

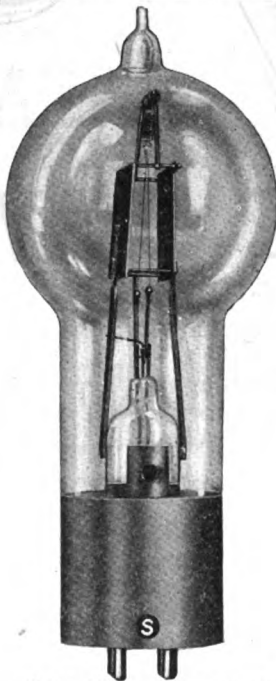
# PACIFIC RADIO NEWS

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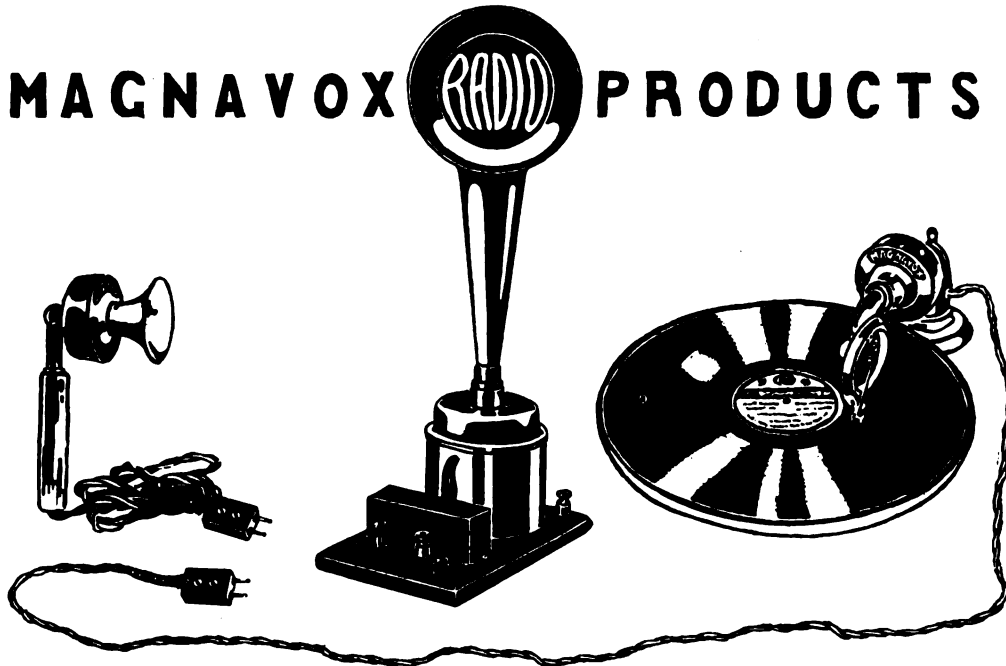
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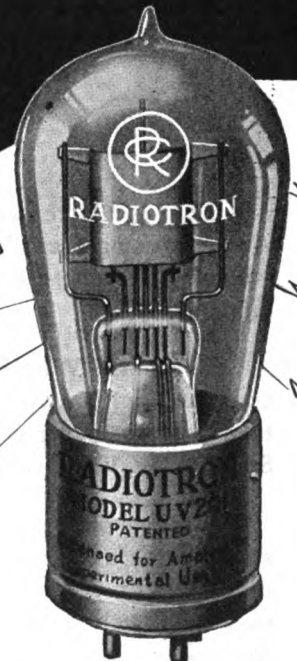
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over-land receiving. Probably nearby wires acted as an aerial  
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I have just received confirmation from 61d, corresponding  
in every particular with what I reported. I would have written  
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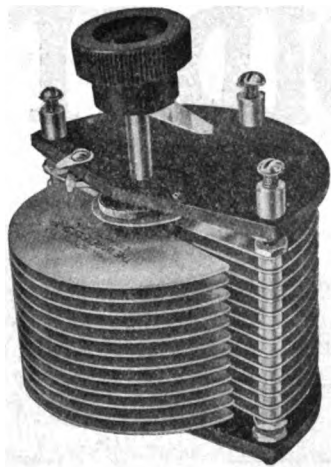
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## RADIOTORIAL

# PERSONALITY BEHIND THE KEY

By LAWRENCE MOTT

**A**UTHENTIC reports reach me of "fake" signals, of very "broad" transmission—on the part of them that have no license to exceed 200 meters—of persistent "air hogging"—and of other incidentals, none of which are at all conducive to the bettering of the Amateur Radio Cause.

I am impelled to a prophecy: Unless these things be stopped, the Federal Authorities will take certain steps that are not pleasant to cogitate upon!

It undoubtedly is a very great pity that a well-recognized type of Amateur operator is seriously endangering the feeling of kindness and co-operation that is shown by the new Administration toward amateur radio effort. The innate selfishness of a few is most distinctly jeopardizing the pleasure and profitable research of a very great many!

Why is this?

Because there is a kind of human mind that actuates only in one way, to-wit: for itself! The rights of others, and the serious efforts of others—mean less than nothing to the selfish operator.

Furthermore: Linked with this selfishness is a form of rabid jealousy that would be laughable, were it not such a confounded nuisance. I know types of men who are jealous of another's better apparatus, of the kind of a license another has—and so on, *ad nauseam*. No one cares a whit about these childish whims and picayune attitudes—until these show themselves in such manners as breaking up serious long-distance work, and attempts at DX records, by persistent and useless chatter, on full power, with some chap two city blocks away—and by illegal methods of various kinds.

From my station on Catalina Island I nightly hear would-be KAISERS of the Air, in Los Angeles and environs,



Mr. Lawrence Mott, Associate Editor of "Pacific Radio News." Mr. Mott was formerly City Editor of the New York "Herald" and later acted as Staff Correspondent for the New York "Sun" in the Far East during the war period. His Radiotorials and articles on CW activities will be of interest to every enterprising radio amateur.

operating on—to say the least—"broad" wave lengths. I hear the owners of fine stations vainly trying to get through the infernal racket in order to do serious work—work that tends to the furthering of radio effort because of its very earnestness of character and studiously-careful operating conditions. I hear two-letter signs—strictly forbidden. I am informed that a certain well-known amateur in Los Angeles whose station has never had a black

mark against it, and whose reputation for effective achievements is second to none—has been very seriously annoyed by amateurs in the northern part of the State, "faking" his call, and by loosening of couplers, obtaining a fading effect that would deceive any but a well attuned ear. I understand that this "faking" of his call has brought him up on the carpet before the Radio Inspector.

And the mainspring of ALL this sort of contemptible work is . . . jealousy!

Radio should not be looked upon as a boyish game—a "stunt"—whose sole object is to have something to boast of! I think that I am not putting the case too strongly when I say that there is no more entrancing field of endeavor, nor is there one whereby more actual GOOD can accrue to this great Nation of ours, than by all manner of radio research and invention. Every useful discovery is a step forward.

In all these praiseworthy results the Amateur classes have every chance to share. There are many amateurs who have developed distinctly new apparatus, and derived excellent things therefrom. This because of their unique opportunities to experiment—one with the other, etc.

As I have said in a previous article—the Authorities at Washington have shown that they are glad to welcome, recognize and assist the serious-minded individual in the radio field. But that they will NOT permit of the courtesies and leniency to be made ducks and drakes of by a heterogeneous lot of narrow-minded, callow youths, whose utter irresponsibility is something to marvel at and cogitate upon!

I have written to Secretary Hoover—and herewith publicly suggest—that a

(Continued on page 387)

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

In part one of this series of articles the audion itself was discussed. We shall now consider some types of amplifiers suitable for radio telegraphic and telephonic work themselves. For our purposes audion amplifiers may be conveniently divided into the following classes:

1. Voltage amplifiers.
  - a. Radio frequency.
  - b. Audio frequency.
2. Power amplifiers.
  - a. Radio frequency.
  - b. Audio frequency.

We will now discuss amplifiers in the above named order.

**Voltage Amplifiers**

As has been previously stated the inherent characteristic of the audion is that when a certain a. c. voltage is impressed upon the grid, an a. c. flows in the plate circuit which is many times larger than the grid voltage which caused it to flow. Let us consider a typical circuit, see Fig. 4. The secondary of the input transformer is wound so as to impress as high a voltage as possible on the grid. (B) and (C) are the usual grid and plate batteries and (Z) represents the load into which the output of the audion is delivered. Now let us consider two cases. (1) when (Z) is pure resistance and (2) when (Z) is practically

# VOLTAGE AMPLIFIERS

By A. K. ASTER  
Instructor, Department of Physics, University of California.

were not for this property of the resistance coupled amplifier it would be impossible to construct a radio frequency amplifier whose action is practically independent of the wave length of the incoming signals nor would it be possible to apply amplifiers to cable telegraphy when the frequencies are so low that it would not be practical to construct reactances of the necessary size for best results because of their size and cost.

As has been previously stated, the resistance coupled amplifier fills the bill for an aperiodic radio frequency amplifier. For wave lengths below 600 meters it is not practical to use over two steps of amplification because one is not able to properly control the resonance point. In relay and long distance work it is very often desirable to increase the selectivity of the receiving set beyond the limit obtainable by the usual tuning devices. An amplifier which is not aperiodic but has

facility in readjusting it for the next station.

For audio frequency the question of distortion must be considered. For radio telegraphic signals and the spoken voice the reactance coupling is to be preferred because of the lower plate battery but it is not sufficiently free from frequency effects to give the very best results for music as the range of frequencies for music is far greater than for the spoken voice. Hence for the very best results with music the resistance coupling is to be preferred. It must always be remembered that to obtain distortionless amplification one must not add so many steps to the amplifier that the variations in plate current ever exceed the straight portion of the characteristic curve of any tube used in the amplifier.

The circuits previously shown do not show the necessary details for best operation in practice. Suitable practical circuits will now be discussed. Fig. 6

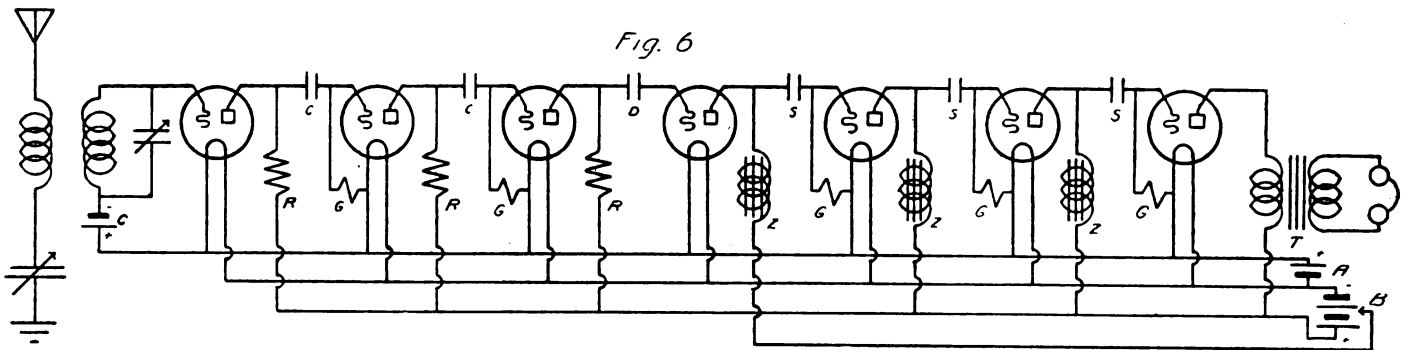


Fig. 6

pure reactance. In case (1) a mathematical investigation of the circuit (which is outside of the scope of this paper) shows that it is necessary to use a resistance at (Z) whose value is about ten times the plate impedance of the tube in order to get an amplification of the incoming voltage at least 90 per cent of the voltage amplification constant of the tube. While on the other hand a mathematical investigation of case (2) shows that the reactance at (Z) need only be two or three times the plate impedance of the tube to get 90 per cent of the maximum voltage amplification of the tube. The above clearly indicates that it would be very advantageous to use a reactance instead of a resistance at (Z) because if a resistance were used it would be necessary to use a very high (B) battery in order to get the necessary difference in potential from filament to plate for maximum amplification. The use of a reactance would permit a much smaller initial and upkeep cost of the (B) battery and for the average amateur this item is of extreme importance. It must be remembered, however, that the resistance coupled amplifier has certain very distinct advantages over the reactance coupled type. Its operation is practically independent of the frequency of the current to be amplified except for extremely high frequencies and it produces extremely little distortion. If it

a sharp peaked resonance curve is excellent for this purpose. For this purpose the tuned reactance coupled is the most suitable. See Fig. 5 for connections. For 200 meter work, coil (L) should be about 25 turns of No. 20 B. & S. gauge D. C. C. wire wound in a single layer on a tube about three inches in diameter. Condenser (N) should be a continuously variable condenser of about 0.0005 mfd. maximum capacity. This arrangement can be carried out to

shows a practical circuit for a combination of three stages in resistance coupled radio frequency, a detector and three stages in reactance coupled audio frequency amplification. It will be noted that all tubes are worked from a common filament and a common plate battery. For best results it is essential that the adjustable tap on the plate battery for the detector tube shown be used.

A word about the construction of

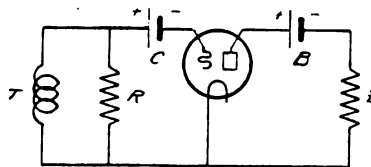


Fig. 4

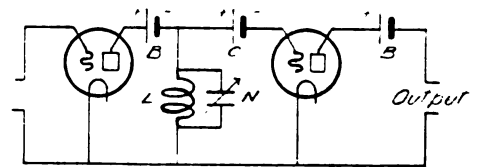


Fig. 5

5 or 6 steps with good success as the resonance point of each step can be controlled and adjusted to its proper value by the operator. Should extreme selectivity be desired, each coil and condenser can be replaced by a loose coupler, the primary and secondary of which are each tuned by a condenser. In this arrangement the degree of selectivity is controlled by the amount of coupling between the coils. This method, while extremely selective, is not to be recommended because of the dif-

high resistances for amplification is out of place here. The common high resistance for grid leak work consists of an ink or a pencil mark on a strip of paper. This will work satisfactory for a single detector tube but not for an amplifier. The coupling resistances should be preferably graphite rods or other substantial inductance free resistances capable of carrying at least 10 milliamperes without heating. For grid leaks, graphite rods should be used. (Continued on page 384)



# THE MAGNETIC AMPLIFIER

A Treatise on its Theory, Design, and Construction.  
By Jennings B. Dow

Published by Permission of the Secretary of the Navy.

BEFORE taking up the subject matter of this article, a few paragraphs will be devoted to some of the fundamentals which must be considered in the design of the magnetic circuit in general.

Iron is a substance with which the average experimenter is more or less familiar, however, there are a few points which must be given additional consideration in view of its application herewith to high-frequency circuits and apparatus.

If an electric current is passed through a long coil of constant section wound uniformly with  $N$  turns of wire per centimeter of axial length, each turn conducting a current of  $I$  amperes, the field intensity at any point in the plane of the central turn when the sec-

The former is due chiefly to the molecular structure of the iron, and increases with the frequency at which magnetization takes place, i. e., for every magnetic cycle which the iron passes through a certain amount of energy is lost through hysteresis and this appears as heat in the iron. Fig. 2 shows a typical hysteresis curve for a given sample of iron. The abscissae represent the field intensity and the ordinates, the magnetization or flux density within the iron. The area bounded by the curve is a measure of the loss due to this cause.

Eddy current losses are due to the electrical conductivity of the iron, and vary also as the frequency. If it were possible to insulate each particle of the iron so that no current paths could be formed, no loss from this cause would result. In practice, magnetic circuits in iron are laminated to reduce this loss to a minimum, and the nicety of lamination is governed by the frequency at which the magnetic circuit is to be worked.

In the selection of iron which is to be used in magnetic circuits operated at commercial frequencies, one has merely to consider the following qualities in order of importance (neglecting mechanical considerations):

1. Iron losses.

(At frequencies below 500 cycles per second, 90% of these losses are ordinary due to hysteresis alone and seldom exceed four watts per pound of iron used).

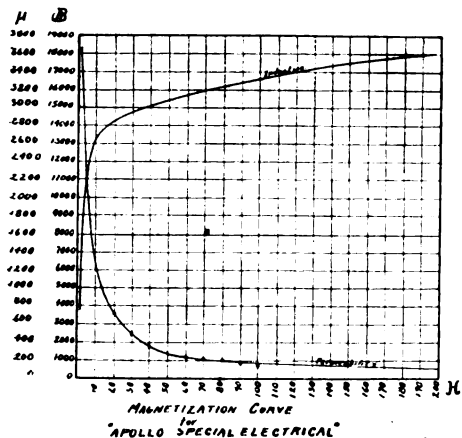


Fig 1

tion of the coil is of any shape and its dimensions are smaller compared with the axial length, is  $H = \frac{3.1416 \times NI}{10}$  lines per square centimeter.

If a bar of some magnetic substance such as iron, is substituted for the air core, a flux density,  $B = 4\pi \times 3.1416 \times \text{Permeability} \times H$  will be produced in the iron for every ampere turn. Solving these equations for permeability, permeability

$$\frac{B}{H}$$

This relation is called the permeability, and for low degrees of magnetization, its value for iron may be as great as 6000. The amount of induction in iron for any magnetizing force is not the same, and as a matter of fact, varies over a considerable range, as may be seen by referring to the curves in Fig. 1, which are typical of a good grade of transformer iron. From this fact, it will be observed that the permeability of a given sample of iron is not a constant, and varies also over a considerable range. The permeability curve for this sample of iron is plotted from

$$\frac{B}{H}$$

in the same figure. The losses in a given piece of iron influenced by magnetic lines of force consist almost entirely in hysteresis and eddy currents.

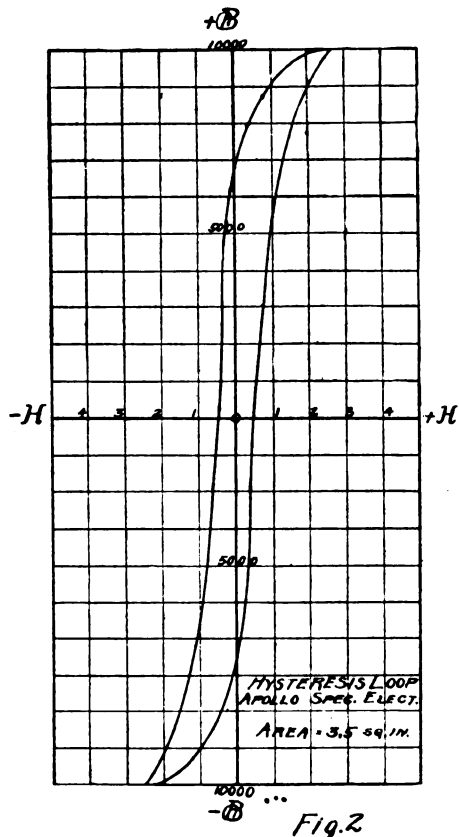


Fig. 2

2. Induction characteristics.  
(The induction characteristics of good grades of electrical sheets are quite similar and seldom vary enough to make choice uncertain).
3. Stability or ageing.  
(This may be determined from a sample and corrected by treatment).

In the selection of iron for use at radio frequencies, one must consider the qualities in a vastly different light. Here also the iron losses must be considered first, but instead of finding 90 per cent of the total losses due to hysteresis, only 25 per cent is found. The remaining 75 per cent is accounted for in eddy currents. These figures must not be taken to mean that there is less iron loss due to hysteresis in the second case, for the total losses may be fifty times greater under certain conditions of magnetization. The above figures are based upon data collected in actual practice, using electrical sheets manufactured by the American Sheet and Tinplate Co. Number 29 gauge "Apollo" was used and the laminations were insulated additionally with 5 mils of fish paper. The apparently great eddy-current loss resulted from the fact that the limit of lamination was reached. If it were possible to obtain good sheets

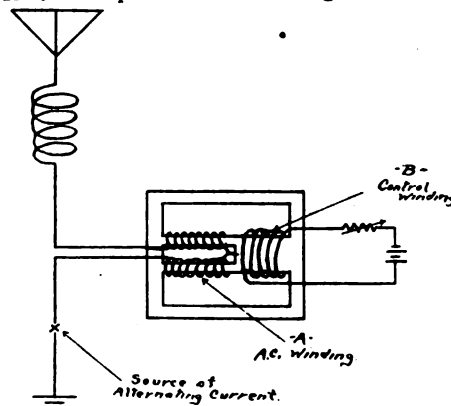


Fig. 3.

of number 45 or 50 gauge, the total losses would probably be reduced to one-half, and possibly not more than 30 or 40 per cent of these could be charged to eddy-currents.

At a given frequency, the hysteresis losses in the various grades of rolled sheets will be found not to vary considerably, and this will be found especially so as the frequency increases. While no actual figures are available to verify the following statement, it may be said that a frequency of 1,000,000 cycles per second, the hysteresis loss in iron would be the same for all grades, and this, regardless of thickness or other dimensions. In the selection of iron for work at high frequencies, particularly radio frequencies, it becomes a matter of considering only eddy current losses, and selecting iron which can be manufactured into shapes which will eliminate these losses. This practically eliminates the high silicon alloys which have won such great favor in general electrical work, for it is impossible to manufacture this substance into thin sheets. This material was used, however, in the construction of the single piece of apparatus described in this article, but this attempt was entirely experimental and efficiency was given secondary consideration.

In the design and construction of the (Continued on page 381)

## THE CALIFORNIA THEATRE RADIOPHONE

(By Lieut. E. W. Stone)

**T**HE De Forest radiophone station operated at the California Theater in San Francisco by the Moorhead Laboratories, Inc., of that city, which is the exclusive distributor of the De Forest Company on the Pacific Coast, has been in operation for over a year and it is thought that a description of same will be found of interest to readers.

The California Theatre is the largest motion picture house in San Francisco and is one of three controlled by the Famous Players-Lasky Corporation, the other two being the Imperial and Portola Theatres. A fourth, the Granada, is under process of construction.

The station was installed early in 1920, through the courtesy of Directors Roth and Pardington of the "Big 3" Theatres, and is located in a concrete room in the fly galleries of the California Theatre. The antenna is rigged off the tower of the Humboldt Bank Building, directly adjoining the theatre.

