

DESIGN OF VERY COMPACT SETS (See Inside)

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RADIO

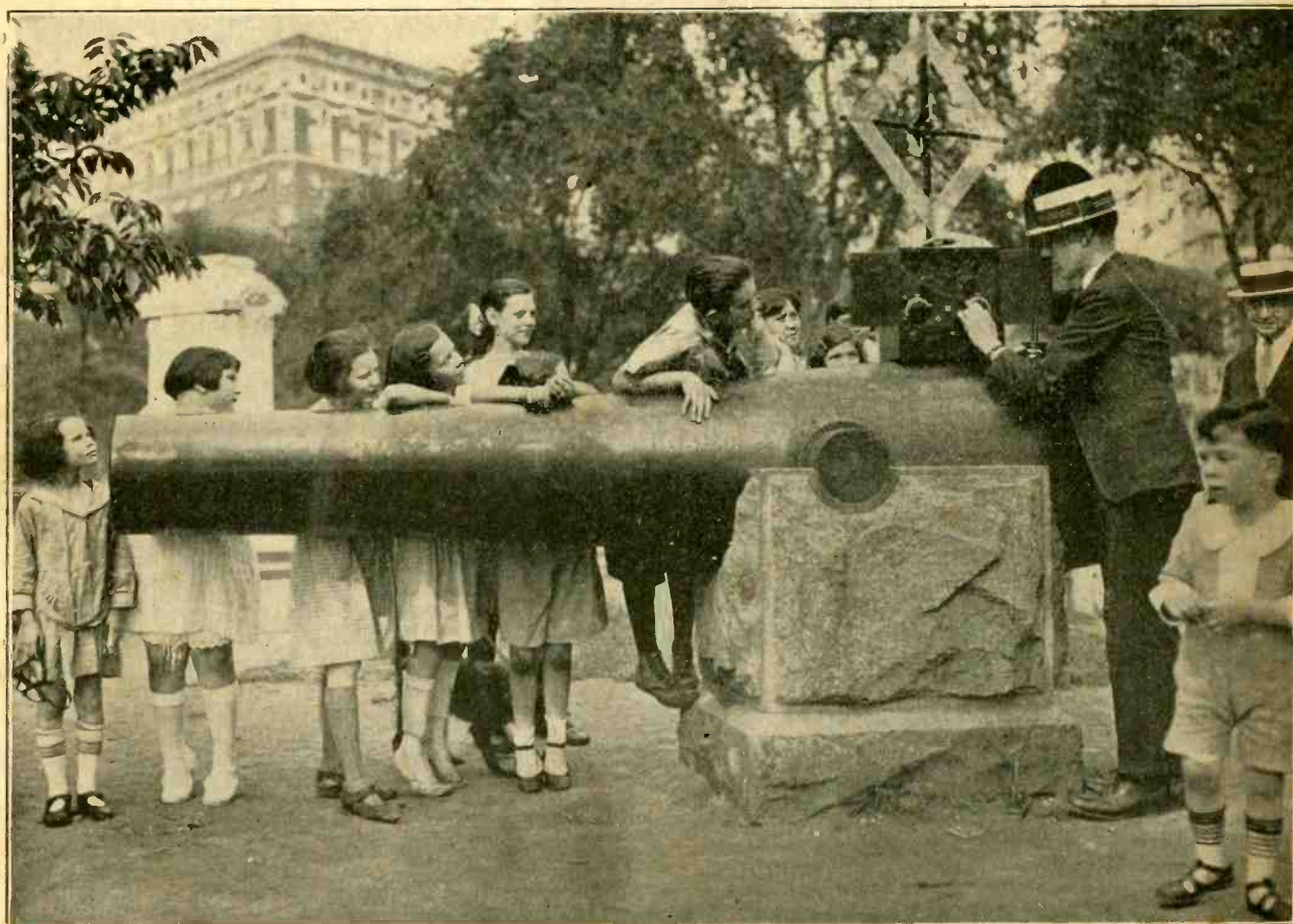
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WORLD

ILLUSTRATED

EVERY WEEK

RADIO AMATEUR EXPERIMENTS IN NEW YORK CITY PARK



(C. Kadel and Hertert)

Richard Bourne, New York amateur who is a skeptic, is here seen observing the effect of a large steel mass on radio signals and tuning. He found out that the signal strength remained practically the same, but that the directional effects of the loop were seriously harmed, and in most cases the loop was entirely non-directional. All positions were tried out, both on top and under the cannon, which happened to be the largest mass of solid steel in the vicinity. One would naturally expect that the presence of such a large mass of metal would tend to absorb a great amount of the radio waves in its immediate vicinity, but such was not the case. Probably the fact that it was partially insulated by resting on a granite base had a lot to do with it.

NEWSDEALERS, READ PAGE 22!

Why
Federal Standard

**Receiving Sets
 should be your
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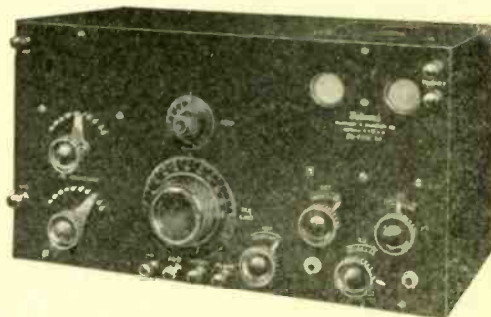


FEDERAL Standard Receiving Sets offer the most in real entertainment. The reproduction of voice and music is clear, accurate and pleasing.

The sets are made entirely of guaranteed Federal Standard parts. Each part working in perfect harmony with all the others in the set produces a quality and range of radio entertainment which cannot be equalled by instruments at anywhere near the price range of the Federal.

Distant stations can be tuned through local stations and the operation of the set is so simple that any man, woman or child can easily master it.

Almost any aerial can be used satisfactorily, including small indoor loops or wire around the moulding of the room. It is, therefore, the ideal set for the radio enthusiast who wants to receive both local and distant stations but cannot use an outside aerial.



Federal D. X. Type No. 58 Receiver, \$116.00 each (without tubes, batteries or headset). This receiver is exceedingly sensitive and makes reception possible over ranges greater than can be accomplished with ordinary means of amplification. It is unsurpassed for local work also. Ask your dealer for a demonstration.

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RADIO WORLD

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The Design of Very Compact Sets

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

IT seems that radio fans like to experiment with odd and bizarre contraptions more than any other group of human beings in the world. They develop and construct some of the most unique looking sets and work with the strangest hook-ups. It is a wonder they have such success as they many times do. The craze now foremost seems to be the building of very small and compact outfits, such as can be put in cigar boxes and the like. Leaving out the very tiny untuned sets, some of the very small ones do remarkable work, though it could not be expected that no efficiency would be lost in reducing the size so materially. The main trouble, when these sets do not work as well as they might, is generally due to incorrect design and the use of incorrect hook-ups for a particular group of apparatus. The following paragraphs will attempt to give some data on the fundamental design of these small sets, so that those who are experimentally inclined can go about their construction with the knowledge that the set will work right when it is finished. However, it is only suggestive, aiming to encourage original ideas rather than to array a lot of conventional dogma.

The only small set that is worth bothering with by those who are really serious and who desire consistent results, is one that is tuned, no matter how simple the tuning device may be. A set that can be included in a very small measure is shown in Fig. 1. Either a crystal or a tube may be used as a detector.

In this set the tuning coil is the part that will have to be constructed to suit the individual requirements. Such a coil may be made in one of many forms, as long as the wire takes the form of a coil. Mailing tubes or cardboard containers of all kinds may be used to wind the wire on. After you have selected one of

the style you need, it is best to thoroughly impregnate it with some good insulating varnish to stiffen it and at the same time make it waterproof. It is best to have the tube as near round as possible; although square tubes have been used successfully. Next comes the wire. This should be not smaller than No. 26, for past this point the wire has a very high resistance, and sometimes enough to dampen out the waves entirely and thus prevent reception. Enameled wire takes up the least space, although single silk or single cotton covered wire would be better on account of its smaller dielectric constant.

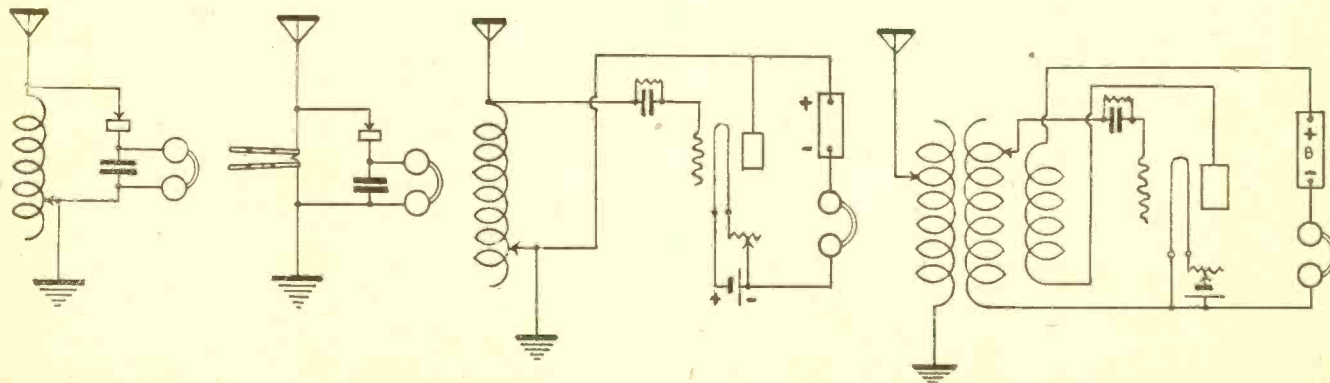
The number of turns you will need depends upon the wave length of the stations you desire to receive, the diameter of the tube, and the length of the aerial you intend to use with the set. It may range anywhere from 20 to 100 turns for short wave reception. However the correct number can easily be found by experiment.

With this type of coil, some sort of slider or tap and switch arrangement is necessary in order to be able to vary the inductance. Of course, it could be fixed and a variable condenser used across it, but this would to a certain extent defeat your purpose of building a very small set.

Where extreme compactness is desired, the spiderweb coil lends itself very readily to adaptation. These coils can be used the same as the cylindrical coils in any of the circuits. A switch and tap arrangement in this case would be more convenient and preferable to a slider.

A way to use two spiderweb coils as a variometer to be used as the sole tuning unit is shown in Fig. 2. Here, both coils are wound with the same number of

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Four simple circuit diagrams particularly adapted to extremely small sets. The first two are crystal receivers and the last two are small tube receivers. The first is a single slide tuner, the second a spiderweb variocoupler, the third an ultra-audion single tube circuit, and the fourth a three-circuit regenerative.

Impressive Harding Memorial Services Broadcast from Station WJAZ

By R. H. G. Mathews

THE story of the first attempt of a broadcasting station to visualize by means of music and the spoken word a current event of large significance—in this case the final tribute paid President Harding in the city of Washington—doubtless will be a source of intense interest to thousands of broadcast listeners.

The unseen audience of WJAZ—the Zenith-Edge-water Beach Hotel Broadcasting Station at Chicago—were carried in the imagination to the starting point of the funeral cortege and accompanied the sorrowful procession step by step up Pennsylvania Avenue, now to the tune of "Abide with Me," again to children's voices singing "Nearer My God to Thee," again to the inspiring strains of "Onward Christian Soldiers," the impressive Chopin's Funeral March, President Harding's favorite, "Lead Kindly Light," and so on up the wide stairs of the Capitol building. Then as strong male voices sang "Lead Kindly Light," the coffin mantled in the flag was placed on the catafalque in the rotunda. The brief and impressive funeral services followed and were concluded by the sounding of taps.

When the procession got under way the bells of St. John's Episcopal Church began to toll "Nearer My God to Thee" and continued until Reverend J. Freeman Anderson's voice was lifted in prayer. "Nearer My God to Thee," played by the church chimes fell on the ears of the mourners loud and clear at first, fainter and fainter as the procession neared the Capitol—the key-note, as it were, of the pathetic spectacle.

All this passed before the mental vision of the listeners with the aid of word pictures painted by N. A.

Fegen at Station WJAZ, the program spoken by E. F. McDonald, Jr., and Dr. Anderson's invocation read by Mr. Fegen.

WJAZ has been submerged since with letters of praise for the effectiveness and sincerity with which the event was handled. To some of the listeners it was so realistic as to provoke tears.

Plate Batteries

IN nine cases out of ten half the troubles brought to my notice are caused by faulty plate batteries, half of which were cheap when they were bought and the other half were bought so long ago that they were long past their useful life," is the remark of a dealer who has been making an investigation of the troubles surrounding receivers. This is a true statement and one that is not regarded as serious by the average fan who has entered the field during the past year or two.

In the matter of constructing plate batteries the principle is fine. But stop to consider for a moment that over nine-tenths of those that attempt this branch of the work do it mainly from the experiences related by another. It takes real experience to make storage batteries, and even greater care to make those for the plate circuit. Unless you understand what to do and how to do it, the cheapest way is to buy a good standard B battery—with the shelf life and the date marked on it plainly!

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turns, and fastened together at one side by a hinge made of some flexible insulating material. In this case no taps or slider are needed, the tuning being done by changing the relationship between the coils.

That mutual inductance idea suggests another tuning method—that of varying the distance between the individual turns in a coil. The idea is used quite successfully on a little receiving set which is on the market, and which is no larger than an ordinary pocket-book. In this set about 30 turns of wire (the turns each being about 2" in diameter) are grouped together in a bunch. The only support they have is afforded by a little strip of tape which binds one side and fastens it to the base of the set. By spreading apart the turns on the free side, the inductance is decreased and hence the wave length. Another way to use the same principle would be to make a coil of some good springy wire, fasten one end and draw out or let in the other end, accordion fashion.

A very good hook-up for use with a tube in connection with a midget set is the ultraudion shown, in a simplified form, in Fig. 3. If the tuner is capable of fine tuning, this set will regenerate very nicely. Where a short wave length range is all that is needed, the variometer idea in Fig. 2 would do fine. A tuner with a slider would do quite well, but it would be best to use a vernier condenser across it to tune in between the turns. A single spiderweb coil with one of those new thin variable condensers would allow the build-

ing of a set of this type that would be extremely compact. A variable grid leak would help.

The hook-up shown in Fig. 4 is a standard one, and would be excellent for our work if spiderweb coil were used for the inductances. A mounting should be arranged somewhat similar to the three-coil honeycomb mountings, so that the primary and the tickler coil can be adjusted in their relationship to the secondary.

The primary tuning need not be critical and taps may be taken off to switch points at every few turns. The secondary needs a much finer adjustment, and a switching arrangement must be provided that will cut in single turns, or else a vernier condenser must be used across it. The tickler coil should have about a third more turns on it than the secondary.

Most any tubes may be used for these sets, but the dry cell tubes are the most sensible to carry out your purpose more fully. The WD11, WD12 and the UV199 lend themselves admirably, the latter tube, especially, because flashlight cells can be used to light the filament.

Whatever way you build your set, remember that the same principles apply. A tuning coil is the same whether it is wound around the end of a cane, around the crown of a hat, or around one of the more conventional tubes. The writer has constructed a number of these radio freaks and they worked very well, everything taken into consideration. However, there is something very important that must not be overlooked, and that is the joy that was derived from conceiving, designing, and constructing them.

The Practical Side of Vacuum Tubes

By C. White, Consulting Engineer

ANY one who attempts to cover all about vacuum tubes in one article would indeed be rather crazy. There are at present, in many technical libraries, great numbers of books more or less directly connected with the theory and operation of vacuum tubes of some kind or other. Hence what I shall say in this brief article should only be considered a mere drop in the bucket in the largest possible terms. Over a year ago I wrote a brief history of the vacuum tube, but in this article I shall deal with the practical side of its theory and operation. We all are quite familiar

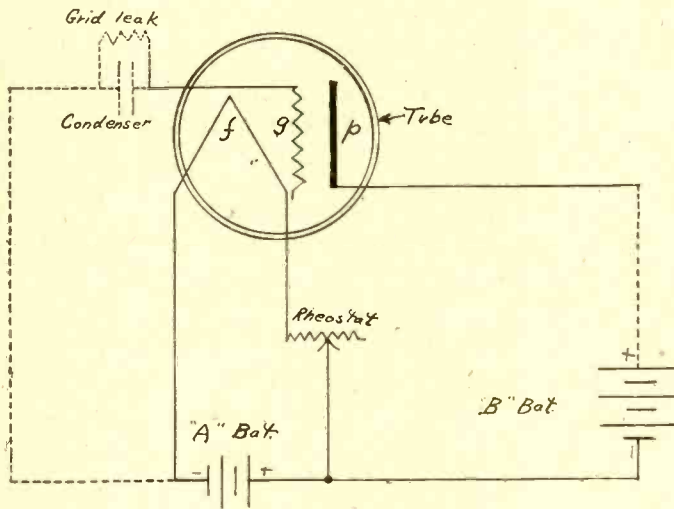


Fig. 1. General schematic representation of a vacuum tube showing the elements and connections.

with the theory apparent when a pot of water boils over a fire. The water sends off into the surrounding adjacent space water vapor or steam.

Exactly the same thing, or the analogous thing, exists when we pass a current through a filament. The current causes the filament to be heated up in the same manner as the fire under the pot, and as a result of this heating electrons are given off instead of steam. We can readily see steam vapor, although steam itself is invisible, but there is no actual form the electrons can take to show us that they are there. The amount of steam that will be generated will depend upon the rate at which heat energy is supplied to the pot and the pressure of the surrounding atmosphere. The analogy is exact with a lighted filament; therefore, to get the best emission of these invisible particles carrying electrical charge it is necessary to remove the air surrounding the filament, hence the use of a vacuum of either high or low amount of evacuation. It is of interest to know that these electrons carry negative charges of electricity. The actual theory behind this statement is rather long and involved in its proof and discussion, and it is well enough to accept it on faith since it has been definitely proven by renowned scientists.

