

# RADIO WORLD

Reg. U. S. Pat. Off.

America's First and Only National Radio Weekly

Vol. 9 No. 23

Illustrated

A 36" Cone Speaker

Rider Neutralizing Plan

Tuning the Browning-Drake

Art's Great Inventions



*~New Maternal Alertness~*

*This mother, lounging at home, amplifier and speaker at her side, can hear her baby's cry in a far-off room because a microphone is at the crib. (Herbert Photo's Inc)*

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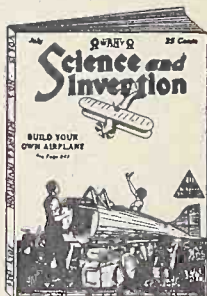
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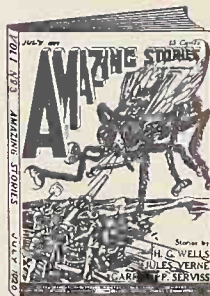
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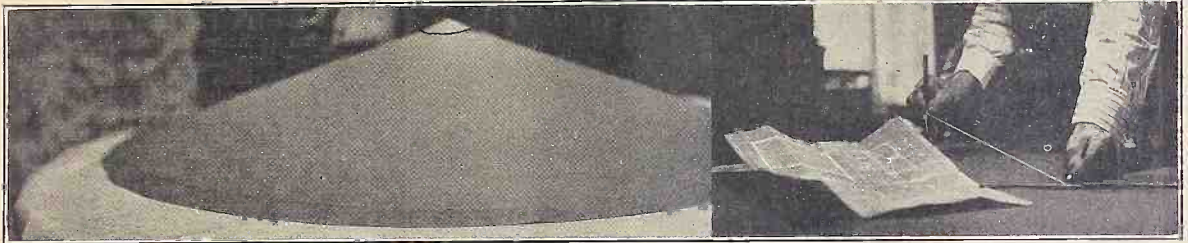
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## Rolls His Own 36" Cone



FIGS. 1 AND 2

The cone itself, independent of unit, is shown at left, after the pasting process has been completed. The glue is allowed to dry thoroughly. At right is the previous process, the description of the 19" outer circle. The cord must be kept taut.

### Author Gets Bass Notes Very Satisfactorily from Reproducer That Has Unit With Ample Driving Power.

By James H. Carroll

(Photographs by the Author)

THE orchestra, the player or the speaker in the room with full volume and perfect reproduction is the goal now sought by the radio researcher. Probably no radically new circuit will be developed this Fall, so that most efforts are being bent toward refinements of existing circuits, development of power amplification and the reproducing means, namely, the loud speaker. And this season really sees the passing of the horn—the cone has come into its own.

In order to get the most out of a cone we need power and this leads us to the power amplifier as the newest and most perfect development in the form of a separate audio amplifier coupled with B power supply, all in one unit ready to plug in on the power line. The input plugs in on the detector stage of the receiver and may be used in many ways. The set may be installed in the den with the power unit in the cellar while the auditors sit in the parlor listening to the program exactly as it sounds at the transmitting end, whether that be stage, auditorium or studio. Another speaker may be mounted in the dining room for the dinner music so that your guests may enjoy music while dining and then adjourn to the parlor for an evening's enjoyment of concert, opera, lecture and vaudeville.

#### Uses 36" Cone

This brings us to the consideration of the best type of speaker to be used for this ultimate in reception and all signs indicate that the 36" cone will be a favorite among advanced fans who have realized that the coming set will be merely a detector unit with the power pack plugged in. Many leading experi-

menters are working on TRF and other circuits along this line.

Working along my own lines and finishing up my own idea of a power amplifier to use with my Victoreen, I entered into experimentation on the three-foot cone. There will be several of this type on the market this Fall, and good ones, too, at a list price of about \$35 to \$85. After long research and experiment I found I could make an excellent 36" cone with little trouble. Taking one's time and using due care in every operation pays well in this work.

The driving unit must be scientifically constructed of the best materials to be capable of fully actuating this large surface. Cheap units will not give satisfaction. The paper must be the best

### Works Fine From Good Audio Channel and Is Highly Suitable for Connection to Power Amplifier.

procurable. Faced Alhambra was what I used. This is parchment of the finest quality, used by the manufacturers of quality cones. Failure to use the best will result in a mighty poor product.

Some excellent kits are procurable for making such a speaker as mine. I used the kit put out by Engineer's Service Company, which includes blueprint so novices will meet no mysteries.

All you need now is a small bottle of liquid glue, a large flat surface and a little patience. The sheet of Alhambra paper is 38" square and comes carefully rolled up in a long box. Open it out, roll it in reverse, being careful to avoid creasing, then smooth it out on a table. Now we are ready to proceed.

#### The Procedure

It is advisable first to study the blueprint thoroughly and we are now ready to go ahead. You may thumbtack the paper to your table, although we did not find it necessary to do so. First we make a 19" circle, using a pencil and string as shown in the illustration. Then we make an 18 3/4" circle, which allows us a margin of 5/8" which is afterwards folded out toward the apex of the completed cone. Next we score our inner circle with a blunt point, being careful not to cut through our paper. Now we proceed to draw a smaller 3" circle for which there is room up in one corner of our paper. This is for fastening our metal washer and screw on the apex of the cone.

Now, on the bottom of our 19" circle we measure off 6 1/4". From the right of this space to the center of the circle we rule a heavy line. On the top of this from the center of the circle to the left end of our 6 1/4" we rule a dotted line. And 3/8" in from this we rule a heavy line. This is for pasting our flap. Now we proceed and cut out our two circles, the large and small, being sure to cut outside

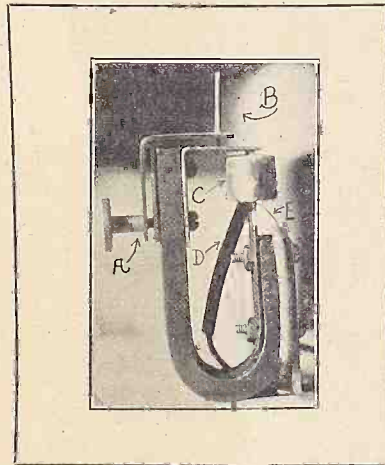


FIG. 3

The unit that is used must have sufficient driving power. "A" represents the adjustment screw, for establishing the correct air gap. Once properly set, this adjustment need not be varied, unless battery voltages are changed. "B" is the driver or pin that is inserted on the cone center and secured with thumb-nut. "C" is the speaker windings or bobbin, while "D" and "E" are the leads of the speaker cords.

# Where to Place a Speaker

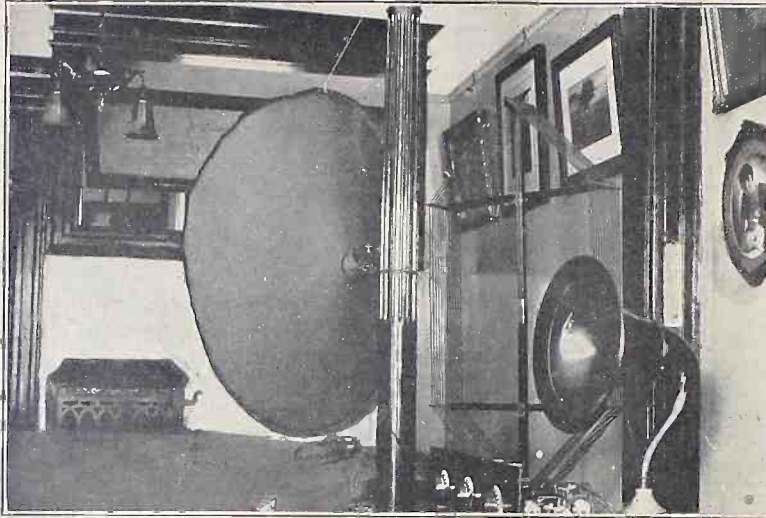


FIG. 4

The 36" cone in action. The unit happens to be tied to the pillar for security, but the support is furnished by the cord at top.

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We now leave the cone to dry, as shown, while we paste our little cone which is a simpler operation. When both are thoroughly dry we take our metal washer, applying glue on the under side, placing it firmly on the apex of our cone and securing it tightly by glueing our small cone over it, making sure that the little set screw is free. The creased outer edge is now folded back toward the apex of the cone and we insert the driving rod of the unit into the metal washer securely fastening it by tightening the screw. Our cone is now ready for operation and the result is a revelation in tone quality.

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## Needs Good Audio

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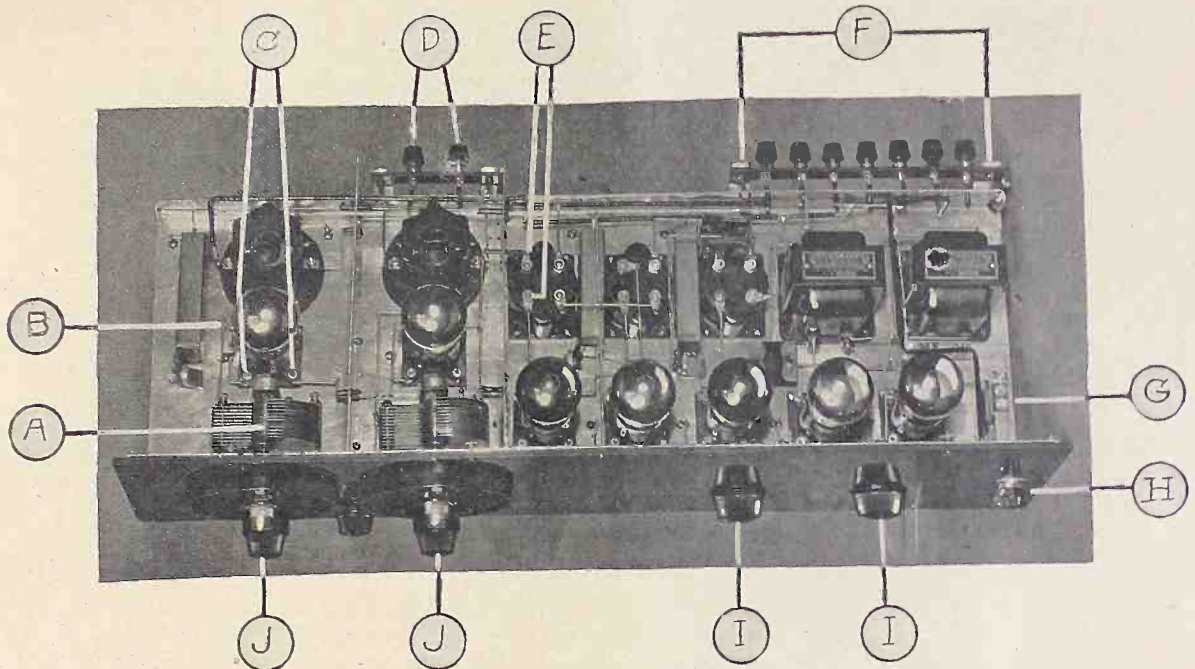
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# Trouble Cures For Sets



(Photo by Garbor Eder, 630 Fifth Avenue, N. Y. City)

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## Problems Considered From the Service Man's View-point, But Presentation of Them Is Equally Useful to Fans Who Build or Repair Their Own Sets

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In this paper we will endeavor to group service problems under general classifications, prescribe methods of diagnosing them followed by a prescription for correcting them.

We believe that general methods may be applied in spite of the fact that there are so many different types of sets on the market, each one claiming individual distinction all its own. All radio sets, no

matter what type, which fail to give satisfaction do so for a number of reasons that are fundamental.

### The Four Circuits

In general, there are four basic pick-up circuits in use today: the so-called regenerative detector, the untuned radio frequency, the tuned radio frequency and the Super-Heterodyne. Any set on the market may be classified as using one of the foregoing types or possibly a combination of one or more. There are two additional types of pick-up circuits which have fallen more or less into oblivion and will not be found in general use in the broadcast receivers of today. They are the crystal detector and the straight audion detector which employs no form of regeneration whatsoever.

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### Troubles Classified

In much the same way that receivers may be grouped under circuit classifications, their failure to operate may be grouped under certain general classes, namely:

- Lack of operating experience on the part of the user.
- Location.
- Defective accessories.
- Open circuit.
- Short circuit.
- High resistance connection.

Lack of operating experience may be the result of not following out instructions carefully enough, or, as is sometimes the case, the instructions are not complete enough and are not entirely clear to the novice. It may be the result of insufficient instruction on the part of the service man who made the installation. Then, too, it may be the result of impatience on the part of the customer. It is a peculiar condition, but a fact nevertheless, that the first night a customer has a set, he feels that he should be able

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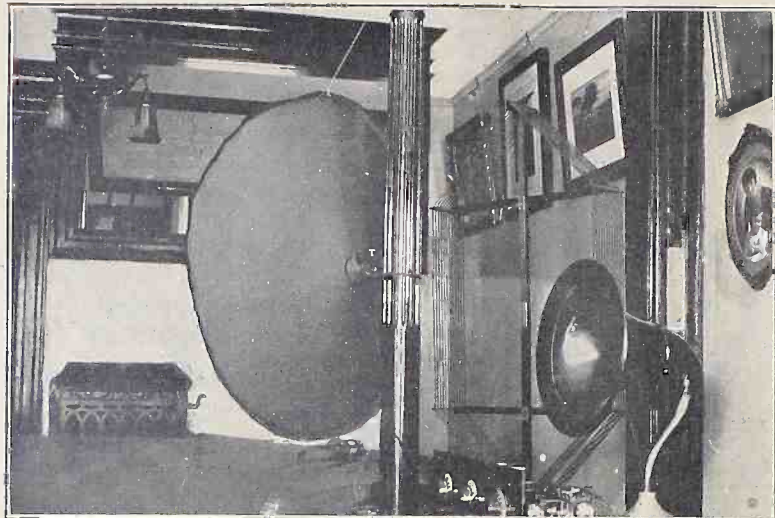


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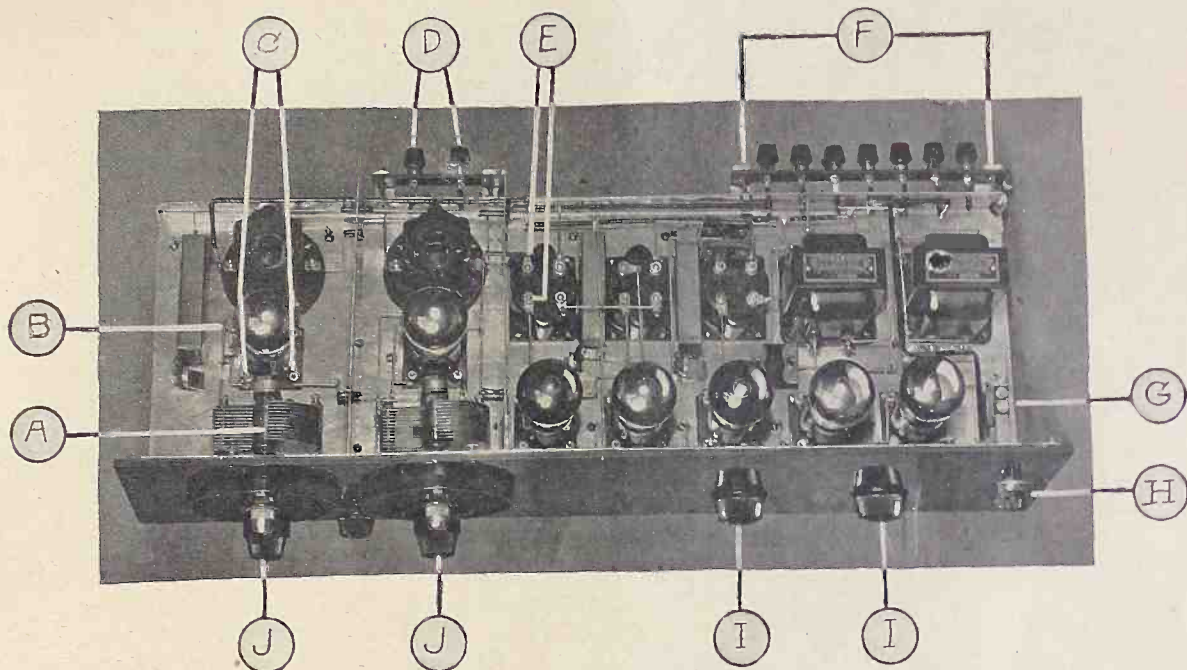
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# A Radio Doctor's Manual

to get Chicago and points west from New York City. The responsibility for this condition rests with either the salesman who sold the set or the service man who failed to correct this fallacy in the customer's mind, or with the manufacturer of the set for over-advertising his product, and being a little too optimistic as to the possibilities of reception.

A manufacturer who in New York City receives the Pacific Coast stations on his product is not justified in making a general statement that this can be repeated at will, giving the impression to the reader of the advertisement that that particular receiver will perform likewise in every other locality. That is incomplete advertising and should be discouraged as it has a detrimental effect on the industry as a whole, and results in unnecessary service costs.

## The Dead Area

Under the caption of location many factors must be considered. The type of building in which the installation is made, the proximity to steel buildings, power lines, trolley and railway lines, and the geological and topographical conditions surrounding the installation are all important factors. Certain areas appear to be "dead" to certain stations, while at the same time particularly good for others. We believe that this is due not to the area being "dead," but to a distortion of the wave front from the transmitting station, causing it to be deflected in such a manner as to render reception of signals from that station very difficult or impossible in that particular location.

Under defective accessories we may include defective tubes, batteries, loud speakers, antenna and ground installations, also improper battery connections. Many sets fail or are returned to the dealer as unsatisfactory because of poor antenna and ground installations. Many a set of good quality and capable of delivering satisfactory results fails because the loud speaker that is used with it does not have the proper electrical characteristics to operate satisfactorily in conjunction with the receiver. Tubes will also cause trouble as they are subject to certain defects incidental to fragility.

## Open Circuit Points

Open circuits are generally found in the movable connections of the set such as a condenser pigtail, loop leads loud speaker leads, and any other connection that is subject to movement or vibration in the normal operation of the set. Open circuits may also result from burned-out transformers or from mechanical failures in telephone jacks, rheostats, and switches.

If a set has been once tested and found to be O. K., short circuits rarely occur. When they do it is the result of a mechanical failure of the moving parts or of tinkering with the mechanism of the set. It will sometimes happen that the pigtail of a moving element of the receiver will break and fall in such a way as to cause a short circuit of that element. This is particularly true of the pigtails of variable condensers.

The principal cause of short circuits that occur in the normal operation of a set is in the tubes. If the filament of the tube should break there is a possibility of its falling in such a way as to cause a short circuit between itself and the plate and grid elements of the tube. When such a fracture of the filament occurs the voltage of the B or C battery, as the case may be, is short circuited through the conductors involved. This type of short



(Herbert Photos, Inc.)

**"IN loudspeakers of the adjustable type, adjustment of the air gap will sometimes eliminate howling." Arrow points to the adjustment post.**

circuit is generally of very brief duration as the filament will generally burn out as soon as the short circuit occurs. A contact between the grid and plate element of a tube is a more serious type of short circuit, resulting in the rapid deterioration of the B and C batteries and may possibly cause a burn-out of the transformer windings in the circuits involved.

## High Resistance Trouble

The foregoing troubles are relatively easy to check up as they are immediately apparent or can easily be located by a continuity of circuit test.

The most difficult type of failure to locate is that caused by a high-resistance connection. It is not only difficult to locate, but it is difficult to determine. This condition will cause the set to operate indifferently with rather unsatisfactory results. This condition is sometimes mistaken as location trouble. A high resistance is possible at any connection in the receiver. Soldered connections that are soldered with a corrosive flux that has not been properly treated after the soldering operation are probably the worst offenders. Weak mechanical springs in telephone jacks and switches may also introduce high resistance connections.

Radio sets, like individuals, are very much the same the world over. They fail or succeed according to a few fundamental laws. They are subject, as it were, to the same ills. The doctor can diagnose the trouble in a man's system whether he be well dressed or poorly dressed, whether his name be Smith or Jones, because he knows the fundamental laws governing the human system and is not confused by size or shape or a difference in physical dimensions.

One doesn't have to be a radio engineer or a radio expert to be able to service a radio set, but one does need experience to become adept, and some knowledge of the fundamentals is valuable. One must be, of course, familiar with the various parts that are commonly used in radio receivers such as rheostats, jacks, etc., and must know, in a general way, the function of each.

## Like a Doctor's Work

Given a first-aid manual, the man in the street with an ordinary amount of

common sense and an ability to read, might go out and administer first-aid treatment and, if he followed the directions properly, might effect a recovery. A doctor could do no differently. His experience would permit him to handle the case more skilfully and his intimate knowledge of the workings of the human system would permit him to diagnose the case more quickly from the apparent symptoms, but the man with the first-aid manual would produce the same results in a little longer time and yet he knows nothing of the medical science.

For instance, what does a doctor do when he is called in to treat a sick person? The first thing he generally does is to feel the pulse and while doing that he starts a series of questions as to the length of time the person has been ill, where the pains are, etc., and he may even go as far as to inquire into the family history. Let that be the practice of the radio service man.

Do not immediately get out the tool bag and start pulling the set apart, but try to find out what the difficulty is by questioning the customer.

What would one think of a doctor if at the first sight of every patient, he started to operate, and yet you will see a service man start in immediately to pull the set out of the cabinet and look for trouble, and the trouble may be in a battery connection.

What we will attempt in this paper is to outline a first-aid manual for the treatment of "sick" radio sets; that will enable the man who is not a radio engineer and who has only a slight knowledge of the art, to recognize trouble and make the necessary repairs. We have avoided, therefore, all theoretical considerations so far as possible and will treat the subject from a practical viewpoint and refer only to theoretical discussions when absolutely necessary. We have prepared a list of complaints that are most frequently heard, and we will analyze each complaint as to the possible reason for it.

## Tip to the Dealer

Let us start with a suggestion to the dealer or, for that matter, to anyone who sells a radio receiver. Test all sets before sale. This takes but a very few minutes and will surely pay well in avoiding dissatisfaction as well as time that is some times necessary to service a defective set that has been shipped to a customer. A radio receiver that is working properly today does not as a rule go bad tomorrow, and if such an installation does fail, the dealer may feel that the trouble is due to a defective accessory rather than the set itself. When the service man is called on to service such a set he has the confidence that the set is O. K. and he will immediately be able to concentrate on the real probability of failure rather than imaginary ones.

Then, too, if the dealer would acquaint the customer with the limitations of radio reception, what to expect and what not to expect, service problems would be minimized. Acquaint the customer as to the probable length of time his batteries will last. This is quite important, and if followed out, will avoid some very disagreeable service jobs.

For example, when a man purchases a radio set he becomes quite enthusiastic and will read all available literature on the subject, and at the end of a month he has absorbed just enough information that may prove dangerous. About this time the signals on his set will start to decrease and he will remember having read somewhere that this might be caused



# How to Remedy Distortion

by a defective transformer, and he immediately gets out the tools to make the repair, and then the dealer has a regular service job on his hands. Had the dealer in the first place acquainted the customer with the facts concerning the life of the batteries, the customer would be more than likely to recall such information and take the proper steps to renew them.

## The Service Kit

The question has been asked at times, "What should the service man's equipment consist of?"

He should carry the necessary tools and apparatus to be able to run a complete test on the set to be serviced and be able to make any minor repair necessary. We would suggest the following items:

- Set of tested tubes.
- Multi-scale voltmeter of good quality.
- Pair of head phones.
- Large and small screwdrivers.
- Small soldering iron.
- Solder and non-corrosive flux.
- Spare wire and tape.
- Test-leads with clips.
- Pipe cleaners.
- Large piece of cloth.
- Set of B and C batteries (small).

When a service man goes into a customer's home he is usually going there as a representative of a commercial establishment. He should be instructed to be courteous and considerate. If he must take a set out of the cabinet for adjustment he should use the piece of cloth provided in his kit to protect the surface of the table he works on. He should answer all questions asked him no matter how absurd they may appear to him.

The customer generally has one question that he would like to have answered, and in his mind the service man must be an expert, in order to be able to do such work, and so he unburdens his mind. The service man should respect this attitude on the part of the customer and should do his best to point out the fallacies tactfully and set the customer right in his ideas about radio. The service man should make the customer enjoy his visit and if this is done the service man becomes a valuable asset to a business and is a potential salesman.

