

15c. a Copy

Vol-3.
No-66

June 30 1923

\$6.00 a Year

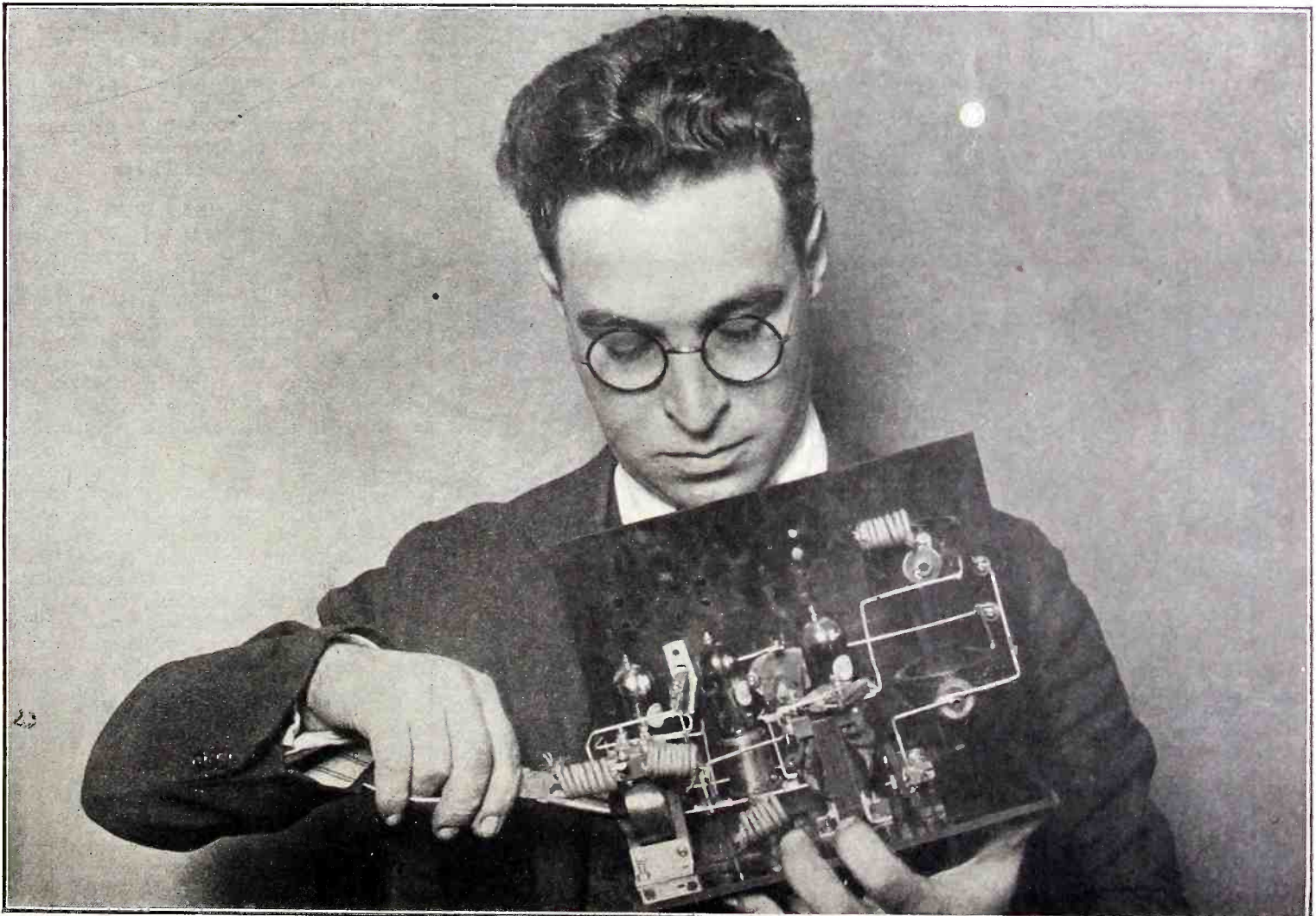
RADIO WORLD

Title Reg. U. S. Pat Off.

ILLUSTRATED

EVERY WEEK

NO AERIAL OR GROUND NEEDED WITH THIS LITTLE SET



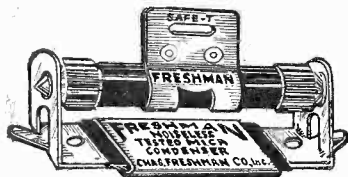
(C. Kadel & Herbert)

Bob Kalmus, of New York City, and the interesting set he has just constructed. It is light, compact, efficient, and has copied many DX stations. See description on page 18 of this issue.

Radio Equipment of the S. S. "Leviathan" (See Inside)

Freshman FIX-O

A Fixed Resistance Leak Combination—4 in ONE



Freshman Condenser Leak Mounting
Freshman Fixed Leak SAFE-T HANDLE

Price Complete **65c**

Furnished in any value of resistance from 1/2 to 10 Megohms

Separate Condenser and Mountings 40c

Separate Leaks with Safe-T Handle 30c

At your dealers. Otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 SEVENTH AVENUE NEW YORK

Marconi Experiments With Directive Radio on New Wave

IMPORTANT developments are likely to result from experiments just completed by Senator Marconi and his staff, who arrived at Southampton, England, last week after a two months' cruise. Marconi said to a New York Times correspondent on his arrival:

"I have been working on a system of directive wireless telegraphy with highly satisfactory results. The new system effectively eliminates atmospheric disturbances. Wireless is still in its infancy."

Marconi has been developing his system of sending direct messages by wireless for many months. On his last cruise he has been experimenting on localization. Whereas wireless messages hitherto have been broadcast and could be picked up by other suitable instruments besides that of the recipient, with the new system it will be possible to send messages by wireless to one place only.

Senator Marconi, in a further interview on the results of his experimental cruise, said they constituted a great progressive step in wireless telegraphy.

"We have transmitted a message up to the distance of 2,500 miles not only with a very much smaller amount of power and energy, but also faster and more cheaply than with the ordinary system of long-distance wireless," he said.

"There is a great increase in efficiency and the cost is much reduced where this system is adopted. It will mean that a power station for long-distance work can be erected at much less cost. I have telegraphed on this system from the Cape Verde Islands, off the African coast, to Marconi House, and I wanted to try telegraphing from Brazil, but time prevented it.

"To send this message clearly and more rapidly over those 2,500 miles took less power than a message from London to Paris by ordinary methods. In fact, it was only a small fraction of the power required. It is done by the utilization of waves that have not been used before, and the production of them makes for efficiency."

During this cruise the yacht "Electra," on which the experiments were conducted, touched at Seville, Gibraltar, Teneriffe, Tangier, Capablanca and Madeira. Thence the yacht went to St. Vincent, Cape Verde Islands. Marconi purposes to go on another experimental trip in a few weeks' time and later to try his new system of long-distance wireless from off the coast of America.

Yours Sincerely

Greenwich Radio Co

185 GREENWICH STREET

NEW YORK, N. Y.

Genuine Western Electric VT2, \$8.00

U. S. L. 24 plate vernier bakelite ends condenser.....\$2.95

U. S. L. 46 plate vernier bakelite ends condenser.....\$3.25

Cockaday Coil, bank wound according to specifications.....\$2.25

Murdock Phones, 2200 Ohms..\$2.95
Nerco Phones, 2200 Ohms.....\$2.55

Complete Stock at Bargain Prices

SEND MONEY ORDER INCLUDING POSTAGE—PROMPT AND CAREFUL ATTENTION

Civil Service Examination to Fill Junior Positions

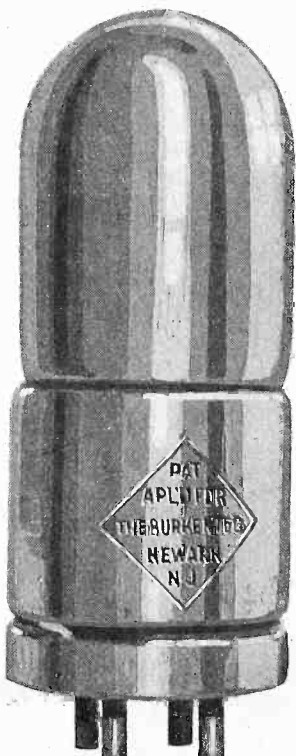
THE United States Civil Service Commission announces an open competitive examination for junior engineer, junior physicist and junior technologist.

The examinations will be held throughout the country on September 5. They are to fill vacancies in the Bureau of Standards, Department of Commerce, at entrance salaries ranging from \$1,200 to \$1,500 a year, plus the increase of \$20 a month, and vacancies in positions requiring similar qualifications.

Examinations will be given in the following optional subjects: For junior engineer, ceramic engineering, civil engineering, chemical engineering, electrical engineering, engineering of materials, mechanical engineering and radio engineering; for junior physicist, electricity, heat, mechanics, optics, physical metallurgy and radio; for junior technologist, general technology, leather technology, oil technology, paper technology, rubber technology and textile technology.

The work of the Bureau of Standards includes many branches of physics, chemistry and engineering, such as mechanics, heat, optics, electricity, sound, metrology, metallurgy, radio, electronics, etc., and offers valuable experience in these professions, combining, as it does, theoretical, experimental and practical work.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post office or custom house in any city.



SAVE YOUR \$6.50 TUBES AND BATTERIES

FOR LOCAL RECEPTION USE

THE BURKE UNIVERSAL DETECTOR

FITS YOUR TUBE SET

NO CHANGE OF HOOK-UP NECESSARY

REQUIRES NO BATTERIES

CANNOT BURN OUT

TESTED AND GUARANTEED

MAIL ORDERS PROMPTLY FILLED

IF YOUR DEALER DOESN'T CARRY THEM

Address

ACADEMY SALES CO.

924 KINNEY BUILDING

NEWARK, N. J.

Price \$2.50 Prepaid
Money Order, Check or C. O. D.

THE FAMOUS SLEEPER TWINS THE FIXED COUPLER AT \$4.00 THE VARIOMETER AT \$6.50

The fixed coupler is the first real improvement in loose or variocouplers in ten years. Looks like the variometer—a wonderful pair.

Sleeper Radio Corporation

88 W Park Place

New York City

VOLUME THREE OF
RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 14. Whole No. 66

June 30, 1923

15c. per copy, \$6.00 a year

“Leviathan” Has Duplex Radio Equipment of Great Power

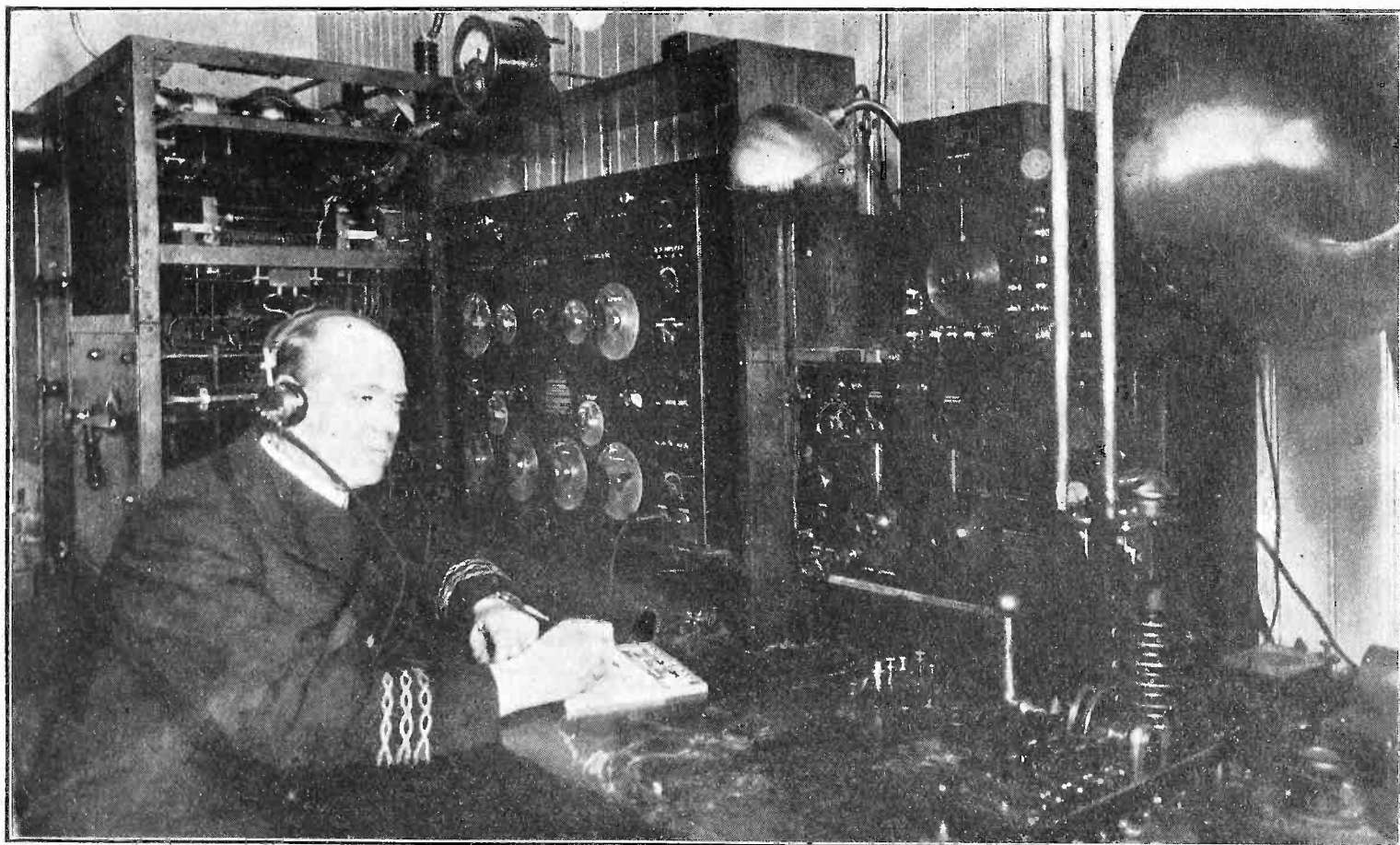
By Charles Raymond

WHEN the reconditioned “Leviathan,” the giant greyhound of the seven seas put out of Boston on a five-day trial trip it boasted the finest radio apparatus that graces any ship afloat. It is the first vessel to be equipped with radio apparatus that will allow simultaneous reception and transmission over a number of wave lengths.

This was accomplished after many months of experimentation by the engineers of the Radio Corporation of America, who equipped and will operate the station. In external appearances the transmitting ap-

paratus greatly resembles the conventional radiophone apparatus used by broadcasting stations of the present date. But here the similarity ends. By a special arrangement of channels and controls it will be possible for anyone on the ship to get into communication with any telephone receiving and transmitting station on land, and talk and listen with no more trouble than is experienced over a land wire. There will be no switching from listening to transmit-

ting, or vice versa, and it is planned to establish a system of stations on land whereby the regular telephone lines can be used and by means of relays the people in the farthest reaches of the United States can be put into instant communication with anyone aboard the ship. A special antennae system is installed, the major one of which is 600 feet long and over 200 feet above the water line. Other antennae are erected and can be switched to any of the apparatus used.



(C. Underwood & Underwood)

Powerful radio transmitters and receivers, allowing perfect duplex operation, installed on the S. S. “Leviathan.”

paratus greatly resembles the conventional radiophone apparatus used by broadcasting stations of the present date. But here the similarity ends.

By a special arrangement of channels and controls it will be possible for anyone on the ship to get into communication with any telephone receiving and transmitting station on land, and talk and listen with no more trouble than is experienced over a land wire. There will be no switching from listening to transmit-

Special tube transmitters of higher power than ever used on board ship before are installed, and communication can be carried on over a radius of approximately 4,000 miles by means of CW, ICW, and phone. The receiver is specially designed and is the most powerful yet made. It is said to have a consistent range of 6,000 miles.

This is the first time that any ship has had radio equipment of such tremendous power and scope.

Pointers on Radio Trouble Diagnosis

By Kenneth Malcolm, A. I. R. E.

THE radio game is certainly discouraging to those who have had perpetual ill luck with their instruments. However, there is a cause for every little squeak and every click, and a careful search will bring all the troubles to the light where you can set about to remedy them. The following description of symptoms covers most of the ailments that are to be found in amateur receiving sets of the more conventional types.

First of all, a mention of the quality of apparatus will not be amiss; this factor cannot be emphasized too strongly. Whereas a set using a given circuit and high quality parts will give extremely fine results, a set using the identical circuit but with inferior parts may not work at all—so great is the difference. Just what constitutes quality in receiving apparatus? Well, let us look at the various instruments and see.

The coils of variometers, variocouplers and other such instruments should be wound on some rigid, non-hygroscopic form; that is, if a tube is used, it should be of impregnated cardboard, hard rubber, or one of the phenol condensation products, such as bakelite, formica or condensite. Wood parts should be thoroughly seasoned and impregnated to prevent absorption of moisture. All lead wires should invariably be soldered. The wire on coils should preferably be insulated with cotton or silk and uncolored.

All insulating parts should be of hard fibre, hard rubber, or one of the phenol products mentioned. Wood is not a good insulator unless perfectly dry and well seasoned. Metal parts should be of copper, brass, aluminum or some material that is non-magnetic.

Condensers are very important instruments and should be chosen carefully. Be sure that the plates are securely mounted and rigid enough to keep from bending, thus either short-circuiting or changing the capacity. Grid condensers, and other small fixed condensers, should preferably have a dielectric of mica. If paper is used, it should be so compressed and impregnated that it is impossible for the foil and the paper to change their relationship to each other. It is best to throw out a condenser whose capacity can be changed by squeezing.

The most common noise in a receiving set is a kind of clicking or grating that may sometimes be mistaken for static. This can be due to only one thing; the microphonic action set up by a loose connection, or an imperfect contact. Go over all your wiring and see that all connections are soldered. Look to your batteries and see that all wires are tight. Possibly a connection is defective on one of your instruments. If the concerts come in intermittently and go out the same way, without any apparent cause, the loose connection is an actuality. Take a peek at your aerial and make sure that it is not blown against some grounded conductor.

If signals come in fine on the detector tube, and not so good on the amplifier, inspect the jacks and the transformers. Many times the jack springs become weak and cause an imperfect connection. You can tell if there is an open circuit in the transformer by connecting it in series with a phone and a dry cell—one coil at a time. If you can get a click the coil is perfect. How are your B batteries? Are you employing the proper voltage for the tube you are using? With certain tubes it is just as much a sin to use too great a voltage as it is to use too little.

Squeals and howls are caused by a number of things, both natural and unnatural. If you are using a regenerative set, the tube would naturally squeal as it passes on either side of the incoming wave mark. If it squeals otherwise, your plate voltage is too high, your filament voltage too high, the regenerative coupling is too close, or else your grid condenser or grid leak is of improper value—possibly it is one of that squeezable changeable kind. Possibly your grid circuit leads run too near to the connections of the plate circuit. If you are using several stages of amplification it is possible that your transformers are too close together; shielding them, separating them, or tuning them at right angles to each other will help this.

If your set howls when you bring your hand near it or take it away, the best thing to do is to extend the shafts and move the instruments farther back in the cabinet, or shield the set with a metal plate fastened on the back of the panel; this latter should be connected to the ground post.

If your set works perfectly for local reception, but makes all kinds of noises when getting distant stations, your trouble is clearly defined. It simply means that you have to use too much regeneration in order to bring in the distant station. Regeneration can be carried only to a certain point; after that the waves become distorted and unintelligible. If it is necessary that you get the station in question perfectly, the regeneration must be cut down, and a stage or two of radio-frequency amplification added.

The tuning may be made sharper, especially in single circuit sets, by shortening the aerial to about say 80 feet, and adding a loading coil to make up the difference.

Those who are bothered excessively with static can move their aerial indoors to advantage, or a temporary aerial can be strung up around the picture molding. If you have a sensitive set, a loop aerial would make an excellent static eliminator; and would also give an added selectivity. Static can be reduced in sets having a loose coupler, or a variometer, by reducing the coupling. The static will be reduced greatly out of proportion to the reduction of signal intensity.

Coils may be tested for open circuits by the method mentioned for use with transformers. Condensers may be tested in the same manner, except that a click in the phone in this case would mean a short-circuited condenser, whereas no sound at all would indicate that it was perfect.

The tubes themselves are many times at fault, and the best thing to do is to test them on some other person's set. Shifting tubes will sometimes help. One particular amplifier tube might work better in the first stage than in the second stage; a detector tube might be better as an amplifier; and vice versa. Soft tubes make poor amplifiers, and all hard tubes cannot be successfully used as detectors.

How are your phone cords? Many times these become broken under the heavy outer insulation and pass detection. Test them, or try a new set of cords. Such a condition would prevent reception entirely or would produce the scratchy noises that have been attributed to loose connections.

Scrambling the Conversation Insures Radio Telephone Privacy

THE radio telephone link between Los Angeles and Catalina Island, 30 miles off the coast of California, has set a new record in the history of communication. It is the scene of the first trial on a commercial basis of a radio telephone system insuring privacy to its users. The radio telephone apparatus which has heretofore established connection with the mainland is now replaced by a new radio development of the Bell System engineers which may be called a privacy system for the radio telephone. The new apparatus prevents any of the receiving sets commonly in use picking up the messages transmitted by this system and converting them into understandable speech.

The wireless "talk bridge" which has given telephone service across the 30 mile gap of water separating Catalina from the California coast is unique in many respects. It was designed and installed in 1920 to give two-way talk between the mainland and an island 30 miles at sea, and has proved in on a commercial basis, giving satisfactory transmission day and night throughout the year.

Now again the Catalina Island radio link is distinguished as the first to be equipped with the wireless

telephone privacy system recently developed by the engineers of the Bell System.

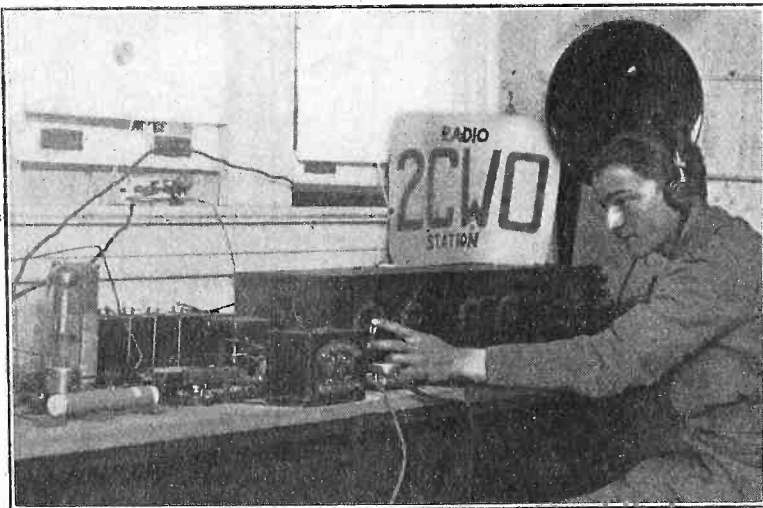
Heretofore talks over the Catalina Island link while clear and understandable to those using the service, have also been picked up by amateur radio receiving stations in the neighborhood, so that the privacy of the usual telephone conversation was lacking. Any radio receiving station in that part of the country, if it happened to be tuned to the right wave length, might get fragments of the talk with Catalina Island, which would be of no interest to the radio listener. Of course, the talker could not tell how far afield his words might accidentally go.

The privacy system was designed by the American Telephone and Telegraph Company to largely remedy this situation. It is not claimed that the new system is absolutely secret, but at least privacy has been obtained, so that no one will inadvertently overhear the conversations which are transmitted by this system.

The new radio equipment which has been installed both on the Island and the mainland will handle telephone messages in such a way that they will be unintelligible to all ordinary radio receivers. In a word, the new sets, before putting the messages "on the air" will distort or scramble them, and no receiving set which is not specially designed or manipulated to unscramble them can obtain anything intelligible.

While anyone familiar with this system, and possibly an ingenious person not familiar with it, might devise a set which could listen to the system, such a set would be much more complicated than the ordinary set, and the added complication would be of no value except for picking up transmission over this system. It is, therefore, not likely that many people will undertake this work.

Such a privacy system may be compared to a lock and key. A person relies upon a lock to secure his house and other property and is not much troubled by the possibility of a thief breaking in to steal. However, this is always a possibility. The privacy system presents an analogous case. For all practical cases it insures the requisite privacy to a radio telephone conversation but it does not make impossible the designing of a special set, near enough like the receiving sets used in the system itself, to transform the messages into more or less intelligible form.



(C. Photonews, N. Y.)

Edward C. Tassi, a Brooklyn, N. Y., amateur and his radio station. He uses a single 50-watt tube transmitter employing the Hartley circuit, and has been heard great distances.

(Concluded from preceding page)

that such good results are so easily obtainable. But you will have to be more particular with your little constructional details. All connecting wires should be kept as short as possible and at the same time they should be well insulated. Do not allow two different wires to rest against the copper foil shielding. If this is done serious capacity leakage will occur if the wires happen to be at a difference of radio-frequency potential.

While this outfit is not so compact as some other types of summer receivers still I think that for reliability of results it is worth the increased bulk. Of course, if you prefer loud speaker operation one or two stages of audio-frequency amplification ought to be employed. If this is done it will not be absolutely necessary to use a separate set of "A" and "B" batteries for the amplifier, since the same "A" and "B"

of the detector will amply serve. But it will be advisable to use a separate small flashlight type of "A" battery for each tube. Of course, if the No. 6 type of dry cell is used for the detector "A" it will be large enough to supply filament current to the amplifier tubes as well. For average usage 45 volts on the plate of the radio-frequency tube, about 22 volts on the detector and 45 on the audio-frequency tubes, if audio-frequency is employed, will be about the right "B" potentials. To enhance portability the small style of "B" batteries can be used. The set could have been designed to use choke coils and telephone size condensers, but it is cheaper and more reliable to employ separate "A" and "B" batteries. The UV199 tubes, as I have said before, are the ideal tubes for this set because they draw little current for filament use and an ordinary set of two flashlight cells is enough to supply current for quite an extended period.