Keeping in mind the case of a kettle of water over an open fire, let us continue an analysis of the vacuum tube action. The "A" battery supplies the energy to heat up the filament which, when the correct temperature is reached, emits an invisible electron vapor in the same way as a kettle emits steam vapor. Now if we should cover the kettle with a lid and have a suction pump so connected to the lid as to draw off the steam

vapor at a certain rate then we will have the same action as the positive charge on the plate performs. The positive charge on the plate of the vacuum tube acts as a magnet to the negatively charged electrons which "boil off" the filament.

In other words, the plate gives directional motion to the electrons which would otherwise be more or less stationary. On moving from the filament, where they are generated to the plate, it is necessary for the electrons to pass through a sieve-like structure known as the grid. It is plain to see that this grid structure can be made to accelerate or retard the motion of the electrons on their way to the plate, much in the same way as a valve in a water main can accelerate or retard the flow of water, depending on how far it is open. Electrically, the grid performs this action by taking on a positive or negative charge. When a positive charge is on the grid the magnetic attraction in the direction of the plate is greater and when a negative charge is on the plate the magnetic attraction is decreased. The old rule obtains—like charges repel and unlike charges attract. The total amount of electrons generated will depend upon the heat of the filament, the material of the filament, the amount of vacuum, the amount of positive charge on the plate and the action of the grid. Of course, there is a definite limit, which is the determining limit in tube design.

Vacuum tubes are listed according to kind of fila-

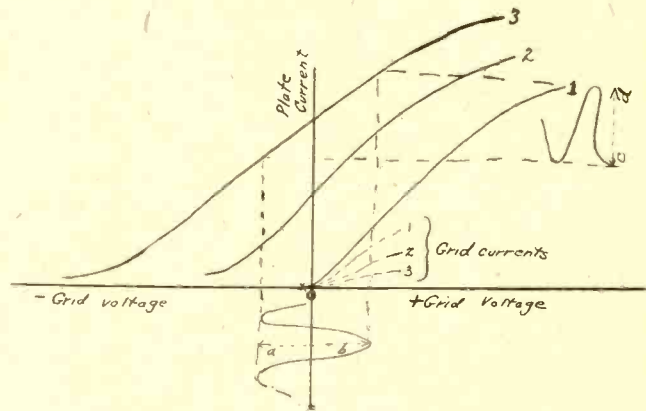


Fig. 2. Characteristic curve of a receiving tube showing the relation of the grid voltage and the plate current.

ment, amount of vacuum, and the power generated. The kinds of filaments now on the market are the oxide coated filament, the pure tungsten filament, and the thorium coated tungsten filament. The Western Electric tubes known as the VT-1 or J tube and the VT-2 or 216 A tube are excellent examples of a filament coated with an oxide which has a property of giving off a high amount of electrons at a low operating temperature, hence giving a long life. The pure tungsten filament is more common and the UV200 or C300 are examples.

This type of filament operates at a high temperature and care must be exercised to see that it is not exceeded or its life will be greatly shortened. The new thorium coated filaments, as the UV199 and the UV201A, operate at a much lower temperature than the pure tungsten filament, hence giving long tube life. The terms hard and soft are general terms relating to the relative amount of evacuation. A hard tube is one

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"Standing By" For News That Shocked the Continent

ANOTHER instance of radio serving as an almost instantaneous means of advising of President Harding's death is recounted by an official of the Department of Commerce who was touring in upper New York on August 6.

Following a cordial reception at the farm of W. E. Carpenter, a vineyardist living near Burdette, N. Y., who had not heard anything over a radio set, the government official set up his three-tube, portable set and tuned in on Schenectady. Neighbors began to gather round the loud speaker. The concert ceased at 9:30 and the operator tuned in WDAP, the Chicago Board of Trade, which was broadcasting musical selections. Suddenly, a vocal selection was interrupted by a message to stand by for an important announcement. The farmers and their families, now numbering over a hundred, not more than one of whom had heard a radio message before, stood in suppressed excitement. The station then announced the reported death of President Harding and explained that it was being verified. This was accomplished at 10:53 Eastern time, and the country people in the neighborhood were thus advised of the national calamity eight minutes after the official announcement was made in San Francisco. It proved a tragic introduction to radio for these novices. Later other stations broadcasting the sad tidings were also picked up as the message sped on its way eastward over press wires.

The midshipmen of the navy cruising in Europe were drawn up on deck for a local ceremony where a radio dispatch to the Admiral of the Fleet advising of the death of their Commander-in-Chief was read. Immediately the ceremony was cancelled and flags half-masted.

Radio, it would seem, did more than any other method of communication to speed the tragic announcement around the world.

New Out-door Radio Sport at Chicago Ham Convention

CHICAGO, ILL.—A new sport involving a unique principle of radio will be introduced for the first time at the Second National American Radio Relay League Convention, which is to be held here September 12-15 under the auspices of the Chicago Radio Traffic Association with headquarters at 959 Rookery Building, Chicago.

Several hundred tiny loop receiving sets are to be loaned by the Drake Hotel to delegates and will be used by them to locate a "hidden" transmitting station. The method used in finding the position of an unknown station is somewhat similar to that employed by navy shore stations in determining the location of ships.

A vessel coming into port may have lost its bearings and the captain, who has been unable to make observations on account of fog, or a cloudy sky, will instruct his radio operator to advise shore stations of this condition, and the latter make "cross bearings" by means of loop receivers, discover the exact location and report it.

Usually when two shore stations work together and advise each other of their observations by land wire, the exact position can be found in a few minutes, but when only one loop set is used and this by someone on foot in the midst of city traffic, the problem is more difficult and requires real skill.

The operator must turn the loop antenna in such a direction that he can tune the transmitter in or out by a slight variation of the finder. After noting the place where this observation was taken he moves several blocks to the right or left and again tunes in his loop receiver as before.

He then draws an imaginary line from both points in the general direction of the "hidden" station and proceeds toward the place where they join together. Frequently this whole operation has to be repeated many times.

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that has been almost completely drained of gas, such as the UV201A, and a soft tube is one that has a little gas remaining, such as the UV200. Of course, there are many tubes that lie between the two limits which we might call medium. The size and spacing of the elements largely determine the amount of power the tube can generate, but for reception the non-power tubes are employed. For power amplification and transmission larger tubes, which can handle the required amount of power, are used.

In Fig. 1 is illustrated the general schematic representation of a vacuum tube. The grid is represented by the letter g, the filament by f, and the plate by the letter p. The dotted lines replace the coils and other working apparatus of a radio outfit since we are here concerned only about the tube and the batteries necessary to operate it. In Fig. 2 is shown the characteristic of the tube. It is a plot of the performance of a given vacuum tube showing the relation of the grid voltage and the plate current. In other words it shows the existing relation between the two. The solid curves marked 1, 2, 3 are drawn for three separate plate or "B" battery voltages. The curve with the highest number indicates the relation with the highest "B"

battery voltage on the plate. The small dotted line curves marked similarly represent the amount of current relatively flowing in the grid circuit for the given plate voltage. Please note that the higher the plate voltage the less the current flowing in the grid circuit.

If we should desire a given tube to act as a detector of radio signals the tube should operate with a plate voltage which will allow it to work as outlined by curve 1. It is plainly observed that this curve ends at the point marked x and you will note that when the grid voltage is negative there is no plate current; therefore, only the positive grid variations will appear in the plate circuit current. This means that the signal is rectified or detected. In order to properly regulate the grid current that flows at the lower plate voltage, such as used with the tube as a detector, a grid leak and leak condenser is employed. If the tube is to be used as an amplifier it is important that the negative as well as the positive variations of the grid voltage should be passed along to the plate circuit amplifier. Hence we must work on characteristics 2 or 3 since 1 only passes on positive grid variations. Assuming we work with plate voltage 3, then, for example, the grid variation a-b will appear as the current variation c-d in the plate circuit.

Blind Police Hero Builds His Own Set

THE fact that radio brings contentment is a proven and established fact. Many helpless humans who cannot stir are kept happy by their radio sets. One case of note is that of Patrick O'Keefe, blind



(C. Keystone Views)
Patrick O'Keefe listening in on his receiving set.

hero of the New York Police Department. He lost his sight in the performance of his duty by a pistol bullet. For many months, handicapped as he was, he was extremely unhappy. Naturally a very active man he could not accommodate himself to enforced idleness. Being,

however, of a mechanical turn of mind, he thought of radio, and with the help of a friend built a crystal radio set.

Now, though unseen and unseeing he is the guest of many an important dinner and reception that is broadcast, where the microphone acts as his "eyes." He chuckles heartily at the jokes, enjoys the music and through his mind's eye, though really in his arm chair, he is sitting right next to the toastmaster, or has a table next to the orchestra that is playing. He even "sees" all the popular plays that are broadcast. It is said that blindness sharpens man's perception and imagination, and therefore he can readily have a ring-side seat at all the fights, with all the comforts of his home and easy chair besides.

Radio has probably done more to alleviate the suffering of the afflicted than any agency human or otherwise. It brings contentment to those that are used to action, by keeping their minds active and away from their trouble, which doctors tell us helps more than medicine. To substantiate this fact, for it really is a fact, think of the number of hospitals that have called radio to the fore in cases where the brooding of the patient would seriously deter his cure or treatment. And for a man that has been active, as Patrick O'Keefe surely must have been, the loss of his sight is really something to brood over, brave as he may be. But radio does not give him the chance, for you cannot "listen in" and think of other things.

"Big Bill" Edwards Radios Address on Boy Scouts

BIG BILL" EDWARDS, former Collector of the Port of New York and well-known former athlete, recently gave a talk from Station WEAJ on the subject of Boy Scouts. "Big Bill," who is a lover of the great outdoors and an ardent supporter of the Boy Scout movement, spoke for the Boy Scouts Foundation of Greater New York.

Many listened with interest to the talk, especially the Boy Scouts in camp, and those having radio sets were sure to be popular when "Big Bill" made his address. The Honor Scouts who were allowed to be present at the studio at the time the address was made were highly impressed with the entire proceedings, especially as they were the only people allowed in the studio at the time the address was made.

The illustration shows "Big Bill" Edwards making his address attended by the Honor Scouts. During his long political career "Big Bill" never talked to as large or attentive an audience as on this occasion.



(C. Photonews)
"Big Bill" Edwards attended by Boy Scout Honor Squad.

Amateurs Pick Up MacMillan Message

JAMES A. TRAINOR, of Dorchester, Mass., and R. B. Bourne, of Chatham, Mass., both radio amateurs, on August 29 picked up a radio message from Captain MacMillan's Arctic ship "Bowdoin." The news sent out by Operator Mix, of the "Bowdoin," was "Located latitude 78° 30'," and was the first word received by the world from the explorers in 32 days.

This would locate the expedition on the northwest

coast of Greenland, about 2,400 miles north of where the message was received and within the auroral band.

After proper verification, it would seem that one or both of the amateurs named will be entitled to the receiving set offered as a prize to the first amateur to deliver the next message from Captain MacMillan to the Zenith Edgewater Beach Hotel Broadcasting Station, Chicago, announced in last week's RADIO WORLD.

France and America Standardizing Waves

By Carl H. Butman

WASHINGTON, D. C.—In an effort to standardize radio frequencies used in trans-Atlantic communication, the Navy Department is co-operating with the French Government and once a month the frequencies of the Annapolis and Lafayette radio stations are recorded and compared. Transmission on standard frequencies, or wave lengths, is essential to efficient communication in order that all stations can keep to the wave lengths assigned them by national or international law. Special efforts are now being made by the United States and foreign governments to keep all their stations on the prescribed waves and it is essential that their standards be equivalent and their instruments be calibrated.

Every month special signals are transmitted from Lafayette and Annapolis on known frequencies between 16 and 17 kilocycles. These signals are observed simultaneously at the Naval Radio Research Laboratory at Bellevue, D. C., and at the French Military Radio Telegraph Laboratory at Paris. The stations are advised by radio and also by mail of the exact frequency measured on receipt and thus the check is made. If an error of more than one-tenth of one per cent. is found, further tests are made and the apparatus for measuring frequencies at both stations is also calibrated. Eventually, perhaps within a year, it is hoped by naval radio experts that the error can be reduced to one-hundredth of one per cent., but at present they are satisfied with an error of less than one-tenth of one per cent.

The basic measure of radio-frequency is a standard

tuning fork and upon this is calibrated a multi-vibrator on which a mere beat can be measured. Wave meters are checked against the multi-vibrator and are used in measuring the frequencies of waves used in commercial and official communications.

The frequencies of the naval radio stations at San Francisco and Annapolis are also compared periodically by the laboratories at Bellevue and Mare Island, so that the naval standard frequency measure is kept constant throughout the United States. Eventually the Bureau of Standards will test the waves assigned to stations and calibrate their instruments. The work of the Navy Department is carried on primarily for the efficiency of its own communication service. As there are hundreds of naval ships and a large number of shore stations, each operating on distinct waves, it is essential that they stick to their allotted frequencies and not interfere with other ships or stations.

When all stations maintain their proper wave lengths or frequencies exactly, tuning in will be more readily accomplished, it is pointed out, the process approaching the simple adjustment of a dial to a known position. Perhaps dials will be marked "London," "Paris," "Berlin."

The Bureau of Standards has already sent out standard waves at known frequencies for the benefit of eastern amateurs and broadcasters, so that these stations can calibrate their instruments and set their transmitters on their proper frequencies. This work shortly will be put into definite practice, it is understood, and the stations which do not keep their proper waves may be closed.

Cavalry to Have Portable Radio Sets

A REPORT on the requirements of radio equipment for the cavalry has just been completed by a board of cavalry and signal corps officers which met recently at Fort Bliss, Texas. While the recommendations of the board have not yet been made public, it is known that they contain considerable data as to improvements on existing radio sets together with suggestions for the signal corps in designing new apparatus for the use of cavalry in the field.

Both cavalry squadrons and regiments are now equipped with pack radio telegraph sets known as SCR-127, a tube set capable of transmitting about 60 miles. The apparatus, which weighs 200 pounds, is split up when transported between three horses or mules, one pack comprising the generator, another the batteries and aerial and the third the set itself with spares and auxiliary equipment.

Brigade headquarter troops are outfitted with more powerful sets, designated as the SCR-130, and having a slightly longer range. This set is now transported on a wagon.

Recommendations of the special board include methods of transportation, whether horse pack, wagon or motorized; power plant, extent of wave band, range, weight, and other specifications for the new issue of radio equipment for cavalry. It is believed that motor equipment for the larger units such as brigades will be recommended, and that the range of the sets will be extended to over 60 miles. Radio telephone equipment will not be assigned, since these sets are of greater weight than it is practical for field transportation and radio telegraph seems to serve the needs of the cavalry. The signal corps is understood to be awaiting the report of the board before undertaking improvements on old sets or developing new equipment.

NC-4 Had First Radio Aircraft Compass

THE use of the radio compass on aircraft of the navy dates back to the trans-Atlantic flight of the three NC boats in May, 1919, on which occasion Commander Reed of the NC-4 made a very practical use of his direction-finding instrument.

In taking off from Horta, Azores, to Lisbon, the third leg of the trip, Commander Reed in his report states that a rather hard "porpoise," or bump on the surface of the sea, was made. This caused one of the gimbals of the navigator's compass to jump out, causing an error of 7 to 8 degrees, although it was not known until some time later, he writes. The first destroyer stationed on the route was picked up apparently in its proper place, but it must have been south of its position on a line to Lisbon it was discovered later. The NC-4 passed ten to twelve miles to the

south of Destroyer No. 2, only the smoke being sighted, while No. 3 was not seen at all.

Commander Reed here decided he was far to the south of his route and headed north. With the aid of his radio compass he picked up Destroyer No. 4 just off his port bow, and then continued eastward sighting all the remaining destroyers as he proceeded to Lisbon.

If he had not been able to check his position, or locate the fourth destroyer by means of the radio compass, it is possible that he would not have reached Lisbon, and the trans-Atlantic air trip might never have been completed.

To-day, many naval long-range aircraft, including the ZR-1, airship, are fitted out with radio compasses in the interests of safety and so that navigators can check their positions independently of their regular compasses.

Converting the Spark Coil

By Byrt C. Caldwell

THE spark coil is doomed to die as far as damped wave radio transmission is concerned. The great interference which the spark set causes, and the short distances which it covers, make it unsatisfactory for the up-to-date amateur. The C. W. or I. C. W. set is undoubtedly ideal. When handled with reasonable care, this causes no interference to the broadcast listener, and with the same amount of power has a reliable range of at least fifty times the distance of the spark. Interference among the amateurs themselves is also reduced to a minimum, as the emitted wave is extremely sharp.

I will not go into the details of the reasons why the undamped wave set has such a high efficiency when compared to the damped wave set, as this has been explained

the tube. This is supported by brass strips fastened to the edges of the coil and the base.