The service man, before he starts to make any adjustments other than turning on the set and trying the various controls, should question the customer as to how it happened, the time, place, and conditions surrounding the failure. Such questions as the following:

How long has the set been in operation?

Was the set operating satisfactorily up to the time of failure?

Were you tuning the set when the failure occurred?

If so, what control were you moving? Did you make any change in the connection of the batteries, if so, what were they?

Did it suddenly stop operating? Was there any squeal or howling sound just prior to failure?

Were you moving the loop? Did the loud speaker fall? Is the antenna OK?

In short, have the customer re-enact the conditions at the time of failure. Get all the symptoms and an astonishing amount of time may be saved in running down the difficulty.

## Customer Can Help

If sufficient questions are asked, the customer will generally give you the real



**LISTENING** carefully to the detector output, quietly running a speaker, as compared with no reception from final audio output, locates one's trouble in the audio amplifier.

cause of trouble or he will suggest something to you in the course of inquiry that will point out just what the cause of failure was. Sets as a rule do not go bad of themselves. The failure usually occurs while some operation is taking place, such as plugging in the loud speaker, turning the condensers or making a change in the battery connections.

The length of time that a set has been in operation will be an indication of various types of trouble. A set that has recently been installed is subject to a certain type of failure, while a set that has been in operation for a year or more, is subject to other types of failure.

If a set has been installed for a period of two weeks or less, outside of the inability of the customer to procure the desired results, there are only a few reasons why the set should fail. They are:

- A defective tube.
- Defective battery or battery connection.
- Loud speaker connection loose in telephone plug.
- Burn-out of transformer.

Of course, there may be other reasons, but these are the most common and are given in the order of their probability of occurrence.

If the set has been in operation for a month or six weeks and has been giving satisfactory service for that period, the cause of failure is generally due to the weakening of the batteries.

If the set has been in operation for a period of six months or a year, the possibilities of trouble will increase. If the failure in this type of installation has been gradual, the first thought would be that the tubes were becoming deactivated through continual use.

## The Sudden Breakdown

If the breakdown was sudden, a mechanical failure might be expected in one of the movable connections or pigtailed. A burned-out transformer could be expected in difficulties of this sort. If the trouble is due to a noise conditions, the failure

might be ascribed to dust or dirt accumulations on the condenser plates or other important parts of the receiver. The defect might also be due to a soldered connection. It will require, as a rule, a rather long period of time for a soldered connection to corrode to such a degree as to cause this conditions. The local atmospheric conditions under which the set has been operating may have some bearing on the cause of failure. If the set has been operating near the seashore and has been subjected to the action of salt atmosphere it may have caused sufficient corrosion of the connections or other metallic parts to introduce high resistance or leakage path. Moisture may saturate the cheaper grades of insulating material to such an extent as to cause high-frequency short circuits.

If a set has been operating for a long period of time and has given satisfactory results and then develops noises and scratching sounds, one should not look for a loose connection in the wiring of the set, but rather look for an open circuit in the moving parts. Worn mechanical parts are often mistaken for loose connections in the wiring. The wiring is absolutely stationary and it is not at all likely that it will be disturbed in the ordinary use of the set so as to cause a failure due to a loose connection.

Vernier drive shafts and vernier plates will wear loose and while apparently they are making perfect contact to the metal surfaces of the condenser when the set is brought into a critical condition, as is the case when receiving distant stations, will cause noises that might be thought due to a loose connection in the wiring.

## "Set Just Stopped"

Another item to be considered in the servicing of radio sets is the cost of the original apparatus. Radio, like any other merchandise, is a matter of price. As a rule, the more you pay for a set, the better should be the quality of the equipment you get and you may reasonably expect longer and more satisfactory service from it. In a high-grade receiver the mechanical failures are less frequent than in the cheaper grades of sets. The same is true of electrical failures. The cheaper grades of sets are much more subject to climatic conditions than are the better grades.

We have compiled a series of complaints in such terms as they are received by the dealer, and we will take each up in turn as to what it suggests as the possible cause of failure.

"The set just stopped operating. It was giving excellent results, but it suddenly stopped." This complaint is quite unsatisfactory from a service man's point of view. It does not suggest anything definite and it may be the result of many factors. Trouble generally occurs when some operation is taking place, whether it be tuning or making adjustments or plugging in the loud speaker, or revolving the loop. The service man should inquire just how the failure took place, just what the customer was doing when the set failed.

If the failure occurred when some adjustment was being made, he should look for a broken connection or a mechanical breakdown in the control being used at the time. There are several causes of a set failing completely and suddenly, namely, a burned-out tube, a burned-out transformer, a broken connection, or a short circuit. A broken loop connection will also cause complete failure as well as a burned-out loud speaker. Of course, there are many reasons why a set may fail to function, but the list just given

# Rules For Gaining Volume

represents the principal causes for a complete and sudden failure.

A burned-out tube will be immediately obvious and should be replaced. A broken battery connection or pigtail may be located by inspection and necessary repairs made. A defective loud speaker may be determined by replacing the loud speaker with a pair of head phones and noting whether the head phones operate satisfactorily.

## Listen For the Click

In making all checks on defective sets, the first thing that the service man should do is to light the tubes to their proper brilliancy and then plug the loud speaker in and out of the jack. If the B battery is properly supplying the tubes in the amplifying circuit, a loud click will be heard in the loud speaker. If there is a jack provided on the detector tube, repeat this, using the head phones. In other words, see that there is a B battery voltage at the plate contact of each tube.

In the radio frequency tubes, if used, measure the voltage across the tube contact springs in the socket. This may be accomplished by removing the tubes from the sockets and making direct contact with the springs. There is another possibility of failure in sets that employ a large by-pass condenser which is connected across the B battery supply. In event of this condenser becoming short-circuited, it will cause the B batteries to drop in voltage very rapidly and if the short-circuit is complete enough, the batteries will heat up. This can be very quickly determined by breaking the connection through the negative B battery.

If a heavy spark occurs, it is an indication that there is a short circuit in the B battery supply which may be due to this condenser.

In testing this condenser should, by chance, the tubes be lit when the B battery connection is broken, a small spark will be present. The small spark is due to the normal drain on the B batteries and represents the total plate current of the tubes in the set. If the tubes are not lit, no sparking should occur when the battery connection is broken, but if there should be, this is an indication of a short circuit within the set. Of course there is the possibility of a wire breaking free in the set itself and falling in such a way as to cause a short circuit, but this is immediately apparent on inspection. There is also a possibility of a short circuit of the elements in the tubes.

## "Can't Get Distance"

"I cannot get distance," is a general criticism that is met with radio receivers of all types.

The most general cause for this complaint is the inability of the customer to tune the set properly so as to get the most out of it. The obvious remedy for this is to instruct him further in the operation of the set. The service man should spend an evening with him and show him just how to do it, and once the customer knows that the set is capable of receiving distance, he will never admit that he cannot get it.

A defective tube will sometimes prevent distant reception. Perhaps one of the tubes used in the radio frequency circuit is not particularly adapted for that purpose, but will make an ideal detector or audio frequency amplifier. Try interchanging tubes so as to get the best possible combination. Do not make a practice of interchanging tubes after the most satisfactory combination has once been determined. This is particularly

applicable to dry-cell tubes. Because of their delicate structure, it is not well to subject them to excessive handling.

Location and local conditions materially affect the ability of a set to receive distant stations. Antenna construction and ground conditions are important factors. If a loop is used, the shielding of nearby metallic bodies will affect the results. In a case of loop sets it is advisable to install the set near a window. This is particularly true in the latest types of homes and apartment houses which employ in their construction metal lathing which acts as an electro-static shield to the incoming signals.

## "Loud and Out"

In the case of sets employing antennas, it will be necessary to experiment with antennas of different length and in different directions. However, before the service man blames the location for the failure, he should take a set of similar make which he knows operates satisfactorily in another location, and check the results in the doubtful location, comparing results received on the new set with those of the standard set. In some instances, the service man is prone to use location as the cause of failure to receive distant signals, whereas it may be due to a defective part in the radio set.

The signal comes in loudly and then dies out." This is generally due to the phenomenon of fading.

However, should this condition exist on the local stations, as well as the distant stations, we would be inclined to suspect either a defective A battery connection or a defective A battery. A soldered connection in the filament circuit that has become corroded or broken for some unknown reason while not completely open so as to cause the tube's failure to light, but just making contact, will cause this condition. This defective connection, at times, will become highly resistant; sufficiently so to cause a decrease in the filament brilliancy. This condition is rarely met, but it is extremely difficult to locate the defective connection and requires careful inspection of every connection.

## Battery Troubles

This condition may be brought about by a defective dry-cell type A battery. In this case, it is due to a local action within the dry-cell. The internal resistance of the cell will vary, due to this local action, and cause effects similar to that caused by the defective connection just described. In the case of dry cells, it is sometimes necessary to readjust the filament rheostats slightly in order to restore the set to its normal operating condition, and at times, the set will recover itself.

In a storage type A battery this condition may be brought about by a so-called "treering" effect. This condition is generally present only in old storage batteries and is the result of a lead tree building up on plates in such a way as to penetrate the separator. This lead tree builds up until it touches the opposite plate and causes a momentary short circuit of the plates involved. The short circuit burns off the lead tree and immediately the building process is started again. When the short circuit occurs there will be a slight decrease in the total voltage of the battery, which will cause a slight decrease in the filament brilliancy resulting in a fading effect. In cases of this type, the fading periods are only momentary and recur at fairly uniform time intervals and are present on all positions of the tuning scale.

A similar condition may be caused on

sets employing an antenna, by swinging of the antenna or lead-in. This condition should not be confused with the fading phenomenon and may be identified by the fact that the volume of the signal will not change, but will swing in and out. The particular danger to be encountered is when the antenna is close to a metallic or other conducting body and in swinging, touches the same, causing a momentary short circuit. This is recognized by a click in the loud speaker when the ground occurs.

## "No Volume"

"I don't get any volume; the signals are weak." If this condition is persistent and investigation shows that good results were never had on the receiver, and the location has been carefully checked by a similar type set, the difficulty would seem to be due to one of the following causes:

Inferior grade of set, not capable of producing good results.

Inexperience, lack of knowledge of tuning.

Defective tubes.

Defective batteries.

Reversed A battery connection.

Poor antenna location or installation.

Defective ground connection.

Defective loud speaker.

These are listed in their order of importance and occurrence. If the receiver is of an inferior quality some advantage may be had by replacing the grid condensers and audio-frequency transformers with similar instruments of better quality. If it is due to lack of knowledge, it is the duty of the service man to instruct the customer more fully. Defective tubes should be replaced. This condition may be checked by replacing the entire set of tubes in the defective set with tubes that are known to be O.K.

A defective battery may be located by checking the voltage. It is generally conceded that a B battery whose voltage has dropped 25 per cent. from the normal rating of the battery, should be discarded. If the A battery connections are reversed on receivers employing audio frequency amplification, little or no amplification will be had. This is easily checked by reversing the battery leads.

## Antenna Difficulties

Just when an antenna is defective is very difficult to say, as there are so many local conditions which play important parts in the success or failure of an antenna installation. In general, the antenna should be removed as far as possible from all objects, such as trees and buildings, and metal objects in particular. In general, the higher the antenna, the better will be the results obtained. If the antenna is erected in the vicinity of a high-tension transmission line, it should be erected so that the line of the antenna is at right angles to the transmission line. The antenna should be carefully insulated at all points throughout its length including the lead-in. It will sometimes happen that a set employing an antenna operates quite satisfactorily during periods of dry weather, but during, and after rain storms, the operation of the set becomes rather indifferent. This condition is generally due to a defective insulator which breaks down during periods of wet weather, causing high losses. An opposite condition may be had where the set operated more successfully during periods of wet weather than it did in dry weather. This would indicate that the moisture in the ground enhanced the value of the ground connection by reducing the ground resistance of the circuit.

Some care should be exercised in the

# Pepping Up the AF Circuit

selection of a ground and the service men should not necessarily use the first ground available. Several ground connections should be tried and an effort made to determine the one giving maximum results, and this one used. In the present day equipment it seems to be customary to use an aperiodic circuit in the antenna, and for that reason defective grounds do not manifest themselves quickly. In antenna sets employing a series antenna condenser, a defective ground will cause the antenna condenser to tune very broadly.

## Speaker Polarity

A loud speaker that has been connected into a receiver with a polarity reversed will, after a time, become demagnetized and result in very poor volume and quality.

"The volume was great for a short time, but suddenly started to weaken." This condition generally results from using an excess voltage on the tubes. It is particularly true in the case of sets employing dry cell tubes. The customer sometimes has a peculiar psychology and believes that by turning the rheostats of the tubes on full that he is getting better results. With the tubes used today, employing thoriated tungsten filaments, this is a fallacy. Operating tubes using this type of filament at a greater than normal voltage deactivates the filament very rapidly and decreases its useful life. Under no consideration should a thoriated tungsten tube be operated at a voltage higher than the rated voltage as indicated by the manufacturer. A defective battery that has deteriorated abnormally will also cause this condition.

"I get one station well, but another station is weak and they are both about the same distance away." It is the general belief that this condition is caused by metallic obstructions, such as steel buildings, high-tension systems, railroads, etc., or possibly mineral deposits near on the earth's surface. It is believed that these obstructions cause either an absorption or a deflection of the radio waves which renders certain areas incapable of receiving signals from certain stations.

You have probably all heard of the recent investigation carried on by the American Telephone and Telegraph Company, in which it plotted the signal strength of its New York station in different sections of the metropolitan area, and of the peculiar results noted. Certain areas in Central Park were practically dead to signals from this station.

## Set Not at Fault

There is perhaps no remedy for this condition and it is not the fault of any particular set, as this condition would be true whether a crystal detector or a super-heterodyne be used in such a location. Of course, the super-heterodyne circuit, because of its sensitivity, would respond to an extremely weak signal that would be inaudible in a crystal detector set, but for practical considerations, reception in such an area would not be satisfactory, while at the same time, excellent results might be obtained from other nearby stations.

"The volume used to be O.K., but has been getting weaker and weaker." This condition is generally caused by the normal decrease in voltage of the batteries. It may also be caused by the use of a slight excess voltage on the tubes which will cause a slower deactivation of the filament than described previously.

In the case of a recent installation, defective batteries should be looked for. Should the installation have been made a



(Herbert Photos, Inc.)

**"FAULTY JACKS are the cause of a large percentage of the failure of amplifiers to operate properly. To check these, plug the telephones in and out of the jack very slowly."**

year previously, the difficulty might be due to the normal depreciation of the useful life of the tube.

"It works O.K. for a while, but suddenly a howl starts which sounds like a siren or a fog horn which can only be stopped by shutting off the set or cutting down the volume." This effect is due to a vibrating air column which is set up between the loud speaker and, usually, the detector tube of the set. The action is similar to that which results when a receiver of a telephone instrument is placed in front of the mouthpiece of the transmitter. This condition is generally caused by a microphonic tube in the detector socket. It may be due also to a loose element in some part of the circuit. A loose transformer lamination or condenser plate might cause the same condition. A popular theory of this condition is that the vibrating air column from the loud speaker causes a vibration of the filament in the detector tube. The vibration of the filament causes a variation of the tube characteristics which causes in turn a variation of the plate current, and an acoustic feed-back results.

## Speaker Adjustment

In loud speakers of the adjustable type, adjustment of the air-gap will sometimes eliminate this howl. In the case of non-adjustable loud speaker units it will be necessary to try interchanging the tubes in the sets in order to eliminate this condition. If interchanging the tubes does not correct it, place the loud speaker so that the bell points away from the set and place either the loud speaker or the set or both on pads of soft felt or sponge rubber. It is because of this effect that it is not advisable to place the loud speaker on the top of the cabinet, unless the tube sockets are sufficiently cushioned.

This condition, however, usually occurs only when the set is operating at maximum output and the radio-frequency amplifiers are set in an extremely sensitive condition. Reduction of the volume will invariably eliminate the howling effect.

"The quality is terrible, we cannot understand a thing that is said." This

condition is known as distortion and is due to many factors. As a general rule, distortion occurs only in the audio-frequency circuits. Distortion may be caused by a defective tube, a defective battery, a defective loud speaker, a broken-down by-pass condenser across the output or, what is the most common cause of distortion, overloading of the tubes. A soft or gassy tube will cause distortion, but this defect in a tube is rarely encountered in standard makes of tubes.

## In the Audio Channel

A weak or defective C battery is also a very common cause of distortion and will be evidenced by a tendency of the amplifiers to squeal. A B battery whose voltage has dropped 25 per cent. will often cause distortion and may be accompanied by a continuous high pitched squeal.

Audio-frequency transformers of poor quality and design will cause distortion. This is generally indicated by the inability of the amplifiers to reproduce the extremely high and low musical tones. A transformer in which the leads have been soldered with a corrosive flux will cause distortion a short time prior to the time when the corrosive action of the flux causes the winding to open.

Overloading of the amplifier tubes is evidenced by a blasting of the loud tones of the program. This is particularly true on local reception. The customer should be instructed to watch the overloading of the tubes and if the blasting does occur, he should detune his set slightly so as to reduce the volume to the point where the tubes will function properly. It is quite possible with the multi-tube sets used today, when installed in the vicinity of a powerful broadcasting station, to impress on the grid of the last tube in a series, sufficient voltage to swing the grid voltage beyond the limits of the straight line-portion of the characteristic curve.

Increasing the C battery potential or voltage on the amplifier tubes will tend to reduce this blasting. But this is not recommended as good practice because of the possibility of increasing the negative potential to such a point as to cause distortion when the tube is operating with normal volume. A great many amplifiers in receiving sets use a fixed condenser, ranging from the values of 0.002 to 0.006, connected across the loud speaker terminals. This condenser is known as a by-pass condenser and is subjected in this part of the circuit to considerable peak voltages. Should this condenser fail, a distorted signal will result. If, on servicing, this condition is met and all the foregoing items have been checked with no results, replace this by-pass condenser, as a potential breakdown in this condenser is rather difficult to test for unless laboratory equipment is available. Both these conditions call for the replacement of the transformers.

## "Loud Enough; Very Noisy"

"It is loud enough, but very noisy. There is a continuous, cackling, rasping or scratching sound in the loud speaker." This may be the result of any one of many causes. Interference from either atmospheric or local sources is the most common cause of this defect. By local sources we refer to such apparatus as X-ray machines, violet-ray machines, electric railway systems, elevator controls, leaky power lines or transformers, automatic telephone switching lines, telegraph lines, and local telegraph stations in the vicinity of the receiver.

[Part II, the conclusion of this great article, will be published next week.]

# The Constant Coupling

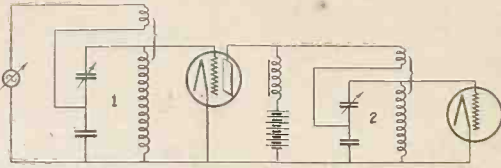


FIG. 14.

[Part I of this article was published in the August 21 issue. The final instalment follows.]

By Edward H. Loftin and S. Young White

## PART II

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AS an example of the seriousness of this phase of the set, a Neutrodyne licensee was catering to the trade in the far West when a well-known manufacturer of tubes decided to modify tube bases from metallic to insulating material. The Western jobber suddenly got numerous complaints from his dealers that the set owners were getting nothing but squeals from their sets, so the matter came back to the manufacturer who already knew only too well the effect of this seemingly innocent change in tube bases. He couldn't make good with explanations—his set had to work under the new conditions—so at a cost of \$25,000 he organized a readjusting party and corrected every set he could locate in his chosen territory.

### How New Idea Works

Of course it would be easy to make the neutralizing condensers  $C_n$  variable so that the ultimate purchaser could adjust it to take care of any tubes he should purchase, but then it would become the same as an ordinary regenerative control and return radio to the early days of broadcasting and squealing regenerative sets. This was tried by one manufacturer, but it landed him out of business through a court decree under a regenerative patent.

Now we can come back to combined electromagnetic and electrostatic coupling and point out how we make use of it to eliminate the defects pointed out in the regenerative multiple tube radio receiver and neutralized radio receiver, and by so doing avoid regenerative patents and neutralizer patents.

Starting by using the combined coupling of Fig. 5 in the input side of the first tube we are enabled to get uniform energy transfer throughout the broadcast band from the antenna, or any form of transfer desired, such as stronger on the long wavelengths or vice versa. It is a flexible coupling that will satisfy any demand along the lines shown graphically in Fig. 6. Of course, the combined coupling can be made tight or loose to any degree desired, all being a matter of selecting the relative values throughout.

Mr. R. P. Clarkson, the well-known radio technical writer for "The New York Sun," stated as to the constant coupling feature alone in the Sun Radio Section for July 17, 1926:

"It is one of the most interesting developments of recent years and from casual study appears to be the nearest approach to exact engineering applied to radio."

### Uses Small Primaries

A feature of manufacturing importance is that we need fewer turns in our primary coil of the inductive coupling in

getting as much overall coupling as is contained in the ordinary receiver because part of the coupling is capacitive.

There thus results less distributed capacity in the coil system which permits a given modified coil system and tuning condenser to reach a lower wavelength, it being quite obvious that when the tuning condenser is at its minimum setting the distributed capacity is quite a factor in the residual capacity of the circuit. For instance, we have converted commercial receivers which could not reach below 230 meters and brought them down below 200 meters without sacrificing any overall coupling. We find no difficulty in constructing a tuning system using commercial condensers that ranges from 150 meters to 600 meters, and have been unable to accomplish the same result with a normally effective inductive coupling alone.

We also find it unnecessary to arrange two connections to take care of long and short antennae. The coupling has the effect of eliminating the so-called "absorption hump" that occurs when the antenna natural period falls within the broadcast band.

Examining the combined coupling between the plate circuit and the tunable circuit 2 in Fig. 14, it is obvious that the coupling condenser interrupts the continuity of the plate circuit to prevent the plate being energized through this path, so we have to provide the auxiliary plate energizing path shown which includes a choke coil suitable to make the coupling path the effective path of the plate circuit for the broadcast band of frequencies.

### Keeps Two Apart

It is seen that the location of the tuning condenser of circuit 2 is proper to prevent impressing the plate potential on the grid of the succeeding tube.

Taking up for consideration the plate circuit reactions through varying the circuit 2, we find its tuning will create the same cycle of reactions heretofore pointed out for plain inductive coupling, but the important feature of the new system is that we can control in most definite manner how these reactions will vary with frequency.

By comparison, the plain inductive coupling causes the troublesome predominating inductive reaction to increase most substantially with frequency, so that if we construct an inductive coupling that will be sufficiently loose not to create oscillations at the shortest wave, then at the longest wave regeneration is gone to such an extent that the receiver is extremely poor in this region. It is for this reason that the commercial receivers depending upon regeneration do not design to go below about 230 meters. If such

A CHOKE COIL in the constant coupling circuit (Fig. 14) provides the auxiliary plate energizing path. C is not common to two circuits (Fig. 15).

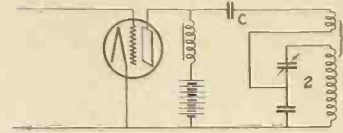


FIG. 15.

a receiver were designed not to oscillate at 200 meters it would be practically useless at 550 meters.

On the other hand, with the new coupling we can so select the relative values of the elements and adjust them that we obtain just the reverse condition, that is oscillations or near oscillations on the long waves and falling off on the short waves; or any other result such as just below oscillations throughout, and therefore maximum regeneration throughout, and we have done it from 150 to 600 meters, or just in oscillations throughout the same range. So here is a most important regeneration control, offering the possibility of a regenerative type of set than can be set as the regenerative user likes it, namely just below oscillations, without producing squeals for his neighborhood as he tunes, and we will point later a still simpler form of regenerative detector set.

### Adds a Condenser

We have constructed the arrangement as a regeneratively reactive one stage radio frequency and detector (with two stages of audio), adjusted just below oscillations, and got results in both selectivity and intensity which we have not encountered in any other 4-tube set, but when we tried to add another stage likewise critically adjusted for regeneration we ran into difficulties due to the critical conditions brought in by the excessive regeneration, so from our experience do not recommend more than one stage. We built such a 4-tube receiver, adjusted it in selectivity under New York conditions, and gave it to an experienced engineer who took it down the Jersey Coast for trial. When he brought it back his only criticism was that he found it too selective for inexperienced operators on distant work.

