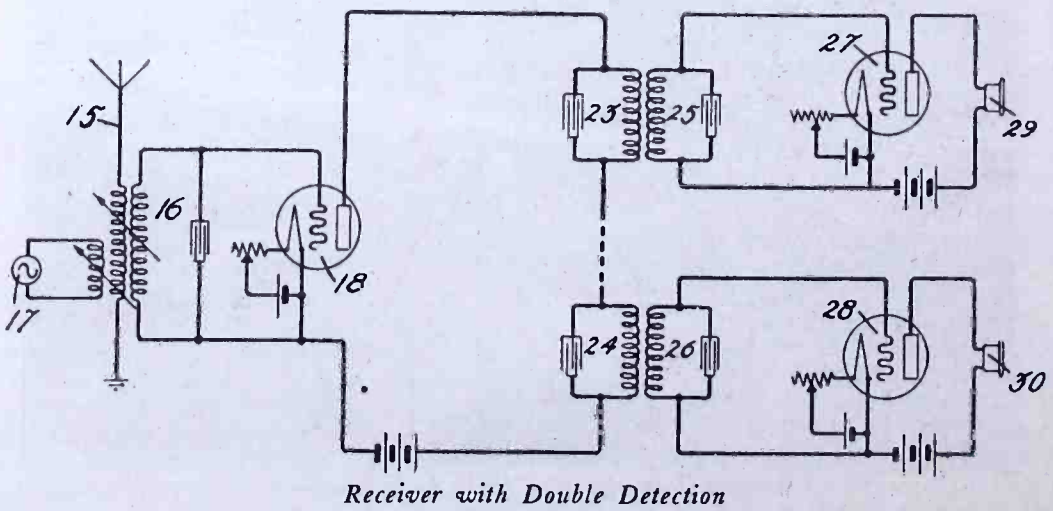
The frequency of the local source *17* may be varied within limits to suit individual requirements. It should however be far enough away from the received modulated frequency so that the difference frequencies will be beyond the range of audibility. Of course for ordinary broadcast reception where only one signal is desired, but one of the tuned circuits *23, 24* need be used, and only one detector tube *27* or *28* is necessary.

BOOK REVIEW

"222 Radio Circuit Designs," by John E. Anderson, Arthur C. C. Mills and Elmer H. Lewis. 271 pp. 5x8. Published by Norman W. Henley Publishing Co., N. Y. City.

This is a comprehensive collection of receiver hook-ups of all kinds from crystal detectors to super-heterodyne receivers. It includes design data for both receiving and transmitting circuits. Many practical suggestions are given on radio theory and practice.

Radio Tube Data Book, published by E. T. Cunningham, Inc., San Francisco, gives a complete technical exposition of Cunningham vacuum tubes. This 40-page booklet gives information on the selection of a tube to give the best results under any given conditions. It gives careful explanation of important terms and symbols and of characteristic curves and presents complete sets of curves for each kind of receiving tube. The price is ten cents.



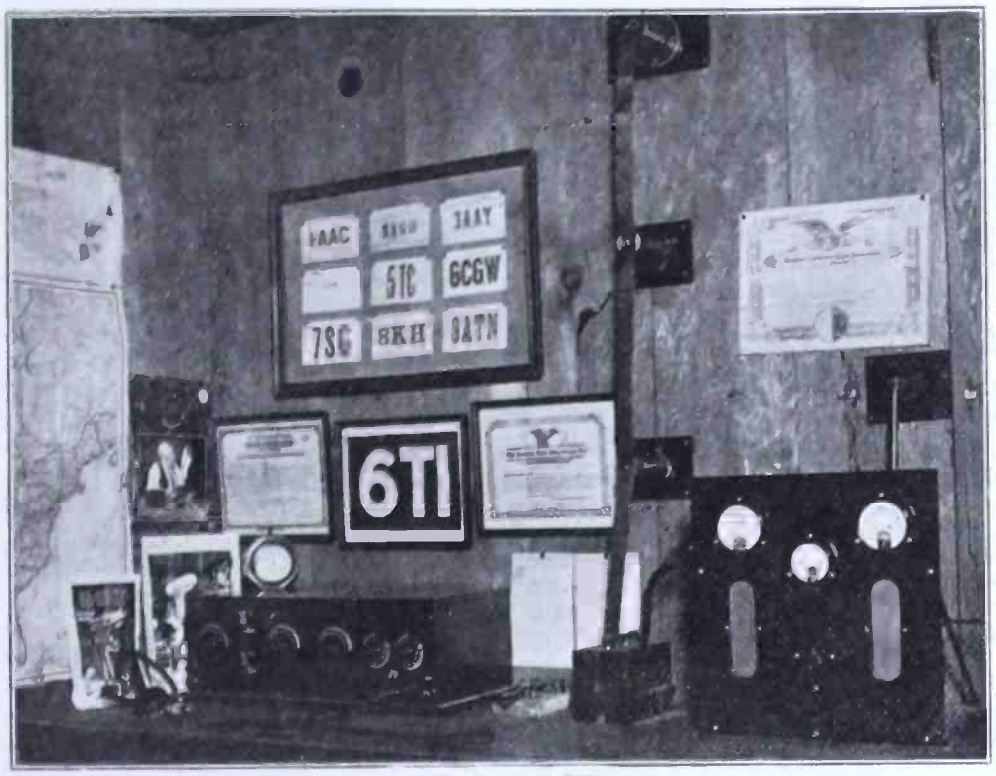
Receiver with Double Detection

WITH THE AMATEUR OPERATORS

RADIO STATION 6TI

By HORACE GREER

Every town has some one amateur station that, because of its power and consistent long distance work, becomes unconsciously associated with it in the minds of us amateurs. Mention Chicago to a radio amateur and he immediately thinks of 9ZN. With Minneapolis it is 9ZT; with Los Angeles, 6KA; with San Francisco, 6AWT; with Berkeley, 6ARB, Mention Oakland, Calif., and it is 6TI.



Radio Station 6TI

The present transmitter was installed in October, 1922. It consists of 50 watts A.C.C.W., and I am proud to say that I am still using the same tube. My DX would take too many pages to write as I have been heard from the most southern part of the world to the most northern, and almost every place in between.

On the first night of operation I was reported by the operator on the KEDV while 1350 miles E.N.E. of New York with 2½ amps. in the aerial. At this present writing I have been heard in 43 states, all districts, 4 Canadian, every district worked except the second. IBNL in Saco, Maine, was worked some time ago. Was one of the first American amateurs to be reported in New Zealand January, 1922, and was reported very often during the May trans-Pacific tests. Have been heard many times off the coasts of Japan, China, Alaska, New Zealand and Australia, as well as being heard in Panama, Mexico, Samoa Islands, Canal Zone, Alaska, New Zealand and Hawaii at 4PM by 6ZY daylite all the way. 8ZD reports me heard QSA at 5:20 PM E.S.T. 3:20 PM P.S.T. Daylight all the way in Pennsylvania. One can safely say that there is no other 50 watter in the United States for A.C.C.W. that can come up to 6TI'S records.

On my 50 watts I put about 1000 volts a.c. on plate, 10 volts a.c. on filament, and draws 110 milamps. Normal antenna current is about 4 amperes. Power is supplied by home-made transformers.

The aerial is a 85-foot cage, almost vertical. The cage is 56 feet long, 1½-foot hoops with tapering cage lead in 1½ feet to 8 inches. There is about 35 feet from one pole to my radio shack where another 25-foot pole stands. The counterpoise consists of 7-wire fan 8 feet high 60 feet long.

The receiver was a Grebe CR9, till just lately a special basket weave set and one step was put into operation and every district has been copied in less than one hour.

Would appreciate cards from all those hearing me, all cards answered. This is an A.R.R.L. station. Address all correspondence to 414 Fairmount Ave., Oakland, Calif.

MEXICAN BX

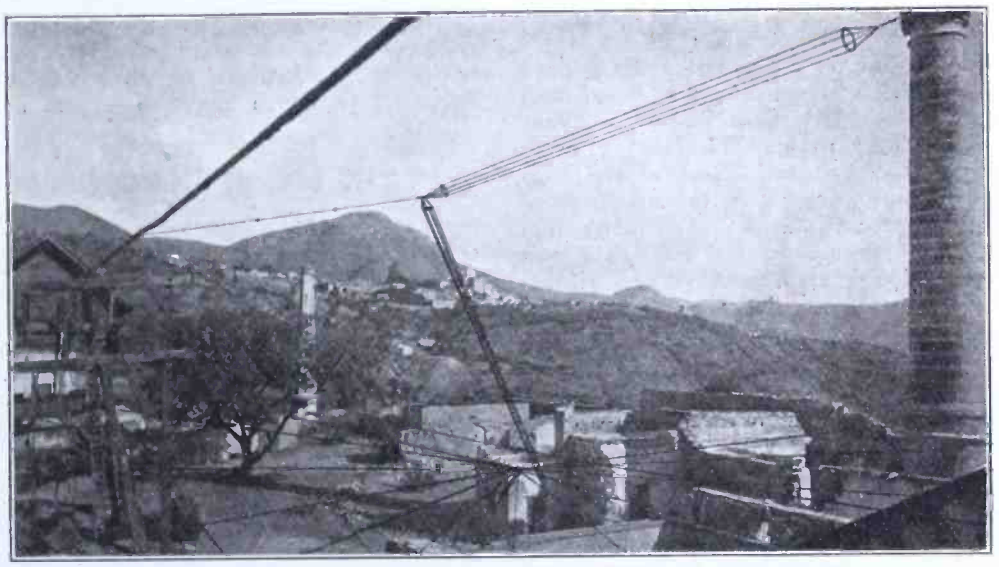
Mexican "BX" at Guanajuato, Mexico, which has been reported from all states in the U. S., Canada and Honolulu and has worked IZL and 7LN, is owned and operated by Harold T. Mapes, pre-war 3AUC. The transmitter is a 50 watt, 1500 volt, using sync. rectifier and Hartley circuit. The radiation is 4.5 amps. on a 215-meter wavelength using a 6-wire cage and fan counterpoise.

The transmitting equipment is on top of a hill and is operated by remote control from the station in the bottom of a canyon a quarter of a mile away. The station is now shut down because of the Mexican revolution but Mr. Mapes hopes to again be on the air as soon as things settle down.

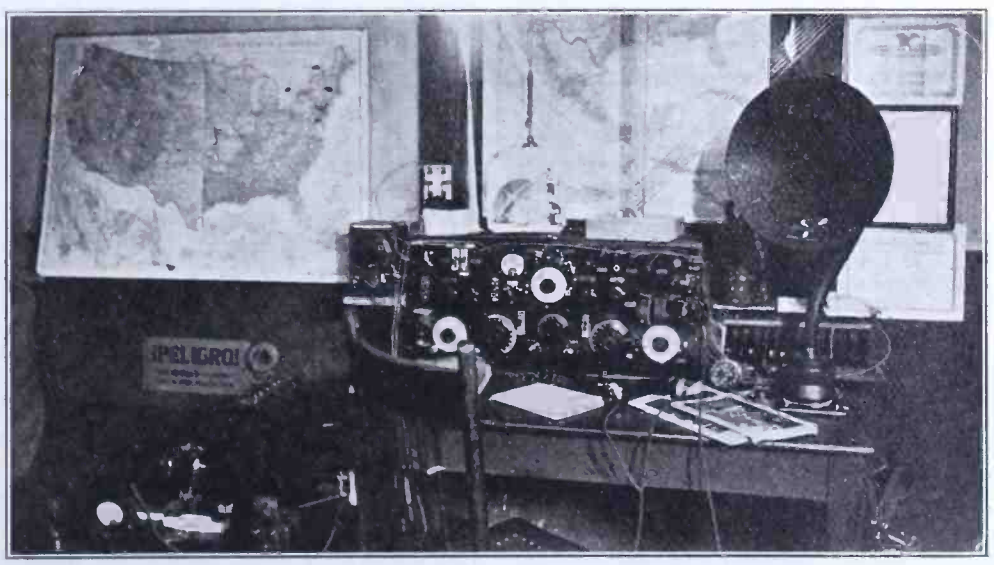
This receiver is a 5-tube homemade set with 2 stages r.f. detector and 2 stages a.f. using the RCA circuit and r.f. transformers.

Seventh District Convention

The Executive Council, Amateurs of the Seventh Radio District, will hold its 1924 Convention in Seattle on the 11th and 12th of April. At this gathering new officers will be elected for the coming year; the needs of the western gang will be thoroughly discussed and a general good time is promised for all real dyed-in-the-wool hams. It is anticipated that a number of A.R.R.L. officials will be at the meeting. Licensed amateurs from other districts will be given a cordial welcome. Reservations are being received by I. V. Iverson (7ADQ) at 4102 Second Ave. N. W., Seattle, Washington.



Antenna at Mexican BX



Operating Room at Mexican BX

NEWS OF THE RADIO OPERATORS

Paul Franklin Johnson, 6XR, Altadena, Calif., is recruiting a Southern California Section of the Radio Pioneers, which was successfully started at San Francisco last year. All Southern California old-timers who have been in the game for more than ten years are invited to get in touch with 6XR.

Call 3SJ has been reassigned to Arthur B. Cochrane, 317 Main St., Crisfield, Md. QSL appreciated.

Call 4XE has been assigned to an experimental station owned and operated by John C. Cooper, Jr., and Wm. Justice Lee. It is located at Ortega seven miles from Jacksonville, Florida, on the banks of the historic St. Johns river. Both Cooper and Lee were naval officers during the war and are conducting some experiments, information relative to which will be announced later.

Call 3KO has been reassigned to Paul R. Kern, 1030 N. 10th St., Reading, Pa. He'll appreciate rpt. of sigs. from his 100-watt C. W.

Call 6KB has been assigned to L. E. Martin, ex-6ZU, 100 Olive Ave., Fresno, Calif. Pse QSL his 10-watt C. W.

Allen H. Babcock, 6ZD, Pacific Coast director A.R.R.L., is in receipt of advice from Charles Maclurcan, Australian 2CM, that his motor-generator is busted. This means that Maclurcan probably will not be able to transmit from the *Tahiti* while en route from Australia to San Francisco during March. Arrangements have been made for a suitable motor-generator for his use during his return trip. His call while en route is 26DM. He is due at San Francisco March 23rd, and will leave March 27th.

Milwaukee Radio Amateurs' Club

A "Broadcast Listener's Night" at which some of the country's foremost radio experts spoke was the big feature on the last month's program of the Milwaukee Radio Amateurs' Club, Inc. At a regular Thursday evening meeting in the Trustees' Room of the Milwaukee Public Museum with an audience overflowing the hall, E. T. Flewelling, Chicago, of flivver super-regenerative circuit fame; David Grimes, New York and Minneapolis, known for his inverse duplex and reflex circuits; H. J. Marx, Technical Editor of *Radio Digest,* Chicago; Milo Guerney, the "mystery man," and F. D. Pearne, Chief Electrical Instructor of Lane Technical High School, Chicago, but better known as Technical Editor of *Radio Age,* and Technical Radio Editor of the Chicago *Herald and Examiner,* addressed the gathering on various topics. Mr. Grimes discussed the history of radio telephony, dating back to the work of Dr. Alexander G. Bell, Mr. Flewelling and Mr. Marx dwelt on the efficiency of modern apparatus and circuits, Mr. Pearne told what Mr. Grimes wouldn't about inverse duplex circuits, and the "mystery man" gave a humorous talk.

Periodically, events of this kind are staged to encourage the friendliness of B. C. L.'s, who, though invited to all meetings, find that these special gatherings are of more interest inasmuch as the programs are not as technical nor confined wholly to the interests of the transmitting amateur.

Other meetings have included such talks as "The Development Work of Sodium Vapor Tubes at the University of Illinois" given by Ben J. Chromy, 9CJO, an electrical engineering student. R. E. Lathrop, 9ATX, of the Technical Committee, has presented reports entitled "The Application of the Mercury Arc Rectifier to Radio Telegraphy" and "The Construction of Electrolytic Filter Condensers." Another regular program feature is the description of local stations by their owners. Stations 9ATO, which was recently in contact with WNP near the North Pole, 9CKW, and 9ELD were recent ones described with the aid of stereopticon slides.

For Central Division Directorship in the American Radio Relay League, the Milwaukee Radio Club, which is a local section of the A.R.R.L., has nominated one of its best known members, Clarence N. Crapo, 9VD, and a strenuous campaign is being waged in his favor by Wisconsin men. C. E. Darr, 8ZZ, Detroit, incumbent director, is said to have the greatest backing in the present race but in view of the Milwaukee operations will find keen competition for votes in Wisconsin if not all over the Division.

Power line interference and its mitigation has somewhat superseded commercial spark QRM in the attention of the Traffic Committee, but with this trouble it is found that the electric light and power company must do most of the work, aside from some locating tasks, which amateurs may do.

BARTLESVILLE RADIO CLUB

The Bartlesville Radio Club has been formed at Bartlesville, Oklahoma, with a charter membership of 40. Harper G. Akins is president; C. L. Estey, vice president; and O. H. Prescott, secretary-treasurer. The club room is in the new Civic Center building. An aerial has been erected on this building and several sets have been demonstrated and discussed at the meetings. Two members of the club have C. W. transmitters which have been heard in nearly every state in the union; also in Canada and Mexico. The objects of the club are: To study the radio art, to locate and eliminate all interferences possible, to bring about harmony between the transmitting amateurs and the B. C. L.'s, and to make the conditions for radio work in general as good as possible. The interference committee has already located one case of interference, caused by an arc in a high voltage line, which has been repaired.

DX List at 6XAD-6ZW

(From January 28th to February 28th)

My report is "slimmer" than that of last month, and it marks practically the end of sustained radio effort at my station until September—as the splendid deep sea fishing about Catalina Island is almost at hand, and I must admit that the lure of the sun-bathed, wind-crinkled waters of the great Pacific holds far more for me than does pounding a bit o' brass in ye wee, sma' hours! QRN, too, is becoming annoying. I shall, however, be glad to hold especial tests with any station desiring so to do—provided that I am given several days' notice.

My work with WNP has been *nil.* His signals—at such times that I have heard them—have been so QRZ and QSS that it was a waste of time to even attempt communication. The best daylight work in the past month was with 9BEZ—at Wichita, Kansas. Communication was maintained with him until 6:13 A. M.—PST—on the 12th of February. I have worked several East Coast Stations—with full daylight there, but still dark at this end.

The opportunity is here to thank all my radio friends throughout the nation, whose courtesy in sending me cards, etc., is cordially appreciated. The motto at 6XAD-6ZW is: "for every card that comes *in*—one goes *out*" —and I do not think that I have neglected to acknowledge every communication that I have received—at least I hope not!

Stations Worked

1cak, 3bgj, 3aqr, 3iw, 3yo, 3ab, 5aiu, 7ak, 7gq, 7wm, 7ih, 7ahd (daylight), 8anb, 8abx, 8bxx, 8amd, 8bcp, 8hj, 8acy, 8bau, 8abx, 8vq, 8dhq, 8zd, 9awf, 9cp, 9ato, 9acx, 9bjt, 9aec, 9buh, 9brs, 9aog (daylight), 9zt, 9eld, 9dsl, 9bez, 9dyy, 9brs, 9vm, 9cp, 9dc, 9bij, 9vm, 9ap, 9ajv, 9avg, 9bch, 9cfk, 9awf, 9aad, 9acx, 9brs.

Stations Reporting 6XAD-6ZW

1pp, 1cak, H. Mellem, Somerville, Mass.; 2cpx, 2adu, 2ams, 3me, 3jr, 3bwq, 3tf, 3wx, 3atb, 5hj, 5rh, 5alx, 8xhm, 8bzc, 8acy, 8dcy, 8bxv, H. W. Kocher, Jr., Haverford, Pa.; 8acy, 8ajw, 8boa, 8cac, 8dcf, 9bbi, 9brs, 9ajv, 9aru, 9zy, 9vm, 9arc, 9wu, 9elh, 9boe, 9cnb, 9arc, 9cjj, 9bga, 9po, 9dmm, 9bba, 9eju, 9bgy, 9ox, Speckman, New Zealand (vy 9sa).

THE WHITE RADIO BILL

By Washington Radio News Service.

The new radio bill introduced by Representative Wallace White, of Maine, when enacted, will grant the Secretary of Commerce authority to regulate radio communications in all the United States and its possessions. It is intended by the author, who had the assistance of Representative Davis of Tennessee and many governmental officials in framing the bill, that "H. R. 7357" will supersede the radio act of 1912 and fully meet all present legislative requirements.

The new bill, which is now before the Merchant Marine and Fisheries Committee, provides that all transmitting ship and shore stations and operators be licensed at specified fees, but exempts Government stations and all receiving stations. The bill confers upon the Secretary of Commerce general powers of regulations over all transmitting stations, in the interest of reducing interference and the development of an orderly system of communication. Certain obsolete requirements have been eliminated, ambiguities clarified, and new provisions of importance introduced.

The Secretary of Commerce is authorized to license, classify, locate, assign calls, and supervise all transmitting stations; control the nature of service rendered, allocate wave lengths, prescribe operating time and prevent interference. The President is given authority to close or take over any station in time of war or disaster.

Station licenses may not be issued to aliens, and all licenses may be revoked or suspended by the Commerce head. Whereas present laws place no time limitation upon licenses, time limit for licenses is now authorized at 10 years. Special provisions seek to promote efficiency of mobile stations, making for safety of ships at sea, and require transmission for at least 100 miles.

No licenses are required for receiving sets or stations, and no control over such sets is attempted by the bill. Transmitting amateurs are not specifically provided for, but the limitations of wave lengths and power set forth in the 1912 bill are eliminated. Under his general power to allocate wave lengths, the Secretary of Commerce may now assign amateurs such wave lengths as the importance of their work may make advisable.

He is directed to refuse to license any applicant who is seeking unlawfully to monopolize radio communication, either through control of manufacture, sale of apparatus or exclusive traffic arrangements, or other means. Revocation of licenses may be made when provisions of the bill or its regulation are broken, or whenever the Interstate Commerce Commission, or another proper body, shall find that a licensee has failed to provide reasonable facilities, or has made any unjust charge, or has instituted unreasonable practices in connection with communications. All laws relating to monopolies shall apply to radio apparatus and communication, the bill states, and in addition to other penalties, licenses may be revoked. The bill also pro-

vides for the application of the "Cable Landing License Act" to radio transmission to foreign countries.

Fees for Transmitting Stations and Operators

The Secretary of Commerce is authorized to collect, in advance of the issuance of licenses, fees for both transmitting station licenses and for operators' licenses. A trans-oceanic station license will cost $300 per annum; a land commercial license a minimum of $50; a ship station license, $25; experimental station, $25; technical and training school licenses, $15; special amateur, $10; and general and restricted amateur stations, $2.50. Operators' licenses run for two years and range from $2.50 for extra commercial first class, to $1.00 and $0.50 for first and second class amateurs. Charges ranging from $2.50 to $0.50 will be made for each examination if the bill becomes a law. The bill provides that all fees collected for examinations and licenses may be used to defray part of the Department's expenses.

A maximum fine of $1000 will be imposed upon all persons who violate provisions of the pending bill or any regulations authorized by it, within four months after the passage of the act.

Before a radio station may be erected in the future, a construction permit must be secured from the Secretary of Commerce, setting forth all necessary information and the station.

The advisory committee authorized will comprise members appointed by the Secretaries of State, Treasury, War, Navy, Post Office, Agriculture and Commerce Departments, the Shipping Board, and seven members, not representing the Government, will be appointed by the Commerce Secretary. No salaries are provided but expenses in connection with meetings are to be paid out of Commerce Department appropriations.

Broadcasting and other private stations located within such proximity to governmental stations as to interfere with government business, must not operate during the first fifteen minutes of each hour, the bill sets forth. On the other hand, governmental stations located within a hundred miles of commercial stations, may not handle commercial traffic. Divulging of commercial or private radio communication is forbidden. All SOS or distress signals are given right of way, and penalties for transmitting fraudulent distress signals are provided.

NEWS OF THE AMATEUR OPERATORS

6AOR will be back on the air with 50 watts by April 1st and with 100 watts by May 1st if not before. All former A.R.R.L. relay stns please take notice. Wave will be 140 meters.

6AME has moved from Riverbank, Calif., to Route A, Box 11 B, Modesto, Calif., where special facilities are ready for short wave work.

Call 6COU has been issued to H. L. Smith, 711 D St., Oxnard, Calif. Pse qsl on mi 5 watts. All crds answered.

Qra of 6BER is now 5520 Lawton Ave., Oakland, Calif. All cards answered.

Some months ago the Revolutionary Government forbade by legal decree the operating of private wireless apparatus in Greece. This measure was taken largely to prevent the Greek public from being reached with propaganda unfavorable to the revolution, it is reported. According to unofficial advices, the Ministers of Finance and Marine of the present government have prepared a law to be submitted to the National Assembly for ratification, by which the operation of private radio sets belonging to Greek individuals will be permitted under certain restrictions and subject to the payment of a license tax.

Readers are invited to send in lists of calls heard from stations distant 250 miles or more from their own station.

At Canadian 3TB, 300 Wolfe St., London, Ontario

(1aez), 1ali, (1all), 1apc, 1ary, (1aww), 1bis, 1bkq, 1boq, (1ka), 1kw, 1ow, (1se), (1va), 1vv, 1xam, 1yb, (2acs), (2awf), 2crp, 2cvj, 2cxb, (2cyw), 2by, 2rk, 3ajd, (3cfi), 3iw, 3ab, 3cc, (3hh), (3kd), 3yp, 4bx, 4dx, 4eb, (4gz), 4ft, 4ik, (4ot), 5aac, (5ads), (5agj), (5ahr), 5ek, 5ht, 5nn, 5nv, 5qf, 5sr, 5tm, 5ua, 5uk, 5za, 5xap, 6aos, 6arb, 6ame, 6auu, 6bcl, 6beo, 6bic, 6bih, 6bm, 6bnc, 6bua, 6bve, 6cfz, 6cgw, 6ckr, 6lv, 6pl, (6xad), 6zah, 6zau, 6zar, 7adh, 7co, 7du, (7lu), 7kr, 7sc, 9aci, 9ahy, 9amb, 9aon, (9aox), 9ayx, 9azj, 9bis, 9bak, 9bcb, 9bhx, 9bgc, (9bsg), 9bto, (9buo), 9bvo, 9bxq, 9byc, 9ccs, 9cho, (9cja), 9cmn, 9cnb, 9cte, 9cyd, 9cyw, 9czg, (9ddu), 9dcw, 9dch, (9dfq), 9dky, 9dsl, 9dsv, 9dxn, 9dyy, 9dzy, (9edm), 9eea, (9efj), (9eld), (9elv), (9eq), 9vk, 9zy, (9yu).

Can.—1dq, 2bn, 2bg, (2ic), 5cn, (9bx).

Canadian "threes" and U. S. "eights" too numerous.

At 5ADB, El Paso, Texas

1adn, 1aez, 1apf, 1bdi, 1boq, 1emp, 1cpn, 1sn, 1zi, 2afp, 2cxd, 2rk, 2ts, 2xq, 2xs*, 3ab, 3aln, 3bnu, 3bji, 3bva, 3tr, 3zo, 4eq, 4fn, (4ft), 4hn, 4on, (5ado), 5aes, 5agt, 5ahr, 5aiu, (5ajj), (5akn), (5ama), 5be, (5cv), 5ek, 5fa, (5fj), 5ft, 5ht, 5ia, (5lg), 5lw, (5nk), 5oo, (5sd), (5ui), 5uk, 5xd, (5yk), 5zav, (6aak), (6adt), (6ahu), (6aks), (6ani), (6aoi), (6bbh), 6beo, (6beq), (6bic), (6bjj), (6bkx), 6bnc, (6cgd), (6cgw), (6chu), (6chv), (6cmr), (6cms), (6cmu), (6cng), (6ec), (6en), (6fp), 6lu, 6zah, 6zam, (6zau), (6zh), 7abb, 7aci, 7co, 7fd, 7hw, 7io, 7jd, 7ly, (7ob), 7oh, 7ot, 7zu, 8afd, 8aim, 8awj, 8bch, 8bda, 8bfc, 8bhn, 8bmc, 8byo, 8bzc, 8cdz, 8ced, 8cgx, 8csf, 8cvg, 8cwu, 8fu, 8jj, 8tr, 8xe, 8yn, 8zz, 9abv, 9amu, 9aou, 9asn, 9aua, (9avn), 9axx, 9bdl, (9bds), 9beh, 9bes, 9bfk, (9bgi), 9bqj, 9bsh, 9byc, 9bze, (9caa), 9cjs, (9ckm), (9cld), 9ccl, 9czm, (9daw), 9dgi, 9dhb, (9dte), 9dso, 9dxh, 9dyz, 9dzy, 9edb, (9ehn), 9em, 9fm, 9mc, 9ss, 9xi, 9yy, (9zg).

Can.—2ic, 3bp, 4cn, 4ea, 9bx. Mex.—(bx). Army—as6 (qra?).

*2xs fone heard vy qsa on about 6,000 meters.

Following stations heard during daylight, before 6 p.m.: 1bwj, 1xam, 4ft, 5abh, 5ahc, 5ahr, 5aht, 5aiu, 5aqt, 5be, (5cv), 5fx, 5gi, 5in, (5kc), (5lg), 5nn, 5qw, 5uk, (5sd), 5zg, (6ahu), 6brf, (6ec), (6fp), 8apn, 9aau, 9ahz, 9avn, 9avg, 9ayp, 9aim, 9bez, 9bds, 9bwv, 9bri, 9cea, (9cdj), (9ccv), 9bfh, 9daw, 9dgv, 9ehn, 9ejz, 9ekf, 9nr, 9pw, 9qw. Will qsl cards if requested. All reports on our sigs appreciated.

By 6BBC-6ZBK, H. P. Borden, Fullerton, Calif.

1all, (1cmp), (1er), 1fd, 1hx, 1xm, 2afp, (2bsc), 2by, 2csr, 3ab, 3atb, (3hg), 3lg, 4cr, 4cw, 4eq, 4fs, (4ft), 4hs, 4io, 4iw, 4iz, 4ku, 4oa, 4py, 4qf, 4qw, 4xj, 4za, 5aej, 5ahd, 5ahr, 5aib, 5aiu, 5ajj, 5akf, 5akn, 5amu, 5ane, 5ap, 5by, 5ce, 5cv, 5di, 5ge, 5gg, 5gj, 5ht, 5hy, 5hz, 5je, (5lg), 5li, 5lr, 5mz, 5mn, 5qi, 5ql, 5qq, 5qw, 5rg, (5sd), 5sk, 5tj, 5uo, 5vf, 5xd, 5xap, 5zb, 5zh, 5zm, (6ceu), 8aey, 8ada, 8adg, 8aep, 8agp, 8ajd, 8anm, 8apt, 8ard, 8aue, 8avt, 8baz, 8bbw, (8bda), 8bfm, 8bnh, 8bno, 8bnz, 8brm, 8bxt, 8bxx, 8bzc, 8bzd, 8edz, 8chy, 8com, 8cpd, 8cux, 8cwk, 8cwp, (8daa), 8dae, 8dat, 8ddc, 8dgo, 8dgp, 8do, 8eb, 8er, 8fu, 8gh, 8gz, 8hv, 8jj, 8jq, 8oa, 8pl, 8qk, 8rm, 8sp, 8vn, 8vq, 8vt, 8vx, 8vy, 8wx, 8wy, 8xh, 8ze, 8zz, 8zw, 9aec, 9afm, 9agb, 9agl, 9ahv, 9aim, 9amb, 9amk, 9amu, 9aog, 9ape, 9apf, 9apo, 9aps, 9asn, 9ato, 9aue, 9auw, 9awc, 9awv, 9axs, 9azg, 9bak, 9bcx, 9bdu, 9bez, 9bg, 9bgh, 9bhi, 9bhk, 9bhy, 9bif, 9bij, (9bjk), 9bjn, 9bkf, 9bkp, 9bly, 9bof, 9boz, 9bq, 9bqj, 9bqy, 9brk, 9brx, 9bth, 9btt, 9byo, 9bwc, 9bwy, 9bxq, 9caa, 9ccm, 9ccs, 9ccy, 9ccz, 9cdj, 9cdz, 9cea, 9ceh, 9cga, 9cgm, 9cgu, 9chc, (9chn), 9cjc, 9cju, 9cld, 9cle, 9clq, 9co, 9cpo, 9crs, 9ctg, 9cuc, 9cyc, 9cvi, 9cxf, 9cyw, 9czg, 9czm, 9czw, (9day), 9dfh, 9dhs, 9dkb, 9dkf, 9dkq, 9dky, 9dlf, 9dli, 9dlm, 9dpx, 9dqa, 9dqh, (9dqu), 9dr, 9dug, 9dun, 9dxn, 9dyn, 9dxy, 9dyr, 9dzs, 9eer, 9ees, 9egw, 9ehj, 9ejz, 9ekf, 9eky, 9ell, 9er, 9fm, 9hk, 9hn, 9mc, 9qr, 9rc, 9rm, 9ss, 9tv, 9yb, 9ye, 9yy, 9zt.

Can.—3oh, 4cn, 4cl, 4hh, (5ah), 5cn, 5fy, 5go, 9bx. Mex.—bx.