The spark coil may be a 1/2" to 1" instrument. If a coil which has only three terminals is used a separate battery must be used. The glass plate condenser is necessary to reduce the secondary voltage of the coil to a value where it will not damage the tube. A fairly large condenser will be necessary for this purpose. The size will vary, according to the coil used, and the voltage requirement of the tube. The larger the spark coil, and the lower the voltage required by the tube, the larger the condenser will have to be. One for use with a 1" coil and a five watt tube can be made by separating about 25 4" x 6" sheets of tinfoil with 5" x 7" photographic plates. These can probably be obtained for nothing from your photographer, as the manufacturing companies are not buying them back at the present time. Be sure to clean the plates absolutely free of the last trace of emulsion. The tube should be a five watt transmitting tube, although a hard receiving tube, such as the UV201A will give good results up to a distance of 100 miles or more. With this tube the condenser across the secondary of the coil must be larger than specified above. The inductance consists of 30 turns of bare No. 12 or No. 14 copper wire, stranded preferred. It is wound on a form made of bakelite or hard rubber strips, either cylindrical or square in shape, and about 4" in diameter and 6" long. Fasten the wires securely by running the ends through holes drilled in the form. Do not use shellac. The bare wire, and the frame instead of a solid bakelite form, are used so that air is employed wherever possible as an insulator. Lugs are soldered to each turn of the inductance, so that the set may be tuned by varying the number of turns used. The grid leak should have a 10,000

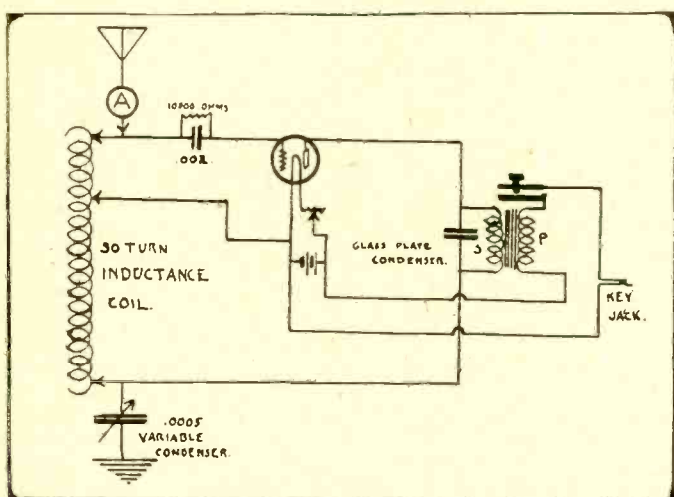


Fig. 1. Circuit diagram illustrating the use of a spark coil for CW transmitting. Extremely simple and efficient, and, if well tuned, is capable of much longer distances than could be obtained by the spark coil alone.

dozens of times in magazines and books which anybody may easily obtain.

If you have a spark coil set at the present time and, at a cost of several dollars, wish to change it into a set which has a range of several hundred instead of several miles, and which causes a minimum of interference, you would do well to construct the set described below.

It is very simple and is as easy to build as a regenerative receiving set. In the diagram, the full lines show the layout of the front of the panel and the dotted lines show the arrangement of the instruments at the rear of the panel. This panel layout should be followed carefully, as it is planned for the shortest possible leads and for maximum efficiency. The hot wire ammeter is in the upper left hand corner of the 7" x 12" panel. This, while not absolutely necessary, should be used if you wish to get the best that is in the set. A miniature tungsten lamp may be used instead. When tuning, adjust the set until the lamp lights the brightest. The variable condenser, which has a capacity of .0005 mfd., is in the upper right hand corner of the panel. This condenser should preferably be of the two-plate mica dielectric type. The rheostat is mounted in the center of the panel and the binding posts for the coil and filament are directly underneath this. The antenna and ground binding posts are both at the top of the panel and the jack for the key is on the right side of the panel. The instruments are arranged as follows: The spark coil is on the right hand side of the panel and the glass plate condenser is to the left of this. The tube is directly in back of the rheostat and the inductance is behind the ammeter and

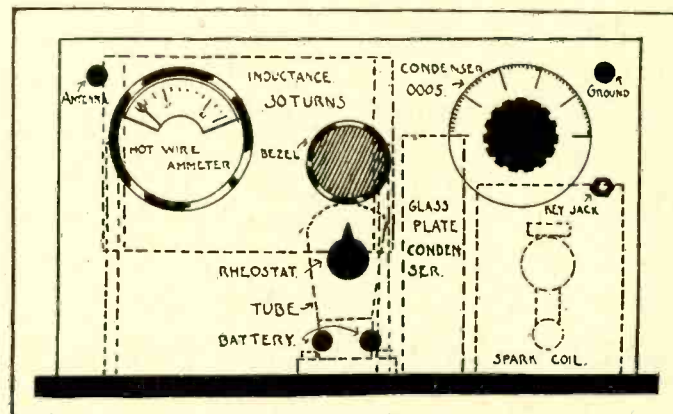


Fig. 2. Suggested panel and instrument layout for the spark coil transmitter.

ohm resistance. The grid condenser may have a capacity of about .002 mfd. The condenser in the ground lead should have a capacity of .0005 or .001 mfd., and should have a mica dielectric.

The hook-up shown is one of the simplest and most satisfactory. This set gives a tone which may be varied by means of the vibrator of the coil. The connections from the secondary of the coil should be reversed and left at the connection which gives the greatest antenna current. In wiring the set, use bus wire, and solder every connection. This is especially important. You will never get results with loose connections and poor wiring. Bare wire should be used, except where two wires cross very close to each

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A Reader Objects to Antenna Figures

EDITOR, RADIO WORLD:

I have just been reading your article called "Properly Installed Antenna Greatly Aids Better Reception" (RADIO WORLD, August 25, 1923) in which you state that a height of 40 feet and a length of not more than 75 feet for a receiving antenna has been found most suitable for good reception.

According to my personal experience, I think these statements are absolutely wrong when made without qualifications. With a three-tube regenerative receiver, which I use, an antenna 250 feet long gives far superior results to an antenna of half the length. An antenna 80 feet high gives results far superior to those obtained with an antenna 40 feet high. These are results of actual experience.

I am now using at the Eastern Yacht Club, Marblehead, a single wire antenna, which with the lead-in, measures 250 feet and I am getting very satisfactory results on all wave lengths from the shortest broadcasting station upward to 20,000 meters. Signals come in very clearly and satisfactorily.

In your article you state why the height should be limited to 40 feet but you do not state why the length should be limited to 75 feet.

In my opinion such unqualified statements do great harm. An antenna which will work with one receiving set satisfactorily may not work with another receiving set satisfactorily. This important statement you have left out of your article entirely.

I have in my room beside the regenerative receiver a four-tube crystal detector reflex receiver which connected to the long antenna above referred to brings in ship signals

of great clearness and distinctness. These I suppose are on 600 metres but ordinarily it will not bring in broadcast stations at all.

To get broadcast stations with this reflex receiver, I use a wire strung around my room on the floor simply fastened to the corners. This wire is about 45 feet long and brings in Chicago stations, even in summer weather, more than loud enough for a loud speaker.

I have in my home in Concord a cage antenna which I use for receiving which is 4 feet in diameter and composed of eight wires 100 feet long with a single 7-20 lead-in. My idea in building this form antenna was for its ultimate use for transmission but it is too long for 200 metre work and I do not care to cut it down because I get such marvellous results with it in receiving all wave lengths from 150 metres to the highest used in transatlantic work. This antenna is 80 feet high.

At my summer home at Seal Harbor, Maine, I had a long single wire antenna, probably 250 feet, on which I got Cuba in July on a three-tube regenerative receiver, using only two tubes and also using coils 25-35-50. I could get the shortest amateur stations much better than on a short 100 foot single antenna which I put up especially for short wave lengths. So far I have found with this regenerative receiver the longer and the higher the antenna, the better the reception.

I find that in almost everything connected with radio, positive statements such as you made in your article on antennae are always wrong. Yours very truly,

W. K. SHAW.

160 State Street, Boston, Mass.

New Class A Stations

Two limited commercial or broadcasting stations were licensed during the past week by the Department of Commerce:

Call	Station	Class	Frequency Keys.	Wave Length Meters	Power Watts
KFJR	Dixon, Ashley C. & Son, Stevensville, Mont.....	A	1160	258	50
WTAJ	Radio Shop, The, Portland, Maine	A	1270	236	50

Distance

MANY fans who do not really understand radio always want to know "the distance my set will receive." This is impossible to predict, as there are entirely too many variable features which

bear on the subject. If a salesman tells you that the set he tries to sell you will receive 2,000 miles take it with a large amount of salt and tell him that you know he is "stringing you along." It is impossible to even fairly guess at the distance a receiver will function. Also do not expect to pick up more than one-third the distance in the summer time that you received in the winter. Be satisfied with local stations.

Too Much Is Bad

MANY amateur builders, when constructing sets, have a very bad habit of using too much soldering flux when making connections. Do not use too much, as it will spread and cause leakage. A little (very little) goes a long distance when the iron is properly tinned and hot.

(Concluded from preceding page)

other, when a piece of insulating tubing should be slipped over one of the wires.

A word about the antenna system. A great deal more care is required in the construction of a sending antenna and ground system than is necessary for an antenna and ground which is to be used for receiving only. The best type of aerial is the cage type. About eight wires, 80' long, soldered to metal hoops about 3' in diameter and with a cage lead-in which tapers sharply, so that the point is at the lead-in insulator, will make the most efficient sending antenna that you can erect. Keep it as far away from trees and other objects as possible, as all these things absorb some of the energy. If possible, use a counterpoise ground. Keep it well insulated from the ground, and have it extend

a few feet on all sides of the antenna, directly underneath. If it is impossible for you to have a counterpoise, use buried copper plates or chicken wire, placed directly beneath the center of the antenna. If the counterpoise is used, have it perfectly horizontal, because if one portion is higher than the rest, the resistance is increased.

With this set an antenna current of one ampere is easily obtained, if a power tube and a good antenna system are used. The reliable range of the set is several hundred miles, and under very good conditions distances of 1,000 miles or more are often reached.

This set, if adopted by all the spark coil "brass pounders," would cause a tremendous reduction of QRM amongst the amateurs, as well as a reduction of interference experienced by broadcast listeners.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Closes Big Radio Deal



(C. Kadel & Herbert)

Scene at the Metropolitan Trust Co., New York City, when the syndicate headed by Edward H. Jewett, of Detroit, took control of DeForest Radio Telegraph and Telephone Co., of Jersey City, N. J., by purchase of the personal stock in the company held by Dr. Lee DeForest, radio pioneer.

At times people talk of the warfare between science and religion, but a minister in the Middle West has said: "Religion that is killed by gasoline or radio never was alive."

In order to protect workers from accidents and eye sight damages, no less than five states—New York, New Jersey, Pennsylvania, Wisconsin and Oregon—have now in force lighting codes for industrial establishments. Other states are now considering the adoption of similar codes, and it seems only a question of time when all the states will adopt such a code.

Owen D. Young, president of the General Electric Company of Schenectady, N. Y., who recently returned from abroad, visited Washington last week and gave to President Coolidge his views on conditions in Europe.

Radio enthusiasts will be particularly interested in "Zeno," which opened at the Forty-eighth Street Theatre, New York City, last Saturday night, because radio is used not only to create many of the spiritualistic illusions with which this new thriller abounds, but is also employed by the criminals in eluding the police and finally by the police themselves in capturing the gang and clearing up the mystery.

Radio will play a large part in the next Presidential campaign in Mexico. Two leading newspapers—one morning and one afternoon—have opened broadcasting stations, which are giving concerts three nights a week. Politicians are studying a plan to use these stations to broadcast the ideas of candidates. Mexico City alone has 600 receiving sets, with many more in the suburbs. Other large cities, such as Guadalajara, Monterey and Puebla, have scores of radio fans.

Dr. Charles P. Steinmetz, the electrical wizard of Schenectady, N. Y., has been indulging again in prophesy. He predicts that in another 100 years electricity will do most of our work, so that no one will have to labor over four hours a day. This would leave lots of time for "voluntary agriculture" and many forms of self-improvement and leisure. All of which leads Heywood Brown to observe in his column in the New York World: "In spite of the lack of leisure in the land, most lives are organized for sporadic expeditions to kill time. We mangle hours and whip seconds through a slaughter-house. Treat time kindly and it will do as much for you. Pat it on the head and it will arch its back and stretch. In fact, anything which can be done to keep time alive renders it a far more pleasing playmate than do all the various devices by which it may be slain."

Making One 22 1-2 Volt B Battery Serve for Detector and Amplifier

By E. C. Mallory

DURING the course of my daily work as radio operator aboard the S. S. "Governor Cobb," I have made a little discovery, which may not be new to some people, but strikes me as being something that I have never heard about before.

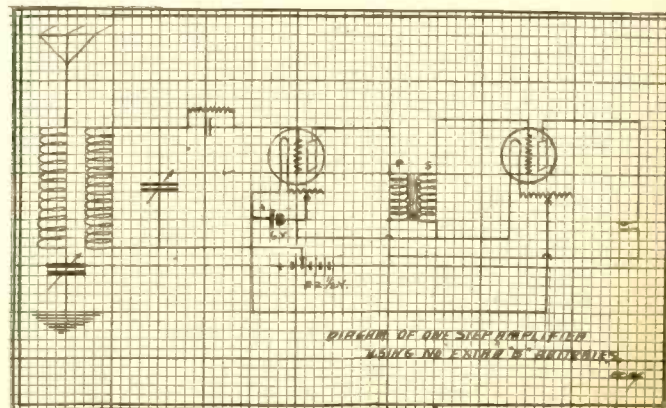
On board we use the type 106 B Marconi receiver and also a standard regenerative circuit. During my "fooling" around and changing B batteries, I happened to connect just one 22½ volt B in such a manner that when I looked the second time I saw that it would supply both the detector and amplifier.

In the diagram which I am submitting (detector and one stage non-regenerative) you will notice that there is no 45 volt B amplifier battery. The diagram is the same as the ordinary hook-up, only that the lead which generally goes to the positive of the 45 volt B battery goes back to one side of the primary of the transformer, thus eliminating the B battery.

I have used this hook-up very successfully and have surprised many when I tell them of it. Everybody is trying to figure out just why they did not discover it before, especially when the amplifier B batteries were running low.

One point that I found out that is necessary is that it is sometimes best to reverse the primary leads to the

transformer to get the best results. Of course, it should be tried both ways to determine which is the best. The circuit works as well on the non-regenerative as it does on the regenerative, which is saying something. I am giving it to you so that you can tell the fans and maybe help some of them.



Showing how to use one 22½ volt B battery for both detector and amplifier.

Why I Flunked Three Times in the Radio Code Examination—And Then Passed

By One Who Did

OUT of the tens of thousands of broadcast listeners there is bound to evolve a goodly number of radio amateurs and commercial operators. When once the virus has been absorbed, the attraction of code work is irresistible. The short and long buzzes from the spark and C. W. stations seem to have a sort of romantic allure-ment that is less apparent in the more common voice trans-mission. And the joy of personally getting on the ether is far too great for adequate expression.

About five years ago I got the bug that I wanted to be-come a commercial operator. For a like amount of time before that I had been an amateur, or "ham." As I was self-conscious to a large degree, and furthermore, as I had irregular business hours, I had a sort of aversion to per-sonal instruction; so I did what was the next best thing and took up a correspondence course in the subject. I took the particular course that I did because it was very widely advertised, because it had been established for a number of years, and because the staff of instructors had credentials that indicated them to be capable men. With the course I received several books, some instruction sheets and an omnigraph for learning the code.

Right here let me give my opinion of a correspondence school for learning such a subject as that of radio. In themselves, they are fine institutions (the best of them), but what a person can get out of them depends a great deal upon his own psychological characteristics. A person, in order to get the most out of a home study course, must be a "plugger." He must be perfectly contented to sit alone for long periods and study, and persistently listen to the code buzzes even before they are in any degree intelligible. He must be a person who burns with the desire to learn and not one who must have everything knocked into him with a mallet. If there is that earnest desire that will sustain persistent effort, and if the person is naturally intelligent and responsive to book learning, if his time and money is limited, and if he does not require the personal touch of a teacher, the correspondence method is to be highly recom-mended. Otherwise, disappointment would be avoided by taking up class work with a real live instructor.

Being very busy with other work at the time I started the course, I had very little time to spend on my studies. Getting home rather late nights, and being tired out, I found it difficult to concentrate to any extent. It required on an average of six readings to thoroughly digest the contents of a single page of the book. But there is one thing that I learned afterward, and that was that the knowledge I gained in this way did not go in one ear and out the other, but stuck fast; and much of it I remember to this day.

Being of a naturally phlegmatic disposition, the code was even harder to master. It simply would not seem to sink in. And it was especially difficult to listen for long periods to the very impersonal omnigraph, which repeated the same old thing over and over. So the result was that I suc-cumbed to procrastination, and many nights I did not listen in at all, but simply did my theory work. Then again, I had the fault of wanting to get ahead too fast, which tempted me to increase the omnigraph speed beyond my capabilities at the time. This trick did nothing but tend to increase my disappointment at not being able to copy, and at the same time retarded my progress.

Later I tried to do some reception over a regular receiv-ing set, with still less success than with the omnigraph, for the reason that most of the stations which I wanted to copy sent too fast, and some others too slow. That is one thing

that is soon realized by a code student—that there is a too slow speed as well as one too high. Of the ten word a minute stuff, I could copy about every second letter, of the fifteen word stuff, about every third letter; and of the stuff at twenty words, only about every fourth. Still I persisted in trying to copy these speeds, instead of seven or eight on the omnigraph, which I should have done.

The theory came on pretty well; and to make it more interesting, I accepted a position as instructor in a large Y. M. C. A. radio club. There I had the surprise of my life. Those fellows could ask some of the darndest ques-tions that existed—some that I would never think of in a lifetime. That put me on my mettle, and rather than show my ignorance, I put in some intensive study in a big library. There was nothing in the line of radio that I did not touch on; from the ether and electron theories down to the practical phase of adjusting a catwhisker. The value of this work, which was just to satisfy the "kids," was not realized until later on in my experiences. It did one good thing in that it gave me a very firm foundation for later practical work.

Once more getting the craving to have a radio license, so that I could "shove off" as an operator, I went back to intensive code practice—or, at least, what I called inten-sive. But, try as I might, it seemed that the harder I worked toward this end, the farther back I slid. One day a friend came to me and asked why I did not attend a certain resident school, as he had made such remarkable progress there. This was a new hope, and I grasped at it eagerly, enrolling for code practice almost immediately.

At this school there were a number of long tables at which the students sat to send and listen in, and at the end of the room was the instructor with his hand sending key, and several automatic sending machines. Under this sys-tem I was first advanced to the ten word and then to the twelve word table. But at this point my receiving ability came to a standstill, and occasionally even seemed to drop back a pace or two. I could send fairly well at a twenty word rate, but my receiving was rotten. At about this stage in their learning, the students all seemed to like to waste their time, and cut-up rather than do earnest work. So, for at least a month, I did not visibly advance one particle.