Coming to the final step that permits of constructing a true tuned radio frequency amplifier of any desired number of stages that is entirely free from tube capacity regeneration, and includes the decidedly new feature of being independent of tube capacity, tube construction, and therefore tube manufacturers, and also embodying the entirely new feature of constant energy transfer, or uniform results throughout the broadcast band, or further if desired, refer to Fig. 15, where we examine the effect of putting a condenser C in the plate circuit just as we did with the condenser  $C_n$  in the case of Armstrong, Fig. 13.

The first thing obvious is that we do not make the condenser C, Fig. 15, common to the two circuits as is the condenser  $C_n$ , Fig. 13, and therefore have to consider only the plate circuit reaction it creates and not any inter-circuit coupling. Of course the condenser C of itself would tend to produce a plate circuit reaction to send amplified current through the inherent tube capacity out of phase, as shown vectorially in Fig. 8 in connection with Fig. 7, but the magnitude of this capacitive reaction will vary with frequency.

### Two Oppose

Now if we can introduce in series with condenser C an arrangement that will

(Continued on page 28)

# Sets Should Be Balanced

**Failure to Include Means of Suppressing Over-Oscillation Causes Receiver to Be Poor in Performance—Effect of Regeneration on Undesired Reaction.**

*By Capt. P. V. O'Rourke*

QUITE a few circuits are advocated and constructed without regard to the important consideration of stabilization. Various forms of balancing are in use, and some form should be used, particularly in a tuned radio frequency receiver. All too often the coil, condenser and other connections are shown for a 5-tube set, and nothing said about the vice inherent in tubes, whereby they flop into over-oscillation at some low wavelength, or even at an intermediate wave, like 431 meters, and misbehave on all wavelengths below that.

One form of attempting to avoid the consequences is to resort to detuning, for it is at resonance, or trivially off resonance, that over-oscillation is most likely. But the energy transfer is greatly reduced, the amplification suffers badly and efficiency is flung to the four winds when detuned radio frequency amplification is used. Distortion is inevitable.

## Hazeltine Paved Way

The first popular form of stabilization was that developed by Professor Louis A. Hazeltine, then of the Stevens Institute of Technology, and it resulted in the now famous Neutrodyne. It is a good method. It is something like the Hartley and Rice methods, except that in application these were not introduced for the non-squealing effect Hazeltine set out to accomplish. In fact, or rather, in law, it has been established that the Hazeltine method does not infringe the Rice and Hartley patents of the radio trust.

As regenerative sets are popular, it is well to keep in mind that they are stabilizable, if one may coin that word. They are not stabilized, yet they do not absolutely require any neutralization of tube capacity or other form of balancing out over-oscillatory vice, unless several stages of RF are used. For instance, in the most popular form of the day, this circuit consists of a stage of tuned RF, a regenerative detector and suitable audio for speaker operation.

## Rider's Important Invention

It is well to neutralize the RF tube with a small balancing capacity, say from a point on the interstage secondary to grid of the RF tube, the reverse current flow being through the neutralizing capacity. Yet it is not absolutely imperative because the plate of the detector tube is connected, although not with keen premeditation, to the batteries common to the plate of the RF tube, and also and more importantly because the coil in the plate circuit of the RF tube transfers energy to the secondary of the 3-circuit coil, and the third coil therein is the tickler, in inductive relationship to the secondary and hence in the same relationship to the primary or coil in the RF plate circuit. The adjustment of the tickler to below the saturation point therefore has a

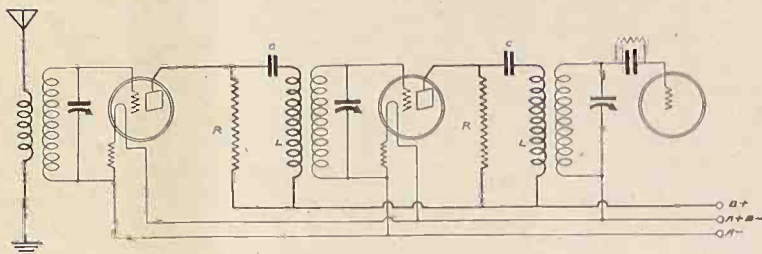


FIG. 1

The fundamental idea of the new neutralization method invented by John F. Rider.

stabilizing effect on the RF tube as well as on the detector tube.

The subject of neutralization was treated very thoroughly in last week's issue of RADIO WORLD, in the first installment of the article by Edwin H. Loftin and S. Young White, which is concluded in this week's issue. That article advocates a particular method of balancing that enables uniform energy transfer throughout the wave band, and which is independent of tube capacity. It is a new method, as is the one illustrated in Fig. 1 herewith, known as the Rider method, invented by John F. Rider, noted radio engineer. The Rider method (patent pending; serial number 124, 182), may be employed in tuned radio frequency receivers, even if three stages of tuned RF are used (normally four controls), and without recourse to shielding. A resistor is connected from the plate of a tube to B plus amplifier. A fixed condenser is connected from the plate to one terminal of the primary of a radio frequency transformer, the other primary terminal being tied to B plus amplifier. The input to the next tube is along conventional lines. The resistor is R in Fig. 1, the condenser is C and the primary of the tunable RF transformer is L.

This neutralization method, which Mr. Rider announced in his weekly full-page technical department, The Laboratory Scrap Book, in "The New York Sun Radio Section," absolutely squelches over-oscillation, yet maintains high amplification. The explanation, as given in the patent

## Rider Develops a New and Effective Neutralization Method, Based on Duplication of Antenna Constants and the Absorption Effect.

application, is that absorption takes place, due to resistance, capacity and inductance (R, C and L in Fig. 1), that approximate these constants as they exist in the normal antenna circuit.

## Has Designed a Set

Depending on the electrical characteristics of the transformer and other items, the values of R and C especially would have to be determined experimentally. As a test one may try .00075 mfd. for C, 400 ohms for R, with an 8-turn primary on a 3" diameter for L. These are merely suggestions.

In the design of a receiver using this system Mr. Rider has worked out the values with scientific accuracy for the parts used, and the set will be described for public benefit in weeks to come. Mr. Rider has made an important contribution to the science. Readers of RADIO WORLD, familiar with his contributions published in this magazine know the height of his scientific radio knowledge.

## McNamee In Movies; Finds It Hard Work

Graham McNamee, the well-known WEAf announcer, is almost daily adding to his varied list of accomplishments. During the past week the outcome of his debut as a movie actor has been shown upon the screen. The familiar "This is Graham McNamee announcing from WEAf" is thrown upon the screen and the picture then depicts the announcer at the broadcasting of a prize fight.

He enjoyed the thrill of appearing in the movies but learned that his belief that movie actors had a "snap" was hardly founded on fact. After the intricate tricks of make-up had been explained and tried out, after the many rehearsals, the time consumed in placing the lights and their heat on a hot day, he was still enthusiastic but not one bit envious of the actors' lot. He lost four pounds during his movie debut.

## He Waxes Artistic With a 10c Whistle

SPRINGFIELD, MASS.

Felix Livingston, "America's Tin Whistle Virtuoso," presented a novelty radio concert from WBZ. One of the few flageoletists on the vaudeville stage, he created a sensation in his recent theatrical tour of the South and Middle West. He has been heard over the radio in the West, but his concert from WBZ marked his first appearance on the wave of any broadcasting station in the East.

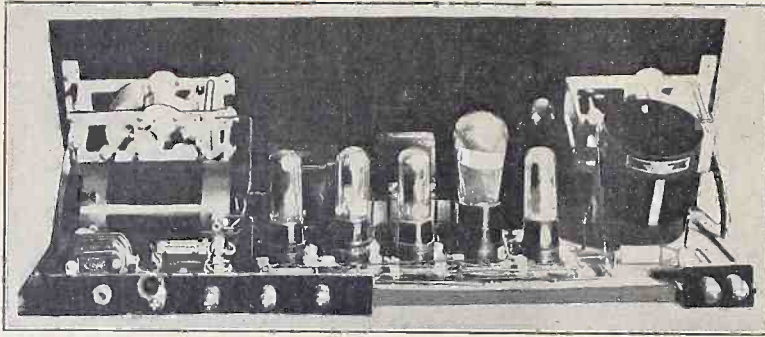
A 10-cent whistle was the only instrument used by Mr. Livingston in his novelty program from WBZ but listeners were astonished by the quality of the music obtained from such a cheap instrument. Classical selections as well as the latest dance numbers and song hits were offered by Mr. Livingston and the tests made on the WBZ wave showed that the cheap whistle is well adapted to broadcasting.

ON ITS  
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A 6-Tube Set Destined to Win Great Popularity

# How to Operate the Improved BROWNING-DRAKE



(Photo Topics)

FIG. 6

The rear view of the Improved Browning-Drake, as designed by Arthur H. Lynch, noted radio editor and author. The input is at right as you look at this photograph, hence C1 is located there, C2 being at left. This of course is the opposite to the relative positions when you are actually tuning, with the front panel nearer you.

[The theory of the Improved Browning-Drake was expounded in the August 14 issue, while the construction was detailed step by step in the August 21 issue. Following are the tuning and operating directions. Other phases of the circuit and its care will be discussed in subsequent issues.]

## By Herman Bernard

Associate, Institute of Radio Engineers

TAKEING it for granted that batteries are properly connected and that the tubes light as they should, and as they will, if the diagrams are followed and the tubes are good, we will now proceed to a discussion of the tuning and operating features of the Improved Browning-Drake. This receiver was designed by Arthur H. Lynch along lines consistent with the laboratory perfections achieved by Glenn H. Browning and Frederick H. Drake in coil design, and in consultation with Laurence M. Cockaday, technical editor of "Popular Radio."

The whole circuit is built along quality lines, and that presupposes a due regard for the side bands, or inflections on the carrier wave caused by impregnating it with the audible frequencies. Thus the input circuit, CL2 in Fig. 1, page 3, issue of August 14, will not tune exceedingly sharp, for it should not do so. There is a tuned radio frequency stage after it, represented by the detector input, and this detector stage is regenerated, so that the feedback here gives one a high degree of selectivity indeed. Any design that would heap that high selectivity factor upon an ultra-selective tuned input preceding it would be a fable.

### Going After DX

In searching for distance stations one may rely upon somewhat greater leeway with the dial tuning C1, unless the signal strength is very feeble, when distance can be tuned in only by accurate setting of this dial, too. So, to get distance, you should know at about what point on C1, judged by its dial, the station should come in, and the setting should be made there and C2 should be tuned with the tickler just at the oscillation point. When resonance is established in the receiver circuit, and this tuning is pitted against the incoming signal frequency, an audible frequency results, due to the difference between the two frequencies. Now we have the familiar beat note or squeal,

which may be heard from the speaker, but which does not get into the air outside to annoy neighbors who are listening in, for the radio frequency tube performs some slight blocking duty and more important by far it is neutralized, so that the heterodyne wave generated in the receiver does not get far outside of the set.

Now, with the beat note established, slightly retard the tickler that is, loosen the coupling, and turn the dial of C2 ever so slightly one way and another, and then back to the original position, so that no squealing results when this is done.

### Easiest Operating Point

If you do hear a whistle you have too much plate reinforcement of the grid circuit, so loosen the tickler coupling just a trifle until the goal is reached. One of the panel knobs, the one to the left of the C2 dial, actuates the tickler.

Your set is now tuned so that the tickler coil enables the detector tube to function just below the saturation point, and this is where most generally satisfactory reception is received on distant signals. Somewhat tighter coupling, known as critical coupling, gives greater amplification but blurs the signal.

Leave C2 set as it is and slightly vary the setting of C1 on both sides of its original setting until maximum volume is obtained. Then retune the C2 dial just a bit and finally try tightening the tickler coupling by the barest fraction of a dial division. This last-named precaution is taken to be sure that not even slightest detuning of the secondary L4 has been occasioned by any tickler setting, or if detuning has resulted, then you are taking proper steps to tune to resonance.

### Freaks of DX

Distant stations perform freakishly at times. Fading is one nuisance and swinging is another. These considerations are independent of the receiver. Unaccountable factors cause the carrier frequency to change perhaps only a trifle, and once in a while you may have to retune to catch up with it. This swinging phenomenon is often ascribed to changed courses taken by the radio wave, whereby intervening objects trivially affect the frequency. At best this sounds like a weak explanation, but the problem is there, and an occasional touch of the dial will straighten matters out satisfactorily.

Of course one must know something about the location of different wave-

lengths in respect to the C1 and C2 dials to be able to tune in distance with any degree of certainty. It is assumed that any one can tune in locals, hence has done so, and has made a log or chart which enables him to know with a certainty what the C1 position is for any wave, and approximately what it is on C2. As for the tickler, that can not be calibrated with scientific precision, due to changing factors, such as altered A battery condition affecting the filament temperature and electron emission, and the similarly changed feed to the plate from the B battery.

### Another Method

For instance, in tuning in a station far away that has a wavelength near that of some local, you may use the system of tuning to the local's wavelength, and if the DX station is of slightly lower wavelength, then turn the dial slightly to come somewhere near the necessary frequency, and await the beatnote which a tightened tickler setting affords.

Particularly in the reception of distant stations, and in large cities in receiving low wavelength locals too, a steady whistle may be heard, its pitch not being varied though the dials are turned a little. Of course the total volume declines, both of the signal and of the whistle or moan, but the pitch never varies. This is an audible note caused by the wave of one station beating against that of another, or against the second harmonic of another, and no receiver can offer any cure for that. It's in the air, is the best you can say about that and forget it until Congress meets again.

### Tickler On Locals

In tuning in local stations it is never necessary to use tight tickler coupling, indeed the looser it is, consistent with desired volume, the better, for the quality is most easily upheld and the B battery consumption is kept down. Over-oscillation or anything like it causes the plate drain to rise very pronouncedly.

It is obvious, therefore, that for quite a stretch of the wavelength spectrum it is possible to tune in locals satisfactorily without much attention to the tickler. It is set for good regenerative effect at some medium or low wave, and the higher waves will require no tighter coupling, unless great volume is required, as when there is dancing at home, or in cases of screened location, where the incoming wave is partly dissipated, and the extra amplification afforded by greater feedback is desirable.

No sign of distortion is to be tolerated. The tickler always should be set so that the detector tube is under the saturation point. When there is over-oscillation there is bad distortion, but that simply means the set is being abused, for if it is tuned and operated correctly you have no distortion, as that term is commonly applied, with the single exception that a poor speaker will spoil much of the merit.

### Louder DX

Yet if you want to tolerate a little distortion on distant signals, to make them as loud as locals, you have this choice in the tickler setting, since some fans like to do this just to test the maximum volume possible consistent with discernment of what is being said, sung or played at the station.

The set will reach out into the far distance, if conditions are suitable, yet it is a quality set in every sense of the word.

# Radio University

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When writing for information give your Radio University subscription number.

I WOULD like to have a wiring description of the Federal Type 102 receiver. Please give the constants of the parts.—Thomas Vurt, Spring Valley, N. Y.

The receiver employs a tuned stage of radio frequency amplification, a non-regenerative detector, coupled with a untuned air or iron core RFT and two stages of transformer coupled audio frequency amplification. A single winding antenna inductance is used. This consists of 55 turns of No. 22 double cotton covered wire wound on a tubing 3" in diameter. Taps are taken from the 4th and 8th turns from the beginning of the coil. The antenna post is brought to either of the tapped portions of the coil, depending upon the length of the antenna. The beginning of the coil is brought to the rotary plate post of a .00025 mfd. variable condenser, to the arm of a 400 ohm potentiometer, to a terminal of a .00025 mfd. fixed condenser and to a terminal of a .01 mfd. fixed condenser. The other terminal of the .00025 mfd. fixed condenser is brought to the ground post. The other terminal of the .01 mfd. fixed condenser is brought to a resistance post terminal on the potentiometer and to the F minus post on the RF tube socket. The other resistance terminal of the potentiometer is brought to the F plus post on this same socket. The F minus posts of the two AF tubes are connected to the F minus post of the first RF tube. This connection is then brought to the resistance terminal of a 10 ohm rheostat. The arm of this rheostat is brought to the A minus post. It is also brought to the arm of a 20 ohm rheostat. The resistance post of this rheostat is connected to the F minus post on the detector tube socket. The F plus posts are all connected together and thence to a terminal of a switch. The other terminal of the switch is brought to the A plus post. This same post is also connected to the minus post of the B battery. The end of the antenna winding is brought to the stationary plate post of the .00025 mfd. variable condenser and to the grid post on the RF tube socket. The P post on the untuned RFT is connected to the P post on the RF tube socket. The B post is brought to the B plus 45 volt post. The G post on this RFT is connected to one terminal of a .00025 mfd. grid condenser and a 2 megohm grid leak combination. The other terminal of this combination is brought to the grid post on the socket. The plate post on this socket is brought to the P post on the first AFT and to one terminal of a .003 mfd. fixed condenser. The F post on the fixed RFT is brought to the F plus post on the detector tube socket. The B posts of both AFT are connected together and thence to the B plus 90 volt post. The G posts on the first AFT is brought to the G posts on the first AF tube socket. The other terminal of the .003 mfd. fixed condenser is brought to the F Post on the first AFT and to the F minus post on the socket. The P post on the first AF tube socket is brought to the bottom terminal of a single circuit closed jack. The second terminal from the bottom of this jack is brought to the P post on the second AFT. The B post on the second AFT is also brought to the top of this jack. The G post on the second AFT is brought to the G post on the last AF tube socket. The plate post on this socket is brought to the top terminal of a single circuit open jack. The bottom terminal of this jack is connected to the B plus 90 volt post. The

filaments of the RF and the AF tubes are controlled by a single rheostat. The -01A tubes work best in this receiver.

I WOULD like to have the circuit diagram of the set using a carborundum crystal with a potentiometer to control the battery flow which was described in the Radio University columns of the August 21 issue of Radio World. Please designate each part.—Gerald Sharten, East Pittsburgh, Pa.

Fig. 417 shows the wiring diagram of this receiver. L1 is the tapped Primary, while L2 is the secondary, which is shunted by a .0005 mfd. variable condenser C1. P is the potentiometer. C2 is the .002 mfd. fixed condenser. SCJ indicates the place where the phones are to be inserted. These may be substituted by phone tip jacks. A minus and plus indicate the 1½ volt battery. The switch arm and taps are shown at S.

I HAVE a 1-tube reflex as shown in the diagram, which I would like to change into a 2-tube reflex, using a tube as a detector, instead of the crystal. The changes made on the original diagram, will be appreciated. I am using standard RFT, with .0005 mfd. variable condenser tuning the secondaries. The primaries consist of 10 turns, while the secondaries consist of 45 turns. These are wound on

tubings 3" in diameter, using No. 22 double cotton covered wire. There is no separation between the windings. The rheostat that controls the filament of the RF tube is of the 30 ohm type. The AFT used is of the high ratio type. A fixed crystal detector is used.—Bernard Smith, Haines Falls, N. Y.

In Fig. 418 you have the circuit diagram of your receiver, with the necessary changes to be made, show in dotted lines. R3 and C3 are the grid leak and condenser (2 megohm-.00025 mfd.) combination. R2 is a 20 ohm rheostat, which controls the filament temperature of the new detector tube. The stationary plate post of the second condenser C2 is connected to one terminal of the condenser-leak combination. The other terminal of this combination is brought to the grid post on the new socket. The rotary plate post of the condenser C2 is brought to the F plus post on the new socket and to the beginning of the secondary winding. The crystal detector is disconnected. The plate post on this socket is brought to the P post on the AFT. The B post on this AFT is brought to the B plus 45 volt post. The connection from the B post of the AFT to the beginning of the secondary winding of the second RFT is broken also. B plus detector indicates the use of 45 volts, while B plus amplifier indicates the use of 67½ to 90 volts.

I AM using the new UX200A detector tube in the Diamond of the Air, instead of the -01A and at times hear a continuous whistle or noise, which I cannot control, unless I force the tubes. A reduction in the plate voltage does not help either;

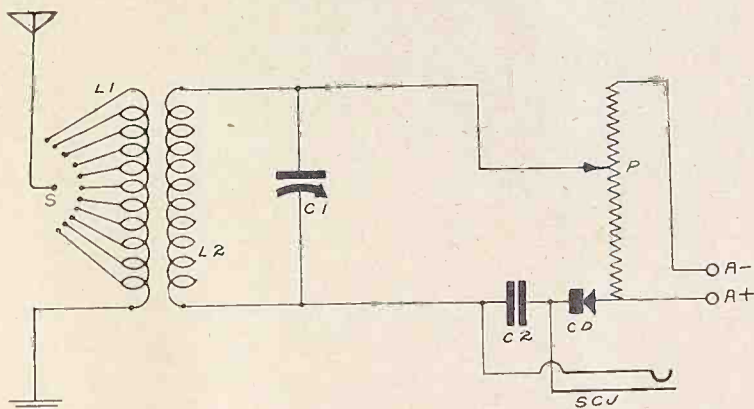


FIG. 417

The electrical diagram of a receiver using a crystal with a battery.

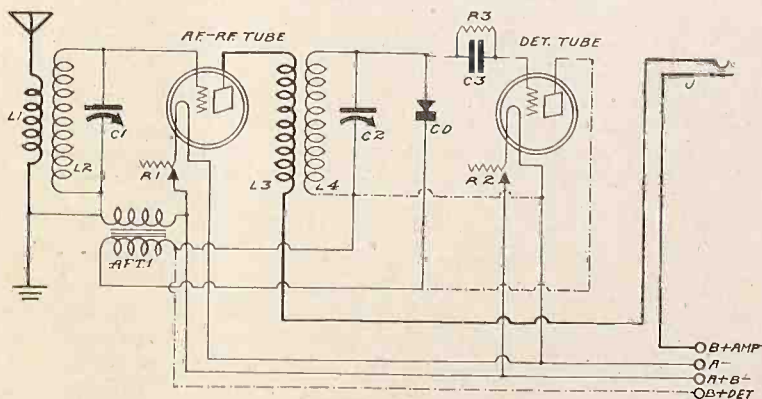


FIG. 418

The electrical diagram of the 1-tube reflex, using a crystal detector, changed to a 2-tube reflex, using a tube detector.

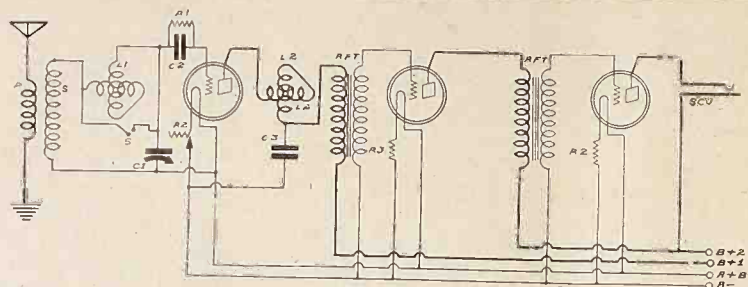


FIG. 419

The circuit diagram of the 3-tube regenerative set using variometers to tune the plate and grid circuits.

installing the -01A however clears up the noise. What can I do to remedy this?—Max Rosacker, 26 South 10th St., Reading, Pa.

Evidently you did not change the grid return to minus. The -01A tube requires a positive grid return, while the 200A works better with a negative grid return. The 200A will stand a high plate voltage, e.g., about 45. Try decreasing the grid leak resistance.

**WHERE DOES** the grid return of the detector tube in the Diamond go, to the minus or to the plus of the filament?—Henry Lee, 904 West College St., Austin, Minn.

If the -01A or -99 tube is used, it is brought to the plus.

**IS IT** possible to add a stage of resistance coupled audio frequency amplification after two stages of transformer coupled audio frequency amplification and get satisfactory reception? If so, please describe how to hook it up, giving the constants of the resistors and the condenser, etc.—J. Welsh, 903 West 8th St., Cincinnati, O.