The transmitting set consists of the standard De Forest 1 KW radiophone set with additional loading inductance so as to obtain the working wave length of 1260 meters. The call letter of this station is 6XC. The antenna current varies from 4 to 5 amperes, according to the amount of input energy. Ordinarily, less than a half kilowatt is used for transmission. As the set is essentially an experimental one, various transmitting circuits of the De Forest Company have been tried out. The circuit at present in use is one developed by the engineers of the Moorhead Laboratories, for which patents have been applied. The receiving set is of the standard De Forest type.

For best results in receiving from the California Theatre, the following Ultra Honeycomb Coils should be used: Primary—DL 200, with series condenser on moderate antenna. Secondary—DL 200, Tickler—DL 150.

In connection with the transmission of music, several interesting methods have been developed through experimentation. For collecting and transmitting the music from the theatre's symphony orchestra of 50 pieces a large Magnavox horn is suspended in the fly galleries in such a position as to be clear of the side "drops." At the small end of the horn, a Kellogg microphone transmitter is mounted in a vertical position. From here the usual wires are lead to the radio modulating circuit. For

### NAVY RADIO GIRL LOSES VOICE FROM ELECTRIC SHOCK

**H**ER voice lost, but otherwise absolutely unharmed by contact with a high voltage wire of the radio apparatus which she was attempting to operate at Twelfth Naval District headquarters, Miss Clara K. Grady, secretary of Lieutenant J. O. Twiss of the navy radio service, offered a baffling problem to the navy doctors who attended her following the accident.

Miss Grady herself, who bubbles with

wit and volubleness in ordinary circumstances, though voiceless after the incident, wrote reams of letters during the afternoon protesting against being dumb and insisting that she felt no discernible effect except her mysterious inability to articulate.

It is thought that the fright, accompanying the electric shock, temporarily paralyzed the vocal cords, and that Miss Grady will be as chatty as ever when she punches the navy time clock at a minute to nine.—S. F. Examiner.



The Radio Room at the California Theater in San Francisco. Dr. Lee De Forest is shown demonstrating his invention to Miss Mary White, one of the many entertainers who have had the distinction of singing to the "unseen audience."

the transmission of phonograph records, several devices have been used. One is a standard Magnavox phonograph microphone, consisting of a microphone mounted at the end of the usual phonograph tone-arm. Another method developed by the Moorhead Laboratories is to utilize the steel needle holder so as to bear directly on the microphone diaphragm in place of the usual phonograph diaphragm.

For special concerts, which are frequently given, a sound-proof room in the basement of the theatre is utilized. For small chamber or instrumental music, a Magnavox horn similar to the one suspended in the fly galleries is utilized, but for vocal selections Kellogg desk transmitters are used by each singer. By placing the singers with their backs to the grand piano used for accompaniment, enough of the sound intensity from the piano is obtained through the singers' microphones so as to obtain a proper blending of the voice and piano.

Harp solos by Miss Jay Clark, piano solos by Mr. Hans Hanke, and vocal solos by Miss Mary White, Miss Ruth Williams, and Mr. Ford Rush of the California Theatre, and Madam Frieda Hempel and Forrest Lamont, stars of the Chicago Grand Opera

Company, have been the big features of the special concerts.

The regular concerts, consisting of the Herman Heller Orchestra music and phonograph records, are sent out at 4:00, 7:15 and 9:00 p. m. on weeks days, lasting for at least one-half hour. Special vocal and instrumental concerts are sent out at 9:00 p. m. on Wednesdays, and a special Sunday concert given by the Herman Heller Orchestra is sent out from 11:00 a. m. to noon.

The transmission of music from the De Forest station at the California Theatre has developed from an experimental standpoint to a worth-while contribution to the musical progress of the city, and receiving sets for the reception of this music alone have been installed at clubs, hospitals, hotels, and many private homes since the inauguration of this service.

The accompanying photograph shows Dr. Lee De Forest, inventor of the audion, at the radio set, and Miss Mary White singing over the set on the occasion of one of the special concerts.

The station is operated under the direction of Lieut. Ellery W. Stone, general manager of the Moorhead Laboratories; Mr. B. F. McNamee, chief engineer, and Mr. J. E. Squires, operator of the station.

Have you a copy of Lieut. E. W. Stone's "Elements of Radio Telegraphy"? The book contains over 400 pages of radio data, much of which is found in no other radio book. Price \$2.50 per copy, postpaid. Pacific Radio Publishing Co., San Francisco.

The Leo J. Meyberg Company of San Francisco has installed a radio telephone in the Fairmont Hotel. Concerts will be given on Monday and Friday evenings from 8 to 9 o'clock.

# AN INTERESTING PAPER ON RADIO COMMUNICATION

**L**IEUT. ELLERY W. STONE, U. S. N., R. F., general manager of the Moorhead Laboratories, delivered a lecture on the radio-telephone, followed by a demonstration of a radiophone in operation, before the San Francisco Electrical Development League, on January 24, 1920, and the Commonwealth Club of California on March 18, 1921, at their weekly luncheons held at the Palace Hotel in San Francisco.

Lieutenant Stone's talk is reproduced below.

At the Commonwealth Club luncheon the following musical program was rendered by local artists:

1. Vocal Solo—"Do You Ever Think of Me?"  
By Miss Ruth Williams
2. Vocal Solo—"I'm Learning to Love You"  
By Mr. Ford Rush
3. Piano Solo—"Caprice Viennois" . . . Kreisler  
By Mr. Hans Hanke
4. Vocal Solo—"Patsy"  
By Mr. Rush
5. Vocal Solo—"Humming"  
By Miss Williams

The lectures and concerts were given in the ballroom of the Palace Hotel before audiences of several hundred. Although the ballroom is a very large room, the music was as loud as that of an orchestra and completely filled the room.

Mr. President, Ladies and Gentlemen:

I propose to tell you today something about what is probably the latest form of communication, that is to say, the radio telephone. And following my talk, I hope to present a demonstration of actual radio telephone operation, receiving music and speech from the DeForest radio station at the California Theater. I say "hope" advisedly, because upon the occasion of our last demonstration, the fuses at the transmission station were inconsiderate enough to blow out, which caused a delay of some twenty minutes or more. However, I have given instructions today to have all of the fuses "coppered" with No. 10 wire, so unless these "grin and bear it" fuses should renig on the job, we expect to exhibit to you a satisfactory demonstration.

In order to have a proper conception of the radio telephone, it will be necessary for me to review briefly a few of the facts concerning its theory and development, and I hope you will not consider that I am turning this luncheon into a school room.

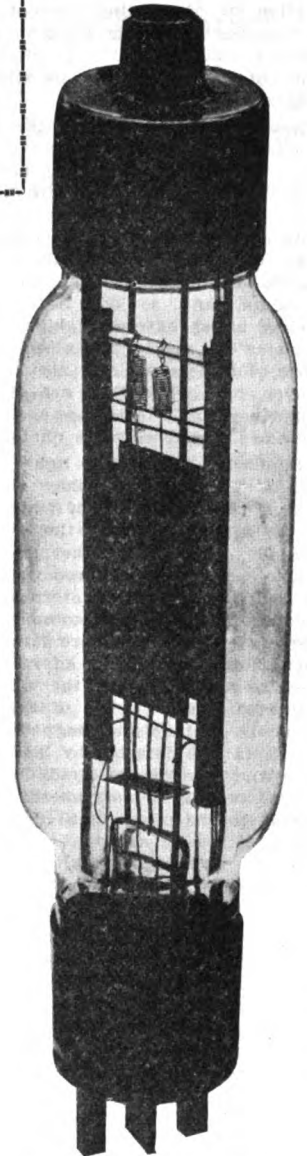
Communication by wireless is carried on by ether waves, and it is helpful in understanding these etheric or electromagnetic

waves to consider waves on water, which are closely analogous. If we drop a rock into a pool of distilled water, there will be waves radiated in all directions from the center of the disturbance. These waves consist of crests and troughs—the crests, of course, constitute the top part of each wave, and the trough, the lower part between the troughs of any two successive length of such waves by taking the distance between the crest of one wave and the crest of the next succeeding one. This distance is, of course, the same as the distance between the troughs of any two successive waves, and this measurement is called the wave length. It is obvious that as we increase the number of waves radiated in any unit of time, say a second, they will be more closely crowded together, so that the wave length is decreased. The number of waves radiated per second is called the "frequency," and it is readily seen that as the frequency is increased, the wave length is reduced.

Sound waves, which affect the ear, travel on a gas, a liquid or a solid, as their conducting media. The ear is only sensitive to sound waves of definite frequencies—from 16 to about 32,000. This range of frequencies is indicated on this chart, as shown, but the waves used in radio transmission travel on an entirely different medium, which pervades all space and which, for want of a better name, we term the "ether."

In the 80's, I believe it was 1883, an English physicist by the name of Maxwell, advanced the theory that light waves, as we commonly know them, are electromagnetic waves traveling on this mysterious ether—the difference in color in light waves being simply a difference in frequency or wave length. These light waves travel at a speed of 186,000 miles per second, or seven and one-half times the circumference of the earth. Wireless waves are of exactly the same nature as light waves, and have the same velocity, so that if it were possible to build a sufficiently powerful station, we should be able to transmit a radio wave seven and one-half times around the earth in one second.

Since Einstein published his now famous Principle of Relativity, there has been some doubt in the minds of scientists as to the necessity for our arbitrary conception of this almost fictitious ether. If Einstein is correct, there is very possibly no mysterious ether at all, but I hope you will not ask me



A DeForest Power Tube

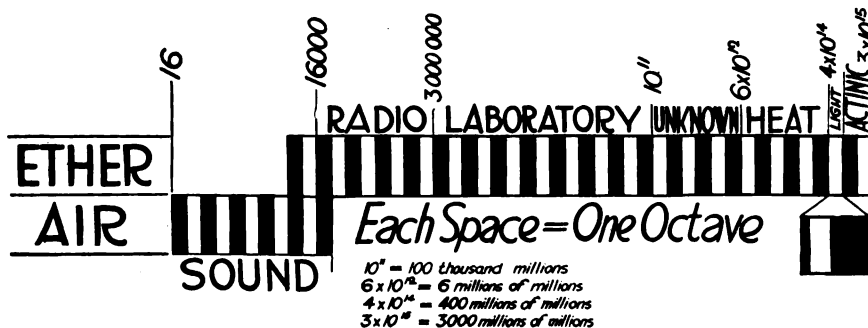
any questions about his theory of relativity because I happen to be one of the unfortunate many who are not educated to the point of understanding the fourth dimension and theories of relativity.

Just as the ear has certain frequency limits of sensitivity, so also will the eye respond to waves of given frequency only. The lowest frequency to which the eye will respond is about four hundred millions of millions per second, and electrical waves striking the retina of the eye at this frequency register the color red on the brain. The highest frequency to which the eye will respond is just about double this frequency, and at this rate of vibration we sense the color violet.

This band of colors indicated here, which you will recognize as the primary colors of the rainbow, range successively from red, orange, yellow, green, blue, indigo, through to violet, differing from each other only in their frequency.

It is interesting to note that while the ear responds to an actual physical vibration, the eye responds to an electrical one, and while we do not fully understand these things at present, it is very possible that the phe-

(Continued on next page)



nomenon which actually occurs is the generation of alternating currents of various frequencies in the nerve channels connecting the eye and the brain. In other words, our sense of sight is really a detector of electromagnetic waves.

Now, I have shown that the eye is sensitive to electromagnetic waves of certain very limited frequencies. There are frequencies very much higher than those of the color violet which are popularly termed "ultra-violet" waves, and we find such very high frequency waves emitted from radioactive substances such as radium, thorium, uranium, and so on, X-Ray tubes, and bodies under extremely high temperatures, such as the sun or the electric arc. These ultra-violet waves are also called actinic waves, and while they are of too great a frequency to affect the eye, nevertheless they are registered on a photographic plate.

Similarly, below the light waves, there are a great many other electromagnetic waves, the frequencies of which are too low to be distinguished by the eye, but which may be detected by other media. For example, below the color red we have a series of radiations popularly termed "infra" (or below) red waves, the commonest of which are heat waves. You are familiar with the fact that when a piece of metal is heated, such as an iron poker, the vibratory energy imparted to the molecules of the metal cause them to emit electromagnetic heat waves which can be detected by holding the poker near the face or the hand, but which cannot be seen until more energy has been imparted to the poker, until finally the waves are radiated at so great a frequency that they are able to affect the eye and we say the poker is "red hot."

Below the infra-red, or heat waves, there are electrical waves of frequencies which have been produced in the laboratory but which are too short to be used for wireless communication.

At the lower end of this chart are shown the waves actually used for radio communication, and their frequency varies from about 16,000 to 3,000,000.

Although I have shown the frequencies of sound waves which are sensible to the ear, at the lower end of the chart, they are really not electromagnetic waves, but are only included to show you the magnitude of the radio frequencies.

Each division on this chart represents an octave; that is to say, each unit of frequency is twice that of the one next below it. This means that this chart is laid out according to geometric law and not a straight line progression, because each unit doubles the one preceding. This is similar to the laying out of a slide rule.

Now we have seen that to produce waves, whether they be sound waves or electromagnetic waves, it is necessary to have some vibrating medium which will set up these waves. In the case of sound waves, it is a vibrating solid, gas or liquid, but in the case of electromagnetic waves, it is a conductor which is vibrating electrically, or which contains a vibrating electrical current, and this we term an alternating current.

It has long been known that the discharge of a condenser or Leyden jar is oscillatory. In other words, it sets up electrical currents of a radio frequency; that is to say, one of the frequencies shown on the lower end of this chart and which is suitable for radio communication. In building a radio station, therefore, we must erect a condenser big enough to handle powerful electrical currents, so that the current in this condenser can be of the power frequency to radiate waves. As you know, a condenser consists

of two conducting surfaces separated by an insulator, which may be of paper, glass, oil, or mica. This big condenser which we use in a radio station is called the aerial or antenna and consists of the elevated portion which constitutes one plate of the condenser, the other conducting plate being the earth, and the air between the two forming the insulator.

The different systems of radio-telegraphy are simply the different methods of charging this enormous condenser, and the nature of the waves radiated from this condenser depends upon the kind of current which the particular charging apparatus supplies to the antenna. Thus, it is sufficient for wireless telegraphy to set up electrical currents in the antenna which can be regulated by a telegraph key, but for the wireless telephone these currents must be modulated by the human voice in order to produce speech at the receiving end. This is exactly similar to wire communication. In the telegraph a continuous flow of current is made and broken with a telegraph key, while in the telephone a microphone, or transmitter, through its varying resistance, modulates these currents to conform to the human voice.

It is interesting to note that in wire communication, the telegraph preceded the telephone, and so in radio, Marconi's telegraph preceded by some years the radio telephone, as we know it today.

The delay in the development of the radio telephone is due to the fact that until recently we did not have a generating device which would produce oscillations regularly and continuously enough, so that no distortions would be introduced into the radio telephone speech. The waves produced by the old-time spark sets were so irregular that to superimpose voice currents on these spark waves would have produced an unintelligible jumble. The device which made the radio telephone possible is known as the "audion" or vacuum tube.

This tube came into being as the result of an early discover of Edison's, known as the "Edison Effect," and which consists of the radiation of electrons or minute electrical charges from an incandescent lamp filament. Fleming, an English scientist, made use of this phenomenon in a small gaseous rectifier, a development of which we find on the market in the form of the familiar "Tungar" rectifier.

It remained for Dr. Lee DeForest of New York to improve upon Fleming's work by the introduction of two electrodes into the ordinary electric lamp, thus producing what is known today as the three electrode audion, or vacuum tube.

The operation of these tubes is a little too complex to enter into today, but I may say that they are unique in that they play the three-fold role of detection, amplification and generation. In other words, they will not only set up electrical oscillations at a transmitting station, but they will make them audible at a receiving station, and, in addition, and by a different process, will amplify them to almost any given strength.

This is one of the small audions used for detection and amplification purposes, and it may interest you to know that these are made in San Francisco at the Moorhead Laboratories, which happens to be the largest factory in the world exclusively devoted to the manufacture of these tubes.

This audion here is of very much larger and more rugged construction and is used for transmission purposes and rated at ½ kw. capacity. As many as eight of these have been used in parallel, thus producing at 4 kw. transmitting set.

These tubes are exhausted to a very high vacuum and a potential of 1500 volts D. C. is applied to the plate.

The DeForest Company has a 1 kw. telephone using tubes of this type installed at the California Theatre, and by suitably placed microphone, which is connected to a large horn and suspended in the "fly" galleries, the music is collected from the Herman Heller Orchestra and transmitted, three times a day, many hundreds and even many thousands of miles, to all wireless stations within range. It may interest you to know that an ordinary wireless telegraph receiver is capable of receiving wireless telegraph messages, so that all vessels within a suitable range from San Francisco are receiving two concerts a night from the California Theatre.

The radio telephone finds its greatest use in those places ashore where it is not economical to build a telephone line to connect two points, on account of the very small amount of traffic handled over such a line, so that power companies, and other large industries and public utilities which have widely separated plants or branches, have been installing our radio telephones for communication. As an example, I may say that the Southern California Edison Company has recently purchased three sets, and other power companies are expecting to follow suit. During the war, radio telephones were installed on aeroplanes, battleships, and so on, and rendered very excellent service.

In connection with communication for power companies, it is possible to radiate the radio waves directly into the transmission lines themselves and to talk by means of a sort of "wired wireless."

We now propose to give you a demonstration of a radio telephone in operation. These DeForest instruments here, all of which, as you see, employ Moorhead audions for reception and amplification, will receive music and other signals from the DeForest California Theatre station, and through the courtesy of the Magnavox Company, will be amplified by this Magnavox so as to be audible to you all.

In conclusion, I wish to express my appreciation to my engineer, Mr. McNamee, whose efforts have made it possible to give this demonstration today.

## LIBEL CHARGED IN RADIO DISPUTE OF LAWYERS

A WARRANT charging criminal libel was issued against Louis Seidenberg on complaint of James H. Boyer. Both are lawyers with offices at 625 Market street.

The warrant was issued in Oakland by Assistant District Attorney Frederick Donohue.

The charges are an outcome of a dispute over the affairs of the National Radio Company. Boyer, as representative of stockholders, recently laid before the San Francisco grand jury allegations, which are to be considered Monday, including embezzlement, obtaining money by false pretenses and making assessment after the concern was defunct.

Boyer said the libel charge was made in Oakland because the alleged libelous matter was issued in the vicinity of his home there.

The charge is based on a postscript to a letter sent out by the company April 6, calling for a ninth assessment.

Seidenberg is secretary of the company, of which Dr. Adolf Tschumi is president.—S. F. Examiner.



Photograph Courtesy of The Radio Shop, San Jose, Cal.

## New Long and Short Wave Regenerative Receiver is Remarkably Flexible

(By E. G. Arnold, Radio "6ZAA")

**T**HE new type "RS 1-24" receiver recently placed on the market is one of the most remarkable pieces of apparatus and also one of the most welcome that has ever been offered to the experimental field.

I have had the privilege of being one of the first to use this new set and as I am so pleased with the work it will do, I feel the desire to let the many thousands of fellow amateurs who are interested in the art, know the merits of this original piece of apparatus.

The type "RS 1-24" receiver, 1-24 you will recognize, means from 100 to 24,000 meters is a remarkable compact set measuring only 7x7x25 inches over-all. One of the features that will appeal to all, besides compactness, is the few controls, which in a receiver of this wavelength range, is a remarkable achievement in itself.

For the past eight years I have searched for a receiver that was flexible enough to tune, without any "holes," to the wavelengths of any station of the world. I have found it in the "RS 1-24," and with no sacrifice on any of the wavelengths covered. The superior variometer method of tuning, employing the wonderful Armstrong regenerative circuit to its maximum efficiency is employed throughout the entire range, which in itself is more than

a guarantee of maximum efficiency and selectivity. A cleverly wired "cam" switch takes care of the three main groups of wave-lengths covered. When thrown to the right the circuits are arranged for amateur wavelengths, 100 to 400 meters, employing the well known Radio Shop design, with a few added refinements. In the center position reception of from 350 to 1000 meters is in order, and remarkable amplification of commercial sparks is obtained. When this switch is thrown to the left damped and undamped stations up to 24,000 meters can be brought in with remarkable ease.

There is another feature of this receiver that will appeal to all. That is a "stand-by" position that may be employed for general "listening-in" purposes and which enables one to pick up stations that otherwise never would be found on account of their sharpness. When you hear your station you can instantly switch over to the tuned side and eliminate interference.

Regarding the operating merits of this set I can truthfully say that it is the combined equal, if not much better, than any individual wavelength receiver ever before put on the market. On amateur and short wave commercial sparks and C.W. it leaves nothing to be desired by the most

exacting "DX" man. Then there is the feature of being able to "hop up" to the long waves without the disagreeable feature of plugging in and out of coils. The tuning on these long waves is remarkably easy and clean cut. Troublesome combinations of tuning have apparently been eliminated and when you find your station you can rest assured that you will find him in the same place the next time you "go up."

While there have been other pieces of apparatus offered to the field with a range covering all wavelengths, it has been my experience that some efficiency has been sacrificed on some section of the range covered, usually on the lower end of the scale. Now this is just where every relay man wants the best efficiency. I was a little skeptical myself about the "RS 1-24" until I had the opportunity to prove to myself that absolutely no efficiency had been sacrificed on any section of the scale.

In addition to the usual run of short wave stations, spark and C.W., I have copied practically all European continental stations, using one tube and the "RS 1-24." What appeals to me most of all is the remarkable flexibility of operation and the positive control of oscillation and amplification attained in this receiver.

### TIMELY COMMENT

By B. F. McNAMEE

San Francisco, Cal., May 1, 1921.  
Editor Pacific Radio News,  
Dear Sir:—

I have just read Mr. Aster's article in the May issue of Pacific Radio News entitled "The Audion Amplifier," and while I agree with him in the main, there are a few statements in this article on which I would like to express a difference of opinion.

Mr. Aster states that "assuming the grid to be entirely insulated from the plate and filament, some of the negative electrons shot off from the filament and attracted to the plate will strike the grid and charge it negatively. This charging will continue (assuming no leakage) until the grid is charged so highly negative as to repel practically all the negative electrons shot off from the filament and hence practically stop the plate current."