At the end of that time I had another spurt of enthu-siasm, and almost overnight I found I could easily copy fifteen words. Then eighteen! This was all too good to last, and I came to another standstill. I could take down twenty or twenty-two words in my mind, but I could not get them on the paper; my hand wouldn't respond quickly enough to the mental impressions that were telegraphed to it.

So at last, giving up the idea of getting a first grade license as hopeless, I made an appointment with the in-spector to try for a second grade license. I was confident that I could get this, as the required speed was only sup-posed to be twelve words a minute. It was only a few days before the examination, so I did a goodly bit of "cram-ming" both on code and theory.

The eventful day arrived, and shivering, yet perspiring, I found myself sitting by a little desk in the Radio In-spector's office at the Custom House, with pencil in hand, paper before me and a single phone over one ear. Im-mediately the destroyer, Worry, popped up. "There is so much noise about the room. It's getting cold. You are not used to a single receiver, and therefore you will not be

able to hear well. The omnigraph that the inspector uses will kick and jump, and you will miss many letters. You can't pass, so what's the use?" All of those things ran through my mind and gave me the cold chills. And it seemed that everyone else about me was in the same mood. There was at least a half hour of suspense before the inspector announced that everything was ready.

Then came the five minutes of torture. First a little squeak as the buzzer was adjusted, then a moment of testing the omnigraph speed, and finally the real sending for the test. The speed was about eighteen words a minute. About five words passed before I was able to make the first stroke with the pencil, then for about eight words I ran along very nicely. But at that moment the omnigraph gave a lurch and rendered a letter indistinguishable. This threw me off my track, and I missed a half dozen of the following words. For the remainder of the five minutes I got about every second word, and a few of the letters in between; but as to pass requires at least sixty consecutive letters in one string, I managed to fail, miserably. The inspector was good enough to give the same test over again for those who failed, but I was so shaky by this time that I flunked once again, and was told that I could come around at the end of a month and try it over.

At the end of the month, I tried again—and flunked flat. At the end of another month I tried again, and again failed. The third month spelled failure for me once again. Then the new law came into existence, that made it necessary for a flunkee to wait three months before being given a chance to try again.

Having all that time on my hands, I started to thinking. Possibly I was following the wrong track. Possibly I was following something that was hopeless. But whatever was the matter, I was determined to find out. And I did! The result was that I passed the test at the next trial, and almost got a first grade license instead of a second. As far as theory was concerned, I lost only three points, and this was taken off in half points at different places for being too brief.

What did I find out? It was simply that I had been wasting my energies trying to fight a something that did not exist. I was fighting against worry, fear, mental sluggishness and lack of concentrative power; when, if I had but known it, they were nothing more than imaginary beings that I had created myself. I learned that all good operators worked subconsciously, rather than consciously, and that though this power was natural in some, it could be acquired by others. I learned that a proper attitude would almost entirely eliminate all the extraneous disturbing factors and render a perfect concentration possible.

The goal I strived for was to make the radio code an integral part of my subconscious mind; so that whenever I put myself in a passive state of mind I could recognize the characters automatically. Then I was to try to gain the subconscious co-ordination between my mind and my hand. A seemingly difficult problem I had before me, but one which appeared simpler later than at first.

As a starter, I learned that by a change in diet I could quicken my speed and decrease a sluggish mental action. So, cutting out all the heavy proteins, such as meat and cheese, I filled up on fresh vegetables, fresh fruit and milk. This diet allowed considerable variety, and I thrived on it—a very noticeable difference in my health taking place within several weeks. Another thing which I cultivated was deep abdominal breathing. Also the habit of drinking two or three quarts of water daily, to keep the system flushed,

Whenever I chose to do my code practicing, I centered my mind about that and nothing else. Everything was done in a calm manner. Sitting down quietly before the set, I picked up the phones, and handled them for a few moments, thinking of nothing in particular. After putting them on my head, the set was slowly tuned until something was heard. The signals were brought in to a medium intensity, and for about five minutes at each period I sat with my mind fixed on this code jargon, but without making any definite effort to distinguish the individual letters. Occasionally it would occur to me that a certain combination represented "the," and another "and," and still another "New York"—the most usual words used. At the end of that period I would begin to copy. If it were at the right speed, I would continue for a time; but if it were too fast I would wait as before, or else try to tune in someone else.

I lived quite near a high-powered station, and I could get signals all over the room with a crystal detector. Occasionally I left the switch on for the night, and the signals would be the last things I would hear before going off to sleep and the first thing upon awaking in the morning, and many times upon awaking in the night I would hear them. This practice, though it may seem silly to the average person, did a lot of good.

Every time I sat down before a set I tried to free myself of all excitement, and obtain a perfect passive attitude. Nothing at all outside was allowed to worry. In a short time, by using this method, I became able to copy almost unconsciously, and instead of letters, words would form themselves. The result was that at the next examination I got my second grade commercial license—and the next examination, a *first*.

Quiet Hours Bring Harmony to Ether Waves

HARTFORD, CONN.—Recent radio regulations are helping to bring harmony into the ether where formerly chaos reigned, and this winter will see, doubtless, a vast improvement in receiving conditions, officers of the American Radio Relay League believe.

This view is based on reports from all of the League's Operating Department divisions, which indicate that the "quiet hours" between 8 and 10:30 P. M. advocated by the Department of Commerce are being observed faithfully.

It should be noted particularly that the department specifies local standard time for amateurs, which means that, if the local community has adopted daylight saving time, the quiet period to be observed is between 9 and 11:30 o'clock. A letter from the Bureau of Navigation comments in part as follows:

"The Bureau expects the amateurs to conscientiously ad-

here to these regulations * * * and when complaints are received from broadcast listeners that they are experiencing interference from code stations, which they believe to be amateurs, they will be required to furnish the name and address or the radio call letters of the station causing the disturbance.

"Where complaint is made that amateurs are causing interference after 10:30 P. M., local standard time, the parties making such complaints will be informed that the amateurs are required to observe a silent period of two and one-half hours each day to permit uninterrupted reception of the broadcast service, so far as the amateurs are concerned, and that as the amateurs are rapidly replacing their spark sets with tube transmitters and many of them using C.W., it is believed that they are contributing their share in the matter of giving relief from interference."

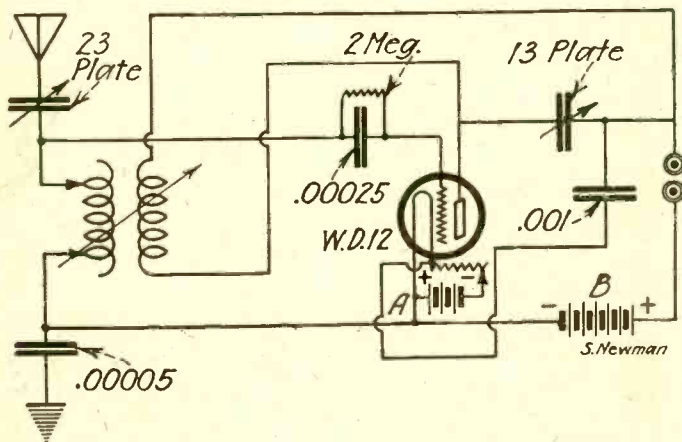
Another Improvement on Single Circuit Receivers

By A. A. Teeter

IN perusing the literature on the subject the fact is very prominent that there is a wide difference of opinion as regards the efficiency of the single and three-circuit tuner. I have made an impartial study of all circuits possible since the first of the year, and have constructed from the best of material practically every one of the popular circuits, including many of the so-called "trick" ones, and have finally come to the conclusion that the real circuit is the single or three-circuit regenerative one.

They both have their advantages and disadvantages, as we all know, but after having made exhaustive experiments with both, I must admit I have found the single circuit, properly constructed with a few additional refinements, the better thus far. However, I am using both at present.

The first question to arise in the minds of your readers will be: Is it selective and sensitive? Yes; extremely so, the most selective and sensitive I have ever



Schematic diagram of one method of improving the regular single circuit set through the use of two condensers in the plate and plate filament circuits. Greater selectivity and control of regeneration is thus possible.

operated. As an example, I can set my antenna condenser at 0 and using about 60 turns of the primary inductance, within a range of 0 to 50 on the secondary condenser dial I have tuned in WJZ, WOR, WGY, WHN, WEA, WAAM, WBZ, KDKA, WEAS, WJAX, WFI, WOO and WIP. Sometimes, merely a fraction of a turn of the vernier of the secondary condenser will throw out WHN and bring in WGY. I do not have to sit up until midnight to get distant stations. One night during the last week of July—a hot night at that—between 8:30 and 11:00 o'clock, I tuned in the following stations, loud and clear, on detector: WOO, WIP, WFI, WDAR, WHN, WEA, WJZ, WGY, KDKA, WBZ. On the detector and one stage audio, using phones: WJAX, WLW, WEAS, WAAF, WDAP, WOC. On the detector and two stages audio, with loud speaker: KDKA, WGY, WJAX, WWJ, WEAS, WBZ and WMAF.

Regarding the construction of this set, I have made two of them, each one using different material and parts, and the results obtained were *not* the same. Therefore, in justice to all who may want to construct this set, I will mention the manufacturer of the various parts, though I am not partial to any manufacturer's merchandise.

You will recognize this hook-up as that of the single circuit regenerator, the tickler shunted with a condenser, and the addition of two condensers so placed as to give high efficiency.

Material needed for detector unit: 1 panel, 7x18; 1 baseboard, 6x16x1/2; 1 vernier rheostat (Cutler-Hammer); 1 socket (Fada); 1 double circuit jack; 1 two-meg. leak, tubular R. C. A.; 1 .00025 Micadon condenser; 1 coupler (either Shamrock or Fisher No. 52); 1 13-plate vernier condenser (U. S. Tool); 1 23-plate vernier condenser (U. S. Tool); 3 switch arms and contact points; 1 .00005 Micadon condenser, 1 .001 Micadon condenser; 3 3" dials; 1 pair Brandes phones; 1 WD12 tube; 1 22 1/2 volt Burgess battery; 1 spool of No. 16 plain copper wire (do not use bus wire); spaghetti, tin foil, binding posts.

In constructing the set shield the panel with tin foil and ground it, and note carefully the following:

Connect the rotor plates of the 23-plate condenser to the aerial.

Connect the rotor plates of the 13-plate condenser to the phone.

Run one of the leads from the secondary (rotor of variocoupler) to the stator plates of the 13-plate condenser, thence to the plate connection on socket.

Run the other lead from the secondary to the rotor plate of the 13-plate condenser thence to the phone, as previously referred to.

Connect the .001 fixed condenser between the filament (-) pole of the socket and the rotor plates of the 13-plate condenser.

In reference to the .00005 fixed condenser in the ground lead, arrange a switch whereby you can cut it out and in. It will not be needed for local reception, but has a tendency to clear up the disturbance on distant stations.

Use 22 1/2 volts on plate of detector.

I am located on the west side of a mountain, 40 miles from New York, with a 45' aerial single copper wire between two trees 25' high. I can tune in New York and Philadelphia stations on detector alone without ground or aerial, and Schenectady without ground. This, I think, indicates in itself how sensitive the receiver is.

For amplifiers I use 201A tubes and Federal transformers. With this set I have, since June 1st, tuned in all the principal broadcast stations east of the Rockies, including such distant ones as WDAF, WIAK, WOC, WMC, WFAA, WBAP, CFCA, WSB, WDAP, WAAF and KYW.

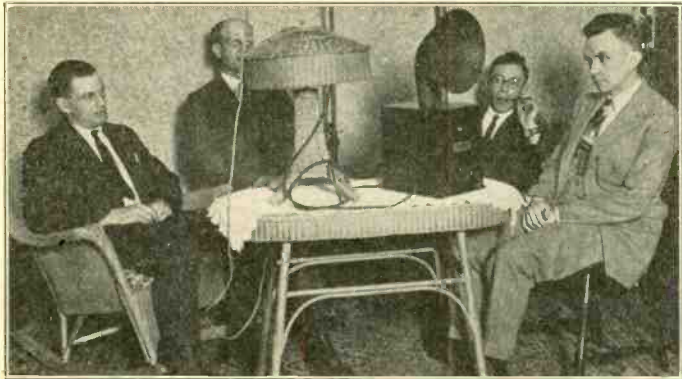
What Not to Expect

IT is quite evident from the letters and reports of various makers of home-made sets, that they expect entirely too much from their receivers. They have read reports of records made by single tube receivers that cover 2,000 miles. Consider the fact that this is not a *steady performance*. It may be done in certain localities quite often, where there are no steel buildings, tall hills or forests, but to expect a single tube receiver to have a steady range of 2,000 miles is out of the question. Consider yourself good if you can get 900 to 1,000 miles out of it, and wear a happy contented smile.

Practical Wired Wireless Demonstrated

WHEN General George O. Squier made the announcement some months ago that he had perfected a system of "carrier current telephony" whereby radio telephone signals were sent over high tension or lighting lines, quite a furore was created in radio circles, and many suppositions regarding its possibilities were made.

The North American Company, one of the largest public utility corporations in America, seeing great possibilities in the system toward supplying users of commercial electric light with "wired radio" obtained permission to use the system, under the basic patents of General Squier. Its subsidiary, Wired Radio, Inc., has since then perfected the system and is putting it into active use.



(C. Kadel and Herbert)

An installation of a two-tube "Wired Radio" receiver in a house. Note the fact that it is very compact and has but one dial for adjustment. R. D. Duncan, Jr., and engineers of "Wired Radio," listening in.

Wired Radio is just what its name signifies. Instead of allowing the radio waves to emanate into space, they are confined to the limits of the lighting system. Thereby any one supplied with electric lighting, by the use of the proper apparatus, is enabled to receive radio signals anywhere in his home where there is a light socket simply by plugging the receiver into the light socket.

At the transmitting end, the system resembles the regular broadcasting station. There is a studio with its "pick-up" devices or microphones. The sound waves are carried along to the amplifiers where they are boosted up preparatory to being put into the transmitter and sent out along the wires. The transmitters being used were developed by the engineers of Wired Radio, Inc., especially for this purpose.

The receivers used to make the music audible to the people desiring the service were also specially designed. They are made to be as near fool-proof as possible. In the receivers that will be used there is just one dial and a crystal detector. A fixed crystal detector is being perfected that will eliminate that adjustment.

It is easily seen that with this system, no antenna or ground being necessary and only one dial to operate that it is indeed "simplified." At present music or broadcast programs will be sent on only one wave length, therefore no tuning will be necessary after the first adjustment.

The method to be pursued by Wired Radio, Inc., is as follows:

The users of electric light desiring to receive the programs that will be sent out over the Richmond Light and Railroad Companies Electric Lighting lines by Wired Radio, Inc., will be able to choose from three sets which have been standardized. The first is a crystal set, with ear phones; the second is a two-tube

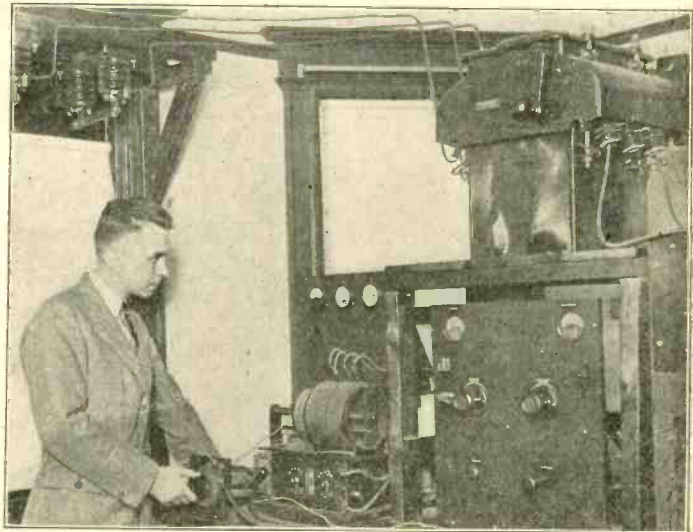
receiver with loud speaker, and the third a three-tube receiver with loud speaker. The crystal receiver will rent at \$2.00 per month, the small loud speaker set will rent at \$3.50 per month and the large set will rent for \$5.00. The receivers remain the property of Wired Radio, Inc., and their use will be billed the same as the regular electric light service.

The service is installed on Staten Island, N. Y., and a demonstration of it was given to a group of press representatives on August 29, 1923.

The studio, which is at present a private house in Staten Island about one mile distant from the power house is where the programs will emanate from. On the first floor is the studio, draped with heavy hangings and having the necessary "pick-up" devices for broadcasting of piano music, talks, or orchestral selections. On the second floor are the amplifiers and transmitters, as well as a United Press Station where United Press reports will be received direct, and all the latest news will be given from the studio. The transmitter is coupled with the high tension lines that supply Staten Island, and radiate the energy directly over these lines. On the top floor is a loop receiver comprising four stages of radio-frequency (one of tuned radio, three of broadly tuned or transformer coupled) detector and power amplifier, operated on a two-foot loop. This receiver will also be used to pick up the programs sent out at the present time by the broadcasters, amplifying it, and re-transmitting it over their wired radio system.

It will only be necessary for the subscribers of the Wired Radio, Inc., to plug their sets into the sockets and turn on the light in order to receive the programs.