"Radio Movies Are Here"—Jenkins

By Washington R. Service

THE near future will see the perfection of radio movies; essentially, they are here to-day. Every "listener-in," with the aid of a special apparatus, contained in a box about a foot square, and a small curtain, will be able to see as well as hear over the versatile radio, according to C. Francis Jenkins of Washington, D. C.

Last week Professor Jenkins, who has previously demonstrated the transmission of still pictures by radio, showed on a screen in his laboratory the movements of his hand and other objects held in front of his radio transmitting apparatus in another room. The apparatus used in transmitting still pictures was employed in the last experiment, but a new "lens-faced prismatic ring" was introduced to show a rapid succession of pictures depicting movement.

Perfection of the moving picture radio transmitting set now awaits only the manufacture of a new and more powerful electric lamp of the "corona-glow" type. In the recent demonstration a temporary lamp was made by the inventor but it is not strong enough to transmit large pictures. The question of rapidity is solved, Professor Jenkins says, as he has already sent pictures at twice the standard movie speed. What he needs is a better and stronger lamp which will stand up when the signal strength is increased about 3,000 times, as is necessary in sending pictures in motion.

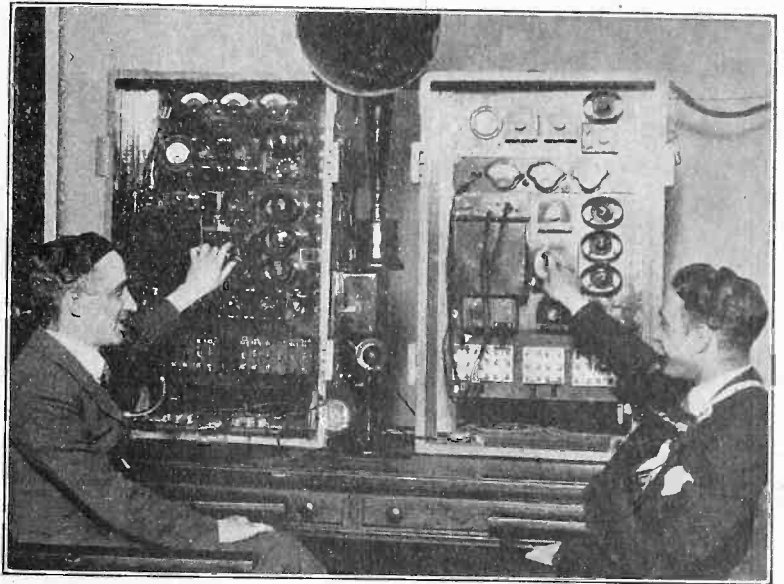
Not only actual pictures of moving bodies can be transmitted, by pointing the machine at them, but films can be broadcast, he claims, as shown on screens in theatres or homes where proper receiving and reproducing apparatus and a screen are available. When the power of the light is raised the size of the picture can be increased, it was explained.

Radio experts of the Navy, who saw the first demonstration between two rooms of Professor Jenkins' laboratory on Connecticut Avenue, say that the invention is adaptable in military operations as well as in commercial fields. They point out that a transmitter used in an airplane over the enemy fleet or trenches, would give officers far in the rear an actual view of the

fall of shells and all front-line activities. In the commercial field, with some adaptations, moving picture distributors might transmit their films to subscribers via radio instead of by express, saving time and the making of many copies.

With the completion of his new lamp, probably not sooner than several weeks, Professor Jenkins promises to give a long-distance demonstration, transmitting pictures of objects in motion and perhaps films, between Washington and probably Philadelphia.

Four Large Broadcasters Operate Simultaneously



(C. Photonews, N. Y.)

For the first time in history four radio stations broadcast the same program, although separated by many miles. The annual convention of the National Electric Light Association at Carnegie Hall, New York City, was broadcast through Stations WEA, KDKA, KYW and WGY, first relaying the speech over land lines by means of the double set of speech amplifiers shown here.

Radio Frequency Indicator for Broadcasting

AT the recent Second National Radio Conference held in Washington, it was resolved:

"That every broadcasting station should be equipped with apparatus such as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within two kilocycles of the assigned wave frequency."

The Bureau of Standards has designed a preliminary model of a radio frequency indicator to meet the above need and has prepared specifications covering its construction. These specifications may be had by any broadcasting station upon request.

The instrument consists essentially of a 72-turn space-wound coil on a 3¾-inch tube, an air condenser, and a sensitive thermo-galvanometer. These three elements are connected in series. The condenser, which is of the variable type, is provided with a locking device so that it may be locked and soldered into position after the instrument has been adjusted to indicate the required frequency. This instrument may be set to in-

dicating any radio-frequency in the range from 1350 kilocycles (222 meters) to 550 kilocycles (545 meters).

If any instrument is constructed according to the specifications and sent to the Bureau of Standards Radio Laboratory, by a licensed broadcasting station, it will be adjusted for a nominal fee to operate at the frequency of the station.

Who Is Your Favorite Radio Entertainer?

THE editor of RADIO WORLD is interested in finding out just what kind of entertainment and just which entertainers are most appreciated by listeners throughout the country.

We should be glad to have you, as a RADIO WORLD reader, write us and let us know, in a short letter running from twenty-five to fifty words, the kind of entertainment you like best and the name of the man or woman who has most appealed to you as a radio entertainer.

Address Editor, RADIO WORLD, 1493 Broadway, New York City.

Hints and Tips for the Radiofan

Shop Kinks, Short Cuts and Easy Rules of Thumb for Amateurs

UNDER this heading RADIO WORLD will publish from time to time helpful hints that the average fan is not aware of and that will help him to get the most out of the construction and operation of his set. Such things as shop hints and little warnings of what not to do and what to do in the use and care of a set will be told in such a manner as to be of real practical value.

Phones—How To Take Care of Them and Use Them Properly.

By C. E. Brigham,

Radio Engineer, C. Brandes, Inc., New York City

Telephone receiver apparatus is one of the most delicate of the sensitive instruments used in or around a radio set. Therefore, a certain extra amount of care should be taken of them, if they are to render the



(C. Underwood & Underwood)

A summer's day at Rye Beach, N. Y. First a sea bath and then a rest in the canoe while the radio concert comes in. Almost ideal, what?

exacting service that they should and do it in the proper manner.

The average amateur would do well to memorize a few good rules that will prolong the life of the phones and help them to give him perfect service. Some of these are:

1. Don't try to find out what is inside of your receivers. By doing so you spoil the tone quality by disturbing the setting and also destroy the perfect tone matching of the two receivers.

2. Don't drop your receivers from a height of greater than three feet. To do so you will cause the magnets to lose their magnetism and render the phones useless. It has been proven that a good phone should stand a jar occasioned by a drop of three feet without any great harm. But don't try it just to prove it—take it for granted and take care.

3. Don't connect up your telephone receivers at random. There is a correct manner in which receivers should be connected when used with a set. This is especially true of a vacuum tube receiver. Make sure of the polarity of your cords when hooking up your phones in a plug. Trace your connections.

4. Don't blame the headset for every trouble which occurs. Check up the rest of your set.

5. Receivers should not be re-magnetized unless

the proper equipment for doing so is at hand. You cannot do this by connecting them across a 110 volt current. If you do so you will burn out the wires which are finer than a human hair.

6. A headset should not be judged by its direct current resistance, but by its alternating current opposition which is known as its "impedance."

7. It is a good plan to have a convenient hook to hang your receivers on. This prevents any chance of them being dragged or pushed off the table onto the floor, and makes a much neater appearance.

8. If you think your receivers are losing sensitivity send them to the manufacturer and he will fix them. Don't attempt it yourself—it is the work of an expert.

9. Always keep your phone cord dry. Do not let acid come in contact with them.

10. An ordinary receiver is not a loud speaking phone and should not be used as such. Loud speakers are specially made to stand heavy currents and it is poor policy to use regular head phones in conjunction with a power amplifier.

11. Phones are poor battery testers and batteries are poor for phone testers. Do not use head phones where there is current flowing. The current normally flowing in the plate and phone circuit is of minute quality and the fact that you are using 22½ or 45 volts in the circuit does not mean that phones will stand that direct current through them. They will not.

12. The correct manner to connect up numerous pairs of phones is known by few people. If you are using

A—2 pair—they should be connected in series.

B—3 pair—they should be connected in series.

C—4 pair—they should be connected in series—parallel groups of two each. Two in series and the lot in parallel.

D—6 pair—they should be connected in series-parallel—three groups of two each. Two in series and the three groups in parallel.

Shop Kinks for the Amateur Worker

When turning down or dressing a rough casting, and it is not desired to use your good tools, try using an old file sharpened to a flat or sharp edge as needed by the class of work.

Bakelite will sometimes swell when worked fast. Tools used for drilling or cutting bakelite should not be forced or their temper will be lost. You may be in a particular hurry to drill a piece of bakelite, but you will lose a good drill, or saw if you force it. Take it easy, and stop when it shows signs of heating.

Good work cannot be accomplished with dull tools. It only takes a minute to keep them sharp with the aid of an oil stone, or emery wheel, and you can do much neater work.

If your drills go dull on you don't try to sharpen them unless you understand how. A good drill has a certain angle for each type of work, and if you don't understand it, you run a chance of spoiling your drill and the work also. Take it to some one in the shop who knows.

A handy marker for use when drilling and sawing a polished panel can be made from an old nail punch sharpened to a point.

Pitfalls of the Radio Investigator and Inventor

By *Everett N. Curtis*

(Concluded from last week's RADIO WORLD)

[*Everett N. Curtis, the author of this article, is the lecturer on patent and trade-mark law at Columbia University and is a patent solicitor in active practice in New York City. He is the author of Curtis' "Manual of the*

Sherman Law" and a number of monographs. He was graduated from the Massachusetts Institute of Technology in 1898 and from the Boston University Law School in 1900.—Editor, RADIO WORLD.]

ANOTHER matter to be considered by the inventor is the importance of preserving the dates of his invention. If he obtains a patent and thereafter brings a suit, it may be advisable to show that he conceived his invention and reduced to practice before the person who is claimed to be a prior inventor, or prior user, or author of a prior publication. Such proof may also be important should he be thrown into interference in the Patent Office during the prosecution of his application. No inventor's mere say so, uncorroborated by other evidence, will be sufficient to establish the date of invention. There must be evidence of disclosure to others, drawings or writings, or the embodiment of the invention in some perceptible form. Memorandum books with dated and witnessed sketches and descriptions are often used to prove the date of conception. All inventors should have such books or memorandum sheet, and should carefully preserve the same. As soon as the creative thought occurs to the inventor, he should record the same in his memorandum book, and if possible should fully illustrate the same with sketches. When he has done this, he should have the same witnessed and signed by one or more witnesses. Letters written to some member of the inventor's family or to a friend, making the same disclosure, are also good evidence, particularly where the envelope showing the cancellation date of the Post Office is preserved. Probably the best evidence outside of a reduction to practice is an affidavit with attached sketches before a notary public, with his seal attached. But even the establishment of the first date of invention may come to naught unless the inventor is shown thereafter to be diligent in reducing his invention to practice. The inventor should, therefore, be prompt in trying out his invention in some practicable form; his work must be promptly finished physically as well as mentally. If he waits too long between conception and reduction to practice some other inventor who may independently conceive the invention subsequent to his date of invention but who first reduces to practice may be held to be entitled to the patent because of the want of diligence of the earlier inventor. Reduction to practice may be accomplished in two ways. *First*, by carrying out a process on a commercial or practicable scale, by constructing and operating a practicable machine, or by producing an article of manufacture, or composition of matter, or *Second*, by filing an application for patent, which operates as a constructive reduction to practice. In any event the inventor, should take care, in so far as possible to make his disclosures to persons of intelligence, since otherwise he may jeopardize his rights if he depends upon evidence of witnesses who

do not rightly comprehend the invention or its purposes, and cannot therefore clearly testify as to what the disclosure really was. Memoranda, sketches, and letters if once established speak for themselves, it is true, but corroborating witnesses if not intelligent may make difficult even the establishment of such written evidence.

Another matter sometimes overlooked by the inventor is the necessity of making a full disclosure in his application for patent. If the patent attorney who draws the application has not all of the facts as the inventor knows them, such inventor should not complain if he finds his invention is not fully covered and protected. If possible, the inventor should supply his attorney with the fullest possible written description of his invention, together with working or intelligible drawings. If the inventor must supply his description verbally, let it be very full and complete. Furthermore, the inventor should insist that he be permitted to take home and consider the specification and claims after the same have been prepared by this attorney, and after he receives such specification he should read the same with the utmost care to be sure nothing has been left out. After the application has once been filed, while the full opportunity is otherwise afforded for amendment, the Examiner will not permit *new matter* to be added. The inventor should also study the claims, which are the measure of the patent, and carefully bear in mind that everything which is not claimed is dedicated to the public. He should also consider that the more carefully prepared the specification and claims of the application, the more valuable will be the patent when issued. If he hurries his patent attorney, or in his anxiety to get a patent at the least possible expense, employs inferior talent, he must not be surprised if his patent when issued is of such narrow scope as to be of little or no value. If, therefore, the inventor finds himself in a position where by reason of lack of means, he is unable to employ a solicitor of standing and experience, he should endeavor to seek out and interest some person with capital in his invention. It is better by far to have a half interest in a valuable patent with broad claims than the whole interest in a patent with claims so narrowed that they are limited to the precise device shown and can be easily avoided without penalty.

The inventor should also consider the two years statutory bars of the statute, and take care not to use his invention commercially or publicly for two years before applying for a patent. A public publication or use two years prior to an application completely bars an inventor to the right to a patent. If therefore any person, including the inventor, has de-

(Continued on next page)

(Concluded from preceding page)

scribed such invention in a printed publication or has used the invention for more than the two years prior to his application the inventor forfeits his rights unless he can show such public use was entirely his own and was experimental in character. An example of such experimental use is that of an invention for a city pavement, where it might be necessary in order to test the same experimentally, to employ more than the two years public use. Courts, however, are prone to look askance at the suggestion of experimental use in reply to the defense of public use, so that it is wise to avoid experimental use by the inventor if possible.

Where an employee invents, even though the invention is made during hours of employment, and the employer pays for the prosecution of the application, all that the employer will obtain in the absence of any express agreement is a shop right or at the most an implied license. The right to the patent still remains in the employee. Where there is an express agreement that the employee will assign to his employer all his inventions relating to the employer's business during the period of his employment, the courts will enforce such agreement and compel the inventor to assign. Agreements, however, of this character are strictly construed, and unless the word assign or the equivalent is used, the tendency of the courts is to give the employer only a shop right in the invention. If the agreement were not restricted to a particular class of inventions, or to the business of the employer, and required the inventor to assign to his employer all his inventions of any nature whatsoever, the court would hold such an agreement to be in restraint of trade and would refuse to enforce it.

The patent law requires all assignments of patents as against a subsequent purchaser or mortgagee for a valuable consideration without notice, to be recorded at the Patent Office within three months from the date of the assignment or prior to such subsequent purchase or mortgage. Except, however, as against such purchaser or mortgagee, recording is not necessary to the validity of the assignment or chain of title. This clause is not very important as to the inventor, except as he may desire to protect the interests of assignees, or except perhaps as he himself may acquire patent interests. Any person purchasing a patent should cause a search of the title to be made at the Patent Office at Washington in order to make sure that such title is clear, and should in general take the same precautions as if he were taking title to a parcel of real estate.

By joint inventors is meant those inventors who together create a single invention. They are entitled to a joint patent, but neither of them can obtain a separate patent for the invention. If they desire they may file separate or joint applications, but only one patent will issue. The fact that one person furnishes the capital and another makes the invention does not entitle them to make an application as joint inventors, but in such case they may become joint patentees upon the inventor assigning an undivided interest to his colleague. Independent inventors of distinct and independent improvements on the same machine cannot obtain a joint patent for their separate inventions. In such case a separate application should be filed for each inventor. Since it is but rarely it can affirmatively be shown that two or more persons have joined in the creation of the invention, very few applications for a joint invention are filed. Great care should be exercised by the inventor where he supposes he is a joint inventor. In many cases it will be found after carefully sifting the facts there is in reality but one

inventor, and if such inventor is so careless as to permit another person to be joined with him as joint inventor, the results may be very serious in case of litigation. After the patent for a joint invention has been issued, if it develops that the invention is not in fact joint, the patent will be declared to be void.

In some instances it may be determined that particularly where a process is concerned that such process will be held secret. In case the inventor determines upon such course, he should carefully bear in mind that once he has determined to keep his invention secret, while availing himself of the results commercially, he may if such secret use is long continued, lose his rights to a patent. In some cases the inventor after using his secret process for a number of years has become alarmed lest such process through the unfaithfulness of an employee might be divulged to the public and has made application for and has received a patent for such process. Where such facts, however, have appeared to the court, it has been held, in the case of a concealment for the purpose of profit over a long period of years, the patent will be held to be void because of constructive abandonment or forfeiture of the right of an inventor to a patent.

So far as concerns foreign countries, the inventor should bear in mind that once the invention is divulged to the public, either in the form of a patent or other printed publication, such publication will become a bar to the issuance of a patent. This applies particularly to foreign countries, there being an exception relative to U. S. patents in the case of the inventor himself who is not debarred from receiving a patent for his invention in this country by reason of its having been first patented by him abroad, unless the application for the said patent was filed more than twelve months prior to the filing of the application in this country. The proper course to pursue in the ordinary case is after notice of allowance is received by the inventor in this country, to utilize the six months in which he is to pay his final fee for the filing of such applications in foreign countries as he may desire. In this country a patent does not go to issue, that is become published, until the final fee has been paid, and since the inventor has six months for such payment he has ample time before paying such fee to file his applications abroad.

Another important matter to be considered is that of constructive abandonment of an invention. This occurs where the inventor by reason of indifference or otherwise permits others to use his invention without objection over a substantial period. Where the invention has been thus abandoned the right of a patent is gone on the theory that where a gift is once made to the public it can never be taken back. Sometimes where an inventor has ceased experimenting upon a particular device which has proved defective for the purposes for which it was designed, such situation gives rise to the presumption of an abandoned experiment. Once the inventor has exercised his creative faculty and has conceived an invention it is accordingly incumbent upon him to proceed diligently in perfecting his invention and applying for a patent, since otherwise, his lack of diligence or slothfulness may be construed as an abandonment, in which case his right to a patent is entirely gone.

Such are the main pitfalls to be encountered by the ordinary inventor in this country, most of which may be avoided through the use of ordinary care on the part of the inventor. At all times the inventor should bear in mind the maxim of the equity courts, in which most patent cases for infringement are tried, which is that equity aids the vigilant, not those who slumber upon their rights.

RADIO PRIMER

For the New Army of Radio Beginners

By Lynn Brooks

AUDIO-FREQUENCY AMPLIFICATION: In a receiving circuit consisting of the regulation tuning circuit and rectifier or detector, no more current can be made to flow through the phone circuit than is originally found in the circuit itself. Self amplification is possible through regeneration as previously stated, but even this method has its limits. To make the received signals louder means have to be employed to step up the current and for this purpose amplifying circuits are employed.

A properly designed audio-frequency amplifying circuit bears a great resemblance to a tuned detector circuit as can be noted by comparing the two. The main difference in the two is that a transformer is used and there is no condenser in the grid circuit, as the signals are of audio-frequency (15,000 cycles or lower) and they are pulsating direct current and do not have to be rectified. The amplifying transformers used bear a great resemblance to the ordinary step-up transformers used in low frequency work. An iron or steel core is wound with a great number of turns of very fine wire. Over this is wound another coil of wire, generally of a smaller size wire, and with $3\frac{1}{2}$ to 10 times the amount of wire of the first coil. Upon the ratio of one winding to another depends the ratio of the transformer.

This transformer is inserted in the place of the phones, the primary or smaller winding taking the place of the phone windings. The secondary is connected in the grid circuit of the second tube. When a current is flowing in the detector circuit an induced current is caused to flow in the secondary winding. As this winding is connected in the grid circuit, any current flowing in it will be correspondingly heard in the phone circuit of the second or amplifying tube. This current, due to the fact that the transformer steps up the minute currents allows a very weak current in the first tube to be heard, with a corresponding increase in strength in the second tube.

It is to be understood however that audio-frequency amplification will not allow the amplification of signals which cannot be heard with the detector alone.

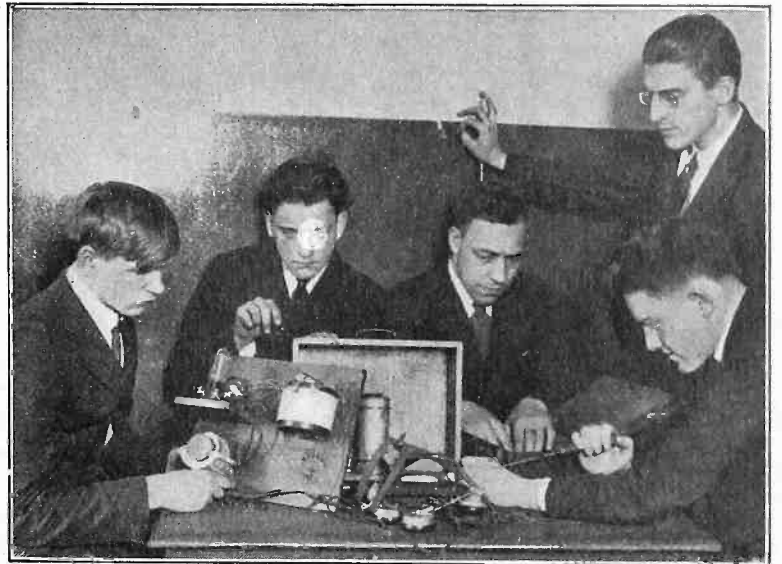
When handling audio-frequency amplification circuits, certain precautions must be observed. Due to the fact that there is an electromagnetic field of considerable strength generated around a transformer, it is necessary to see that the transformer is not placed in such a manner that the field will interfere with the other parts of the circuit.

Should this occur, howling and inter-tube noises will be generated and the circuit will not give the good results that are desired of it. It should also be borne in mind that if more than one stage of amplification is used the transformers should not be placed too close together, and they should be so placed that their magnetic fields will not interfere with one another. It is always a good plan to place the transformers at right angles to one another. Occasionally it is of value to surround the transformers with a metallic shield, and then ground the shield. This effectively prevents interstage coupling, or noises due to the magnetic field of one tube setting up induced currents in its neighbor.

When using more than one stage of audio-frequency amplification it is generally the best practice to use a lower ratio transformer in the second step than in the first. This of course varies with the tube used, and as each type of tube has its own internal characteristics, the manufacturer generally specifies a certain ratio transformer, when used as a first or second stage.

When more than two stages of amplification are desired it is best to use what is known as the push-pull transformers, with two tubes in parallel. If more than two stages of straight amplification are used the signals will be distorted, whereas if the power amplification idea is used the signals will not be distorted due to the fact that the current is evenly divided between two tubes and they are not overloaded.

Blind Boys Build Radio Sets



(C. Kadel & Herbert)

Making radio sets that will function efficiently is a hard task for one possessed of all his senses. But when one is blind, it is an extra hard task. Olaf Larson, Stanley Wartenberg, Christopher Cerone and George Keene, four boys from the New York Institution for the Blind, are here shown constructing a tube set under the instruction of Arthur Richmond.

A Warning About Radio Stocks

IT is natural that a field so prolific and progressive as that of radio, should attract the stock vultures who already have started out to corral the dollars of the unwary investor.

There are several good radio stocks that are worth buying.

Many of those offered are not worth even as much as a German mark.

Although the Hennessy Radio Publications Corporation has a limited amount of stock of its own to sell, this is not written for the purpose of inducing any of our readers to buy a single share of it. It is written,

however, in an effort to save the hard-earned dollar of our readers in cases where an investment would in all probability lead to total loss.

If you intend buying radio stocks of any kind, tell us just what is in your mind. We will make an investigation at our own expense and let you know the results. You will find that we will praise the right kind of stock investment just as honestly as we will tell you the truth about some of the wildcat radio stocks now being offered.

Address Financial Manager, RADIO WORLD, 1493 Broadway, New York City.

The Old Reliable Variometer Hook-Up

By C. C. Hermann, M. E.

I HAVE heard a good deal of complaint against the variometer hook-up, in fact so much that I decided to build a set and find out for myself whether or not such complaints are justifiable. I have had this hook-up in operation about a year and with a summer's and winter's experience in the background I believe I can safely recommend it to those desiring a variometer receiving set. Before presenting the hook-up and a description let us analyze some of the more common complaints.