Let us say that some of the electrons do get on the grid and charge it slightly negatively. As soon as this charging has amounted to a very small negative potential, it will be sufficient to repel all further electrons from itself. This small negative charge on the grid will slightly decrease the plate current, but will not be sufficient, in any ordinary tube, to practically stop it. The effect which such a small charge will have on the plate current will depend on the structure of the tube, and on the filament and plate voltages em-

ployed. The fact that the plate is positively charged and is drawing electrons from the filament will not cause electrons to collect on the grid. This is clearly stated by Van der Bijl in his book, "The Thermionic Vacuum Tube," page 44, as follows: "The positive charge on the plate does not draw electrons to the grid; it tends to draw electrons to the anode through the openings of the grid."

It is well known that even under the ordinary operating conditions of the vacuum tube there is required a negative potential of several volts to stop the plate current. Now, if a grid having a negative potential of several volts were connected through a galvanometer to the filament there would certainly be a flow of grid current. But Ralph Brown, writing in the September, 1917 issue of the "Physical Review," states: "When a blocking condenser is inserted in the grid circuit no current can flow through it and so the grid must assume the potential at which the grid current becomes zero." So it does not appear reasonable to suppose that an isolated grid would assume such a big negative charge.

When a hard tube is used in a detecting, amplifying, or oscillating circuit with a grid condenser, it is found that if a grid leak is not employed, the tube will not operate due to the high negative charge collected by the grid. This fact does not, however, prove Mr. Aster's statement, because it must be remembered that in this case the potential of the grid is being varied from outside the tube so that it reaches a certain positive value of potential, during which time it attracts negative electrons.

As no grid leak is employed these electrons cannot leave the grid, and the result is a negative potential which may bring the plate current to a non-operative point on the characteristic curve.

Again Mr. Aster states as follows: "Assume the grid to be connected to the midpoint of a resistance connected directly across the filament. The grid will now be at zero potential with respect to the filament. It will therefore neither attract or repel electrons shot off from the filament. In their course from the filament to the plate a few electrons will strike the grid and charge it negatively. This charge will be conducted away to the filament and the grid will remain at zero potential with respect to the filament. The result is that the tube will act as though there were no grid in it at all."

Connecting the grid to the midpoint of a resistance which is connected across the filament brings the grid to the same potential as if it were connected to the midpoint of the filament inside the tube, provided that such a resistance has the same value as the resistance of the filament itself. Therefore the grid is charged negatively with respect to half the filament and positively with respect to the other half. It has zero charge with respect to the midpoint only. Now there will be a flow of grid current as long as the grid is positive with respect to any portion of the filament. Therefore in the present case the grid will attract electrons from half the filament and a grid current will result.

Practically all authorities on vacuum tubes

(Continued on page 385)

# THE SPARKING OF LIZZIE PROUT

BY V. G. MATHISON

Author of  
"Archibald Augustus Gets a Scare," etc.

"SO you're going back to sea tomorrow, eh," remarked Cunningham, when the waiter had brought the after-dinner coffees and the plates of cooling dessert. "Seems to me you're cutting your summer vacation pretty short, Samuel."

"Yes, an' I'll cut it a lot shorter next time, let me tell you," growled Samuel Jones, elevating his voice above the banging of the jazz-orchestra, to the metallic discord of which a few drooping couples danced dispiritedly in the pervading sultriness. "There's a darn sight more comfort for me aboard a good old tramp steamer than there is driftin' around here among this bunch of stuek-up powder puffs an' dopey ice cream soda drunkards."

"But I though you were spending your vacation up in the cool mountains, off among the big trees and the speckled trout. A week ago you were all packed up and waving a pink ticket and a bathing suit—Boulder Creek, wasn't it?"

"Boulder Creek's a blasted fake, same's all the rest of the summer insane asylums!" exclaimed the veteran brass-pounder, frowning negatively at a distasteful-looking blonde at a table close by, who seemed to be fishing for an invitation to dance. If you look at a railroad folder an' see a name like Redwood City, you can be sure there ain't a confounded tree as big as a toothpick within a hundred miles—redwood or no other kind; if you find a place called Lakeside, you can figure it's probably a coupla shacks an' some sagebrush out in the middle of the Mojave Desert some place; an' so, likewise, this beautiful Boulder Creek's just about as cool, wet, an' refreshin' as a combination of hell, blue laws, an' prohibition!

"When I gets off the train with my baggage an' my bathin' suit, it was around the middle of the day, an' so blasted hot that even the Africano train porter's tongue was hangin' out about a yard an' a half. Around on the shady end of the little yellow depot I spots an old gink with slack suspenders an' a tobacco-stained goatee, who is chewin' the fat with a couple other old mossbacks, also fitted out with galluses an' soup-strainers. They was all sittin' on a rickety-lookin' express wagon, which has the name 'Halleck's Hotel' painted in crooked letters on the side-boards.

"Where's the rest of the hotel busses, pop?" I inquires of the old buck sittin' up in the bow, evidently the driver of the one-horsepower limousine.

"Hain't no others," he answers, sisin' me up, critical like, an' spittin' out a quid of tobacco big enough to float a battleship.

"Then you can take my grip—but first show me the way to the creek," I says, the sweat streamin' down my face an' onto my collar, which was already as limp as a dishrag an' looked like somebody's cleaned his shoes on it; 'I want to have a swim before I dry up an' disappear like a bottle of booze in a prohibition agent's hip pocket.'

"Th' crik's gone dry," he informs me, calm as you please. "That's it, right there." He points to an old dried-up ditch, with a handful of sand an' a coupla pebbles in the bottom, which runs along close to the depot.

"Sufferin' Judas! You call that a creek! I pants. 'I bet there hasn't been enough water in that ditch to wet a flea's eyebrow since the time old Noah went to sea with his menagerie!

"Wall, that's jist where yer mistaken, young feller," returns the old buck, his chin-whiskers vibratin' like a kid's jumpin'-jack; 'last December I seen nigh onto two foot of water in that there crik—drowned one of Joshua Perkin's pigs, and raised a helluva ruction—'twas a reg'lar flood!'

"That must 'a been terrible, all right,' I snaps, pretty sarcastic. 'I don't think I want to stay around a place where there's such rampageous floods. I don't think I could stand it after bein' used all my life to nothin' more'n the little spoonful of moisture that's in the Pacific Ocean. I reckon you can leave my baggage right here, an' I'll grab the next choo-choo back to Frisco!'

"Hain't no more trains till th' end of th' week,' chips in one of the other Boulder Creek flood survivors. 'Th' next train won't be here 'fore Friday, at the soonest, an' more likely Sattidy or Sunday—she's a little mite late some times, dependin' on how many milk cans she hex ter pick up.'

"Good Lord! Today's Tuesday—three day's to stay here,' I glooms, moppin' the sweat off my face again. 'Well, come on, take me up to the hotel, an' I'll do a high dive into a bath tub, anyway.'

"Hain't no bath tub in town,' chirrupps old Methuselah, 'but if yer want ter swim so gosh durned bad, there's a fine hog waller down there under the railroad bridge!'

"I sees I'm in for stayin' till Friday, anyway, so I lets old chin-whiskers cart me up to Halleck's Hotel. Talk about a hotel—well, I won't try to describe it!

"Be ye a drummer?" asks the fuzzy bird who runs the dump—a long, lanky old fence rail, with a pair of big iron-bowed spectacles an' a facial hay ranch similar to the lightnin' speed bus driver's.

"No, I answers, 'I'm a brass-pounder.'

"He looks blank.

"Ye're a brass-smith!' he exclaims. 'Ye don't look it!'

"No, not that,' I says, 'a code-slinger, key-juggler—wireless operator!'

"You don't say!' ejaculates the old hick, gapin' at me like I was a freak out of a zoo. 'Ye're a wireless man on one of them ocean ships! Good gosh a'mighty! Hev ye ever bin shipwrecked? Did ye ever see a cannibal or a sea-snake? Zeke Hoggle drunk a quart of white lightnin' onct, an' he had a whole ruction of cannibals an' snakes chasin' him fer three weeks! He crawled under th' cow barn, an' wouldn't come out till his ol' woman drug him out with a stump puller!'

"Yes, I've had a little experience like that, myself,' I remarks.

"When the old gink finally shows me my room, I undresses an' swabs down a little with a wet towel, after which I puts on some fresh clothes an' drifts downstairs again.

"There was quite a bunch loafin' around in front of the dump; an' pretty soon I notices that the old hick who runs the joint is out gabbin' with 'em. They all begin lookin' at me like I was the original Wild Man from Borneo, or somethin' worse; an' I feels like kickin' myself good an' hard for ever tellin' the old magpie I was a brass-pounder. I didn't fancy bein' the object of so much attention, so I goes back up to my shoe box of a room an' lies down. I'd just about dozed off into a nap, when all of a

sudden somebody comes stampin' up the stairs an' starts bangin' on my door.

"What th' hell—' I starts to think to myself, but before I could think anything more'n that, the door flies open like it was struck by a Arizona whirlwind, an' in breezes a big, gawky young gink in overalls an' straw hat. He looks like he's about nineteen.

"I'm Jake Plummer!' he announces, straight off the bat. 'Ever'body 'round town's sayin' you're a wireless operator—'s that so?'

"Well, sometimes I try to bluff people into believin' I'm one,' I answers, kind of inclined to like kid Jake, even if he did have a style like a cyclone. 'I've worn out about half a dozen first grade tickets, an' a couple of extra firsts along with 'em.'

"Then I reckon mebbe you know more about wireless than I do—a little more, anyway,' says Jake, promptly. 'I've got a big sendin' outfit what don't work wuth a cent, an' I come ter ask you if you'll mind to come down ter my place an' have a look at 'er. It ain't fur.'

"Sure thing,' I says, glad of somethin' to do, now that it was evenin', an' gettin' cool. I puts on my hat, an' we goes down stairs.

"Is there any other hams in this burg?' I asks, as we steps out into the dusty street.

"There didn't uster be, but there's another one here now—that's jist th' trouble!' exclaims Jake. 'I wisht he'd git a shock off'n his trans-former an' kill hisself, blast him!'

"What's he done?' I asks, surprised.

"He's tryin' to steal my girl, gosh durn him!' flares up Jake. 'You see, there's a girl amacheur named Lizzy Prout up to Bingleton, about thirty-five miles north of here; an' me an' her uster have a high ol' time chewin' th' rag together. Ever'thin' was all right till that gosh-blasted Elmer Pendleton goes an' gets stuck on Lizzie. His ol' man owns th' feed store here, an' he's got about a bushel of greenbacks; so Elmer goes down ter Frisco an' buys one of them big, old-fashioned Marconi two-killowatt synchronous sets what they took offn the ships; an' then he puts up a couple hundred-foot gum poles fer to hank his aerial on. Course, that outfit's drowned my rig clean out—an' Elmer Pendleton's hoggin' th' air, an' th' rag-chewin' with Lizzie. My spark allus uster come pretty weak; an' Lizzie likes that big strong note of Elmer's outfit so well she won't hardly listen fer me a'tall no more.'

"Kinda like tryin' to run opposition to a hundred-horsepower fog-whistle with a ten-cent cow-horn, eh,' I remarks.

"Yes, but I hain't told you th' worst of it,' continues Jake, bitterly. 'Th' devil's to pay fer fair now—th' other day Lizzie sends me an' Elmer each a note sayin' she'd rigged up one of them frame-aerials what everybody's gettin' so crazy about lately; an' she's gonna listen for us on it next Thursday evenin'—day after to-morrow. Th' heck of it is, she says th' first one who kin raise her on her frame-aerial is goin' ter have th'—what'd she call it?—th' exclusive priverlege of workin' with her, hereafter. Th' other guy might's well shut up shop—an' th' other guy'll be me, unless you kin find out what's th' matter with my set, 'cause th' way it is, I hain't got a ghost of a show with that rig of Elmer Pendleton's—I'd like ter chew his neck off, gosh-blast him!'

"That's a hell of a pickle, all right,' I agrees, sympathetically, as we go trampin' through the

dust, down the middle of the street. 'I hope I can help you to get your set to percolate.'

"So do I, b'gosh," says Jake, 'cause if you—hey, fer th' luvva Mike, jump! Before I knows what's happenin', Jake grabs me by the arm an' yanks me to the side of the road; an' about a hundredth part of a second later a big gray contraction goes shootin' by like a cannon-ball, tearin' up a cloud of dust like a tornado, an' roarin' like forty machine guns!

"Sufferin' wildcats! I splutters, spittin' out a couple shovelfuls of dust, 'what was that? A skyrocket?'

"Nope, that's Zachary Bingdon's air-burnin' ottermobile," answers Jake, in a indifferent tone, like it wasn't nothin' unusual. 'Hafta always be on th' lookout fer it—if it ever hits you, yer done fer.'

"I don't doubt you're right about that," I agrees, 'but what do you mean by an air-burnin' automobile?'

"Runs on air—don't use no gasoline nor nothin'. Zachary invented it hisself.'

"Zachary must be some inventor, then," I remarks.

"Yep, he sure is," says Jake. 'When he tried the ottermobile th' first time, he come tearin' through town same's he done jist now, goin' 'bout twenty miles a minnit—he runned over Sally Spiggins's ol' red rooster an' killed him dead; tore half th' tail off'n Si Biddle's spotted heifer; an' raised a helluva rumpus. It's again th' law to go more'n three miles an hour in Boulder Crik, anyhow, so th' constabule an' the deputy shuriff, an' all th' kids an' dogs in th' town light out after him, an' chases him clean down ter Bungville 'fore he stops. But when they goes to arrest him, he explains he's jist invented a new air-burnin' engine, an' couldn't run it no slower because the air-control wasn't workin' very good yet.'

"When he says that, ol' Hezekiah Hodge, th' constabule, lets him go. "Yuh gotta give a inventor a chance, I reckon," he says, 'an', anyway, we kin afford ter hev th' speed law bruk if you're inventin' a air-burnin' engine, 'cause mebbe ye'll bust up that gosh-durned Standard Oil Company, so they'll hafta quit robbin' us ten cents a can fer axle grease!" So now Zachary goes roarin' 'round Boulder Crik fast 's he pleases with th' air-burner.'

"Smelled like gasoline to me," I says, still spittin' dust.

"Well, it don't burn nothin' but air, jist the same," declares Jake, positively. 'Zachary puts fifteen gallons of gasoline in th' tank every mornin' to get her goin'; an' then she runs all day on air—whatcha laughin' at!'

"Nothin'," I says, half-chokin'; 'Zachary's a humdinger!'

"Yep, he's all right," agrees Jake. 'Th' only thing I got again him is he's stuck on Lizzie, too, same 's that doggoned Elmer Pendleton. He goes up t' Bingleton in th' air-burnin' ottermobile ter see her—but she don't care nothin' about him, nohow.'

"By this time we'd reached Jake's place, an' he takes me to a little shack out in the back yard, where he had his outfit. Talk about a wireless set—Jake's was a world-beater!

"First, he had a sendin' transformer that stood about two feet high, an' probably weighed about a thousand pounds—looked like a twenty kilowatt. Jake explains that it used to be a step-down transformer on the power company's line into Boulder Creek, but it burnt out, an' Jake buys it cheap an' rewinds it.

"His high-tension condenser was made out of a pile of window panes an' tin sheets, stacked in a big galvanized iron washtub, filled with lubricatin' oil; an' on top of the condenser was a big clumsy helix with a frame that looked like it had been built out of timbers for a railroad bridge.

"But the most amazin' thing of all was his spark-gap. A big hand-crank an' a lot of gear-wheels from an old emery grinder was hooked up with a small leather belt to an insulated bicycle wheel. The wheel had a lot of brass

screws stickin' around on its rim, all connected together with a piece of copper wire, an' the projecting heads of these screws run between a couple of heavy iron bolts, stickin' up through a board—the stationary electrodes!

"Some gap," I remarks. 'How do you work it?'

"That's easy," answers Jake. 'I'll show you.' After throwin' in a couple of switches, he sits down an' starts turnin' the crank of the emery-grinder. 'I run th' spark-wheel with my left hand, an' send with my right,' he explains. He presses the key, an' a crash of fire goes streakin' between the iron bolts an' the bicycle wheel, roarin' like the spark of a hundred-kilowatt transoceanic discharger.

"Should think you'd go broke buyin' juice for that thing," I says, when he let go the key. 'You must be pullin' a hundred amps!'

"Yes, it uster coat like blazes, but not now," answers Jake. 'I've invented a swell rig t' put on th' meter to slow her down—I allus take it off, though, 'round th' end of th' month.' He points to the meter, which is up on the wall, in the corner. Lookin' up at it, I see a bunch of coils an' magnets hangin' on the front of it. Jake presses the key again, an' the meter-wheel hardly moves.

"Great invention, all right," I says, 'but why don't you just jump a couple of wires around the meter, instead. That would be a lot easier, wouldn't it?'

"But, gosh, that'd be stealin'!" exclaims Jake, horrified.

"Yes, that's so. I didn't think about that," I replies.

"What do you think's the matter with my set?" asks Jake.

"I don't see nothin' the matter with it," I answers. 'Seems to have all kinds of pep.'

"But it hain't got it, though," affirms Jake. 'See here.' He opens his aerial-switch about a quarter of an inch, cranks up the bicycle gap, an' presses the key. With all the roarin' an' racket in the spark-gap, there's only a thin weak spark across the aerial-switch.

"Right away, I seen what the trouble was—the set was out of tune. That washtub condenser was too big for the aerial. I puts Jake to work, cuttin' out half the condenser; then we retune the set. Before we got through, we were getting a big, thick, flamin' spark, over an inch long in the aerial-switch.

"I guess it'll be your turn to boss the atmosphere 'round Boulder Creek now," I tells Jake. 'You've really got about a seven kilowatt outfit, an' when you open up on that Pendleton guy's two kilowatt rig, you'll knock him dead.'

"Jake was tickled to death, but still he looked a little worried.

"I reckon I'm all right now," he says, 'but, b'gosh, I sure hope th' power don't go off to-morrow night, or I'll be out's luck anyhow.'

"How's that?" I demands. 'You're on the same power line as Pendleton—if the juice goes off he won't get none, either.'

"He's got a storage battery an' a motor generator," was Jake's amazin' answer. 'He's all right even when th' power does go flooey—which is about half the time—while I hafta sit an' suck my thumb. But I won't hafta much longer, though, by heck!'

"He points to what looks like some kind of a motor or dynamo, standin' over in the corner of the shack. I takes a look at it, an' sees it's an old worn-out self-excitin' alternator—about five kilowatt.

"I got it cheap down to Santa Rosa from the power company," he explains. 'Pa's sent fer a new gasoline pumpin' engine, an' soon's it comes I'm goin' ter take our old one an' hook 'er up to this here generator. Then the durned power company kin go to blazes!'

"Sufferin' smokes!" I exclaims. 'Are you doin' all this just on account of that Lizzie Pratt, or whatever you call her?'

"She's wuth it, by heck!" declares Jake, hotly. 'You couldn't find another girl like Lizzie in the whole world! Why, at the pumpkin

fair last fall she took first prize fer havin' the reddest hair of any girl in th' county! I bet you hain't got nothin' in Frisco like that!'

"I feels like tellin' Jake he's a damn fool, but I knows from experience it ain't no use, an' I keeps my mouth shut.

"Early next Thursday night I rambles up to Jake's hangout to watch the ether-wreckin' contest. At about seven o'clock Jake cranks up his spark-gap an' starts in.

"L-I-Z, L-I-Z, L-I-Z de J-I-P," he hammers out, about four words an hour.

"What are you doin' with them calls?" I demands. 'Haven't you got a license, an' a regular call?'

"License fer what?" he asks, windin' up the emery-grinder again. Just as he stops to listen in, there is a terrific roarin' outside, an' Zachary Bingdon in his air-burnin' speed wagon goes shootin' down the road like a comet.

"Gol blast that ottermobile!" mutters Jake, clampin' his phone to his ear. 'A feller can't hear hisself think when that durned thins anywhere inside of ten mile.'

"I was listenin' with one of Jake's phones, an' the noise from Zachary's air-burnin' boat had just about died away when all of a sudden, whango! such a racket comes squawkin' outa the receiver that I though somebody'd blowed a butcher horn in my ear!

"That's Elmer," growls Jake.

"J-I-P de E-R-P," toots the cow horn. "What you done to your set? You burnt my detector half up. Shut her down a little, will you?'

"Go to hell!" screeches the bicycle gap. 'L-I-Z, L-I-Z, L-I-Z, L-I-Z de J-I-P, J-I-P, J-I-P.'

"When Jake stops, we hear the other guy hammerin' out the same thing, 'L-I-Z, L-I-Z, L-I-Z de E-R-P, E-R-P, E-R-P.'

"Then we all listen, but don't hear nothin'.

"She ain't on yet, but she's liable to be any minnit," declares Jake, grindin' his handle, an' bangin' away again. But there was no come-back.

"At ten o'clock J-I-P an' E-R-P were still screecin' an' tootin' their ether-splittin' duet—an' still not a chirp from Lizzie the Red Head.

"B'gosh, Lizzie must be there pretty quick now," mutters Jake, crankin' up the bicycle wheel once more. 'L-I-Z, L-I-Z,' he begins, for the hundredth time, when, bango! off goes the juice, an' the shack's pitch dark!

"There, I knew it'd do that! S'all off!" wails Jake. As he lights an old stump of candle, we hears E-R-P still saxophonin' away, same's if nothin' had happened.

"He's usin' his storage battery, gosh dern it!" sobs Jake. 'Oh, how kin I beat him! How kin I beat him! He grabs his hair with both hands an' yanks on it with all his might, at the same time gnashin' his teeth like a wild hyena sufferin' with hydrophobia. Then he slumps down in his chair an' bawls like a baby, while E-R-P keeps tootin' away merrily, all by himself.

"Hurrah!" whoops Jake, after a minute, jumpin' up so sudden he nearly startles me outa my shirt. 'I got it! I got it!' Before I can ask him what he's got, he goes rushin' into the house, comes tearin' back in a minute with a five-gallon can of coal oil an' a lantern, an' drags me out through the dark to the barn.

"There's a lot of farmin' machinery in there, but the main thing is a big steam tractor, such as belongs with a threshin' machine. Jake makes for this, an' in about two minutes he's got a roarin' fire going' in the furnace. Feedin' the fire with the coal oil, he gets up steam so quick it would have sure busted any kind of a civilized boiler.

"When steam was up, Jake backs the tractor out of the barn an' around in front of his wireless shack. I wonders if he's gone bugs an' is goin' to drag the whole business off the ranch, but no—he rushes inside, gets hold of that self-excitin' alternator that was lyin' in the corner of the shack, drags it out into the middle of the floor, an' spikes it down facin' the doorway.