The wired radio program will consist of complete news service supplied by the United Press. Reports of all sporting events, time service, fashion, health food, housekeeping, gardening talks, stories, reviews, lectures, all kinds of music and reports of various func-



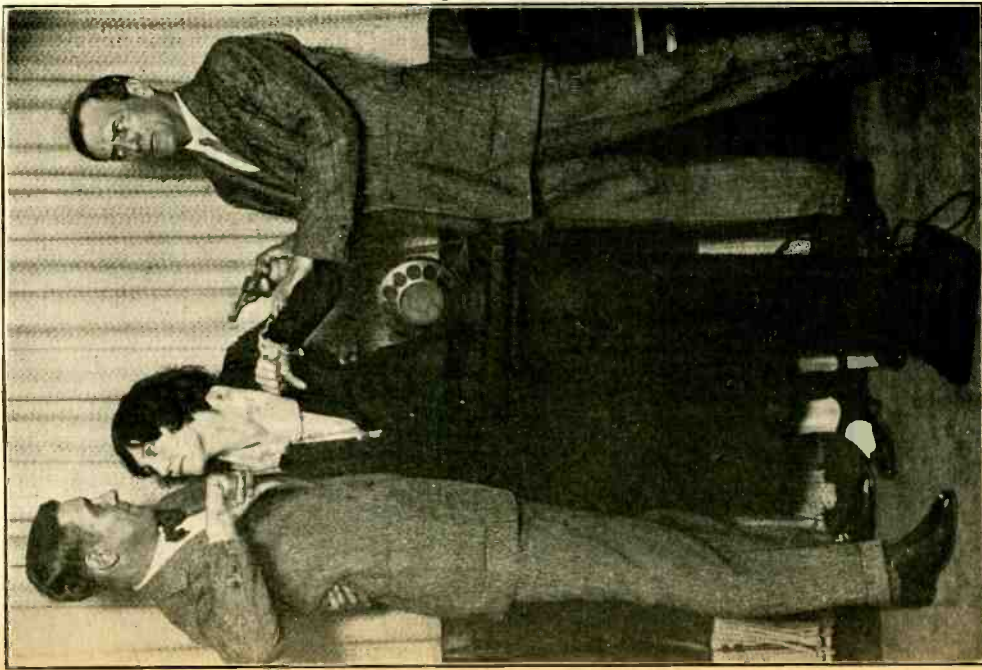
(C. Kadel and Herbert)

R. D. Duncan, Jr., engineer, adjusting the wired wireless transmitter. Note that it is directly coupled to the 2,300 volt high tension transformers through the switching arrangement on the window over his head.

tions. Its programs will start at 7:00 in the morning, and continue until 11:00 at night. It is expected to provide as soon as a survey is made of the programs that are desired two or three different types of programs on different wave lengths.

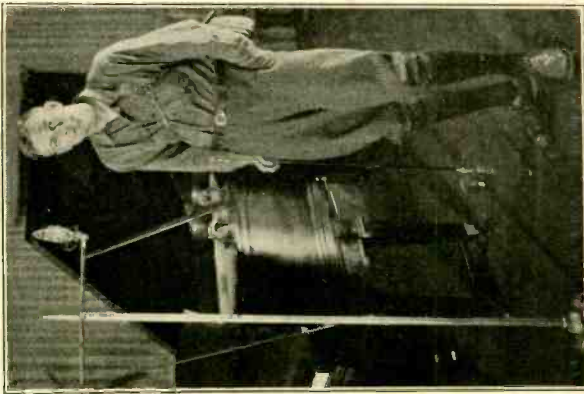
The personnel of Wired Radio, Inc., is: C. W. Hough, president; R. D. Duncan, Jr., chief radio engineer; James T. Kolbert, editor news service. Wired Radio Service Co.: J. A. Mears, president.

Radio News Pictures Arranged Poster-wise



(C. Kadel and Herbert)

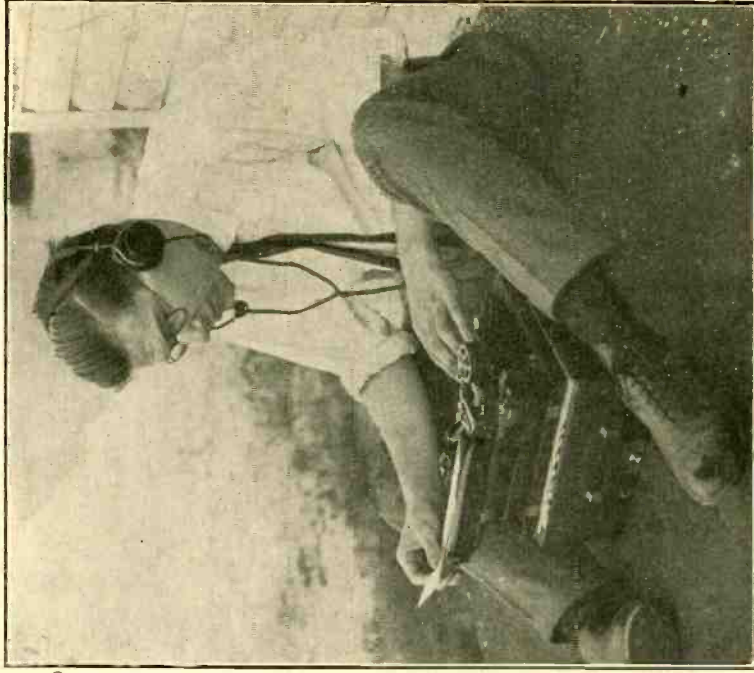
Here is one of the scenes that the radio audience recently "heard" from the drama "Thumbs Down" broadcast from Station WOR, Newark, N. J. The play was summarized before beginning, as to settings, and the cast, and then was broadcast in the manner shown. Music was played between acts, and the ringing of a gong warned the folks of the "rise of the curtain." The illustration shows John Marston, Sue MacManamy and Howard Lang, the principals, acting one of the "tense" scenes before the Mic.



Jud Landon, Apostle of the Great Outdoors, who recently gave a series of addresses at WGY, Schenectady, N. Y. He has given talks on fishing and hunting and has accumulated quite a number of followers who like to listen to him, even though they cannot follow his methods of "smoking out a bear" or "fighting a giant tuna fish." The illustration shows "Jud" in front of the new "glow-discharge" microphone.



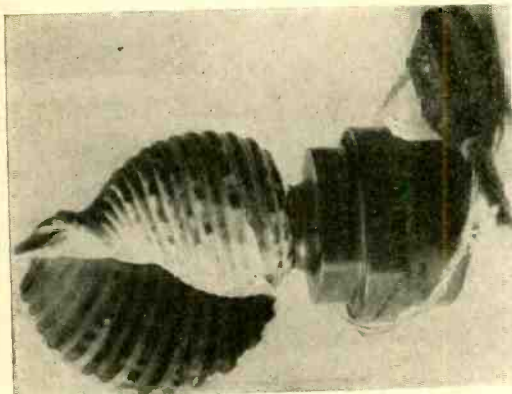
(C. Underwood and Underwood)



Kenneth M. Swezey, the writer for RADIO WORLD and who is a favorite with many fans, is here shown "picking ideas" out of the ether while sitting on the roof outside his room. With his trusty Corona and radio set, he can get them as they "come through" and keep right on thinking up new ones for the fans to play with. This is, by the way, a good way of testing out your speed in copying. If you can type code messages at 30 per minute as they are sent, you need have no fears about getting a "1st Commercial."



takes her walk with "Dolly." She had brother rig up a crystal set that she used on a loop aerial, and parades around the park near 2LO and hears the programs as they are broadcast.



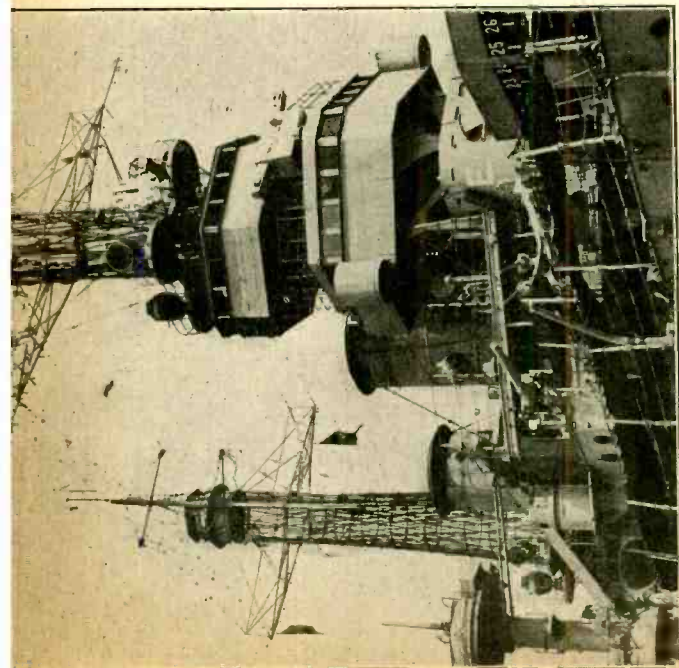
(C. Atlantic Foto Service)

An idea for radio fans who want a good small loud speaker. An Atlantic City amateur discovered that an ordinary conch shell when properly attached would make an excellent loud speaker. A shell of that sort having absolutely perfect acoustics gives a volume of sound that is really surprising. Compare the entire loud speaker with the plug alongside of it.



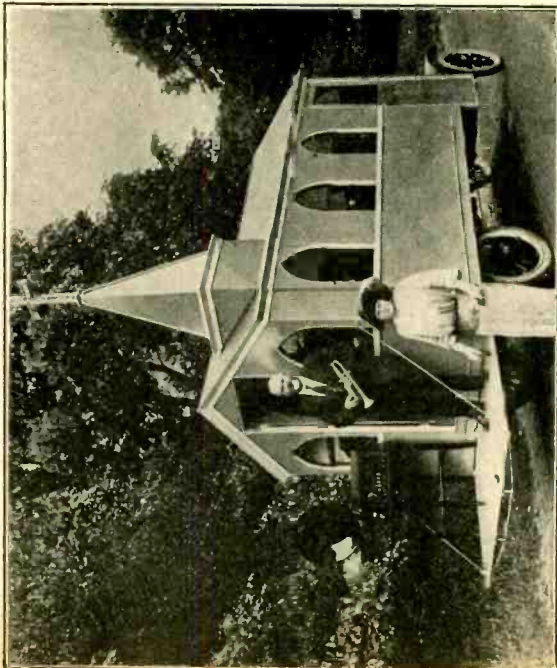
(C. P and A Photos)

Mrs. H. A. Leslie, of Los Angeles, who claims that she was cured of a serious illness, by hearing Aimee Semple MacPherson, noted woman Evangelist, over the radio, while practically waiting for death. The illustration shows Mrs. Leslie listening in on the set she says was responsible for her marvelous cure.



(C. Kadel and Herbert)

You fans who think you have elaborate antenna systems take a peep at the antennae of the U. S. S. "Wyoming," one of the latest battle ships. Four antenna systems can be used either separately or together.



(C. Gilliams)

A curious sight these days in and around staid Boston is the "Radio Church on Wheels." It is a replica of a church, mounted on the chassis of a car. Sermons and sacred music are received over the radio and broadcast to the open air crowds. Therefore, even the ones who claim they "live too far from the church" cannot get away from this ardent evangelist and his wife.



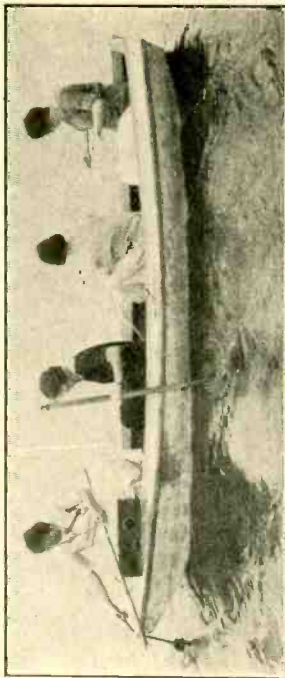
(C. Kadel and Herbert)

Judge Ben B. Lindsay, of Denver, examining the new radio set he has just bought. It is the RC receiver with power amplifier and loud speaker. If it was not for the fact that there is no jack in the detector panel, and no battery connections to the loud speaker, we might tell you that he was listening to WEAF, but we cannot do anything so obviously wrong. Anyway, it is enough to state that Judge Lindsay is a "reg'lar fan."



(C. P and A Photos)

Radio detachment of the 69th Regiment in camp at Peekskill, N. Y., setting up their portable field set for practice. The set used is a combination receiver and tube transmitter, being operated by means of storage batteries, which, while not considered portable in every sense of the word by average fans who have to lug them to the battery shop every two weeks, are portable for this type of work and furnish steadier current than a hand driven generator.



Four girls crabbing with the aid of radio. They are using a regenerative set, with two wires in the water for antenna and ground. The one wire used for an antenna is well insulated and the open end sealed with wax to prevent contact with the water. The ground wire is bare and both are trailed in the water. Makes a good antenna, too. And by-te-by, although you cannot see it in the picture, the young lady with the earphones has just landed a crab in her net.

RADIO PRIMER

The Radio Woman

For the New Army of Radio Beginners

LOCATION OF TROUBLES IN A RECEIVER: After a fan has constructed a receiver or even bought one, there is no guarantee that little minor troubles will not occur. If he is a beginner he will fuss around and probably spoil the receiver, or cause trouble, where none existed. Therefore by knowing just where to look for the minor troubles he can obviate the necessity of calling in "expert" advice.

The commonest trouble is probably due to faulty connections. For some unknown cause, wires will come loose without the least apparent reason. The first place to look for trouble in that line is in the B battery circuit. Examine your connections to the set, and see that all the connections from the batteries are tight, and the wires scraped clean. Examine your antenna and ground connections and see that they are all tight.

If the set has been carefully soldered, and the mechanism has not been fooled with, there is no use to look at the connections inside unless lugs have been used to fasten the wires under the binding posts. If such is the case, light the tubes and very carefully joggle each lead. Do not feel too strong when doing this, and do not use any metallic instrument such as a screwdriver. Rather use a pencil or your fingers. If there is a loose connection it will immediately show by various clicks and the connection should be tightened.

Should all the connections be found tight, examine the tube by taking it out of the socket and seeing that all the lugs are clean, and making positive contact with the socket.

Probably one of the commonest causes of faulty operation is the use of poor B batteries. A B battery can be in fine condition one night and will rapidly fall in value until it will probably just operate or operate spasmodically. Therefore test your batteries by means of touching them quickly to a voltmeter. Do not hold the voltmeter across the battery as it will short circuit and be no good altogether.

Next examine your plug and phone cords. The tinsel inside the cord is fragile, and oftentimes breaks off inside the cord, the outside not showing the break. Therefore examine your plug and jack, by connecting a weak dry cell across it. If no response is given to the connection, remove the tips from the plug, and connect it across the battery, and then carefully "feel out" the cord by holding it in the hands and wiggling the cord an inch at a time looking for the break.

Should you prove unsuccessful in finding the trouble after the above take the phones and battery, remove the tubes from the socket, and individually test out each connection by means of the battery and phones, taking particular care with the inductances and transformers, always testing out on both sides of the condensers, and also across the condensers, to determine if any of them are blown or shorted. A condenser when the phones are thrown across with the battery should not give any response when the connection is made and broken. If it does the condenser is shorted and should be taken out.

A little care taken in the testing instead of madly searching around with fervid brow and beating heart, and by reasoning everything out before "flying off the handle" and wrecking the set without any cause, will oftentimes help more than calling in one of your friends and having him wreck the set for you. The old saying of the miner who was packing "grub" up the mountainside should prove of value to everyone in this case—"Slow and steady, does it, son."

FRIEDA, the General of the Kitchen, otherwise known as the cook, had been looking askance at radio for some months. "Dot aind't right—Gott nefer made beobles to make music in the air, and I woun't listen from it," used to be her daily speech, as she would hurry to the kitchen and slam the door. She is a really good cook, so we decided to humor her and turn the set off when she was feeling particularly bad about the matter. The inevitable change has come, however, and now Frieda wants us to put "one of dos radios" where she may hear it. The reason for the sudden change is that her cousin, who has been out west for years, recently returned and told her that he is a research engineer in one of the western radio plants. He had quite a rumpus with her, but he told her that it was not "defil's magic," and even went to the trouble to take her down to the city on her day off and let her see how it was done.

* * *

Isn't it queer what notions some people take into their heads? F. H., who is now considered quite an expert on radio troubles, was called in by a friend living down the block to find some trouble on the receiver that he had just made, and which wouldn't tune a bit. As a matter of fact, every station in the world seemed to be mixed up in one grand jumble, with code and everything.

"Well," commented Friend Husband afterwards, "outside of the fact that he didn't use the coils prescribed, but had a bright notion that honeycomb coils used in place of the special bank wound and other coils would be better, hearing that they were more efficient, and also using two condensers where they were not supposed to be, and using any kind of wire and wiring it up exceedingly messy, with too much paste and tons of solder, he had it worked out very well. It's a wonder to me that it even peeped. If some of these amateur constructors would read the articles thoroughly, and pay less attention to their 'radio expert' friends, who have probably built one home-made set and get all their knowledge from having bright thoughts on the subject, I think that everybody who attempts the building of a set would be helped immeasurably. I think I'm going to start a school for radio men to teach them the art of soldering one wire to another. I think that a three-year-old child could have done as messy a job as that grown man did, but I am not sure."

* * *

Friend Husband, through his talking and talking and talking radio, finally persuaded his club mate and golf friend to get a set at one of the big stores. Accordingly, Billie purchased the set, hooked up a nice antenna according to directions, connected the batteries very nicely and then started in to listen. He is not a "dumb dora" by any means, having played around with tools and wires—but not radio—for quite some time, so that far he was successful.

About a quarter of eleven that evening, the phone bell rang, right in the midst of our Philharmonic Symphony, and Billie told F. H. that he had connected everything right, was perfectly sure he had, but couldn't get a sound out of it. Friend Husband groaned something about "pests" and put on his coat.

He was gone about 20 minutes when back he came, with a smile all over his face. "That wise man goes and hooks up his set and then leaves the tubes in their boxes lying on the table upstairs and tries for two hours and a half to hear something, and cursing the day that I ever persuaded him to buy it!"