Complaint number one: Difficulty of tuning due to body capacity. This trouble is experienced with variometers and can be overcome by any one of three methods of construction as follows:

1. By shielding the set. Shielding consists of a thin copper sheet attached to the back of the panel. Sheet copper of 30 gage will be just the thing. Approximately the same results can be obtained by the use of tin foil glued to the back of the panel. The shielding material must be cut away around all instruments and binding

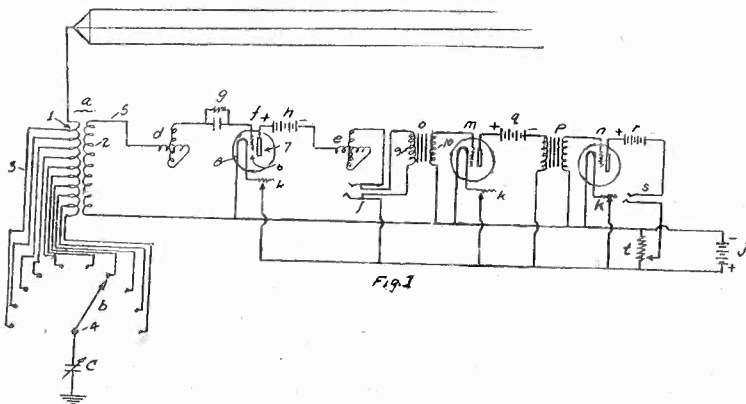


Fig. 1. Schematic hook-up of three unit regenerative set with two steps of audio-frequency amplification.

posts in order to maintain insulation between all parts of the set. The shielding material is, however, grounded to the ground binding post. Shields may also be placed between the instruments and are an assistance in tuning-in.

2. By locating the variometers a distance back from the panel. The variometers may set several inches back from the panel and a shaft extension of non-conducting material such as bakelite or hard rubber used to attach the dial.

3. By proper manipulation of the tube rheostats. If the tube filament current is turned down while tuning and when a signal is obtained then turned up to increase the volume, body capacity will be minimized.

Complaint number two: Inability to tune closely. This is due to improperly constructed instruments. The variometer, to tune closely, must be constructed with a minimum amount of clearance between the windings. It is almost impossible to obtain efficient operation with a home built variometer unless the builder is equipped with the necessary tools and has the ability to form the windings. The outer winding should be placed on the inside of the outer shell and as close as it is possible to get it without actually touching the inner winding, which is wound on the rotor.

Complaint number three: The variometer set takes up so much room. It is true that the variometer set requires more room than other types of hook-up. The variometers must not be placed too close together; however, by placing a shield between them space may be conserved. I placed the detector tube between the

grid and plate variometers in my set and had good success.

Complaint number four: The variometer set costs more to build than other sets. This is primarily due to two reasons—the extra space required, as the panel must be somewhat larger for the detector and consequently a larger cabinet is required, and the variometer if of first class design and accurately constructed constitutes a higher price article.

Referring to the diagram the various elements are as follows: The variocoupler is shown at a, having 60 turns of No. 24 gauge, cotton-covered magnet wire on the stator (1) and with ten taps (3) connected to the variable switch, shown at b. The center terminal (4) of the switch is connected to a 43-plate variable condenser (c) of .0005 microfarads capacity. The rotor (2) of the variocoupler has 40 turns of No. 24 gauge, cotton-covered magnet wire. A wire (5) connects one terminal of the variocoupler rotor to one terminal of the variometer (d). The variometer (d) and (e) are constructed with 56 turns of No. 24 gauge, cotton-covered wire on rotor and stator. The electrical connection between rotor and stator must be positive so that the winding is continuous, there being two terminals on the complete instrument. The variometer (d) is known as the grid variometer and the variometer (e) the plate variometer. The detector tube, which is a Radiotron U. V. 200, is shown at f. A grid leak and grid condenser of mica construction and having a fixed capacity of .00025 mfd. is shown at g, connected between one terminal of the variometer (d) and the grid (6) of the detector tube. The plate (B) battery shown at h is a 22 1/2-volt Eveready T22-15 cell, with its positive terminal connected to the plate (7) of the tube (f), and its negative terminal connected to one terminal of the variometer (e). An (A) battery is shown at j, and used to heat the filament (8) of the detector tube (f), and also the filaments of the amplifier tubes. The negative side of the (A) battery, shown at j, is connected to the remaining terminal of the variometer rotor (2), shown at a. Another lead is taken from the positive side of the (A) battery for the remaining terminals of the tube filaments. The filament (8) of the detector tube (f) is connected to the (A) battery circuit by taking a wire from one of its terminals direct to the negative side of the (A) battery. The remaining terminal is connected to one terminal of the rheostat (k), the other terminal of the rheostat being connected to the positive wire of the (A) battery. A telephone jack (1) is inserted between the one remaining terminal of the plate variometer (e) and the positive side of the (A) battery. This completes the detector circuit, and by plugging in the head set nearby stations should be heard.

The tuning in is effected by turning the coupler and grid variometers (d) back and forth, first one way and then the other, and, at intervals, moving the coupler switch (b) to intermediate steps until a signal is heard. As soon as a signal is heard leave the coupler and tune as closely as you can with the grid variometer (d), then move the plate variometer until the signals are clearest. The signals may be brought in clearer sometimes by adjusting the tube rheostat (k) slightly one way or the other.

Best results are obtained by the addition of one or more stages of amplification. In the circuit shown two stages of amplification are used. The amplifiers consist of the tubes shown at m and n, and are Radiotron U. V. 201. Amplifying transformers are shown at o and p, and plate batteries of 43-volt T22-27 cells each are shown at q and r. The primary (9) of the transformer o is connected through

(Concluded on next page)

(Concluded from preceding page)

the telephone jack (1) to the plate variometer (e) and the positive wire of the "A" battery. The secondary winding (10) of the transformer o is connected to the grid of the amplifier tube m and the negative wire of the "A" battery. The plate of the amplifying tube m is connected to the positive side of the "B" battery (q), the negative terminal of this battery being connected to the primary of the second transformer (p). The filament of the tube m is connected direct to the negative wire of the "A" battery and the rheostat to the positive wire of the "A" battery. The remaining terminal of the transformer (p) is connected to the positive side of the "A" battery. One terminal of the secondary

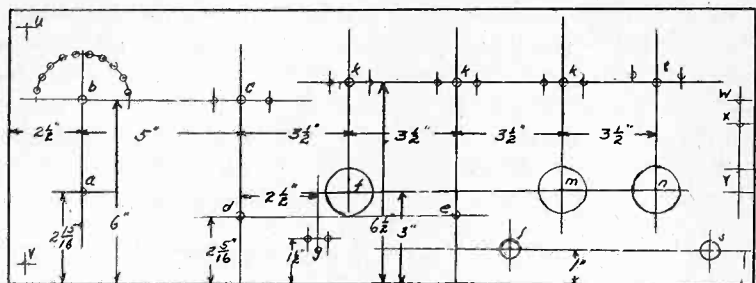


Fig. 2. Panel layout for set described herewith.

winding of the transformer (p) is connected to the negative lead of the "A" battery and the other terminal to the grid of the amplifying tube (n). The plate of the tube is connected to the positive side of the second "B" battery (r), which is identical with the "B" battery shown at q. The negative side of this battery is connected to the telephone jack (s). A wire is then connected to the remaining terminal of the telephone jack (s) and the center terminal of the potentiometer (t). The two terminals of the potentiometer are connected between the two leads of the "A" battery.

The layout of the panel is shown in Fig. 2. The panel is of bakelite, 3/16 inch thick, 8 inches high and 24 inches long. The locations of the various instruments are shown by letters, a being the variocoupler, b the coupler rheostat, c the variable condenser, d the grid variometer, e the plate variometer, f the sight hole for the detector tube, g the grid leak fixed condenser, k the tube filament rheostats, l the telephone jack for detector only, m and n the amplifying tubes' sight holes, s the telephone jack, and t the potentiometer. The lead-in binding post is located at u, the ground binding post at v, the "A" battery negative binding post at w, the "A" battery positive binding post at x, and binding posts for the loud-speaker at y.

In Fig. 3 is shown a front elevation of the panel A, a plan view of the cabinet B, and the various connections diagrammatically. The primary or antennae circuit consists of the lead-in shown at 1, connected to the binding post 2. A connection is taken from this binding post 2 to the binding post 3 of the variocoupler a. The ten taps from the primary winding of the variocoupler are shown at 4. The variocoupler switch 5 has a connection taken from its center terminal 6 to the terminal 7 of the variable condenser C. Another connection is made at terminal 8 of the variable condenser c to the ground binding post 9, from which a wire 10 goes to ground 11. The ground is preferably a water pipe; however, an iron stake driven into moist earth will give satisfactory results.

The secondary high-frequency circuit starts with the rotor of the variocoupler a. The rotor has two binding posts, 12 and 13. A wire 14 is attached to the binding post 13 and connects at its other end to the binding post 15 of the potentiometer and thence to the negative binding post w. Another outside connection is made between this binding post and the negative terminal of the "A" battery, shown at j. The second wire 16 is taken from the variocoupler terminal 13 and connects to the terminal 17 of the variometer d. The remaining variometer terminal 18 is connected to the grid terminal marked G of the detector tube f through the grid leak and fixed condenser g, mounted

on the panel. The plate terminal marked P of the detector tube f is connected by the conductor 19 to the positive terminal of the 22 1/2-volt "B" battery h. Another conductor 20 is attached to the negative terminal of this battery and attaches to the terminal 21 of the plate variometer e. The other terminal, 22, of the plate variometer e is connected, through the telephone jack 1, to the primary terminal marked P of the transformer o. The other terminal of the primary coil of the transformer is connected to the negative wire 14 at the point 23 after passing through the telephone jack 1. The positive wire of the "A" battery is shown at 24, and starts with the terminal marked F of the filament of the detector tube f. This conductor attaches to the terminal 25 of the potentiometer t, and has a lead 26 taken off at this point, which connects to the positive binding post x. An outside conductor connects the positive terminal of the "A" battery s, shown at j, to the positive terminal x. The other terminal of the tube filaments, shown at 27, on detector tube f, also amplifier tubes m and n, has a wire 28 connecting it with the filament rheostats k, k, k. The central terminal of the rheostat is connected by wires to the negative wire 14 of the "A" battery. It will also be noticed that one terminal of the transformer secondary coils is connected to the positive wire 24 of the "A" battery, thus completing the circuit supervised by the

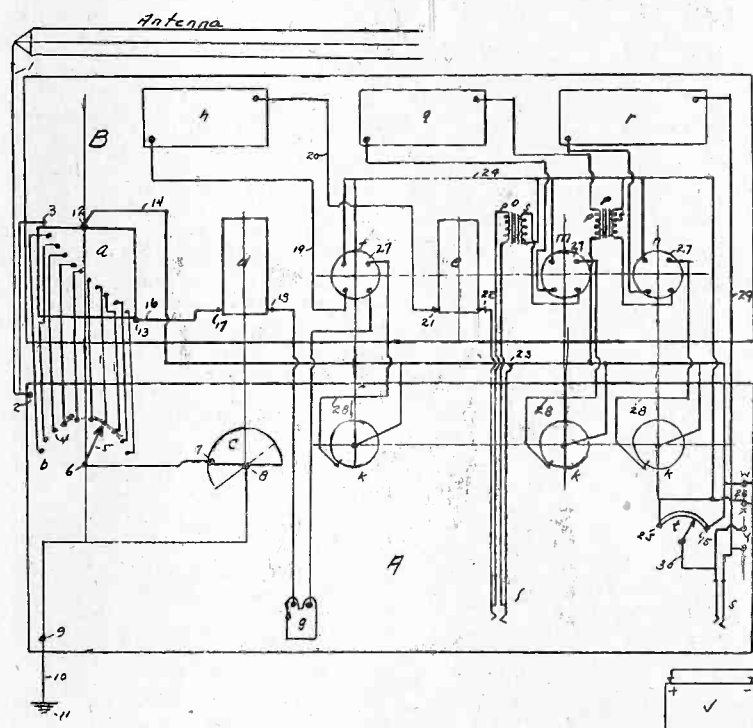


Fig. 3. Plan view of set showing location of various instruments and controls.

"A" battery. The other terminal of the secondary coil of the transformers o and p connect to the grid terminals of the amplifier tubes and marked G. The plate terminals marked P of the amplifying tubes m and n connect to the positive terminal of their respective "B" batteries, q and r; the negative terminal of the "B" battery marked q being connected to the primary terminal marked P of the transformer p, and the negative terminal of the "B" battery marked r is connected to the telephone jack s by the conductor 20. The telephone circuit is then completed by taking a connection 30 from the center terminal of the potentiometer t. Taps are also taken off of the conductors 29 and 30 to the loud-speaker binding posts y in the front of the panel.

One important matter that should not be overlooked in building a receiving set is the soldering of the connections. Every connection should be scraped clean and soldered securely to prevent corrosion and looseness. A corroded joint causes a high resistance, and the incoming signals, being weak at best, should be given the least resistance possible. All connections should be made just as short as possible.

We Hope You Are Not Classified Here

THE chap who tunes by the "beat note" method and successfully establishes a record of being the best hated amateur or broadcast fan in the vicinity.

The pest who is always blowing about his DX accomplishments and then when you show up at his house tells you that he is so sorry "but my B battery just ran down."

The much loved young man who is always making a new set, with the result that his neighbors are kept awake until near morning by his hammering and sawing. And then after he gets it up, are also kept from the arms of Morpheus by his two stage loud speaker with power amplifier.



(C. Kadel and Herbert)

The bug hit him hard, as can be seen by the photograph. He takes his small crystal set along with him, and even though five stories in the air, Michael Bourke manages to enjoy WDT during his lunch hour.

The modest young man who runs over to his neighbor's house with his storage battery and asks to charge it, "because we are going to have a party tonight" and then doesn't invite you.

The bright human being that insists that you "stay just another few seconds—he must be on tonight" and keeps you for several hours while he is hunting for PWX, just when you are too tired to appreciate even Galli-Curci.

The modern scientist who insists on explaining the working of your circuit to you—whether you understand or want him to or not.

The optimist that always laughs when you blow a tube and with an intelligent expression tells you that "you can get plenty more in the stores."

The entertainer who insists on singing seventeen choruses of that popular and idiotic ditty, "Yes, we have no bananas."

Active Broadcasters Total 595

THERE were 595 active radio broadcasting stations on June 16, according to the Department of Commerce records. Of these stations, 180 are in Class A, 42 in Class B, 372 in Class C, and 1 in the experimental Class. A gain of four stations is shown over the survey made on the first of June.

During the past two weeks, 16 stations stopped transmitting and failed to renew their licenses. One new B station, located at Zion, Ill., and eight new Class A broadcasters were licensed last week, and seven Class C stations in as many states, operating on 360 meters transferred to Class A with special wave lengths. One of the new A stations licensed is in Lihue, Hawaii, which brings the total broadcasters in Hawaii to four, the three others continuing as Class C stations.

The list of stations licensed and transferred in the past week follows:

Call	New Class A Stations	Kcys.	Meters	Watts
KFHQ	Curtis Bros. Hardware Store, Los Gatos, Cal.	1,240	242	5
WABM	Doherty, F. E., Saginaw, Mich.	1,180	254	100
KFHS	Dow, Clifford J., Lihue, Hawaii	1,090	275	30
WRAX	Flexon's Garage, Gloucester City, N. J.	1,120	268	50
WRAW	Good, Horace D., Reading, Pa.	1,260	238	10
WABN	Grover, Waldo C., La Crosse, Wis.	1,280	234	100
WABO	Lake Avenue Baptist Church, Rochester, N. Y.	1,190	252	30
WDBF	Phillips, Robert G., Youngstown, O.	1,150	261	50
TRANSFERRED CLASS C TO CLASS A				
WQAL	Cole County Tel. & Tel. Co., Mattoon, Ill.	1,160	258	10
WEAA	Fallain & Lathrop, Flint, Mich.	1,070	280	150
WMAN	First Baptist Church, Columbus, O.	1,050	286	20
WQAV	Huntington & Guerry, Inc., Greenville, S. C.	1,160	258	15
KLN	Monterey Electrical Shop, Monterey, Cal.	1,150	261	10
WCAD	St. Lawrence University, Canton, N. Y.	1,070	280	50
WEAN	Shepard Co., The, Providence, R. I.	1,100	273	100
NEW LIMITED CLASS B STATION				
WCBD	Voliva, Wilber Glenn, Zion, Ill.	870	345	500

The Radio Woman

SINCE radio phone conversations have become so common, the old time gossip who used to take such pleasure in imparting deep, deep secrets and little bits of scandal has had quite a set-back. What formerly was common gossip and choice tid-bits are now universal knowledge to anyone with a sensitive receiver.

* * *

It used to be that a girl always respected and envied the other girl whose male friends had automobiles. Now the girl who knows a fellow who has a broadcasting or amateur phone station is the one upon whom the envy falls. And doesn't she just love to talk about "Joe's set," or "When Philly operates!"

Radio West Point Graduates Sixty-five Experts

By Carl H. Butman

GENERAL George O. Squier, Chief Signal Officer of the Army, presided at the graduation exercises at Camp Alfred Vail, New Jersey, a few days ago, when sixty-five officers received certificates as signal officers. They all completed a ten months' course in communication work, including radio in its many phases, and now have been ordered back to their regular duties with cavalry, artillery, infantry, and other arms of the service where they will act as communication specialists.

In addition to 60 regular U. S. Army Officers, there were among the graduates of the Signal School two members of the Marine Corps, one Philippine Scout, and two Cuban officers. The school, which is under the supervision of Lt. Col. J. E. Hemphill, and a corps of twelve instructors, is regarded by experts as one of the finest in the country. Many commercial schools of the type are now following the system of instruction laid down by the experts of the Signal Corps. At Camp Vail the students have the benefit of a fine laboratory and every type of radio, telegraph and telephone equipment from the lowly spark and crystal sets to the latest type of high powered tube transmitters and receivers. From the surplus material left over from the war-time equipment and new apparatus, practically every radio device known to the world is at hand for experimental and test work.

Besides the regular courses under officers of the Signal Corps, the students are given the benefit of lectures by radio and communication engineers from the big corporations and manufacturers. They also are taken on trips of inspection to large telegraph and radio terminals where they gain a knowledge of the commercial end of the work.

A little over a month ago a special class of national guard and reserve officers graduated after a six weeks' course in military communications. This special course of 350 hours of instruction, included 96 hours of radio, 31 hours of radio procedure, and 26 hours of code practice. The aim of the special course is to fit reserve and militia officers in the elements of wire and wireless communication, and school them all in the actual transmission and reception of code messages.



(C. Fotograms)
Misses Mildred and Dorothy Knapp, of Minneapolis, Minn., have taken advantage of the daily calisthenic drill on the radio program of one of the local broadcasting stations, and get up bright and early to enjoy their "daily dozen" before breakfast.

Naval Radio Monitor Control

THE question of what "monitor control" is seems to be worrying a number of radio fans who try to keep abreast of the rapidly advancing art of radio communication.

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

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

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

To overcome these difficulties, a monitor collecting or receiving station is established at a place free from all electrical disturbance. Signals are there received

on overhead antenna or loops, and are impinged through suitable coils, on land wire loops, called "tone channels" composed of two land wire circuits between the monitor and the administration station, where the signals are transferred through suitable coils to the operator's head phones. By this method, operators are relieved of all functions except operating.

A large number of messages for simultaneous transmission and reception, including duplexing, can be handled, at the same time from Administration Headquarters. At San Diego, the monitor station is located at Point Loma, eight miles from District Headquarters. All incoming signals are monitored from Point Loma to headquarters. All outgoing signals are sent from headquarters, the operator at headquarters controlling the transmitting key at the high-power transmitting station at Chollas Heights, 12 miles from San Diego by land wire.

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

Newsdealers Will Deliver Radio World to Your Home

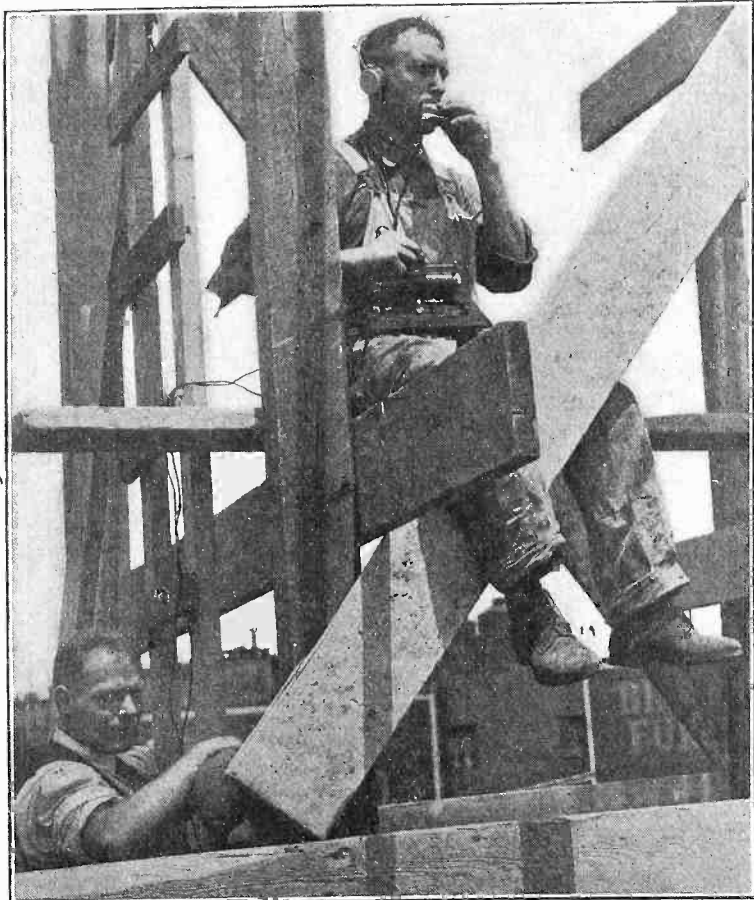
If you have daily, weekly or monthly publications delivered to your home, you can also instruct your dealer to deliver RADIO WORLD with your other papers.

We Hope You Are Not Classified Here

THE chap who tunes by the "beat note" method and successfully establishes a record of being the best hated amateur or broadcast fan in the vicinity.

The pest who is always blowing about his DX accomplishments and then when you show up at his house tells you that he is so sorry "but my B battery just ran down."

The much loved young man who is always making a new set, with the result that his neighbors are kept awake until near morning by his hammering and sawing. And then after he gets it up, are also kept from the arms of Morpheus by his two stage loud speaker with power amplifier.



(C. Kadel and Herbert)

The bug hit him hard, as can be seen by the photograph. He takes his small crystal set along with him, and even though five stories in the air, Michael Bourke manages to enjoy WDT during his lunch hour.

The modest young man who runs over to his neighbor's house with his storage battery and asks to charge it, "because we are going to have a party tonight" and then doesn't invite you.

The bright human being that insists that you "stay just another few seconds—he must be on tonight" and keeps you for several hours while he is hunting for PWX, just when you are too tired to appreciate even Galli-Curci.

The modern scientist who insists on explaining the working of your circuit to you—whether you understand or want him to or not.

The optimist that always laughs when you blow a tube and with an intelligent expression tells you that "you can get plenty more in the stores."

The entertainer who insists on singing seventeen choruses of that popular and idiotic ditty, "Yes, we have no bananas."

Active Broadcasters Total 595

THERE were 595 active radio broadcasting stations on June 16, according to the Department of Commerce records. Of these stations, 180 are in Class A, 42 in Class B, 372 in Class C, and 1 in the experimental Class. A gain of four stations is shown over the survey made on the first of June.

During the past two weeks, 16 stations stopped transmitting and failed to renew their licenses. One new B station, located at Zion, Ill., and eight new Class A broadcasters were licensed last week, and seven Class C stations in as many states, operating on 360 meters transferred to Class A with special wave lengths. One of the new A stations licensed is in Lihue, Hawaii, which brings the total broadcasters in Hawaii to four, the three others continuing as Class C stations.

The list of stations licensed and transferred in the past week follows:

Call	New Class A Stations	Keys.	Meters	Watts
KFHQ	Curtis Bros. Hardware Store, Los Gatos, Cal.....	1,240	242	5
WABM	Doherty, F. E., Saginaw, Mich.	1,180	254	100
KFHS	Dow, Clifford J., Lihue, Hawaii	1,090	275	30
WRAX	Flexon's Garage, Gloucester City, N. J.....	1,120	268	50
WRAW	Good, Horace D., Reading, Pa.	1,260	238	10
WABN	Grover, Waldo C., La Crosse, Wis.	1,280	234	100
WABO	Lake Avenue Baptist Church, Rochester, N. Y.....	1,190	252	30
WDBF	Phillips, Robert G., Youngstown, O.	1,150	261	50

TRANSFERRED CLASS C TO CLASS A

WQAL	Cole County Tel. & Tel. Co., Mattoon, Ill.	1,160	258	10
WEAA	Fallain & Lathrop, Flint, Mich.	1,070	280	150
WMAN	First Baptist Church, Columbus, O.	1,050	286	20
WQAV	Huntington & Guerry, Inc., Greenville, S. C.....	1,160	258	15
KLN	Monterey Electrical Shop, Monterey, Cal.	1,150	261	10
WCAD	St. Lawrence University, Canton, N. Y.....	1,070	280	50
WEAN	Shepard Co., The, Providence, R. I.....	1,100	273	100

NEW LIMITED CLASS B STATION

WCBD	Voliva, Wilber Glenn, Zion, Ill.	870	345	500
------	---------------------------------------	-----	-----	-----

The Radio Woman

SINCE radio phone conversations have become so common, the old time gossip who used to take such pleasure in imparting deep, deep secrets and little bits of scandal has had quite a set-back. What formerly was common gossip and choice tid-bits are now universal knowledge to anyone with a sensitive receiver.

* * *

It used to be that a girl always respected and envied the other girl whose male friends had automobiles. Now the girl who knows a fellow who has a broadcasting or amateur phone station is the one upon whom the envy falls. And doesn't she just love to talk about "Joe's set," or "When Philly operates!"