(Continued on page 383)

This Department is conducted by the U. S. Radio Inspectors of the Sixth District.  
CO-OPERATE!

# WITH THE RADIO INSPECTOR

Questions answered by the Inspector.  
No names will be printed.  
Initial your letters only.

DEPARTMENT OF COMMERCE  
Navigation Service  
Office of Radio Inspector Custom-house, San Francisco, Cal.

May 10, 1921.

The Editor  
Pacific Radio News  
San Francisco, Cal.

Dear Sir:—

*I wish to call the attention of your readers to the unlawful use of high power for short distance communication. The law states "all stations shall use the minimum amount of energy necessary to carry out any communication desired."*

*Apparently, a large number of operators, both amateur and commercial, either have forgotten the existence of this regulation or carelessly or willfully ignore it altogether. This law means that you are not under any circumstance to use full power on an amateur set when "chewing the rag" with the small boy in the next block, but in this case a low power tap on the power transformer or even a lamp in series with the primary of same will give a spark powerful enough to be heard within a radius of a few miles, which is plenty of range for ordinary communication.*

*The same thing refers to ship operators. When near a Naval station, the law requires that the power be reduced to 1 KW when within 15 miles and to 1-2 KW when within 5 miles. Actually, much less power can be used. In most cases it will be found that enough power will be radiated by using one unit of the quenched gap to carry a good deal more than 15 miles.*

*I have observed a growing practice among operators to use the letter V between the call and the signal when calling a station. No authority exists for the use of any other signal or symbol than DE, which is required by law. The letter V was at one time used as an interval in the Inter-Allied Naval procedure during the war, but this does not constitute any reason for its use in commercial or amateur work.*

Yours very truly,

(Signed)

D. B. McGOWN,  
Asst. Radio Inspector.

Regulation 153, authorizing the renewal of commercial operators' licenses without re-examination where the service record on the back of the license shows three months' satisfactory service during the last six months of the license term, is modified by the addition of the following proviso: Provided that such renewal licenses may also be issued in the discretion of the radio inspector where the service record on the back of the license shows 12 months' satisfactory service during the two year period of the license.

## QUESTIONS ANSWERED By THE RADIO INSPECTOR

The following questions were answered by the radio inspector of the Sixth District since the last issue of the Pacific Radio News.

Q. Will a small spark coil transmitter require a license if located at Banning, Calif.?

A. Yes! When the existing Laws and Regulations were formulated the development of the radio art was in a rather crude state, hence it was considered possible to have a small transmitter in operation in isolated sections without interfering with the receipt of signals from beyond the jurisdiction of the state in which it was located, and without transmitting beyond the border of the state. At present time, owing chiefly to the efficiency of the ultra-sensitive vacuum tube detectors and amplifiers, even the small ford spark coil transmitters may seriously interfere with Ship to Shore radio traffic, or with the inter-state radio correspondence of other operators in the vicinity. It is therefore held that the operation of any transmitting device must be licensed in order to comply with the law.

In the above connection much of the pernicious interference complained of at the present time is caused by the unlawful use of spark coils and buzzer transmitters, which may at any time involve the users thereof in very serious difficulty.

Q. Is the Fourteenth Regulation which provided that the minimum amount of power shall be used on all occasions, apply to Amateurs?

A. Yes! Amateurs who have been disregarding this provision in the past have been jeopardizing the continuation of their license, and will, if they persist in the practice, be deprived of any license privilege whatever.

The Commissioner of Navigation has stated, repeatedly, that it was not the policy of the Bureau to continue in force the license of any Amateur who fails to comply with the Laws and Regulations in every respect, hence amateur operators located at out-lying districts whose local correspondence is received at the listening-in stations here, may expect to have their license suspended at any time without additional warning from this office, if it appears that excessive power is being used.

License will not, as a rule, be granted to applicants who are guilty of violating the law by transmitting before applying before applying for licenses.

Q. I have my operator and station licenses. When I applied for my station license I put down a 1-2 KW transformer, which I intended to install later. Would there be any objections to my installing a spark coil until I am able to get the transformer?

A. No, there will be no objections.

## INEXPERIENCED RADIO AMATEUR UNKNOWINGLY SENDS DISTRESS SIGNALS

DEPARTMENT OF COMMERCE  
Navigation Service, Office of Radio Inspector, Custom House, San Francisco, Calif.

May 10, 1921.

Editor "Pacific Radio News"

San Francisco, Calif.

Dear Sir:

*On the 6th instant an Amateur in testing out a radio transmitter which he had installed at Bakersfield, Calif., carelessly sent out signals which were interpreted as "SOS", the distress call agreed upon by the International Radio Convention. This call was picked up by other stations and repeated to the Naval Station at Point Arguello, and as a result Naval Vessels were at once dispatched in search of the ship which was supposed to be in distress.*

*In formulating the existing Laws and Regulations, Congress placed special stress upon the clause prohibiting the transmission of such false or malicious signals by providing a penalty consisting of a fine of \$2,500 and imprisonment not exceeding five years. The charges against the Bakersfield offender have been referred to the U. S. District Attorney at Bakersfield for appropriate action, and it is safe to assume that the punishment will be commensurate with the seriousness of the offense.*

*This incident should serve as a warning to Amateurs and others who make a practice of using their transmitters for sending out superfluous signals of any character, as such action may involve them in serious trouble, although they may not be aware that their transmission extends beyond the limits of their own cities.*

(Signed) J. F. DILLON,  
U. S. Radio Inspector.

## PACIFIC COAST TO ASIA RADIO SERVICE MAY 1

New facilities for transpacific commercial relations will be available May 1, when the United States will begin operating its naval radio on a commercial basis between this coast and southern Asia.

The service will be given in co-operation with that of the French government, which has opened a new station at Saigon, Indo-China, and through use of a new American station at Los Banos, P. I., according to announcement made by Lieutenant Commander S. D. McCaughey of the Twelfth Naval District, whose headquarters are in San Francisco.

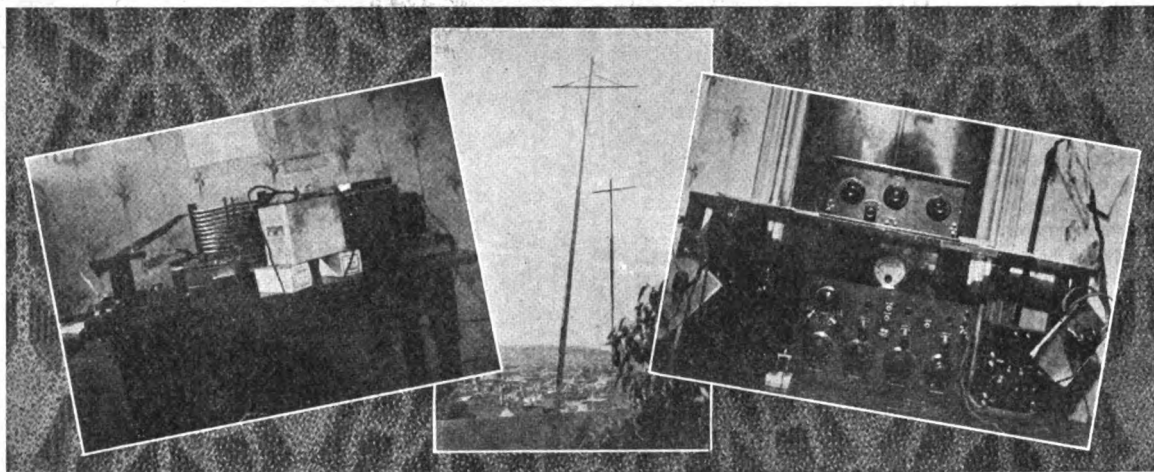
The rate from Saigon to any point in America will be 96 cents a word.—San Francisco "Call."

## RADIO RECORD MADE

Fifty-four radio messages without a break were received on May 10 by Chief Electrician Maynard L. Hart at the Goat Island radio wireless station, which establishes a new record for this station. The messages came from Cavite, Philippine Islands, a distance of 5000 miles.—San Francisco "Journal."



# "6APH"—SAN FRANCISCO'S BEST



**6**APH sprung-up overnight as did the Tent City of the Yukon. It has only been in operation three weeks and many distance records have already been made. San Diego, Houston, Boise, Seattle and all intermediate points along the West Coast have been covered by the 1-2 K.W. Acme transformer. Expense was no object in the erection of the station and nothing but the best equipment obtainable was put into service. Mr. Clyde C. Young, owner of 6APH, does not believe in fancy work with an accompanying decrease in the efficiency of apparatus. The station has the "plain

spoken" air. Brass tacks and less show is the motto of the owner.

Mr. Young is Chief Operator with the Associated Press in San Francisco and is one of the few pioneer radio men of the West. His commercial radio interest dates back to old "PC," Astoria, Oregon. Young has, without a doubt, the best station in San Francisco, considering power input, location, efficiency and Results. The Grebe CR-6 Receiver is used for copying the DX stations. "The first night that I installed the Grebe set I copied enough 'DX' stations to fill an entire page," says Young.

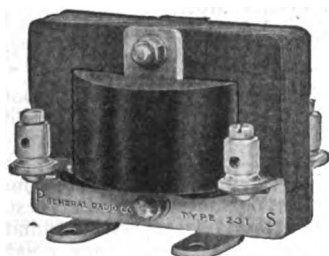
The successful dispatching of 26 messages on the opening night of the station speaks well for the operator and his equipment. The Grebe receiver was also used by Young to receive the boat race news in connection with the California-Washington contest, recently held at Alameda. The race reports were sent by radio from a navy sub-chaser and copied in the offices of the Associated Press.

A radio telephone set will soon be installed by 6APH. Live amateurs of this sort will stimulate the game and make competition keen. We need more of them. Who's next?

## New Amplifying Transformer

**I**N order to get the maximum of results from tubes as amplifiers, they must be used with correctly designed amplifying transformers. Type 231A transformer was built specifically to meet this situation. The primary receives the maximum amount of energy and delivers it undistorted in waveform and at the correct potential to the grid of the amplifying tube.

The core construction is such that there is little tendency for the setting up of external fields, with the resultant howling in the audio frequency circuit. The distributed capacity of the secondary is low, so that the maximum potential is obtained on the grid of the tube.



Photograph Courtesy of Gen. Radio Co.

The primary has a direct current resistance of 1100 ohms, an alternating current resistance at 1000 cycles of 11,000 ohms, and a reactance at this frequency of 66,000 ohms. These figures for the secondary are 5500, 130,000 and 700,000 ohms respectively.

In order to obtain the best results from an amplifying transformer, certain precautions should be observed. Since what is wanted is the production

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

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

## RESEARCH MEN JOIN STAFF OF RADIO FACTORY

### Important Developments Being Made in Wireless by Federal Company

**T**WO noted research men have been added to the personnel at the wireless factory of the Federal Telegraph Company, and are engaged in work interesting and important to the advancement of radio communication.

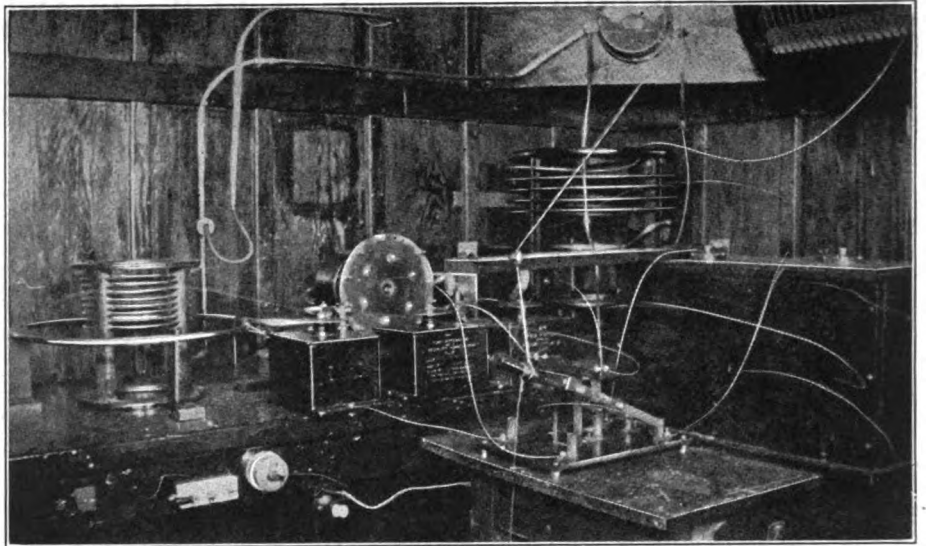
Glenn W. Carpenter, radio engineer from Washington, D. C., is interested in research in connection with the coastwise wireless stations with reference to high speed transmission and reception, and the application of a printing telegraph to radio. While the printing telegraph has been developed for use in wire telegraphy, its perfection for radio work is yet to be accomplished.

Frederick A. Kolster, formerly of the Bureau of Standards at Washington, D. C., who recently joined the Federal Telegraph Company here as research engineer, is working on the development of a uni-directional receiver for long distance reception which will enable signals to be received from distant points without interference from outside sources. The need for the development of this device for radio transmission will be especially felt when the trans-oceanic communication is begun with the completion of the proposed \$5,000,000 radio system to be installed in China, and for which the Palo Alto factory is to manufacture the parts.—Palo Alto "Times."

The new wireless station of the Federal Telegraph Company at Hillsboro was formally dedicated on May 10. A large party of Portland officials and business men were in attendance.

## 6ZR—One of the Two Synchronous Spark Stations in California

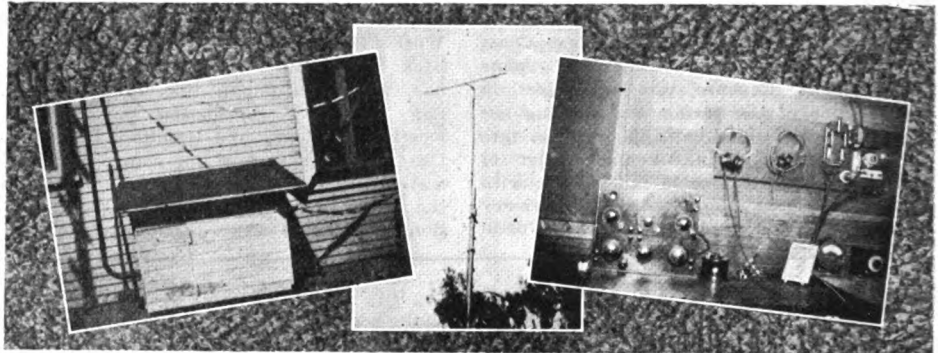
Here we are at last, fellows. Berringer is known from East to West, but nobody has ever seen the photo of his station in print. Take a good look at it and you will see why 6ZR is hammering through in such fine style. Note the absence of useless apparatus. The station has the husky commercial appearance and has seen much hard service. Standard apparatus that will stand the grind is used. 6ZR has two transmitters. One is tuned to 375 and the other to 200 meters. Radio shop apparatus is used for receiving—and a Magnavox to cap the climax.



## Radio Station 6ED

Many Western amateurs will be interested in the photos of station 6ED. His transmitter is of the remote controlled type. A 1 KW Acme transformer is used, as well as a 10 point Benwood Gap driven by a 3000 RPM induction motor; home-made oil condenser and Oscillation Transformer. The condenser capacity is 0-01 M. F., although the closed circuit leads are very short. In order to ascertain if the rotary gap motor is running properly, 6ED uses a pilot light. All AC wiring is in conduit.

A home-made regenerative receiver and two step amplifier with Baldy phones do the trick for receiving. The aerial is of the inverted "L" type, 70 feet high at one end and 38 feet high at the other end.



It is 56 feet long, well insulated and of the six wire type. The receiving aerial is 165 feet long and 70 feet high. One wire only is used.

# THE "CW" CLUB OF CALIFORNIA

BY LAWRENCE MOTT

IT gives me a great deal of pleasure to chronicle that I am in receipt of many letters—all of them enthusiastic—with regard to the suggestion that I made in the last number of "Pacific Radio News" for a CW Club. There are seven men—so far—who wish to belong, and who have sent me the details of their stations. These will appear in the next issue. The names are: Assistant Radio Inspector McGown, 6ZZ; Dr. A. E. Banks, 6ZB; Messrs. D. P. Trim, 6FK; J. J. Mahler, 6IY; M. P. Baker, 6FM; A. F. Pendleton, 6UV; Oliver Wright, 6RN; H. W. Dickow and the writer, 6XAD.

A very comfortable beginning, when it is considered that the average amateur is very loath to explore the unknown deeps of CW effort!

My co-enthusiasts are of my opinion: that CW has come to stay, and their action bespeaks a spirit of progressiveness that augurs exceedingly well!

In the near future, when a sufficient number of amateurs have expressed their earnest interest—I hope to take up with Major Dillon, inspector in chief, the matter of a CW wave length, and ask him to use his good offices in the behalf of CW work at Washington.

I would again suggest that all who are, or who might be, interested in *The CW*

*Club of California*—a tentative name that I have tacked on, but that is by no means a final one—to get in touch with me at Avalon, Catalina Island, California, as soon as may be. Details of their stations are most important.

To the Editor,  
"Pacific Radio News."

The communication from Mr. Lawrence Mott, 6XAD, in the last number of your esteemed magazine is, in the opinion of the writer, most timely. Without a doubt there should be a regularly defined organization whereby co-operative work and exchange of ideas can be carried out to the best advantage. Mr. Mott's proposed CW Club would seem to promise much. As in all other activities, it would give just as much as we put into it. However unpopular CW may be at the present writing, there is little doubt but that it will in the very near future be the most important branch of radio communication. Everything that can be done to advance amateur CW interests will, therefore, be worth while.

I desire to have Station 6ZB enrolled with others of the CW class and will forward station data requested directly to Mr. Mott.

May I not urge other amateurs working in the CW field to do likewise?

Yours truly,  
A. E. BANKS.

Santa Paula, Cal., May 4, 1921.

Mr. Lawrence Mott,  
Avalon, Cal.

Dear Sir: I read with much interest your article in the last issue of "Pacific Radio News" and am with you tooth and nail for the betterment of CW conditions. I am probably blocked as bad by broad amateur stations here in Santa Paula as any part of the state, as I am about mid-way between the northern and southern stations.

I have a four tube set with a radiation of .09 amp. and have done some good work when I have been able to get through, on radio phone as well as CW. I am reported QSA in Santa Cruz, Palo Alto and several of the northern stations.

At present I am using HC coils with practically a De Forest hook up, but will change to short wave degenerative soon, with two stage amplification, which should give me much better CW reception. I would consider it a favor if I can help you out in the good cause.

Yours for better CW,  
Call 6AOZ G. M. SANDERS.  
W. L. 200 Meters.

*I broke into print today  
as crazy as they make 'em,  
So please don't get mad, boys,  
It's just the way you take 'em.*

*Watch the P. R. N. each month,  
I'm surely going to shake 'em.  
Everything will be authentic,  
Just the way they say 'em.*

By SQUAWK MCGUFF

Ladies and Gentlemen: I wish to announce that our dit-dat friend 6CH claims to have the amplified that will make us turn green with envy. This wonderful instrument marks the epoch in electrical science. It is so sensitive that one can hear the grass grow and the footsteps of a fly sound like a regiment of soldiers marching. It entirely obviates QRN and Mars will have to be included in the itinerary of special working hours.

However, and insofar as this be, 6BN is about to install a station with which he will work 2PL at 12 noon, providing, of course, that he can come to some working agreement with 6CH and Mars. Should these three stations enter into controversial methods at the physiological moment, the most awful ponderanium of the age will result. Earthquakes would probably make their appearance. Debates on the above may be heard daily between 8 a. m. and 6 p. m. at the Conservatory of Hams, scientific rendezvous, Leo. J. Meyberg Co., Radio Telephone Shop and Colln B. Kennedy Co. All are invited. Terrific applause!

6KA has found a remedy for QSS. He tried it on 6APH one morning about 2 a. m. with three kinds of power. For obvious reasons this is a secret for the present. 6APH must have the power warning hereafter as he values his Baldy's. More power to you, 6KA, gosh what a kick.

6AS is having a lot of hard luck regarding location and has finally decided to ask Mayor Rolph of San Francisco, for a location on Twin Peaks. He has tried every place else in town and expects to be with the DX boys shortly. Please QSL if heard in Oakland.

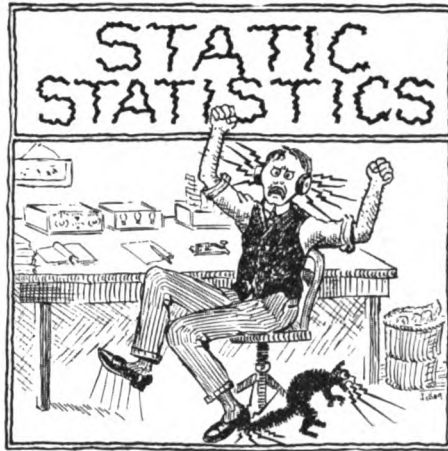
6SN informs me that he is compelled to stop sending at 9 p. m. on account of sparks flying from the sewer pipe on his roof. Who ever heard of a sewer pipe on the roof, for the love of Mike? P. S.: You can get the same brand for \$9 a bottle, boys. HI. HI.

Two Hams in a restaurant.  
"I wonder why I can't get any place?"  
"Dunno. But listen—put in more ground, lower your antenna, get some radiation, etc., etc., etc., etc., blaasaa—bla a a a—etc.

"Yeah, I done all that but nuthn' doin a-tall. I can't figure it out."

"Say, listen, you guys," squeaks a heretofore unseen individual at the next table, "A waterpipe is the best ground you can get. Don't it run all over town full of water?" Whassamatah, whassamatah?

6XW, the man that put the air in music (or music in the air) is surely the topic of discussion among the fair sex. One lady



said: "That boy surely has a wonderful voice and I can just picture him as a nice little fat person with a smile that doesn't wear off—and surely he is an Irishman with all that wit." Oh Boy! Mr. Tavers, where will this all end? And say, fellers,—he's a batchelor, too. Watchur step, watchur step. Hello Rosey, Oh I sey, Roseeee e-e-e. Ask him who Rosey is. Heh heh. And ole Tavers is going on a vacation soon. Won't it be a shame if one of those scientific old maids land him? Our usual Wednesday and Sunday concerts will sound like this:—"Good evening, gentlemen. Good Bye!"