At 6BUR-6AQF

1aw, 1ajx, 1bxk, 1sk, 2by, 2blp, 2cla, 2rk, 2ts, 3bdo, 3bgj, 3buy, 3lg, 3oi, 3tr, 4gz, 4hn, 4hs, 4it, 4io, 4oa, (5adb), 5ahr, 5aiu, (5ajj), 5aky, 5anc, 5be, (5bx), 5bz, 5ce, 5ef, 5gm, 5jf, 5lg, 5mm, 5qi, 5ql, 5qq, 5qy, 5my, 5ra, 5rg, 5ph, 5vm, (5xt), (5zav), (6abk), (6abs), (6age), (6aht), (6ani), (6apr), (6atz,, (6avv), (6bbw), (6bfa), (6bqb), (6bso), (6cc), (6cdc), (6cdg), 6ceu, (6chz), (6cid), (6cix), (6ckh), (6clb), (6cmd), (6do), (6jz), (6nf), (6on), (6zbn), (7ada), 7adg, (7af, (7ahn), 7aho, 7aim, 7ajv, 7akz, 7ald, 7bj, 7br, 7co, 7cy, 7du, 7el, 7em, 7fd, 7fq, (7hf), 7kk, (7ks), 7kv, 7mp, (7ny), (7qd), 7qj, 7qn, 7qu, 7qy, (7ra), (7sn), (7tq), (7wp), (7vm), 7zx, 8aa, 8act, 8agp, 8aib, 8aih, 8amm, 8apt, 8ard, 8avt, 8bbi, 8bcv, 8bda, 8bho, 8bji, 8bkd, 8bkn, 8byn, 8ckv, 8cpp, 8ctu, 8cvx, 8cwp, 8cxk, 8cyu, 8dgo, 8dhg, 8dhq, 8dkw, 8ef, 8er, 8fm, 8fu, 8jj, 8jy, 8oa, 8mz, 8pu, 8qk, 8tt, 8ve, 8un, 8wx, 8yu, 8yy, 8zc, (9aec), 9aep, 9ahj, 9ami, 9aou, 9apf, 9ato, (9avs), 9avu, 9azg, 9bab, 9bak, 9bed, 9bez, 9bgy, 9bhk, 9bis, 9bli, 9bly, 9bri, 9bsg, 9btt, 9bxq, (9bzh), 9bzo, 9caa, 9ccm, 9ccy, 9ccs, 9cfi, (9cgu), 9cip, 9cht, 9cjc, 9ckj, 9cmk, 9czm, (9czw), 9dc fone, (9dcw), 9ddf, 9dkv, 9dlo, 9dte, 9dug, 9dun, 9dxu, 9dyr, 9ei, 9eea, 9ekf, 9eky, (9fm), 9gy, (9mc), 9nc, 9qe, 9rc, (9um), 9yaw.

Can.: 3gg, 3co, 4cl, 4cr, 4hh, 4io, 5go, 9bx. Mex.: bx.

By 6AAQ, 107 E. Buckthorn St., Inglewood, Calif.

2rd, 3lg, 4me, 5ado, 5ahd, 5aiu, 5aky, (5be), 5ce, 5lr, 5qi, 5xd, 5za, 6's too numerous, 7acg, 7aci, 7acq, 7ael, 7af, 7afu, 7agv, 7ahn, (7akz), 7ala, 7awd, (7bj), 7co, 7eo, 7hw, 7no, 7ob, (7qd), 7qu, 7sc, 7to, 7ws, 7yl, 7abo, 8bk, 9aim, 9amb, 9aog, (9aou), 9apf, 9aue, 9avs, 9awv, 9azg, 9bji, 9bjk, 9bly, 9bof, 9bxy, (9caa), 9ccs, 9ceh, 9ckj, 9clq, 9cte, 9czg, 9dt, 9dxy, 9dyr, 9efh, 9efu, 9eht, 9eld, (9ql), 9oz.

Hawaii: 6ceu, 6bdt. Qsl's on my five-watter appreciated. All cards answered.

By 6AOO, James B. Herreshoff, San Diego, Calif.

1xam, 6cay, 6chl, 6zar, 7co, 8abm, 8mp, 9uk, 9xw.

At 6BQA, 855 Birch St., Los Angeles, Calif.

2wr, 3hs, 3adb, 3bwj, 4ba, 4bz, 4cl, 4ik, 4rn, 5ht, 5lr, 5ql, 5tj, 5nw, 5cv, 5nr, 5rg, 5adb, 5ado, 5aer, 5ahd, 5ahr, 5aiu, 5amo, (5xd), 5za, 5zau, 7em, 7en, 7ly, 7lh, 7lr, 7qq, 7lw, 7ob, 7rp, 7sf, 7sh, 7fg, 7hw, 7abb, 7ajd, 7jy, 7adg, 7ahs, 7age, 7afy, 7zn, 7zu, 7zi, 8pl, 8bkn, 8dgo, 8czy, 8xap, 8hn, 9bq, 9amb, 9if, 9beu, 9bed, 9bez, 9bdl, 9bgy, (9bab), 9apf, 9ccm, 9ccu, 9ql, 9aus, 9dle, 9djb, 9dyr, 9cld, 9cjy, 9cly, 9dkq, 9dhw.

Can.: 5go, 4co. All hring my synk C. W. pse qsl.

By 7ALI, James Wallace, Jr., Mt. Vernon, Wash.

1ajx, 1yb, 2bqh, 2lg, 2rk, 3alx, 3azy, 3lg, 4ai, 4gu, 4gz, 4my, 4ado, 5agf, 5ahd, 5ahr, 5aic, 5ajj, 5ajq, 5alx, 5amb, 5anc, 5be, 5bx, 5cv, 5ef, 5fc, 5ft, 5gj, 5gm, 5hk, 5jg, 5jt, 5jw, 5kc, 5lp, 5ml, 5mw, 5ny, 5pw, 5ql, 5qq, 5qw, 5rg, 5rh, 5rw, 5sp, 5xab, 5xd, 5yw, 5zav, 6aao, 6acv, 6acz, 6afq, 6agc, 6age, 6agk, 6aik, 6aja, 6ajd, 6ajh, 6alv, 6alw, 6aoh, 6arf, 6aru, 6atz, 6auu, 6awe, 6awq, 6bbc, 6bbw, 6bin, 6biw, 6bkx, 6blq, 6blz, 6bm, 6bnf, 6bnu, 6bon, 6bou, 6bpf, 6bq, 6bri, 6buf, 6buh, 6bui, 6bum, 6cay, 6cbb, 6cbi, 6cbw, 6cc, 6ccu, 6cgd, 6cgg, 6chw, 6cis, 6cjb, 6cjv, 6clz, 6dd, 6do, 6fm, 6hs, 6kf, 6kw, 6lq, 6lv, 6nx, 6ol, 6pl, 6pu, 6qb, 6ux, 6zx, 6zar, 6zbo, 6zbs, 6zbu, 8abx, 8aca, 8aev, 8aig, 8anm, 8apn, 8apt, 8bau, 8bep, 8bda, 8bdr, 8bjy, 8bk, 8bmb, 8bnh, 8bsi, 8btm, 8bvt, 8bwb, 8bwc, 8bwj, 8bzc, 8com, 8cpk, 8cse, 8cto, 8cwk, 8cwp, 8cwu, 8czy, 8dae, 8dat, 8ddc, 8dp, 8er, 8fm, 8jy, 8mz, 8nb, 8oe, 8pl, 8rv, 8vq, 8vy, 8wo, 8yd, 8yn, 8zz, 9aaw, 9ac, 9aei, 9ack, 9aec, 9afm, 9agb, 9agl, 9ahz, 9aic, 9aim, 9alc, 9amb, 9amf, 9amp, 9amz, 9any, 9aog, 9aou, 9ap, 9aru, 9asn, 9ato, 9att, 9avg, 9avs, 9awv, 9axs, 9axx, 9ayj, 9bal, 9bbg, 9bdz, 9bez, 9bfb, 9bis, 9bji, 9blx, 9bly, 9bmx, 9bnu, 9bp, 9bpv, 9bqj, 9bqq, 9brk, 9brs, 9bvn, 9bvv, 9bxa, 9bxm, 9byd, 9bzd, 9bzi, 9caa, 9caj, 9ccm, 9ccv, 9cea, 9cee, 9cga, 9chc, 9cjm, 9cka, 9cly, 9cms, 9cpo, 9csi, 9cvs, 9cvv, 9cwj, 9cwx, 9czm, 9daw, 9dbf, 9deq, 9djb, 9dli, 9dmw, 9dsw, 9dum, 9dun, dxu, 9dyr, 9eak, 9ebh, 9egu, 9ehj, 9eky, 9elb, 9er, 9fe, 9lb, 9mc, 9oy, 9pf, 9ql, 9vm, 9zt, 9zy.

Can.—3bq, 3he, 3ni, 4ab, 4aw, 4co, 4cr, 4fn, 4fz, 4gh, 4hh, 4io, 9bj, 9bx.

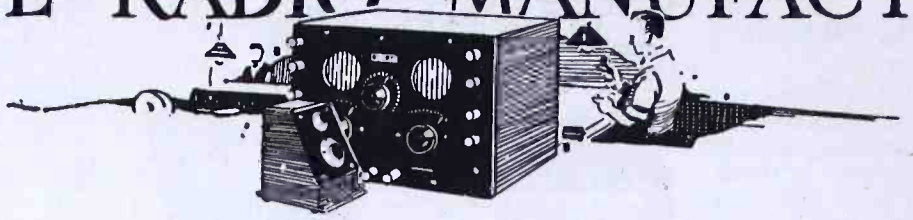
By 6CNL, Myron Hexter, 127 N. Serrano Ave., Los Angeles, Calif.

5be, 5ft, 5qd, 5xd, 5adb, 5ado, 5aib, 5aky, 6's and 7s too numerous; 8fm, (8zy), 8apt, 8bda, 8bkn, 8byo, 9ap, 9aep, 9aey, 9aim, 9avs, (9bly), 9ccg, (9ceh), 9dfh, 9dyr, 9eky, 9elv. The folowing were heard in 40 minutes on the nite of Jan. 28, 1924—4oa, 5ft, 5aky, 5zav, 7io, 7ot, 8aa, 9aau, 9afq, 9ape, 9apf, 9axx, 9bgx, 9bgy, 9bij, 9biz, 9bof, 9buj, 9bvo, 9caa, 9cjy, 9ebi.

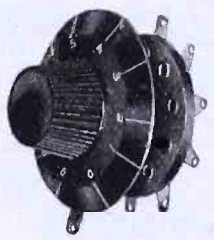
Anyone hearing 6CNL pse qsl crd. All crds answered and appreciated.

Continued on page 44

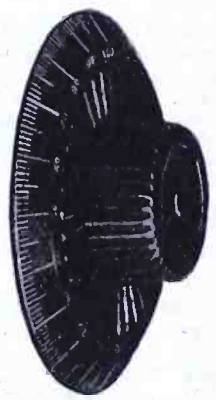
FROM THE RADIO MANUFACTURERS



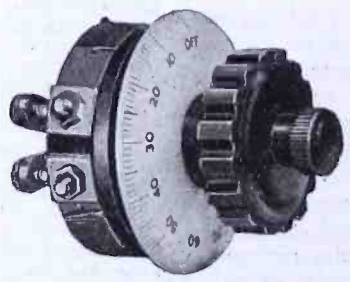
Freshman tested noiseless mica condensers are now equipped with a special lug at each terminal designed so that three or more wires may be conveniently soldered to it or even given good temporary connection by bending over the sides of the grooves in which the wires are laid.



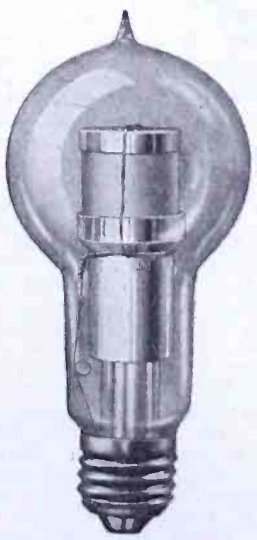
The ten-point Walnart inductance switch eliminates the need for drilling the panel for a switch lever, points and stops, but one 9/32-in. hole being necessary for mounting. Connections can be soldered to the terminals before fastening the switch to the panel.



The Radion ribbed dials are made in 3 and 4 in. diameters of either black or mahoganite finish with gold graduations. They fit either a ¼ or 3/16 in. shaft and are equipped with a stop slot. The ribs facilitate delicate tuning, a very small motion of the dial being secured with a considerable movement of the finger tip near the periphery.



King dial rheostats are supplied in either plain or vernier type. The bases and knobs are of Bakelite, either black or mahogany finish. Metal parts are of brass heavily nickelplated and polished. The dials are of English Ivory, 2¼" diameter, graduated to 100 spaces.



The Amrad "S" tube rectifiers alternating current to produce direct current for charging storage *B* batteries, or supplying plate current to power tubes. It is rated to carry 100 mil. amps. at 1000 volts d.c. per tube. It has no filament, rectification being accomplished by gaseous conduction. It fits a standard incandescent lamp socket.

The Erla Selectoformer is a new device for coupling the antenna to the receiver without causing a broadening of signals. When substituted for a variocoupler or loose coupler it increases the selectivity of two and three tube reflex circuits. It requires no adjustment. It gives a low value of inductive and capacitive coupling between the primary and secondary circuits, reducing the resistance of the secondary and thereby increasing the signal volume. It may also be used as a wavetrap with a 23 plate variable condenser or as an absorbing circuit for re-radiated oscillations.

Tell them that you saw it in RADIO

CALLS HEARD

Continued from page 41

By Harold T. Mapes Rdo. "BX", Guanajuato, Guanajuato, Mexico.

1bgq, 2bsc, 2brb, 2bgj, 2rk, 3ajd, 3fs, 3lg, 3yo, 4cs, 4cr, 4er, 4eq, (4ft), 4fs, 4gz, 4hs, 4io, 4iu, 4jz, 4oa, 4pt, 4xj, 5ado, 5adb, 5akn, 5aju, 5adc, 5amk, 5agt, 5aic, 5afh, 5alj, (5akn), 5ahj, 5amw, 5aom, 5as, 5aiu, 5adv, 5ajt, 5amu, 5au, 5anc, 5ahr, 5aat, 5abn, 5aes, 5amw (fone), 5akj, 5alx, (5aht, 5ajv, 5amw dalite), 5ana, 5acr, 5ana (voice), 5bz, 5bx, 5cm, 5cv, 5dr, 5dw, 5ek, 5ei, 5ez, 5eh, (5ft), 5fm, 5gg, 5ga, 5gj, 5hw, 5hz, 5ht, 5iq, (5jc), (5jf), 5jl, 5kg, 5kp, 5kh, (5lr), 5lg, 5mo, (5mt), 5mm, 5na, (5nk), (5nh), (5nn), (5ov), 5oq, 5py, 5ph, 5qt, 5ql, (5qw), 5qx, 5rb, 5rq, 5rg, 5sp, 5sd, 5sx, 5tj, (5tm), 5to, 5uo, 5ua, 5vf, 5vm, 5vo dalite, 5xap, 5xd, 5xt, 5xv, 5xaq, 5xa, 5yg, 5yt, 5yw, 5yk, 5zu, 5xbf, 5zh, 5zx, 5za, 5zav, 5zax, 6auu, 6awt, 6ahu, 6aos, 6aam, (6alk), 6avr, 6aak, as6, 6acm, 6ani, 6aja, 6bbh, 6brf, 6bvg, 6bpz, 6bic, 6beo, 6buo, 6bwz, 6bah, 6bjj, 6brk, 6buf, 6bdt, 6beo, 6cgw, 6cng, 6cmr, 6cdg, 6cfx, 6cgd, 6clr, 6cbd, 6cax, 6cbb, 6cei, 6cek, 6chl, 6ceu, 6fp, 6ft, 6gt, 6jz, 6kj, 6la, 6mh, 6nx, 6ne, 6ol, 6pl, 6rn, 6su, 6ux, (6xad), 7agv, 7co, 7cs, 7fq, 7ks, 7sn, 7sc, 8ame, 8alf, 8apn, 8apt, 8agp, 8aig, 8bxx, 8bda, 8byn, 8bul, 8amm, 8bde, 8bzd, 8byf, 8cgj, 8ckv, 8ddc, 8ef, 8gz, 8jy, 8jo, 8oa, 8oe, 8vq, 8yn, 9and, 9aim, 9ato, 9ahz, 9avn, 9apf, 9avz, 9adp, 9awp, 9aqb, 9aus, 9asx, 9aec, 9aau, 9aey, 9ami, 9bji, 9bez, 9bsg, 9bzs, 9bly, 9bp, 9boz, 9brk, 9bmx, 9bth, 9bof, 9bey, 9brs, 9bal, 9byc, 9bwc, 9cdj, 9cip, 9cdo, 9crr, 9cil, 9cht, 9caa, 9chg, 9chj, 9clq, 9ccm, 9cfk, 9cxp, 9cvs, 9cgn, 9cji, 9cgn, 9dug, 9doe, 9day, 9dqw, 9dli, 9dzy, 9dhw, 9dqu, 9ehj, 9eak, 9eky, 9eq, 9elv, 9eeg, 9edb, 9eak, (9fm), 9mc, 9pq, 9vm, 9ve, 9wu, 9xm, 9zt, 9zy.

Mex.—(1b), (1k), (ax), mm.

"BX" is closed down at present, QRM Fm Revolution Hi.

By 6CEU, Hilo, Hawaii

1yb, 1aqm, 2ayv, 2rk, 2ccx, 2el, 2by, 3ir, 3jj, 3hg, 4gx, 4ku, 4cs, 5gj, 5ahd, 5ov, 5ht, 5lr, 5tj, 5zh, 5ph, 5zax, 5zav, 5qy, 5ahd, 5aiu, 6clr, 6bcj, 6ahu, 6cee, (6ckp), (6auy), (6arb), (6cgw), (6cnh), (6bvg), (6buy), (6afz), (6aos), (6ckr), (6ame), (6age), (6cnc), (6ahp), (6cng), (6buz), (6ajf), (6bql), (6zba), (6aoq), (6ckp), (6atz), (6agj), (6qm), 6ea, 6nx, 7agr, 7zx, 7qj, 7sf, 7lr, 7jd, 7zu, 7so, 7ot, 7sn, 7se, 7qc, 7io, 7hg, 8xe, 8bda, 8bgo, 8mz, 8bf, 8agp, 8zy, 8sz, 8fu, 8jj, 8wx, 8aim 8yn, 8bci, 8cuq, 8tt, 8cei, 8eoi, 8aaf, 8wa, 8oa, 8bfq, 8cko, 8chb, 8cmy, 8amm, 8ue, 9lz, 9ss, 9aim, 9dky, 9bzi, 9aaq, 9zt, 9ccz, 9mc, 9dsw, 9zy, 9bez, 9dro, 9aou, 9aps, 9avz, 9nr, 9cdb, 9djb, 9cr, 9bly, 9cvs, 9ahz, 9acm, 9awk, 9dkq, 9clq, 9dte, 9btt, 9cjr, 9djb, 9dxy, 9dhu, 9edb, 9ceu, 9cvc, 9aon, 9bq, (9eky), 9bp.

Canada: 2bn, 3bp, 3tb, 3co, 4dy, 4cn, 4dx, 5cn, (5go), 5hk, 9ss, 9bp.

Spark: 6aqu.

Broadcasting Stations: wgy, kdka, kgw, wbap, wlag, wdaf, wdap, kfi, kpo and klx.

Pse qsl if u hr 6ceu. 15 watts dc-cw used. Above dx recd on honeycomb type receiver and one step amplification. qra 113 Ululani Street, Hilo, Hawaii, U. S. A.

By "xa" of 9JO Evanston, Ill.

1aez, 1agh, 1atp, 1bcn, 1cqp, 2bqh, 2cqi, 3ahp, 3bta, 3ta, 4ft, 4mi, 4qf, 4wl, 5aic, 5amh, 5jl, 5kp, 5ml, 5na, 5tj, 5zg, 6aao, 6acm, 6acv, 6aja, 6akz, 6arq, 6avr, 6awt, 6ayd, 6bih, 6bnt, 6bqe, 6cbw, 6cef, 6cgg, 6cgw, 6chl, 6cid, 6cjb, 6cjk, 6ckp, 6fp, 6of, 6rn, 6zh, 6zbh, 6zbu, 6xad, 7adf, 7ajt, 7co, 7qf, 7fq, 7ny, 7lu, 7qc, 7qu, 7zu.

Can.: 2az, 3rg, 4ea.

Mex.: jh Qra?

By 6BUF, 4257-23rd St., San Francisco, Calif.

Canadian, C. W.: (4cl), 4cw, (5cn), 5ct, (5ef), 5go, 9bx.

U. S.: C. W.: 2ts, 4ay, 4el, 4hs, 5aby, 5ahr, 5alj, 5akn, 5ch, 5ct, 5fx, 5qy, 5xa, 5xd, 5yw, 5zav, (6afq), (6afg), 6agk), (6aqq), (6beo), (6bfg), (6blr), (6bqa), (6bqe), (6bqr), (6brk), (6buh), (6bur), (6bwd), (6caq), (6cbb), (6cbn), (6cdg), (6ccy), (6cfm), (6chv), (6ckl), (6cms), (6cmu), (6cng), (6nb), (6tf), (6ux), (6yb), (6zbj), (7abb), (7aci), (7acq), (7adf), (7adg), (7agf), (7aif), (7aiy), (7ajc), (7ak), 7akh), (7akt), (7alk), 7ca, 7co, (7dc), (7dm), (7em), (7ez), (7fy), (7go), 7gq, (7hg), (7hj), (7io), (7lh), (7mn), (7no), 7ob, 7pz, (7qj), 7qd, (7qt), 7ra, (7rc), (7sm), (7sy), 7td, (7tt), (7ut), (7vn), (7xaf), 7zu, 7zz, 8apn, 8bbd, 8byn, 8ckv, 8cqh, 8cuo, 8dgo, 8fu, 8we, 8yn, (9amb), 9amm, 9aon, 9ap, 9ape, 9apf, 9aqv, 9aua, 9bav, 9bcf, 9bly, 9bof, 9bpv, (9caa), 9ccz, (9cea), 9cip, 9cly, 9cms, 9cr, 9cvv, 9cxp, 9cyw, 9czc, 9daw, 9dfg, (9djx), 9dkb, 9dkq, 9dky, 9dli, 9dso, 9dsw, 9dug, (9dun), 9dyn, 9dyr, (9eae), 9edb, 9eer, 9eky, 9fm, 9mc, 9nk, 9rc, 9tj, (9ql), 9vz.

Voice—6cgd, 6yb, 7to, (7xaf).

I. C. W.—2rk, 6bih, 6brf, (7dm), 7el.

Anyone hearing 6buf, pse. qsl card. All cards answered.

5-watts fone es c. w. here.

At 2BBN, John Wilcox, 518-9th St., Carlstadt, N. J.

French 8bf, Q. S. A.

4aa, 4ft, (4fz), 4hw, (4jk), (4js), 5gp, 5aat, 5uk, 5alx, 5zav, 6awt, 6buy, 6pl, 6xad, 7io, 7lu, 7zs, 7zu, (9abf), (9aem), 9agy, 9adp, 9amb, 9aus, 9ayj, 9azp, 9bcx, (9bgh), (9bhq), (9blt), (9brx), 9bpt fone, (9cjx), 9co, 9cpu, (9crk), (9day), (9dhg), (9djx), 9dro, 9dsw, 9efh, 9er, (9mm), (9rc), (9vc), (nre) will Q. S. L. Q. R. K.?

Continued on page 46

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By 9CCZ, 1241 Perry Ave., Wichita, Kas.

1jv, 1hx, 1alj, 1ayt, 1arq, 1apn, 1bjb, (1boq), 1cgo, (1cmp), 1yb, 1agh, (2al), (2by), 2kf, 2bwt, 2bqb, 2cgr, (2cpa), 2cnw, 3hg, 3iw, 3ms, 3wb, 3, (3abt), (3bgg), (3cel), 3bva, 3bmv, 3cah, 3ckj, 3go, 4ay, (4db), 4el, (4fg), 4ea, 4fs, 4mb, 4mr, (4na), 4rh, 4qw, 4oa, 4pd, 6dd, 6et, 6rm, 6pe, (6gr), 6fy, 6vf, 6fh, 6fp, 6nx, (6vd), 6pl, (6avl), 6alk), 6ajp, 6afg, 6agk, 6aed, 6aos, 6bon, 6bih, (6bui), 6bcl, (6buh), 6bwd, 6blg, 6buo, 6blm, 6bjj, 6bur, 6bhk, 6bnc, 6biz, (6bjb), (6cgw), (6cyr), 6cfz, 6cgl, 6cfs, 6cib, 6chc, 6cnm, (6chl), 6cmb, 6cmr, 6cgd, 6zah, 6zi, 6zh, 6xad, (6yb), 7ln, (7to), 7ge, 7ca, 7qc, 7co, 7sc, 7hw, 7nb, 7qn, 7gj, 7ads, 7aif, 7abb, 7agv, 7aim, 7aiy, (7xae), 7yl, (7aea), 8uk, (8pl), 8vc, 8we, (8apm), (8aex), (8atc), (8pn), (8alv), (8ard), 8agj, 8bcp, (8bmb), (8blv), (8bjo), (8bct), (8bfm), (8chb), 8cuv, 8cdz, (8cwk), (8cwl), (8cpk), (8ddc), (8dle), (8dal), 8dbm, 8dkm, 8dcy, 8dcz, 8die, (8dat).

Hawaiian: 6ceu.

Can: (3ni), (4hh), (3oj), 2ic, 2cg, 9bj, 5go, 4hf, 3od, 3oh.

Harmonics heard on 400 meters: 5ahr, 5akn, 5nw, 5lr, 6fp, 6cgw?, 7co, 8jj, 8byn?, 9ahz, 9aim, 9bof.

Will qsl to those desiring it.

By 6AFY, Lynwood, Calif.

3oi, 4cs, 5gj, 5jf, 5lg, 5aky, 6en, 6ii, 6ki, 6ms, 6nb, 6ol, 6pe, 6rn, 6ux, 6wt, 6zh, 6zp, 6aaq, 6ahp, 6aib, 6aja, 6aud, 6auu, 6bad, 6beg, 6bgl, 6bjw, 6bur, 6buz, 6caw, 6cdg, 6cdy, 6cfm, 6cfs, 6cft, 6cfy, 6cgi, 6cgl, 6cgm, 6cgw, 6ckp, 6ckv, 6cmu, 6cng, 6cnm, 6coq, 6cwb, 6xad, 6zar, 6zbt, 7cf, 7co, 7ez, 7iw, 7lh, 7ob, 7qc, 7qd, 7qj, 7qt, 7zu, 7aci, 7ald, 7apf, 7apu, 8zd, 9bu, 9apf, 9amz, 9btt, 9caa, 9crr, 9cvs, 9cyq, 9czg, 9dli, 9dgu, 9dug, 9dyz.

Will qsl if wanted.

By 6BUH, Salt Lake City, Utah

1bom, 1sk, 2bjc, 2by, 2un, 2xda, 3bva, 3hg, 4cw, 4fn can, 4hh can, 4cl can, 4hw, 4sh, 5adb, 5adv, 5agj, 5ahd, 5aij, 5akf, 5lg, 5ht, 5aiv, 5vf, 5vm, 5xd, 6aam, 6aao, 6abc, 6acv, 6adp, 6adh, 6agk, 6ahu, 6age, 6agn, 6akz, 6alq, 6amg, 6amw, 6ao, 6aos, 6aiu, 6arf, 6atz, 6auu, 6auy, 6bdt, 6beo, 6bel, 6bez, 6beq, 6bcu, 6bfd, 6bfh, 6bh, 6bij, 6bjq, 6bj, 6bjj, 6blw, 6bkb, 6blg, 6bmn, 6bnu, 6bou, 6bpz, 6buc, 6bve, 6bui, 6bsg, 6bqb, 6bqr, 6bqe, 6brf, 6bra, 6brk, 6buo, 6cbe, 6ccy, 6cdg, 6cgw, 6cef, 6cfs, 6cgd, 6cbb, 6cfm, 6cie, 6chv, 6chl, 6che, 6ckp, 6cmu, 6cmr, 6cmd, 6cmt, 6cng, 6cnl, 6cjj, 6dd, 6ea, 6en, 6fc, 6fp, 6fy, 6gt, 6hc, 6ja, 6kj, 6la, 6li. 6lv, 6mh, 6nb, 6ol, 6od, 6pl, 6qb, 6rn, 6tg, 6uo, 6wt, 6yc, 6yb, 6zbh, 7abf, 7acg, 7acx, 7abb, 7aci, 7ads, 7af, 7afo, 7ail, 7aif, 7aje, 7akz, 7ajt, 7akt, 7ahn, 7ald, 7alf, 7alk, 7co, 7dc, 7fy, 7fq, 7gi, 7hg, 7if, 7iw, 7it, 7jr, 7jt, 7kr, 7lh, 7lz, 7ly, 7lr, 7mp, 7ng, 7no, 7nq, 7ob, 7ot, 7om, 7pl, 7qj, 7qt, 7qd, 7rs, 7td, 7wa, 7zl, 8blb, 8azg, 8brc, 8deo?, 8ua, 9aec, 9aej, 9aew, 9aep, 9aey, 9afm, 9ahz, 9aiv, 9aim, 9aby, 9any, 9aou, 9auw, 9avb, 9avu, 9awu, 9aww, 9avc, 9azg, 9bez, 9bfe, 9bg, 9bgh, 9bji, 9bkp, 9bof, 9bri, 9bsp, 9bun, 9bwc, 9cae, 9ccb, 9ccz, 9ccs, 9ccv, 9ceh, 9cfi, 9cht, 9chd, 9cjc, 9ckj, 9cld, 9cmk, 9csi, 9cvv, 9czg, 9czw, 9day, 9dge, 9bkb, 9dkx, 9dk, 9dlr, 9dec, 9dli, 9dof, 9dss, 9dsw, 9dug, 9dun, 9dwb, 9dwn, 9dyr, 9dte, 9ebt, 9edb, 9efh, 9ee, 9eea, 9eer, 9mc, 9qe, 9ql, 9uh, 9zt, wnp. es mny more not logged.

By 9AOJ, Columbia, Mo.

1acm, 1aep, 1ahy, 1ajp, 1akl, 1all, 1arp, 1awe, 1ayb, 1azl, 1bdi, 1bsz, 1cac, 1cji, 1cpn, 1cqo, 1csw, 1er, 1hx, 1ka, 1kc, 1my, 1oa, 1yb, 2acd, 2acs, 2agb, 2auy, 2azy, 2bbx, 2bgi, 2bqh, 2brb, 2btl, (2bxw), 2byp, 2cee, 2cjk, 2cjr, (2crp), 2czr, 2dx, 2hh, 2rk, (icw), 2xna, (3btl), (3cel), 3ms, 6ajj, 6aos, 6apl, 6aru, 6awt, 6bcl, 6bic, 6bij, 6bjq, 6bsg, 6bsh, 6bud, 6cgw, 6chv, 6cid, 6cnh, 6fh, 6hp, 6mg, 6mh, 6mm, 6xad, 6yb, 6zv, 7alk, 7co, 7iw, 7nf, 7zu.

Can.: 2bn, 3aa, 3bg, 3nf, 3oh, 3pg, 3rg, 3tb, 3xe, 3xi, 3zl, 4ea, 4er, 4fq.

Eng.: 2kw.

Anyone hearing mi50 watt c. w. set pse. Q. S. L. and Q. R. K.

By 5JY, 6109 Linden, Dallas, Texas.

1anq, 1cmp, 1ary, 1zl, 1aol, 1xaq, 2aoy, 2agb, 2by, 2cc, 2cr, 3adb, 3adn, 3ahp, 3aoz, 3bmo, 3cc, 3ccu, 3can, 3ckp, 3jy, 3ni, 3ws, 3xx, 3yv, 4ai, 4ay, 4ft, (4 fz), 4io, 4it, 4iu, 4iz, 4jk, 4pt, 4rh, 5's too numerous, 6aja, 6aqq, 6bbw, 6blg, 6cfz, 6cgw, 6cjj, 6lv, 6zb, 6zh, 7co, 7dae, 8acn, 8agf, 8ajh, 8ajw, (8anm), 8apt, 8ard, 8atp, 8axt, 8bbt, 8bct, 8bgj, 8bgt, 8bis, (8bpa), 8bzd, 8cci, 8ced, 8cjd, 8cmu, 8coj, (8cpm), 8dcy, (8 ddt), 8es, 8fm (daylite), 8gp, 8jy, 8oi, 8wz, 8xbl, 9's too numerous, all daylite, (9aep), (9atn), (9axs), (9ayj), 9bcx, (9ctd), (9czw), 9dqu, 9mz, 9qr, (9tm), 9xw.

Canadian: 3adn, 3gn, 3tb, All stations that hv hrd my 5 watter pse qsl., tnx.

By 6CAB, A. H. McGovern, South San Francisco

1ht, 1kv, 1jv, 2cee, 3ba, 3co, 3aip, 3bva, 4fz, 4ft, 4qf, 4gz, 4gx, 5ek, 5fv, 5xd, 5qy, 5qi, 5lr, 5zh, 5qp, 5sd, 5adb, 5aiw, 5aiy, 5zav (vy), 6bb, 6ol, 6ov, 6pl, 6qj, 6kj, 6ux, 6wt, 6ja, 6nb, 6mh, 6oh, 6aen, 6agk, 6adt, 6ahq, 6aoh, 6ahu, 6aoi, 6atq, 6aix, 6aja, 6ajj, 6age, 6afw, 6bdw, 6bsj, 6biq, 6bih, 6bqe, 6bwe, 6bkx, 6bqy, 6bny, 6bcu, 6ber, 6byl, 6buh, 6bur, 6bel, 6blh, 6brc, 6bsq, 6bfy, 6bra, 6cng, 6ckh, 6cgw, 6cny, 6cbg, 6cgg, 6cyc, 6clr, 6cfy, 6clc, 6ccy, 6chc, 6clz, 6cnm, 6cjj, 6clw, 6cid, 6xad, 7ad, 7ab, 7gj, 7sc, 7qu, 7bj, 7br, 7sf, 7gq, 7lh, 7mp, 7ob, 7zl, 7zn, 7ol, 7wp, 7fd, 7kk, 7ez, 7ly, 7oy, 7ada, 7afk, 7adf, 7adr, 7aek, 7agv, 7acy, 7agx, 7abb, 7aci, 7air, 7age, 8fu, 8wx, 8amf, 8apt, 8abm, 8bfm, 8cof, 8dlb, 9mm, 9dq, 9nf, 9bp, 9avu, 9abu, 9ase, 9awv, 9apf, 9aim, 9ami, 9azy, 9agn, 9ads, 9bkc, 9bez, 9bzi, 9bjk, 9bof, 8bxq, 9bup, 9ctr, 9czm, 9cpu, 9che, 9cvs, 9caa, 9cyy, 9dun, 9dte, 9dxy.