Radio West Point Graduates Sixty-five Experts

By Carl H. Butman

GENERAL George O. Squier, Chief Signal Officer of the Army, presided at the graduation exercises at Camp Alfred Vail, New Jersey, a few days ago, when sixty-five officers received certificates as signal officers. They all completed a ten months' course in communication work, including radio in its many phases, and now have been ordered back to their regular duties with cavalry, artillery, infantry, and other arms of the service where they will act as communication specialists.

In addition to 60 regular U. S. Army Officers, there were among the graduates of the Signal School two members of the Marine Corps, one Philippine Scout, and two Cuban officers. The school, which is under the supervision of Lt. Col. J. E. Hemphill, and a corps of twelve instructors, is regarded by experts as one of the finest in the country. Many commercial schools of the type are now following the system of instruction laid down by the experts of the Signal Corps. At Camp Vail the students have the benefit of a fine laboratory and every type of radio, telegraph and telephone equipment from the lowly spark and crystal sets to the latest type of high powered tube transmitters and receivers. From the surplus material left over from the war-time equipment and new apparatus, practically every radio device known to the world is at hand for experimental and test work.

Besides the regular courses under officers of the Signal Corps, the students are given the benefit of lectures by radio and communication engineers from the big corporations and manufacturers. They also are taken on trips of inspection to large telegraph and radio terminals where they gain a knowledge of the commercial end of the work.

A little over a month ago a special class of national guard and reserve officers graduated after a six weeks' course in military communications. This special course of 350 hours of instruction, included 96 hours of radio, 31 hours of radio procedure, and 26 hours of code practice. The aim of the special course is to fit reserve and militia officers in the elements of wire and wireless communication, and school them all in the actual transmission and reception of code messages.



(C. Fotograms)

Misses Mildred and Dorothy Knapp, of Minneapolis, Minn., have taken advantage of the daily calisthenic drill on the radio program of one of the local broadcasting stations, and get up bright and early to enjoy their "daily dozen" before breakfast.

Naval Radio Monitor Control

THE question of what "monitor control" is seems to be worrying a number of radio fans who try to keep abreast of the rapidly advancing art of radio communication.

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

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

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

To overcome these difficulties, a monitor collecting or receiving station is established at a place free from all electrical disturbance. Signals are there received

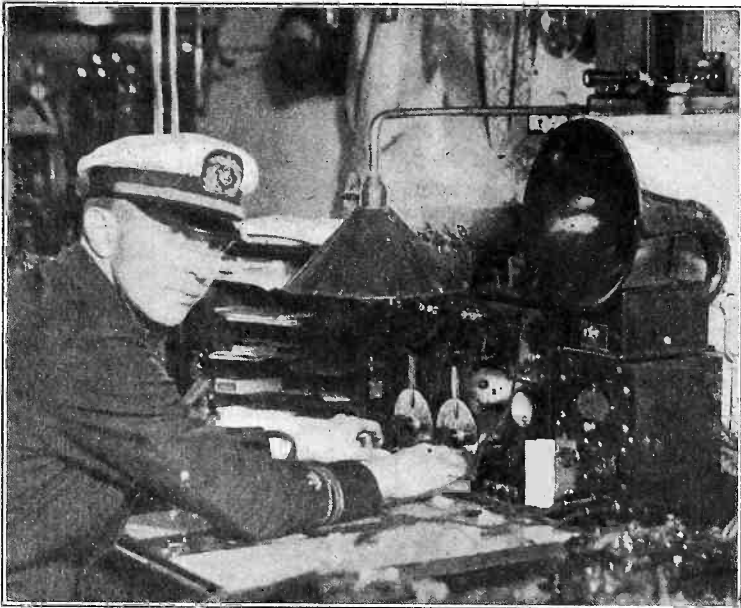
on overhead antenna or loops, and are impinged through suitable coils, on land wire loops, called "tone channels" composed of two land wire circuits between the monitor and the administration station, where the signals are transferred through suitable coils to the operator's head phones. By this method, operators are relieved of all functions except operating.

A large number of messages for simultaneous transmission and reception, including duplexing, can be handled, at the same time from Administration Headquarters. At San Diego, the monitor station is located at Point Loma, eight miles from District Headquarters. All incoming signals are monitored from Point Loma to headquarters. All outgoing signals are sent from headquarters, the operator at headquarters controlling the transmitting key at the high-power transmitting station at Chollas Heights, 12 miles from San Diego by land wire.

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

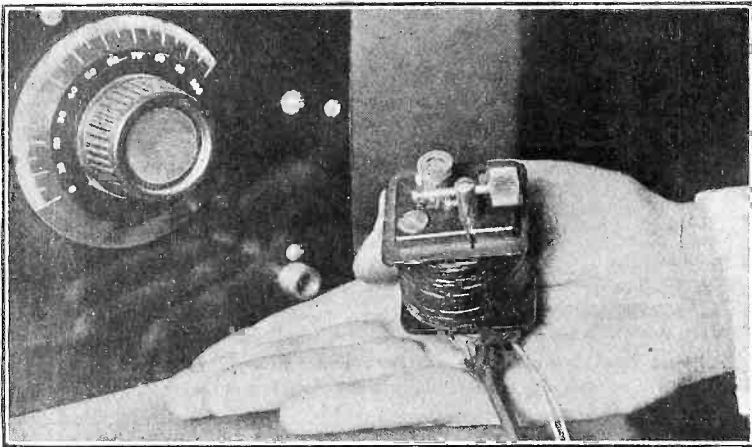
Newsdealers Will Deliver Radio World to Your Home

If you have daily, weekly or monthly publications delivered to your home, you can also instruct your dealer to deliver RADIO WORLD with your other papers.



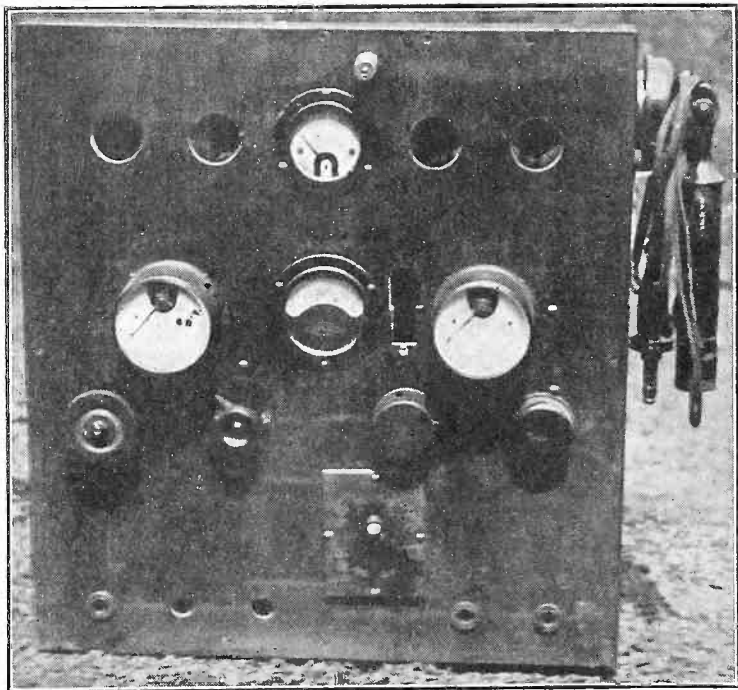
(C. Fotograms, N. Y.)

Because of its powerful radio equipment, the S. S. "President Polk" has given medical assistance to many ships. This has earned it the nickname of "The Radio Doctor Ship." P. N. Ritter, the operator, has transmitted most of this inter-ship communication, which in many cases has saved the lives of those injured. The ship has kept in touch with its home port all the way across "the pond," even keeping in direct communication while in London.



(C. Kadel and Herbert)

Although small in size when compared with its brother, the dial of which is seen in the upper left-hand corner, this minute crystal set is capable of receiving 25 miles. It consists of a tiny fixed inductance, a condenser and crystal detector, with a common pin for a catwhisker.



(C. Photonews)

Here is a front view of the four-tube transmitter constructed by Chief Electrician Bebaut, of the Radio Center, U. S. Navy, New York City. The radiation meter is located in the top center. Directly under is the plate milliammeter, while on either side of it are the volt and ammeters used to tell the current in the filament circuit. The special tuning system is controlled by means of the handle on the left, while the other directly next to it controls the filament and plate currents. A special jacking system is used, so that either CW or phone may be employed by simply plugging in the correct instrument.

Here's Another Ne And A Few Words



(C. Kadel and Herbert)

A demonstration was recently held at the Bronx Zoological Park, New York City, to determine the effect of radio music on wild animals. It is quite evident that the lion doesn't appreciate it in the least, which same is also shown in the "hit and run" position of Keeper John Toomey.



(C. Photonews)

Olle D. Engstrom, 163 East 69th Street, a student at the Polytechnic Institute, Brooklyn, N. Y., and his radio car, which he has perfected. It can easily be operated by a distant transmitter, obeying the operator's signals instantly and without a murmur of dissent.



(C. Kadel and Herbert)

Leonard F. Plummer, who delivers letters by day and copies letters by night by means of the radio set he constructed. It is an example of very neat workmanship and careful planning. Due to the fact that most of the parts were second-hand, being bought from his friends, he constructed the set (not counting the tubes or phones) for a cost of exactly \$20.00.

How Radio It's Pho

TO many people of wonder how published in RADIO order to keep them su news.

Besides its own WORLD has on its staff photographers in the of these men to ferre penings and immedia dence of them by the eye" of the camera.

Easy as this sound thing, because it may rapher only overhea happening or incident momentary loss as t who did it, or why it inspired camera man, around a city, seeking ing until he finally cl in the knowledge th finally and faithfully

Of course, if there nary every-day occur him to get his picture that the incident may up a big building unc tall radio mast, or ou in order that he may incident for the public

In order faithfully and us, the camera toes every minute of cause it is no indicat is 5.30 that the world is ever prepared, ay subjects (in a kindly must have a wonder order to gain entranc tically "taboo." He words as "It can't be mean nothing to him click his shutter and Fear has no meaning simply another worc in anything simply be comfort or a chance ever alert and ever w

These are just a RADIO WORLD can give tures" weeks ahead c azines. With a staff wakeful men constan ers are able to visuali as soon as it happens

And then, after been received by RAD dergo a careful edito are passed along to the half-tone plates printed.

vs Picture Gallery— How We Get 'Em

World Gets graphs

is a constant source
ne photographs pub-
ORLD are secured in
ed with the latest in

otographers, RADIO
ne of the best known
l. It is the business
at all the latest hap-
make concrete evi-
of the "ever-seeing

t is quite a difficult
pen that the photog-
someone mention a
nd then is left at a
here it happened or
pened. To the ever-
s may mean chasing
robing and question-
his camera, satisfied
his picture story has
n secured.

a parade or an ordi-
ce it is quite easy for
But consider the fact
ecessitate his climbing
onstruction, or up a
a precipitous ledge
hfully reproduce the
edification.

serve both himself
must be up on his
e day and night, be-
that just because it
s gone to sleep. He
night, to "shoot" his
y, not otherwise) and
store of ingenuity in
places that are prac-
esn't know any such
e." Royalty or riches
long as he is able to
ke away his pictures.
his vocabulary—it is
nd he must not fail
se it necessitates dis-
a good fall. He is
nful.

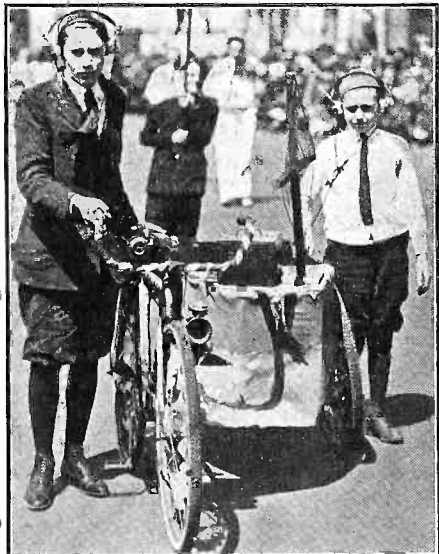
of the reasons why
ou "the news in pic-
ny of the radio mag-
competent and ever
on the job" our read-
he radio news almost

photographs have
ORLD, they must un-
scrutiny before they
engravers who make
om which they are



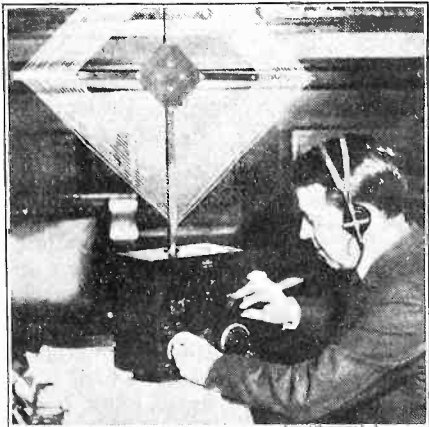
(C. Kadel and Herbert)

Wave meter which on account of its small size is a favorite among the radio operators of the French Army. An interesting point is the fact that the condenser dial is calibrated in meters instead of capacity and direct reading is therefore possible. Corporal P. Famelo, of the 212 Anti-Aircraft Artillery, is pointing to the small fixed crystal detector which is used.



(C. P. and A. Photos)

Just to be different, these two boys equipped their bicycle with a sidecar and stuck a portable loop set on it, during the parade which opened Boy's Week in Philadelphia, Pa.



(C. Fotograms)

In keeping with his motto of "Make your boy a radio fan and keep him off the streets," Mayor George E. Leach of Minneapolis, who is an ardent fan himself, has had this portable loop receiver installed right on his desk so that he can keep in touch with the latest in radio and news during his few spare moments throughout the day.



(C. Kadel and Herbert)

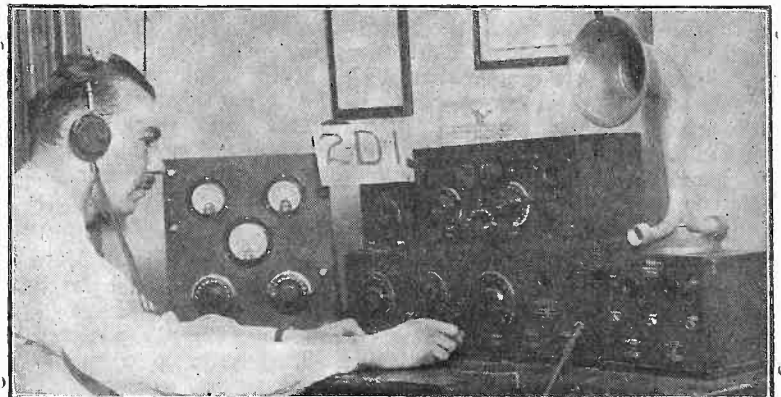
The latest foe to crime are these radio-equipped motorcycles, which were introduced to New Yorkers during the opening parade of the New York City Silver Jubilee. A powerful tube set is used employing a loop as shown by means of which the rider can keep in touch with headquarters and receive instructions.

Captions by Robert L. Dougherty



(C. Underwood and Underwood)

Captain D. C. Hanrahan, U. S. N., Commander of the scout cruiser "Omaha," the newest and fastest addition to the U. S. Navy, in his "remote control station" which is a part of the latest "speedster of the seas." It was from this station that the first radio telephone conversation between Hilo and Honolulu was conducted.



(C. Photonews)

Dr. E. A. Cyriax, assistant manager of the second district, A. R. R. L., and his radio station 2DI. Two transmitters are used, one a half kilowatt 500-cycle Telefunken spark, and the other a 50-watt CW set. for receiving a Grebe CR8 with two stages of audio-frequency is used. He has made several long distance records both in transmitting and reception.

New York Amateur Builds a Neat, Compact, Portable Receiver

By Captain Adrienne Le Page

AS the trend of all construction in radio sets these days seems to follow in the tracks of "making it as small as possible," it is not at all surprising that some very fine portable sets have been made. One of the neatest and most workmanlike of these has been constructed by Bob Kalmus, a New York amateur. The set is illustrated on the front cover of this issue.

A particular point of interest in the set is the fact that the new U. V. 199 tubes are used. They lend themselves very well to sets of this type, as they are extremely small and also because they can easily be used with portable sets, as they use dry cells.

The tuning of this set is accomplished by two special variometers which are of the honeycomb coil wound type, and as can be seen take up very little space in the set. They are so placed that they are inductively

related to each other. This mounting does away with the necessity of varying the coupling, as the best point was found through experimentation and then the set was constructed.

There are two stages of audio-frequency amplification used, and the transformers are mounted in such a manner that they will not cause howling. This is accomplished by mounting them at right angles to each other, and separating them quite a distance.

The extreme neatness of construction of this set should prove to prospective builders of sets that it pays to be neat. Before this set was made, the builder spent many hours planning the panel and the location of the instruments, so that they would take up as little space as possible, yet not make the wiring too intricate, or have the instruments interfere with one another electrically.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY
PHRASED FOR OUR BUSY READERS

Naval Radio Station NSS, Annapolis, Md., transmits time signals daily between 3:55 and 4:00 a. m., Eastern Standard Time, on 17,145 meters.

* * *

General John J. Carty, chief engineer and vice-president of the American Telephone & Telegraph Company, received the honorary degree of Doctor of Science from Princeton University at the recent annual commencement.

* * *

Lieutenant Wilbur J. Ruble, U. S. N., who has been Fleet Radio Officer, Scouting Fleet, stationed on the U. S. S. "Wyoming," has been designated as Fleet Radio Officer of the Battle Fleet under Admiral Robison, and will be transferred to the U. S. S. "California."

* * *

A program of French music will be broadcast from WGY Schenectady, N. Y., on the night of July 5 under the direction of Professor Joseph Brodeur, organist and choir director of the Cathedral of the Immaculate Conception of Albany, N. Y. Professor Brodeur will deliver an address on "French Canadians and Their Music."

* * *

An X-ray treatment lasting 56 hours was applied to a woman cancer patient at Bellevue Hospital, New York City, last week. A voltage of 250,000 was used, and the X-rays generated were powerful enough to outline the bones of the hand at a distance of 200 feet. The patient was protected by silk and lead screens, took food and water, and occasionally slept during the treatment, which is said to be the longest on record.

* * *

Capt. Roald Amundsen, the Arctic explorer, definitely has abandoned his long-heralded flight over the North Pole in an airplane. According to a message sent to his brother, Amundsen made a trial flight on May 11 somewhere near Point Barrow. It was so unsatisfactory that the proposed flight over the pole was called off. Much had been expected of the trip by aeronauts and radio experts, as the plans called for frequent communication with Point Barrow and Spitzbergen, the final terminus of the flight.

* * *

The concerts at the stadium of the College of the City of New York, beginning this year on July 5, to run six weeks, are to be enjoyed by millions instead of the 10,000 or 15,000 of other years. They will be heard at sea, in New Orleans and Canada, past the Mississippi River and on moving trains. The music is to go out by an elaborated system of radio, and broadcast more completely than any symphony in the history of radio by the Radio Corporation of America from the Aeolian Building. Not every concert thus will be sent out, but at least two or three a week.

A. Orsi, a radio engineer of Rome, Italy, informs RADIO WORLD that Italy will now permit free radio reception, which formerly was limited to a few stations.

* * *

Station WSB, Atlanta, Ga., celebrated its first anniversary June 13. It is estimated that about 100 receiving sets in Atlanta heard the first program and that over 50,000 listened in to the birthday celebration.

* * *

Miss Vaughn De Leath, managing director, informs RADIO WORLD that the studio acoustics of Station WDT, New York City, have been properly adjusted, and that active broadcasting has been resumed.

* * *

Commander S. C. Hooper, in charge of radio engineering in the Navy, it is reported, will become Fleet Radio Officer under Admiral Coontz when the latter assumes command of the fleet early in August.

* * *

"Radio rapidly is becoming a public servant of great value, and has in it the promise of a new democracy of thought, culture and universal contact that will touch more people than ever have been reached by any agency, with the possible exception of the printing press."—Powel Crosley, Jr.

* * *

Comparison of the annual reports of the two electrical giants, General Electric and Westinghouse Electric, shows both took full advantage of resumption of business activity last year, and strengthened their respective positions in preparation for a record volume of orders expected in 1923 and subsequently.

* * *

Donald C. A. Butts, connected with the Pennsylvania State Department of Health, has announced his belief that cancer is caused by an excess of positive electric ions, or energy, in cells where cancerous growths have developed. It is only when certain cells are exposed to constant irritation, generation after generation, that a pre-disposition to cancer is inherited.

* * *

In a final tryout of the Belin telautogramme, or telegraphic transmission of written script, which is to be placed at the disposal of the public in a few days, 1,453 words were transmitted in six minutes, according to a Paris cable to the New York Times. The document covered 128 square centimetres, and, at prescribed rates, would cost the sender twenty francs. Under ordinary transmission by telegraph the document would require twenty-five minutes for transmission, and cost the sender 218 francs. The telautogramme was sent from Lyons to Malmaison, near Paris.

Answers to Readers of Radio World

I have constructed the Flewelling set as described in RADIO WORLD for February 24, using mica condensers and Freshman grid leaks. The coils I wound myself. The set only responds to CFCN. I get that station very loud but nothing else. What can I do to remedy this condition?—D. P. Hartley, Jasper, Alta, Canada.

As previously stated, this set is difficult to work. Would advise you resetting your grid leaks as spoken of in the article until the high frequency whistle is so high that it is almost inaudible. If you are not getting this scream or whistle, try switching the leads on your tickler. Also try reversing the minus B lead that goes to the filament. By that we mean instead of the lead that comes from the center of the condenser bank going to the plus of the filament circuit and then to the minus of the B battery, place it so that it goes to the minus of the filament and the minus of the B battery. As to the home made coils would advise trying some ready manufactured ones. You may have the windings wrong, or some condition may be present that would cause your set

remedy it?—Roy Smith, Lock Box 13, Millersburg, Ohio.

The amplifier hook-up you mention was specified for the Flewelling circuit. In order to use it for the circuit you mention it will be necessary to remove the grid leak across the input of the first transformer. This is a standard two-stage audio-frequency amplifier, and will work, when the grid leak is removed, with the three-circuit receiver.

I desire to build a set that is capable of getting distant stations, and have been advised to build one incorporating two stages of radio-frequency, detector and two stages of audio-frequency. Will you please give me a hook-up for same? Can such a set be used with a loop, or are antenna and ground with a coupler necessary?—A. L. Hallam, 12 Ludlow Street, Yonkers, N. Y.

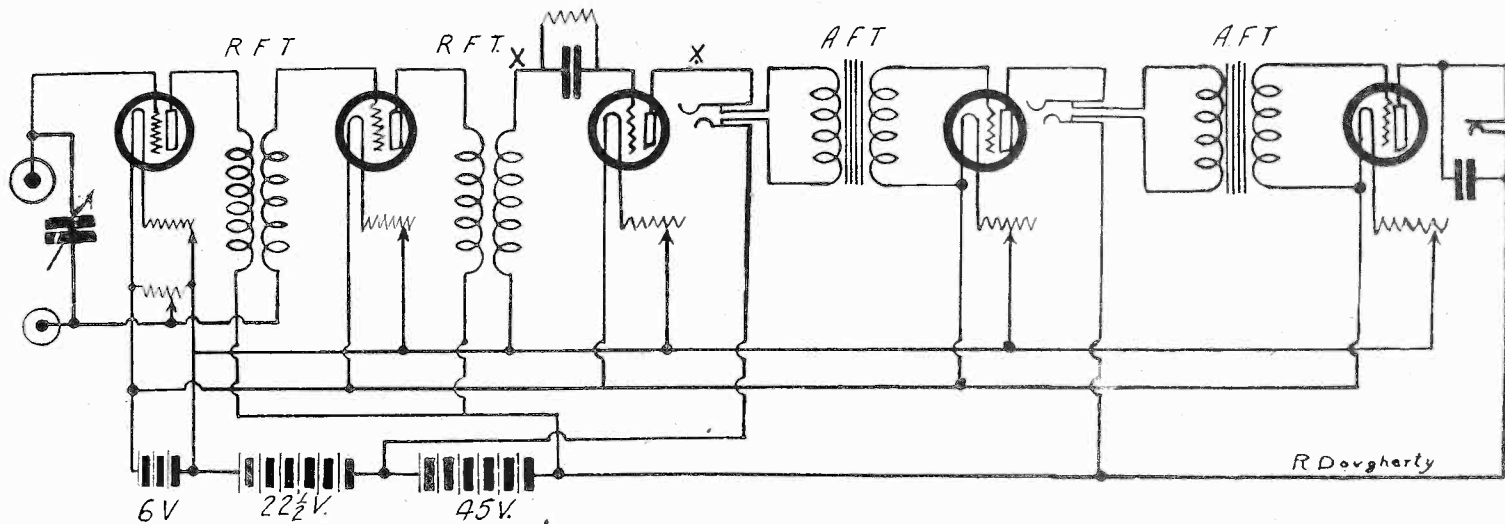
The hook-up you desire is herewith printed. It is possible to use either loop or antenna, ground and coupler with such a set. You can use either by simply connecting them across the leads shown at the

writer of the article, care of RADIO WORLD. The letter will be forwarded to him, and your question will be answered direct. In any of the very selective and sensitive circuits it is best to shield the panel. This will lessen any chance of capacity effects.

I want to build a set that will enable me to reach from coast to coast. Will a variocoupler variometer set enable me to do this?—L. A. Boyd, Route 1, Box 335, Hammond, Ind.

You might be able to do as you wish to by using this type of receiver, but would advise using a circuit that embodies radio-frequency amplification. If you desire to construct such a set see hook-up on this page. If you do not desire to incorporate more than three tubes the two stages of audio-frequency amplification can be left off.

In connection with the Reinartz circuit, how many turns should be put on the coils to enable me to reach all the broadcasters?