Answers to Readers

Where can I obtain a circuit diagram using the following apparatus: WD11 tube, variocoupler, variable vernier condenser, switch? How do you place the condenser in series with the variocoupler?—L. B. Reid, 605 Van Nuys Bldg., Los Angeles, Calif.

A very fine article using the apparatus you mention, and giving very excellent plans for the building of the receiving and detector unit appeared on page four of RADIO WORLD April 14, 1923. All details are explained in that article which is well illustrated.

Will you kindly give me the address of Bob Kalmus, whose article appeared in a recent issue?—John Keiler, Los Angeles, California.

The address is c/o H. Baran Co., 2325 Broadway, New York City.

I have been told by friends that I should renew the cartridge in my lightning protector after every storm. I am located in such a position that I cannot very well do so without buying a whole box of the renewal cartridges. How can I eliminate the necessity for this?—Jacob Strausman, Ellen-ville, N. Y.

You have been misinformed. You do not have to renew the cartridge after a storm unless the antenna of your set is actually hit. This is a very faint possibility, so you need not worry about it.

Does the ground wire have anything to do with the correct operation of the receiver? My set tunes very broadly, being able to hear WJZ while trying to listen to WEAf or WOR. I use a loose coupler, crystal detector, phones and condenser. My antenna is 100 feet long, and my ground 45 feet from my set.—Alfred Kulick, New York.

Your ground lead should be as short as possible to make it. It is entirely too long. You will not be able to get sharp tuning on a crystal set, as no crystal set is capable of tuning out one station completely when its wave length is so near to that of another as the stations you mention.

Please inform me as to the effective wave length range of the spiderweb coils described by Arthur S. Gordon in RADIO WORLD Feb. 10, 1923.—Harry Vetter, 10807 91st Ave., Richmond Hill, N. Y.

With an antenna 100-150 feet long, these coils will respond to waves up to 600 meters.

I am contemplating the construction of a three tube set and have been seriously considering the inverse reflex described in RADIO WORLD by W. S. Thompson. Have also heard a great deal of the three tube neutrodyne and would like to have your opinion of which would give the best signals as to distance and volume where an outside antenna is absolutely out of the question. Will the duplex eliminate locals a little over a mile away? The single tube reflex that I am at present working does this, as well as several others I have constructed. The circuit therefore must be able to accomplish sharp tuning in order to be satisfactory.—Geo. P. Stamm, 1011 N. Wahsatch, Colorado Springs, Colo.

Both circuits you mention are excellent circuits. However, as between the two, the neutrodyne is probably capable of the best tuning as all reflex circuits using more than one tube are generally a bit broad in tuning. You can make no mistake in constructing the three tube neutrodyne, if you are careful to use the best parts and follow directions. When used with one additional stage of audio-frequency it is a wonderful "loud speaker" circuit, is clear and no distortion is possible. Suggest you write to the manufacturers for circulars and matter pertaining to the home construction of the circuit.

Will my detector and two-stage set (Atwater Kent parts) operate a loud speaker on WD-11 Tubes?—John Salbiston, Jr., Bayshore, N. Y.

You should be able to get sufficient volume from the set you mention to operate a loud speaker very nicely, depending, of course, upon the surrounding conditions. If you are in a "dead spot" you will not be able to.

In RADIO WORLD, August 4, 1923, you published a circuit by A. D. Turnbull. How many plates should the variable condenser .0005 mfd. have? From what part of the variometer is the third tap taken? How should I place the condenser on the panel in regard to inductive relation with the variometer?—Harvey Johnson, 47 Layton St., San Francisco, Calif.

The condenser mentioned should be 23 plates if of the rotary type. If the book type, you will have to get one which has that particular capacity. The third tap is taken from the wire that connects the rotor to the stator. In variometer construction, they generally make the rod that is used as the bearing act as the connector. Trace the connections and find out. You cannot place a capacitance in inductive relation to an inductance. This expression, when used, signifies placing two inductances together in such a manner that a current in one will "induce" a like current in the other, and therefore transfer part of the energy into the second coil. You cannot do this between a condenser and an inductance.

I am using a WD-12 tube on my receiver. Will using a two volt cell from a storage battery hurt the tube?—Carl Zuspan, 505 Watson Bldg., Fairmont, West Va.

You can use a two volt storage cell for the purpose you mention, if care is taken not to turn the rheostat all the way on. Suggest that you place an additional resistance in the filament circuit to prevent this happening by accident. One of the 25 ohm resistances placed in series with your regulation filament rheostat, and the slider moved down to the proper place will suffice, and act as a safeguard against burning out your filament.

Have you ever described the construction of a voltmeter? If so, in what issue?—Claude Schaffner, 67 Woodlawn Street, New Haven, Conn.

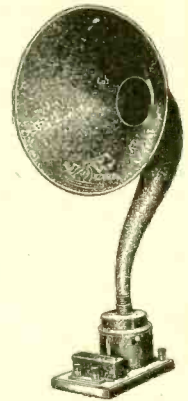
We have never described the construction of the apparatus you mention. Apparatus of this type cannot be made by the average amateur constructor because of the extremely fine work necessary. You can purchase one much cheaper than you could construct it. There are several good makes at a reasonable price on the market.

I have constructed a two-stage tuned radio-frequency receiver, two coils 3½" in diameter, 5" long, wound with 100 turns apiece of No. 22 DCC wire and tapped every 20 turns. They are shunted with .001 condensers. I have had good success with it, but notice that condenser 2 (that in the second stage) and the tapped coil have to be tuned higher than the first stage. Is this right? If not, how can I remedy it?—L. F. Jacobson, New York City.

The fact that you have to tune your condenser on the second stage higher than the first stage is correct. That is to make up for the amount of wire used in the first stage. You should not have to tune your coil higher, however, as there should not be such a great change as that. Try tuning your condenser higher and using the same value of inductance. As a general rule, the first condenser should read from 10 to 12° lower than the second.

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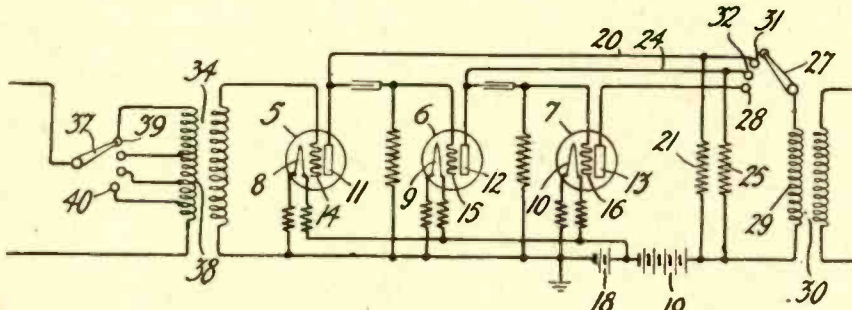
Multistage Amplifier Circuits

No. 1,459,419: Patented June 19, 1923. Patentee: E. O. Scriven, New York City.

This invention relates to multi-stage amplifier circuits and more particularly it relates to vacuum tube circuits wherein a plurality of repeaters or amplifiers are employed to amplify signals impressed thereon from an incoming line.

One of the objects of this invention is

to provide a means for regulating the degree of amplification of a multi-stage amplifier set for signals impressed thereon. As is well known in the art, weak currents or signals may be amplified to any desired degree by impressing them on a plurality of vacuum tube amplifiers arranged to work into each other by suitable circuit connections. In employing such a multi-stage amplifier set for amplifying weak currents, it is frequently found undesirable to use the total ampli-



Method used to control the input and output of a multi-stage amplifier, using resistance coupling between the second and third stages, and switches to vary both the input value as well as the number of stages feeding into the output transformer.

prevent overloading the last stages. In accordance with this invention, a single switching means is employed to cut in or out one or more of the plurality of the amplifiers so as to regulate the amount of amplification for any given case. An additional switch is also provided for regulating the strength of the currents impressed on the first tube so that by operating both switches any desired degree of amplification from the set may be obtained.

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to a form of cathode element for use in such devices, and its object is to produce a large energy output therefrom.

One way of increasing the energy output of a thermionic translating device, such, for example, as an audion, is to increase the active area of its cathode member. Where the cathode is in the form of a filament and is heated by a flow of current therethrough, the two ends of the filament will be at different potentials by virtue of this current flow and the resistance of the filament. When, as is customarily the case, the anode or plate element is made positive with respect to the filament by means of some external electromotive force, it is seen that there will be a greater difference of potential between the negative end of the filament and the anode, than between the positive end of the filament and the anode. There is, within certain limits, a direct relation between the output of an audion and the potential applied between the anode and cathode. It follows that other parts of the filament being at a higher potential than the negative terminal with respect to the anode, will not be working at maximum efficiency, the greatest inefficiency occurring at the positive end of the filament. In other words, the space current between the

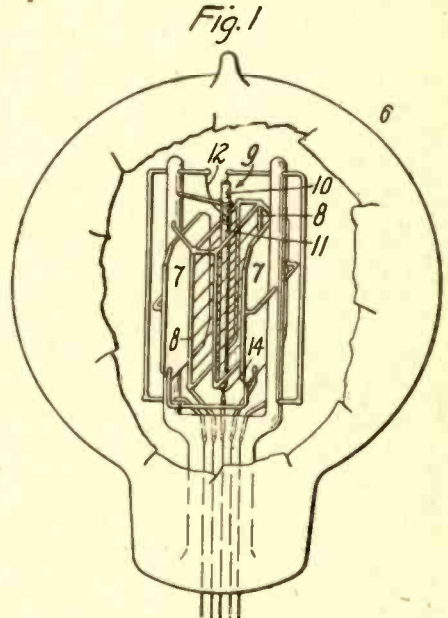
Electron Discharging Device

No. 1,459,417: Patented June 19, 1923. Patentee: Paul Schwerin, New York City.

This invention relates to electron discharge devices and especially to vacuum tubes of the audion type, and has as an

In electron discharge devices of the audion type, two or more elements are used, one of the elements being a cathode or a source of electrons. Another element is the anode or collector of electrons. Under the action of a strong electrical field, the electrons from the cathode travel towards the anode, and acquire a high velocity. As a result of the electronic bombardment to which it is thus subjected, the anode becomes heated. This fact limits the power input, since excessive heating of the anode drives off the occluded gas, or may even melt the anode, destroying the device.

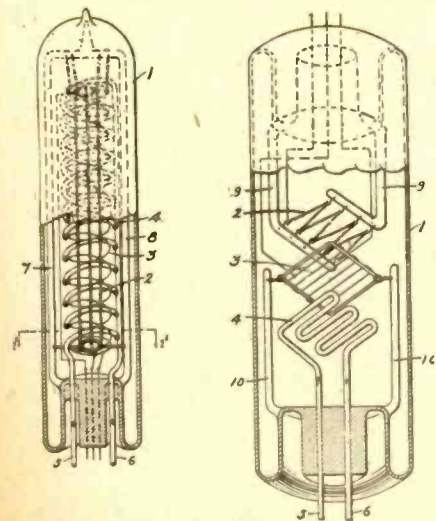
In this invention then, the purpose is to so construct and arrange the anode that it will be able to dissipate a very large quantity of heat. Such an arrangement will make vacuum tubes of this type largely independent of the heating factor, which heretofore has been a serious limitation to their efficiency. This result has been obtained by having a circulating medium in contact with one surface of the anode element to act as a cooling agent, and of the various agents which may be used, it has been found that water or oil is particularly suitable. This cooling of the anode, as herein described, has made possible a manifold increase in the amount of power which the audion tube can handle.



Arrangement of elements in a newly designed vacuum tube which overcomes several difficulties now present. The arrangement of the heated filament and its position with regard to the other elements is considered with regard to the space current flowing between the filament and anode.

anode and the filament will be unsymmetrically distributed. While this unsymmetrical distribution is not of great importance where short filaments are used, it becomes of serious importance when the length of the filament is increased to give a greater active area for the purpose of increasing the energy output of the tube.

This invention provides a thermionically active cathode which, while affording a large active area, will be devoid of the property of presenting a drop of potential between its terminals. It is in fact an equipotential cathode, that is, a cathode, all parts of whose active surface can be maintained at the same potential. Thus, an even distribution of space current over the cathode surface is permitted, and the cathode as a whole may be worked at its maximum efficiency. This result is obtained by divorcing the heating agent from that which produces the thermionic activity.



Two methods of construction to be used in making vacuum tubes designed for transmitting or carrying excessive amounts of plate current. Elements are arranged to allow quick cooling preventing excessive heating of active elements.

object a device of the above character which has a very large power capacity.

Thermionic Translating Device

No. 1,459,412: Patented June 19, 1923. Patentee: A. McL. Nicholson, New York City.

This invention relates to thermionic translating devices and more particularly

Some Interesting Radio History

IN the early days of radio, following the splendid achievement of Marconi in transmitting the letter S across the Atlantic, scientists and engineers in this country and England believed that reliable long distance transmission and reception could be obtained by increasing the power on the antenna and by building higher antenna masts. As much as one hundred kilowatts were used on spark sets and the masts were sometimes 500 feet high.

J. T. H. Dempster, an engineer in the research laboratory of the General Electric Company at Schenectady, N. Y., and a pioneer in the field of radio, explains that the American amateurs are today communicating with English amateurs with 1,000 times less power than was used with indifferent results twenty years ago. "Insensitive receiving equipment," says Mr. Dempster, "was the cause of uncertain reception and it was not until the vacuum tube came into its own that rapid progress was made."

Back in 1904, a few years after Marconi startled the scientific world with his experiment that promised to revolutionize long distance communication, the General Electric Company engineers were actively interested in the new art and they, like others, tried for a long time to offset the shortcomings of receiving apparatus by boosting the power at the transmitting end. R. A. Fessenden, formerly a professor at the University of Pittsburgh and then head of the National Electric Signalling Company, was engaged to install transmitting and receiving equipment at the Schenectady, N. Y., and Lynn, Mass., plants of the General Electric Company with the expectation that this method of communication would replace the telephone and telegraph lines.

A. A. Isbell, now Pacific coast manager of the Radio Corporation of America, was placed in charge of the installation by Mr. Fessenden. A spark transmitter of the straight gap type was built. In order to keep the gap from arcing it was necessary to blow air across it at about 100 pounds pressure. The power was supplied by a 20 KW transformer charging a condenser composed of steel plates, separated by glass plates, all immersed in oil in a steel tank. A special relay breaking a very large current in the primary circuit was designed by Mr. Dempster, in co-operation with Mr. Isbell. In operation air was blown across the carbon contacts of the relay. Because of the high potential in the antenna it was possible to draw sparks from any insulated conductor within 100 yards of the masts. The antenna mast was 180 feet high and 96 amperes were used in transmission.

The receiving apparatus consisted of the famous Fessenden liquid barretter or, in better known terms, the electrolytic detector, which was used in connection with the Fessenden interference preventer circuit. The electrolytic detector consisted of a platinum wire coated with silver. This was known as Wollaston wire. The silver coating gave mechanical strength to the wire which was less than ten thousandths of an inch in diameter. The nitric acid in a platinum cup into which the wire dipped formed the electrolyte. The platinum cup was the other pole of the cell.

The electrolytic detector was a marked advance over the Marconi coherer but it was still much less sensitive than the crystal detectors now in use. Static frequently burned the point from the platinum wire temporarily destroying the use of the detector.

With this equipment sporadic communication was established between the two plants of the company during the cold months but reception was very uncertain in the summer. In efforts to improve trans-

mission more power was used without improving reception. The test signal used by the operator in the two cities was the letter D—a long dash and two shorts—repeated hour after hour at a stretch. This became so tiresome that Mr. Dempster built a motor driven transmitter set for Schenectady and the machine relieved the tedious work of the operators.

The headphones adopted were especially made according to the navy standard and they were wound for the first time with enameled wire. These phones were about one-twenty-fifth as sensitive as the cheapest headphones on the market today.

In the early days of radio the signal acted directly on the receiving apparatus, whereas today, by means of circuits and B batteries, the signal is magnified from one to 25,000,000 times, the signal acting as a valve to regulate the B battery current. Back in the old days signals were occasionally received when fifty kilowatts were impressed on the antenna, using 180 foot masts. Today, an operator in Lynn with a three-bulb receiving set can get Schenectady signals 1,000 times stronger than was possible in 1903 and that from a transmitter using but five watts and a mast fifty feet high.

At the same time experiments were being carried on in Schenectady and Lynn, Prof. Fessenden was operating two very high powered stations using 100 kilowatts with 480 foot steel masts and umbrella antenna. One of these stations was located at Brant Rock, near Plymouth, Mass., and the other was at Machrihanish, Scotland.

Twelfth Edition of a Popular Radio Text Book

WIRELESS Course in Twenty Lessons," by S. Gernsback, A. Lesca-boura and H. W. Secor. 264 pp., many diagrams and illustrations. Experimenter Publishing Co., New York City. Price \$2.00 net.

This is the twelfth edition of a standard radio textbook which has proved its popularity since its initial appearance in 1911. Many revolutionary changes have taken place in radio since this book was born but the authors have kept track of the progress made and the present edition has been completely rewritten in greatly enlarged form. The twenty lessons form a comprehensive course of instruction in radio and should appeal to the new and constantly growing army of radio enthusiasts.

New Signal Corps Pamphlet on Radio

A PUBLICATION giving an introduction to the subject of line radio communication has just been prepared under the direction of the Chief Signal Officer of the Army in co-operation with the Bureau of Standards. The pamphlet gives an explanation of how messages are carried to distant points by radio frequency currents directed over ordinary telephone lines or power wires. The fundamental principles of radio and its relation to line radio telegraphy and telephony are discussed. Copies of the work, known as Signal Corps Radio Communication, Pamphlet No. 41, and entitled "Introduction to Line Radio Communication," can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at ten cents per copy.

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If he refuses to allow the construction of an aerial. The **LEVIN "NO-AERIAL" RECEIVER** solves the problem in an economical way. Just connect your Levin "No-Aerial" receiver to the water pipe or radiator and listen in. This receiver requires **ONLY** a ground connection for perfect reception. Send stamp for further information or \$1.00 for plans and specifications, including full-size panel layouts and instructions.