Crds on the qrk of my C. W. appreciated.

At 5ADB, 2117 Grant, El Paso, Texas

1cmp, 1pa, 2al, 2bsc, 2blp, 2cee, 2cla, 2gk, 3btl, 4fs, (4ft), 4gz, 4hs, 4oa, (5ajq), (5anc), (5amb), (5ado), (5akn), (5adv), (5ez), (5gj), 5kr, (5nn), (5ov), (5ts), (5ui), (5xb), (5za), (5zg), (5zh), (6aib), (6ahp), (6ajd), (6adh), (6bah), (6bjj), (6bur), (6chv), (6cgd), (6cbb), (6ccy), (6cnc), (6chz), (6gt), (6jl), (6nb), (6tf), 7co, 7hw, (7ob), 7wm, 7hc, 7lu, 7sn, 8coj, 8do, 8wx, 8zm, 8cci, 8yv, 8cp, 8bda, 8com, (9apf), 9axb, (9amb), (9bjk), (9bhd), (9bjc), (9bly), (9clq), (9czo), 9dcr, (9elv), 9qe.

Mex.: Bx, ax.

Spark—(6aud).

Following stations heard before 6 P.M.: 1bgq, 3iw, 4dx, 4gx, 5aic, 5aiu, 5ahr, 5alr, 5amb, 5amu, 5amw (fone), 5fa (fone), 5ft, 5je, 5jf, 5ei, 5ek, 5gj, 5ny, 5qw, 5rv, 5vf, 5yw, 5zu, 6bon, 6chv, 7zu, 8adk, 8bxx, 8cgw, 8dgr, 9amb, 9amu, 9avc, 9aim, 9bgh, 9bji, 9cfy, 9cdo, 9ccw, 9dug, 9djx, 9ehn, 9eky, 9ell, 9mc, 9uo, 9qw

Gld to qsl crds on above sigs if requested. Pse qsl our sigs.

By 3BMN, R. J. Carr, Petersburg, Va.

6ak, 6dc, 6fp, 6jx, 6lv, 6mh, 6mo, 6nx, 6pl, 6wt, 6zh, 6zr, 6zu, 6ach, 6ahf, 6ahu, 6ajh, 6aja, 6aos, 6auu, 6awt, 6bcl, 6beh, 6beo, 6bic, 6bin, 6bjj, 6bqe, 6brf, 6bua, 6buo, 6cfz, 6cgd, 6cgw, 6cmr, 6cnf, 6cpy, 6zah, 6zar, 6zbl, 7af, 7co, 7lu, 7qu, 7sc.

Can.: 1dd, 9bj. French: 8ab. Dutch: pa-9. English: 2sz. Anyone hearing my 50-watts d.c. C. W. plse qsl. All cards answered same day received. Anyone wishing a report card on the above will be furnished one for the asking.

By 1CMP, 32 Clarence Ave., Bridgewater, Mass.

5abh, 5adv, 5afq, 5aik, 5am, (5amf), 5amh, 5arn, 5dr, (5ek), 5ge, 5gp, 5gy, (5ht), (5in), 5kc, 5kn, (5kr), 5li, 5ll, 5lr, (5nn), 5nr, 5oh, 5ov, (5pb), 5qi, (5qy), 5rg, 5st, 5uj, 5uk, (5uo), 5vm, (6alv), (6aos), 6arb, 6aru, 6aua, (6awt), (6bbc), (6bcl), (6bpf), (6bvg), 6ceu, (6chl), 6ck, (6cmr), 6fp, 6gg, (6lv), 6nb, 6to, 6tu, (6xad), 6zah, (6zbk), (6zw), 6zz, 6zzb, 7agv, 7co, (7ln), 7ob, (7sc), (7wp), (7xt), 7ly, (7zt), 7zo. 71 nines worked. (French, 8ab), (European ko).

By Can. 3DU, D. L. Hutchinson, 424 Holton St., London, Ontario

4je, 4oi, 5bx, 5cm, 5he, 5ht, 5hy, 5jc, 5jh, 5jl, 5jw, 5ka, 5kc, 5kn, 5ku, 5lo, 5lr, 5ma (C. W. & fone), 5mq, 5nn, 5nw, 5ov, 5pn, 5ql, 5rg, 5rh, 5sk, 5sz, 5tc, 5uk, 5va, 5vf, 5xd, 5xk, 5yw, 5za, 5zg, 5zu, 5aar, 5abc, 5acf, 5ado, 5aic, 5akf, 5aki, 5akn, 5alj, 5amg, 5amk, 5amw, 5anv, 6ak?, 6cc, 6fp, 6gg, 6gr, 6gt, 6if, 6lv, 6lx, 6od, 6oh, 6ol, 6nx, 6pl, 6rn, 6zh, 6zu, 6aao, 6abk, 6acm, 6age, 6ahu, 6akz, 6anb, 6arf, 6auu, 6avv, 6awt, 6bic, 6bih, 6bjj, 6bjr, 6bql, 6brb, 6brf, 6buo, 6buy, 6bve, 6bwe, 6cdg, 6cfz, 6cgd, 6cgg, 6cgw, 6cjb, 6ckr, 6cmr, 6cmt, 6xad, 6zah, 6zar, 6zbi, 6zbu, 7aw, 7co, 7fq, 7mw, 7nt, 7ot, 7qc, 7qd, 7qu, 7sf, 7ws, 7zl, 7zu, 7abb, 7adh, 7ahv, 7aod, 9amb, 9auy, 9avs, 9bji, 9bjk, 9bkf, 9bvo, 9cde, 9czg, 9dfh, 9dte, 9eae, 9eea.

Can.: 4cl, 4cr, 4dy, 4ea. Mex.: bx, ng?, (qra?).

Jan. 13, '24, from 8:13 p.m. to 10:07 p.m. E. S. T.—4db, 5ac, 5nv, 5zu, 5adb, 5alj, 6cc, 6gt, 6lx, 6nx, 6oh, 6abk, 6acm, 6age, 6anb, 6arf, 6awt, 6avv, 6bjj, 6bql, 6buy, 6bwe, 6cdg, 6cgw, 7qc, 7ws, 7zl, 7abb, 9amb, 9bof, 9bkf, 9cde, 9dfc (fone), 9dte.

Jan. 28, from 8:28 p.m. to 10:28 p.m. E.S.T.—4bg, 4je, 5he, 5jc, 5jl, 5ka, 5kr, 5ml, 5wk, 5afq, 5aju, 5alj, 6gr, 6fp, 6if, 6lv, 6nx, 6od, 6rn, 6zh, 6aao, 6akz, 6arf, 6auu, 6brf, 6cgg, 6cgw, 6zah, 6zbi, 6zbu, 7co, 7ft, 7nt, 7ot, 7qd, 7qu, 7sf, 7ahv, 9dte.

All 6's and 7's logged during silent periods. All cards will be answered promptly.

By 6CEU, Hilo, Hawaii

C. W.—1akl, 1yb 1ze, 1fd, 1bep, 1xm, 2by, 2afp, 2bqu, 2awf, 2ts, 2aed, 3bvn, 3bva, 3ni, 3bnu, 3ccu, 3uw, 3oh, 3lg, 3tb, (4cl), 4hf, 4fn, 4ft, 4ay, 4cw, 4mb, 4eq, 4cr, 4kz, 4hz, 4fs, 5hz, 5aec, 5alu, (5amu), (5ht), 5ql, 5zav, 5akf, 5eh, 5xt, 5zax, 5qf, 5fj, 5adw, 5aes, 5fx, 5rm, 5ce, 5aic, (6chl), (6aos), (6auy), (6bff), (6biq), (6auu), (6bih), (6afz), (6cgd), (6ajf), (6cbb), (6zbk), (6acm), (6ux), (6buy), (6age), (6alv), (6akz), (6ckc), (6ahu), (6li), (6ccy), (6cjj), (6fh), (6cid), (6arb), (6zbn), (6aru), (6anb), (6cmr), (6gt), (6cbe), (6ckp), (7sc), (7bj), (7ks), 7co, (7qt), 7lh, (7iw), 8xan, 8abm, 8sr, 8bcp, 8jy, 8bqi, 8rv, 8bkk, 8px, 8bzd, 8bul, 8bju, 8tr, 8adg, 8wx, 8dld, 8ld, 8ef, 8bqi, 8agp, 8jj, 8cpx, 8cyu, 8zz, 9ahz, 9ckd, 9ccz, 9aon, 9cmk, 9cyf, (9eky), 9bqy, 9ehj, 9ck, 9dnd, (9dli), (9bg), (9bri), (9dug), 9bez, 9ayj, 9eq, 9dxu, 9bof, 9ih, 9ebt, 9aey, 9ap, 9qr, 9drw, (9vm), (9aep).

Can.: 3ni, (4cl), 4hf, 5go, 3oh, 4cw, 3ds.

North Pole: (wnp).

BRD: kdka, cfcn, (iccw wbwa), whaz, whb, kgw, wdaf, wlag, wdap, Honeycombs and 1 step used hr. 15 watts d.c. C. W. My time is on every nite, any time, QSR anywhere.

At 7ZU, Polytechnic, Mont.

1aw, 1adk, 1ajp, 1akl, 1ana, 1bcn, 1bes, 1bj, 1bgg, 1cnu, 1hw, 1ji, 1jv, 1kc, 1kx, 1ml, 1mm, 1rz, 1ts, 1uk, 1xw, 1vb, (1yb), 1yk, 2agb, 2awf, 2ajk, 2azy, 2baq, 2bgy, 2bte, 2cei, 2cpd, 2cpt, 2cys, 2dy, 2gk, 2rk (spk), 2qv, 2ts, 3ab, 3adp, 3aqr, 3arm, 3bco, 3bk, 3bn, 3bq, 3bta, 3cah, 3cgn, 3cwx, 3fa, 3gc, 3hg, 3iw, 3lq, 3me, 3oi, 3pg, 3sl,3ti, 3vm, 3wh, 3zl, 4abu, 4ah, 4af, 4aw, 4ay, 4bcj, 4bk, 4cau, 4cr, 4cy, 4ce, 4ee, 4er, 4ft, 4gr, 4io, 4it, 4iu, 4jk, 4nr, 4oh, 4pb, 4qf, 4ql, 4qr, 4ru, 4ti, 4xj, 4xt, 5aac, 5adc, 5afq, 5ago, 5ahd, 5ahr, 5aiu, 5aiv, 5ajb, 5ajd, 5ajq, 5akf, 5aki, 5akn, 5amu, 5ans, 5bc, 5bn, 5bon, 5ce, 5dr, 5ef, 5ek, 5fj, 5gg, 5hw, 5in, 5je, 5jc, 5jf, 5jv, 5kl, 5kx, 5lq, 5lr, 5nn, 5na, 5ng, 5mm, 5oa, 5pa, 5ph, 5px, 5py, 5ql, 5qy, 5ro, 5rw, 5tj, 5tm, 5tw, 5ud, 5uf, 5up, 5vf, 5vg, 5vn, 5wa, 5xa, 5xb, (5zav), 6aaq, 6aay, 6acm, 6adm, 6afg, 6age, 6ah, 6ahu, 6aja, 6aju, 6ak, 6aln, 6anb, 6ang, (6ao), 6aob, 6aol, 6aos, (6arf), 6arq, 6aru, 6atn, 6aut, 6auu, 6avh, (6avv), 6bdt, 6bef, 6bgc, (6bic), 6bih, 6bir, 6bjj, 6blg, 6blh, 6blm, 6blw, 6bm, (6bnt), 6bpz, 6bqe, (6brf), 6brk, 6brt, 6bu, 6buo, 6buf, 6buh, 6bum, 6bun, 6bur, 6buy, 6bwu, 6caf, 6caq, 6caw, 6cbb, 6cbe, 6cbw, 6ccy, 6cdg, 6ceb, 6cek, 6cfj, 6cfs, 6cfq, 6cfy, 6cgd, 6cgw, 6chn, (6chv), 6cjd, 6cjj, 6cju, 6ckr, 6ckx, (6cmr), 6cmu, 6cnc, 6dat, 6ea, 6en, 6erk, 6fm, 6fy, 6gr, (6gt), 6jx, (6lv), 6mf, 6mh, 6nx, 6ol, (6pe), 6su, 6tn, 6vf, 6wt, (6xad), (6zai), 6zam, 6zar, 6zf, 6zl, 6zp, (6zu), (6zw), (7abb), 7aby, (7aci), 7ack, 7ads, 7aek, (7afm), 7afo, (7agf), (7agv), 7ahs, 7ahw, 7aiy, (7ajd), (7ajp), 7ajy, (7ak), 7ald, 7ana, 7arv, 7bo, 7br, 7bz, (7co), 7dr, 7em, 7fa, 7fb, 7fl, 7fo, 7fp, 7fy. (7hf), 7hi, 7ip, 7iw, (7jf), 7kr, 7ln, 7iq, 7lu, 7ly, (7mp), 7no, (7nt), 7ob, 7oc, 7om, 7oy, 7pg, 7qd, 7qt, 7qu, 7rp, 7sc, 7sh, 7sn, 7so, 7to, 7vn, 7vs, 7wm, 7xaf, 7xuf, 7ya, 7yl, 7zf, (7zo), 7zz, 8acn, 8aff, 8aeg, 8agp, 8agt, 8aic, 8ajd, 8ak, 8alt, 8aol, 8anm, 8apt, 8aqa, 8asr, 8asv, 8ath, 8av, 8avt, 8bah, 8baq, 8baz, 8bbm, 8bbt, 8bbw, 8bbx, 8bci, 8bda, 8bdr, 8bf, 8bfm, 8bix, 8bjv, 8bmg, 8bow, 8bpa, 8buf, 8buv, 8bwk, 8bxa, 8bzc, 8bzd, 8bzf, 8cca, 8ccq, 8cfo, 8cgj, 8cke, 8clf, 8cm, 8cmc, 8cmt, 8cmy, 8ces, 8cfo, 8cj, 8cgj, 8cjd, 8cke, 8clf, 8cm, 8cmc, 8cmy, 8co, 8com, 8cp, 8cqj, 8crf, 8crk, 8crn, 8cry, 8cse, 8csk, 8cun, 8cvx, 8cwk, 8cwr, 8cww, 8cx, 8cya, 8cyu, 8czy, 8da, 8dax, 8dcy, 8dd, 8ddo, 8dg, 8dgp, 8dis, 8dkm, 8dlm, 8dlt, 8duj, 8efn, 8el, 8es, 8fc, 8fm, 8fu, 8hn, 8gz, 8jj, 8kg, 8lv, 8oa, 8oi, 8pl, 8pv, 8rg, 8rj, 8rm, 8rn, 8ro, 8tt, 8tv, 8uf, 8up, 8bg, 8bv, 8bz, 8wl, 8xan, 8xx, 8xv, 8yn, 8yv, (8zz), 9abt, (9acs), 9ad, 9aec, 9aem, 9aey, 9aft, 9agl, 9ahz, 9aib, 9al, 9amx, 9ana, 9anq, 9aoc, 9aod, 9aom, 9aou, 9ap, 9apf, 9aps, 9aqk, 9ar, 9arg, 9aua, 9aun, 9abz, 9axb, (9ayd), (9ayl), 9bal, 9bax, 9bcb, 9bcf, (9bg), 9bje, (9bjk), 9bkp, 9bof, 9bop, 9bpu, 9bqy, 9bri, 9brs, 9bsx, 9bu, (9bvn), 9bwc, 9bxj, 9cmk, 9cmn, 9cms, 9cmt, 9cny, 9cot, (9col), 9cow, 9csy, 9cu, 9cuc, 9cwz, 9czm, 9czw, 9dav, (9day), 9den, 9deq, 9djp, 9djq, 9dk, 9drb, (9dky), 9dnv, 9dsv, 9dxn, 9dxu, 9dyy, 9dzf, 9ee, 9ecn, 9efx, (9eil), 9ell, (9elv), 9eq, 9fm, 9gy, 9hn, 9if, 9la, (9ur), (9bm), 9wi, 9xat 100 meters, 9yu, 9yy, 9zl.

Can.—2hg, 3gg, (3ws), 4ca, (4cl), 4cm, 4cn, 4cr, 4cw, 4dx, 4er. (4hh), (5go), (9bx) fone. French—8ab, 8am or n.

B. C. Stations: Can.—ckck, cfac, cfcn. U. S.—kdef, kdka, kfaf, kfai, kfck, kffq, kfi, kfix, kfjc, kfkf, kgo, kpo, wac, wcaf, wcal, wdap, wfaa, wgaf, whaz, wjaz, wlw, wmaq, wpas, wsat, wtas, pwx.

By 6BUO, J. H. Humbrock, 1344 E. Mariposa Ave., Los Angeles, Calif.

U. S.—C. W.: (2rk), 4cs, 4cl, 4ft, 4ku,4oa, 4kf, 4sc, 5bp, 5be, 5ct, 5cy, 5dw, 5ek, 5fm, 5fx, 5ga, 5gj, (5ht), 5in, (5jf), (5kc), 5lr, (5lg), (5ql), 5rv, 5sk, 5sd, 5tj, 5ui, 5uo, 5vm, 5yg, (5za), 5zb, 5zh, 5zp, (5adb), 5ana, 5akn, 5amh, 5aif, 5akf, (5aac), 5ahd, 5aky, 5aeh, 5xap, 5xac, (5zav), (5zax), 6ceu, (7ak), (7bj), 7co, (7dc), (7em), 7eb, 7ez, 7fd, 7fq, 7fy, 7fl, 7gi, 7gp, (7hg), 7hw, 7iw, (7io), 7jd, 7ks, 7lr, 7ly, (7ln), 7nc, 7nt, 7om, 7ob, (7oh), (7ot), 7pj, 7qc, 7qd, (7qj), (7qt), 7qu, (7ra), (7sc), 7sf, (7sh), 7sn, 7sy, 7to, 7ve, 7ws, 7wm, 7yl, 7ze, 7zl, 7zb, (7zu), 7zr, 7zx, 7ags, (7agu), (7akt), (7akk), 7agv, 7ads, 7ael, (7aci), 7abb, 7agr, 7agf, 7aek, 7alk, 7akh, (7aea), 7afo, 7aiy, 8aa, 8bt, 8fu, 8gz, 8gh, 8hn, 8hv, (8oa), (8pl), 8vy, 8wx, 8xe, (8zy), 8aaj, 8avt, 8acn, 8apn, 8aku, 8axc, (8abm), 8bch, 8bfh, 8bqi, (8bda), 8bhf, 8cjl, 8cpp, 8cve, 8dgp, 9ba, 9cr, 9ei, 9eq, 9fp, 9fs, 9fm, (9gd), (9lw), 9kp, 9mc, 9ox, (9ss), (9vm), 9xi, 9yy, (9zt), 9zv, (9zy), 9aav, 9ach, 9ahz, 9aic, 9aim, 9alg, 9amc, (9amb), (9ami), 9amv, 9amf, (9any), (9apf), (9aps), 9aqd, 9auw, 9avs, (9avu), (9awv), 9azg, 9bak, 9ban, (9bdu), 9bed, 9bey, (9bez), (9bhi), 9bik, (9bji), 9bjk, (9bly), 9bof, 9bri, 9brx, 9bun, 9bwv, 9bxg, 9bxm, 9bxq, 9bzi, (9caa), 9ccz, 9ccs, 9cde, (9ceh), 9cea, 9cfi, 9cip, (9cjy), 9cks, 9cld, 9cle, 9clq, 9cns, 9cpu, 9cte, 9cuv, 9cvc, 9cvs, 9cvk, 9cxb, 9cyp, 9czg, (9day), 9adfh, 9dhg, 9dkb, 9dlm, (9dqu), 9dsg, (9dte), (9dug), 9dve, 9dxy, 9dyz, 9dzy, 9edb, 9eea, 9eer, (9eky), 9ejz, 9xaq.

Can.—C. W.: 3oh, 4cn, 4cb, 4dy, (4hh), (5cn), (5go), 5ah, 9bp

U. S. kdef on 220 meters (qra?). Stations over 1500 miles pse qsl to 6BUO sigs.

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Continued from page 48

At 5JF, San Angelo, Texas.

1af, 1acx, 1akl, 1awe, 1bd, 1bgf, 1bgq, 1caz, 1cdo, 1cmp, 1cpn, 1er, 1gv, 1jv, 1mv, 1pa, 1xg, 1yb, 1ze, 1zl, 2be, 2blp, 2cee, 2oj, 2opq, 2crp, 2cwj, 2el, 2kf, 2le, 2rk, 2ts, 3aa, 3ack, 3aor, 3bg, 3bqu, 3buy, 3cor, 3dz, 3fc, 3go, 3hh, 3lg, 3lx, 3qv, 3rv, 3zo, 4af, 4ag, 4ay, 4ba, 4bk, 4by, 4cl, (4db), 4er, 4fg, 4fs, 4ft, 4gw, 4gx, 4gz, 4hh, 4hs, 4it, 4iz, 4mb, 4oi, 4pb, 4pk, 4qf, 4ql, 4qw, 4rf, 4ru, 4xj, 6aaq, 6age, 6agk, 6ahu, 6aib, 6aja, 6aju, 6akz, 6alv, 6alj, 6anb, 6ao, 6aos, 6arb, (6aru), 6atn, 6auu, 6avv, 6baf, 6bbc, 6bcl, 6bel, 6fg, 6bjq, 6bbj, 6bjr, 6blg, 6bm, 6bnc, (6bpi), 6bpz, 6bqe, 6brf, 6brk, 6bsh, 6bsq, 6bts, 6buo, 6bur, 6buy, (6bwd), 6bwu, 6cbb, 6cbe, 6cbw, 6ccg, 6cdg, 6cei, 6cej, 6cek, 6cfs, 6cfz, 6ckr, 6cmo, (6cmu), 6cng, 6cnl, 6cqe, 6gg, 6gr, 6gt, 6ja, 6kw, 6lw, 6lx, 6qj, 6rn, 6tf, 6vf, (6xad), 6yb, 6yc, 6zax, 6zb, 6zh, 6zu, 6zx, 7ads, 7agv, 7akh, 7co, 7fy, 7hg, 7hw, 7iw, 7ot, 7qu, 7ry, 7sy, 8aa, 8acn, 8afd, 8afl, 8ahq, 8aih, 8aje, 8anb, (8anm), 8apn, 8apt, 8atc, 8atp, 8avt, 8azm, 8bau, 8bci, 8bda, 8bdm, 8bju, 8blg, 8bmb, 8bmy, 8bnn, 8bqi, 8bt, 8bzd, (8cdz), 8cqu, 8clf, 8clk, 8com, 8cp, 8cqj, 8crf, 8crn, 8cse, 8ctp, 8cum, 8cus, 8cwr, 8cxu, 8czz, 8ddc, 8dfw, 8dgj, 8dhn, 8fc, 8fm, 8ii, 8jo, 8kj, 8oa, 8oe, 8om, 8oz, 8pd, 8pl, 8qa, 8rj, 8rn, 8tt, (8uy), 8wg, 8xaw, 8yae, 8yv, 8zc, 8zz.

Canadians: 2bg, 3ge, 3pz, 4ea, 4eq, 5go, 9bj.

Mexican: (BX)—Wi, qsl, to any of above. qsl if u hr my 10 watt cw.

By 9CKM, Kansas City, Kansas

1er, 1gy, 1ii, 1jv, 1jx, 1lc, 1oa, 1va, 1wo, 1ws, 1asp, (1aol), 1ary, 1aua, 1aur, 1awy, 1axo, 1bcg, 1bes, 1bhm, 1boq, (1bsz), 1cab, 1cal, 1cki, (1cpn), 1bqi, (1yb), 1zd, 1zh, 2al, 2bj, 2by, 2fz, 2gk, 2hs, 2lg, 2rk, 2rm, 2ts, 2wb, 2afp, 2aqy, 2awf, 2ayv, (2bqh), 2brd, 2bte, 2bue, 2cnk, 2ccd, 2cee, 2cla, 2clu, 2cor, 2cua, 2cwp, 3ba, 3cc, 3de, 3dz, 3gg, 3ir, 3jy, 3ko, 3lg, 3mb, 3me, 3mp, 3ms, 3oe, 3of, 3ov, 3ph, 3rg, 3tr, 3abj, 3adp, 3aek, 3ahd, 3aqr, 3bdo, 3bpu, 3bdz, 3bei, 3biz, 3bjk, 3blp, 3bmn, 3bss, 3btu, (3bva), 3bvn, 3ccd, 3cdv, 3cfi, 3cjn, 3crr, 3cqz, 3yv, 3zh, 4ay, 4fz, 4gl, 4gz, 4hr, 4hs, 4hw, 4ih, 4it, 4iu, 4jk, 4mb, 4na, 4nv, 4oa, 4om, 4pd, 4pk, 4rh, 4th, 5aa, 5bx, 5ek, 5fm, 5gm, 5jc, (5jf), (5kc), 5kd, (5lr), 5nz, 5pf, 5ph, 5qd, 5ql, (5qw), 5sd, 5sr, 5ua, (5ud), 5uk, 5uo, 5vf, 5xd, (5xv), (5yw), 5za, 5aac, 5aat, (5abg), 5aby, 5acm, 5avb, 5adc, 5ade, 5adh, 5ado, 5afh, 5afq, 5aih, (5aiu), 5asp, (5akn), (5alx), 5amh, 5amk, 5amw, (5xaq), 6ak, 6dd, 6fp, 6fy, 6gr, 6lv, 6mb, 6mh, 6nx, 6pl, 6rm, 6rn, 6vf, 6aao, 6aaq, 6acm, 6afq, 6agk, 6aja, 6ajh, 6ajv, 6akz, 6ani, 6aos, 6ape, 6atq, 6auu, 6auw, 6awb, 6awq, 6awt, 6awx, 6bah, 6bbc, 6beo, 6bbew, 6bfg, 6bfh, 6bic, 6bih, 6bin, 6blg, 6blm, 6bln, 6bng, 6bon, 6bpm, 6brf, 6bum, 6bun, 6cdn, 6cgw, 6che, 6chu, 6ckr, 6clk, 6cmr, 6cmf, 6zh, 6zv, 6zah, 6zar, 6zbn, 7af, 7ah, 7br, 7co, 7dc, 7fd, 7kk, 7lu, 7ny, 7ot, 7qc, 7qd, 7sc, 7adh, 7afx, 7agv, 7ahv, 7aif, 7aip, 7ajd, 7ajd, 7ajt, 8bq, 8cr, 8ct, 8dc, 8dp, (8es), (8jj), 8mt, (8oa), 8oe, 8pl, 8pt, (8rr), 8ve, 8wa, 8wx, (8abl), 8act, (8aeg), 8aga, 8agp, 8aic, 8alf, (8alw), 8ape, 8apn, 8apt, 8atp, 8azo, 8bbn, 8bbw, 8bcj, (8bda), 8bdu, 8bgr, (8bgh), 8bgq, 8bho, 8bkk, 8bnh, 8bqi, 8cap, 8cdz, 8cko, 8ckv, 8cop, 8crc, (8cse), 8cvh, 8cvx, 8cwr, (8cwu), 8cxi, (8cyt), 8czz, 8daa, 8dag, 8dat, 8dcb, 8ddc, (8ded), 8ddn, (8dfv), 8dfz, (8dgo), 8djp, 8dtt, (8xe), 8xbi, 8yn, (8yw), 8zc, 8zz.

Can.: 1ci, 2am, 2be, 2bg, 3aa, 3ac, 3bq, 3he, 3hi, 3ly, 3mn, 3pz, 3wg, 3yh, 3yv, 4ea, 4hh, 5cn, 5go, 9bp, 9bx.

By 7AIX, Sam Spittle, 284 Irving Ave., Astoria, Ore.

5ado, 5ahr, 5amw, 5nk, 5pb, 5zav, 8amm, 8bv, 8cpd, 8pd, 8oz, 9adf, 9aej, 9aim, 9and, 9apf, 9apw, 9apk, 9awv, 9bak, 9bcb, 9bqq, 9bly, 9aua, 9bri, 9bzi, 9caa, 9ccv, 9ccz, 9clq, 9cly, 9cjc, 9cbj, 9cns, 9cr, 9ctd, 9did, 9dli, 9doc, 9dvu, 9ee, 9ebt, 9ekf, 9edb, 9fm, 9qr, 9vf, 9yy, 9zt.

Alaskan: 7mn. Can.: 3ni, 3tf, 4cl, 4cn, 4cq, 4ct, 4cw, 4dy, 4ea, 4er, 4dq, 4fn, 4hf, 4hh, 4io, 9bx.

By Fenlon Quigley, 645 Polk Blvd., Des Moines, Iowa

C. W.—4oi, Can. 9al*, Can. 9bx*, 9xw, Can. 9bx*.

Fones—5amw, 5ek, 5qd, 5ma, 5ml, 5zs, 8ab, 8kg*, 8zz*, 9abx, 9bbp, 9bis*, 9bkl, 9clh*, 9dnx*, 9dxb, 9dxn*, 9ebt.

*Confirmed.

At 9CA, Dwight, Ill.

1adn, 1af, 1afa, 1aiq, 1ajp, 1ajx, 1akl, 1alj, 1ary, 1bdi, 1bgq, 1bsz, (1cab), 1cdo, 1cgq, 1ij, 1oa "lq", 1xam, 1xw, 1xz, 1yb, 6aak, 6adh, 6ahu, 6arb, 6arf, 6aua, 6avr, 6awt, 6bic, 6blg, 6bru, 6bur, 6cbd, 6cbg, 6cgw, 6chv, 6gt, 6li, 6pl, 6rm, 6rn, 6xad, 6zah, 6zp, 7afk, 7aim, 7cf, (7co), 7eb, 7fq, 7hc, 7ih, 7ly, 7qc, 7vm.

Can.: 3aa, (3ad), 3ada, 3fo, 3gc, 3nj, (3qs), 3yv, (4ea). French 8ab often. QRK my 10-watts! Pse QSL. Every station heard is logged complete.

By 6CMM, 775 19th Ave., San Francisco

1bk, 1cmp, 2rk, 3lg, 3cc, 4bs, 6aoh, 7pf, 7jy, 8bgs, 8ve.

Continued on page 78

THE ENCHANTED JACKASS

Continued from page 52

"Dos pesos," says Jimson holdin' up a couple of U.S.A. bucks.

"Si," says the bozo, chuckin' the woollies and comin' over with a grin.

Jimson writes out a message to Ramirez, who was chief frijole in them parts, askin' would he mosey over the line that night, whilst the Tex rangers was out to dinner, for a little palaver.

"Cavite!" says he, and the bimbo tucks the message in his sombrero and fades.

"Bueno," says Jimson. "Now me and you gets busy. First off we gotta have a jack."

Well—I picks out a couple of onery lop-ears we has staked out back. They was the dumbest jacks I ever seen. There was one with a wide face, Pedro, which was quite rugged as compared with Anastasia which was some weak until stood behind.

"Boot him up here, Bud," says Jimson, "Whilst I sees is he got any static."

I does and we starts work. The first thing we uncrates was a loud speaker with a tin horn.

"Say," says Jimson, "there's libel to be some of them Mex mucklucks that knows this here by sight. We got to disguise it some way."

I studies the situation.

"He's got a most gosh-awful spread in the jaw," I says. "If it was cut down some," I says, "we might—"

"Good," says Jimson. "We could at that."

He digs out a pair of shears and we cuts down that horn so's it aint so long. Then I pries open the jack's face with my Colt six and Jimson slips in the horn and a receiver which was fastened to it.

"Lemme tie that in," I says. "Them jacks gets to coughin' sometimes and I aint aimin' to go over in Montana to get back that there horn," I says.

We lashes him fore and aft. Pedro looks kinda reproachful but he don't say nothin'. He's that used to eatin' cactus and other kinds of Mex food, he thinks maybe we got some new way of feedin' him. An' anyhow he's too lazy.

"Here's hopin' he don't fall down an' bust that horn," says Jimson. "Better stick a two-by-four under him."

I done so and we goes on unpackin'. There is a classy radio set, and a fancy fly-swatter which is marked "loop" and a lot of wires. Jimson and me savveys a little bit about it, and we shortly has it hooked up. We braids the wires from Pedro's horn into his tie rope and leads 'em around behind the shack and into the window.

"We're all set," says Jimson, "providin' Fate don't deal us no rough stuff."

Such was the status quo of the situation when General Ramirez tamale-in-chief of the rebel boys, comes ridin' down

Continued on page 54

TELEDYNE

TELE means distance.
DYNE means power.

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Alexander & Lavenson, San Francisco,
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Pacific Coast Representative:
J. I. Hermans, 585 Mission St. San Francisco.

Ask Your Dealer to Demonstrate

Cutting and Washington

Tell them that you saw it in RADIO

Continued from page 52

from the foothills with some of his help, on them foolish lookin' Mex cayuses. I lets Jimson do the palaverin' owin' to him havin' rode through the university of San Leandro and bein' quite fluent with verbs.

"Stamos!" says Gen, fallin' off his sheep and comin' forward. He is a bandy-legged little runt with a fierce look and a weepin' Lazarus hangin' from his upper lip.