Hook-up given in answer to request of A. L. Hallam. It is two stages of radio-frequency, detector and two stages of audio-frequency. If regeneration is desired it can be obtained by simply inserting variometers in the grid and plate leads at the places marked X X in the diagram. Note that there is a 200 ohm potentiometer in the filament leads of the first tube.

to function as it does. Watch all your connections and see that they are properly insulated and that they cross at right angles. When they are in close proximity it is best to insulate them by means of rubber tubing or varnished cambric (spaghetti). Also experiment by reversing the two coils, using the 50 as tickler and the 75 as primary and vice versa. Be careful about your soldered connections and see that the flux used in soldering has not spread. If this is the case wash the connections with alcohol to remove the excess flux. Be careful when using alcohol on or around rubber panels. If you are using a loop, try connecting the ground side of the circuit which connects to the loop through a condenser to the ground. This sometimes helps on loop reception. In any event be very careful of your construction on the condenser bank. If there should be anything wrong in this bank your set would function, but not in the correct manner, and your reception would be seriously hindered.

I constructed the enclosed receiver (three-unit honeycomb set) from a hook-up in RADIO WORLD. I added the two-stage amplifier shown in the March 31 issue of RADIO WORLD and I cannot get it to work. All it does is squeal and howl. How can I

extreme right. When a loop is used it will be necessary for you to shunt a variable condenser across the terminals of the loop to get tuning.

In RADIO WORLD for June 2 you published a reflex circuit by W. S. Thompson. What make of R. F. and A. F. transformers are used in this circuit? In the May 19 issue you published an improved Grimes circuit by W. S. Thompson. What make of R. F. and A. F. transformers are used in this circuit? What do you find is the average reception of this set using a loop antenna? Using an average ground and antenna? What are the proper connections for the transformers? Is it necessary to shield the panel when constructing this latter circuit?—Alfred Wagstaff, 500 Fifth Avenue, New York City; Earl W. Hoover, 309 Slocum Avenue, Syracuse, N. Y.; A Constant RADIO WORLD Reader, Booneville, Ind.

It is impossible for us to specify competitive apparatus. In regard to transformers, buy the best you can get. This also applies to all other apparatus necessary to build a set. It is impossible accurately to state even the average range of any type of receiver as there are too many conditions that have to be considered. Send a self-addressed and stamped envelope to the

What is a choke coil core constructed of?—Phil Soucy, 895 Aurora Avenue, St. Paul, Minn.

We refer you to RADIO WORLD for January 13, where you will find the information you desire, on page 23, in answer to a question similar to your own. The circuit also appears on that page, with all constants marked. The core of a choke coil is generally constructed of soft Swedish steel. Sometimes they use what are called air core chokes, and these are designated as common coils. The metallic cored choke has a lot of parallel lines shown drawn through the center.

I have constructed the set described in RADIO WORLD for January 13, column two, circuit No. 3. I have made it without putting the condenser in the plate circuit, and it will not work. Is this condenser absolutely necessary? What is the capacity of it? Will it work when the condenser is put in?—Gorham G. Winchester, 213 Waldo Street, Providence, R. I.

It is absolutely necessary that every circuit be constructed just as the description and diagram state. See article on page two of RADIO WORLD for June 23. It explains why. The capacity of the condenser should be .0005.

Latest Radio Patents

Radiotransmitter

No. 1,452,064: Patented April 17, 1923. Patentee: Vannevar Bush, Chelsea, Mass.

The present invention relates to radio transmitters having a primary or closed circuit of the impact type in which a series of unidirectional pulses are produced.

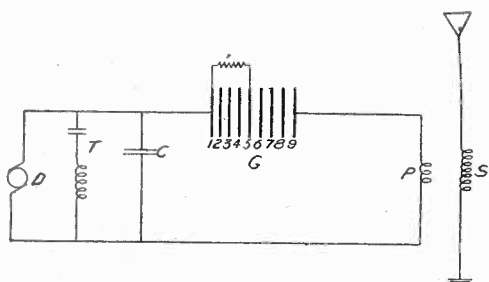
The best known types of commercial transmitting apparatus embody an oscillating primary circuit having a spark gap and a secondary or antenna circuit tuned in resonance with the primary circuit and giving off group trains of waves. The efficient operation of this type of transmitter is dependent directly upon an accurate tuning of the two circuits, as otherwise the transference of a substantial amount of energy to the antenna circuit is precluded and the radiated energy from this latter circuit decreases rapidly. This accurate

installations where the antenna capacity changes rapidly.

The resurgence of current in a persistently oscillating primary circuit, moreover, tends to heat the gap and dissipate the useful energy in the circuit, and attempts have been made to overcome these objectionable features by the provision of a form of gap which quenches or damps the oscillation, and also by providing means for artificially dissipating the heat which is generated in the gap. However, the interposition of this quenched type of gap in the primary circuit renders even more acute the difficulties due to a de-tuning of the two circuits which causes an irregular quenching action and a variation from the desired smooth tune.

The ideal condition for a primary circuit is that in which a single loop of unidirectional current passes through the gap at each discharge of the condenser, thus ensuring the utilization of the maximum amount of energy and permitting the efficient coupling of two circuits which are not in resonance.

Repeated attempts have been made to secure a rectifying spark gap of this character which would cause the flow of a unidirectional current in the primary circuit, but these constructions have universally failed to attain the desired result, either because of the complicated and intricate nature of the constructions employed and the extremely delicate adjustments required to cause the apparatus to function in the desired manner, or because of a misunderstanding of the principles involved.



Method of producing equal damping in spark signals.

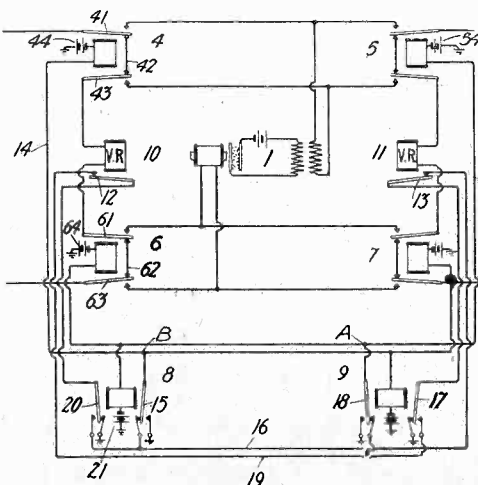
tuning of the two circuits is difficult to obtain under ordinary conditions, and this difficulty is more particularly evident in connection with ship, aeroplane, or portable

Repeater System

No. 1,455,957: Patented May 22, 1923. Patentee: E. D. Johnson, East Orange, N. J.

THIS invention relates to repeater circuits in which a one-way repeater is reversibly connected in a transmission circuit to provide for the two-way transmission of signals. An object of the invention is to provide means for connecting the repeater in circuit automatically and in response to current such as voice current impressed on the line. This is accomplished, giving rise to a very positive con-

to change the connections of the other control relay so that these relays will assist each other in maintaining the repeater properly connected. The assistance of the second or subsequently operated relay is of material advantage, for this second relay in the embodiment chosen to illustrate the invention and its various aspects, is connected in the output circuit of the repeater and accordingly energized.



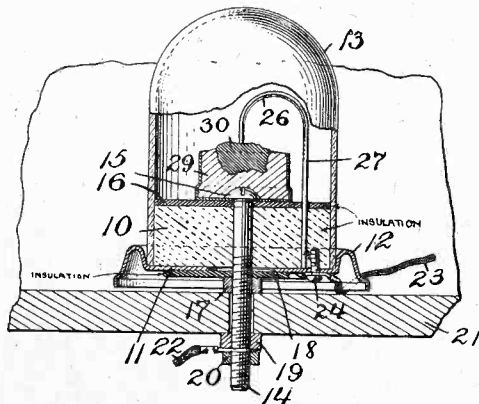
Method used for duplex or two-way transmission.

control of the circuit connections, by providing a voice-operated relay for each of the two line terminals or sections, the operation of either relay in response to current impressed on its corresponding line section serving not only to connect the repeater properly in circuit but also

Crystal Detector

No. 1,454,997: Patented May 15, 1923. Patentees: G. Greco and K. G. Wolff, Newark, N. J.

THIS invention relates to an improved crystal detector for wireless receiving sets, and is adapted to be placed in position in a set and is easily accessible for



Improved dustproof crystal detector.

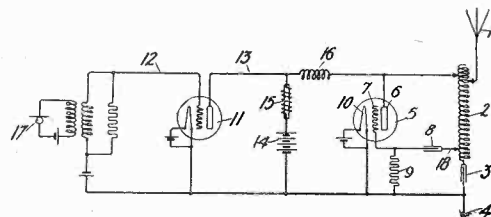
adjustment, if the small wire engaging the piece of crystal becomes dislodged from a detecting point, by the removal of the dust-proof cover, which cover fits over a block.

Oscillating Generator for Signaling Systems

No. 1,452,032: Patented April 17, 1923. Patentee: John F. Farrington, New York, N. Y.

This invention relates to oscillation generators, and more particularly to those of the vacuum tube type, and radio systems employing such generators.

An object of the invention is to provide means for oscillation generators of the kind herein described whereby the feed-back coupling and hence the amplitude of oscillations can be adjusted without changing the frequency of the generated oscillations. In a transmitting station this is of importance, as the necessary adjustment of the oscillator can be made without changing the transmitted wave length. For purposes



Method employed to change the oscillatory circuit without changing the frequency.

of illustration, an oscillation generator of the audion or three-electrode vacuum tube type is employed.

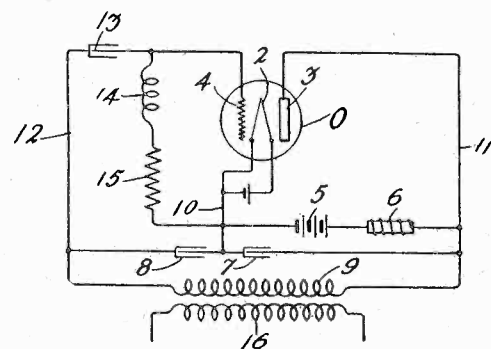
Electrical Discharge Device

No. 1,452,339: Patented April 17, 1923. Patentee: Raymond A. Heising, East Orange, N. J.

This invention relates to electric discharge devices and more particularly to arrangements for using such devices to generate, repeat or amplify electric currents.

Heretofore use has been made of a high resistance leak path to discharge undesired electrical charges which accumulate upon the grid or impedance-varying element of highly evacuated electronic discharge devices. It has been found that high frequency energy is dissipated because of this resistance, thereby lowering the efficiency of such devices; and a primary object of my invention is to prevent this dissipation of energy. This result is accomplished by the means herein described without causing the leak path resistance to act less efficiently in controlling the potentials upon the grid. This saving of energy may be accomplished by allowing less high frequency current to flow in the leak path, by causing the current which does flow to be substantially wattless, or by a combination of both these effects.

It has been proposed to place the high resistance leak path between the grid and cathode, but it may be located between any two points which will cause the desired leak.



Heising's system for control of grid current in tubes.

The invention is described herein in connection with highly evacuated tubes of the audion type which function as generators, but may obviously be of utility in connection with similar or equivalent discharge devices functioning as detectors, amplifiers, modulators or for other purposes.

Some Good DX Records

From 'Way Down East

From Franklin M. Dyer, 162 Summer St.,
Somerville, Mass.

I HAVE been a close follower of your column, and, while I don't pretend to have established much of a DX record, I am submitting the following list of stations heard. I am using the "Greene Concert Receiver" hook-up—a very popular circuit in this section of the country.

Radiophone Broadcasting Stations—CFCA, Toronto, Ont., Canada; CHTC, Montreal, Quebec, Canada; KDKA, Pittsburgh, Pa.; KSD, St. Louis, Mo.; KYW, Chicago, Ill.; NAA, Arlington, Va.; WAAJ, Boston, Mass.; WBAP, Fort Worth, Texas; WBAH, Minneapolis, Minn.; WBZ, Springfield, Mass.; WCAE, Pittsburgh, Pa.; WDAF, Kansas City, Mo.; WDAP, Chicago, Ill.; WEAF, New York City, N. Y.; WFAU, Boston, Mass.; WFI, Philadelphia, Pa.; WGI, Medford Hillside, Mass.; WGM, Atlanta, Ga.; WGY, Schenectady, N. Y.; WHAS, Louisville, Ky.; WHAZ, Troy, N. Y.; WHB, Kansas City, Mo.; WIP, Philadelphia, Pa.; WJZ, Newark, N. J.; WLAK, Bellows Falls, Vt.; WMAK, Lockport, N. Y.; WNAC, Boston, Mass.; WNAV, Knoxville, Tenn.; WOC, Davenport, Ia.; WOO, Philadelphia, Pa.; WOR, Newark, N. J.; WSB, Atlanta, Ga.; WWJ, Detroit, Mich.; WGR, Buffalo, N. Y.; WHA, Madison, Wis.; WHAM, Rochester, N. Y.; WJAX, Cleveland, O.; WLW, Cincinnati, O.; WOAW, Omaha, Neb.; WJY, New York City, N. Y.; WJZ, New York City, N. Y.; AV8, Aviation Squadron, South Armory, Boston, Mass.

Naval and Commercial Radiotelegraph Stations and Ships at Sea—NAD, Charlestown, Mass.; NAF, Newport, R. I.; NAH, New York, N. Y.; NBD, Bar Harbor, Me.; WSA, East Hampton, L. I., N. Y.; KYP, S.S. Oneida; KEXT, S.S. Peter H. Crowell; WRS, S.S. Suffolk; KIVX, S.S. Guardsman; KUTX, S.S. Richconcal; JAH, S.S. Italy Maru (Ja.); YES, S.S. Clan Kenneth (Br.); KRF, S.S. Ramson B. Fuller; KRC, S.S. Camdem; GBWD, S.S. S. Blas (Br.); WCC, Chatham, Mass.; WNY, New Brunswick, N. J.; WCY, Cape May, N. J.; WSC, Siasconset, Mass.; NUGN, U.S.S. Potoka; KEZR, S.S. West Celina; GDO, S.S. Boviv (Br.); TXY, S.S. Breedijk (Du.); NARF, U.S.S. Wandank; KIMQ, S.S. East Side; YRD, S.S. Amarna (Br.); KMOU, S.S. Edward Pierce; KRN, S.S. Calvin Austin; KMM, S.S. Panuco.

Amateur Radiotelegraph Stations—1AAW, 1AF, 1AFT, 1AGM, Massachusetts; 1AJP, Connecticut; 1AKB, Massachusetts; 1ALJ, Connecticut; 1ANY, 1AOH, 1AOK, 1AOR, Massachusetts; 1AQI, 1ARM, ?; 1ASA, 1ASJ, 1ASK, 1ASP, 1AST, Massachusetts; 1AUA, Connecticut; 1AUH, 1BNS, 1BOP, 1BTA, 1BVH, 1BWJ, 1BXC, 1BYG, Massachusetts; 1CDO, Maine; 1CEH, 1CIT, 1CJD, 1CKB, 1COC, 1CPI, 1CPN, Massachusetts; 1CRU, Maine; 1CSH, 1CSX, 1DM, 1EO, 1JL, Massachusetts; 1KX, Maine; 1PL, Massachusetts; 1RA, ?; 1SI, 1SW, 1VV, 1DV, 1MQ, 1ZE, Massachusetts; 2AFP, New Jersey; 2BXW, 2CBC, New York; 2CGR, 2CQ, New Jersey; 2CVJ, 2TS, New York; 3BRW, Pennsylvania; 1AWH, ?; 1AWL, 1AWP, Massachusetts; 1AWU, ?; 1AX, Massachusetts; 1AXJ, Connecticut; 1AXO, ?; 1AXX, Massachusetts; 1AYZ, Connecticut; 1AZE, ?; 1BDI, Maine; 1BDT, Massachusetts; 1BET, ?; 1BHR, 1BJS, 1BLX, Maine; 1BMN, 1BNT, 1BQI, 1BTR, 1BVW, 1JV, 1PF, 1QA, 1SF, 1SN, 1VG, 1WM, 1GS, 1XM, 1WW, Massachusetts; 2AU, 2BYA, 2CG, 2CPA, 2CUZ, 2CVS, New York; 3BEI, New Jersey; 3GC, Pennsylvania; 3TR, Washington, D. C.; 3ZO,

8CKO, 8VN, Pennsylvania; 3XM, New Jersey; 8CKN, 8UF, New York.

This completes the list of stations heard to date. I don't expect that you will want to print all of these, but as so many radio fans in the West are submitting lists of stations heard I couldn't resist the temptation to show them that we, in the East, pick up a few of them also.

I find a great deal of pleasure and help from RADIO WORLD, and I wish you every success.

A Brave and True Aeriola User Makes a Request

From E. E. Williams, Woodston, Kan.

I HAVE been looking over your DX records for some time and decided to send one from Kansas, that may interest the DX nite owls. I have a single tube set (Aeriola Sr) with an aerial 18 feet at one end and 21 at other, 150 feet long from set. The following are a few of the distant stations I have heard:

South PWX, WFAA, WBAP, KOB; North CJCG, CKCK, CFAC, WLAG, WPAK, KYW; East KDKA, WGY, WJZ, WGM, WSB, WDAJ; and West KHJ, KDYL, KFI, KFDB, and many others. I have heard all told 227 stations in United States, 12 in Canada, one in Cuba and one in Old Mexico.

Would be glad to hear from Aeriola Sr. Set users to get something new to try. Will answer all letters and cards.

From the Land o' Cotton

From William Britton, 200 East 18th Street,
Jasper, Alabama

HAVING read all the D-X records in Radio World I am now sending in mine. I use a one tube, single circuit regenerative hook-up with Remler, Chelsea, Allen-Bradley, parts in the set. I have heard 80 stations with this set listening in about two hours every night. During the winter I heard an average of 12 stations in two hours listening in. On several occasions I heard fifteen stations in the same time. My aerial is 90 feet long, 30 feet high at the south end and 10 feet high at the north end. The stations I have heard are, WGY, WLAG, WWJ, KYW, WJZ, WDAP, WJAZ, KDKA, WDAR, WDAF, WHB, WDAE, WDAO, WSAT, PWX, WBAV, WOAI, WIAR, WTAW, WEAM, WOAW, KFAF, WAAQ, WHAS, WBAP, WOC, WBAX, KZN, KFFQ, KFI, KWH and also Frank Jones station in Tunicu, Cuba. This only half of the number of stations I have heard.

I want to say a word about single circuit outfits. There is five in town within a radius of one mile of my house and these sets have never bothered me when I was listening in. The above record is not bad for my kind of set, eh, what!

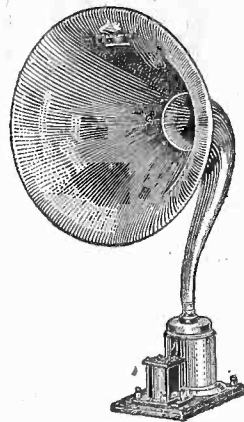
All on the Magnavox

From Ralph Mallon, 33 East 4th St., Columbus, O.

I HAVE a three-step and Magnavox. The following stations were heard Saturday, May 26:

KDKA, 200 miles; WHAS, 200 miles; KFI, 2,079 miles; WDAJ, 500 miles; WJZ*, 550 miles; WJY, 550 miles; WOAW, 690 miles; WGY, 550 miles; WDA*, ship; WJAD*, 1,035 miles; WIP*, 435 miles; PWX, 1,400 miles; WOR, 550 miles; KHJ (speech), 2,070 miles. Total miles, 10,450. Total stations, 14. All of these were on the Magnavox. This record is better than my other record that I sent in. Since April 30 I have received 21 states, without Cuba and ships, numbering 38 stations.

MAGNAVOX Radio Products



R2
Magnavox
Radio
The
Reproducer
Supreme

The Utmost in Sound Amplification

Where the reproduction of broadcasted programs is desired in large volume, the Magnavox Reproducer R2 should be used.

Thanks to the Magnavox (electro-dynamic) principle of construction, this result is secured with minimum electrical energy.

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . \$90.00

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field . . . \$60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . \$35.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, \$55.00
AC-3-C, 3-stage, \$75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.

Oakland, California
New York Office: 370 Seventh Avenue

THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word.

Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Thos. H. Oliver, 401 West Erie St., Albion, Mich. (Dealer.)
 F. M. Olzewski, 201 South Broadway, Baltimore, Md.
 Geo. Mulholland, Craigvale, Ontario, Canada. (Will soon enter radio business.)
 Sidney Wiswall, Ballston Spa, N. Y.
 Kerr B. Cowan, 1532 West Fourth Ave., Corsicana, Tex.
 Joseph Jarvine, Junction, Texas.
 John H. Whitcomb, 58 Forest St., Keene, N. H.
 Wilson's Radio & Electric Shop, Third and Pike Sts., Seattle, Wash.
 2DX Radio Club, Charles Baronofsky, 92 Newport Ave., Brooklyn, N. Y.
 J. E. Grove, 646 Market St., Wheeling, W. Va. (Builds sets.)
 Elbert Janes, 1119 East 14th St., Davenport, Iowa.
 William Moulton, Box 172, R. F. D., Acushnet Station, Mass.
 Jack A. Smith, P. O. Box 445, DeLeon, Texas.
 Paul Weber, 1339 DeKalb Ave., Brooklyn, N. Y. (Builds sets of standard parts.)
 F. F. Loder, 1621 Rice Ave., Corning, Tehama Co., Calif.
 William Shoncite, 163 East 42nd St., New York City.
 L. Hamilton Adams, Jr., 10 Roosevelt St., Norwalk, Conn.
 S. Zelony, 60 East 109th Street, New York City. (Builds sets and buys parts in quantity.)
 Riverside Radio Club, 646 West Ninth Street, Room 6, Virginia Block, Riverside, Cal.
 Wesley Rumery, R. F. D. No. 1, Derby Line, Vt.
 Payton Lewis, 3826 Dennison Place, N. W., Washington, D. C.
 George McKee, Mallet Creek, O. (Radio salesman.)
 Private Charles E. Ernst, D. & R. Cantonment, Fort Hamilton, Brooklyn, N. Y.
 J. W. Kilgore, 1122 Third Street, Fort Madison, Ia.
 F. W. Becker, 31 North Main Street, Gloversville, N. Y. (Dealer.)
 Arthur F. Hansen, 227 South Main Street, Los Angeles, Cal.
 Ing. A. Orsi, Via Due Macelli 60, Rome, Italy.
 Robert Henry, 307 West Pine Street, Butler, Mo. (Retailer.)
 P. Van Derzee, 70 Ruggles Street, Roxbury, Mass. (Will establish a radio business in early fall.)
 John W. Hoke, 214 Cottage Street, New Castle, Pa.
 B. L. Thomas, 74 McCormick Street, Clifton Forge, Va.
 C. L. Storer, 127 South Eleventh Street, Lincoln, Neb. (D. E. Moore, manager, Radio Department.)
 J. L. Manson, Jr., Prairie Home, Mo.
 B. S. Williams, Woodston, Kan. (Dealer.)
 R. I. Pennell, care George Hall, Hebron, Neb.
 Private George C. Olsen, Company "H," Second Infantry, Camp Custis, Michigan.
 F. Throcheski, 2145 Alumni Place, Dubuque, Ia.
 T. Hauptert, 809 Seminary Street, Dubuque, Ia.
 A. C. Greenbaum, 5036 Michigan Avenue, Chicago, Ill.
 Robert G. Youngren, 5445 South Wells Street, Chicago, Ill.
 John Remmers, Oskaloosa, Kan.
 J. C. Roper, 5325 Bond Street, Oakland, Cal.
 R.-B. Battery & Electric Service Station, Galva, Ill. (Wholesale and retail.)
 Frank S. Harris, Sacandaga, N. Y.
 L. I. McBrien, R. 3, McCook, Neb. (Consumer.)
 A. W. Lindstrom, 14 East Main Street, Torrington, Conn. (Interested in used sets.)
 F. V. Healy, 116 South Pearl Street, Joplin, Mo.
 G. E. Shutt, City Garage, Fayetteville, Ark.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for \$1.00 Radio World, 1493 Broadway, N. Y.

New Radio and Electric Firms

Scotia Electric and Manufacturing Co., Scotia, N. Y., light and power plants, \$5,000; J. Steinbach, W. N. Vandenberg, A. C. Neilson. (Attorney, J. H. Gould, Schenectady.)

G. Sommers & Co., St. Paul, Minn., will add a radio department. The buyer is J. A. Dieber.

Consolidated Hydro-Electric Corp., Dover, Del., manufacture motors, \$100,000. (U. S. Corporation Co.)

Audio Laboratories, New York City, radio manufacturing, \$5,000; V. Himmer, Jr., C. Bosworth, M. Didshun. (Attorney, S. Sprung, 291 Broadway.)

S. S. S. Radio, New York City, make parts, \$20,000; M. Schier, N. Jurgrau. (Attorney, H. S. Cantor, 280 Broadway.)

Magnus Electric Co., New York City, has increased its capital stock from \$100,000 to \$250,000.

Radio Stores Corp., New York City, has increased the number of shares from 1,000 common, no par value, to 500 preferred, \$100 each, and 1,000 shares, no par value.

Chelsea Electric Corp., New York City, \$10,000; B. V. Price, J. Ort, H. Reikes. (Attorney, M. Ornstein, 147 Fourth Avenue.)

E. L. Electric Welding Repair Co., Brooklyn, N. Y., \$10,000 to \$20,000.

Public Electrical Supply House, New York City, \$10,000; N. J. and J. and A. Feinberg. (Attorney, B. Kronenberg, 302 Broadway.)

American Manufacturers, Go After the English Trade

AN authoritative announcement reaches RADIO WORLD to the effect that the number of radio fans is increasing at the rate of fifteen hundred a week in England.