Yes. The signals will be very loud. A power tube should be used in the last stage with a high plate and grid voltage. The plate resistors, which should be connected in the output of the last amplifier stage, should be of the 100,000 ohm type. The resistor in the grid circuit of the new tube should be of the 1 megohm type. The stopping condenser should be of the .25 mfd. fixed type. One terminal of the fixed condenser should be connected to the plate of the 2nd AF tube. The other terminal of the condenser is connected to one terminal of the 1 megohm resistor and to the grid post of the new socket. The other terminal of this resistor is connected to the minus post of a C battery. The plus post of this battery is connected to

the minus post of the A battery. The plate post of this tube is connected to the top terminal of a single circuit jack or some terminal which will make contact with a terminal of the speaker. The other jack terminal, or otherwise, should be connected to the B plus post. The filament of this tube should be controlled by a ballast resistor. Both the 120 and the 171 require a 1/2 ampere ballast resistor. The 210 draws 1.25 amperes at 7.5 volts, while at 6 volts, it draws 1.1 amperes. For further information regarding grid and plate voltages of these tubes, see the chart which appeared in the July 10 issue of Radio World.

**I HAVE** the following parts, which I would like to use in the construction of a 3-tube receiver: two Cardwell .0005 mfd. variable condensers; two variometers (150 to 600 meters); one coupler (10 turn primary, 45 turn secondary, 3" diameter); two All-American audio frequency transformers, one having a 10 to 1 ratio and one having a 3 to 1 ratio; one 30 ohm, three 20 ohm and one 6 ohm rheostats; four 1-A type Amperites; one 112 Amperite; one 6 volt storage battery.—Arthur Zaloff, Cleveland, O.

The circuit diagram of a receiver using these parts is shown in Fig. 419. P indicates the primary of the coupler while S indicates the secondary of the coupler L1 is the variometer; which is used in the grid circuit, while L2 is the other variometer, which is used in the plate circuit for obtaining regeneration. C1 is the .0005 mfd. variable condenser used to tune the secondary. S is a switch, used to cut in or out the variometer, for long and short wave reception. C2 and R1 are the grid leak and condenser combination, e.g., 2 megohm and .00025 mfd. C3 is a .001 mfd. fixed condenser used for bypassing RF currents. AFT1 is the 10 to 1 ratio trans-

former. AFT2 is the 3 to 1 ratio transformer. R3 and R4 are the 1/4 ampere (1-A Amperites) ballast resistors. The -01A tubes are used. A 112 may be used in the last stage. However when doing this, it will be necessary to install the 112 Amperite. SCJ is a single circuit jack. B plus 1 equals about 45 volts, while B plus 2 equals about 90 volts. All the filament controls are placed in the negative leg. The two AF tubes have a minus grid return, while the Det. tube has a plus return.

**PLEASE GIVE** a description of the action of the Tungar or Rectagon tube as a rectifier—George Wells, Tacoma, Wash.

A coiled tungsten filament is heated by current delivered from the secondary of an auto-transformer. During the half cycle, when the filament is negative, the electrons emitted from it ionize argon gas in the tube. A current of a few amperes is carried by the ions in the direction from a graphite anode to the filament. Upon the reversal of the alternating supply voltage, the newly emitted electrons are driven back into the filament. Thus no electrons are available for starting the ionization of the gas and consequently no conduction of current takes place.

**PLEASE ADVISE** me whether the B minus is connected to the A plus or to the A minus in the Set With a 1-Turn Primary described in the July 3 issue of RADIO WORLD.—R. L. Byrd, Winter Garden, Fla.

The A plus is connected to the B minus.

**PLEASE GIVE** the electrical characteristics of the first and second stage Amertran DeLux audio frequency amplifying transformers.—Max Lenton, Bear Mountain, N. Y.

The primary inductance at 200 cycles of the first stage type, is 168 henrys. The approximate resistance of the primary (direct current) of this AFT is 1,470 ohms. The approximate resistance of the secondary (direct current) is 6,000 ohms. The plate current limit of this AFT is about 3 milliamperes. This current is at DC when applied to the plate. The primary inductance at 200 cycles of the second stage AFT is 110 henrys. The approximate resistance of the primary (direct current) is 1,090 ohms. The approximate resistance of the secondary of this AFT (direct current) is 6,150 ohms. The plate current limit of this AFT is 7 milliamperes.

## RESULTS

Results Editor:

I have recently had the pleasure of constructing the Bernard 1-Tube DX set, which was described in the Oct. 24 issue of Radio World, with the addition of a stage of audion frequency amplification. The set worked right off the bat and in a few nights I have logged over 30 stations. I got the surprise of my life when I tuned in the following stations all on the loudspeaker: WREO, WBBM, KDKA, WBAL, WWJ and WPG. WREO could be heard all through the four rooms, the other stations coming in with enough volume to fill the room. Although this sounds more like fiction, it is an honest-to-goodness fact and I think it is quite remarkable for only two tubes.

HAROLD KING, Olivet, Mich.

Results Editor:

My Diamond of the Air works great. I have had no trouble in tuning in DX. Havana and Dallas, Texas, came in with great volume.

DANIEL PIZZICA,  
1163 Grant St.,  
Indiana, Pa.

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[In sending in your queries to the University Department please paragraph them so that the reply can be written under or alongside of each query. Write on one side of sheet only. Always give your university number.]

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Enclosed find \$6.00 for RADIO WORLD for one year (52 Nos.) and also enter my name on the list of members of RADIO WORLD'S University Club, which gives me free information in your Radio University Department for 52 ensuing weeks, and send me my number indicating membership.

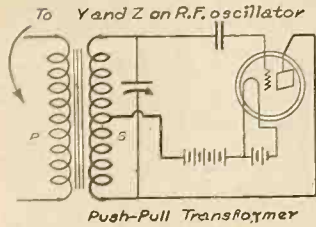
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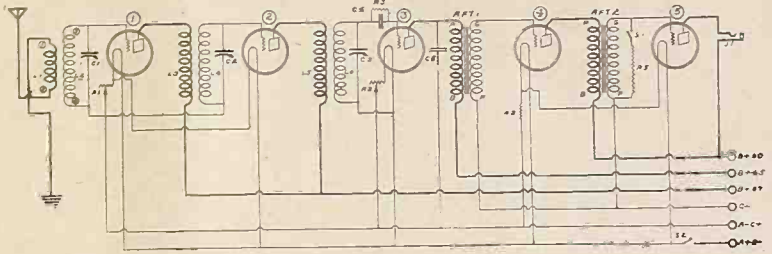
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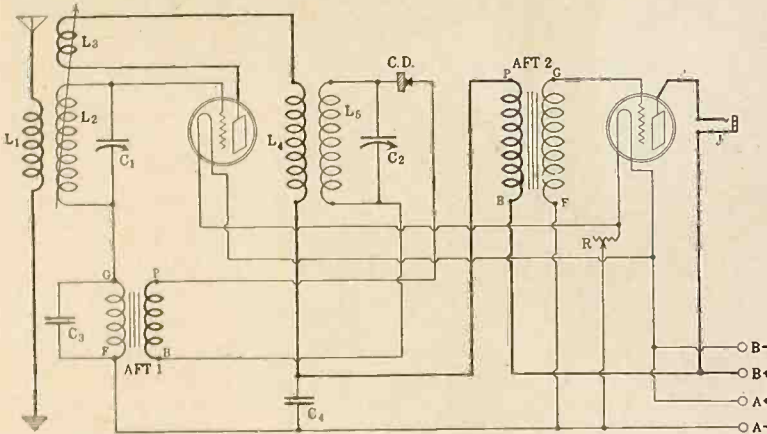
# Hookups for the Fastidious



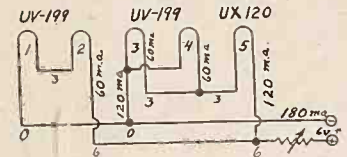
**FOR LOW** audio frequencies, 50 to 200 cycles, the unit diagrammed above may be used as an audio oscillator. The transformer used is of the push-pull type. The value of the variable condenser across the secondary is dependent upon the frequency output that is desired.



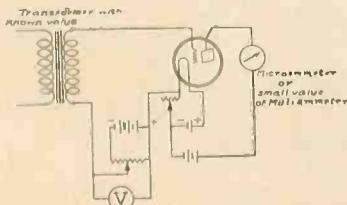
A 5-TUBE receiver, employing two RF, a non-regenerative detector and two stages of transformer coupled AF tubes. Rheostats are used for RF and detector filament control, while a ballast resistor is resorted to in controlling the filaments of the last two AF tubes.



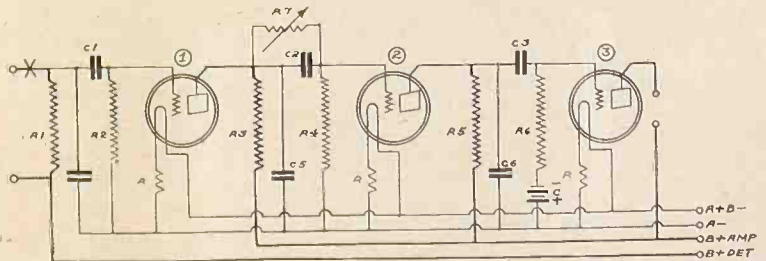
A POPULAR 2-tube circuit diagram, wherein a regenerative RF tube, a crystal detector and a stage of transformer coupled AF coupling are used. The RF tube also acts as an AF amplifier.



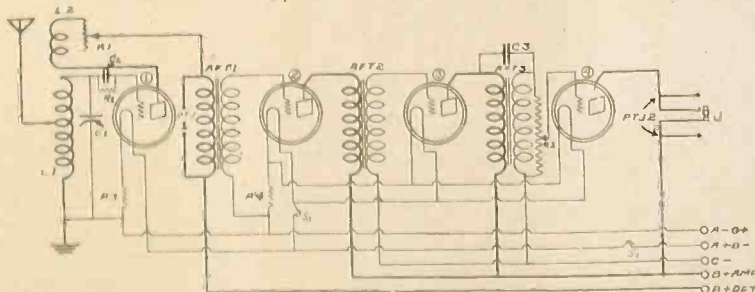
IN THE diagram shown above the filaments of the first two tubes are connected in series, the next two are connected in parallel and this parallel combination in series with the filament of the 120 tube. The 120 draws 120 milliamperes, but only 3 volts. The -99 type tube requires the same voltage, but only half as much current. Therefore two of the -99 tubes connected in parallel, will require the same current as the 120. The voltage across the three tubes is then 6. They therefore may be connected across a 6 volt battery and operated economically. The total drain when using the tubes in the combination is only 180 milliamperes. This is low enough for a single series of four No. 6 dry cells to supply the filament for a long time.



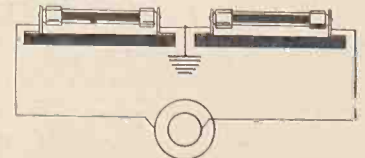
HOW A vacuum tube voltmeter appears in a circuit diagram. V indicates a volt meter, used for ascertaining the exact grid bias required to obtain a plate drain of known value, previously calibrated.



IF YOU are using a resistance coupled AF amplifier, in conjunction with a B eliminator and are troubled with a "steamboat" effect, the installation of the variable resistor R7 will cure that ill.



A VERY successful way of adding three stages of transformer coupled AF amplification is shown above. The Centralab 500,000-ohm variable resistance in third audio grid prevents distortion. Low ratio AFT should be used.



A GOOD way to kill external power line noises is to place two resistors, having a fixed resistance of about 3 megohms in series and grounding the middle tap. The generator above presents the incoming line. These resistors may be substituted by fixed condensers of a rather large size, e.g., 2 mfd. These should be able to stand at least 750 to 1,000 volts. The ground may be the same as used for the receiver, e.g., the waterpipe.

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When we're happy we like to think aloud. So thinks Mr. Wrenp. But he was soon interrupted by his mother.

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He did so and his mother pointed to the dictionary, which she had opened to page 407, where *in-kwir-i* was the only pronunciation given, the second *i* being sounded like the one in *mite*. He kept his eyes open as she turned to him.

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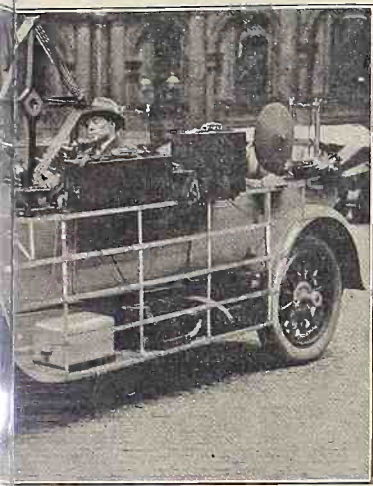
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# Open Forum Created For Debate on Waves

**Broadcast Listeners' Association Wants All Interests  
To be Represented on Platform at National  
Radio Exposition in Chicago**

"The threatened complete chaos of radio, as predicted by Secretary of Commerce Hoover and others when the claim was made that the Department of Commerce had no authority under existing laws to control radio, has not as yet materialized but we are heading toward that end," said Frank H. McDonald, president of the Broadcast Listeners' Association of America. "Stations are jumping their wavelengths and increasing the power allotted them by the Department of Commerce. Other stations are coming on the air, choosing the wavelengths and power. There is no telling what the situation will be by the time effective legislation is enacted. It is hoped this will be in the early Fall.

"The Broadcast Listeners' Association of America has called a general strike, using the boycott as a means of bringing the pirating stations to understand that the listeners' rights will be protected. This strike is now in full swing, the volume of strike pledges increasing each day, the listeners refusing to tune in on any pirate station at any time under any circumstances.

"Realizing it would be dangerous to rely on the pirate stations using common sense or good business judgment in the matter, the Broadcast Listeners' Association, in an endeavor to obtain complete data from all the angles, asks all stations to meet the Broadcast Listeners' Association in open debate and will hold an open forum.

"From September 27 to October 2, at the National Radio Exposition, Hotel Sherman, Chicago, this forum will be held. Satisfactory arrangements have been made with Milo E. Westbrooke, manager of the exposition.

"The Broadcast Listeners' Association will not wait and hope for the best, or depend upon the radio strike to solve this

problem, although the strike will eventually force the pirating stations to act in a manner that will prevent chaos. Even with this accomplished there remains the future of radio to be considered. Therefore, the officers of the association have unanimously decided to use its entire power, influence, and all its facilities to bring about a solution of this problem."

Those wishing to take part in the Open Forum should write the approximate date they will be present, substance of theories and views for debate in duplicate manuscript form. The remarks will be read and recorded if it is impossible for the author to be present. Address Frank H. McDonald, 431 South Dearborn St., Chicago.

## Public Opinion Called Decisive

Commenting on the present changes in wavelength by broadcasters who are interested in obtaining better results for themselves Frank Reichmann, president of the Reichmann Co., expressed regret that the present radio law did not control the assignment of wavelengths.

"There need be no worry about chaos of the air, however," Mr. Reichmann explained. "The voice of the public would be heard should any broadcaster transgress on the right of any other station already transmitting.

"The public is the final judge of the value of a broadcasting station, and with the only payment broadcasters get from their listeners being in the form of good will, there is little doubt that no waves will be used at any time that are not satisfactory to a large majority of the listening public."

## 5 STATIONS INCREASE IN METERS

WASHINGTON.

Four new stations were licensed by the Department of Commerce, while five stations changed their wavelengths.

### NEW STATIONS

KGBX, Julius B. Abercrombie, St. Joseph, Mo., 3478 meters, 862 kc.

WKBS, H. L. Ansley, Birmingham, Ala., 225 meters, 1,333 kc.

WJBY, Electric Construction Co., Gadsden, Ala., 270.1 meters, 1,110 kc.

WJBX, Henderson & Ross, Oosterville, Mass., 280 meters, 1,071 kc.

### WAVE CHANGES

KTAB, Associated Broadcasters, Oakland, Calif., from 240 to 302.8 meters.

KFPY, Symons Investment Co., Spokane, Washington, from 265.3 meters to 275 meters.

KFQU, W. Riker, Holy City, Calif., from 217.3 meters to 273 meters.

KMA, May Seed and Nursery Co., Shenandoah, Iowa, from 252 meters to 461.3 meters.

KWKH, W. K. Henderson I. W. and S. Co., Shreveport, La., from 260.7 meters to 312.3 meters.

## Freshman Opposes Wavelength Grabs

Chas. Freshman said:

"The present broadcast situation, though far from being in a chaotic state, as some prolific newspaper accounts seem to bear out, is nevertheless undergoing a remarkable series of changes which will result in a more dependable public service.

"Instead of having the effect of deterring people from purchasing radio receivers, the very fact that our sales are steadily climbing proves that the majority of the people have faith in Congress and that everything will be straightened out to the best advantage.

"Those few stations which have jumped their wavelengths will soon realize that public sentiment is against any extreme measures that they may undertake, and in one instance, already on record, a judge has decreed that any change in wavelength is illegal.

"We must be thankful that the greater majority of our broadcasters have good common sense and that they use it."

# Trend Is Toward Much Higher Power

**Fourteen New Stations Listed in Six Weeks, But Many  
More Increase Their Output— 50 More  
Licenses Prophesied**

WASHINGTON.

Changes in the alignment of stations since June 30 indicate what the fan may expect when cold weather makes distance reception possible.

On June 30 there was a total of 528 stations. At present there are 542 stations, an increase of 14. Furthermore, there has been a sharper increase in power than in the number of stations.

At the time of adjournment of Congress there were 114 stations operating between 545.1 and 280.2 meters inclusive, with 414 stations between 280.2 and 202.6 meters inclusive. At the present time

there are 145 stations between 545.1 and 280.2 meters and 397 stations between 280.2 and 202.6 meters.

Most of the new stations which are operating in the former class B band are working simultaneously with one or more other stations on the same wavelength.

Chief Radio Supervisor W. D. Terrell does not think the situation particularly grave at present, but he is not very optimistic for this Winter. He expects that around fifty more stations will be licensed and that there will be a big increase in power on the part of a number of other stations.

## Operatic Soprano Is a Hit at WSM

An artist of rare ability has been added to American radio by WSM, Nashville, Tenn., with the advent of Mrs. M. H. Goldschein, whose dramatic soprano voice has interpreted many of the airs from opera for the radio audience.

Madame Goldschein received her training from Paul Eisler, the conductor of the Metropolitan Opera Company of New York City and was being trained for opera when she transferred her residence to Nashville.

Her voice has a sure, mellow tone which lends itself admirably to the arias from Italian operas and her handling of American compositions meets the approval of the sternest critics. She broadcasts regularly from the studio of WSM.

# Inventions Light Progress of Radio

**Forty-seven Years Ago First Demonstration of Sending  
And Receiving Signals Was Given—Rapid Advance  
Followed—Great Inventions Cited**

Within the past few years, the radio field has been invaded by thousands of persons who know nothing of its evolution and are many times unable to distinguish between what is new and what is old. As a consequence, they waste much time and money in reinventing old devices and in evolving others to circumvent imagined patents on inventions long since in the public domain.

Back in 1678 Huygens, a Dutch mathematician and physicist, propounded the undulatory theory of light. It was from this date that wave motion was conceded to be connected with manifestation of energy such as heat, light and electricity. In 1843 Professor Joseph Henry, in an address before the American Society, announced that he had been successful in magnetizing needles at a distance of 220 feet. Twenty-four years later, in 1867, Ruhmkorff perfected the "Ruhmkorff coil," later used almost exclusively in wireless stations.

## Theory of Light

At about the same time James Clerk-Maxwell propounded the electromagnetic theory of light. This theory confirmed and extended that of Huygens and was supported by mathematical proofs which form the basis of radio engineering today. It was in 1879 that the first demonstration of the transmission and reception of radio signals up to a distance of several hundred yards was given by Professor D. E. Hughes and it was in 1888 that Rodolf Heinrich Hertz demonstrated experimentally the possibility of creating electromagnetic waves in the ether.

And from this beginning other scientists and investigators have added their work to the end that the world might have a better means of intercommunication.

The splendid work of Dolbear, Edison, Sir William Crookes, Elihu Thomson, Nikola Tesla, Lodge, Popoff, Marconi, Fessenden, Pickard, Dr. Rogers, and others famous for their pioneer work in the field, stand as shining examples of contributions to the art.

## Important Inventions

It will be interesting to learn which inventions are the most vital to an efficient broadcasting station.

In 1908 De Forest was granted a patent on the three-element tube, the wonderful device which makes broadcasting possible.

In this connection I might say that the so-called "Edison Effect," discovered in 1883 by Edison, lies at the base of the operation of a vacuum tube and it was De Forest's brilliant idea of conceiving a grid to control the electronic flow from an incandescent filament which is responsible for the very wonderful advances made in intercommunication.

The Heising modulation system and other refinements, such as speech control and speech amplifying devices, have greatly added to the efficiency and development of the modern broadcasting station. Thus, through the cooperative work of De Forest, Arnold, Logwood, Colpitts, Lowenstein, Heising, Farrington, and others, we have witnessed in the relatively short time a tremendous progress which will stand for all time in the

annals of history as having been the most rapid and most benefitting to mankind.

## Indirect Aids

Some of the more important inventions which do not find direct application to broadcasting but are indispensable for commercial and governmental uses are the direction finder as conceived by Bellini and Tosi, the carborundum detector by Dunwoody, the Fessenden beat method of reception, the Duddell and the Poulson arcs, the Alexanderson high frequency alternator, the decremeter as devised by Colster, the Marconi beam transmitter, etc. There are also thousands of minor inventions which find application and use in both a radio receiving and transmitting station. The nature and purpose of the countless various articles of course determines their value.

The carbon type microphone, invented by Edison, is one of the indispensable devices finding unlimited application in both telephony and radio. Without the microphone we would be at a distinct loss in modulating the carrier wave as efficiently as it is being done today.

## Wireless at Sea

Among the other important dates which stand as milestones in the progress of radio, December 12, 1901, will be remembered as the date when the first successful trans-Atlantic communication was accomplished. From then on until 1909 events of relatively little importance took place and then on January 23, of that year the S. S. Republic, after collision with the S. S. Florida, succeeded in calling assistance by wireless, with the result that all of her passengers and crew were

## GIFTED VIOLINIST



**PAULINE WATSON**, violinist, enjoyed often by those who listen to leading New York stations. She was most recently heard from WGBS, where she played classically pieces with superb technique.

saved before the vessel sank. This incident fanned men from all walks of life into a greater interest in wireless and from that time on we have witnessed a most rapid progress.

Following the Republic event on April 15, 1912, the S. S. Titanic struck an iceberg and sank, but owing to the prompt wireless calls for assistance the lives of more than 700 of her passengers were saved. The disaster aroused the world to the need of better and more reliable wireless communication, and so in the following June the International Radiotelegraphic Conference opened in London, where uniformity of practice in wireless telegraphic services was enacted into a binding legislation.—Leon L. Adelman.

# Sentimental Songs Lead the Requests

**Lost Sweethearts, Mothers Who Have Passed Away  
'And Religious Compositions Predominate  
As Themes in McQuhae's Mail**

A national census of songs that live is being made by Allen McQuhae, Irish tenor who conducts the Sunday evening Atwater Kent radio concerts this Summer. The songs of the series are chosen from requests from radio listeners. The census is expected to reveal not the "hits" of the day, which after a wave of popularity die out, but the songs that live through the years.

Mr. McQuhae's list of songs requested already runs far above 500. To sing all of them he estimates it would take him more than six months in half hour weekly concerts. He selects those, however, for which he receives the greatest number of requests each week and places them on his Sunday evening program.

For example, Mr. McQuhae says no one

has yet asked him to sing, "Yes, We Have No Bananas," while hundreds have requested such fine old favorites as "Silver Threads Among the Gold," "When You and I Were Young, Maggie," "Holy City," and "I Hear You Calling Me."

Requests for the songs popular during the world war are not numerous and as yet only one man has asked Mr. McQuhae to sing "The Star Spangled Banner."

Mr. McQuhae's census is expected to be an excellent guide for ambitious song writers as to theme and character. Sentiment is shown to be the prevailing motive in the songs most called for, with the themes of lost sweethearts, mothers who have gone and inspiring songs of religious character predominating.