"Hasta peruna!" says Jimson, snappin' him a first-sarg with the elbow. "Como la revolution?"

"Oh—fair to middlin'," says His Nibs. "We're doin' our noble best for El Liberador," he says. "But that damn Obregon—he is all over the place."

Jimson nods.

"I savvey how it is," he says. "I used to hobo on the S. P. There's a marshal at Mojave who's the same kind of hombre. Never mind—we got an ijea—me and my partner—this dog-faced object standin' on my left. If it works, we're gonna show Obregon somethin' he never saw.

The General bowed and helped himself to our cigarettes.

"The Senor is mos' kind," he says. "But I have the doubts. What has the Senor up the sleeves?"

"El garanon encanto!" says Jimson, "or in good old U. S.—the enchanted jackass."

Gen looks kinda startled, bein' superstitous like all them battlin' mavericks.

"No sabe," he says.

So Jimson explains.

"We have captured the famous 'el garanon encanto'," he says. "The garanon that sings in the hills, the garanon from whose throat comes the strains of martial music, who speaks in a strange tongue like a human being. In fact," he says, "this is the garanon called 'El Diablo'—the devil. You remember the tradition—he who owns a garanon encanto shall be king of men?"

I looks at Jimson and right away I tumbles that he's makin' up a nice fresh tradition to fit the situation. But Gen falls for it hard.

"Santa Columbo!" he says.

"Would you have proof?" asks Jimson. "Then watch!"

He goes off behind the cabin and returns leadin' Pedro, the dumbest jackass south of the Platte river. Pedro is perfectly content seems, and suckin' away on his little tin horn. Jimson is careful to keep him back so's Gen couldn't see what he had in his mouth. I tumbles that the time is ripe, so I goes into the back room and switches on the radio set.

We aint got a program down there and I just takes a chance. As it happens, luck is with us. Gen is lookin' out the door with the light behind him, with Jimson standin' beside him. Pedro is

Continued on page 56

Continued from page 54

about twenty feet away and the rebel guard is lying around smokin' and keepin' an eye out for Tex rangers.

Suddenly Pedro opens up with his tin dinkus.

"Radio KHJ," says he in a perfect burro-contralto. "This is the broadcasting station of the Los Angeles Times, at Lohs Angeles, Caleefornia," says he.

General Ramirez sucks in his cigarette, sparks and all.

"Santa Paula Obispo claro!" says he, grabbin' Jimson.

"The first selection will be La Spittoonia from Expectoration" says Pedro, switchin' his tail, and cuttin' in with a piano.

As the first notes comes toodlin' out of that jackass' throat there is a wild scramble among the Mexican help. Some makes the cayuses. Others doesn't stop for no such thing as a hoss, but just starts streakin' it for Mexico City. In ten seconds there wasn't nothin' there but Jimson and me and Pedro, in the moonlight with a couple of coyotes sittin' over on a sand-dune, makin' side bets on which of us was the better eatin'. I never seen so much getaway in so little space.

Jimson slaps me on the back.

"Great stuff", he says. "Turn her off Bud, and we'll give the animal's face a rest. They won't be back tonight!"

Jimson turns out to be a fair-sized prophet. None come back like he said, and we puts in the night figgerin' out ways and means of fittin' Pedro to the indignities of war, as it were.

"If we sells him, as is", says Jimson, "we got to go along with him to work him. Furthermore we got to keep him stabled clost to a shack", he says, "so's we can work the radio".

"None such mince meat", I says. "That aint my ijea at all. This here jackass is gonna be a self-workin' broadcaster", I says "with no end losses. He packs his own power-house, and shuts down when he gets ready. He's the only brainless thinkin' jackass in creation".

"No" says Jimson, "there's two of you, but's he's the most reasonable".

I lays down some more cards, the which I has thought out a heap careful.

"We fixes the radio set on his pack and covers it up with blankets", I says. "Then we sets up a loop on his back and tunes her in for coarse work. After which we leaves her all set and goin'. The rest is up to Nature. Them batteries ought to run for two days anyhow," I says.

"How much are you figgerin' to get for this here self-talkin' mule?" he requires.

"Well I aint no Crocus", I returns. "But one grand-kale of the rellum ought to be cheap", says I. "That's the regu-

lar market price for jackasses encanto", I opines.

Jimson does some figgerin'.

"U.S.—not Mex?" I cuts in, gettin' his drift.

"Oh", says he. "That aint so worse in that case. We paid two hundred for the radio set. That leaves us four hundred apiece—not so worse, not so worse!"

We turns in at that and waits for the dawn's early light, which comes about sun-up as usual.

Shortly thereafter or sooner, we sees a couple of Gen's boys comin' over the hill. They was in plain clothes, which means they was barefooted instead of in boots. They seems a heap surprised we was alive and eatin' beans from a tin dish, and inquires most polite after our noble jackass.

We says he's doin' as well as could be expected, and that he's away just at present getting his enchant charged up for another night's work. That seems to satisfy 'em and we gets down to business. Seems they was ministers extraordinary, accordin' to what they said. They sure looked it and I said so. Jimson gives me a shut-up sign and I cuts down the gas.

"How much for garanon? One thousand iron men in the mitt!"

They argues the matter. But Jimson knocks 'em clean over.

"Senors", he says, "I'd like to give you boys a discount", he says. "But El garanon ast me special not to let him go for no less! You see how it is!"

That rolled 'em for a ghoul. They would have gone up against me and Jimson any time. But arguin' with a jack that spouts music on a hillside was kinda stiff stuff.

"I wouldn't want to make him sore none", says Jimson, throwin' in a high-powered clincher.

They nods kinda thoughtful and reckons that it might be all right after all. They leaves sayin' they would report to Gen and we counts the jack as good as sold. Which he was.

The deal is closed official, late that afternoon. Gen doesn't come hisself, but some of his prime ministers and a couple of cabinets drops over. Each was told to watch the other and shoot the guy with the money if he cut and run. General killin' was avoided, howsomever, by him bein' honest, and sundown sees us with the said kale in our jeans and a escort all ready for Pedro which we was to deliver in person.

We tells the guard that el garanon never shows until after sundown for reason of his own, and they eats it up. We has Pedro stabled in a back room, kinda surprised but otherwise comfortable, keepin' him hid until time for him to come on the stage as it were. Jimson keeps the guard busy whilst I gives him a finishin' touch.

Just before the light goes dim, I opens a can of paint which is used for paintin' numbers on doors so's the husband of the family can find his way home. I aint a heap strong on Mex lingo, but I does right fair.

"They always yells 'Viva' when they wins", I says to myself. "So that ought to look right purty."

Which sayin', I letters that jack on the flanks with as nice a 'viva' as was saw down there for some time. Even Jimson was surprised when it comes time for us to boost Pedro through the back window and lead him round front.

The guard is sittin' around gruntin' at each other when they gets a lamp at Pedro. He's got his horn hid in his gizzard, his pack, and his loop sittin' up on top. Just for luck, I ties on an old pair of cow horns we has handy and he sure was a plumb curious lookin' animile.

"Madre de Dios!" shrieks a guard, and they begins backin' away toward the horses.

"Needn't be so blamed scarey", says Jimson. "El is a good ol' scout, he is", he says, "as long's you treat him right".

He pats Pedro on the nose and wakes him up. Then he makes a speech, the royal guard stayin' back as far as they can get.

"El Diablo", says he. "You go now to aid the cause of freedom, alias liberador. You got a grave responsibility on your honored spine", says he, "and God help you if you busts any of radio-frequency tubes", he says, "because you sure are gonna get slammed, encanto or no encanto. And remember this — you ornery slab-sided hunk of dumbness— don't roll over or you'll scramble the works".

The guards was all crossin' theirselves and tryin' to look like they was elsewhere. One polite hombre had his sombrero off just in case El happened to be lookin' his way.

"Lead on", says Jimson. "We go to bust the cause of freedom high, wide and handsome", he says.

He looked plumb noble in the ingrowin' moonlight and I thinks of General Grant at Waterloo, defying the Trojans.

"Horatius had nothin' on that maverick when it comes to slayin' the Philippines", I thinks, and carries on.

The guards takes the lead and we hits out on hossback for Chile or some place south, me leadin' Pedro. Jimson rides up alongside.

"Bud", he says, "them 'vivas' of yourn sure light up the scenery. I hopes there's nobody abroad in Reno or Kansas City", he says, "or we're gonna be saw sure".

"Wait 'til it gets real dark", I says. "I've read orders from the c.o., by a watch face", I says, "and this here jack is a whole watch works".

Two hours travellin' and we hits a

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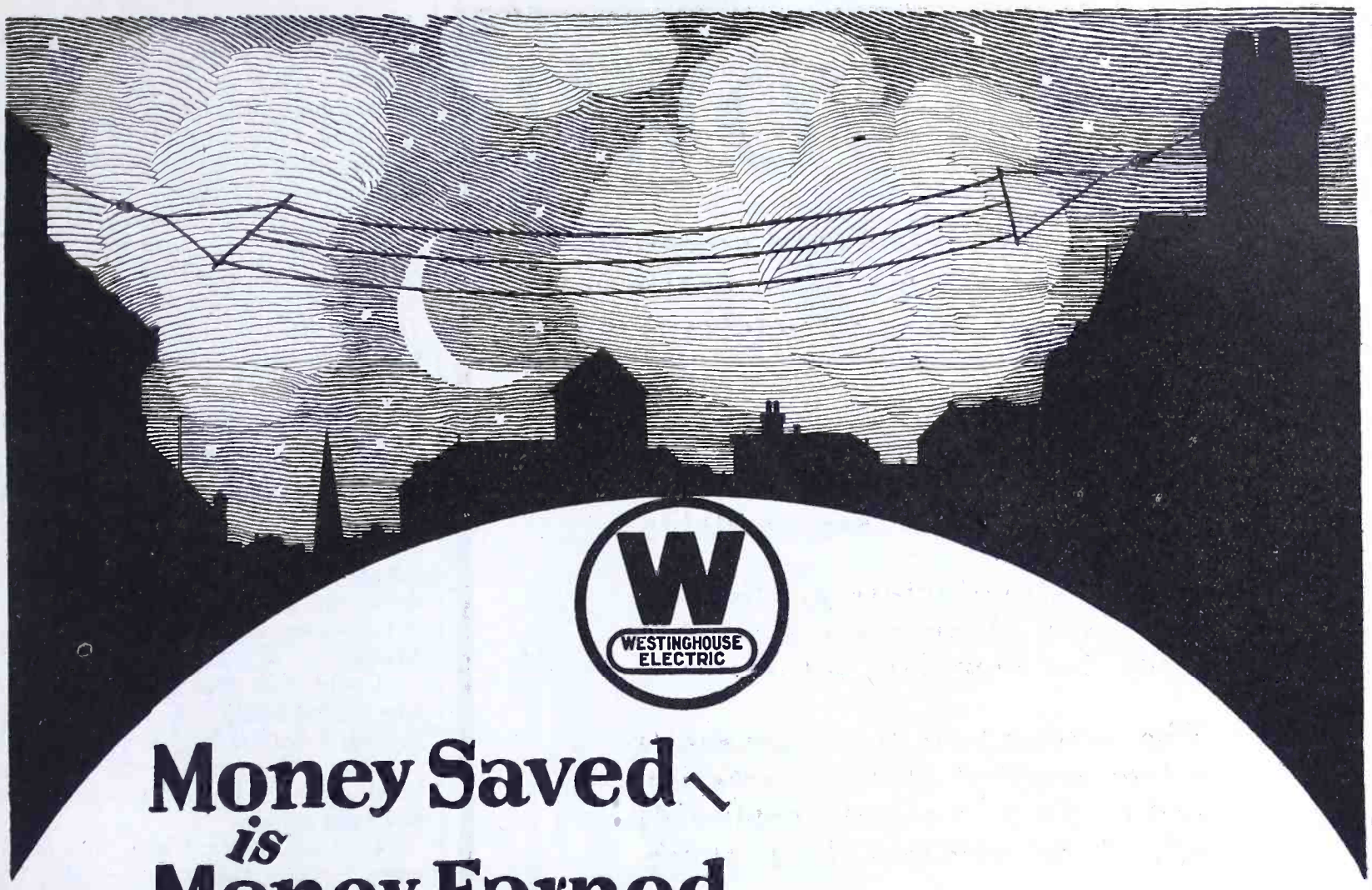

WESTINGHOUSE ELECTRIC

Money Saved *is* Money Earned

Charging your own and other radio batteries with a Rectigon Battery Charger will soon pay for the Rectigon. Why miss good programs night-after-night while waiting to get your battery back from the service station?

Buy a Rectigon today, hook your weak battery to it tonight and notice the difference in your radio set tomorrow — excellent receptivity, distance-carrying with the utmost clearness, and the cost per battery charge is only about ten cents.

Get Folder F-4491-B
"Charging the Radio Battery at Home"

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Sales Offices in All Principal Cities of the
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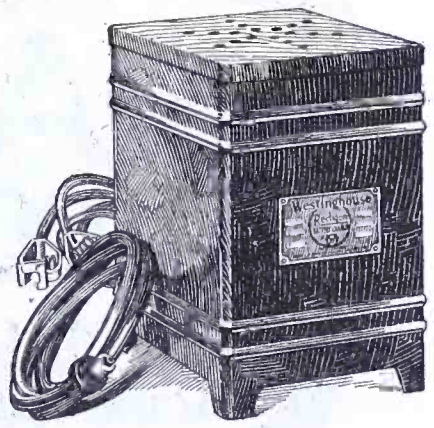
The Rectigon is a small inexpensive device, made especially for charging radio batteries. It is light and portable. It is entirely automatic in operation and clean—no oil or grease.



Westinghouse

Tell them that you saw it in RADIO

Continued from page 58

slice out of the hills. There is some rough talk up front, and we moseys up to find a couple of sentries who has forgot the passwords and is shakin' dice to see does we get by or not. I boosts Pedro forrard and they gets a good look at him.

"Eek!" says the toughest, and layin' down his gun he crosses two ranges of mountains and rings in at Vera Cruz as he goes past. The other said nothin'. He just fell over his face and we goes on. Two miles farther we meets General Ramirez all Sundayed out in gilt tassels like an Odd Fellow at a convention.

He tries to keep his mind on his work, but Pedro was too much for him. He backs away and we do our talkin' from a distance. Some of Gen's army comes out, gets a squint at the jack, and fades down the canyon. I learns afterward it takes two days to get 'em back into Mexico.

"Could it be that the honored garanon encanto might keep from sight until the battle starts?" he asks politely.

I says I'll inquire of the gentleman hisself. And I leads Pedro to one side and talks it over.

"He's agreeable", I says, "but he says make it snappy because he's mighty busy and he aint got time to fool around".

"Ah—" says Gen. "We hurry—yes. Si-cierte!"

He gives a lot of commands and the barefoot boys begins to slide up and down and in and out. Me and Jimson reclines right comfortable on the hill whilst Gen arranges the battle. He's a fussy old person and he's got a lot of ijeas on the subject.

There's regular rules and such in Mexico for fightin' it seems. Surprise attacks is done at night. Marchin' is usual early in the mornin'. In the daytime when it's hot, fightin' is called off and both sides swap tobacco and have cock fights. It aint bad they way them boys fight, only it don't get nowhere.

Come 9 o'clock, we hears some shootin' off to the left. Pedro kinda sighs in his sleep, and flicks an ear.

"Huh!" says Jimson, "Fort Sumpter has fallen again".

I takes a look through the brush.

"Here comes Robert E. Lee", I says, "with King George right behind him. This looks bad for the house of Toodle-oo".

Up dashes a horse brigadier with no hat and a scared look.

"Ven-pronto!" he says.

"'Bout time", remarks Jimson, and we gets up and cranks up our jackass.

To keep from losin' him too soon, we covers him with a blanket and go forrard where the noise is thickest.

General Ramirez is there with a lot of fancy boys, peerin' across a canyon

Continued on page 62

Selected Wood Produces Faithful Tones

LISTEN! The Sextette from Lucia! The living voices of the great artists—as if floating in through the window on wings of magic!

MUSIC MASTER, Radio's musical instrument, catches the softest tones, the most delicate shadings, the personality of each artist's voice—and the illusion of their presence in your home is perfect.

The wood amplifying bell of MUSIC MASTER eliminates blast, rattle and thin nasal tones and substitutes in their stead full, clear, resonant tones—faithful and lifelike, a delight to the ear.

There is a scientific reason for the material, size and design of every part of MUSIC MASTER—developed and perfected by men who have spent more than a score of years in the study of sound reproduction.

Go to your dealer and let MUSIC MASTER speak for itself; or, better still, have one sent to your home to test and prove on your own set.

Dealers Everywhere

MUSIC MASTER CORPORATION
(Formerly General Radio Corporation)
Makers and Distributors of High-Grade Radio Apparatus
S. W. Cor. 10th and Cherry Streets
PHILADELPHIA
CHICAGO *PITTSBURGH*

14-inch Model for the Home.....$30
21-inch Model, for Concerts and Dancing..$35

Connect in place of headphones
No batteries required ***No adjustments***

Music Master
RADIO REPRODUCER

Tell them that you saw it in RADIO

Continued from page 60

with race-track glasses. When the boys gets a look at Pedro they scatters, leavin' Gen all to hisself. He wants to back too, but he's afraid Pedro'll catch him before he can get into action, so he sticks. I gets to laughin' at the way his sword was chatterin' from his knees knockin' together.

"T-t-there senors", he says, "thee enemy . . . thee troops of that Obregon . . ."

We follows his finger. Little puffs of smoke is shootin' from the hillside and now and then we hears "splat" on the rocks. The moon was right bright now, and everything was black and silver.

"Grand view!" says Jimson. "If the Western Pacific could only see this now!"

It might of been the hickey, but I didn't like them splats and I says so.

"Shucks", says Jimson, "be an iron man", he says. "This is war. Bonapart only slept four hours on duty", he says.

"Then he done France dirt", I says. "I could make Chicago in three", I says, "the way I feels right now".

Jimson don't answer me none. Instead, he takes off Pedro's blankets, exposin' them illuminated vivas of mine. General Ramirez and the boys drops on their faces and begins prayin'.

"Sick 'em garanon, old kid", says Jimson. "Yuh got freedom in yore vest pocket . . . Where's that switch?"

"The hope of Mexico depends on you", I says puttin' in my oar. "Under the saddle", I says.

Jimson snaps on the lamps of the radio set, sees that the loop is all set tight, and I boots the jack in the wheel-house. He sighs reproachful-like and ambles into the canyon and starts up the other side—El garanon encanto, the enchanted jackass of liberty, en rouay to Paris or bust.

Well—I've heard of lots of queer war stuff. There was Helen from Troy, N.Y., who rode a wooden horse naked into Rome and was turned to salt when she looks back. Then there was Useless, who shot the eye out of a lawsuit which was annoyin' his wiff when he got home. But they was pikers compared to what Pedro the jackass done that night.

The Obregoners spots him comin' up the hill. At first they was gonna plug him, the rule in Mexico bein' shoot fust and rob 'em afterward. They thinks he is a pack train with lanterns. But the light looks kinda funny and they holds their fire like Commodore Perry. When he gets a little closer, and they makes out them 'vivas' on his legs, they gets kinda nervous and the firin' begins to drop off.

"I wonder how come that radio aint workin'" I remarks sotto vowel to Jimson.

Continued on page 64

ZENITH

Licensed under Armstrong U. S. Patent No. 1,113,149

AT THE NORTH POLE

Inside the Arctic Circle, nine degrees from the North Pole, a little 89-foot schooner is frozen fast in the ice of Smith Sound. Aboard this schooner a group of brave men are enduring, as best they can, the desperate cold of the Arctic—cold that often drops to 60 degrees below zero. Human atoms in a boundless field of ice!

Cold is hard to endure, but far more terrible is the Arctic solitude—unbelievably oppressive. Radio, at length, has broken this spell forever!

Concerts from Honolulu!

Daily, by means of powerful sending and receiving apparatus, the crew of the "Bowdoin" are in communication with relatives and friends in the far-off States. Daily they listen to concerts as far away as Chicago, Dallas, and Honolulu!

When the sanity, the very lives of one's shipmates may depend upon contact with the outside world, none but the ***best*** is good enough.

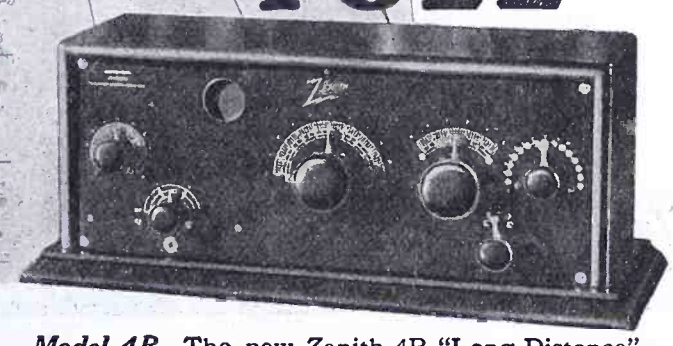
Dr. MacMillan's Choice—the Zenith

Out of all the radio sets on the market, Dr. MacMillan selected the Zenith exclusively—because of its flawless construction, its unusual selectivity, its dependability and its tremendous ***reach.***

Already his operator, on board the "Bowdoin" ***in Northern Greenland,*** has tuned in several hundred stations. You along the Atlantic who brag a little when you tune in Catalina Island—what would you say if you tuned in Hawaii ***from the Arctic Circle?***

The set that Dr. MacMillan has is a standard Zenith receiving set. And you can do all that MacMillan does, and more, with either of the two new models shown at the right. Their moderate price brings them easily within your reach. Write today for full particulars.

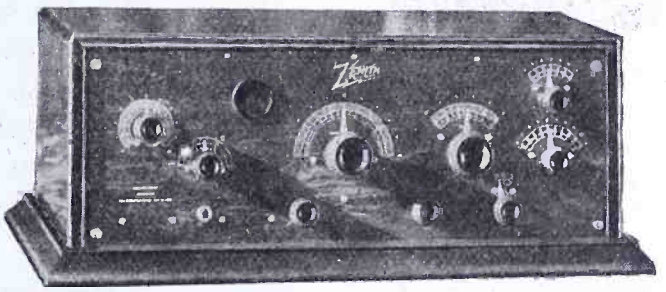
Zenith Radio Corporation
McCormick Building
CHICAGO



Model 4R—The new Zenith 4R "Long-Distance" Receiver-Amplifier comprises a complete three-circuit regenerative receiver of the feed-back type. It employs the Zenith regenerative circuit in combination with an ***audion detector*** and ***three-stage*** audio-frequency amplifier, all in one cabinet.

Because of the unique Zenith "selector," unusual selectivity is accomplished without complication of adjustment.

The Zenith 4R may be connected directly to any loud-speaker ***without*** the use of other amplification for full phonograph volume, and reception may be satisfactorily accomplished over distances of more than 2,000 miles **$85**



Model 3R—The new Zenith 3R "Long-Distance" Receiver-Amplifier combines a specially designed distortionless three-stage amplifier with the super-efficient Zenith three-circuit regenerative tuner.

Fine vernier adjustments—in connection with the unique Zenith aperiodic or non-resonant "selector" primary circuit—make possible extreme selectivity.

2,000 to 3,000 Miles with Any Loud-Speaker

The new Zenith 3R has broken all records, even those set by its famous predecessors of the Zenith line. Satisfactory reception over distances of 2,000 to 3,000 miles, and over, is readily accomplished in full volume, using ***any ordinary loud-speaker.*** No special skill is required.

The Zenith is the only set built which is capable of being used with all present-day tubes as well as with any tubes that may be brought out in the future. The Model 3R is compact, graceful in line, and built in a highly finished mahogany cabinet **$160**

ZENITH RADIO CORPORATION, Dept P
328 South Michigan Avenue, Chicago, Illinois

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

Name .....

Address .....

Continued from page 62

He looks at his watch.

"It's 9:15", he says. "They're all takin' an intermission. Give 'em time."

We waits a minute, and then all of a sudden Pedro kinda pivots around out there and sniffs at somethin' he seen. The loop cuts acrost a radio station a couple of hundred miles away.

"Wham bingety-bang-bang, oink-ity oink-oink, boom-clang-clang" goes the loud speaker.

It's a jazz orchestra somewhere in Texas, playin' in a hotel ball-room. General Ramirez, who is standin' next to me, clutches my arm.

"You hear!" he hisses, and begins crossin' hisself.

Pedro swings about and raises his head.

". . . . sea smooth; wind southerly in the east portion with northerly gales south of Point Reyes . . . " says he in clear and distinct tones.

The firin' drops away and dribbles out. Pedro, total unconscious of it, stands out on a rock in the moonlight in plain sight of both armies, wagging his ears and wobblin' them cow horns which wasn't tied on none too tight.

" . . . and the good fairy tapped the little girl on the head and she became a squash pie with a crust over her for a blanket . . . " declares Pedro, with no accent worth mentionin'.

Dead silence falls over the canyon and we can see heads all over the place peekin' out like fleas on a beach in summer. Pedro likes the view and kinds peers down the valley. The loops hits off somethin' else.

" . . . . . you can't buy mamma earrings if you don't hold mamma's hand . . " bellows a bass voice, with a saxophone tryin' to keep up, from somewhere in Idaho or Canada, maybe.

"Carramba!" mutters General Ramirez, making the sign of two crosses.

The jackass encanto, so-called, decides he don't think much of the canyon and looks the hill over. And right there somethin' happened. You see, not havin' no radio program was a handicap the which we couldn't get around. We was plumb in the dark as to what was goin' on and where.

When that jack swings around, the blamed loop points at KFI, down in Los Angeles. How did we know there was a military band on that night? Ask me? I ain't got no answer, because there ain't none. But there was and take it from me, it sure ruined one of the finest wars I ever seen.

Pedro just gets all set when all of sudden that band busts out with the Mexican national anthem, and right there all hell busts loose. Yuh see, the Obregoners was tryin' to figger out the jackass. Was he on their side or wasn't he? Was he a four-legged Jenny the

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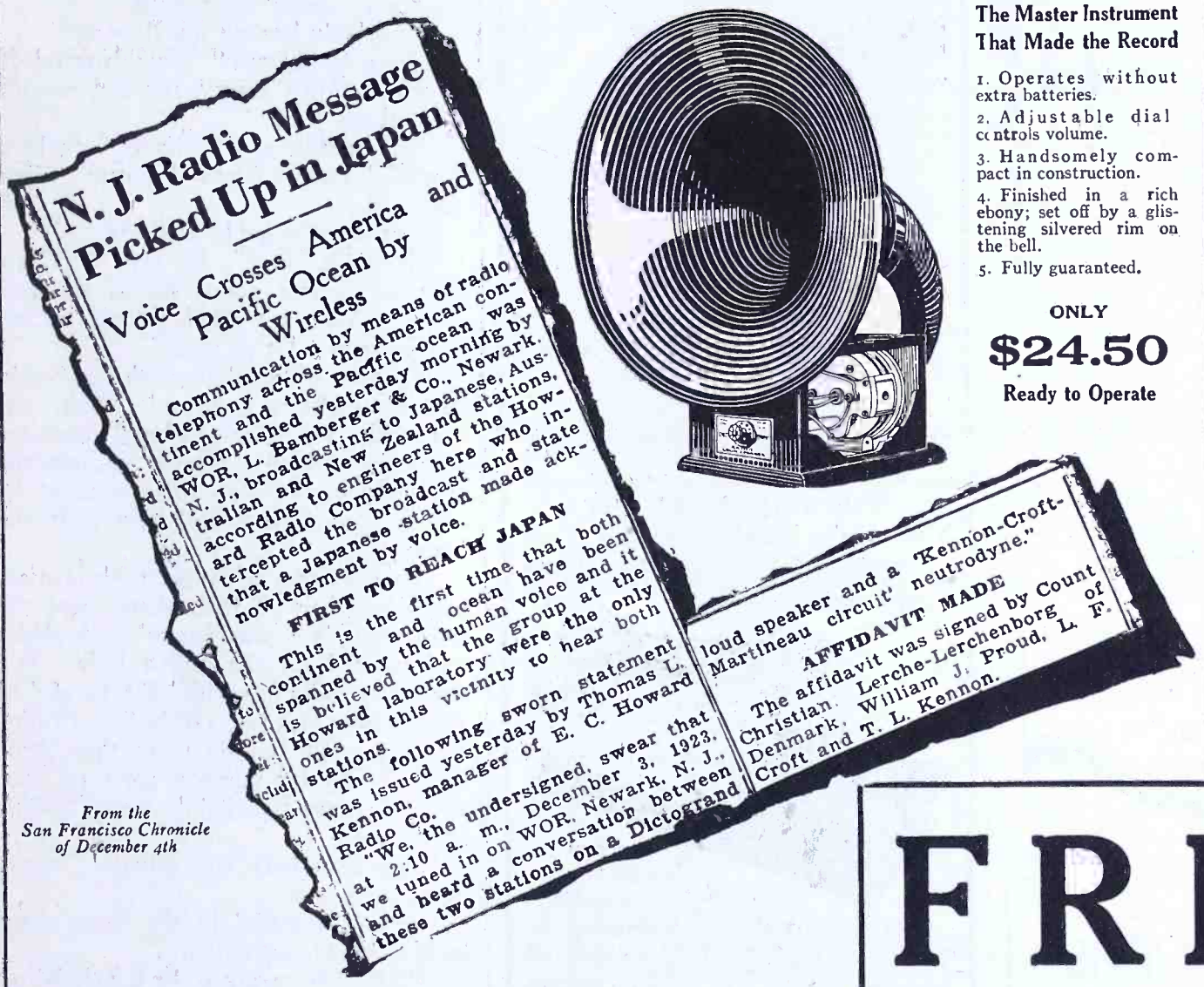
San Francisco Hears Japan and Newark on the DICTOGRAND!


N. J. Radio Message Picked Up in Japan

Voice Crosses America and Pacific Ocean by Wireless

Communication by means of radio telephony across the American continent and the Pacific ocean was accomplished yesterday morning by WOR, L. Bamberger & Co., Newark, N. J., broadcasting to Japanese, Australian and New Zealand stations, according to engineers of the Howard Radio Company here who intercepted the broadcast and stated that a Japanese station made acknowledgment by voice.

FIRST TO REACH JAPAN

This is the first time that both continent and ocean have been spanned by the human voice and it is believed that the group at the Howard laboratory were the only ones in this vicinity to hear both stations.

The following sworn statement was issued yesterday by Thomas L. Kennon, manager of E. C. Howard Radio Co.

"We, the undersigned, swear that at 2:10 a. m., December 3, 1923, we tuned in on WOR, Newark, N. J., and heard a conversation between these two stations on a Dictograph loud speaker and a 'Kennon-Croft-Martineau circuit' neutrodyne."

AFFIDAVIT MADE

The affidavit was signed by Count Christian Lerche-Lerchenborg of Denmark, William J. Proud, L. F. Croft and T. L. Kennon.

From the San Francisco Chronicle of December 4th

The Master Instrument That Made the Record

1. Operates without extra batteries.
2. Adjustable dial controls volume.
3. Handsomely compact in construction.
4. Finished in a rich ebony; set off by a glistening silvered rim on the bell.
5. Fully guaranteed.

ONLY

$24.50

Ready to Operate

WHAT a superb loud speaker! The instrument that broke all records by reproducing faint signals from far away Japan with audible loud speaker volume!

Clearly! With such clarity that this communication between the ends of the earth was understood distinctly by the 4 listeners-in!

Why not get many more distant points on a loud speaker than you are now getting with your present equipment? Get a Dictograph today. Tune in some distant point tonight. See your dealer.

The "Aristocrat" Dictograph Headset

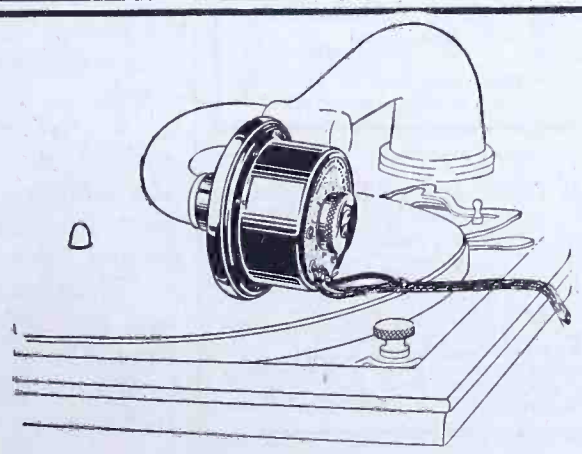
1. *3,000 ohms*
2. *10 ounces (None lighter)*
3. *Head-fit headband*
4. *Cup-curved ear pieces*
5. *Finished in black and orange*
6. *Guaranteed fully*

The Dictograph "Phono-Unit"

Makes a loud speaker of your phonograph!

1. *Uses no extra batteries*
2. *Has adapters* to fit any make of phonograph
3. *Attached and detached in a moment*
4. *Calibrated dial on back controls volume*
5. *Finished in nickel*
6. *Fully guaranteed*

$10.00



FREE

"Applause Cards"*

"—Station K-CLX signing off. If you have enjoyed the artists' program, won't you write in and tell them?"

By all means! Quickly and easily with "Applause Cards."* They're handsomely printed mailing cards. All ready for you to fill in with your comments, sign, and drop in the mail box.

Keep a pack of them near your receiving set. You can use "Applause Cards"* liberally because they are FREE AT YOUR RADIO DEALER'S.

"Applause Cards"* were originated by this Company, makers of the popular Dictograph Loud Speaker and the Aristocrat Dictograph Headset. The only "Applause Cards"* are Dictograph Copyrighted "Applause Cards."*

A big FREE package of them awaits you at your dealer's. Or if he has not yet stocked, write us, and we'll ship you a generous supply of "Applause Cards"* free, prepaid, direct, provided you give us your dealer's name. Dept.X-4.