At that rate there would be an increase of about eighty thousand radio fans in England during the coming year. Due to the fact that the ratio of increase becomes greater with each new thousand it can readily be seen that England offers a fine market for the right kind of radio goods.

The suggestion is hereby made that manufacturers and distributors of American radio goods should investigate the new conditions in the English market and guide their business activities accordingly.

A New Radio Booklet

"SIMPLICITY OF RADIO" is the title of a booklet by Powel Crosley, Jr., published by the Crosley Manufacturing Company, Cincinnati, Ohio. The booklet is well illustrated and contains considerable interesting radio information, more especially referring to Crosley apparatus.

Rova Now Operates Four Radio Stores

IN the Hotel Claridge, Forty-fourth street and Broadway, New York City, a fourth Rova radio store has been opened. This store, formerly operated by Radio Reynolds, is in the heart of the theatrical district, and will cater to uptown trade.

Public Broadcasting Station Proposed for Philadelphia

ERECTOR of a central radio broadcasting station, to be owned and operated publicly as one of a chain which will extend throughout the country, is asked by representatives of the National Radio Chamber of Commerce in a proposal laid before the Philadelphia Chamber of Commerce. Dr. Wilmer Krusen, chairman of the Municipal Affairs Committee of the Philadelphia Chamber, has the proposal under consideration.

The National Chamber is quoted as saying:

"The public broadcasting station must, and will, be supported by the people whom it serves. We are presenting to Philadelphia the opportunity to lead the way in the great, new development of this epoch-making art by establishing the first public broadcasting station in the United States, owned and operated by the public."

Argentina Radio Manufacturer Bankrupt

THE largest manufacturer of radio telephone and telegraph apparatus in Argentina has applied for a receivership, according to advices reaching the Department of Commerce. The financial difficulties of this company are due, it is said, to intense competition existing in the Argentine market, which resulted in considerable price cutting.

Hartzell Opens Syracuse Office

THE Hartzell Sales Company announce the opening of a branch office in Syracuse, N. Y., to be in charge of Arthur C. Smith as branch manager. The temporary address will be 1615 West Genesee street. This office will cover all of the New York State territory with the exception of Greater New York and a radius of fifty miles therefrom.

Westinghouse Suit Against De Forest in Court

THE Westinghouse Electric & Manufacturing Company began legal action last week in New Jersey against the Radio-Craft Company, Inc., and De Forest Telephone & Telegraph Company. The Westinghouse company claims the defendants are infringing on the Armstrong patent, which it controls.

Modell's Seventh Store Is Opened

MODELL'S, the well-known radio supply house, opened its seventh New York City store last week at 140 West Thirty-second street. By the autumn of this year it is expected that Modell's will be operating twelve high-class radio stores in the metropolitan district.

Standardizing Radio Equipment

By S. Herbert Mapes

ALL radio fans will remember the condition of affairs a year ago. At that time there were all kinds of fraudulent and freakish sets and parts—poor merchandise in every way—so that legitimate and reliable radio apparatus was hardly able to gain a foothold in the market.

The first step taken to bring order out of chaos was by the Federal Telephone & Telegraph Company, which started to standardize their receiving sets and parts, and guarantee every product that left their factory, in this way establishing the confidence of the public and placing radio in its true position in the field of legitimate merchandise.

This move, made by a manufacturer who has been producing quality apparatus for the past twenty-two years, will be a great help to the unformed layman because he knows nothing about radio, and if he knows he can purchase a radio set with a guarantee from a manufacturer who is a veteran at the game then it is up to him to settle in his own mind that he wants the best and with a guarantee.

The uninformed layman who selects and purchases instruments for his radio receiver is about as likely to make a wise choice, as Edgar Felix so truly says, "as a Hindoo attempting to fit out an Arctic expedition."

He is offered the choice of an extensive line of material, each piece of which seems to have certain technical merit, and if he does not know just what to buy he is lost in a maze of indecision.

The answer to the layman's general question, "What kind of sets should I buy?" may best be answered by a consideration of what he wants his set to do—the service he expects from it.

How loud a signal does the owner want? If he can pay the price he can receive music from a broadcasting station more than a thousand miles distant and make it audible for a block or two from his house. On the other hand, he may be told that a certain station can be heard at a certain distance with a particular set, yet that signal may be

so weak that it will be drowned out by the ticking of a watch.

If the buyer is content with a pair of ear phones on his head then signal strength obtained on a crystal set or vacuum tube detector will be sufficient.

But if he wants to dance to radiophone music, or if he wants to make concerts audible to as many persons as he can accommodate in a room, apparatus will be needed which produces much greater signal energy. This must be sufficient to operate a loud-speaking horn, and, except for short distances, an amplifier is necessary.

If money enough is available amplification can be provided so that a signal can be amplified to practically any degree of strength.

The type of receiver essential to obtain signals of sufficient loudness for head telephones, and the type for operating loudspeakers for various distances from the transmitting station, is, of course, something that must be determined. Every layman is confronted with questions such as these when he starts out to select his equipment. Should he spend \$20.00 or \$300? Should he choose a crystal set or a tube set? Should he buy head phones or a loud-speaker? What facilities has he for putting up an antenna, and what kind of antenna should he have? These are questions which the layman must decide before he makes his purchase.

During the year just passed great improvement has resulted in radio apparatus and its usefulness. Transmitters and receivers have been greatly improved, with the result that greater public interest has been stimulated. Perhaps in no other line of endeavor has there been more activity and progress through improvement of apparatus than in radio.

The primary thing to do now is for all those interested in radio to maintain the high standard of technical requirements and ask for standard, guaranteed radio products, such as the Federal Telephone & Telegraph Company manufacture.

Who Will Give This Sick Man a Radio Set?

EDITOR, RADIO WORLD: Being dependent upon an aged father for support and physically handicapped through paralysis and tuberculosis, unable to work, or enjoy life as I see others all about me enjoying it, I am led to make this appeal to you. Would you or some of your readers be willing to donate to me a radio outfit—nothing elaborate, but a simple set that I could operate successfully here in the mountains? I assure you it would bring new joys and thrills into the life of me, to whom many of the good things that others enjoy are but a dream. I sincerely thank you for any favors you deem advisable to grant me.

Sincerely yours,

36 Broadway, CHARLEY BARRETT.
Saranac Lake, N. Y.

Manufacturers, Please Oblige!

EDITOR, RADIO WORLD: Several manufacturers have not answered my inquiries for literature in other publications, and would therefore like to have you place my name with reliable concerns who wish to do business. Am in control of at least six sets and have constant use for high-grade material, but cannot learn their merits except through some understanding of their make-up.

5023 Baltimore Ave., R. J. RUSSELL.
West Philadelphia, Pa.

Calculating Inductance of Polygonal Coils

COILS wound on forms such that each turn incloses a regular polygon are finding frequent use in radio circuits. Not only are they easy to construct, but support for the wires of the coil is necessary only at the vertices of the polygon. Thus, the amount of dielectric near the wires is small, making it easy to reduce energy losses in the dielectric to a very small amount.

In Scientific Paper No. 468, "Formulas and Tables for the Calculation of the Inductance of Coils of Polygonal Form," published by the Bureau of Standards, Washington, D. C., formulas are derived for the calculation of the inductance of such coils. The cases treated are triangular, square, hexagonal, and octagonal coils. It is found that a circular coil inclosing the same area as the polygonal coil, the length and the number of turns being the same in both cases, has nearly the same inductance as the polygonal coil.

This suggests the presentation of the results in such a way as to enable the radius of the circular coil having the same inductance as the given polygonal coil to be found. Knowing this, the inductance of the polygonal coil can be found by existing formulas and tables applicable to circular coils.

The tables given show what is the equivalent radius of the polygonal coils which are likely to be met in practice. Other cases can be treated by a simple interpolation.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

Test Case on Broadcasting Copyrighted Music

WHETHER the broadcasting by radio of a copyrighted musical composition constitutes an infringement of the copyright law will be threshed out in a friendly suit which M. Witmark & Sons, music publishers of New York City, will bring against the department store of L. Bamberger & Co., which operates Station WOR, Newark, N. J.

The alleged infringement occurred June 4, the song being "Mother Machree," rendered vocally. The defendants will admit they have been broadcasting copyrighted music without license, the suit being primarily for test case purposes.

J. C. Rosenthal, general manager of the American Society of Composers, Authors and Publishers, in an affidavit, sets forth he offered to license the Bamberger firm for \$1,000 annually, which was refused.

Mexico City Has New Broadcasting Stations

TWO radio telephone broadcasting stations were recently opened in Mexico City, a report from Consul Thomas D. Bowman, Mexico City, states. Various efforts have been made in recent months to obtain concessions for the establishment of such stations, but it is only recently that the government granted this permission.

There appears to be great enthusiasm over local broadcasting and it is believed that the market for radio sets in Mexico is favorable to considerable development by American manufacturers.

Radio sets are now sold by electrical dealers, for the most part, although some American concerns have sent direct agents to promote sales. One dealer has estimated that approximately 150 high power sets have already been sold in Mexico City. It is reported that other broadcasting stations are to be erected in Mexico.

Latest Move in Broadcaster-Music Publisher Fight

THE National Association of Broadcasters, with offices at 1265 Broadway, New York City, under the direction of Paul B. Klugh, Executive Chairman, have followed up the announcement that no performing rights royalties will be paid to copyright owners with a country-wide appeal to song-writers and publishers to turn over their mechanical royalty money to the association.

In a circular sent to music men and writers the association declares that the broadcasting of tunes is a great publicity movement, will stimulate sales, and, in fact, makes quick hits, with the following of big returns for the publishers and writers from the sale of their songs.

The American Society of Composers, Authors and Publishers holds a contrary opinion. It asserts that broadcasting hurts music sales; that it is public performance for profit, and that royalties should be collected in the same manner as from the motion picture theatres, dance halls and cabarets.

Religious Services From WMC Highly Appreciated *By George D. Hay*

HEARING a sermon for the first time in her life, after being born deaf, Mrs. J. C. Lockert of Jackson, Tenn., writes to WMC, The Commercial Appeal's radio station at Memphis, Tenn., through her husband, expressing deep appreciation of the revelation that has come to her through the medium of radio. Hundreds of cases have been reported

throughout the country of deaf persons being made to hear the oral language through radio.

Following is part of Mr. Lockert's letter: "Wish to thank you for the excellent sermon by the Very Reverend I. H. Noe, dean of St. Mary's Cathedral in Memphis, which came in today through a loud speaker with such distinctiveness

that it was heard throughout an eight-room dwelling and was also heard by neighbors across the street.

"In this connection I would like to say that my wife, who was born deaf, heard this, her first sermon in the oral language, by the use of ear phones. Please extend the Reverend Noe and his splendid choir our appreciation, etc."

Since WMC began broadcasting Dean Noe's sermons, and the services at St. Mary's Church a month ago, hundreds of letters have been received from all over the country, expressing appreciation of the innovation.

An Episcopalian directly across the street, who had remained indoors on Sunday mornings was brought face to face with the church services through radio and forthwith decided to arise each Sunday and attend church. All of which proves that it is not a case of distance.

T. C. Scott and his family, of Leachville, Ark., are now holding open house on Sunday mornings, inviting people from miles around to take advantage of Dean Noe's sermons through their radio set.

The faculty and Normal School students of the State Agricultural College at Jonesboro, Ark., hold a "relay" service each Sunday in the school auditorium, where over 200 persons gather for the sermon.

Mrs. Aaron Allen, of Memphis, who has been confined to her room for eight years with a serious illness, heard her first sermon since she was stricken when her radio set caught St. Mary's choir and the dean's sermon.

John Myers, a world War Veteran, who has been paralyzed for four years, was also the recipient of the spiritual message.

Mrs. H. H. Cruse of Houston, Tex., reports that her little daughter, Thelma, insisted upon wearing the receiver throughout the service, to fall peacefully asleep at its close.

Dr. J. H. Lockey of Ripley, Tenn., writes that his wife could not attend her own church on account of illness, and was given the entire service from St. Mary's over the radio. C. V. Hunter of Kennett, Mo., reports that he entertains a large number in his home every Sunday with radio and WMC's service.

WMC could go on indefinitely relating instances that are reported each day, as a result of its Sunday service, through the courtesy of Dean Noe.

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

	Large	Medium	Small
22½ Volt plain	\$1.25	\$1.00	\$0.70
22½ Volt variable	\$1.38	\$1.13	\$0.75
45 Volt plain	\$2.50	\$1.75	—
45 Volt variable	\$2.75	\$2.00	—

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

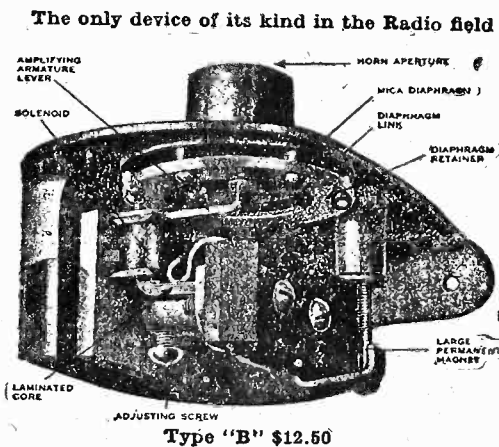


The Trinity Loud Speaker

TYPE "A1"
\$25.00

21-in. Fiber Horn

Study the illustration carefully and you will understand why it produces full, clear, natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph. No storage battery required.



The only device of its kind in the Radio field

Labels in diagram: AMPLIFYING ARMATURE LEVER, SOLENOID, LAMINATED CORE, ADJUSTING SCREW, HORN APERTURE, MICA DIAPHRAGM, DIAPHRAGM LINK, DIAPHRAGM RETAINER, LARGE PERMANENT MAGNET.

Type "B" \$12.50

The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.

Ask your dealer for demonstration—if he cannot we can.

TRINITY RADIO CORP.

168-"B" DARTMOUTH STREET

BOSTON, MASS.

SPECIAL VACATION SUBSCRIPTION OFFER (FOR NEW SUBSCRIBERS ONLY)

In order to materially increase our subscription list we are offering for a limited time a special subscription of seven issues of Radio World for \$1.00. You may begin your subscription now, or have us start sending the first issue on this subscription offer when you go out of town.

CUT OUT THIS TODAY SO THAT YOU WILL NOT FORGET ABOUT IT

Radio World's Special Summer Subscription Offer

Radio World, 1493 Broadway, New York City

Enclosed find \$1.00, for which send me Radio World for seven issues, beginning with your number dated.....

SUBSCRIPTION RATES

Single Copy.....\$.15
One Year (52 numbers)..... 3.00
Six Months..... 1.50
Three Months..... .75
Add \$1.00 a year for foreign postage.
50 cents extra yearly to Canada.

Name.....
Address.....
City and State.....

Two Good Reasons for Suspending Amateur Licenses

RECENTLY the license of an amateur operator was suspended by the Department of Commerce for a period of three months on account of the operator being examined within three months after a prior examination in which he failed to pass, which constituted a violation of regulation 133 of the Radio Communication Laws of the United States, which reads, in part, as follows: "No applicant who fails to qualify will be re-examined at any examining office within three months from date of the previous examination. . . . When the records of the bureau develop the fact that an applicant has failed to qualify and has applied for re-examination or been re-examined at the same or another office within three months his existing license may be suspended or revoked by the Secretary of Commerce."

In another case an amateur operator had his operator's license and station license suspended for one year for violation of Section 7 of the Act of August 13, 1912, in that he transmitted a false distress signal (SOS).

Summer Hotel Stuff

"This room is small and seems poorly furnished—one chair and a folding bed."

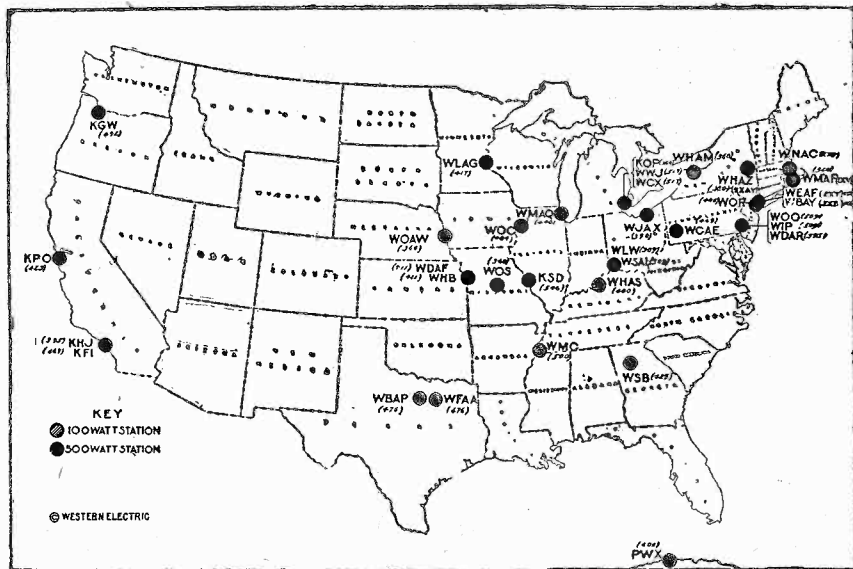
"That, sir, is the telephone booth."—*Louisville Courier-Journal.*

Old Friends with New Wave Lengths

The map herewith visualizes a number of stations well known to distance listeners, which are now operating on the new wave lengths. All are equipped with 500-watt Western Electric transmitters, except

WHAM and WNAC which deliver 100 watts; station WMAF has both 500 watt and 100 watt transmitters. The stations shown on the map, with their new wave lengths, are as follows:

Call Signal	Station Name	Wave Length
KFI	Examiner—Earl C. Anthony, Los Angeles, Calif.	469
KGW	Oregonian Publishing Co., Portland, Ore.	492
KHJ	Times-Mirror, Los Angeles, Calif.	395
KOP	Police Department, Detroit, Mich.	360
KPO	Hale Brothers, San Francisco, Calif.	423
KSD	Post Dispatch, St. Louis, Mo.	546
PWX	Cuban Telephone Co., Havana, Cuba	400
WBAP	Star Telegram, Fort Worth, Texas	475
WBAY-2XB	Western Electric Co., Inc., New York City	492
WCAE	Kaufman & Baer Co., & Pittsburgh Press, Pittsburgh, Pa.	469
WCX	Free Press, Detroit, Mich.	517
WDAF	Star, Kansas City, Mo.	411
WDAR	Lit Bros., Philadelphia, Pa.	395
WEAF-2XY	American Telephone & Telegraph Co., New York City	492
WFAA	News, Dallas, Texas	476
WHAM	Eastman School of Music and Democrat & Chronicle, Rochester, N. Y.	360
WHAS	Courier Journal, Louisville, Ky.	400
WHAZ-2XAY	Rensselaer Polytechnic Institute, Troy, N. Y.	380
WHB	Sweeney Automobile School, Kansas City, Mo.	411
WIP	Gimbel Brothers, Philadelphia, Pa.	509
WJAX	Union Trust Co., Cleveland, Ohio	390
WKAQ	Radio Corporation of Porto Rico, San Juan, Porto Rico	360
WLAG	Cutting & Washington Radio Corp., Minneapolis, Minn.	417
WLW	Crosley Mfg. Co., Cincinnati, Ohio	309



Map Showing Location of Well-Known Stations With New Wave Lengths.

WMAF-1XV	Round Hills Radio Corp., So. Dartmouth, Mass.	360
WMAQ	The Fair Corp., & Chicago Daily News, Chicago, Ill.	448
WMC	Commercial Appeal, Memphis, Tenn.	500
WNAC	Shepard Stores, Boston, Mass.	278
WOAW	Sovereign Camp, Woodmen of the World, Omaha, Neb.	360
WOC	Palmer School of Chiropractic, Davenport, Iowa	484
WOO	John Wanamaker, Philadelphia, Pa.	509
WOR	L. Bamberger & Co., Newark, N. J.	405
WOS	Missouri State Marketing Bureau, Jefferson City, Mo.	360
WSAI	U. S. Playing Card Co., Cincinnati, Ohio	309
WSB	Journal, Atlanta, Ga.	429
WWJ	News, Detroit, Mich.	517

Marvel - Capacity - Switch

THREE-WAYS

Series, Parallel, Direct-Ground

Patents Pending



Panel-mounted

Enables you to receive long waves in the parallel position; short waves in the series position; and waves of medium length by eliminating the condenser entirely. Instructions for mounting and for wire connections given with each instrument.

List Price \$1.25

Attractive discounts for dealers and jobbers. Write for descriptive circular.

MARVEL-SWITCH CO.

28 WEST 25TH STREET

NEW YORK

YOU SAVE 50% OF THE USUAL COST

WORLD BATTERIES FOR RADIO



6 Volt 60 Amps.	\$10.00
8 Volt 80 Amps.	12.50
6 Volt 100 Amps.	14.50
6 Volt 120 Amps.	16.00

A Better Battery Cannot Be Built

The best of material—careful construction by skilled mechanics—makes a battery that will give a long life of hard service.

A written two (2) year guarantee. You take no chances with a World Battery—it is the most satisfactory battery you can get and you save 50%.

Mail Your Order Today

We ship C. O. D. subject to inspection, or will allow 5% discount for cash with order. All orders shipped same day as received.

WORLD BATTERY CO.
Dept. 17, 1219 So. Wabash Ave.
Chicago, Ill.

GUARANTEED 2 YEARS

Send us your Burnt-out Tubes

We Repair



U. V. 200	\$2.75
U. V. 201	2.75
C. 300	2.75
C. 301	2.75
W. D. 11	3.50

Fine Workmanship Quick Service
Mail Orders Promptly Attended to

Badger Radio Tube Repair Works
4913 North Ave. Milwaukee, Wis.

KELLY WAVE SUSTAINING COIL

Eliminates Aerials, Loops and Danger from Lightning

Fit Inside Set

The Kelly Wave Sustaining Coil will work perfectly in any tube set. The coil being sealed under a vacuum, it eliminates STATIC and all interferences.

Price \$4 Each



Makes It Portable

Simple to connect. One lead to terminal marked aerial, the other to A or B battery—That's all.

Dealers, write for special terms.

Manufactured by

JOS. GELB COMPANY, 250-258 West 54th Street, New York

Something New in Batteries

Exceptionally good proposition. Assigning Territory Rapidly.

JOBBER and DISTRIBUTORS

Write or Wire
SIDBENEL

25 Mt. Eden Ave.

New York

DID YOU GET THE VACATION NUMBER OF RADIO WORLD

It had page after page of interesting and practical ideas and hook-up for people who are going camping, canoeing, yachting, or just vacationing up in the mountains. You really can't afford to be without it, if you intend leaving the city behind this summer and want to take your radio with you. Dated June 2. Mailed for 15c.

Radio World, 1493 Broadway, New York City

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS
DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

TWO FOR THE PRICE OF ONE—Send \$3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send \$6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

AGENTS, crew managers, \$20 daily distributing bamboo self-filling fountain pens; imported; something new; everybody going wild; sample free. SPORS CO., Lesueur Center, Minn.

HONEY COMB COILS—35, 50 or 75 Turn, 40c. Each Mounted, \$1.25; Special Windings to Order. Tapped Honey Combs, 3c per Tap. Crystals—Honest John's Old Fashioned Crystals, "Thunder Note" (Pyrites) and "Wonder Rock" (Galena). Tested, guaranteed and individually boxed. Each Crystal as big as a walnut. Biggest value in radio, 25c each. Small Pyrites or Galena Crystals for mounting, 75c per pound. Dealers and jobbers, write for special quotations. Factory agents wanted in some States. HONEST JOHN MFG. CO. (Dept. RW.), 1509 East 11th Street North, Portland, Ore.

HAVE A BRAND NEW RADIO INVENTION that every radio fan needs and will buy, as it greatly adds to the efficiency of his set. Need money to advertise and buy new material. Will you join inventor with some cash and share in the big profits? W. B. GRAHAM, 125 West 74th Street, New York City.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

SALE—Exide 120 hr. Battery, \$12.50; Kellogg Sockets, 30c.; Transformers, \$1.90. All kinds. Guaranteed apparatus at proportionate prices. KENNETH JONES, London Mills, Ill.

RADIO MANUFACTURERS—South America is the coming field. Have your catalogs, booklets and bulletins translated into Spanish by a specialist. Submit English originals for estimate. TECHNICAL, Box 126, Trinity Station, New York City.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

GRAM'S RADIO BROADCASTING MAP OF THE UNITED STATES AND CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up-to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. The Columbia Print, 1493 Broadway, New York City.

RADIO DEALERS !!!

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for \$1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

Build your sets with quality parts and get sure results. Radio Parts Co., Box 56, Dunellen, N. J.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingo-mar, Ohio.

MAGNAVOX TYPE R3.—Latest curvex, improved acoustic models, in original sealed factory cartons. List \$35. Introductory offer \$25. RADIO CENTRAL, Dept. W, Abilene, Kans.

OLD MONEY WANTED—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, \$1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

WANTED—Omnigraph in good working condition. Box 435, Hardin, Montana.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hipodrome Bldg., Cleveland, Ohio.

RADIO FANS Do you want to sell your old set?
Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department
for your personal radio and other needs.

RADIO WORLD, 1493 Broadway, New York City

RADIO WORLD IN THE PUBLIC LIBRARIES

Many public libraries throughout the country are sending in their subscription orders for RADIO WORLD.

Librarians evidently have made up their minds that the visitors to their libraries are anxious to read articles about and see pictures of the latest developments in radio when they are news.

If your library has not placed RADIO WORLD on file, tell your local librarian how interesting and important is this once-every-seven-day radio paper.

Address: RADIO WORLD, 1493 Broadway, New York, N. Y.