## A THOUGHT FOR THE WEEK

IT was never intended by radio officials that broadcasting should be turned to propoganda purposes. But the word propoganda has been so worn to a frazzle during the past few years that it now means about everything from treason to a kind word about a new brand of chewing gum. So who shall say where interest ends and down-right offense starts?

# RADIO WORLD

REG. U.S. PAT. OFF.

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TELEPHONE BRYANT 6558, 6559  
PUBLISHED EVERY WEDNESDAY  
(Dated Saturday of same week)  
FROM PUBLICATION OFFICE  
HENNESSY RADIO PUBLICATION CORPORATION  
146 WEST 45th STREET, NEW YORK, N. Y.  
(Just East of Broadway)  
BOLAND BURKE HENNESSY, President  
M. B. HENNESSY, Vice-President  
FRED S. CLARK, Secretary and Manager  
European Representatives: The International News Co.  
Brema Bldg., Chancery Lane, London, Eng.  
Paris, France: Brunato's, 8 Avenue de l'Opera  
Los Angeles: Lloyd B. Chappell, 611 S. Coronado St.

EDITOR, Roland Burke Hennessy  
MANAGING EDITOR, Herman Bernard  
TECHNICAL EDITOR, Lewis Winner  
ART DIRECTOR, J. Gerard Sheedy

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Fifteen cents a copy. \$8.00 a year. \$3.00 for six months. \$1.50 for three months. Add \$1.00 a year extra for foreign postage. Canada, 50 cents.  
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AUGUST 28, 1926

## A Matter of Money

GRANTING that the De Forest Radio Co. will hold its present position at law as the owner of the regeneration patent, it may sue to enjoin infringers of these patents, with an accounting for back profits and a refusal to permit the manufacturers to obtain a license to continue, or it may adopt a more conciliatory and financially profitable method and seek all it can get by the previously mentioned method, yet offer the opportunity of purchasing a license.

Interest focuses on what attitude will be adopted by the De Forest Co. in regard to the Radio Corporation of America. By announcement of counsel for the De Forest Co. the way is open for others to obtain licenses, but will this privilege be extended to the R. C. A.? Very likely it will, because even the bad feeling between the R. C. A. and the De Forest Co. will hardly deter the real owner of the patents from gathering in all possible money, which could be put to good advantage. Stockholders are not particularly inter-

## Tim Turkey Tells 'Em A Few About Patents

By Tim Turkey

THE R. C. A. in 1924 was too busy making patent suits to be able to make any money on selling its receivers. Maybe now it can turn most of its attention to the business of the day.

*How long does a patent have to be worthless before you can prove it?*

Whether you're a big manufacturer or just on the outside looking in depends on whether the judge writes "granted" or "denied" at the end of the long spiel that your lawyer has handed him.

De Forest will protect his patents for all they are worth and 10 per cent. extra. But he will grant licenses. That was more than the R. C. A. and Westinghouse were willing to do, unless for 10 per cent. or more of the gross. Lots of independents won't be suffering from abrasions, due to being slapped on the left forearm with injunction papers several times a day.

*If it takes nine years to find out that you own a patent, how much am I bid for the best radio patent on the market?*

ested in the satisfaction of grudges, and the De Forest stockholders probably would prefer to receive dividends than penniless revenge. Another point is that, even if the De Forest Co. now has the power virtually to put the R. C. A. out of the set business, an assumption not completely established, the R. C. A. must be given due credit for the position it occupies in the radio industry as a whole, and in the set manufacturing business in particular. It is really a sales organization, so far as sets go, the manufacturing being done for it, but the general public does not appreciate the distinction. The idea of putting the R. C. A. out of business, or seriously crippling it, has been maintained in spiteful quarters for quite a while, not only by persons in the industry, but by some politicians as well, and these base aims of its enemies have cost the R. C. A. a pot of money, a fact over which no one with a spark of fairness in his bosom need gloat.

But a patent is a patent and its owner has certain broad rights which it is his high privilege, indeed his duty, to enforce. Were the De Forest Co. to sleep on its recently confirmed right of ownership of the regenerative patents—two in number, in its case—it might well be deemed to have waived its rights. But there is no need to fear that pillows will be required in the offices of the De Forest patent asserters and defenders, for they are hot on the trail of gold, and if the courts are consistently good to them, huge riches will swell the coffers of the company whose valiant struggle has won the admiration of many.

A patent is a monopoly. In exchange for the disclosure of what the invention consists of, and the reversion to the public of the patent after 17 years of its life, the inventor gets exclusive control over and ownership of his contribution to the improvement of civilization. This smacks of lofty theory and socialized benevolence, when contrasted with the actuality—process servers secreting themselves in unexpected places, with summons and petition in injunction suits in their inside coat pockets. The law has been generous to the lawyer no less than to the inventor.

Counsel for the De Forest Co. points out that the R. C. A. can not drag out

Two fellows were discussing their girls. One said that he was quite satisfied that they exchange girls, but that he really did consider his girl just a trifle better. It was agreed the other fellow should relinquish his girl and one patent.

*No patent is any better than its lawyer.*

Pride cometh before a fall, and great demands for royalties and other penalties cometh before a discovery that the patent under which they are demanded isn't worth a burnt-out tube with the base removed and the glass envelope broken.

If you don't see any patent that you like, ask for it. Or if you see one you like, and you don't think you own it, sue for it, and check back on the other fellow's sales for the last five years.

Every set manufacturer should keep two sets of books, one for his own business and the other for anybody who may prove to him that his patent isn't his but the other fellow's. In the profit-and-loss column of the open-for-inspection book use red ink.

*Build a business today, and lose it to a patent lawyer tomorrow.*

the case interminably by appealing to the United States Supreme Court, since the District Court of Appeals is the court of final resort, and to that court the R. C. A. must be expected to appeal. This is no stage at which the R. C. A. will stop, after nine years of bitter struggle. What the final outcome may be no one dares to prophesy, since the courts frown on decision guessing, but the De Forest Co. wants the R. C. A. and all other alleged infringers enjoined or stayed from making or selling regenerative sets, pending appeal.

Tied up with the fight is a large number of set and parts manufacturers operating under the now exploded Armstrong patent, as direct or indirect licensees. The fight is an all-important one, indeed is momentous, although it is viewed even now with almost disinterested eyes by persons and concerns that should be alert to its great consequences.

As the upset of the Armstrong patent and the issue of two patents instead to De Forest took place in 1924, and as patents have 17 years to run, these two will expire in 1941, whereas the Armstrong patent would have run its course by 1931. The many who were impatiently awaiting the day when they could make regenerative sets and assemble such kits with hookups enclosed in the carton, without fear of patent suits, must therefore check their feelings for ten years extra, or suffer inconceivable tortures over a most protracted period.

## FINER SETS POPULAR

Time was when any old kind of a set that worked was plenty good enough, and people marveled at the phenomenon of reception. Now the public wants efficient and handsome sets and manufacturers are making such.

## FIRST ALASKAN BEACON

WASHINGTON.

The first radio beacon established in Alaska was placed in commission according to the Lighthouse Service. This signal is located at Cape Spencer and it marks the northerly entrance from the Pacific Ocean into the channels of southeastern Alaska.



# De Forest to Sell Licenses

## Offers Opportunity to Westinghouse to Buy Right Under Regenerative Grant That Has 15 Years Still to Run—Same Offer Likely to R. C. A. and Others—Rigorous Assertion of Patent Rights Promised.

Samuel E. Darby, Jr., chief patent counsel for the De Forest Radio Co., in a statement announced the readiness of his client to grant to the Westinghouse Electric & Mfg. Co. a license, under proper financial terms, to use the regenerative patents which the courts have awarded to Dr. Lee De Forest, cancelling Major Edwin H. Armstrong's patent. This declaration was taken to mean that the same opportunity would be extended to other alleged infringers, including the Radio Corporation of America, rather than attempting to stop infringement without alternative of the license purchase privilege.

Mr. Darby said the American Telephone & Telegraph Co. and the General Electric Co. are authorized De Forest licensees under the patents, the arrangements having been made long ago. An alleged grant by General Electric to the R. C. A. and to Westinghouse is void for illegality, Mr. Darby contends.

He pointed out the De Forest patents have fifteen years to run, while the Armstrong patent would have expired in five years.

The decision of Federal Judge Thompson in Philadelphia, invalidating the Armstrong patent No. 1,113,149 and holding that Dr. De Forest was the first and original inventor of the feedback circuit and the oscillating audion, as covered by his patents assigned to the De Forest Radio Company, Nos. 1,507,016 and 1,507,017, may be far reaching in its effect upon the present and future of the radio industry, Mr. Darby intimated.

### Darby's Statement

Mr. Darby's statement follows in full: "Those effected may be divided into four groups: (1) the Westinghouse Electric and Manufacturing Co., defendants in the recent suit, owners of the Armstrong patent and manufacturers of radio receiving and transmitting sets embodying the regenerative or feedback circuit and employing the oscillating audion (2) the licensees under the Armstrong patent; (3) the independent radio manufacturers; (4) De Forest Radio Company.

"To more fully appreciate the effect of this litigation on the radio art and industry one must realize the scope of the De Forest and Armstrong patents. First, this decision invalidates the Armstrong patent and substitutes the patents of De Forest.

"The Armstrong patent has been adjudicated by various courts to cover not only the feedback circuit for regeneration and reception but also radio transmission. Likewise the Armstrong patent has been held by Federal courts to cover radio frequency amplification where regeneration is usually always present and is controlled. A great majority of the reception sets now being manufactured or already in use employ regeneration in one form or another. Therefore the De Forest patents

will largely dominate the entire radio manufacturing industry as to both receiving and transmitting equipment.

### Peril to Westinghouse

"The Westinghouse Electric and Manufacturing Co. is immediately affected by the decision as it cannot continue to manufacture its present radio receiving and transmitting equipment without infringement of the De Forest patents, unless, of course, it procures a license.

"The Westinghouse Co. has been receiving royalties from a large number of licensees under the Armstrong patent. With this decision, these licenses are terminated with the Armstrong patent cancellation, and the former licensees become independent manufacturers whose product by reason of their statement that they are operating under such Westinghouse-Armstrong licenses make them infringers of the De Forest patents who may be immediately enjoined from further manufacture of their regenerative equipment.

"The following are the original licensees under the Armstrong patent. Some of these licenses have been transferred or the companies owning them have been acquired by other manufacturers.

Radio Corporation of America  
International Radio Telegraph Company  
A. H. Grebe & Company, Inc.  
Chicago Radio Laboratory  
Clapp-Eastham Company  
Culting & Washington, Inc.  
Adams-Morgan Company  
Precision Equipment Company  
Jones Radio Company  
Mignon Manufacturing Export Corp.  
Tri-City Electric Manufacturing Co.  
Klitzen Radio Manufacturing Co.  
Card Radio Laboratories  
Pennsylvania Wireless Manufacturing Co.

Eastern Radio Company  
Chelsea Radio Company  
Radio Craft Company  
The C. D. Tuska Company  
The Radio Shop  
The Colin B. Kennedy Company

### Independents Warned

"The position of the independent manufacturers is not changed. Their equipment previously infringing the Armstrong patent now infringes those of De Forest.

"The De Forest Radio Company may now hold every radio manufacturer in the United States employing the Armstrong patent or whose equipment heretofore was held to be an infringement of the Armstrong patent, such as regenerative receivers, transmitters, and radio frequency amplifiers with regeneration, for an accounting of their profits from such

## Pennsylvania Decision, Defeating Armstrong Patent, Can't Be Appealed to U. S. Supreme Court, Only to District Appeals Court, Says Darby—Will Seek Injunctions Against Infringers Pending Outcome.

manufacture made since September 2, 1924, and may enjoin these corporations against the continued manufacture of such apparatus.

"Authorized licensees under the De Forest patents at the present time are the American Telephone & Telegraph Co. and the General Electric Co. The latter is said to have granted a license to the Radio Corporation of America and the Westinghouse Electric & Manufacturing Co., the legality of which is now being litigated in the Federal courts.

### Appeal Limited

"Should the Westinghouse Co. elect to appeal from this decision to the United States Court of Appeals for the Third Circuit and court of last resort, the De Forest Radio Co. retains the right to institute injunction proceedings for infringement until such an appeal is finally decided. The decision of Judge Thompson was based on the law laid down by the United States Supreme Court and heretofore consistently followed by the Third Circuit Court of Appeals. Since no new point of law is involved, no appeal may be taken from the Circuit Court to the Supreme Court."

The De Forest patents were applied for early in 1914 but did not issue until September 2, 1924, because the right of De Forest to these patents had been vigorously contested in the Patent Office and it was necessary for him to press litigation up to and including the United States Court of Appeals for the District of Columbia, the court of last resort on United States Patent Office cases. Dr. De Forest's right was also contested by the United States Government, The General Electric and the Westinghouse companies. His patents will not expire until September 2, 1941; that of Armstrong would have expired in 1931.

## 25 Stations Win Frequency Honors

### WASHINGTON.

According to the Bureau of Standards the broadcasting situation is being stabilized in part by the friendly rivalry of stations for places on the Bureau's honor roll of those who maintain their frequency with high accuracy. During the past month, measurements revealed that twenty-eight stations have given evidence of holding their frequencies accurately on the assigned values and are of value as frequency standards.

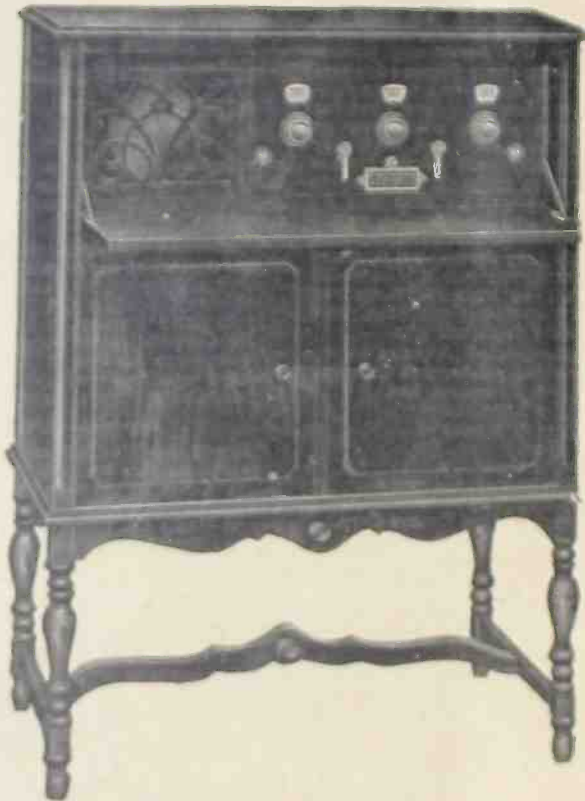
The special devices for frequency regulation employed by the constant frequency stations include piezo oscillators, piezo resonators and frequency indicators. The

number of stations upon which measurements were made was necessarily limited because of the practical difficulties involved in any measurements of this nature.

The constant frequency stations follow: WOC, Davenport; WTIC, Hartford, Conn.; WMAQ, Chicago; WCCO, Minneapolis-St. Paul; WWJ, Detroit; WLS, Chicago; KFAB, Lincoln, Neb.; WJJD, Mooseheart, Ill.; WEAQ, Columbus, O.; KFKA, Greeley, Colo.; KFH, Wichita, Kansas; WENR, Chicago; WCAD, Canton, N. Y.; WAAM, Newark, N. J.; WSKC, Bay City, Mich.; WOWO, Ft. Wayne, Ind.; KBBM, Chicago; WEBQ, Harrisburg, Ill.; KFVS, Cape Girardeau, Mo.; WOK, Homewood, Ill.; WPDQ, Buffalo; NAA, Arlington; WEAJ, New York; WRC, Washington; WJZ, New York; WGY, Schenectady; WBZ, Springfield, and KDKA, Pittsburgh.

# Freshman Announces Line for New Season

Latest Developments Represented in Receivers and  
Accessories—Power Plant Enables Complete  
Operation From the Line



The Freshman 6-F-10, in burled walnut, known as the Aristokrat

Meeting the demand for a popular priced radio receiver, the Chas. Freshman Co., Inc., has this season, as in the past, realized the necessity for bringing forth a receiver incorporating the latest radio developments and design. The all-

metal panel and subpanel which characterize the Freshman products this year are but two distinct features embodied in the Freshman Masterpiece Receivers.

Other points of interest are: The manner of telephone cable wiring of the low potential leads; the speedometer type of tuning controls which allow ease in tuning; the auto type thermostat controls which afford minute filament adjustment; the

non-microphonic socket suspension; the exceptionally beautiful mahogany and walnut console cabinets with their built-in loud speakers.

Very little change has been made in the circuit design itself, since the Freshman circuit is the only self-stabilized one ever popularized and employs no additional compensating controls or adjustments.

This year, however, instead of arranging the circuit for use with standard tubes, the second stage of audio frequency amplification is designed to accommodate a power tube, if so desired. A step further ahead was also made by using a jack in the output of the first stage of audio frequency amplification into which can be plugged the power amplifier unit, which the Freshman Co. also manufactures. Thus special heavy duty, non-distorting audio frequency amplifier transformers have been designed and employed with excellent results. C battery connections are also provided, and with the A-B-C Power Supply unit which the company makes, the entire receiver can be operated from the light socket.

This year's models include: The 6-F-1, compact console in a five-ply genuine mahogany with built-in loud speaker. In burled walnut, the console, known as the "Hi Hog," is 6-F-2.

The 6-F-3, a two-toned mahogany console with compartments for batteries and battery eliminators and chargers, also has a built-in loud speaker. This model in burled walnut is known as the 6-F-4.

Those desiring a table model in a receiving set will find the 6-F-5 most satisfactory. Complete with built-in loud speaker, it is encased in a heavy genuine mahogany cabinet.

The Franklin receiver is the handsomest of the Freshman table models. This receiver has a hinged front panel of the desk type of construction and with its self-contained loud speaker offers a splendid value.

The Franklin Console is a combination of the Franklin receiver and a beautiful mahogany table of vigorous lines and fine proportions. It is made in a two-tone effect of soft and alluring beauty.

Of the highest type of radio console is the model 6-F-9. The "Aristokrat," a sumptuous creation of lustrous finish and outstanding lines. It is made in a genuine two-toned mahogany as the 6-F-9, and in a most artistic burled walnut as the 6-F-10. A cone type loud speaker is incorporated.

The 1927 advance models of the Freshman Masterpiece receivers show that quality, both in workmanship and performance, is the outstanding feature.

## R. C. A. SUES WALKER; FACES STIFF FIGHT

Suit has been begun by the Radio Corporation of America against the George W. Walker Co., of Cleveland, over the sale of parts useful in Super-Heterodyne receivers. An injunction is asked. The patents cited by plaintiff are Armstrong 1,342,885; Hammond, 1,491,772 and 1,491,774; and Alexanderson, 1,465,990 and 1,508,151. Attorneys for Walker state these patents have not been adjudicated in the Sixth Judicial Circuit.

The George W. Walker Co. asserts that it intrudes no patent and will fight the suit to a finish.

## "Look Up Down"

### FOR SERVICE

A Complete Line of Radio Parts of the highest kind for all popular circuits.

Official Factory Service for

RADIOLA R. C. A. OPERADIO

CHAS. W. DOWN  
250 BROADWAY NEW YORK CITY

## "RAMBLER-SIX"

THE ONLY  
REAL  
PORTABLE

**\$90**

without  
tubes or batteries

Satisfaction Guaranteed

WRITE FOR KIT PRICES

Approved by Radio World Laboratories

American Interstate Radio Service  
183 Greenwich Street, New York City  
Sole Distributors, Dealers, write for special trade terms

GRAM'S OFFICIAL PAVED ROAD ATLAS OF THE UNITED STATES. Now ready. Make no those who want to map out the best routes covering continental, national, international, and foreign travel, showing the essential, avoiding intricate details, important to interests and increasing pleasure. Made on request of the company, ask for number COLUMBIA PRINT, 145 W. 45th St., N. Y. C.

SEE SEPTEMBER, 1926,  
"RADIO NEWS"  
ON THE NEW  
"1927 DIAMOND  
OF THE AIR"

Send in for Bulletin 708

B. C. L. Radio Service, Inc.  
25 FULTON ST. NEW YORK CITY

THE BRETWOOD GRID LEAK 6A8 and you to get 125 tubes in the structure. Order an amount of 12.30. South American Bretwood Co., 145 W. 45th St., N. Y. C.

# THE RADIO TRADE

## Schott Promoted To Chief of Sales

Announcement has been made by the National Carbon Company, Inc., manufacturers of Eveready flashlights, radio batteries, and dry cells, of the appointment of Harry S. Schott as general sales manager. Mr. Schott goes to his new office from the post of assistant general sales manager, which he has occupied for the past two years.

Mr. Schott is a widely known figure in the electrical industry, with which he has been identified in both the jobbing and manufacturing ends of the business for almost 25 years. During most of this period he was actively engaged in selling and sales direction in the Eastern States and Canada.

His first association with the line of goods made famous by the Eveready trademark was in 1913 when he went with the old American Eveready Works to assist in launching the first advertising campaign undertaken for Eveready flashlights. Mr. Schott then entered the Canadian territory for the American Eveready Works, whose Canadian branch was established in 1914. When the Canadian branch was taken over by the Canadian National Carbon Company in 1918, he was named assistant sales manager.

Mr. Schott returned to New York in 1920 as Eastern sales manager of the American Eveready Works, and when they were absorbed by the National Carbon Company in 1921 he became the Eastern district manager for the latter concern. He was appointed assistant general sales manager of the National Carbon Company in 1924, and continued in that capacity until his recent appointment as general sales manager.

## Fiske Takes Post With C. E. Mfg. Co.

Edward R. Fiske, formerly Eastern sales manager for the Waage Electric Company of Chicago, has joined the staff of the C. E. Manufacturing Co., Inc., at 702 Eddy Street, Providence, R. I., as assistant director of sales.

Mr. Fiske has long been associated with radio sales work and activities, having managed the Eastern field for the Waage Electric Company for the past two years. Prior to that he was buyer for the radio section of the John Wanamaker Store, New York City. From shortly after the war up until his entering the Waage Electric Company he was identified with that organization, and during the world war, Mr. Fiske was on active duty in the Radio Communication Department of the U. S. Navy.

The wide, varied and successful experience in the radio field, makes the new sales executive of the C. E. Manufacturing Co. well capable of riding to success with the "CeCo" tubes, which the concern manufactures.

Incidentally, the C. E. Manufacturing Co. are the largest exclusive tube manufacturers in the United States, and are making an excellent product which can account for their rapid strides made in the past few years.

Mr. Fiske feels that he will be able to do many a good turn to his old friends by lining them up with his new employers.

### WBBM IS ELECTED

The Stewart-Warner Speedometer Corporation which conducts the Stewart-Warner Air Theatre through station WBBM, has been made a member of the Chicago Broadcaster Association.

## Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

Trade Service Editor,  
**RADIO WORLD,**  
 145 West 45th St., N. Y. City.  
 I desire to receive radio literature

Name .....

Address .....

City or town .....

State .....

- William McCann, Irving, Mich.
- J. Southwick, Eastport, Maine.
- Jas. J. Burda, Gannon, Ia. (Dealer.)
- Joseph Kase, 9410 Nelson Ave., Cleveland, Ohio.
- Eugene L. Meadows, 312 South Ave., Wilkinsburg, Pa.
- Wilbur Bardin, Wauchuta, Fla. (Dealer.)
- C. W. Poff, 249 S. Lincoln St., Denver, Colo.
- Louis Thomas, 524 Baldwin Ave., Hays, Pa. (Dealer.)
- J. Ferguson, Kreps, 17 West Main, Madison, Wis.
- Franklin Shaffer, 861-20th St., Merced, Calif.

## Business Opportunities Radio and Electrical

Rates 10c per word; Minimum, \$1.00; Cash with order

**WILLING INVESTOR** with sales ability to manage chain store; must have \$5,000 to invest in a well-established radio and hardware concern needing capital to open a series of chain stores; no previous experience necessary; complete instructions given; every prospect must be willing to submit to training in one of our stores before taking over complete management. Phone Cortland 0677 (N. Y. City) for appointment with Mr. Pering. Excellent opportunity for right party.