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DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWINS.
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"Saving money by NOT advertising gives the sheriff and auctioneer most of their business."—F. S. C.

Radio Merchandising

Advertising Rates: Display, \$5.00 an inch, \$150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Lackawanna 6976

National Radio Week Will Be from Nov. 25 to Dec. 1

THE National Radio Week Executive Committee of the Radio Trade Association has decided to hold National Radio Week this year from November 25 to December 1. Details may be secured from L. A. Nixon, secretary of the Radio Trade Association, 1133 Broadway, New York City.

Pierre Boucheron, manager of the publicity department of the Radio Corporation of America, will head a special committee of publicity men who will use their combined efforts to forward the interests of this important event.

H. Gernsback, editor of RADIO NEWS, as chairman of the publicity committee of the Radio Trade Association, will urge the co-operation of the trade at large in making National Radio Week a success.

A special committee of the leading directors of broadcasting stations is now working out a type of program for the week which will permit every broadcasting station in the country to co-operate in making their programs especially appropriate to the event and attractive to

thousands who now do not own receiving sets.

National Radio Week will mark the opening of the buying season for the holiday trade. Every radio firm who takes advantage of this opportune publicity should reap great profits.

Any one with ideas to make National Radio Week even more successful is invited to address the secretary, Mr. Nixon, or any member of the executive committee which is composed as follows:

F. Clifford Estey, National Chelsea Radio Corp., Boston, Mass.

Arthur H. Lynch, RADIO BROADCAST, Garden City, N. Y.

Arthur H. Halloran, publisher, RADIO, San Francisco, Calif.

Theodore R. Gerken, The Marshall-Gerken Company, Toledo, Ohio.

Benjamin Gross, Radio Stores Corp., New York City.

Roland Burke Hennessy, publisher, RADIO WORLD, New York City.

Major J. Andrew White, WIRELESS AGE, New York City.

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:

- B. A. Harden, Le Roy, Minn.
A. J. Benkett, 966 South State St., Syracuse, N. Y.
Nate W. Hunter, 641 Palmwood Ave., Toledo, Ohio.
Leonard Klarnet, 165 Beach 117th St., Rockaway Park, N. Y.
Charles Woodhams, 808 Center St., Chicago, Ill.
Summers T. Carter, 1507 Pechin Ave., Roanoke, Va. (Dealer.)
John Elker, 542 South Third Ave., Kankakee, Ill. (Builds sets.)
M. G. Stevens, Kendall, N. Y. (Dealer interested in power amplifiers.)
C. C. Lewis, 49 Main St., Fairchance, Pa.
Virgil R. Harbert, Lumberfort, W. Va. (Builds sets.)
R. F. Siggelkow, 316 East Prairie St., Lanark, Ill. (Builds and remodels sets. Interested in parts.)
Wm. R. Holloway, 1333 Locust St., Norristown, Pa.
James F. Clark, 142 West 82d St., New York City. (Interested in up-to-date variocouplers and variometers.)
Sam Chernetzley, 593 Stone Ave., Brooklyn, N. Y. (Wants to buy a set.)
H. G. Bergman, 103 Lake Ave., Mariners Harbor, N. Y.
Manley G. McKinley, Mendota, Mo. (Retailer.)
F. E. Whitcomb, Jr., 3838-a Blaine Ave., St. Louis, Mo.
W. B. Shanafelt, Sigourney, Iowa.
W. V. Trott, 9 Barker Ave., Hamilton, Ontario, Canada.
Gail Bartlett, Atlanta, Macon County, Missouri.
Donab Fregoll, 16 Washington St., Central Falls, R. I.
Max Robbins, 296 Georgia Ave., Brooklyn, N. Y. (Builds sets.)
William Devereux, 1371 Green Ave., Brooklyn, N. Y.
Michael E. Kondrat, 94 Exchange St., New Haven, Conn.
Anthony C. Budenkaye, 45 First West St., East Plymouth, Pa.
Guy M. Chase, 677 Garden St., Elizabeth, N. J.
A. D. Coleman, Farragut, Iowa.
John Daly, 45 Enterprise St., Adams, Mass.
Joaquin Sanguis, Perla No. 15 (Gracia), Barcelona, Spain.
Arthur Cauffield, 908 Lafayette St., Niles, Ohio.
Arthur G. Davis, 624 Vine St., Camden, N. J.
Sam Barclay, 1812 Washington St., Fort Worth, Texas.
George T. Vallee, 17 Commerce St., Norwalk, Conn.
George Broadbent, 18 Cross St., Millintown, Pa. (Distributor.)
A. Abbati, 319 East 152nd St., New York City. (About to start a retail radio business.)
H. B. Hassinger, 654 12th St., Newark, N. J.
August Nardore, 7001 Tenth Ave., Brooklyn, N. Y.

United Cigar Stores Trying Out Radio Sales

THE United Cigar Stores Company last week began an interesting sales experiment in three of its New York City stores.

Standard radio sets and parts were placed on sale in charge of experienced salesmen. The object is to determine whether the public will buy radio goods through a cigar store.

No cut price goods of any kind will be carried and only standard sets and material will be stocked. Competent advice

and service will be given to all purchasers.

If the experiment proves successful, it should afford a tremendous outlet for radio goods of every description, as the United Cigar Stores Company is one of the largest and most profitable retail selling organizations in the world.

The radio industry will await with great interest the verdict of the public and the decision of the United Cigar Stores on this interesting and very important experiment.

A Good Thing Worth Repeating

Sol Kahan keeps a prosperous news, stationery and cigar store at 305 North Avenue, New Rochelle, N. Y. He sells a great many RADIO WORLDS in the course of a month. We noticed recently that Mr. Kahan had two unsold copies of RADIO WORLD of August 11 on his stand. A few days later he was asked if these copies had been returned to the American News Company, and he replied, "No, I keep my back numbers of RADIO WORLD in stock and sell them out, sometimes quite a while after their dates. I find there is a good demand for back numbers. In this way I always sell out my full supply of RADIO WORLDS."

Here is a tip worth following by other newsdealers.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

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.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

Putting Radio on the Map of the World

P. C. KULLMAN & CO., 110 Nassau P. Street, New York City, specialists in wireless securities, are continuing their efforts to "put radio on the map of the world" and have issued the seventh of a series of circular letters addressed to government officials in charge of wireless in 112 foreign countries. The firm has secured the services of E. Walker Sawyer, I.R.E., who will answer any technical or commercial questions addressed to him as above, in English, French, Spanish, Italian, German or Portuguese. Replies will be made by mail, cable or radio as the inquirer directs.

National Radio Chamber of Commerce Will Demonstrate Radio to Farmers

THE National Radio Chamber of Commerce, 165 Broadway, New York City, assisted by the manufacturers and distributors of radio, has begun a campaign for the purpose of educating farmers in the practical everyday value of radio on the farm. The importance of this movement to the radio industry may be judged by these facts:

The population of the United States is one-third farmer. But, economically, the farmer is more important than is his voting power. He possesses *one-half the country's buying power.*

Because of his daily need of weather, crop and market reports, and because of his need for the recreation and educational means furnished by radio, the farmer is, potentially, *the nation's biggest user of radio.*

The National Radio Chamber of Commerce has first hand information in the form of letters and telegrams from hundreds of farmers' organizations in New York, New Jersey, Pennsylvania, Ohio and other states, and from the national organizations, which indicate that the leaders among the farmers are keenly interested in radio.

The National Radio Chamber of Com-

merce has been assured by these leaders of their co-operation in such a program.

The manufacturers and distributors of radio equipment are entering into the plan and are sending out demonstration parties with receivers and loud speakers, the chamber securing for them also the privilege of exhibiting their lines and taking orders.

The demonstrations have so far been chiefly confined to "County Picnics." Those in New York State occurring in September have an estimated attendance of more than 160,000, more than half of which will be covered by demonstration. Following these picnics, the county fairs furnish the next opportunity to reach the farmers in large number. These are beginning now and extend well into the fall and offer ideal opportunities for educational work of this sort.

The National Radio Chamber of Commerce calls upon all manufacturers and distributors of radio equipment, regardless of affiliation, and all manufacturers' and distributors' organizations to assist in this movement, co-operatively, if possible—independently, if they must.

It is "seed sown upon good ground!"

New Radio and Electrical Firms

Ponder Motor Manufacturing Corp., Wilmington, Del., \$2,500,000. (Colonial Charter Co.)

American Batteries, Dover, Del., \$1,500,000. (U. S. Corporation Co.)

Admiral Electric Corp., Brooklyn, N. Y., to deal in mechanical appliances, \$10,000; B. and J. Storch. (Attorney, B. Berger, 225 Fifth Ave., New York City.)

Automatic Repeating Phonograph Co., Wilmington, Del., radio transmission, \$1,000,000. (Corporation Service Co.)

Non-Tenna Radio, Queens, N. Y., make wireless instruments, \$25,000; J. H. and M. F. Weatherlow, H. Brand. (Attorney,

W. Rasquin, Jr., 305 Broadway, New York City.)

Electra Brokerage Corp., New York City, make electric products, \$100,000; R. Fisher, I. A. Siddons. (Attorney, G. Price, 66 Broadway.)

Webster Radio Corp., New York City, make radio parts, \$10,000; L. Kaplan, F. R. Linden, R. E. Sackstein. (Attorneys, Glaze & Fine, 217 Broadway.)

Electrical Art Shop, Glens Falls, N. Y., \$10,000; E. L. and F. D. Hubbard. (Attorney, D. F. Imrie, Glens Falls.)

Newbrook Radio Sales Corp., New York City, \$50,000; H. H. Southgate, S. I. Godley. (Attorney, S. Sternfeld, 15 Park Row.)

A Radio Song Prize Contest

MR. FRED FISHER, of the Fisher Music Publishing House, New York, announces that he has completed arrangements with I. R. Nelson Co., operators of WAAM, Newark, N. J., for a novel popular radio song contest that will start September 11 and continue through seven broadcasting evenings until September 27.

Mr. Fisher's new song hit, "M. T. Pocket Blues," will be broadcast each of the seven evenings by Fisher's song artists at WAAM. The contest is as follows:

First Contest—A prize for best letter of not over two hundred words telling why the writer liked or did not like "M. T. Pocket Blues." Prizes: First, one year's subscription for RADIO WORLD and one pair W. E. phones. Second, two Victor records or one piano roll.

Second Contest—A prize will be given for the best funny chorus written by any one who hears the WAAM contest. Prizes: First, two rolls or two Victor dance records, and one pair W. E. phones.

Third Contest—For radio fan sending in letter from farthest distance one copy of all the Fisher song hits will be given with a pair of radio ear phones.

Fourth Contest—The first ten telephone calls on each of the nights will receive an autographed copy of "M. T. Pocket Blues" by the composers, or each copy will be autographed by James Barton who featured this song in "Dew Drop Inn" at the Astor Theatre. In all, this will make seventy copies of the song that will be given away.

The following nights have been selected for the broadcasting contest of "M. T. Pocket Blues": September 11, 8.00-8.40 P. M.; September 13, 8.40-9.00 P. M.; September 18, 9.15-9.30 P. M.; September 19, 10.00-10.30 P. M.; September 20, 8.30-9.00 P. M.; September 25, 8.25-9.00 P. M.; September 27, 8.25-9.00 P. M.

All letters must bear the post mark of September 30 or before. Announcement of awards will be made October 17 at 8.40 P. M.

A Lively Radio Sales Aggregation



Delegates to the first radio sales convention held recently by the Crosley Manufacturing Company at Cincinnati. The picture was made at the entrance to the company's manufacturing plant, which also houses Broadcasting Station WLW

Radio Trade Notes

Anthony C. Budenkaye, 45 First West St., East Plymouth, Pa., informs RADIO WORLD that he intends to open a radio school this fall.

* * *

Joaquin Sanguis, Perla No. 15 (Gracia), Barcelona, Spain, wants to get in touch with manufacturers of tubes and dealers who stock UV199 and other tubes.

* * *

Alcon Electrical Supply Co., 86 Walker St., New York City, has been placed in the hands of Joe Healey as receiver. Liabilities about \$9,000; assets about \$3,000.

WANT TO REPRESENT RADIO WORLD?

If you can get subscriptions for Radio World let us know and we will send you a generous proposition. Radio World, 1493 Broadway, New York City.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

The Wireless Oracle

By Hirsch M. Kaplan

THE Skinner Organ Company's recital is a fitting conclusion at any evening's programme, but more so to a Sunday.

Have you noticed the revival of all the old popular and classical music during the past few weeks? Suppose the new music is slow in the coming or else the old is the best after all.

WBZ gave an organ recital that was on a par with many of our local ones.

Of all the programmes rendered by Roxy and his troupe this week's was by the far the best of them all. "Day by Day In Every Way They're Getting Better and Better."

See where this column must do some good, for as you might have noticed and as was suggested, the Alpha Syncopators and Bruno Brothers' Chin Lee Orchestras were with us again.

Lemme whisper somethin' to you! If you enjoy good plays with plenty of good music watch the programmes of the daily papers for when WGY is to broadcast a play, and take my word for it you will spend an enjoyable evening. Only the other evening they broadcasted a comedy, "The Country Boy," and it sure was the berries.

Giving dinners of welcome these days is getting mighty popular. First, they gave a dinner for our famous jazz king, Paul Whiteman, and this time it's for his second best, Paul Specht.

I suppose that many of you farmers in the vicinity of New York City have missed the noon market reports from WJZ. Well, don't let this bother you for if you will only tune a little higher you can get them from WEAJ.

Phil Lunberg and his orchestra came through in fine shape from station WJAX of Cleveland, Ohio.

Another ivory tickler that made a hit with me is Mr. Brow.

WFI "verniered" its way through with a 75 per cent. orchestra.

WBS, your phonographic programmes may be all right, but the modulation of your station makes them sound worse than terrible.

"We have been assigned the call letters KDYR," writes the Pasadena, Cal., *Star-News*, but as Rube Goldberg says, "It doesn't mean anything," for "Yes! They have no transmitter" as yet.

It sure was some treat to have our old friend Betsey Ayres with us again. Yes, and as good as ever.

Congratulations, WDT, your modulation has improved.

If between six and seven P. M. you should hear a station offering a programme of orchestra selections interrupted occasionally by the giving of baseball scores, then you may be safely assured that this is station WFI, Strawbridge & Clothier, Philadelphia, Pa.

Paul Specht and his orchestra from station WMAF, "Way Down East" or "The Land of the Pilgrim Fathers," helped us to spend a pleasant hour.

The B. C. L.'s in the vicinity of New York City have long been crying for a Silent Night. This could be easily obtained if WHN would agree not to have a late programme on an evening when WDT was silent. Don't you think, WHN, that you are on the air long enough each day, and could afford to set aside a night for the dx fan? Think it over.

May Singy Bren sure can "Say It With a Banjo."

Edwin Franko Goldman nighted us for the last time other night. We sure will miss you, Frank, but let's hope that you will soon be with us again in the near future. So long!

WAAM, although a small powered station and on a low wave length, still makes itself conspicuous by offering popular programmes through a station that can rank with the best. That's the stuff. You sure do set a fine example for your complaining brothers.



Grewol
THE PERMANENT DETECTOR

FIXED ADJUSTMENT

The Grewol is adjusted on the most sensitive spot on the crystal and fixed—proof against vibration and jar. Protected from dust and moisture by glass enclosure. Grewol adds to the efficiency of reception.

Packed in individual carton with instructions. **\$2.00**

Write for Booklet

Randel Wireless Company
5 Central Ave. Newark, N. J.

THE TRINITY LOUD SPEAKER



TYPE "A1"
21" FIBER HORN
\$25.00



TYPE "B"
(For Phonographs)
\$12.50

INTERIOR CONSTRUCTION

An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

Send for Literature.

TRINITY RADIO CORPORATION
446 TREMONT STREET, BOSTON, MASS.

All Broadcasters Urged to Join the National Association

EDITOR, RADIO WORLD: We have this day received what we believe to have been intended as a most threatening letter from the American Society of Composers, Authors, and Publishers, signed by Mr. J. C. Rosenthal. It particularly interests us to note how they refer to us broadcasters and the radio audience as "beggars who cannot be choosers." We believe that they have endeavored to say, in most adroit language, "We have the legal decision against you broadcasters (Federal Judge Lynch's decision in favor of Witmark Publishing Company against Broadcaster Bamberger). Now you *must* pay us, even though you do popularize our music." Frankly, they are right so long as we, the broadcasters, remain an unorganized entity.

Unquestionably the present copyright law favors this society, who, I am advised, were instrumental in having the law enacted. The society is a highly organized association with plenty of funds to employ and maintain their highly paid, highly skilled attorneys throughout the United States and unquestionably there will be a multiplicity of suits started within the next few weeks against many of the broadcasting stations throughout the country. Just so long as the present copyright law exists, we believe they can win against any broadcaster using their music.

They state in this communication that they will license the broadcasters to popularize their songs at tributes ranging from \$200 to \$5,000 per annum. Their fee for the first year will probably be small, or they may offer licenses to some of us free to get us to recognize their so-called rights, but the tribute will unquestionably be increased from year to year after once we have recognized them. This is not all. The next step will be the musicians' unions, then the payment of artists, and then the end of broadcasting.

Is it not high time that all the broadcasting stations got together by joining the National Association of Broadcasters, for protection if nothing else? If we remain unorganized, it is only a question of time when most of us will be forced to pay tribute to this and other societies. We have in prohibition an excellent example of the power of an organized minority against an unorganized majority. Do we want a repetition of this in broadcasting?