DICTOGRAPH PRODUCTS CORPORATION

220 West 42nd Street, New York City

* Reg. U; S. Pat. Off.

Continued from page 64

Ark sent to lead 'em or was he El Diablo himself prongin' for victims. They couldn't tell, and General Ramirez has been so busy he aint had time to tell his own boys.

No sooner does them strains of inspirin' band music come kyoodlin' from said jackass than everybody gets the ijea, only they gets it different. The Obrekoners thinks it reinforcements from Mexico City. The rebels thinks its troops comin' up behind.

Everybody lets out a yell to onct.

"Viva el libertad!" shouts the rebels, throwin' down their guns and runnin' like all get out.

"Viva el Obregon!" shouts the others, grabbin' their rifles and pottin' where they can.

Jimson grabs me by the arm.

"Hoof it, Bud", he says. "There aint no jackass gonna do us no good now. What we wants is a couple of fast cayuses and a lot of room."

We goes plungin' through the brush, makin' tracks to good old U.S.A. As we skids, we hears General Ramirez screamin' orders and tryin' to stop the stampede of his boys. But it want no use. That jackass had sure spilt the beans.

We overtakes a couple of brigadiers and drags 'em off their skates, and the next thing we was passin' jackrabbits and pointed for the North Pole. We done fifty miles in nothin' flat, keepin' in the shadows of a range of hills and ridin' like sin. We has no more than skun over the border when a gang of Tex rangers comes sloughin' down lookin' for trouble.

"You boys hear any shootin' 'round here?" asts one.

We was standin' in the shack door looking kinda nonchalant.

"Well, there seems to be a hangin' or somethin' goin' on over in Mexico", I says. "But I don't reckon its nothin' much."

The ranger shrugs.

"Probable nothin' but the regular war", he says, and rides on.

"Shut up", says Jimson to his hoss, which was pantin' like an accordeen, and leanin' up against the shack. "Aint we got t r o u b l e s e n o u g h without you wheezin' us into the San Anton jail?" he says.

I sits down kinda weak on the front stoop.

"I wonder how pore ol' Pedro's makin' out?" I asks, for I kinda liked the animile. And he was sure an elegant broadcastin' station, takin' it all by and large, and I was proud of him.

"How's Gen Ramirez makin' out?" says Jimson, sour-like. "That's what I'd like to know. If *he* aint dead, *we'll* be by mornin'" he says. "Of all the plumb fool ijeas . . . "

"Lissen" says I. "Yuh got four hundred bucks in yore jeans aint yuh?"

"I would have had if that blamed Mex cayuse hadn't of jolted it out over there in Mexico somewheres", he says.

I clutches my pockets. They was as empty as an old ladies' lap.

"My gosh", I remarks. "Wuz it them hosses or was it Ramirez?"

Jimson grunts.

"I don't put it past either of 'em", he says. "Furthermore, I'm that disgusted I'm goin' to bed."

He stomps into the shack and I follows suit, and we piles into our bunks, each plumb full of thoughts and too heap sore to be polite.

Come maybe half an hour, I hears a rustlin' outside. I grabs my six-gun and jabs Jimson.

"Ramirez and his boys", I whispers.

We slides along the floor and gives a look-see out the door. The moon was some low and we can't quite make nothin' out. All of a sudden, I hears a kind of a hissin'. Then a voice bellows right at me.

" . . . , that will be all for tonight", it says. "Radio KPO . . . ."

Jimson and me collapses on the floor. It was Pedro come home to the folks, with his cow horns hangin' under his chin and a bullet hole through his ear. He is still suckin' on the horn an' looks kinda tired.

We gets up and disconnects him. Jimson stands starin' at the horn for a minnit. Then he pulls off the attachments and hands it to me.

"Bud", he says, "you an' Pedro might as well do one more broadcast", he says, "an' make it official".

"How come?" I says.

He chuckles.

"Jus' tell the world 'Two darned fools signin' off' ", he says.

With which superm insult he goes back to bed and leaves me an' the jack out there rubbin' noses in the moonlight, with the horn between us.

When charging a storage battery be sure that the little vents in the caps are open or, better still, unscrew them to allow a free escape for the hydrogen gas that is generated. Otherwise there is danger that the hydrogen gas will be exploded by an accidental spark or flame.

FLIVVER SUPER HETERODYNE

Continued from page 14

trolling the filament of the second detector. In fact the rheostats for the oscillator and amplifier tubes can be left in almost any position, and these tubes can be turned on and off with a switch. Under no condition should the rheostats be touched when tuning in a station.

The results obtained on this receiver will depend to a great extent upon the skill of the operator. The super-heterodyne has been greatly overrated. Nevertheless it will be found to be extremely sensitive and very selective. During the winter months at any time stations within 2000 miles can be received with loud speaker volume and any Class B station in the country can be heard on the head phones. On a loop, stations within 1000 miles will come in clearly on a loud speaker and very careful tuning will bring in stations 2000 miles or more distant. On 600 meters for spark and on 200 meters for C. W. the night receiving range is 5000 miles or more. In order to receive 200 meters C. W. an external oscillator should be set up about 3 ft. from the set and this oscillator should have a wavelength of about 1800 meters. It will heterodyne with the amplifier in the set and form a beat note.

If the receiver is used with a loop, the loop should be 18 in. or 2 ft. square and should have 12 turns spaced about ⅜ in.

A list of material necessary to construct the set is given below. This list gives the names of the different parts used in the set about which this article is written. It is not essential that these parts be used. In case of substitution be sure that the material used is of equally high quality as that named in the list.

1	43-plate Gilfillan Vernier Condenser, C_1	$ 7.00
1	23-plate K. & C. Plain Condenser, C_2	3.50
1	3-in. dial for ¼-in. shaft	.75
2	.001 Micadon Condensers C_3, C_4	.80
7	.00025 Micadon Condensers, C_5, C_6, C_7, C_9, C_{10}, C_{11}, C_{15}	2.45
1	.002 Micadon Condenser, C_8	.40
2	1 mfd. 1000-w. Condensers, C_{12}, C_{13}	4.00
1	.006 Micadon Condenser	.75
2	Movable Honeycomb Panel Plugs	1.80
1	No. 40 Remler Coil Plug	.50
1	K. & C. Midget Variometer	6.00
1	50-turn Honeycomb Coil	1.60
4	Bakelite Tubes, 3¼-in. dia., 2½ in. long	1.50
4	Cardboard Tubes, 3-in. dia., 2½ in. long	.10
	¼-lb. No. 36 D.S.C. Wire	2.00
8	Standard V.T. Sockets	5.60
5	5-ohm rheostats	3.75
1	400-ohm potentiometer, R_3	1.00
1	5000 or 10,000-ohm Grid Wire-Wound Leak, R_1	1.10
1	Remler Pencil Mark Leak, R_2	.20
6	Single Closed Circuit Jacks	4.20
1	1-in. Rotary Switch	.40
2	⅛-in.x¼-in. Taps	.04
2	Switch Stops	.04
7	Binding Posts	.35
2	Federal Audio-Frequency Transformers	11.00
1	Panel 3/16 in. x 8 in. x 38 in.	7.60

Mr. Claude L. Johnson, graduate of the Radio Institute of America, Radio Operator on Grace Line ships sailing to interesting South American ports.

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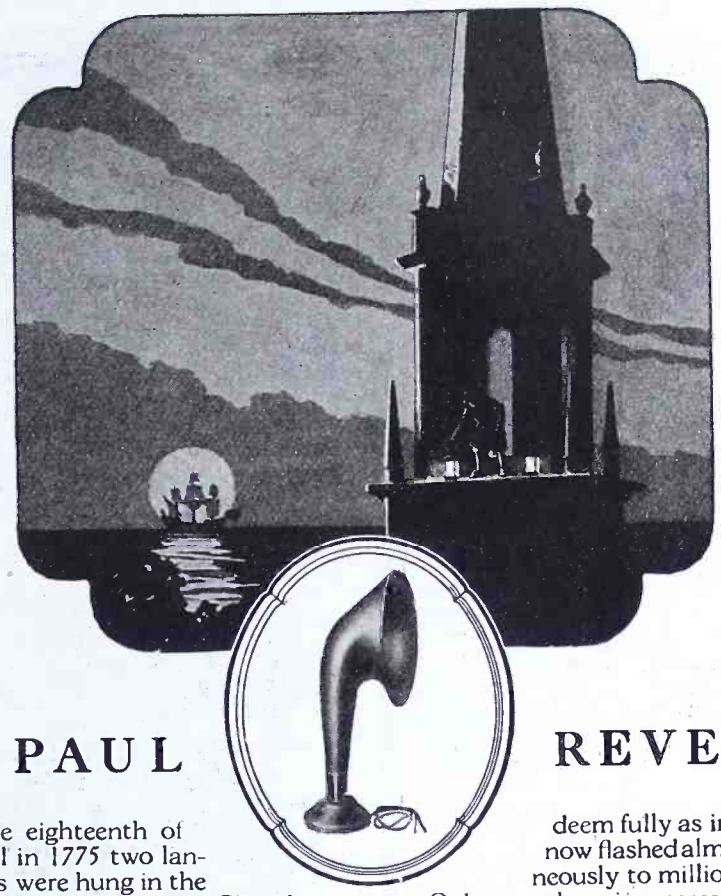

PAUL REVERE

ON the eighteenth of April in 1775 two lanterns were hung in the tower of the Old North Church in Boston signaling to Paul Revere in Charlestown the movement of the hostile troops. Thus began the famous ride which will always live in our history.

Paul Revere's broadcasting, although romantic and spectacular, seems crude to us today. The death of a president, an earthquake in far-off Japan, and many other instances which history may deem fully as important are now flashed almost instantaneously to millions of homes.

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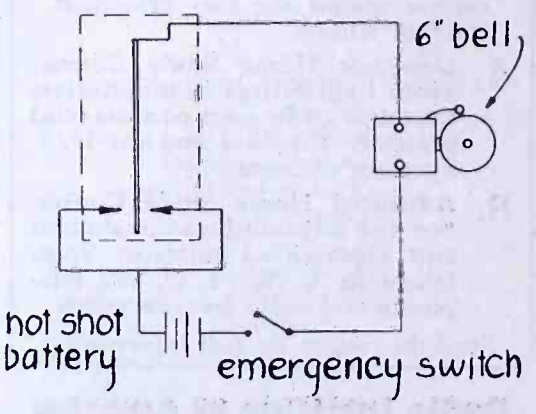
"RADIO" - Pacific Building - San Francisco

BURGLAR-PROOF COUNTERPOISE

Continued from page 16

A cabinet hinge was soldered to one end and this in turn soldered to a tiny angle bracket. A pair of silver contacts, taken from an old spark key were fastened to the free end, and right above them on the starboard side was fastened a binding post—one of the kind with a hole in it large enough to let a piece of standard piano wire pass through it. The stationary contacts were an old straight gap, the kind that we bought from Murdock before the war. The zinc contacts were removed and some copper ones substituted. This animal was screwed to board and right above it an arm was fastened and from this was hung the trigger. The whole was mounted on a shelf on the inside of the outer wall. A hole was bored through the wall and a rubber bushing shoved in. The bushing has nothing to do with the working of the alarm, but just to keep the plaster from removing itself from the wall. An angle pulley was screwed into the edge of the shelf, and then I went out and made a new counterpoise.

When it was up I ran the wire from the window weight over the pulley, through the binding post and out the hole in the wall and fastened it to the insulator on the corner of the counterpoise. The counterpoise was a fan, but there is no reason why any other type won't work as long as the points of suspension are limited to three. I came back in the house and pulled the slack out of the wire and had the counterpoise up tight. Then I set the lock nut, and the trigger was set.



All that was left to do was to connect up the electrical circuit. One contact was soldered to each of the electrodes of the gap, and another to the trigger arm. The two on the electrodes were fastened together and the lead run to a Hot-Shot dry battery. The other lead was run to a noisy bell and from there to the other terminal on the battery. I tested the device out and it worked to perfection.

The principle is that if the counterpoise is cut down the weight drops and the circuit is closed, and if the skunk tries to pull the wire down the circuit closes on the other contact. So the culprit is caught either way. There is no

jamming the works, for as soon as he starts monkeying he runs a good chance of setting it off. The only trouble was that when the counterpoise swung in the wind the bell would tinkle, but this was good, for if the wind was strong enough to swing the counterpoise it was evident that it was liable to swing the aerial off the roof, and it gives the "op" the warning that it is time to loosen the halyard. No exact dimensions are given, for no ham ever follows them any way, and besides the conditions of each station are slightly different and when the material on hand can be utilized, that much is gained.

There is no reason why the alarm system need be limited to a bell. If the builder wants something more complicated a system of relays may be rigged up and made to a fire a shotgun, close the circuit of a 2000 volt transformer and turn the kick loose in the counterpoise, set off a flashlight and take a picture of the man, open the door to the doghouse and let the pet bull dog out to do his duty, or most anything else that may tickle one's fancy. Needless to say, since the installation no one has bothered me with his friendly visits.

Tell them that you saw it in RADIO

SHORT WAVE RECEIVER

Continued from page 20

requires considerable care. The leads should be direct, without superfluous bends. This is contrary to all opinion, for most people favor the square bend, parallel running leads. Do not wire this receiver that way—in fact any receiver—for the capacity between the leads impairs the efficiency of the receiver. Use No. 14 or 16 pure copper wire, rather than the tinned bus wire. The tinned surface offers greater resistance than the pure copper. See that all joints are perfect before applying the solder, and do not use acid paste as the soldering flux, rosin core solder is superior, as it does not corrode.

The operation of this receiver is practically the same as that of the standard grid and plate variometer set, except for the fact that the set tunes sharp and is extremely selective, due to the increased variations in wavelength. The lower the wavelength the greater the selectivity. The results obtained when the primary and secondary circuits are in resonance, and the proper degree of oscillation, are surprising, and cannot be realized until one actually manipulates the controls. The plate circuit adjustment is important, although, with one setting oscillations can be obtained over a fair range of wavelengths.

This receiver has been thoroughly tested and has at all times come up to expectations. It has been placed side by side with some of the standard receivers, and proved overwhelmingly superior on the short waves. Stations were copied on this receiver that could not even be heard on the others. In a poor location in the Bronx 4's and 5's come in regularly, in addition to a multitude of 9's. On one occasion three 6's were heard in one night. All of the local broadcasting stations are copied on their third lower harmonic. During the short wave tests this receiver heard the majority of the stations operating as low as 80 meters. Considering all facts, it is a step towards the ultimate short wave receiver for the broadcast fan as well as for the amateur.

The SIGNAL FIRE of TODAY

PIONEERS of the old west were amazed to see how quickly the Indians learned of their presence.

The advance of a wagon train was known days ahead. Even a lone trader was known long before he arrived in the Indian camp.

Eventually the pioneers learned that the savages had a highly perfected signal code. From mountain top the signal fire blazed its message at night, or by day sent up its smoke in columns, wreaths, puffs—white smoke, black smoke—it carried a story far and wide.

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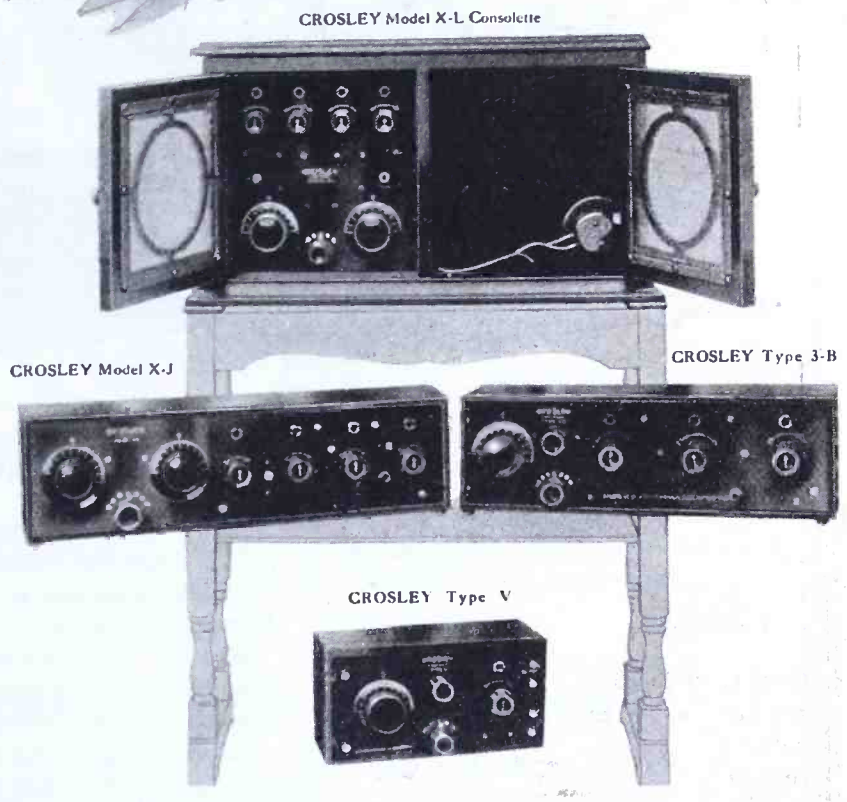

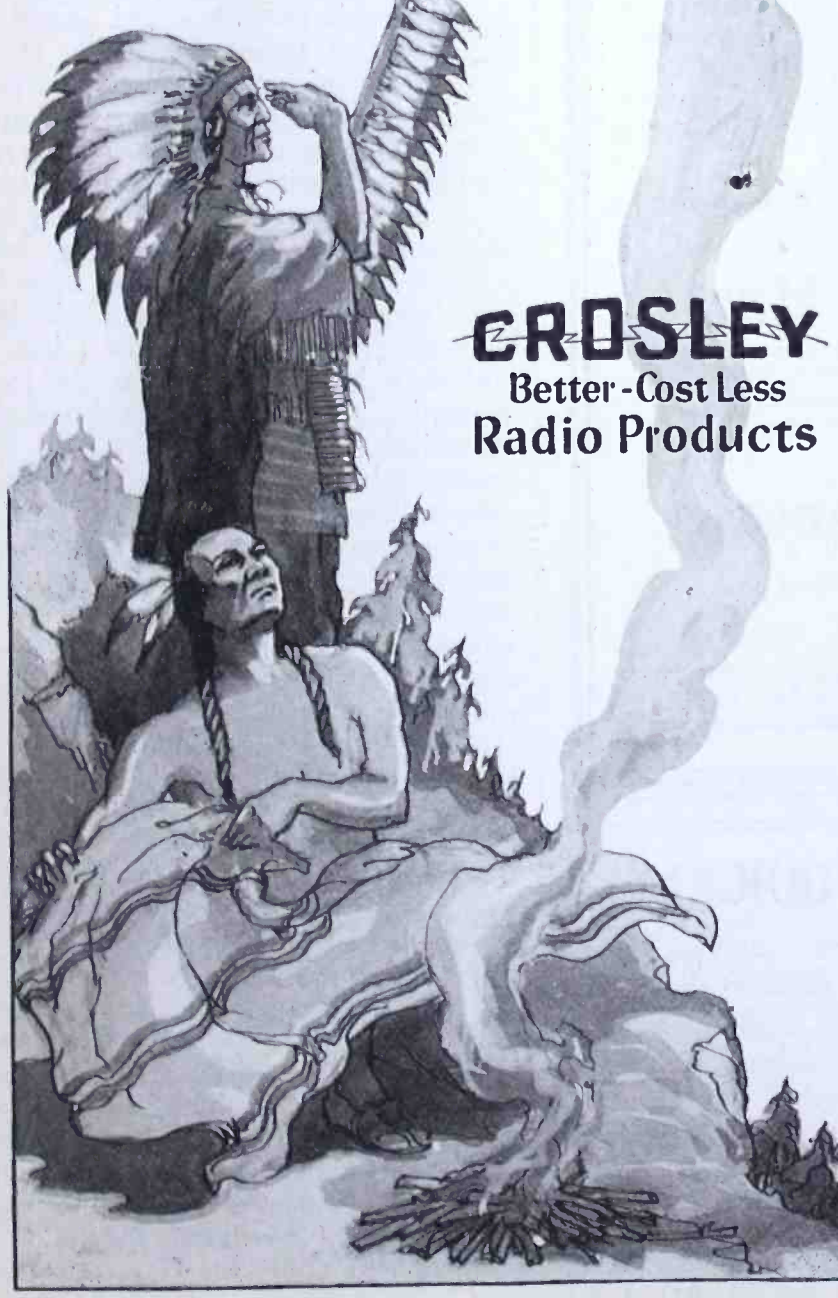

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A duplicate of the Model X-J except for the arrangement and mounting into a beautiful mahogany cabinet with the addition of a built in loud speaker. Space is provided in the cabinet for housing the necessary batteries. A special mahogany stand as illustrated in outline for the Model X-L may be had for $25 extra.

This instrument provides an exquisite piece of furniture for any home together with all the pleasures of a long distance radio receiver.

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OFFICIAL REGISTRATION

Continued from page 34

amateur world we find ponderous "rock crushers" competing with commercial stations, entirely blotting them out from the transaction of business, with little sympathy on the part of the amateur toward his professional brother, in fact it was taken as a joke. Following his restriction by law to a one kilowatt input and a wavelength of two hundred meters with a decrement of as near to two-tenths as could be attained he not only did more creditable work but enjoyed it more.

From 1912 up to a couple of years ago the amateur fraternity progressed both in the matter of transmitters and receivers until transcontinental traffic was an assured thing and shortly afterwards trans-Atlantic and trans-Pacific. Whereas two hundred meters was assigned the amateur as something of no value it was developed by him to a point where it became evident that the shorter wavelengths were more desirable than the longer ones.

Without proper regulation on the part of the Department of Commerce it is doubtful if amateurs would have accomplished a great deal in the field of radio. If regulation did nothing else, it standardized equipment in so far as transmitting apparatus is concerned. The future for the transmitting amateur is just as bright as ever, and practically the only objection that one could take to existing regulations is the discriminatory elimination of two hundred meter work during the early evening hours. When we consider, however, that from eleven p.m. to daylight we have ample time for carrying on relay and experimental work we really have no kick, and the concert hours provide us with a real source of enjoyment at times, and enable us to devote some of our energies to the perfection of sensitive receiving apparatus instead of putting most of our energy into the perfection of our transmitters.

As we all know, about two years ago the broadcast movement began in real earnest. At first it was looked upon by outsiders as more or less of a joke but with the introduction of the Class B stations it became apparent to the least discerning that in the public broadcast there had arrived one of the most important educational media so far available to man. At the present time a rough survey of any city discloses a large and rapidly growing population interested in the broadcast, and right here is where we have been shortsighted in that certain troubles arising through the improper use of receivers could have been eliminated from the beginning had we been in a position to regulate receiving stations. On account of the pernicious effect of oscillating receivers reception which should normally be efficient is not only poor at times, particularly in congested districts, but continues to get worse and worse.

San Diego Radio Club is an organization composed of a mixture of broadcast listeners and licensed amateurs and has gone on record officially as in favor of registration of all stations whether transmitting or simply receiving. The club membership feels that only good can come of such a procedure. Indeed, it is apparent that unless the Department of

Commerce has definite knowledge as to the existence of receiving stations it can do little in the way of regulating the same.

There seems to have been an oversight in this matter of receiving stations. It is clear to even the novice that any apparatus which produces radiation from the antenna is a transmitter, and that a receptor which radiates, no matter how little energy, is really operating in direct violation of law when not licensed.

It is believed that it is reasonable to require the owners of all receiving stations to report the fact in writing to the Supervisor of Radio for the District involved, setting forth the name and address of the owner and receiving operator, the type of apparatus being used and a brief description of the station. It is also thought that it would be reasonable action on the part of the Department of Commerce to require the owners of those receiving stations which are, for example, of the single circuit variety to appear for examination for amateur license or else institute such changes as will render the set in question free from radiated energy either intentionally or accidentally. Other countries have required this from the beginning. In passing be it remembered this would provoke no hardship for the broadcast listener as his reception of broadcast programs can never be good when his tubes are oscillating and when he is radiating energy. A squealing tube is a thing he does not desire. It is an accident he regrets and under the proposed regulatory system he would be saved much embarrassment though probably not so much as his neighbors.

Briefly, San Diego Radio Club visualizes the future somewhat as follows: First, the Secretary of Commerce to demand prompt registration of all receiving stations throughout the United States except those already licensed either as amateurs, commercial stations or broadcast stations, requiring such data as might seem expedient. The next advance which might be expected in the course of a reasonable time would be the notification of all such registered stations that receivers which radiate energy would not be permitted without the owners thereof obtaining licenses for amateur transmitting stations. It could never be legal under the existing assignment of wavelengths for amateurs to radiate energy on the wavelengths assigned to the broadcast stations. The Department could indicate an inexpensive method of eliminating the aforesaid radiation. There seems to be no reason why the Department of Commerce should not derive enough income from the listening public in the form of license fees to maintain an adequate inspection bureau which would function entirely in the interests of the listening public.

STORAGE BATTERIES

Continued from page 30

Sulphating is more generally caused by a battery being discharged too low. Bear that statement in mind. Everyone is more or less careless about charging his battery, especially when charging facilities are not the best. More trouble has developed in storage batteries because of this fact than for any other reason. And this is liable to happen more often today with the low-ampere tubes now available. The extremely low drain makes it possible to use the storage battery to the point where sulphation has set in and practically lowered the capacity of the battery.

A sulphated plate in a storage battery has its active material covered and the acid cannot get out during the charging process and the acid remaining in the plate adds insult to injury—so to speak. Furthermore, that portion of the plate which is sulphated is practically eliminate from the storage battery—just as though you had cut a piece of it away and removed it from the battery.

There is a way of removing this whitish scale from the plate. However, in falling off the plate it takes with it some of the active material of the plate and furthermore produces what is known as buckling or warping of the plate. Sulphate on one side of a plate prevents the action from taking place there, so that the contraction and expansion of the active material on the other side of the plate (which occurs in normal working) will cause the plate to buckle. It will have to be removed and straightened between two flat boards. By placing the plate between these boards and tapping slightly one of them with a wooden mallet (very carefully) the plate may be straightened. Of course this is to be done by an expert battery man, and you should take the necessary eare of your battery so that this will not happen.

If a battery becomes highly sulphated, it will be necessary to bring it to an expert who will try and remove it without having to tear the battery down and scrape the plates. By fully charging and partially discharging a storage battery a number of times it may be possible to eliminate the sulphate on the plates. There is no legitimate excuse for a battery to become sulphated.

From normal operation the electrolyte will gradually get lower and lower in the battery cell. Never permit it to get lower than ½ inch above the tops of the plates. The water in the electrolyte evaporates and is dissipated during the operation of the battery and from time to time it will be necessary to add distilled water to the cells.

If a battery is turned over by accident and the electrolyte is spilled out of the cells, go to some battery concern and buy new electrolyte. They will mix the

water and sulphuric acid to the correct specific gravity.

Ampere hour means very little to most of us, but it should be well understood so that one may purchase the right kind of battery, which depends mainly on the kind of apparatus in use and the number of amperes consumed by the tubes, amplifiers and loud speaker. A 60 ampere-hour battery is supposed to give 1 ampere for 60 hours. 2 amperes for 30 hours and so on. However, it could not be expected to give 60 amperes for one hour as the excessive heat generated would buckle the plates and destroy the battery long before the end of the hour. For an example—let's say that you have one of these 6 volt 60 ampere hour storage batteries and you have in use a three-tube set and a battery type magnavox. The detector tube UV-200 and two UV-201A amplifier tubes.

Current conumption	UV 200	1.00 ampere
	UV 201-A	.25 "
	UV 201-A	.25 "
	Magnavox	1.00 "
	TOTAL	2.50 amperes

Therefore you are drawing from your battery 2½ ampere hours. Let's then assume that you listen in three hours each night. With 100% efficiency the battery would last for eight consecutive nights. You could hardly expect to get that much out of any 60 ampere-hour battery and therefore we will accept as a reasonable performance of this type battery 5 nights' operation of the above set. It should then be given a full charge.

SOME POINTS TO REMEMBER

A fully charged cell should read from 2.2 to 2.5 volts.

Never discharge a cell below 1.8 volts.

Never let a battery stand idle without being fully charged.

When battery is idle—charge up to boiling once a week.

Do not habitually overcharge the battery.

Bubbles of gas are given off freely when the battery is fully charged.

Positive plates vary from light brown to a chocolate color when fully charged and to nearly black when overcharged.

Negative plates vary from pale to dark slate color.

Do not discharge too rapidly.

Storage batteries depreciate about 10% of their cost per year.

By greasing the terminals the battery can be kept clean enough to keep indoors.

When an outside aerial is not available the telephone wire makes a good substitute if a .00025 mfd. mica condenser is placed in series with the aerial binding post of the set and the nickel-plated screw that holds the 'phone transmitter in place.

CALLS HEARD

Continued from page 50

At 8BNH, 142 S. Union St., Akron, Ohio

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By R. L. Butler, U.S.S. Rochester, Amapala, Honduras, C. A.

Dec. 28—1ml, 2rb, 2rk, 3ahp, 4iz, 5aby, 5amh, 5nms?, 5lr, 5rb, 5zav, 8bnh, 8es, 8rm, 8gh, 8zz, 9aim, 9bof, 9caa, 9mc.
Dec. 29—2ajw, 2cee, 2cla, 3ta, Can. 3co, 4hr, 4py, 5alj, 5ana fone and C. W., 5gne?, 5ei, 5ml, 5qw, 5rb, 8apv, 8atp, 8cpp, 8zo, 9and, 9brx, 9dvw, 9dnx, 9dhg, 9dxn, 9eer, 9vz, 9ysq?. Particulars from 5ZAV.

By 9CCV, Ed Barricklow, Courtland, Kansas

(1aac), 1af, 1ain, (1awe), (1aww), (1ayt), (1bsz), 1cew, (1cmp), (1cmx), 1crm, 1lk, (1sw), (2aay), (2ayp), (2apx), 2ayl, (2bnz), 2bb, 2bqc, (2brb), 2bsc, (2cee), (2cnk), 2crq, (2csl), 2ct, (2cyw), 2kf, 2kx, 2rm, 3abp, 3ar, 3atb, (3ava), (3bdr), 3bez, (3bgj), (3bkl), (3bpm), 3bqp, (3bqy), 3cc, 3cej, 3cez, (3cfi), 3cjn, (3hd), 3me, 3sh, 3te, 4fs, 4ft, 4hn, 4je, 4jk, 4js, (4pb), (4qf), (5ags), (5agv), 6aao, 6acm, 6afq, (6ahp), 6avr, (6bbw), (6bel), 6bm, 6bnu, 6bny, 6bql, (6buh), 6bur, 6cbw, 6ceb, 6cek, 6cet, 6cgg, 6cjv, (6cng), 6et, 6hi, 6ip, 6ja, 6lv, 6of, 6pf, (6pl), 7ael, 7af, 7ajy, 7ak, (7br), (7co), 7du, 7em, 7er, 7ez, 7fr, 7hg, 7ng, 7no, 7qc, 7rd, 7sy, 7tg, 8act, 8ah, 8ape, (8aq), (8bnh), 8ccq, 8cwk, 8dcn, (8es), 8fq, (8kc), (8mt).
Can.: 2hm, (3ad), 3yv, 4co, hv? qra?

By 9BLY, 1619 16th Ave. No., Minneapolis, Minn.

1akl, 1ap, 1aqm, 1ary, 1asu, 1bbh, 1bes, 1bhw, 1bom, 1ci, 1cip, 1cpn, 1cru, 1fs, 1pa, 1wo, 1yb, 1zl, 2aar, 2aay, 2aco, 2ana, 2awh, 2aww, 2azy, 2bhc, 2bn, 2bqh, 2brb, 2bsc, 2bwr, 2by, 2cee, 2chg, 2cla, 2cpa, 2crp, 2crw, 2csr, 2cwj, 2gk, 2le, 2mj, 2oe, 2qs, 2rk, 2ts, 2xn, 3ade, 3adp, 3adv, 3ajh, 2av, 3bdo, 3bei, 3bgj, 3bm, 3bnu, 3bpf, 3btl, 3buy, 3bvl, 3cah, 3can, 3ccu, 3ccv, 3ccx, 3gg, 3hg, 3hh, 3lg, 3ml, 3qv, 3te, 3tr, 3wf, 3yo, 3zm, 4ab, 4af, 4aj, 4cm, 4dv, 4eq, 4fs, 4ft, 4gz, 4hn, 4hr, 4hs, 4io, 4ku, 4ll, 4lp, 4oa, 4pk, 4qf, 4sc, 4sh, 4tx, 4za, 5aac, 5aaw, 5adb, 5adc, 5ado, 5agd, 5agh, 5ahr, 5aic, 5aiu, 5ajt, 5aky, 5alx, 5amb, 5amu, 5anh, 5be, 5bx, 5bz, 5cv, 5dm, 5ei, 5ek, 5fx, 5ht, 5jc, 5je, 5jl, 5lg, 5lr, 5mm, 5nn, 5nv, 5ow, 5ph, 5pv, 5pw, 5qi, 5qw, 5rw, 5sk, 5sy, 5tm, 5to, 5ud, 5uk, 5vm, 5vt, 5xd, 5xk, 5zav, 5zh, 5xap, 6aaq, 6acm, 6adh, 6age, 6agj, 6ahu, 6ahv, 6aja, 6ajp, 6aju, 6akz, 6amq, 6ao, 6aos, 6arf, 6auu, 6awt, 6bic, 6bjj, 6blg, 6blh, 6blw, 6bnf, 6bql, 6brf, 6bui, 6buo, 6cay, 6cbb, 6cbu, 6cdg, 6cgw, 6cid, 6cjb, 6ckp, 6cnl, 6gk, 6gt, 6kw, 6lv, 6pe, 6pl, 6od, 6rn, 6tn, 6wt, 6xgt, 6xl, 6zah, 6zar, 6zbh, 6zh, 7abb, 7ald, 7co, 7lw, 7nr, 7ot, 7qd, 7qj, 7yl, 7zl, 7zp, 7zu, wnp.
Can.: 2an, 2ct, 2dn, 2ic, 3afz?, 3bg, 3co, 3de, 3gg, 3he, 3kp, 3ml, 3pg, 3pz, 3qs, 3rg, 3ud, 3ws, 3xi, 3yv, 3zt, 4ab, 4cl, 4dy, 4ea, 4fv, 4fz, 4hh, 5go, 5cn.
Records of this station are: Cordova, Alaska; Pribilof Islands, 1350 miles west of San Francisco; Hilo, Hawaii; Guanajuata, Mexico; Porto Rico, 975 miles east of New York City. Power 100 watts Hartley circuit.