**RADIO LOUD SPEAKER** cries aloud for proper representatives; everywhere; exclusive territory; cheap for cash buyers, otherwise strictly commission. Brownie Products Corp., Ridgewood, N. J.

**U.J. Herrmann**  
Managing Director

**G. Clayton Irwin Jr.**  
General Manager

# Radio Manufacturers' Show Association

Third Annual **RADIO WORLDS FAIR**  
Madison Square Garden  
New York City  
Sept. 13-18-1926

Fifth Annual **CHICAGO RADIO SHOW**  
Coliseum  
Chicago  
Oct. 11-17-1926



### THE WORLD'S FOREMOST RADIO EXHIBITIONS

With new distance records being made daily, radio is destined to link the world, bringing all nations into one big family. Whether or not you are a radio fan, you should keep abreast of the latest developments in this marvelous new industry.

At the New York and Chicago shows every representative radio manufacturer will display his new products—a complete showing of everything new in radio. There are all kinds of shows, but this is the show you can't afford to miss.

**"Go to the Radio Show"**

# Stoner & Heath Take a New Line


The English-Whitman line of products is now ready for the trade. One is the English-Whitman loop, known as the "Tun-A-Loop" which matches all tuning dial settings regardless of the size of the condensers. Made of genuine Bakelite and spider web wound with silk over phosphor bronze wire, it prevents dielectric losses and eliminates possible leakage. It can be used on any set which has radio frequency, gives amazing results on regenerative sets, works on Neutrodynes and all classes of Super-Heterodynes. The list price is very reasonable.

The English-Whitman speaker is expected to create a sensation, as it uses an entirely new principle and is hornless and coneless. After much thought and consideration of the field, the English-Whitman Company have placed their lines in the hands of Stoner & Heath, 122 Greenwich Street, New York City. Full information may be had from this concern. Mention RADIO WORLD when writing.

# Acme Apparatus Announces Models

The Acme Apparatus Company of Cambridge, Mass., known the world over for their famous slogan, "Acme for Amplification," announces the release of their 1927 specialties. The K-1 and K-2 double free-edge cone speakers will be on the market

**WORLD'S FINEST  
LOUD-SPEAKER**



A three-foot cone speaker—unit developed by the inventor of the Trapadyno. Easily assembled, saving 80% of the cost. Complete Kit with blue prints sold on rigid money-back guarantee—shipped prepaid or C.O.D. \$10.

**Engineers' Service Co.**  
25 Church Street New York

in improved form, with the addition of a new K-3 single free edge cone 11" in diameter. All the faithfulness of reproduction inherent in the two other models is maintained in this speaker. The K-3 can also be adapted to wall mounting by a simple adjustment.

Three models of B power supply at reasonable prices are also part of the new Acme line, together with a model for A supply and one for C supply. Eliminator kits for those who prefer to build their own may also be had, also a full line of filters, chokes and transformers. Audio amplification and miscellaneous parts to fill every need are also in the line. The "ham" is not neglected, for in the catalog appears everything to meet his heart's desire, all of the well-known Acme quality. A beautifully illustrated catalog will be sent to those interested upon application either to the Acme Apparatus Company, Cambridge, Mass. or Percy W. Mack, 1270 Broadway, New York City. Mention RADIO WORLD.

# New De Jur Catalog

The De Jur Products Company, 199 Lafayette Street, New York City, has just issued a 12-page catalog, illustrating describing and pricing their entire line of radio products for 1927. Featured therein is the new De Jur Resistance Coupled Amplifier which the company is marketing under the trade name "Planofier." This company is the maker of the famous De Jur rheostat and other excellent parts. They will be glad to send the catalog free. Mention RADIO WORLD.

# FERGUSON ENLARGES

J. B. Ferguson, Inc., manufacturers of "The Gold Standard of Radio Receivers," have been compelled to double their factory space due to the increased volume of business. The factory is located at 3542 41st Street, Long Island City, N. Y. The office is at 225 W. 57th Street, N. Y. C.

Bring in Europe on a  
**Victoreen "Super"**  
Write for Layout and Parts List  
**THE GEORGE W. WALKER CO.**  
6515 Carnegie Avenue Cleveland, Ohio

# Attention, Radio World Subscribers!

Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows a date earlier than the current issue, please send payment for renewal. Changes in expiration dates on wrappers appear two weeks after receipt of renewal.

RADIO WORLD, 145 West 45th St., New York City. (Phones: Brvant 0558-0559.)

# FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

# RADIO WORLD

RADIO WORLD

145 West 45th Street, New York City  
(Just East of Broadway)

Please send me RADIO WORLD for..... months, for which

please find enclosed .....

### SUBSCRIPTION RATES:

Single Copy.....	15
Three Months.....	1.30
Six Months.....	3.00
One Year, 52 Issues.....	6.00
Add \$1.00 a Year for Foreign Postage; 50c for Canadian Postage.	

# Empire-trons Line For 1927 Is Ready

The new line of Empire-trons, including the new gas-filled detector (EX200), high-mu and power amplifiers, is now on the market. These tubes are sturdily built for long service and are built to the most rigid and exacting requirements. On recent laboratory tests a line of Empire-Trons were kept in continuous operation over 1,200 hours without showing signs of paralysis. The internal workmanship is novel and clean-cut, and each tube must pass the most exhaustive test before being shipped from the factory. The three volt tube is made both in regular and adaptor base while the six-volt tube is made in both standard and navy style. A fully descriptive circular will be sent to those interested by the Empire Electrical Products Co., 132 Greene Street, New York City. Mention RADIO WORLD.



The second annual Pacific Northwest Radio Exposition will open its doors at the Public Auditorium, Portland, at noon, Tuesday, September 21, and will last five days.

# Pacific Show To Open Sept. 21

The decoration scheme is accentuated by the brilliant flood lights, Oregon scenic strips and colorful stage sykes that hide bare wall spaces.

The exploitation cost runs well over \$5,000. A very elaborate advertising campaign was prepared by Crossley & Failing, Inc.

The entertainment is so varied and of such quality as to encourage show goers to attend several nights. Stations KFJR, KFWV, KTBR, KGW, and KOIN will broadcast every evening.

### NEW CORPORATIONS

Century Radio Panel Corp., N. Y. C.; \$20,000.  
Reid & Green, Inc., Newark, N. J., electrical accessories; \$50,000.

### NAME CHANGES

Luxor Radio and Sport Shop to Luxor Radio Corp., N. Y. C.

### SEE JAY POWER UNIT



Here at Last!

A combination alkaline element battery and trickle charger all in one. Can be charged while set is operating. Price complete shipped dry with solution, \$16.00. 100-volt with Chemical Charger, \$12.00. 140-volt, \$17.00.

Write for our illustrated 24-page booklet and Send No Money Pay Expressman.

**SEE JAY BATTERY COMPANY**  
913 Brook Avenue New York City

BROADCASTING STATION, SUPERPOWER, 5,000 watt, licensed A. T. and T., and department includes Western Electric amplifiers and tubes, for sale, lease or hire; offers wanted immediately. Address Box 927, San Antonio, Texas. Business address 101 West Pecan St.

DETAILS OF WIRING THE DC B ELIMINATOR Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

**COMING EVENTS**

Aug. 21-28. Pacific Radio Exposition, Civic Auditorium, San Francisco. Pacific Radio Trade Association, 905 Mission St., San Francisco, Cal.  
 Sept. 5-11. Los Angeles Radio Exposition, Ambassador Auditorium, Auspices Radio Trades Association of Southern California. A. G. Farhamson, Secretary, 515 Commercial Exchange Building, Los Angeles, Cal.  
 Sept. 6-11. Omaha Radio Exposition. City Auditorium. Auspices Omaha Radio Trade Association, F. R. King, Secretary, Hotel Fontenelle, Omaha, Neb.  
 Sept. 13-18. Third Annual Radio World's Fair, New Madison Square Garden, New York City. Radio Manufacturers' Show Association, 1800 Times Building, New York City  
 Sept. 15-18. Akron Radio Show. Auspices Radio Dealers Association and "Times-Press." George Missig, Secretary, "Times-Press," Akron, O.  
 Sept. 20-25. Pacific Northwest Radio Exposition. Public Auditorium. George J. Thompson, Jr., Secretary, 411 Journal Building, Portland, Ore.  
 Sept. 20-26. Cleveland Second Annual Radio Exposition. Public Auditorium. G. B. Boden-hoff, Manager, 511 Guarantee Title Building, Cleveland, O., Room 817.  
 Sept. 25-29. Fourth Wisconsin Radio Exposition, Municipal Auditorium, Milwaukee, N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.  
 Sept. 27-Oct. 2. Second Allied Radio Congress and National Radio Exposition, Exposition Hall, Hotel Sherman, Chicago. Milo E. Westbrooke, Manager, 608 South Dearborn Street, Chicago, Ill.  
 Sept. 27-Oct. 2. Boston Radio Exposition, Mechanics Building, Shelden Fairbanks, Manager, 209 Massachusetts Avenue, Boston, Mass.  
 Sept. 27-Oct. 2. North-west Radio Exposition, Kenwood Armory and Coliseum, Minneapolis. Harry H. Cory, Executive Secretary, 301 Tribune Annex, Minneapolis, Minn.  
 Sept. 28-Oct. 1. Utica Radio Show. State Armory. Auspices Utica Radio Association. H. Benner, Manager, "Observer-Dispatch," Utica, N. Y.  
 Oct. 2-9. Salt Lake Radio Exposition. Manufacturers Building, State Fair Grounds. Auspices Mountain States Radio Trades Association. H. S. Jennings, Secretary, 221 South West Temple, Salt Lake City, Utah.  
 Oct. 4-9. Pittsburgh Radio Show. James A. Simpson, Managing Director, 420 Bessemer Building, Pittsburgh, Pa.  
 Oct. 11-16. Rochester Radio Show. Convention Hall. Auspices Rochester Radio Dealers Association, Rochester, N. Y.  
 Oct. 11-17. Fifth Annual Chicago Radio Show, Coliseum. Radio Manufacturers Show Association, 127 North Dearborn Street, Chicago, Ill.  
 Oct. 18-23. Second Southwest National Radio

Show, New Coliseum, St. Louis. Auspices St. Louis Radio Trades Association. William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.  
 Oct. 25-30. Second Annual Indianapolis Radio Exposition, State Fair Grounds. Auspices Broadcast Listeners' Association. A. J. Allen, Secretary, 1406 Merchants' Bank, Indianapolis, Ind.  
 Oct. 25-31. Detroit Radio Show, Convention Hall. Sponsored by the Radio Trade Association of Michigan. A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.  
 Oct. 25-30. New Orleans Radio Exposition. Auspices Radio Trade Association and "The States." P. K. Ewing, Manager, States Building, New Orleans, La.  
 Oct. 26-29. Sioux Falls Radio Show. Coliseum. Auspices Civic Club. Roger S. Brown, Secretary, care "Argus-Leader," Sioux Falls, S. D.  
 Oct. 30-Nov. 6. Third annual Brooklyn Radio Exposition, 23rd Regiment Armory. Stephen T. Rogers, Managing Director, Suite 513, Albee Building, Brooklyn, N. Y.  
**Conventions**  
 Sept. 21-22. Cleveland First Annual Radio Convention. Hollenden Hotel. Jobbers and Dealers. Warren Cox, Chairman. Radio Apparatus Co., Cleveland, O.  
 Sept. 27-28. Wisconsin Radio Trade Convention. Auditorium. Milwaukee. N. C. Beerend, Manager, Box 1005, Milwaukee, Wis.  
 Oct. 18-23. Jobbers and Dealers Convention. Southwestern states. Auspices St. Louis Radio Trades Association. William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.  
 Oct. 25-31. State Radio Dealer Convention. Auspices Radio Trade Association of Michigan, Convention Hall, Detroit. A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.  
**Canadian Trade Shows**  
 Sept. 13-18. Winnipeg Radio Show, Royal Alexandria Hotel. Auspices Canadian Exhibition Co., 204 King Street, East Toronto, Canada.  
 Oct. 4-9. Mcatreal Radio Show, Windsor Hotel. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.  
 Oct. 25-30. Toronto Radio Show, Coliseum, Canadian National Exhibition Grounds. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.  
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**Canadian Products  
Totalled \$5,548,660**

WASHINGTON.  
 The total Canadian production of radio apparatus during 1925 amounted to \$5,548,660, according to a report to the Department of Commerce from Trade Commissioner L. W. Meekins, at Ottawa. The statistics for the year show a steady development of the industry and a tendency toward production of complete sets rather than parts. About 48,500 complete sets valued at \$2,196,000 were produced in Canada in 1925.

Imports of radio apparatus and parts into Canada totalled \$5,552,530, of which the United States supplied \$3,358,200. Royal Radio Corp., Jersey City, N. J., radio appliances, \$100,000; Samuel Coccaro, Byron Pull, Sigmund Auerbach, Jersey City, N. J. (Attys., Levitan & Levitan, Jersey City, N. J.)

**HAGER FATHER OF TWINS**  
 Twin girls, weighing six and eight pounds respectively, were born to Mrs. Kolin D. Hager. Her husband is studio manager and chief announcer of WGY, the Schenectady station of the General Electric Company.

The world's greatest variable grid leak, distributed by the North American Bretwood Co., is selling enormously, and is giving universal satisfaction. Get more out of your set by using the Bretwood Grid Leak. Mailed for \$1.50. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

**TO KEEP YOUR FILES COMPLETE,** you can order your newsdealer to put a copy aside for you each week while on your vacation. Or, send \$1.00 for RADIO WORLD from now until the end of August, and in this way you will not miss any copies. **SUBSCRIPTION DEPT., RADIO WORLD, 145 W. 45th St., N. Y. C.**

**JUNE EXPORTS \$441,396**

WASHINGTON.  
 Exports of radio apparatus from the United States during June totalled \$441,396, compared to \$443,981 during May.

**COMING  
SPECIAL SHOW NUMBER  
OF RADIO WORLD—DATED SEPTEMBER 11**

Last Red Form Closes Aug. 30—Last Black Form Closes Aug. 31.

Last year's Show Number of RADIO WORLD was one of the outstanding issues of the year in the radio publishing business. It gave splendid value to the shrewd advertisers in its pages. We aim to beat it this year.

This Show Number will be issued at a time when radio sales start again, and, as RADIO WORLD is the only National Illustrated Weekly, it will carry the New York Show to radioists all over the country. Cash in on this great interest in the Show by taking advertising space in this Show Number.

All the news of the New York Show, complete list of exhibitors—what they will display—and service features of value to the radio public.

**Regular advertising rates in force as follows:**

<b>GENERAL ADVERTISING—</b>	
1 Page, 7¼"x11", 462 lines.....	\$300.00
½ Page, 7¼"x5½", 231 lines.....	150.00
¼ Page, 4¾", D. C., 115 lines.....	75.00
1 Column, 2¼"x11", 154 lines.....	100.00
1 inch.....	10.00
Per agate line.....	.75
<b>TIMES DISCOUNTS—</b>	
52 consecutive issues.....	20%
26 times consecutively or E. O. W. one year.....	15%
4 consecutive issues.....	10%

For space in this unusually valuable issue, communicate at once with

**ADVERTISING MANAGER, RADIO WORLD, 145 W. 45th St., New York City**

# Steinmetz Lived Quaintly at Camp

## Had Own Menagerie as Guests, Enjoyed Canoeing, Was Quite Informal, Yet Always Kept Eye on Work

[Earlier chapters of the life of Charles P. Steinmetz were published in the three preceding issues.]

By John W. Hammond

Few men of science were so surprisingly informal, or so fond of knocking around with a few chums, as was Steinmetz. The friend who was closest to Stein-

metz for ten years or more after they both came to Schenectady was Ernst J. Berg, who was a fellow-worker with him at Lynn, and who was also transferred when the calculating department was moved from that city to the present headquarters of the company.

Steinmetz and Berg, one Sunday afternoon, were rowing on the Mohawk River, when their boat came to the mouth of a small tributary, locally known as Viele's Creek. The view at this point, as they looked upstream, was so pleasant that they pointed their boat in that direction and rowed as far as they could in the shallow water. Before long they came to a most attractive bluff which, they found upon landing, gave them a fine view of the landscape.

### Picked a Camp

It was a splendid place for a camp; and within five years, Steinmetz built a camp on that very spot. It was a little one-room shack at first, supported on the rather steep slope of the bluff by slender timbers, which hardly looked strong enough to bear very much weight. Later it was enlarged until it was a rough, but pleasant group of structures, all joined together and able to accommodate several persons overnight.

This camp became the one thing that Steinmetz really wanted for himself; and

it was the one thing which he took pains to secure as soon as he could afford to do so.

Hardly any other person in Schenectady lived in such a simple style as Steinmetz did, nor had such curious hobbies, nor enjoyed life in such a picturesque manner.

The Liberty Street place had a small green house on the grounds. This little building, enclosed in glass, was immediately made use of by Steinmetz to start a collection of cacti, ferns and especially orchids, of which latter he was always fond. Out in the yard, and also in the stable which stood back of the house, Steinmetz and Ernst Berg constructed some pens and cages for the numerous pets which they soon began to own.

### Great Friend of Animals

Steinmetz seemed to be able to make friends with creatures such as men do not often have about them. He managed to tame two crows that were accustomed to fly about the yard. Steinmetz used to call to them and offer them things to eat, until finally, to the astonishment of the whole neighborhood, he got them so tame that they would perch on his wrist and eat out of his hand.

They seemed to watch for him to come out into the yard, and would sometimes alight on his shoulder. They would also fly to the window-ledge of his bedroom and peer in at him when the window was open.

There were quite a few raccoons in the "menagerie" at Liberty Hall. One of these gave much trouble to the cook. He was so much better behaved than the others that the men allowed him to roam about the house. After he had discovered the kitchen, however, he ate up so much of the food that he was finally put back in his cage. Several young eagles were part of the collection of pets. There were also cranes and owls, squirrels and dogs, and a most intelligent monkey, known as Jenny.

Most remarkable of all was a young alligator, three feet long. Steinmetz and this alligator were great chums. It was a favorite pastime of his to teach the alligator tricks. He always told his friends that he could make the alligator do anything he wanted it to do. Sometimes this really appeared to be true.

Steinmetz insisted on having a little

**FREE!** To Each Purchaser of a WORLD 6-V. Radio or Radio BATTERY

**12-Cell — 24-Volt Storage 'B' Battery**

Positively given free with each purchase of a WORLD "A" Storage Battery. You must send this ad with your order. WORLD Batteries are famous for their guaranteed quality and service. Backed by years of successful manufacture and thousands of satisfied users. Equipped with Solid Rubber Cases, an insurance against acid and leakage. You save 50 per cent and get a

**2-Year Guarantee**

**Bond in Writing** WORLD Batteries "tell their friends." That's our best proof of performance. Send your order in today.

**Solid Rubber Case Radio Batteries**  
 6-Volt, 100-Ampere . . . . . \$14.25  
 6-Volt, 120-Ampere . . . . . 13.25  
 6-Volt, 140-Ampere . . . . . 14.00

**Solid Rubber Case Auto Batteries**  
 6-Volt, 11-Plate . . . . . \$11.25  
 6-Volt, 13-Plate . . . . . 13.25  
 12-Volt, 7-Plate . . . . . 16.00

**Send No Money** Just state battery you want and we will ship day order in received, by Express C. O. D. **FREE "B" Battery** included. Extra offer: 5 per cent discount for cash in full with order. Buy now and get a guaranteed battery at 50 per cent saving to you.

**WORLD BATTERY COMPANY**  
 1219 So. Wabash Ave., Dept. 17 CHICAGO, ILL.

**World STORAGE BATTERIES**

Get your Radio Date at 210 meters for the new 100 watt World Storage Battery Station, W5BC, Chicago. Watch for announcements.

"Outsell, Because They Excel"

**Empire TUBES and Loud Speakers All Types**

Dealers and Jobbers Write for Prices and Folder "W-11"

Look for "EMPIRE" Booth at Radio Show

**EMPIRE ELECTRICAL PRODUCTS CO.**

Laboratories and Factory: Kearney, N. J.  
 Sales Office: 132-134 Greene St., New York

**New and Improved FRESHMAN MASTERPIECE**

AT AUTHORIZED FRESHMAN DEALERS ONLY

## SUMMER PREMIUM SUBSCRIPTION OFFER

### For NEW RADIO WORLD Subscribers Ordering NOW

Radio World has made arrangements

—To offer a year's subscription FREE for any one of the following publications with one year's subscription for RADIO WORLD

—RADIO NEWS or —BOYS' LIFE or  
 —POPULAR RADIO or —RADIO DEALER or  
 —SCIENCE AND INVENTION or —RADIO (San Francisco) or  
 —RADIO AGE

This is the way to get two publications

—for the price of one:  
 —Send \$6.00 today for RADIO WORLD  
 —for one year (regular price)  
 —for 52 numbers)  
 —and select any one of the other  
 —nine publications for twelve months.

—Add \$1.00 a year extra for  
 —Canadian or Foreign Postage.  
 —Present RADIO WORLD subscribers  
 —can take advantage of this offer by  
 —extending subscriptions one year  
 —if they send renewals NOW!

**RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK**

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for which send me RADIO WORLD for twelve months (52 numbers), beginning.....  
 and also without additional cost, Popular Radio, or Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Radio Age, or Boys' Life (or \$10.00 for two yearly subscriptions).

Indicate if renewal. Name .....

Offer Good Until Street Address .....

Sept. 15, 1926 City and State .....

laboratory in the house, and in tinkering around in the evenings or perhaps late at night, making all sorts of experiments. Sometimes he would try an investigation in chemistry that would fill the house with unbearable odors and leave yellow stains on the window draperies. And sometimes it would be an electrical experiment, which to any one except an electrical engineer, might seem even more terrifying because of the sputtering blue sparks and flashes that were produced.

Frequently during the time that he was at Liberty Hall, he was visited by young engineers of the General Electric Company who admired his brilliant engineering accomplishments. About the beginning of 1901, a young engineer named Chamberlain, who had known Steinmetz a short time, called at Liberty Hall. He brought another young visitor with him, Joseph LeRoy Hayden, whom he introduced to Steinmetz. A few days later they called again and gradually Hayden began to feel quite at home with Steinmetz, whose manner and conversation greatly interested him.

**Adopts a Son**

From these purely ordinary little occasions, growing out of a mere chance acquaintance, there developed a life-long intimacy between Steinmetz and Hayden that finally provided Steinmetz with the only family life he ever knew. It was an extremely pleasant domestic circle, with Hayden as the adopted son of the famous engineer, and, as the years went on, Hayden's children as the adopted grandchildren.

The opportunity for Hayden to become a special friend of Steinmetz's occurred during that summer of 1901, at the latter's camp.

According to his regular custom, Steinmetz invited Hayden to spend a week-end at the camp. It was the usual thing for a party of young men to go out there every Saturday afternoon and stay until Sunday night. As a rule, there was a most enjoyable social party on Saturday night, and boating and bathing all day Sunday, with beef steak dinner Sunday noon. That was Steinmetz's favorite Sunday dinner, which he cooked himself. No one thought of wearing ordinary clothes at the camp. They always wore bathing suits. Steinmetz wore one constantly.

In 1900, Steinmetz abandoned Liberty Hall for new and larger quarters on property which he had bought for the

purpose. The General Electric built him a two story laboratory, which was finished before his house, so he moved into the laboratory.

He brought with him a number of articles of furniture which he had purchased while living on Liberty Street, and these were scattered about in the laboratory wherever there happened to be room for them. A bookcase, a horse-hair lounge, some parlor chairs, and several pieces of bric-a-brac seemed all mixed in with the laboratory and chemical equipment. It looked very odd to those who came to see Steinmetz; but it did not disturb Steinmetz in the least.

He felt exceedingly happy in his new surroundings. He had a wonderfully fine place for his ceaseless experiments. He had provided his rare plants with a shelter even before he had thought of lodgings for himself. And for the time being, he felt that he could live very comfortably in his new laboratory; for he was quite used to such an odd, half-disorderly kind of home as men often create when they live by themselves.

But the thing that made him most happy was his laboratory work. Only he never called it work. He liked electrical experiments so much, especially when he had to make use of mathematics, as he usually did, that it never seemed like work to him.