THE BOY MECHANIC



700 THINGS FOR
BOYS TO DO

480 Pages—700 Articles
800 Illustrations—Cloth

Price \$2.00 Prepaid

The Ideal Book
for the
Wide-Awake Boy

All the things described in this volume have actually been built or experimented with by boys. The ideas contained in "The Boy Mechanic" would more than keep a boy occupied until he grows up and also be an incentive to original thinking and achievement.

The Most Interesting Boys' Book

Unlike so many other books of a somewhat similar nature, it is not confined to only one or a few subjects, but describes 700 different things boys can make and do in the fields of mechanics, electricity, sports, arts and crafts work, magic, etc.

An unusually generous book; size 7 by 10 in. and 1 1/2 in. thick; printed from large, clear type on high grade book paper and durably bound in cloth. Attractive four-color cover design.

Wholesome, Practical, Instructive
Besides telling how to make scores of things useful about the house, full and complete directions are given for constructing hundreds of things which appeal to the heart of every boy.

Many hours of enjoyment are in store for the boy who becomes possessor of this book.
Price \$2.00 Prepaid to Any Address

THE COLUMBIA PRINT
1493 Broadway New York City

2000 MILES ON ONE TUBE!

Easily made by anyone. No trick circuit. Few parts. Distance, Volume, Selectivity. Guaranteed to work or your money refunded. Complete parts, including drilled panel, bulb, phones, batteries and diagram, only.....\$12.95
Circular free.

Scientific Radio Laboratory
25 THIRD AVENUE NEW YORK

Two-Tube Portable Set

(Tubes Included)

Consisting of

- 1 23 P Condenser and Dial
- 1 150 to 600 Meter Inductance Coil
- 1 6 Ohm Rheostat with Automatic Control for Amplifying Tube
- 1 Audio Frequency Amplifying Transformer
- 1 Standard Double Socket
- 1 Mica Grid Condenser
- 1 Tubular Grid Leak and Holder
- 1 Detector Tube
- 1 Amplifying Tube
- 1 Pair Federal Phones
- A and B Batteries

All Connections Automatic, enclosed in 7x7½ Mahogany Finished Cabinet and Formica Panel.

A Very Special Bargain at **\$30.50**

AETACO Condensers

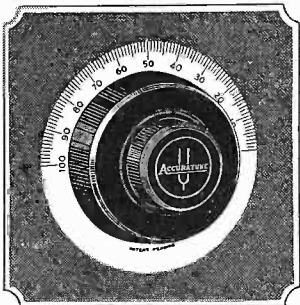
43 Plate Condenser	\$1.75
23 Plate Condenser	\$1.35
17 Plate Condenser	\$1.25
11 Plate Condenser	\$1.00
3 Plate Condenser60c.

Back Mounting Inductance Switches, \$1.00

Complete Line of Receiving and Transmitting Apparatus. All Orders Must Include Postage. Checks Certified.

American Radio Stores

235 Fulton Street New York City



All the family can tune-in with

ACCURATUNE
MICROMETER CONTROLS

Granddad, dad, mother and little brother all agree that "it is real joy to tune-in now with Accuratunes." A slight turn of the smaller knob operates the micrometer control for delicate tuning. Those stations you used to work so hard over, and others you could "just about get" are easily brought in clear and strong with Accuratunes. Knobs are of genuine Bakelite, either black or brown. Dial is silvered with neatly engraved graduations. \$3.50 at your dealers' or by mail.

MYDAR RADIO CO.

9-B Campbell Street
Newark, N. J.

Features of the Program from WGI, Medford Hillside, Mass.

Saturday, June 30, 1923

6:00 P. M.—New England Weather Forecast furnished by the U. S. Weather Bureau.
New England Crop Notes furnished by V. A. Saunders, Statistician.
Late News Flashes—Early Sports News—Boston American.

6:15 P. M.—Conditions of Massachusetts Highways furnished by the Automobile Legal Asso. Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Sixty-Nine.

8:30 P. M.—Evening Program.
1. Thirteenth of a series of talks on New England Business Problems conducted by Arthur R. Curnick of the New England Business magazine.
2. Concert Program.

Sunday, July 1, 1923

4:00 P. M.—Twilight Program.
1. "Adventure Hours," conducted by the Youth's Companion.
2. Concert by Miss Miriam Stanley Carlton, Soprano and Violinist, accompanied by Miss Nellie Dean, Pianist.

8:30 P. M.—Fifth in a series of talks on World Unity by prominent New England speakers, conducted by the Massachusetts Federation of Churches.

9:00 P. M.—Musical.

Sweden to Have Liberal Radio Laws

THE proposed Swedish law for regulating radio telephony in that country recognizes the principle of free competition with regard to the manufacture of radio apparatus. It will permit amateurs to build their own sets, requiring only that these shall be constructed in accordance with certain regulations, advices to the Department of Commerce from Assistant Trade Commissioner Sorensen state. The Telegraph Department does not contemplate limiting within narrow margins the wave lengths on which amateurs may receive.

In accordance with the proposed law the government is to erect the broadcasting stations and rent them to the Radio Telephony Company, which in turn will receive a rental from receiving stations.

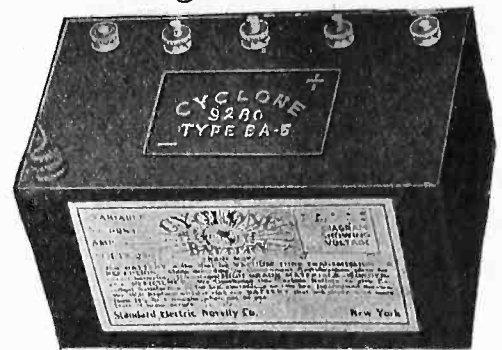
No mention is made in the law regarding sending apparatus. The Telegraph Department will control receiving sets and supply them with a certain control mark, whereas the Radio Telephone Company will give permission to use such against payment of a license fee, 10 per cent of which reverts to the State for the control privilege.

PATENTS

promptly procured. Trade Marks designed & registered
FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7212



Cyclone



WORLD'S BEST

"A" and "B" BATTERIES specially built for your Radio Set in all types. Highest quality GUARANTEED for DISTANCE, CLEARNESS, and LONG LIFE.

Standard Electric Novelty Co.

NEW YORK CITY
Best proposition for Jobbers and Dealers. Some territory still available for New Distributors. Write for details at once.

10 DAY SUNBEAM SPECIAL

NEW TUBES GUARANTEED GENUINE IN ORIGINAL PACKAGES

U. V. 200	\$3.95
U. V. 201A	\$5.50
U. V. 199	\$5.50
W. D. 11	\$5.50
W. D. 12	\$5.50
W. E. VT2	\$6.00
W. E. Peanut	\$6.50
W. E. 216-A	\$9.50

Add 25c. Postage and Insurance

SUNBEAM QUALITY goods, to complete the COCKADAY CIRCUIT. One guaranteed, accurate set of coils consisting of one plain and one Bank-wound coil sent postpaid for.....\$2.75

FANS! Buy Your Summer and Winter Supply Now—This Price Is Rock Bottom.

SUNBEAM ELECTRIC CO.
71 THIRD AVENUE NEW YORK

AMATEURS! FANS! ATTENTION!

ALL BROADCASTING STATIONS—Complete with the call, location, wave length, frequency of the station, and power used started in Radio World of June 9.

This list is most complete, and no amateur or fan should be without it. It will be completed in following issues, and as revisions or changes are made the list will be kept up-to-date, so that you will always have an up-to-date list to which you can refer. Don't miss any issue. Send 15c to

RADIO WORLD, 1493 BROADWAY New York City, or start your subscription with that number.

DO IT NOW—DON'T DELAY!

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

FILL OUT AND MAIL NOW
SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD

1493 Broadway, New York City

Please send me RADIO WORLD for months, for which please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy	\$.15
Three Months	1.50
Six Months	3.00
One Year, 52 Issues	6.00
Add \$1.00 a Year for Foreign Postage; 50c for Canadian Postage.	

Extra Sensitive Tested Radio Crystal

PREPAID 30 CENTS

Each One Tested and Guaranteed

RADIO PARTS COMPANY

Lock Box 56

DUNELLEN, NEW JERSEY

FADA INDUCTANCE SWITCH

40¢



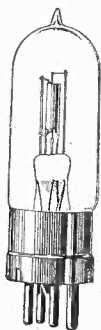
A Knobby Switch that fits the fingers and improves the appearance of your set. FADA Handbook only a dime.

F. A. D. ANDREA, INC.
1381 W. Jerome Ave., N. Y. C.

FADA RADIO EQUIPMENT



ON APPROVAL FOR 30 ¢
ZOBEL-STEIN LABORATORIES
322 9TH ST. BROOKLYN, N.Y. SOUTH 2650



WE REPAIR

WD-11, \$3.50

AND POSTAGE

Also other vacuum tubes, excepting VT-1 and VT-2.

Mail orders solicited and promptly attended to.

H. & H. RADIO CO.

514 Clinton Avenue

Newark, N. J.

Cram's Radio Broadcasting Map of United States and Canada

With all the new alterations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 24x28.

PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS.

The Most UP-TO-DATE MAP out!

35¢. (Postpaid)

THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN

Patent Lawyer

32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Radio Waves to Fight Aircraft

German scientists were reported last week as having devised a method of putting out of commission any motor using electric ignition, by stopping its magneto with radio waves. The Los Angeles *Times* asserts that Southern California experts claim that they are able to outwit the German inventors. This is said to be possible in two ways. While the German use of radio waves of unusual potency will undoubtedly put many types of internal combustion motors out of action, other forms have been developed which can not be so affected. The *Times* goes on to say:

The success of the Siemens-Stinnes experts in Germany may stimulate especially American use of the steam turbine engine for aircraft, according to local airplane motor experts. This type, and the heavy-oil burning engine, such as the Diesel, will not be touched by the German development.

The turbine has already been developed for actual use in airplanes. Harry Peters of La Crescenta, widely known aviation motor expert of England, whose health sent him to Southern California after the war, made flights in a turbine-equipped airplane before leaving England.

A turbine engine for airplanes and automobiles has been developed at San Diego by John T. Waugh and Capt. B. H. Taylor, and, according to local airplane experts who have witnessed its operation, it works successfully, and has a much lighter weight per horse-power than the aircraft gasoline engine.

E. M. Fisk and R. S. Gradle, officers of the Commercial Aircraft Association, believe that engines burning heavy oil can be made feasible for aircraft, and that these will be made in America in the near future.

"The method reported in the *Times* cablegram has been suspected as having been developed for some time," said Bennett Harrison, of the Radio Service Company's staff. "It is feasible, for it puts the magneto out of commission and so stops any motor with electric ignition. It is surprising that the Germans conducted their experiments where the French investigators could learn of them, for their efficiency is now greatly affected.

"Experts of all nations will begin to search for means of counteracting the radio attack by developing motors which will not be subject to radio. France and England, whose main defense in future must be aircraft, are either forced to develop defensive radio control or scrap a great amount of their newly built equipment in engines.

"Radio control and interference will be enormous factors if we have another war. The influence of radio will be everywhere. Great stations like KHJ of the *Times* will have a great patriotic part, for they will reach millions on the instant and arouse and organize as was not possible in the campaigns of the past war. They will also warn an enemy of the temper of the American people.

"These stations should be considered by the Government as actually being powerful aids to defense and methods developed to protect them against any aerial interference in case of war. If possible, an enemy will cut them off from the air as surely as he would cut a cable. The possibilities of this are suggested by the report from Paris on the radio interference with aircraft motors."

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.



Pruden Reliable
Radio Specialties
For Good Results

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN, Inc.

993 Bergen Ave., Jersey City, N. J.

"RADIO TUBES REPAIRED"

Work Guaranteed

W. D. 11 and 12 \$3.25

U. V. 201 A

SIX VOLT TUBES

DETECTORS \$2.75

AMPLIFIERS \$3.00

Radio Tube Laboratories

776 Broad Street

Newark, N. J.

THE BEST INSULATION "RADION" HARD RUBBER

PANELS

DIALS
V. T. SOCKETS
TUBING
KNOBS

Black and Mahogany "Radion" Panels

	Mahogany	Black
7 x 10.....	\$1.55	\$1.25
7 x 18.....	2.75	2.25
7 x 24.....	3.70	3.00
7 x 30.....	4.65	3.75

16 other stock sizes and also CUT TO ANY SIZE REQUIRED

"Radion" Tubing Cut to Any Length

Price per inch: 2"—10¢, 2½"—12½¢, 3"—15¢, 3¼"—16½¢, 3½"—17½¢, 4"—20¢, 5"—24¢.

Send Money Order with Order

New York Hard Rubber Turning Co.
212 CENTRE STREET NEW YORK

DISTANCE

With one tube and a COAST COUPLER you can select at will any distant station. With each COUPLER we enclose our special Hook-Up, which we guarantee will surprisingly increase the efficiency of your set. This Coupler will be mailed anywhere in the United States \$5.00 upon receipt of

THE COAST COUPLER CO.

245 East 7th Street, Long Beach, California

Dealers, Investigate!

YOU CW BOYS!

Do You Want to Change Your Transmitter or Are You Planning to Build One?

Then you will want these back numbers of Radio World: March 31, A Low Power CW Transmitter, by C. White. April 21, Haus Transmitter, by John Kent (circuit used by 2VK). May 5, Combined CW and Phone Set of M. Bebat, at Radio Central. May 26, A Simple CW or Phone Set That Works. R. W. E. Decker. 2UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No up to date amateur should be without them. 15¢ a copy. The four copies for 60¢. or start your subscription with any number. Radio World, 1493 Broadway, New York City

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Reinartz circuit for 2 tubes.....	Jan. 13
Good 2 tube WD-11 Circuit for DX.....	Jan. 27
Satterlee Circuit.....	Feb. 3
G. W. May's Wonder Circuit.....	Feb. 17
Power Amplifier Circuit.....	Feb. 24
Reflex Circuits.....	Feb. 24
Flewelling Super Circuit.....	Feb. 24
Multi-tube Reflex Circuits.....	Feb. 24
One tube Superregenerative.....	March 3
Lewis Three Tube Circuit.....	March 10
Regenerative Radio Frequency Circuit for 5 tubes.....	March 24
Hazeltine Neutrodyne Receiver.....	March 31
2VK'S Transmitter circuit.....	April 21
Compact Universal Receiver.....	April 28
Stockerburg Pup receiver.....	May 5
Cockaday receiver.....	May 12
Improved Grimes Circuit A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Reinartz.....	May 19

Any number for 15¢. Any 7 numbers for \$1.00. All 14 numbers for \$2.00. Or start subscription with any number. Radio World, 1493 Broadway, New York City.



It's the contact that counts

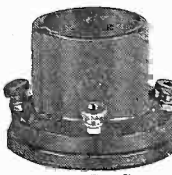
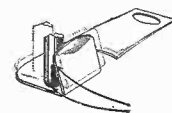
A careful examination will show that each contact in Na-ald sockets and adapters is of a wiping nature on a broad surface, of sufficient tension, and so designed that tension is permanent, no matter how often the bulbs may be removed and how much the connecting prongs in the tubes vary.

Also it is little realized that sockets are being sold which, owing to faulty choice or control of material, develop current leakages from plate to grid that rob many otherwise well-made sets of their efficiency. Na-ald sockets in their design avoid all these troubles.

Na-ald Sockets

- Na-ald No. 499.....50c
- Na-ald Adapter, No. 429.....75c
- Na-ald DeLuxe, No. 400.....75c
- Na-ald Small Space, No. 401.....35c
- Na-ald W. D. 11, No. 411.....75c
- Na-ald Two in One, No. 450.....50c

Booklet with diagram of Hazeltine's Neutrodyne circuit and other selected circuits packed with each Na-ald product.



Alden Manufacturing Co.

Manufacturers of Sockets for Every Tube and Requirement
Dept. L 52 Willow St.
Springfield, Mass.



RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y. BY HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY, President and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
European Representative: The International News Co., Breems Bldgs., Chancery Lane, London, Eng.
Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor: Stephen L. Coles
Technical Editor: Robert L. Dougherty

Field Representatives:
New York—Arnold D. Friedman, W. H. Oke.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
Los Angeles—Stevens & Baumann, Inc., Higgins Building.
San Francisco—Stevens & Baumann, Inc., Holbrook Building.

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for foreign postage. Canada 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.

One inch, one time—\$5.00. Per agate line \$0.40.

On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.

Terms: 30 days net. 2% 10th days.

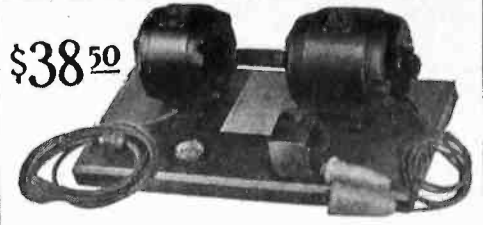
CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

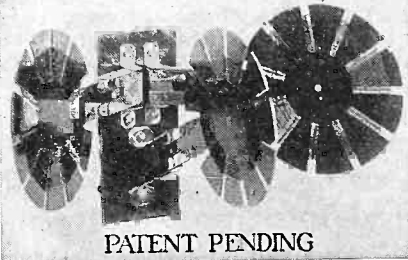


\$38⁵⁰

RECHARGE YOUR OWN BATTERIES

WHY pay out good money constantly for recharging batteries when the Ohio Motor Generator will do it quickly at a slight expense. This inexpensive home charging outfit keeps your Radio in service all the time and pays for itself—by charging your neighbors' batteries. It is noiseless, gives no trouble, and will even recharge totally exhausted batteries quickly. The set is made up of the celebrated Ohio A C motor and D C generator wound for 6-10 volts. The motor and generator have ball bearings and are of the highest grade construction. It has none of the troubles common to cheap charging sets and will last a lifetime. It will charge quickly any three cell automobile or Radio "A" battery. Furnished complete on a substantial base with ammeter and field rheostat to adjust the charging rate from one to twenty amperes. The motor is for 80 cycle, 110 volt service and is complete with ten foot cord and attachment plug ready for instant connection and operation. Full instructions provided. Motor and generator can be specially wound to charge six cell batteries or other unusual conditions. Price \$38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory. NOTE—If your service is other than 80 cycle, 110 volt, ask for special price. THE OHIO ELEC. & CONTROLLER CO. CLEVELAND OHIO

THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

EXCEPTIONAL!

Three brand-new receivers, latest models, EACH having BOTH radio-frequency and audio-frequency: DAVIDSON, five tubes, Cost \$125.00—Sell for \$90.00 (Bought 5-11-23). MELCO SUPREME, four tubes, List Price \$125.00—Sell for \$90.00 (Bought 5-25-23). RADIO INSTRUMENT CO., six tubes, List Price \$140.00—Sell for \$70.00 (Bought 5-8-23). All require loop aerial only. Melco operates either way. All are FAMOUS long-distance receivers. Davidson has remarkable volume, (3 steps audio). Priced for immediate sale. First Money Orders with REASON FOR SELLING: To make room for super-heterodyne.

Dr. Donald M. Gildersleeve

169 Prospect Park West, Brooklyn, New York
If inspection and test is desired, WRITE for appointment.

Construction of New Type Transatlantic Receiving Sets
By M. B. SLEEPER

Fully Illustrated. Price 75 Cents
In addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

Sent P. P., prepaid, on receipt of price, by THE COLUMBIA PRINT
1493 BROADWAY, NEW YORK CITY

United States Civil Service Examination

THE United States Civil Service Commission announces an open competitive examination for laboratory assistant, senior grade.

The examination will be held throughout the country on September 5 and 6. It is to fill vacancies in the Bureau of Standards, Department of Commerce, at entrance salaries ranging from \$1,200 to \$1,380 a year, plus the increase of \$20 a month granted by Congress, and vacancies in positions requiring similar qualifications.

Examination will be given in the following optional subjects: Advanced general physics, ceramics, chemical engineering, civil and mechanical engineering, electrical engineering, paper technology, physical metallurgy, physics and chemistry, and textile technology.

Applicants must have graduated from a four years' high-school course, and, in addition, must have completed at least 90 credit hours of study in a college or university of recognized standing, majoring in the optional subject selected unless the optional chosen is physical metallurgy or physics and chemistry. Competitors will be rated on general chemistry and elementary physics, mathematics, optional subject and education, training and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post office or custom house in any city.

THE COMO

DUPLEX TRANSFORMERS

Something really new in Audio Amplification. (See article in RADIO WORLD, June 9, by C. White, on "A Super Amplifier.") We guarantee more volume and infinitely better quality than is possible with any other transformer on the market.

Sold only in matched pairs

PRICE \$12.50 PER PAIR

Send for descriptive literature

Como Apparatus Company

168 DARTMOUTH STREET
BOSTON, MASS.

Westinghouse WR 21

4 Volt \$3.50

- UV-201-A \$4.16
- WD-11 5.95
- WD-12 5.95
- UV-199 5.95

- Brandes Superior Phones..... \$5.50
 - Original Baldwin Double..... 7.75
 - Knock Down Loop Aerial, Complete.. 1.45
- Money Order or Check Must Accompany Order

J. J. KELLEHER

"The Radio Man on the Square"

14 Union Square N. Y. City

Sell Shirts
Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition. WRITE FOR FREE SAMPLES. MADISON SHIRT CO., 503 B'way, N. Y. City

**Extra Sensitive
Tested Radio Crystal**
PREPAID 30 CENTS
Each One Tested and Guaranteed
RADIO PARTS COMPANY
Lock Box 56 DUNELLEN, NEW JERSEY

FADA INDUCTANCE SWITCH
40¢
A Knobby Switch that fits the fingers and improves the appearance of your set. FADA Handbook only a dime.
F. A. D. ANDREA, INC.
1381 W. Jerome Ave., N. Y. C.
FADA RADIO EQUIPMENT

"VERILOUD" SYNTHETIC RADIO CRYSTAL
ON APPROVAL FOR 30 ¢
ZOBEL-STEIN LABORATORIES
322 9TH ST. BROOKLYN, N.Y. SOUTH 2650

**WE REPAIR
WD-11, \$3.50**
AND POSTAGE
Also other vacuum tubes, excepting VT-1 and VT-2.
Mail orders solicited and promptly attended to.
H. & H. RADIO CO.
514 Clinton Avenue Newark, N. J.

Cram's Radio Broadcasting Map of United States and Canada
With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 34x28.
PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS.
The Most UP-TO-DATE MAP out!
35¢. (Postpaid)
THE COLUMBIA PRINT
1493 BROADWAY, NEW YORK CITY

PATENTS
To the Man with an Idea
I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.
Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.
My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.
Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.
RICHARD B. OWEN
Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Radio Waves to Fight Aircraft

German scientists were reported last week as having devised a method of putting out of commission any motor using electric ignition, by stopping its magneto with radio waves. The Los Angeles *Times* asserts that Southern California experts claim that they are able to outwit the German inventors. This is said to be possible in two ways. While the German use of radio waves of unusual potency will undoubtedly put many types of internal combustion motors out of action, other forms have been developed which can not be so affected. The *Times* goes on to say:

The success of the Siemens-Stinnes experts in Germany may stimulate especially American use of the steam turbine engine for aircraft, according to local airplane motor experts. This type, and the heavy-oil burning engine, such as the Diesel, will not be touched by the German development.

The turbine has already been developed for actual use in airplanes. Harry Peters of La Crescenta, widely known aviation motor expert of England, whose health sent him to Southern California after the war, made flights in a turbine-equipped airplane before leaving England.

A turbine engine for airplanes and automobiles has been developed at San Diego by John T. Waugh and Capt. B. H. Taylor, and, according to local airplane experts who have witnessed its operation, it works successfully, and has a much lighter weight per horse-power than the aircraft gasoline engine.

E. M. Fisk and R. S. Gradle, officers of the Commercial Aircraft Association, believe that engines burning heavy oil can be made feasible for aircraft, and that these will be made in America in the near future.

"The method reported in the *Times* cablegram has been suspected as having been developed for some time," said Bennett Harrison, of the Radio Service Company's staff. "It is feasible, for it puts the magneto out of commission and so stops any motor with electric ignition. It is surprising that the Germans conducted their experiments where the French investigators could learn of them, for their efficiency is now greatly affected.

"Experts of all nations will begin to search for means of counteracting the radio attack by developing motors which will not be subject to radio. France and England, whose main defense in future must be aircraft, are either forced to develop defensive radio control or scrap a great amount of their newly built equipment in engines.

"Radio control and interference will be enormous factors if we have another war. The influence of radio will be everywhere. Great stations like KHJ of the *Times* will have a great patriotic part, for they will reach millions on the instant and arouse and organize as was not possible in the campaigns of the past war. They will also warn an enemy of the temper of the American people.

"These stations should be considered by the Government as actually being powerful aids to defense and methods developed to protect them against any aerial interference in case of war. If possible, an enemy will cut them off from the air as surely as he would cut a cable. The possibilities of this are suggested by the report from Paris on the radio interference with aircraft motors."

Fifty-two issues for \$6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

**Pruden Reliable
Radio Specialties
For Good Results**
Dealers write today for our interesting proposition.
FREDERICK H. PRUDEN, Inc.
993 Bergen Ave., Jersey City, N. J.

"RADIO TUBES REPAIRED"
Work Guaranteed
W. D. 11 and 12 \$3.25
U. V. 201 A
SIX VOLT TUBES
DETECTORS \$2.75
AMPLIFIERS \$3.00
Radio Tube Laboratories
776 Broad Street Newark, N. J.