That big, broad-shouldered fellow by the name of Highstone was elected Sgt.-at-Arms of the San Francisco Radio Club. "He's a good pick," says Major Dillon, when he installed him at the last biz meeting of the club. The big fellow sized up the crowd, never showed up again. And now we hear that he's on that sea-going hack, Barge 91, or some other name that don't mean much to the Admiral of the navy. Keep your eye on the distilled water bottle for the storage batteries, Highstone. Never forget about the fellow on that tug up in Astoria who started looking for his distilled water and found it in the Captain's room, with a drinking cup hanging to it.

A certain gent (name on request) put up the highest and most elaborate aerial on the Coast. He was a generous soul, too, and had written in advance that he would compile a long list of "DX records busted by me," and send them in each month. But alas and behold—signals came from one direction only. He fumed and sweated, cussed and cried for two months. But why look at the antenna? Wasn't it OK? Didn't he solder all the joints? Sure. Wasn't it a hundred feet off the ground? Sure. But with all hope gone and in a moment of the utmost despair and dejection, he went to the roof to drown away his sorrow looking at the moon. The big round, beautiful sympathetic moon. Tomorrow he would tear the whole thing down. A tear rolled down his static-charred face. He cast a mournful look at the prize antenna.

"Great suffering horn toads and little green apples," he cried, "did I put two leads on my aerial?" They were there—plain as day. One on each end. One lead running to his room—and the other to someone else's room on the next floor. Some people would steal anything. But whoever heard of a man stealing half an aerial? Ye Gawds!

Sergeant Lufkin of the Presidio was flirting with annihilation the other night: Lufkin (on wireless phone)—Hello, Bessey; Hello Bessey; 6ZK, Bessey. Wife (standing near him)—Bessie who? The Sergeant—MISTER Bessey. Wife—Oh!

I highly recommend for 6XW a degree of bachelor of science. After extended research he has discovered two kinds of magnets. One is a blonde, the other a brunette. Hoot, mon!

Well, friends, I have been receiving so many letters of late in regard to theoretical difficulties that it would be impossible to answer them all. So I selected a few of the most important ones and if they are of no help please wire me at once via the underground telegraph company.

1—LIGHT BLINKING AND POWER.

If you have trouble blinking the lights, purchase an alternating current storage battery. This will also give unity power factor. In order to get a synchronous note use direct current induction motors.

2—CURRENT.

Now, if the current is not up to where you think it should be, more currents may be had at the nearest grocer's. Of course, they come cheaper in the bulk.

3—OSCILLATION TRANSFORMERS.

"600" has a very efficient and effective instrument along this line. He wound the tubing around a pickle barrel. This will give a pickled effect and preserve the signals.

Owing to the heavy deluge of inquiries as to what is a meter and what is a wave length, I will attempt to set forth in clear lines so that those not familiar with wireless may understand.

A meter is 39 inches, plus. Therefore, in order to work with 7YA, which is 800 miles air line, tune your set to 7,567,487,981,264.08 plus. But before tuning get an enlarged wave meter. As an example, if 6AET wished to work with 6ABR, he would tune to 7,421,682 meters or two blocks. However, if you wish to go further, I suggest you see the Radio Inspector.

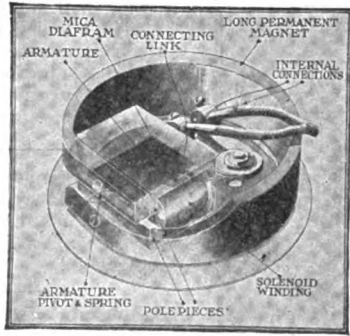
6XW had a serious operation last week and we all send our hearty felicitations on his recovery. He had his counterpoise taken out.

6AF has a fine job at the electric works. While laying some conduit he ran across a pipe. The foreman instructs him to saw the other pipe in half. He did. Well, the long and short of it is that when half way through the pipe 6AF was interrupted. He took a close-up of the planets, called out all the fire departments in S. F. and shut off the town's power. 6AF wants to know who told the foreman it was a water pipe and where in the heck did a water pipe get 11,000 volts? 7DA must have been grounded to it.

6ZR is the fastest sender in Hamdon. After timing him I am pleased to announce he transmitted exactly forty words per eye-shut.

Bell Boy—A call for Mr. Watt, Mr. Watt! Clerk—What Watt? Bell Boy—A. Kilo Watt. Heh, Heh!

P. S.:—Well, so long, fellers. Watch me next month. I'm just getting my second wind. If somebody has something good on anybody let me have it, but it must be authentic. PPS:—Ta. Ta. "30" dit dit dit dah dit dah.



This illustration shows the amplifying mechanism in a Baldwin unit. Note that four pole pieces of single solenoid act on the armature, which in turn connects with the super-sensitive mica diaphragm.

- Type "C" Navy standard .....\$16.50
- Type "E" Super-sensitive ..... 20.00
- Type "F" light weight ..... 21.00
- Units for loud speakers.
- Type "C" .....\$8.50
- Type "E" .....10.00

# Equal to two stages of radio amplification

THE experience of leading radio operators,—who have found Baldy Phones "equal to two stages of radio amplification"—clearly indicates the outstanding advantages of using good phones. From a standpoint of radio efficiency, you will get "more value per dollar" from your investment in Baldwin Amplifying Phones than from any other item of your equipment.

Here are the actual (un-asked-for) letters from experienced radio men, telling of their results with Baldys. They're worth careful reading!

"Have used a pair of Type 'C' Baldys for some time. In naval communication and commercial service. Consider them the most sensitive telephone on the market."  
(Name on request.)

"I faithfully believe the use of Baldwin Phones will improve any receiving set at least 50 per cent."  
(Name on request.)

"Have found your Baldwin Telephones equal to one and two stages of radio amplification."  
(Name on request.)

"In our station it is a common occurrence to place the receivers (Baldys) on the table and copy in daylight the long undamp wave stations with but one V.T."  
(Name on request.)

"Equal to one and two stages of radio amplification": Of course Baldys cost more,—but where can you get better value? Where else can you buy amplification equal to the super-sensitive Baldwin mechanism, for so little?

And, the more limited your investment in radio must be, that much more important becomes the use of a super-sensitive and selective Baldwin head set!

*The best radio dealer in your town, undoubtedly has a supply of booklets explaining the superior construction of Baldwin Phones, Eldredge Meters and other Firth Specialties. If he does lack a supply, write, mentioning his name and address, direct to*

**John Firth & Co. Inc., 18 Broadway, New York**

- Distributors for
- Baldwin Phones
  - Eldredge Meters
  - Kolster Decremeter
  - U. S. Bureau of Standards
  - Wavemeter
  - Brownlie Adjustable Phones.

Dealers: Write for advance information on new popular-priced loud speaker.

# BALDY FOR LAND SEA AND IN THE AIR PHONES

## RADIO CLUB DIRECTORY

Published every month. It keeps you posted on important meetings.

United Radio Telegraphers' Association, Pacific Coast Division—Rooms 418-420, 24 California St., San Francisco Cal. Phone Douglas 706. All commercial operators eligible for membership. Address communications to above address.

San Francisco Radio Club, Inc., S. F. Gymnastic Club, Sutter and Divisadero Sts. San Francisco, Calif. Meetings every Thursday evening at 8:30 P. M. Visitors welcome at any meeting except first meeting of the month. Initiation fee \$2.50. Monthly dues 50c. For experimental and commercial radio operators, address communications to the secretary. —adv.

### CALLS HEARD BY WESTERN AMATEURS

This department has met with such favor that we will devote as much space to same as possible. Unusual Records are Particularly Desirable. Your list should be neatly printed in ink, using one side of paper only. All errors will thereby be avoided.

Stations Heard by Paul M. Smith, 701, Powell, Wyo.

- 5HV 5IF 5LS 5XB 5XD 5ZA 5ZI 6AE
- 6AK 6AR 6BJ 6BQ 6CO 6CV 6EJ 6FI
- 6IG 6IK 6JP 6KP 6MK 6OT 6PD 6QR
- 6RE 6WV 6ZA 6ZG 6ZK 6ZM 6ZN 6ZO
- 6ZR 6ZV 7AM 7BQ 7CC 7CU 7DA 7EX
- 7FI 7IM 7IN 7JK 7LG 7LN 7LW 7ME
- 7PD 7XB 7XD 7YA 7YG 7YU 7YW 7ZG
- 7ZH 7ZI 7ZK 9AE 9ABX 9AEG 9AEQ
- 9AEY 9AMB 9AGN 9AIG 9ALO 9AMH
- 9ARG 9ARX 9ASF 9AUO 9AWD 9BM
- 9BR 9BW 9BEM 9CA 9EE 9EL 9FZ 9HI
- 9HT 9IF 9JN 9LA 9LB 9LO 9LR 9XI
- 9XM 9XW 9YI 9YT 9YW 9YY 9ZC 9ZH
- 9ZL 9ZN 9ZO 9ZQ 9LW 9OE 9OX 9PA
- 9SC 9TEY 9UT 9WU.

Calls Heard by Asa S. Keller, Cashmere, Wash., during April

- ADM 6AFN 6AGF 6AH 6ATW 6AJT
  - 6APR 6DD 6FH 6IF 6IH 6LR 6LT 6LX
  - 6OH 6QR 6TC 6ZA 6ZH 6ZK 6ZM 6ZX
  - 7AD 7BA 7BC 7BK 7BQ 7CE 7CN 7CQ
  - 7CU 7DA 7DK 7ED 7EX 7FQ 7FI 7FL
  - 7FT 7IY 7JW 7KK 7KM(cw) 7LF 7LM
  - 7LR 7LW 7LY 7MK 7MY 7NL 7OF 7XD
  - 7YA 7YG 7YS 7ZG 7ZH 7ZK 7ZM 8CL.
- (Camp Lewis field set at American Lake, Wash.)

Calls Heard at Radio 7HN, Eugene, Ore., from March 14 to May 1

- 6AH 6AK 6AT 6BB 6BP 6CV 6DP
- 6DD 6EA 6EB 6EC 6EN 6ER 6FH 6FI
- 6FM 6FY 6GI 6GF 6IC 6IF 6IY(cw)
- (6JR) 6JS 6KL 6KM 6LX 6MZ 6NN 6OH
- 6OW (6PR) 6QR 6RT 6SC 6SK 6SU 6TC
- 6UO 6ZB 6ZI 6ZR 6ZU 6ZX 6AAK 6AAR
- 6AAT (6ABM) 6ABP 6ABX 6ACR 6AEI
- 6AFN 6AFM 6AFY (6AGF) 6AGH 6AGM
- 6AID (6AIW) 6AJM 6AMO 6APH 7AD
- (7BA) 7BC 7BK 7BQ 7CB 7CE 7CU 7DA
- 7FI 7FG 7FL 7IN (7IY) 7LS 7LY 7LG
- 7NN 7YA 7YS 7ZI 7ZM.

Calls Heard by 6FM, Los Gatos, Cal., All CW ICW or Phone, Month of April

- 6AAT, 6AFV 6AOY 6BB 6BU 6EN 6EJ
- 6IT 6IY 6JX 6KA 6OU 6RR 6SN 6TA
- 6UV 6XAD 6XAE 6XAF 6XW 6ZB 7ZI.

Heard at 6ABQ, San Francisco, on One Tube

- 5ZA 6AJ 6AK 6BQ 6DD 6DP 6EA 6ED
- 6EK 6EJ 6EN 6ER 6JD 6JI 6JM 6LC
- 6MK 6OH 6OW 6PQ 6QR 6RE 6RN
- 6SK 6ZA 6ZN 6ZU 6ZX 6AAB 6AAK
- 6ABP 6ADF 6ADL 6AGF 7BC 7BK 7BQ
- 7CC 7CQ 7GQ 7GY 7IN 7MY and 7ZA.

Calls Heard at 6AME from March 15 to April 15 on a Crystal Detector

- 6AG 6AJ 6AK 6AN 6AV 6BL 6BP 6CJ
- 6CV 6DD 6DK 6EJ 6FI 6FT 6HT 6IG
- 6IM 6IK 6JI 6KK 6KM (spk. and phone)
- 6LB 6LC 6LH 6LR 6LT 6LX 6MZ 6NQ
- 6PX 6RN 6RW 6SD 6SF 6SK (6ST) 6SU
- 6TC 6UR 6ZM 6ZN 6ZR 6ZI 6ZX 6AAK
- 6AAM 6AIM (spk. and phone) (6AJE)
- 6ALI 6ALV 6ANB (6AOI) 7BR 7BQ 7CV
- 7FI 7GQ 7YA 7YN and 7YU.

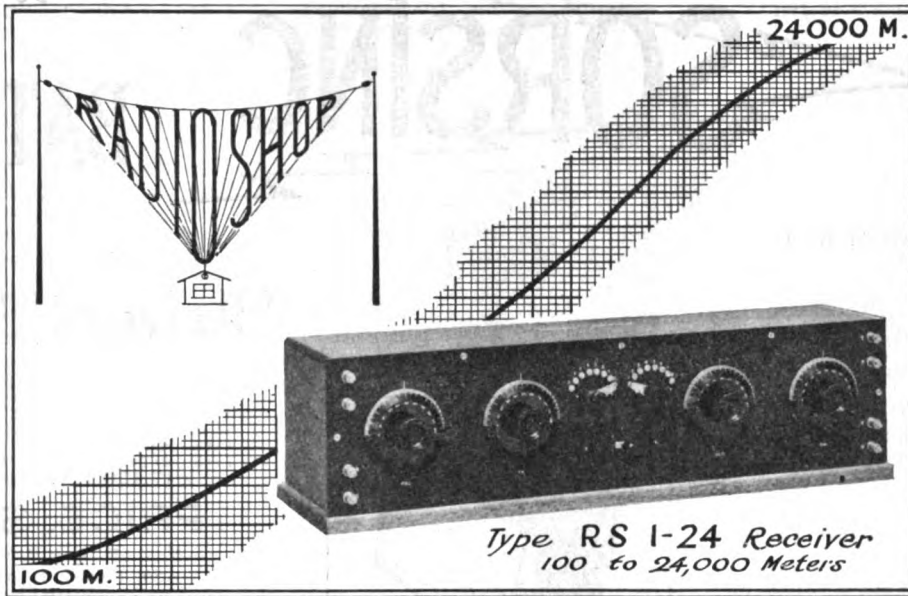
Calls Heard and Worked During Month of March, 1921, by 6ZX, Formerly 6EJ (Only Calls Exceeding 100 Miles are Listed)

- (5ZA) (6AAK) (6ABP) (6ACY) (6ADX)
- (6AGF) (6AIK) (6AJX) (6DP) (6ED)
- (6EF) 6EN (6ER) 6FT (6GP) 6ID (6IF)
- 6IV 6JT (6KP) 6KS 6MH (6MZ) (6LC)
- 6OH (6PQ) (6RN) (6SK) (6XZ) 6ZB
- (6ZH) 6ZM (6ZN) 6ZY (6ZZ) 7AD 7AX
- (7BC) 7BJ (7BK) (7BP) (7BQ) (7BR)
- (7CU) (7CW) 7DS 7ED 7FI 7FG 7FL
- 7FQ (7CQ) (7IN) 7JW (7ZI) (7ZM)
- (7ZJ) 9YW.

Stations Heard and Worked at Station 6QS, Berkeley, Cal., from March 1 to April 5, One Tube

- 5ZA (6AK) 6CV (6DK) (6DS) (6EA)
- (6EB) 6EC (6ED) (6EJ) 6EK 6ER 6EN
- 6FD 6FI 6FH 6GC 6GI 6GB (6GT) (6GP)
- (6HC) 6HH 6HY 6IC (6ID) 6IF 6IG 6IH
- (6IM) (6IS) (6IY) 6JI 6JT (6KA) (6KM)
- 6KP 6KY (6KS) 6ML 6LC (6MH) 6OC
- 6OH 6OL 6OW 6OZ 6PC (6PO) 6PQ

(Continued on page 382)



# Something Concise:

Concentrated essence of efficiency, the new RADIO SHOP type RS 1-24 receiver. The latest application of regenerative tuning to a range spanning every wave-length used in radio communication throughout the world.

Haven't you ever tired of the "QRM" on amateur wave-lengths and wished for a receiver that would bring in the commercial ships and long wave damped and undamped stations, without the trouble of changing wires and plugging in and out of numerous coils?

**THIS IS IT!** 100 to 24,000 meters, without a "dead spot," all in one cabinet! Variometer tuning applied to the entire scale with the resultant ease of control of regeneration and oscillation. Circuits so synchronized that troublesome "combinations" of tuning are entirely eliminated, making definite adjustments and reliable reception an assured thing, and the RS 1-24 the ideal receiver for all wavelengths, with absolutely no sacrifice of efficiency on any particular wavelength. A "stand-by" arrangement is also incorporated that will broaden tuning, when so desired, for general "listening in" work.

The very popular RADIO SHOP short wave receiver construction applied to wavelengths below 1,000 meters assures maximum selectivity and efficiency for amateur and short wave commercial spark and C. W. reception. Wavelengths from 1,000 to 24,000 meters are taken care of by an entirely new application of the variometer principle, which has already been employed in the RADIO SHOP long wave receiver, described in previous advertisements. The result:—

**SATISFACTION**

A few mechanical features that will appeal to the most exacting:—Banked windings. Dials that run true. Heavy bus-bar wiring. Non-shortening variable condensers. Grained, engraved, Formica panel. Interior as well as exterior workmanship of the highest possible order. **NO SEALS.** We are as proud of our interior as of the outward appearance and want the purchaser to know just as much about the apparatus as we do.

The "RS 1-24" carries the same "money back if not satisfied" guarantee that applies to all RADIO SHOP products. So far we have never had to live up to this guarantee, and enviable record to say the least.

**"THE SET THAT YOU WILL EVENTUALLY BUY"**

Licensed under Armstrong's Regenerative Patent and applying this unapproachable circuit to its maximum effectiveness.

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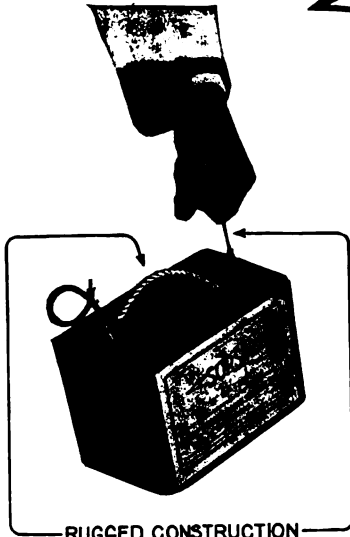
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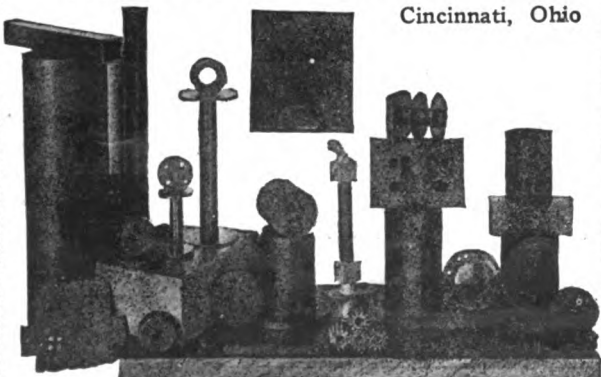
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**THE MAGNETIC AMPLIFIER**

(Continued from page 367)

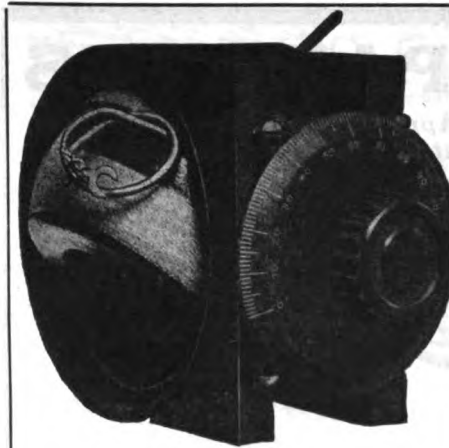
iron relay or magnetic amplifier, particularly the smaller types and types used in receiving circuits (some experimental work has really been done in connection with this latter application), it is a most important consideration to minimize absorption losses in the iron composing the magnetic circuit. If sheets are used, only the thinnest obtainable must be selected, and each component part of the core must be insulated from the next. Needless to say, insulation other than that provided by the oxide coating must be used. For general designs of low powered relays, enamel insulated soft Norway iron wire, about 32 to 38 gauge, if obtainable, will be found most satisfactory. Insofar as the writer is aware, the insulated article is not obtainable from stock, but it can be obtained on order, or manufactured from bare iron wire by the user. It adapts itself quite well to shapes commonly called for in this work, and on account of its dimensions, greatly minimizes eddy-current losses, which are so pronounced in sheet cores.

Theory of the magnetic amplifier. This may best be explained in the words of E. F. W. Alexanderson, who is responsible for the original application of this device to the control of radio frequency currents. "If two windings (e. g. A and B in Fig. 3) are related to each other and a common magnetic structure as shown in Fig. 3, it is apparent that there is no direct transformation of energy possible from one winding to the other. Each turn in the controlling or exciting winding B include both the positive and negative branch of the flux produced by the A. C. winding, A, and hence there is no voltage induced in B. The current in either winding A or B, on the other hand, influences the permeability of the common magnetic material; and, therefore, changes the inductance of the other winding. If a current flows in either winding sufficient to saturate the iron, it is thereby rendered practically non-magnetic and the inductance of the other winding is reduced to the value it would have if the coil included only air. If, on the other hand, a current flows in the other winding which gives a magnetic-motive force equal and opposite to the first, the iron is rendered magnetic again. Inasmuch as the two branches of winding A are wound relatively opposite to winding B, the one branch will oppose the ampere turns of winding B on one-half cycle and the other branch during the next half cycle. In order to have any large flux variation in winding A, the opposing ampere turns must be at least equal to the ampere turns in winding B. The relation of currents in these windings is substantially the same as that between the primary and secondary current in a transformer, although in this case, one is an alternating and the other a direct current on a current of a different frequency. It is thus obvious how the current in winding A can be regulated in proportion to the controlling current in winding B.

**CALL LIST CORRECTIONS**

The listed call, 6AML, of the station operated by F. Burgess of Agnew, Cal., should have been 6ALM.