By 6CJD, P. O. Box 33, Merced, Calif.

1ki, 1cma, 2on 3ni, 3bgg 4it, 5ado, 5amb, 5nn, 5er, 5nw, 5tj, 5zav, 6avj, (6acu), (6afe), 6ads, (6afq), (6agk), 6aga, (6anp), 6aw, 6aem, 6aos, 6ami, 6adh, 6aqq, (6adb), 6beg, 6bsx, 6bwe, 6bsj, 6bjj, (6blm), 6bdt, 6buy, 6bqb, (6bwu), 6buz, 6bes, 6beh, 6big, 6bri, 6bko, 6bbq, 6bqe, 6bho, 6cef, (6cdg), 6ceb, 6cen, 6cei, 6cfi, (6cgg), (6cia), 6cgw, 6cmi, 6cag, 6cbb, 6cjw, 6cgi, (6ccy), (6ckh), (6chy), 6cbw, 6cef, 6cvg, 6cnc, 6ccd, 6cih, 6pl, 6mh, 6rm, 6fy, 6bv, 6ik, 6ci, (6mp), 6em, 6la, 6ac, (6nb), 6jd, 6yb, 6zbj, 7em, 7fq, 7ks, 7zf, 7co, 7io, 7hp, 7to, 7so, 7ald, (7adr), 7af, (7akh), 7ajd, 7qd, (7om), 7ot, 7en, 7hi, 7ow, 7ajd, 7td, 7di, 7mp, 8cjd, 7ala, 7cea, 8caa, 8ak, 8da, 9aby, 9bbl, 9bwi, 9bjk, 9bji, 9efn, 9cme, 9cca, 9cfo, 9cem, 9dtu, 9dt, 9dez, 9dgu, 9ecv, 9rv. Wud appreciate all reports on my C. W. sigs. All crds answered promptly.

At 6CIS, Yosemite, Calif.

C. W. and spark—1cy, 2gk, 4ik, 4cw, 4cr, 4cl, 4fn, 4pk, 5zav, 5za, 5sd, 5aea, 5ahr, 5qy, 5xd, 5zax, 6as, 5sl, 5tj, 5nn, 5gg, 5aic, 5jg, 5qi, 5ado, 5lr, 5lg, 5hz, 5eh, 5fc, 5afh, 5rg, 5ua, 5na, 5be, 5uk, 5aju, 5adb, 6's too many, 7sf, 7om, 7kv, 7ajd, 7aim, 7tq, 7ae, 7it, 7vn, 7alk, 7aci, 7ze, 7agv, 7os, 7ael, 7ll, 7ot, 7hg, 7so, 7iw, 7zl, 7kk, 7co, 7cf, 7ln, 7abb, 7vc, 7zf, 7gv, 7aky, 7afu, 7pz, 7fq, 7hr, 7ed, 7ft, 7ry, 7rd, 7em, 7rk, 7ahn, 7pj, 7sn, 7ak, 7ald, 7sj, 7ads, 7no, 7mp, 7du, 7td, 8rc, 8fc, 8bcp, 8bjv, 8vy, (8da qsa), 8zc, 8bkd, 8aa, 8dcb, 8ak, 9dsw, 9bdz, 9bnk, 9ack, 9aqc, 9amf, 9bgh, 9bch, 9ahz, 9dyr, 9ctg, 9aua, 9cvy, 9aec, 9deq, 9clj, 9aqd, 9akf, 9ih, 9bed, 9cly, 9dco, 9afr, 9zg, 9ahq, 9axx, 9bkk, 9cjm, 9aaq, 9be, 9bly, 9bjk, 9mc, 9aul, 9dky, 9egp, 9bhi, 9czm, 9bqu, 9atn, 9ayl, 9cvo, 9cfi, 9dte, 9bxa, 9aew, 9btx, 9ake, 9amf, 9azg, 9can, 9eer, 9avu, 9cip, 9dsv, 9aps, 9apf, 9dli, 9aim, 9caa, 9nx, 9cld, 9qe, 9bth, 9amp, 9cpc, 9cvs, 9cmk, 9elb, 9dxu, 9ccv, 9dew.

By Melbourne Renken, Cole Camp, Mo.

C. W.—1aez, 1aw, 1bqq, 1bsz, 1bqc, 1gh, 1uj, 1pa, 1ayt, 1bwd, 1ij, 1bfq, 1atj, 1axn, 2cwp, 2acd, 2adb, 2cpd, 2cpk, 2btl, 2cc, 2ba, 2mb, 2aed, 2cee, 2by, 2kf, 2brx, 2adb, 2bum, 2cla, 2abs, 2cm, 2cia, 2ate, 2adw, 2ayp, 2cei, 2cet, 2azy, 2za, 2ana, 2bxg, 2baw, 2azy, 2crq, 2cqp, 2awf, 3bkl, 3adp, 3arm, 3buy, 3lg, 3bss, 3lj, 3tr, 3chg, 3gc, 3cia, 3chp, 3cbl, 3zi, 3ly, 3nf, 3zo, 3bsc, 3bop, 3bz, 3ud, 3btk, 3bco, 3caf, 3bco, 3vh, 3jy, 3btl, 3by, 3ajd, 3bei, 3bof, 3bdo, 3uu, 4bg, 4hw, 4jh, 4af, 4ql, 4qf, 4pd, 4qw, 4iu, 4it, 4la, 4ru, 4af, 4fq, 4jk, 4mi, 4ba, 4na, 4gu, 4dl, 4qu, 4er, 4bx, 4jl, 4ay, 4ft, 4mb, 4ab, 4ai, 4cb, 4fz, 4cl, 5xab, 5alv, 5ek, 5vk, 5gg, 5ahr, 5aic, 5aiu, 5ql, 5uk, 5za, 5anc, 5pv, 5vc, 5aac, 5amh, 5nt, 5gj, 5afs, 5ajb, 5ahr, 5iv, 5sr, 5gd, 5amu, 5afa, 5adh, 5qd, 6ol, 6zu, 6bqb, 6bic, 6acm, 6cur, 6bpz, 6brk, 6zp, 6cfm, 6bqc, 6aru, 6fp, 6brf, 6anb, 6buo, 6bae, 6mh, 6zar, 6gr, 6cfz, 6cdy, 6age, 6cmr, 6aao, 6ckp, 6cc, 6ahu, 6cjv, 6ao, 6brw, 6bjj, 6la, 6dd, 6aaq, 6auu, 6rp, 6cdf, 6big, 6ne, 6cgw, 6pl, 6bm, 6fm, 6fp, 6im, 6qj, 6aqq, 6zh, 6wt, 6ux, 6bkx, 6amq, 6bbc, 6akt, 6zq, 6bkx, 6beq, 6ccw, 6lu, 6aug, 6blp, 6aas, 6fy, 6abc, 6bua, 6blg, 6bm, 6cgl, 6bjx, 6cnm, 6cum, 6acm, 6mk, 6uo, 6ff, 6bdi, 6brc, 6oy, 6aja, 6amo, 6akz, 6id, 6bpz, 6qj, 6oh, 6auu, 6lv, 6bqr, 6alk, 6apw, 6cmt, 6pm, 6ckp, 6bec, 6zx, 6chu, 7mp, 7ba, 7qu, 7ze, 7ob, 7co, 7ot, 7om, 7oc, 7bj, 7ago, 7cf, 7tq, 7co, 7qi, 7aea, 7ob, 7adh, 7cr, 8cwk, 8cuz, 8aiq, 8biz, 8px, 8bub, 8cej, 8fc, 8cjy, 8bue, 8aiq, 8wl, 8amk, 8bgs, 8dfo, 8bka, 8bwc, 8fq, 8brc, 8adg, 8aue, 8kc, 8cqx, 8bbq, 8rm, 8ckv, 8alx, 8pd, 8ak, 8dkj, 8czy, 8cpd, 8auc, 8aak, 8fm, 8cwk, 8aim, 8afq, 8aeg, 8afq, 8aey, 8bfh, 8cvr, 8ak, many more 8's, too many 9's.

Spark—8bda, 9cre, 9cox, 9dtm, 9cmk.

Fone—5aeu, 5aua, 5sp, 9aaq, 9cls, 9cyf, 5ana.

By Fred Hoffman, Jr., 1963 61st St., Brooklyn, N. Y.

C. W.—1aj, 1ac, 1av, 1ad, 1cq, 1tx, 1aw, 2's too numerous, 3htb, many others, 4ne, 4ft, 4jk, 5ac, 5bk, 6vac, 6bum, 6brf, 6cng, 7zu, 7nr, 8nw, 8kn, 8cci, 8wt, 8boc, 9aaw, 9ca, 9aci, 9or, 9ov, 9nr, 9uc, 9da,.

Can.: 3nf, 5ax, 3yu. Would appreciate qsl by crd.

By 9RC, 1711 Estes Ave., Chicago, Illinois

1aac, (1abf), 1aiq, 1akz, 1ary, (1avq), 1awe, 1boq, 1bsz, 1bvb, 1cak, 1cgq, (1cmp), 1cmx, 1cpc, (1cpn), (1ka), 1kc, 1yd, 1zd, 1zj, 2aay, 2aed, 2agb, 2al, 2ana, 2awa, 2azy, 2be, 2bij, (2bir), 2bkl, 2bpz, (2brb), 2bt, 2by, 2car, (2ccd), 2ccx, 2ce, (2cee), 2cnh, 2cqz, (2cpz), 2crp, 2hg, 2kx, (2le), 2qs, 2rb, (2rk), 2ts, 2xx, 3aa, 3aak, (3aao), 3ab, 3adv, 3ajs, 3apc, 3aqr, 3ay, 3bal, 3bdo, 3bg, 3bif, 3bij, (3bnu), (3bpf), 3bty, 3buy, 3bva, (3bvl), 3bwj, 3ccd, 3ccv, 3cdn, 3cfi, 3cjn, 3gg, (3hh), 3hk, 3iw, 3kg, 3lx, 3og, (3ov), 3oq, 3nf, 3ss, (3tf), 3wf, (4ab), 4af, (4ag), 4av, (4ba), 4ai, 4bn, 4cr, 4cs, 4dx, 4eb, (4eq), 4fg, 4ft, 4fv, 4fz, 4gz, (4hr), 4io, 4it, 4jh, 4lj, (4mi), 4nd, 4oa, 4ot, 4qf, 4qk, (4sh), 6age, 6ahp, 6ajh, 6akz, 6alv, 6aos, 6aqf, 6aqq, 6arb, 6ars, 6aru, (6auu), (6avr), 6awq, 6awt, 6bas, 6beo, 6bic, 6bih, 6bhk, (6bjj), 6bkx, 6blg, 6blm, 6bm, 6bnf, 6bny, 6bri, 6brf, 6buo, 6cbo, 6cbw, 6ceu, 6cgd, 6cgw, 6cie, 6cih, 6ckr, 6cnc, 6cnl, 6cz, 6dl, 6fp, 6gg, (6gt), 6ka, 6ng, 6nh, 6nx, 6pl, 6qj, 6tf, (6xad), 6zb, 6zbu, 6zq, 6zu, 7co, 7wp, 7ss, (7yl), 7zu, (kdef), nkf.

Hawaiian: 6ceu.

British: 2kl, 5ws.

Can.: 2be, (2bn), 2cg, 2ei, 2fu, 2hg, 2ic, (3adn), (3afz), 3iv, 3ph, 3tb, 3ws, 3yv, 3zt, 4ea, 4fz, (5cn), 5go, 5oh(?).

By 5ADB, 2117 Grant, El Paso, Texas

1bdi, 1xw, 2cla, 3yo, 4ba, 4fs, 4gu, 4gz, 7ael, 7are, 7co, 7ei, 7er, (7hg), 7hw, (7jw), (7qc), 7zu, 8apt, 8atc, 8bce, 8bk, 8bkn, 8cnf, (7ctp), 8dkb, (8ef), 8fc, (8fm), 8pl, 8vq, 8xap, 8xaq, 8xbp, 8xw.

Can.—3bq, 3je, 3ni, 3ws, 3xn, 4bz, 4co, 4cr, (5go).

QRA? KGV, KFZ.

By 6CIS, Kenneth Hughes, Yosemite, Calif.

1cy, 2gk, 4ik, 4cw, 4cr, 4cl, 4fn, 4pk, 5zav, 5za, 5sd, 5aca, 5ahr, 5gy, 5xd, 5zax, 5as, 5sl, 5tj, 5nn, 5gg, 5aic, 5jg, 5qi, 5ado, 5lc, 5lg, 5hz, 5eh, 5fc, 5afh, 5rg, 5ua, 5na, 5bc, 5uk, 5aju, 5adb, 6's too many, 7sf, 7om, 7kv, 7ajd, 7aim.

By 7JU, 650 12th Ave. East, Eugene, Ore.

1jv, 1bsd, 1bdi, 2cgj, 3vw, 3yo, 3hs, 3cby, 3oj, 3oy, 3he, 3ajd, 3bv, 4cr, 4my, 4hx, 4er, 4ft, 5aac, 5xh, 5na, 5aja, 5ek, 5nv, 5anc, 5bi, 5go, 5aiv, 5ro, 5tu, 5ado, 5xd, 5lav, 5aky, 5tj, 5aic, 5ie, 5ef, 5zav, 5xv, 5ahr, 5gg, 5sd, 5be, 5ank, 5air, 5alx, 5xa, 5qy, 5ce, 5hg, 6ceu, 8anm, 8baf, 8ana, 8fm, 8fu, 8dfw, 8apt, 8sp, 8aog, 8ak, 8bsl, 8xap, 8ame, 8td, 8big, 8cvd, 8czy, 8kk, 9caa, 9djp, 9atx, 9aqd, 9ap, 9bqf, 9aec, 9ehn, 9fm, 9apf, 9bqr, 9cga, 9ctv, 9brk, 9dun, 9ami, 9ahn, 9bly, 9aza, 9ccv, 9cah, 9hn, 9dxy, 9dfq, 9bl, 9bx, 9mc, 9yy, 9afz, 9czg, 9any, 8bxt, 9bof, 9bzh, 9cji, 9zy, 9aci, 9mc, 9dqr, 9aux, 9dma, 9bec, 9agb, 9bly, 9aaw, 9cxo, 9chc, 9bkk, 9abc, 9gzr, 9zt, 9bmf, 9lrs, 9aio, 9bav, 9ayx, 9dxn, 9aps, 9avm, 9dky, 9edb, 9dhs, 9bv, 9cef, 9bdj, 9amp, 9azg, 9mc, 9bhi, 9ai, 9dfq.

Anyone hearing my 5 watts please qsl. All cards answered.

By 3CB, Geo. D. Nardelli, Cedarville, N. J.

1aha, 2rb, 3tl, 3cbd, 3cko, 3bdr, 3bdo, 3cia, 3awe, 3bcd, 5amf, 8ag, 8mr, 8kg, 8ba, 9aaw(!). —We ans all crds reporting my 10 watt C. W. and fone.

By Can. 5FU, 8696 Oak St., Vancouver, B. C.

1cpc, 1bkq, 2aus, 2bkg, 2ccd, 3ani, 3axm, 3gm, 3ml, 4ch, 4cx, 4tu, 4ty, 5ado, 5ais, 5asg, 5bik, 5ek, 5fo, 5gm, 5lr, 5kc, 5gl, 5xd, 5zav, 6's and 7's too many, 8alx, 8auj, 8asv, 8bda, 8bjy, 8apn, 8bov, 8bys, 8ckf, 8er, 8ozy, 8fu, 8ly, 8xe, 9ar, 9ame, 9afm, 9apf, 9asr, 9aaq, 9age, 9azf, 9ami, 9avm, 9ake, 9bly, 9bji, 9bof, 9bab, 9bai, 9bzi, 9bik, 9bao, 9bhk, 9bhi, 9bfi, 9bav, 9axx, 9aep, 9bds, 9cyn, 9ctr, 9cjc, 9cly, 9cdb, 9djn, 9dys, 9dxu, 9doe, 9dkq, 9ei, 9edb, 9eky, 9es, 9elv, 9fb.

Fone—6kf, qsa vy.

Can.—3ri, 4cb, 4cl, 4co, 4fr.

By 5AEE-5ADE, 14th and Youngs Blvd., Oklahoma City

Jan 25-26.—2eb, 2ts, 2vu, 3atb, 3buk, 3hg, 3ts, 3va, 4ab, 4ba, 4fd, 4ft (vry qsa), 4gz, 4hh, 4hs, 4ic, 4it, 5ku, 4oa, (5adw), (5agh), (5anc), (5bx), (5qy), (5rq), 6bbw, 6cgw, 6lj, 7bw, 7co, 7jw, 7zo, 8aax, 8aex, 8alx, 8amp, 8apt, 8ari, 8bcw?, 8bdn, 8blb, 8bmb, 8bnv, 8br, (8bxa), 8cci, 8cgj, 8ckv, 8com, 8cpp, 8cpt, 8cip, 8dal, 8dez, 8dhq, 8dlm, 8do, (9aog), (9ayl), (9cka), (9ckl), (9cle), (9dqe), (9qe).

Jan. 28.—4by, 4rh, (5za), (5cv), 8sf, (9ckj).

Feb. 16-17.—1anq, 1apc, 1bsz, 2aay, 2br, 3aw, 3abw, 3nf, 3yv, 3xi, 4aai, 4atu, 4bz, 4cpa, 4ft (vry qsa), 4hr, 4ku, 4oa, 4rm, (5mn), 6cbq, 7to (vry qsa), 8anm, 8aok, 8aqm, 8bab, 8bbi, 8bkn, 8bkx, 8cqj. 8dac, 8dbo, 8pl, 8ut, 8zk, (9bhy).

Will qsl crd upon request. Qrk 5ADE's 10 watts, 5AEE'S snk.

At 6AKW ex-6AJH, Lee Roy Potter, Lancaster, Calif.

1yb, 1rm, 1arb, 1sn, 1wh, 1er, 1cmp, 1hx, 1vv, 1zl, 1beg, 1zi, 1ii, 2dx, 2xq, 2by, 2oi, 2el, 2cr, 2cg, 2rr, 3oo, 3un, 3bp, 3oq, 3wg, 3aea, 3cc, 3su, 3bof, 3adb, 4em, 4er, 4ab, 4af, 4hh, 4hf, 4ao, 5qq, 5abt, 5ek, 5bw, 5zav, 5yw, 5adb, 5in, 5ahr, 5hl, 5ua, 5ik, 5oc, 5aiu, 5abb, 5ht, 5qi, 5za, 5be, 5amb, 5yo, 5ado, 5xd, 5abn, 5sd, 5lr, 5sn, 5aic, 5qd, 5ol, 5gh, 5ahr, 5ts, 5gn, 5pa, 7ke, 7adg, 7nt, 7lw, 7afo, 7xaf, 7sc, 7zx, 7ac, 7adf, 7ol, 7zo, 7ob, 7aiy, 7aci, 7dc, 7gs, 7acx, 7sn, 7jd, 7io, 7to, 7sf, 7qo, 7eo, 7ze, 7zu, 7abb, 7xaa, 7au, 7dc, 7qt, 7akh, 7yt, 7ih, 7fd, 7qd, 7nn, 7ahv, 8pu, 8dat, 8sf, 8dlh, 8fm, 8aa, 8iv, 8bqk, 8lf, 8xe, 8dhq, 8bvt, 8dgr, 8apm, 8uk, 8aaf, 8apn, 8xf, 8gm, 8ly. 8yn, 8aib, 8tv, 8bfm, 8ze, 8ph, 8bky, 8bhn, 8bbw, 8dte, 8aar, 8aau, 8bda, 8er, 8ak, 8ol, 8cbe, 8oaa. 8xbh, 8xan, 9chf, 9cky, 9bzi, 9cwj, 9cde, 9czg, 9crg, 9aja, 9cjc, 9zy, 9ceu, 9bnw, 9cxp. 9aog, 9aem, 9djb, 9eam, 9dhp, 9asn, 9bhm, 9ceh. 9dwg, 9aio, 9cld, 9bof, 9ccz, 9deu, 9aio, 9dyz. 9dhg. 9bji, 9asv, 9bly, 9asg, 9ww, 9qe, 9dkb. 9azg, 9bly, 9dyy, 9doi, 9efu, 9aic, 9vm, 9bp, 9amu, 9dsw, 9dyr, 9bo, 9ccz, 9bjk, 9aua, 9gk, 9dxn, 9djq, 9cun, 9aap, 9mu, 9ea, 9eae, 9dzv. 9apf, 9dte, 9bdy, 9brk, 9arm, 9agx; 9dpx, 9avu, 9dfh, 9bhz, 9cgu, 9eea, 9dkg.

Can.: 5go, 9bx, 4cb, 3zn, 5hk, 5nr, 4cl, 2ic, 5cn, 9bj. Anyone hearing sig 6AKW pse qsl. Will appreciate a report.

Heard WNP several times, usually QRZ and QSS's wkg with 6XAD. Wkd WNP Feb. 15, 1924, early a.m.; at 12:25 a.m. P.S.T. Q.S.A. at 12:25 for few minutes, then went almost out, due to faulty "B" battery. Tried to copy msg for 6AWT but had to give it up about 12:40 a.m. as to weak sigs. Heard him wkg a 7 later around 1:00 to 1:30 a.m., but only intermittent rec. here, due to no "B" battery at that time. W.N.P. said QRO mostly with 6AWT now.

By 8WY, Akron, Ohio

1ci, 1aaw, 1alj, 1aqi, 1asu, 1bgq, 1emp, 1cmx, 1zj, 2gk, 2aay, 2ami, 2axf, 2bxw, 2cee, 2cgk, 2crc, (2cwj), 2cxy, 3me, 3mf, 3tj, 3tr, 3uz, 3abj, 3adn, 3apb, 3bdo, 3bqu, 3buy, 3bvn, 3chg, 3zo, 4af, (4it), 4iu, 4ou, 4qf, 4qw, 4sh, 5ap, 5ek, 5lr, 5ql, 5uk, 5vc, 5aac, 5aby, 5aiu, 5amh, 5yw, 5za, 6ao, 6bm, 6cc, 6dd, 6fy, 6lv, 6od, 6pl, 6rn, 6acm, 6ahw, 6akz, 6auu, 6bih, 6bqe, 6buy, 6cgd, 6cgw, 6cng, 6zh, 6zar, 6xai, 7co, 7fq, 7oh, 7qd, 7agv, 7ahv, 7ajd, 7ald, 9er, 6kc, 9lt, 9sd, 9ta, 9vz, 9we, 9acx, 9ahj, 9aju, 9alx, 9amb, 9amu, 9and, 9aru, 9aue, 9axa, 9bcb, 9bez, 9bhi, 9bhl, 9bhx 9bis, 9bjk, 9blw, 9bly, 9bmr, 9bqy, 9cic, 9cks, 9cnb, 9cpc, 9czs, 9day, 9dbf, 9dff, 9dfh, 9dfz, 9dge, 9dkx, 9dnn, 9doe, 9dpw, 9dqu, 9dun, 9wx, 9dxs, 9dyy, 9dzx, 9eac, 9efz, 9ehq, 9eja, 9eky, 9ela, 9yy.

Daylite—1rv, 2 qs.

Can.—3ws, 4bk.

By 6CLZ, 2131 Grant St., Berkeley, Calif.

U. S.: 1xz, 2bof, 2bqh, 2by, 3atb, 3lg, 4io, 4oa, 5adb, 5ado, 5ahr, 5akf, 5au, 5bm, 5fv, 5he, 5ht, 5jc, 5lr, 5mo, 5na, 5qy, 5vm, 5xat, 5xd, 5xt, 5yw, 5zav, 5zu, 6adh, 6aja, 6aru, (6atn), 6bfb, 6buh, 6bui, 6cbu, 6ceu, 6cjb, 6cqe, 6fm, 6nf, 6pe, 6qj, 6rm, 6zbs, 6zh, 7abb, 7acg, 7aci, 7ada, 7adf, 7adg, 7adm, 7adr, 7ads, 7afn, 7afo, 7aft, 7afu, 7agv, 7aha, 7ahv, 7aim, 7ajd, 7ajv, 7akh, 7akv, 7akz, 7alk, 7av, 7bj, 7br, 7ca, 7cb, 7co, 7cq, 7di, 7dm, 7du, 7ei, 7ej, 7er, 7es, 7fd, 7ff, 7fq, 7fr, 7ft, 7gi, 7hi, 7io, 7je, 7jy, 7ks, 7lh, 7ln, 7ly, 7nt, 7ob, 7om, 7ot, 7oy, 7pj, 7pz, 7qc, 7qd, 7qt, 7qu, 7qy, 7rp, 7rs, 7sh, 7sn, 7sx, 7sy, 7td, 7tq, 7tt, 7vn, 7wm, 7wq, 7zj, 7zl, 7zo, 7zu, 8aa, 8acy, 8aih, 8amm, 8apt, 8bda, 8bob, 8bxx, 8cei, 8cud, 8czy, 8dbl, 8dgo, 8dhs, 8jj, 8nb, 8tv, 8ve, 8yv, 9aau, 9ady, 9aem, 9agb, 9agp, 9aim, 9ami, 9aou, 9apn, 9auu, 9avg, 9awn, 9azg, 9bak, 9bav, 9bez, 9bhk, 9bjz, 9bof, 9bp, 9boj, 9boq, 9bsi, 9bto, 9caa, 9ccv, 9ccz, 9cfi, 9cfy, 9cga, 9chc, 9cht, 9ckj, 9cld, 9clq, 9cp, 9crr, 9cui 9cvs, 9daw, 9dkq, 9dlm. 9dpx, 9dts, 9dwn, 9dvw, 9dun, 9dxn, 9dxy, 9dyn, 9dyr, 9ebh, 9ebt, 9edb, 9eea, 9eek, 9ehj, 9eky, 9elv, 9eq, 9gd, 9lw, 9mc, 9rc, 9ss, 9vm, 9zy.

Can.—4 cw, 5ct.

Qrk 6CLZ 5 watt a.c. C. W.? All cards answered.

By 6BEZ, 407 Hillside Court, Piedmont, Calif.

1aur, 1bcr, 1bkq, 1fs, 2bqh, 2bsc, 2xna, (3adb), 3be, 3blu, 3je, 3wf, 4bz, 4fs, 4rr, (5aac), 5aat, 5abn, 5adb, 5ads, 5adt, 5aft, 5ahr, 5aky, 5alr, 5bm, 5cv, 5dm, 5eh, 5gg, 5he, (5ib), 5jg, 5jl, 5mz, 5ov, 5qd, 5qq 5qx, 5rb, 5sd, 5tj, (5ts), 5vf, 5xaf, 5zav, 5zb, 7mn, (8abm), 8abs, 8ada, 8aip, 8ak, 8anm, 8azg, 8bbt, 8bdr, (8bkm), 8bmb, 8bsy, 8com, 8cxm, (8dcw), 8dkb, 8fm, 8yn, 9abc, 9abf, 9aci, 9acx, 9aec, 9agb, 9aim, (9aju), 9aki, (9aog), 9ap, 9apf, 9aru, 9asn, 9atn, 9ato, 9aue, 9aus, 9avg, (9avs), 9azg, 9azp, (9bab), 9bcx, 9bdz, 9bed, 9bez, 9bfx, 9bg, 9bjk, 9bmx, 9bnu, 9bop, 9bqj, (9bvn), 9bvv. 9bzi, 9ca, 9caa, 9caj, 9ccm, 9ccv, 9cee, 9ceh, 9chc, 9cho, 9cin, 9clh, 9cvi, 9cvv, 9dap, 9day, 9dcp, 9dct, 9dfh, 9djb, 9djn, 9dkb, 9doj, 9dqa, 9dr, 9dug, 9duh, 9dun, 9dxn, 9eak, 9edb, 9efh, 9efu, 9eib, 9eja, 9ekf, 9fm, 9hm, 9ry, 9ve, 9vm, 9zt, 9zy.

Can.: 3kg, (3xi), 4er, 5ct.

Work done on 154 meters with 10 watts. Would appreciate any reports on my sigs. Cards answered promptly.

By 6CCY, Riverbank, Calif.

1axn, 1bes, 1cmp, 1ez, 1fd, 1xz, 1yb, 1zd, 2bqh, 2by, 2rk, 2dm, 2gk, 2ts, 3ck, 3oi, 3ni, 4ce, 4cs, 4db, 4fs, 4er, 4gz, 4gu, 4iz, 4it, 4io, 4ku, 4hs, 4oa, 4pk, 4qf, 4xe, 4za, 5aak, 5adv, (5adb), (5ado), 5aij, 5aiu, 5ahd, 5ajj, 5anc, 5ama, 5xws, 5zav, 5ef, 5ei, 5he, 5jw, 5ht, 5ek, 5kc, 5kr, (5kw), 5lg, 5lr, 5mb, 5nz, 5rh, 5rs, 5na, 5qi, 5rv, 5ti, 5uk, 5vm, 5zh, (6ceu), (7ajd), (7xaf), 8aib, 8aim, 8avt, 8alx. (8atc), 8aue, 8agf, 8awc, 8atx, 8bda, 8bzd, 8bfq, 8zy, 8aih, 8dig, 8bdu, 8dif, 8asv, 8bro, 8dgi, 8akd, 8baa, 8cwk, 8cpp, 8czy, 8bm, 8oa, 8vq, 8wx, 8tv, 8rv, 8ij, 8zz, 8xe, 8wv, 9aou, 9ath, 9amb, 9ahb, 9ahz, 9apf. 9ady, 9awp, 9aps, 9afy, 9avs, 9awv, 9awf, 9ahj, 9aci, 9afr, 9avu, (9atn), (9bji), (9bjk), 9bak, 9bjj, 9btt, 9bun, 9bzi, 9bly, (9bdz). 9bxa. 9bis, 9bri, 9byt, 9brs, 9boo, 9bto, 9brk, (9bka), 9bhk, 9bth, (9cde), 9caa, 9cui, 9cby, 9cvs, 9ccz, 9cga, 9chc, 9ccd, 9cld, 9cgu, 9cgs, 9ctg. 9cic, 9cka, 9dte, 9dfh, 9daw, 9dpx, 9dwn. 9dyz, 9drx, 9eea, 9eev, 9pe, 9dc, 9bp, 9ei, 9uh, 9ss, 9yy, 9yp, 9qe, 9tg. 9cm, 9be.

Can.: 3bp, (4co), 4cl, (4cw), 5cn, 5ct, (5ah), 5go.

Anyone hearing my cw pse qsl. All cards answered.

By 6ZT-6EU-6XPE, P. O. Box 772, Salt Lake City

1anr, 1bbo, 1cpn, 1fd, 2aet, 2al, 2awl, 2bqh, 2br, 2bwp, 2kx. 3adb, 3be, 3bj, 3bji, 3bwt, 3ckg, 4cr, 4cs. 4rr. 8ack, 8ak, 9aki, 8al, 8alm, 8apt, 8atc, 8bbm, 8bfh, 8bkn, 8bmb, 8cp, 8cud, 8dha, 8dhq, 8dkb, 8kg, 8ry, 8vn, 8wx, 5's,6's. 7's and 9's too numerous to mention. Salt Lake City is a "hole" for reception from east.

By H. T. Mapes, "BX," Guanajuato, Gto. Mexico

1aw, 1ary, 1bsz, 1yb, 2gk, 2aet, 2bqb, 3rg, 4ab, 4ba, 4cs, 4er, 4ft, 4hn, 4ik, 4oa, 4qf, 5adb, 5amb, 5amu, 5aim, 5alz, 5ahr, 5aiu, 5air, 5co, 5cv, 5cs, 5er, 5ek, 5fc, 5gv, 5gj, 5hz, 5jl, 5kh, 5lr, 5ml, 5na, 5nh, 5ql, 5rv, 5sg, 5tj, 5ua, 5vm, 5va, 5xau, 5yw, 5zas, 6acm, 6aol, 6adh, 6aqd, 6awt, 6abc, 6ahp, 6arf, 6acu, 6awq, 6brf, 6bui, 6cms, 6cnl, 6cl, 6cbb, 6cgw, 6cmr, 6mh, 6od, 6ms, 6eb, 6dd, 6li, 6pl, 7afo, 7abb, 8atc, 8atx, 8alx, 8acn, 8acy, 8anb, 8amm, 8bpc, 8bk, 8bzc, 8cci, 8cno, 8czy, 8cud, 8cku, 8ded, 8qw, 8rv, 8vq, 8ou, 8cvg, 9aal, 9aau, 9aei, 9aku, 9aim, 9ahz, 9aqg, 9brk, 9blg, 9bhi, 9brs, 9bhd, 9bjn, 9boz, 9bzh, 9brk, 9bds, 9beu, 9cly, 9clq, 9cvt, 9czw, 9cjc, 9cga, 9cvt, 9czm, 9cvo, 9cah, 9clj, 9cgn, 9cpe, 9ctr, 9cvc, 9cmk, 9dhw, 9drx, 9dxu, 9dsv, 9doe, 9dmk, 9edb, 9eeb, 9eak, 9es, 9hw, 9ih, 9ri, 9rc, 9ss, 9vz, also 5rg, 5ado, 6bvg, pd, xfz, kpo.