THE BEST INSULATION "RADION" HARD RUBBER
PANELS DIALS V. T. SOCKETS TUBING KNOBS
Black and Mahoganite "Radion" Panels
Mahoganite Black
7 x 10..... \$1.55 \$1.25
7 x 18..... 2.75 2.25
7 x 24..... 3.70 3.00
7 x 30..... 4.65 3.75
16 other stock sizes and also CUT TO ANY SIZE REQUIRED
"Radion" Tubing Cut to Any Length
Price per Inch: 2"—10¢, 2½"—12½¢, 3"—15¢, 3¼"—16½¢, 3½"—17½¢, 4"—20¢, 5"—24¢.
Send Money Order with Order
New York Hard Rubber Turning Co.
212 CENTRE STREET NEW YORK

DISTANCE
With one tube and a COAST COUPLER you can select at will any distant station. With each COUPLER we enclose our special Hook-Up, which we guarantee will surprisingly increase the efficiency of your set. This Coupler will be mailed anywhere in the United States \$5.00 upon receipt of
THE COAST COUPLER CO.
245 East 7th Street, Long Beach, California
Dealers, Investigate!

YOU CW BOYS!
Do You Want to Change Your Transmitter or Are You Planning to Build One?
Then you will want these back numbers of Radio World: March 31, A Low Power CW Transmitter, by C. White. April 21, Haus Transmitter, by John Kent (circuit used by 2VK). May 5, Combined CW and Phone Set of M. Bebut, at Radio Central. May 26, A Simple CW or Phone Set That Works. B. W. E. Decker, 2UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No up to date amateur should be without them. 15c. a copy. The four copies for 60c. or start your subscription with any number.
Radio World, 1493 Broadway, New York City

HOOK-UP AND CIRCUIT HOUNDS
Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:
Reinartz circuit for 2 tubes..... Jan. 13
Good 2 tube WD-11 Circuit for DX..... Jan. 27
Satterlee Circuit..... Feb. 3
G. W. May's Wonder Circuit..... Feb. 17
Power Amplifier Circuit..... Feb. 24
Reflex Circuits..... Feb. 24
Flewellling Super Circuit..... Feb. 24
Multi-tube Reflex Circuits..... March 3
One tube Superregenerative..... March 3
Lewis Three Tube Circuit..... March 10
Regenerative Radio Frequency Circuit for 5 tubes..... March 24
Hazeltine Neutrodyne Receiver..... March 31
2VK'S Transmitter circuit..... April 21
Compact Universal Receiver..... April 28
Stockelburg Pup receiver..... May 5
Cockaday receiver..... May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Reinartz..... May 19
Any number for 15c. Any 7 numbers for \$1.00. All 14 numbers for \$2.00. Or start subscription with any number. Radio World, 1493 Broadway, New York City.



Na-ald Special Socket No. 499

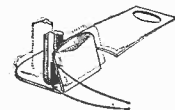
It's the contact that counts

A careful examination will show that each contact in Na-ald sockets and adapters is of a wiping nature on a broad surface, of sufficient tension, and so designed that tension is permanent, no matter how often the bulbs may be removed and how much the connecting prongs in the tubes vary.

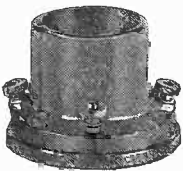
Also it is little realized that sockets are being sold which, owing to faulty choice or control of material, develop current leakages from plate to grid that rob many otherwise well-made sets of their efficiency. Na-ald sockets in their design avoid all these troubles.

Na-ald Sockets

- Na-ald No. 499.....50c
- Na-ald Adapter, No. 429.....75c
- Na-ald Deluxe, No. 400.....75c
- Na-ald Small Space, No. 401.....35c
- Na-ald W. D. II, No. 411.....75c
- Na-ald Two in One, No. 450.....50c



Booklet with diagram of Hazeltine's Neutrodyne circuit and other selected circuits packed with each Na-ald product.



Na-ald De Luxe No. 400

Alden Manufacturing Co.

Manufacturers of Sockets for Every Tube and Requirement
Dept. L 52 Willow St. Springfield, Mass.



RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y. BY HENNESSY RADIO PUBLICATIONS CORPORATION

ROLAND BURKE HENNESSY, President and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

European Representative: The International News Co., Breams Bldgs., Chancery Lane, London, Eng.
Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor: Stephen L. Coles
Technical Editor: Robert L. Dougherty

Field Representatives:

New York—Arnold D. Friedman, W. H. Oke.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
Los Angeles—Stevens & Baumann, Inc., Higgins Building.
San Francisco—Stevens & Baumann, Inc., Holbrook Building.

SUBSCRIPTION RATES

Fifteen cents a copy, \$6.00 a year. \$3.00 for six months. \$1.50 for three months.
Add \$1.00 a year extra for foreign postage. Canada 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—\$5.00. Per agate line \$0.40.

On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.

Terms: 30 days net. 2% 10 days.

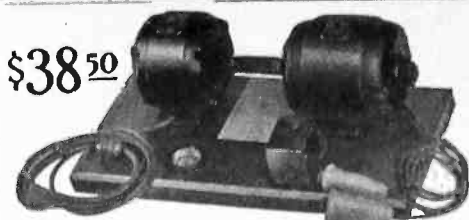
CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.



\$38⁵⁰

RECHARGE YOUR OWN BATTERIES

WHY pay out good money constantly for recharging batteries when the Ohio Motor Generator will do it quickly at a slight expense. This inexpensive home charging outfit keeps your Radio in service all the time and pays for itself—by charging your neighbors' batteries. It is noiseless, gives no trouble, and will even recharge totally exhausted batteries quickly.

The set is made up of the celebrated Ohio A C motor and D C generator wound for 6-10 volts. The motor and generator have ball bearings and are of the highest grade construction. It has none of the troubles common to cheap charging sets and will last a lifetime. It will charge quickly any three cell automobile or Radio "A" battery. Furnished complete on a substantial base with ammeter and field rheostat to adjust the charging rate from one to twenty amperes. The motor is for 60 cycle, 110 volt service and is complete with ten foot cord and attachment plug ready for instant connection and operation. Full instructions provided.

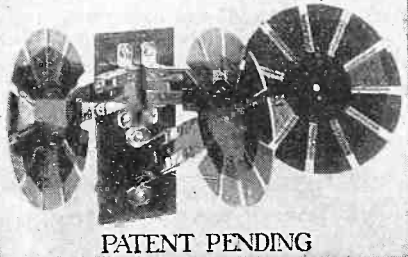
Motor and generator can be specially wound to charge six cell batteries or other unusual conditions.

Price \$38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory.

NOTE:—If your service is other than 60 cycle, 110 volt, ask for special price.

THE OHIO ELEC. & CONTROLLER CO. CLEVELAND OHIO

THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market Only \$6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

EXCEPTIONAL!

Three brand-new receivers, latest models, EACH having BOTH radio-frequency and audio-frequency: DAVIDSON, five tubes, Cost \$125.00—Sell for \$90.00 (Bought 5-11-23).

MELCO SUPREME, four tubes, List Price \$125.00—Sell for \$90.00 (Bought 5-25-23).

RADIO INSTRUMENT CO., six tubes, List Price \$140.00—Sell for \$70.00 (Bought 5-8-23).

All require loop aerial only. Melco operates either way. All are FAMOUS long-distance receivers. Davidson has remarkable volume. (3 steps audio). Priced for immediate sale. First Money Orders win.

REASON FOR SELLING: To make room for super-heterodyne.

Send Money Order or Certified Check for One or All to

Dr. Donald M. Gildersleeve

169 Prospect Park West, Brooklyn, New York

If inspection and test is desired, WRITE for appointment.

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER
Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

Sent P. P. prepaid on receipt of price, by

THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

United States Civil Service Examination

THE United States Civil Service Commission announces an open competitive examination for laboratory assistant, senior grade.

The examination will be held throughout the country on September 5 and 6. It is to fill vacancies in the Bureau of Standards, Department of Commerce, at entrance salaries ranging from \$1,200 to \$1,380 a year, plus the increase of \$20 a month granted by Congress, and vacancies in positions requiring similar qualifications.

Examination will be given in the following optional subjects: Advanced general physics, ceramics, chemical engineering, civil and mechanical engineering, electrical engineering, paper technology, physical metallurgy, physics and chemistry, and textile technology.

Applicants must have graduated from a four years' high-school course, and, in addition, must have completed at least 90 credit hours of study in a college or university of recognized standing, majoring in the optional subject selected unless the optional chosen is physical metallurgy or physics and chemistry. Competitors will be rated on general chemistry and elementary physics, mathematics, optional subject and education, training and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post office or custom house in any city.

THE COMO

DUPLEX TRANSFORMERS

Something really new in Audio Amplification. (See article in RADIO WORLD, June 9, by C. White, on "A Super Amplifier.") We guarantee more volume and infinitely better quality than is possible with any other transformer on the market.

Sold only in matched pairs

PRICE \$12.50 PER PAIR

Send for descriptive literature

Como Apparatus Company

168 DARTMOUTH STREET
BOSTON, MASS.

Westinghouse WR 21

4 Volt \$3.50

- UV-201-A \$4.10
- WD-11 5.95
- WD-12 9.95
- UV-199 5.95

- Brandes Superior Phones..... \$5.50
 - Original Baldwin Double..... 7.75
 - Knock Down Loop Aerial, Complete. 1.45
- Money Order or Check Must Accompany Order

J. J. KELLEHER

"The Radio Man on the Square"

14 Union Square N. Y. City

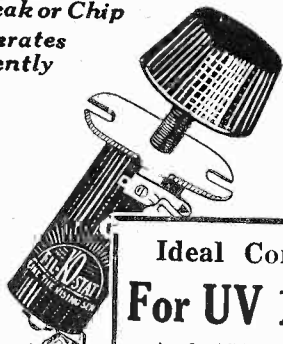
Sell Shirts

Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition. WRITE FOR FREE SAMPLES. MADISON SHIRT CO., 503 B'way, N. Y. City

Guaranteed
No Disks to
Break or Chip
Operates
Silently

Proven
the Best

by Laboratory
tests, fine ad-
justment area 18
times that of wire
rheostat and sev-
eral times that of
next best filament
control.



Ideal Control For UV 199's

And ALL TUBES

permits Accurate Con-
trol of "A" Battery
current with infinite ad-
justment at critical op-
erating point. Utilizes
the great tuning pos-
sibilities of the tube
itself, increasing range
of your set.

\$2.00
at
Dealers
Everywhere

FIL-KO-STAT

The Filament Control
of Infinite Adjustment

Brings
in Weak
Stations
Strong
& Clear

Manufactured and Guaranteed by
D X Instrument Co., Harrisburg, Pa.
Radio Store Corp., 218 W. 34th St., New York
Sole International Distributors

WD-11 WD-12

UV201A

\$3.75

25c. allowed on old tubes

Rebuilt Equal to New Guaranteed

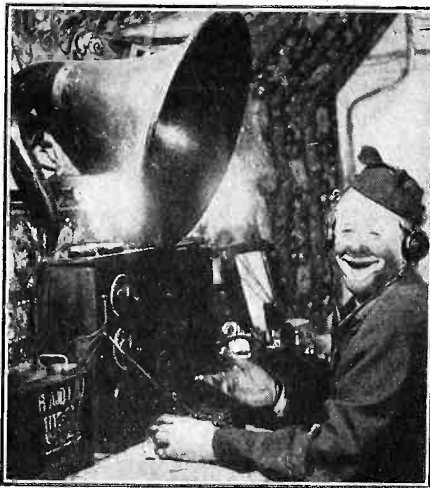
IMMEDIATE DELIVERY

Mail Order Only

Radio Tube Service Co.

41 WEST 32D STREET NEW YORK, N. Y.

Joe Jackson Tries Radio



(C. Fotograms, N. Y.)

Joe Jackson, the funny man of the stage, getting quite a "kick" out of hearing other funny people being funny over the air. It is said that Joe can be just as side-splitting manipulating his radio set as he is when riding one of his trick bicycle wheels and keeping people in roars of laughter. The only difference is that we can't even pay to see Joe get funny with radio. It would give us heart failure every time we thought about a new tube.

Government Tests of Radio Receiving Sets

DURING the past two years the radio laboratory of the Bureau of Standards has been developing methods of testing radio receiving sets, and has made tests on receiving sets of a number of different types. The results of the tests on these sets are given in a series of letter circulars which are in preparation. The first letter circular in this series is designated as Letter Circular 90, and has recently been issued. The sets on which tests are therein described are regenerative sets using electron-tube detectors and are of the type intended for such use as the reception of continuous wave signals from arc transmitting stations on wave frequencies down to 60 kilocycles (wave lengths up to 5,000 meters).

The Bureau of Agricultural Economics, U. S. Department of Agriculture, on account of its interest in the reception of crop, market and weather reports by radio, has assisted in this investigation. The particular receiving sets studied are referred to by arbitrary reference numbers rather than by a statement of the manufacturers' names and type or model numbers. It is believed that the methods followed and the examples given in this circular will be of assistance to manufacturers in the development of methods of testing and describing their own products, and thus improving them. It is believed that purchasers will also be directly aided in deciding what features and characteristics to look for in the selection of apparatus.

A limited number of mimeographed copies of Letter Circular 90 are available, and can be secured by those who are directly concerned with the testing of receiving sets by addressing the Bureau of Standards, Department of Commerce, Washington, D. C.

Measuring Properties of Electrical Insulating Materials

THE Bureau of Standards at Washington, D. C., states that it receives frequent requests for information on the methods which it has found practicable for making measurements of properties of electrical insulating materials. The methods are described in Scientific Paper No. 471, "Methods of Measurement of Properties of Electrical Insulating Materials."

In Technologic Paper No. 216, "Properties of Electrical Insulating Materials of the Laminated, Phenol-Methylene Type," the authors have indicated the reasons for selecting certain of the physical properties for measurement in a research on electrical insulating materials. The same considerations apply in the measurement of many types of insulating materials besides the laminated phenolic materials. The information obtained by making measurements for a given material on all these properties is quite comprehensive. The properties for which methods of measurement are given are: Phase difference and dielectric constant at radio frequencies, voltage effects at radio frequencies, volume resistivity, surface resistivity, density, moisture absorption, tensile strength, transverse strength, hardness, impact strength, permanent distortion, machining qualities, thermal expansivity, and effects of chemicals.

Another Satisfied Subscriber

EDITOR, RADIO WORLD: Find enclosed a check for \$3.00 for my renewal subscription to RADIO WORLD, beginning No. 66, dated June 30, 1923, for six months. I am proud to say that I have been a subscriber to RADIO WORLD for nearly a year and have found it to be the best radio magazine to be had. It handles everything in radio to perfection.

Yours truly,
KENNETH H. JONES.

London Mills, Illinois.

GUARANTEED REPAIRS

Broken and Burned Out
VACUUM TUBES

W.D.-11 not accepted for repair

Your dealer should know, but if he does not, send direct to
HARVARD RADIO LABORATORIES
Boston 9, Mass.

Tubes returned parcel post C. O. D.

¶ "Radio," the San Francisco magazine, is a very excellent publication. We have made arrangements with the publishers by which we are able to offer for a limited time only a six months' subscription for RADIO WORLD at the regular price of \$3.00 and also "Radio" for six months without extra cost.

¶ Send your \$3.00 at once, as this offer is open only until July 30, 1923.

----- CUT OUT AND MAIL TODAY -----

Special Radio World and "Radio" Subscription Blank

RADIO WORLD, 1493 Broadway, New York City.

Enclosed herewith find \$3.00 for which please send RADIO WORLD for six months beginning with issue of and "Radio" for six months, beginning with issue of There is to be no other charge to me.

You may, if you wish, send remittance for \$6.00 and receive RADIO WORLD for one year (52 issues) and "Radio" for one year without extra cost. This offer good only until July 30, 1923.

Name
Street Address
City and State.....

Here's Your Radio Library!

Useful Technical Articles Published in 1922 Issues of RADIO WORLD

See prices at end of this page

APRIL 1.

A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

APRIL 8.

Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred. Chas. Ehlert.

APRIL 15.

First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

APRIL 22.

Valuable Pointers on Aerial Construction, by Edward Linwood.
What is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.

MAY 6.

The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What is Meant by It, by Fred. Chas. Ehlert.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.

MAY 13.

My Practical V. T. Detector and Two-Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
The Reason for the Loop Aerial, by George W. May.
Tuning and What is Meant by It, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.

MAY 27.

The Beginner's Catechism, by Edward Linwood.
How to Make Your Own Condenser, by George W. May.
Tuning as Applied to Telegraphy, by Walter J. Howell.
Why the Condenser Doesn't Condense, by E. L. Bragdon.
Making Signals Louder with Two-Stage Amplifier, by George W. May.

JUNE 3.

The Cost of a Single-Circuit Receiver, by Howell W. Miller.
The Beginner's Catechism, by Edward Linwood.
How to Compute and Build a Fixed Condenser, by E. L. Bragdon.
Design for an Amateur's Receiving Set, by C. White.
Simple Method of Recharging a Storage Battery, by John Grayson.

JUNE 10.

Radio Receiver for Short Waves, by George W. May.
How to Filter Atmospheric Conditions, by C. White.
The Messenger Boys of Broadcasting, by E. L. Bragdon.
Are You a Member of the N. O. D. C.? by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
How to Construct One- and Two-Slide Tuning Coils, by George W. May.

JUNE 17.

The Vacuum Bulb's Start in Life, by C. White.
How to Select the Right Set, by E. L. Bragdon.
The Beginner's Catechism, by Edward Linwood.
Test of Inductance Coils, by Fred. Chas. Ehlert.
Short Waves from a Simple Receiver, by Stanley Bryant.

JULY 1.

Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
Why You Must Use a Condenser, by C. J. Williams.
How Wave Lengths Travel, by Fred. Chas. Ehlert.
Radio World's Revised Dictionary, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Use of the Vacuum Tube Detector, by George W. May.

JULY 8.

Radio's Place in the Phenomena of Nature, by E. L. Bragdon.
The Function of the Loose Coupler, by Charles H. Plath.
Armstrong's Superregenerative Amplifier Fully Explained, by John Kent.
Operating a Transatlantic Station, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Reducing Strays and Static, by Fred. Chas. Ehlert.

JULY 15.

Assembling a Detector and Two-Stage Amplifier, by H. S. Stanford.
Combined Radio and Audio Frequency Amplification, by C. White.
The Beginner's Catechism, by Edward Linwood.
Locating Your Aerial, by Harold Day.
Facts for Beginners, by Fred. Chas. Ehlert.

JULY 22.

When Your "Movies" Come by Radio, by Stanley Bryant.
Underlying Principles of the Vacuum Tube, by George W. May.
Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Importance of Aerials to Radiation, by C. White.

JULY 29.

The Vacuum Tube as a Transmitter, by Charles H. Plath.
My 20-Kilowatt Tube and its Uses, by Irving Langmuir.
Importance of the Capacity Switch, by E. L. Bragdon.
The Truth about Lamp-Socket Aerials, by Harold R. Hart.

AUGUST 12.

The Work of the Audio-Frequency Transformer, by George W. May.
Practical Measurements of Capacity and Inductance, by W. A. Dickson.
Experimenting with Armstrong Circuit Produces Unusual Hook-up, by Dr. O. S. Kelly.
How to Secure Perfect Regeneration, by Fred. Chas. Ehlert.

AUGUST 19.

How to Build a Portable Field Buzzer, by De Witt H. Thompson.
Using Two Tubes for Receiving, by C. White.
The Storage Battery as an Important Factor in Radio Reception, by Donald Van Wyck.
The Use of Capacity in a Circuit, by George W. May.
The Beginner's Catechism, by Edward Linwood.

AUGUST 26.

How to Build a Spider-Web Receiver, by Frederick J. Rumford.
My Detector and One-Step Amplifier, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Hints for Fans, by C. F. Rye.

SEPTEMBER 2.

Generating C-W for Transmission, by C. White.
Wonders of Radio-Frequency Amplification, by H. S. Potter.
How to Connect the Electric-Light Socket Aerial, by John Kent.
Practical Circuits for Regenerating Loud Signals, by O. S. Kelly.

SEPTEMBER 9.

Radio Ideas for the Amateur to Test Out by Carl Masson.
How to Make a Practical Wave-Meter, by Frederick J. Rumford.
How to make a Honey-Comb Coil with a Two-Stage Amplifier, by Fred. Chas. Ehlert.
Perfect Short-Wave Radio-Frequency Amplification, by George W. May.

SEPTEMBER 16.

How to Make a Two-Tube Superregenerator by Frederick J. Rumford.
Methods of Amplifying Radio Signals, by E. Bradbury.

Voice Distortion in Vacuum-Tube Receivers, by W. A. Dickson.
Charging a Battery—from a French Radiolist's Point of View, by Marius Thouvaia.
Working Diagrams for Beginners.

SEPTEMBER 23, 1922

New V T Hook-up Worth Testing Out, by P. F. Metzler.
New Method for Lighting Filaments, by C. White.
Why the Radio Compass Is the Fighting Element of Science, by Ortherus Gordon.
Complete Table of Symbols Used in Radio Reception, by Fred. Chas. Ehlert.
The Radio Primer, by Edward Linwood.
Complete Method for Building an Electron-Tube Detector Unit, by Experts of the United States Bureau of Standards.

SEPTEMBER 30, 1922

Increasing the Wave Lengths of a Receiving Set, by George W. May.
The Importance of the Variometer to a Receiving Set, by Donald Van Wyck.
Successful Stunts of an Amateur Radiolist, by C. F. Rye.
Employing Jacks with a Two-Stage Amplifying Receiver, by Fred. Chas. Ehlert.

OCTOBER 7.

Superheterodyne Receiver as Applied to the Armstrong Superregenerative Circuit, by Charles R. Leutz.
Constructing a Radio-Frequency Regenerator, by C. White.
Why the Open Antenna Is Best for the Radio Listener, by C. D. Wagoner.
Broadcasting Stations of United States and Canada.
The Radio Primer for the Beginner, by Lynn Brooks.

OCTOBER 14.

Neat Home-Made Tube Socket, by Gordon S. Arthur.
Vessels Now Guided Through Fog by New System of Radiotelegraphy, by Ortherus Gordon.
What Makes the Receiver Work, by Donald Van Dyck.
Using the Variocoupler in a Short-Wave Receiver, by George W. May.
Regenerative V-T Receiver for Short Waves, by Fred. Chas. Ehlert.

OCTOBER 28.

A simple Super-regenerative Receiver, by Harold S. Potter.
Vacuum Type of Arrester Safe, by Fred. Chas. Ehlert.
How to Make Your Aerial Function, by Horace Beers.
How to Avoid Interference When a 360 Meter and a 400 Meter Station Are Operating Simultaneously, by C. W. Horn.

NOVEMBER 4.

Receiver for Amplifying Weak Signals, by Horace Beers.
How to Learn the Code, by Ortherus Gordon.
Detectors—and How They Work, by Donald Van Wyck.

NOVEMBER 18.

Radio Devices You Should Understand, by John Kent.
The Counterpoise, by Frederick J. Rumford.
Changing Inductance and Capacity, by Fred. Chas. Ehlert.
The Importance of Understanding and Testing Radio Apparatus, by C. White.
Operating a Three-Unit Honeycomb Regenerative Receiver, by John Kent.

DECEMBER 9, 1922

Why Radio Frequency Amplifies Signals, by Donald Van Wyck.
Capacitively Coupled Receivers, by A. O. Curtis.
Efficient Crystal Set, by C. H. Plath.
How to Prepare Hard Rubber Sheeting for Your Panels, by W. S. Standiford.

DECEMBER 16, 1922

How to Put a Vernier on Your Condensers, by Ortherus Gordon.
A New Three Slide Regenerative Tuner Hook Up, by R. L. Dougherty.
Factors That Affect the Range of Transmitters, by B. R. Cummings.
New List of Broadcasters Recently Licensed.

DECEMBER 23, 1922

A New Application of the Power Amplifier, by Frederic W. Proctor.
My Simple Inexpensive Receiver, by O. White.

DECEMBER 30, 1922

How to Make a Single-Blade Vernier, by Ortherus Gordon.
Peanut-Tube Hook-ups I Have Used Successfully, by P. F. Metzler.

Any single copy of Radio World, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for \$1.00. The above 32 numbers sent for \$4.50. Or send \$6.00 for 1 year (52 numbers) and have your subscription start with any number. Radio World, 1493 Broadway, New York.

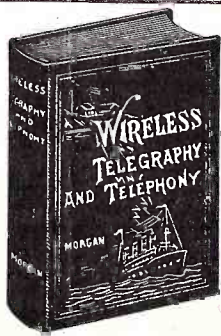
Two New and Valuable Radio Helps

Two new and remarkably good radio books by M. B. Sleeper—one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a generative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for \$1.00 and no extra charge for postage. The Columbia Print, 1493 Broadway, New York City.

IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

Radio Books for Your Vacation

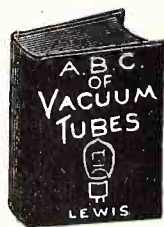
Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



Wireless Telegraphy and Telephony Simply Explained

By ALFRED P. MORGAN

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings.....PRICE \$1.50

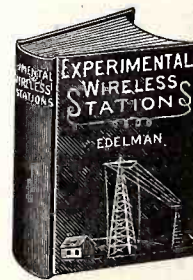


The A B C of Vacuum Tubes Used in Radio Reception

By E. H. LEWIS

Assoc. I. R. E., and Radio Instructor

Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE \$1.00



Experimental Wireless Stations

By P. E. EDELMAN

Tells how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonable long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been published. 392 pages, 167 illustrations.....PRICE \$2.00

☐ The 3 Books for \$5.00 to One or Different Addresses

Any of These Books Sent Prepaid on Receipt of Price

ADDRESS **THE COLUMBIA PRINT**

ROOM 326, NO. 1493 BROADWAY, NEW YORK