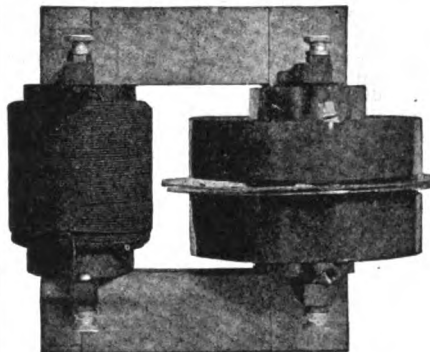
Calls heard by 6AIK as published in our May issue should be credited to 6AID.



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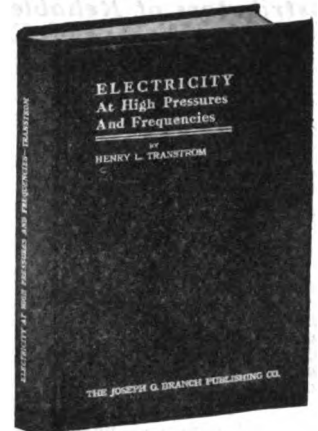
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- Radio Telephony, by Goldsmith..... 2.50
- Robinson's Manual of Wireless, by Robinson..... 2.50
- Consolidated Radio Call Book, Just out..... 1.50

**CALLS HEARD**

(Continued from page 378)  
 6QR 6RR (6SK) 6TC (6TV) 6TF 6TL  
 6UM 6UO (6VX) 6WH 6ZH 6XZ 6ZO  
 (6ZN) 6ZX 6ZA (6AAK) (6AAT cw ana spk.) 6ABP (6ACA) 6ACY 6ACX (6AID) 6AIC 6AIK 6AIW 7AD 7BH 7BK 7BJ 7BC (7BP) 7BQ 7CC 7CN (7CU) 7CW 7CG (7DS) 7ED 7EX 7FI 7FL 7FQ 7HN 7HF 7JR 7JW 7KM 7LS 7IN (7ZI) 7ZK (7ZJ) 7YA 7YW 9OE 9YW.

Calls Heard by 6AJH, San Ysidro, Cal. (San Diego County).

Anyone hearing 6AJH please QSL.  
 5JF 5XD (5ZA) 6AE 6AH 6AK 6BX(cw) 6DP 6EA (6ED) 6EK (6EN) 6ER 6FI 6GH (6HY) 6HR (6IF) 6IL 6IM 6JJ 6JM (6KA) 6KM 6KP (6LC) 6MZ 6OC (6OH) (6OW) 6PO 6PR 6PQ (6SK) 6SR 6TH 6TU (6TV) 6UK 6VX 6VW 6VZ 6ZA (6ZH) 6ZK 6ZN 6ZR 6ZT 6ZU (6ZY) (6ZX) (6ZZ) (6ABP) 6ACA (6ACY) (6ADX) 6AFN (6AGF) (6AHQ) 6AHY 6AJE 6AOM 7CU.

Calls Heard by 7CT, Portland, Ore.  
 6AC, 6AK, 6DK 6DP 6EJ 6EC 6EX 6FH 6GY 6HC 6KM 6KL 6LX 6OH 6PR 6QR 6TR 6TC 6ABM 6ABW 6ACA 6AGF 6ZM 6ZR 6ZU 7BC 7BH 7CE 7CC 7CW 7FI 7FU 7IN 7ZM 7YA. Anyone hearing 7CT please QSL.

Calls Heard by Kenneth Hill (6HA) at Eureka, Cal., During Month of April  
 6ACM 6ACF 6AF 6AGF 6AGR 6AH 6AJE 6AJR 6AL 6AN 6AP 6AT 6AU 6BA 6BS 6CH 6CM 6DK 6DM 6DP 6DW 6DY 6EA 6ES 6FH 6FI 6FU 6GW 6HC 6HF 6HH 6HX 6IT 6JI 6JR 6KM 6LC 6LR 6LX 6MZ 6OH 6OW 6PD 6PR 6QR 6RH 6SA 6TB 6TC 6TP 6TV 6VK 6VM 6XR 6YN 6ZA 6ZB(cw) 6ZH 6ZM 6ZN 6ZR 6ZT 6ZU 6ZX 6ZV 7BA 7BC 7BH 7BK 7BQ 7CC 7CU 7CW 7DA 7DI 7HN 7IY 7LN 7LY 7NN 7OR 7YA 7ZH 7ZJ 7ZX. Anyone hearing me, please write.

Calls heard at 6CH, 1737 Union Street, San Francisco, Cal., after 11 p. m., From April 1st to May 6.

5ZA 6AK 6AID 6ABM 6AGH 6ACY 6AIK 6ADL 6ANG 6ALB 6ALA 6ABM 6ACR 6AAU 6AFN 6AR 6DP 6DA 6ED 6EN 6EB 6FH 6GP 6IS 6IC 6IF 6LU 6LC 6MZ 6OW 6QR 6RN 6SK 6TV 6VX 6ZH 6ZA 6ZU 6ZX 7AD 7BK 7BP 7CU 7CW 7DA 7FI 7HF 7JW 7NN 7YA 7ZN 7ZM.

New Calls Heard at 6ACM, Berkeley Calif.

6DD 6DS 6FT 6KM (6KS) (6LC) 6MH 6MZ 6OL 6OW 6PR (6RR)—CW 6WH 6ZH (6ZU) (6ZX) 6AAD 6AAP 6ABM 6ABX 6ADA 6ADL 6AEL 6AEP 6AGC (6AID) 6AJE 6AOD 7BA 7BQ 7CU (7HN) 7MY 7NN 7ZR 9ZN. Anyone hearing 6ACM please QSL.

Heard at 6AUB San Diego  
 5ZA 6AK 6AQ 6DP 6ED 6EN 6ER 6GE 6HI 6JD 6JM 6KA 6KP 6LC 6MK 6OC 6OH 6OW 6SK 6UM 6ZA 6ZH 6ZN 6ZR 6ZU 6ZX 6ZZ 6AAK 6ABP 6ADX 6AIL.

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## THE SPARKING OF LIZZIE PROUT

(Continued from page 373)

Then he gets a small leather belt from the barn, slips it over the generator pulley an' around the drivin' pulley of the steam engine on the tractor. Next he gets out some insulated wire, an' hooks the alternator to his transformer an' key, style a la grapevine. This done, he backs away the tractor, easy, till the belt is tight an' true; then he throws out the drive an' starts the steam engine which is belted to the generator. Talk about fast work—I never seen a generatin' plant put into commission with such speed in my life!

"Will you do the sendin' while I stay out with the tractor an' keep up steam?" asks Jake, throwin' down his hammer, an' moppin' his face with his red bandana.

"Sure, go ahead," I answers; an' I sits in. I speeds up the bike wheel, an' begins to pound away. The candle went out, but the room was lit up by the purple fire that roared in the bicycle gap like an eighteen-inch gun, while brush discharge squirted an' glowed all over the place.

"The generator had altogether too much voltage for the transformer, which soon gets like a red-hot stove. The transformer was hard up against the oil-condenser; an' it heated up the oil so much that pretty soon it starts to smoke. I keeps hammerin' away, never lettin' up for a second, because I knows it's no use to try to listen in with that old rattle-trap of an alternator hangin' away behind by back. I figures I'll keep E-R-P drowned off the map, anyway. In fact, the way the juice was flyin', it looked to me like I ought to be bustin' up every con-founded station on the Pacific Coast!

"So there I sat, crankin' the emery-grinder with one hand an' poundin' brass with the other; the room filled with a purple glare from the juice that was crashin' onto the bicycle wheel, screechin' like forty wildcats with the itch; brush discharge shootin' from every inch of metal; the heat from the sendin' transformer burnin' the hide off'n my legs, an' the smoke from the hot lubricatin' oil in the condenser risin' at my elbow; at my back the old generator rattled an' shook; outside in the dark the steam tractor clattered an' clanked, an' sent smoke an' fire flyin' a mile high as Jake piled pitch pine into the furnace.

"This keeps up about half an hour, an' then, all of a sudden, plop! the sendin' transformer takes fire. I sings out to Jake, an' we try to drag away the wash tub condenser full of smokin' oil, but, instead, we only upset it, an', whish! the oil flashes up, fillin' the shack with a solid sheet of flame! We makes a dive for the door, an' about ten minutes later the whole blasted shack is nothin' but a roarin' mass of fire.

"Funny nobody comes," mutters Jake. "Generally the whole town comes runnin' to a fire—holy Jerusalem, look!" He points over across the village to a big, bright blaze, a good deal like our own, with crowds of people rushin' around it.

"Two fires to onct in Boulder Creek—jumpin' Jehovah, whadd'ya know about that!"

"About twenty minutes late, the other blaze was dyin' down a little, an' then all the town comes rushin' up to our campfire. At the head of the crowd is a long, lanky young fellow, who Jake seems to take particular notice of.

"Well, Elmer Pendleton, I reckon you feel happy watchin' my outfit go up in smoke, eh?" spat Jake, glarin' at him.

"That's a mean thing fer you to say, Jake," exclaims the other gink, in an injured tone. "Min's gone, too!"

"Wh-what!" splutters Jake, "Is that your shed burnin' over there?"

"Yes. While I was sendin', there comes a terribul kick-back, or somethin', an' the next thing I know the whole gosh-blamed woodshed was afire—we're both in the same boat!"

"Just then there was a roar an' a racket like

(Continued on page 388)



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First—Vernier adjustments on tuning condensers are absolutely necessary for receiving maximum continuous wave signals or telephone speech; and DeForest are the only condensers so equipped:

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Third—Long life and freedom from "loose play," due to excellence of workmanship and mechanical strength.

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## VOLTAGE AMPLIFIERS

(Continued from page 366)

used although some well constructed india ink resistances have been found satisfactory. Good resistances with firm, non-microphonic contacts are absolutely essential or the amplifier will "hiss," "howl," be very "noisy" and a total failure. The connections for a reactance coupled radio frequency amplifier are very similar to a resistance coupled type. Referring to Fig. 6, the only change necessary to convert this to a reactance coupled type is to replace the resistances, (R), by a coil and condenser as shown in Fig. 5. This arrangement is to be preferred for 200 meter work as it is absolutely free from capacity troubles and "noisy" resistances.

The audio frequency reactances shown in Fig. 6 may be made as follows. On a core of fine annealed soft iron wire  $\frac{1}{2}$ -inch diameter by  $2\frac{1}{2}$  inches long, wind with No. 36 or 38 enameled wire for a depth of  $\frac{1}{2}$ -inch and a length of 2 inches.

A transformer should always be provided in the output circuit for two reasons. (1) It is best to keep the direct current out of the telephone receivers in order not to ruin their permanent magnets. (2) The impedance of the average telephone receiver used for radio work is not high enough for the plate circuit. The output impedance of this transformer should be equal to the impedance of the telephone receivers. Hence if a variable number of receivers are to be used suitable taps should be brought out from the transformer secondary so that the total impedance of the receivers in use can always be matched. This arrangement makes it unnecessary to use high resistance receivers as high grade low resistance receivers will function equally well provided transformer and receiver impedances are properly matched. Transformers for this purpose should never be of the open core type, but should be designed for the minimum of magnetic leakage. The torrial transformers (ring type) are the very best, but complicated machines have to be used to wind them and they are therefore ruled out. The so-called "shell type" is the next best. It is very difficult to give actual dimensions for the construction of a transformer of this type unless one knows the plate resistance of the tube and the impedance of the telephone receivers with which the transformer is to be used. The following general suggestions may be of value. The pri-



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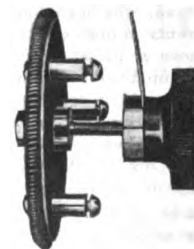
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Rheostat

Heavy current Rheostat for use with new power tubes. Carrying capacity  $2\frac{1}{2}$  amperes.

Rheostat Type SR17 \$1.75

mary should be about the same as that of an amplifier transformer primary suitable for the type of tube to be used. The secondary should have about one and one-half times the number of primary turns and be provided with about six or eight taps starting at a point having the same number of turns as one-half the primary. The taps should be evenly spaced from the first tap to the end of the winding. These suggestions for the secondary are only a rough guess, but may serve as a guide in designing a transformer of this type. The telephones should be connected to the secondary taps which will give the longest signals.

In the next article power amplifiers will be discussed.

**TIMELY COMMENT**

(Continued from page 371)

have adopted the convention that all potentials in the vacuum tube are relative to the negative end of the filament; the grid is said to have zero charge when connected to this point.

In ordinary tubes there is one certain value of grid potential which will bring the plate current to the same value it would have if there were no grid in the tube. The value of grid potential necessary to do this must be such that it will compensate for the screening action of the grid, and this required potential will vary with the distance from grid to plate.

Therefore it is not reasonable to assume that this potential is always the same as that of the midpoint of the filament.

If it is understood that only "Hard Tubes" are considered in the above.

**B. F. McNAMEE,**  
Chief Engineer,  
**MOORHEAD LABORATORIES.**

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THE Joseph G. Branch Publishing Company of Chicago, Ill., publishers of many books on electricity and science, will shortly announce to the radio men their new correspondence course in radio communication. Among the many books published by the concern, "Electricity at High Pressures and Frequencies" is of much value to the experimenter.

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Money refunded if this phone set does not work. Here is a phone set that costs only \$17.40 to construct, and when the Audiotron sold by the Kehler Radio Laboratories, whose ad appears on another page of this magazine, is used in conjunction with this circuit, will transmit 15 miles. "B" Batteries are used and results guaranteed. Enclose \$1.00 for blue print and directions. H. D. Selvaige, Dept. R, 1906 Clinton Ave., Irvington, N. J.

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Tests conducted in our own laboratories lead us to recommend this equipment *unreservedly!* Its operation is simplicity itself,—its tuning exceptionally sharp,—its performance, day-in and day-out, remarkable. Literature gladly sent on request. As usual, A. R. Co. is among the first to have a complete stock and information about this new line.

Type RA
Short Wave
Tuner
Style 307189
180-700 Meters
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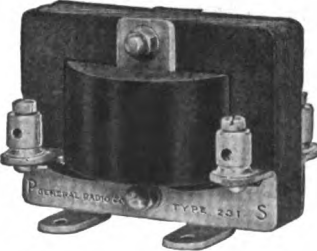
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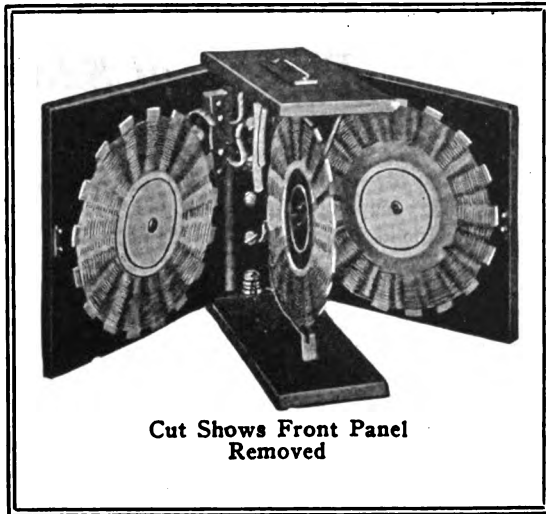


The new Radiotron Vacuum Tubes are accurately designed electrical instruments. To get the maximum results from them, they should be used with apparatus designed specifically to agree with their electrical characteristics. For greatest amplification of signals, use our Type 231A Amplifying Transformer and a UV201 Tube. A C-W set using UV202 Tubes will have the maximum modulation possible without distortion when used with our Type 231M Modulation Transformer.

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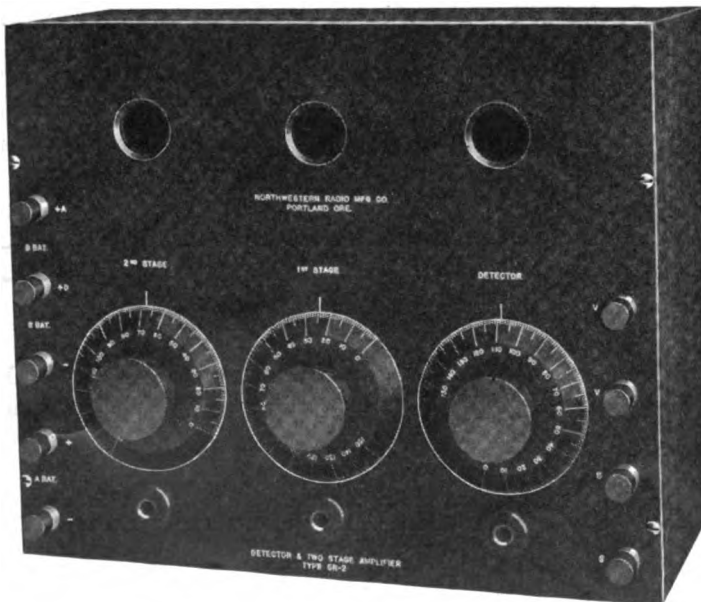
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A detector and two stage amplifier that will give you results. This instrument is in use in many stations in the Northwest and its performance is a proven fact. You must see and use this set to appreciate its value. Material and workmanship are the best.

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Knobs and dials are machined from sheet bakelite and turn TRUE. All socket supports are constructed of bakelite and cast aluminum.

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Portland, Oregon

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**RADIOTORIAL**

(Continued from page 365)

Radio Inspector should be stationed in Los Angeles, whose district shall be that of the Southern portion of the State—in precisely the same way that there is a Fish and Game Commissioner there resident who has all southern matters under his direct supervision.

I would further suggest that an amateur council of five—or three—be appointed by the Radio Inspector-in-Chief. This council to consist of southern operators who, by their work and general efficiency, have proven their radio worth. Let this council act as aid guardians and log all wilful QRM, illegal uses of wave lengths and call letters. Then let these findings be reported to the Inspector when he comes on one of his trips, and he will have something to work on.

The charge may be set forth by amateurs that this is setting spies among us. My answer is this: ANY method of controlling certain turbulent, illegal and refractory operators would be more than welcomed by the sober-minded, earnest members of the radio fraternity in the Southland!

Amateurs ask the Government for everything under the sun, and when the long-suffering authorities give them

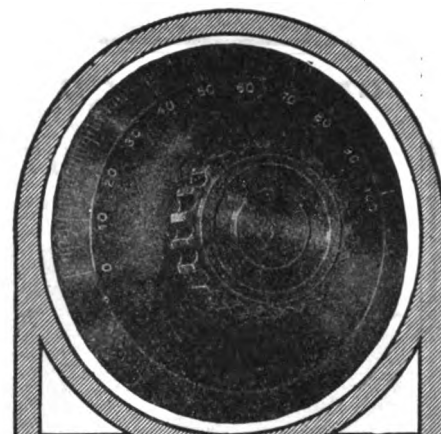
almost everything, they abuse these extended courtesies shamefully!

Why should not the amateur be as rigidly controlled in his operating as are the commercial operators? There is a short shift, indeed, do they cause unnecessary QRM, or transmit needless messages! I fail, utterly, to see why the amateur—and I am an enthusiastic member of that clan—should be permitted to do as he selfishly pleases, out of sheer gratification of his own personal desires!

And finally I appeal to the REAL operators among us—the fellows who want to improve the work and incidentally themselves—to use their influence for the all-round betterment of radio conditions.

Surely we do not wish to have Washington clamp down the lid, with far more severe regulations, saying: "We tried to treat you as men, with the intents and ideals of men. We find that you disregard the laws and conventions; that you act as a lot of school children, when the teacher's back is turned, and for these things it has been decided that more stringent rules shall be put into effect."

In the hands of the amateurs themselves lies the future of their radio work!



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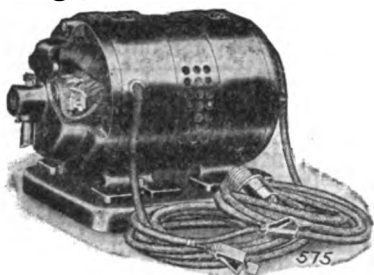
It is just as easy to specify "Corwins" when buying dials, and it implies that you have quality apparatus thruout. Dealers acquire respect for those who specify good makes of radio goods.

3" Dial, 75c—with knob, \$1.30  
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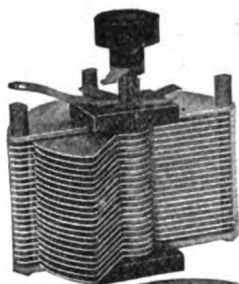
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Offices & Works: CLEVELAND, OHIO

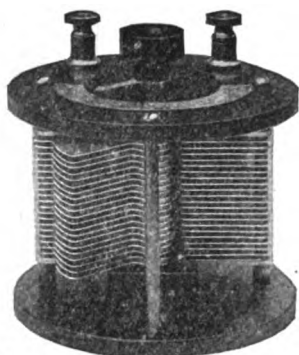
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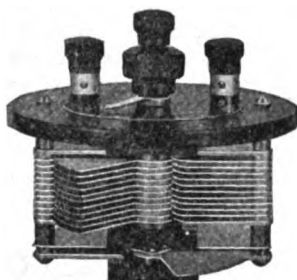
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Money back if not satisfied. Just return condenser within 10 days by insured Parcel Post.

With Style No. 1, we will, if desired, furnish 3 inch Metal Dial with large Knob, instead of Scale and Pointer. Extra Price 75 cents. Or we will, if desired, supply the Condenser with smooth 3-16 inch center staff, without Scale, Knob and Pointer, at 15 cents off the list to those who prefer to supply their own dial.

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Foreign Orders other than Canada not solicited.

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### THE SPARKING OF LIZZIE PROUT

(Continued from page 383)

a battleship firin' a broadside, an' that air-burnin' speed-boat comes dashin' up alongside us. By the light of the fire, I sees a nutty-lookin' rube at the wheel, an' sittin' beside him a freckle-faced young female with a little pug nose an' fiery red hair.

"Jumpin' Jerusalem, there's Lizzie with Zachary Bingdon in his air-burnin' ottermobile!" exclaims Jake, astonished.

"Oh, hello there, Jake an' Elmer!" hollers out the red-headed outrage, in a voice that reminds me of somebody scrapin' a file across the edge of a tomato can. 'I jist come down to tell you that I fergot all about listenin' fer you this evenin' on my new frame antenner. Zachary come an' took me fer a ride down ter Bungville, an'—a—tee-hee—we've jist got married!"

Los Angeles, Calif., May 3, 1921.  
Editor "P.R.N.,"  
San Francisco.

Dear Sir:—  
Just received another long distance "call heard" card.  
This one is from "9KL" of Spring Valley, Ill., who reported the reception of Station 6EA.