"BX" is closed down at present due to QRM from Revolution.

By 6BBQ, Frank F. Macik, 194 S. El Molino Ave., Pasadena, Calif.

2aet, 3lg, 4cq, 4sh, (5lg), 5ht, 5na, 5nw, 5ty, 5xd, 5aat, 5adb, 7bj, 7by, 7co, 7fq, 7hg, 7ke, (7qd), (7rd), 7ry, 7zl, 7zu, 7adf, 7adg, 7ajd, 7alk, 7akh, 8aa, 8er, 8aig, 8aim, 8akj, 8alm, 8apt, 8bzd, 8cwk, 8dat, 8djp, 9afm, 9amb, 9awv, (9avu), 9axx, 9beu, 9bmx, 9brk, 9brs, 9cdg, 9cgm, 9cjc, 9cld, 9cly, 9daw, 9dfh, 9eae.

All cards answered. All above heard on 1 wd 12.

By W. Jervey Ravenel, 4SS, Charleston, S. C.

1ahb?, 1aur, (qra), 1aw?, 1axn, 1bgc, 1bgq, 1bhr, 1boq, 1bax, 1crf, 2ana, 2bsz, 2cjb, 2cka, 2gr, 2hj, 2ts, 3af, 3akr, 3bdo, 3cc, 3qw, 4af, 4ai, 4aj, 4ba, 4bg, 4ch, 4cl, 4db, 4eh, 4el, 4ep, 4er?, 4ez, 4fa, 4ft, 4if, 4ii, 4io, 4it, 4in, 4iz, 4ja, 4kc, 4lj, 4lr, 4ma, 4me, 4mi, 4my, 4na, 4ne, 4og, 4pk, 4pt, 4qu, 4qw, 4qy, 4sh, 5aac, 5abf, 5abw, 5ac, 5afv, 5agj, 5air, 5aiu, 5al, 5amh, 5amz, 5ana, 5ek, 5qf, 5gj, 5gn, 5jl, 5jw, 5kr, 5lp, 5lr, 5mi, 5mo, 5nn, 5ov, 5pl, 5qi, 5ql, 5rd, 5rh, 5su, 5sy, 5tw, 5ua, 5vt?, 5vv, 5vy, 5wg, 5xk (qra), 5yw, 5za, 5zas?, 5zc, 5zg, 6aig, 6awq, 6bic, 6bjj, 6bun, 6buy, 6cbi, 6cgd, 6cgf, 6cgw, 6chr, 6cib, 6ckv, 6ckw, 6dog (qra), 6eb, 6fm (qra), 6fr (qra), 6nb, 6pp (qra), 6zh, 6zz, 7co, 7lq, 8abx, 8adb, 8ajc, 8ama, 8bdt, 8bdu, 8bwn, 8chb, 8cqh, 8cyh, 8dgl, 8fm, 8rj, 8uu, 9ahj, 9ahz, 9amu, 9apf, 9aps, 9arm, 9aue, 9bbo, 9bbr, 9bc, 9bcc, 9bdt, 9bed, 9bht, 9bij, 9brk, 9bst, 9ccs, 9cee, 9cin, 9cyq, 9cyw, 9czm, 9deu, 9dnn, 9drx 9dte, 9dwk, 9dwx, 9ecv, 9er, 9ln, 9vm, 9vz.

I. C. W.: 1ckp, 8apz.
Spark—4rk.
Phone—1alj, 4ft, 5amf.
Would appreciate QSL by card, especially from those who are QRA.

By 5TA, P. T. Crosby, 329 East D. St., Oklahoma City, Okla.

1ajp, 1asd, 1avl, 1abf, 1ali, 1all, 1bkq, 1cdo, 1xak, 2cxd, 2aed, 2awf, 2bwp, 3anm, 3blp, 3bms, 3bof, 3bt, 3cjx, 3jy, 3mf, 3ms, 3oi, 3ud, 3zs, 3adt. 3afs, 3bdi, 3cbk, 3ckl, 3dx, 3kq, 3yk, 4cm, 4dv, 4it, 4jr, 4og, 4pu, 4ru, 4sh, 4ab, 4je, 4qy, 6aam, 6ahc, 6aro, 6atz, 6awq, 6bjj, 6blw, 6cab, 6caq, 6cbi, 6cdg, 6cgg, 6ckr, 6cmu, 6cnm, 6dd, 6eu, 6hc, 6nx, 6pp, 6pu, 6tv, 6zah, 6zbu, 6bh, 6brf, 6buy, 6cei, 6cgi, 6cgw, 6cih, 7afu, 7ahs, 7aim, 7fr, 7adr, 7ahv, 7du, 7to, 7tq, 8ak, 8awl, 8ayt, 8bfe, 8bfh, 8bqs, 8bvy, 8cge, 8cqj, 8cx, 8cxm, 8cxw, 8dfm, 8diz, 8dlu, 8gp, 8jt, 8wo, 8wz, 8zb, 8zu, 8ape, 8bkb, 8bwf, 8bwj, 8bxh, 8ccu, 8cke, 8cud, 8dp, 8icy, 8ij, 8ve.

Can.: 3hi, 3wg, 3yv, 2bg, 3fc.

By 6CMI, H. A. Highstone and W. T. Campbell, 9410 E. 14th St., Oakland, Calif.

1akl, 1all, 1bsg, 1cmp, 5ac, 5bx, 5cu, 5nw, 5qd, 5ru, 5tu, 5to, 5ts, 5xd, 5za, 5zav, 5aiv, 6ceu, 6tq, 6amw, other 6's too numerous, 7mn and every 7 on the air, 8azg, 8apt, 8cwg, 9fm, 9lz, 9tc, 9tw, 9qe, 9zy, 9aau, 9afm, 9aga, 9agb, 9agy, 9aim, 9amn, 9apf, 9ash, 9avn, 9avu, 9ayr, 9axx, 9azg, 9hab, 9bed, 9bfh, 9brs, 9bqj, 9bjk, 9bzi, (9caa like local), 9caj, 9ccv, 9ceh, 9cga, 9cjc, 9ctp, 9ctr, 9dcr, 9dkb, 9dqa, (9eld very qsa), 9eae. Fones—6brf, 7vn. 6CMI appreciates reports on his signals, hw.

By 60F-AIQ, 3419 So. Hope St., Los Angeles

1xw?, 1xak?, 2agb, 2gk, 3bg, 3bz, 3mb, (4ft), 4hs, 4ku, 4oa, 5aac, 5adb, 5aij, 5aiu, 5ajb, 5be, 5fy, 5ga, 5jr, 5jw, 5kc, 5kq, 5ml, 5nw, (5qd), 5qi, 5qw, 5sd, 5sr, 5xd, 5xv, 5yv, 5za, 5zav, 6's too numerous, 7acx, 7adf, 7ael, (7ajq), 7akh, (7bj). 7co, (7em), 7fd, (7fq), 7gr, 7ij, 7io, 7iw, 7ke, (7ks), 7lg, 7lh, 7lu, 7mp, 7ob, 7ot, 7qd, 7sf, (7wp), 8adm, 8atp, 8apn, 8bkm, 8bqs, 8bxh, 8hs, 8kg, 8kc, 8wx, 8yy, 8yd, 9aac, 9aci, 9afy, 9ahz, 9aim, 9ais, 9ami, 9aog, 9ape, 9apf, 9asn, 9avz, 9awc, 9azg, 9bdz, 9bez, 9bjk, 9bjn, 9bun, 9bxw, 9caa, (9ccv), 9ccz, 9cea, (9ceh), 9cel, 9cku, 9clq, 9ctr, 9czg, 9djb, 9dkb, 9dsu, 9dun, 9dyr, 9efh, (9efu), (9ehj), 9ekf, 9eky, 9bg, 9fm, 9ve, 9vm, 9xw, 9xax? Anyone hearing my C. W. pse qsl. All crds answered.

Continued on page 84

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Pacific Building San Francisco

Continued from page 82

By 8ANM, 8CPK and 8COM, Medina, Ohio

1aal, 1aap, 1aer, 1afn, 1ags, 1ah, 1ajh, 1anx, 1aoo, 1aou, 1atg, 1bep, 1bfv, 1bhn, 1bnt, 1btt, 1bvl, 1cav, 1cde, 1cit, 1cjc, 1cjr, 1cjs, 1cpi, 1fd, 1rv, 1yk, 1zk, 2aay, 2abn, 2apb, 2au, 2axf, 2baq, 2bck, 2bco, 2blm, 2blu, 2bm, 2bum, 2buq, 2bwm, 2byw, 2cay, 2cgk, 2cnh, 2cph, 2cqp, 2cts, 2cvy, 2cyw, 2kr, 2ku, 2tp, 2vb, 2wr, 3abb, 3adt, 3aek, 3agf, 3aic, 3aou, 3apc, 3auo, 3bay, 3bcq, 3bfq, 3bgc, 3bgz, 3bhl, 3bkl, 3blu, 3bms, 3bmz, 3bpp, 3caf, 3cbx, 3cch, 3ccx, 3ccz, 3chg, 3chf, 3cia, 3ckg, 3ckp, 3ds, 3ii, 3kq, 3lr, 3oq, 3qv, 3wb, 3yo, 4af, 4fz, 4ia, 4jk, 4jr, 4js, 4ob, 4sh, 4ft, 4sb, 5aac, 5afh, 5aic, 5aiw, 5ahr, 5ajb, 5ajq, 5ajv, 5amu, 5amw, 5ek, 5fc, 5fj, 5gb, 5ht, 5nw, 5pa, 5ql, 5ro, 5rq, 5sk, 5ts, 5uu, 5ws, 5za, 6acu, 6ahj, 6ahp, 6ajh, 6are, 6avr, 6avv, 6bbc, (6bbw), 6bel, (6bh), 6bfc, 6bjj, 6boe, 6buy, 6bwp, 6cbw, (6cgw), 6cjv, 6ckr, (6cmr), 6cnh, 6fp, 6gt, 6mh, 6nx, 6ol, 6pl, 6sn, 6vm, 6zh, 6xad, 7abb, (7ael), 7afa, (7co), (7fq), 7hw, 7ih, 7lu, 7ly, 7ob, 7to, 7qv, 7zu, 9afx, 9ahq, 9aaio, 9aju, 9ape, 9auu, 9bav, (9bji), 9bly, 9bna, 9bqj, 9bqo, 9btm, 9boq, (9bun), 9caa, 9ccg, 9ccn, 9ccw, 9cdb, 9cfd, 9cg, 9cka, 9ckd, 9cld, 9cnb, 9ctg, 9ctn, 9ctt, 9cbii, 9cvi, 9cwf, 9cyg, 9cyy, 9dap, 9dcw, 9dip, 9dlt, 9dlr, 9dli, 9dlr, 9dnj, 9dnd, 9dte, 9dtt, 9dtu, 9dun, 9dws, 9ea, 9eak, 9ed, 9ees, 9ehy, 9ei, 9eib, 9qx, 9nu, 9oy, 9st, 9ur.

Can.: 2an, 2bf, 3ms, 3ni, 3pg, 4cl, 4co, 4cr, 9by. Will be glad to qsl. Write either 8ANW, W. Washington St.; 8CPK, 421 S. Broadway St.; or 8COM, 519 E. Washington St., Medina, Ohio.

By 6CIX-6ABO, 317 N. Friends Ave., Whittier, Calif.

1bcr, 1au, 2bsc, 2cee, 2by, 2gk, 3fz, 3me, 4eu, 4fz, 4io, 4pf, 5aar, 5aaw, 5abh, 5ace, 5adb, 5aee, 5aic, 5aiu, 5ajb, 5ajd, 5ajq, 5ajt, 5ala, 5alh, 5alm, (5amo), 5ams, 5anc, 5zav, (5ag), (5az), (5be), 5bx, 5co, 5dv, 5eh, 5ga, 5gj, 5jc, 5jl, 5jr, 5nk, 5nt, 5nw, 5pz, 5qd, 5ql, 5xd, (6anp), (6apr), (6cif), (6cjj), (6ckr), (6clp), (6cmd), 7acg, 7acx, 7adf, 7adg, 7ael, 7aek, 7aha, 7ahv, 7aim, 7akh, (7akk), 7ald, 7alk, 7alq, 7amj, 7aqd, 7xaf, 7af, 7aj, 7by, 7co, 7ej, 7em, 7ez, 7fq, 7fr, 7gr, 7hg, 7io, 7it, 7iw, 7jy, 7ke, 7ks, 7lu, 7lw, 7mp, 7nr, 7ob, 7od, 7ot, 7pf, (7pj), 7pz, 7qc, 7qd, 7qe, 7qu, 7ra, 7rd, 7rh, 7rq, 7ry, 7sy, 7to, (7tq), 7tt, 7vn, 7vx, 7wa, 7wq, 7ya, 7zu, 8aaj, 8ajj, 8apt, 8ard, 8bba, 8bda, 8bhx, 8bkn, 8da, 8dc, 8oe, 8qv, 8rm, 8vq, 8wy, 9aal, 9aau, 9abc, 9aci, 9aec, 9aen, (9afm), 9ahv, 9ahz, 9aia, 9ajd, 9amb, 9and, 9any, 9ape, 9apf, 9aqk, 9aru, 9asn, 9atn, 9avg, (9avs), 9azg, (9bdu), (9bdz), 9beg, 9bez, 9bgh, 9bgk, 9bhi, 9bij, 9biv, 9bjk, 9bjm, 9bkf, 9bly, 9bnb, 9bnu, 9bpn, 9bqr, 9bty, 9bun, 9bxa, 9bxq, 9caa, 9cch, 9ccs, 9ccv, 9cdv, 9ceh, 9cgm, 9cgu, (9cht), 9cjy, 9cld, 9cly, 9cnv, 9cpc, 9ctg, 9cyb, 9czm, 9daj, 9dbf, 9dch, 9dcw, 9dfh, 9dfn, 9dhr, (9dkb), 9dro, 9dun, 9dxu, 9dyr, 9eae, (9eam), 9ecn, 9eep, 9eht, 9eky, 9elv, 9elz, 9xba, (9bg), 9dr, 9hv, 9ve, 9vm, 9zt, Can. 4co. Any rpts on my sigs wud be greatly appreciated; all crds gldly ansd.

By 6BBW, 234 N. Painter Ave., Whittier, Calif.

1ah, 1bcr, 1bkq, (1cmx), 1fd, 1yb, 3blu, 3ccx, (3qv), 3xi, 4bz, 4gz, (4io), 4my, (4oa), 4rr, 5agh, 5aiu, 5ajb, 5akt, 5amu, 5be, 5lr, 5nw, 5tj, 5za, (6acu), 6acv), 6adv), (6age), (6amg), (6anp), (6aoh), (6aos), (6atq), (6atz), (6avv), (6ccy), (6cdg), 6ceu, 6cgc, (6cgd), (6cid), (6cmi), 7adm, 7afu, 7ahc, 7ajy, (7akh) (7akk), (7bj), 7br, (7cf), 7en, 7fq, 7gq, (7hg), 7ld, 7om, (7qd), 7rd, 7sf, 8acn, (8ada), (8aih), (8anm), 8ape, 8apt, 8avt, 8bda, 8bjy, 8bxx, 8cud, 8dae, 8ddk, 8djf, 8qk, 8ry, (8vq), (8vy), (8zc), 8zz, 9acx, 9amf, 9aog, 9avg, 9bis, 9blb, (9brk), 9cjc, 9ckm, (9dap), 9dhr, 9eak, 9ehj, 9eq, 9qe.

Can.; (3ad). Will QSL cards to the above if requested. All reports on my sigs appreciated and QSL'd.

By 9EFH, C. H. Morgan, Newton, Iowa

(1ah), 1ajx, 1aqm, (1arf), (1ary), 1boq, 1bsz, 1cmp, 1cmw, 1cmx, (1cnw), (1csw), (1er), 1mv, (1rr), (1sw), (1jv), 1yb, (1xw), (1xah), 1xam, (2aiu), (2ajf), 2ana, (2atz), (2ayp), (2azy), 2bcj, (2bdg), 2bhk, (2bsc), (2cee), (2cpa), (2crc), (2cty), 2cxl, (2gk), (2le), (2rk), (3abw), 3ady), (3adb), (3aen), (3aqr), (3bjy), (3bpm), (3ccu), (3chh), (3ckl), 3ia, 3lg, 3oe, (3oi), (3te), 3zo, (4ai), 4bq, 4ft, 4fx, 4fz, 4hs, 4iw, (4eb), (4lj), 4pd, (5sh), (4xe), (5aac), 5aag, (5ac), (5ad), 5ads, (5aeu), 5agh, (5agt), (5agz), 5agj, 5ahr, (5air), (5aic), (5ajb), 5akn, (5amu), (5anc), (5ap), (5bs), 5cd, (5eh), 5ek, (5fj), 5gf, 5gg, 5hi, (5in), (5jf), 5jj, (5kc), (5kn), (5kr), (5lr), 5mm, (5nn), (5nw), 5ov, (5ow), 5qd, (5ql), 5qq, (5qw), (5qy), 5sd, (5rg), (5ts), 5uk, (5uy), (5vc), 5vf, 5xap, (5xaq), 5yk, 5za, (5zav), (5zg), 6alk, 6ark, 6auu, 6awt, 6bvg, 6ceu, 6cgd, 6chl, 6eb, (6eu), 6lv, (6rn), 6xad, (6zar), 6zh, 7co, (7fq), 7mp, (7abb), (7om), 7pz, 7se, 7sv, 7zu, 7xba?. Eights and nines too numerous.

Can.: 2cg, (2hg), (2bn), 2oc, (3ia), (3ir), (3ml), (3ms), (3oj), (3om), (3ud), (3yh), (3yv), (4aj), (4ea), (4fz), 4fv, (5go), 9bp.

Mexican: "BX."

English: 2nm, 2od, 2kg, 2kf.

Holland: pcii, pctt.

Italian: acd.

French: 8ab, 8ac, wnp.

Pse, QSL mi 15 watt CW. All cards answered.

By 6CDC, Earl Barnett, 3024 44th Street, Sacramento, Calif.

5ado, 5aic, (5aij), 5ain, (5ajb), 5azv, 5fc, 5gj, (5ht), (5lr), 5sk, 5xd, 6bdt, qra, Honolulu, (7adg), (7aim), (7akh), (7bj), 7di, 7dz, (7em), (7fq), 7fr, 7go, (7qu), (7it), (7hf), (7jo), (7ke), 7mp, (7mr), (7rd), 7rn, 7to, 7wa, (7wq), 8aa, 8aig, 8anm, 8apt, 8avt, 8bek, 8bf, 8cnd, 8czy, 8ipe, 9afn, 9amp, 9ap, 9apf, 9awv, (9ayl), (9azg), 9bea, 9ben, 9bhi, 9bfh, 9bqj, (9bop), (9brk), 9bth, 9bqj, 9bwv, (9caa), 9ccm, 9ccv, 9cga, 9cjc, (9ctg), 9ctv, 9djh, 9dkg, 9dyr, (9doe), 9daw, 9eld, 9oy, 9rc, 9zy.

Can.: 4co, 4ct, 5ct, (5go).

By 9AQK, 5022 Underwood Ave., Omaha, Nebr.

1er, 1sk, 1zd, 1xz, 1zi, 1zs, 1zs, 1zt, 1aw, 1kv, 1aol, 1ary, 1anr, 1azn, 1asr, 1asu, 1bwj, 1byw, 1bez, 1bnn, 1bes, 1bsz, 1cab, 1cac, 1cdo, 2rk, 2gk, 2sh, 2ts, 2kx, 2wr, 2gl, 2aan, 2ana, 2agh, 2aeb, 2apy, 2aql, 2bbn, 2bwp, 2bqb, 2bsc, 2bee, 2boi, (2bqh), 2cee, (2cpa), 2cnk, 2cza, 2cjr, 2cei, 2cmx, 2cxf, 3tr, 3wf, 3ro, 3ta, 3je, 3hh, 3lg, 3bj, 3hg, 3ys, 3qc, 3qv, 3me, 3adb, 3adt, 3adp, 3atb, 3ajd, 3abw, 3anp, 3aqr, (3bva), 3buy, 3bta, 3bgj, 3bvh, 3bkl, 3bof, 3bbu, 3boj, 3cun, 3cez, 3cia, 4ay, 4aa, 4ai, 4ba, 4gz, 4fq, 4db, 4ep, 4si, 4dv, 4ru, 4hr, 4hs, 4iu, 4mb, 4jh, 4jk, 4ku, 4rh, 4pb, 4io, 4pk, (4eq), (4oa), (4it), 4hs, 4fv, 4gh, (4ea), (4hh), (4fz), 6go, 6lv, 6au, 6zh, 6bm, (6eu), 6tu, 6acm, 6ajh, 6awt, 6aos, 6aja, 6aru, 6aos, 6aak, 6ajp, 6bra, 6bhl, 6big, 6bgc, 6bnt, 6bbc, 6buy, 6bqb, 6cgw, 6ccd, 6cmr, 6cub, 6chl, 6zah, 6zbu, 7mp, 7qj, 7qu, 7zu, 7co, 7ot, 7wa, 7pe, 7qc, 7zl, 7tq, 7hg, 7af, 7lu, 7ahv, (7ajd).

Can.: C. W.—3ud, 3wf, 3he, (3ad), 3ir, 3pz, 3afz, 3ds, 3ada, 3hh, 3kp, 3rg, 3adu, 3yv.

By 7GR, Vancouver, Wash.

1bie, 1ii, 2bqh, 2gk, 3lg, 4ft, 5aac, 5acu, 5aij, 5akn, 5akt, (5alv), 5dm, 5fg, 5ht, (5nw), 5qd, 5qy, 5jj, 5zav, (6aan), (6aaq), (6aea), 6ape, (6aps), (6avh), (6asj), (6blq), (6blz), 6bnu, (6bny), (6bwv), 6bjj, (6cgl), (6cgo), (6clp), 6cie, 6che, 6ew, (6ja), 6zi, 6zx, 8anm, 8apt, 8bmb, 8tm, 8ckv, 8cmy, 8czy, 8dae, 8hn, 9aec, 9asn, 9afm, 9atn, 9apf, 9axx, 9axd, 8blb, (9bun), 9brx, 9bis, (9boz), 9bsi, 9bez, (9bxa), 9bqj, 9bed, 9blx, 9ceh, 9cnb, 9caj, 9ccm, 9ccv, 9daw, 9dcr, 9dpx, 9eak, 9efh. All crds answered. 5 watts r.a.c.c.w. here.

By 6CKF, P. O. Box 51, Burlingame, Calif.

3abu, 5adb, 5aaw, 5anc, 5tj, 5ajj, 7hr, (7no), 7nt, (7vm), 7wp, 7zd, 8buc, 8alm, 8cbu, 8ctp, 9ami, 9avn, 9cev, 9cpz, 9drw, 9er, 9vm.

3lg, 4cs, (5adb), 5ajj, 5eh, 5ft, 5rg, 5tj, 5abm, 8aok, 8atc, 8asv, 8ckm, 9aci, 9aik, 9bmx, 9brk, 9ccm, 9cee, 9chc, 9cmk, 9czm, 9dbf, 9drk, 9dxn, 9dr, 9nu, 9xbe. Complete log hr. crd on request.

By Leonard Strobel, 680 Yale St., Akron, Ohio

1aap?, 1aat, 1bbh, 1ber, 1bes, 1bho, 1boq, 1bsd, 1bsz, 1ici, 1ckp. 1cmp, 1ez, 1uj, 1wu, 1xm, 1xz, 1yb, 1db, 1er, 1hs, 1ik, 1io, 4je, 4jr, 4ku, 4kw, 4lj, 4me, 4og, 4on, 4pk 4rz, 4su, 5aaw, 5abd, 5abw, 5adb, 5afq, 5afv, 5ags, 5aia, 5air, 5aiu, 5alj, 5alv, 5amh, 5ams, 5amu, 5dz, 5ek, 5fu, 5gj, 5in, 5qp, 5rh, 5tj, 5vv, 5xa, 5xd, 5xau, 5yw, 5za, 5zg, 6asv, 6auu, 6awq, 6awt, 6bbw, 6cbu, 6cgg, 6cgw, 6cka, 6eb, 6fp, 6lv, 6nx, 6rn, 6yb, 6zah, 6zbm, 6zh, 7afo, 7ajd, 7co, 7fq, 7gu, 7tq, 7zb, 7zc, 7zu, 9ali, 9aol, 9apf, 9aps, 9arj, 9atu, 9ave, 9aww, 9ayl, 9aza, 9azg, 9bex, 9bjk, 9bly, 9bof, 9brk, 9bun, 9ccs, 9cdj, 9cga, 9cjc, 9ckh, 9cpi, 9dmj, 9dwk, 9dxk, 9dxu, 9dz, 9ecn, 9edb, 9eid, 9ss.

Can.—1ar, 3pz, 3zt?

At 6BUB-6AQF

1anr, (1fd), 1hx, 1cmp, 1yb, 2awl, 2by, 2bsc, 2rk, 2ts, 3ade, (3atb), 3bdo, 3mc, 3ws, 3zo, 4gz, 4hs, 4io, 4ll, 4my, 4oa, 5ahr, 5ajq, 5alr, 5amu, 5anc, 5be, (5bx), 5ce, 5cv, 5dm, 5fc, (5hs), 5lr, (5nk), 5nw, 5qd, 5qi, 5qq, 5qw, 5qy, 5rh, (5sd), 5vm, 5za, 5zav, (6aas), (6acz), (6adv), (6afy), (6anp), (6aps), (6avv), (6bq), (6blw), (6bum), (6ccy), (6cei), (6cgg), (6cka), (6clb), (6clv), (6dt), (6hp), (6jz), (7acv), 7acx, (7adg), 7ael, (7af), 7ak, (7ajq), (7ajv), 7akz, (7amu), 7amk, (7bj), (7co), 7em, 7fd, 7fq, 7fr, (7gu), 7hi, 7ij, (7ju), 7jw, 7jy, 7ke, 7kk, (7lw), 7ly, 7nf, 7om, (7ot), (7qd), 7ra, 7ry, 7sf, 7sh, (7sn), (7um), 7zu, 8acm, 8acn, 8ada, 8amm, 8amn, 8apt, (8azg), 8bjv, 8bkn, (8cci), 8cpk, 8ctp, 8ctr, 8cvg, 8cvx, 8cyo, 8dlb, 8do, 8jy, 8kg, 8pl, 8vy, 8zc, 8zy, 8zz, (9abv), 9aci, 9aec, 9apf, 9aps, (9avs), 9awv, 9azg, (9bdo), 9bdz, 9bea, (9bed), 9bez, 9bga, (9bgx), (9bie), (9bij), 9bis, 9bjn, 9bly, 9bmx, 9bof, 9bqy, (9brk), 9bsp, 9bxa, (9byc), (9bzh), 9bzi, 9caa, 9cab, 9ccm, (9ccw), 9cdo, 9cga, 9cgu, 9cju, 9ckj, 9clq, 9cly, 9clz, (9ctr), 9cvo, (9czw), 9dbf, 9dbh, 9dda, (9dfh), (9dlr), (9dmq), 9dur, (9dxu), 9dyr, 9eak, 9edb, (9eea), 9ekf, 9elb, 9gy, 9nu, 9qe, 9ss, 9xba.

Can.—3gg, 4cl, 4co, 4hh, 5go. Dope on above upon request. Have u hrd me?

By 5VV, Birmingham, Alabama

1abf, 1acb, 1alj, 1aw, (1bcr), 1bhb, 1bhl, 1btr, 1cmp, 1xam, 2azy, 2be, 2bgh, 2brb, 2bqb, 2buy, 2cee, 2cjx, 2cln, 2cpd, (2crc), 2crq, 2ts, 2qv, 2cvj, 3ada, (3atb), 3ajs, 3aqr, 3awe, 3bbu, (3be), 3bei, 3blu, 3bmn, 3ccb, 3cjx, 3lq, 3mo, 3oi, 3ph, 3uu, 3wv, 3yo, (4af), (4er), 4ft, 4gh, 4gz, 4jk, 4jr, 4mv, 4og, 4pk, 4qw, (4sh), (5agl), 5aic, (5ajg), 5amz, 5cm, 5cv, 5ev, (5gi), 5gn, 5he, 5ht, 5jl, 5lp, 5ml, (5nn), 5ov, 5og, 5qd, (5qh), 5qj, 5ql, 5rg, (5sd), (5tq), (5ua), 5uu, (5wg), 5wo, 5xd, (5xk), 5xv, 5yn, 5yw, 5zav, 6ak, 6bic, 6bkx, 6bqb, 6bqe, 6bri, 6bui, 6cbi, 6cgw, 6cih, 6ckp, 6cmr, 6fp, 6gl, 6mh, 6pl, 6rn, 6zbj, 6zh, 7afo, 7ajt, 7bk, 7co, 7if, 7ir, (8aa), 8aaf, 8abh, 8agc, 8agp, 8aig, 8aje, 8ajy, 8ak, 8alb, 8alx, 8apt, 8ard, 8arv, 8atp, 8atz, (8bdm), 8bfe, 8bhq, 8biq, 8bjy, 8bmb, 8bnh, (8bqi), 8brm, (8bwr), 8bxd, (8cci), 8cei, (8chy), 8coj, 8cpd, (8ct), 8cta, 8cva, 8cvm, 8cwk, 8cwx, 8czy, (8dal), 8daw, 8dbl, 8dcy, (8dfb), 8dgq, 8dhs, (8diu), 8djf, 8djh, 8dka, 8fm, 8fu, 8gh, 8hd, 8rh, 8rj, (8tt), 8ve, 8wz, 8xy, 8yn, 8yx, 8zz, 9aau, (9abf), 9ahj, 9ahz, 9aiq, 9ajw, (9ali), 9amq, 9aom, 9apd, 9apf, 9aps, 9aqc, 9arf, (9aru), 9asu, (9aue), 9avf, 9avs, (9awp), 9awv, 9axb, 9axx, 9ayp, 9ba, 9bbj, 9bcb, 9bcc, 9bec, 9bez, 9bgk, 9bhd, (9bhi), 9bhk, 9bis, (9biz), 9bjt, 9bof, 9bgj, (9brk), 9brt, 9bru, 9buj, 9bun, 9bvm, 9byc, 9bxa, 9bye, 9byf, 9bzt, 9caa, (9cbd), 9ccj, 9ccm, 9ccs, 9ccw, 9cdj, 9cgn, 9cht, 9cjc, 9cka, 9ckm, 9cld, 9cms, 9cpt, 9ctu, 9cvi, (9cvo), 9cvv, (9cyq), (9day), 9dbj, 9dcj, 9dcp, (9dcw), 9dfh, 9dfq, 9dhb, (9dlr), 9dlw, 9doe, (9dqu), 9dte, 9dun, 9dyr, 9dyy, 9edc, 9edo, 9ees, (9efe), 9ehy, (9ei), 9ekf, (9eky), 9elj, 9ell, (9gd), 9la, 9pb, 9vk, 9vm, (9we).

Can.—3cx, 3ko, 3nf, 3xi, 3yv, 4ai, 4co.

At Can. 5GO, 466 Pender St., E. Vancouver, B.C.

(1bwj), (1cmp), (1ii), (2rk), 2bqh, 3hg, (4eb), (4fs), (5be), (5ek), (5ga), (5gj), (5ht), (5in), (5lr), 5ov), (5sk), (5uk), (5uo), (5za), (5amb), (5amh), (5adb), (5ahr), (5aij), (5air), (5aiu), (5xaj), (5zav), (8cp), (8qc), (8tr), (8vy), (8xe), (8zc), (8zz), (8abm), (8aih), (8apn), (8bau), (8bjy), (8brm), (8bvr), (8bzc), (8bzd), (8bxx), (8dat), (9ei), (9jf), (9mc), (9ox), (9vm), (9yy), (9zt), (9ack), (9amk), (9apf), (9ase), (9avs), (9bed), (9brk), (9bzi), (9ccs), (9ceh), (9cgn), (9cjc), (9ctr), (9czw), (9daw), (9dfh), (9dkb), (9dkk), (9dky), (9dli), (9dmj), (9dsw), (9efh), (9ekf), (9eky), (9elv).

Can.—(3si), (3ws), (4ab), (4ax), (4cl), (4cn), (4co), (cw), (4dq), (4er), (4fn), (4fv), (4hf), (4hh), 9bx. Hawaii—(6ceu. Greenland—(wnp). Wrkd on 145 meters: 1ii, 4fs, 5xaj, 6nx, 7akk, 8bjy, 9bed, etc.

By 6BPQ, Milton Smith, 326 East Stocker St., Glendale, Calif.

1fd, 2bqh, 2by, 2rk, 2wr, 3ccx, 3cn, 3lg, 3lo, 3tb, 4aw, 4eu, 4gu, 4ll, 4my, 4rh, 5aao, 5aaw, 5abn, 5adb, 5alm, 5alr, 5alv, 5amf, 5amo, 5amw, 5ana, 5be, 5co, 5cv, 5ga, 5jc, 5lp, 5ml, 5mz, 5nc, 5nh, 5nl, 5pw, 5qd, 5qi, 5qj, 5qw, 5qy, 5rb, 5rg, 5rw, 5sd, 5sr, 5tj, 5to, 5za, 5zas, 5zb, 6adq, 6bcu, 6bpi, 6ckn, 6tv, 7aci, 7adm, 7af, 7afo, 7akh, 7ft, 7gp, 7ju, 7jy, 7kk, 7qu, 7tq, 8anm, 8chy, 8cqj, 8dat, 8dcy, 8dhs, 8dkb, 8do, 8eb, 8er, 8pl, 8rn, 8tv, 8yt, 9abc, 9aci, 9adp, 9afm, 9afy, 9ahg, 9aim, 9amz, 9an, 9and, 9aos, 9ap, 9ape, 9arj, 9atn, 9ato, 9aua, 9aue, 9aun, 9avs, 9aws, 9awv, 9bal, 9bas, 9bav, 9bgx, 9bis, 9biz, 9bjn, 9blb, 9bmx, 9bof, 9brk, 9bsi, 9bsp, 9bth, 9bvo, 9bwv, 9bxa, 9bxq, 9ccm, 9ccv, 9ccz, 9ceh, 9cfm, 9cgn, 9chl, 9cit, 9clq, 9cly, 9cms, 9cof, 9csq, 9ctg, 9cvi, 9czg, 9daw, 9dbf, 9dfh, 9dkq, 9dlm, 9dpj, 9drw, 9dsv, 9eak, 9efh, 9efu, 9efz, 9ei, 9ekf, 9elb, 9eq, 9lz, 9ss, 9vk, 9wb.