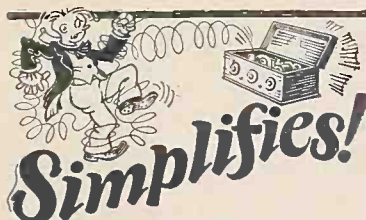
When he felt tired, or wanted to rest his mind, he would go into his conservatory and walk about among his plants. All around the conservatory, in hanging baskets, were many beautiful orchids, his favorite flower. And beyond them, in the

larger part of the conservatory, were all sorts of queer, tall desert plants, especially cacti. In these surroundings he spent the entire winter of 1901-1902, having moved out to his camp in the summer, finding life altogether a delightful experience.

**Invents an Arc Lamp**

In the very first year that Steinmetz took possession of his new private laboratory, he invented an arc lamp for street lighting. This was not by any means his only important invention. All his inventions together numbered nearly two hundred. But this one was the first one to attract wide attention.

(Broadcast by WGY)



No guessing, less wiring and—no grief—with AMPERITE. Eliminates hand rheostats. AMPERITE is the only perfect filament control. Specified in all popular construction sets. Price \$1.10.

**Radiall Company**

Dept. R.W.-9, 50 Franklin St., New York City



Write for FREE Hook-ups

The "SELF-ADJUSTING" Rheostat

**HARD RUBBER**  
SHEET—ROD—TUBING  
Special Hard Rubber Parts Made to Order  
**RADIUM HARD RUBBER**  
PANELS ANY SIZE  
Send for Price List  
WHOLESALE NEW YORK HARD RUBBER TURNING CO. 212 Centre Street  
RETAIL New York

1926 DIAMOND OF THE AIR BOOKLET, containing complete constructional data and diagrams, with blue print, 50c. Guaranty Radio-Goods Co., 145 West 45th Street, New York City.

**THE DIAMOND A BADGE OF MERIT**

Join the Happy Thousands Who Triumphantly Built This 5-Tube Set!

Real A Great Summer Easy to Know Quality! Receiver Tune, Easy to Build!

Herman Bernard, designer of this wonder circuit, has written an illustrated booklet on "How to Build RADIO WORLD'S 1926 Model Diamond of the Air." Send 50c and get this booklet, including a full-sized wiring blueprint and free nameplate.

Outstanding Features of Set: (1) Fans, charmed by tone quality, sensitivity and selectivity, report speaker reception of far-distant stations with great volume. (2) A 2-tube earphone set, a 5-tube speaker set, and a separate 3-stage audio-amplifier for immediate use with any tuner, are combined in one. (3) No rheostats are used. (4) The set is inexpensive to construct and maintain. (5) The set works from outdoor aerial or loop, hence no aerial problems present themselves, in city or country. Send \$6 for year's subscription and get booklet, blueprint and nameplate FREE.

[Newsdealers or radio dealers, order the booklets with blueprints included, in quantity, direct from American News Co. or Branches.]

Radio World, 145 West 45th St., New York City  
Nameplates Free to All

**FREE RADIO CATALOG**



**Special Summer Bargain Bulletin**

Parts, accessories, kits and sets—all the best and the latest. A \$1,000,000.00 Radio Stock to choose from. A copy of this unusual catalog is yours for the asking. Just drop us a line—now.

DEPT. R.W.

**CHICAGO SALVAGE STOCK STORE**

509 S. State St., CHICAGO, U. S. A.

# Stoner & Heath Take a New Line

The English-Whitman line of products is now ready for the trade. One is the English-Whitman loop, known as the "Tun-A-Loop" which matches all tuning dial settings regardless of the size of the condensers. Made of genuine Bakelite and spider web wound with silk over phosphor bronze wire, it prevents dielectric losses and eliminates possible leakage. It can be used on any set which has radio frequency, gives amazing results on regenerative sets, works on Neutrodyne and all classes of Super-Heterodynes. The list price is very reasonable.

The English-Whitman speaker is expected to create a sensation, as it uses an entirely new principle and is hornless and coneless. After much thought and consideration of the field, the English-Whitman Company have placed their lines in the hands of Stoner & Heath, 122 Greenwich Street, New York City. Full information may be had from this concern. Mention RADIO WORLD when writing.

# Acme Apparatus Announces Models

The Acme Apparatus Company of Cambridge, Mass., known the world over for their famous slogan, "Acme for Amplification," announces the release of their 1927 specialties. The K-1 and K-2 double free-edge cone speakers will be on the market

**WORLD'S FINEST  
LOUD-SPEAKER**



A three-foot cone speaker—unit developed by the inventor of the Trepadync. Easily assembled, saving 80% of the cost. Complete Kit with blue prints sold on rigid money-back guarantee—shipped prepaid or C.O.D. \$10.

**Engineers' Service Co.**  
25 Church Street New York

in improved form, with the addition of a new K-3 single free edge cone 11" in diameter. All the faithfulness of reproduction inherent in the two other models is maintained in this speaker. The K-3 can also be adapted to wall mounting by a simple adjustment.

Three models of B power supply at reasonable prices are also part of the new Acme line, together with a model for A supply and one for C supply. Eliminator kits for those who prefer to build their own may also be had, also a full line of filters, chokes and transformers. Audio amplification and miscellaneous parts to fill every need are also in the line. The "ham" is not neglected, for in the catalog appears everything to meet his heart's desire, all of the well-known Acme quality. A beautifully illustrated catalog will be sent to those interested upon application either to the Acme Apparatus Company, Cambridge, Mass. or Percy W. Mack, 1270 Broadway, New York City. Mention RADIO WORLD.

# New De Jur Catalog

The De Jur Products Company, 199 Lafayette Street, New York City, has just issued a 12-page catalog, illustrating describing and pricing their entire line of radio products for 1927. Featured therein is the new De Jur Resistance Coupled Amplifier which the company is marketing under the trade name "Planofier." This company is the maker of the famous De Jur rheostat and other excellent parts. They will be glad to send the catalog free. Mention RADIO WORLD.

# FERGUSON ENLARGES

J. B. Ferguson, Inc., manufacturers of "The Gold Standard of Radio Receivers," have been compelled to double their factory space due to the increased volume of business. The factory is located at 3542 41st Street, Long Island City, N. Y. The office is at 225 W. 57th Street, N. Y. C.

Bring in Europe on a  
**Victoreen "Super"**  
Write for Layout and Parts List  
**THE GEORGE W. WALKER CO.**  
6515 Carnegie Avenue Cleveland, Ohio

# Attention, Radio World Subscribers!

Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows a date earlier than the current issue, please send payment for renewal. Changes in expiration dates on wrappers appear two weeks after receipt of renewal.

RADIO WORLD, 145 West 45th St., New York City. (Phones: Bryant 0558-0559.)

# FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

# RADIO WORLD

RADIO WORLD

145 West 45th Street, New York City  
(Just East of Broadway)

Please send me RADIO WORLD for.....months, for which

please find enclosed .....

### SUBSCRIPTION RATES:

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

# Empire-trons Line For 1927 Is Ready

The new line of Empire-trons, including the new gas-filled detector (EX200), high-mu and power amplifiers, is now on the market. These tubes are sturdily built for long service and are built to the most rigid and exacting requirements. On recent laboratory tests a line of Empire-Trons were kept in continuous operation over 1,200 hours without showing signs of paralysis. The internal workmanship is novel and clean-cut, and each tube must pass the most exhaustive test before being shipped from the factory. The three volt tube is made both in regular and adaptor base while the six-volt tube is made in both standard and navy style. A fully descriptive circular will be sent to those interested by the Empire Electrical Products Co., 132 Greene Street, New York City. Mention RADIO WORLD.



standard and navy style. A fully descriptive circular will be sent to those interested by the Empire Electrical Products Co., 132 Greene Street, New York City. Mention RADIO WORLD.

# Pacific Show To Open Sept. 21

The second annual Pacific Northwest Radio Exposition will open its doors at the Public Auditorium, Portland, at noon, Tuesday, September 21, and will last five days.

The decoration scheme is accentuated by the brilliant flood lights, Oregon scenic strips and colorful stage sykes that hide bare wall spaces.

The exploitation cost runs well over \$5,000. A very elaborate advertising campaign was prepared by Crossley & Failing, Inc.

The entertainment is so varied and of such quality as to encourage show goers to attend several nights. Stations KFJR, KFWV, KTBR, KGW, and KOIN will broadcast every evening.

### NEW CORPORATIONS

Century Radio Panel Corp., N. Y. C.; \$20,000.  
Reid & Green, Inc., Newark, N. J., electrical accessories; \$50,000.

### NAME CHANGES

Luxor Radio and Sport Shop to Luxor Radio Corp., N. Y. C.

### SEE JAY POWER UNIT



Here at Last!

A combination alkaline element battery and trickle charger all in one. Can be charged while set is operating. Price complete shipped dry with solution, \$16.00. 100-volt with Chemical Charger, \$12.00. 140-volt, \$17.00.

Write for our illustrated 24-page booklet and Send No Money Pay Expressman.

**SEE JAY BATTERY COMPANY**  
913 Brook Avenue New York City

BROADCASTING STATION, SUPERPOWER, 5,000 watt, licensed A. T. and T., and department includes Western Electric amplifiers and tubes, for sale, lease or hire; offers wanted immediately. Address Box 927, San Antonio, Texas. Business address 101 West Pecan St.

DETAILS OF WIRING THE DC B ELIMINATOR Part II, by Lewis Winner, appeared in RADIO WORLD dated April 24. Sent on receipt of 15c, or start sub. with that issue. RADIO WORLD, 145 W. 45th St., N. Y. C.



**COMING EVENTS**

Aug. 21-28. Pacific Radio Exposition, Civic Auditorium, San Francisco. Pacific Radio Trade Association, 905 Mission St., San Francisco, Cal.  
 Sept. 5-11. Los Angeles Radio Exposition, Ambassador Auditorium, Auspices Radio Trades Association of Southern California. A. G. Faruharson, Secretary, 315 Commercial Exchange Building, Los Angeles, Cal.  
 Sept. 6-11. Omaha Radio Exposition. City Auditorium. Auspices Omaha Radio Trade Association, F. R. King, Secretary, Hotel Fontenelle, Omaha, Neb.  
 Sept. 13-18. Third Annual Radio World's Fair, New Madison Square Garden, New York City. Radio Manufacturers' Show Association, 1800 Times Building, New York City  
 Sept. 15-18. Akron Radio Show. Auspices Radio Dealers Association and "Times-Press." George Missig, Secretary, "Times-Press," Akron, O.  
 Sept. 20-25. Pacific Northwest Radio Exposition. Public Auditorium. George I. Thompson, Jr., Secretary, 411 Journal Building, Portland, Ore.  
 Sept. 20-26. Cleveland Second Annual Radio Exposition. Public Auditorium. G. B. Boden-hoff, Manager, 511 Guarantee Title Building, Cleveland, O., Room 817.  
 Sept. 25-29. Fourth Wisconsin Radio Exposition, Municipal Auditorium, Milwaukee, Wis. C. Beerend, Manager, Box 1005, Milwaukee, Wis.  
 Sept. 27-Oct. 2. Second Allied Radio Congress and National Radio Exposition, Exposition Hall, Hotel Sherman, Chicago. Milo E. Westbrooke, Manager, 608 South Dearborn Street, Chicago, Ill.  
 Sept. 27-Oct. 2. Boston Radio Exposition, Mechanics Building. Sheldon Fairbanks, Manager, 209 Massachusetts Avenue, Boston, Mass.  
 Sept. 27-Oct. 2. Northwest Radio Exposition, Kenwood Armory and Coliseum, Minneapolis. Harry H. Cory, Executive Secretary, 301 Tribune Annex, Minneapolis, Minn.  
 Sept. 28-Oct. 1. Utica Radio Show. State Armory. Auspices Utica Radio Association. H. Benner, Manager, "Observer-Dispatch," Utica, N. Y.  
 Oct. 2-9. Salt Lake Radio Exposition. Manufacturers Building, State Fair Grounds. Auspices Mountain States Radio Trades Association. H. S. Jennings, Secretary, 221 South West Temple, Salt Lake City, Utah.  
 Oct. 4-9. Pittsburgh Radio Show. James A. Simpson, Managing Director, 420 Bessemer Building, Pittsburgh, Pa.  
 Oct. 11-16. Rochester Radio Show. Convention Hall. Auspices Rochester Radio Dealers Association, Rochester, N. Y.  
 Oct. 11-17. Fifth Annual Chicago Radio Show, Coliseum. Radio Manufacturers Show Association, 127 North Dearborn Street, Chicago, Ill.  
 Oct. 18-23. Second Southwest National Radio

Show, New Coliseum, St. Louis. Auspices St. Louis Radio Trades Association. William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.  
 Oct. 25-30. Second Annual Indianapolis Radio Exposition, State Fair Grounds. Auspices Broadcast Listeners' Association. A. J. Allen, Secretary, 1406 Merchants' Bank, Indianapolis, Ind.  
 Oct. 25-31. Detroit Radio Show, Convention Hall. Sponsored by the Radio Trade Association of Michigan. A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.  
 Oct. 25-30. New Orleans Radio Exposition. Auspices Radio Trade Association and "The States." P. K. Ewing, Manager, States Building, New Orleans, La.  
 Oct. 26-29. Sioux Falls Radio Show. Coliseum. Auspices Civic Club. Roger S. Brown, Secretary, care "Argus-Leader," Sioux Falls, S. D.  
 Oct. 30-Nov. 6. Third annual Brooklyn Radio Exposition, 23rd Regiment Armory. Stephen T. Rogers, Managing Director, Suite 513, Albee Building, Brooklyn, N. Y.  
 Conventions  
 Sept. 21-22. Cleveland First Annual Radio Convention. Hollenden Hotel. Jobbers and Dealers. Warren Cox, Chairman. Radio Apparatus Co., Cleveland, O.  
 Sept. 27-28. Wisconsin Radio Trade Convention. Auditorium. Milwaukee. N. C. Beerend, Manager. Box 1005, Milwaukee, Wis.  
 Oct. 18-23. Jobbers and Dealers Convention. Southwestern states. Auspices St. Louis Radio Trades Association. William P. Mackle, Executive Secretary, 1207 Syndicate Trust Building, St. Louis, Mo.  
 Oct. 25-31. State Radio Dealer Convention. Auspices Radio Trade Association of Michigan, Convention Hall, Detroit. A. M. Edwards, Secretary, 4464 Cass Avenue, Detroit, Mich.  
 Canadian Trade Shows  
 Sept. 13-18. Winnipeg Radio Show, Royal Alexandria Hotel. Auspices Canadian Exhibition Co., 204 King Street, East Toronto, Canada.  
 Oct. 4-9. Montreal Radio Show, Windsor Hotel. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.  
 Oct. 25-30. Toronto Radio Show, Coliseum, Canadian National Exhibition Grounds. Auspices Canadian Exhibition Co., 204 East King Street, Toronto, Canada.  
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 Republished by Special Permission  
**JUNE EXPORTS \$441,396**  
 WASHINGTON.  
 Exports of radio apparatus from the United States during June totalled \$441,396, compared to \$443,981 during May.

**Canadian Products Totalled \$5,548,660**

WASHINGTON.  
 The total Canadian production of radio apparatus during 1925 amounted to \$5,548,660, according to a report to the Department of Commerce from Trade Commissioner L. W. Meekins, at Ottawa. The statistics for the year show a steady development of the industry and a tendency toward production of complete sets rather than parts. About 48,500 complete sets valued at \$2,196,000 were produced in Canada in 1925.

Imports of radio apparatus and parts into Canada totalled \$5,552,530, of which the United States supplied \$3,358,200.

Royal Radio Corp., Jersey City, N. J., radio appliances, \$100,000; Samuel Coccaro, Byron Pull, Sigmund Auerbach, Jersey City, N. J. (Attys., Levitan & Levitan, Jersey City, N. J.)

**HAGER FATHER OF TWINS**

Twin girls, weighing six and eight pounds respectively, were born to Mrs. Kolin D. Hager. Her husband is studio manager and chief announcer of WGY, the Schenectady station of the General Electric Company.

The world's greatest variable grid leak, distributed by the North American Bretwood Co., is selling enormously, and is giving universal satisfaction. Get more out of your set by using the Bretwood Grid Leak. Mailed for \$1.50. Guaranty Radio Goods Co., 145 West 45th Street, New York City.

TO KEEP YOUR FILES COMPLETE, you can order your newsdealer to put a copy aside for you each week while on your vacation. Or, send \$1.00 for RADIO WORLD from now until the end of August, and in this way you will not miss any copies. SUBSCRIPTION DEPT., RADIO WORLD, 145 W. 45th St., N. Y. C.

**COMING SPECIAL SHOW NUMBER OF RADIO WORLD—DATED SEPTEMBER 11**

Last Red Form Closes Aug. 30—Last Black Form Closes Aug. 31.

Last year's Show Number of RADIO WORLD was one of the outstanding issues of the year in the radio publishing business. It gave splendid value to the shrewd advertisers in its pages. We aim to beat it this year.

This Show Number will be issued at a time when radio sales start again, and, as RADIO WORLD is the only National Illustrated Weekly, it will carry the New York Show to radioists all over the country. Cash in on this great interest in the Show by taking advertising space in this Show Number.

All the news of the New York Show, complete list of exhibitors—what they will display—and service features of value to the radio public.

**Regular advertising rates in force as follows:**

<b>GENERAL ADVERTISING—</b>	
1 Page, 7 1/4"x11", 462 lines.....	\$300.00
1/2 Page, 7 1/4"x5 1/2", 231 lines.....	150.00
1/4 Page, 4 1/8", D. C., 115 lines.....	75.00
1 Column, 2 3/4"x11", 154 lines.....	100.00
1 inch.....	10.00
Per agate line.....	.75
<b>TIMES DISCOUNTS—</b>	
52 consecutive issues.....	20%
26 times consecutively or E. O. W. one year.....	15%
4 consecutive issues.....	10%

For space in this unusually valuable issue, communicate at once with

**ADVERTISING MANAGER, RADIO WORLD, 145 W. 45th St., New York City**

# Steinmetz Lived Quaintly at Camp

## Had Own Menagerie as Guests, Enjoyed Canoeing, Was Quite Informal, Yet Always Kept Eye on Work

[Earlier chapters of the life of Charles P. Steinmetz were published in the three preceding issues.]

By John W. Hammond

Few men of science were so surprisingly informal, or so fond of knocking around with a few chums, as was Steinmetz. The friend who was closest to Stein-

metz for ten years or more after they both came to Schenectady was Ernst J. Berg, who was a fellow-worker with him at Lynn, and who was also transferred when the calculating department was moved from that city to the present headquarters of the company.

Steinmetz and Berg, one Sunday afternoon, were rowing on the Mohawk River, when their boat came to the mouth of a small tributary, locally known as Viele's Creek. The view at this point, as they looked upstream, was so pleasant that they pointed their boat in that direction and rowed as far as they could in the shallow water. Before long they came to a most attractive bluff which, they found upon landing, gave them a fine view of the landscape.

### Picked a Camp

It was a splendid place for a camp; and within five years, Steinmetz built a camp on that very spot. It was a little one-room shack at first, supported on the rather steep slope of the bluff by slender timbers, which hardly looked strong enough to bear very much weight. Later it was enlarged until it was a rough, but pleasant group of structures, all joined together and able to accommodate several persons overnight.

This camp became the one thing that Steinmetz really wanted for himself; and

it was the one thing which he took pains to secure as soon as he could afford to do so.

Hardly any other person in Schenectady lived in such a simple style as Steinmetz did, nor had such curious hobbies, nor enjoyed life in such a picturesque manner.

The Liberty Street place had a small green house on the grounds. This little building, enclosed in glass, was immediately made use of by Steinmetz to start a collection of cacti, ferns and especially orchids, of which latter he was always fond. Out in the yard, and also in the stable which stood back of the house, Steinmetz and Ernst Berg constructed some pens and cages for the numerous pets which they soon began to own.

### Great Friend of Animals

Steinmetz seemed to be able to make friends with creatures such as men do not often have about them. He managed to tame two crows that were accustomed to fly about the yard. Steinmetz used to call to them and offer them things to eat, until finally, to the astonishment of the whole neighborhood, he got them so tame that they would perch on his wrist and eat out of his hand.

They seemed to watch for him to come out into the yard, and would sometimes alight on his shoulder. They would also fly to the window-ledge of his bedroom and peer in at him when the window was open.

There were quite a few raccoons in the "menagerie" at Liberty Hall. One of these gave much trouble to the cock. He was so much better behaved than the others that the men allowed him to roam about the house. After he had discovered the kitchen, however, he ate up so much of the food that he was finally put back in his cage. Several young eagles were part of the collection of pets. There were also cranes and owls, squirrels and dogs, and a most intelligent monkey, known as Jenny.

Most remarkable of all was a young alligator, three feet long. Steinmetz and this alligator were great chums. It was a favorite pastime of his to try to teach the alligator tricks. He always told his friends that he could make the alligator do anything he wanted it to do. Sometimes this really appeared to be true.

Steinmetz insisted on having a little

**FREE!** To Each Purchaser of a **WORLD 6 v. Auto or BATTERY**

**12-Cell — 24-Volt Storage 'B' Battery**

Positively given free with each purchase of a **WORLD "A" Storage Battery**. You must send this ad with your order. **WORLD Batteries** are famous for their guaranteed quality and service. Backed by years of successful manufacture and thousands of satisfied users. Equipped with **Solid Rubber Cases**, an insurance against acid and leakage. You save 50 per cent and get a **2-Year Guarantee**

**Bond in Writing** — Approved "tell their friends." That's our best proof of performance. Send your order in today.

Solid Rubber Case Radio Batteries	Approved
5-Volt, 100-Amperes . . . . .	and Listed
6-Volt, 130-Amperes . . . . .	as Standard
6-Volt, 140-Amperes . . . . .	by Leading
Solid Rubber Case Auto Batteries	Authorities
6-Volt, 15-Plate . . . . .	including Radio
6-Volt, 18-Plate . . . . .	News Labora-
12-Volt, 7-Plate . . . . .	series, Popular
	Science, Insti-
	tute of Stand-
	ards, Popular
	Radio Labora-
	series, Radio
	Broadcast Labo-
	atories, Radio
	in the Home,
	and Lectur-
	ized batteries at 50 per cent saving to you.

**WORLD BATTERY COMPANY**  
1215 So. Wabash Ave., Dept. 17 CHICAGO, ILL.

**World STORAGE BATTERIES**

Get your Radio Diets at 210 motors for the new 1000 watt World Storage Battery Station, WSPC, Chicago. Watch for announcements.

KOKA • WFAA • WGN • WJZ • KRLD • KGO • KFAP • WJY • KOB

"Outsell, Because They Excel"

**Empire**  
Ask The Manager, Please

**TUBES and Loud Speakers All Types**

Dealers and Jobbers Write for Prices and Folder "W"

Look for "EMPIRE" Booth at Radio Show

**EMPIRE ELECTRICAL PRODUCTS CO.**

Laboratories and Factory: Kearney, N. J.  
Sales Office: 132-134 Greene St., New York

**New and Improved FRESHMAN MASTERPIECE**

AT AUTHORIZED FRESHMAN DEALERS ONLY

## SUMMER PREMIUM SUBSCRIPTION OFFER

### For NEW RADIO WORLD Subscribers Ordering NOW

Radio World has made arrangements

- To offer a year's subscription FREE for any one of the following publications with one year's subscription for RADIO WORLD
- RADIO NEWS or
- POPULAR RADIO or
- SCIENCE AND INVENTION or
- BOYS' LIFE or
- RADIO DEALER or
- RADIO (San Francisco) or
- RADIO AGE

This is the way to get two publications

- for the price of one:
- Send \$6.00 today for RADIO WORLD
- for one year (regular price)
- for 52 numbers)
- and select any one of the other
- nine publications for twelve months.
- Add \$1.00 a year extra for
- Canadian or Foreign Postage.
- Present RADIO WORLD subscribers
- can take advantage of this offer by
- extending subscriptions one year
- if they send renewals NOW!

**RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK**

RADIO WORLD, 145 West 45th Street, New York City.