Yours truly,  
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Plans for the training of amateur radio operators and their induction into service in case of a war emergency are being formulated by the War Department, according to information received from Washington by headquarters of the Ninth Army Corps area here. The plans provide for the recognition of organizations of amateurs within each army corps area.—San Francisco "Chronicle."

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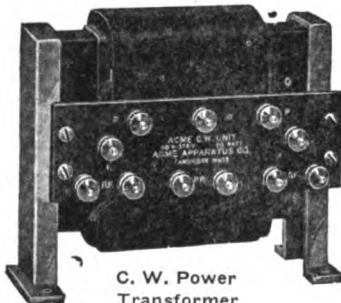
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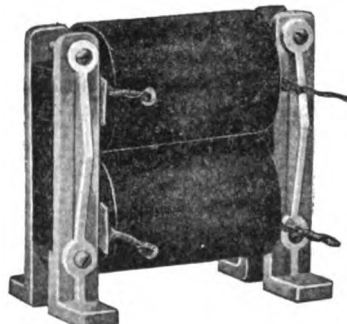
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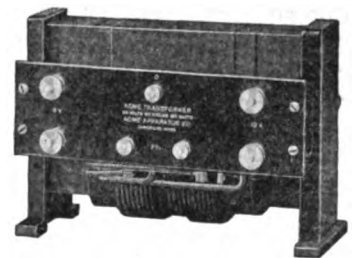
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1 1/2 Henry Choke Coil



Filament Heating Transformer

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50	10	2.5	350	100
200	12	5	250-550	200
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Two filament windings  
No filament windings

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When you think of tuners say TRESKO.  
 One for every need and wave length.



Presume you would like to hear something of the luck I have had with your "TRESKO tuner", which I bought of you some time ago. I am more than pleased with it. If I could not get another, I wouldn't take a hundred dollars for it, and it is certainly the best tuner I have ever used. All stations of from 4,000 to 20,000 meters come in loud and strong, and without amplifier. Another feature is, that it will work right through static, with a little adjustment. Since owning this Tuner, I haven't "closed up" on account of static.

J. B. ELLIS, Rancho De Casa Loma, Cochise, Arizona.

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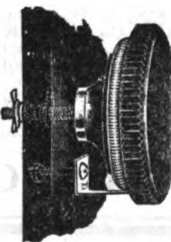
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- Detector—Just audible signals.
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- Two Stage—All over the house.

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## Just off the Press— Corwin's 1921 Catalogue

THIRTY-two pages of radio, all Radisco apparatus,—instruments for every part of your station,—codes, abbreviations, etc. All for ten cents. Send us your name and your dime by next mail, will send the 1921 catalogue just as quick.

**NEW RADISCO COUPLER—**  
 The vario-coupler that's "accurate to the .002 part of an inch." Moulded base, Formica tube. Brass for all metal parts.  
 Price \$7.50, postpaid

**UNIVERSAL-COIL MOUNTING PLUGS**  
 Anyone can easily make smooth-running mountings with these plugs. Exceedingly accurate. Made to fit Radisco and all hand wound coils.  
 Price 50 cents, postpaid

**VACUUM TUBES**  
 Electron Relays .....\$6.00  
 VT Amplifier, (1 lb.) ..... 7.00  
 VT Extra Hard for transmitting.... 7.50

**VARIABLE CONDENSERS**  
 A. R. Co. .001.....\$6.25  
 A. R. Co. .0005..... 5.00  
 With No. 67 Dial add \$1.00

Murdock 366 .....\$4.75  
 Murdock 367 ..... 4.75  
 Murdock 368 ..... 2.75  
 Clapp-Eastham 800 ..... 7.50  
 Clapp-Eastham 800A ..... 9.50  
 Clapp-Eastham 800B ..... 11.50

Complete with dial  
 Shipping weight One Pound.

**GRID CONDENSERS**  
 Radisco, Postage 3 cents.....35c  
**ANTENNA SWITCHES**  
 Murdock, 3 lbs.....\$4.50  
 Clapp-Eastham, 10 lbs.....12.50

**OSCILLATION TRANSFORMERS**  
 Murdock No. 424 (5 lbs.).....\$5.00

**RADIO CRAFT PRODUCTS**  
 Detector .....\$15.00  
 Two step Amplifier ..... 50.00  
 Detector and 1 step..... 45.00  
 Detector and 2 step..... 70.00  
 Postage paid

**"B" BATTERIES**  
 Radisco No. 1, 2 lbs.....\$1.50  
 Radisco No. 5, 5 lbs..... 2.65  
 Eveready Storage battery prices on application

**TUSKA C. W. APPARATUS**  
 181 Coil, 2 lbs. ....\$ 7.50  
 182 Coil, 2 lbs. .... 10.00  
 183 Coil, 3 lbs. .... 12.50  
 170 Filtr., 3 lbs. .... 16.00

**AMPLIFYING TRANSFORMERS**  
 A.R. Co., 1 lb.....\$5.00  
 Federal, 1 lb..... 7.50

**JACKS AND PLUGS**  
 Federal Closed Circuit ..... 85c  
 Federal Open Circuit ..... 70c  
 Federal Double Circuit.....\$1.00  
 Federal Plug ..... 2.00  
 Postpaid

**ALL RADISCO COILS and Wireless Press Books.**

**ROTARY SWITCHES**  
 Clapp-Eastham, No. 19.....\$1.00  
 Clapp-Eastham, No. 19A..... .35  
 Our Own, No. 1..... .40  
 Our Own, No. 2..... .55  
 Postage 5 cents.

**CORWIN DIALS**  
 No. 66, 3" .....\$ .75  
 No. 67, 3" with knob ..... 1.30  
 No. 68, 3 1/2" ..... 1.00  
 No. 69, 3 1/2" with knob..... 1.70  
 Postage paid.

**RECEIVERS**  
 Murdock No. 55, 2000 ohm.....\$4.50  
 Murdock, No. 55, 3000 ohm..... 5.50  
 Brandes Superior ..... 7.00  
 Baldwin C ..... 16.50  
 Baldwin E. Improved..... 20.00  
 Brownlie, New ..... 12.50  
 Shipping weight, 2 pounds

All orders for apparatus not listed as postpaid must be accompanied by postage charges.

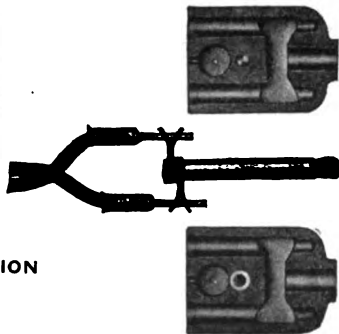
**A. H. CORWIN & COMPANY**  
 Dept. G6. 4 West Park St., Newark, N. J.

PACENT UNIVERSAL PLUG



Price \$2.00

The only Plug for Radio  
No connections to solder  
Connected in a jiffy  
Essential for Modern Radio  
For TRANSMISSION and RECEPTION  
Approved by the Navy Department  
Used by Commercial Companies  
Endorsed by foremost amateurs  
Obtainable from your dealer



DUBILIER UNIVERSAL CONDENSER



Price \$2.00

Supplied in most used capacities  
For TRANSMISSION and RECEPTION  
Especially designed for C. W.  
Will carry one Ampere at 1000 Volts  
Ruggedly Constructed  
Has constant capacity  
Approved by our Government  
Easily mounted anywhere  
Of Universal Radio use  
discounts.

We shall be pleased to send you bulletins describing the above and our other products on receipt of 5 cents in stamps.  
**AMATEURS AND EXPERIMENTERS**—Get in touch with your dealer.

Dealers—Write immediately for our liberal  
**SOLE DISTRIBUTORS FOR**  
Wicony's Complete Line of "Eventual" Apparatus.  
Duo-Lateral Coils, Pacent Universal Plugs, Sullivan Apparatus,  
Standard VT Batteries, Dubilier Condensers, Selbt Condensers,  
Special Distributors for Brandes Phones.

**PACENT ELECTRIC COMPANY, Inc.**

150 NASSAU STREET

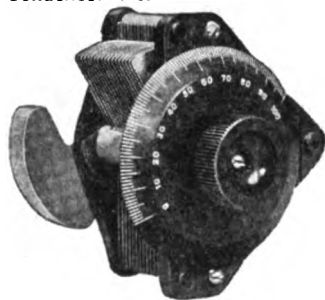
Telephone Beekman 5810

Louis Gerard Pacent,  
President

NEW YORK CITY

**CHELSEA Variable Condensers**

Condenser No. 3



(Die-Cast Type)

No.	Capacity	Type	Size	Weight	Lbs.	Price
2	.0011 m. f.	Mounted	4 1/4 x 4 1/4 x 3 1/4	1 1/4		\$5.00
2	.0006 m. f.	Mounted	4 1/4 x 4 1/4 x 2 1/4	1 1/4		4.50
3	.0011 m. f.	With Dial	4 1/4 x 3 x 4	2		4.75
3	.0011 m. f.	Without Dial	4 1/4 x 3 x 4	2		4.35
4	.0006 m. f.	With Dial	4 1/4 x 3 x 3 1/4	1 1/4		4.25
4	.0006 m. f.	Without Dial	4 1/4 x 3 x 3 1/4	1 1/4		3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates. Unmounted types will fit any panel and are equipped with counterweight.  
Purchase from your dealer; if he does not carry it, send to us.

Bulletin upon request.

**CHELSEA RADIO COMPANY**

13 FIFTH STREET CHELSEA, MASS.  
Manufacturers of Radio Apparatus and Moulders of Bakelite

Statement of the Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912, Of Pacific Radio News, published monthly at San Francisco, Cal., for April 1921. State of California, County of San Francisco—ss.

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

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Pacific Radio Publishing Co., 50 Main St., San Francisco.  
Editor, Paul R. Fenner, 50 Main St., San Francisco.  
Managing Editor, none.

Business Manager, H. W. Dickow, 50 Main St., San Francisco.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)  
H. W. Dickow, 50 Main St., San Francisco.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgagees, or other securities are: (If there are none, so state.)  
Paul R. Fenner, 50 Main St., San Francisco.

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

H. W. DICKOW, Owner.

Sworn to and subscribed before me this 28th day of March, 1921.

(SEAL) MARGUERITE S. BRUNER,

Notary Public in and for the City and County of San Francisco, State of California.

(My commission expires January 8, 1922.)

**TRANSFORMERS**

The new "Puget" transformer is now ready. Don't be misled by ads for low voltage transformers. The "Puget" is resonant and puts the most energy into your condenser. The 1/2 K.W. far outclasses 1 K.W.'s of other makes.

500 Watt Size.....\$26.75

25,000 volts

GIVES A CLEAR NOTE ON AMRAD GAPS

**AMPLIFIERS**

1 Step Panel, \$18.00; 1 Step in Cabinet, \$22.00; 2-step in cabinet, \$45.00. Full line of Amrad, DeForest, Radisco, Murdock, Etc.

Fast Mail Order Service

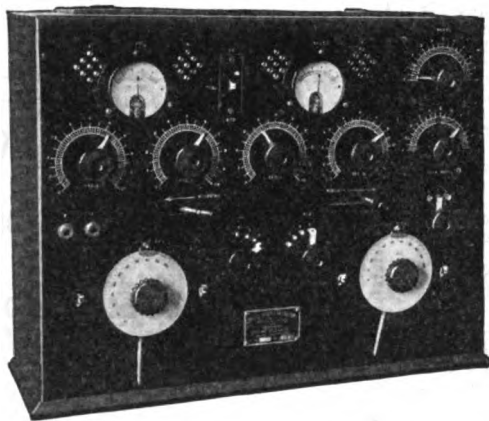
**Northwest Radio Service Co.**

609 FOURTH AVENUE

SEATTLE, WASH.

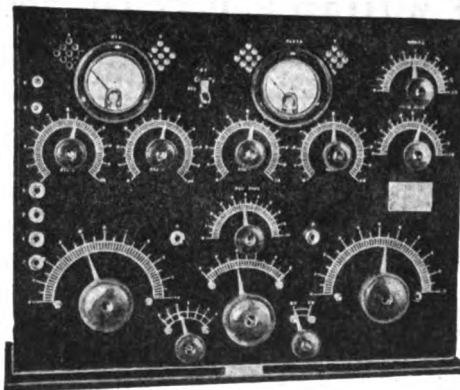
# ARE YOU IN THE CLASS

of discriminating purchasers who keep quality foremost in their selections? If so, the two new receivers shown below are of interest to you



The Altaceiver, type CW-3 comprises a long wave damped or undamped wave receptor combined with a detector and three step audio-frequency amplifier. Inside tube mounting, potentiometer plate battery control, separate filament battery control, detector plate and filament circuit meters, vernier tuning adjustment and undistorted amplification are among its many special features. Used by the Chicago Tribune in copying foreign press despatches.

The Multiceiver, type MC-3 combines a short-wave regenerative receiver of the tuned tertiary type and of extreme efficiency, with a detector and three-step audio-frequency amplifier. Delicate plate and filament potential control, detector plate and filament meters, inside tube mounting, special battery-control, transmitting-receiving switch, antenna series condenser, and special amplifying transformers are provided. Provision made for addition of external loaders or use of external tuner and detector by means of simple plug and jack.



Our new Catalog F-21 describes these sets in detail. Write for it!

**All our prices have been reduced! F-21 quotes new prices**

## CHICAGO RADIO LABORATORY

(New Address) 6433 RAVENSWOOD AVE.

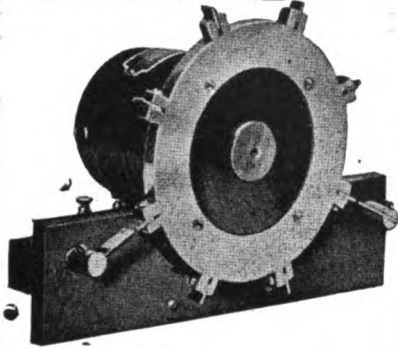
Testing Station: 9ZN, 5525 SHERIDAN ROAD

CHICAGO, ILL.



# DUCK'S New Big-200 Page No. 14 Wireless Catalog 21 and 27

Mailed for 12c, either in stamps or coin, which amount you are privileged to deduct on your first order of \$1.00. Catalog positively not sent otherwise. This edition of our wireless catalog is the most complete and elaborate we have ever put out. It embraces everything in wireless worth while. As an encyclopedia of information it is invaluable. It is printed on excellent paper with a beautiful cover. Your amateur friend will tell you that there never has been any wireless catalog to take the place of Duck's, and above all, that you can absolutely rely on the quality of every instrument listed in this catalog. In a word it is all worth while catalogs in one.



## Improved Type Sayville Rotary Gap

Embodies the latest and best features in Spark Gap Construction.

Our New Type Sayville Rotary Gap is, we believe, far in advance of any rotary gap on the market within a range even of twice the price. It is the final development of many different types made in our experimental Radio laboratory. It fulfills every requirement of the ideal rotary gap. It is neat and attractive in appearance; simple and durable in construction; possesses a wonderful motor; has a cast aluminum rotary wheel, beautifully polished; every part is in perfect alignment; there is no wobbling of the motor; produces and maintains a clear and pure 500-cycle note; is instantaneous in action; permits of no dragging of the spark;

has contacts of tempered flat copper of proper length and width, easily and quickly removable, and inexpensively renewable; the stationary contacts are adjustable to any length.

The picture above really does not do it justice. There is no rotary gap we have ever sold that we consider in the same class with this gap, and we have therefore, discontinued the sale of all other types listed in our catalog.

Any purchaser is privileged to return it within three days if it does not come up to all the high claims we make for it. A first-class Rotary Gap is the very heart of an efficient transmitting set, and we cannot too strongly emphasize care in the selection of this instrument if effective and dependable results are desired.

- No. A1788—Improved Type Sayville Rotary Gap (shipping weight 9 lbs.).....\$27.50
- Renewable Rotary Electrodes (not less than five sold), each..... .05
- Renewable Stationary Electrodes, each..... .10
- Type A Motor as supplied with above gap (shipping weight 6 lbs.)..... 15.00

**THE WILLIAM B. DUCK CO., 210-212 Superior St., Toledo, Ohio**

## A Word To the Wise!

The "STANDARD VT BATTERY" is made by people who specialize. They concentrate their facilities upon the manufacture of plate circuit batteries. They know how and why plate circuit batteries are used, and what is expected of them in the way of service—for which purposes an assembly of common flashlight batteries will not serve efficiently.

Dealers who sell any of the three types of the "STANDARD VT BATTERY" guarantee them fully. They know of their excellent qualities, and offer you the benefit of their knowledge and selection when they sell you the "STANDARD VT BATTERY." Still, they're not expensive. This, combined with A-1 quality, is the secret of their extensive use.

Treat yourself to a full round of satisfaction by purchasing the "STANDARD VT BATTERY" from your nearest dealer.

**RICHTER-SCHOTTLER CO., MFRS.**  
293 CHURCH STREET NEW YORK, N. Y.  
PACENT ELECTRIC CO., Sole Eastern Agents, 150 Nassau St., New York City



## "B" Batteries AN EVEREADY PRODUCT

- 43V. Batteries, tapped.....\$5.00
- 22½V. Batteries, Navy Type.... 3.50
- 22½V. Batteries, Commercial Type 2.00

Latter two types especially adapted to Cunningham and Radiotron Tubes. Postage Prepaid Anywhere in U. S.

## Ets-Hokin & Galvan

Wireless Engineers  
10 Mission Street San Francisco

## ALTADENA RADIO LABORATORY

ALTADENA, CALIFORNIA  
Radio 6ABA

### THAT MEANS HIGH GRADE RADIO APPARATUS

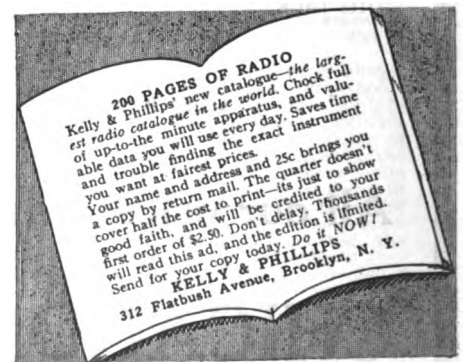
PARTICULARLY

### CHICAGO RADIO LABORATORY THE BENWOOD COMPANY

THE RADIO SHOP  
RAY-DI-CO.

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- AM. RADIO AND RESEARCH CORP.
- BALDWIN MICA DIAPHRAM FONES
- BROWNIE ADJUSTABLE FONES
- CUNNINGHAM VACUUM TUBES
- MOORHEAD VACUUM TUBES
- DOOLITTLE DECREMENTERS
- STANDARD B BATTERIES
- ELECTROSE INSULATORS
- ACME TRANSFORMERS
- ELDRIDGE METERS
- COPPER BRAID
- WIRE OF ALL KINDS

## PAUL F. JOHNSON



5c

brings you by return mail the ABC catalogue. It describes the wonderful ABC Unit series, as well as a complete line of "Professional radio apparatus at amateur prices."

Send your name and nickel today.

WIRELESS EQUIPMENT CO. Inc.  
32 AUSTIN ST. NEWARK, N. J.

**LOOK!!**

A Yearly Subscription to QST and Pacific Radio News for \$3.25  
You Save 75c.

Pacific Radio Pub. Co. - 50 Main St.  
San Francisco, Cal.

## Classified Advertisements

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

**RADIO PHONISTS, ATTENTION—HIGH VOLTAGE GENERATORS.** We supply motor generator units in various capacities, especially designed for radio phone work. Low powered rotary converters, dynamotors, fractional H. P. motors, storage batteries. Various types of meters, condensers, navy type "4" nickel plate brass engraved dial, spark gap rotors. **SYNCHRONOUS SPARK GAPS.** **RAY-DI-CO RADIO PHONE** sets furnished knocked down ready for assembling and your connection. Get acquainted with our **SERVICE.** **RAY-DI-CO,** 2653C N. Clark St., Chicago, Ill.

**RADIO CABINETS—Mahogany or oak** finished or unfinished, to your design. Send rough sketch for quotation. Prompt service. Formica cut to size. Radio supplies, parts, etc. Pacific Radio Exchange, 439 Call Bldg., San Francisco, Calif.

**THE BEST HONEYCOMB COILS AT THE LOWEST PRICE.** Many satisfied customers are using them. Immediate delivery on the following sizes: 25 turns, 45c; 35 turns, 45c; 50 turns, 55c; 75 turns, 60c; 100 turns, 65c; 150 turns, 70c; 200 turns, 75c; 250 turns, 80c; 300 turns, 85c; 400 turns, 90c. Postage extra. Superior Coil Co., 183 1/2 Balboa St., San Francisco, Cal.

**FOR SALE—DeForest A. C. Radiophone,** with 25-mile range, multiwave tuner, utility receiver, vernier condensers and other DeForest instruments at extremely low prices. All instruments **NEW.** Write to 5118 Harold Way, Hollywood, Cal., or phone Hollywood 3583 for further information.

**FOR SALE—Detector and 3-step amplifier,** complete, including honeycomb coil, Tungar rectifier, Exide storage battery, and six audions. Cost \$200 to make. Sell for \$150. H. R. LEE, 3828 Sacramento St., San Francisco.

**FOR SALE—Beginners' telegraph instruments,** 20 ohms, \$3 apiece; also 500 ohms Mineral detector for \$2. Good as new. E. SHAFER, 1316 Ohio St., Quincy, Ill.

**VARIOCOUPERS,** wound on bakelite forms, \$5.25; Variometers, inside windings, \$4.25; Microphone, transmitters, \$3; Regenerative units; Oak cabinets with and without bakelite panels. Meade Bakelite Radio Apparatus, 975 Putnam Ave., Brooklyn, N. Y.

**FOR SALE—Baldwin Type E mica-diaphragm phones,** new, in perfect condition, \$15. Savage .22 calibre hi-power rifle in perfect working and shooting condition, bluing slightly worn, \$35. Above absolutely guaranteed. H. B. HARGUS, 119 S. Fourth St., Klamath Falls, Ore.

**ALEXANDER HAMILTON INSTITUTE COURSE FOR SALE,** 1919 edition. All books in absolutely new condition, but one having ever been removed from its original wrapper; complete edition; cost \$120; sell for \$65 cash, or express C. O. D. D. B. MCGOWN, 1247 47th Ave., San Francisco.