Can.—4cb.

Continued on page 88

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At 8AMS, Tawas City, Mich.

1ahl, 1ajg, 1ajp, 1all, 1ama, 1anr, 1atc, 1atj, 1avl, 1aw, 1axn, 1bez, 1bgc, 1bgu, 1bom, 1cab, 1ccp?, 1ckp, 1cpi, 1cql, 1cmp, 1cwc, 1kc, 1ii, 1lm, 1qm, 1uj, 1xu (voice), 1xz, 1yb, 7yk, 2abn, 2aj, 2ale, 2ana, 2ats, 2auy, 2ay, 2ayc, 2be, 2bbk, 2bbx, 2blp, 2blu, 2bsc, 2bzl?, 2cel, (2ccd), 2ccx, 2cgb, 2cjr, 2cjj, 2cjx, 2clt, 2cor, 2cpz, 2cvj, 2cqp, 2cta, 2gk, 2kf, 2kx, 2nf, 2om, 2rb, 3abw, 3acy, 3ade, 3ajs, 3buv, 3buy, 3cel, 3gc, 3gg (voice), 1ia, 3iz, 3fc, 3fo, 3fk, 3cjn, 3csc, 3cf, 3crp, 3jx, 3lg, 3nc, 3nf, 3pz, 3qf, 3pi, 3rf (spk.), 3si, 3xm, 3yg, 3zo, 4ai, 4bg, 4bs, 4cg, 4eq, 4es, 4ft, 4io (spk.), 4iu, 4je, 4me, 4mi, 4og, 4qv, 4qw, 4qx, 4sb, 4se, 4sh, 5aac, 5ac, 5ail, 5aio, 5aiu, 5aln, 5amf, 5amh, 5ek, 5fv, 5gg, 5gn, 5kq, 5kr, 5mb, 5pl, 5qh, 5qq, 5qs, 5sk, 5sy, 5tq, 5uk, 5un, 5xab, 5ye (voice), 5za, 5zav, 5sc (voice), 5aaz (daylite), 6aao, 6acv, 6bbw, 6bcz, 6bdc, 6bjj, 6bm, 6cgn, 6cgw, 6co, 6ff, 6gr, 6fq, 6cmu, 6lv, 6nb, 6qh, 6tq, 6uw, 6zat, 6zh, 7aim, 7co, 7eu, 7fd, 7fq, 7tq, 7tu, 7ry, 9aau, 9aci, 9ack, 9aed, 9ael, 9afm, 9ajd, 9alc, 9amu, 9amf, 9aom, 9ape, 9apf, 9arp, 9asr, (9axd), 9ayp, 9azg, 9bg, 9bgh, 9bhk, 9bhy, 9bis, 9bhi, 9blg, 9bof, 9bpn, 9bbqx, 9bqy, 9bsi, 9bsp, 9bsk (voice), 9bvm, 9byp, 9bzi, 9bzh, 9bcd (voice), 9ccs, 9ccw, 9cde, 9cdu, 9ceh, 9cfi, 9cga, 9clh, 9clq, 9cld, 9cla, 9cfz, 9con, 9cpy, 9cmk, 9crk, 9cug, 9cur, 9cvg, 9cyg, 9cyp, 9daw, 9ded, 9dep, 9dev, 9dge, 9dgv, 9dhl, 9doe, 9dr, 9drx, 9dxu, 9dyl, 9dyu, 9dwn, 9eak, 9edb, 9ekc, 9eky, 9elj, 9hm, 9mb, 9um, 9uv, 9zt. The following daylite: (9crw), 9dwn, 9dwr. Can—1ar.

By 6ALV, Alameda, Calif.

1alj, 2rk, 3lg, 3aqg, (4oa), 5az, 5gm, 5ek, 5kc, 5kh, 5lr, 5qd, 5qk, 5qy, xd, 5xab, 5yd, 5zb, 5abf, 5adi, 5aiu, 5ajq, 5aky, 5aly, 5alv, 6ceu, 8gh, 8oa, 8agp, 8avd, 8atp, 8bke, 8bwb, 8dgp, 8zb, 8bmb, 8bdg, 8cus, 8dgo, 9aa, 9ac, 9fm, 9lb, (9ql), 9ya, (9yy), 9yau, 9vc, 9aeq, 9aej, 9amh, 9aou, 9ape, 9asn, 9afy, 9auv, 9axl, 9ayl, 9azg, 9bcx, 9bhw, 9bly, 9bqq, 9brs, 9bzh, (9caa), 9ccs, 9ccr, 9cfi, 9ckp, 9ctr, 9czm, 9czw, 9day, 9dkb, 9dkq, 9drw, 9dsw, (9dun), 9dwn, 9dxu, 9ebt, 9efh, 9eld, wnp. 100 to 150 meters: 1abf, 1afn, 1cpn, 1xam, 4bz, 4io, 5tj, 5aic, 5aiu, 5xd, 5xab, 5zb, 8fm, 8abm, 8xbp, 9vm, 9azg, 9bfh, 9bly, 9bzh, 9czw, 9yy, f8ab, g2s?. Using Reinartz and 1-step. Would appreciate qsl's on my sigs on 150 meters, 50 watts.

By 9DBF, 804 Ridge Terrace, Evanston, Ill.

6aaj, 6aak, 6aao, 6abx, 6acg, 6ada, 6afi, 6ahp, 6aik, 6aja, 6aji, 6ajp, 6akx, (6axz), 6amb, 6amg, 6arb, 6aua, 6auu, 6auy, 6avr, 6avv, 6awt, 6azv, 6bbc, 6bcl, 6bic, 6bih, 6bik, 6bm, 6bni, 6bnu, 6boq, 6brf, 6bsn, 6bua, 6buo, 6bvs, 6bwe, 6cbg, 6cbi, 6cbj, 6cbw, 6cdg, 6cfi, 6cfz, 6cgs, 6sgw, 6chj, 6cid, (6cih), 6cix, 6ckp, 6ckr, 6cmr, (6cmu), 6cng, 6cpe, 6cpw, 6cu, 6dd, 6fh, 6fp, 6fy, 6gg, 6lv, 6mh, 6od, 6pl, 6qq, 6ti, 6ts, 6vf, 6xad, 6zar, 6zau, 6zb, 6zbu, 6zh, 6zi, 6zq, 6zw, 6zz, 7abb, 7co, (7fd), (7fq), 7hg, (7kr), 7ln, 7lu, 7qd, 7qe, 7ql, 7sh, 7za, 7zt. Sunday A.M. schedules a specialty.

SCRATCHI BUILDS A .....?

By DAVID P. GIBBONS

To Editor RADIO,
(May it long wave overhead)
Dear Sir Ed:—

I have rather suttel question which I desire to puzzle at you and it are this. What are suitable, snappy name for the last shout in radio receivers which my Cousin Scratchi have joined together by himself and which he wish to spring upon the listening public? He wilfully admits that this set have all others, both past and future, licked to a fizzle, and for pudding-proof, he sights following quick-selling pointers.

Excessive Simpleness — only fourteen knobs to turn, and if you get any station once, you may get it again sometimes by repeating secret football numbers like 4,8,12,16 and so fourth.

Terrible Selectiveness—You can tune off any undesirable announcer by quick spinning of most nearby knob. In special laborty test in San Francisco, my cousin got rid of PWX when both KPH and KFS were on at same time.

Splendid Volume—With all eleven tubes acting, the volume of sounds must be seen to get proper description. As several tubes are worked upon several times, the delikit undertones of most jazzie simphonie are brought out in highly spiriting manner. All the modern dancing motions come natural to any home-lover who have such set instauled.

High Classiness—The set are mounted upon lovely hand-scrubbed buhl console of the Second Louie period, with Ionic columns and thermionic bah-relievings. This tasty design will make elegant

harmonic with any furnishings you may have, from cellar to attick.

Low Costliness—The price complete without any necessories will be slitely lower (few hundred $) than price complete with same, but for present time these are to remain secret surprise.

You can judge, I think, Mr. Ed, how surpassing difficult it are now become to involve new title for even such marvel receiver and my cousin and me have spent many sleepless days and much grayish matter in cambattling the problem. I have sniggested a few up-to-the-moment titles like "The Ultra-putridyne", "The Super-geniflex", "The Paragoidine", and "The Nitro-glisseradyne", but Scratchi deject them all with unpatient dome-shake.

"Too common", he snip, "I require name which fit more accurively". So what do you think, Mr. Ed, if at all?

In order to display what this radio receptacle can perform when properly mandipulated, my cousin took along first model of complete messup when on recent farewell visit to banzai homeland, and while around about the midsection of so-called Pacific Ocean he give it severe testing-up. He flavor me with a glimp at private log book on return back and here are some of the result.

First day of test, he tune everything up after early fastbreak, and he pick up station in Hoboken which are emitting, as special treat, bedtime tails for far off Japanese schoolchilds. As entire program was pronounced in New Jersey dialectric, Scratchi did not grab everything, but he was muchly delated to hear Japanese station answer back to it, and repeat daily stocking mark flotations in pure Yoshiwari.

My cousin then redopted simple system of insuring himself what stations he have heard by means of drawing gridleak with pencil through name in call book of each station which he pick up on the loudhorn. On third day he have to debandon this, as book become quite full of gridleaks, and no more names are visible to the uncovered eye.

He then tuned all the knobs to very lowly waves and around seven or eight meters he hear wellknown professional amateur in Wooloomooloo, Australia, talking to similiar person who are located on ice yot at North Pole. Three-way conversations were carried along for fifteen or ten seconds, but not one of them could hear the other of them, account of young whale-baby sending up distress signals on continuous waves in between the both of them.

About middle of the daytime my cousin swing up to most lengthy waves and operator on maru which are passing by along horizon dot over to him and ask "What for are all that gun-firing on your ship?"

"These are not gun-bursts", Scratchi

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Continued from page 90

flip back, "These are time-ticks from the home-seat of the republicans at Washington, U.S."

He then pick up some more long-off broadcasters and hear English station sending forth a few awful funny goaks. One of these was given off by gent named either George Loyd or Sir Tarry Longer who spun jolly annygoat about the prince of whales tumbling from horse's neck into river near Paris and getting fished up inseine.

When ether have cooled down slitely after that one, Scratchi move one of the verinear dials about two atoms to the left and catch heavy carrying whistle from Berlin. He rejust the grid tabulizer about half a megavolt and hear chorus of low-mark voices singing "The Cancellation Song from the new musicle trajedy by Stein-Bock". At sound of opening bar, the tenth tube, which Scratchi claim were genuine bootleg bottle, begun showing its true blind tiger ancestory by howling and yodling, and refused to accept all peace terms.

This bring test to instant seclusion, but my cousin say it are suffice to show what people who buy this set can expect.

Since return he have hitched up and sold quite many of these on the strict QRT, and he are waiting for special report from "radio-expert" in Oakland, who bought first complete product.

He are still up in the aerial about correct name-title and with so much unusual thinking he are pretty close to hopeless case.

Hoping you are the same, Mr. Editor, as usual, Yours very fatefully,

HILOLI NOGO.

P. S.—Never mind, please, Mr. Ed, responsing to question of interrogation as problem have became solved. Oakland "radio-expert" send most correct answer. He write "Tried out your (unnameable) set last night. It are "The Bunk".

To remember the wire table for B & S gauge copper wire it is sufficient to know that a wire which is three sizes larger than another wire has half the resistance, twice the weight and twice the area. No. 10 wire is 1/10 in. in diameter, has an area of 10,000 circular mils, a resistance of 1 ohm per thousand ft. and weighs 32 pounds per thousand ft. (approximately).

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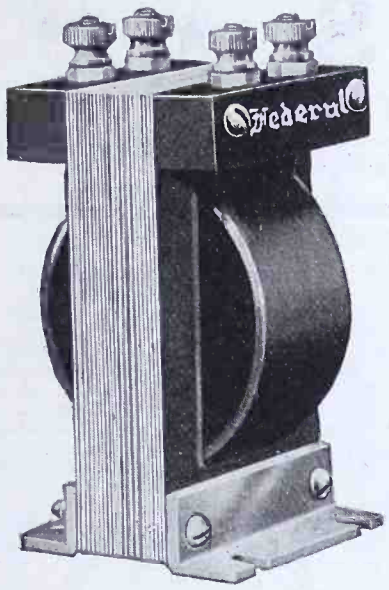
At 5ADB, 2117 Grant, El Paso, Texas

1bcr, 1bdi, 1bgq, 1brq, 1bkq, 1bsz, 1cmp, 1pa, 1xah, 1xw, 1yb, 2al, 2bsc, 2blp, 2cee, 2cla, 2gk, 2rk, 3btl, 3bj, 3iw, 3qv, 3yo, 4ba, 4bz, 4dx, 4fs, (4ft), 4go, 4gx, 4gz, 4hs, 4ik, 4my, 4oa, 4pk, 4xe, (too many 5's), (6aib), (6ahp), (6ajd), (6adh), (6aao), (6aoi), (6adt), (6ajh), 6beq, 6bon, (6bhh), (6bjj), (6bwd), (6blw), 6bkx), (6bur), (6boy), (6bts), (6bbq), (6bvd), (6bgv), (6bvg), (6bqr), (6bra), (6chv), (6cgd), (6cgw), (6cbb), (6ccy), (6cgg), (6cnc), (6chz), (6cbi), (6cbf), (6cbg), (6cfp), 6cee, (6cdv), (6chl), (6fp), (6gt), 6la, (6lj), 6nx, (6pl), 6ux, (6zh), 7aci, 7ael, 7are, 7co, 7ei, (7em), 7er, 7fd, 7go, (7gq), 7hc, (7hg), 7hw, 7io, (7jw), 7lu, 7ly, 7ot, (7ob), (7qc), 7qd, 7sn, 7wm, 7zu, 8atc, 8apt, 8atp, 8abm, 8apn, 8abk, 8bxx, 8bda, 8bkn, 8bce, 8bk, 8bmb, 8bcp, 8bfa, 8bau, 8gf, 8cgw, 8cp, (8cci), 8com, 8coj, (8ctp), 8cnf, (8cnl), 8chy, 8czz, 8dkb, 8bbm, 8bbc, 8bgr, 8bo, (8ef), 8fc, (8fm), 8gu, 8oa, 8pl, 8rv, 8rj, 8vn, 8vq, 8wu, 8xaq, 8xap, 8xbp, 8xbh, 8xw, 8yv, 8zm, (9amb), 9amu, 9axb, (9apf), (9avc), 9ahq, (9avg), (9ape), 9azx, 9asn, (9asr), (9aey), 9bji, 9bez, (9bjk), (9bly), 9bed, 9bmx, 9blt, 9bis, (9bhd), (9bjc), 9bgh, 9bg, 9bgx, 9bab, 9bun, 9bkf, 9bof, (9bsp), 9cfy, 9cdo, 9ccw, (9caa), 9ccs, (9clq), 9cjc, (9czo), 9cnb, 9ccz, 9czm, (9cgs), (9cgu), 9djx, 9dcr, 9dug, 9dte, 9dxu, 9day, 9eky, 9ehn, 9eht, (9elv), 9ell, 9edb, 9fm, (9hn), 9mc, 9nu, 9qw, 9ss, 9uo, (9wa), 9xw, 9yy.

Can.—2bg, 3xn, 3ws, 3bq, 3je, 3ni, 3kq, 3zl, 4bz, 4co, 4cr, (5go). Mex.—ax, bx. Cards on above if requested.

By 8ZE-8YAE, Oberlin College, Oberlin, Ohio

C1ar, C5cn, C5go, 4je, (4oi), 6ao, 6bm, 6dd, 6bg, 6gt, 6gc, 6ii, 6if, 6ip, 6ja, 6lv, 6nx, 6pl, 6uo, 6zh, 6zw, 6aak, 6acm, 6ahu, 6akz, 6aos, 6ane, 6apc, 6ape, 6apw, 6arb, 6arf, 6aru, 6auo, 6avv, 6awt, 6bbc, 6bcl, 6bic, 6bin, 6biz, 6bkx, 6bnc, 6bnt, 6boe, 6bqb, 6brf, 6bua, 6buo, 6bur, 6bve, 6bvg, 6bvz, 6cbw, 6cdg, 6cgd, 6cgw, 6ckx, 6ckr, 6cmr, 6dlf, 6xad, 6zah, 6zar, 7bj, (7co), 7gs, 7hg, 7it, 7iw, 7ot, 7sc, 7zg, 7zu, 7abb, 7adr, 7aro (qra?). 8ZE-8YAE reported in all states except Oregon, Wyoming, Idaho and New Mexico. Would especially appreciate cards from these states. Will qsl all of 'em—"GX".



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3000 MILE Reception on receiving set built from our Blue Prints for One Dollar Postpaid. Cosmopolitan Radio Co., 1709 Suburban Ave., Pittsburgh, Pa.

LISTEN TO French, German, English high power radio stations with a Single Bulb. Long distance broadcasting stations also come in loud and clear. Most of the parts you already have. Complete copyrighted instructions with Blue Print and Foreign Transmitting schedules, wavelengths, etc., mailed promptly on receipt of sixty cents in coin or money order. C. H. Stoup, Box 6, Valencia, Pa.

HERE IS A REAL OPPORTUNITY TO GET RADIO APPARATUS FREE. It requires very little effort on your part and your time will be well spent. We have a stock of excellent radio apparatus on hand and you can have one of the following instruments without a penny of cost to you if you merely send us your subscription to "RADIO" for one year, or get one of your friends to subscribe to "RADIO" for one year. Our subscription rate is only $2.50 per year. Here is what we offer you for only one subscription:—

- The 320-Page Book, "Elements of Radio Communication," by Lieut. E. W. Stone, regular price $2.50.
- The Chelten Midget Vernier Variable Condenser.
- The 3-plate Signal Vernier Condenser.
- The new Citizens Radio Call Book.
- A large Radio Map of the U. S.
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- The Standard "Radio Record" book.
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THINK IT OVER—you get one of the above instruments free of charge with only a one year subscription to "RADIO." Full price is $2.50. Send us $2.50, your name and address and the premium that you want and your order will be filled without delay. We further guarantee all premiums to be absolutely new, in first class condition, and we will replace the instruments or refund your money in full if you do not believe that this is the greatest subscription offer ever made by a radio publisher.

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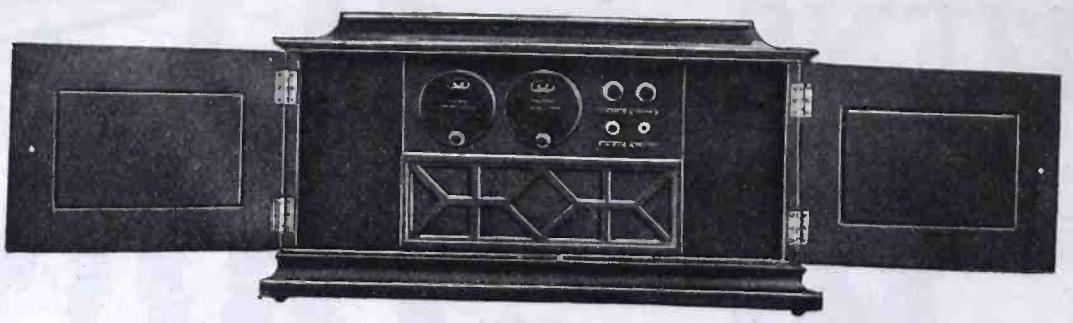
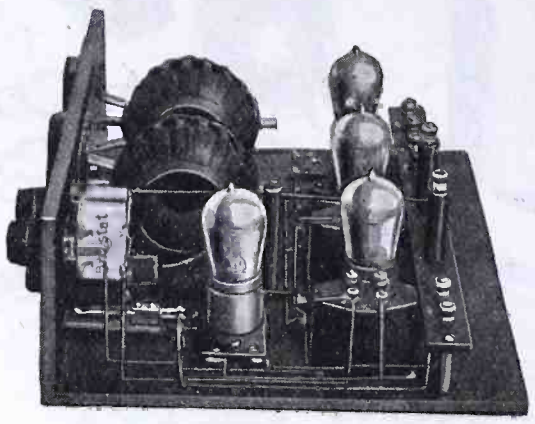




Amrad Radio Unit, removed from Console Cabinet, to show Bradleystat and Bradleyleak mounted in front of detector tube

Amrad Adopts Both Bradleystat and Bradleyleak!

The Amrad Jewel—Italian Renaissance Period Art Model Is Now Equipped With Ultra-Fine Tuning Control

ALL of the more expensive Amrad receiving sets, including the beautiful Jewel Console models, are now equipped with Bradleystats and Bradleyleaks! The noisy wire rheostats have given way to the noiseless Bradleystat. The old type of grid leak is replaced by the stepless Bradleyleak. The perfect filament control of the Bradleystat means greater range and louder reception. The stepless grid leak adjustment of the Bradleyleak, from ¼ to 10 megohms, means higher tube efficiency.

The Console models, with self-contained loud speaker, battery compartment, and highly perfected tuner, are made more selective with the ultra-fine filament and grid control, so essential for long range reception.

YOUR radio receiving set will afford new possibilities and new thrills if equipped with Bradleystats and Bradleyleaks. Many radio dealers replace the wire rheostats of ready-built sets with Bradleystats, and they invariably recommend them to set builders who seek the best in radio.

The Bradleyleak has the endorsement of Amrad, Flewelling, Kennedy, Crosley, Clarkson, Cockaday, and other radio engineers. It is pronounced "the perfect grid leak" by all users.

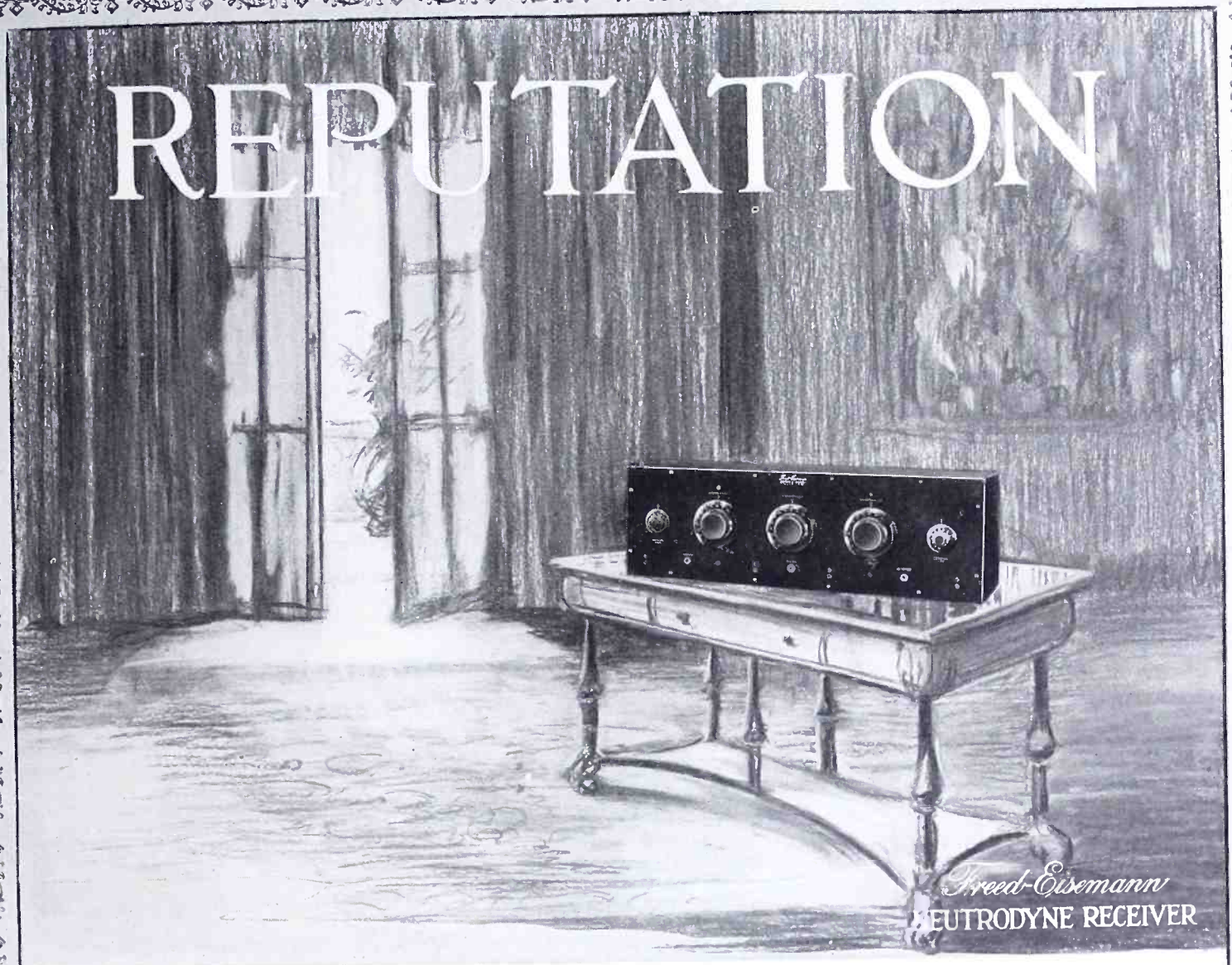
Get the benefit of the graphite disc design by avoiding all substitutes. Carbon or metallic powder was abandoned, years ago, as impractical and unreliable. Insist that your dealer supply you with the genuine Bradleystat and Bradleyleak.

Send for the latest bulletins on closer tuning and perfect grid leak control

Allen-Bradley Co.
Electric Controlling Apparatus
288 Greenfield Ave. A-B Milwaukee, Wis.

There is no substitute for the scientifically-treated graphite discs

THE ALLEN-BRADLEY CO. HAS BUILT GRAPHITE DISC RHEOSTATS FOR OVER TWENTY YEARS



IN EACH industry, the names of certain manufacturers stand out as synonymous with only highest quality. Here is a large organization of truly expert, highly specialized Radio craftsmen, in which every man is proud of having been selected to maintain its enviable reputation.

If you contemplate purchasing a "better" radio instrument ask to see the one bearing the name Freed-Eisemann. Then, before you make your selection—compare performances.

The striking thing about the Freed-Eisemann Neutrodyne Receiver, NR-5 is the fact that it brings in tremendous distance with greater clarity and greater power than has hitherto been accomplished by any receiver.

Freed-Eisemann Radio Corporation

Builders of the finer types of Radio apparatus for Government and home use

Sperry Building — Manhattan Bridge Plaza — Brooklyn, N. Y.

Licensed under Hazeltine Patent No. 1450080

"This Free Book Showed Me the Way to Big Money in *Radio*"

It has Started Thousands on the Road to Independence and Success—has Lifted Them Out of the Rut of Office Routine and Helped Them Become Experts in This New, Fascinating, Profitable Profession. Let It Do the Same For You.

SIX months ago I was what you might call "a handy man about the office." I had what I considered a good job with a large manufacturing concern. Having taken a two years' business course, I knew enough of stenography and elementary bookkeeping to be of real value in general office work.

I took special dictation from the President, assigned general correspondence to the regular typists, was responsible for the purchase of office supplies, approved petty cash vouchers for the errand boys and clerks, and was entrusted with the responsibility of making deposits at the bank and bringing in the payroll.

In addition to these, I was often privileged to arrange accommodations for the President when he went off on a trip. And when he wanted some personal matter attended to, such as purchasing theatre tickets or having his evening clothes brought down to the office, I was always selected for such tasks. I was, in fact, an assistant to the President. And accordingly I was paid $40 a week.

I won't say that I was satisfied with this salary—although it was more than the other clerks were getting—but the fact that the President had confidence in me gave me a certain standing among the others which kept me fairly contented.

Then one day, having a little extra money on hand, I bought a small radio receiving set.

Several of my chums had radio outfits and I had always wanted one in order to enjoy the broadcast programs in the evenings at home. There was ordinarily nothing unusual about this, yet that little radio set changed my whole slant on life and opened up my future overnight.

I didn't know a thing about radio, but I soon got onto the tricks of operating a receiving set and rapidly became a real "fan." But much to my surprise, I got more fun out of the mechanical operation of my set than I did from the music, speeches, reports and regular programs of the nearby stations.

Then I began to take my set apart, reassemble it and experiment. I rigged up an outdoor aerial and installed a tube set. Then I bought a loud speaker and gradually added part by part until I had a first class outfit with a wave-length capable of "picking up" the programs from distant stations.

Naturally, I didn't stop there. Several of my friends had "sending" sets and I wanted nothing less. I began to study the code and longed for the day when I could get a license and have a "call letter" of my own. My routine, humdrum work at the office began to lose its appeal. I could hardly wait until evening came so that I could get home to the "work" I actually enjoyed.

One day the traffic manager at the office mentioned that he was going to buy a radio and flattered me by asking my advice. I offered to help him select a set and install it. He told me to go ahead, rig one up for him and let him know what I wanted for my trouble. It wasn't trouble—it was *real fun*—and I made $30 for a single night's amusement.

That set me thinking. Why not get into radio in earnest? Two fellows I knew had given up office work and were making big money as Certified Radio-tricians. One was a salesman for a large radio manufacturer, with a fine office of his own in his home town; the other was a ship operator, traveling around the world, seeing the things I had always wanted to see—and getting *big money* for doing it.

I decided to study radio and train for a real job. But I wasn't in a position to give up my work at the office, for I had saved little or nothing, and had to contribute something at home every week.

Then one day I noticed an advertisement in RADIO MAGAZINE. The heading first attracted me, for it read—"Men Wanted in Radio—You Can Train at Home for One of These Big-Paying Positions—This Free Book Will Tell You How." Here was a chance, I thought. At least it wouldn't cost anything to get the book for it was *free*.

I sent for the book—"Rich Rewards in Radio." That was six months ago. What this free book meant to me is best explained by the fact that, as a Certified Radio-trician, my income this year will be at least $5,000. And that's only the beginning. For I can already see the enormous possibilities for trained men in this fascinating, profitable profession. And I'm going to get my share of the big money being made by those who are "growing up" with this fast growing industry.

Thanks to the splendid training which I got from the National Radio Institute, *in my spare hours at home*, and with a Government First Class License in my pocket, the rest is up to me. But the opportunities for money, independence and success are unlimited in radio and I'm going to go the limit.

I won't attempt to tell you all the details of the wonderful opportunity that awaits you in radio. The Free Book of the National Radio Institute—the same one that I sent for—will tell you all you want to know. It showed me the way to *big money* in *radio*—it lifted me out of the rut of office routine and made me an expert in this fascinating profession. Why can't it do the same for *you?* It *can*—the 32 page, fully illustrated free book will tell you how. The coupon will bring it to you—without obligation. Why not send for it—TODAY.

NATIONAL RADIO INSTITUTE

DEPT. 1- IODA **WASHINGTON, D. C.**

NATIONAL RADIO INSTITUTE,
Dept. 1, IODA, Washington, D. C.

Without obligation on my part, please send me the free book, "Rich Rewards in Radio," with full details as to how I can quickly train for a big money radio position in my spare hours at home. Also tell me of your special free offer, and how your free Employment Service will help me secure a good paying position. Please write plainly.

Name.....Age.....

Street.....Occupation.....

City.....State.....

What Our Course Has Meant to Just a Few of Our Recent Graduates

Triples His Salary As Radio Engineer

Thanks to your course and help it gave me, I have had another boost in pay. This is the third one in less than a year. Today I am getting three times as much as I got before I began your course.

MERLE WETZEL,
Chicago Heights, Ill.

$300 a Month and All Expenses as Salesman

Your course was worth $5000 to me, but I wouldn't take ten times that for the value I've gained from it. I signed up with a company for $300 a month and expenses paid. I owe this to your course.

EMMET WELCH,
Peculiar, Mo.

Prepares For All Radio Jobs

It will interest you to know that since completing your course I was 1st operator on Steamship Lake Giltedge. Last summer I had charge of broadcasting station WIAI, and in December connected with the Colin B. Kennedy Radio Corp., as sales correspondent, handling all technical inquiries which I enjoy immensely.

N. R. I.
WILLIAM WEST,
St. Louis. Mo.

A Few of Many Letters We Receive which explain How We Place Graduates in Radio Positions.

Dear Sir:

We are in need of the services of a competent radio engineer who has a thorough knowledge of radio, together with selling ability, and would appreciate it if you could recommend to us any person or persons that could fill a position as outlined above.

Very truly yours,
DX-INSTRUMENT CO.
By John F. Whittiku,
Vice-President.

Good Future

I want a man who can show the customer about circuits, and answer questions. One who can set up sample sets.

He must hold at least a third grade commercial license in order that our broadcast station may be operated at least twice a week. This position offers a fine future to the right man.

Yours very truly,
JOHN R. KOCH.

Executive Position

Gentlemen:

We thought you would be in a position to cooperate with us in securing men with executive ability as well as knowledge of the Radio business to take charge of our offices as local managers.

Yours very truly,
UNIVERSAL RADIO CO.

SUNSET PRESS, SAN FRANCISCO