Enclosed find \$6.00 for which send me RADIO WORLD for twelve months (52 numbers), beginning . . . . . and also without additional cost, Popular Radio, or Radio News, or Science and Invention, or Radio Dealer, or Radio (San Francisco), or Radio Age, or Boys' Life (or \$10.00 for two yearly subscriptions).

Indicate if renewal. Name . . . . .  
Offer Good Until Street Address . . . . .  
Sept. 15, 1926 City and State . . . . .

laboratory in the house, and in tinkering around in the evenings or perhaps late at night, making all sorts of experiments. Sometimes he would try an investigation in chemistry that would fill the house with unbearable odors and leave yellow stains on the window draperies. And sometimes it would be an electrical experiment, which to any one except an electrical engineer, might seem even more terrifying because of the sputtering blue sparks and flashes that were produced.

Frequently during the time that he was at Liberty Hall, he was visited by young engineers of the General Electric Company who admired his brilliant engineering accomplishments. About the beginning of 1901, a young engineer named Chamberlain, who had known Steinmetz a short time, called at Liberty Hall. He brought another young visitor with him, Joseph LeRoy Hayden, whom he introduced to Steinmetz. A few days later they called again and gradually Hayden began to feel quite at home with Steinmetz, whose manner and conversation greatly interested him.

**Adopts a Son**

From these purely ordinary little occasions, growing out of a mere chance acquaintance, there developed a life-long intimacy between Steinmetz and Hayden that finally provided Steinmetz with the only family life he ever knew. It was an extremely pleasant domestic circle, with Hayden as the adopted son of the famous engineer, and, as the years went on, Hayden's children as the adopted grandchildren.

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But the thing that made him most happy was his laboratory work. Only he never called it work. He liked electrical experiments so much, especially when he had to make use of mathematics, as he usually did, that it never seemed like work to him.

When he felt tired, or wanted to rest his mind, he would go into his conservatory and walk about among his plants. All around the conservatory, in hanging baskets, were many beautiful orchids, his favorite flower. And beyond them, in the

larger part of the conservatory, were all sorts of queer, tall desert plants, especially cacti. In these surroundings he spent the entire winter of 1901-1902, having moved out to his camp in the summer, finding life altogether a delightful experience.

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In the very first year that Steinmetz took possession of his new private laboratory, he invented an arc lamp for street lighting. This was not by any means his only important invention. All his inventions together numbered nearly two hundred. But this one was the first one to attract wide attention.

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# Opposing Reactions Balance the Circuit

## Degeneration May be Employed by Permitting Preponderance of Capacity in the Plate Circuit

(Continued from page 10)

supply an inductive reaction that varies in the same way with frequency, then the two reactions will oppose.

We have already pointed out how we can control the magnitude of the inductive reaction, created as circuit 2 is varied in any desired manner, to produce or not produce oscillations, and by the same token we can control it to neutralize the capacitive reaction of the condenser C. By proper selection of elements we can make the reaction neutralization complete

to produce a non-reactive plate circuit, not only for one frequency but all frequencies, and therefore have neither regeneration nor degeneration, and all entirely independent of the inherent tube capacity.

The energy in the plate circuit is therefore solely the energy of natural amplification of the tube, and can be selected out of the plate circuit at and with the efficiency of exact resonance, and with further efficiency of as tight a degree of coupling as the overall requirements of the receiver dictate.

We find that the adjustment that produces a non-reactive plate circuit gives substantially constant energy transfer with frequency, so that we term this new system the Loftin-White Constant Coupling Non-Reactive Plate Circuit System, or L-W Circuit for brevity.

### Uses Degeneration

A further advantage of the system is that the plate circuit can be adjusted to remain slightly capacitive throughout the range, thus producing degeneration which may be useful in a particular multiple tube design of receiver where the overall location of parts leaves some regener-

ative or positive stray or distant stage feedback. This, of course, cannot be had in the neutralized type of set because the limit of adjustment is neutralization and nothing on the side of degeneration. This feature makes it possible for us to build sets with three stages of radio frequency without the elaborate per stage shielding that is being practiced in the more-than-two stage commercial neutralized set.

We think a good practical example of the stabilizing characteristics of our system is illustrated in our experience with the Atwater Kent "Compact." Its proportions and arrangement of parts offer unusual factors toward stray feedback regeneration. We removed from one of these sets the grid resistances used to limit regenerative effect, converted it to include our system, and thereafter operated it with impunity with full filament voltages, 200 volts on the plates, and with any and all tubes with perfect stability throughout.

As to our simplified regenerative detector see Fig. 16.

Here we use the grid circuit as the only tuned circuit of the system and couple the plate circuit to the tuned grid circuit with a combined coupling. The antenna may be coupled to the tuned grid circuit in any suitable way, but a combination Constant Coupling as shown is preferable.

### Resistive Tickler

The ordinary connection of the grid leak around the stopping-condenser cannot be made as the tuning condenser on one side and the coupling condenser on the other effectively interrupt the grid circuit against a grid bias, so that the grid leak must be connected directly between grid and filament.

By properly adjusting the combined coupling between the grid and plate circuits, constant regeneration or "tickling" with frequency is had, and by including a limited element such as the resistance R, it is easy to hold the system without repeated adjustment below oscillation for broadcast or spark telegraphy reception, or in oscillations for CW or heterodyne reception.

It will be noted that the connection across the coupling condenser is in the opposite sense to that shown in previous figures, but this is necessary as the feedback must be such as to aid the current

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**A DISCUSSION ON SELECTIVITY**, by J. E. Anderson, appeared in RADIO WORLD, dated June 19. Sent on receipt of 15c, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

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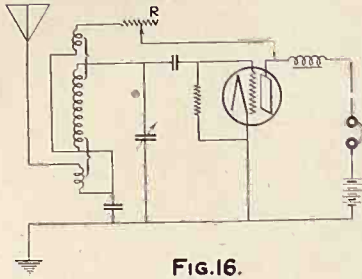


FIG. 16.

in the grid circuit. Care must be taken to so pole the inductive coupling that it will aid this new arrangement of capacitive coupling. This alternative capacity connection permits of connecting the rotary side of the tuning condenser to ground. Such a connection becomes necessary in multiple tube receivers using single dial control where all of the rotary elements must be at the same potential, usually ground potential. There results a slight reduction in voltage applied to the grid, since grid and filament are connected across the tuning condenser alone, which connection divides the overall available potential in the inverse ratio of the tuning and coupling condenser capacities.

While the matters outlined are based on long and most intensive laboratory study and experiment combined with actual construction from the ground up of numerous receivers of different plans and numbers of tubes, and the conversion of some fifteen or more well-known commercial models, yet we think there can be no more certain practical ratification of their soundness than is contained in the new "Single Six" receiver of The Hartman Electrical Manufacturing Company of Mansfield, Ohio, which receiver embodies the collaborative design of the engineers of that company and the writers conducted during the past winter to include the L-W Circuit in a radically new receiver.

The result is a 6-tube set having three stages of radio frequency amplification, detector and two audio stages, with single dial control, the whole being housed in the shortest space yet attempted for a multiple tube radio frequency system.

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**Directional Effect  
Of Aerial Doubted**

**Author Says Tests of Receiver Pickup Agencies Shows Other Factors Account for Difference in Results— Points to Fundamental Wavelength as Causing Deceptive Findings**

By *K. B. Humphrey*

That there is a directional effect in aerials when used in transmitting broadcast signals has been proven time and time again by accurate measurements. That there is a directional effect in a receiving aerial of the outside wire type has been proven, but not with the degree of accuracy that gives the definite results obtained in the first case. I will not go as far as to say that there is no directional effect, but I will say that it has never been proven to me conclusively that there is an effect.

By that I do not mean that different results are not to be obtained by putting up the aerial in different directions, but that the difference in almost every case can be traced directly to other things than the mere fact that the aerial is facing where the experimenter was using two different aerials to receive from different directions, the aerials themselves probably were totally unlike in shape and size.

**One Kind of "Test"**

Take for instance the case of one man. He had two aerials and in using the same receiver one aerial would bring in Boston at New York very loud while on the other the station could barely be heard at all. He attributed all to the directional effects of the two aerials. However, the aerial

which brought in the best results from Boston was lower in height and quite a few feet shorter. In fact the other aerial was by far the better aerial from all of the conventional ways of looking at an aerial! No measurements were taken at  
*(Concluded on page 30)*

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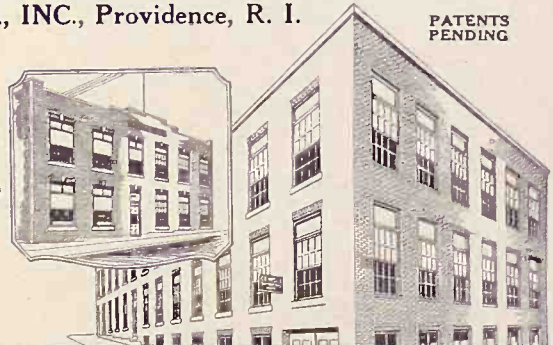


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# Loop Is Directional But Within Limits

## Incoming Wave Often Deflected, And In Some Instances All Stations Come in Best at One Particular Setting—Problem Arises in Big Cities

(Concluded from page 29)

the time but in all probability the shorter aerial in conjunction with the set was more particularly suited to the wavelength of the Boston station. This would cause the signal to come in with greater volume without taking into consideration any directional effects. It cannot be doubted that most of the cases where directional effects are attributed to the aerial that there are also other factors.

It is a well-known fact that to get the best results, or the greatest pickup, from a given station the aerial circuit must be tuned, at least approximately, to the same wavelength as the station.

### Needs Extra Control

This, however, introduces another control on the panel, and as a rule is not necessary. The fact that a tuned circuit in the aerial does bring better reception explains an otherwise unexplainable situation which is often met in receiving.

For instance, one man in the neighborhood will get a certain distant station with great regularity and good volume while his next-door neighbor can not get that station at all but can get some stations that the other man can not get. The whole thing rests in the aerial and ground installation. One happens to be best receptive to one particular wavelength and the other to another wavelength. Nothing can be done about it except possibly to change the aerial around. The experimenter, when he

changes his aerial, usually changes the entire characteristics and possibly he gets the results he wants. At least he gets different results. Such experiments give no definite results and lead the operator to conclusions which have little, if any, foundation for making a statement in regard to the directional effects. This is particularly true of experiments which are made in the city.

### Loop Is Directional

Some time ago some experiments were made with a loop aerial, which is directional. Directional readings were taken in different parts of the city on various stations. With loop fairly clear the directions as indicated by the loop approximated very closely the direction of the station, but when the loop was used in various positions inside of buildings and homes the directional effects as indicated by the loop were very erratic indeed.

In one house in Brooklyn the ether waves apparently came through in the same direction, as the maximum response was obtained by placing the loop in a certain direction, no matter in what direction the station was located. This condition did not seem to vary in the slightest whether the station was at some distance or a local station nearby and of the high power class.

Located in a steel building in the up-town section of New York there was a directional effect noticed but it varied considerably from the true directions in which the various stations were located.

Another fact was noted: each room in which the receiver was placed seemed to have a position in which the response was greater than in any other position in that room. This may be explained by the shielding effect of large masses of a metallic nature.

### Loop Limitations

From these experiments it would seem that even the loop is not a true directional finder when located in the city, especially inside buildings. There is no doubt in my mind that the broadcast waves are bent out of their true path in many instances. This effect was also noticed at one place located at some distance from surrounding objects and many miles from the city. It did not seem possible that a steel bridge located about two miles away could have any effect, yet Schenectady, according to the loop, was located in the direction of Chicago, rather than due north, as it should be.

From the foregoing it does not seem possible that any aerial could have any true directional effect, as is often claimed. Granted an aerial may work better in one position than in another, but it seems almost certain that the directional effect may be entirely due to the effect of screening by metallic objects, the length of the aerial, the properties of the ground, and the location of the receiver.

Most of the accounts that have appeared on this question have given very little authentic information. In most cases the fact that an aerial should be directional according to the way signals are sent out from an aerial is taken more or less for granted. Remember, we are discussing only the aerials commonly used for receiving broadcast signals and not specially designed aerials of highly complex characteristics.

### Asks for Information

Unfortunately I have never had an opportunity to get any accurate results on the subject of directional effects of aerials and consequently the effect, if it is of any consequence, is still an open question to me. Some experiments were performed in an airplane in regard to the directional effects but the results seemed to vary to such an extent that no definite conclusions could be reached whether there was a noticeable increase in signal strength due to direction alone. In these experiments the aerial was stationary on the ground in one direction and the plane was sending from all directions in turn it being flown in a wide circle. No particular difference could be noted in signal strength.

I would be interested in hearing from any one who has given this matter some thought and actually has proven that there is or is not a directional effect.

## Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in recent issues of RADIO WORLD:

1925:

- Sept. 19—The 1-Dial, 2-Tube Speaker Set, by Percy Warren. Anderson's Theory of Fading. The Way of the Frequency Dial, by Capt. F. V. O'Rourke.  
Oct. 24—The 3-in-1 RF Receiver, by Sidney E. Finkelstein. A Phonograph Cabinet Set, by Lewis Winner.  
Nov. 7—A 3-Tube Dry-Coil Circuit, by Capt. F. V. O'Rourke. One of the Best Crystal Sets, by Herbert E. Hayden. 1-Tube DX Set, by Herman Bernard.  
Nov. 28—The Zero Potential Loop, by Frank Freer. The 1-Tube Headset Receiver, by J. E. Anderson.  
Dec. 12—A Self-Contained Receiver, by H. E. Hayden (Part 1). B Battery Eliminator, by Lewis Winner (Holiday Gifts No.).  
Dec. 26—The Regenerative Wave Trap, by John P. Editor. The 5-Tube Tuned RF Set, by Capt. F. V. O'Rourke.

1926:

- Jan. 2—The 2-C Set for Simplicity, by Capt. F. V. O'Rourke.  
Jan. 9—The 4-Tube DX Symphony Set, by A. Irving Witz. A Skillfully Made 1-Dial Set, by Herman Bernard.  
Jan. 16—Anderson's 5-Tube Quality Receiver. The Raytheon B Eliminator, by Lewis Winner.  
Jan. 30—An Individual AF Amplifier, by H. E. Hayden. Trapping Out Super-Power in New Jersey, by Capt. F. V. O'Rourke.  
Feb. 20—The 8-Tube Victoreon, by Herbert E. Hayden. Quality Stressed in 3-Tube Set, by Brainard Poole.  
Feb. 27—The 4-Tube DX Dandy, by Herbert E. Hayden. Umbrella Aerial for DX, by Hugo Gernsback. Part 2 of the Victoreon.  
Mar. 6—The 1-Tube Set, by Capt. O'Rourke. The Chemistry of Batteries, by A. R. Held. The Victoreon Set (Part 3), by Herbert E. Hayden.

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# THEY ALL PRAISE THE **BRETWOOD** Variable Grid Leak

The Bretwood Grid Leak came with today's mail. It is now exactly 9:00 P.M. and the leak was installed about a half hour ago. This note is not only an expression of appreciation but also an attestation of the truth of your advertising. During the past half hour I have tuned in stations "ALL OVER THE DIALS" at leisure, and can adjust reception with the leak almost equal to a variable condenser.

I feel constrained to add that while waiting for reply and then receipt of leak from you, there has been on the set a fixed leak and condenser of well known and thoroughly reliable make, and fairly good reception has been enjoyed, but during this half-hour-only test thus far the results are inexpressibly beyond expectation. Have been a radio fan only about four years, but feel I have sufficient knowledge and experience to recognize a good thing upon fair trial. Your promptness and desire to satisfy your trade, in this case has won for you another "BRETWOOD BOOSTER." Thank you.  
The Rev. **WALTER G. BARLOW**,  
Bishopville, Md.

Very many thanks for your kind letter of the 21st ult. and for the grid leak, which works perfectly. I have tried four different makes of grid leaks. The Bretwood "has 'em beat."  
**M. SAWYER**,  
Box 238, Los Gatos, Calif.

Received your grid leak and wish to say that none can compare with it when it comes to clearing up reception.  
**JOHN A. BLACKBURN**,  
5328 Warren Ave., Norwood, Ohio.

Enclosed find P. O. money-order for \$3.00. Please send me two of your Variable Grid Leaks. I am using one and it works fine. Please mail them as soon as possible.  
**W. H. PERRY**,  
119 Congress St., Buffalo, N. Y.

Received your grid leak and many thanks. It is the best \$1.50 that I have spent for radio equipment.  
**ED. JENKINS**,  
703 E. Main St., Louisville, Ky.

Enclosed herewith find check for \$1.50 for one Bretwood Grid Leak. I am using your leak and find it far superior to any others. This is my third Bretwood.  
**J. C. WHITE**,  
422 W. Wooster St., Bowling Green, Ohio.

Will you please send me by return mail two Bretwood Variable Grid Leaks. I enclose herewith check for \$3.25, the 25c. being for a special handling stamp, as these leaks are needed at once. The leaks are the only satisfactory instrument on the market. I find them absolutely essential in the construction and operation of sensitive experimental receivers.  
**ED. J. WHITTIER**,  
The American Appraisal Co.,  
Milwaukee, Wis.

I want to thank you for your leak, it makes the set 100% better. I was going to have a Diamond of the Air built, but since I have added your leak to my set I am now down in the dining room of the first floor and the set is on the second floor. I can hear the set just as plainly as if I were up there. I can hear every player in any band or music which is on air. The first night I gave the leak a very good test, and I got four stations in Chicago, one in Detroit, one in Canada, one in Atlanta, Ga., and several others without any noise. All were good and clear. It is going to make me spend more money, as I will have to get a good loud speaker. The horn I have now is a Manhattan Jr., and is good and clear, but as soon as your leak is installed the howling present when using three tubes is immediately stopped.

**LEON E. COLE**,  
5816 Tilbert St., Philadelphia, Pa.

Grid Leak received and tested out, and find it is the only variable leak I ever used that is really variable. Enclosed find \$1.50, for which please send me another one.

**F. E. STAYTON**,  
Box 240, Ardmore, Okla.

Thank you for introducing me to the Bretwood Variable Grid Leak! I have installed one in my Three-Circuit Tuner, according to your instructions, and find that it does all you said it would—and more. I am now recommending the Bretwood to all my friends, and those who have used this wonder grid leak have nothing but high praise for it. The fact that it can be adapted for any hookup makes it invaluable to the experimenter.

Although I have only used the Bretwood leak for three weeks I have pulled in several of the weaker stations which were inaudible before, and the microphonic noises which were decidedly pronounced before have entirely disappeared. Please accept my best wishes for your continued success and also for the Bretwood Grid Leak.

**S. R. HUBBS**,  
180 Quincy St., Brooklyn, N. Y.

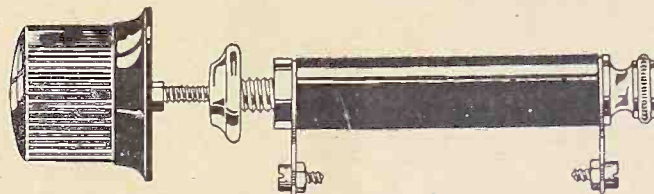
Let me say that the Bretwood Grid Leak improves the set 100%.  
**J. E. McGINNISS**,  
27 Lenox Rd., Brooklyn, N. Y.

I wish to take this occasion to thank you for your courtesy in furnishing me with your very excellent Grid Leaks. I have installed one with your Condenser on my own personal radio set, and am delighted with the results.

**R. W. DeMOTT**,  
Experimenter Pub. Co.,  
53 Park Place, N. Y. C.

I have received the Grid Leak you sent me and it is perfect. It is surely wonderful the way it works. Please send me another by return mail for a friend.

**J. F. COOPER**,  
1029 Courtlandt St.,  
Cincinnati, Ohio.



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Sole Distributors for United States

North American Bretwood Co., 145 West 45th St., N. Y. City.

Gentlemen: Enclosed find \$1.50. Send me at once one Bretwood Variable Grid Leak on 5-day money-back guarantee.

NAME .....

ADDRESS .....

CITY ..... STATE .....

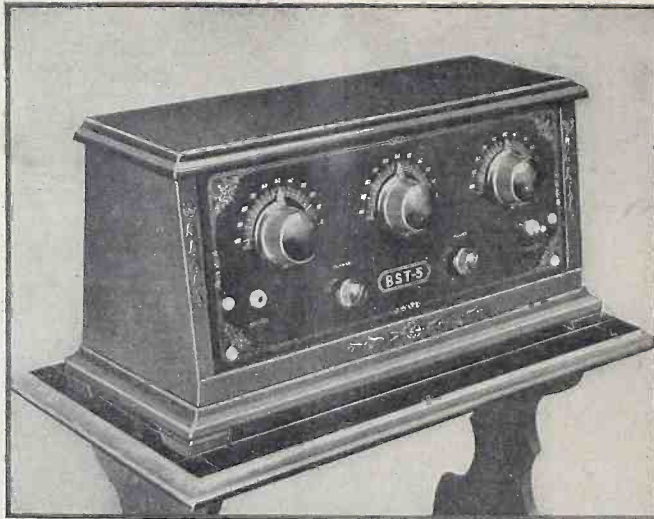
*Inquiries Solicited from the Trade*

# NOW you can afford the best in RADIO Sold on the Clark Fifty-Fifty Plan half cash--half trust

## BST-5

5-Ply Walnut  
Vernier Piano  
Finish Cabinet

Send Only **\$20**



NEW  
MODEL  
Shielded  
Receiver

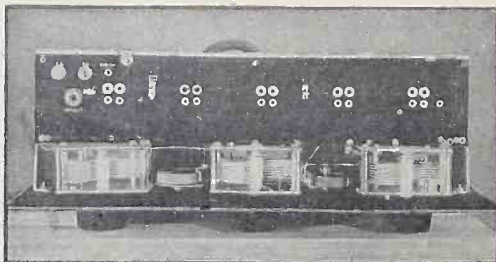
**\$40.00**

*New model cabinet base 21" long by 8" wide, height 9½", top 21" by 6".*

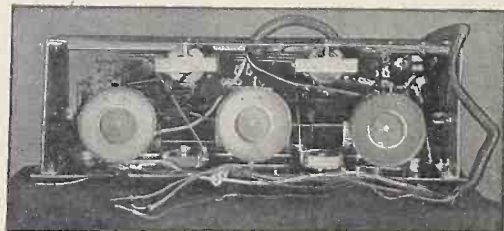
**T**HIS highly sensitive, powerful and selective BST-5 radio receiver has all up-to-the-minute improvements. Heavy aluminum automobile type chassis, shielded against stray currents and distortion. Flexible grip, Universal type sockets, eliminating microphonic noises. Has provision for battery eliminator and any power tube. Fahnestock clips on sub-panel for adjusting C battery, has voltages for power tube. Efficient on either long or short aerial, including indoor aerial. This BST-5 sets a new standard for true tone values and selectivity. This BST-5 gives greater volume than many six-tube sets and consumes less current.

### 28 Stations in 3½ Hours

Mr. E. H. Thiery, Tax Collector, New Hartford, Conn., writes: "I am well pleased with my BST. In three hours and a half on Wednesday night I got the following stations: WTIC, WJZ, WGY, WBZ, WPG, WNAC, WMSG, WEEI, KDKA, WAAM, WEAN, WSAR, WJBI, WMAC, WLWL, WJAR, WAHG, WBNY, WESH, WSN, WHK, WMCA, WRVA, WHN, WHAR, WWJ.



*Top inside view showing compact aluminum shielded indestructible chassis.*



*Bottom inside view showing improved foolproof curkoid coils and rigid construction, with complete harness for simple installation.*

**Our Offer:**—Send us your check or post office money order for \$20.00, one-half its price, try out the BST-5 in your own home for ten days, then either send us the other \$20.00, making \$40.00 in all, or return the set and we will return your \$20.00—no questions, no argument.

**GUARANTY RADIO GOODS CO.,**  
145 West 45th Street, New York City.

Gentlemen:—Ship me one BST-5, \$40.00 Radio Set, for which I enclose \$20.00 on account. I am to test it out for ten days in my own home and if satisfactory I will then send you the balance of \$20.00; but if not satisfactory to me I will return the set at the end of the ten days' trial and you are to return my \$20.00 immediately on receipt of the set without question.

NAME .....  
ADDRESS .....