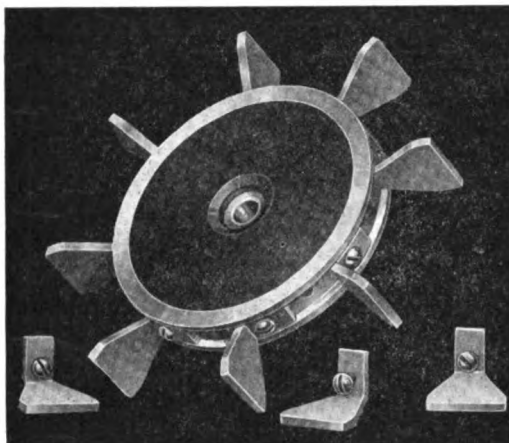
**FOR SALE—Two short wave regenerative sets,** without cabinets, \$25 each; 800 meter loose coupler, \$5; large lightning switch, fine marble base, \$5; E. I. Co. vario set, \$5; storage battery, \$8. **RALPH HAYNES,** 615 Woodlawn Ave., Canon City, Colo.

**RADIO ENTHUSIASTS, ATTENTION!!!** Our proven VT hookups, each on a separate blue print, are making a hit. No station complete without these handy, easily understood diagrams. Twelve receiving or twelve phone circuits in heavy cover, 50c. No stamps. Special to introduce our service. We are headquarters for radio plans. **THE PLAN BUREAU,** 1929 McCausland Ave., St. Louis, Mo.

**HAVE A NEGATIVE OF YOUR FAVORITE HOOKUP!!!** We will draw it on tracing cloth and you can make all blue prints wanted. 50c each or three for \$1.25. No stamps. **THE PLAN BUREAU,** 1929 McCausland Ave., St. Louis, Mo.

**UNMOUNTED LONG DISTANCE RECEIVING INDUCTANCES.** These are duo lateral wound coils, each tapped at five points. Two coils with a tickler make an unbeatable receiving combination. Range 2500 to 25,000 meters, Arlington to Lafayette. Prices, Primary and Secondary Coils, \$3.50 each. Tickler Coil, \$2.00. Send \$9.00 for the three coils and diagram, and make a guaranteed receiving set. **P. J. STOCKWELL,** Reading, Mass.

# Bust Thru the QRM With a Benwood Removable Point Disc



ANY  
NOTE

ANY  
FRE-  
QUENCY

## Double Your Radiation

Sparking points are variable from 2 to 16. Teeth are **Renewable** as well as **Removable**. Disc is **Six Inches** in diameter and sparking points are **One Inch** in width. Complete disc weighs less than half pound; absolutely accurate and finely balanced.

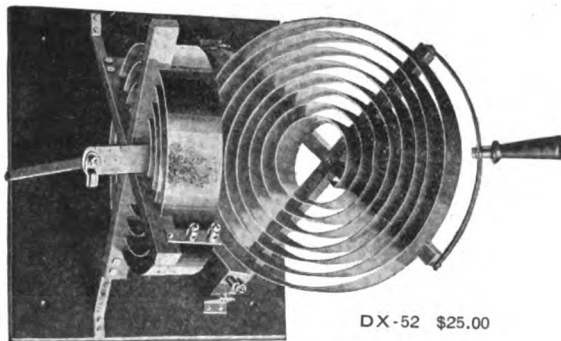
This disc enables the operator to vary the frequency of the spark at will, regardless of the speed of the motor used. It enables the operator to obtain the maximum radiation from any spark transmitter by being able to change the spark discharge frequency to conform to **Any Condenser Capacity** and **Any Wave Length** that is in use at the present time. This disc will absolutely increase the transmitting range of **Any** spark transmitter because it is at once applicable to any make transformer on the market regardless of the voltage. It is the ultimate in rotary disc design and fills the long-felt need of every radio man.

A **Clear note** can now be had at all times. As soon as the sparking points on this disc become worn and uneven a complete new set can at once be put into service thus assuring the operator of maximum results at all times. The center of the disc is **Moulded Bakelite**, the best insulation obtainable. Disc is fitted with carefully machined brass bushing and set screws for fastening to the motor shaft. It is also furnished with shaft for use with any of the enclosed **Benwood** gaps that are now in use.

**Price complete with 16 sparking points, \$10.00**  
Specify size of motor shaft when ordering.  
Extra sparking points 20 cents each or \$2.50 per set of 16.

## The Benwood Company, Inc.

1300 OLIVE STREET ST. LOUIS, MO.  
Sold by WESTERN RADIO ELECTRIC COMPANY Los Angeles, Cal.



DX-52 \$25.00

The Oscillation Transformer that made possible 8ZR'S transcontinental transmission to 6RJ, 6AK and 7ZJ.

Three-inch heavy ribbon Bakelite insulation, rugged construction. Write for a circular describing DX apparatus—the power apparatus. Dealers Wanted—Liberal contracts.

**THE AMERICAN RADIO SALES & SERVICE CO.**

Great American Bldg.  
Mansfield, Ohio  
Testing Station 8ZR.

**DODGE SHORT CUT** made it possible to memorize and master Continental code in one hour. Thousands have. Is simple. Anybody can. Method costs 50 cents. Save \$50. C. K. DODGE, Box 220, Mamaroneck, N. Y.

**FOR SALE—One K. W. transformer,** \$23. Marconi jar condenser, \$3. C. I. MAYO, 2328 Channing Way, Berkeley, Cal.

**PRINT your PICTURES on PHOTO SILK.** Package only \$1.35. F. Irsa, Elizabeth, N. J.

### RADEQ AUDION CONTROL PANELS

The best control panel for the money; has polished formica panel mounted on oak base and equipped with tube socket, grid leak, condenser, rheostat, and nickel-plated binding posts. Price without B batteries or tube, \$10.00.

Wireless apparatus made to order; sets designed to use material you now have on hand. Send for price list.

A. C. PENFIELD, Conneautville, Pa.



**It Isn't Necessary—**

for you to live in San Francisco to enjoy the benefits of Kennedy Service. If there isn't a Kennedy dealer in your city, you can deal directly with us. Your needs will be filled promptly and satisfactorily.

We carry a full line of radio parts, accessories and supplies of other makes as well as our own. Here are a few suggestions:

<b>Vacuum Tubes</b>	
Cunningham Detector, C-300.....	\$5.00
Cunningham Amplifier, C-301.....	6.50
Cunningham 5-watt Transmitter, C-302.....	8.00
Moorhead E-R Detector .....	6.00
Moorhead V-T Amplifier .....	7.00
Moorhead T-T Transmitter .....	7.50
<b>Vacuum Tube Sockets</b>	
Murdock No. 55 .....	\$1.00
Remler No. 92, one piece moulded bakelite.....	1.50
General Radio No. 156 .....	1.75
<b>Vacuum Tube Filament Rheostats</b>	
R-49 Porcelain base for table mounting.....	1.00
Remler No. 810 for panel mounting.....	1.00
Remler No. 811, large size for panel mounting.....	1.75
Remler No. 813, for 3 tubes .....	1.75
Paragon No. 25 .....	1.75
General Radio No 241-A .....	2.50
<b>Vacuum Tube Plate Batteries</b>	
Eveready No. 766, 22½ volts .....	\$3.50
Eveready No. 776, 43 V., 7 Terminals.....	5.00
<b>Vacuum Tube Control Units</b>	
Paragon No. 70 .....	\$6.00
Remler No. 330 .....	8.00

<b>Receivers (Telephones)</b>	
Murdock No. 55, 2000 Ohms .....	\$4.50
Murdock No. 55, 3000 Ohms .....	5.50
Brandes "Superior" .....	8.00
Brandes "Transatlantic" .....	12.00
Brandes "Navy" .....	14.00
Brownlie Adjustable .....	12.50
Baldwin Type "C" .....	16.50
Baldwin Type "E" .....	20.00
Baldwin Type "T" .....	21.00
<b>Telephone Plugs and Jacks</b>	
Federal open-circuit jack No. 1421.....	\$ .70
Federal closed-circuit jack No. 1422.....	.85
Federal two-circuit jack No. 1423 .....	1.00
Federal brass plug for above jacks, No. 1428.....	2.00
Federal No. 1428 plug, silver plated .....	2.50
<b>Buzzers</b>	
Century .....	\$2.50
Mesco No. 55 .....	2.50
<b>Honeycomb Coil Mounting</b>	
Q. S. A. No. 400.—3-coil mounting with base, vertical standards, bakelite panel, stationary plug, two swivel plugs with levers for adjustable coupling. For standard mounted lattice-wound coils .....	\$6.50

Our price list and catalog containing many more items will be sent you on request.

**THE COLIN B. KENNEDY COMPANY**

INCORPORATED

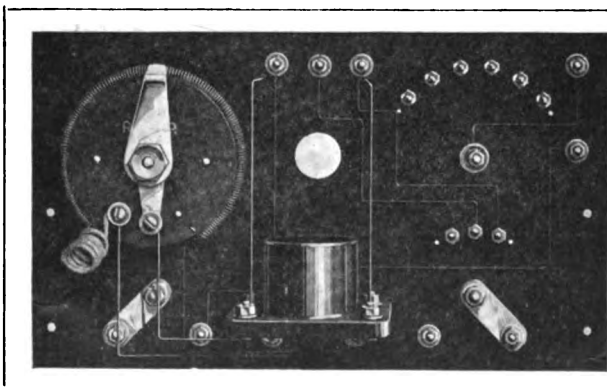
RIALTO BUILDING

SAN FRANCISCO

**Special price reductions**

Audion Control Panels with VT mounting, as illustrated.....\$11.00  
 Same as above, but without the VT mounting, price ..... 9.00

CESCO Variometers, each at.....\$ 5.50  
 CESCO Variocouplers, each at..... 4.50  
 Bakelite Base Crystal Detectors, very special at ..... 1.25



REAR VIEW OF AUDION CONTROL PANEL

This is the greatest panel value ever offered. It will not discolor like hard rubber, nor is it brittle or easily damaged. The panel is cut from solid sheet, not moulded. Surface highly polished. Lettering and scales machine cut, not stamped, and whitened. Metal parts heavily nickled. Filament rheostat back mounted. Wound for 5 ohms, it permits close adjustment of filament temperature. See prices above.

*These prices are special, very special, and temporary only. The apparatus is standard, ace high in quality, and the saving to you considerable, in fact far greater than you may reasonably expect to secure again for some time to come, if ever. Mail your orders at once—*

CALIFORNIA ELECTRIC SUPPLY CO.—643 MISSION ST., SAN FRANCISCO, CALIF.

**Radio supplies that R right**

When writing to Advertisers please mention this Magazine

# CONTINENTAL NEWS

JUNE, 1921

Published Every Month In Pacific Radio News By Continental Radio and Electric Corporation

## New York Radio Service by Mail

New York City is the center of radio development. A majority of the big manufacturers are located in or near New York. The latest ideas, the most advanced apparatus usually appears in New York first.

The Continental Store (in the Heart of Downtown New York) is in the best position to secure advance news and apparatus. The Continental Mail Order Service puts all these advantages, plus the most complete stock in the world's biggest city, as near to you as the quickest mail express. No matter where you live, Continental can—and will—fill all your radio needs with

### Courtesy: Speed: Accuracy

To avoid delay, please make all remittances by bank draft or P. O. Money Order.

## Do you spend over \$50.00 a year for Radio?

THEN YOU can afford a Paragon R. A. Ten Receiver. Although the original price is Eighty-Five Dollars, the iron-clad guarantee protects you from any up-keep expense for two full years!

Combine your radio investment for the next two years now, and invest in a Paragon. In no other way can you get such genuine pleasure, such remarkable results from any equal amount of money. For, every cent you pay for a Paragon represents high quality materials and workmanship. The unequalled design—the secret of Paragon's marvelous selectivity and amplification—doesn't add a cent to the cost over what you would pay for inferior engineering principles.

In last month's advertisement we printed unsolicited letters from three operators (including a Y. M. C. A. radio school), all of whom had made actual tests and comparisons. In each case, the Paragon "fulfilled every advertised superiority." One man said, "Nothing like it ever heard before, especially for strength of signals on detector alone."

Certainly, it pays to buy the best. Order your Paragon R. A. Ten, or send for FREE descriptive booklet today!

## C. W.

In the words of Dr. Alfred N. Goldsmith, at the Second District Radio Convention, "Here's to the amateur, continuously may he wave!"

If there is anything you want for C. W. work not listed here, write us for information. We have it, or can get it for you quickly.

### C. W. INDUCTANCES

No. 181 Tuska C.W. Inductance	\$7.50
No. 181 Tuska C.W. Inductance, unassembled	5.00
No. 182 Tuska C.W. Inductance	10.00
No. 182 Tuska C.W. Inductance, unassembled	7.50
No. 183 Tuska C.W. Inductance	12.50
No. 183 Tuska C.W. Inductance, unassembled	10.00

### CHOKE COILS

Acme 1½ Henry, 500, M. A. Single Coil	\$6.00
Acme 1½ Henry, 500, M. A. Double Coil	8.00
Acme 1½ Henry, 150, M. A. Single Coil	4.00
Acme 1½ Henry, 150, M. A. Double Coil	6.00
C. E. Co., ZRX 8 Henry, 150, M. A. Single Coil	3.75

### TELEPHONE TRANSMITTERS

Sterling Microphone	\$2.50
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### RESISTANCES (Ward Leonard)

Ward Leonard Resistance, 5000 ohm	\$1.70
Ward Leonard Resistance, 10,000 ohm	2.95
Ward Leonard Resistance, 1500 ohm	1.50
Ward Leonard Resistance, 12,000 ohm	3.50
Lavite Resistance, 48,000 ohm, for Radio frequency amplifiers	3.00

### MODULATION TRANSFORMERS

Acme A-3 unmounted	\$7.00
Acme A-3 semi-mounted	5.00
Acme A-3 unmounted	4.50
C. E. CO. ZRM MODULATION TRANSFORMER	4.50

### GRID LEAKS

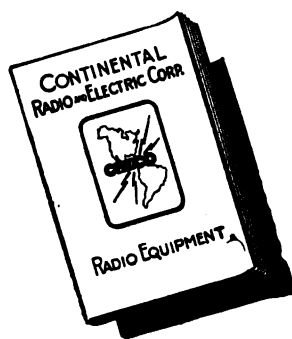
Marconi 1, 2, 3 or 5 megohms	\$1.25
Chelsea Variable ½ to 5 megohms, 10 values	3.00
Chelsea Oscillator	3.00

### METERS (Weston Model 301)

Model 301 0-3 amperes flush	\$8.50
Model 301 0-5 amperes flush	8.50
Model 301 0-50 volts flush	8.50
Model 301 0-100 Milli-amperes flush	8.50
Model 301 0-300 Milli-amperes flush	8.50
Model 301 0-500 Milli-amperes flush	8.50
Model 301 0-800 Milli-amperes flush	8.50

## Do You Own a Quarter?

If you do,—and you're interested in radio,—the best thing you can do with it is to exchange it for the Creco catalogue.



25 cents, stamps or coin.

The Creco catalogue brings you 112 pages, full to the brim with descriptions, illustrations, prices, on radio apparatus for every need. It includes codes, abbreviations, tables for quick calculations, and other valuable material that you will use every day.

And, anyway, your quarter is refunded on your first \$5.00 order. Come on, be a sport, risk a quarter. You'll never regret it after you see the Creco catalogue. And you'll be mighty glad you saw this ad after you once experience Continental Mail Order Service.

Just your name and address and 25 cents. But do it now—the edition is limited.

### METERS (Hot Wire)

No. 127 Gen. Radio flush 0-1 Amp	\$7.75
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No. 127 Gen. Radio flush 0-10 Amp	7.75
No. 127 Gen. Radio flush 0-5 Amp	7.75

### RHEOSTATS

214 Gen. Radio front or back mounted	\$2.50
Paragon Rheo. front or back mounted	1.75
Mesco Porcelain base	1.40

### BUZZERS FOR BUZZER MODULATION

Century 168 Buzzer	\$2.50
Mesco No. 55 Buzzer	2.50
Mesco 251 Buzzer	.95

### HIGH FREQUENCY CHOKE COILS

Electrodyne Rectifier consists of 500 V Transformer and 2 rectifying vacuum tubes all mounted ready for use.	1.50
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No. 25 R. T. Rectifier, less tubes	35.00
No. 25 V. T. Vacuum tube each	7.00

TRANSMITTING TUBES, Gen. Radio Drum Switch	7.50
G. R. TRANSMITTING TUBE SOCKET	1.75

### JEWELL METERS

Model 33 0-1 flush	\$6.00
0-3 flush	6.00
0-5 flush	6.00

0-50 Volts flush	6.00
0-500 Volts flush	15.00
0-50 Mill Amp	6.00
0-100 Mill Amp	6.00
0-300 Mill Amp	6.00
0-500 Mill Amp	6.00

### JEWELL THERMO AMMETERS

0-1 Amp	\$15.00
0-3 Amp	15.00
0-5 Amp	15.00
0-10 Amp	15.00

### TRANSFORMERS (For C.W. Work)

Acme 200 Watt, mounted	\$20.00
Acme 200 Watt, unmounted	16.00
Acme 50 Watt, mounted	15.00
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International 500 V 100 Watt AC Drive	\$99.00
International 500 V 100 Watt DC Drive	110.00
Electric Specialty Co. 350 V 50 Watt AC or DC	97.00

### CONDENSERS

WE 21 A A I M F D tested at 1000 volts, each	\$2.50
Dubilier 25 M F D Mica Condenser, tested at 1800 Volts	6.00
Dubilier .0005 Grid Condenser for transmitting sets	1.00
High Voltage Variable Air Condenser, will stand 1000 V Capacity .001 M. F. D. Just the condenser for your Antenna circuit	29.00

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Radio Craft Variometers	\$6.00
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Nightingale Variometers (large)	5.50
Grebe Variometers	8.50
Clapp-Eastham Variometer with knob and dial	6.50
Clapp-Eastham Variometer less knob and dial	5.75

# CONTINENTAL

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New York

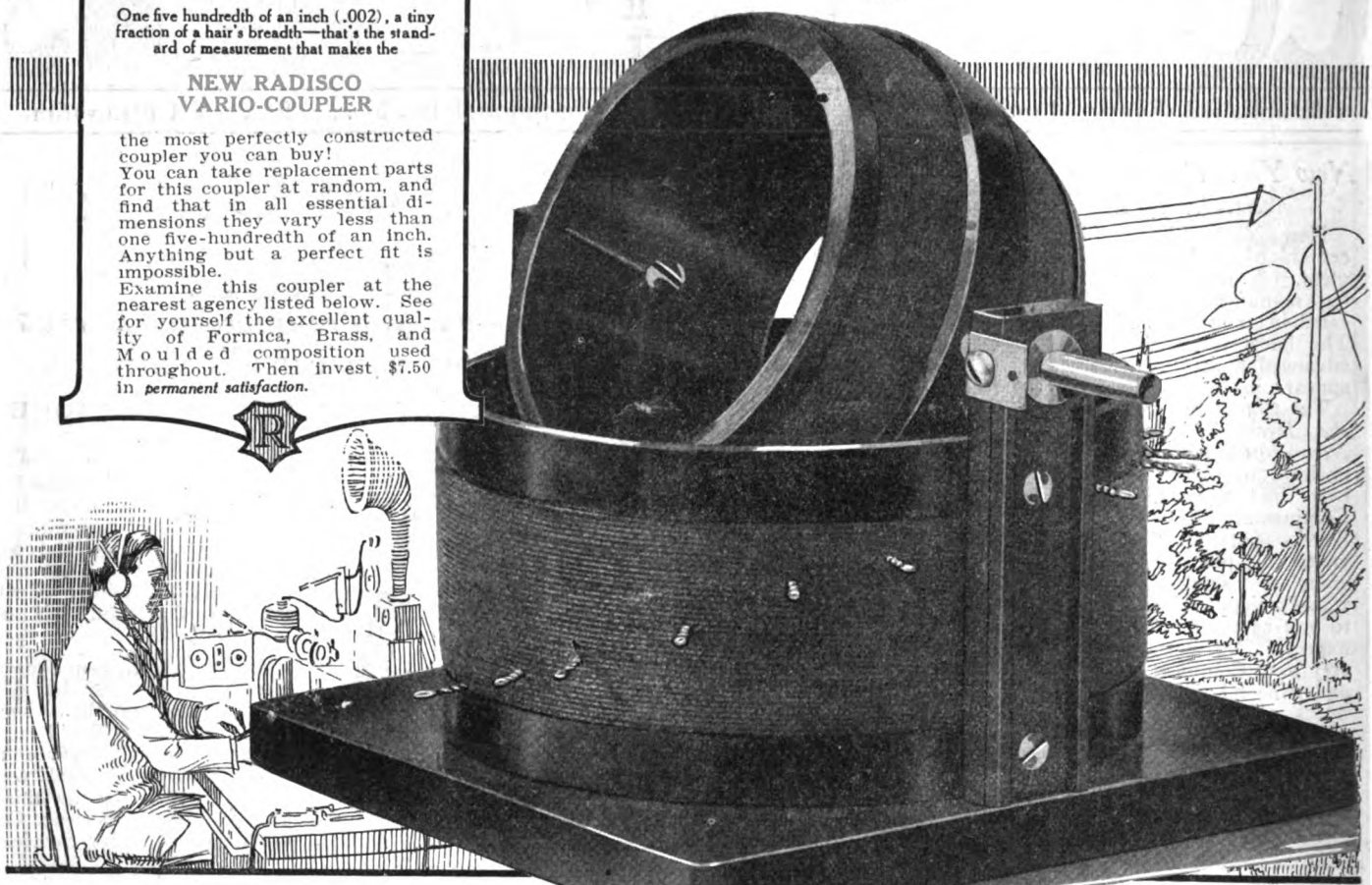
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One five hundredth of an inch (.002), a tiny fraction of a hair's breadth—that's the standard of measurement that makes the

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the most perfectly constructed coupler you can buy! You can take replacement parts for this coupler at random, and find that in all essential dimensions they vary less than one five-hundredth of an inch. Anything but a perfect fit is impossible. Examine this coupler at the nearest agency listed below. See for yourself the excellent quality of Formica, Brass, and Moulded composition used throughout. Then invest \$7.50 in permanent satisfaction.

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**THE RADIO DEALERS LISTED** below are progressive merchants. They are equipped to give you helpful advice and real service in selecting your radio equipment. As an indication of their up-to-date methods, they carry a complete line of Radisco apparatus, including the coupler shown above, Radisco Coils, Better "B" Batteries, Corwin Dials, etc. Go to the nearest Radisco agency, and be sure of satisfaction.

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