Station WJAZ is a member of the National Association of Broadcasters, which has its executive offices at 1265 Broadway, New York City, and unqualifiedly endorses it. We are receiving from the association their weekly release of new songs, on which we have not only the temporary, but the permanent rights to broadcast, even after we have popularized each new selection. Our orchestra leader, Mr. Dan Russo, of the Oriole Terrace Orchestra at the Edgewater Beach Hotel, is not only playing our new releases received from the Broadcasters' Association for broadcasting purposes, but is using them as his dance numbers, because they are so excellent. The Chicago Daily News, who broadcast from the La Salle Hotel and who are also members of the National Association of Broadcasters, tell us that their orchestra leader, Mr. Scheetz, is doing the same.

Our station broadcasts *only* the music supplied by the National Association and other copyrighted music, on which the copyright has expired, and we, with pride, say that our programs speak for themselves.

We must also be highly organized, so that we may have a voice in opposing the passage of many bills proposing radical radio legislation, which bills are now in the files in Washington.

We are sending this letter out unsolicited, but we trust its message will bear fruit. It behooves every one of us broadcasters

to get behind this National Association, join it, use their music, and thereby make *radio* music the most popular in the country and save ourselves from being forced to pay tribute to a society that has *no interest in us other than to collect fees.*

Cordially and sincerely yours,
ZENITH-EDGEWATER BEACH
HOTEL BROADCASTING
STATION WJAZ,

By E. F. McDonald, Jr.

Chicago, Ill.,
332 South Michigan Ave.

Radio World is \$6.00 (52 issues), \$3.00 six months, \$1.50 three months, 15c. single copy. Radio World, 1493 Broadway, New York City.

REINARTZ CIRCUIT

GREEN SILK SPIDER-WEB COILS
NO COMPOUND USED

TYPE C\$1.50

NOLTE MFG. CO.

61 GAUTIER AVE. JERSEY CITY, N. J.
LIBERAL DISCOUNTS TO DEALERS



**Pruden Reliable
Radio Specialties
for Good Results**

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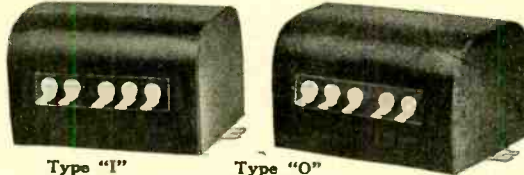
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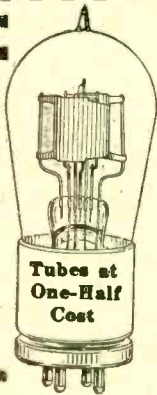
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If that is what you are after, and have not yet succeeded
in finding it, send 15c for RADIO WORLD of Feb. 17,
and see hook-up by G. W. May on page 11. RADIO
WORLD, 1493 Broadway, New York City.

Velma Carson Visits a Broadcasting Station

VELMA CARSON, who has contributed several articles to RADIO WORLD, recounts in *Farm and Fireside* for September her experiences while visiting a radio broadcasting station for the first time. Miss Carson's story, in part, follows:

Six months after first marveling on our farm at the powers of the radio, chance brought me across the country from whence the voices had come, to its home in East Pittsburgh. I would hunt up KDKA, I promised myself, and see what supernatural agencies were at work.

Arriving at the plant of the Westinghouse Electric and Manufacturing Company in East Pittsburgh one evening, I found myself at a door marked KDKA, near the main entrance of the plant. Maybe we had heard something real after all. I began to be sorry for my doubting. Or else they were going a long way to carry out the delusion.

I entered an office where a dozen or more persons were sitting about chatting and visiting. Violin cases, music rolls, and manuscripts were lying about in a convincing manner. Visitors were taking turns at a radio receiving set on the desk. A pleasant young man walked about playing host. Another tapped furiously on a telegraph instrument. A breath of excitement was in the air. A company taxicab stopped outside, and a couple rushed in breathlessly. It was twenty-five minutes after seven, and the world sat waiting. We all looked expectantly toward a door marked "Studio"—"SILENCE." Then it opened, and we all filed soberly into a muffled room. We were quiet, partly because the strained stillness of the room affected us into further silence, and partly because most of us who were there for the first time felt we were in the presence of some great unseen, awesome force. The studio is about 20x30 feet, completely lined and draped with cloth and burlap and without windows, so that there will be no echoes and no penetration of sound from the outside.

The draperies are a warm gray. Palms, rose and gold floor lamps, a grand piano, a thick gray velvet carpet, and gay tapestries and cushions make it a very lovely room. One likes to think that the Little Symphony Orchestra plays on a well-set stage. When I go home to the farm again and listen to KDKA I shall always see in the concert a happy group of people in the lamp's rose glow, gathered to give me their best talent.

It seemed to me, as I sat there waiting, that I was about to witness a startling phenomena. I expected at least thunder and lightning to accompany the sending of the concert. I once visited a wireless station where the messages start off with a convincing popping. This would surely be greater!

It is now twenty-nine minutes after seven. The announcer is frantically asking everyone how to pronounce Macheroni, the name of a composer someone is to interpret. He gets a dozen different versions, then makes a run for the dictionary. The announcer takes great pains to see that every word is pronounced with absolute correctness.

At one end of the studio, in a glass box projecting from the wall, flash the words "Set On." This means that the radio is ready any time the speakers are. Two men come in and work with the sending apparatus. One speaks into the microphone, and the other asks over a telephone if everything is in working order.

The microphone looks like a tin can swinging on the end of a fishing pole stuck in the ground at right angles. The "pole" is a mahogany bar of wood. The "can" is neat and black. But one gets the willow-pole-tomato-can idea just the same.

The clock points to seven-thirty. A button is pushed and simultaneously the signal box flashes in large letters "SILENCE" and "On the Air." The announcer steps up

to the microphone and says with emphatic articulation, "You are listening to KDKA, East Pittsburgh, Pennsylvania. The first number on the program will be Schubert's Serenade, played by Mr. Tom Jones." We hear the opening chords by Mr. Jones. That is all there is to see or hear. The program is on. Some family out in Michigan has put on the loud horn and settled down for the evening.

The tenor who is to follow the piano solo is nervous. He has a right to be. He is about to sing to 2,000,000 persons. He never in all his life before has had an audience of more than 800 people. And even though he is an excellent singer his audiences have seldom numbered more than 200 persons. He is a church singer, and has been used to appearing before his own acquaintances and friends, who overlook his mistakes, and who also, by the way, take his excellency for granted. Until now he could fall back upon a smile or a gesture to carry him through. But only the actual merit of his singing will please this vast audience.

The piano solo ended, the announcer signs off, and the signal says to "Stand By." The

radio couldn't hear us talk any more. "Don't be afraid. Just put your pep into it," the violinist encourages the tenor.

Until a few months ago she herself was as unknown to anyone outside her home city as is the rose in the desert. Now she gets familiar and favorable mention out in Higginsville, Illinois.

The violinist played with all her heart. She had received many personal letters from all over the United States since her radio debut, and when she tucked her violin under her chin it was to no abstract audience before which she was performing. She played to the bedfast woman who had written to her from Ohio; to the old, old man who had painfully scribbled a thank-you note from West Virginia; to a little crippled boy she had become acquainted with out in Wisconsin; to the men of the Michigan lumber camp who had sent her their appreciation; to the Arkansas farm family who had told her they would be listening in on this night; and to many others near and far. She played better for every letter that had come to her. She has the joy of giving to appreciative people.

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RADIO WORLD'S technical editor suggests using two INDORARIALS as a set, one as an antenna, the other (two or three feet below it) as a counterpoise in lieu of a ground—"this gave perfect reception."

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight 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 eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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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.

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Station WHN Interferes With Amateurs

Editor, RADIO WORLD:
 I hope that station WHN can be persuaded to sign off two or three nights a week at eleven o'clock in order to give "DX" stations a chance to be heard, as you know that a good many out-of-town stations are at 360 meters. It is impossible to hear anything around that wave length until WHN signs off. In the spirit of fairness I think that they should comply with this wish.

I have spoken to over 25 people in my neighborhood about this matter and they all agree with me fully. Trusting that something can be done regarding this,

Sincerely yours,
R. D. EMMERICH.
 322 West 100th St.,
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RADIO WORLD in England

Editor, RADIO WORLD:
 Congratulations on the production of such a wonderful periodical. I look forward to getting the latest copy each week with lots of joyous anticipation.

I am a real novice, just being bitten by the bug and am dying to get hold of a circuit suitable for our English broadcasting.

In my opinion we here are miles behind you in radio matters and so, therefore, why should I not have a real American circuit? Unfortunately we are only allowed to use a regenerative hook-up under certain conditions and at certain times. Lucky American fans!

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The Improved Basket Weave, Covering All Broadcasting Wavelengths

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Tuned Radio-Frequency at Its Best

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Have New Radio Device—Simple, Practical, Proven Worth—Cheaply Made—Large Selling Possibilities—Sell Outright or Royalty Basis.

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Radio Tubes Repaired

\$1.50 \$1.50 \$1.50

Send old tubes with \$1.50 and receive by return mail a guaranteed tube. Be sure and state in your letter type wanted; detectors or amplifiers.

New Tubes Cut Prices

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Guaranteed A tubes . . . \$2.00

RADIO TUBE EXCHANGE

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453 Washington St. Boston, Mass.

German Apparatus Installed in Norway

APPARATUS for the radio station which is to be built at Bergen, Norway, has been received in that country, according to advices to Washington from Consul George N. Ifft, and preliminary tests have assured the government of its efficiency. Because of the failure of an appropriation for duplex apparatus which would enable the transmission of messages both ways simultaneously, and the failure of the plan to establish a telephone line between Bergen and the Rundemanden radio station, the chief use of the new station will be for the transmission of wireless communications to ships at sea.

Actor Builds a Receiving Set

THE company playing "Merton of the Movies" at the Cort Theatre claims to be the only theatrical organization in New York City which has a radiophone receiving set that was assembled by one of the cast. The set was built by Howard Dale, who plays one of the extras in the film studio scenes. Dale was in both the United States Army and Navy during the war—being thereby rather an ambidextrous performer—and won a scholarship for wireless work offered by the Y. M. C. A.

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it by buying your "B" Batteries freshly tested and passed by our laboratories—sold direct to the consumer at the following low prices—guaranteed in every respect!

	Large	Medium	Small
22½ Volt plain	\$.125	\$1.00	\$0.70
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45 Volt plain	\$.250	\$1.75	—
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SPECIAL OFFER—We offer our customers a 0-50 standard Voltmeter listed at \$2.75 for \$3.87 with any order for batteries amounting to \$5.00 or over.

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COCKADAY COILS \$2.50 A SET

17-Plate Vernier Condenser \$3.25

PANELS—GRADE A RUBBER



7 x 10 65c	7 x 12 80c	7 x 14 90c
7 x 18 \$1.25	7 x 24 \$1.65	

Parts for Neutrodyne set

Complete line at special prices

23-Plate Vernier Condenser Special, \$3.25

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PATHE Moulded Variometers and Couplers. Guaranteed 600 M. \$2.25

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GENUINE WESTERN ELECTRIC VT 1, \$5.95 VT 2, \$8.00

CROWN TRANSFORMERS, \$2.95 Adapted for ALL TUBES, Ratio 5 to 1.



CONDENSERS U. S. L. VERNIER BAKELITE ENDS

17 PLATE	\$2.95
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SEND MONEY ORDER. INCLUDING POSTAGE—PROMPT AND CAREFUL ATTENTION

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U. S. L. 23-Plate Vernier Condenser	3.10
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Acme Audio Transformer	4.00
Acme Radio Transformer	4.00
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Baldwin Type C, Single Phones	4.50
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Many Other Bargains. Complete Stock. Write for Prices.

Send Money Order or Certified Check and include Postage.

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115 West 23rd Street New York

Wireless Will Control Future Wars

PROFESSOR A. M. LOW, scientist and inventor, whose work during the World War was highly valued by the British War Inventions Board, contributes a prophetic article to the Fortnightly Review on the sort of warfare that may be expected a hundred years hence. Among the things he expects to play a part in future warfare are:

Jets of water, charged with electricity, to kill horses and men.

Wireless telephony, sight, heat, power and writing.

Wireless control of tanks and airplanes. Battle plane engines developing wireless power to destroy aircraft within hundreds of yards.

Wireless heat to destroy European regions.

Giant transport airplanes with incredible speed.

Secret war plans ferreted out by wireless telephone and sight, the future war eyes and ears. Propaganda striking terror into every home by means of wireless receivers which will be more common than the telephone today.

FOUR REASONS FOR ADVERTISING IN RADIO WORLD'S FALL BUYERS' NUMBER

1 At four dollars an inch (yearly contractrate) 74,000 radio-buying readers learn of your goods—a greater number of eyes than four dollars can reach in any other radio advertising medium.

2 Radio World gives **quicker results**—i. e., advertising copy received by Thursday p. m. is published and on the news-stands the following Wednesday morning.

3 A Weekly has greater **reader interest**—the Saturday Evening Post, Literary Digest, Iron Age, are Weeklies. Radio World, the big success of radio, is published every week.

4 Advertising is a gamble. Life itself is. A gambler bets his money on past performances. Radio Corporation of America tried out **Radio World**, then gave us a yearly contract. Magnavox tried us for small space thirteen times, and have just renewed for fifty-two times, using pages. The Federal Telephone & Telegraph Company investigated us from every angle for weeks, then gave us a fifty-two consecutive issue order. A four-time trial of Radio World almost invariably ends with a fifty-two time contract at \$120 per page net or \$4.00 an inch.

DATE OF THIS IMPORTANT ISSUE—OCTOBER 6

(LAST BLACK FORM CLOSSES SEPTEMBER 27)

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Write, wire or phone now for special positions

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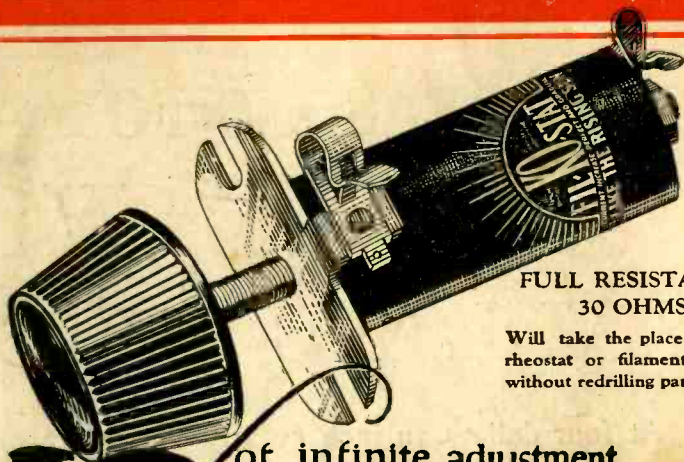
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Special Editorial and Pictorial Features will make this FALL BUYERS' NUMBER of extraordinary interest and value from the reader's standpoint.



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Recommended and sold by dealers in high quality radio supplies.



FULL RESISTANCE
30 OHMS

Will take the place of other rheostat or filament control without redrilling panel.

The filament kontrol of infinite adjustment

FIL-KO-STAT

enables you to hear stations you have never heard before and gives absolutely noiseless operation

Missing What You Get

Your set is probably bringing in D X stations you never heard because your rheostat cannot control your filament action. The Filkostat gives infinite adjustment and enables you to magnify the weak stations and bring them in strong and clear.

Paul H. Woodruff, Editor Industrial Power, Chicago, writes that after installing the Filkostat he picked up KHJ and KWH, 2000 miles on a single tube regenerative detector.

Eighteen Times More

Laboratory research proves FIL-KO-STAT to have a fine adjustment area (i.e. ability to control filament heat and electronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

FIL-KO-STAT cylindrical design is the outcome of extensive experimentation. It gives the resistance element sufficient radiating surface to eliminate excessive heating. This is one of the outstanding FIL-KO-STAT features.

Adjusted For All Tubes

You have no screws to tamper with on the Filkostat. No adjustments to puzzle you. Experts have taken care of this for you. The Filkostat is not just fabricated. It is a laboratory product triple tested before being sent out and scientifically adjusted to the ideal "off" position for **UV200, 201, 201A, WD11, WD12, UV199, DV6A, W. E. Peanut, and all other tubes.**

No Wires—No Discs

The makers of the FIL-KO-STAT express their confidence with an unconditional guarantee. Filkostat is assembled by precision craftsmen. It contains a resistance element so finely divided that further resistance is impossible. There is nothing to break or chip. When you buy a FIL-KO-STAT you know that you are not only getting the finest filament control made but that, its reliability and durability are fully and completely—

GUARANTEED BY THE MAKER



Professional Testimony

The RADIO GUILD writes "comparisons with every reliable filament and current controlling device now available proved Filkostat far superior to all other types of filament controls giving the closest possible adjustment of any type of filament tube and the only instrument which could be used for all tubes giving equal critical adjustment at the high resistance as at the low resistance."

Amateur Enthusiasm

Out of hundreds of testimonials, we quote:

W. R. Hagedorn, Hay Springs, Neb. — "tried 4 different Rheostats. Filkostat beats them all."

W. R. Williams, Woodsfield, Ohio "Filkostat on a single circuit regenerative giving excellent satisfaction. The noiseless operation means a great deal."

S. George Kerngood, President of Bluebird Hats, New York "only since using it I realized how wonderful a set can be made."

Dealers' Delight

Dealers everywhere are delighted with Filkostat. Its noiseless operation has increased the joy of Radio and the "fans" are recommending it. Here's one of many interesting dealer letters.

E. M. Pace, Vicksburg, Miss. writes — "Send carton of Filkostat as early as possible. Sold sample Filkostat 5 minutes after it was received. It is proclaimed by the fan that bought it as being 100% better than the best."

A Booklet You Will Want

By Walter C. Garvey, of Evening World's Radio Section, Editorial Staff, Handbook of Helpful Hints for Radio Set Builders, includes tables charts, legends, statistics and 16 carefully selected hookups with diagrams and full descriptions. Reading this interesting book we discovered Mr. Garvey recommended the FIL-KO-STAT. We bought an edition of the books and will gladly send a copy anywhere at handling cost 10c. postpaid.

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